

Motivated Belief and Anxiety in the Financial Domain

Duangrat Prajaksilpchai
Tilburg University

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Introduction

Anxiety is defined as an anticipatory and aversive emotion regarding an occurrence of negative uncertain future events. The desire to reduce anxiety can motivate many decisions (Caplin and Leahy, 2001).

Introduction

Financial anxiety or financial worries can negatively impact personal financial decision making.

- Higher anxiety is associated with poor financial management such as overspending, irresponsible credit card use and inadequate insurance (Grable *et al.*, 2020; Sages *et al.*, 2013).
- Financial scarcity leads to avoiding dealing with one's financial situations (Hilbert *et al.*, 2022).
- High financial anxiety is related to less engagement in financial planning or seeking help (Grable *et al.*, 2015).

Introduction

Motivated beliefs and anxiety

- Theoretical framework:
 - Caplin and Leahy (2001) - Utility does not depend only on material outcomes but also the feeling from anticipating those outcomes, i.e., anticipatory utility.
 - Other models include penalties such as sub-optimal outcomes or disappointment (Brunnermeier and Parker, 2005; Bracha and Brown, 2012; Gollier and Muermann, 2010; Schwardmann, 2019).

Introduction

Motivated beliefs and anxiety

- Empirical evidence: Households with lower savings and wealth or individuals in lower income group often exhibit more optimism regarding their financial prospects (Brown and Taylor, 2006; Bissonnette and van Soest, 2010)

Research Question

“Does financial anxiety induce distortion in belief updating?”

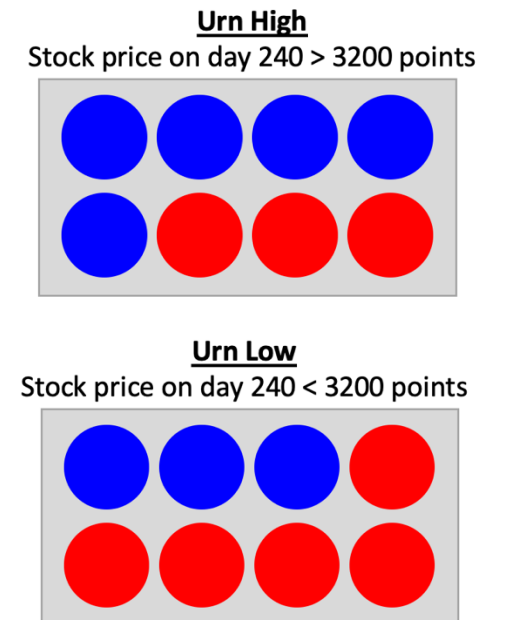
Related Literature

- Asymmetric belief updating in different domains with mixed results
 - Ego-related context
 - Overly sensitive to good news: Eil and Rao (2011), Möbius et al. (2022)
 - Overly sensitive to bad news: Ertac (2011), Coutts (2019)
 - No asymmetry: Buser et al. (2018)
 - Non-ego-related context
 - Overly sensitive to bad news: Coutts (2019);
 - No asymmetry: Barron (2019)
- Anxiety and beliefs
 - Anxiety induced from both electric shock and monetary loss leads to higher engagement in wishful thinking (Schwardmann et al., 2022).

Experimental Design

The main task is to report belief (probability) about the predetermined stock price on day 240 being higher/lower than day 180

- (1) before receiving any signal to elicit a prior and
- (2) after receiving signals which are balls drawn from an urn corresponding to the real state of the world



Experimental Design: Anxiety

Treatment	Control
<ul style="list-style-type: none">• Get endowment (3,200 points)• See the stock• Decide whether to actually buy or short-sell the stock but<ul style="list-style-type: none">• keep the endowment if buy and stock price increases OR short sell and stock price drops• lose the endowment otherwise	<ul style="list-style-type: none">• Get endowment (1,600 points)• See the stock• Decide whether hypothetically they would buy or short sell the stock if they could but keep the endowment for sure

Experimental Design: Manipulation Check

Before and after the decision on buying and short selling:

“At this moment, do you feel anxious about the future stock price movement, i.e., the stock price being higher or lower than 3200 points after 60 days?”

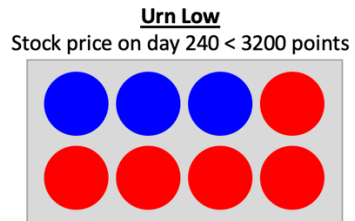
- not at all
- very slightly
- slightly
- somewhat
- moderately
- very much
- extremely



Experimental Design: Belief Updating

Total of 6 rounds = 1 round before getting a signal (prior) + 5 rounds after signals (posterior)

True state of the world is predetermined.



Information #1: The ball is 

Please indicate a probability that the stock price on day 240 will be higher than 3200 points.



Data Analysis Framework: Augmented Bayesian Updating Model

$$\pi_{it+1} = \delta\pi_{it} + \underbrace{\gamma_a \log\left(\frac{q}{1-q}\right) \cdot 1(S_{it+1} = \text{GoodNews})}_{\text{Good news:}} + \underbrace{\gamma_b \log\left(\frac{q}{1-q}\right) \cdot 1(S_{it+1} = \text{BadNews})}_{\text{Bad news:}}$$

Good news:

- buy and see blue ball OR
- sell and see red ball

Bad news:

- buy and see red ball OR
- sell and see blue ball

Data Analysis Framework: Augmented Bayesian Updating Model

$$\pi_{it+1} = \delta\pi_{it} + \underbrace{\gamma_a \log\left(\frac{q}{1-q}\right) \cdot 1(S_{it+1} = \text{GoodNews}) + \gamma_b \log\left(\frac{q}{1-q}\right) \cdot 1(S_{it+1} = \text{BadNews})}_{\text{Asymmetric Update}}$$

- $\gamma_a - \gamma_b > 0$ Optimistic updating
- $\gamma_a - \gamma_b < 0$ Pessimistic updating
- $\gamma_a - \gamma_b \approx 0$ No asymmetric updating

Results

Participants are from Tilburg University's CentERlab

- Total number of participants = 303 (Control = 151, Treatment = 152)
- Total number of observations (posterior beliefs) = $303 * 5 = 1,515$
- Total number of wrong update = 170 (11% of total observations)

Results

Manipulation check for anxiety

	Level of anxiety before the task is introduced	Average change in level of anxiety
Control	2.5	0.4
Treatment	2.7	1.0
P-value (Wilcoxon rank sum test)	0.1521	0.0006

Results

The control did not update beliefs differently in response to good news and bad news. But the treatment updated in **response to bad news significantly more than good news**.

	Control	Treatment
logit(prob _{t-1})	0.83*** (0.08)	0.93*** (0.05)
good news	1.15*** (0.11)	0.89*** (0.08)
bad news	1.11*** (0.10)	1.08*** (0.09)
P(good news = bad news)	0.766	0.093
Number of observations	655	690

Heteroskedasticity-robust standard errors clustered by individual in parenthesis

***1% significance level, **5% significant level, *10% significant level

Results

The treatment updated beliefs in response to good news significantly less than the control. But there is no significant difference in belief updating in response to bad news.

	Control	Treatment
logit(prob _{t-1})	0.83*** (0.08)	0.93*** (0.05)
good news	1.15*** (0.11)	0.89*** (0.08)
bad news	1.11*** (0.10)	1.08*** (0.09)
P(good news = bad news)	0.766	0.093
Number of observations	655	690

Heteroskedasticity-robust standard errors clustered by individual in parenthesis

***1% significance level, **5% significant level, *10% significant level

Results

	All
logit(prob _{t-1})	0.83*** (0.08)
good news	1.15*** (0.11)
bad news	1.11*** (0.10)
logit(prob _{t-1}) * T	0.10 (0.09)
good news * T	-0.26* (0.14)
bad news * T	-0.03 (0.13)
Number of observations	1,345

Heteroskedasticity-robust standard errors clustered by individual in parenthesis
***1% significance level, **5% significant level, *10% significant level

Conclusion

- Contrary to some theoretical predictions that suggest optimistic beliefs to maintain a positive emotional state, this paper does not find evidence for optimism bias. Instead, **individuals incorporate unfavorable news more readily than favorable news when experiencing financial anxiety.**
- The findings align with a psychological phenomenon known as **the negativity bias** which suggests that anxiety or stress exposure when evaluating a potential threat increases threat attention and the estimated probability of the threat (Hartley and Phelps, 2012; Grupe and Nitschke, 2013).
- This study complements the information avoidance literature and provides insights for practical implications concerning the communication of information.

Thank you

Appendix

Results: Main Treatment Effect

The treatment effect is consistent for almost all rounds.

	Round1	Round2	Round3	Round4	Round5
logit(prob _{t-1})	0.49***	0.69***	0.76***	0.70***	1.0***
good news	0.94***	0.89***	0.98***	1.46***	1.68***
bad news	0.71***	0.73***	0.95***	1.28***	1.42***
logit(prob _{t-1}) * T	0.37*	0.09	0.21*	0.27	0.0
good news * T	-0.46***	0.06	-0.33*	-0.05	-0.62*
bad news * T	0.19	-0.04	-0.12	0.13	0.05
degree of freedom	267	272	270	257	279

Heteroskedasticity-robust standard errors clustered by individual

***1% significance level, **5% significant level, *10% significant level

Hedging – Ambiguity Averse

Possible hedgers – those who report prior belief to be less than 50% (31 out of 303 subjects)

	All	Excluding all possible hedgers
logit(prob _{t-1})	0.83*** (0.08)	0.81*** (0.08)
good news	1.15*** (0.11)	1.14*** (0.13)
bad news	1.11*** (0.10)	1.13*** (0.11)
logit(prob _{t-1}) * T	0.10 (0.09)	0.14 (0.10)
good news * T	-0.26* (0.14)	-0.27* (0.16)
bad news * T	-0.03 (0.13)	-0.06 (0.15)
Number of observations	1,345	1223

Experimental Design: Post-experiment Questionnaire

Defensive pessimism¹

(4-likert scale: not at all, somewhat, moderately so, very much so)

- I often start out expecting the worst, even though I will probably be okay.
- I worry about how things will turn out.
- I often worry that I will not be able to carry through my intentions.
- I imagine how I would feel if things went badly.
- In these situations, sometimes I worry more about looking like a fool than doing really well.

Confidence

- Compare to your peers, you believe that your ability to predict stock price is better than average/ about the same/ not as good as the average

Financial anxiety²

(4-likert scale: not at all, somewhat, moderately so, very much so)

- I have difficulty controlling worrying about my financial situation.
- I have difficulty concentrating on my school/or work because of my financial situation.
- I feel anxious about my financial situation.

¹Defensive pessimism questionnaire (Norem, 2008)

²Financial anxiety scale (Archuleta et al., 2013)

Heterogeneity

Increase in Anxiety

	All	Control	Treatment
logit(prob _{t-1})	0.81***	0.81***	0.88***
good news	1.20***	1.2***	0.81***
bad news	1.06***	1.06***	1.00***
logit(prob _{t-1}) * T	0.07		
good news * T	-0.39***		
bad news * T	-0.06		
logit(prob _{t-1}) * anxiety change	0.04	0.04	0.04
good news * anxiety change	-0.11	-0.11	0.09**
bad news * anxiety change	0.10	0.10	0.06
logit(prob _{t-1}) * T * anxiety change	-0.01		
good news * T * anxiety change	0.20**		
bad news * T * anxiety change	-0.04		

Heteroskedasticity-robust standard errors clustered by individual

***1% significance level, **5% significant level, *10% significant level

Heterogeneity

Defensive Pessimism

	All	Control	Treatment
logit(prob _{t-1})	0.92***	0.92***	0.89***
good news	1.17***	1.17***	0.77***
bad news	0.84***	0.84***	0.52***
logit(prob _{t-1}) * T	-0.03		
good news * T	-0.40		
bad news * T	-0.31		
logit(prob _{t-1}) * pessimism	-0.04	-0.04	0.02
good news * pessimism	-0.1	-0.01	0.05
bad news * pessimism	0.12	0.12	0.24**
logit(prob _{t-1}) * T * pessimism	0.06		
good news * T * pessimism	0.06		
bad news * T * pessimism	0.12		

Heteroskedasticity-robust standard errors clustered by individual

***1% significance level, **5% significant level, *10% significant level

Heterogeneity

Confidence

	All	Control	Treatment
logit(prob _{t-1})	0.81***	0.81***	0.92***
good news	1.09***	1.09***	0.88***
bad news	1.11***	1.11***	1.11***
logit(prob _{t-1}) * T	0.12		
good news * T	-0.21		
bad news * T	-0.00		
logit(prob _{t-1}) * confidence	0.11	0.11	0.02
good news * confidence	0.35	0.35	0.05
bad news * confidence	0.01	0.01	-0.51***
logit(prob _{t-1}) * T * confidence	-0.09		
good news * T * confidence	-0.31		
bad news * T * confidence	-0.51		

Heteroskedasticity-robust standard errors clustered by individual

***1% significance level, **5% significant level, *10% significant level

Results: Main Treatment Effect

	Number of participants	Average number of positive signals received per person	Average number of negative signals received per person	Average belief update on good news	Average belief update on bad news	Wilcoxon signed rank test (compare average update on good vs bad signals within the same individual) P-value
control	149	2.34	2.06	10.13	11	0.1517
treatment	151	2.45	2.12	7.48	11.08	0.0003
Total	300	2.39	2.09	8.80	11.04	0.0003