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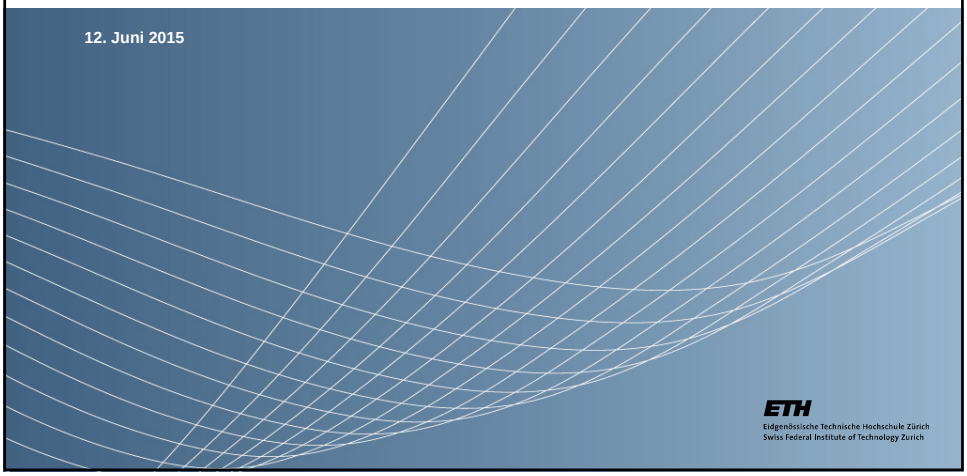
The Use of Ever Increasing Datasets in Macroeconomic Forecasting

Prof. Dr. Jan-Egbert Sturm

12. Juni 2015



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Macroeconomic Forecasting Methods

- Indicator approach
  - Business tendency surveys
  - Buildings permits
  - Job advertisements
  - ...
- Econometric approaches
  - Time series econometrics
  - Structural econometric models

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KOF Business Tendency Surveys

- Manufacturing (M, Q)
- Construction (M, Q)
- Project Engineering (M, Q)

- Wholesale Trade (Q)
- Retail Trade (M)

- Gastronomy (Q)
- Hotel Business (Q)

- Banks (M, Q)
- Insurances (M, Q)
- Other Financial Services (M, Q)

- (Non-financial) Service Sectors (Q)

- KOF Consensus Forecast (Q)
- KOF Investment Survey (H)
- KOF Innovation Survey (2 years)

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KOF Business Tendency Surveys

1. Business situation

a) We judge our business situation overall as

☐ good ☐ satisfactory ☐ poor

b) Over the last 3 months*, our business situation has

☐ improved ☐ remained unchanged ☐ deteriorated

c) Over the next 6 months*, our business situation will

☐ improve ☐ remain unchanged ☐ deteriorate

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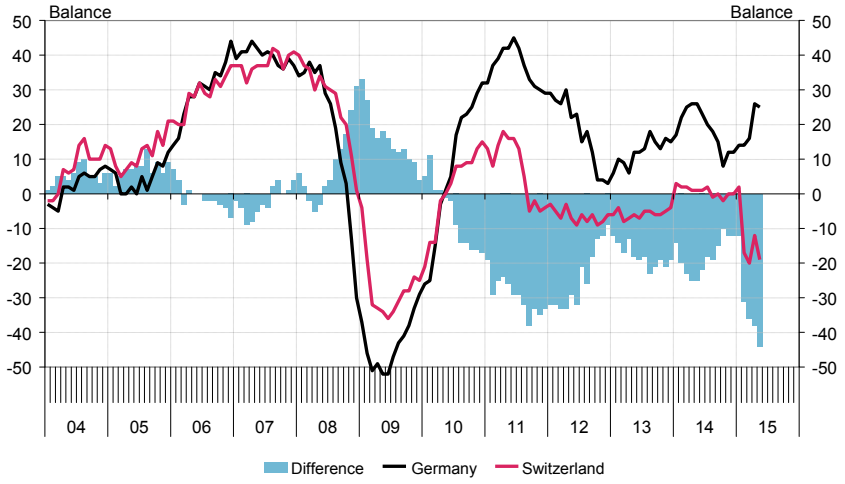
Business Situation Assessment in German and Swiss Industry



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Indicators and Forecasts at KOF

Indicators

- KOF Economic Barometer
- KOF Business Situation Indicator
- KOF Surprise Indicator
- KOF Employment Indicator
- KOF Monetary Policy Communicator
- KOF Baublatt Indicator
- KOF Globalisation Index
- KOF Youth Labour Market Index

Forecasts

- KOF International Forecasts
- KOF Forecasts for Switzerland
- KOF Forecasts for Swiss Health Care Expenditures
- KOF Forecasts for Tourism in Switzerland
- Joint Economic Forecast for Germany
- Forecasts for the Construction Sector (Euroconstruct)
- Forecasts for Europe (EEAG)

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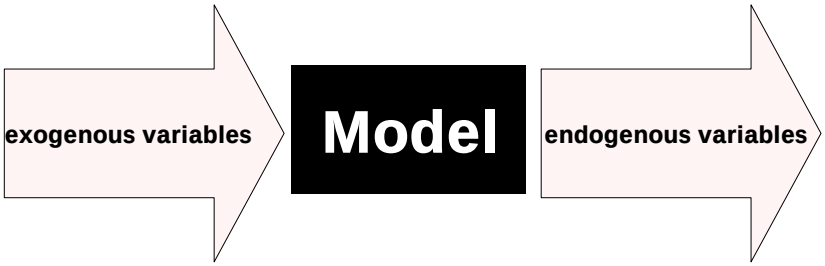
Econometric Approaches



- Examples
  - autoregressive estimation approaches (time series)
    - Estimate an equation like: $C_t = \alpha + \beta C_{t-1} + \varepsilon_t$
  - theory-based estimation approaches (structural models)
    - Estimate equations like: $C_t = \gamma + \delta Y_t + u_t$
      $I_t = \eta + \theta r_t + v_t$
      $Y_t = C_t + I_t$

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KOF Macroeconometric Model

- The KOF macroeconometric model nowadays consists of
  - approximately 300 equations,
  - of which about 50 are behavioural equations
  - and is continuously being updated with new data allowing for changes in the behavioural equations
- (Smaller-scaled) models of the area experts are used to
  - provide estimates of “exogenous” variables
  - verify and adjust/update the macroeconometric model
- Currently we are working on a (large-scale) Bayesian VAR model
  - using priors coming from the area experts
  - producing confidence intervals for all variables

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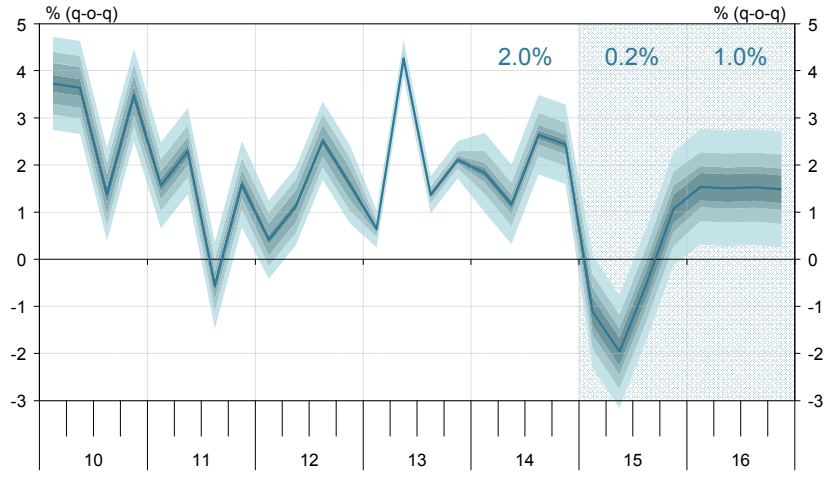
Swiss GDP: KOF forecast and data/forecast revisions

Reference: SECO release after 1st SFSO release



Sources: SECO, KOF

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KOF Economic Barometer

- Many composite leading indicators for business cycle developments exist around the world
  - OECD – Composite Leading Indicators for 47 countries/regions
  - The Conference Board – Leading Economic Indices for 13 countries
  - CEPR/Banca d'Italia – EUROCOIN
  - Many others – mostly at the national level
- Commonalities
  - Reference series needed
  - Selection of variables needed
  - Aggregation method needed
- Relationships and data availability changes over time
  - Once in a while an overhaul is needed
    - This is done at an ad hoc basis and is often time consuming
      - KOF Economic Barometer Versions: 1976, 1998, 2006, 2014

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Construction of the 2014 version

- Objectives
  - No longer use a filter for smoothing by broadening the set of underlying time series
  - Define a standardized procedure to select variables
    - Automatize and regularly apply the variable selection procedure
- Three production stages
  - Preparation phase (done once)
    - Choose business cycle concept, define the reference series, and define the automated selection procedure
  - Variable selection procedure (repeated annually)
    - Pre-select the pool of potential variables
    - Apply the automated selection procedure
    - Calculate the weights using principle component analysis
  - Construction of the leading indicator (repeated monthly)
    - Construct the monthly indicator using the extracted weights

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Comparing the 2006 and 2014 Versions

Version 2006

- Reference series:
  - y-o-y GDP growth
- Variable selection procedure
  - Cross-correlation analysis
  - Expert knowledge
    - Limited # var. selected
  - No updating procedure
- Construction process
  - Principal component analysis
  - Filter to smooth indicator
    - The selected filter assures that only revisions in the underlying variables cause revisions in the KOF Barometer

Version 2014

- Reference series:
  - smoothed m-o-m GDP growth
- Variable selection procedure
  - Cross-correlation analysis
  - Automated selection process
    - Large # var. selected
  - Updated yearly
- Construction process
  - Principal component analysis
  - No filtering
    - Only data revisions in the underlying variables cause revisions in the KOF Barometer (within a vintage)

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Pre-selection of potential variables
(2013 vintage of the 2014 Version)

- International variables: currently 32 variables
  - Concentrate on the 11 most important trading partners
    - 1 Business tendency & 1 consumer survey question per country
  - Ifo World Economic Survey, assessment and expectations for 5 regions
- National variables: currently 444 variables
  - KOF Business Tendency Surveys (411)
  - SECO Consumer Survey (9)
  - BFS, SECO, OZD, SNB (24)
- For each of these variables we determine all
  - sensible transformation (level, log level, quarterly difference, monthly difference, annual difference, balance, positive, negative) (4356)
  - theoretically expected sign of the correlation with the reference series
- Except for year-over-year differences, X12-ARIMA is used to seasonally adjust all variables and their transformations.

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Automated selection procedure

- A variable has valid observations throughout the defined (10-year) observation window used in the cross-correlation analysis.
- The sign of the cross-correlation complies with the exogenously imposed sign restriction.
- Only those variables are retained, for which the maximum (absolute) cross-correlation is found at the lead range specified between 0 and 6 months.
- The computed cross-correlation surpasses a defined threshold.
- Of those transformations that survive, we take the one that optimizes:
  - max $U = |r^{max}| \times \text{sqrt}(h^{max} + 1)$
- Finally, the variance of these variables is collapsed into a composite indicator as the first principal component.
  - This first principal component is standardised to have a mean of 100 and standard deviation of 10 during the observation window.
  - (Dynamic factor analysis approach of Giannone et al. (2008) results in basically the same – using 2013 vintage, the correlation equals 0.998)

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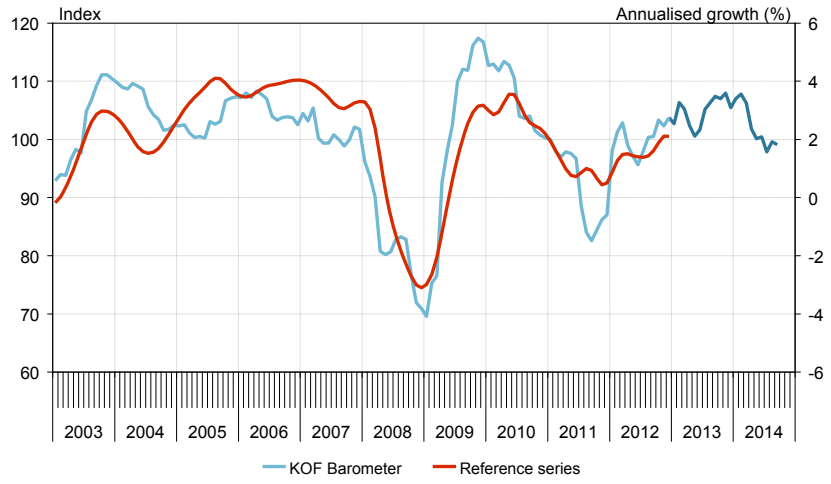
Reference series and KOF Barometer



Sources: KOF, SECO

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Yearly updates in September

- Swiss quarterly SNA is published by SECO
- Swiss annual SNA is published by SFSO
  - Every summer a new vintage is released
  - This vintage contains the first release of previous year's growth by the SFSO
- The subsequent quarterly release of SECO incorporates this annual information

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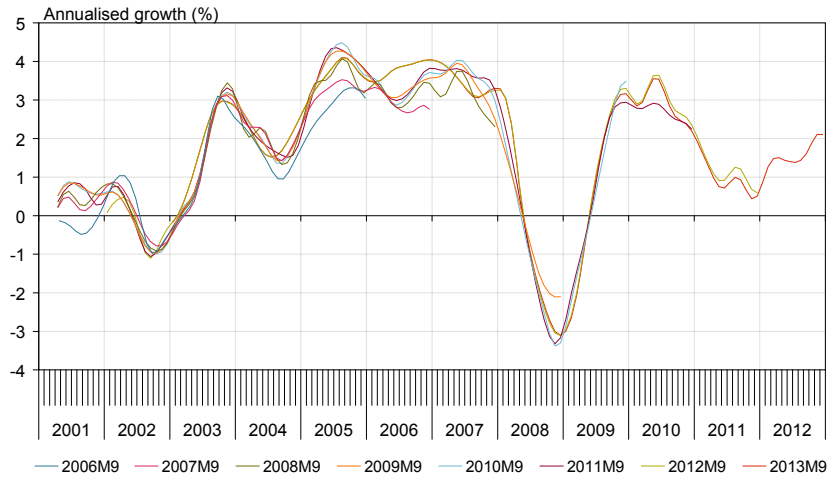
Different vintages of the reference series



Source: SECO

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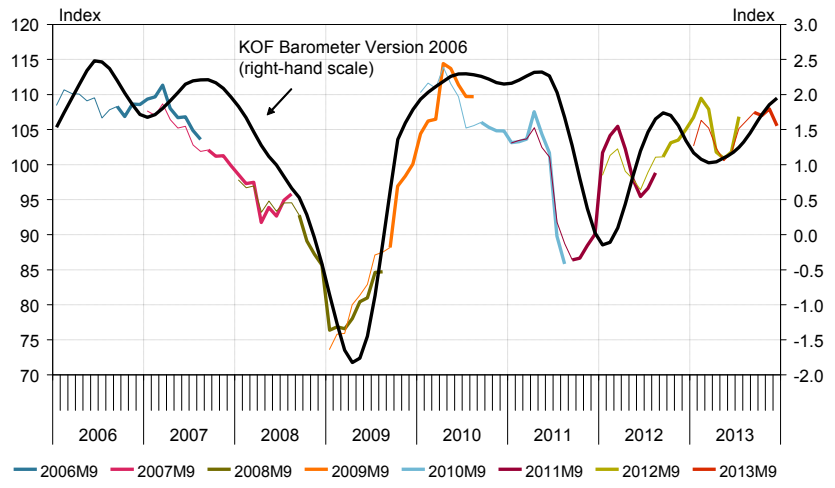
Pseudo real-time vintages of different versions of the KOF Barometer



Source: KOF

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Reasons for revisions between vintages

1. The 10-year reference window is shifted by one year.
2. Existing GDP data might be revised.
3. New variables might become available and some might no longer be published.

- Consequently, the set of variables selected and their loading coefficients might change from one vintage to another.
  - That is, we allow the composite indicator to learn using a largely automatised procedure

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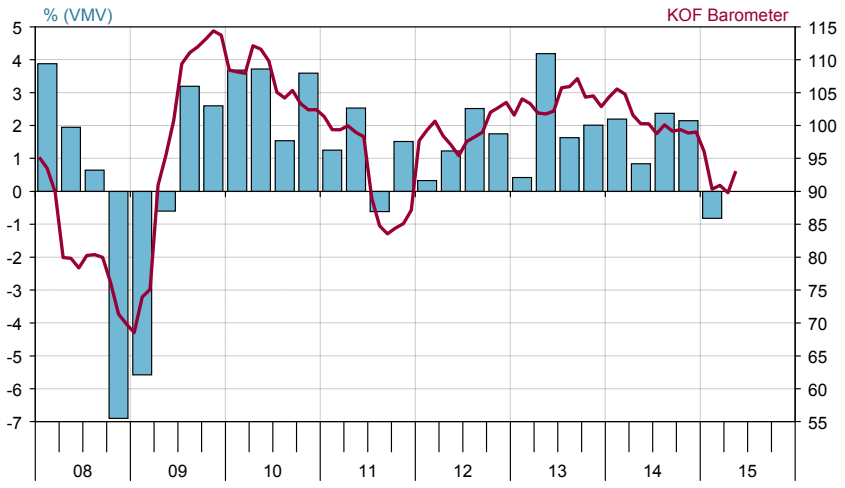
Bruttoinlandprodukt und KOF-Barometer



Sources: Seco, KOF

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Conclusions

- Forecasts and Indicators have become more data intensive
  - More and more time series have become available
    - KOF Economic Barometer uses about 5000 different time series
  - Computation time have gone down substantially
    - techniques to use this have been, and continue to be, developed
    - Estimating large-scale Bayesian VAR models
- Macroeconomic theory have become more micro-based
  - Macroeconomic researchers are more and more using firm-, consumer- and product-specific information
    - KOF Surprise Indicator (firm-specific information)
    - Research using product data from Swiss Customs Administration

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