# Updating inflation expectations: Evidence from micro-data

Lena Dräger [a], Michael J. Lamla [b,*]

[a] University of Hamburg, Germany

[b] ETH Zurich, KOF Swiss Economic Institute, Switzerland

## ARTICLE INFO

## ABSTRACT

Utilizing the Michigan Household Consumer survey's rotating panel microstructure we can identify if individuals have adjusted their expectations towards inflation. This allows us to directly capture the updating behavior of individual consumers regarding their short- and long-run inflation expectations.

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## 1. Introduction

Inflation expectations play a central role in modern macroeconomic models and are an important factor for economic policy. However, despite their importance we still know very little about how people form expectations. Researchers have proposed a wide array of frameworks to model the expectations' formation process. Contributions by Sims (2003) and Mankiw and Reis (2002) revived the interest in information rigidities and their importance for the formation of expectations.

The idea of this paper is to analyze the updating behavior of individual consumers regarding their inflation expectations. For this purpose we utilize the rotating panel structure of the University of Michigan Survey of Consumers, where a fraction of consumers is re-interviewed after six months. Using an identification algorithm we can track the expectations of individual consumers over a period of six months. Hence, we can directly calculate the share of individuals that have adjusted their expectations and thus do not need to rely on inference coming from the cross-section or the aggregated series.

Our paper is related to the literature that analyzes the updating behavior of consumers regarding their inflation expectations. For the US, Carroll (2003) finds support for the conjecture of Mankiw and Reis (2002) that consumers update their inflation expectations roughly once a year. Pfajfar and Santoro (2012) test the hypotheses in Carroll (2003) using micro-data. Looking at the movements of forecast errors in relation to the variable being forecasted, Coibion and Gorodnichenko (2010) document pervasive and robust evidence consistent with information rigidities. For Europe, Döpke et al. (2008) show that consumers update their inflation expectations once every 18 months. Lamla and Sarferaz (2012) document substantial time-variation in the inflation expectation updating behavior of German households. Using micro-data for inflation expectations of professional forecasters, Andrade and Le Bihan (2010) report evidence of information frictions. In sum, these studies provide evidence for staggered updating and for information frictions. Our paper tests the relevance of information frictions by directly identifying the changes of expectations of individuals.

## 2. Data

We employ the micro data set from the University of Michigan Survey of Consumers, where we use both the quantitative and the qualitative questions for inflation expectations regarding the next 12 months, and regarding a longer horizon of five to ten years. The micro-data is available from January 1978 to November 2011. The precise questions of the survey read:

A12. "During the next 12 months, do you think that prices in general will go up, or go down, or stay where they are now?"

* Correspondence to: Weinbergstrasse 35, 8092 Zurich, Switzerland. Tel.: +41 44 632 8623; fax: +41 44 632 1234.

*E-mail addresses:* lena.draeger@wiso.uni-hamburg.de (L. Dräger), lamla@kof.ethz.ch (M.J. Lamla).

**Fig. 1.** Identified cross-section of individual consumers.

1. GO UP 3. STAY THE SAME 5. GO DOWN 8. DON'T KNOW.

A12b. "By about what percent do you expect prices to go (up/down) on the average, during the next 12 months?"

A13. "What about the outlook for prices over the next 5–10 years? Do you think prices will be higher, about the same, or lower, 5–10 years from now?"

1. HIGHER 3. STAY THE SAME 5. LOWER 8. DON'T KNOW.

A13b. "By about what percent per year do you expect prices to go (up/down) on the average, during the next 5–10 years?"

In order to analyze the dynamics of an individual's inflation expectations, we exploit the fact that the Survey of Consumers includes a rotating panel. Each month, a randomly determined sub-sample of consumers is chosen to be re-interviewed six months after the first interview. The complete cross-section each month thus includes about 80% of individuals that are interviewed twice.

While the Michigan Survey provides an identifier for households that are re-interviewed within the rotating panel, we follow Souleles (2004) and additionally control for demographic characteristics to ensure that the same person answered both interviews. We thus only keep pairs of observations, where the respondent had the same sex and race as well as month and year of birth in both interviews, and additionally control for plausible age differences between interviews. In order to rule out extreme values, we furthermore exclude the upper and lower 2.5% of the distribution of both short- and long-run quantitative inflation expectations.[1]

Fig. 1 shows the number of individuals in the rotating panel against the total number of observations in the Michigan Survey of Consumers. While sample sizes varied considerably in earlier months, they have been relatively constant since October 1987. We thus restrict our analysis to the time period 1987m10–2011m11.

## 3. Results

### 3.1. Calculating the updating frequency of inflation expectations from micro-data

Our key interest is the share of individuals that have adjusted their expectations. We denote this variable as the "updating share". The updating share hence relates the number of individuals which have changed their expectations within the past six months to the overall number of re-interviewed individuals. We calculate the updating share for short- and long-run inflation expectations captured by the qualitative answer and the quantitative answer. Summary statistics are given in Table 1.

According to our calculations, individuals update their one-year-ahead inflation expectations based on the quantitative

**Table 1**
Summary statistics of the updating shares for inflation expectations.

| Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| Short-run expectations, one year | 0.741 | 0.054 | 0.602 | 0.871 |
| Short-run expectations, one year, qualitative answer | 0.382 | 0.092 | 0.158 | 0.673 |
| Long-run expectations, 5–10 years | 0.724 | 0.051 | 0.573 | 0.64 |
| Long-run expectations, 5–10 years, qualitative answer | 0.166 | 0.050 | 0.031 | 0.337 |

Notes: SD denotes the standard deviation, while Min and Max represent the minimum and maximum values.

question every 8 months and every 16 months based on the qualitative question. Regarding long-run inflation expectations, the updating frequencies vary between 8 and 36 months based on the quantitative and the qualitative question, respectively. Overall, we find higher updating frequencies using the answers to the quantitative question as reported in the literature from aggregate data. Studies employing the population mean of quantitative inflation expectations from US surveys derive an updating share of roughly 0.25 over a quarter, corresponding to 0.5 over six months (Carroll, 2003). This implies that expectations are updated once within a year.

One explanation for our result of a higher updating frequency at the micro level may be related to the aggregation phenomenon. The effect that aggregation of individual data series reduces the variability of the underlying micro-data and increases its persistence is a known result, e.g. from movements in price indices (Altissimo et al., 2007).

Notably, the difference in the updating frequency between the qualitative and quantitative answers is quite remarkable. Given the way the questions are phrased, this suggests that individuals fine-tune their quantitative expectations very regularly, but change their general view regarding inflation much less frequently. This implies that qualitative adjustments co-move with substantial adjustments in the quantitative assessment.

To test this hypothesis, we check whether the mean change in quantitative expectations is smaller if there is no change in the qualitative assessment. For this purpose we employ comparison of mean tests with different variances. Conducting those tests we find support for the hypothesis that quantitative changes are significantly smaller if the qualitative response did not change.[2]

Long-run expectations are, in line with our expectations, adjusted less often than short-run expectations and hence seem more firmly anchored on average. Long-run expectations should not be affected much by business cycle effects, but rather be related to fundamental factors. Such fundamentals might include the long-run stance of monetary policy, for instance with respect to an inflation target.

### 3.2. Updating inflation expectations over time

Next, we analyze how the share of individuals updating their inflation expectations evolves over time. Several approaches in the literature report evidence that updating shares regarding inflation expectations in the population may vary substantially. Dräger (2011) argues that people respond to the variance of the forecasted variable, Coibion and Gorodnichenko (2010) show that the information rigidity changes over the business cycle and Lamla and Sarferaz (2012) relate the variation of the updating speed for expectations of German consumers to uncertainty and

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[1] Alternatively we control for all demographic characteristics. The results remain virtually unchanged.

[2] Test statistics equality of means $t$-test with unequal variances and with H0: difference of means = 0. One-year expectations: $t$-value = −32.81, Satterthwaite's degrees of freedom = 16808, $p$-value = 0.000; 5–10 years expectations: $t$-value = −19.79, Satterthwaite's degrees of freedom = 3692, $p$-value = 0.000.
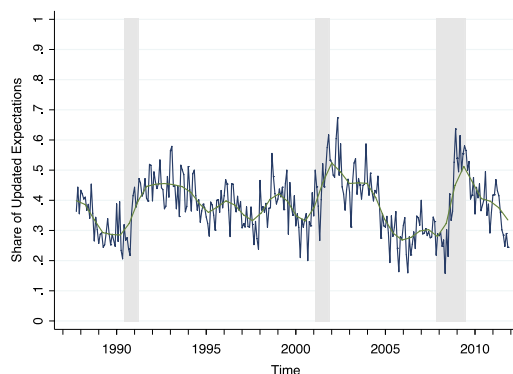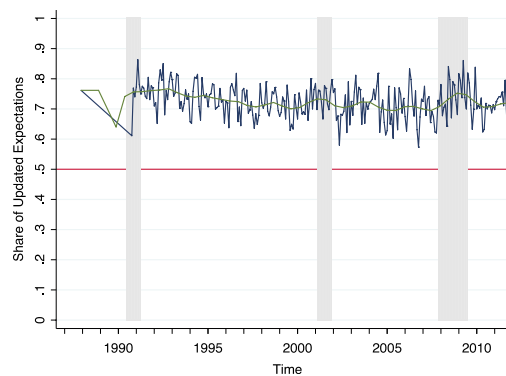
(a) Short-run expectations, one year, qualitative answer.
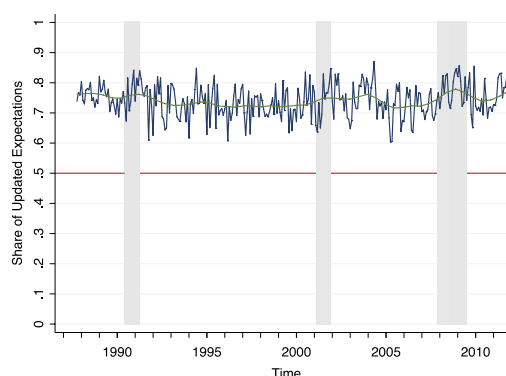
(b) Short-run expectations, one year.
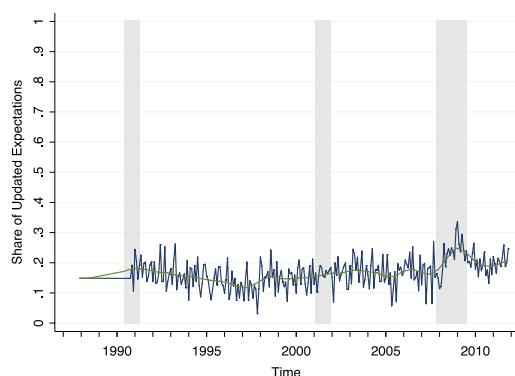
(c) Long-run expectations, 5-10 years, qualitative answer.

(d) Long-run expectations, 5-10 years.

Notes: The graphs show the share of individual consumers that change their inflation expectations within six months together with a smoothing polynomial trend. Shaded areas are recession phases as identified by the NBER.

**Fig. 2.** Updating shares for inflation expectations.

news effects. Finding time-varying updating would favor models of rational inattention rather than sticky information, where the updating share is fixed to a certain rate.

We plot the share of households that update their inflation expectations over time together with a smoothing polynomial trend, shown in Fig. 2. Looking at the changes in qualitative one-year-ahead inflation expectations, we can observe substantial variation in the updating share, varying between about 20% and 60%. Interestingly, we can observe relatively strong surges during recessionary periods. Especially from 2008 onwards, the share of individuals that updated their inflation expectations rose substantially. This can certainly be attributed to the beginning financial crisis as well as to the oil price surge. The cyclical pattern is also present in the updating share from quantitative short-run expectations, albeit less pronounced.

Looking at the updating shares of long-run inflation expectations, we find significantly less time-variation compared to one-year-ahead inflation expectations. Fundamentals and the monetary stance should not change often and hence a rather constant updating share has to be expected.[3]

## 4. Conclusion

Our study contributes to the understanding of the expectations formation process of consumers by providing evidence for individual consumers. Utilizing the rotating panel structure of the Michigan Survey of Consumers, we find evidence that the updating frequency based on quantitative short-run inflation expectations has been underestimated. In contrast, the qualitative assessment regarding inflation is adjusted less often and is correlated with a more substantial revision in the quantitative assessment of the inflation outlook. Hence, people fine-tune their expectations quite regularly, but change their general assessment less often. Moreover, this fine-tuning seems rather time-independent, while the frequency of adjustments of the general qualitative inflation outlook seems correlated with the business cycle. Regarding the horizon of expectations, we find that long-term expectations are adjusted less frequently than short-run expectations.

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[3] The irregular pattern of the updating shares of long-run expectations in the first months of the sample is due to the fact that before October 1990, the question regarding long-run inflation expectations was not included in every monthly survey.

## Acknowledgments

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