Outline I

1. Business Cycles
2. Collecting Potential Indicators
3. Analyzing Individual Indicators
4. Composite Indicators
5. Publication of Composite Indicators
6. Forecasting with Indicators
Outline

1 Business Cycles
   - Reference
   - Types of Cycles
   - Time Series
     - Hodrick-Prescott Filter (H-P Filter)

2 Collecting Potential Indicators

3 Analyzing Individual Indicators

4 Composite Indicators

5 Publication of Composite Indicators

6 Forecasting with Indicators
The phenomena with which business cycles may be confused are 
(1) changes in business conditions which occur between the dates 
of “crises,” (2) fluctuations which affect a minor portion of the eco-
nomic activities of a business community, (3) fluctuations which recur 
every year, and (4) the less definitely established secondary trends 
and “long waves.” From the first of these related species, business 
cycles are distinguished by the fact that each cycle includes one wave 
of rising and falling, or falling and rising activity, whereas the inter-
vals between “crises” often include two and some times include three 
such waves. From the second species, business cycles are distin-
guished by their wider inclusiveness. From the third species they are 
distinguished by not recurring annually. From the fourth species 
they are distinguished by their briefer time-span.
Reference Series

To assess the quality of business cycle indicators reference series are needed. Usually Gross Domestic Product (GDP) is used as reference. In the absence GDP of synthetic activity measures or indicators of key parts of the economy (e.g. industrial production) could be considered.
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The reference series should

- be reliable
- contain a broad/important range of economic activity
- be in a quarterly or monthly frequency
What is a business cycle?
Types of Cycles

Different Cycles

- Classic Cycle
Types of Cycles

Different Cycles

- Classic Cycle
- Growth Cycle
Types of Cycles

Different Cycles

- Classic Cycle
- Growth Cycle
- Growth Rate Cycle
Why is there a trend development?

What drives growth?

- Population
Why is there a trend development?

What drives growth?

- Population
- **Capital accumulation**
Why is there a trend development?

What drives growth?

- Population
- Capital accumulation
- Technical progress
Time Series Composition

Additive Model

Additive components model:

\[ y_t = m_t + k_t + s_t + \epsilon_t, \quad t = 1, \ldots, n, \]

with

- \( m_t \) trend component
- \( k_t \) cyclical component (business cycle)
- \( s_t \) seasonal component
- \( \epsilon_t \) irregular component
Trend estimation with Filters

A conventional definition of business cycle emphasises fluctuations of between about 1.5 years and 8 years. Longer fluctuations are regarded as trend. Shorter fluctuations contain short term fluctuations, weather effects, random effect, measurement errors etc.

One way to extract the smooth component and the business cycle is the application of filters like the Hodrick-Prescott filter and the Baxter-King filter.
Example: Euro Area Manufacturing Production

Index (2010=100)

Seasonal and working day adjusted

Eurostat
Example: Growth of Euro Area Manufacturing Production
Example: Growth of Euro Area Manufacturing Production
Example: Euro Area Manufacturing Production

Hodrick-Prescott Filter of prod

Cyclical component (deviations from trend)
Outline

1. Business Cycles

2. Collecting Potential Indicators
   - Characteristics of good indicators
   - Search for potential indicators
   - Composite Indicators
   - What others do

3. Analyzing Individual Indicators

4. Composite Indicators

5. Publication of Composite Indicators

6. Forecasting with Indicators
Searching for Indicators

Characteristics of good indicators:

- meaningful und reliable
Searching for Indicators

Characteristics of good indicators:

- meaningful and reliable
- timely available
Searching for Indicators

Characteristics of good indicators:

- meaningful and reliable
- timely available
- after publication no big revisions
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- leading or coincident for the business cycle, so that timely signals are given
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Characteristics of good indicators:

- meaningful und reliable
- timely available
- after publication no big revisions
- leading or coincident for the business cycle, so that timely signals are given
- stable relationship with the reference series
- clear signal with minor noise
Types of Indicators

Indicators can be divided into

- leading indicators
Types of Indicators

Indicators can be divided into

- leading indicators
- coincident indicators
Types of Indicators

Indicators can be divided into

- leading indicators
- coincident indicators
- lagging indicators
Potential indicators

Potential leading indicators are classified to one of four types of economic rationale, shown below, that can be used to assess their suitability as leading indicators.

- *Early stage*: indicators measuring early stages of production, such as new orders, order books, construction approvals, etc.
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- **Early stage**: indicators measuring early stages of production, such as new orders, order books, construction approvals, etc.

- **Rapidly responsive**: indicators responding rapidly to changes in economic activity such as average hours worked, profits and stocks.
Potential indicators

- **Expectation-sensitive:** indicators measuring, or sensitive to, expectations, such as stock prices, raw material prices and expectations based on business survey data concerning production or the general economic situation/climate e.g. confidence indicators.
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- **Prime movers**: indicators relating to monetary policy and foreign economic developments such as money supply, terms of trade, etc.
Search for possible Indicators

The list of possible indicators should contain the following information:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Source</th>
<th>Notes</th>
<th>Meaning</th>
<th>Frequency</th>
<th>Publication lag</th>
<th>Revisions</th>
<th>Date first publication</th>
</tr>
</thead>
</table>

In column "Meaning" one should identify why this indicator could be important for the economy (e.g. is an important sector with high value added)

Later this table is expanded with results from statistical analyses.
Composite Indicators

The advantage of composite indicators over the individual component series is that they achieve a better trade-off between responsiveness and stability. Composite indicators can be constructed to have fewer false alarms and fewer missed turning points than its individual components; moreover they tend to have more stable lead-times. Finally, the composites have the capacity to react to various sources of economic fluctuations and at the same time can be resilient to perturbations affecting only one of the components.
What others do: OECD

Look at the different country indicators. There are various types of indicators. E.g.:

- Production, stock of orders, employment, unfilled job vacancies, new car registrations, housing starts, nights spend in hotels
- Business tendency surveys
- Consumer surveys
- Various price figures and share prices, terms of trade, exchange rate, silver price
- Interest rates (spreads), bank credits
- Indicators of other countries

.... and much more.
Purpose of the OECD Composite Leading Indicators

The objective of the OECD Composite Leading Indicators is to provide “qualitative indicators of the business cycle outlook for the short term future”.

So what means

- **business cycle?**
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So what means

- business cycle?
- qualitative?
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So what means
- business cycle?
- qualitative?
- short term?
Purpose of the OECD Composite Leading Indicators

- **Business cycle**: Deviation from trend in GDP (since 2012, before deviation from trend in industrial production).
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- Qualitative: By design the indicators are primarily aimed at identifying turning-points but also tries to identify phases in the cycle and, albeit to a lesser extent, the acceleration/deceleration of the business cycle. The qualitative focus means that the indicators are not optimized for precise numeric forecasting. There is also a risk that one would intuitively interpret higher peaks and lower troughs as stronger/weaker growth. However, such conclusions may be misplaced, because the indicators are not optimized in this way.
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- Short term: The indicators are designed to have a typical lead of between 6 and 9 months. However, in practice the timeliness of data releases affects information lead times.
Building Blocks of OECD Composite Leading Indicators

- From the candidate component series factors like seasonal pattern, outliers, trend and noise (applying the HP-filter) are removed.

- Candidate series are standardized.

- Assessment of components (turning point analysis with Bry-Boschan procedure, cross-correlations).

- Calculation of composite indicator (equal weighting of components) and assessment (turning points, cross-correlations).
What others do: OECD

Stable growth momentum in the OECD area

Easing growth in China

Stable growth momentum in the United States

Positive change in momentum in the Euro area
The Conference Board

- This indicator approach originated in the mid-1930s at the National Bureau of Economic Research (NBER) with the work of Wesley Mitchell and Arthur Burns.
- Starting in the late 1960s, the U.S. Department of Commerce began publishing the composite indexes.
- In late 1995, the indicator program was privatized and The Conference Board took over.
The Conference Board leading indicator for the U.S. uses the following data:

- Average weekly hours, manufacturing
- Average weekly initial claims for unemployment insurance
- Manufacturers’ new orders, consumer goods and materials
- ISM new orders index
- Manufacturers’ new orders, non-defense capital goods excl. aircraft
- Building permits, new private housing units
- Stock prices, 500 common stocks
The Conference Board

- Leading Credit Index
- Interest rate spread, 10 year Treasury bonds less federal funds
- Avg. consumer expectations for business conditions

Standard deviations of monthly changes of the variables are used to calculate a weighted average of the variables.
The Conference Board

The Conference Board coincident indicator for the U.S. uses the following data:

- Employees on nonagricultural payrolls
- Personal income less transfer payments
- Industrial production
- Manufacturing and trade sales
The Conference Board U.S. Coincident Indicator

Note: Shaded areas represent recessions as determined by the NBER Business Cycle Dating Committee.

Source: The Conference Board
The Conference Board U.S. Leading Indicator

The Conference Board U.S. Leading Indicator

The Conference Board Leading Economic Index® (LEI) for the U.S.
The Conference Board Coincident Economic Index® (CEI) for the U.S.

Peak: 60:4  69:12  73:11  80:181:7  90:7  01:3  07:12
Trough: 61:2  70:11  75:3  80:782:11  91:3  01:11  09:6

Note: Shaded areas represent recessions.
Source: The Conference Board
The Conference Board

Construction of Conference Board composite indicators. The components (variables) are

- Seasonal adjusted
- Deflated
- Volatility adjusted
- Aggregated
- In some cases trend adjusted (the leading indicator is adjusted to the trend of the coincident indicator)
- An index is calculated
KOF Economic Barometer

Indicator for the Swiss business cycle. Relies strongly on economic tendency survey results, but not entirely. Uses Swiss indicators and foreign indicators.
KOF Economic Barometer: History

- 1976 Version

Reference series: de-trended real GDP
Number of variables selected: 6 (construction, manufacturing (2x), labour, money, stocks)

1998 Version
Reference series: real y-o-y growth in GDP
Number of variables selected: 6 (all from Business Tendency and Consumer surveys)

Variables were low-pass filtered and then the first principal component was extracted.
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  - Number of variables selected: 25
  - For each module the first principle component was extracted
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  - Number of variables selected: 25
  - For each module the first principle component was extracted
  - Aggregate is filtered using end-point stable Direct Filter Approach (DFA) of Wildi (2008)
KOF Economic Barometer: Construction of the 2014 Version

- Objectives

- No longer use a filter for smoothing
- Broaden the set of underlying time series
- Define a standardized procedure to select variables (Automatize and regularly apply the variable selection procedure)
- Two production stages
  - Variable selection procedure
  - Choose business cycle concept
  - Define reference series
  - Pre-select the pool of potential variables
  - Fix the automated selection procedure
- Construction of the leading indicator (extract the first principle component from the selected variables)
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KOF Economic Barometer: Reference Series

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KOF Economic Barometer: Candidate Variables

- International variables: currently 32 variables
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- KOF Business Tendency Surveys (411)
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- National variables: currently 444 variables
  - KOF Business Tendency Surveys (411)
  - SECO Consumer Survey (9)
KOF Economic Barometer: Candidate Variables

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  - KOF Business Tendency Surveys (411)
  - SECO Consumer Survey (9)
  - BFS, SECO, OZD, SNB (24)
KOF Economic Barometer

Economic Barometer and Reference Series

- KOF Economic Barometer
  (Index values; long-term average 2004–2013=100; left scale)

- Month-on-month change of the Swiss business cycle
  (Reference series; SECO/KOF, right scale)
When we have collected a list of indicators, we have to look for each series whether we need a seasonal adjustment.
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- seasonal adjustment
- data transformation of filtering.
Outline

1 Business Cycles

2 Collecting Potential Indicators

3 Analyzing Individual Indicators
   - Cross-Correlation
   - Turning Points

4 Composite Indicators

5 Publication of Composite Indicators

6 Forecasting with Indicators
Ifo Business Climate and Cyclical Component of Real GDP

1) Standardized.
Cross Correlogramm: Ifo Business Climate and Cyclical Component of real GDP

Correlation Coeffizient \( \rho \)


Lead of the Ifo Business Climate in Quarters
Algorithm for dating turning points

Harding, Pagan: Minimum needs for an algorithm

1. Determination of a potential set of turning points i.e. the peaks and troughs in a series.
2. A procedure for ensuring that peaks and troughs alternate.
3. A set of rules that re-combine the turning points established after steps one and two in order to satisfy pre-determined criteria concerning the duration and amplitudes of phases and complete cycles; what we will refer to as “censoring rules”.
Example

Turning Points of the German Business Cycle and Ifo Business Climate

1) Standardized values

Source: Statistisches Bundesamt, ifo Konjunkturtest.
Example

Turning Points of Real Value Added in Manufacturing in Germany and Ifo Capacity Utilization

- 1) Standardized values
- 2) Including food
- 3) Smoothed with local weighted polynomial regression

Source: DESTATIS, Ifo Business Cycle Test.
Outline

1  Business Cycles

2  Collecting Potential Indicators

3  Analyzing Individual Indicators

4  Composite Indicators
   - Motivation
   - Classical Approach (NBER)
   - Factor Analysis

5  Publication of Composite Indicators

6  Forecasting with Indicators
Approaches

Question:
How can we condense information contained in various indicators into one (or at least in a view) indicator(s)?

- Classical (NBER)
- Factor analysis and Principal Components
Steps in Classical Approach

- Choose and classify indicators (detrending, cross-correlations, turning points, co-spectral analysis)
- Standardize indicators
- Average indicators (and standardize)
Factor Models

These models consider that a common force drives the dynamics of all variables. This common force, also known as common factor, is typically of low dimension and is not directly observed because every macroeconomic variable embodies some idiosyncratic noise or short term movements. Factor models clean every variable from these idiosyncratic movements and estimate the common component in every series.
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Publication of Composite Indicators

Aims

- Inform the public
- Make the data valuable for the audience

How?

- Define a publication strategy with
  - Public publication calendar
  - Media/Press releases and maybe other outlets (reports)
  - Publication of data
Paris, 11 January 2016
OECD Composite Leading Indicators
News Release

Composite leading indicators continue to point to stable growth momentum in the OECD area

Composite leading indicators (CLIs), designed to anticipate turning points in economic activity relative to trend, continue to point to stable growth momentum in the OECD area as a whole but to diverging patterns across major emerging economies.

The outlook is for stable growth momentum in the Euro area as a whole, particularly in Germany and Italy, as well as in Canada and Japan. In France, the CLI signals growth firming.

In the United Kingdom and the United States, the CLIs point to easing growth, albeit from relative high levels.

Amongst the major emerging economies, the CLIs for China and Brazil confirm the tentative signs of stabilisation flagged in last month’s assessment. In Russia, the CLI anticipates growth losing momentum while the CLI for India signals firming growth.

Stable growth momentum in the OECD area

Tentative signs of stabilisation in China

Easing growth in the United States

Stable growth momentum in the Euro area

The above graphs show country specific composite leading indicators (CLIs). Turning points of CLIs tend to precede turning points in economic activity relative to trend by approximately six months. The horizontal line at 100 represents the trend of economic activity. Shaded triangles mark confirmed turning points of the CLI. Blank triangles mark provisional turning points that may be reversed.

Methodological Notes:
The CLI methodological notes are available at: www.oecd.org/std/leading-indicators/44728410.pdf
Watch our video explaining the CLIs: https://www.youtube.com/watch?v=UY8IIPWG5bA

Contacts:
For further information journalists are invited to contact the OECD’s Media Relations Division on (33) 1 45 24 97 00 or e-mail news.contact@oecd.org.
For technical questions contact stat.contact@oecd.org.

Next release: 8 February 2016
Paris, 11 January 2016
OECD Composite Leading Indicators
News Release

Stable growth momentum in Japan
Growth firming in France
Stable growth momentum in Germany
Stable growth momentum in Italy
Easing growth in the United Kingdom
Tentative signs of stabilisation in Brazil
Stable growth momentum in Canada
Growth firming in India
Growth losing momentum in Russia

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Paris, 11 January 2016  
OECD Composite Leading Indicators  
News Release  

Table 1: Composite Leading Indicators*  

<table>
<thead>
<tr>
<th>Ratio to trend, amplitude adjusted</th>
<th>Month on Month change</th>
<th>Year on Year change</th>
<th>Growth cycle outlook</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jul</td>
<td>Aug</td>
<td>Sep</td>
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<td>OECD Area</td>
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<td>Euro Area</td>
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<td>Major Five Asia**</td>
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<td>Major Seven</td>
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** China, India, Indonesia, Japan and Korea.

*** The reference series for China is the Index of Industrial Production.
KOF Economic Barometer: A Further Dip

In December, the KOF Economic Barometer recorded a small dip of 0.7 points (from a revised value of 97.3) to a new reading of 96.6. According to the Barometer, a slightly dimmed outlook for the Swiss economy persists.

As in the previous month, the fall of the KOF Economic Barometer in December was mainly driven by a deterioration of sentiments related to Swiss manufacturing activity, indicating that the lasting effects of the franc shock are not over yet. Further negative tendencies are observed in indicators related to construction activity (especially among architects) as well as those related to private consumption. These negative tendencies are partly counterbalanced by an improving outlook for indicators related to foreign demand and the financial industry.

Within the manufacturing sector, the outlook improved in the mechanical engineering as well as in the textile industry. Slightly positive tendencies are observed in electrical, paper, and wood-processing industries. These positive tendencies are clouded by the worsening outlook especially in the metal industry as well as the food-processing and special industries. As a result, the manufacturing sector contributes negatively to the dynamics of the Barometer. The deterioration of sentiment in manufacturing is primarily reflected in the assessment of production and new orders. At the same time positive impulses come from indicators related to the assessment of employment and intermediate products.

---

KOF Economic Barometer (Index values)

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KOF Economic Barometer (long-term average 2005–2014 = 100)

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KOF Economic Barometer and reference time series: annual update

In September 2015, the scheduled annual update of the KOF Economic Barometer took place. This annual update concerns the following stages: redefinition of the pool of indicators that enter the selection procedure, update of the reference time series, a new execution of the variable selection procedure and a technical adjustment how to cope with missing monthly values of quarterly variables. Compared to 479 indicators that entered the variable selection procedure in October 2014, the current pool comprises 420 indicators due to elimination of KOF surveys related to prices and monthly changes in inventories. The updated reference series is the smoothed continuous growth rate of Swiss GDP according to the new System of National Accounts ESVG 2010, released at the end of August 2015, which takes into account the release of the previous year’s annual Gross Domestic Product (GDP) data by the Swiss Federal Statistical Office. As a result of the indicator variable selection procedure, the updated KOF Economic Barometer is now based on 238 indicators (instead of 217 as in the previous vintage) that are combined using statistically determined weights. Last but not least, with this annual update we introduce a slight modification of how the variables observed at only the quarterly frequency are treated when computing the Barometer. Instead of freezing those values until the next quarterly release is available, we now implement a statistical procedure to interpolate data values for these variables using the information contained in all other variables that are available at monthly frequency.

For detailed information on the new version of the KOF Economic Barometer see:


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David Iselin | Phone +41 44 632 53 44 | iselin@kof.ethz.ch
Elements of a media release

- Headlines
- First paragraph
- Text
- Graphs
- Tables
- Contact
Outline

1. Business Cycles
2. Collecting Potential Indicators
3. Analyzing Individual Indicators
4. Composite Indicators
5. Publication of Composite Indicators
6. Forecasting with Indicators
   - Motivation
Month 1
Month 2
Month 3
Month 4
Month 5
Month 6
Month 7
Month 8
Month 9
Quarter I
Quarter II
Quarter III
GDP/National Account
Flash Estimate t+45

Time
?? casting

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Forecasting exercise

- Backcasting
- Nowcasting
- Forecasting
Composite Indicators

- Leading indicators
- Coincident indicators (but publication lead)
Composite Indicators: Uses

- Nowcasting
- Short term forecasting (e.g. next quarter)
- (Backcasting, revision prediction)
The nowcast of GDP has been produced by the dynamic factor model suggested in Giannone et al. (2008). The model has been estimated using 555 indicators related to the Swiss economy that are sub-divided into the following 9 blocks: Purchasing Managers Index in manufacturing supplied by Credit Suisse (9 time series, "PMGR"), consumer price indices (28, "CPI"), labor market indicators (6, "LABOUR"), producer price indices (11, "PPI"), business tendency surveys in manufacturing collected at the KOF Swiss Economic Institute (150, "CHINOGA"), exports and imports (249, "TRADE"), stock market indices (79, "STMKT"), interest rates (20, "INT.RATE"), and exchange rates (3, "EXCH.RATE"). The forecasting performance of the model was investigated in Siliverstovs and Kholodilin (2012) in a pseudo real-time simulation setup. Siliverstovs (2012) investigates the forecasting performance of the model in real time.

Table 1 reports several most recent vintages of real GDP growth [quarterly, seasonally adjusted]. Table 2 reports the most recent nowcast for the current quarter and tracks record of past nowcasts and first releases of GDP growth by SECO. Figures 1, 2 and 3 display real-time nowcasts for the years 2010-2011, 2012-2013 and for 2014 together with the first quarter of 2015, respectively. SECO estimates of GDP growth are shown by straight lines (a bold line corresponds to the first release for a particular quarter).

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# Quarterly GDP Growth

## Target Nowcast Actual (SECO) |

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Macroeconomic model consisting of Error Correction Models and equations to ensure consistency. This model is used for quarterly forecasts of various variables up to two years. Consistency of the model forecasts is crucial.

Nowcasting and short term forecasting with indicator model. These forecasts are used to adjust the model forecasts in the short term.