The KOF Barometer, version 2013: A composite leading indicator for the Swiss business cycle*

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Abstract: This paper presents a composite leading indicator for the Swiss business cycle as measured using a growth rate cycle concept. It is the result of a complete overhaul of the KOF Barometer as published on a monthly basis by the KOF Swiss Economic Institute since 1976. In line with its tradition, the construction of the new KOF Barometer is done in two broad stages. The first stage consists of a variable selection procedure and in the second stage these variables are subsequently transformed into one leading indicator. Whereas in the previous versions of the KOF Barometer six to 25 variables survived the first stage, the new and more mechanical version of the first stage is much more generous. Out of a set of currently XXX variables resulting in XXX transformations thereof that are tested in the first stage, XXX variables currently manage to enter the second stage. The increased number of variables underlying the second stage allows a relatively stable and robust KOF Barometer that – as compared to its previous versions – no longer has to rely on filtering techniques to reduce the noise in the final indicator. In a (pseudo-) real-time analysis the characteristics of the new KOF Barometer are compared to previous versions and other alternatives.

JEL classification: E32; E37

Keywords: Business cycles; growth rate cycles; composite indicators; leading indicators; principle component analysis; real-time simulations

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1. Introduction

One of the most prominent leading indicators for Swiss business cycle developments is the KOF Barometer. It was introduced in 1976 and has in the past undergone two revisions in respectively 1998 and 2006. This paper in detail describes the third revision (to be) implemented this year, i.e. in 2013.

Whereas the 2006-version of the KOF Barometer was largely calibrated on data representing what nowadays is often labelled the Great Moderation, the Great Recession and the subsequent euro crisis have had strong effects on business cycle developments in recent years and have certainly been a challenge also for this leading indicator. Since the Great Recession, the cyclical ups and downs in the world economy appear to be occurring at a faster pace than before. Especially for the filter used in the 2006 version of the KOF Barometer, i.e. the Direct Filter Approach as described by Wildi (2008), which was calibrated on pre-crisis information, these changes in the economic environment have left its marks. Furthermore, in recent years the amount of time series information that might be helpful in explaining cyclical developments in Switzerland has substantially increased. For most, the business tendency surveys conducted by KOF Swiss Economic Institute have been broadened by including many additional branches and sectors of the Swiss economy. By now these time series have a long enough history to also be taken into account in the production of a leading indicator. Finally, the demand for receiving timely information on economic developments with a substantial news value and at the same time a high degree of transparency has substantially increased in recent years. Not only, but especially the use of the above-mentioned Direct Filter Approach gave the 2006 version of the KOF Barometer a black box character and with hindsight led to a phase shift that, albeit increased reliability in detecting turning points, reduced its leading characteristic.

Combining these elements, we therefore at the outset of this revision had the objective to – within the tradition of the KOF Barometer – develop a new version that could ideally do without a final filter. This requires a pre-filtered reduction in the noise component for instance caused by a much broader set of underlying indicators. Indeed, the new KOF Barometer fulfils these objectives and turns out to be much faster in detecting and capturing cyclical movements of the Swiss economy.

Another new objective was to define a procedure by which in the future the new KOF Barometer would be able to both learn from recent developments and allow for new variables, e.g. coming from additional surveys conducted at the KOF Swiss Economic Institute, to enter. In contrast to previous versions of the KOF Barometer in which the underlying variables did not change during the lifespan of the respective version, the new one will in an automated fashion be able to change the set of underlying variables. Hence, over the course of time different vintages of the 2013-version of the KOF Barometer will exist.

The rest of this paper is set up as follows. After giving some historical background information highlighting the traditions underlying the KOF Barometer in Section 2, the construction of the KOF Barometer, Version 2013, is explained in Section 3. Subsequently, Section 4 analyses the time series characteristics of the new KOF Barometer and compares it to its predecessors. To get a feeling for how sensitive the new KOF Barometer is to some of the decisions made and described in Section 3, some alternative versions are presented and confronted with the new KOF Barometer in Section 5. We end with some conclusions.

2. Historical background

2.1. General principles

Since its first introduction in 1976, the KOF Barometer has been designed to act as a composite leading indicator for business cycle developments in Switzerland. With revisions in 1998 and 2006, so far three versions exist and this document describes the fourth.

The 1976-version relied on the identification of underlying indicator series by both the use of cross-correlation analyses with a reference series reflecting the Swiss business cycle using data available at the time the KOF Barometer was developed and the knowledge of business cycle experts working at KOF. The year-over-year growth rate of a quarterlised GDP series was used as business cycle measure. Six variables were identified to have had a stable lead to this particular reference series.[1] Subsequently, these six indicators were low pass filtered to remove the higher frequency noise,[2] i.e. information that is not necessarily useful when measuring the business cycle. From these filtered series, the first principle component was computed. The resulting principle component, a standardised variable, was updated monthly and published in monthly press statements without further transformation. It therefore by constructing had a(n initial) mean and standard deviation of respectively zero and one. According to the press statements, it was to be interpreted as a qualitative indicator for business cycle developments in Switzerland as measured – within the concept of growth rate cycles – by year-on-year GDP growth.

In 1998 the KOF Barometer was slightly revised to ….

As for the previous versions of the KOF Barometer, also in the 2006 version the fundamental building blocks remained the identification of theoretically valid indicators series with empirically established leads before the reference series and the aggregation of these series into a composite indicator. Albeit the 2006 version kept with the tradition of using cross-correlation analysis and expert knowledge to (re-)select the variables that entered the principle component extraction procedure, two important changes were introduced. First, the moment at which and the type of filter applied did change. Instead of filtering the identified variables *before*, it was move to *after* the principle component analysis. More importantly, to circumvent (large) revisions in the KOF Barometer caused by the low-pass filter used (the so-called end point problem), the revision-free Direct Filter Approach of Wildi (2008) was introduced.

Second, particular sectors whose business cycles appear to have not moved synchronised with that of the major part of the Swiss economy were treated separately. In that way, for the financial sector, the construction sector and remaining (by far largest) part of the Swiss economy separate reference series were defined that allow the selection of underlying indicators using cross-correlation analyses

[1] These were three monthly time series from the KOF manufacturing industry survey (the annual change of incoming orders, the change of the order backlog compared to the previous month and the expected purchase of intermediate goods) as well as three quarterly series (the judgement of wholesale inventories, the real order backlog in the construction sector compared to the previous year and the evaluation of the financial situation in the coming 12 months from the Seco consumer sentiment survey).

[2] Note that all six underlying time series are stemming from qualitative tendency surveys. The qualitative answers are quantified using the so-called balance statistics, i.e. the difference between the percentage good/increase and the percentage bad/decrease answers. Conceptionally, these qualitative survey results therefore do not contain a trend.

and expert judgement. The three modules – financial, construction and core – are subsequently aggregated to the KOF Barometer using their value added shares (Graff, 2010).

2.2. Reflections on the KOF Barometer revision released in 2006

The choice of the three sectoral modules in the 2006-version of the KOF Barometer was based on the consideration that they should be particularly useful to identify those sectoral cycles that are characterised by pronounced deviations from the overall business cycle. Given the data available in 2005, the only two sectors that were identified with both a significant share in GDP and no significant correlation with the overall Swiss business cycle were "construction" and "financial intermediation without FISIM" (NOGA 65).[3] The third module consists of all remaining sectors and with more than 90 per cent of total value added was labelled "core GDP".

The 2006-version of the KOF Barometer addressed the end point (revision) problem by abandoning the smoothing procedure for the indicator series with a symmetrical low pass filter. Instead, it referred to unfiltered indicators and applied an asymmetrical low pass filter at the final stage to the aggregated Barometer, the so-called Direct Filter Approach. Although the end point problem that plagued the previous generations of the KOF Barometer was basically eliminated, this came with a price. The Direct Filter Approach induced a phase shift of up to one quarter reducing the leading characteristics of the final KOF Barometer significantly.

On top of this, the leading correlations of the underlying variables observed when setting up the 2006-version of the KOF Barometer have reduced over time. Similar as with previous versions of the KOF Barometer, also the 2006 version referred to a relatively informal selection procedure to find the variables for its modules. This procedure rested on both statistical information (cross-correlation analysis) as well as expert judgement. By its very nature, this implies that whenever an underlying variable seizes to be published, or simply loses its leading properties, the quality of the final indicator deteriorates.

3. Construction of the 2013 version of the KOF Barometer

3.1. Objectives of the revision

Due to changes of the economic links and patterns, indicator models that are designed to forecast economic developments based on observed correlations in the past, tend to have a limited life span. The KOF barometer is no exception.[4] During the last seven years, the world economy has gone through unique events that certainly affected economic developments also in Switzerland. The selection of variables that was optimal in 2006 is likely to be different nowadays. An important objective of this revision is to set up a mechanism that would allow a standardised updating of the selection of variables now and in the years to come. In that way not only changing economic relationships but also the in the mean-time realised and for the future further expected increase in available time series reflecting business cycle conditions in Switzerland can be incorporated using a pre-set mechanism. The use of such a pre-determined procedure is expected to increase the lifespan

[3] According to international convention, the value added of "financial intermediation" includes so-called "financial intermediation services indirectly measured" (FISIM), which, due to construction, are highly correlated with overall economic value added. After subtracting the FISIM the resulting "independent" financial sector business cycle was no longer significantly correlated with the Swiss business cycle.

[4] Also in the past, this was the driving reason for revising the KOF Barometer.

of this particular version of the KOF Barometer substantially. Furthermore, by allowing many more variables to enter the final construction step we expect to increase the robustness and stability of the KOF Barometer.

Previous versions of the KOF Barometer always relied on specific filtering techniques to increase the signal-to-noise ratio. Whereas in the first two versions the use of a symmetrical low-pass filter led to the so-called endpoint problem, i.e. caused substantial revisions of the most recent observations of the KOF Barometer in the cause of time, the Direct Filter Approach used in the 2006-version introduced a large amount of complexity giving the KOF Barometer a black-box character. The use of these filters therefore is in conflict with two of our objectives: the KOF Barometer should be produced in a transparent way and should not be prone to substantial revisions.

Other objectives are very much in line with the tradition of the KOF Barometer. This composite leading indicator should reflect upcoming business cycle movements for the Swiss economy. By focusing on providing leading information on the business cycle we aim to signal turning points (peaks and troughs) between economic expansions and downturns at an early stage.

As for previous versions of the KOF barometer, the two building blocks are a) identification of theoretically valid indicator series with empirically established leads before a reference series reflecting the Swiss business cycle and b) aggregation of these series into a composite indicator. By allowing hundreds of variables to enter the aggregation procedure, i.e. many more series than in the past,[5] the importance of the principle component analysis within the overall constructing method has increased substantially.

3.2. Principle components analysis

We adopt the basics of the traditional approach, the quantification of a not directly measurable process by means of a bundle of indicators reflecting the underlying process, as well as the extraction of the joint variance of the indicators as the first principle component.

The central idea of principal component analysis is to reduce the dimensionality of a large set of interrelated variables, while retaining as much as possible of the variance present in the data set. The first principal component is the linear combination of the variables, having maximum variance. In that sense the purpose of principal component analysis is the reduction of dimensionality whilst retaining as much information (variation) as possible of the original variables.

In connection with time series analysis Stock and Watson (2002a) suggest cross-sectional principal component analysis as a method to estimate dynamic factor models in cases with a large number of variables. In Stock and Watson (2002b) they apply this approach to forecast eight monthly U.S. macroeconomic time series using 215 variables.

3.3. Business cycle measurement

To make sure that all variables that enter the principle component analysis contain a substantial amount of information regarding the latent variable, i.e. the Swiss business cycle, we need a selection procedure. In light of the tradition of the KOF Barometer, this is largely done based upon a cross-correlation analysis and requires defining a so-called reference series that reflects the business

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[5] Note that the original KOF Barometer contained six variable which was over time expanded to 22 variables in the 2006-version.

cycle concept we have in mind, i.e. an ex-post realisation of our latent variable. Hence, before describing the selection procedure underlying the new KOF Barometer we first need to clarify in somewhat more detail what we mean with the Swiss business cycle and how we try to ex post measure it.

Business cycles are recurrent sequences of alternating phases of expansion and contraction among many economic activities (Burns and Mitchell, 1946). The business cycle reflects the common information and synchronicity simultaneously observed in different branches and demand components. In practise, the term “business cycle” turns out to be somewhat ambiguous as it can refer to conceptually three different ways of measuring economic fluctuations. In the seminal work of Burns and Mitchell (1946), the so-called *classical cycle* is used. It looks at the fluctuations in the level of economic activity. The *growth cycle*, or *deviation cycle*, focuses on fluctuations in economic activity around its potential. Finally, the *growth rate cycle* concentrates on fluctuations in the growth rate of economic activity (see Proietti, 2005 for more details).

Using obviously simulated data, Figure XXX shows these three concepts in case of an output measure that tends to increase over time. The classical cycle can be directly derived from this output measure. Peaks are found mid-2002 and mid-2007; troughs in mid-2004 and mid-2009. To construct the growth or deviation cycle a trend measure is needed which is subsequently subtracted from the output measure. This results in peaks in early 2002 and early 2007; troughs in early 2004 and early 2009. Hence, in case of an upward trend, the growth cycle leads the classical cycle.[6] The growth rate cycle in turns uses growth rates of the output measure. To construct growth rates two data points over time are compared. As a consequence there are several ways in which growth rates can be calculated. One common way is to compare the current month with the same month one year ago. This results in the year-over-year (y-o-y) growth rate. Another option is to compare the current month with the previous month, i.e. the month-over-month (m-o-m) growth rate. Either case will result, in the artificial example depicted in Figure XXX, in a lead against both the growth and the classical cycle. Furthermore, in this example, the m-o-m growth rate shows turning points about half a year sooner than y-o-y growth rates.

The KOF Barometer is intended to detect turning points as fast as possible. As in the previous versions of the KOF Barometer, we will therefore adopt the concept of growth rate cycles, i.e. expansions (contractions) are identified by increasing (decreasing) growth rates.

While the previous KOF Barometer did use the year-on-year growth rate of GDP as reference series to reflect the growth rate cycle, the new instrument targets the same concept using a more current growth rate like the quarter-over-quarter or even the month-over-month growth rate. As these latter ones are known to lead the former, the task to find leading indicator series is now harder than before.

The obvious candidate to measure output is seasonally adjusted GDP. GDP data is also in Switzerland published at a quarterly frequency. The KOF Barometer, however, is a monthly indicator. In the selection stage therefore a monthly reference series is needed. To accomplish this, the level of

[6] Furthermore, in case the trend is strong enough (relative to the variance of the series) peaks and troughs in the classical cycle might occur quite infrequently making this concept also in such a situation less attractive.

seasonally adjusted GDP is interpolated using the Denton additive method.[7] This procedure assures that the monthly observations add up the published quarterly value. These monthly GDP series allows the construction of growth rates at a monthly frequency.

A disadvantage of using m-o-m or q-o-q growth rates is the high volatility of this data. Measurement errors, weather effects, working day effects, and other distortions have sometimes a huge effect on these changes. These figures can also be quite sensitive to the chosen seasonal adjustment procedure. This often makes the underlying business cycle development to become less visible in these data. The aim of the KOF Barometer is to signal the underlying business cycle – not high frequency fluctuations triggered by for example distortions. Therefore, the reference series is smoothed in a very transparent way. We apply a common symmetric Henderson 23 months moving average to our monthly observations.[8] The average is centred on the observation at time *t*. The Henderson filter can be seen as a low-pass filter. The cut-off period of the Henderson 13 term filter is 8.06. That means for a monthly time series that the filter preserves 50% or more of cycles 13.49 months log or longer. Cycles shorter than this are reduced to less then 50% of strength in the filtered series.

Figure XXX shows – using the GDP vintage as published by the SFSO and SECO in the summer of 2012 – the different (filtered) growth rates than can be used to proxy for the Swiss business cycle.

Although the filtered growth rates all look very similar, they differ in one aspect. The m-o-m growth rates have a lead over the q-o-q growth rates which in turn lead the y-o-y growth rates.

While the previous KOF Barometer did use the year-on-year growth rate of the reference series, the new instrument targets the growth rate cycle underlying the month-over-month GDP growth rates. As the latter is shown to lead the former, the task to find leading indicator series is now harder than before.

As in the past, the aim of this new generation of KOF Barometers is to be a forward-looking indicator for the Swiss business cycle as measured using the growth rate cycle concept. In the new KOF Barometer, however, this concept is operationalized by using the centred moving average of the seasonally adjusted monthly real growth rate of Swiss GDP as constructed out of the quarterly statistics released by the State Secretariat for Economic Affairs (SECO) after the first release of the annual System of National Accounts by the Swiss Federal Statistical Office (SFSO) as reference series.

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[7] The objective of the Denton additive method is to temporal distribute the quarterly values to a monthly frequency in such a way that it keeps the difference between the estimated monthly series and an indicator series as constant as possible, subject to quarterly constraints. Since in the present case a constant is used instead of an indicator the additive Denton method is similar to the Boot, Feibes, Lisman first-difference approach. For a discussion of various methods for temporal disaggregation see Chen (2007).

[8] A common method for smoothing time series is local polynomial fitting (see e.g. Fann and Yao, 2003). Local polynomial estimators are determined by three ingredients: the order of the ap- proximating polynomial, the size of the neighborhood, also known as the bandwidth, and the weighting, or kernel, function. The Henderson arises as particular case of a local cubic fit. It can beshown that the kernel function oft he Henderson filter can be seen as a discrete approximation of the triweight kernel (see Kenny and Durbin, 1982).

3.4. The selection of variables

3.4.1. The pre-selection of the pool of potential indicators

All information about the pool of available indicators is presented in Table XXX. It provides the description of the variables including acronyms from original databanks (internal databanks at KOF as well as Datastream).

Indicators are available both at the monthly and quarterly frequencies. The monthly indicators are used as they are, whereas the quarterly indicators are converted to monthly frequency by assigning the value in a given quarter for all months in this quarter. For those indicators that can be assumed to be I(0), both levels and changes (three- and twelve-month differences for monthly indicators and one- and four-quarter differences for quarterly indicators) are used in the selection procedure. For those indicators that are considered I(1), only transformations based on absolute or relative changes are allowed.

Table XXX contains the information about the sign of correlation between of indicator and reference time series that is exogenously determined based on experts' opinion.

As might be expected, some of the indicator series are affected by seasonality, and practically all series show evidence of noise. Whereas we shall not try to increase the signal-to-noise ratio by sending the indicator series through low pass filter as this is bound to lead to instability at the current edge of the indicators, we do – in a very transparent way – correct for obvious seasonality. For that, seasonal patterns are estimated during the reference period and kept constant until the reference period is changed, which is scheduled to take place on an annual basis (in September). Regarding irregular movements in the indicator series, our method refers to a large number of indicators, and assuming that noise are uncorrelated across these many indicators, these should more or less cancel out in the final module estimates. In particular, if the indicators that enter into the sectoral modules are measured independently, a considerable part of the noise should be taken care of by the principle component extractions that identify the common variance of the indicators, i.e. the sectoral cycles, rather than the noise and idiosyncrasies that are particular to specific indicators.

Furthermore, though economic indicators are usually quantitative data, the series from the KOF surveys are mostly qualitative. These can be quantified as plus, minus and equal and as the balance (percentage plus less percentage minus). Depending upon the survey question at stake, a potential indicator series Xt can be transformed into quarterly differences (Xt – Xt–1). Whereas taking first differences of series that result out of questions that refer to changes over time can be questioned[9], it does make perfect sense to do so for so-called assessment (i.e. level) questions.

[9] For instance, in a cyclical upswing firms will at its start increasingly answer that production as compared to the previous period has increased. Hence, the first difference of this change question will have lead. However, if a new production plateau is reached, i.e. the peak is not followed by a cyclical downswing, this first difference will already signal a downswing that has not and depending upon the economic environment for the time-being also might not materialise. This potentially leads to overshooting in both directions and can be considered to be (potentially) spurious.

3.4.2. The automated selection procedure

After these transformations, the set of pre-selected leading indicators is narrowed down by in sample cross correlations of the indicators (all transformations) with the reference series, where the sign of the correlation has to match its pre-determined realisation, based on economic judgement. On this basis, we identify the phase shift to the reference series that maximises the correlation in absolute terms. Then we sort the potential indicators by their lead in quarters. After that, the set of potential indicators is limited to those where the highest correlation in absolute terms can be observed at pre-specified leads of the indicator series before the reference series of at least two quarters.

To ensure that the information conveyed by the same original series enters only once, we apply the following algorithm:

An original series can enter only once. In particular, only one transformation of each variable is admitted, i.e. in case of survey data either plus, minus or the balance. We exclude the equal share, as its informative content is questionable. Moreover, on the time scale, we admit either the level, or the first difference in either the non-seasonally adjusted or seasonally-adjusted form.

An information overlap could also occur when results from the KOF survey are used at different aggregation levels. To avoid a complete information overlap only a part of all available data is used in the procedure forming the barometer. The selected aggregation level differs between sectors and is shown in Table XXX.

For all transformations of the underlying information, the selection criterion is the strength of the absolute cross correlation. However, as we are faced with a trade-off between the strength of the correlations |r| between indicator X and reference series R and the lead of the former be-fore the latter (L), we define our loss function and select the “best” transformation T(X) of any original series only according to.

Max T:sqrt(L(T(X))+1) r (T(X, R))

After that, the variance of the synchronised leading indicators is collapsed into a composite indicator as the first principle component (see Section XXXX)

The aim of the indicator selection procedure is to select variables that are ideally with a substantial lead highly correlated with the reference series. The indicator selection procedure consists of several steps listed below:

Prior to initialising the indicator selection procedure, indicators, for which the values for September are not yet released due to publication lag, are shifted forward to achieve a balanced panel at the end of the sample. The information on publication lag is imposed in September of the current year and kept fixed until September of the next year. It is possible that in the period from October until August the publication of some indicators is delayed, interrupted or abolished. These results in missing values for the latest month(s). These missing values are substituted with the last available value for this indicator.

The selection procedure is based on estimated sample cross-correlations between a candidate indicator and the reference time series. The sample size for computing cross-correlations is set to a

10-year sliding window, introduced for the sake of reduction in dependence on distant past observations. This allows us timely update of the pool of leading variables. A variable is selected into the pool of leading variables if the following criteria are met:

- Maximum (absolute) cross-correlation between an indicator and the reference time series is found at the lead range specified between XXX and YYY.
- The computed cross-correlation surpasses a certain threshold. The threshold level can be set both in indicator- and period-specific manner.
- We use the following result stating that sample cross-correlations at lag h between two independent stationary time series has the asymptotically normal (AN) distribution , where r_y(j) and r_x(j) are the respective autocorrelations at lag j, and T denotes the sample size, see Brockwell and Davies (1987, p. 400). Observe that the use of indicator-specific autocorrelations implies that the variance of the asymptotic distribution and derived relevant threshold values under the null hypothesis of independence are also specific for each indicator. We allow for maximum order of autocorrelation function equal to XXX lags.
- The sign of the cross-correlation complies with the exogenously imposed sign restrictions. The sign restrictions imply that we use one-tailed test for those indicators for which these sign restrictions are explicitly specified and two-sided test for those indicators without sign restrictions.
- Since cross-correlations are computed for combinations of different transformations (level and changes) and different presentations (e.g., for surveys we consider net balances, shares of positive and negative answers) of the same indicator, we allow only for one form through which a given indicator is selected into the pool of leading indicators. Since various forms differ in magnitude of computed maximum absolute cross-correlations and the recorded leads we use the following utility function that helps us select a single form in which the indicator is selected: $U = \begin{cases} \left|\hat{r}_{yx}^{\max}\right| & if \quad lead = 0 \\ \left|\hat{r}_{yx}^{\max}\right| (\left|lead\right| + 1)^{p} \left(\dfrac{lead}{\left|lead\right|}\right) & if \quad lead \neq 0 \end{cases}$, where the exponent parameter p is arbitrary set. This utility function is necessary to address a trade-off between the size of cross-correlation and the lead, as it is typical that larger cross-correlations occur at smaller leads, implying that in order to get advantage in terms of leading properties of individual as well as ultimate (the KOF Barometer) indicator one has to sacrifice the strength of cross-correlation. An indicator form with the highest value of the utility function U is selected into the pool of leading indicators.

3.5. Yearly updates in September

In the construction of the new KOF Barometer as a reference series the seasonally adjusted quarterly real growth of Swiss GDP as released by the State Secretariat for Economic Affairs (SECO) after the first release of the annual System of National Accounts by the Swiss Federal Statistical Office (SFSO) is utilized.

Each year in summer the Swiss Federal Statistical Office (SFSO) publishes a new vintage of the Swiss annual System of National Accounts (SNA). Based upon that, SECO revises the quarterly SNA. As these releases often imply substantial revisions in past data, this is also for us a natural moment to update our reference series and run the automated process to select the variables that go into the KOF Barometer. As a consequence, every year in September a new vintage of the KOF Barometer (based upon this 2013 methodology) will be released.[10]

There are two reasons why each new vintage of the KOF Barometer can lead to revisions in past values. First, the information window that we use is shifted by one year. Hence, one year of new information will be added and (in case the analysis window would thereby exceed 10 years) the oldest year will be removed. Changed economic relationships will thereby be reflected. Second, existing GDP data might be revised potentially causing relationships to change.[11] For both reasons the set of selected indicators underlying the KOF Barometer might change each September.

3.6. The construction of new KOF Barometer values before 2002

3.7. Comparing the new KOF Barometer with other major composite leading indicator in the world.

The construction of a composite indicator with principal component methods used in this work is in line with the work of Stock and Watson (2002a, 2002b). However, in this paper special emphasis is laid on the selection and pre-selection of the indicator variables. A large number of variables is selected in a systematic way. The system is a prerequisite for the automatic annual update of the composite indicator.

The composite leading indicators of the OECD and of the Conference Board rely on comparatively small sets of variables. These variables are "hand-selected". [12] In 2013 the OECD composite leading indicator for Switzerland consists of five variables. These are three time series resulting from the KOF business tendency surveys (assessment of stock of finished goods in manufacturing, tendency of order inflow in manufacturing, production tendency in manufacturing), one times series from the SECO consumer survey (expected economic situation), the UBS 100 share price index and the silver prices. This parsimony is not a flaw in general. However, it implies that economic experts continuously monitor the suitability of each variable. If problems are identified, variables have to be replaced with others. Given the importance of the KOF Barometer and the institutional surrounding in Switzerland, the new KOF Barometer tries to reduce the impact of economic experts. The composition of the barometer and is construction should be very transparent and to some extend non-subjective. This is why the number of variables is larger and strict rules for variables selection has been formulated.

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[10] The reference series underlying the 2006-version of the KOF Barometer was published on XX.XXX.XXXX and – in order to circumvent the use of according to the SFSO preliminary data – used data that ended at the end of XXXX. Once the underlying indicators were hand-selected, no revisions thereof were implemented.

[11] Note that any data revisions in the variables underlying the KOF Barometer will instantaneously result in revisions of the KOF Barometer. Experience tells that these revisions in the kind of (survey) data we use for the KOF Barometer are in general very minor.

[12] See OECD (2012) for a description oft he selection process.

Again, the decision of the KOF to reduce the influence of economic experts does not mean that this procedure is preferable in general. Also with a "hand-picked" set of variables one can construct suitable composite indicators. Other examples of such indicators are the leading indicators published by the Conference Board.[13] Their leading indicator for the U.S. economy consists of ten variables which were selected after an intense selection process.

On the other range of the spectrum of composite indicators are indicators which us even much more variables to form the composite indicator than the new KOF Barometer. On example is Eurocoin, an indicator published by the Centre for Economic Policy Research and the Banca d Italia.[14] Eurocoin is a cyclical indicator for euro area economy and includes almost 1000 variables. Compared to this the new KOF Barometer is more restrictive regarding the variables included. The KOF Barometer relies to a large extend on Swiss and international business surveys and includes only a small fraction of other variables.

A similarity of the new KOF Barometer and the Eurocoin indicator is that both focus on the "medium to long run growth" as reference series[15], removing short term fluctuations in the monthly GDP growth rates. In this sense both the new KOF Barometer and Eurocoin are indicators for the underlying month-to-month growth rate cycle. They are both not intended to target raw growth rates.

4. Characteristics of the KOF Barometer in (pseudo-) real time

4.1. Comparing the new KOF Barometer with its reference series

4.2. Turning point analysis

4.3. Comparing the new KOF Barometer with versions 2006 and 1998

4.4. (Performance in forecasting GDP)

5. Robustness checks

5.1. The lack of a modular structure

5.2. The relevance of higher order principle components

5.3. The consequences of using a different referent series

5.4. Dynamic factor analysis as alternative for the second stage

6. Conclusions

The KOF Barometer is designed to be a quantitative composite leading indicator for the Swiss business cycle. The principle building blocks are a) the identification of theoretically valid indicators with empirically established leads to the reference series and b) the aggregation of these series into a composite indicator. Thus, we adopt the basics of the traditional approach, the quantification of a

[13] See: http://www.conference-board.org

[14] See: http://eurocoin.cepr.org

[15] For the calculation of the reference series for the Eurocoin indicator see Altissimo et al. (2007).

not directly measurable process by means of a bundle of variables reflecting the underlying process, as well as the extraction of the joint variance of these variables as the first principle component.

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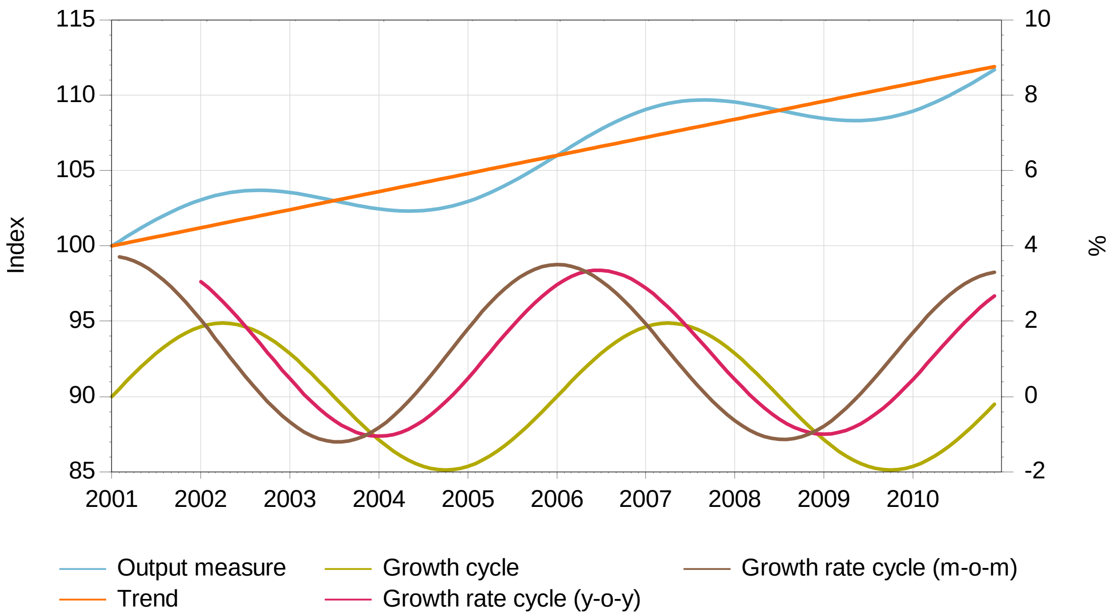
Figures

Figure 1: Concepts of business cycles



Tables

Appendices