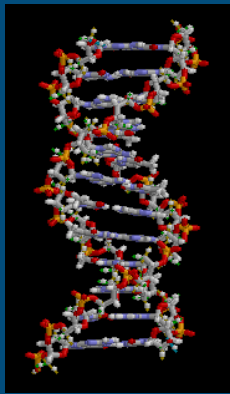


# 2018 Predictive Analytics Symposium

## **Session 21: M/S - Non-quantitative Considerations in Insurance Behavioral Economics - The Reason Your Strictly Analytic Models Will Fail**

[SOA Antitrust Compliance Guidelines](#)  
[SOA Presentation Disclaimer](#)



2019 **PREDICTIVE  
ANALYTICS**  
SYMPOSIUM

# Non-quantitative Considerations in Insurance Behavioral Economics - The Reason Your Strictly Analytic Models Will Fail

19-September-2019

David Snell, FALU, FLMI, ASA, MAAA, CLU, ChFC, ARA, ACS, MCP  
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**NOTE:** the training workbooks can be downloaded at  
[www.GitHub.com/DaveSnell](http://www.GitHub.com/DaveSnell)

# What is Behavioral Economics?

**Behavioral economics** and the related field, **behavioral finance**, study the effects of psychological, social, cognitive, and emotional factors on the economic decisions of individuals and institutions and the consequences for market prices, returns, and the resource allocation.

- Wikipedia (as of 2015-05-06)

# Don't we always follow logical rules?

- Logical Rule: People are rational and make rational decisions
- Logical Rule: Accuracy is more important than marketing hype
- Logical Rule: Everyone acts in a manner that will maximize their own self-interest
- Logical Rule: The work of science is to Substitute facts for appearances and demonstrations for impressions – John Ruskin

(Motto of Society of Actuaries)

# Actuary of the Future newsletter: November, 2012

## Substitute One Mis-impression

By Heshong (Mark) Ma and Dave Snell

The long-standing motto of the Society of Actuaries, from John Ruskin, is "The work of science is to substitute facts for appearances and demonstrations for impressions." We have always had the IMPRESSION that it means our job, as actuarial scientists, is to pursue facts, and facts only. But this time, we decided to substitute our impressions with demonstrations. Mark Googled the quote.

The quote is from Mr. John Ruskin's book, *The Stone of Venice*, Volume 3, page 36. The book is about Venice's architecture. But Mr. Ruskin, as a good actuary, went on commenting on something broader, the relationship between art and science in his term. Here is the context of the quote:

VIII. Science and art are commonly distinguished by the nature of their actions; the one as knowing, the other as changing, producing, or creating. But there is a still more important distinction in the nature of the things they deal with. Science deals exclusively with things as they are in themselves; and art exclusively with things as they affect the human senses and human soul.\* Her work is to portray the appearance of things, and to deepen the natural impressions which they produce upon living creatures. The work of science is to substitute facts for appearances, and demonstrations for impressions. Both, observe, are equally concerned with truth; the one with truth of aspect, the other with truth of essence. Art does not represent things falsely, but truly as they appear to mankind. Science studies the relations of things to each other: but art studies only their relations to man; and it requires of everything which is submitted to it imperatively this, and only this, what that thing is to the human eyes and human heart, what it has to say to men, and what it can become to them: a field of question just as much vaster than that of science, as the soul is larger than the material creation.

\* Or, more briefly, science has to do with facts, art with phenomena. To science, phenomena are of use only as they lead to facts; and to art facts are of use

only as they lead to phenomena. I use the word "art" here with reference to the fine art only, for the lower arts of mechanical production I should reserve the word "manufacture."

Mr. Ruskin's definitions of art and science are different from what most people would think about today. Mr. Ruskin, as part of his religious belief, believed that truth is static and universal—a bit mysterious, but there waiting for us to discover. Starting from this belief, he drew a line between art and science. Many branches of modern philosophy of science would argue otherwise.

However, none of those ideas is as surprising to me as how much I misread the quote. Before, I thought Mr. Ruskin must loathe appearance and impression. I reasoned that they are subjective, volatile, unreliable and therefore unscientific. We have to substitute them with something objective, concrete and "scientific." Obviously, as an art historian, Mr. Ruskin had no interest to down-play "art." Actually, he even rated art higher than science. To Mr. Ruskin, the truth already exists, and produces influence over us, over our souls. The work of science is to express this influence with facts, to substantiate the impression, not to dispute or fight against. To some extent, he was calling appearance and impressions prophets for science. In Ruskin's time, over a century ago, we thought that facts were far more important than impressions. Yet now, we realize that perception is often more important than reality. In fact, the burgeoning science of behavioral economics is focused on exactly that issue.

The well-known example of *The Economist* magazine pricing (from Dan Ariely's book, *Predictably Irrational*) is one notable example:

When given the choice between two subscription arrangements, the online version for \$59 and the print plus online version for \$125, over 2/3 of a group of MIT students chose the \$59 online version. Yet, when



Heshong (Mark) Ma is an actuary at RGA in Chesterfield, MO. He can be reached at [hma@rga.com](mailto:hma@rga.com).



Dave Snell, ASA, MAIA, is technology evangelist with RGA Reinsurance Company in Chesterfield, Mo. He can be reached at [dsnell@rga.com](mailto:dsnell@rga.com).

*“Mr. Ruskin prophetically considered the soft skills of art at least as important as the ‘hard facts’ of science.”*

CONTINUED ON PAGE 18

NOVEMBER 2012 ACTUARY OF THE FUTURE | 17

# Perhaps Not!



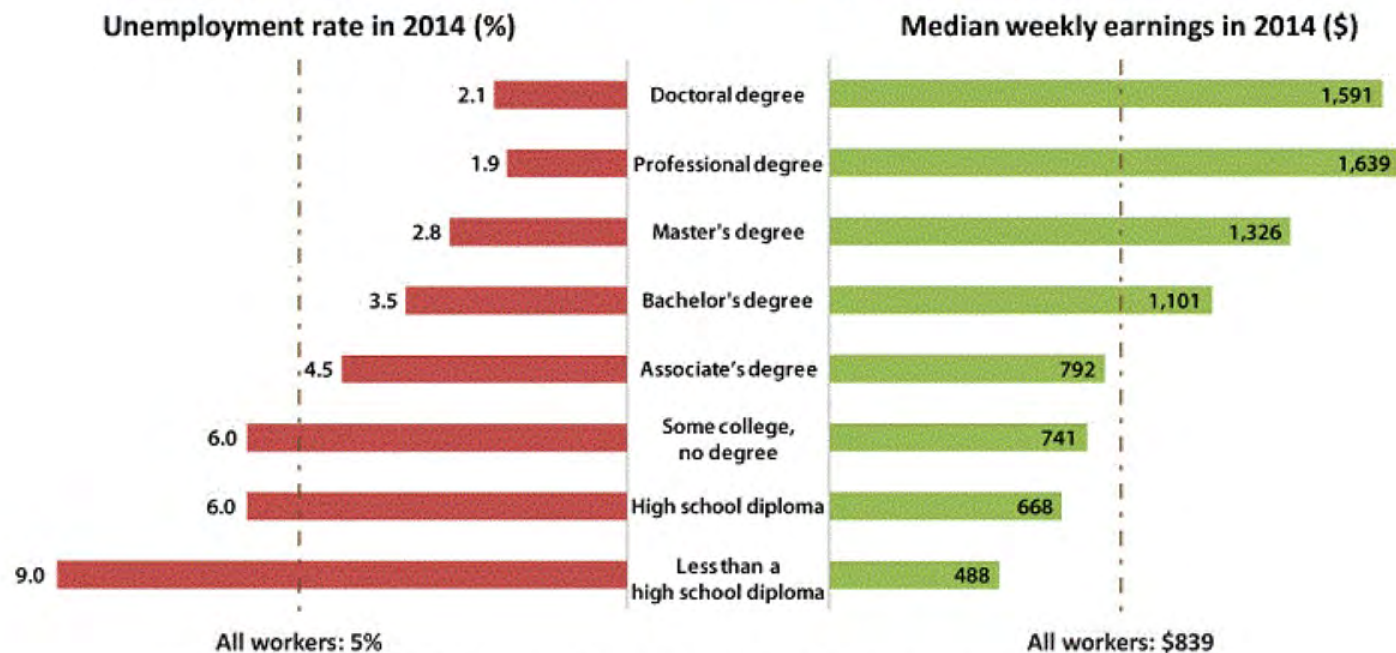
<http://www.jasonheadley.com/INATN.html>

(shown with permission – if you like this video, consider putting a tip in the Vimeo tip jar: <https://vimeo.com/66753575>.)

# Why do we take actuarial exams?

- Fame, fortune, life of the party, assured high income for life, ....

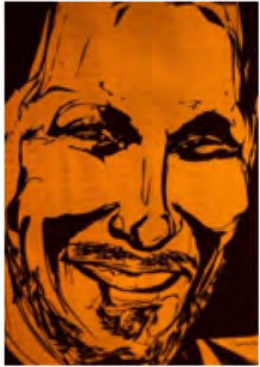
## Earnings and unemployment rates by educational attainment



Note: Data are for persons age 25 and over. Earnings are for full-time wage and salary workers.  
Source: Current Population Survey, U.S. Bureau of Labor Statistics, U.S. Department of Labor

[http://www.bls.gov/emp/ep\\_chart\\_001.htm](http://www.bls.gov/emp/ep_chart_001.htm)

# Regression results show trends ... not inviolable laws





# What are some of the ways humans are not strictly rational?

- Anchoring Effect (and Insufficient Adjustment... both based on missing information during decision-making)
- Confirmation Bias (we tend to discount (or ignore!) disconfirming information)
- Hindsight Bias (similar to framing. once you know something (true or false), you cannot forget it)
- Escalation of commitment (similar to “sunk cost” concept)
- Framing Effects
- Heuristics (experience vs. logic)
- and lots more ...

# What is Behavioral Economics?

- BE is emerging as the leading decision science
  - Economics
  - Psychology
  - Sociology
  - Biology
  - Neuroscience

# What is Behavioral Economics?

- Emphasis on the decision process...
  - ◆ Heuristics, Biases, Decision frames, Emotions, Environmental cues, Culture, etc.
- ... and not solely on the actual decision or outcome.

“There is no need for behavioral assumptions to be valid, as long as our predictions are accurate.”

**Let's question this!**

- Milton Friedman

(Nobel Prize winning economist)

The slide following  
this one will have  
a 10 second test

# Heuristics Test

FINISHED FILES ARE THE  
RESULT OF YEARS OF SCIENTIFIC  
STUDY COMBINED WITH  
THE EXPERIENCE OF YEARS.

Test: Count the number of occurrences of the letter F in the phrase above.

*This slide is intentionally blank*

*(... or is it?)*

**FINISHED FILES ARE THE  
RESULT OF YEARS OF SCIENTIFIC  
STUDY COMBINED WITH  
THE EXPERIENCE OF YEARS.**

- Answer = 6
  - Most common response = 3
- “OF” is often processed as one piece of information
  - The F’s disappear in the mind





# What is Behavioral Finance?

- Our brains are predictably unpredictable
- We take mental shortcuts that affect our decision-making

## CONSIDER THE POWER OF THE HUMAN BRAIN:

I cnat blveiee taht I can aulacly uesdnatnrd waht I am rdanieg.

I tinhk tihs wlil be the msot ecixnitg siesson of the eitnre day - in fcat, of the etinre aannul mnetieg. Aslo, I cnat wiat for lnuch....

Researchers at Cambridge University suggest that if the first and last letters of a word are in the right place, then you can scramble the rest of the letters and the words are still readable. Do you agree?

Source: Society of Actuaries Annual Meeting 2015, Session 92 PD, Brain Games for Actuaries: Understanding Behavioral Finance to Maximize Our Opportunities Moderator: Mary Lynch Wagnon, FSA, MAAA Presenters: Mark W. Griffin, FSA, CERA Christine Irene Hofbeck, FSA, MAAA

# What is Behavioral Finance?

- But we are actuaries, so let's try this one instead:

7H15 M355463 53RV35 70 PROV3 HOW OUR M1ND5 C4N  
DO 4M4Z1N6 7H1N65! 1MPR3551V3 7H1N65!

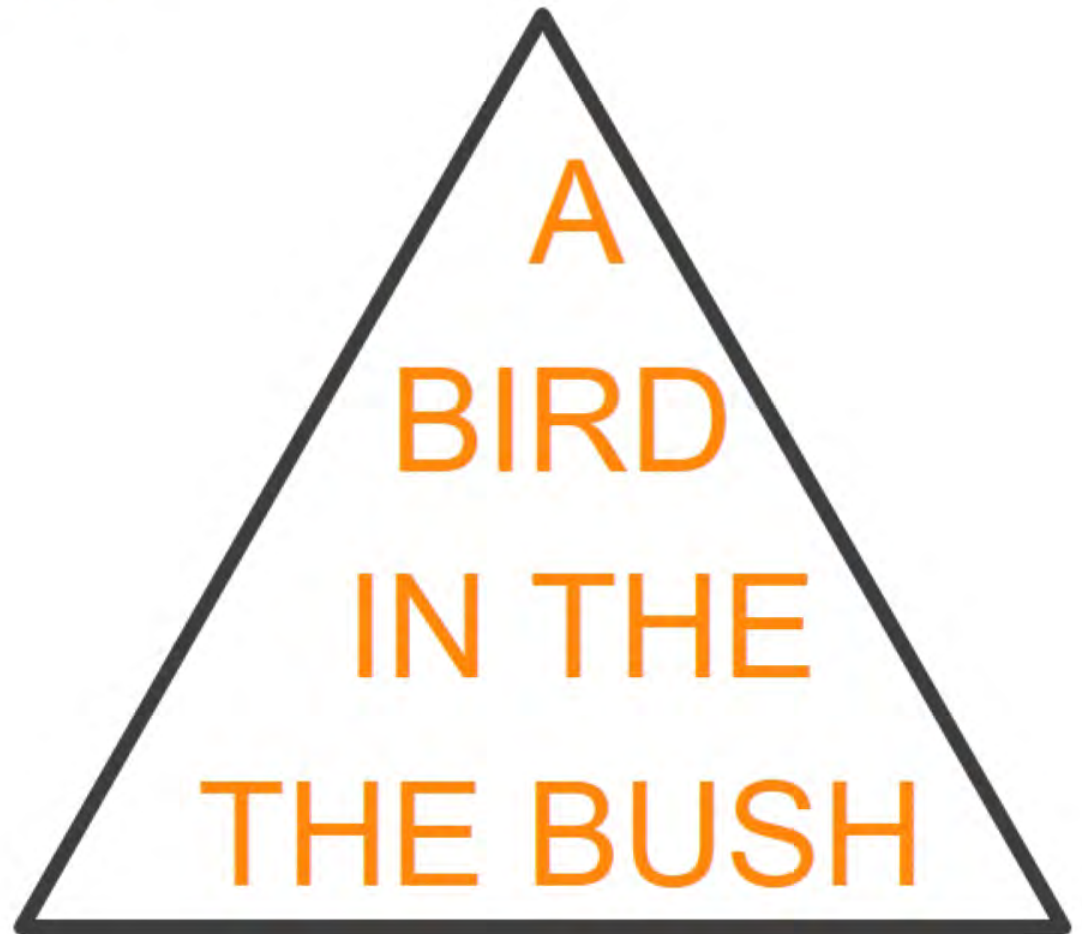
1N 7H3 B361NN1NG 17 W45 H4RD, BU7 NOW, ON 7H15  
L1N3 YOUR M1ND 15 R34D1N6 17 4U70M471C411Y  
W17H OUT 3V3N 7H1NK1N6 4BOU7 17.

B3 PROUD!

Source: Society of Actuaries Annual Meeting 2015, Session 92 PD, Brain Games for Actuaries: Understanding Behavioral Finance to Maximize Our Opportunities Moderator: Mary Lynch Wagnon, FSA, MAAA Presenters: Mark W. Griffin, FSA, CERA Christine Irene Hofbeck, FSA, MAAA



# More Heuristics



# Decision Process: Emotions

- Punishment/Reward
  - Waitress-Diner relationship
  - Day Care Study
    - ◆ Late fee led to increase in delayed pickups

# Traditional Interpretations of Behavior

- *Homo economicus vs Homo reciprocans*

Continuum of human behavior



# New Behavioral Perspective

- The reality: We are human

Continuum of human behavior

*Homo sapiens*



*H. reciprocans*

*H. economicus*

# Why is any of this relevant?

**JUMPING TO  
CONCLUSIONS**



**Why is any of this relevant?**

**JUMPING TO  
GQNSLHSIQNS**



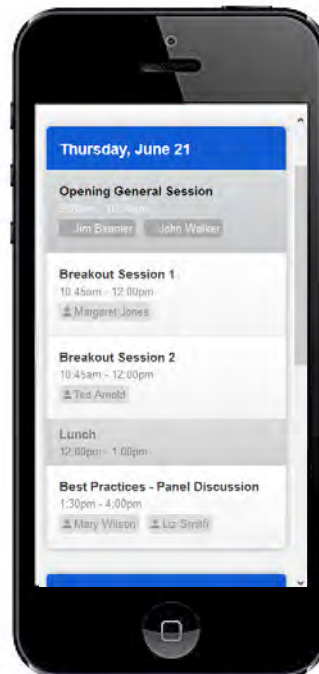


To participate, type in [pas.cnf.io](http://pas.cnf.io) in your browser

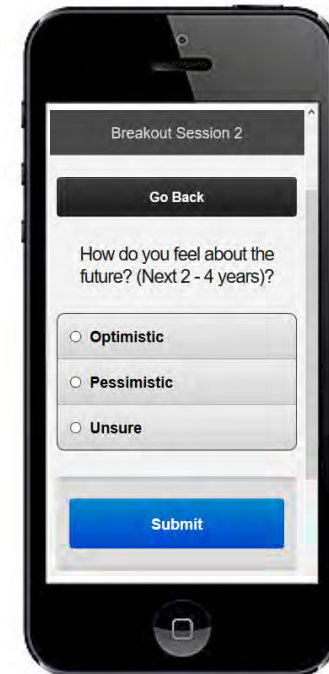
**Step 1: Enter website URL**



**Step 2: Choose a Session**



**Step 3: Respond to Polls when they appear**



# Audience Poll

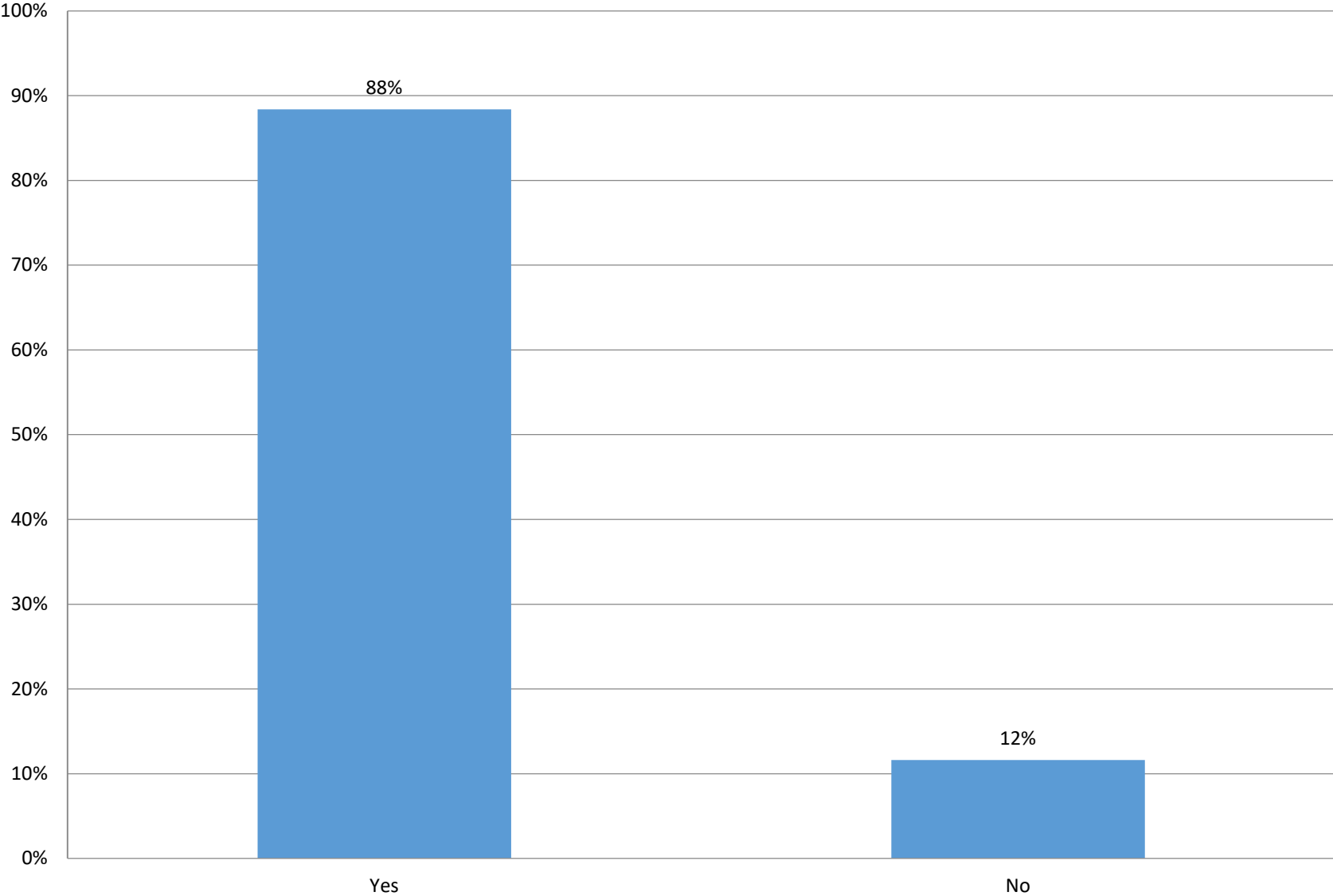
Tom and Jane are each earning \$200,000 this year. Are they happy about this?

1 for Yes

2 for No

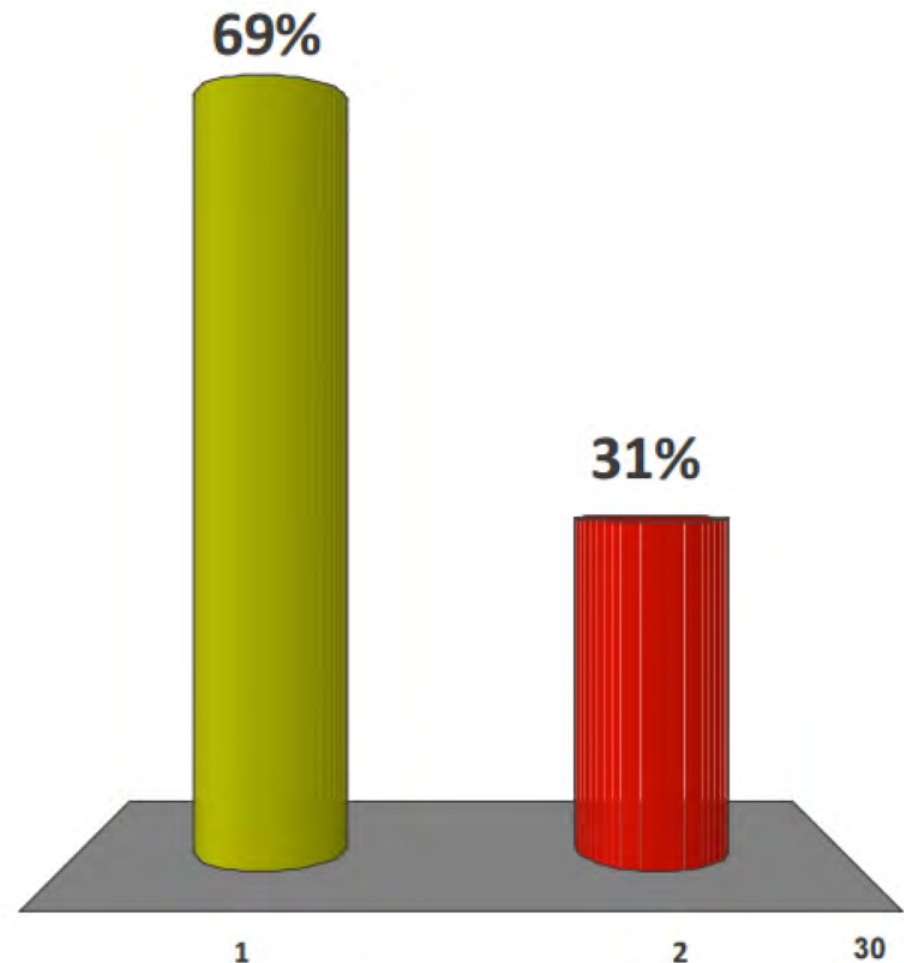
(Discussion of poll results  
and “the rest of the story” at the presentation)

Tom and Jane are each earning \$200,000 this year. Are they happy about this?



**Tom and Jane are each earning \$200,000 this year. Are they happy about this?**

1. Yes
2. No



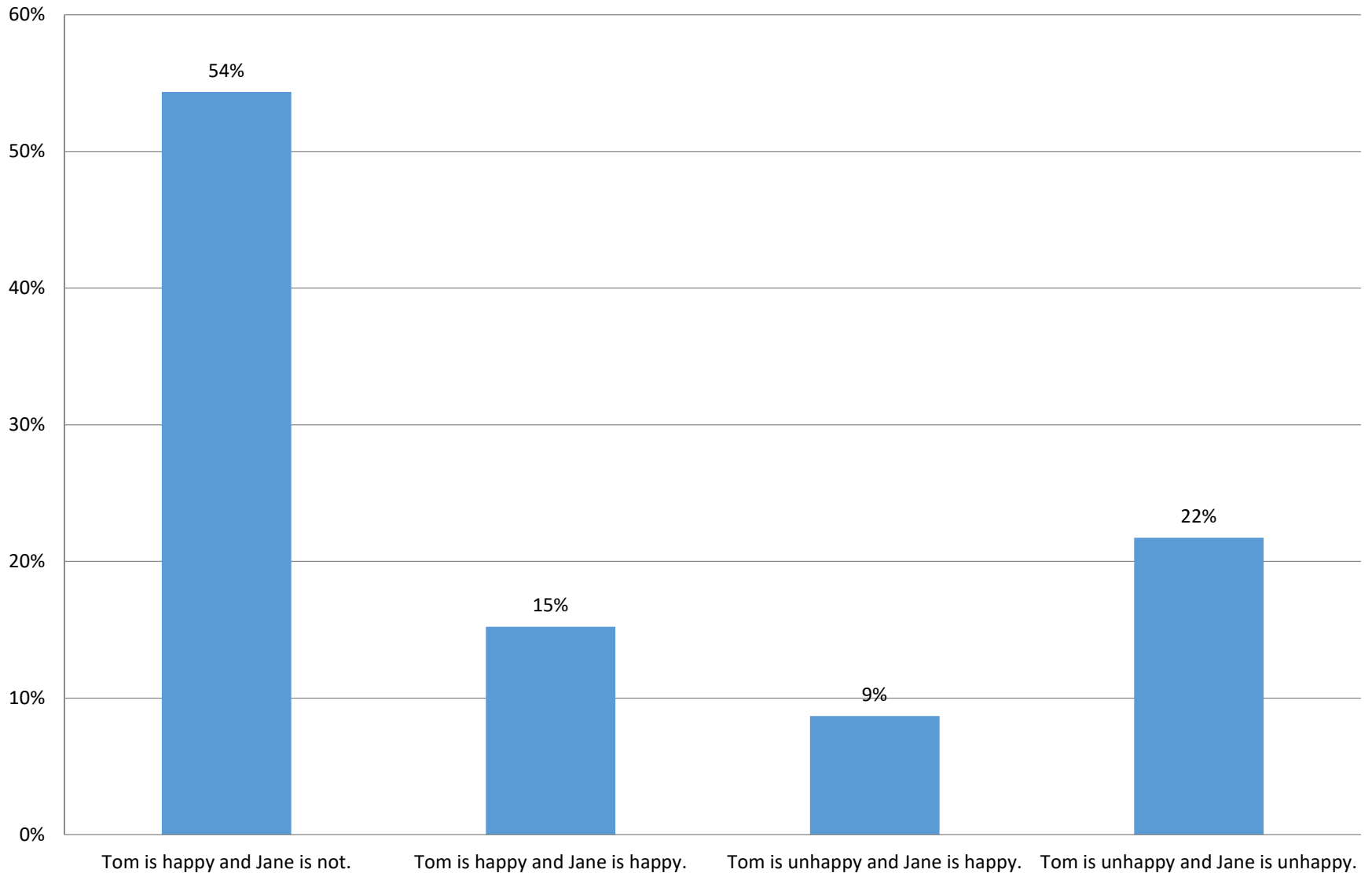
## Audience Poll (part 2)

Tom and Jane are each earning \$200,000 this year. Last year Tom earned \$100,000 and Jane earned \$400,000.

Are they happy about their current incomes?

- 1 if Tom is happy and Jane is not.
- 2 if Tom is happy and Jane is happy.
- 3 if Tom is unhappy and Jane is happy.
- 4 if Tom is unhappy and Jane is unhappy.

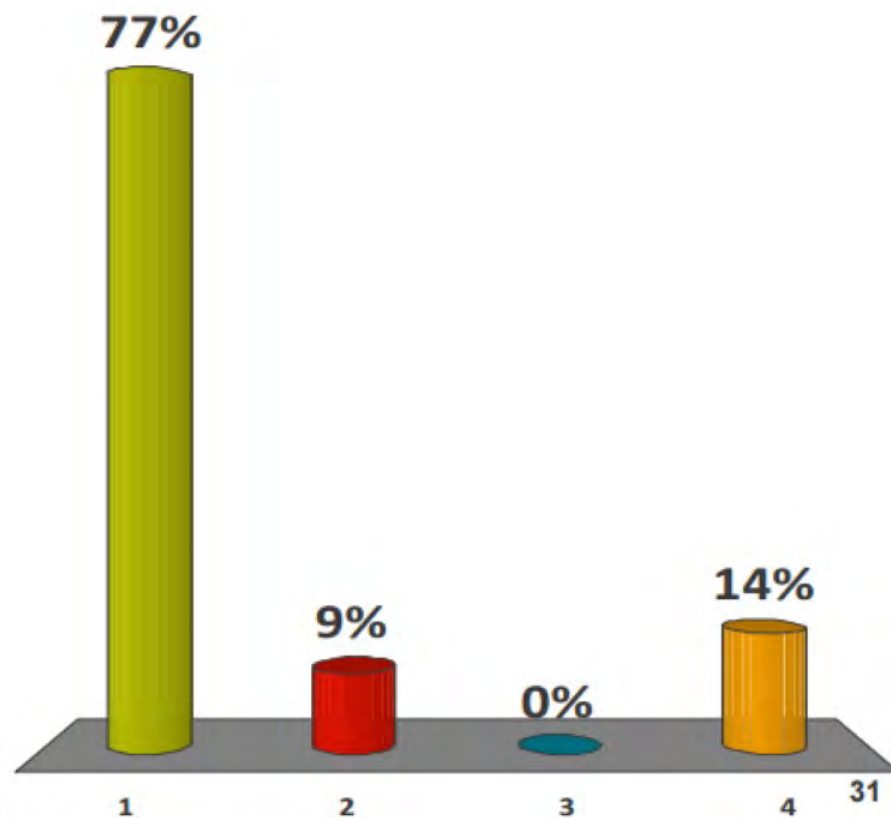
Tom and Jane are each earning \$200,000 this year. Last year Tom earned \$100,000 and Jane earned \$400,000. Are they happy about their current incomes?



**Tom and Jane are each earning \$200,000 this year. Last year Tom earned \$100,000 and Jane earned \$400,000.**

**Are they happy about their current incomes?**

1. 1 if Tom is happy and Jane is not.
2. 2 if Tom is happy and Jane is happy.
3. 3 if Tom is unhappy and Jane is happy.
4. 4 if Tom is unhappy and Jane is unhappy.



# Audience Poll (part 3)

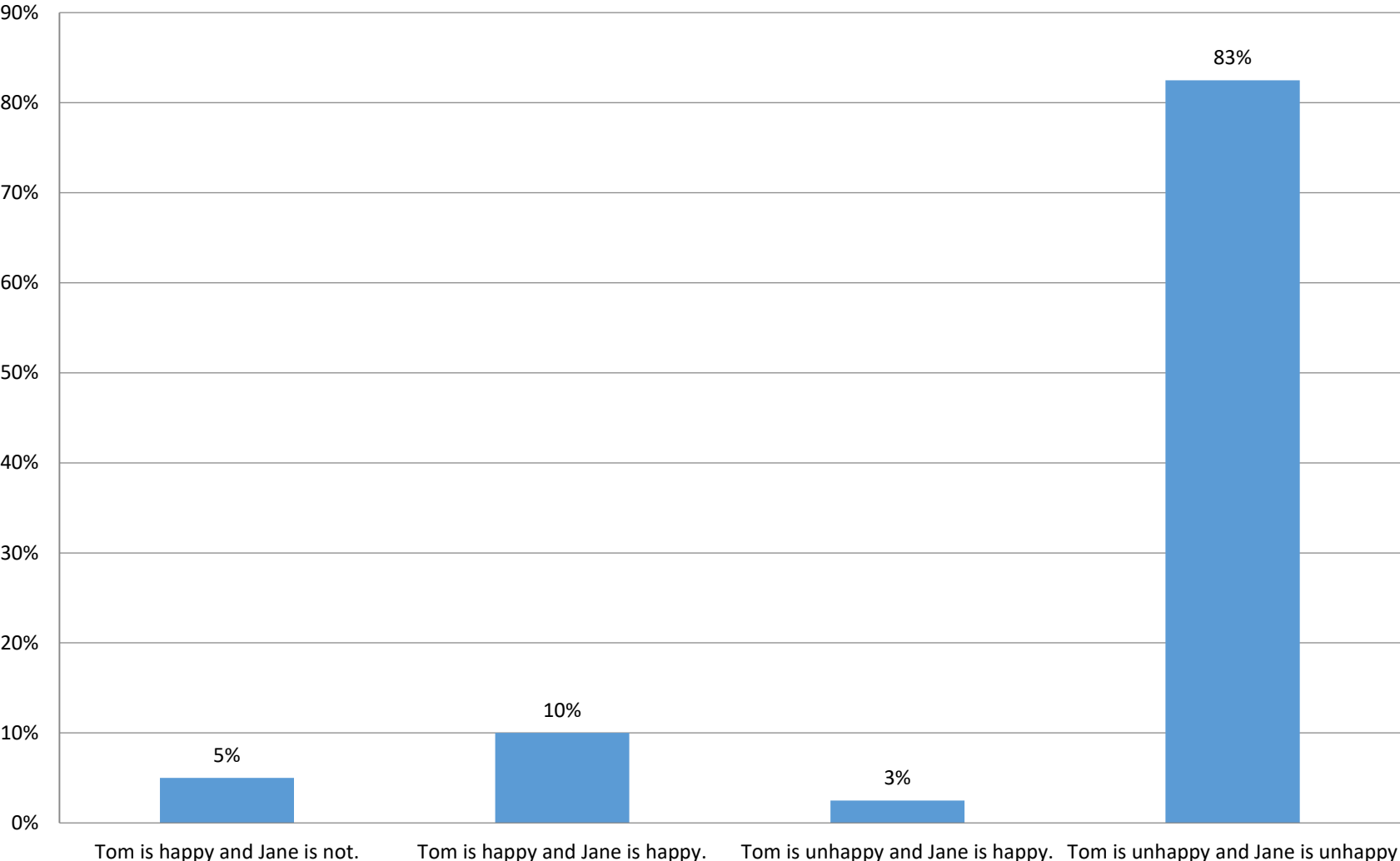
Tom and Jane are each earning \$200,000 this year. Last year Tom earned \$100,000 and Jane earned \$400,000. Tom and Jane live in a very exclusive suburb where the average income is \$800,000. They each have in-laws who live in the same suburb and make twice the average income.

**Are they happy about their current incomes?**

- 1 if Tom is happy and Jane is not.
- 2 if Tom is happy and Jane is happy.
- 3 if Tom is unhappy and Jane is happy.
- 4 if Tom is unhappy and Jane is unhappy.

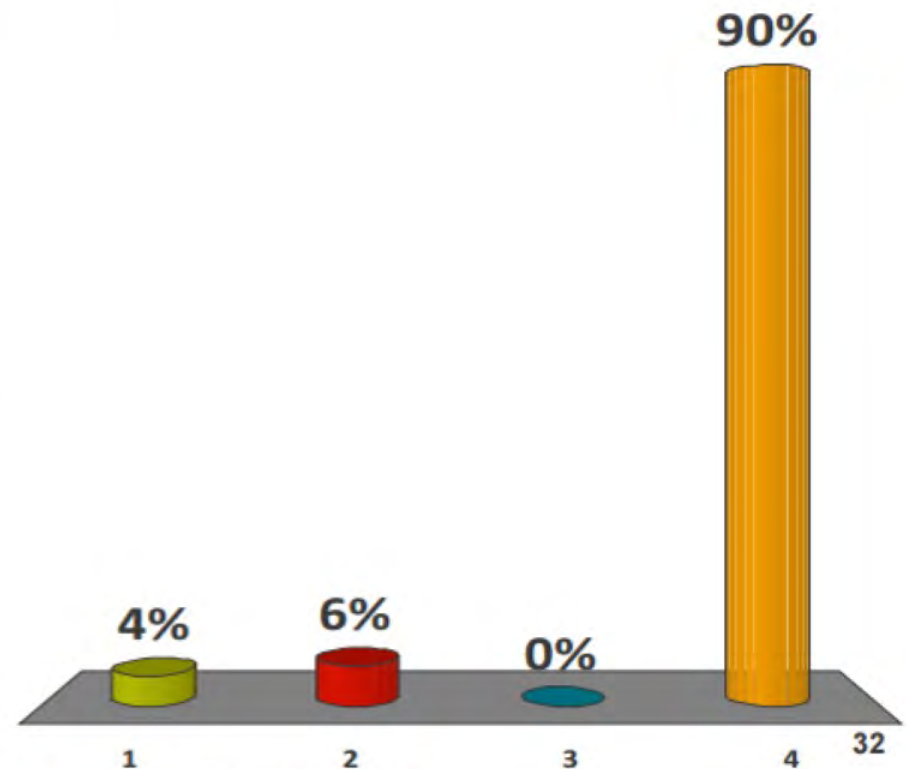


Tom and Jane are each earning \$200,000 this year. Last year Tom earned \$100,000 and Jane earned \$400,000. Tom and Jane live in a very exclusive suburb where the average income is \$800,000. They each have in-laws who live in the same suburb and make twice



Tom and Jane are each earning \$200,000 this year. Last year Tom earned \$100,000 and Jane earned \$400,000. Tom and Jane live in a very exclusive suburb where the average income is \$800,000. They each have in-laws who live in the same suburb and make twice the average income. Are they happy about their incomes

1. 1 if Tom is happy and Jane is not.
2. 2 if Tom is happy and Jane is happy.
3. 3 if Tom is unhappy and Jane is happy.
4. 4 if Tom is unhappy and Jane is unhappy.



# Interesting, but...

- How are the principles of BE applicable to actuarial methods?
- Answer:
  - A new analytical face to the Behavioral movement

# Examples and possible applications from recommended reading

- *Predictably Irrational*, by Dan Ariely
  - See book review in December 2014 issue of Forecasting & Futurism newsletter
- *Why Smart People Make Big Money Mistakes*, by Gary Belsky and Thomas Gilovich
  - See book review in July 2015 issue of Forecasting & Futurism newsletter
  - NOTE: F&F → PAF section

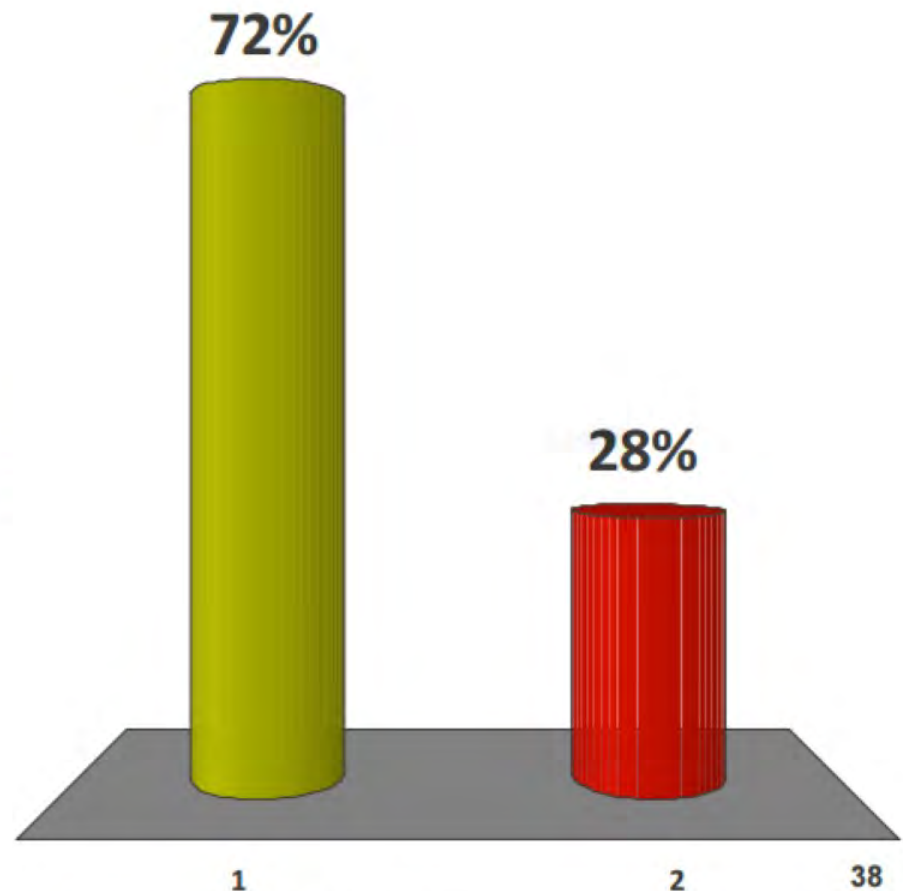
# Weber's Law polling question 1

- You have just been given \$1,000
- A) You can have \$500 more, or
- B) You can flip a coin; if heads, you get \$1,000 more; if tails, you get no more

# Weber's Law polling question 1

## You have just been given \$1,000

1. You can have \$500 more, or
2. You can flip a coin; if heads, you get \$1,000 more; if tails, you get no more



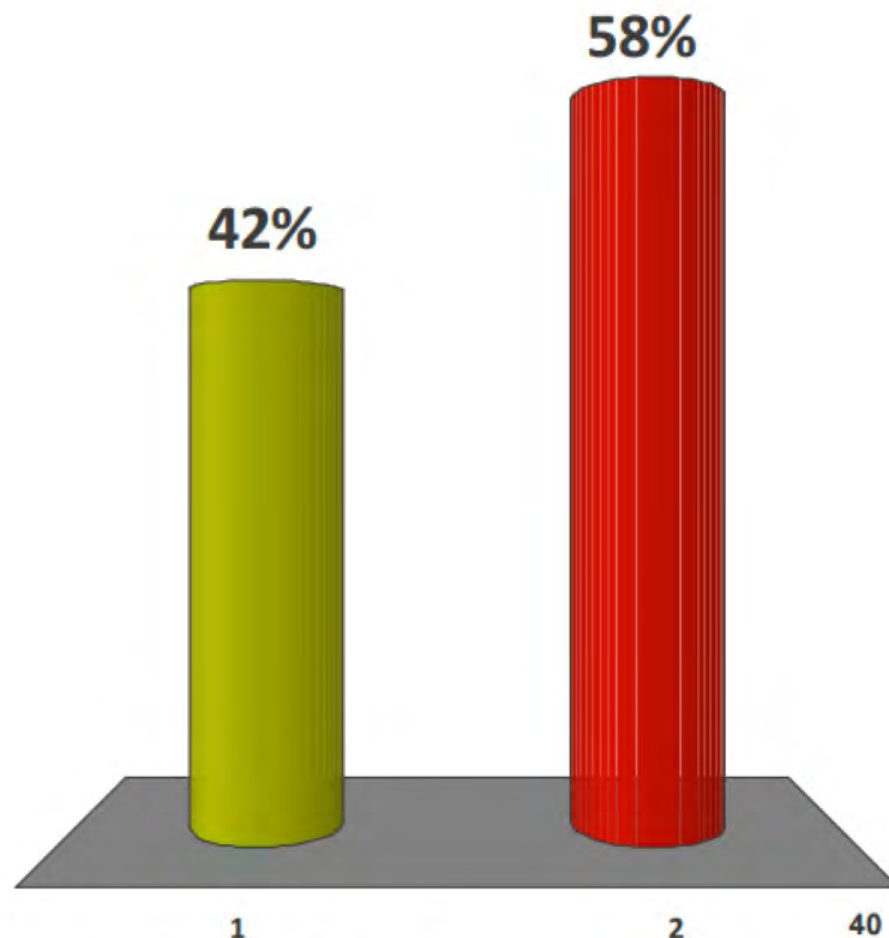
# Weber's Law polling question 2

- You have just been given \$2,000
- A) You can accept a \$500 loss, or
- B) You can flip a coin; if heads, you lose \$1,000; if tails, you lose nothing

# Weber's Law polling question 2

## You have just been given \$2,000

1. You can accept a \$500 loss, or
2. You can flip a coin; if heads, you lose \$1,000; if tails, you lose nothing





# Weber's Law polling questions

- Analysis of polling results
- What Weber's Law predicts, and why
- Typical investing implications
- Applications to actuarial life

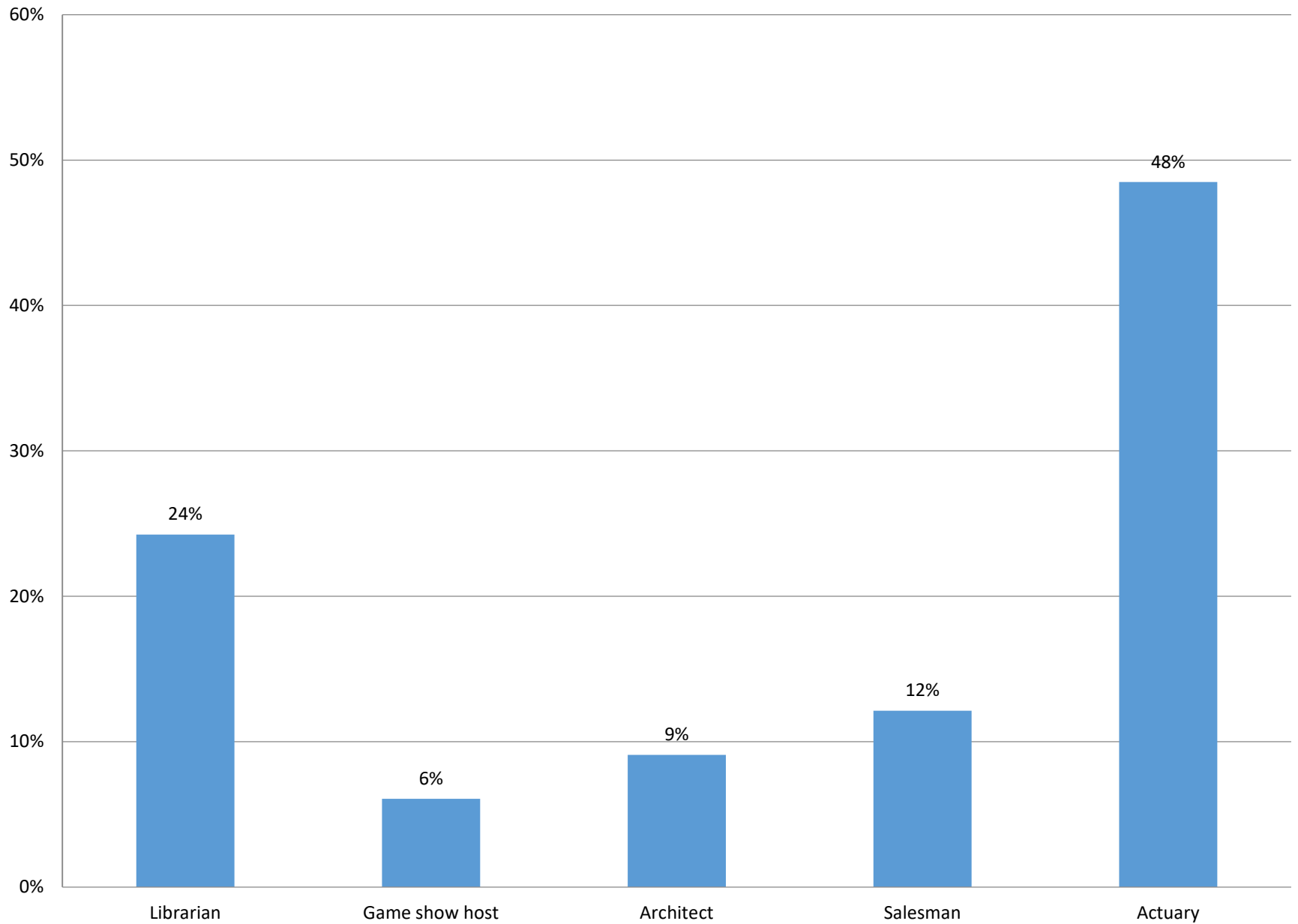
# From Belsky & Gilovich, chapter 4

- “Odds Are You Don’t Know What The Odds Are”
- Steve, a 35 year old American as described by a neighbor

# “Odds Are” polling question

- Which of the following occupations is Steve most likely to have:
- A) Librarian
- B) Game show host
- C) Architect
- D) Salesman
- E) Actuary

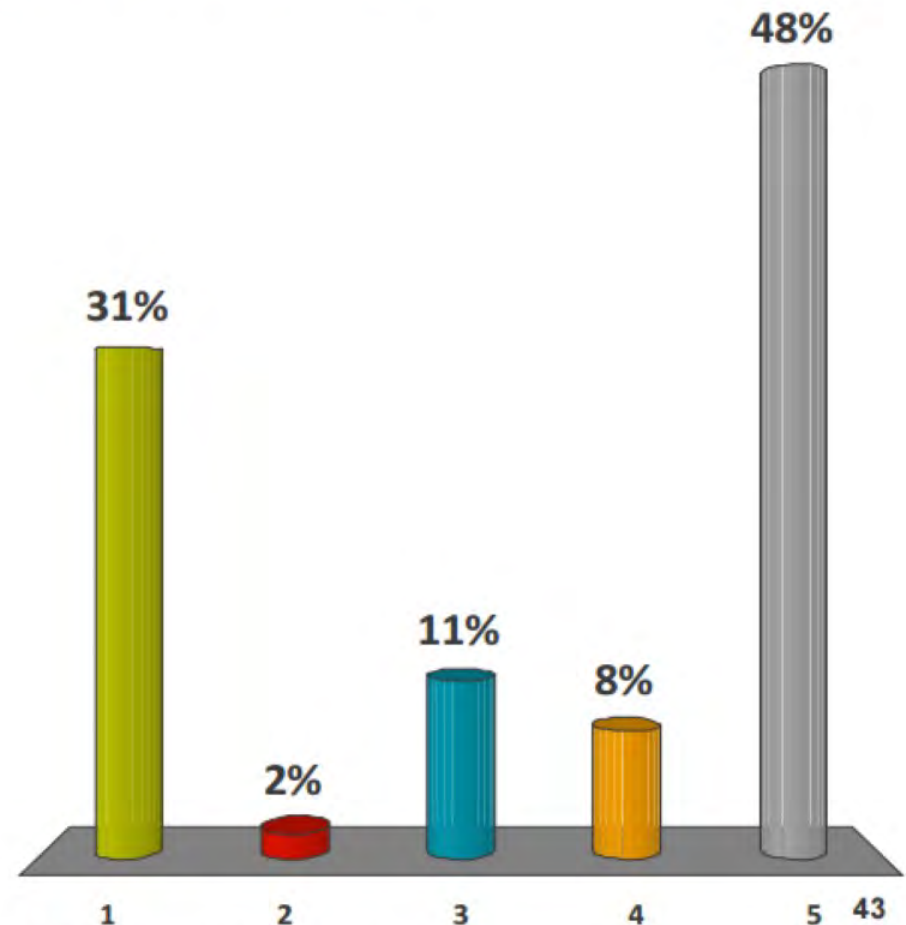
# Which of the following occupations is Steve most likely to have:



# Odds Are” polling question

## Which of the following occupations is Steve most likely to have:

1. Librarian
2. Game show host
3. Architect
4. Salesman
5. Actuary



The correct answer is Salesman (neglecting the base rate).

# “Odds Are” polling question

- Analysis of polling results
- The correct answer, and why
- “Neglecting the base rate”
- Applications to actuarial life - insurance

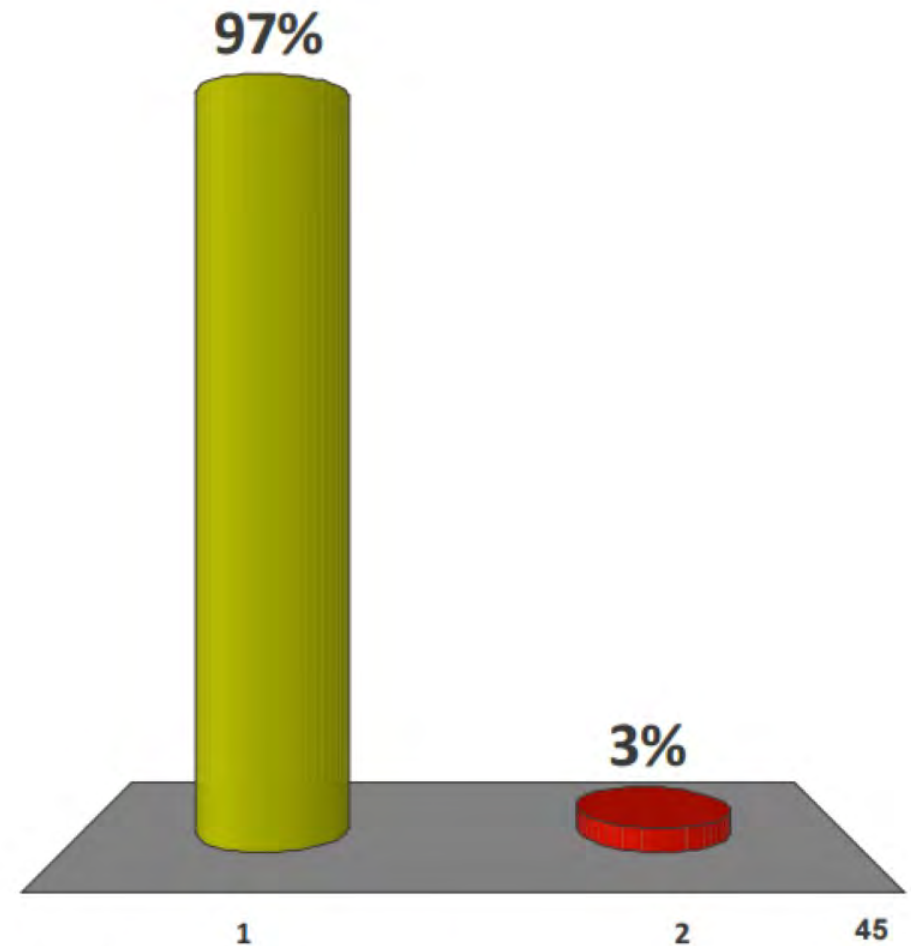
# Audience Poll

Actuaries are known to be logical. They are also experts at financial calculations. Given a choice of a gift of \$10, or zero, would you choose the \$10?

- 1 for Yes
- 2 for No

**Actuaries are known to be logical. They are also experts at financial calculations. Given a choice of a gift of \$10, or zero, would you choose the \$10?**

- 1. Yes**
- 2. No**





# Audience Poll

Actuaries are known to be logical. They are also experts at financial calculations. Given **THIS** choice of a gift of \$10, or zero, would you choose the \$10?

- 1 for Yes
- 2 for No

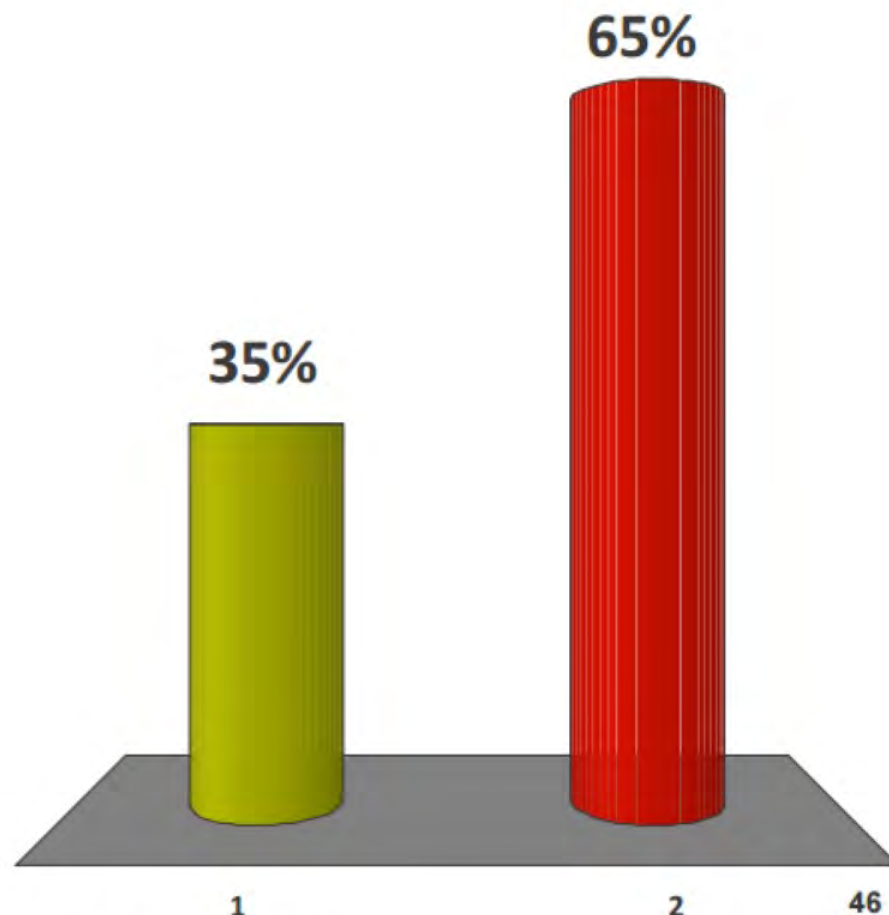


Source:

Eric Beinhoffer "The Origin of Wealth"

Actuaries are known to be logical. They are also experts at financial calculations. Given **THIS** choice of a gift of \$10, or zero, would you choose the \$10?

1. Yes
2. No





# How Can an Actuarial Model Fail?

Formula for Ruin:

Take two Nobel prize winning economists.



Add their highly sophisticated mathematical model – even more sophisticated than the one that became part of the actuarial study notes.



Result: \$3.625 Billion Bailout!

Lesson: Very intelligent people can make huge mistakes when they ignore the likelihood of illogical actions

# An Insurance Example

- When is 6 billion dollars more important than 30 billion dollars?
- When it causes the 30 billion dollar asset company to go into receivership!

# Practical Applications

- **Anchoring** (from Priceless, by William Poundstone)
- **3, 6, 9, 12 Think of a number** (from Numb3rs – Season 1)
- **Dilbert** (2015-02-12 –search Dilbert anchoring)
- **How prevent cheating on a test** (Dan Ariely - MIT)
- **Insurance Application** (Dan Ariely again))



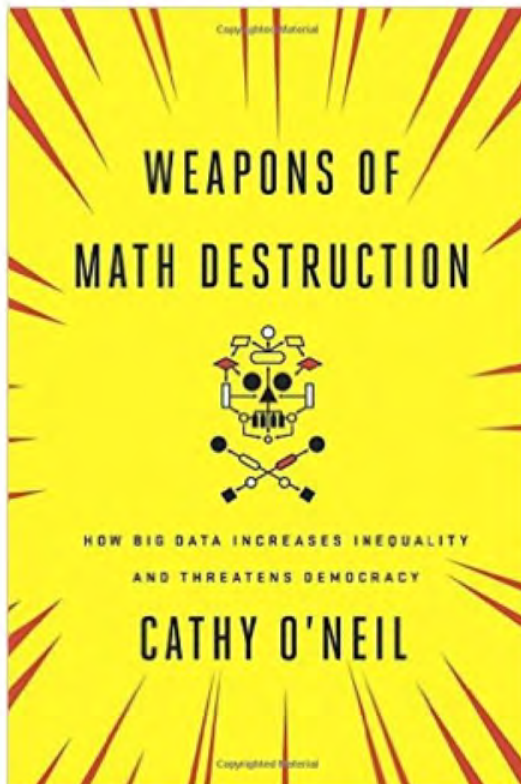
# Progressive Insurance Company

- The first major(?) insurance company to employ predictive analytics in a big way.
- Huge increase in market share.
- Huge increase in bottom line profit.
- What a wonderful endorsement of predictive analytic models!
- But that was only part of the picture

**Behavioral Economics  
was the secret sauce  
that made it palatable  
to the public.**



# Don't use Models to mistreat good drivers. And beware of the dead salmon syndrome!





# Future Direction of BE

- **As a social science:**
  - Recognizing and quantifying individual human variation at the micro level
  - Implications on the aggregate of these variations at the macro level

# Future Direction of BE

- **As a business enterprise:**
  - Providing methodologies for both data extraction and data interpretation
  - Integration of historically segregated data worlds
  - Developing wholly new concepts of predictive analytics and risk assessment

## More Reading from F&F (now PAF) Newsletter

- *Fortune's Formula: The Untold Story of the Scientific Betting System That Beat the Casinos and Wall Street*—by William Poundstone (review by Dave Snell) dangers of implicit belief in mathematical models
- *The Wisdom of Crowds* by James Surowiecki (review by Scott McInturff) review of book explaining that crowds can often give more accurate predictions than experts
- *Linked: How Everything Is Connected to Everything Else and What It Means for Business, Science, and Everyday Life* by Albert-Laszlo Barabasi (review by Brian Grossmiller) book review on network theory
- *Bad Science*, by Ben Goldacre (review by Dave Snell) a good primer on how clinical studies should and should not be conducted; and on how statistics are used and misused to manipulate public opinion
- “Behavioral Economics: Implications for Actuarial Science and Enterprise Risk Management” by David Wheeler Jr. how the human mind can be tricked into jumping to CONCLUSIONS vs GQNSLHSIQNS
- “The Past Is No More Certain Than The Future - Decision-Making In The Face Of Unavoidable Uncertainty” by Charles Brass one crime, two unanimous jury decisions - except they don't agree!
- *Predictably Irrational*, by Dan Ariely - The Hidden Forces that Shape our Decisions (review by Ben Wolzenski) review of best selling Behavioral Economics book, with chapter-by-chapter synopses
- “Risk Management and the Power of Simplicity” by Kurt Wrobel - dangers of overreliance on models - particularly complex models
- *Why Smart People Make Big Money Mistakes and How to Correct Them: Lessons from the New Science of Behavioral Economics*. by Gary Belsky and Thomas Gilovich (review by Ben Wolzenski) book review of behavioral economics book
- *Thinking Fast & Slow*, by Daniel Kahneman (review by Tyson Mohr) book review of behavioral economics book

# How can you prepare for these changes?

## New Tools Require New Skills



$$3+4=4+3$$



$$3-4 \neq 4-3$$



1709



1816



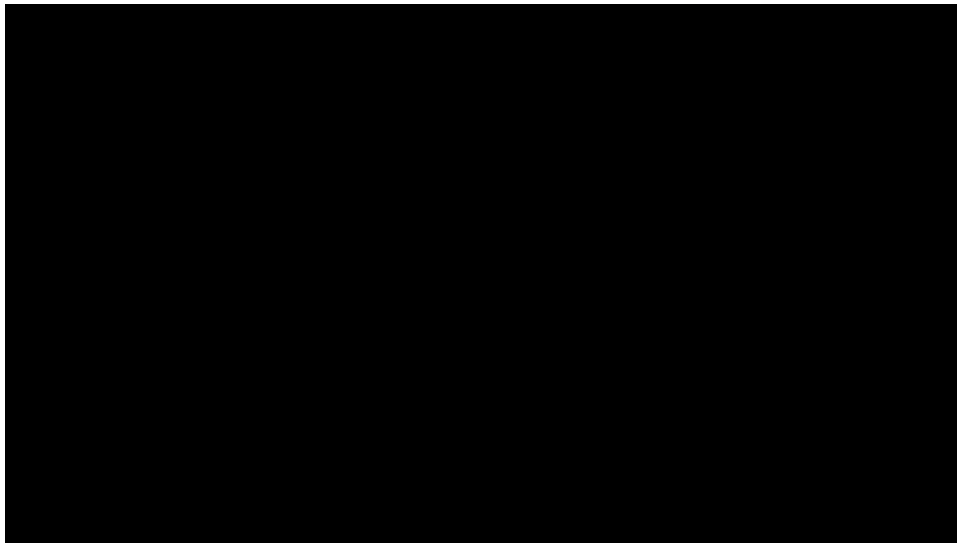
Find this video on YouTube via search term ChainsawAlton (one word).

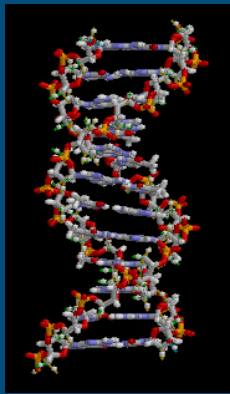


Today!

# How Can Behavioral Economics (and Psychology) Help Save the World?

- ZDOGGMD.COM
- House of Cards Episode 2





2019 **PREDICTIVE  
ANALYTICS**  
SYMPOSIUM

# Non-quantitative Considerations in Insurance Behavioral Economics - The Reason Your Strictly Analytic Models Will Fail

19-September-2019

David Snell, FALU, FLMI, ASA, MAAA, CLU, ChFC, ARA, ACS, MCP  
dave@ActuariesAndTechnology.com



SOCIETY OF  
ACTUARIES®

**NOTE:** the training workbooks can be downloaded at  
[www.GitHub.com/DaveSnell](http://www.GitHub.com/DaveSnell)