**Associative Memory and Overreaction in Expectations (Part 2)**

Benjamin Enke, Frederik Schwerter, and Florian Zimmermann

Harvard University, University of Cologne, and University of Bonn

enke@fas.harvard.edu

This version: July 18, 2019

Laboratory experiments in the Cologne Laboratory for Economic Research to study the effect of associative memory on expectation formation. In contrast to the first set of experiments, we use Cologne’s instead of Bonn’s laboratory because Bonn’s subject pool is exhausted.

This document is the second part of a pre-registration with the title above. All experiments described in the first document (entitled Memory\_PAP\_2019-05-17) are completed.

**I. DATA COLLECTION:**

In the Cologne Laboratory for Economic Research at the University of Cologne, we conduct laboratory experiments. The basic structure of the experimental setup is exactly the same as described in the first document.

**II. ADDITIONAL TREATMENTS:**

The basic structure and timeline of the additional treatments is identical to treatment *Main* outlined in Memory\_PAP\_2019-05-17.

1. **Treatment *Underreaction***

In treatment *Underreaction*, the pieces of news are communicated on subjects’ computer screens along with a context. The context consists of a story and an image. Importantly, in the first part of the experiment, there is a one-to-one mapping between type of news for a given company and context. That is, every positive news for company A is communicated with the same context (image and story). Likewise, every negative news for company A is communicated with the same context (albeit a different one than the positive news of course). The same logic holds for all other companies. Thus, it can never happen that a context is communicated with news for different companies, or with both positive and negative news. A context deterministically identifies a piece of news. Again, in treatment *Underreaction*, this is true only for the first part of the experiment.

In the second part (in which subjects potentially receive an additional piece of news about the value of a company), the mapping between context and type of news reverses in the following sense: for a given company, a positive piece of news is now communicated with the context that was associated with negative news for this company in the first part of the experiment. Analogously, a negative piece of news is now communicated with the context that was associated with positive news for this company in the first part of the experiment.

1. **Treatment *Reminder Underreaction***

In treatment *Reminder Underreaction*, the setup is exactly the same as in *Underreaction*, except that at the beginning of Part 2 of the experiment (i.e., before a subject observes the last signal for a company), a subject is reminded of their own first belief from the first part of the experiment.

**III. OUTCOME VARIABLES:**

The study contains the same outcome variables as described in the first part of the pre-registration.

**IV. NATURE OF ANALYSES**

We analyze our experimental data by means of OLS regressions:

* The main dependent variable is given by a subject’s second belief.
* The ancillary dependent variable is a subject’s recall measure.
* The main independent variable is the realization of the last signal (-10 or +10), as well as its interaction with various treatment dummies per the discussion below.
* Because we have multiple observations per subject (10), we cluster the standard errors at the subject level.

**V. HYPOTHESES:**

1. **Underreaction in expectations**

Restrict attention to treatment *Underreaction*. Take as dependent variables (i) a subject’s second belief as well as (ii) their recall measure. Regress each of these on the value of the last signal, controlling for the value of the company after the first period. We hypothesize that in both cases the OLS coefficient is significantly smaller than one.

1. **The role of memory**

Restrict attention to treatments *Underreaction* and *Reminder Underreaction*. Take as dependent variables (i) a subject’s second belief as well as (ii) their recall measure. Regress each of these on (i) the value of the last signal, (ii) a treatment dummy, and (iii) the interaction of the value of the last signal and a treatment dummy (where treatment *Underreaction* is coded as 1), controlling for the value of the company after the first period. We hypothesize that in both cases the OLS coefficient of the interaction term is significantly smaller than zero.

1. **Variation in the number of cued signals**

Restrict attention to treatment *Underreaction*. Take as dependent variables (i) a subject’s second belief as well as (ii) their recall measure. Regress each of these on (i) the value of the last signal, (ii) the number of signals in the first part that were presented with the same context (image and story) as the signal in the second part, and (iii) a corresponding interaction term, controlling for the value of the company after the first period. We hypothesize that in both cases the OLS coefficient of the interaction term is significantly smaller than zero.

**VII. EXCLUSION CRITERIA**

The same exclusion criteria as in the first part of the pre-registration apply.

**VIII. RANDOMIZATION AND SAMPLE SIZE**

Treatments are randomized within session.

The sample size will be given by:

* Treatment *Underreaction*: 80 subjects
* Treatment *Reminder Underreaction*: 50 subjects