

# Behavioral Economics - The Reason Strictly Analytic Models Fail

**Maryville University**  
**7-March-2016**

David L. Snell, ASA, MAAA, FLMI, CLU, ChFC, ARA, ACS, MCP  
technology evangelist, RGA Reinsurance Company

# My colleagues for this presentation

David Parker Wheeler Jr.,

VP, Synodex

“the first Behavioral Economics major I ever met”



Ben Wolzenski,  
FSA, MAAA, CLU

Managing Partner, Actuarial Innovations, LLC  
former EVP of General American Life, and  
“the actuary’s actuary”

# 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)

# Perhaps Not!

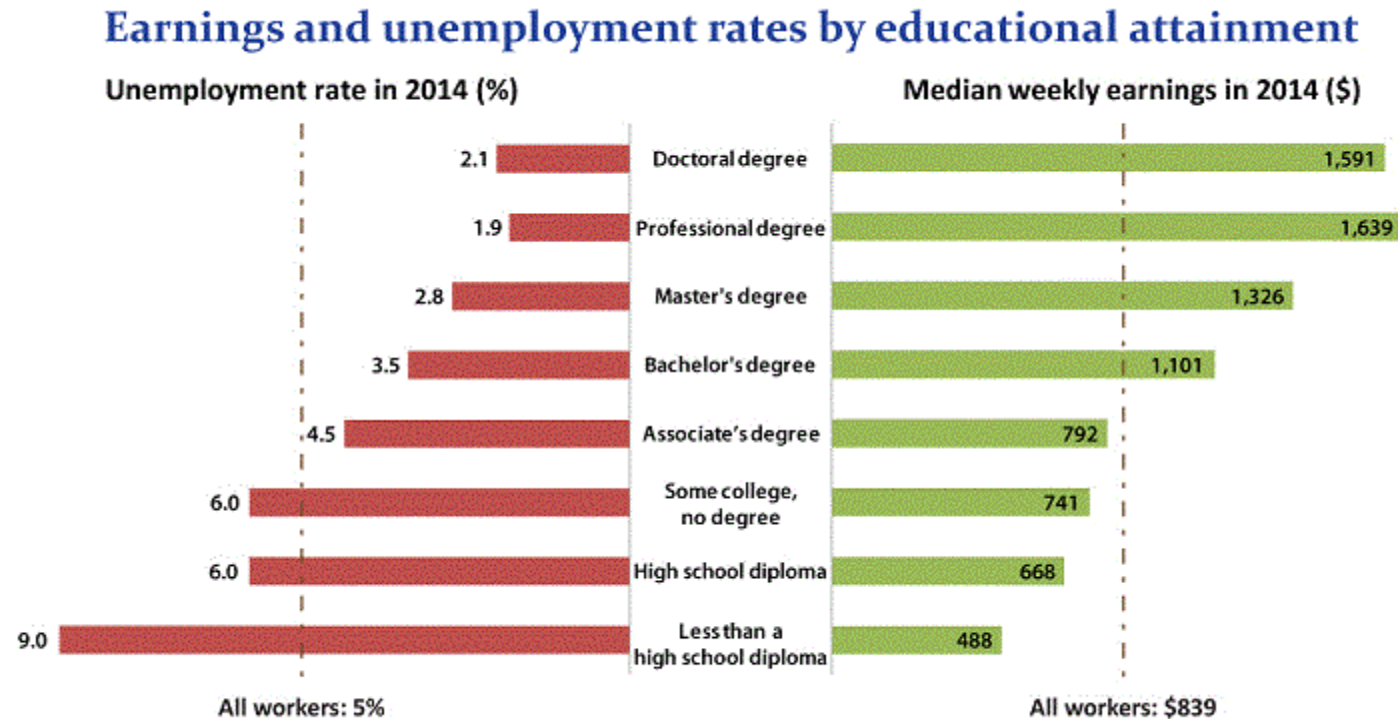


<http://www.jasonheadley.com/INATN.html>

(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?

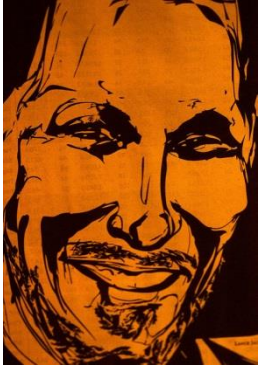
- Fame, fortune, life of the party, assured high income for life, ....



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)

# Heuristics Test

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

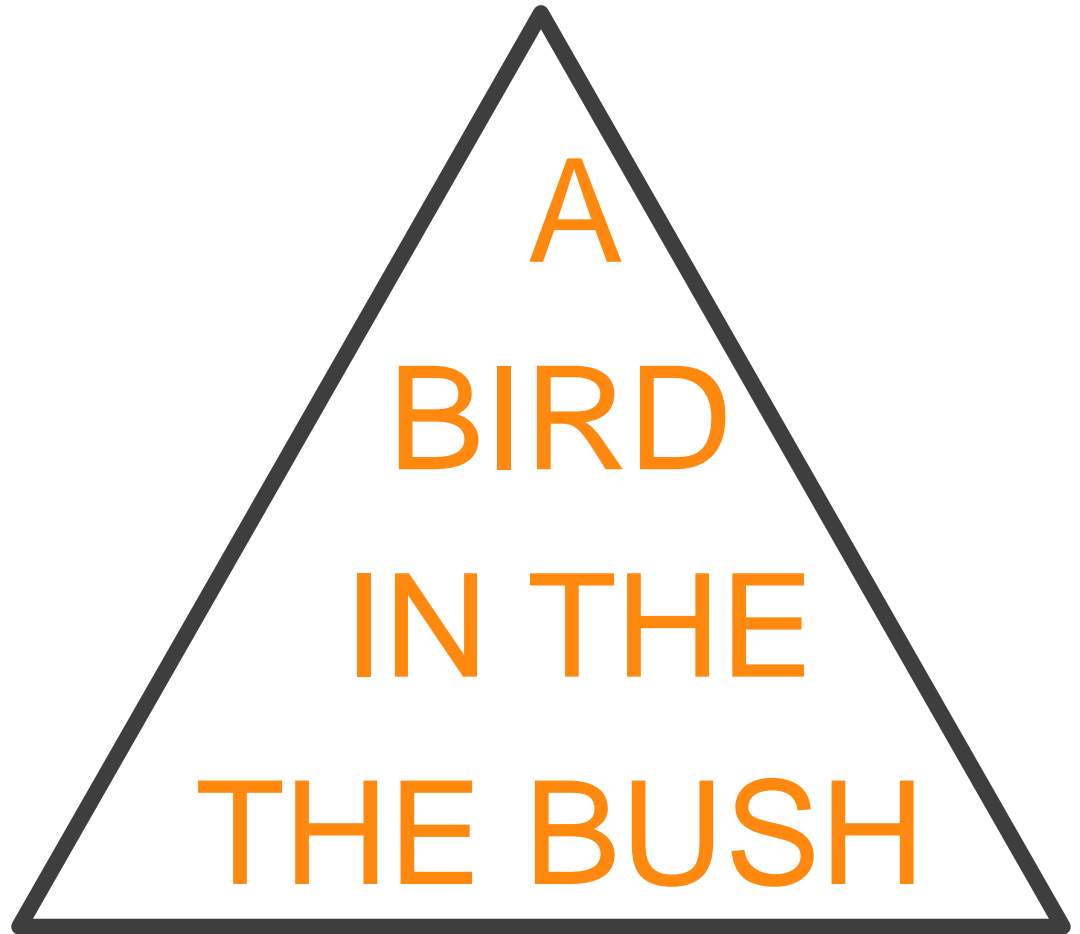
*This slide is intentionally blank*  
*(... or is it?)*

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



# More Heuristics



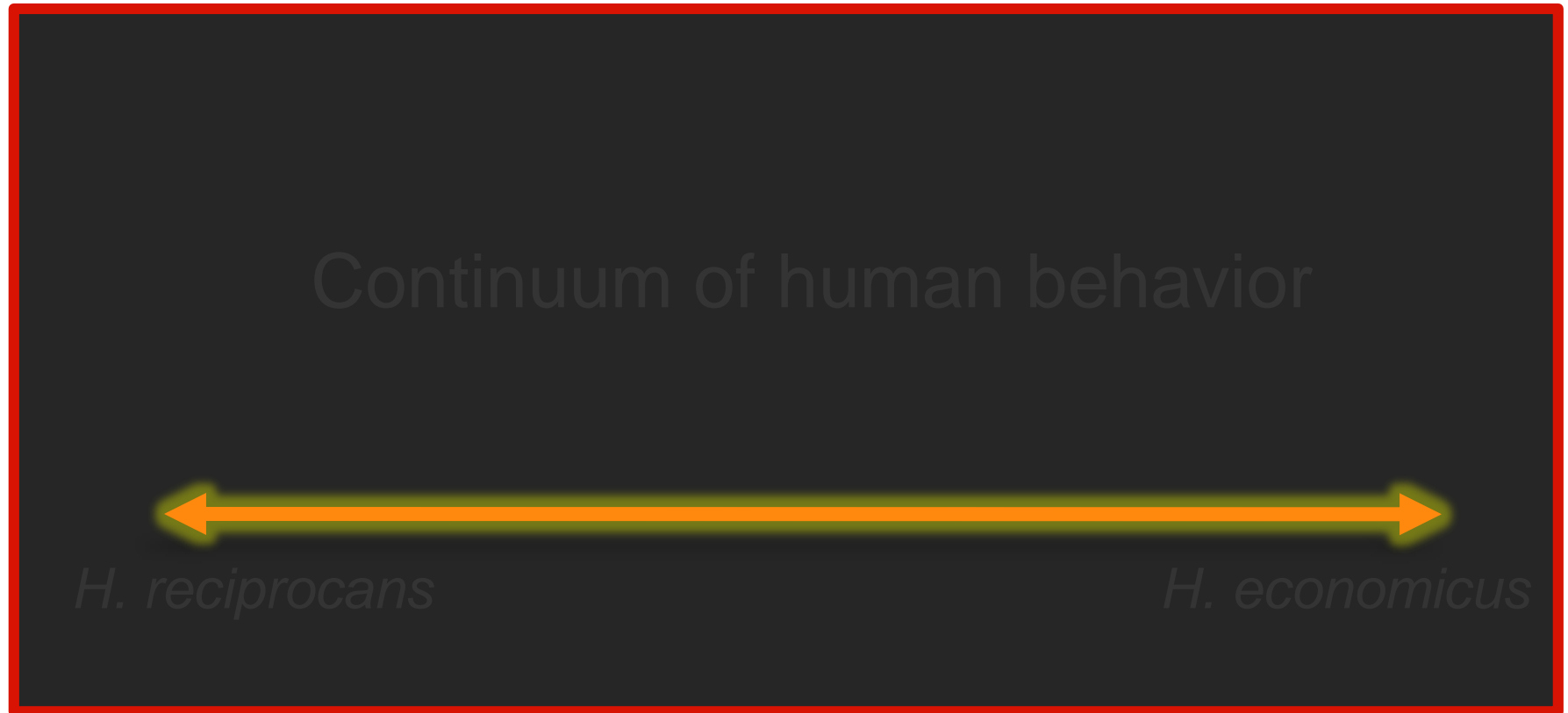


# Decision Process: Emotions

- Punishment/Reward
  - Waitress-Diner relationship
  - Day Care Study
    - ◆ Late fee led to increase in delayed pickups
  
- People are often willing to pay in order to punish others for acting unfairly!

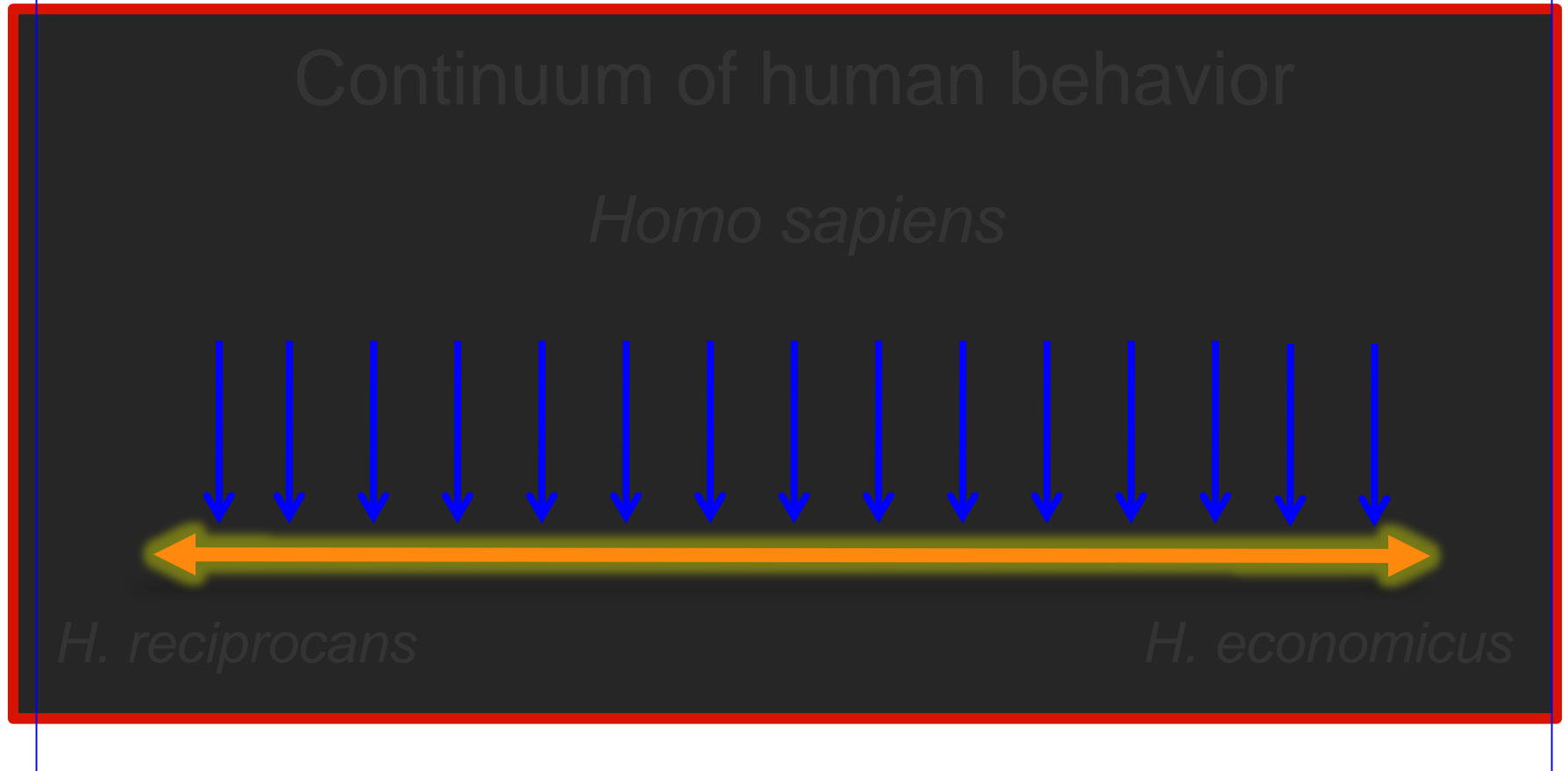
# Traditional Interpretations of Behavior

- *Homo economicus* vs *Homo reciprocans*



# New Behavioral Perspective

- The reality: We are human



# Why is any of this relevant?

## JUMPING TO CONCLUSIONS



# Why is any of this relevant?

**JUMPING TO  
GQNSLHSIQNS**



# Audience Poll

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

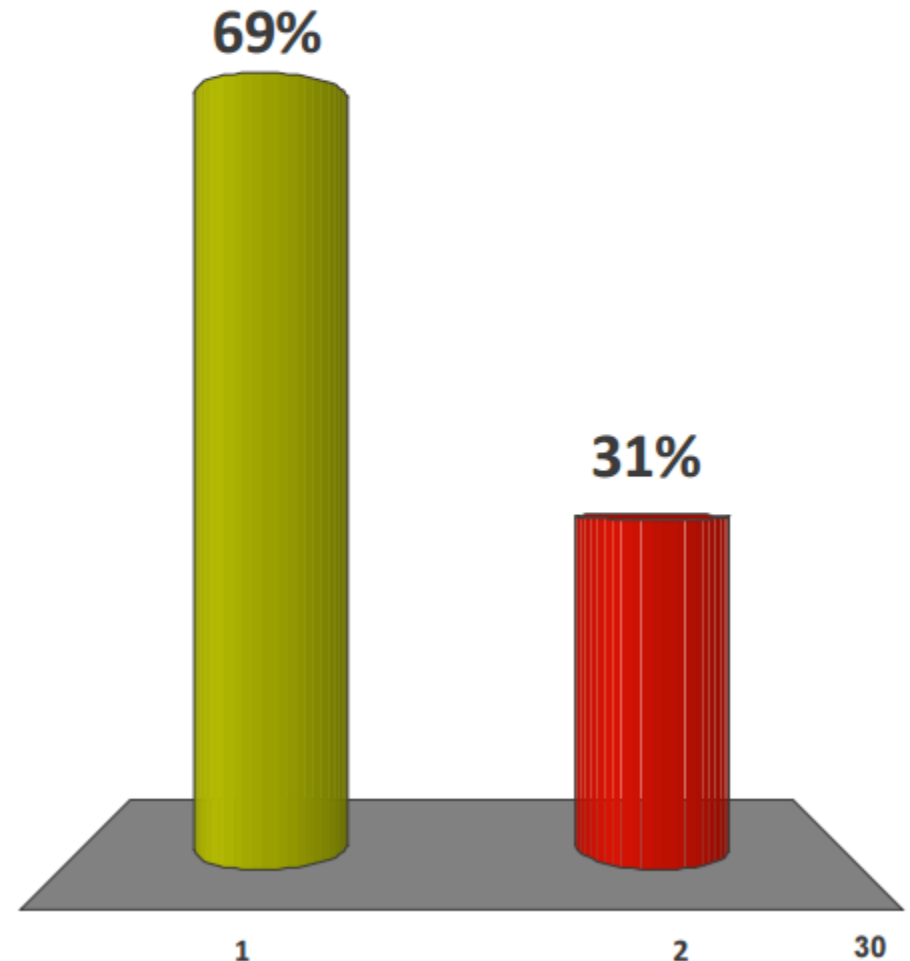
1 for Yes

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?**

- 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.

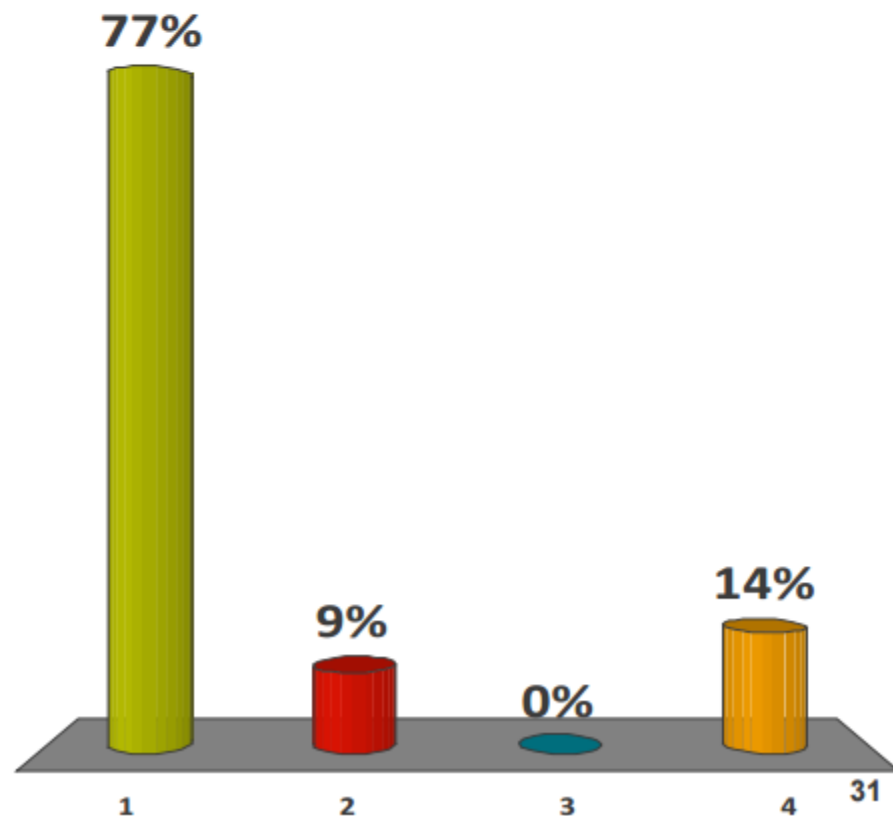
Are they happy about their current incomes?

- 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?**

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3. 3 if Tom is unhappy and Jane is happy.
4. 4 if Tom is unhappy and Jane is unhappy.



# Audience Poll (part 3)

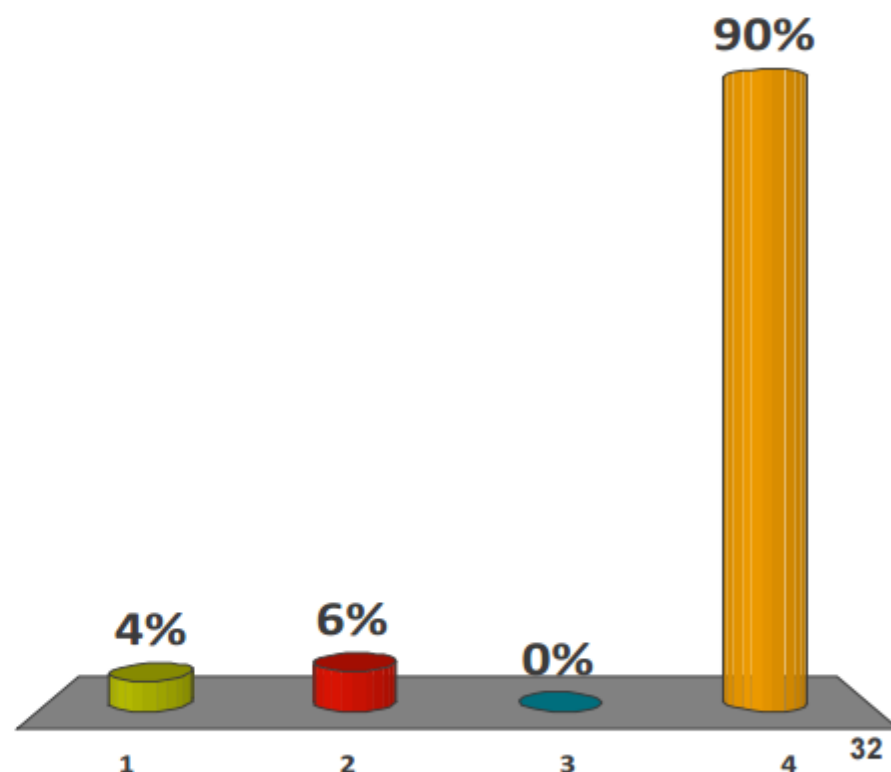
Tom and Jane are each earning \$200,000 this year. Last year Tom earned \$100,000 and Jane earned \$400,000. Tom and Jane live in a very exclusive suburb where the average income is \$800,000. They each have in-laws who live in the same suburb and make twice the average income.

Are they happy about their current incomes?

- 1 if Tom is happy and Jane is not.
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**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

# From Ariely, chapter 7

- The Problem of Procrastination and Self-Control
- University professor offer three different classes three different types of deadlines for the three main papers due over the 12 week semester
- Class 1: Some flexibility to set their own deadlines
- Class 2: Complete flexibility in when to turn in papers
- Class 3: Hard deadlines were set by the professor



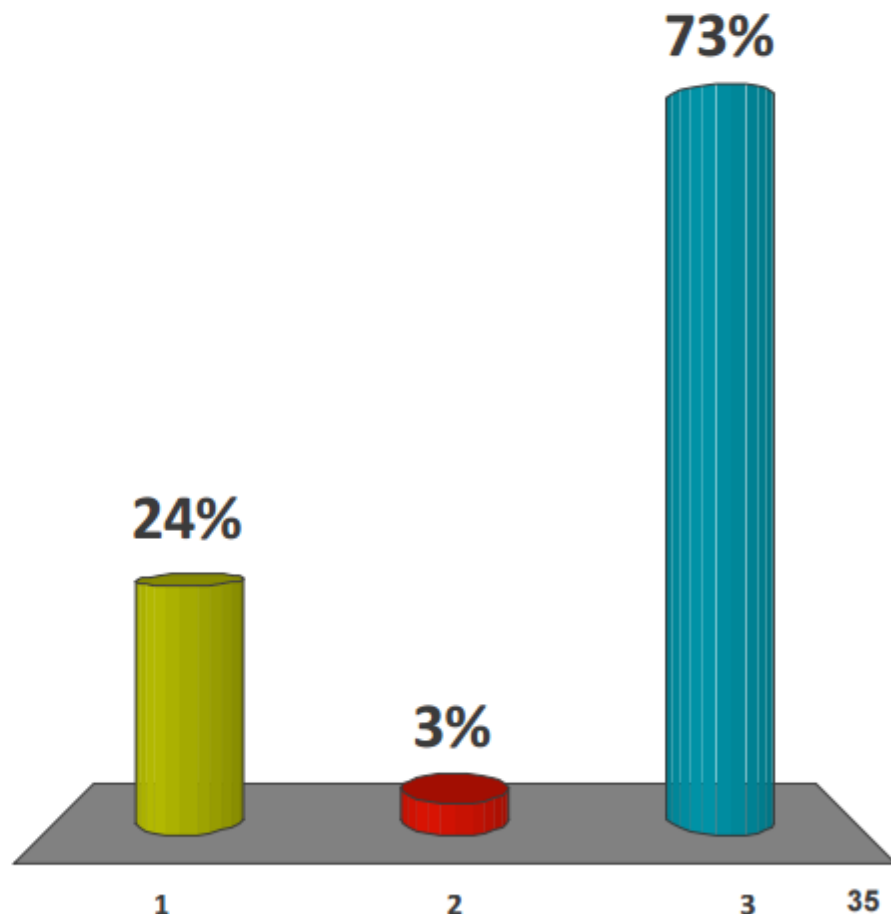
# Procrastination polling question

- Which class achieved the best final grades?
- A) Class 1: Some flexibility
- B) Class 2: Complete flexibility
- C) Class 3: Hard deadlines

# Procrastination polling question

## Which class achieved the best final grades?

1. Class 1: Some flexibility
2. Class 2: Complete flexibility
3. Class 3: Hard deadlines



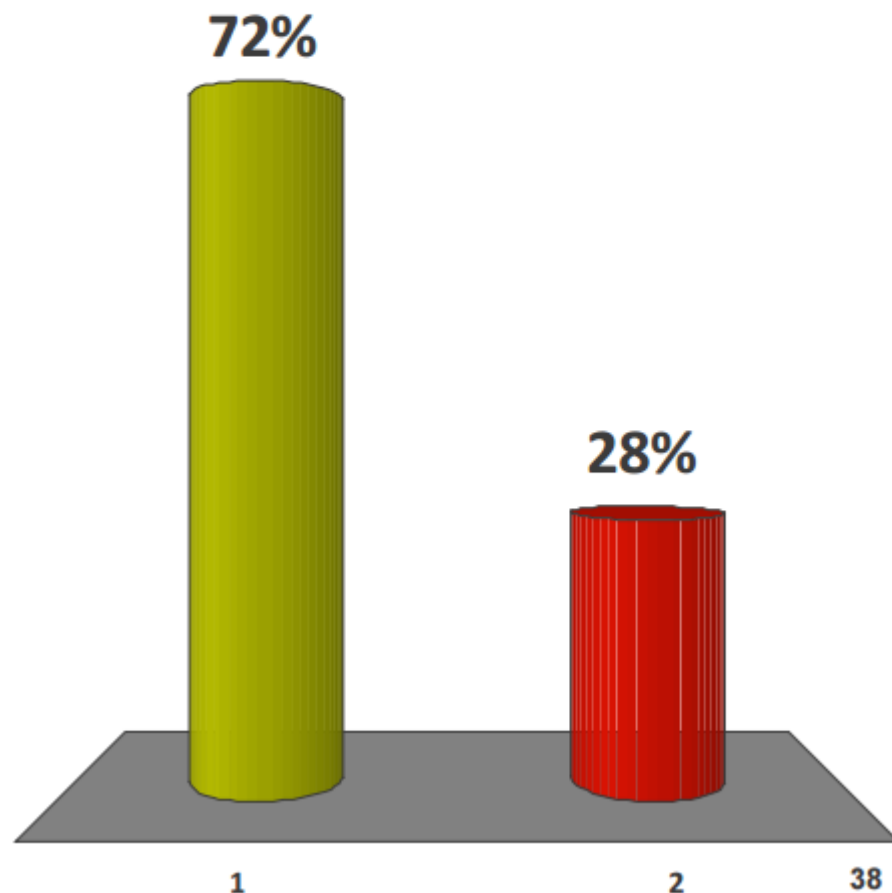
# Weber's Law polling question 1

- 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
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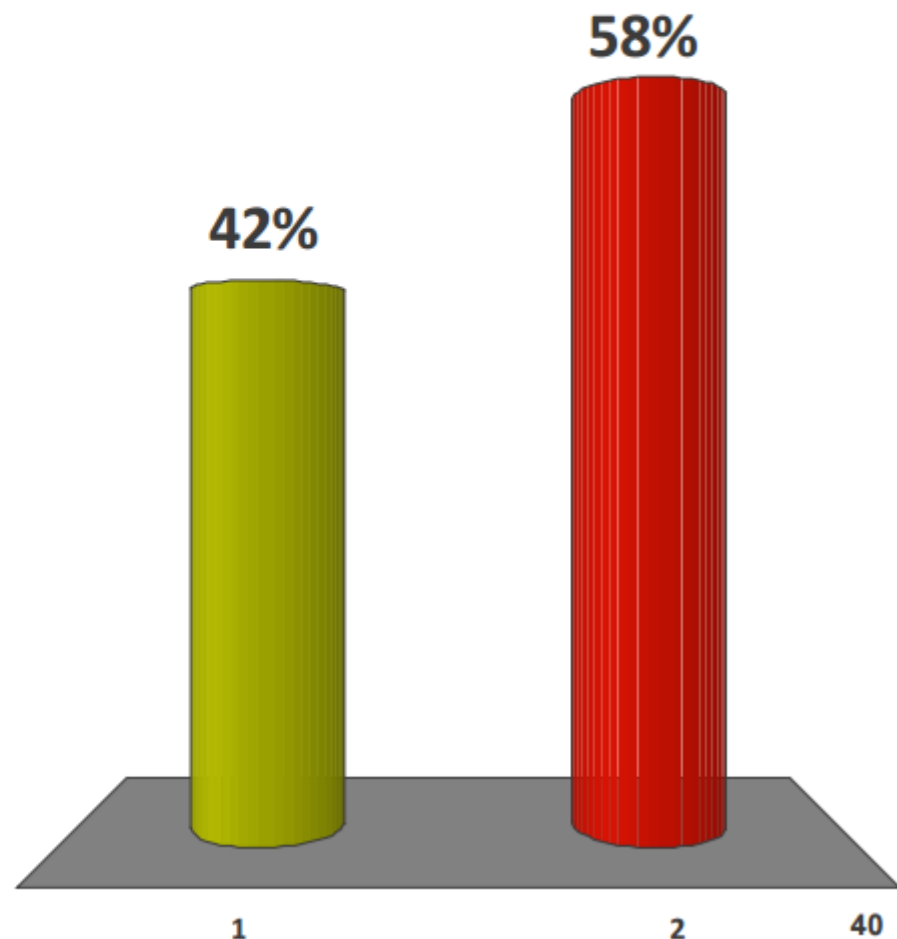
# Weber's Law polling question 2

- 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

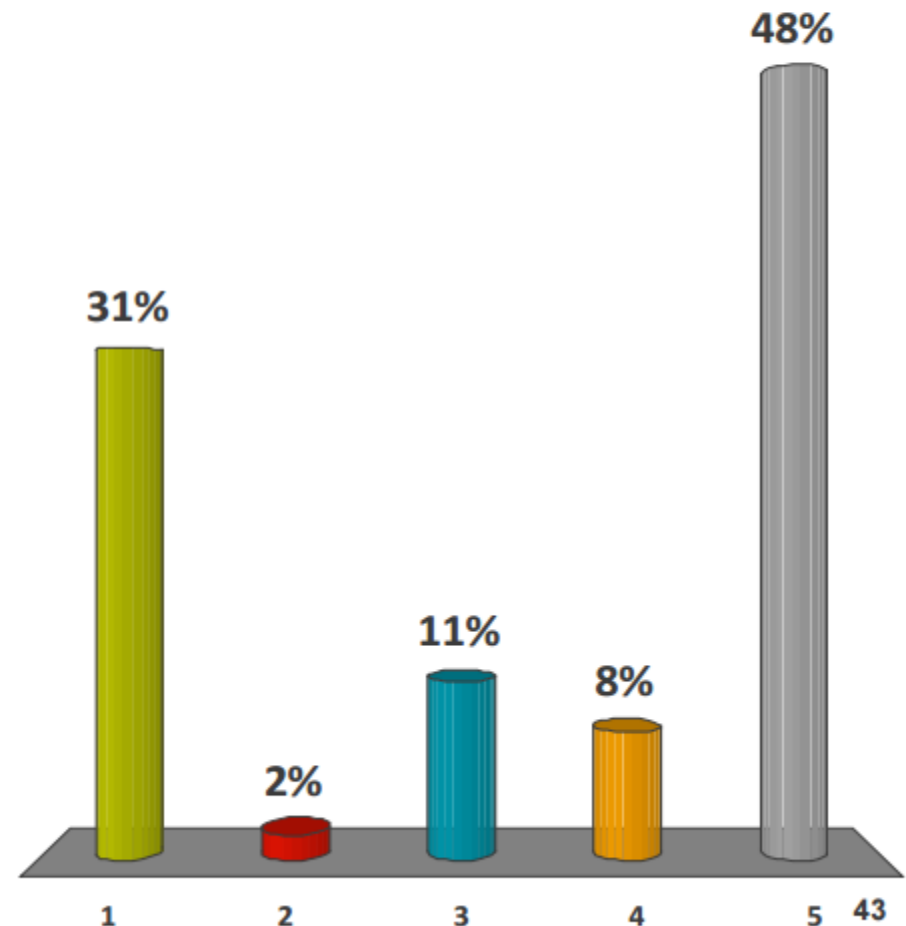
# “Odds Are” polling question

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

# 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



# “Odds Are” polling question

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

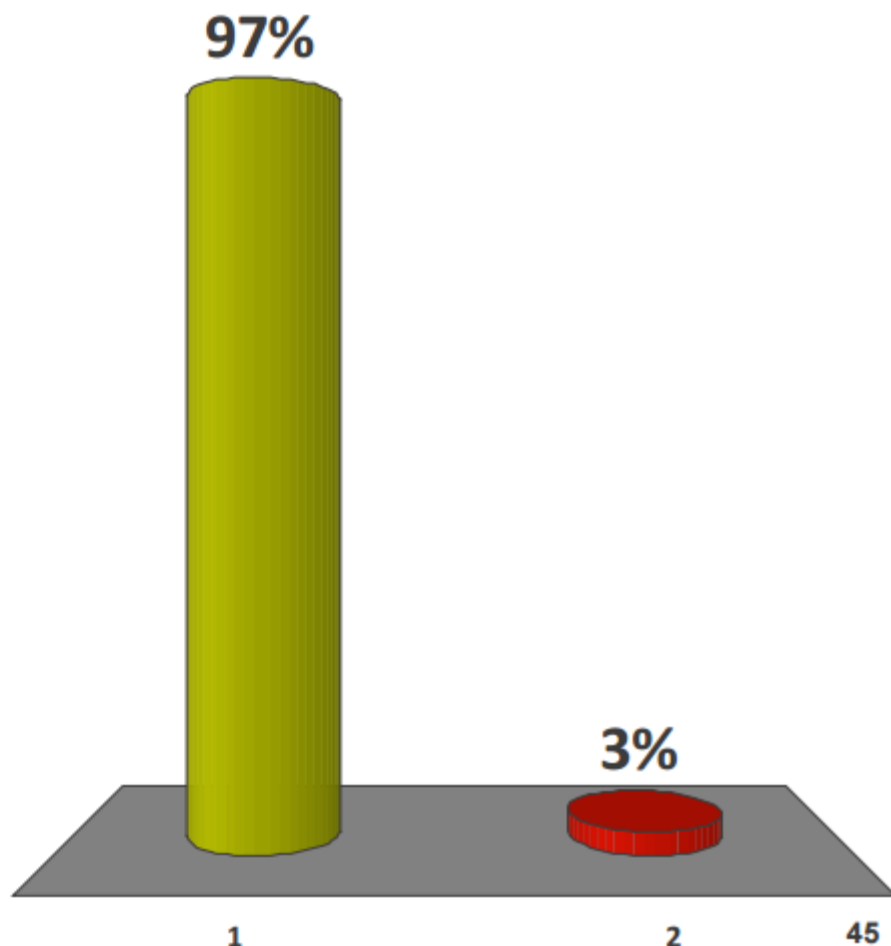
# Audience Poll

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

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- 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

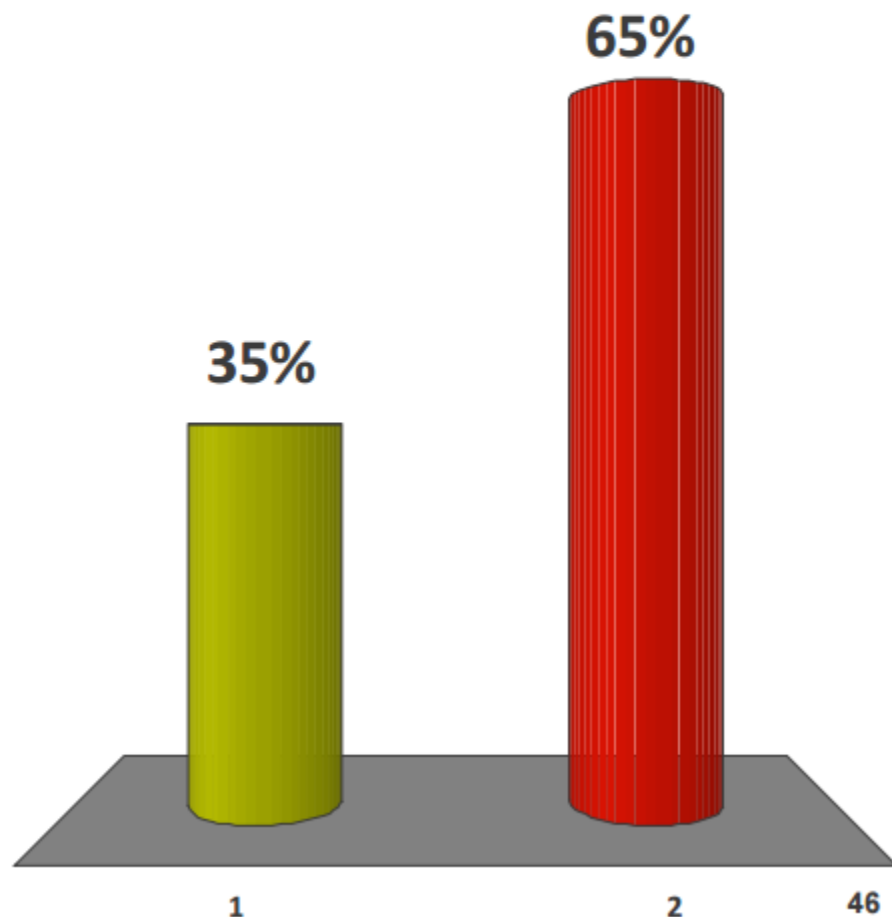


Source:

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?

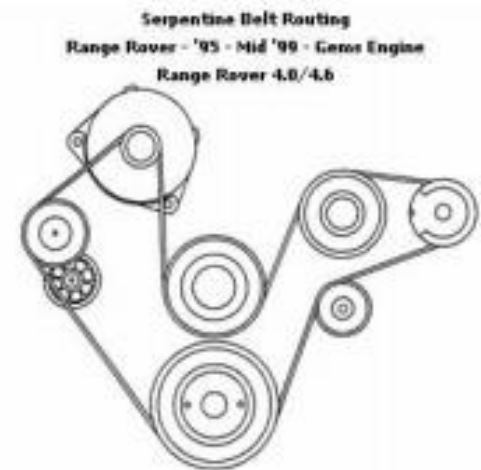
1. Yes
2. No





# True Sales Stories

- How to sell the more expensive non-qualified benefits plan to a meat packing company
- How to sell lots of fan belts
- How to sell a \$50 bottle of wine



# 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.



TARGET

Behavioral Economics - Dave Snell



BE

# 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



# Behavioral Economics - The Reason Strictly Analytic Models Fail

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technology evangelist, RGA Reinsurance Company

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

- ZDOGGMD.COM
- House of Cards Episode 2



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# A math exercise

- Think of a number from 2 to 10
- Multiply that number by 9
- Add the two digits of the product

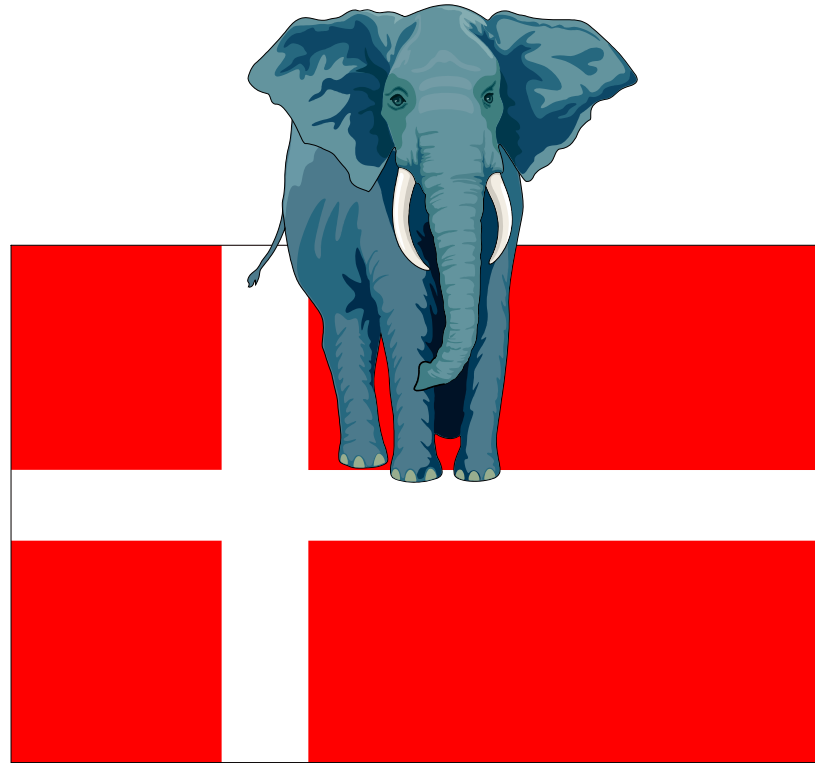
# math exercise (continued)

- Subtract 5 from that number (i.e., from the sum of the two digits).
- Think of a country in Europe that starts with the letter of the alphabet that corresponds to that number (If your number is 1, think of a country starting with the letter A, if your number is 2, then the letter B, etc.).

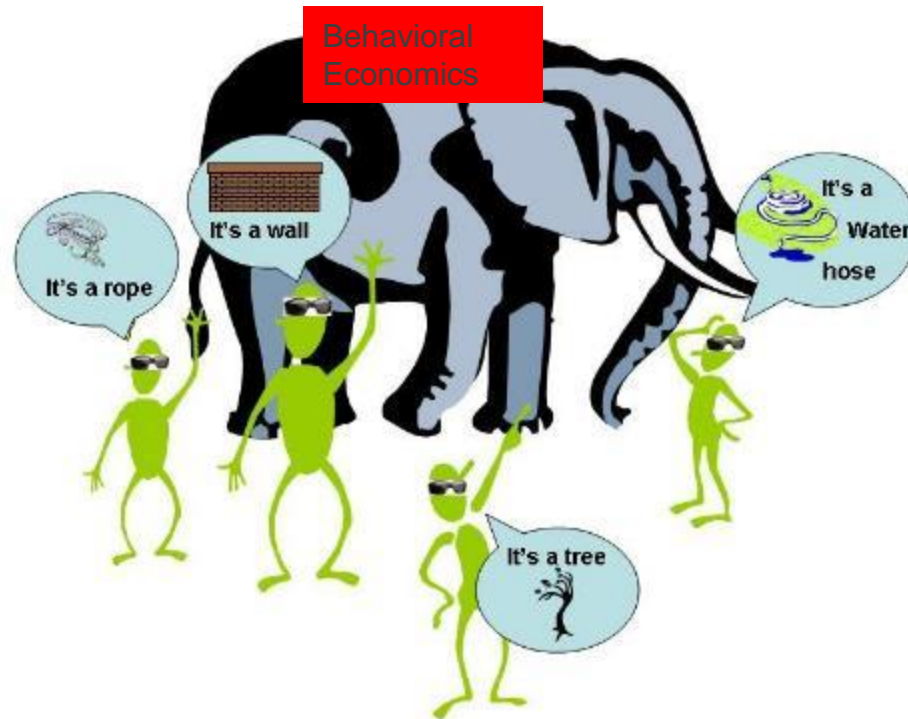
# math exercise (continued)

- Imagine the largest animal you can think of that animal that starts with the second letter of that country.
- Think about the color of that animal.
- Audience Poll

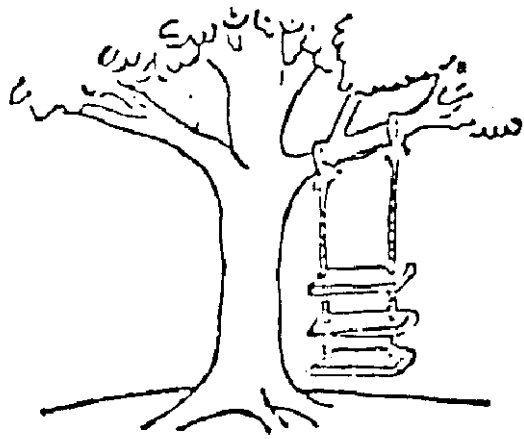
# A gray elephant in Denmark



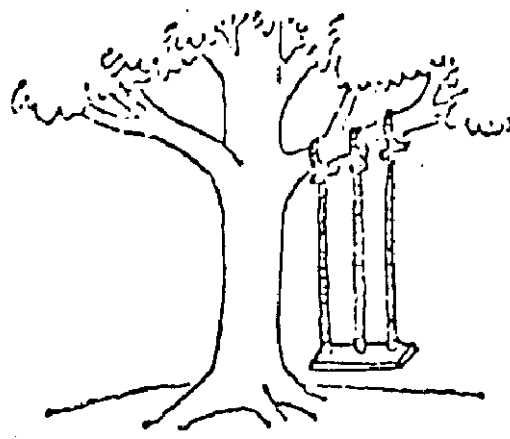
# We have come a long way from the blind men and the elephant



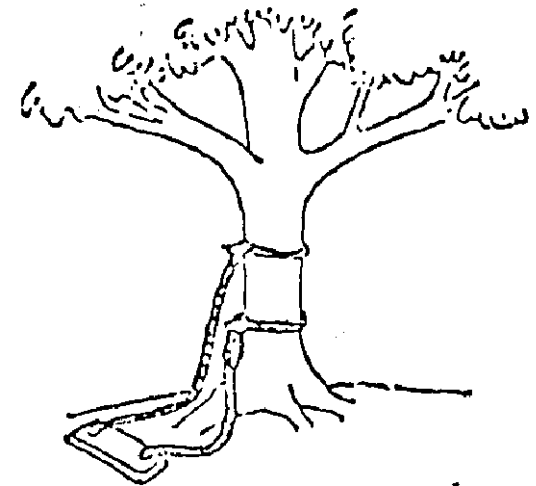




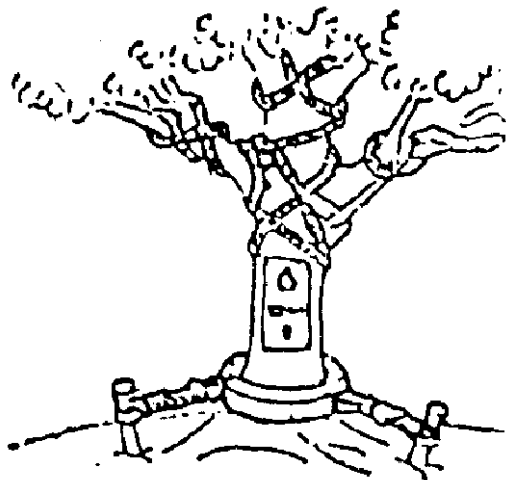
As Marketing Envisioned It



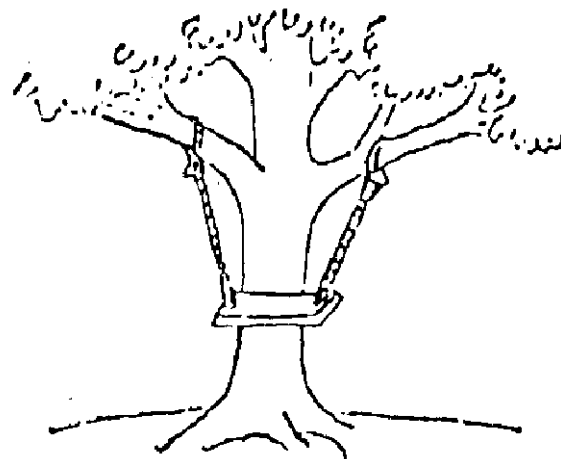
As Sales Sold It



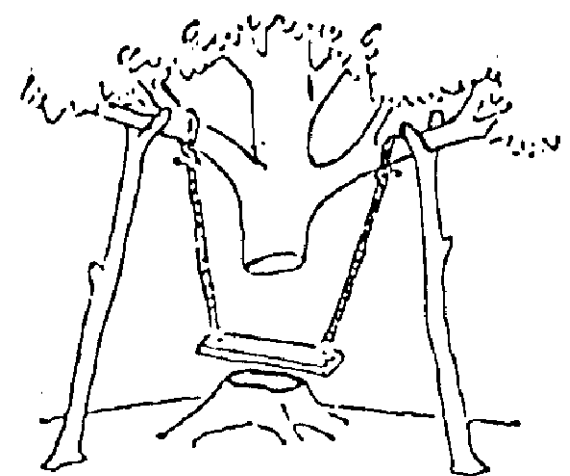
As It Was Requested



As Systems Designed it

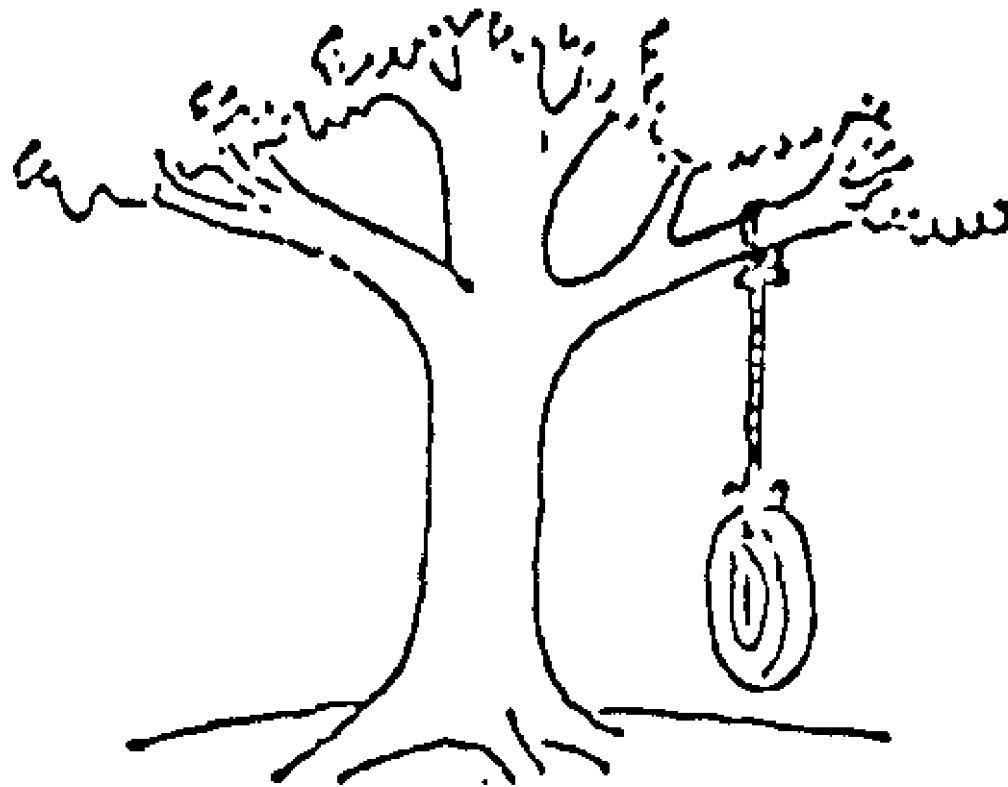


As Programming Wrote It



How Operations Ran It

*Wisdom from 1970*



What The Customer Wanted

*Wisdom from 1970*

# 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



# Actuarial Perspective

- Objectives:
  - Identify the individuals who are insurable
  - Differentiate them into broad risk buckets
  - Price each group appropriately
  
- To what extent can we use BE to better reflect a given individual's risk?
  
- Can new risk classes emerge from new BE findings?

# Actuarial Perspective

- Clearly, people are not rational agents
- More importantly, *people are not rational in very different ways*
  - *How can we find this information/data on applicants and policy holders?*
  - *How can it be incorporated into risk models?*

# Actuarial Applications

- BE provides a unique set of tools
  - Deep microeconomic research is uncovering NEW data
  - Demographics, hobbies, health factors, driving record, criminal history, financial history
- Apply these variables to risk models
  - More (smaller) buckets = wider profit margins

# Actuarial Applications

- But does this information exist?
- How can I use it?



# Actuarial Applications

- Keys to unlocking the “shadow data”:
  1. Data Extraction
  2. Data normalization
    - ◆ Normalization: Information – from various sources, formats, and structures – converted into a standardized data set and fed into a single consolidated database

# Actuarial Applications

- Some data has little to no inherent value on its own
  - Relational value
  - Additive value

# A data playground

- Demographics
  - Health factors/medical history
  - Driving record
  - Criminal record
  - Financial history
  - Hobbies
  - And beyond!
- All in a single database

# A data playground

- Run these factors against historical claims data
  - Uncover trends, correlations, irrelevancies
- Result: an incredibly valuable database
  - Feed into pricing models and risk machines
- Implications are difficult to fully realize

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