

OTA University of Applied Sciences
Guest Lecture on Economics/Business Administration

Macroeconomic Forecasting: A tricky business without tricks

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Macro Analysis and Forecasting

Outline

- **Forecasting methodology (science and art)**
- **DIW products for macroeconomic forecasting**
- **Evaluation of business cycle forecasts**
- **Conclusion**

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Epistemology: Science vs. reading coffee grounds

- Scientific approach \neq guarantee on precision
- Methodological foundations
 - Theories on regularities (behavior, technology) and pattern prediction (formulation of hypotheses, model building)
 - Checking the actual empirical environment (ex-post analysis)
⇒ Inter-subjectively comprehensible forecast
- Economic theory
 - Models do not (and should not!) cover every detail
 - Severe problem: recent structural breaks
- Ex-post analysis
 - Measurement of economic activity is imperfect
 - Assumption setting is unavoidable
- Endogeneity problem via expectation formation

What are business cycle forecasts about?

- Evaluation of macroeconomic developments
 - Business cycle: fluctuations of economic activity (trend vs. cycle)
 - Forecast horizon up to 3 years (larger horizon: growth forecasts)
 - Current situation (month, quarter): Flash-Estimates
- Components
 - Diagnosis of current situation
 - Assumptions on major exogenous driving forces (e. g. oil price, monetary and fiscal policy, exchange rates)
 - Quarter-on-quarter forecasts for various variables (e. g. gross domestic product, inflation rate)
 - Explanations („Story telling“)
 - Scenarios and policy simulations

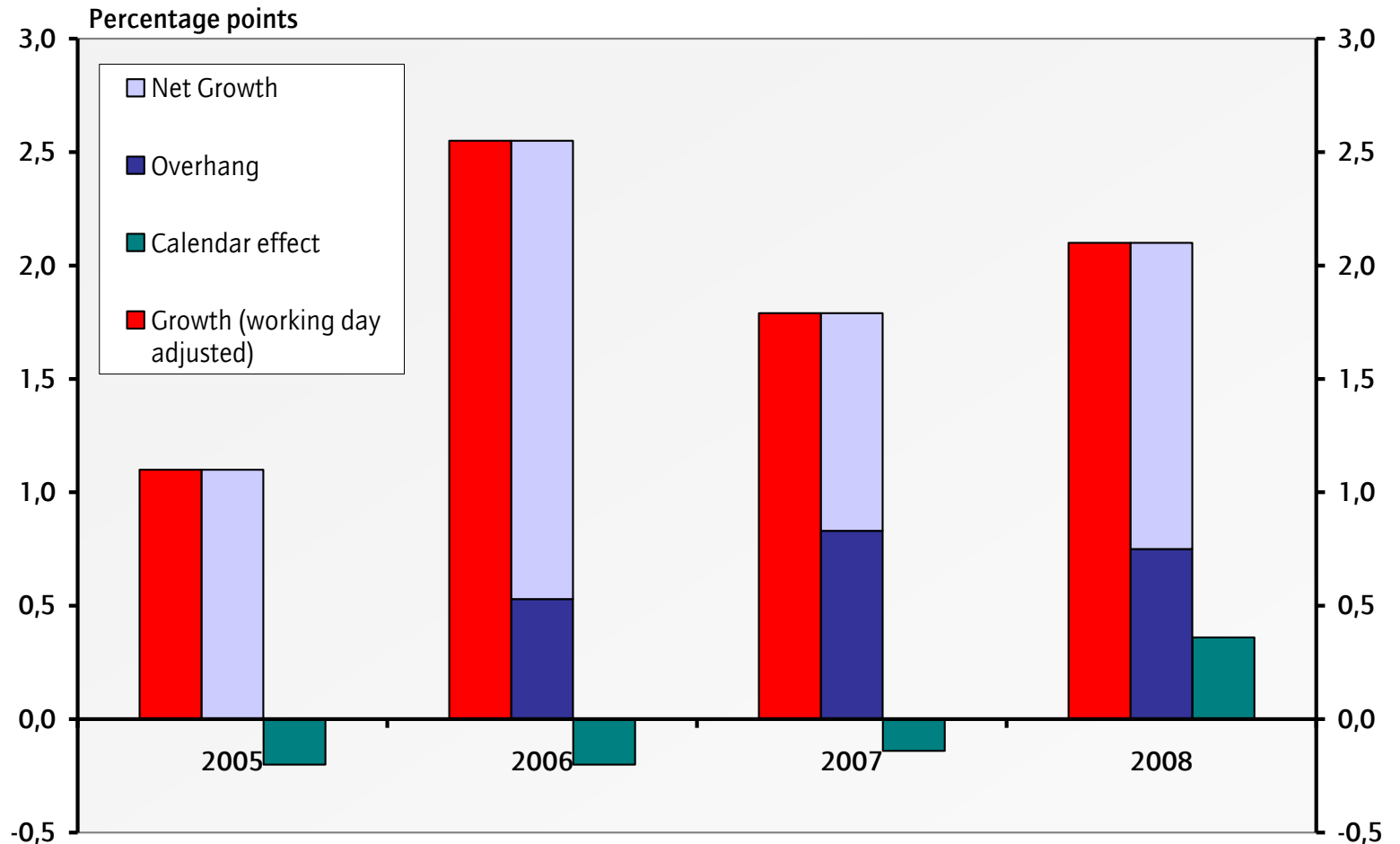
System of National Accounts (SNA): Framework and data source for macroeconomics

- **Systematic (accounting-style like) representation of major economic interdependencies**
 - Activities (production-side, expenditure-side, income-side)
 - Sectors (Companies, pr. households, government, RoW)
 - Industries, Products, ...
- **Data aspects: Availability and quality**
 - Frequency: quarters (months)
 - Fast ex-post reports (GDP): 4-5 weeks
 - Preliminary detailed tables: 7 weeks
 - Revisions up to 3 years back
- **European harmonization via ESA 1995**

Interpreting data

- **Splitting volume and price (deflating)**
 - Fixed-price basis vs. chain-linking
 - Fragile price information especially for stocks (e. g. housing prices)
- **Adjusting for seasonal and calendar effects**
 - Allows for interpreting recent developments
 - Alternative methods (z. B. Census-X12-Arima, BV4)
- **Smoothing**
 - Runaways vs. fundamental dynamics
 - Cycle vs. trend ("potential output" and "output gap")
- **Mechanical effects (statisticians toolbox)**
 - Statistical overhang (component of annual average)
 - Growth vs. capacity utilization cycles

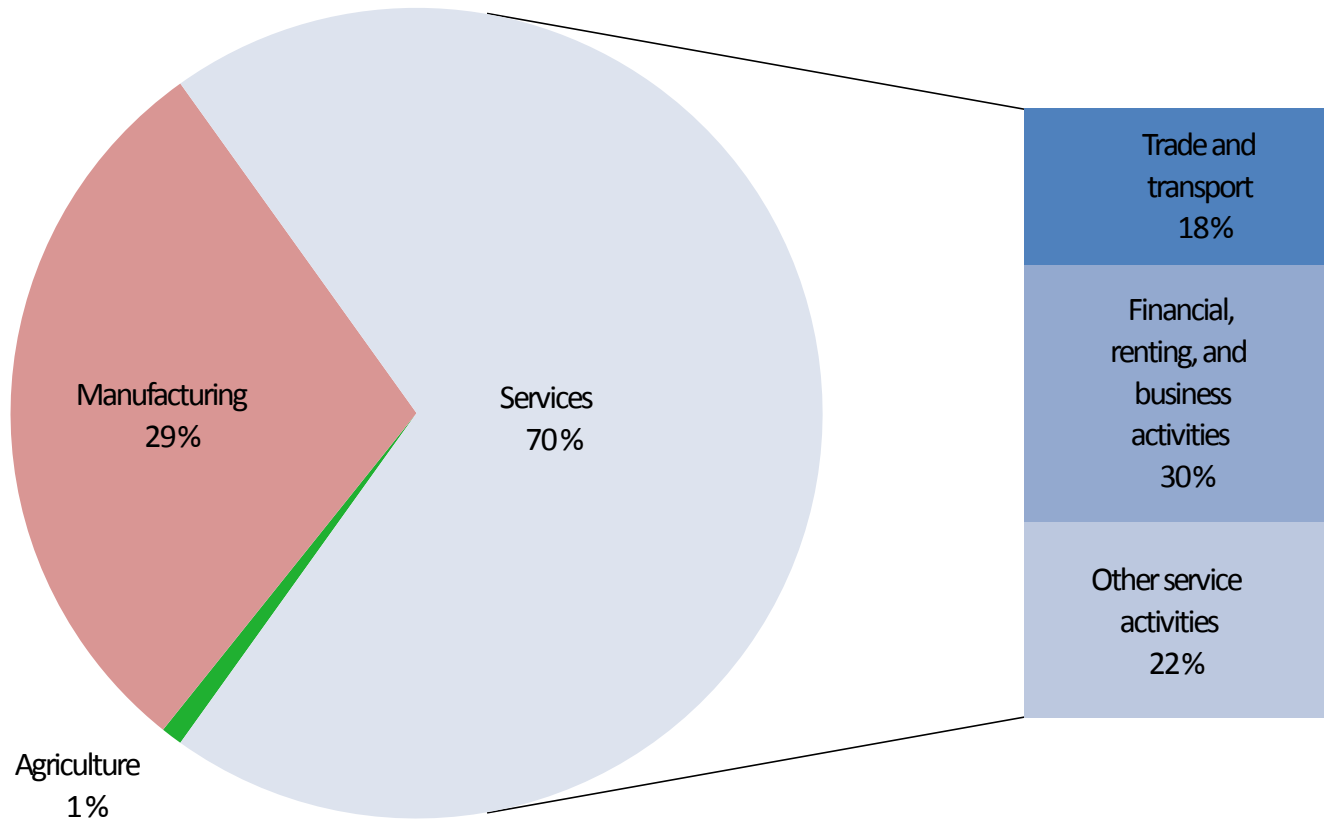
Technical growth components for German GDP



Data availability and quality

- **Ex-post estimates**
 - Statistical offices run estimations themselves
 - Revisions can be substantial
- **Regional (sub-national) accounts**
 - Significantly reduced set of time series
 - Publication takes up to 3 years
 - Very few sub-annual data
 - National accounts \neq sum of regional accounts
- **Industrial imbalance**
 - The more important an industry is (measured by value-added), ...
 - ... the less data are available

Value-added shares (Germany 2006)



Forecasting methods

- **Indicator-based approach**
 - Using leading (early-warning) indicators
 - Batteries of indicators
- **Time series models**
 - Using statistical correlations
 - Probabilistic approach, no strict theoretical foundation
- **Macroeconometric structural models**
 - Using data subject to economic theory
 - Conflict between explanation and prediction
- **Iterative-analytical approach**
 - Using expert knowledge (e. g. VAT-induced shift effects)
 - Plausibility and consistency checks within SNA-framework
 - Future docking with artificial intelligence

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DIW Konjunkturbarometer (DIW Flash estimate)

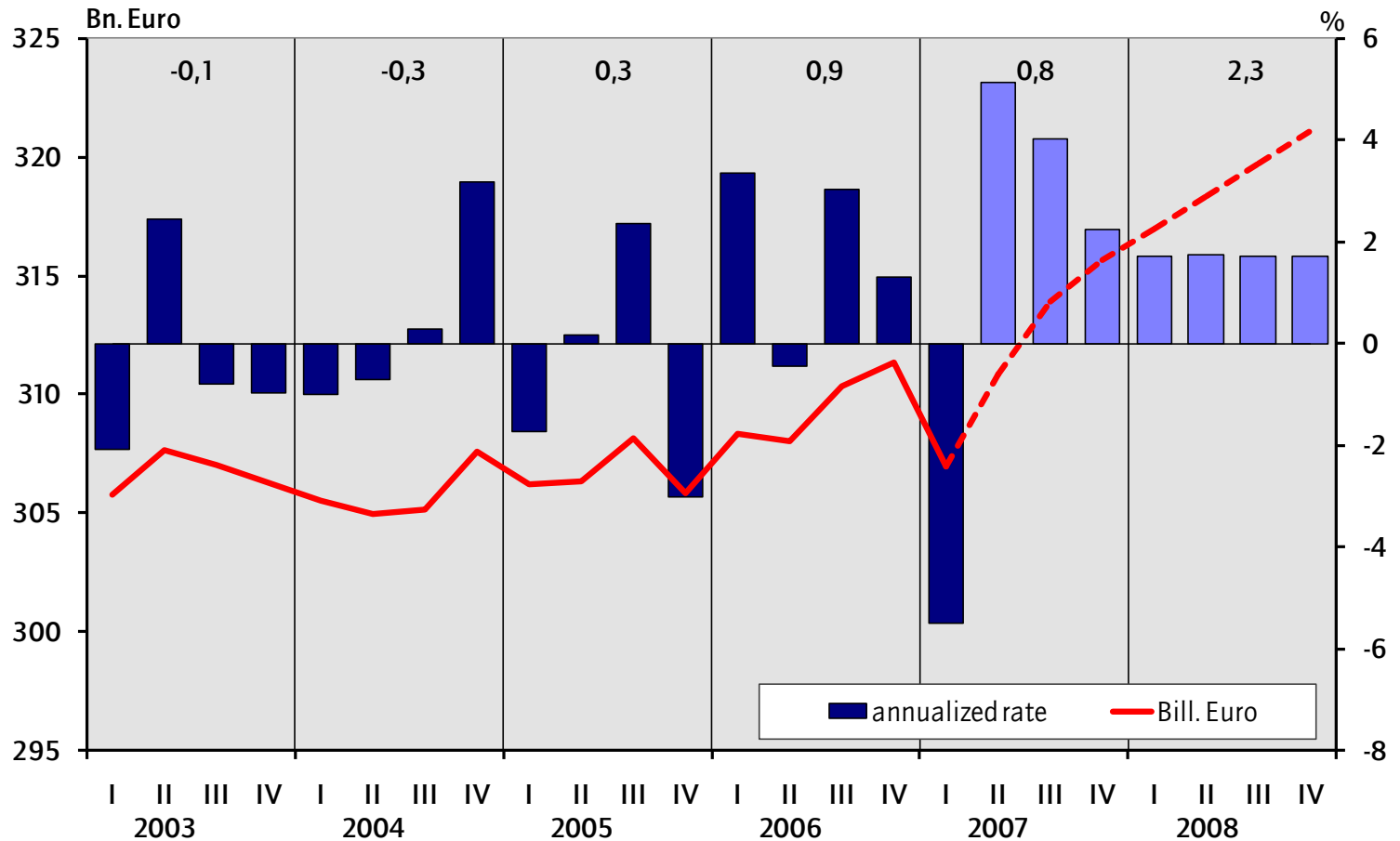
- Monthly forecast of seasonal and working-day adjusted quarterly German GDP growth (leading up to 4 months)
- Production-side: Indicator-based estimation of value-added of the five major industries
- Inputs: Monthly indicators (production, orders, climate, sales) for value-added of each industry
- Autoregressive extrapolation of missing indicator values
- Consolidation to GDP-growth via value-added shares (growth contribution)

DIW Grundlinien (DIW Economic outlook)

- Substantial forecasts (current and following year)
 - Expenditure-, production-, and und income-side + government account
 - Approx. 180 items
 - Special features (e. g. simulation studies)
- Publication schedule
 - So far: Winter/Summer + GD (Spring/Autumn)
 - Future: Winter/Summer (main) + Spring/Autumn (update)
- World economy (partner: Global Insight), Euro zone, Germany (detailed)
- Starting point: model-based econometric baseline
- Discussion of results, iterative SNA-based forecast

Example: Private Consumption (GL Summer 2007)

Consumption spending of private households (volume, seasonal and calendar adjusted)



DIW's Macroeconometric modell (IMM)

- **International macroeconometric model (IMM)**
 - 475 equations (of which 171 behavioral)
 - 518 variables
- **Multi-country-model**
 - Germany, France, Great Britain, Italy
 - Rest of Euro zone, USA, World trade
- **Long-term equilibria and short-term adjustment dynamics (error-correction framework)**
- **New-Keynesian approach: volumes respond faster than prices (short-term price rigidities), market disequilibria as driving forces for price adjustment**

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Evaluating forecasts

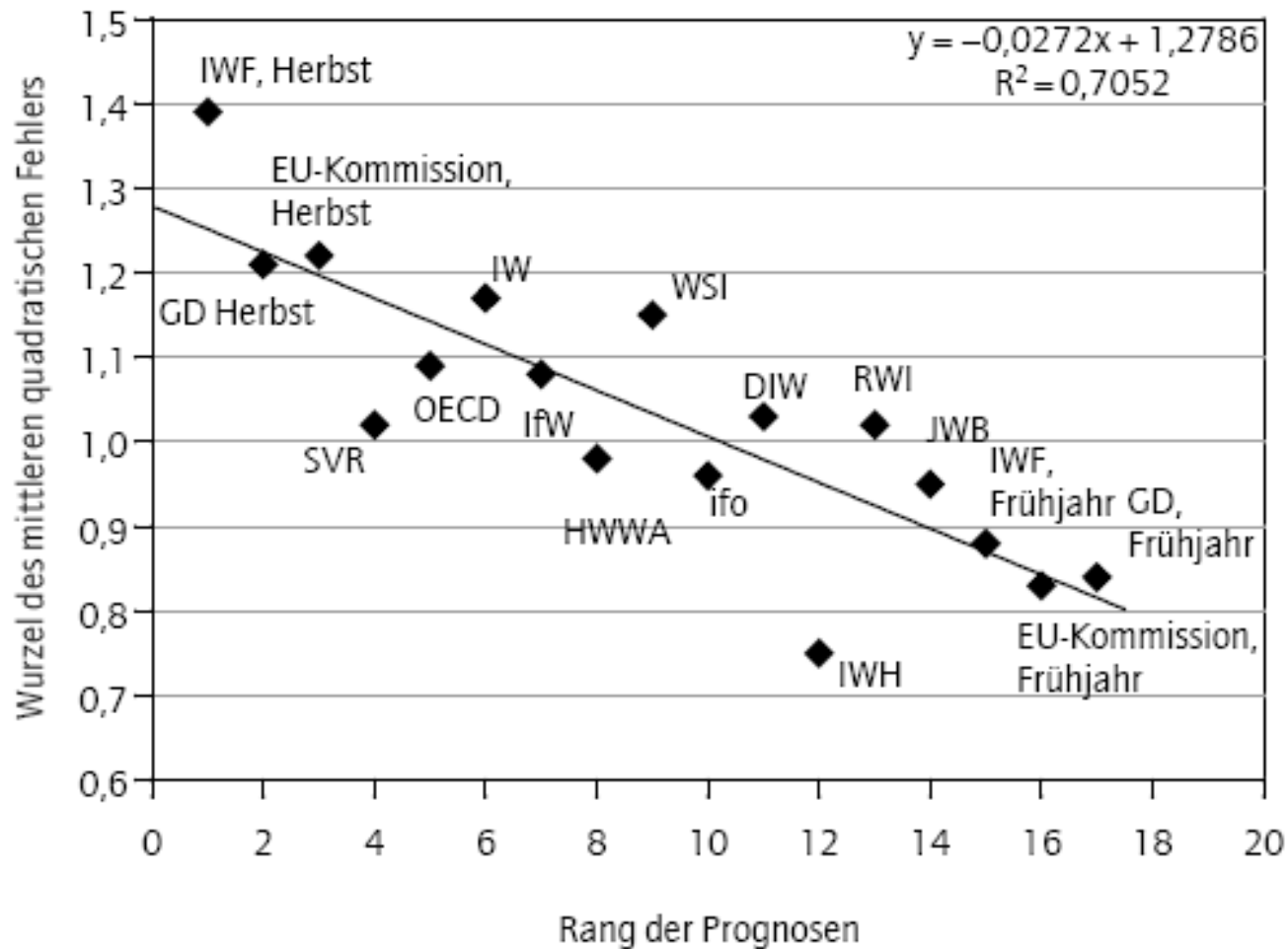
- **Criteria**
 - Precision
 - Rationality
 - Accuracy in terms of tendency
- **Problem**
 - Even well- (non-) performing forecasts can be wrong (correct)
 - Reference for evaluation often not quite clear (differing forecasting dates, data revisions)
- **Benchmarks**
 - Naive predictions
 - AR-/ARIMA-models

Performance measures for forecasters

- **Precision**
 - Mean (squared/absolute) forecast error
 - Relative forecast error (with respect to time series variability)
- **Rationality**
 - Unbiasedness: mean forecast error is zero
 - Efficiency
 - Weak efficiency: learning from past errors
 - Strong efficiency: Making use of all relevant information
- **Accuracy in terms of trend predictions (upward/downward forecasts)**
 - Significance of correct trend signals

Precision: Forecast horizon matters

Forecasts of price-adjusted German GDP growth



Forecast error, unbiasedness and rationality

Forecasts of price-adjusted German GDP growth

Probability to reject respective property by mistake

Institution	Mittlerer Fehler	Mittlerer absoluter Fehler	Wurzel des mittleren quadratischen Fehlers	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-Industrie-produktion 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
IW	-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

Trend forecasts

Forecasts of price-adjusted German GDP growth

	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

Informational content

1 = coin flip

2 = perfect forecast

Test for independence

Probability to outperform coin flip by pure chance

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Conclusion

- Clear demarcation between scientific forecasting and reading coffee grounds
- Business cycle forecasting is more than reporting future GDP growth
 - Multiple numbers (SNA ratio system)
 - Embedding numbers in a clear scenario (story telling)
- Evaluating forecasts is an art in itself

- **Forecasting forces researchers to stay in touch with reality**
 - Salutary shock of empirical evidence
 - Ex-post (almost) everything can be proven (Popper criterion)