

# BETTING ON BIASES

---

## What Sports Betting Reveals About Our Decisions and Financial Markets

---

Eben Lazarus

Assistant Professor of Finance, Haas School of Business

OCTOBER 3, 2025 | UC BERKELEY HOMECOMING WEEKEND



**Berkeley**Haas

# How Much Would You Update?

---

# How Much Would You Update?

---

## **New election poll**

A poll shows your preferred candidate up 2 points; earlier polls were even.

**How much should this change your view of who will win?**

# How Much Would You Update?

---

## **New election poll**

A poll shows your preferred candidate up 2 points; earlier polls were even.

**How much should this change your view of who will win?**

## **Rave review at work**

Your CEO says your work is “so good, LLMs have no hope of catching up.”

**How much should this raise your odds of getting a raise?**

# How Much Would You Update?

## New election poll

A poll shows your preferred candidate up 2 points; earlier polls were even.

**How much should this change your view of who will win?**

## Rave review at work

Your CEO says your work is “so good, LLMs have no hope of catching up.”

**How much should this raise your odds of getting a raise?**

## Great report card

Your child gets an A in advanced math, after getting mostly B’s before.

**How much better are their chances of getting into a top college?**

# How Much Would You Update?

## New election poll

A poll shows your preferred candidate up 2 points; earlier polls were even.

**How much should this change your view of who will win?**

## Rave review at work

Your CEO says your work is “so good, LLMs have no hope of catching up.”

**How much should this raise your odds of getting a raise?**

## Great report card

Your child gets an A in advanced math, after getting mostly B’s before.

**How much better are their chances of getting into a top college?**

**COMMONALITY:** All are **signals** where **direction** is clear, but **strength** isn’t.

[pieces of news]

[good vs. bad]

[exactly **how** good or bad]

# How Much Would You Update?

## New election poll

A poll shows your preferred candidate up 2 points; earlier polls were even.

**How much should this change your view of who will win?**

## Rave review at work

Your CEO says your work is “so good, LLMs have no hope of catching up.”

**How much should this raise your odds of getting a raise?**

## Great report card

Your child gets an A in advanced math, after getting mostly B’s before.

**How much better are their chances of getting into a top college?**

**COMMONALITY:** All are **signals** where **direction** is clear, but **strength** isn’t.  
[pieces of news]    [good vs. bad]    [exactly **how** good or bad]

**How do we tend to update in these common situations?**

# Our Focus: Sports & Finance



## Steph sinks a 3

...to put the Warriors up by 3 points.

**How much better are the Warriors' chances of winning if this happens...**

- 1. Early:** In the first quarter?
- 2. Late:** 0:40 left in the game?

# Our Focus: Sports & Finance



## Steph sinks a 3

...to put the Warriors up by 3 points.

**How much better are the Warriors' chances of winning if this happens...**

- 1. Early:** In the first quarter?
- 2. Late:** 0:40 left in the game?

## Stocks jump

...S&P 500 up 5% today after a flat year so far.

**How likely is it that your portfolio will be positive for the year if this happens...**

- 1. Early:** In mid-January?
- 2. Late:** In mid-December?



# Our Focus: Sports & Finance



## Steph sinks a 3

...to put the Warriors up by 3 points.

**How much better are the Warriors' chances of winning if this happens...**

- 1. Early:** In the first quarter?
- 2. Late:** 0:40 left in the game?

## Stocks jump

...S&P 500 up 5% today after a flat year so far.

**How likely is it that your portfolio will be positive for the year if this happens...**

- 1. Early:** In mid-January?
- 2. Late:** In mid-December?



- 1. Weak signals** (early)  $\Rightarrow$  relatively little info about eventual outcome
- 2. Strong signals** (late)  $\Rightarrow$  very informative about outcome

# A Consistent Bias

Steph sinks a 3 to put the Warriors up by 3 points.

**How does this affect Warriors' winning odds if it's...**

- 1. Early:** In the first quarter?
- 2. Late:** 0:40 left in the game?

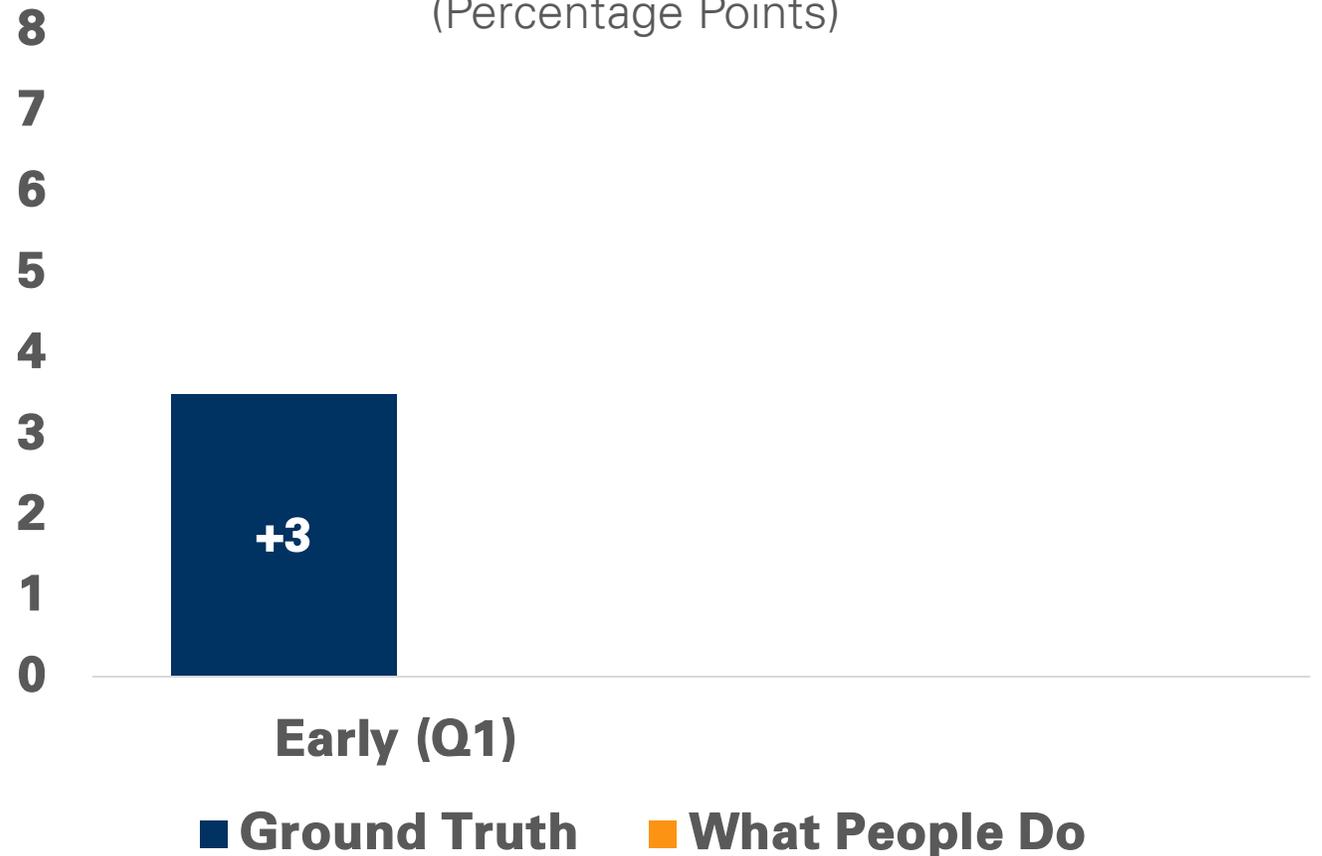
# A Consistent Bias

Steph sinks a 3 to put the Warriors up by 3 points.

How does this affect Warriors' winning odds if it's...

1. **Early:** In the first quarter?
2. **Late:** 0:40 left in the game?

Changes in Win Probability  
(Percentage Points)



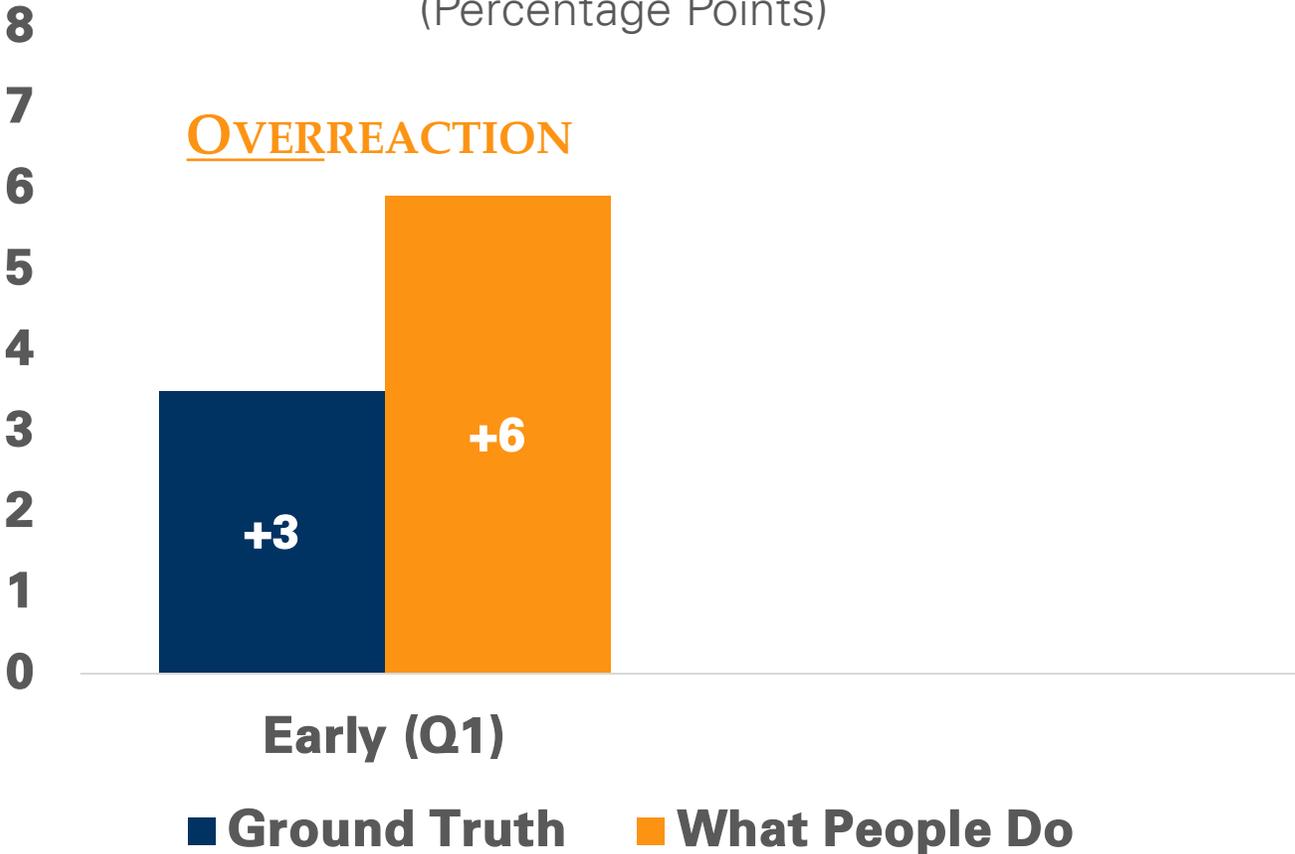
# A Consistent Bias

Steph sinks a 3 to put the Warriors up by 3 points.

How does this affect Warriors' winning odds if it's...

- 1. **Early:** In the first quarter?
- 2. **Late:** 0:40 left in the game?

Changes in Win Probability  
(Percentage Points)



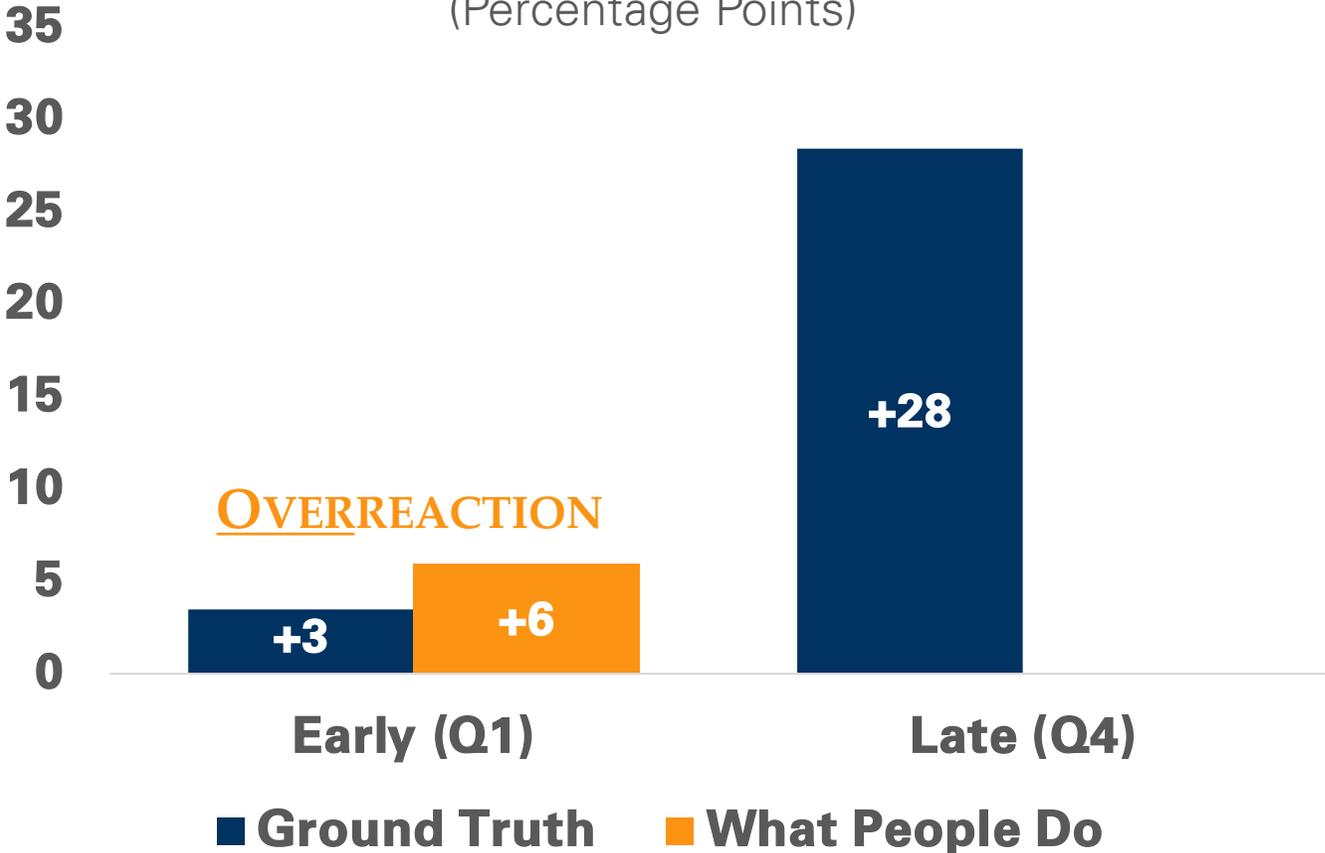
# A Consistent Bias

Steph sinks a 3 to put the Warriors up by 3 points.

**How does this affect Warriors' winning odds if it's...**

- 1. Early:** In the first quarter?
- 2. Late:** 0:40 left in the game?

**Changes in Win Probability**  
(Percentage Points)



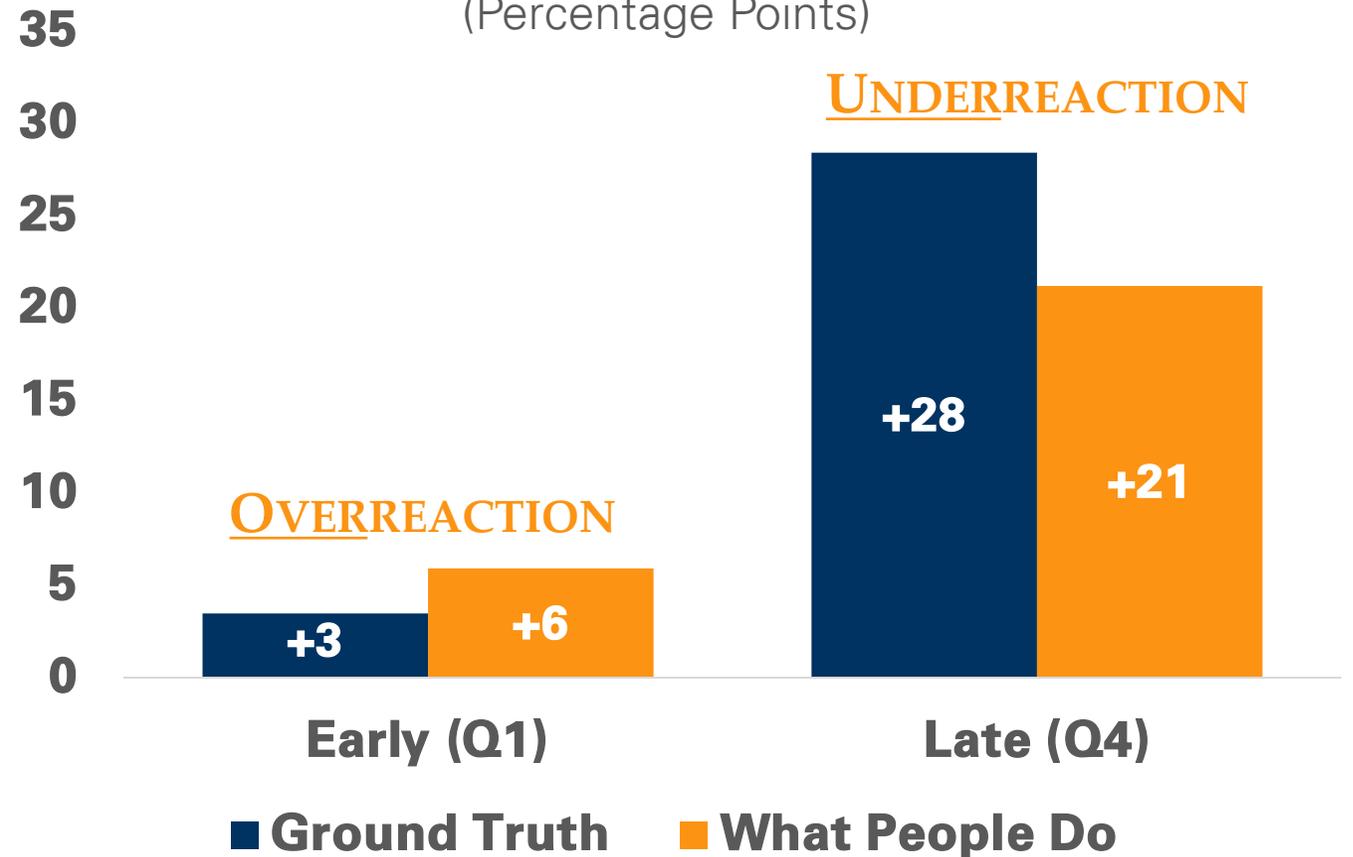
# A Consistent Bias

Steph sinks a 3 to put the Warriors up by 3 points.

How does this affect Warriors' winning odds if it's...

1. **Early:** In the first quarter?
2. **Late:** 0:40 left in the game?

Changes in Win Probability  
(Percentage Points)

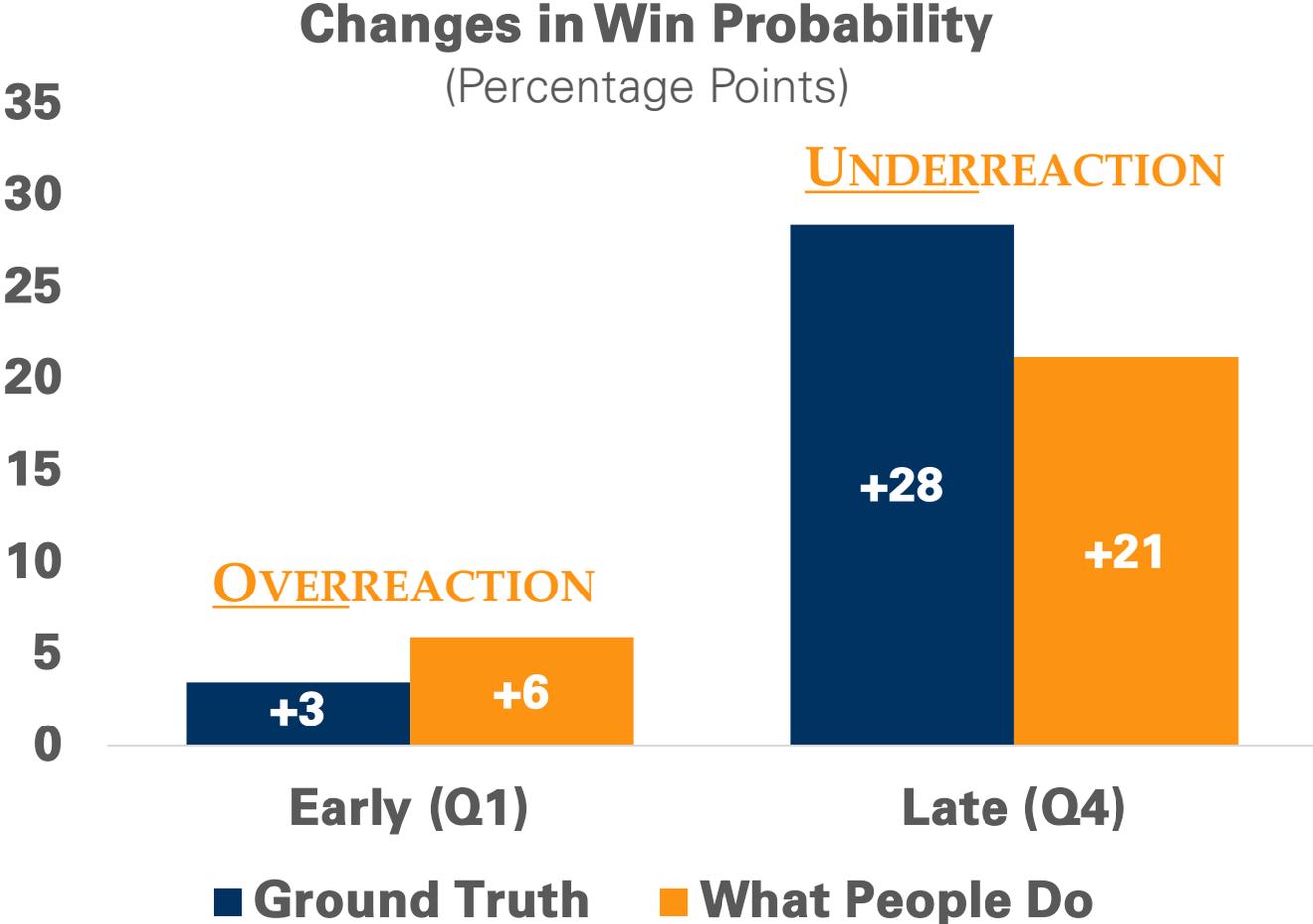


# Overreaction to Weak Signals, Underreaction to Strong Signals

Steph sinks a 3 to put the Warriors up by 3 points.

**How does this affect Warriors' winning odds if it's...**

- 1. **Early:** In the first quarter?
- 2. **Late:** 0:40 left in the game?



# A Single Bias Explains Both Patterns

---

**Overreaction** to **weak signals**, **underreaction** to **strong signals**.

# A Single Bias Explains Both Patterns

---

**Overreaction** to **weak signals**, **underreaction** to **strong signals**.

**Why? Easy** to understand what **direction** the news is in (good vs. bad).  
**Much harder** to figure out **strength** (exactly how much to move).

⇒ given this difficulty, we shade toward a **middle ground**.

# A Single Bias Explains Both Patterns

**Overreaction** to **weak signals**, **underreaction** to **strong signals**.

**Why? Easy** to understand what **direction** the news is in (good vs. bad).  
**Much harder** to figure out **strength** (exactly how much to move).

⇒ given this difficulty, we shade toward a **middle ground**.

**Strong, repeated pattern:** Experiments, sports betting, & financial markets.

All results are from joint work with Ned Augenblick (also at Haas!) and Michael Thaler:

“OVERINFERENCE FROM WEAK SIGNALS AND UNDERINFERENCE FROM STRONG SIGNALS”

Quarterly Journal of Economics (2025), Vol. 140, 335–401.

# Where We're Going

**1. The Core Bias**  
**A Simple  
Experiment**

**2. Real World**  
**Sports Betting**  
**Markets**

**3. High Stakes**  
**Financial**  
**Markets**

**4. Takeaways**  
**What It Means**  
**for You**

# The Core Bias: Experimental Evidence

---

**Theory:** We often **know** if news is good or bad, but much **fuzzier** *how* good or bad.  
⇒ Treat all signals **similarly**: update **too much** after noise, **too little** after real news.

## How to test?

**Difficulty:** If people have trouble figuring out signal strength, why will we be any better?

# The Core Bias: Experimental Evidence

---

**Theory:** We often **know** if news is good or bad, but much **fuzzier** *how* good or bad.  
⇒ Treat all signals **similarly**: update **too much** after noise, **too little** after real news.

## How to test?

**Difficulty:** If people have trouble figuring out signal strength, why will we be any better?

## Two solutions:

- 1. Experiments:** We know exactly how strong a given signal is, but low stakes.
- 2. Real world:** Higher stakes, but need to come up with clever tests.

# The Core Bias: Experimental Evidence

---

**Theory:** We often **know** if news is good or bad, but much **fuzzier** *how* good or bad.  
⇒ Treat all signals **similarly**: update **too much** after noise, **too little** after real news.

## How to test?

**Difficulty:** If people have trouble figuring out signal strength, why will we be any better?

## Two solutions:

- 1. Experiments:** We know exactly how strong a given signal is, but low stakes.  
Three different experiments, but I'll focus on one.
- 2. Real world:** Higher stakes, but need to come up with clever tests.

# The Experiment: An NBA Game

---

Recruited **500 NBA fans** (U.S. adults) on an online experiment platform.

**Signals:** Made/missed baskets by Team A or Team B.

**Questions:** What's the probability that Team A wins?

Monetary bonus for accuracy vs. our estimates from NBA data.

# The Experiment: An NBA Game

Recruited **500 NBA fans** (U.S. adults) on an online experiment platform.

**Signals:** Made/missed baskets by Team A or Team B.

**Questions:** What's the probability that Team A wins?

Monetary bonus for accuracy vs. our estimates from NBA data.

## Prediction

We will give you some more information about the game. With 2:25 left in the first quarter, Team B made a shot to cut the lead to 5 points.

Time left	Last action	Score	Your guess
2:40	Team A made a shot	Team A is up by 7 points	Team A: <b>67%</b> chance of winning
2:25	<b>Team B made a shot</b>	<b>Team A is up by 5 points</b>	?

Now, what do you think is the percent chance that Team A wins the game?

0 10 20 30 40 50 60 70 80 90 100

62



# Overreaction Early, Underreaction Late

---

Split data by quarter and calculate **true signal strength** from NBA data.  
0 (meaningless) to  $\infty$  (know winner for sure)

Calculate **weight participants put on the signal** relative to truth.  
Above 1: Overestimate importance, overreact.  
Below 1: Underestimate, underreact.

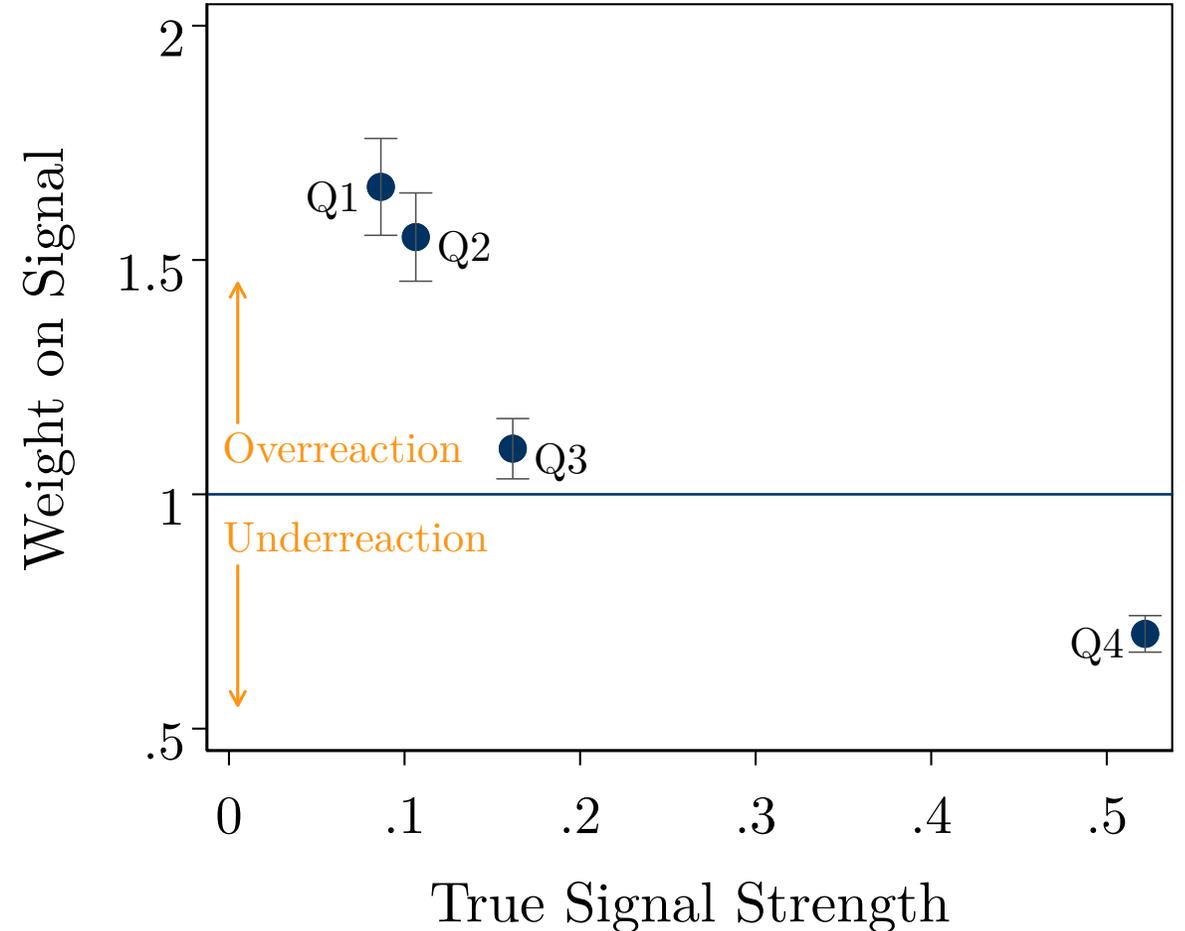
# Overreaction Early, Underreaction Late

Split data by quarter and calculate **true signal strength** from NBA data. 0 (meaningless) to  $\infty$  (know winner for sure)

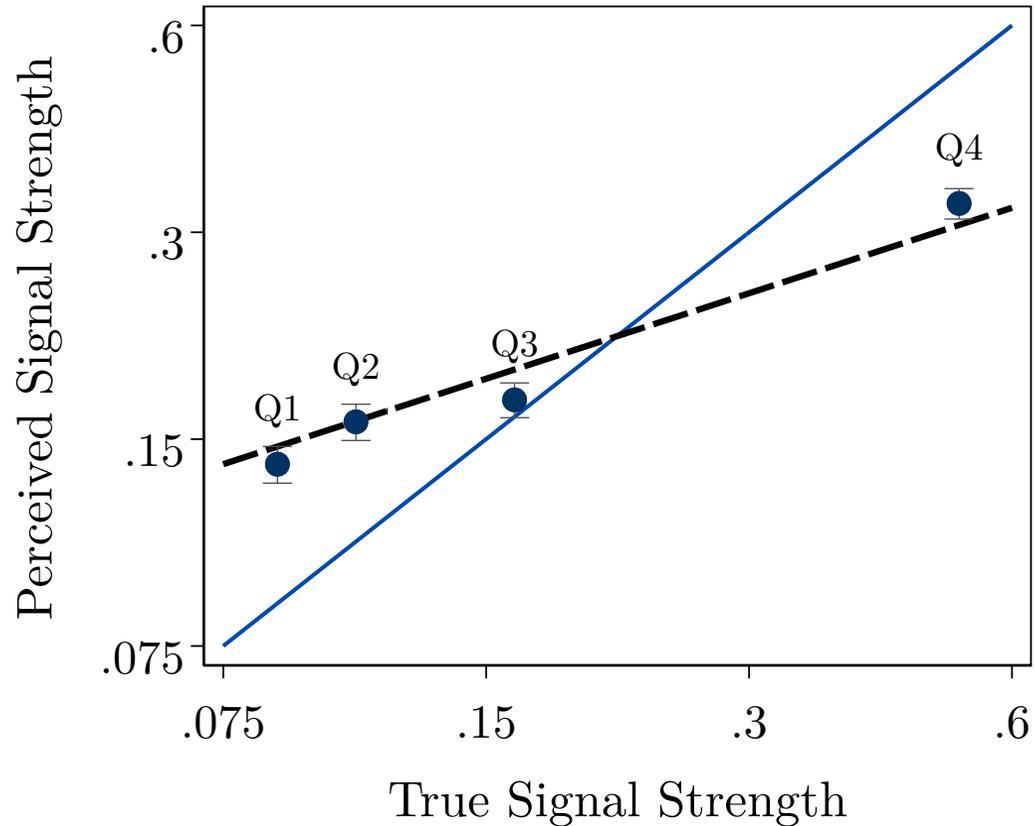
Calculate **weight participants put on the signal** relative to truth.

Above 1: Overestimate importance, overreact.

Below 1: Underestimate, underreact.

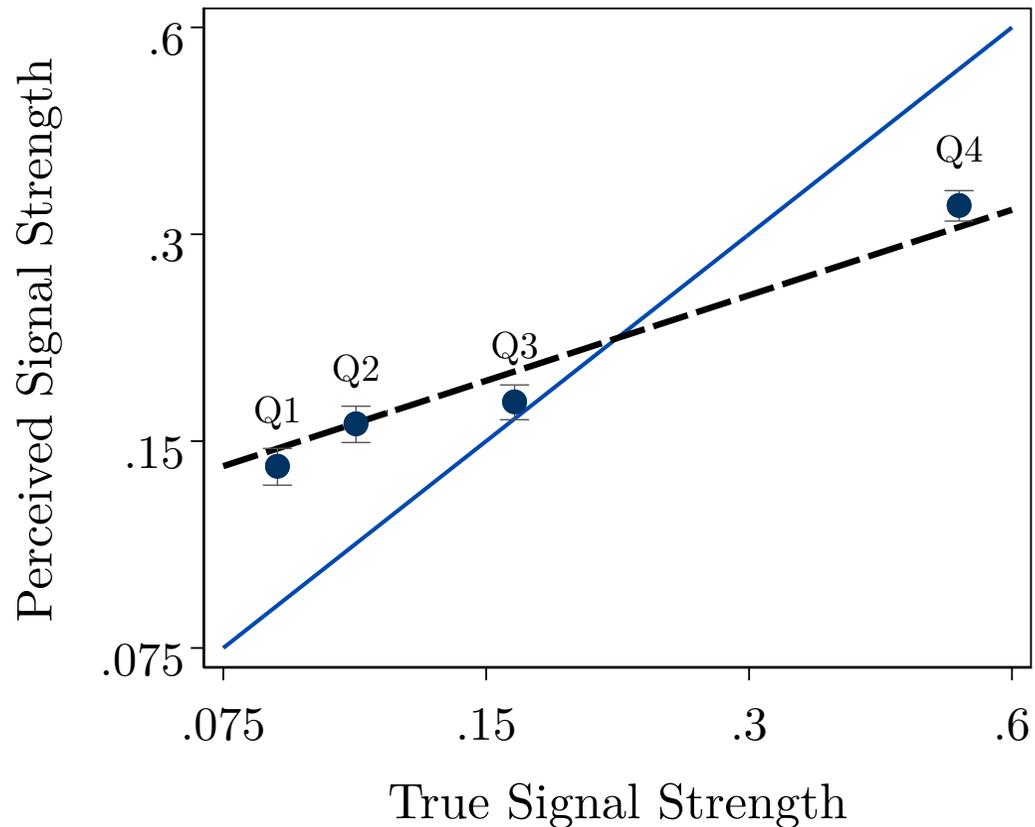


# Other Findings and the Key Mechanism



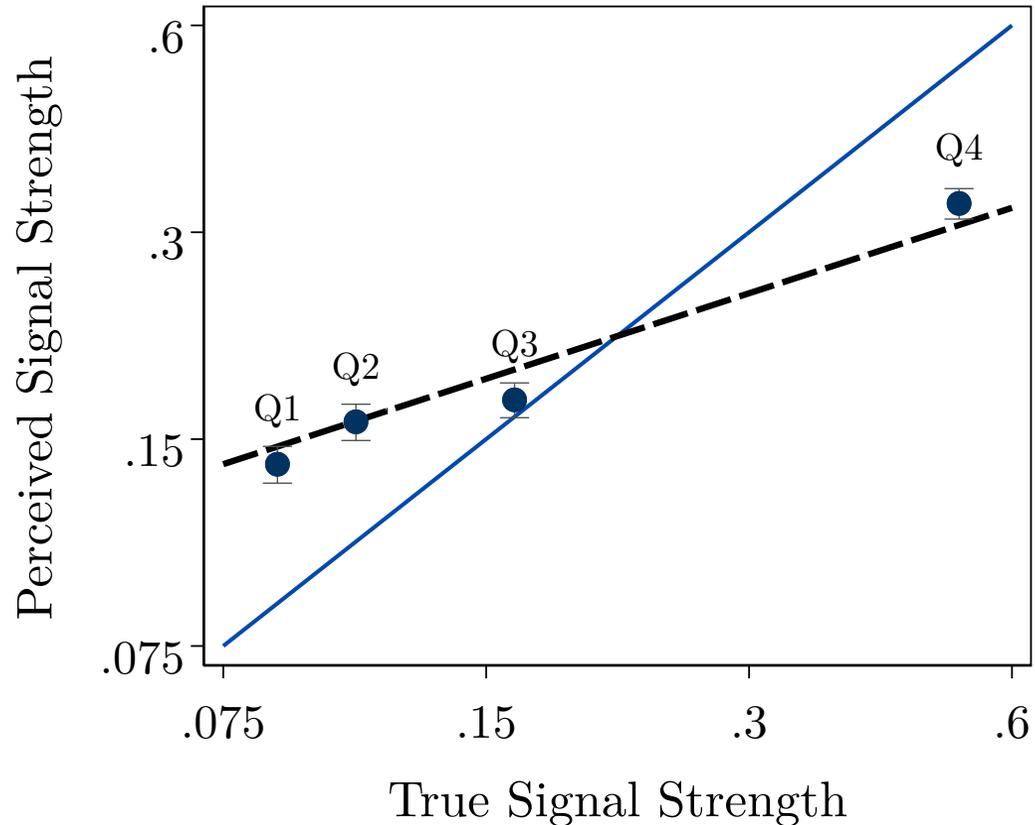
- People **do** understand that stronger signals are stronger...just **not enough**

# Other Findings and the Key Mechanism



- People **do** understand that stronger signals are stronger...just **not enough**
- **Our mechanism:** get direction, not strength
- **Direct evidence:** Ask participants how certain they are of their answers (0 to 100)
  - **More uncertain → much bigger effect** (treat all signals as roughly same strength)

# Other Findings and the Key Mechanism



- People **do** understand that stronger signals are stronger...just **not enough**
- **Our mechanism:** get direction, not strength
- **Direct evidence:** Ask participants how certain they are of their answers (0 to 100)
  - **More uncertain → much bigger effect** (treat all signals as roughly same strength)
- Also replicate findings in other (more standard) experimental settings

# Roadmap

**1. The Core Bias**  
A Simple  
Experiment

**2. Real World**  
**Sports Betting**  
**Markets**

**3. High Stakes**  
Financial  
Markets

**4. Takeaways**  
What It Means  
for You

# What About the Real World?

---

Lab evidence is nice, but we care about understanding **real, high-stakes settings**.

**Setting 1:** Sports betting markets

- Data from **Betfair:** Large **exchange** — people bet against each other, not a bookie.

# What About the Real World?

---

Lab evidence is nice, but we care about understanding **real, high-stakes settings**.

## **Setting 1:** Sports betting markets

- Data from **Betfair**: Large **exchange** — people bet against each other, not a bookie.
- Contract: “Person 1 will pay Person 2 **\$1** if the Warriors beat the Rockets on 5/4.  
Person 2 will pay Person 1 **\$4** if the Rockets beat the Warriors.”

Gives us an **implied probability** of GSW win: **75%**.

# What About the Real World?

Lab evidence is nice, but we care about understanding **real, high-stakes settings**.

## Setting 1: Sports betting markets

- Data from **Betfair**: Large **exchange** — people bet against each other, not a bookie.
- Contract: “Person 1 will pay Person 2 **\$1** if the Warriors beat the Rockets on 5/4.  
Person 2 will pay Person 1 **\$4** if the Rockets beat the Warriors.”

Gives us an **implied probability** of GSW win: **75%**.



# What About the Real World?

Lab evidence is nice, but we care about understanding **real, high-stakes settings**.

## Setting 1: Sports betting markets

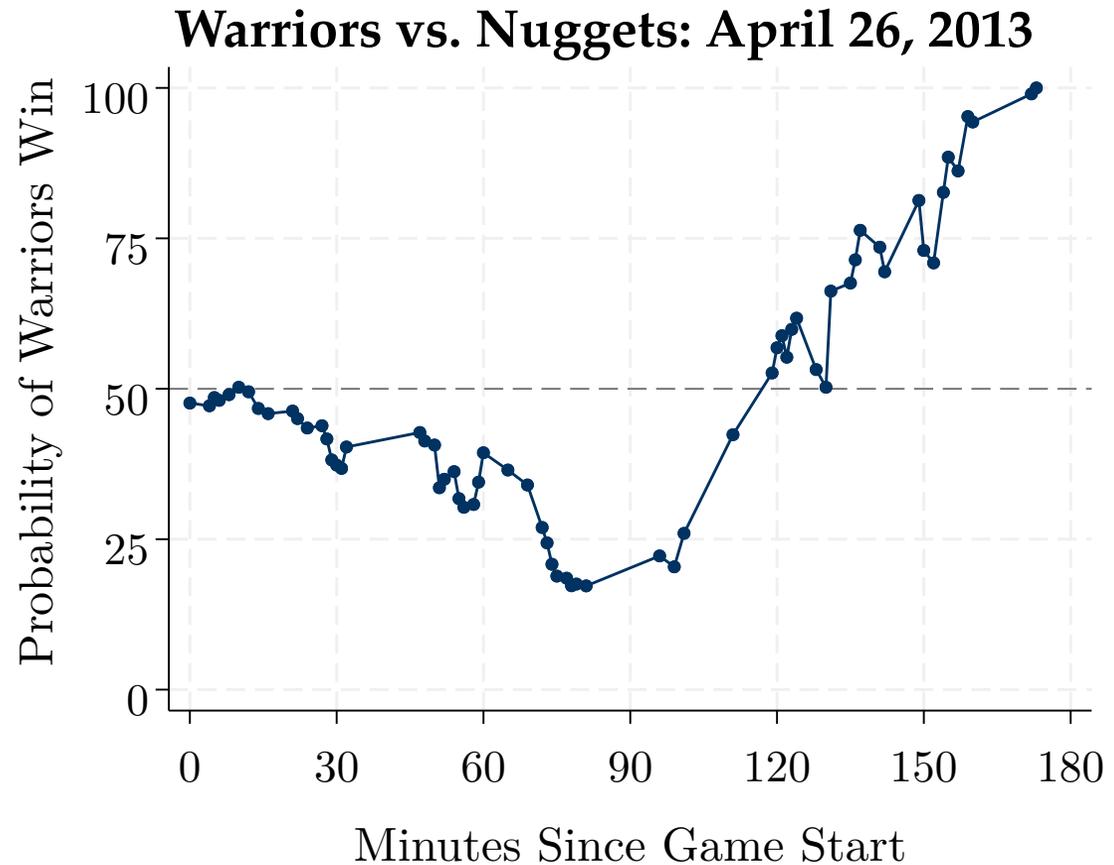
- Data from **Betfair**: Large **exchange** — people bet against each other, not a bookie.
- Contract: “Person 1 will pay Person 2 **\$1** if the Warriors beat the Rockets on 5/4.  
Person 2 will pay Person 1 **\$4** if the Rockets beat the Warriors.”

Gives us an **implied probability** of GSW win: **75%**.

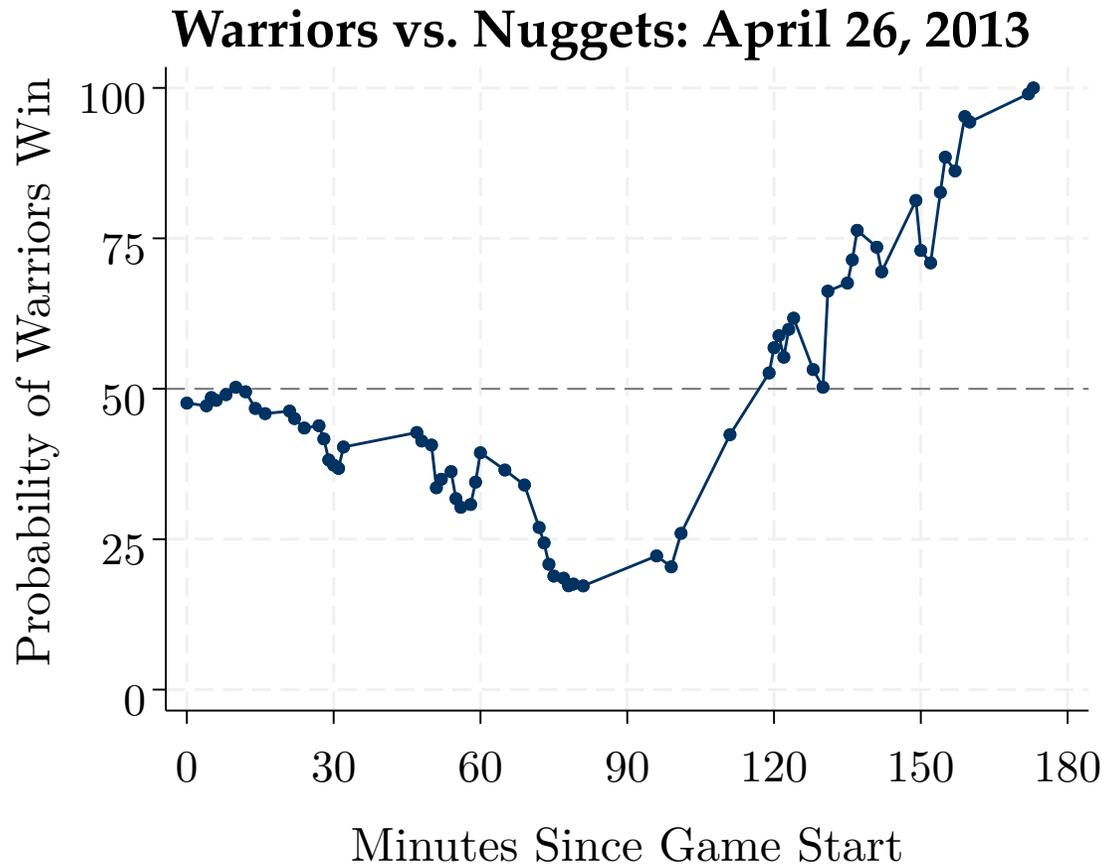
- Contracts trade throughout game → market-implied beliefs change in real time.
- **5 million** within-game transactions from **260k games** (keep 1 per minute)
- **Sports**: Basketball, football, soccer, baseball, hockey



# Market Implied Beliefs: An Example



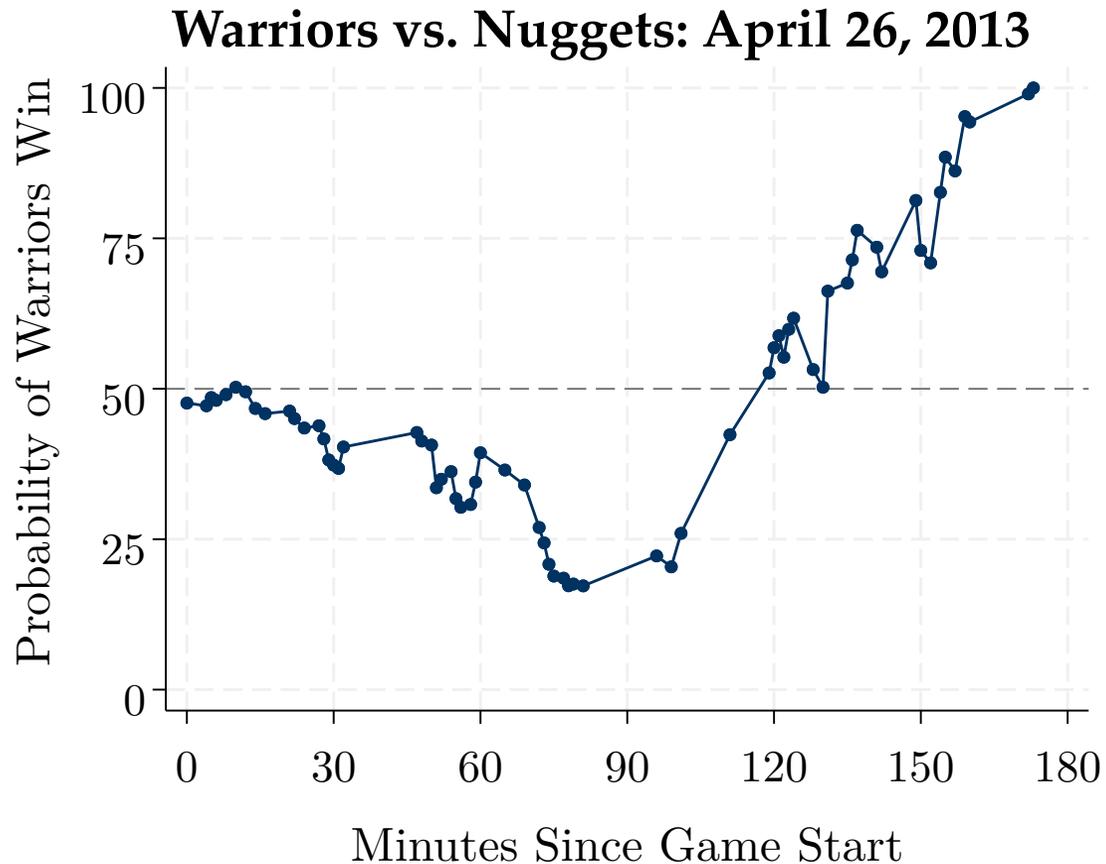
# Market Implied Beliefs: An Example



## How can we test over- vs. underreaction?

- Unlike lab, very unclear what “correct” belief change is in specific scenario
  - Are any players injured?
  - Is one player on a seeming hot streak?

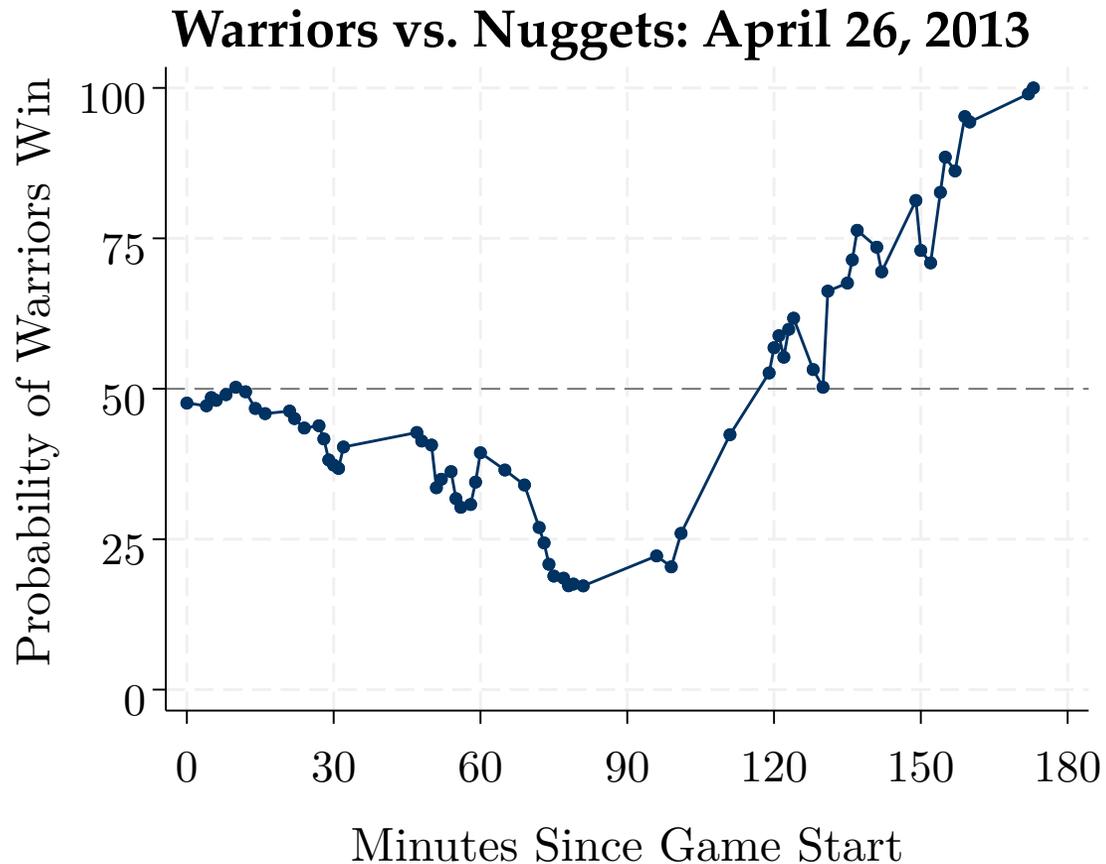
# Market Implied Beliefs: An Example



## How can we test over- vs. underreaction?

- Unlike lab, very unclear what “correct” belief change is in specific scenario
  - Are any players injured?
  - Is one player on a seeming hot streak?
  - Is Drake sitting courtside?

# Market Implied Beliefs: An Example

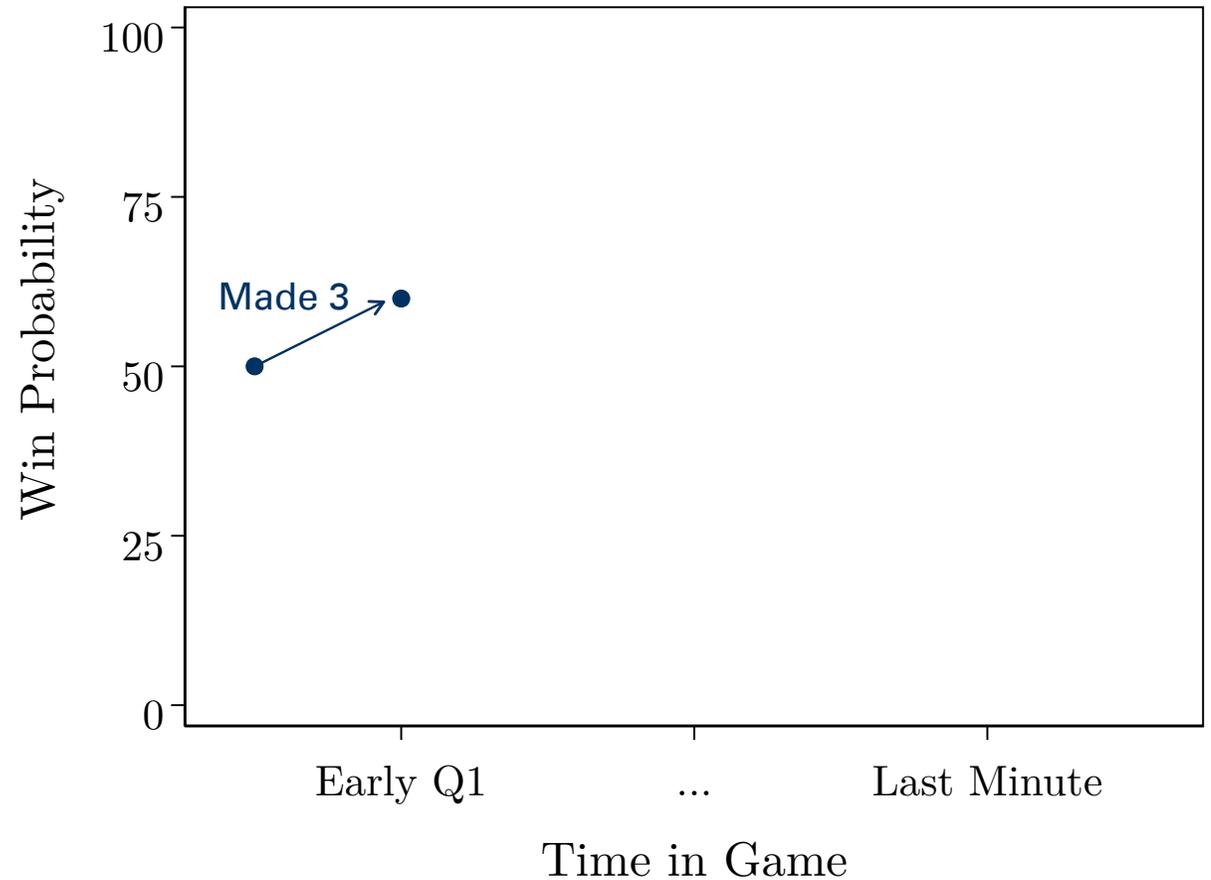


## How can we test over- vs. underreaction?

- Unlike lab, very unclear what “correct” belief change is in specific scenario
  - Are any players injured?
  - Is one player on a seeming hot streak?
  - Is Drake sitting courtside?
- We come up with a **method** to get around this issue, and show formally that it works to measure over-/underreaction in general

# The Test: Reversals Indicate Overreaction

Consider belief changes over a game.



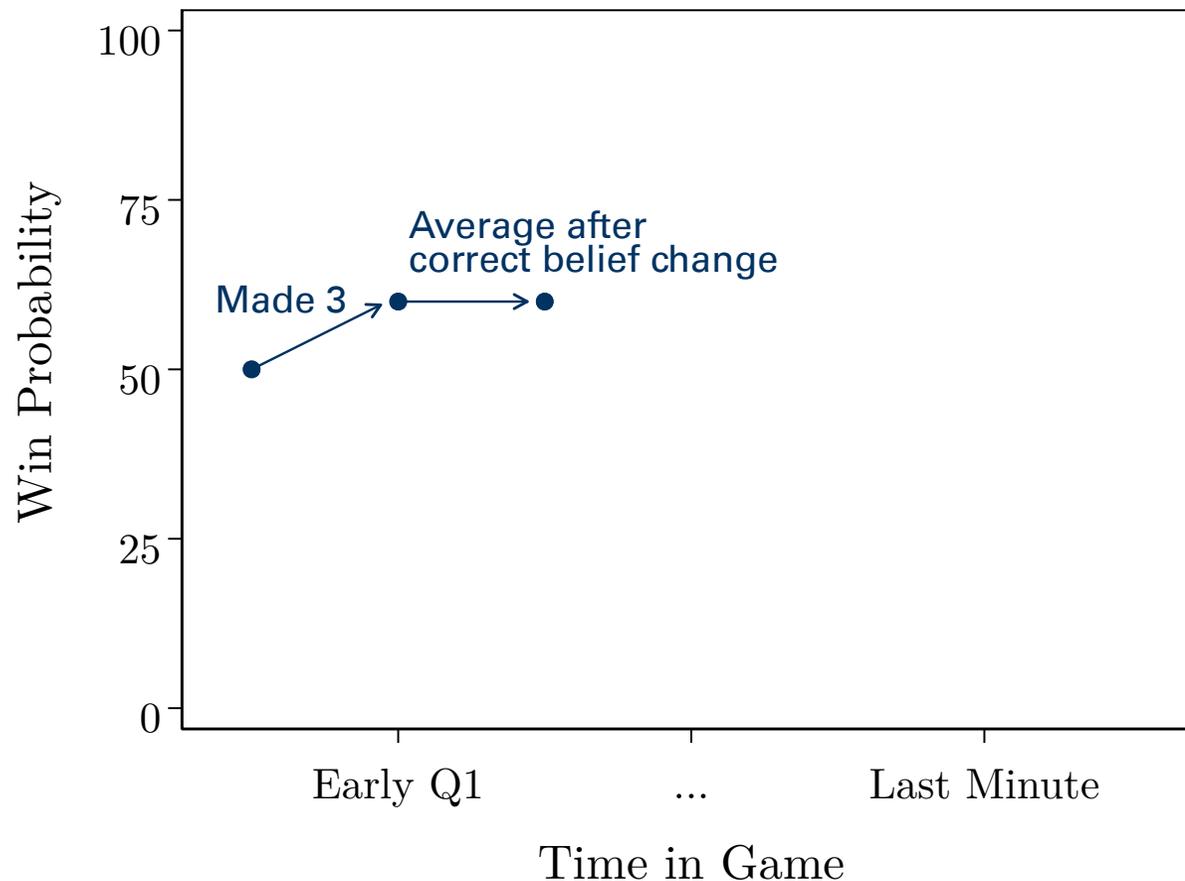
# The Test: Reversals Indicate Overreaction

Consider belief changes over a game.

## Correct reaction:

After a change, further belief changes should not be predictable.

(If you know your beliefs will change predictably in the future, just change them there now!)



# The Test: Reversals Indicate Overreaction

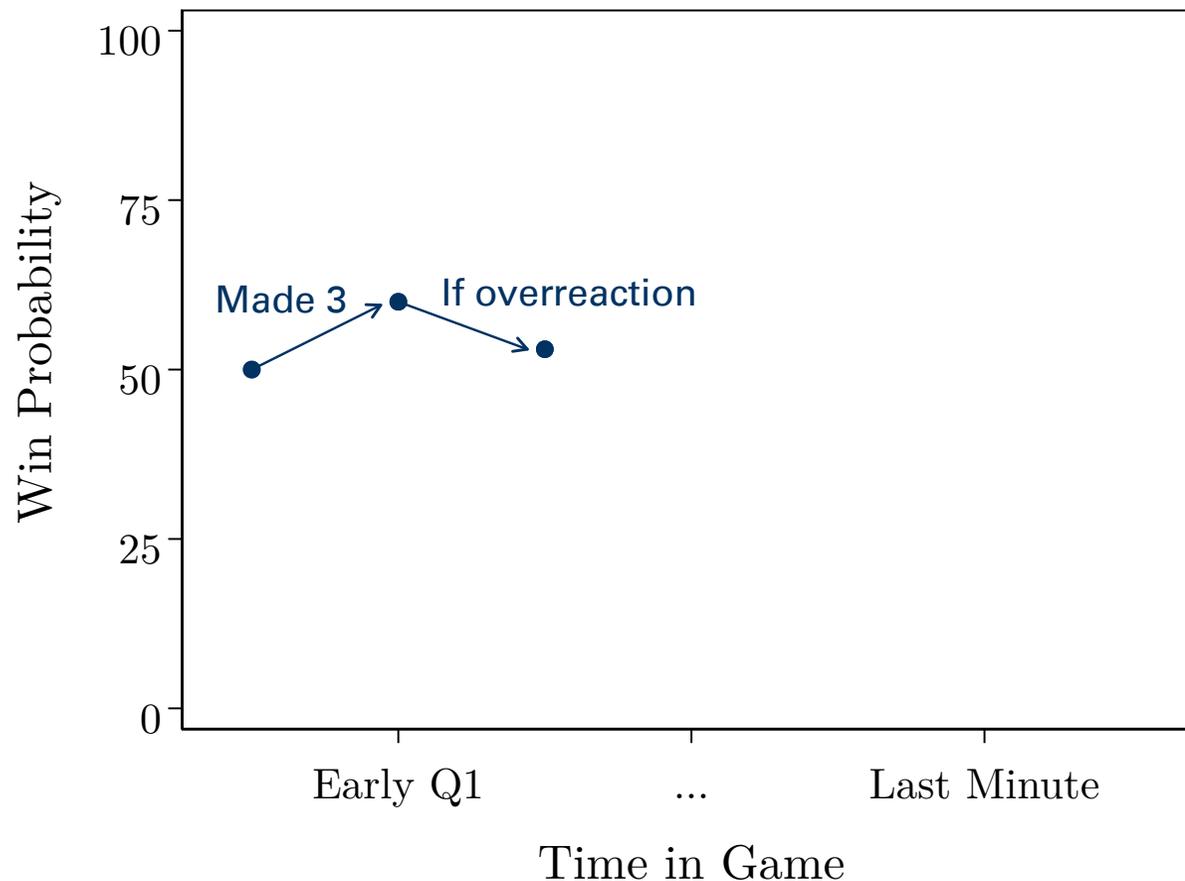
Consider belief changes over a game.

## Correct reaction:

After a change, further belief changes should not be predictable.

## Overreaction:

Beliefs predictably **reverse**.



# The Test: Reversals Indicate Overreaction

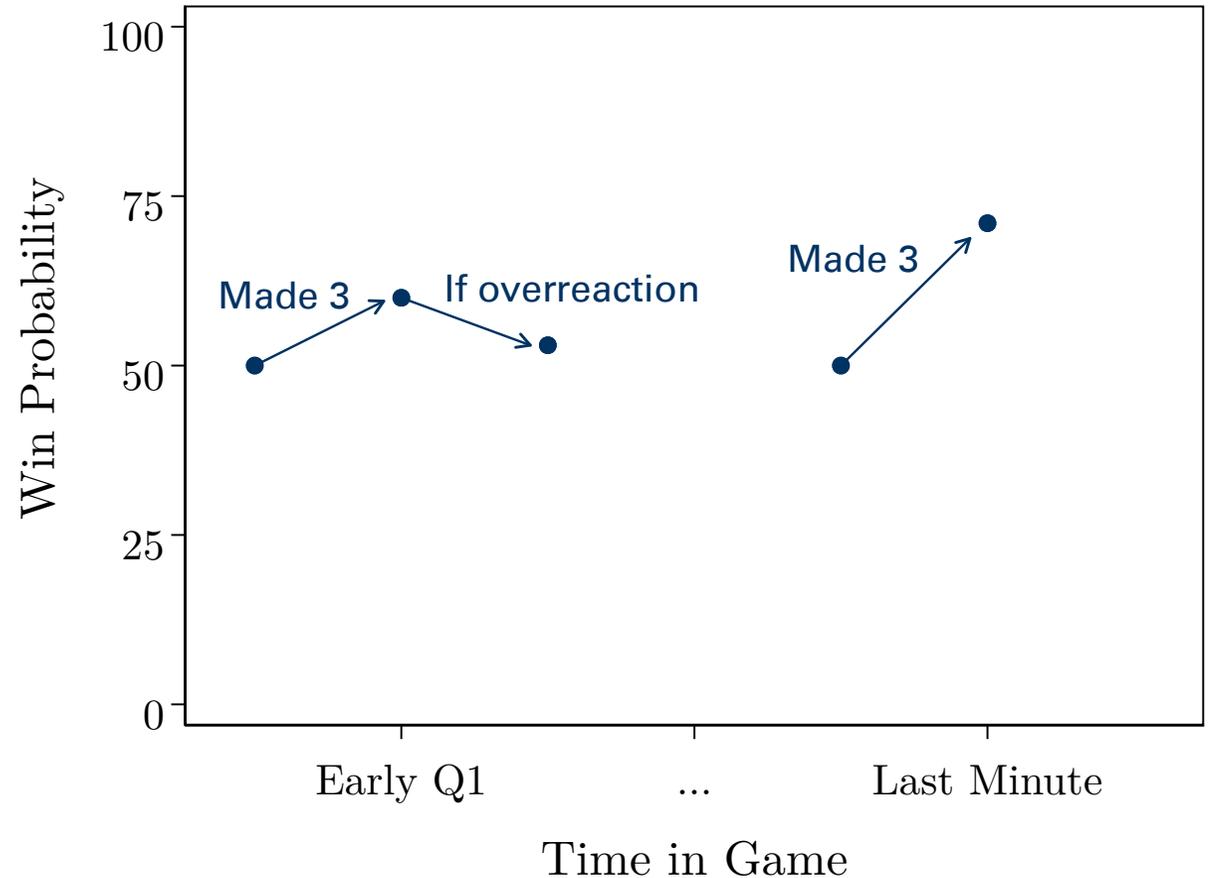
Consider belief changes over a game.

## Correct reaction:

After a change, further belief changes should not be predictable.

## Overreaction:

Beliefs predictably **reverse**.



# The Test: Reversals Indicate Overreaction

Consider belief changes over a game.

## Correct reaction:

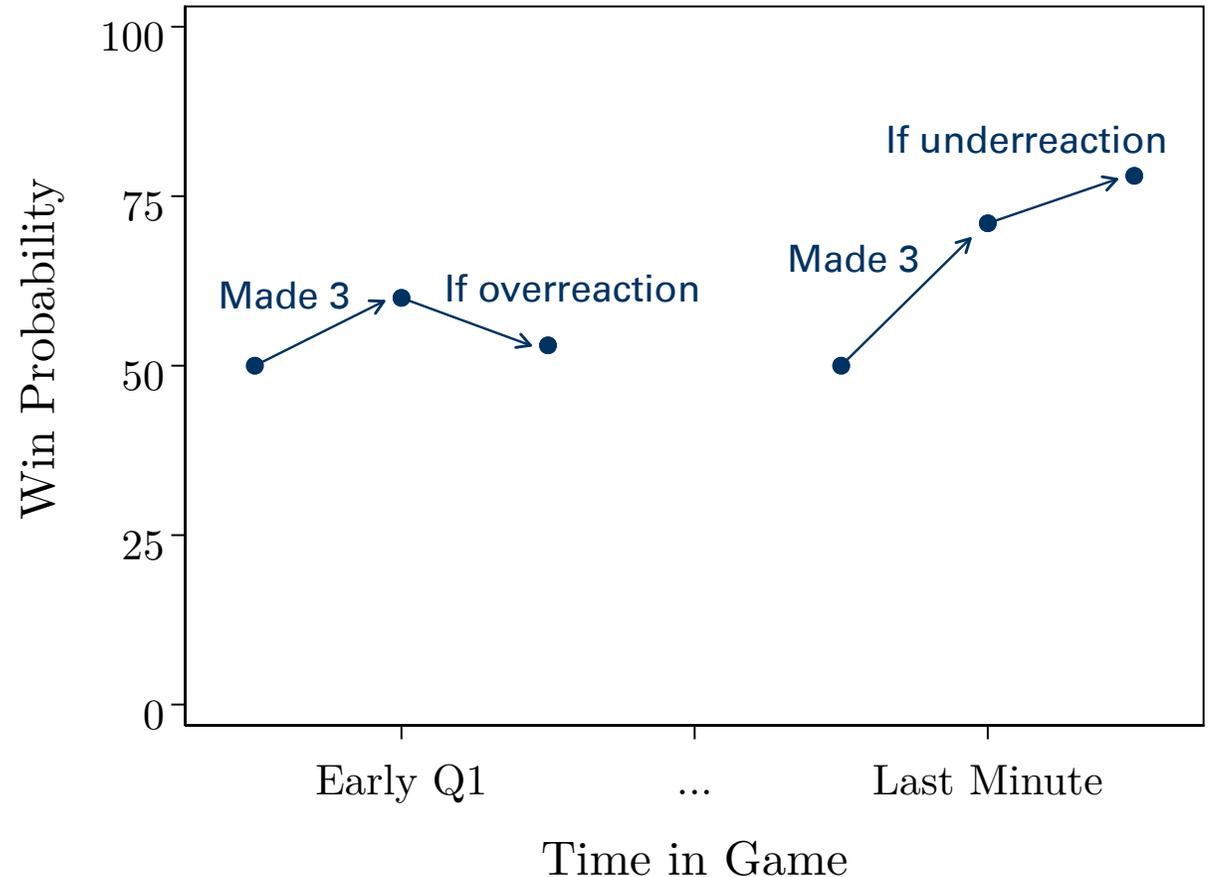
After a change, further belief changes should not be predictable.

## Overreaction:

Beliefs predictably **reverse**.

## Underreaction:

Beliefs predictably **drift** in the same direction after changes.



# The Test: Reversals Indicate Overreaction

## Overreaction:

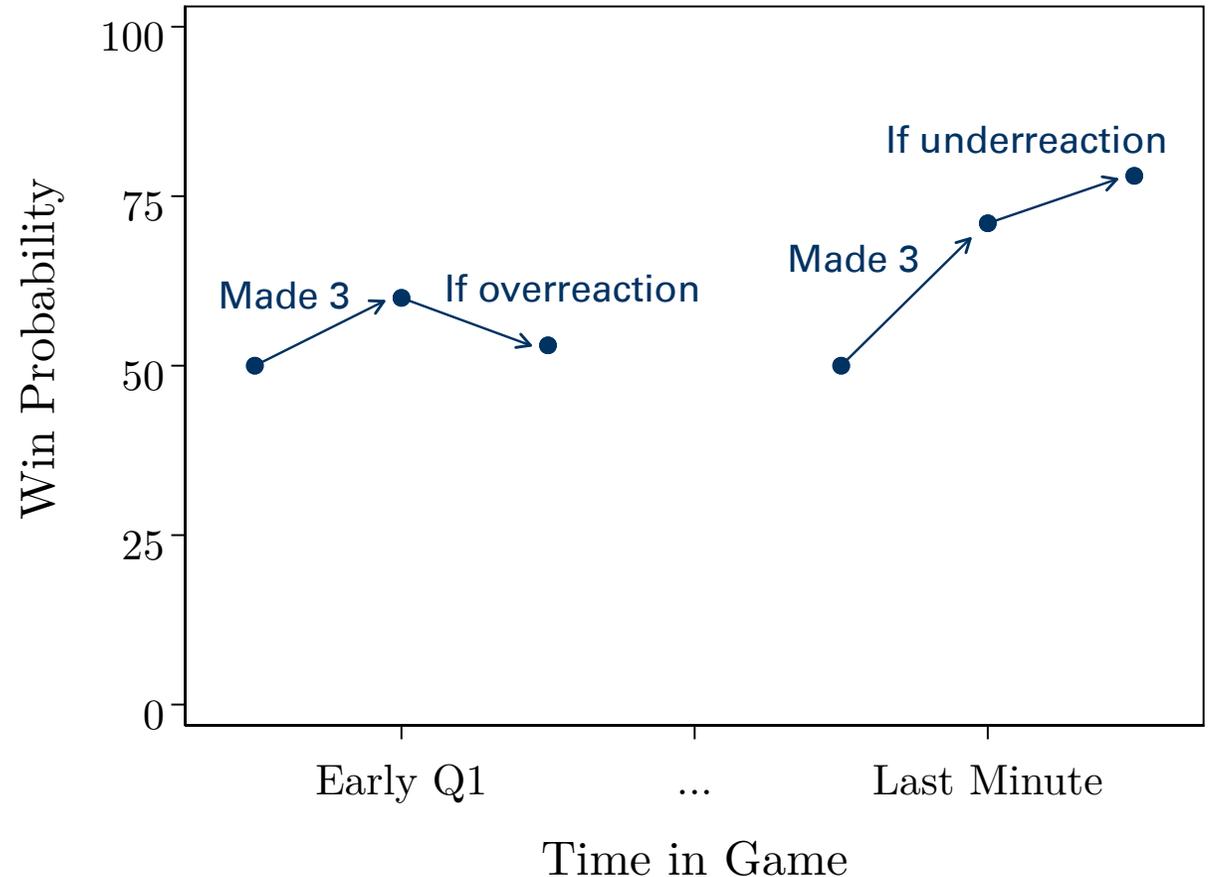
Beliefs predictably **reverse**.

## Underreaction:

Beliefs predictably **drift**.

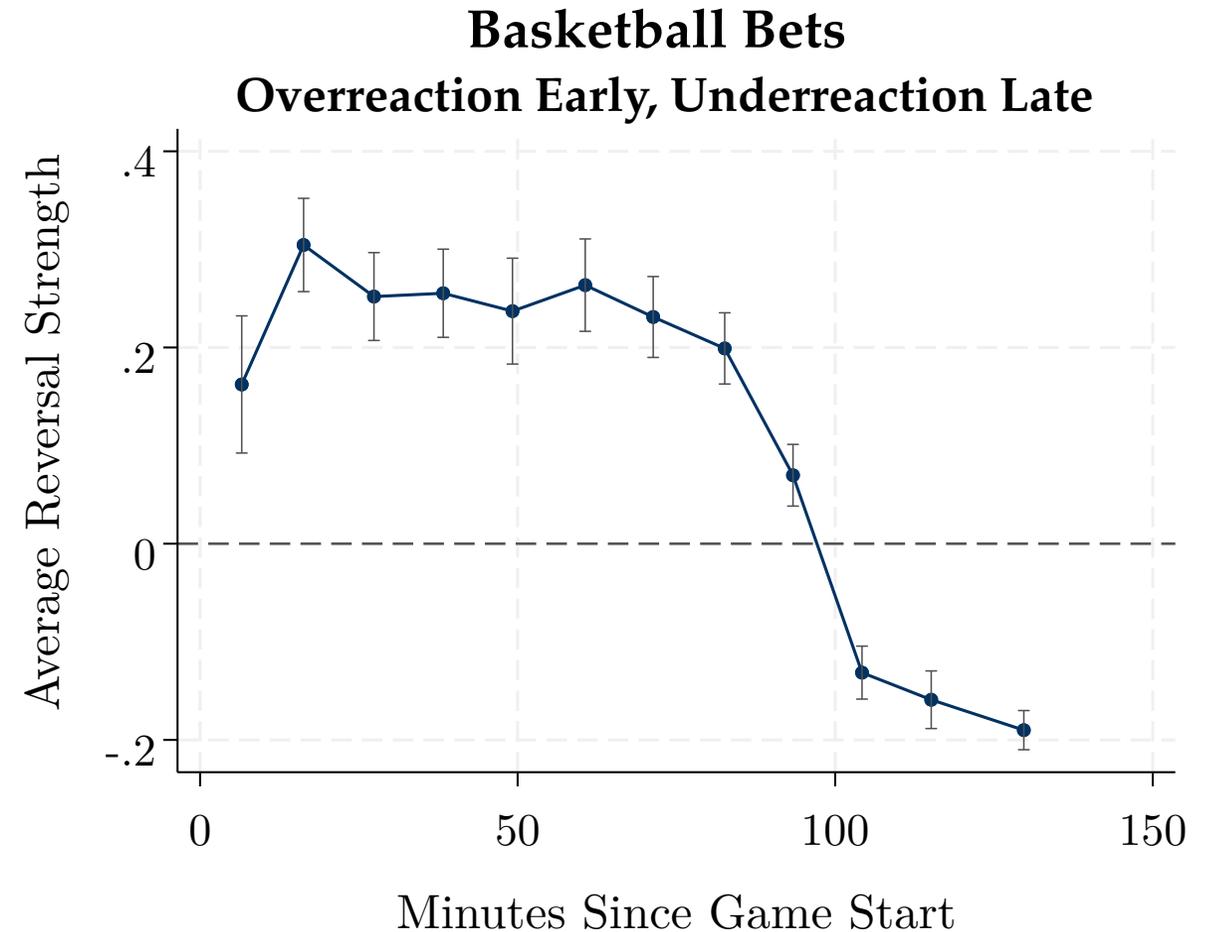
**Test:** Calculate **average reversal** in 12 time windows (early Q1, ...).

- 1: full overreact — belief changes fully reverse
- 1: full underreact — beliefs continue drifting



# Sports Bettors: Same Bias!

**Reversal strength**  $\Leftrightarrow$  % overreaction



# Sports Bettors: Same Bias!

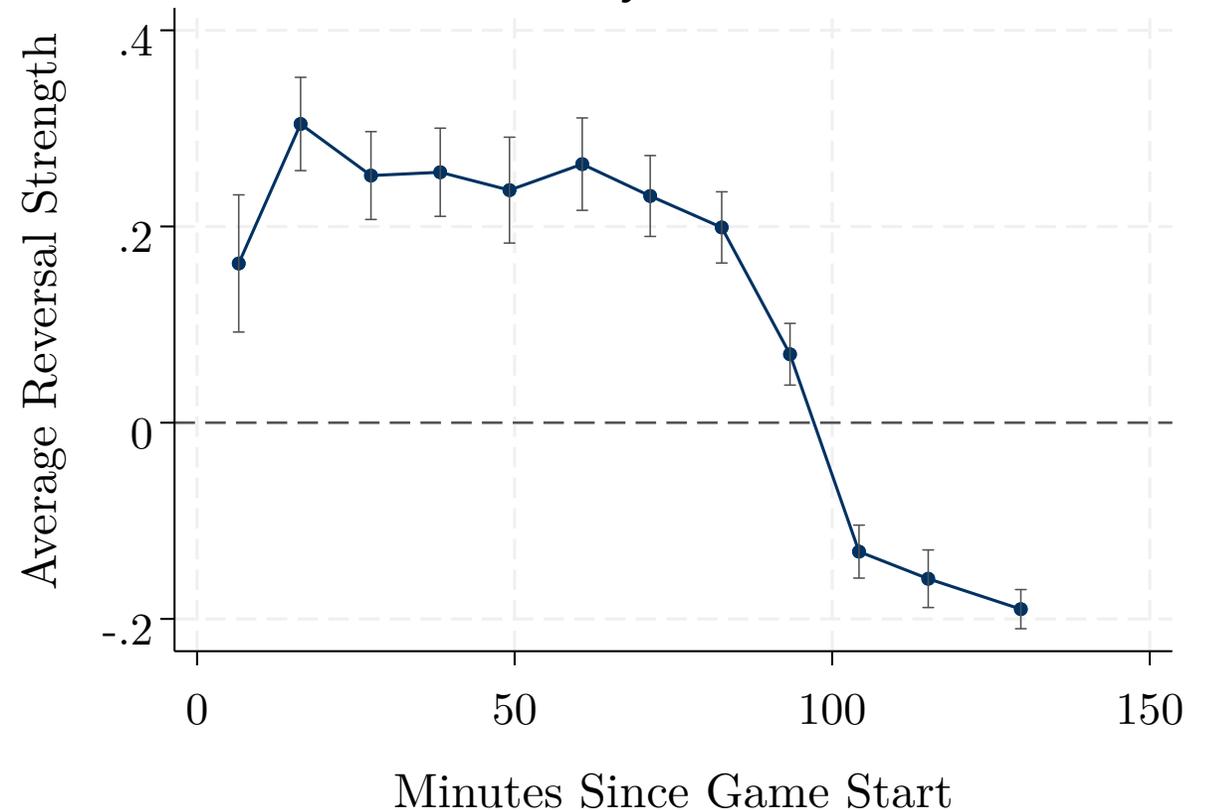
**Reversal strength**  $\Leftrightarrow$  % overreaction

Small early events move odds **too much**  
Big late events move odds **too little**

Even with real stakes, tough to understand which events are **noise** (early baskets) vs. **strong signals** (late)

Beliefs bounce up & down too much until ~end Q3...**same as in the lab**

**Basketball Bets**  
**Overreaction Early, Underreaction Late**



# Sports Bettors: Same Bias!

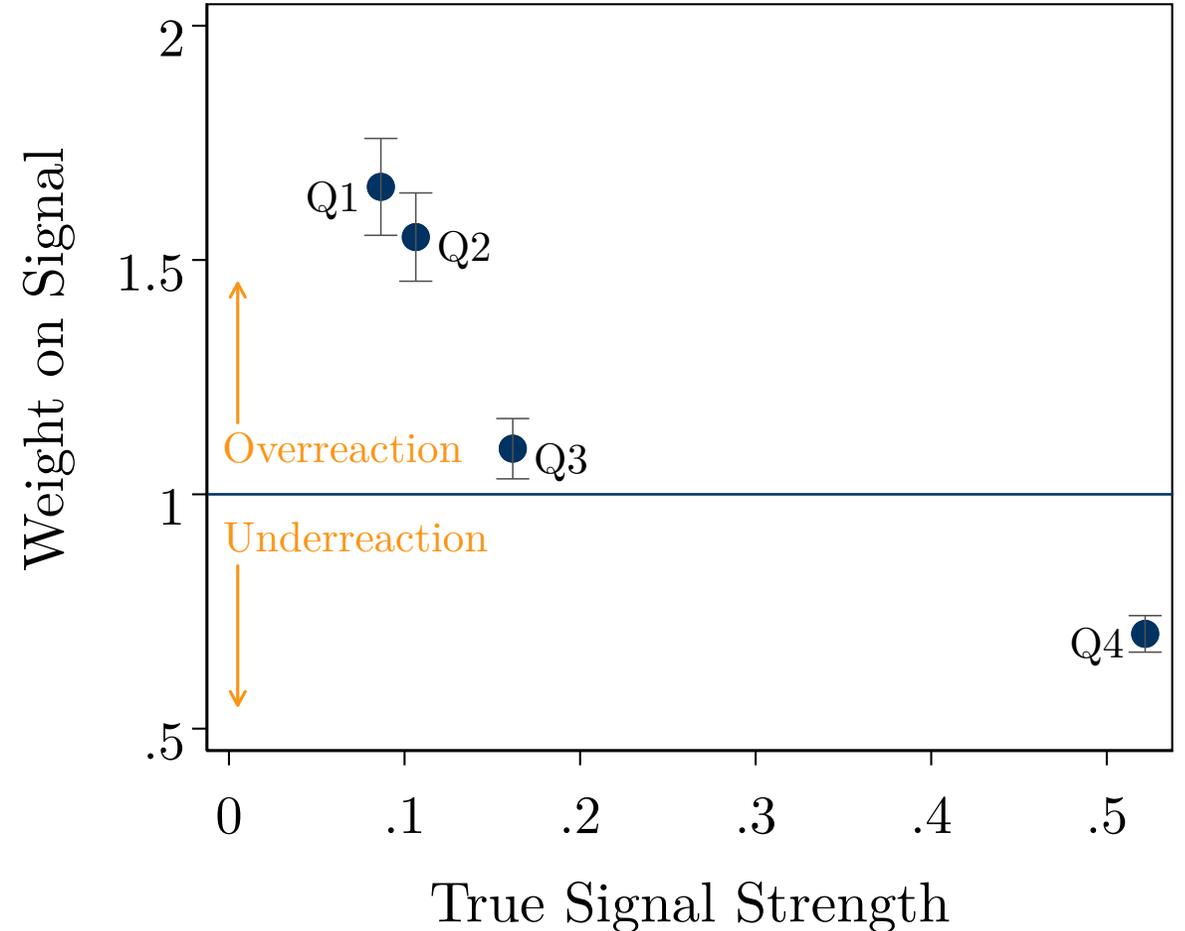
**Reversal strength**  $\Leftrightarrow$  % overreaction

Small early events move odds **too much**

Big late events move odds **too little**

Even with real stakes, tough to understand which events are **noise** (early baskets) vs. **strong signals** (late)

Beliefs bounce up & down too much until ~end Q3...**same as in the lab**



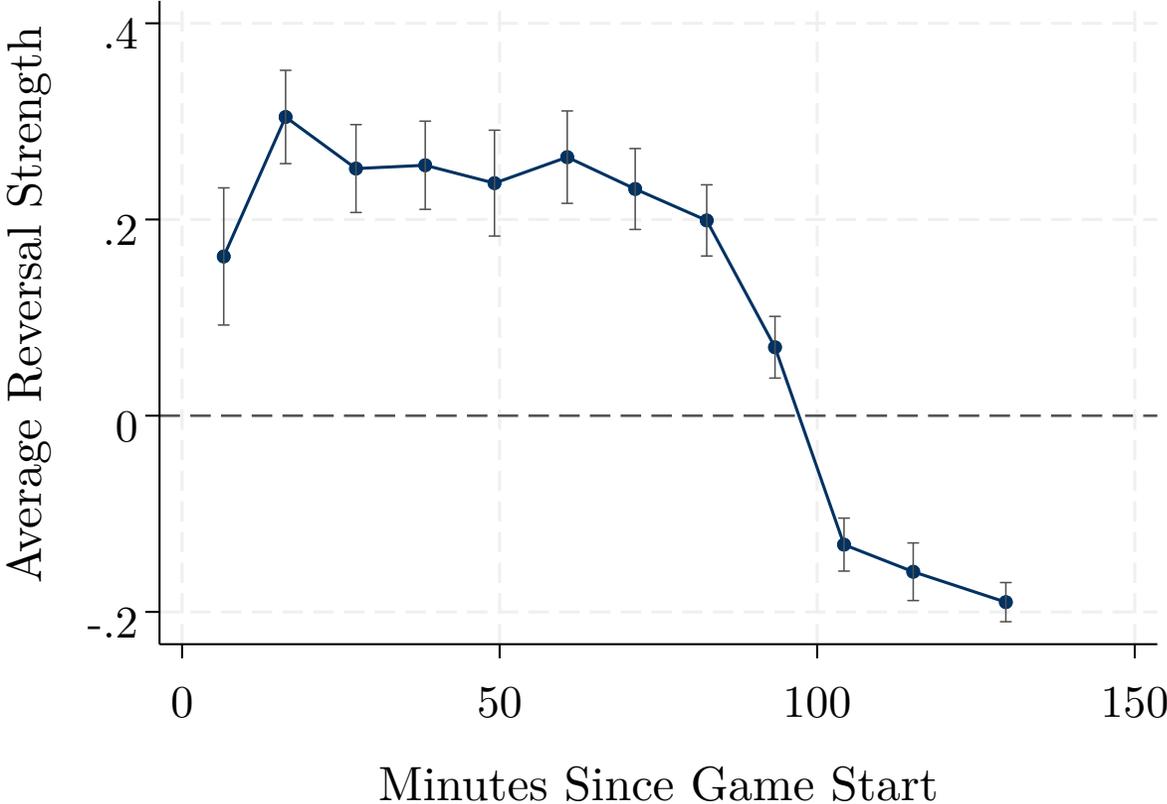
# Sports Bettors: Same Bias!

Big plays **seem exciting** no matter what ...can make it hard to recognize that it matters **when** they happen



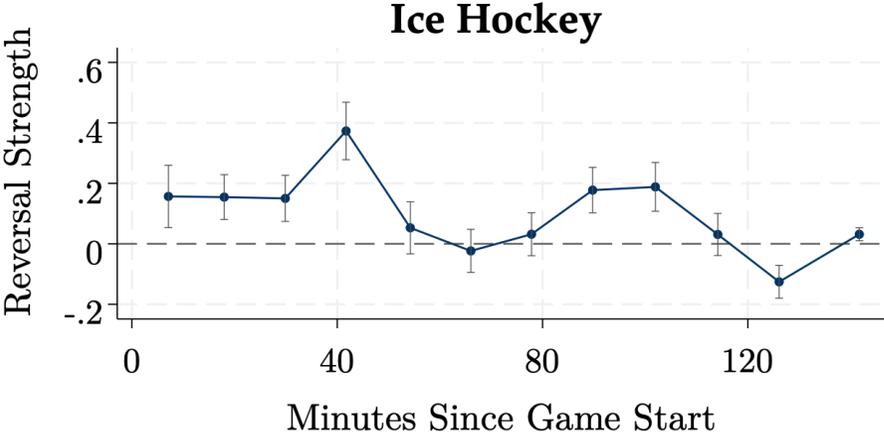
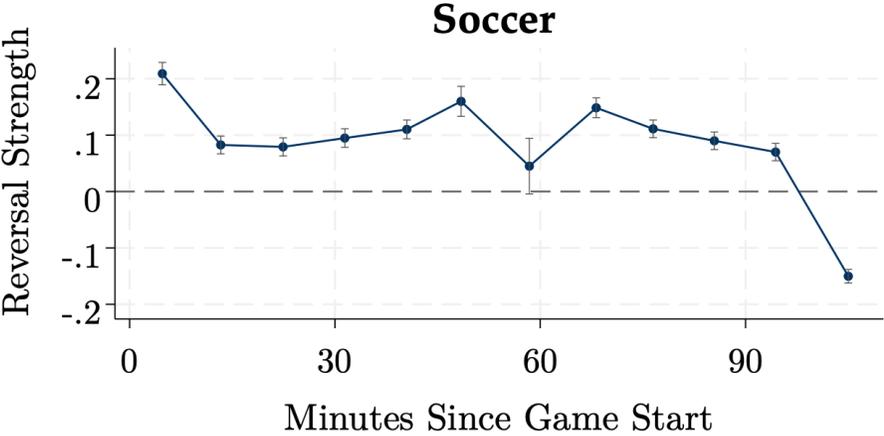
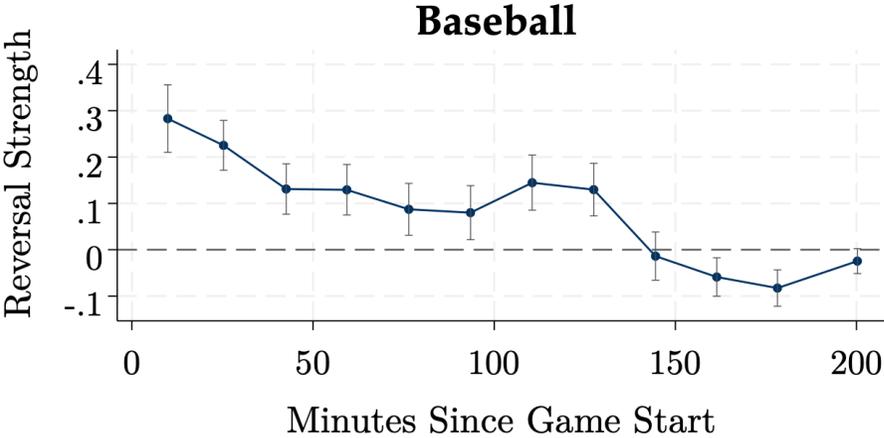
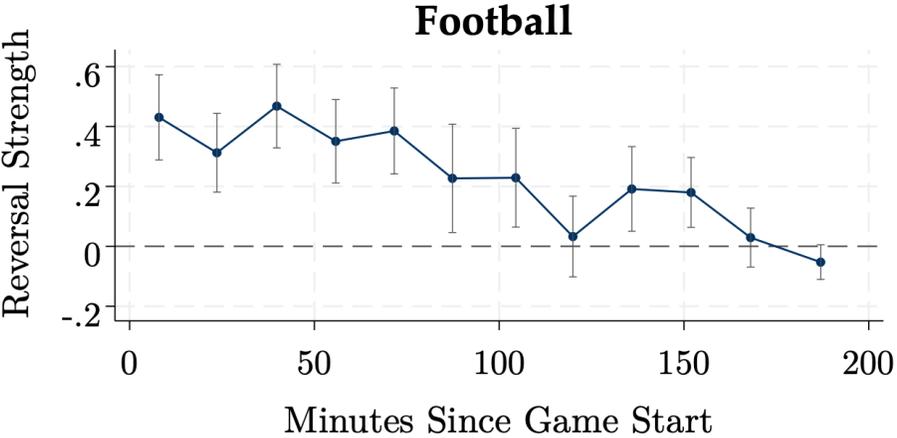
### Basketball Bets

Overreaction Early, Underreaction Late



# Other Sports, Same Bias

## Overreact to Weak, Underreact to Strong



# Roadmap

**1. The Core Bias**  
A Simple  
Experiment

**2. Real World**  
Sports Betting  
Markets

**3. High Stakes**  
Financial  
Markets

**4. Takeaways**  
What It Means  
for You

# From Sports Bets to Stock Markets

---

Investors face a **constant** stream of headlines, earnings calls, policy announcements, ...

# From Sports Bets to Stock Markets

Investors face a **constant** stream of headlines, earnings calls, policy announcements, ...



# From Sports Bets to Stock Markets

Investors face a **constant** stream of headlines, earnings calls, policy announcements, ...



# From Sports Bets to Stock Markets

Investors face a **constant** stream of headlines, earnings calls, policy announcements, ...

Trading on any piece of news  $\Leftrightarrow$  expressing **beliefs** about the meaning of that news

**Huge** scale — same bias? Can we make sense of the ups and downs we see in markets?



# Option Prices Reveal Belief Updates

---

To test over- vs. underreaction, need to look in the right place.

**Our setting:** Option markets.

- An option is a **bet** on the value of a stock (or index) on a fixed future expiration date.

# Option Prices Reveal Belief Updates

---

To test over- vs. underreaction, need to look in the right place.

**Our setting:** Option markets.

- An option is a **bet** on the value of a stock (or index) on a fixed future expiration date.
- Example (simple binary option): “If the S&P is above 7,000 on December 31, 2025, you will get a cash payment equal to \$100.”
- Prices of such options reveal **market-implied beliefs** on where the S&P will be on 12/31.

# Option Prices Reveal Belief Updates

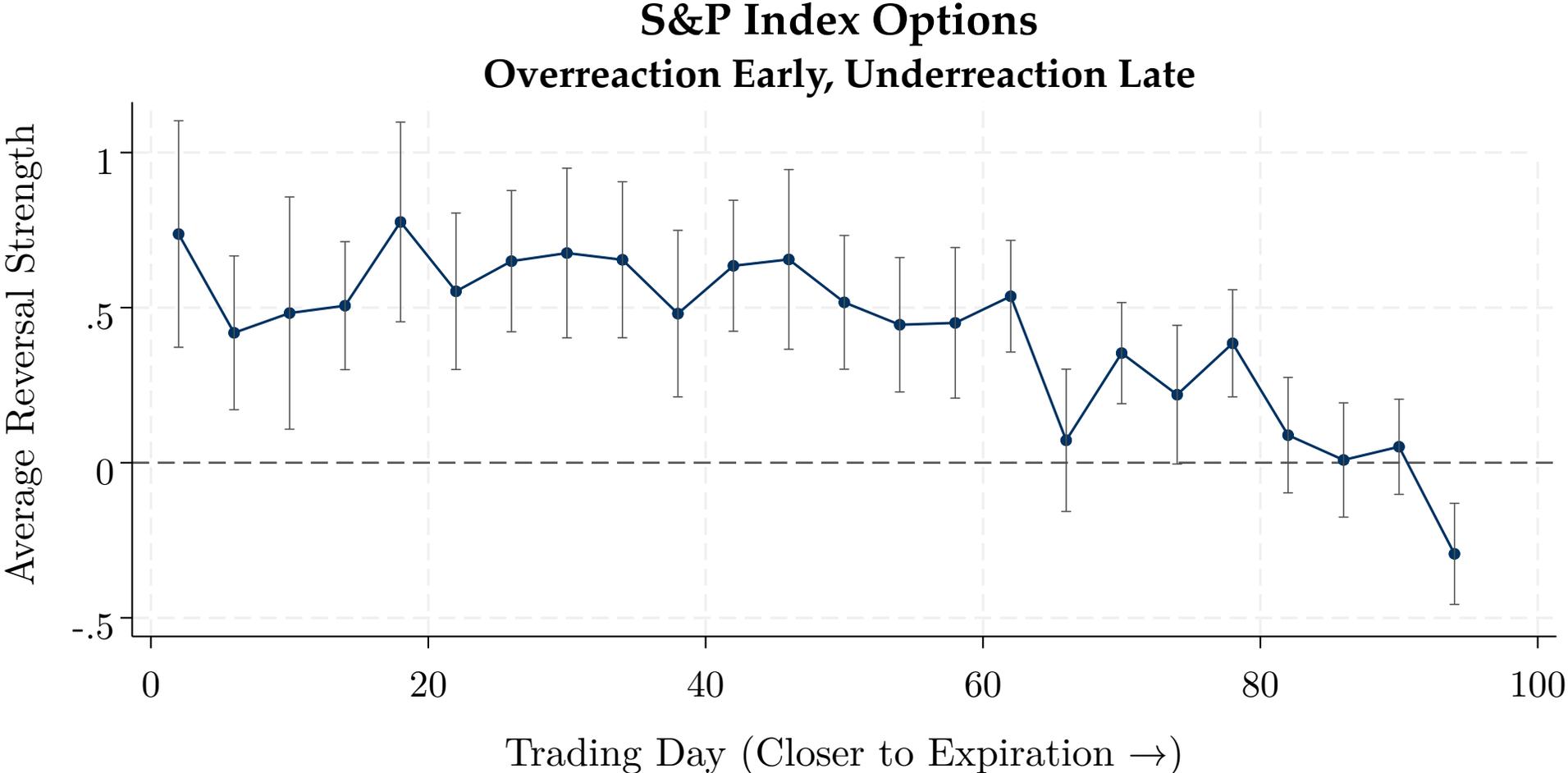
---

To test over- vs. underreaction, need to look in the right place.

**Our setting:** Option markets.

- An option is a **bet** on the value of a stock (or index) on a fixed future expiration date.
- Example (simple binary option): “If the S&P is above 7,000 on December 31, 2025, you will get a cash payment equal to \$100.”
- Prices of such options reveal **market-implied beliefs** on where the S&P will be on 12/31.
- How do these beliefs change over time? **Same reversal/continuation tests!**
  - **Idea:** Signals about where S&P will be on expiration date: generally **weak** early in contract, **strong** late in contract (close to expiration). Test with many contracts.

# No Surprise by Now: Big Stakes, Same Bias



# Roadmap

**1. The Core Bias**  
A Simple  
Experiment

**2. Real World**  
Sports Betting  
Markets

**3. High Stakes**  
Financial  
Markets

**4. Takeaways**  
What It Means  
for You

# Practical Takeaways

## Where to Look for This Bias

---

Over-/underreaction to weak/strong news: not a theory of **everything** (or trading advice!).

But the settings that lead to this bias — **easy** to tell whether news is good or bad, **hard** to tell exactly how good or bad — are very common, and so the bias is too.

# Practical Takeaways

## Where to Look for This Bias

---

Over-/underreaction to weak/strong news: not a theory of **everything** (or trading advice!).

But the settings that lead to this bias — **easy** to tell whether news is good or bad, **hard** to tell exactly how good or bad — are very common, and so the bias is too.

Some examples in finance...and elsewhere:

- Long-term news about the **overall stock market** tends to be **weak**  
⇒ **overreaction** is prevalent — booms/busts untied to fundamentals
- Fundamental news about **individual companies** (e.g., earnings news) is often **strong**  
⇒ **underreaction** often arises — stock prices continue to drift after earnings news

# Practical Takeaways

## Where to Look for This Bias

---

Over-/underreaction to weak/strong news: not a theory of **everything** (or trading advice!).

But the settings that lead to this bias — **easy** to tell whether news is good or bad, **hard** to tell exactly how good or bad — are very common, and so the bias is too.

Some examples in finance...and elsewhere:

- Long-term news about the **overall stock market** tends to be **weak**  
⇒ **overreaction** is prevalent — booms/busts untied to fundamentals
- Fundamental news about **individual companies** (e.g., earnings news) is often **strong**  
⇒ **underreaction** often arises — stock prices continue to drift after earnings news
- Hiring (overreliance on first impressions), strategy, sports, household issues, ...

# A Toolkit for Updating

---

Difficult to fully overcome this tendency, but some clear steps:

- ❑ Make your beliefs explicit **before** news arrives.
- ❑ **Evaluate big-picture context:** Will I care about this news in 2 months? 2 years?
  - What other info will I get about this outcome before it happens? Is it Q1, or last minute?
- ❑ **Stress-test your interpretation:** Seek more info, especially if news is weak.

# A Toolkit for Updating

---

Difficult to fully overcome this tendency, but some clear steps:

- ❑ Make your beliefs explicit **before** news arrives.
- ❑ **Evaluate big-picture context:** Will I care about this news in 2 months? 2 years?
  - What other info will I get about this outcome before it happens? Is it Q1, or last minute?
- ❑ **Stress-test your interpretation:** Seek more info, especially if news is weak.

**The goal isn't to predict the future, but to accurately weigh info we have now.**

**By understanding predictable biases, can learn to separate true signals from noise.**

# Thank you!

Email me: [lazarus@berkeley.edu](mailto:lazarus@berkeley.edu)