



100 YEARS
UNDERSTANDING
AND SHAPING
THE GLOBAL ECONOMY

Advanced Studies Program | Kiel, 31 March 2015

Business Cycle Forecasting: The Endurance Test for (Macro-) Economics

Stefan Kooths
Forecasting Center

Outline

- The Forecasting Center
- The art of forecasting
- The Kiel Economic Outlook for Germany
- A remark on monetary policy

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The Forecasting Center at the Kiel Institute



Foresight: The overarching theme

If something cannot go on forever, it will stop.

Herbert Stein

Forecasting Center: Think Tank Mission

- Regular business cycle forecasts
 - » Quarterly: World, European, and German economy (2-year horizons)
 - » Half-yearly: Medium-term projections for Germany (5-year horizon)
 - ⇒ **Independent input for policy makers**
- Policy debate
 - » Extensive analysis of economic situation: delivering data interpretation, informing the public
 - » Evaluation of current stance of economic policy
 - ⇒ **Bridging the gap between short-run effects and long-run outcomes**
- Consulting projects

Kieler Konjunkturgespräche and key forecasting networks

- KKG
 - » Bi-annual international business cycle conferences in Kiel and Berlin
 - » Most important platform to share the research outcomes and to discuss global macroeconomic issues
 - Forecasters
 - Policy makers
 - Business leaders

- European networks
 - » AIECE
 - » EUROFRAME
 - » Member of ECB's professional forecasters

Consulting: Policy-related research projects (1/2)

- European Parliament
 - » „Monetary policy dialogue with the ECB“ (regular consultancy)
- Government of Dubai
 - » “Medium-term Economic Plan for Dubai 2011-2015”
- Egyptian Center for Economic Studies
 - » „Developing a Model to Enable Scenario Building for the Egyptian Economy”
- Federal Ministry for Economic Affairs and Energy (BMWi):
 - » “Das europäische Verfahren zur Vermeidung und Korrektur makroökonomischer Ungleichgewichte – Auswertung der bisherigen Erfahrung und mögliche Reformansätze”

Consulting: Policy-related research projects (2/2)

- Federal Ministry of Finance (BMF):
 - » “Finanz- und Wirtschaftspolitik bei einer anhaltenden monetären Expansion”
 - » “Weiterentwicklung des Ländermonitoring”
 - » „Unternehmens- und Vermögenseinkommen als Fortschreibungsindikator für die veranlagte Einkommensteuer“ (joint with RWI and ifo)
- State of Schleswig-Holstein
 - » „Evaluierung und Weiterentwicklung der Methodik der Ermittlung des Trendsteuerpfades und der Fortschreibung des Trendsteuerpfades “
 - » „Abschätzung von Bandbreiten als Risikoszenarien für die Entwicklung des Trendsteuerpfades“
- Bundervereinigung Logistik (BVL)
 - » „Logistik-Indikator“ (ongoing, quarterly)

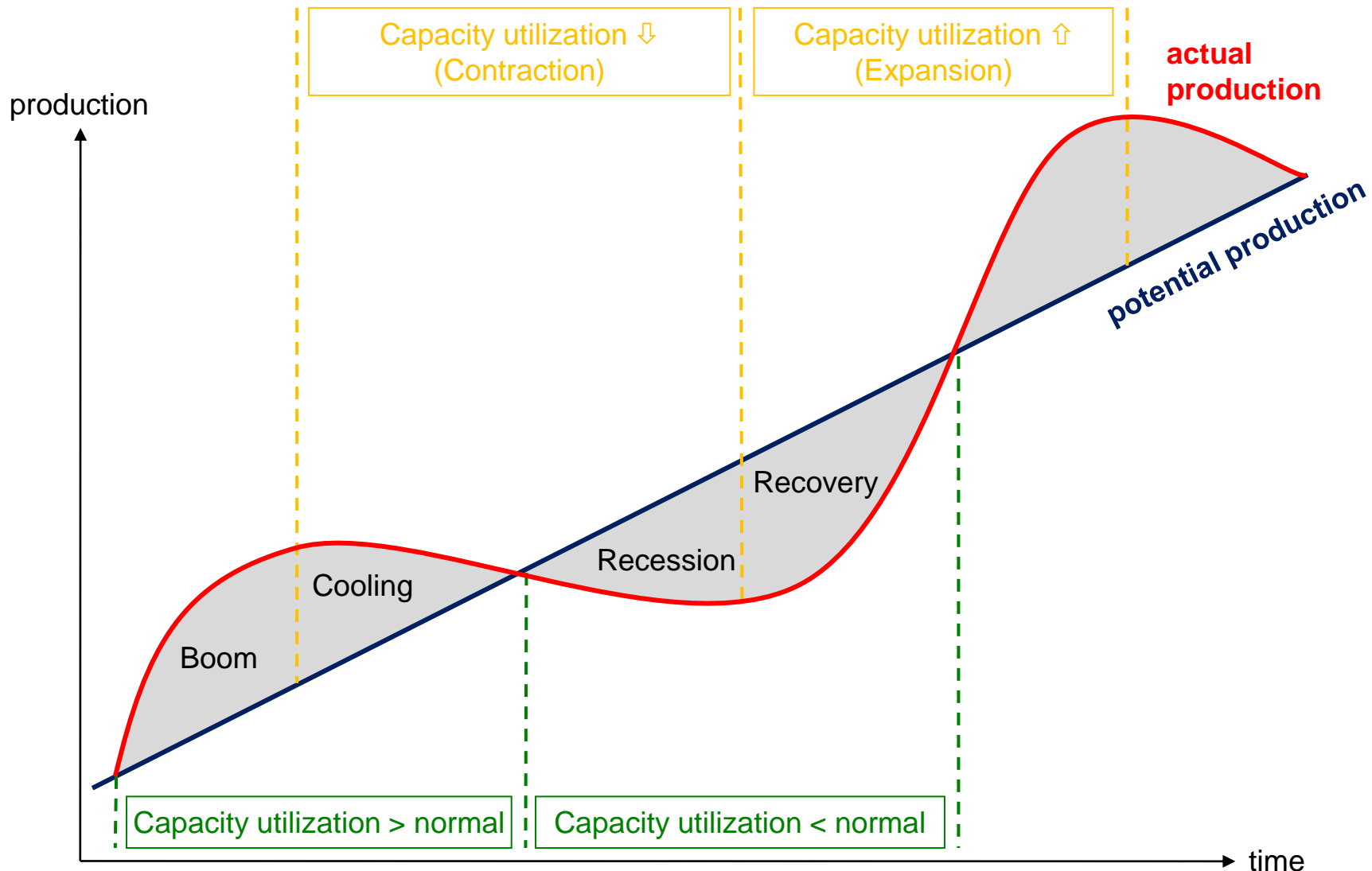
GES contributions (FC-session organizers)

- “The Global Economic Outlook”
(Klaus-Jürgen Gern and Stefan Kooths)
- “Escaping the Medium-Income Trap”
(Klaus-Jürgen Gern)
- “Macroeconomic Surveillance”
(Martin Plödt and Jens Boysen-Hogrefe)
- “The Future for Global Money”
(Stefan Kooths)

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Economic growth and the business cycle: Potential production (long-run) vs. capacity utilization (short-run)



Disentangling cycle and trend

- Interpretation:
Deviations from trend interpreted as ...
 - » ... output gap (fluctuations in capacity utilization)
 - » ... technology shocks („real business cycles“)

⇒ **Theory matters!**

- Methodology:
Smoothing actual production
 - » Direct: Statistical filtering (e.g. HP-Filter)
 - » Indirect: Estimating an aggregate production function (Cobb-Douglas)

⇒ **Econometrics matter!**

National Accounts

- Fundamental framework for empirical macroeconomics
- System for recording economic flows and stocks
 - » Activity (production, use, distribution)
 - » Sectors (companies, pr. households, government, RoW)
 - » Industries, products, ...
 - » Key: Knowledge of concepts and pitfalls (knowing the data)
- Global harmonization
 - » UN: System of National Accounts (SNA)
 - » EU: European System of Accounts (ESA), derived from SNA

Epistemology: Science vs. coffee cup

- Science-based \neq precision
- Methodological fundamentals
 - » Formulating regular patterns (hypotheses)
 - » Describing application conditions (diagnosis)
 - ⇒ Inter-subjective understanding of forecasts
- Theory: Are there economic laws?
 - » Models should not cover all details of the real world
 - » Key problem: structural breaks at the data edge
- Applicability
 - » Imperfect measurement of economic activity
 - » Assumptions/settings remain indispensable
- Problem of endogeneity (expectation formation)

The business of business cycle forecasting

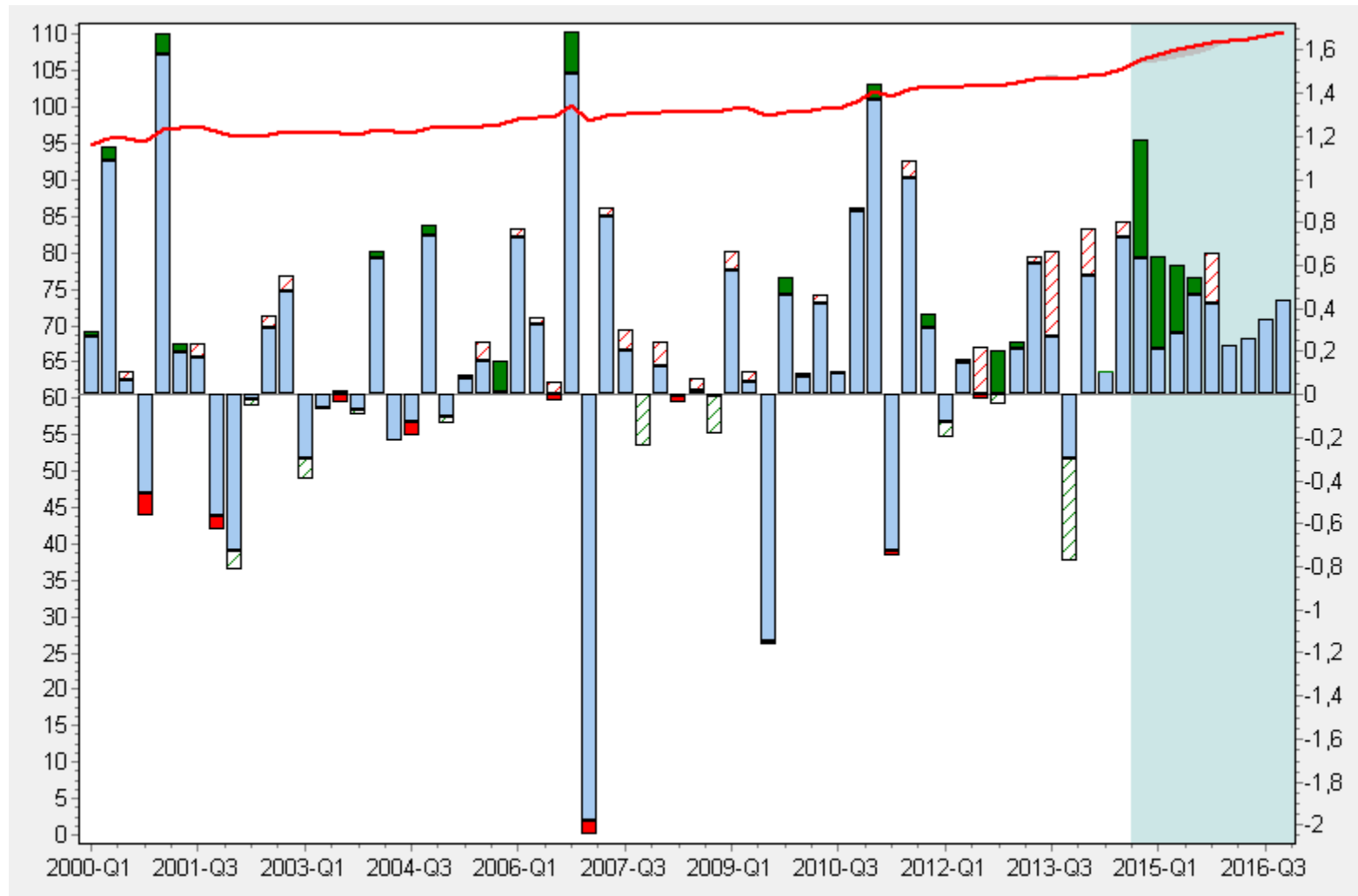
- General assessment of short-term economic trends
 - » Fluctuations of economic activity
 - » Forecasting horizon up to 3 years (beyond: medium-term projections)
 - » Data edge: Flash estimates
- Components
 - » Diagnosis of the current economic situation
 - » Assumptions on key driving forces
(e.g. raw material prices, exchange rates, monetary/fiscal policies)
 - » Time series forecasts for a comprehensive battery of variables
(e.g. GDP, inflation rate, employment, ...)
 - » Explanations („Story telling“)
 - » Scenarios and policy simulations

Key data source: National accounts

- Frequency: Quarters
 - » Flash announcement (GDP): 4 to 5 weeks
 - » Components (use/production): 7 weeks
- Revisions
 - » Ongoing: Up to 3 years
 - » Major: Every 5 years
 - » Methodological (NA framework): Approx. every 15 years
- Regional national accounts: „VGR der Länder“

Data revisions: Private consumption spending in Germany

As of 2014-Q3 vs. 2014-Q2, seasonally and working-day adjusted



Data interpretation

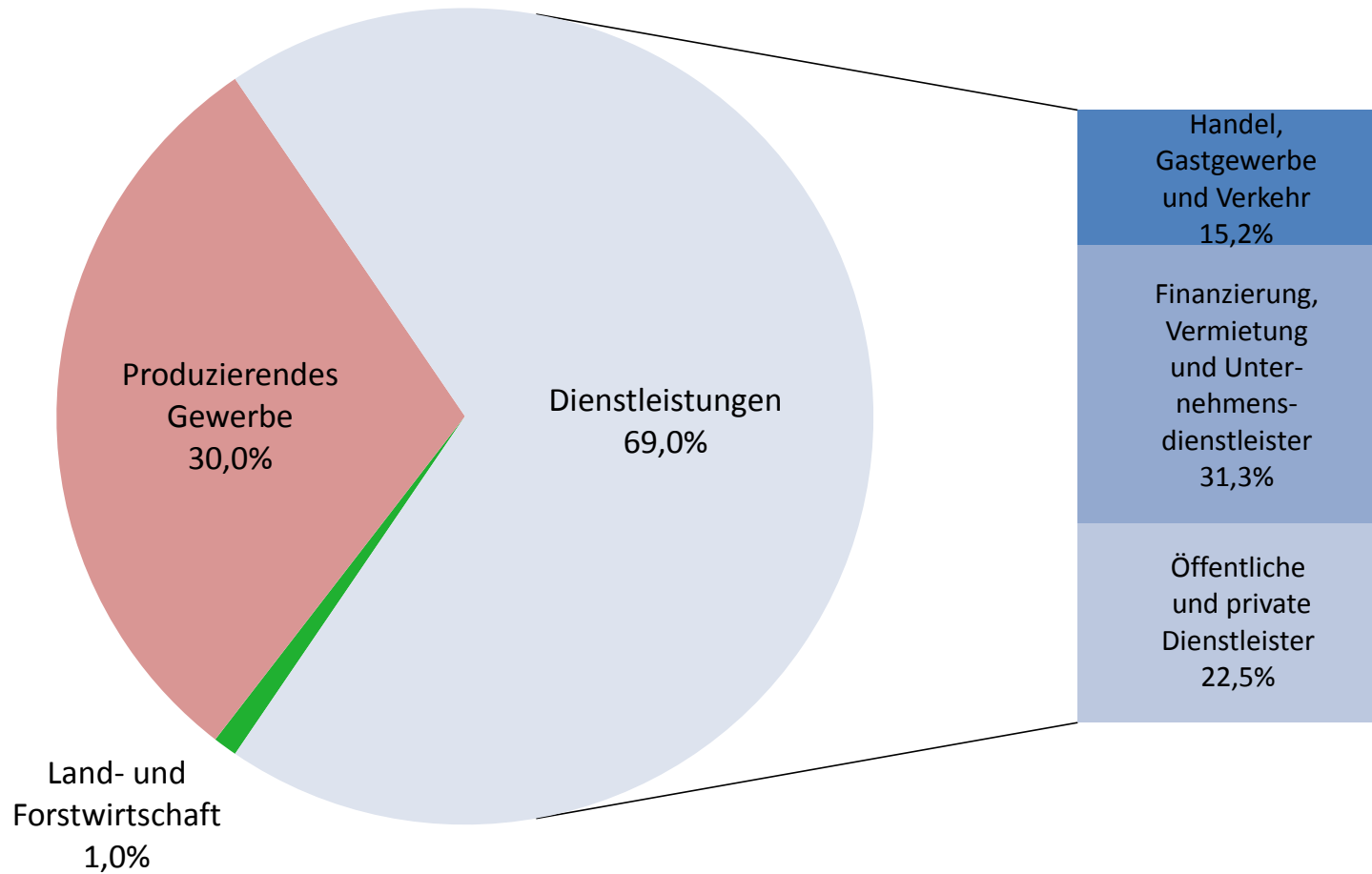
- Separation of volume and price (deflating)
 - » Constant prices vs. chain-linking
 - » Fragile price data (in particular for stock quantities)
 - » Qualitative quantity: Hedonic pricing
- Seasonal and working-day adjustments
 - » Key for interpreting activity at the data edge
 - » Alternative approaches (e.g. Census-X12-Arima, BV4)
- Smoothing
 - » Outlier vs. cycle dynamics
 - » Cycle vs. trend
- Statistical mechanics
 - » Overhang
 - » Cyclical growth rates vs. cycles in capacity utilization

Data availability

- Estimated past („backcasting“)
 - » Statistical offices massively estimate at the data edge
 - » Revisions
- Regional accounts
 - » Limited set of time series compared to national accounts
 - » Time lags up to three years
 - » Almost no quarterly data
 - » Top-down, not bottom-up
- Sectorial imbalance
 - » The more important a sector is (weight in terms of value-added), ...
 - » ... The less data is available

Branches of economic activity

Share in value-added (percent, data for 2011)



Methodology

- Data edge: Leading indicators
 - » Business climate, incoming orders, capacity utilization, ...
 - » Current and subsequent quarter
- Time series models
 - » Statistical correlations
 - » Probabilistic approach, not necessarily theory-based
- Macroeconomic structural models
 - » Linking economic theory and time data
 - » Trade off: Theoretical soundness vs. statistical fit (data edge!)
- Iterative-analytical approach
 - » Integration of expert knowledge (e.g. first-time events)
 - » National accounts framework: Plausibility, consistency
 - » Research: AI-supported reasoning

Evaluating forecasts

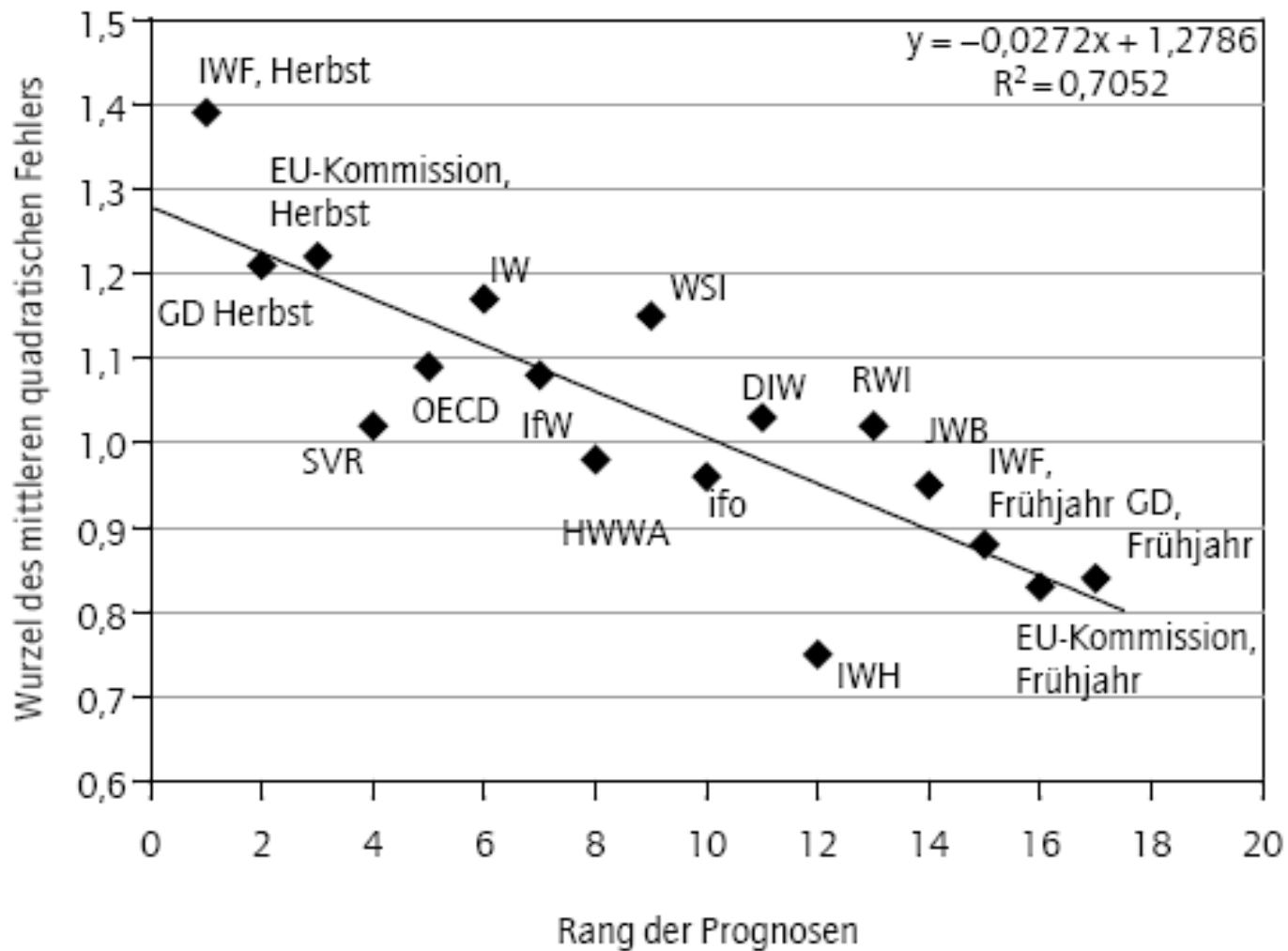
- Criteria
 - » Precision
 - » Rationality
 - » Turning point detection
- Problem
 - » Forecasts that (do not) prove true can be wrong (right)
 - » Mind the forecasting date (data revisions!)
- Benchmarks
 - » Naive forecasts
 - » AR-/ARIMA-models

Measuring forecasting quality

- Precision
 - » Mean squared/absolute errors
 - » Errors and variability
- Rationality
 - » Un-biasedness: mean squared error = zero
 - » Efficiency
 - Weak efficiency: Learning from errors
 - Strong efficiency: Making use of all relevant information
- Turning point detection
 - » Predictive power

Precision and forecasting date

Forecasted change in GDP volume



Quality, Un-biasedness and rationality

Forecasted change in GDP volume

Institution	Mittlerer Fehler	Mittlerer absoluter Fehler	Wurzel des mittleren quadratischen Fehlers	Probability to refuse the non-existence of the respective property by mistake					
				Test auf Unverzerrtheit ¹	Test auf „schwache“ Rationalität ¹	Test auf „starke“ Rationalität unter Zuhilfenahme des kurzfristigen Zinssatzes ¹	Test auf „starke“ Rationalität unter Zuhilfenahme des realen Außenwertes ¹	Test auf „starke“ Rationalität unter Zuhilfenahme des Ölpreises ¹	Test auf „starke“ Rationalität unter Zuhilfenahme der OECD-Industrieproduktion ¹
IWF, Herbst	-0,71	1,39	1,83	0,08	0,96	0,01	0,14	0,09	0,13
GD, Herbst	-0,39	1,21	1,65	0,33	0,86	0,06	0,29	0,28	0,37
Europäische Kommission, Herbst	-0,46	1,22	1,67	0,26	0,88	0,02	0,33	0,21	0,24
Sachverständigenrat	-0,36	1,02	1,45	0,35	0,95	0,09	0,31	0,54	0,34
OECD	-0,35	1,09	1,58	0,42	0,60	0,08	0,49	0,30	0,29
IW	-0,34	1,17	1,71	0,30	0,14	0,09	0,48	0,30	0,42
IfW	-0,26	1,08	1,55	0,35	0,95	0,13	0,30	0,32	0,36
HWWA	-0,22	0,98	1,38	0,67	0,57	0,29	0,61	0,56	0,63
WSI	-0,14	1,15	1,58	0,51	0,71	0,12	0,44	0,33	0,38
ifo	-0,13	0,96	1,33	0,86	0,44	0,40	0,86	0,50	0,64
DIW Berlin	0,02	1,03	1,51	0,50	0,62	0,09	0,46	0,18	0,50
IWH	-0,40	0,75	1,00	0,42	0,17	0,64	0,23	0,61	0,28
RWI	-0,30	1,02	1,34	0,40	0,65	0,15	0,51	0,55	0,56
Jahreswirtschaftsbericht	-0,26	0,95	1,40	0,56	0,38	0,29	0,58	0,35	0,66
IWF, Frühjahr	-0,19	0,88	1,22	0,40	0,12	0,20	0,49	0,21	0,65
Europäische Kommission, Frühjahr	-0,23	0,83	1,11	0,42	0,44	0,24	0,67	0,25	0,76
GD, Frühjahr	-0,24	0,84	1,18	0,48	0,91	0,20	0,66	0,24	0,58

Quelle: U. Fritsche/J. Döpke (2006)

Turning point prediction

Forecasted change in GDP volume

	Wachstumsprognosen	
	Informationsgehalt	Unabhängigkeitstest ¹
IWF, Herbst	1,47	0,01
GD, Herbst	1,34	0,02
Europäische Kommission, Herbst	1,39	0,02
Sachverständigenrat	1,31	0,05
OECD	1,65	0,00
IW	1,78	0,00
IfW	1,41	0,01
HWWA	1,36	0,03
WSI	1,41	0,01
ifo	1,47	0,00
DIW Berlin	1,47	0,00
IWH	1,83	0,00
RWI	1,36	0,03
Jahreswirtschaftsbericht	1,41	0,01
IWF, Frühjahr	1,39	0,01
Europäische Kommission, Frühjahr	1,53	0,00
GD, Frühjahr	1,52	0,00

Information content

1 = Flip of a coin

2 = Perfect forecast

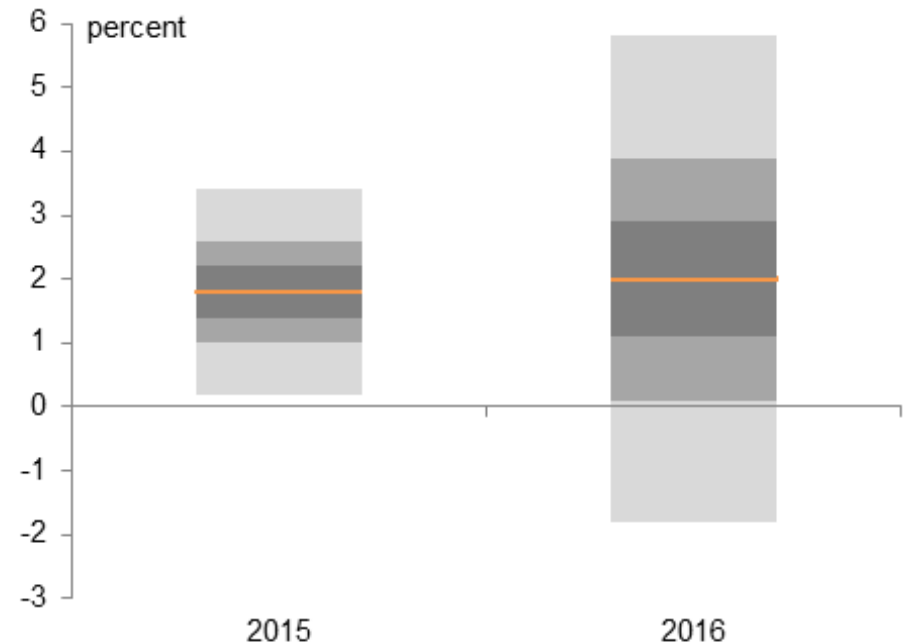
Test for independence

Likelihood to be beat coin flipping only by chance

Quelle: U. Fritsche/J. Döpke (2006)

Independent forecasting vs. fan-charts

- Germany:
Five major (tax-financed)
forecasting institutes
- Spectrum of independent
analysis



GDP: volumes, change over previous year. Point forecasts: orange lines. Forecast intervals gray shaded areas with confidence levels of 33, 66, and 95 percent. Confidence levels calculated based on historical forecast errors of the Kiel Institute in the fourth quarter 1994–2013.

Source: IfW calculations.

Conclusions

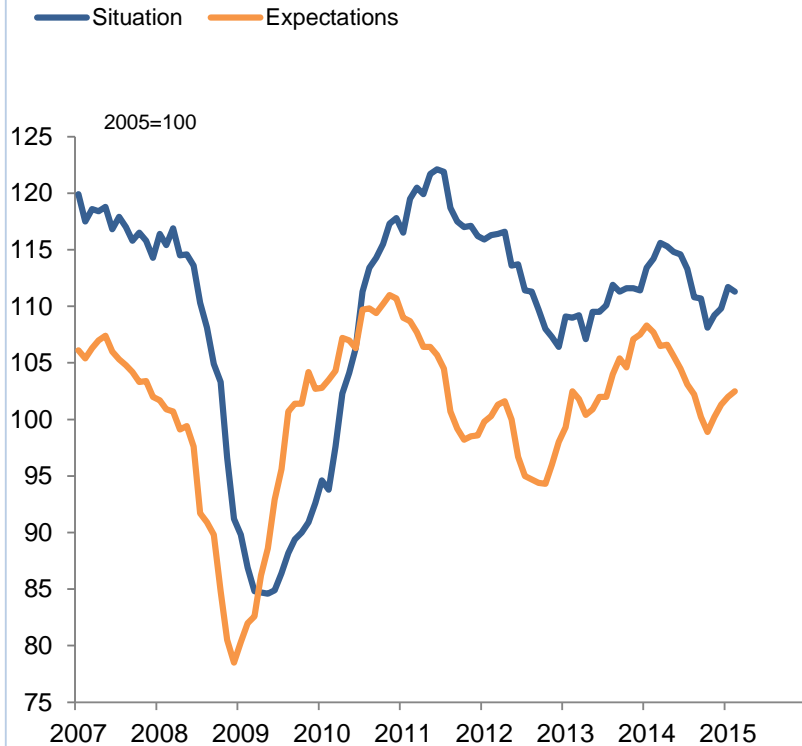
- Clear line between scientific forecasting and mumbo-jumbo
- Business cycle forecasting is more than a number
 - » Many numbers
(full and consistent set of national accounts framework)
 - » Embedded in overall story line
(data interpretation, not only number crunching)
- Forecasting supports economic reasoning and grounds theoretical research

Outline

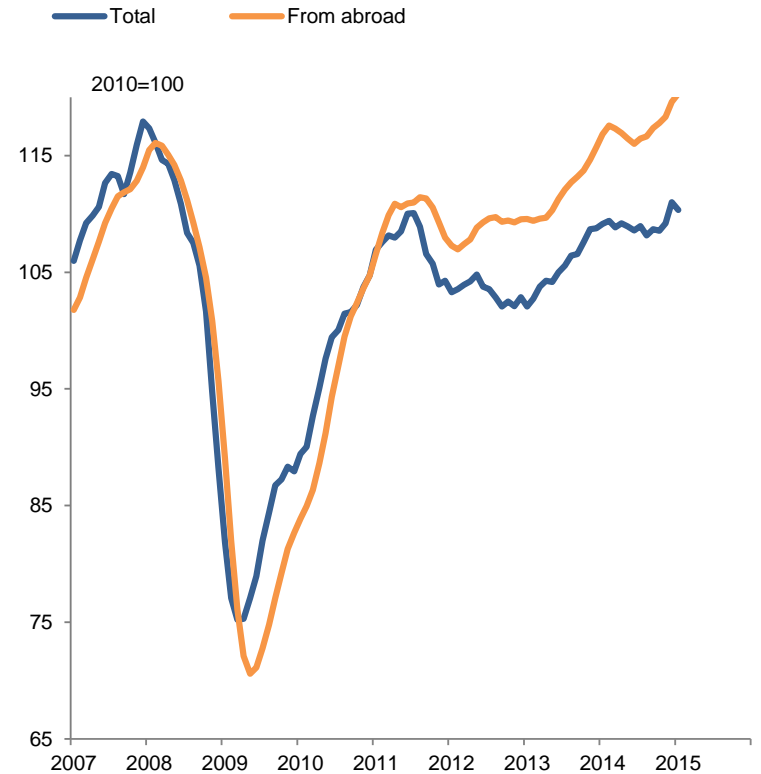
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Data edge: Business sentiment and incoming orders

Business climate

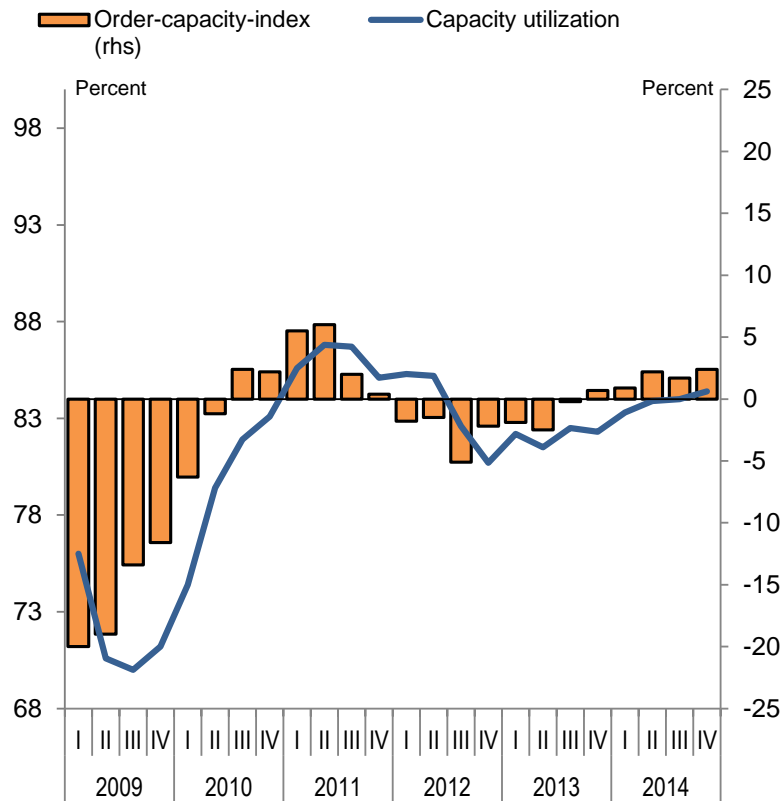


Incoming orders in manufacturing



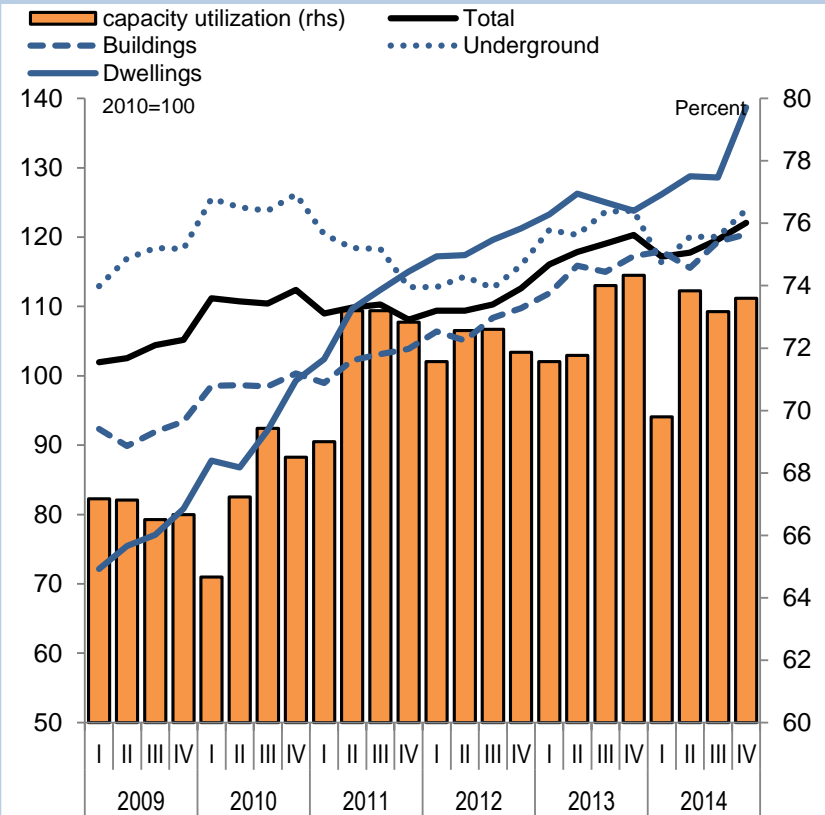
Data edge: Capacity utilization

Capacity utilization



Quarterly data, seasonally adjusted; capacity utilization in manu-facturing (axes cross at normal capacity utilization).

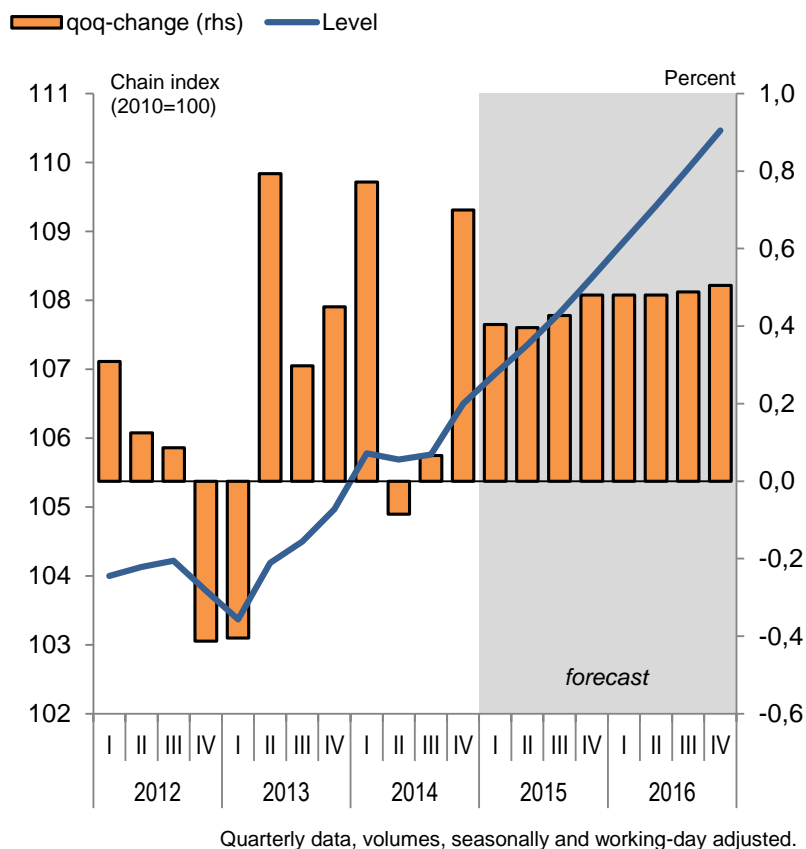
Order stocks and capacity utilization in construction industry



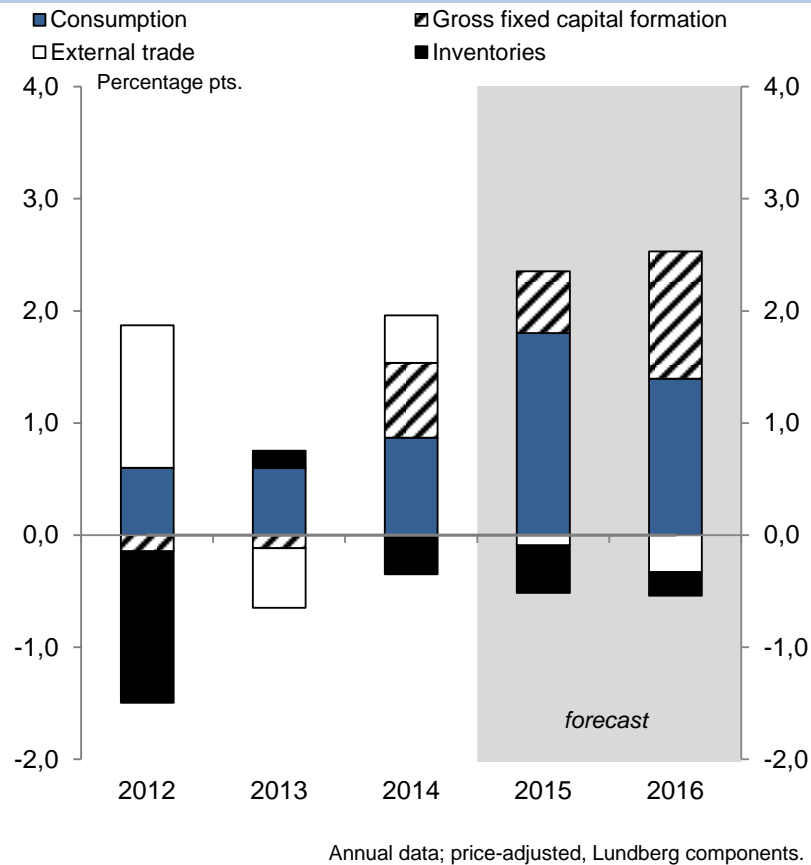
Quarterly data. Capacity utilization: seasonally adjusted (2014-Q4: october/november); Order stocks: price, seasonally and working-day adjusted.

GDP

Gross domestic product

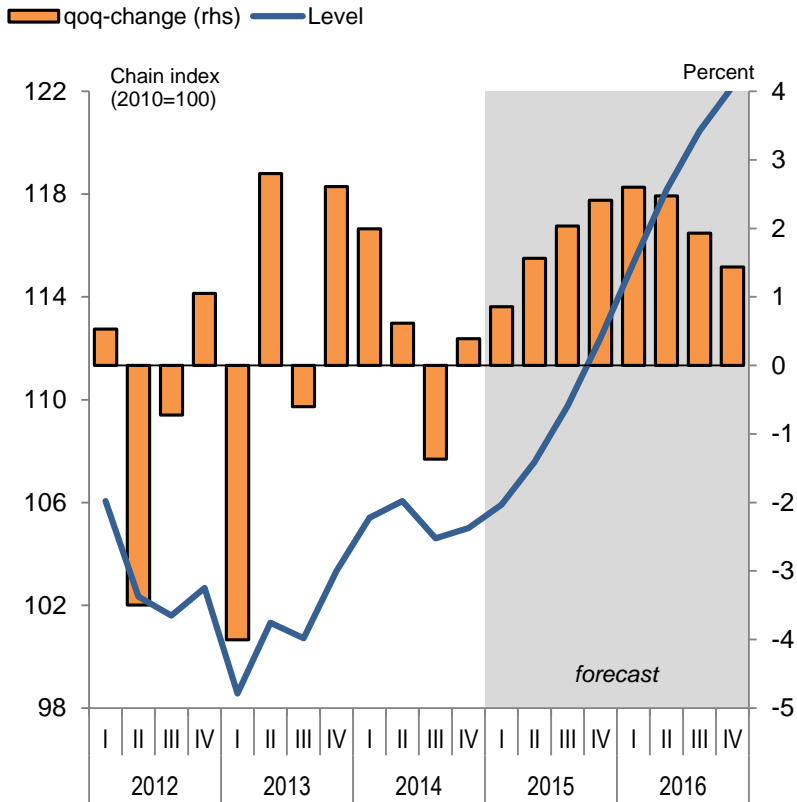


Expenditure-side components to GDP-growth

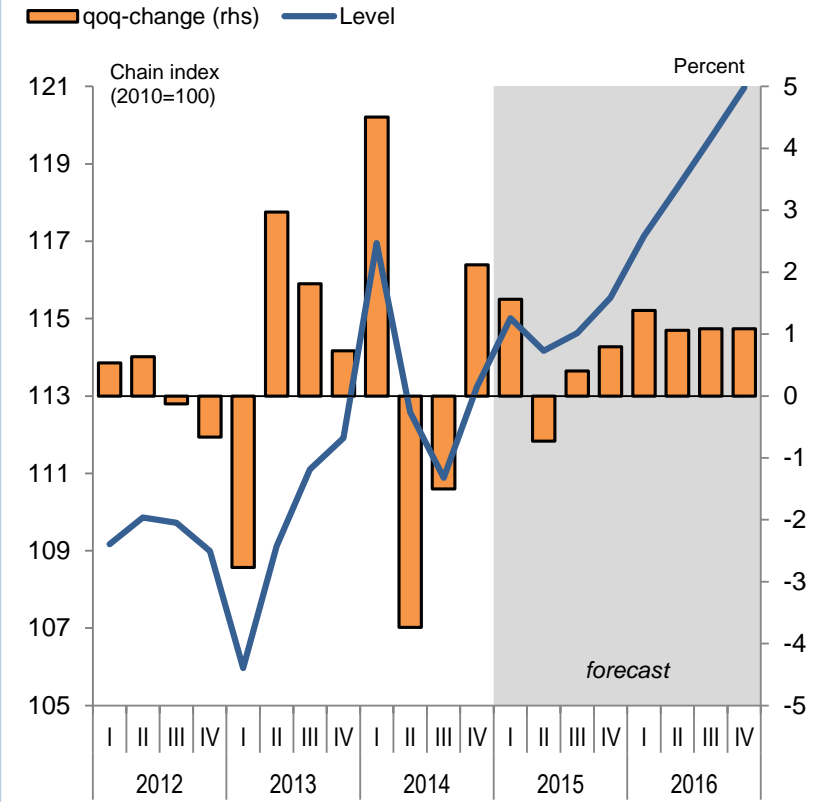


Fixed capital formation

M&E Investments

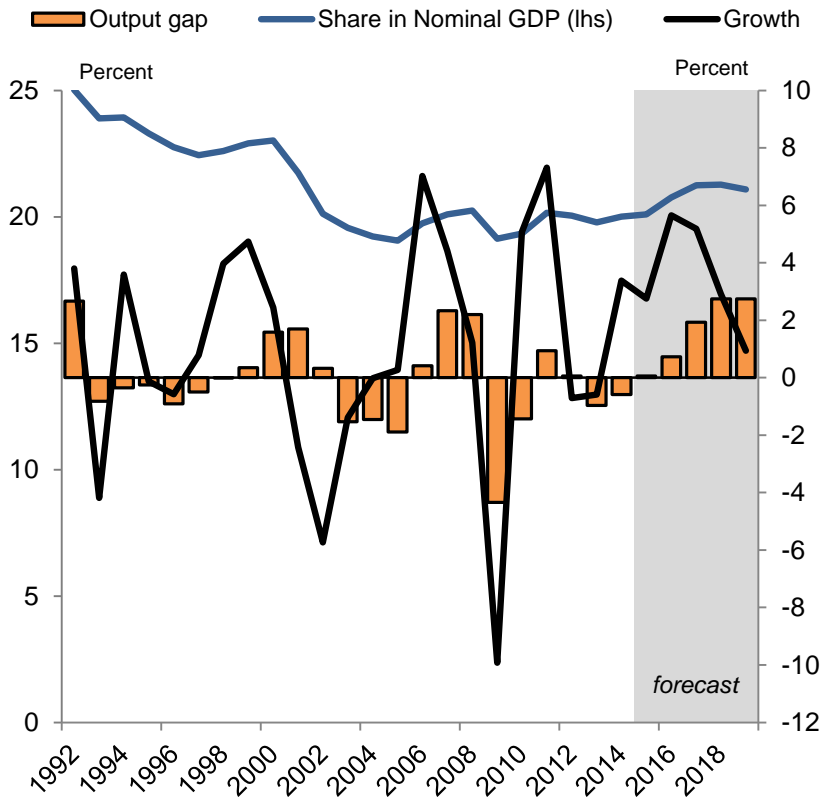


Constructions



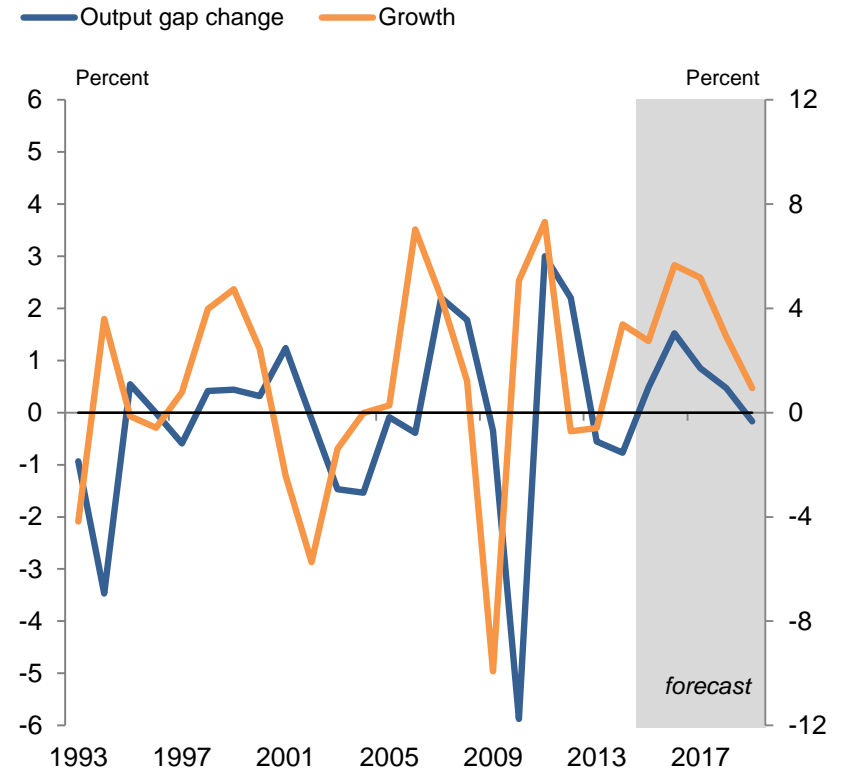
Investment cycles

Gross Fixed Capital Formation



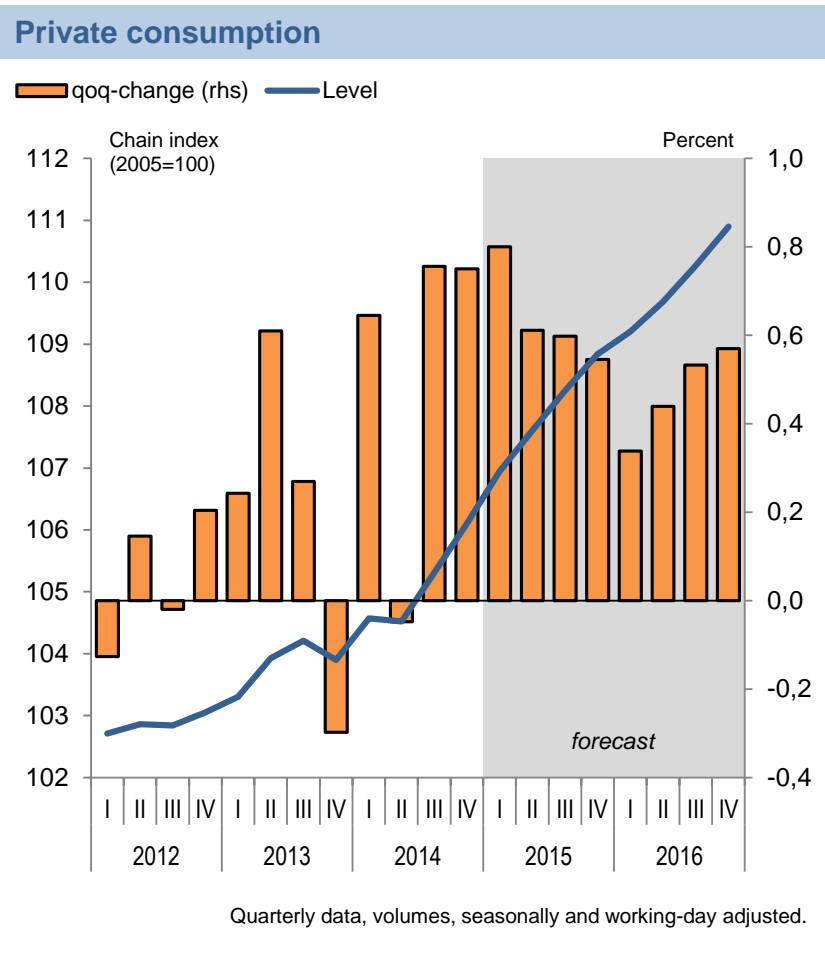
Annual data, volumes; output gap in percent of potential output.

Gross Fixed Capital Formation



Annual data, price adjusted (1992 to 2018).
Output gap in percent of potential output.

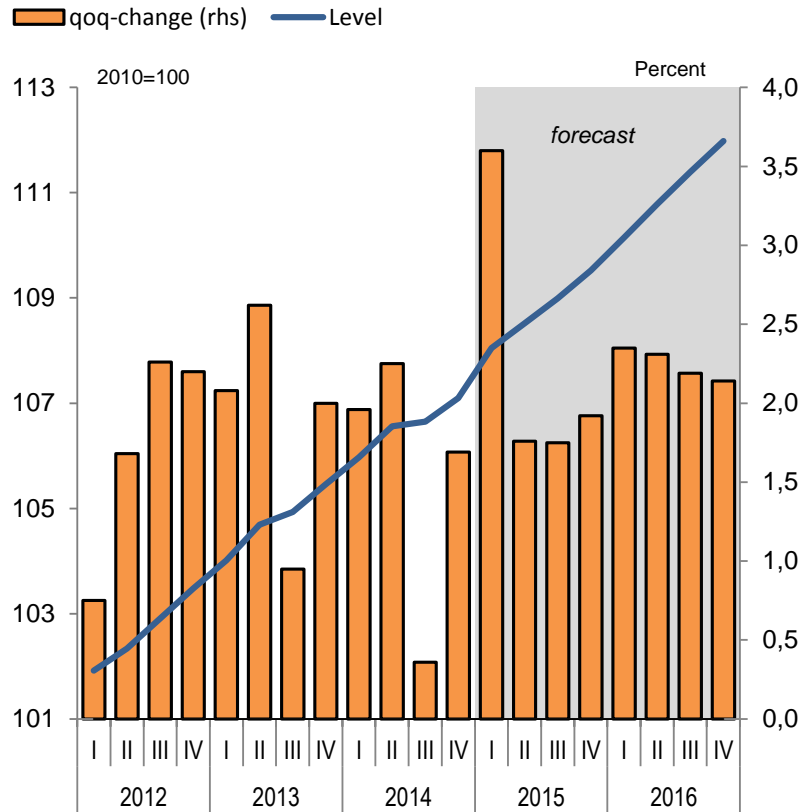
Private consumption spending



- 2014: + 1.2
- 2015: + 2.7
- 2016: + 2.2

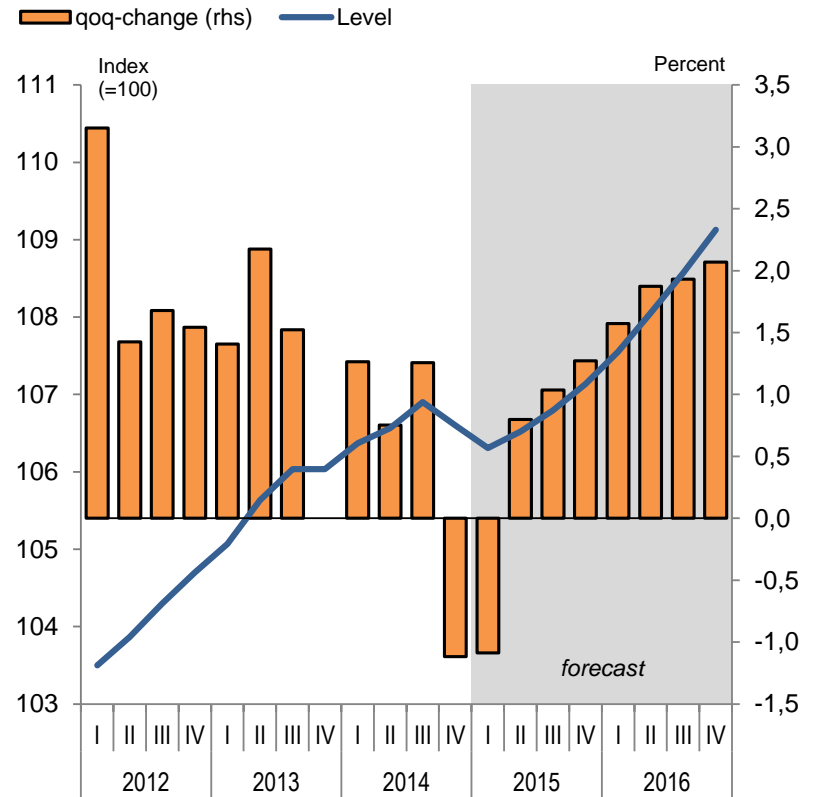
Prices

GDP Deflator



Quarterly data, volumes, seasonally and working-day adjusted.

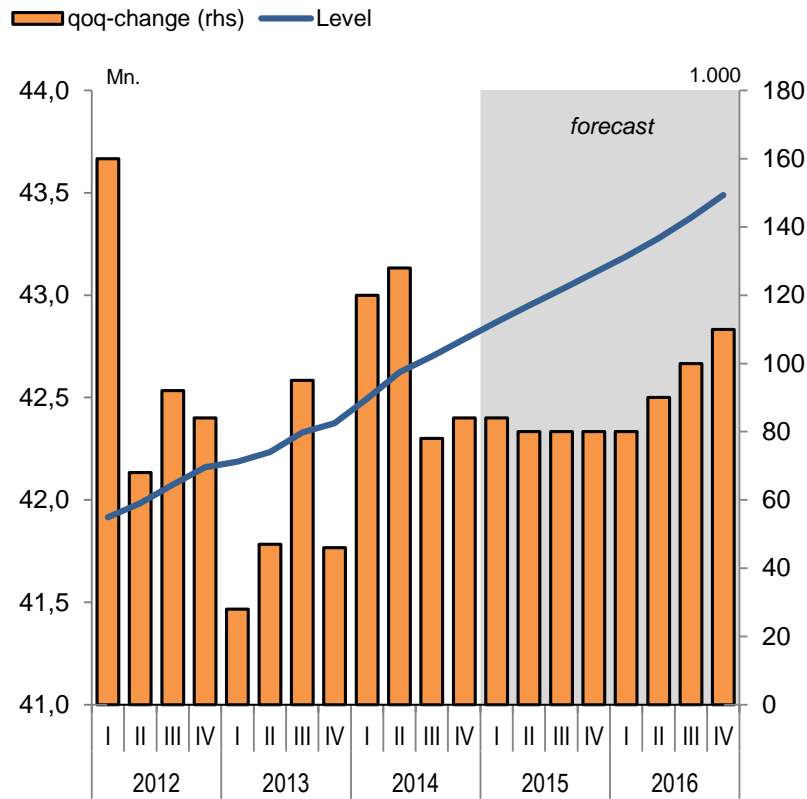
Consumer price index



Quarterly data, seasonally adjusted.

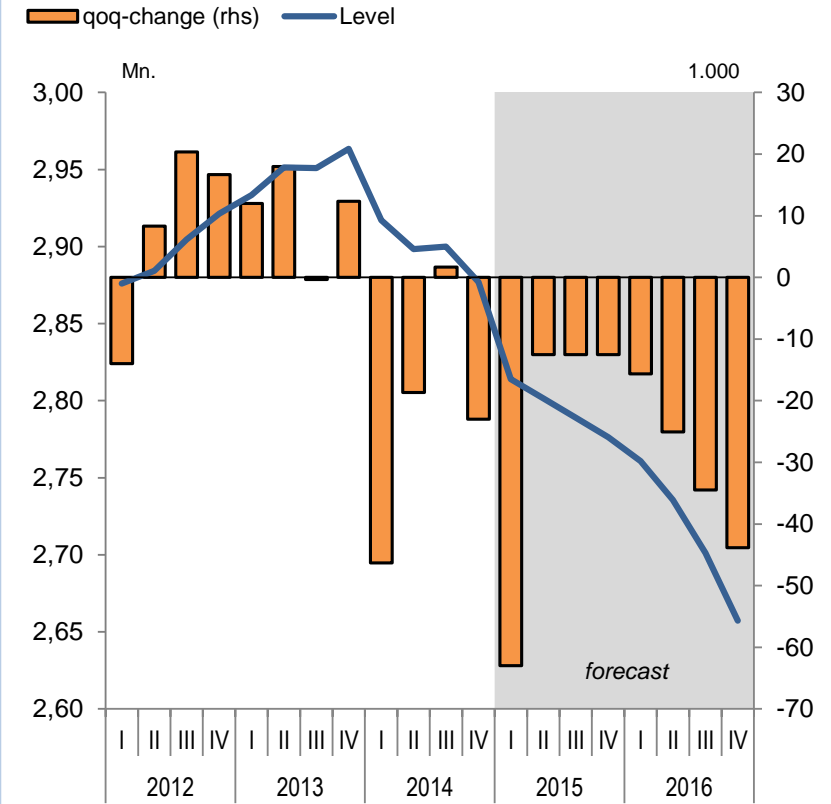
Labor market

Employment



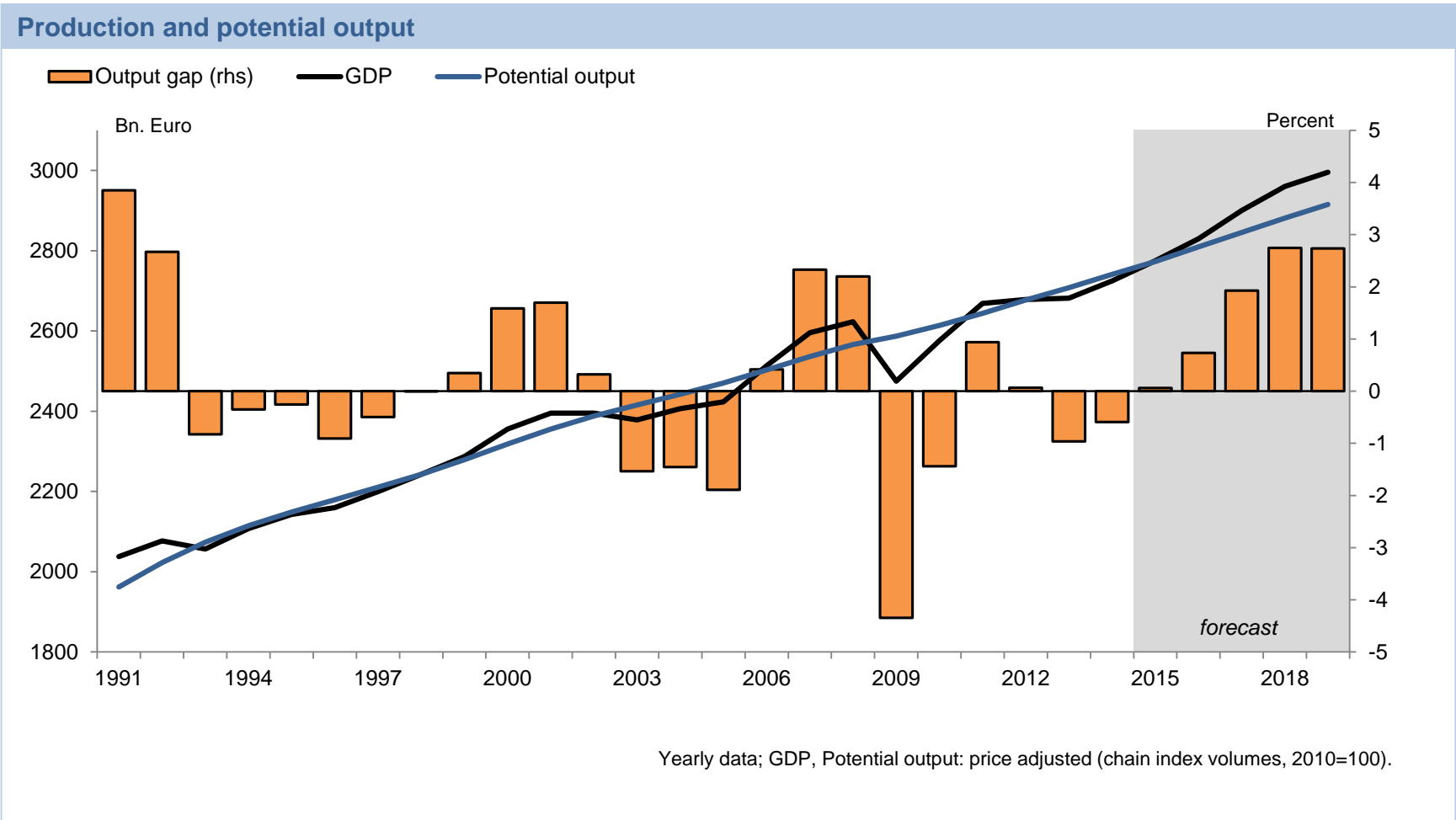
Quarterly data, seasonally adjusted.

Unemployment

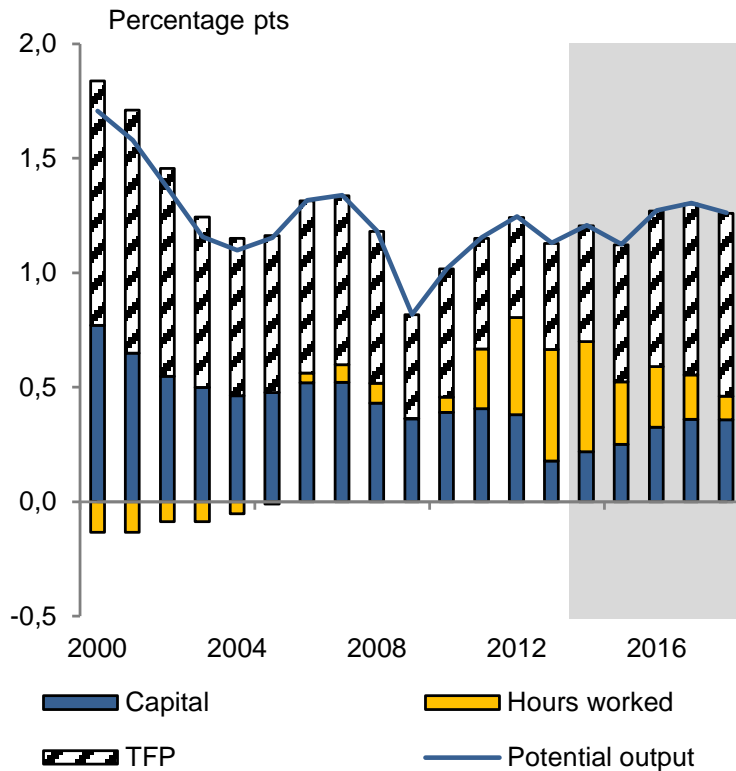


Quarterly data, seasonally adjusted..

Medium-term outlook

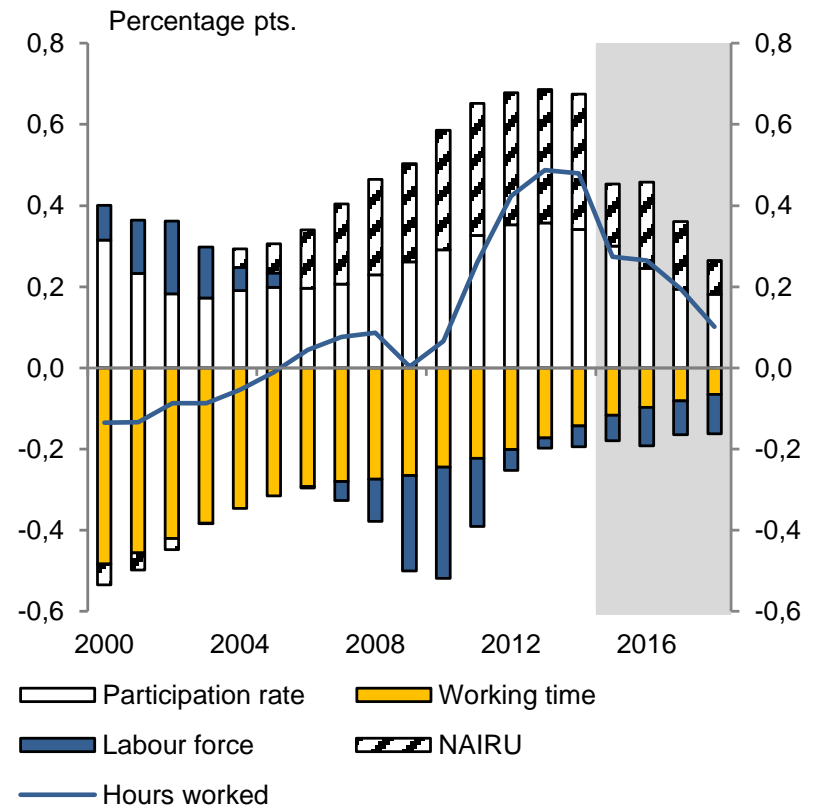


Growth drivers and components of hours worked



Annual data. Potential output: yoy-change in percent;
Components: Growth contribution in percentage points.

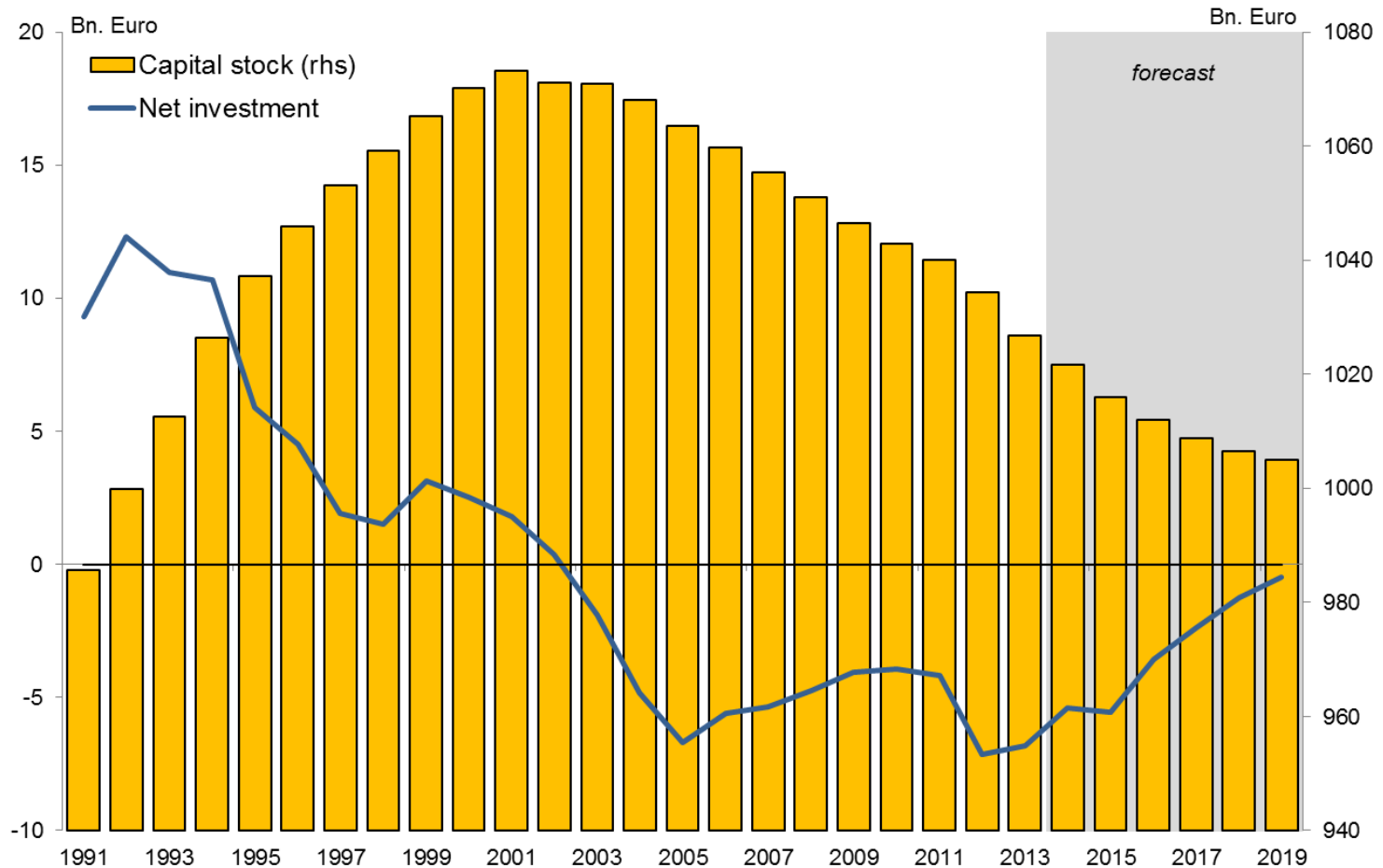
Source: Federal Statistical Office, *Fachserie 18, Reihe 1.2*; calculations from IfW and ZEW; shaded: Forecast.



Annual data. Hours worked: yoy-change in percent; Components:
growth contribution in percentage points.

Source: Federal Statistical Office, *Fachserie 18, Reihe 1.2*;
calculations from IfW and ZEW; shaded: Forecast.

Public capital stock

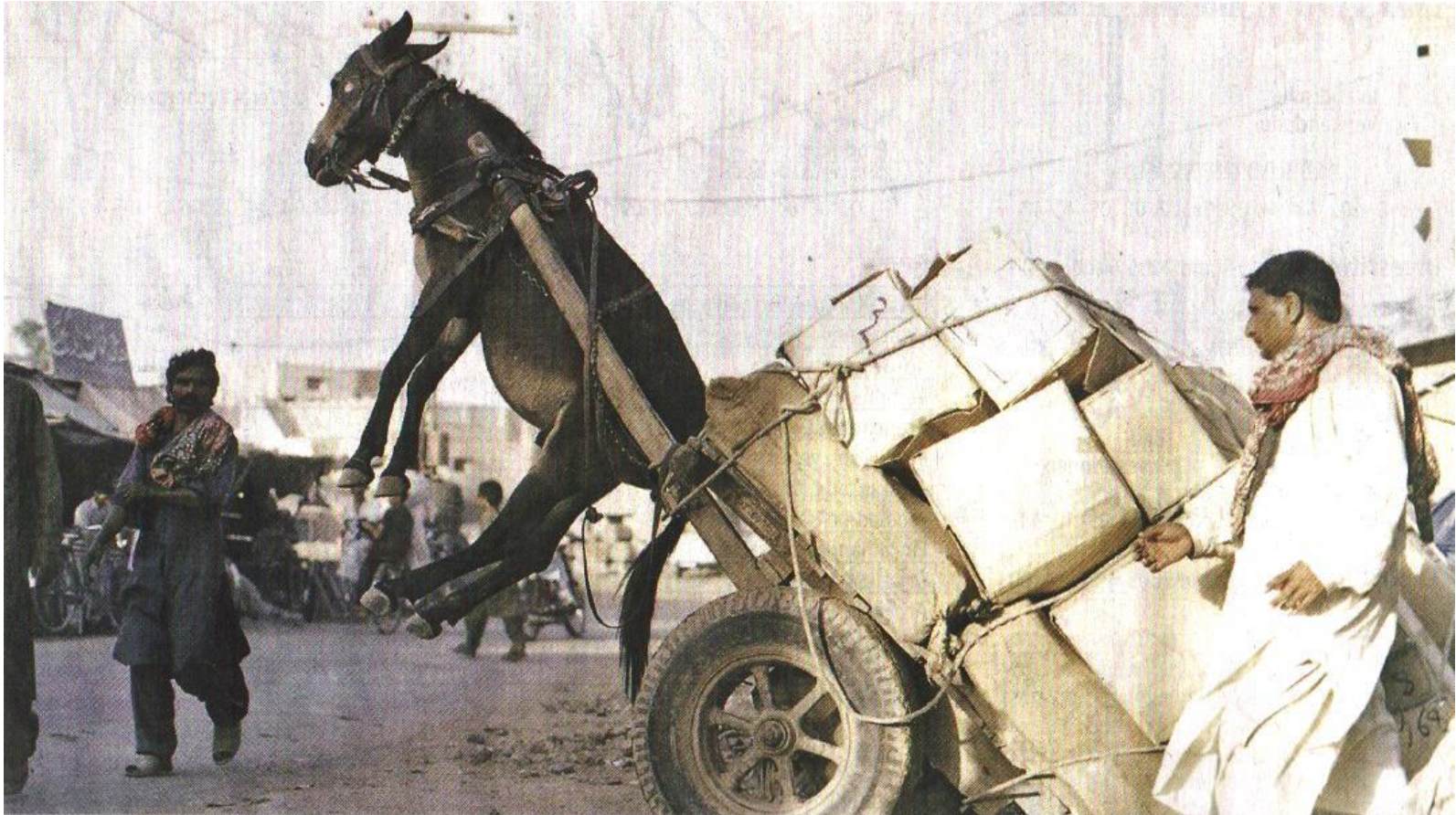


Annual data.
 Capital stock: Net stock of fixed assets, buildings and structures except for dwellings; price-adjusted (chain linked, reference year 2010).
 Net investment: Current prices.

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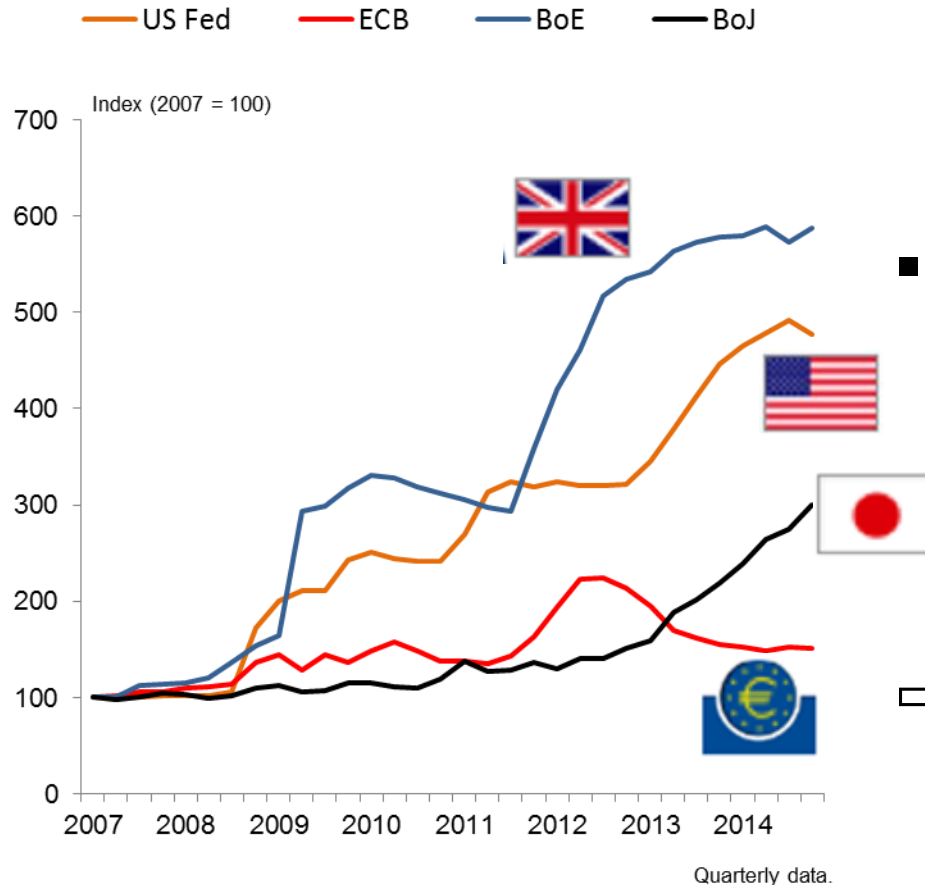
Monetary policy: overloaded!



Source: FAZ, 26. Oktober 2011, S. 11

„Quantitative Easing“ at work

Monetary base



- Type 1:
Liquidity provision in times of financial turmoil

- Type 2:
Boosting demand at the zero lower bound

⇒ **Missing exit experience:
The story is not over yet**

The role of interest in society

Interest rates ...

- ... just another policy instrument for short-run aggregate demand management?
- ... or the price of time preference?
 - » Coordination of saving/investment decisions
 - » Shaping capital stock/production structure
(= future production portfolio possibilities)
 - » Reflected in all other prices

⇒ **„Capital gives money time to cause trouble.“ (Garrison)**

The role of central banks

- „Buying time“
 - » If interest is the price of time, why does buying more time go along with decreasing interest rates?
 - » Buying time = delaying adjustments (by increasing debt)
- „Heroes of the financial crisis“ (C. Lagarde)
 - » No link between pre-crisis credit expansion and the financial crisis?
 - » Addressing crisis symptoms with instruments that provoked distortions of the capital stocks in the first place (fighting debt with debt)
- „Central banks always manipulate interest rates“
 - » Not necessarily so (policy rates may follow market rates)
 - » Doses matter

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