Are Consumers' Spending Decisions in Line With an Euler Equation?

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Motivation: The Role of Macroeconomic Expectations for Economic Decision-Making

- Consumption theory: Households' perceptions of the real interest rate affect their current consumption and saving decisions
- Particular relevance of inflation expectations' power to boost aggregate demand at the zero lower bound (ZLB)
- Monetary policy increasingly also manages expectations of the general public (forward guidance)
- But: Are households' macro expectations as obtained from survey data really relevant for their actual economic decision making?

Optimal Consumption in the Euler Equation

- Households optimize consumption over their life-cycle and prefer to smooth consumption
- Consumption smoothing is enabled via saving and dis-saving on financial markets

$\Rightarrow$ Euler Equation: Current consumption is a function of future expected consumption and the real interest rate determined by the nominal interest rate and expected inflation

$$c_t = E_t c_{t+1} - \sigma^{-1} \left(i_t - E_t \pi_{t+1} - \ln \beta \right), \tag{1}$$

Optimal Consumption in the Euler Equation

- Survey asks about expectations for the *next 12 months*

$\Rightarrow$ Solving forward shows that future expected nominal interest rates also play a role for current consumption:

$$c_t = \frac{1}{12} \sum_{k=1}^{12} \left[E_t \, c_{t+k} - \sigma^{-1} \sum_{j=0}^{k-1} E_t \left(i_{t+j} - \pi_{t+j+1} \right) \right] \tag{2}$$

This Paper

1. Jointly tests whether individual expectations on nominal interest rates and on inflation affect consumers' spending decisions in line with the Euler equation model $\Rightarrow$ two channels

$\Rightarrow$ Estimate Euler equations of the form:

$$c_{it}^{current} = \beta_0 + \beta_1 c_{it}^{e} + \beta_2 i_{it}^{e} + \beta_3 \pi_{it}^{e} + \mathbf{X}_{it}^{controls'} \mathbf{\Gamma} + u_{it} \qquad (3)$$

Test for $\beta_1 > 0$, $\beta_2 < 0$ and $\beta_3 > 0$

This Paper

2. Controls for the role of perceived inflation
3. Uses both qualitative and quantitative macroeconomic expectations
4. Robustness: Alternative specification with consumers' readiness to spend on durables
5. Tests for the role of news on monetary policy, inflation and financial markets

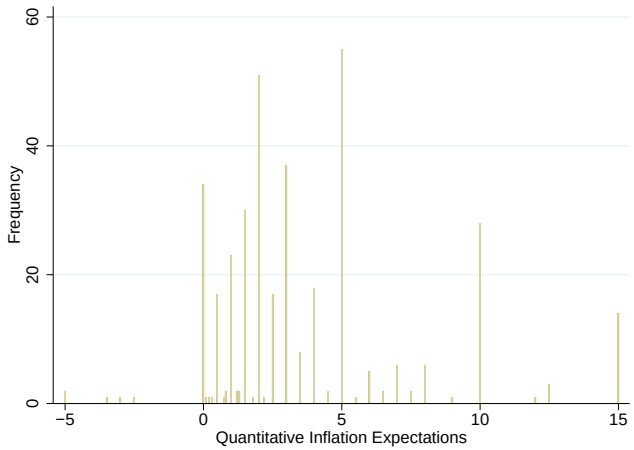
New Survey

- New household survey conducted at the University of Hamburg, representative of the German population
- Two waves during the ZLB period:
  - Oct/Dec 2015, 313 interviews
  - May/June 2016, 183 re-interviews
- Questions on individual current/planned overall consumption spending
- Qualitative and quantitative expectations on inflation and nominal interest rates
- Information on qualitative and quantitative inflation perceptions
- Results are robust in the larger cross-section of the German Bundesbank Panel of Household Finances

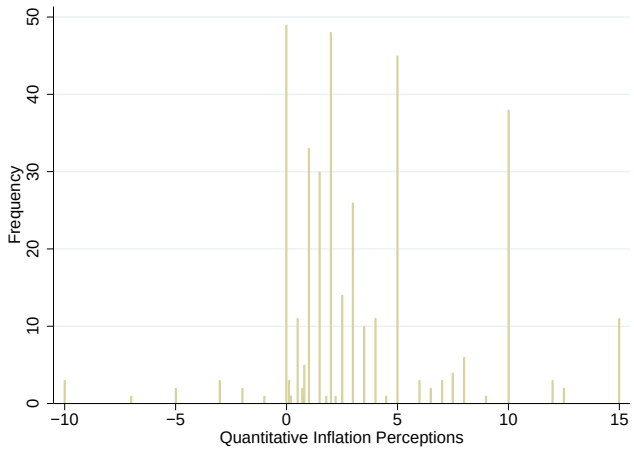
Previous Literature

- US: Almost no link between consumers' reported "readiness to spend" on durables or current consumption and their inflation expectations, if the relationship is significant, it is mostly negative (Bachmann et al., 2015; Burke and Ozdagli, 2013)
- US II: Positive link between quantitative expected consumption growth and quantitative inflation expectations in new SCE data (Crump et al., 2015)
- Japan: Positive link between consumers' actual consumption and expected inflation (Ichiue and Nishiguchi, 2015)
- Germany/Europe: Positive link between consumers' "readiness to spend" and inflation expectations inside and outside the ZLB (D'Acunto et al., 2016; Duca et al., 2018)

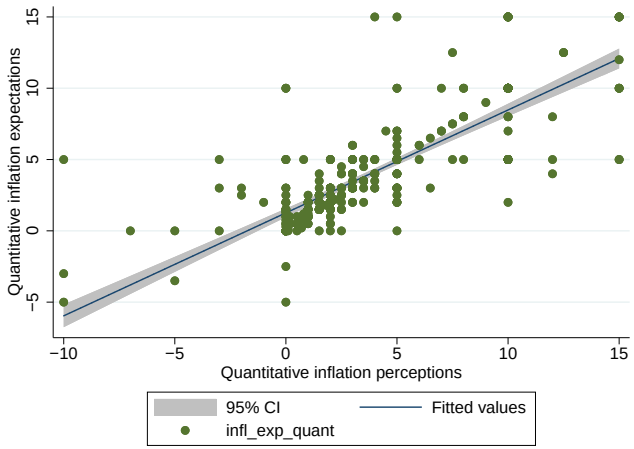
Inflation Perceptions and Expectations



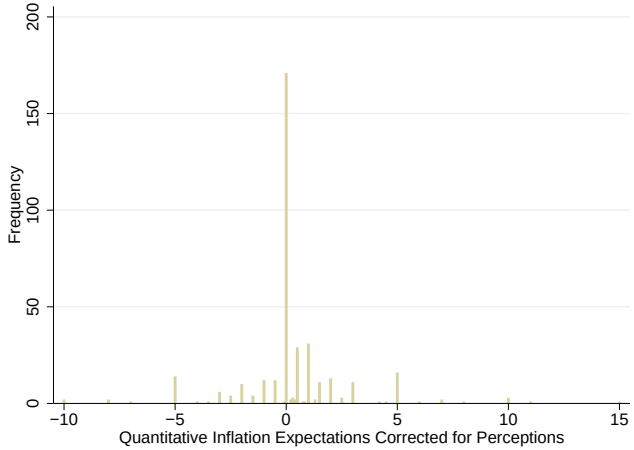
Quantitative Inflation Expectations



Quantitative Inflation Perceptions

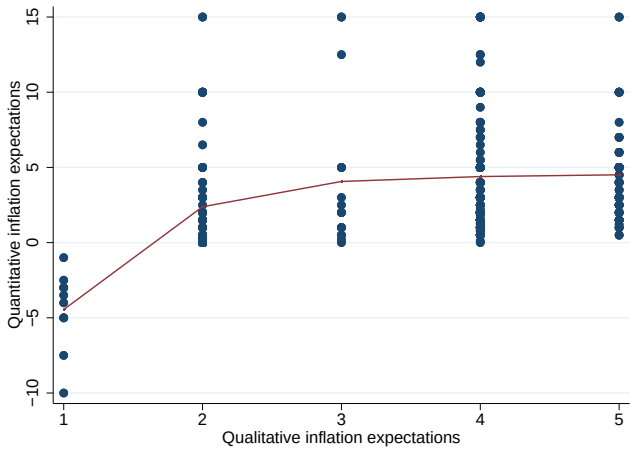


Quantitative Perceived and Expected Inflation

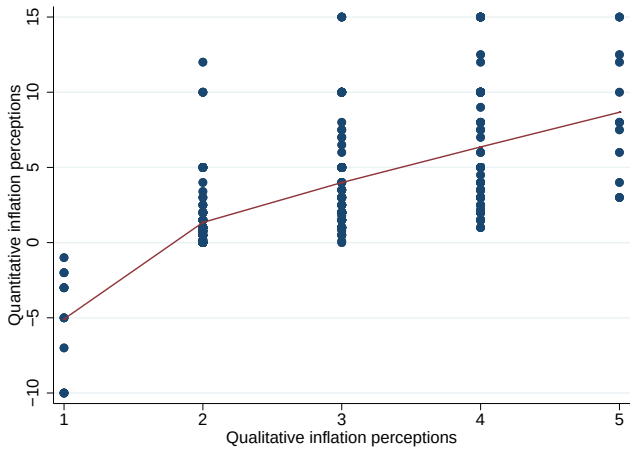


Quantitative Inflation Expectations Corrected for Perceptions ($\pi^e - \pi^p$)

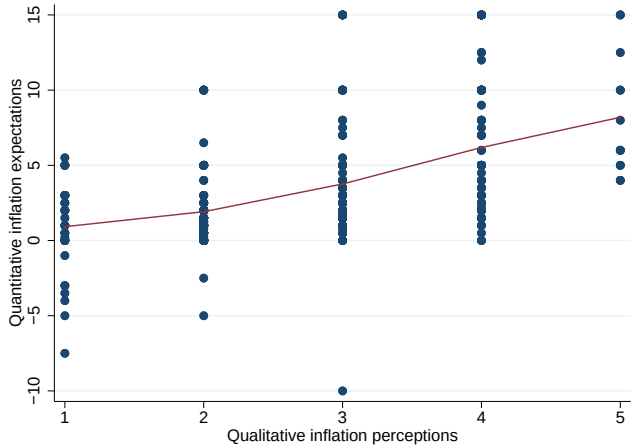
Quantitative vs. Qualitative Inflation Expectations



Inflation Expectations



Inflation Perceptions



Qualitative Perceptions Across Quantitative Expectations

Estimation Strategy

- Ordered probits, report marginal effects for probability of answering "consumption has increased in the past 12 months relative to an average year"
- Population weights and standard errors clustered at the household level
- Control for a large set of demographic variables, additional macroeconomic expectations and a time fixed effect for the two waves
- Quantitative expectations truncated to exclude at $-15 \leq \pi^{e,p} \leq 15$ and $0 \leq i^e \leq 5$

Consumption Euler Equation with Qualitative Expectations

	(1) All HHs	(2) All HHs	(3) Fin. literacy	(4) Fin. literacy
c^e_{it}	0.151**	0.163**	0.005	0.015
	(0.062)	(0.066)	(0.049)	(0.052)
$i^e_{qual,it}$	-0.016	-0.020	-0.146***	-0.150***
	(0.042)	(0.042)	(0.040)	(0.042)
$\pi^e_{qual,it}$	0.063**		0.064***	
	(0.025)		(0.023)	
$\pi^p_{qual,it}$		0.039*		0.016
		(0.021)		(0.023)
Macro Expectations	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes
Wave Dummy	Yes	Yes	Yes	Yes
Pseudo R^2	0.130	0.117	0.142	0.121
N individuals	278	277	187	186
N observations	425	424	292	291

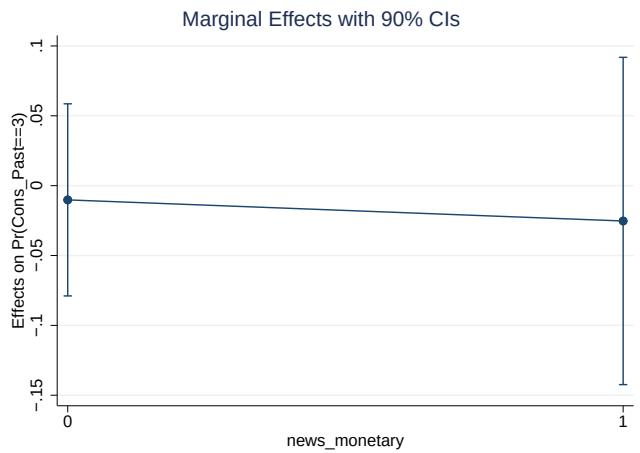
Consumption Euler Equation with Quantitative Expectations

	(1) All HHs	(2) All HHs	(3) All HHs Wave 2	(4) Fin. literacy	(5) Fin. literacy	(6) Fin. literacy Wave 2
c^e_{it}	0.153**	0.078	0.103	-0.032	-0.051	-0.089
	(0.076)	(0.069)	(0.096)	(0.059)	(0.059)	(0.098)
$i^e_{qual,it}$	-0.021	-0.010		-0.172***	-0.148***	
	(0.047)	(0.045)		(0.048)	(0.046)	
$i^e_{quant,it}$			-0.027			-0.121**
			(0.062)			(0.049)
$\pi^e_{quant,it}$	0.011**		0.021	0.020***		0.025**
	(0.006)		(0.014)	(0.007)		(0.012)
$\pi^p_{quant,it}$		0.024***			0.032***	
		(0.008)			(0.008)	
$\pi^e_{quant,it} - \pi^p_{quant,it}$		-0.001			0.029**	
		(0.010)			(0.015)	
Macro Expectations	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Wave Dummy	Yes	Yes	No	Yes	Yes	No
Pseudo R^2	0.119	0.139	0.181	0.142	0.163	0.148
N individuals	246	231	150	169	161	109
N observations	368	333	150	260	237	109

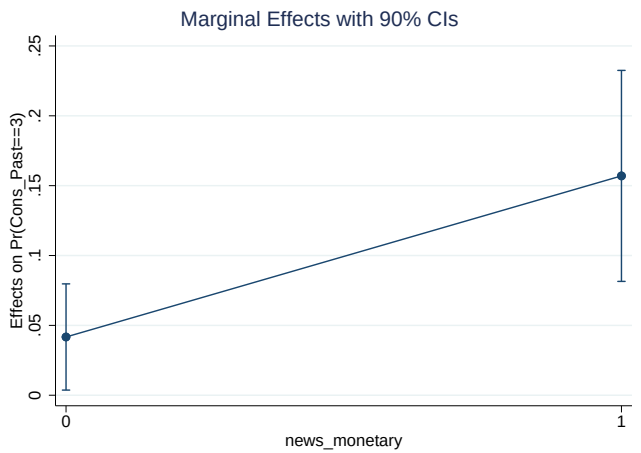
Euler Equation with the Readiness to Spend on Durables

	(1) All HHs	(2) All HHs	(3) All HHs	(4) All HHs	(5) All HHs_Wave2
$c_{it}^{e,dur}$	0.029	0.015	0.034	0.063**	0.065
	(0.038)	(0.042)	(0.036)	(0.032)	(0.073)
$i_{qual,it}^{e}$	-0.006	-0.009	-0.009	-0.008	
	(0.036)	(0.039)	(0.039)	(0.038)	
$i_{quant,it}^{e}$					0.010
					(0.037)
$\pi_{qual,it}^{e}$	-0.022				
	(0.027)				
$\pi_{quant,it}^{e}$			-0.041***		-0.037***
			(0.012)		(0.013)
$\pi_{qual,it}^{p}$		-0.112***			
		(0.038)			
$\pi_{quant,it}^{p}$				-0.031***	
				(0.010)	
$\pi_{quant,it}^{e} - \pi_{quant,it}^{p}$				-0.036**	
				(0.015)	
Macro Expectations	Yes	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes
Wave Dummy	Yes	Yes	Yes	Yes	No
Pseudo R^2	0.129	0.154	0.201	0.223	0.300
N individuals	271	270	243	228	149
N observations	415	415	363	328	149

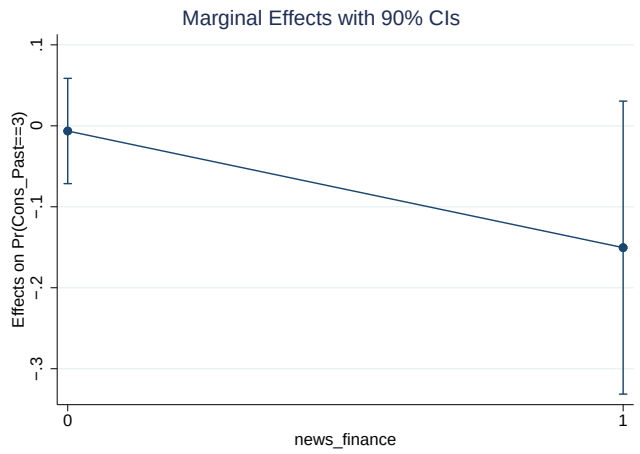
Interaction with Monetary and Financial Market News



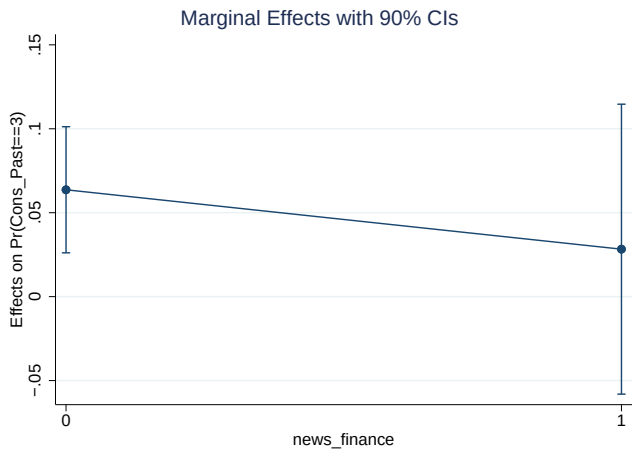
Interest Expectations – Monetary News



Inflation Expectations – Monetary News

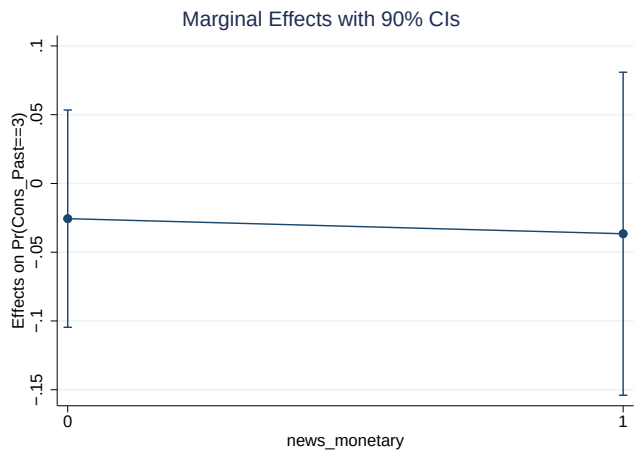


Interest Expectations – Financial News



Inflation Expectations – Financial News

News Effects for Savers



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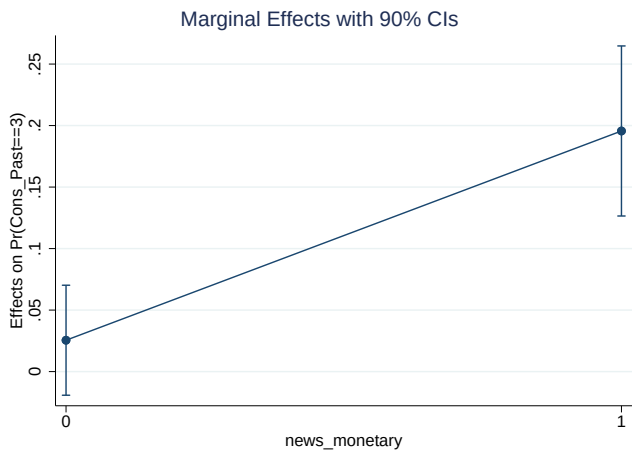

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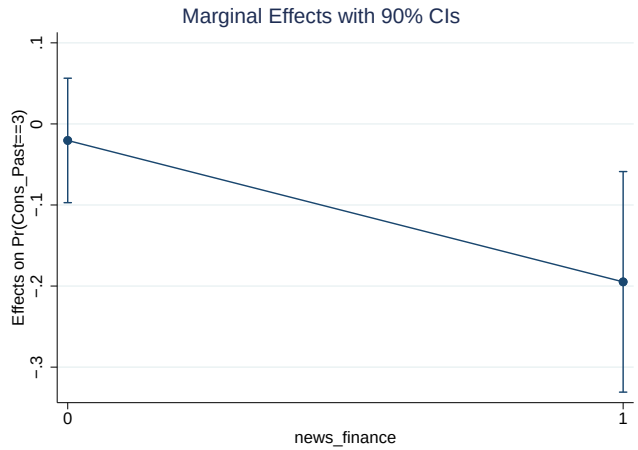
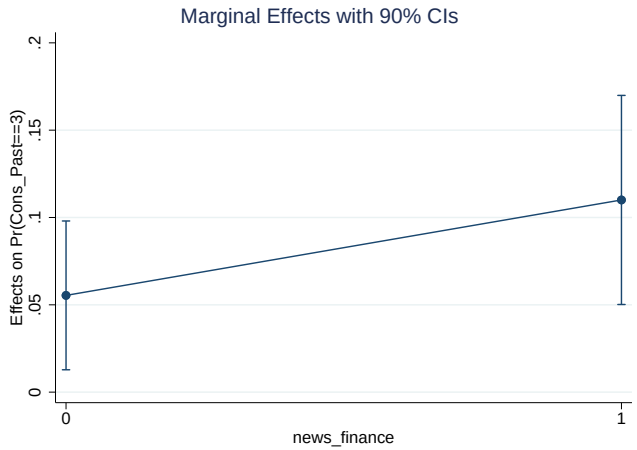
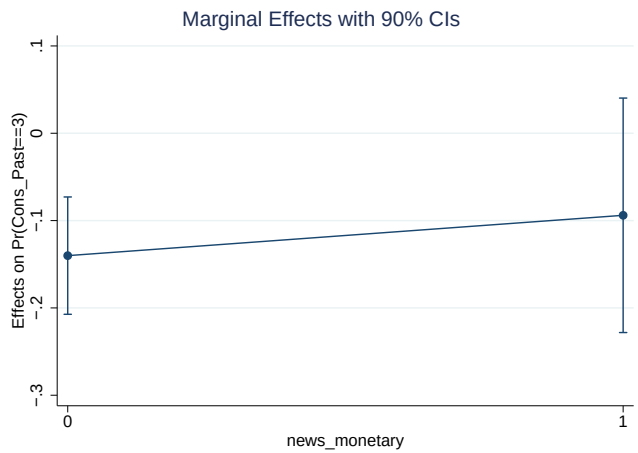


Interest Expectations – Financial News

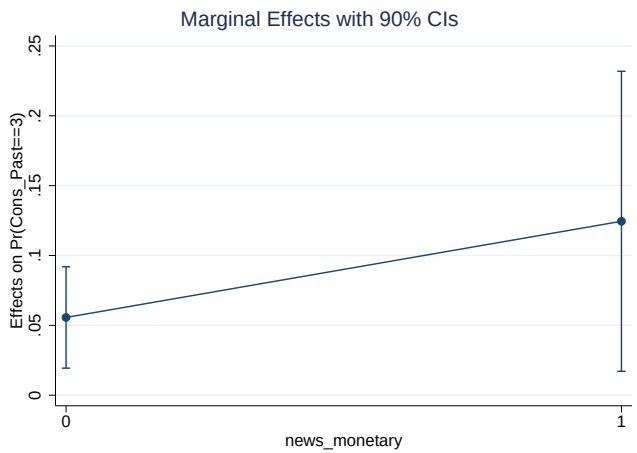


Inflation Expectations – Financial News

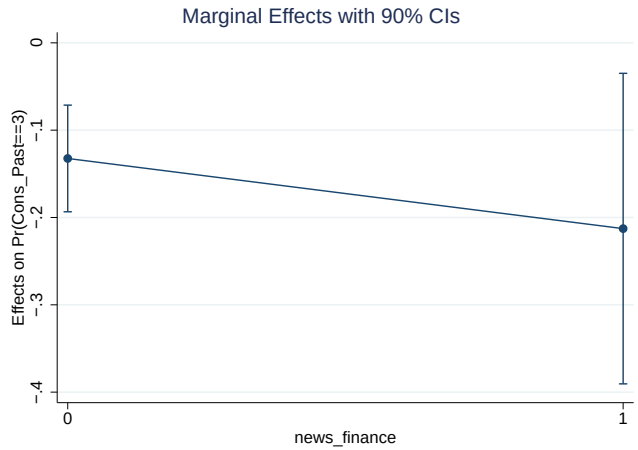
News Effects for Consumers with High Financial Literacy



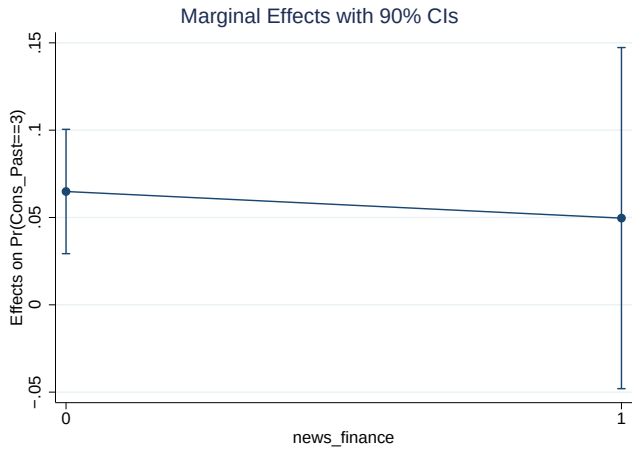
Interest Expectations – Monetary News



Inflation Expectations – Monetary News



Interest Expectations – Financial News



Inflation Expectations – Financial News

Summary and Conclusion

- New survey dataset of consumers representative of the German population
- Evaluate consumption decisions framed in the Euler equation setting

$\Rightarrow$ Consumers smooth consumption patterns and react to changes in the perceived real interest rate with the expected signs

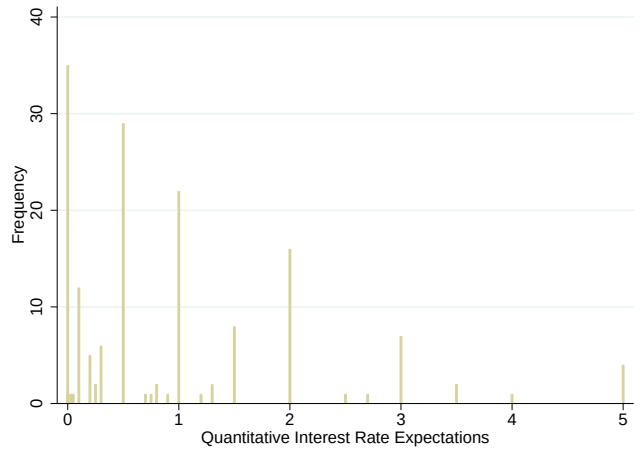
$\Rightarrow$ Importance of basic level of financial literacy, financial market participation and economic news

$\Rightarrow$ Role of ZLB environment?

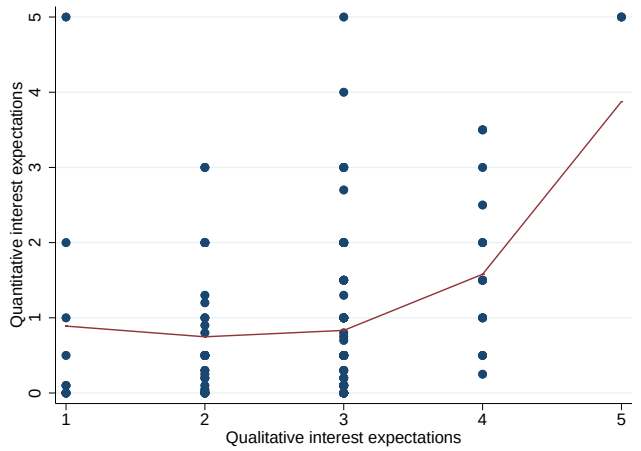
Thank you for your attention!

Appendix

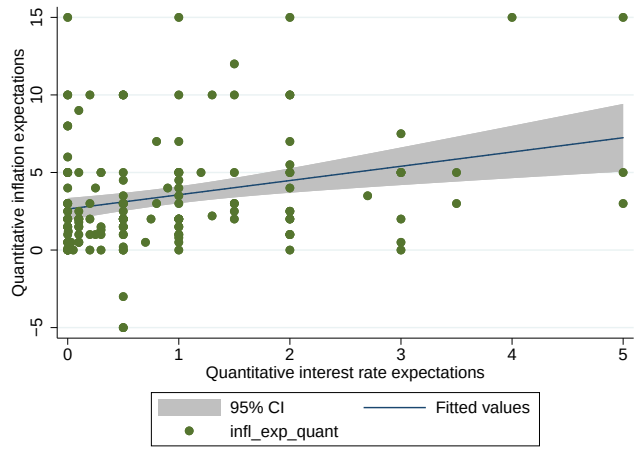
Quantitative Interest Rate Expectations



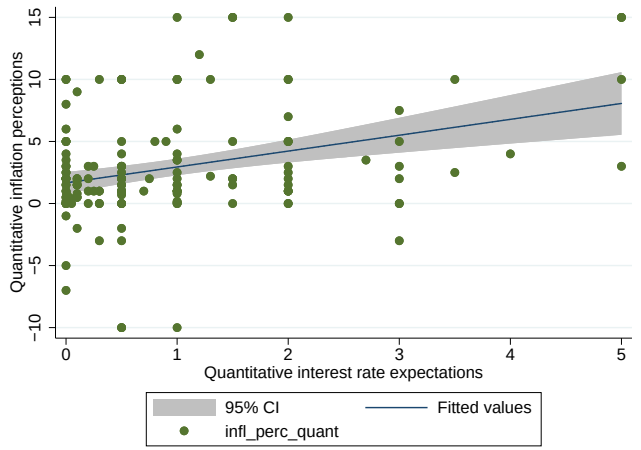
Quantitative Interest Rate Expectations, Wave 2



Qualitative vs. Quantitative Interest Rate Expectations, Wave 2



Inflation Expectations and Interest Rate Expectations, Wave 2



Inflation Perceptions and Interest Rate Expectations, Wave 2

Question Design Consumption

- Current consumption $\Delta c_{it}^{current}$: *"How would you say do your total expenditures in the past 12 months compare to an average year in the past? They were"*
  - Considerably higher
  - About the same
  - Considerably lower
  - Don't know
  - No answer

- Future consumption Δc_{it}^{e}: *"How would you say will your total expenditures in the next 12 months compare to an average year in the past? They will be"*
  - Considerably higher
  - About the same
  - Considerably lower
  - Don't know
  - No answer

Question Design for Qualitative and Quantitative Expectations

- Qualitative nominal interest rate expectations $i_{it}^{e,qual}$: *"How do you think interest rates on saving accounts on average will develop over the next 12 months? They will"*
  - Increase strongly
  - Increase somewhat
  - Stay about the same
  - Decrease somewhat
  - Decrease strongly
  - Don't know
  - No answer

- Quantitative nominal interest rate expectations $i_{it}^{e,quant}$: *"What do you think, how high will interest rates on saving accounts be on average over the next 12 months?"*
  - ... Percent
  - Don't know
  - No answer

Question Design for Qualitative and Quantitative Expectations

- Qualitative inflation expectations $\pi_{it}^{e,qual}$: *"How do you think prices in general will develop over the next 12 months compared to the previous 12 months? They will"*
  - Increase more than before
  - Increase at about the same rate
  - Increase less strongly than before
  - Stay about the same
  - Fall
  - Don't know
  - No answer

- Quantitative inflation expectations $\pi_{it}^{e,quant}$: *"How many percent do you think prices in general will increase/decrease on average over the next 12 months?"*
  - ... Percent
  - Don't know
  - No answer

Question Design for Qualitative and Quantitative Expectations

- Qualitative inflation perceptions $\pi_{it}^{p,qual}$: *"How do you think prices in general have developed over the past 12 months? They have"*
  - Increased strongly
  - Increased moderately
  - Increased slightly
  - Stayed about the same
  - Fallen
  - Don't know
  - No answer

- Quantitative inflation perceptions $\pi_{it}^{p,quant}$: *"How many percent do you think prices in general have increased/decreased on average over the past 12 months?"*
  - ... Percent
  - Don't know
  - No answer

Question Design Additional Questions

- Compound Interest Effect: *"Let us assume you have a balance of €100 in your savings account. This balance bears interest at an annual rate of 2%, and you leave it there for 5 years. What do you think: How high is your balance after 5 years?"*
  - Higher than €102
  - Exactly €102
  - Lower than €102
  - Don't know
  - No answer

- Real Interest Rate: *"Let us assume that the interest paid on your savings account is 1% per year and the inflation rate is 2% per year. What do you think: After a year, will you be able to buy just as much, more or less than today with the balance in your savings account?"*
  - More than today
  - Just as much
  - Less than today
  - Don't know
  - No answer

Question Design Additional Questions

- Qualitative general economic expectations $\Delta econ_{it}^{e,qual}$: *"How do you think the economy in Germany in general is going to develop over the next 12 months? It will"*
  - Improve considerably
  - Improve somewhat
  - Stay about the same
  - Deteriorate somewhat
  - Deteriorate considerably
  - Don't know
  - No answer

- Qualitative unemployment expectations $\Delta u_{it}^{e,qual}$: *"How do you think unemployment in Germany in total is going to develop over the next 12 months? It will"*
  - Increase considerably
  - Increase somewhat
  - Stay about the same
  - Drop somewhat
  - Drop considerably
  - Don't know

Question Design Additional Questions

- News heard $news_{it}$: *"In the recent months, have you heard or read about any positive or negative business or economic news in general?"*
  - Yes, positive
  - Yes, negative
  - Yes, both
  - No, neither positive nor negative
  - Don't know
  - No answer

- News categories open question: *"If yes, what did you hear or read?"*
  - ...
  - Don't know
  - No answer

Question Design Additional Questions

- News on monetary policy $news\_monetary\_policy_{it}$: Mainly news on
  - Interest rate setting by the ECB (neutral)
  - Negative effect of low interest rates for saving
  - Potential future economic/inflation problems related to very expansive monetary policy

- News on inflation $news\_inflation_{it}$: Mainly news on
  - Rising prices (consumer prices, food, rents)

- News on financial market developments $news\_financial\_markets_{it}$: Mainly news on
  - Strong stock prices
  - Rising house prices
  - Stability problems in the banking sector (few)

Question Design Additional Questions

Definitions for financial market participation:

- Respondents who do not save:
  - Question "*Which of the following statements best describes the current financial situation of your household?*"
  - Answer "*The household does not save*"

- Respondents active on financial markets:
  - Question "*In which assets do you normally save?*"
  - Answers "*Bonds, stocks, life insurance, private pension scheme (e.g. Riester), building and loan association*"

- Respondents paying off debt:
  - Question "*In which assets do you normally save?*"
  - Answer "*Paying off credit or a mortgage*"

Question Design Additional Questions

- Income groups:
  - inc_l : Income $<$ 1.000 € per month
  - inc_ml : 1.000 € $\leq$ income $<$ 2.000 € per month
  - inc_mh : 2.000 € $\leq$ income $<$ 4.000 € per month
  - inc_h : Income $\geq$ 4.000 € per month

- Employment groups:
  - $employ\_l$: Does not work
  - $employ\_ml$: Infrequently working or in mini-job
  - $employ\_mh$: Working part-time
  - $employ\_h$: Working full-time

Question Design Additional Questions

- Financial risk attitude $risk_{it}$: *"When taking decisions on savings or financial investment, which of the following statements best describes your personal attitude?"*
  - I take considerable risks and want to gain very high profits
  - I take above average risks and want to gain above average profits
  - I take average risks and want to gain average profits
  - I am not willing to take any financial risks
  - Don't know
  - No answer