

# Report on Master Thesis

Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague

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<b>Title of the thesis:</b>	<b>Emotional Anchoring in Experimental Asset Markets</b>

This thesis introduces so-called „emotional anchoring“ into an experimental „bubble game“ by Moinas and Pouget (2013, *Econometrica*). The topic is highly ambitious for the level of a Master student since it combines a complex topic of emotions and behavior with non-trivial issues of equilibrium iterative reasoning involved in the bubble game.

I have the following comments.

## Theory

- The bubble game is not formally introduced before Section 4.3. Many aspects of the game are introduced either incompletely or not in a right order; for instance, I eventually had to look into Moinas and Pouget (2013) to understand the role of the external investor.
- An explicit derivation of Bayesian Nash equilibria (BNE) is missing. This important benchmark should be introduced at the beginning of Chapter 3.
- Importantly, I miss the derivation of BNE for finite and infinite support of the distribution of initial offers. The two games yield completely different results. While BNE is unique for a finite case, there exist *multiple* BNE for an infinite case.
- In general, we know that multiplicity is a great issue for the theory and therefore one has to be very cautious when testing experimentally a game with multiple equilibria. Such a test could be a test of a selection criterion but also a test of equilibrium (versus non-equilibrium) behavior. This is especially a problem in an experiment where subjects play only once which is exactly the case of this experiment.
- The fact that even a minor change in the probability distribution completely changes BNE means that the equilibrium is *not robust* to even minor lack of common knowledge. I would be extremely careful when examining such a non-robust game. Put simply, whenever subjects generate equilibrium beliefs based on tiny phenomena, then assuming even a tiny portion of naive of irrational players can accumulate into a substantial equilibrium effect. In this experiment, the support of the distribution is finite (with cardinality 5), but the difference to the distribution with infinite support occurs with probability only 3.125%! Thus, even a minor doubt (e.g. about cognitive skills of the other players) may elicit completely different behavior even among perfectly rational individuals.
- The bubble game involves backward induction, and therefore the test of the theory of bubble games is to a large extent a test of backward reasoning in the special context of a Ponzi scheme. There is a large literature on learning of agents using backward induction, involving games like centipede game or beauty contests where iteration is required. My reading is that subjects need time to learn backward induction or any other kind of iterative reasoning. Here, however, we have a one-shot experiment which doesn't allow subjects to think about iterations.
- When thinking simultaneously about „emotional anchoring“ and alternative equilibrium reasoning (QRE and ABEE) seriously, one may think whether emotions could affect equilibrium reasoning. I think this opens a plethora of approaches which are not touched upon here and which are highly complex. For example, response sensitivity parameter in QRE can be endogenous to emotions.
- Unlike the original paper, the use of QRE and ABEE in the thesis is very limited.
- One could discuss whether the bubble game is relevant for the asset bubbles because of the existence of the external investor who always fuels the bubble and bears an increasing risk. Also, price-setting is extremely artificial (namely, exogenous price increments) hence price increments cannot serve as signals of the state of the market (only proposed price can). In the thesis, I would expect a more detailed exposition into the channels leading to bubbles as identified in the existing theory.

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## Design of experiment:

- Unlike the original paper, the subjects receive only show-up fee. Their investments are purely hypothetical; they are not incentivized by real payments.
- For backward induction to work, one has to think carefully and/or have relevant experience. Here, given the absence of real payments, the subjects have almost no incentive to devote attention to the calculations. Also, as written in the text, workers in the pool explicitly care for the cost of their time, as this is a topic in online forums that discuss whether the tasks are worth doing or not.
- Second, the subjects do not have much experience with investing; 147 (about 75%) reported zero or none experience with trading.
- The author generates the distribution of proposed prices by combining the geometric distribution of initial prices with distribution of buyers' responses from the original experiment instead of the distribution derived from responses of MTurk workers. It means that the MTurk workers generate beliefs about behavior of MTurk workers, but in fact play against borrowed strategies of students from Toulouse who played against students from Toulouse. It is not clear to what extent this is a serious problem. Quantification of the difference would help.

## Meaning of the experiment

- The effect of negative pictures (compared to the control group) is non-monotonic in price. Moreover, it changes a sign three times out of six. By inspection of Fig. 2, the sequence is (compared to the control group) 3, -5, 4, 5, 1, 1, -1 and in percentage terms 43%, -36%, 50%, 125%, 25%, 50%, -100%. Given the non-monotonicity, I would be extremely cautious when interpreting the effect of negative pictures.
- It is obvious to say that emotions may have an effect on decision-making. But we need to know whether they influence cognitive skills (e.g., calculations) or whether they are associated with some social behavior (e.g. lower willingness to take the other person's view as discussed in the thesis) or whether they affect preferences (e.g., willingness to take risk if the subject has a feeling of a threat).
- How exactly can we interpret the effect of pictures? I think pictures could involve multiple effects in the context of the experiment and we would need to disentangle the effects.
  - One effect could be lower willingness to pay attention to the investment question which may force the agents to more likely accept a default (e.g. first) answer.
  - Another effect could be that the subject is disappointed for being shown unpleasant pictures and prefers to finish quickly.
  - Or, the pictures may generate associations to activities related to trading. For examples, subjects could associate negative pictures with the costs of „earning money“ (1 picture is about cost of work and 2 pictures are about environmental degradation); trading can also be associated with „earning money“. Hence, the pictures may convey an implicit message on the costs of „earning money“, and the subjects could respond to this message.
- I lack explanation whether the problem of emotions presented in this way (pictures of general phenomena) is relevant for the analysis of bubbles at all. The reason is that general emotions (i.e., not emotions related to the state of the market) may not only affect a decision how to trade but also timing of trades. For instance, if an individual gets angry, I doubt he or she will be willing to think about his or her investments and rather stops trading. Then, participation to trading may be endogenous to general emotions. Even if emotions had an effect when controlled for participation, the effect could be different when participation is not controlled. In experiments conducted this way where subjects have to make a decision and cannot postpone the decisions, we do not observe how participation changes and therefore cannot make lessons for settings where participation is voluntary.

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## Minor issues

- The thesis is not structured well. The author often switches between several arguments. Also, some basic things are not presented at all or are hidden in the text.
- There are also inconsistencies such the distribution of initial offers is initially said to have infinite support (p. 25), but on p. 27, the distribution has support of cardinality five.
- There are many typos spread through the work: expecations (18), Minas (25), caiptal (26), link to footnote 16 (24), missing brackets (23).
- Figure on p. 7 is wrongly placed.

On the positive side, I applaud the ambition to follow a paper recently published in a top journal. The work related to the design and conduct on the experiment in the context of MTurk is definitely valuable.

On the other hand, I am not sure if the combination of the experimental asset market which basically tests iterative reasoning and emotional manipulation through pictures generates helps to improve understanding of asset markets. I also think that the thesis should be structured in a better way. To be honest, at some point I had to read the paper by Moinas and Pouget (2013) to understand the thesis and to make a proper judgment about its value added.

I recommend grading the thesis as **good (B)**.

## **SUMMARY OF POINTS AWARDED** (for details, see below):

<b>CATEGORY</b>	<b>POINTS</b>
<i>Literature</i> (max. 20 points)	14
<i>Methods</i> (max. 30 points)	27
<i>Contribution</i> (max. 30 points)	22
<i>Manuscript Form</i> (max. 20 points)	15
<b>TOTAL POINTS</b> (max. 100 points)	<b>78</b>
<b>GRADE</b> (1 – 2 – 3 – 4)	<b>2</b>

**NAME OF THE REFEREE:** doc. PhDr. Martin Gregor, PhD

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**Referee Signature**

