Leibniz University Hannover
School of Economics and Management
Institute of Money and International Finance

Seminar Monetary Economics Using Microdata
(Belegnummer:)

Thema:

Google inflation? The Formation of Households´ Inflation Expectations since 2020

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1 Introduction

This thesis wants to analyze the formation and updating behavior of inflation expectations of US households from 2012-today, particular in the last two years. By combining aggregated and micro data from the Survey of Consumers Expectations and data from Google Trends about search terms like "inflation" it will be possible to determine when households update their knowledge and therefore their short-term expectations.

After a presentation of the theoretical background to inflation expectations we conduct a short descriptive analysis of the one-year expectations from the last ten years as a whole and two sub-sets. This analysis also focus on differences between certain age cohorts and other properties provided by the SCE. After the presentation of the SCE data set we exercise similar operations for the results from the Google Trends data.

After the descriptive analysis we conduct further analyses by combining both data sets to show the relationship between Google searches and changes in inflation expectations. We look at correlation between expectations and uncertainty, google searches and the actual CPI and in a second model the relationship between google searches and micro-data.

Research question: - Under which circumstances and how often do households update their inflation expectations?

Used Papers:

Afunts(2022): - ukraine war has risen inflation expectations of german households, both short- and long-term - used the Bundesbank Online Panel of Households (BOP-HH) with about 6,000 respondents in January, February, and March 2022

Brainard(2022): - inflation bears high risks - stable and low inflation key for economy and labor market

Bernanke(2007): - explains risks of inflation, benefits of low stable inflation - gives an definition what anchored expectations mean

2 Theoretical Background

2.1 Literature

- a quick overview about the literature

Bernanke(2007):

- inflation makes pricing and investing processes more difficult, messes with taxing and accounting rules
- inflation leads to less public confidence in the economy and economic plicy
- low inflation "promotes growth, efficiency and stability", what is good for productivity and therefore employment
- inflation expectations determine actual inflation
- in 2007 inflation less respondive to supply shocks than in the past
- surveys a good tool to measure expectations, short and long-term

2.2 Carvalho(2014):

Carvalho(2021): - long-term expectations are endogenous, short-term makes the long-term ones

Corsello(2019): - uses data from ECB's Survey of Professional Forecasters, professionals!!! - analysis with the low inflation right before covid19 - hhs expectations are dependent on movements for energy and food prices

Coibion et al. (2020): - there are important differences between expectations of professionals and normal people - people in high income countries are inattentive towards inflation, people in countries like iran, turkey, that have high inflation rates pay attention - ordinary people see inflation only in the volatility of consumed goods, like petrol, therefore more volatility in expectations for uninformed agents - ordinaries people inflation expectations are not anchored - high qualtity of hhs surveys, therefore good tool for analysis - news about inflation, monetary policy ore statements by the CB dont have any effects on normal people only on informend specialists - when people get an information treatment about inflation, their views change, expectations change strongly - expectations and real inflation often differ drastically from one another, as seen in a lot of surveys - economic environment is key for views about inflation - S.5: "economic agents update their beliefs depending on the strengths

of their priors and signals" - shopping experience are important for formation of expectations ("Tomaten sind teuer geworden") –> Cavallo et al (2017) checken - but some goods are more important –> gasoline very important, co movements between expectations and gasoline prices - news about inflation can have an effect, but that is very disputable - people dont know shit about monetary policy. but when they know, they update their expectations towards the real value and towards professional forecasts - Summary for formation of expectations: people are very different in their knowledge depending on their living experiences, economic environment. the successful monetary policy in advanced countries has led to inattention by households about inflation or inflation goals

D'Acunto (2022): - P.1:"household inflation expectations are biased upwards, dispersed across individuals, and volatile in the time series" - Inflation expectations important for CBs - outside crises expectations are anchored - old models: expectations are formed rational, but that is outdated - hhs look at grocery prices to form their expectations: increases are more important than decreases (Luca:loss aversion??) - lifetime experiences are important: if you had lived in a country and time with high infaltion, your perception about future rates are likely higher - hhs have higher expectations than professionals (upward biased) - shopping prices main sources for expectations. Problem: groceries more volatile, dont represent core inflation - the higher the volatility of your grocery products, the higher your expectations - prices signals are important - before covid: young people did not live trough high inflation, had lower expectations than old people how suffered through high inflation - professionals are much more in line with actual inflation, because they have to deal with it, its their job, cognitive task - media did not play a significant role for formation in the past

Dräger,Lamla (2012): - dont know that much about formation of inflation expectations - looking at updating behavior of people in the michigan survey - Idea is to look at the participants that are interviewed twice six months later. Have they changed their expectations or not? - findings: updating on quantitative questions every 8 months, qualitative every 16 months about one-year-ahead inflation. in recessions updating behavior increases, therefore adjustments about the expectations are correlated with the business cycle. long-term less often adjusted than short-term

Dräger and Lamla (2017): - Uses micro-data from the michigan survey from 78-2011, since 87 same number of participants in the survey - volatility in inflation leads to updating of expectations - hearing news about inflation increases probability of updating - uses again the rotating structure of the panel to analyze updating - updating about every 8 to 16 months for (quanti/quali) short-term, and 8 to 36 months for long-term expectations –> anchoring for at least half a year - quantitative changes only small when qualitative expectations stay the same - differences in EU and US are maybe driven by different types of available surveys - long-term more anchored - professionals change their expectations, that triggers consumers - information has no long-term effect - imperfect information plays important role for formation of expectations about inflation

Dräger and Lamla (2018): - analyzing co-movement of short and long-term inflation expectations - older people react more and change their expectations, therefore are less anchored - illustrates different measurement strategies for anchoring - uses data from the MSC - expectations for older cohorts remain more volatile, but in general everything gets more stable -> anchoring, but for older people much more fragile, because they experienced high inflation in the 70s - younger cohorts react stronger to news and price changes

Dräger and Nghiem (2018): - approximately 50% of respondents believed that inflation over the previous twelve months had been 5% or above, at a time when actual inflation was 0.3%.

Ha et al.(2022): - expectations in EMDE, emerging countries, are less anchored and different than in delevoped countries - anchoring has increased, like in advanced economies

Lucas(1975): - modelling of business cycle - imperfect information about prices and the economy is embedded into the model - in this behavior of the agents, their information about prices come from the market clearing prizes of the last periods, so their experiences in the past P.1123: “the history of prices [. . .] observed by an individual is his source of information on the current state of the economy and [. . .] of information on future price.” - agents know about business cycles

Powell(2022): - P.1: “The labor market is very strong, and inflation is much too

high." - rise of inflation greater than expected - supply-side frictions cause present inflation - things can change quickly when shit hits the fan - long-term inflation still anchored! - risk: long tenures of high inflation can increase long-term expectations (what would mean deanchoring) - anchoring long-term expectations critical for CB policy

Weber(2021): - inflation expectations are essential for economics - your perception of future prices influences todays buying decisions. if this holds true expectations about future matter today - explains upward bias - expectations are formed by price signals when we go shopping. although its only a small portion, groceries or gasoline are very important for formation of expectations - the more often you purchased a good, the more important price changes are for your infl. expectations - other important factors: news coverage, media and cognitive abilities - explains MSC and SCE surveys - upward bias differs between demographic groups: the poorer, the higher - detects pos. correlation between short and long-term expectations. that would mean that expectations are not anchored (or not anchored in the sense of bernanke, or the inflation goal of 2%) - media and news coverage not that important. news about inflation, goals of CB dont reach consumers, more at coibion

2.3 Our Hypotheses

-there is a positive correlation between aggregated inflation expectations and uncertainty, Google searches and the actual inflation -there is a positive correlation between Google searches and updating behavior of individual consumers

3 Data

3.1 Our Dataset

- we look at the survey data provided by the Survey of Consumer Expectations of the New York FED
- Q8v2,Q8v2part2,Q9 are relevant for the expectations

D'Acunto (2022): - explains Survey of Consumer Expectations (SCE) - shortcoming: only a small time series because not that old. "anchors" answers with their questions - but overall good material - disagreements increase volatility seen in covid19 2020

data - looking at IQR - only in the covid19 crisis short/long-term expectations differ

```
SCE_Data_unc <- read_excel("DATA/FRBNY-SCE-Data.xlsx", sheet = "Inflation uncertainty", skip =


SCE_Data_unc <- SCE_Data_unc%>%
  rename(Uncertainty=`Median one-year ahead uncertainty`)
```

- a plot of consumer expectations for one-year expectations of the last ten years give a first expression

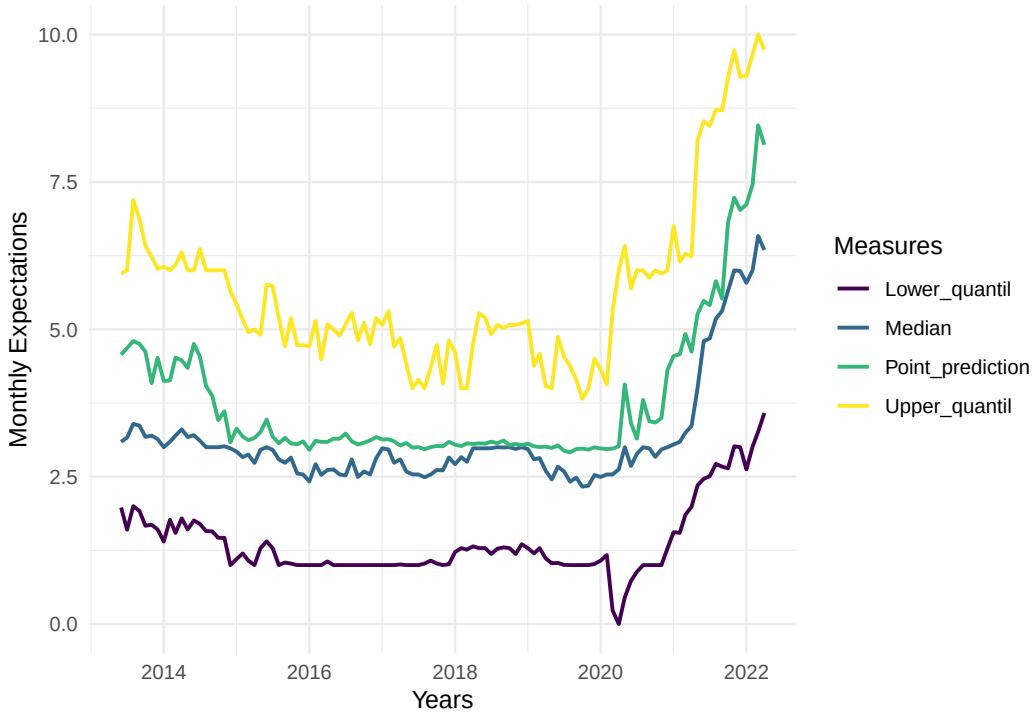

Figure 1: Short-term Expectations from 2013-present

- we see different pattern of behavior which allwos us to split the data in two time intervals.
- we will analyze them in the next chapter descriptive statistics

Table 1: Summary for expectations from 2013-2020

Measure	Mean	Volatility
Median	2.8083	0.2566
Point prediction	3.3424	0.5582
Uncertainty	2.4839	0.2940

Table 2: Summary for expectations from 2020-present

Measure	Mean	Volatility
CPI	1.5563	0.7879
Median	4.2744	1.3970
Point prediction	5.3117	1.6183

3.2 Descriptive statistics

- we now look more into detail of the inflation expectations dataset
- we also look at uncertainty, describe it
- we can see two different phases for inflation expectations: from June 2013 until April 2020 and from May 2020 until today
- first phase: stable expectations with median and point predictions at around 2.5-3.0% inflation
- second phase: sudden increase in expectations with a peak at arond 6.5% in the last months
- we see higher values for average median, point estimate, volatility and uncertainty and therefore a wider range in the second sample

3.3 Some Demographic Differences

-we look at two major differences at the demographic level of our data set, namely sex and age

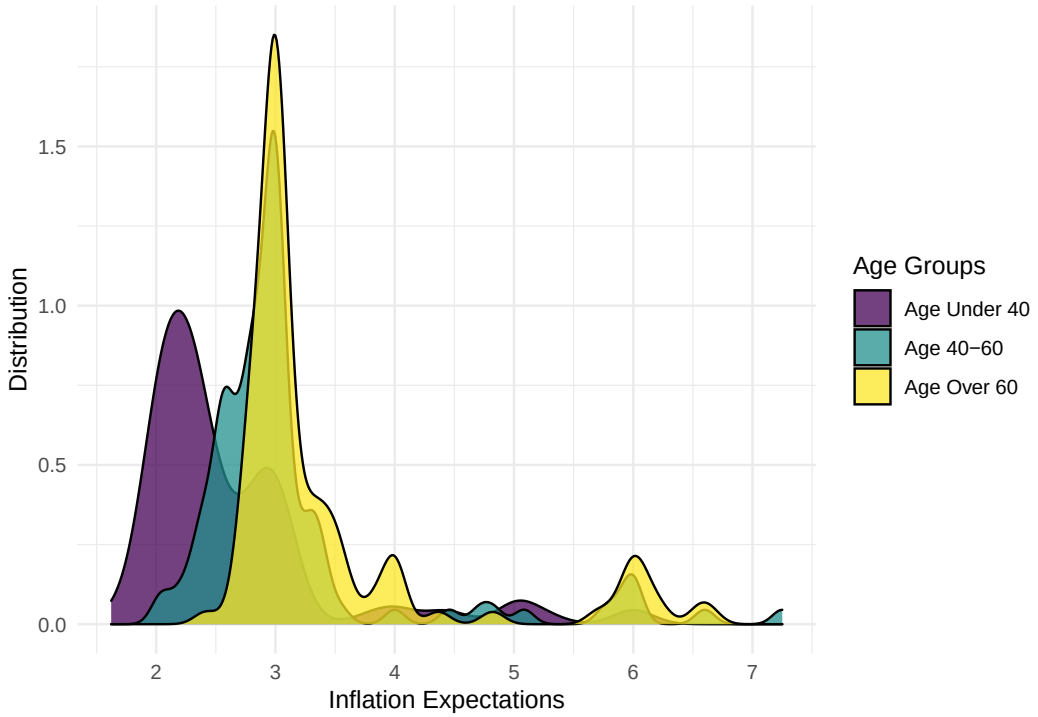

Figure 2: Distribution function for Age Groups

- the next dataset contains the google searches for inflation or inflation rate in the US
- google trends for the US show stable behavior until second half of 2021, after that huge increase
- inflation and inflation rate are very similar in their relative search frequency
- we will later combine these data with the SCE data set in some regression models

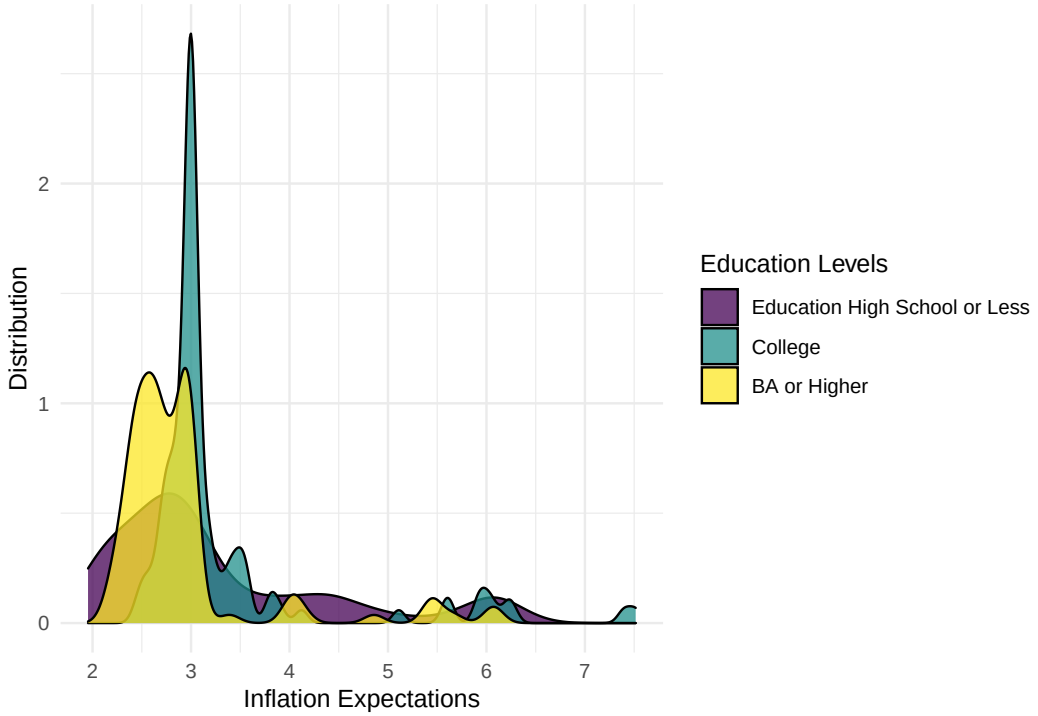

Figure 3: Distribution function for Education Groups

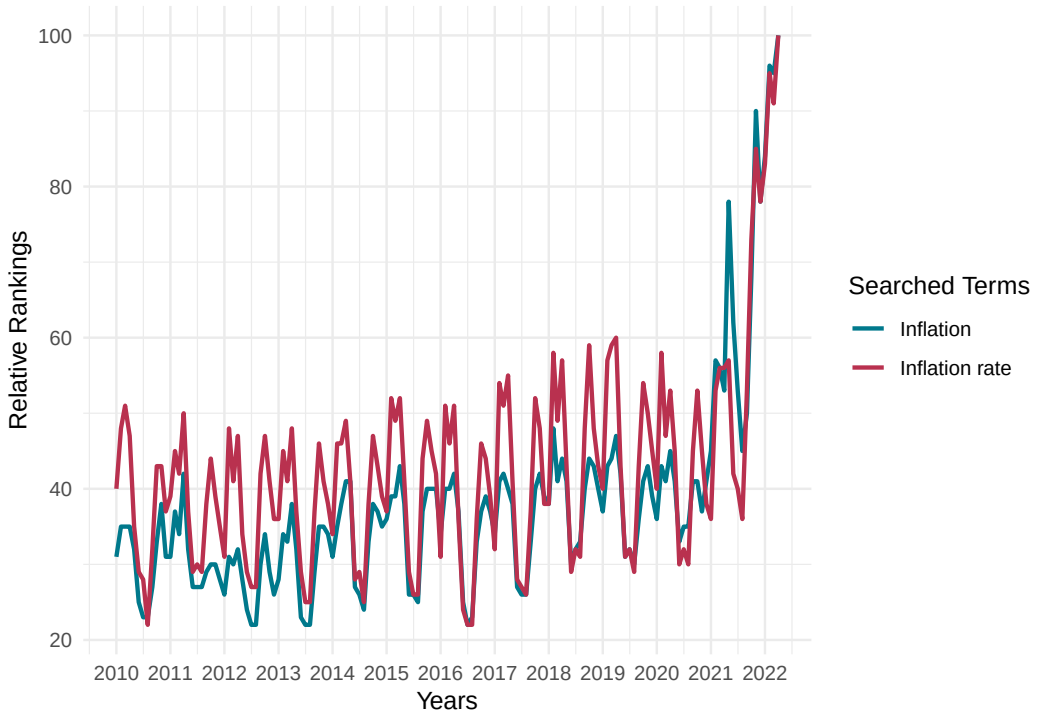

Figure 4: US Google Trends Results for Inflation/Inflation rate from 2010-present

4 Results

4.1 Updating Behavior

- to analyze updating behavior and its relationship with google searches or inflation expectations we need to compute the updating behavior of individuals at the micro level of the SCE data set
- we use the idea of dräger (ZITAT)

4.2 Regressions

- we look now at the updating behavior
- analyzing this needs the micro data from the SCE

-due to the shorter time series for the micro data we build two different regression tables with them we perform the different regressions

-first regression model with aggregated data: uncertainty~ GS_infl+GS_infl_r -second regression model with aggregated data: Median~ GS_infl+GS_infl_r - third regression model with aggregated data: median of exp~ GS_infl+GS_infl_r+Uncertainty+CPI

- we also differ between the two sub time-series to analyze if the correlations differ in the two phases

-we build two models for the first interval to analyze the effect of CPI

- we do the same regressions with our second sub time-series

5 Robustness

5.1 Robustness

5.2 Limitations

6 Conclusion

Space for our Conclusion

Conclusions: - in google trends for US: cyclical updating behavior until mid 2021, after that huge increase, co movement with the expectations of inflation short-term -

Table 3: Regressions for aggregated Data, full sample

	Dependent variable:		
	Uncertainty	Median	
GS_infl	0.056^{***}	0.076^{***}	-0.008
	(0.006)	(0.008)	(0.007)
GS_infl_r	-0.032^{***}	-0.030^{***}	0.010^{**}
	(0.006)	(0.008)	(0.005)
Uncertainty			0.791^{***}
			(0.072)
CPI			0.268^{***}
			(0.028)
Constant	1.872^{***}	1.347^{***}	0.267
	(0.118)	(0.157)	(0.170)
Observations	107	107	107
Adjusted R^2	0.582	0.687	0.907
Residual Std. Error	0.389 (df = 104)	0.517 (df = 104)	0.281 (df = 102)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 4: Regressions for aggregated Data, sample from 06/13-04/20

	Dependent variable:		
	Uncertainty	Median	
GS_infl	-0.021^{*}	-0.028^{**}	-0.022^{**}
	(0.013)	(0.011)	(0.010)
GS_infl_r	0.005	0.014^{*}	0.013^{**}
	(0.008)	(0.007)	(0.006)
Uncertainty			0.455^{***}
			(0.090)
CPI			0.074^{**}
			(0.032)
Constant	3.038^{***}	3.248^{***}	1.809^{***}
	(0.193)	(0.170)	(0.319)
Observations	83	83	83
Adjusted R^2	0.079	0.064	0.280
Residual Std. Error	0.282 (df = 80)	0.248 (df = 80)	0.218 (df = 78)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 5: Regressions for aggregated Data, sample 05/20-04/22

	Dependent variable:		
	Uncertainty	Median	
GS_infl	0.025***	0.054**	−0.021**
	(0.009)	(0.021)	(0.008)
GS_infl_r	−0.006	0.001	0.013**
	(0.009)	(0.021)	(0.006)
Uncertainty			1.089***
			(0.205)
CPI			0.354***
			(0.050)
Constant	2.451***	1.052**	−0.635
	(0.191)	(0.459)	(0.619)
Observations	24	24	24
Adjusted R^2	0.648	0.701	0.975
Residual Std. Error	0.318 (df = 21)	0.764 (df = 21)	0.223 (df = 19)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 6: Regressions for Micro-Data

	Dependent variable:		
	'Updating share'	Uncertainty	Median
GS_infl	−0.0001		
	(0.001)		
GS_infl_r	0.0005		
	(0.001)		
'Updating share'		2.096*	−0.610
		(1.183)	(1.126)
Constant	0.552***	1.421**	3.230***
	(0.017)	(0.673)	(0.640)
Observations	97	97	97
Adjusted R^2	−0.008	0.022	−0.007
Residual Std. Error	0.036 (df = 94)	0.418 (df = 95)	0.398 (df = 95)
Note:			*p<0.1; **p<0.05; ***p<0.01

cyclical updating: increases in spring and around October (black Friday), low interest in the summer and around Christmas/new year

A Tables

B Figures

C Literature

Ehrenwörtliche Erklärung

Hiermit versichere ich, dass ich die vorliegende Arbeit selbständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe, dass alle Stellen der Arbeit, die wörtlich oder sinngemäß aus anderen Quellen übernommen wurden, als solche kenntlich gemacht habe und dass die Arbeit in gleicher oder ähnlicher Form noch keiner Prüfungsbehörde vorgelegt wurde.

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