

# Implications of Overconfidence on Information Investment

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# Is Overconfidence Bad or Good?

Forbes

SEP 19, 2011 @ 11:29 AM 12,700

## The Benefits and Danger of Over-Confidence

BBC

capital

## The trouble with being too confident

By Sydney Finkelstein

27 May 2015

TIME

CAREER STRATEGIES

## You Gotta Have Faith: Why Overconfidence Can (Sometimes) Be Good for You

By David Futrelle | July 13, 2012

NATIONAL GEOGRAPHIC

## Evolution of Narcissism: Why We're Overconfident, and Why It Works

Overestimating our abilities can be a strategy for success, model shows.

By Christine Dell'Amore, for National Geographic News

PUBLISHED SEPTEMBER 16, 2011

# Outline

1. Model of *overconfidence as misperception of info precision*  $\Rightarrow$  three forces that arise from overconfidence:  
 $\uparrow$  overconfidence  $\Rightarrow$  force 1 increases info investment, force 2 and 3 decrease it
2. Given the level of overconfidence, can we change the incentives to improve the outcome?

## Literature Review

1. Overconfidence as correlation neglect:  
*Ortoleva and Snowberg (2015), Levy and Razin (2015),  
Glaser and Sunstein (2009)*
2. Overconfidence as overestimation of one's ability:  
*Heidhues, Koszegi and Strack (2015)*
3. Overconfidence as overprecision, with no option to choose the amount of information to collect:  
*Scheinkman and Xiong (2003), Kyle, Obizhaeva and Wang (2017)*

This paper: overconfidence as overprecision, with the option to choose the amount of information to collect

## PART 1. MODEL OF OVERCONFIDENCE

## Leading example

A judge decides whether to acquit or convict a defendant who can be either innocent or guilty.

## Research question

How does **overconfidence** influence the **quality of the verdict**?

## Moore and Healy (2008): Three Types of Overconfidence

Overestimation of one's actual performance, *I did it great!*

Overplacement of one's performance relative to others, *I did it better than others!*

Overprecision in one's beliefs, *I know everything!*

## Moore and Healy (2008): Three Types of Overconfidence

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### This paper

The judge believes that he has access to information that is *more precise than it actually is*

- ▶ by consuming this information, he becomes overconfident in his beliefs → *overprecision*
- ▶ by overestimating the precision of available information, he overestimates his ability to process this information → *overestimation*



# Model

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- ▶ Unbiased judge:
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  - ▶ utility from acquitting guilty = utility from convicting innocent
- ▶ Info: Brownian motion with state-dependent drift (stream of iid normally distributed signals)

$$dX_t = \mu_z dt + \sigma dW_t, \quad \mu_z = \begin{cases} 1, & z = \text{Innocent} \\ -1, & z = \text{Guilty} \end{cases}$$

- ▶ strategy = stopping time  $\tau$
- ▶ cost =  $\kappa \cdot \tau$

$$u(\text{verdict}, z) - \kappa \tau$$

The judge observes

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### Definition

**Overconfidence** = distortion in perceived variance of the signals:  
the judge believes  $\tilde{\sigma}^2$  instead of  $\sigma^2$

$\frac{\sigma^2}{\tilde{\sigma}^2}$  : the level of overconfidence

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### Question

How does the probability of the correct verdict change with the perceived variance  $\tilde{\sigma}^2$ ?

**Strategy space**

**Tradeoff**

**Result**

<b>Strategy space</b>	<b>Tradeoff</b>	<b>Result</b>

Strategy space	Tradeoff	Result
<p><i>binary</i>: <math>\tau \in \{0, T\}</math></p> <p><i>Ex: hold trial or not</i></p>		
<p><i>continuous</i>: <math>\tau \geq 0</math></p> <p><i>Ex: decide ex ante how long trial will be</i></p>		
<p><i>function</i>:</p> <p>choose <math>\tau</math> dynamically</p> <p><i>Ex: decide during trial when to stop it</i></p>		



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## PART 2. OPTIMAL CONTRACT FOR OVERCONFIDENT AGENT

## Assumption

The principal knows the level of overconfidence of the agent

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- ▶ contract =  $M$ :  $M \in \{\text{dynamic model, static model}\}$   
*Should we restrict the judge to commit to the length of the trial in advance?*
- ▶ contract =  $(M, Q)$ :  $Q$  is the agent's payoff benefit from the correct verdict  
*What if we can also choose how much to pay to the agent?*



## Dynamic vs Static Models

Goal: compare  $\text{Prob}(\text{correct decision}|\text{dynamic model}) \equiv \Pi^D$  vs  
 $\text{Prob}(\text{correct decision}|\text{static model}) \equiv \Pi^C$

- ▶ for rational agent, dynamic contract is better
- ▶ dynamic model brings **force 3** that decreases the probability of the correct decision

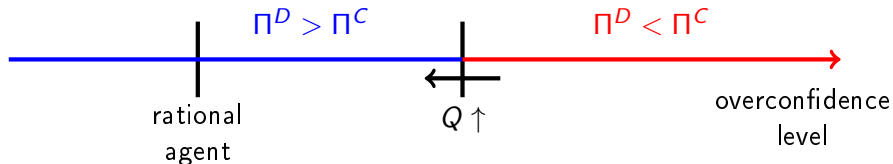
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### Theorem

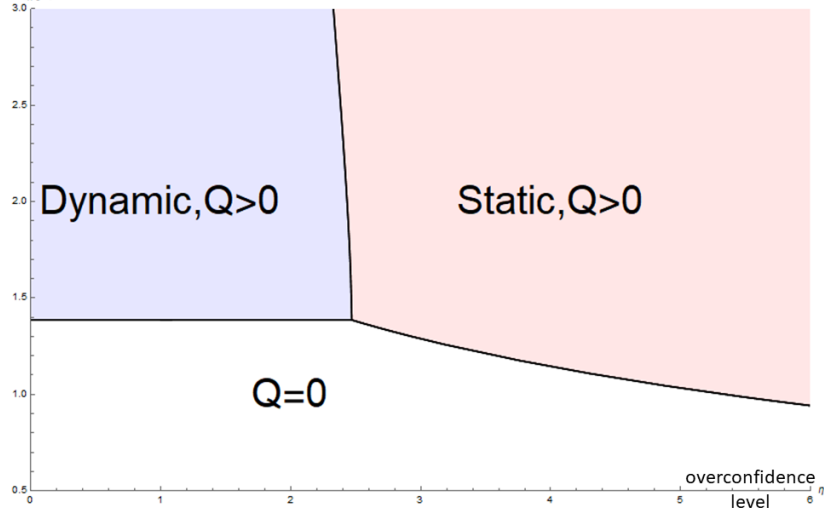
*There is a unique level of overconfidence such that  $\Pi^D > \Pi^C$  below that level, and  $\Pi^D < \Pi^C$  above it. Moreover, this level is decreasing in the agent's payoff benefit  $Q$  from the correct decision*



- ▶  $Q \uparrow \Rightarrow$  for rational agent  $\Pi^D \uparrow 1$  and  $\Pi^C \uparrow 1$

# Optimal Contract (Model, Q)

$$\log\left(\frac{Q_P}{\kappa \sigma^2}\right) = \text{Log} \frac{\text{principal's payoff benefit from the correct decision}}{\text{attention cost} \cdot \text{objective variance of information flow}}$$



# Conclusion

## 1. Model of overconfidence:

- ▶ level of overconfidence = degree of misperception of information precision
- ▶  $\uparrow$  overconfidence  $\Rightarrow$ 
  - force 1 :  $\uparrow$  precision of the next piece of information  $\Rightarrow$  more information
  - force 2 :  $\uparrow$  precision of already collected information  $\Rightarrow$  less information
  - force 3 :  $\uparrow$  weight placed on noise when updating beliefs  $\Rightarrow$  stop sooner than expected  $\Rightarrow$  less information

## 2. Policy recommendation: force a highly overconfident decision maker to commit to the amount of information he is going to collect in advance