Expectations Are Observables. And We Haven't Even Started Yet ...

Rüdiger Bachmann, University of Notre Dame, CEPR, CESifo, ifo

Keynote — 8th Ifo Conference on Macroeconomics and Survey Data

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Preliminary Remarks

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In addition to the standard national accounting data:

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"Subjective" Data in Economics

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I want to start with the most prominent example of such data — expectations — and study a bit the related history of thought.

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Particles do not have a sense of future.

Expectations in Economics

Saying it with Heidegger (*Being and Time*): *An Existenziale of Dasein is temporality. Dasein is care, being-ahead-of-itself.*

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Studies empirically with survey data how firms form and update their expectations.

Critique I

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Aside: recall the revealed preference approach to microeconomics.

Critique II

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In a sense, rational expectations took expectations *as economic data* off the table, because the models took care of it.

Both Strands of Critique Together

This was not a strictly necessary development, because one could have tested rational expectations plus the model assumptions jointly against expectational and other economic data – but the behaviorist streak in economics was quite happy to get rid of expectations as data.

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So, we ended up with testing big rational expectation (often DSGE) models on "objective" outcome data only. Aside: this is orthogonal to the estimation-calibration distinction.

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Both household and firm level expectation data are reasonably predictive of the business cycle, and contain often a strong news component about future productivity. (Barsky and Sims, 2012, American Economic Review: "Information, Animal Spirits, and the Meaning of Innovations in Consumer Confidence".)

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- Rational expectations is still an important benchmark / first pass / default – but no longer the Alpha and Omega of economics.
- Economists see value again in testing not entire large models, but certain key elements / modules of them (the way they had been doing it in earlier times – think of all the PIH tests in the literature).

More Recent Developments

These developments have certainly been reinforced if not triggered by recent macroeconomic events and a resulting general openness / willingness to rethink the foundations of the field.

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> *We need to encourage those who are trying to learn more about how people actually form expectations. [...] At the same time, we need to be a lot more flexible in our thinking about models and theory, so that they can be firmly grounded in this improved empirical understanding.*

"What Can Survey Forecasts Tell Us about Information Rigidities?"

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- Expectations react gradually to news, ruling out full-information models.
- Disagreement in inflation forecasts does not seem to respond to shocks, which means that *noisy* information models are favored over *sticky* information models.

"Is The Phillips Curve Alive and Well After All? Inflation Expectations and the Missing Disinflation"

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Use direct inflation expectations data to "save" the *Phillips Curve*, an important ingredient for monetary macroeconomics.

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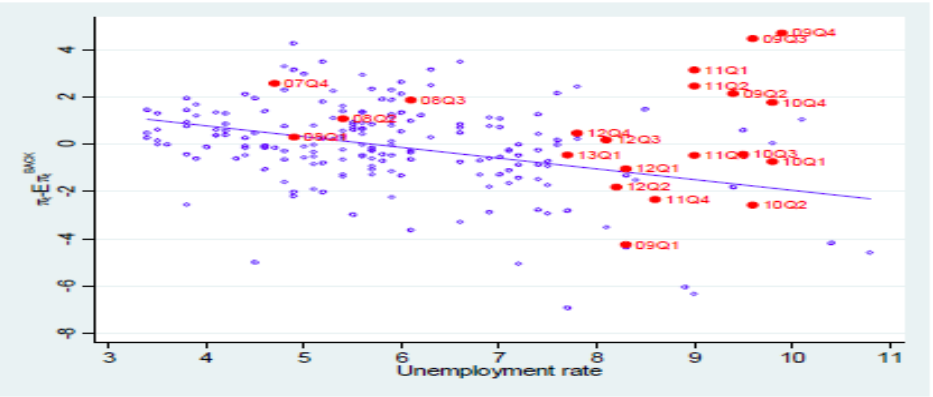
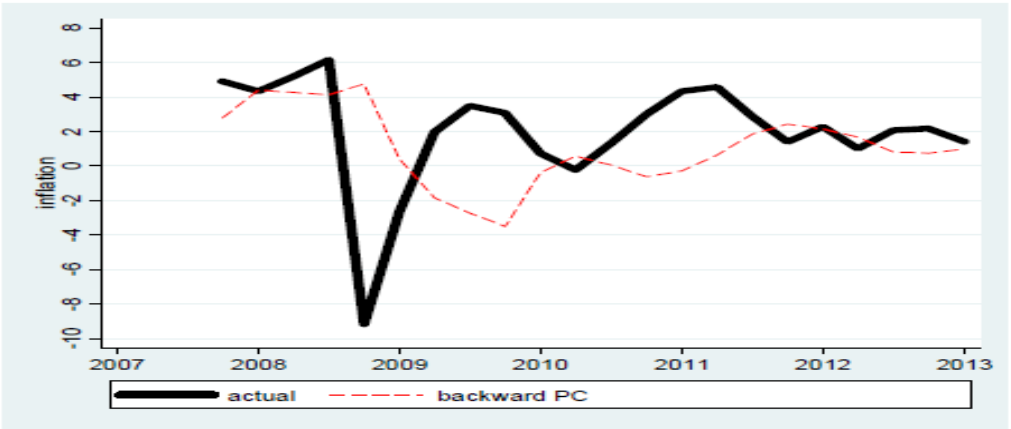
FIGURE 1: THE MISSING DISINFLATION

Panel A: CPI Inflation and U.S. Unemployment



Panel B: CPI Inflation and Predicted Inflation from Phillips Curve



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- Reason: oil price spikes during the time.

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- Taylor rule type reasoning especially prevalent when labor markets are weak (rational inattention story?).

"Inflation Targeting Does Not Anchor Inflation Expectations: Evidence from Firms in New Zealand"

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- Managers are unaware of central bank's objectives and poorly informed about recent inflation dynamics.
- Forecasts of future inflation: very uncertain, dispersed and volatile.

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- Can thus estimate directly the *Euler equation* and the corresponding *elasticity of intertemporal substitution*, a key macroeconomic parameter.
- Recall, that the Euler equation features expected consumption growth, while the literature traditionally has estimated Euler equations on realized consumption growth (Attanasio and Weber in many papers), essentially presupposing rational expectations.

"Inflation Expectations and Readiness to Spend: Cross-Sectional Evidence"

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- Use micro data from Michigan Survey of Consumers to study the association between a respondent's (quantitative) inflation expectations and their readiness to buy durables / cars / houses.
- Example of testing a key micro relationship, rather than a whole model.

Focus on Two Questions

Spending on durables:
"About the big things people buy for their homes – such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or a bad time for people to buy major household items?"

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One-year inflation expectations:
"By about what percent do you expect future prices to go (up/down) on the average, during the next 12 months?"

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Are interested in β_1 and β_2 and the associated average marginal effects.

Baseline

Dependent Variable: Buying Conditions for Durables	Sample: 1984:01 to 2012:12		
Number of observations: 67855	Pseudo R^2: 0.0671		
		Marginal Effects	
Independent Variables	Coefficients	at $D_{ZLB} = 0$	at $D_{ZLB} = 1$
Inflation Expectations (1Y)	-0.0009	-0.0002	-0.0047^{***}
	(0.0015)	(0.0004)	(0.0011)
ZLB Dummy Interacted with Expected Inflation (1Y)	-0.0112^{***}		
	(0.0031)		

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Independent Variables	Coefficients	at $D_{ZLB} = 0$	at $D_{ZLB} = 1$
Expected Financial Situation of Household	0.0263^{***}	0.0079^{***}	0.0101^{***}
	(0.0091)	(0.0027)	(0.0035)
Expected Real Household Income	0.0211^{**}	0.0064^{**}	0.0081^{**}
	(0.0083)	(0.0025)	(0.0032)
Expected Change in Nominal Interest Rate	0.0436^{***}	0.0131^{***}	0.0168^{***}
	(0.0074)	(0.0022)	(0.0029)
Expected 1Y Aggregate Business Conditions (Idiosyncratic)	0.1300^{***}	0.0392^{***}	0.0500^{***}
	(0.0068)	(0.0020)	(0.0026)
Expected 5Y Aggregate Business Conditions (Idiosyncratic)	0.0623^{***}	0.0188^{***}	0.0240^{***}
	(0.0068)	(0.0020)	(0.0026)
Expected Unemployment	-0.0652^{***}	-0.0196^{***}	-0.0251^{***}
	(0.0089)	(0.0027)	(0.0034)
Current Financial Situation	0.1189^{***}	0.0359^{***}	0.0458^{***}
	(0.0067)	(0.0020)	(0.0026)
Economic Policy Trust (Idiosyncratic)	0.1119^{***}	0.0337^{***}	0.0431^{***}
	(0.0088)	(0.0026)	(0.0034)

"Accurate" and "Reasonable" Inflation Expectations

Specification	Coefficients	Marginal Effects at $D_{ZLB} = 0$	Marginal Effects at $D_{ZLB} = 1$
Within one time series std of actual inflation ($N = 20814$, Sample: 1984:01 to 2012:12)	0.0084	0.0025	0.0057
	(0.0097)	(0.0029)	(0.0083)
Within one time series std of actual inflation, 2x ($N = 6551$, Sample: 1984:01 to 2012:12)	0.0157	0.0044	0.0222
	(0.0184)	(0.052)	(0.0157)
Within 0.5 percentage points of actual inflation ($N = 8577$, Sample: 1984:01 to 2012:12)	0.0019	0.0006	0.0379**
	(0.0190)	(0.0056)	(0.0177)
Outside 0.5 percentage points of actual inflation ($N = 59278$, Sample: 1984:01 to 2012:12)	−0.0010	−0.0003	−0.0048***
	(0.0015)	(0.0004)	(0.0011)
Within 1.28 percentage points of mean inflation expectations ($N = 22439$, Sample: 1984:01 to 2012:12)	0.0040	0.0012	0.0019
	(0.0126)	(0.0038)	(0.0098)
Within 1.28 percentage points of mean SPF inflation expectations ($N = 22061$, Sample: 1984:01 to 2012:12)	−0.0218	−0.0066	−0.0200
	(0.0142)	(0.0044)	(0.0122)

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- Prima facie these results tell a cautionary tale about using inflation expectations as a policy instrument.
- We view the results as suggestive that raising inflation expectations may at the very least pose a tough communication problem for central bankers.
- Panel dimension: for "good" inflation forecasters / informed households, we get a significantly positive sign. Salience seems to matter.
- Quantity expectations matter (Old Keynesianism appears to be alive and well).

Other Literature

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Interpretation of these results together?

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- Test whether the public understands monetary policy:

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- Test a key theoretical transmission mechanism of monetary policy and get guidance for its conduct – salience.

Potential Next Steps

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- This is what I mean by "...and we haven't even started yet."

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- Even more specifically: the fluctuations of the year-over-year investment growth rate.
- Novel approach: narrative, survey-based.

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- In the fall of every year decision makers in firms are asked what issues (six to choose from) determined their investment activity in the current (but ending) year, and to what extent - on an ordinal scale.
- We use the micro data to these answers, aggregate (or semi-aggregate) them up and extract things like "demand shocks" and "technological shocks".

Basic Idea

We see the advantage of a survey-based approach towards identifying shocks in its putative *directness*: the survey respondents (*decision makers*) directly report whether their investment activity in a given year was influenced by, for instance, technological considerations and, if so, how strongly.

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See, for instance, Romer (2004, 2010).

Also: these data are confidential, so there is probably little danger of decision makers strategically lying.

Preview of Results

1. On average and in the long-run, technological considerations are the most important investment determinant in the survey. A very neoclassical result!

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2. But: aggregate demand shocks explain the bulk of investment fluctuations.
3. Find suggestive evidence that these demand shocks are sentiment shocks.

Some Background on the Survey

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- Starts in 1955, but the for us relevant questions start only in 1989. Our baseline sample period: 1989-2013.

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  - Investment determinants only annually asked (fall).
  - Relatively short time series, few data, though sectoral disaggregation can help here.

Our Two Questions

Q1. Gross Fixed Capital Formation in Fiscal Year *[Last Year]*

[Last Year] _____
(in 1000 Euro)

Q2. Investment Determinants *[This Year]*

Our investment activity in the Old Laender in *[This Year]* was positively/negatively affected by:

			[This Year]		
Investment Determinant	strongly positive influence	weakly positive influence	no influence	weakly negative influence	strongly negative influence
Sales Situation and Expectation	☐	☐	☐	☐	☐
Finance	☐	☐	☐	☐	☐
Profit Expectation	☐	☐	☐	☐	☐
Technical Factors	☐	☐	☐	☐	☐
Macro Policy Environment	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐
[Codification]	*[+2]*	*[+1]*	*[0]*	*[-1]*	*[-2]*

Investment Determinants

Terminology: `Tech`, `Finance`, `Sales`, `Profit`, `Macro`, and `Other`

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Quantification: -2 (strongly negative influence), -1 (weakly negative influence), 0 (no influence), +1 (weakly positive influence), or +2 (strongly positive influence)

Aggregation

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Then the aggregate investment growth rate, ΔI_t^{IFO}, is given by:

$$\Delta I_t^{IFO} = \sum_{i=1}^{N_t} \omega_{it-1} \frac{inv_{it} - inv_{it-1}}{inv_{it-1}}$$

Aggregation

Similarly, let x_{it} denote one of the six firm-level investment determinants.

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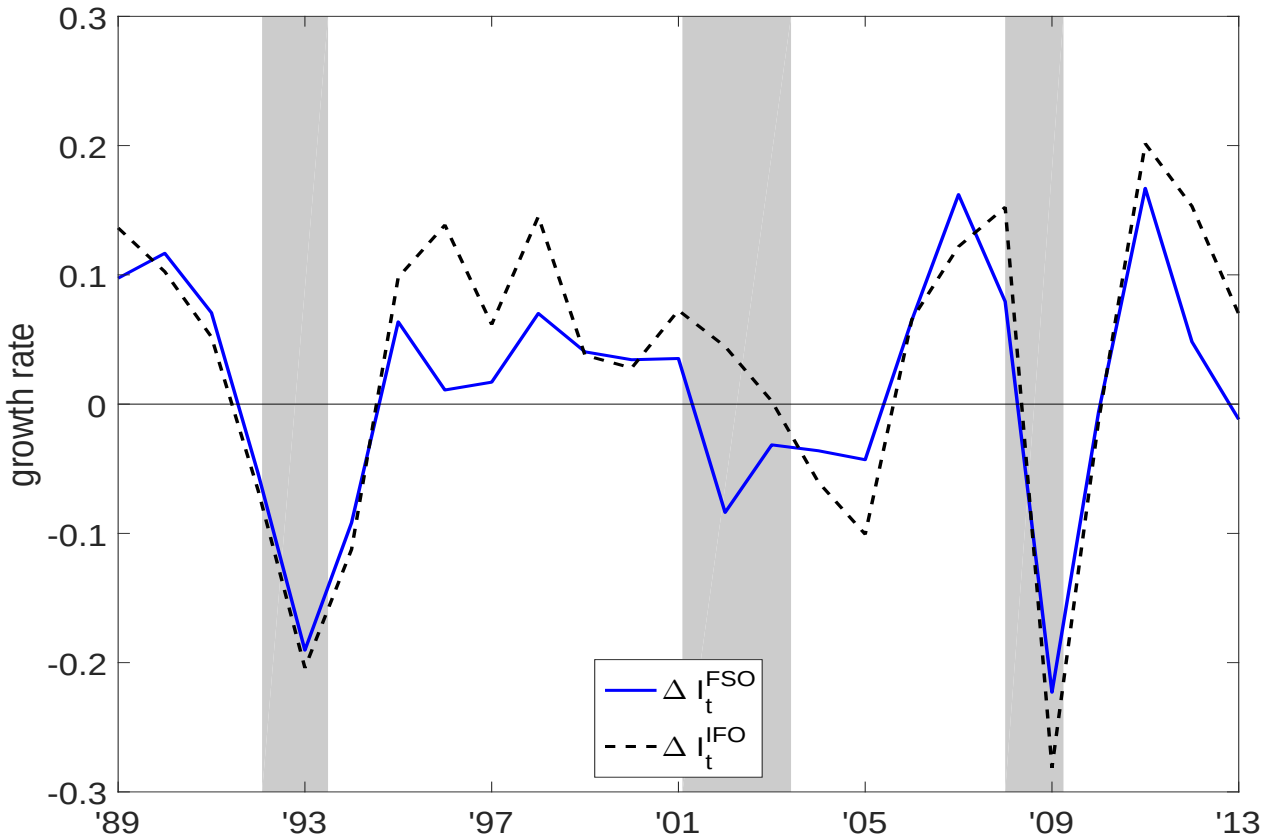
Then, for every investment determinant, we aggregate up to an investment determinant index, X_t, as follows:

$$X_t = \sum_{i=1}^{N_t} \omega_{it} \, x_{it}$$

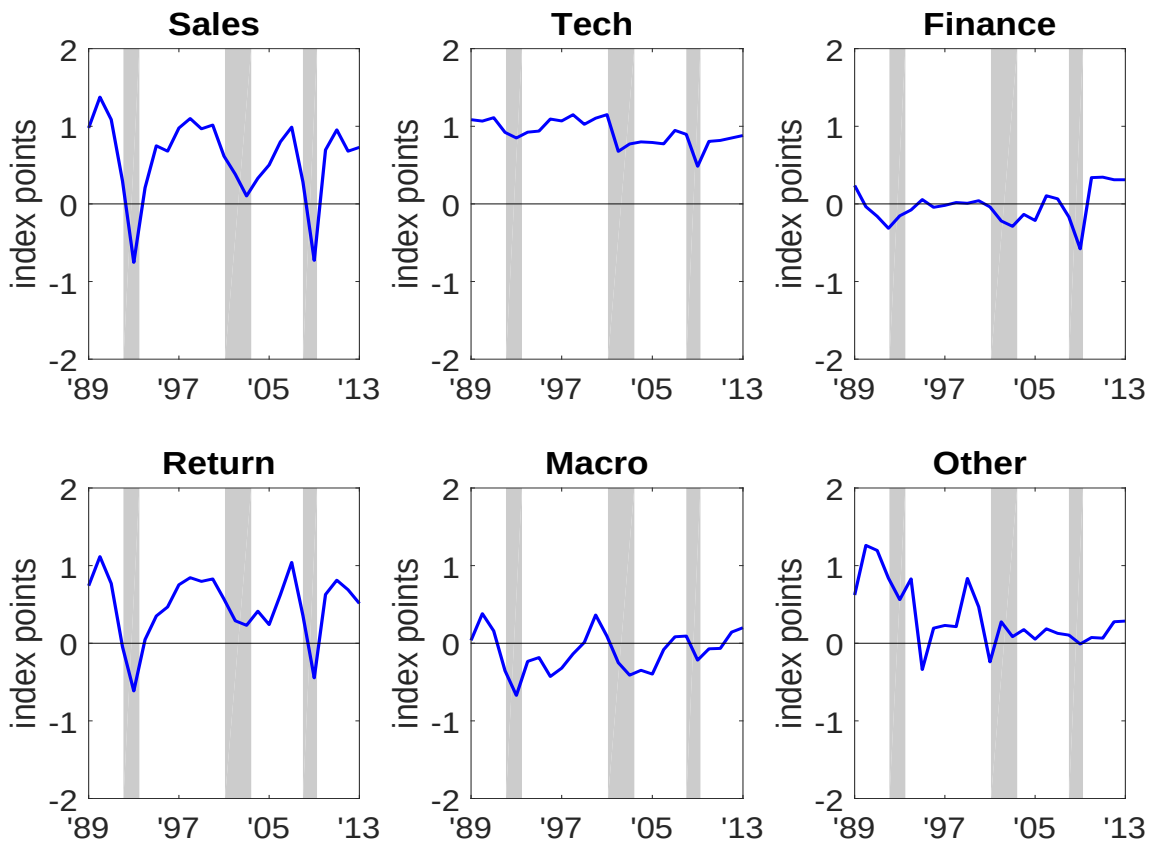
A First Look at the Data - Investment Growth Rate

Measures of aggregate investment growth ($\rho = 0.89$)



A First Look at the Data - Investment Determinant Indices

Aggregate investment determinant indices



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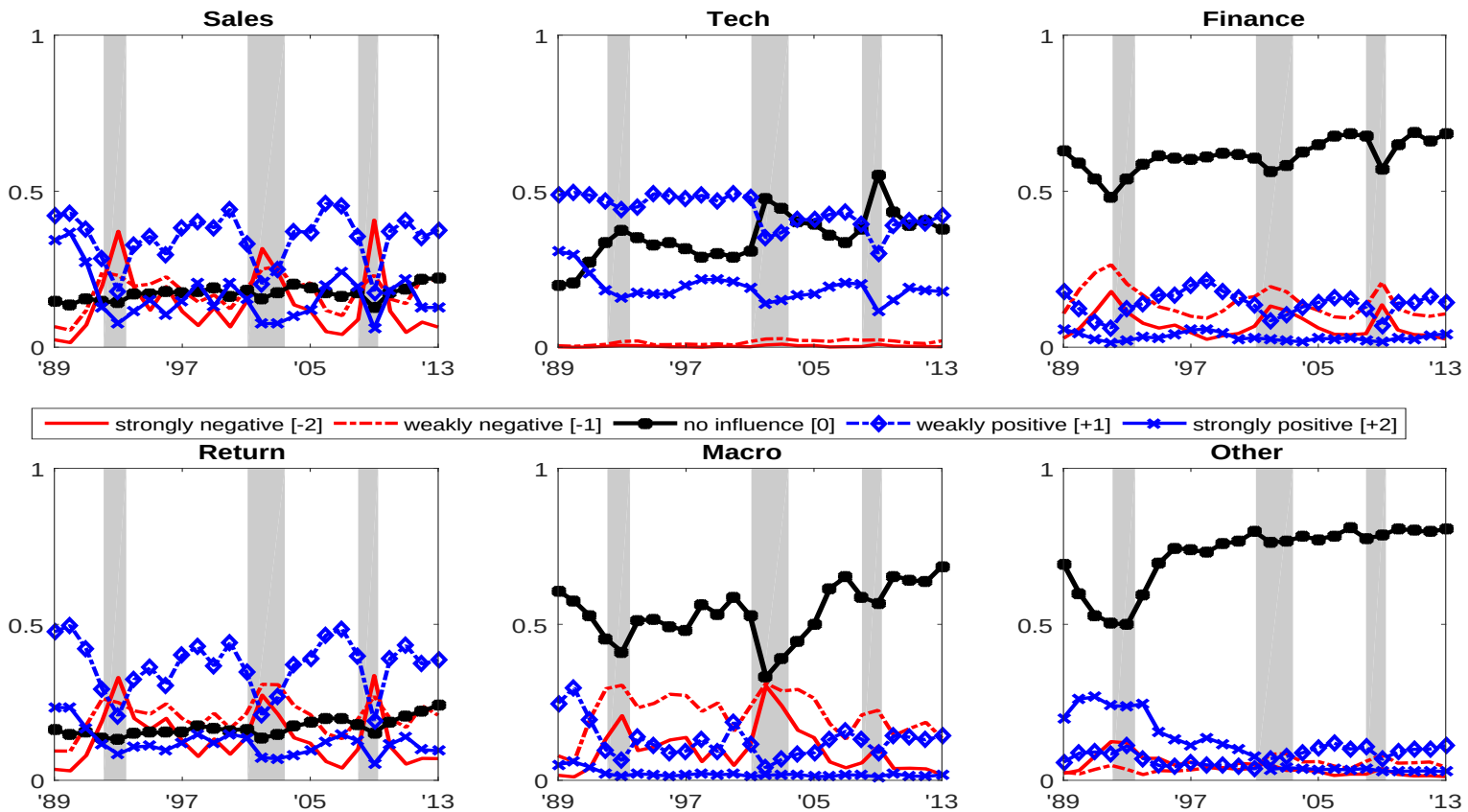

A First Look at the Data

	Sales	Tech	Finance	Return	Macro	Other	ΔI_t^{FSO}
Panel A:							
Sales	1						
Tech	0.6640***	1					
Finance	0.6059***	0.3183*	1				
Return	0.9539***	0.5802***	0.6165***	1			
Macro	0.6381***	0.3733**	0.4481***	0.6987***	1		
Other	0.2228	0.3416*	-0.0796	0.1426	0.2538	1	
Panel B:							
ΔI_t^{FSO}	0.8645***	0.5539***	0.6191***	0.8895***	0.6148***	0.0346	1
Panel C:							
$\hat{\mu}$	0.6005	0.9193	-0.0245	0.4806	-0.1046	0.3347	0.0123
$\hat{\sigma}$	0.5155	0.1642	0.2243	0.4192	0.2630	0.4021	0.0943

Economic Content: Tech

Mean of Tech, conditional on investment in restructuring and rationalization:

Tercile of Restructuring and Rationalization Investment	Mean(Tech)	N
less or equal 20%	0.7640	16403
between 20% and 40%	0.9285	9069
more or equal 40%	1.0657	12654

Difference in means statistically significant at the 1% level.

Economic Content: Finance

Mean of |Finance|, conditional on share of external finance (IFO survey):

Tercile of External Finance	Mean(|Finance|)	N
exactly 0%	0.2299	10597
between 0% and 20%	0.4193	1280
more or equal 20%	0.5080	5525

Economic Content: Sales and Tech

	LHS Variable is...							
	Frequency of Price Increases				Frequency of Price Decreases			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sales	0.015***	0.0069***	0.0073***	0.0091***	-0.023***	-0.016***	-0.015***	-0.014***
	(0.0015)	(0.0015)	(0.0015)	(0.0014)	(0.0020)	(0.0021)	(0.0019)	(0.0016)
Tech	-0.0086***	-0.0076***	-0.0088***	-0.0085***	0.0054**	0.0069**	0.0036	0.00041
	(0.0030)	(0.0029)	(0.0028)	(0.0025)	(0.0027)	(0.0027)	(0.0026)	(0.0023)
Constant	0.096***	0.14***	0.13***	0.14***	0.076***	0.025***	0.032	0.025***
	(0.0039)	(0.0081)	(0.021)	(0.0074)	(0.0042)	(0.0042)	(0.030)	(0.0051)
Observations	11539	11539	11520	11539	11539	11539	11520	11539
R^2	0.013	0.061	0.079	0.072	0.028	0.051	0.082	0.073
Year Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Firm Fixed Effects	No	No	No	Yes	No	No	No	Yes
Industry Effects	No	No	Yes	No	No	No	Yes	No

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  2. Want $\widehat{\texttt{Sales}_t}$ to be positively correlated with PPI inflation: Correlation threshold: 0.005.
  3. Want $\widehat{\texttt{Tech}_t}$ to be negatively correlated with PPI inflation: Correlation threshold: -0.005.
- Orthogonalize `Finance`, `Profit`, `Macro` and `Other` with respect to $\widehat{\texttt{Sales}_t}$ and $\widehat{\texttt{Tech}_t}$ (and – in that order – to each other, Choleski).

Final Regression

$$\begin{aligned}\Delta I_t^{FSO} &= c + \beta_1 \widehat{\texttt{Tech}_t} + \beta_2 \widehat{\texttt{Sales}_t} + \beta_3 \widehat{\texttt{Finance}_t} + \\ &\quad \beta_4 \widehat{\texttt{Profit}_t} + \beta_5 \widehat{\texttt{Macro}_t} + \beta_6 \widehat{\texttt{Other}_t} + u_t\end{aligned}$$

Since we have orthogonal regressors (by construction) we can decompose their contribution to the R^2 of this multivariate regression by computing a series of univariate regressions. We do so for every orthogonalization in the admissible set.

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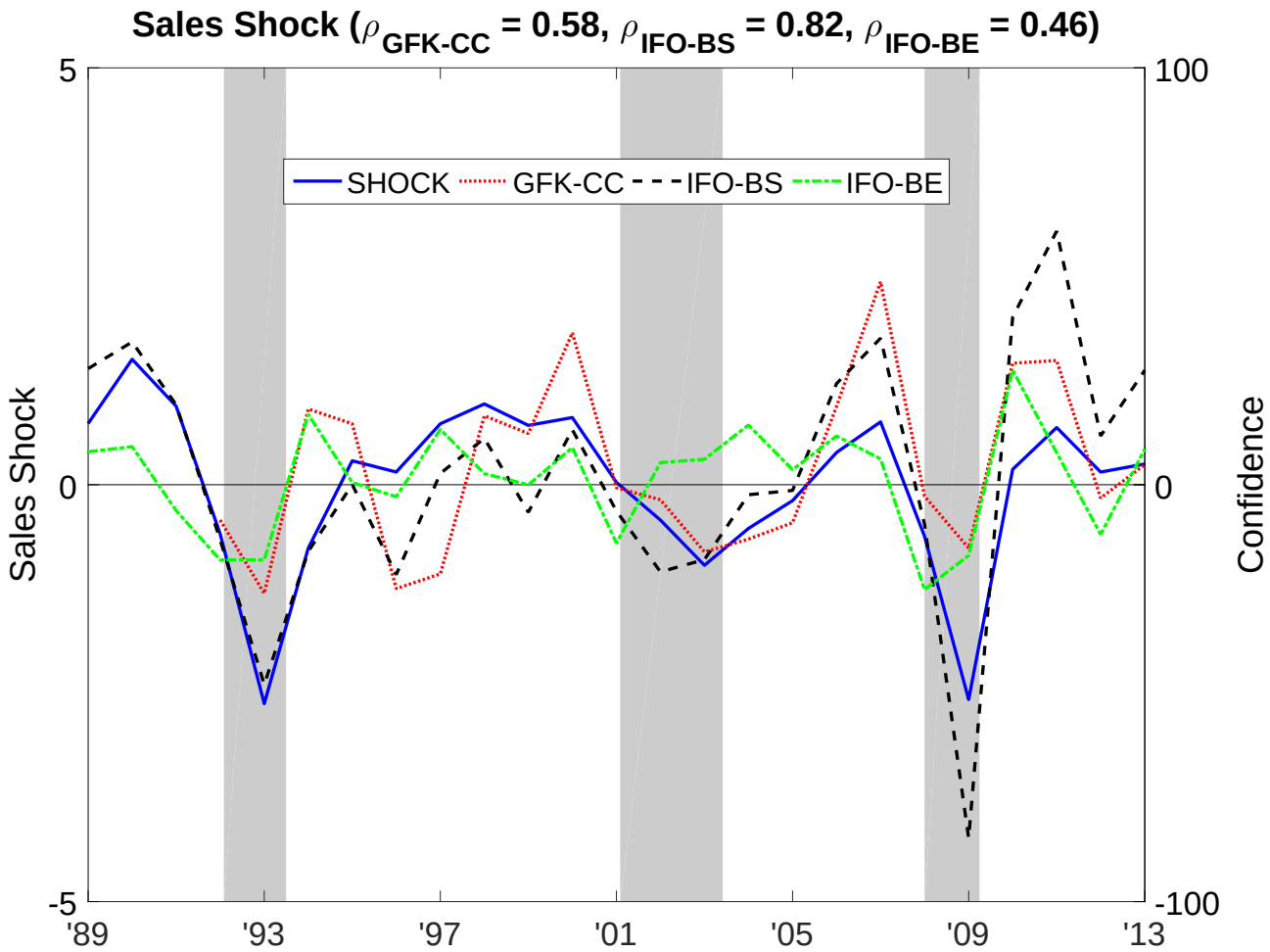
Recall: R^2s are additive with orthogonal regressors.

Relative Contribution to the Variance of ΔI_t^{FSO} (in percent)

	Correlation Restrictions	Recursive: Sales first	Recursive: Tech first
Panel A:			
$\widehat{\texttt{Sales}}$	[65.92, 74.81]	74.74	44.13
$\widehat{\texttt{Tech}}$	[0.00, 8.89]	0.07	30.68
$\widehat{\texttt{Finance}}$	1.37	1.37	1.37
$\widehat{\texttt{Return}}$	4.08	4.08	4.08
$\widehat{\texttt{Macro}}$	0.00	0.00	0.00
$\widehat{\texttt{Other}}$	1.15	1.15	1.15
R^2 of Regression Equation	0.81	0.81	0.81
Panel B:			
Corr $\left(\widehat{\texttt{Sales}}, \text{PPI}\right)$	[0.47, 0.52]	0.51	0.42
Corr $\left(\widehat{\texttt{Tech}}, \text{PPI}\right)$	[-0.22, -0.01]	-0.06	0.30
Corr $\left(\widehat{\texttt{Sales}}, \texttt{Sales}\right)$	[0.95, 1.00]	1.00	0.75
Corr $\left(\widehat{\texttt{Tech}}, \texttt{Tech}\right)$	[0.50, 0.81]	0.75	1.00

$\widehat{\text{Sales}}_t$ and Sentiment Indicators



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- Run a VAR with $\texttt{Tech}_t$, $\texttt{Sales}_t$, the investment growth rate and PPI inflation, and find similar results.
- Disaggregate results for 2-digit industries (and Laender) tell the same story.

What Do We Do? - Final Paper

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> *Collective reputations play an important role in economics and the social sciences. Countries, ethnic, racial or religious groups are known to be hard-working, honest, corrupt, hospitable or belligerent.*

Tirole (1996): "A Theory of Collective Reputation"

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Do so with difference-in-differences regressions, where we compare non-VW German car makers with non-German car makers.

Sales Effect

Dependent Variable	12-month Log Sales Growth			
	non-VW German	BMW	Mercedes-Benz	Smart
	(1)	(2)	(3)	(4)
German × Post-Scandal	-0.104	-0.151	-0.060	-0.308
	(0.035)	(0.012)	(0.011)	(0.012)
Time Fixed Effects	Yes	Yes	Yes	Yes
Make Fixed Effects	Yes	Yes	Yes	Yes
R^2	0.292	0.296	0.294	0.295
N	2150	2014	2014	2014

Rate of Return Effect

Dependent Variable	Abnormal Returns		Cumulative Abnormal Returns	
	(1)	(2)	(3)	(4)
German × Post-Scandal	-0.019	-0.019	-0.064	-0.061
	(0.004)	(0.005)	(0.013)	(0.015)
Weighting	None	Sales Volume	None	Sales Volume
Time Fixed Effects	Yes	Yes	Yes	Yes
Company Fixed Effects	Yes	Yes	Yes	Yes
R^2	0.687	0.600	0.882	0.799
N	60	60	24	24

It is not Just Diesel

Dependent Variable	12-month Log Sales Growth		
Power Type	Baseline	non-Diesel	Diesel
	(1)	(2)	(3)
German × Post-Scandal	-0.104	-0.096	-0.233
	(0.035)	(0.038)	(0.126)
Time Fixed Effects	Yes	Yes	Yes
Make Fixed Effects	Yes	Yes	Yes
R^2	0.292	0.289	0.284
N	2150	2150	428

Reputational Effect

Dependent Variable	Positive Sentiment	Negative Sentiment
	(1)	(2)
German × Post-Scandal	-0.035	0.002
	(0.006)	(0.006)
Time Fixed Effects	Yes	Yes
Make Fixed Effects	Yes	Yes
R^2	0.348	0.268
N	840	840

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- Especially expectation data have a lot to teach us about important macroeconomic ideas and issues.
- I would argue we should go a step further and ask economic agents why they did what they did and how they feel about stuff.