

With great thanks to Dr Ryan Kendall and Christopher Kelly for advice and motivation to keep going.

Current game theoretic models cannot explain different human behaviours (e.g., Games 1 and 2). Can optimism bias lead to more accurate predictions?

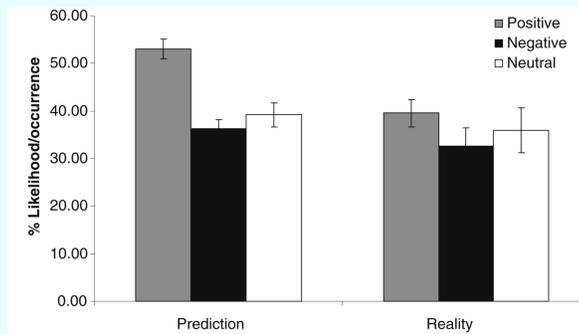


Figure 1 Optimism Bias in Healthy Individuals. (Sharot and Duda, cited in Sharot 2011)

		Player 2	
		A	B
Player 1	A	-5, -5	0, -10
	B	-10, 0	-1, -1

		Player 2	
		A	B
Player 1	A	5, 5	10, 0
	B	0, 10	9, 9

Figure 2 The two variants of the game

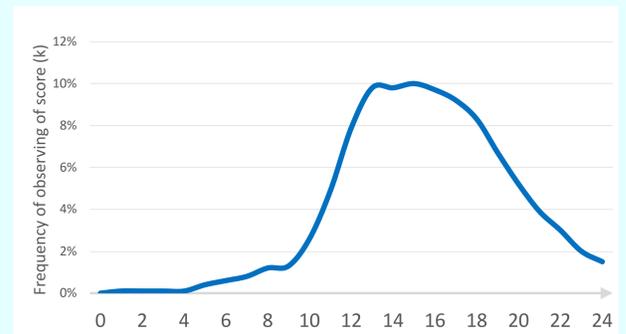


Figure 3 LOT-R Optimism Score Distribution (Gleasner 2012)

## MOTIVATION

The mathematical tools of game theory predict individual behaviour and the equilibrium approach to strategic interaction is used in fields ranging from Economics to Biology.

Agent-rationality assumption has (un)fortunately proven to not hold, people show behaviour deviating from the expectations of the theorists. Behavioural game theory studies these deviations from predictions of the traditional equilibrium approach. (Camerer, 2003)

Psychologists and neuroscientists study a number of biases, bases for irrational behaviour. This project concentrates on the optimism bias. Cognitive illusion by which “we overestimate the likelihood of positive events and underestimate the likelihood of negative events” (Sharot, 2011).

The optimism bias has been observed in 80% of people regardless of their personal characteristics, Figure 1.

By my hypothesis, players in strategic situations expect good luck and beneficial actions of other players, which effectively influences their decision making.

## GENERAL EXTENSIONS TO MY RESEARCH

Game theory models and psychological methods explaining the tendency to optimism can be combined to allow for a better understanding of how people act in strategic situations.

Adjustments for optimism are common in project management or in the markets. Examples include the London Olympic Budget. (Jennings, 2011)

## EXPERIMENT DESIGN

In order to test mathematical predictions of game theory with the optimism bias in mind, the experiment proposed in this poster consists of two parts. First, the participant will be made to play a game with the promise of performance-based payoffs. The second part will include measuring the individual’s optimism bias.

The game played shall be the Prisoner’s dilemma where rationally playing dominant strategies result in a low payoff in the Nash equilibrium. This result draws so much attention as an example of the social disadvantage arising from pure individual rationality and self-interest (Kuhn, 2017).

In my experiment design, the participants will randomly face one of two games of Prisoners’ dilemma (Figure 2) with different payoff matrices which are distinct by the “kernel component” (equal amounts added to or subtracted from all the payoffs). (Jessie and Kendall, 2019)

This game will be played 20 times, implementing the principle of Strangers matching, where each time the pairs of players would change.

In the next stage, the optimism of individuals will be measured. The optimal measure of the bias will be similar to the experiment of Dr Sharot. Unfortunately, however, due to practical limitations, the chosen measure of optimism in expectations using an IQ test and LOT-R questionnaire.

## CONCLUSIONS

For this project, resources and sample constraints present serious issues. More accurate measure of the optimism bias could be used with adequate funding to incentivise respondents. Varied set of games could also be constructed, moving the kernel. Cooperating with Dr Kendall, these limitations can be tackled and the project expanded to full blown research.

Economics is a new developing discipline. Cooperation with other social sciences helps understand the complexity of humans. Choices depending on kernel components can be examined. By exploring the deep rooted characteristic of optimism bias, adjustments could be made to models of strategic interactions. If data can show that this explains why the socially beneficial, albeit not-equilibrium strategy is being played, then the next step is to explore policy implications, to help avoid inefficient or harmful outcomes for the society, as well as to contribute to the interest of researchers in people – irrational agents.

## PROPOSED DATA ANALYSIS AND EXPECTED FINDINGS

The data can be analysed in order to:

- 1) Check the behaviour faced with uncertainty about the kernel component. Despite the games being strategically identical, the possibility variation in the kernel component of the games may change the behaviour.
- 2) Find a correlation between optimism, overconfidence, coin toss outcome and playing the dominated Action B

Expected findings in line with the hypothesis:

- a) optimism should make the respondents believe that the positive payoffs variant of the game is the one they face
- b) the expected reaction of the opponent would be action B, to jointly achieve the positive payoffs so the dominated strategy B could be played,
- c) observing more of either head or tails would be in line with playing Action B (achieving joint higher payoffs)
- d) observing less of head or tails may results in playing A, the dominant strategy, hoping to not reduce payoffs at all by the possibility of getting zero.

This difference between actions while faced with strategically identical games can show the importance of the kernel component of the games.