Economics of Behavioral Finance

Lecture 2

Let's go back to CARA utility…

- Assume that the average U.S. investor has CARA utility, and normalize wealth to 1

- Remember the CARA solution is

$$U(x) = -\frac{e^{-Ax}}{A}$$

$$\$\ in\ stock = \frac{excess\ return}{A \cdot Variance}$$

Estimating Absolute Risk Aversion

- Average excess return of stock is ~7%, standard deviation is ~15%.

- Assume that U.S. investor has 30% of their wealth in stock
  - Definitely higher than reality

$$0.3 = \frac{0.07}{A \cdot 0.15^2}$$

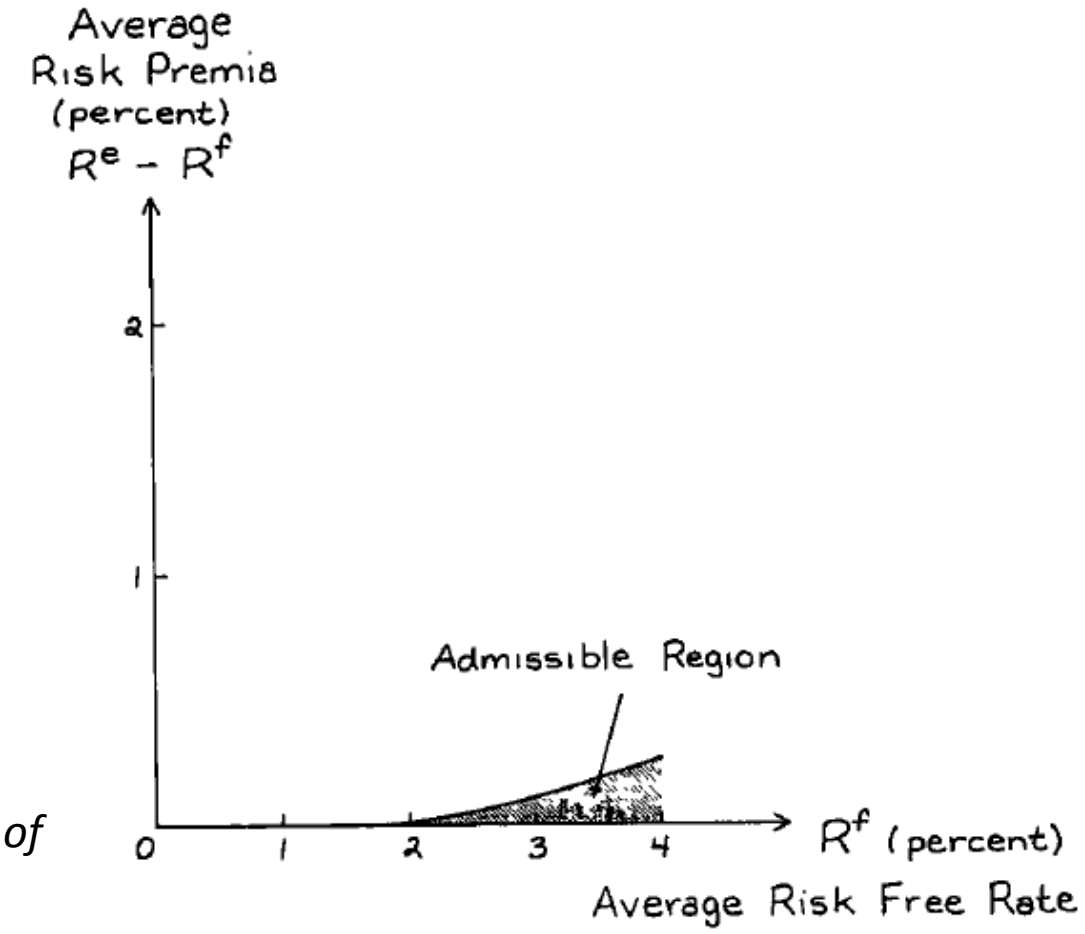
Estimating Absolute Risk Aversion

- A ~ 10

- How risk Averse is an investor with A = 10?
  - She prefers getting an additional 46% of her current wealth for sure, over a 99% chance of getting infinite wealth and 1% change of losing 1% of her current wealth

Maybe it's CARA that is wrong

CARA is sensitive to what we definite initial wealth to be, but you get similar results with CRRA utility too



Source:
Mehra and Prescott. 1985. "The Equity Premium Puzzle", *Journal of Monetary Economics*

Equity Premium Puzzle

- Existing investment pattern suggests an implausibly large rate of risk aversion.

- Put it another way, given the existing return and risk involved, investors are investing too little into the stock market.

Equity Premium 1926-2000

Yearly

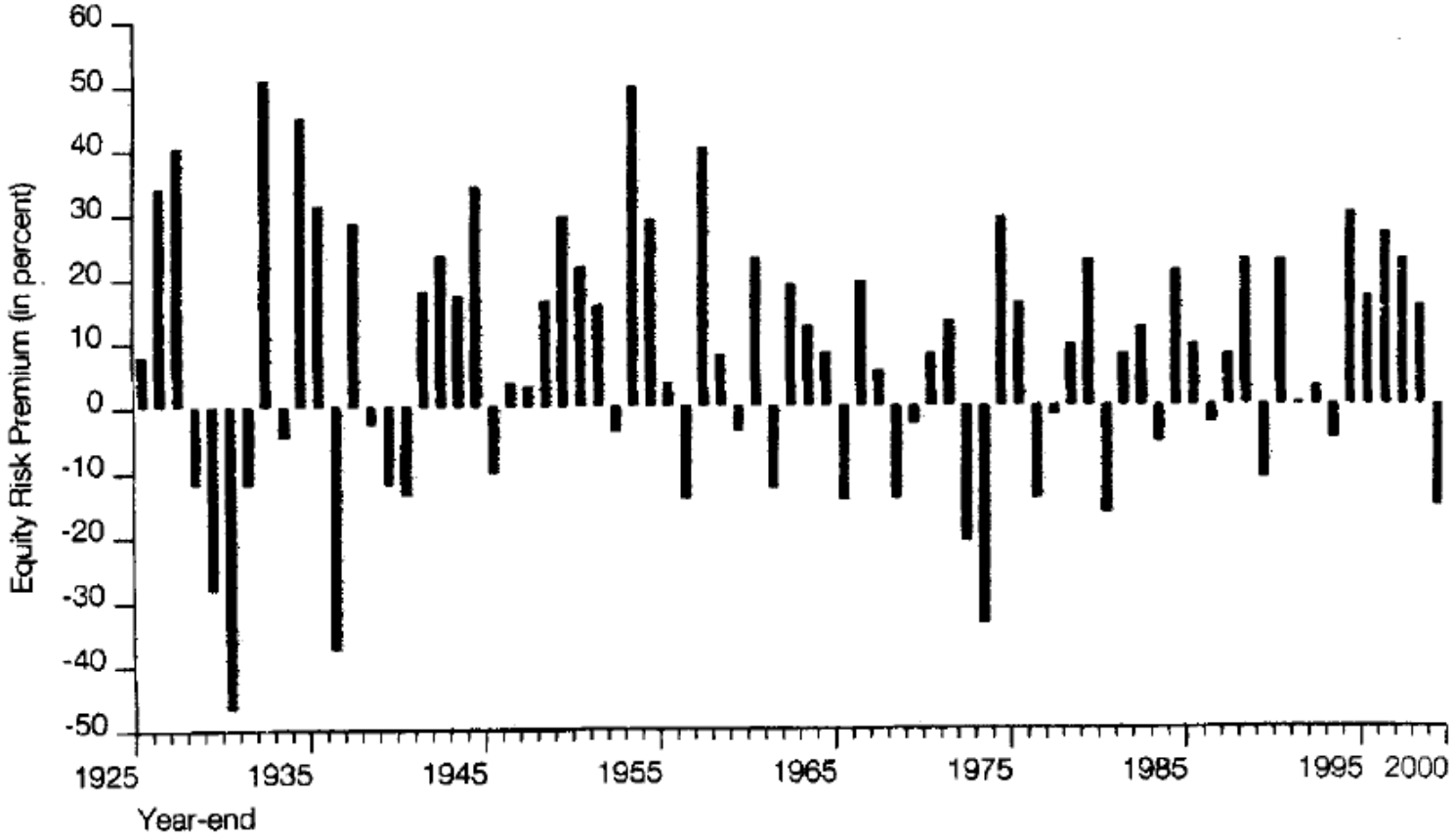


Fig. 1. Realized equity risk premium per year, 1926–2000. Source: Ibbotson (2001).

Equity Premium 1926-2000

20-Year

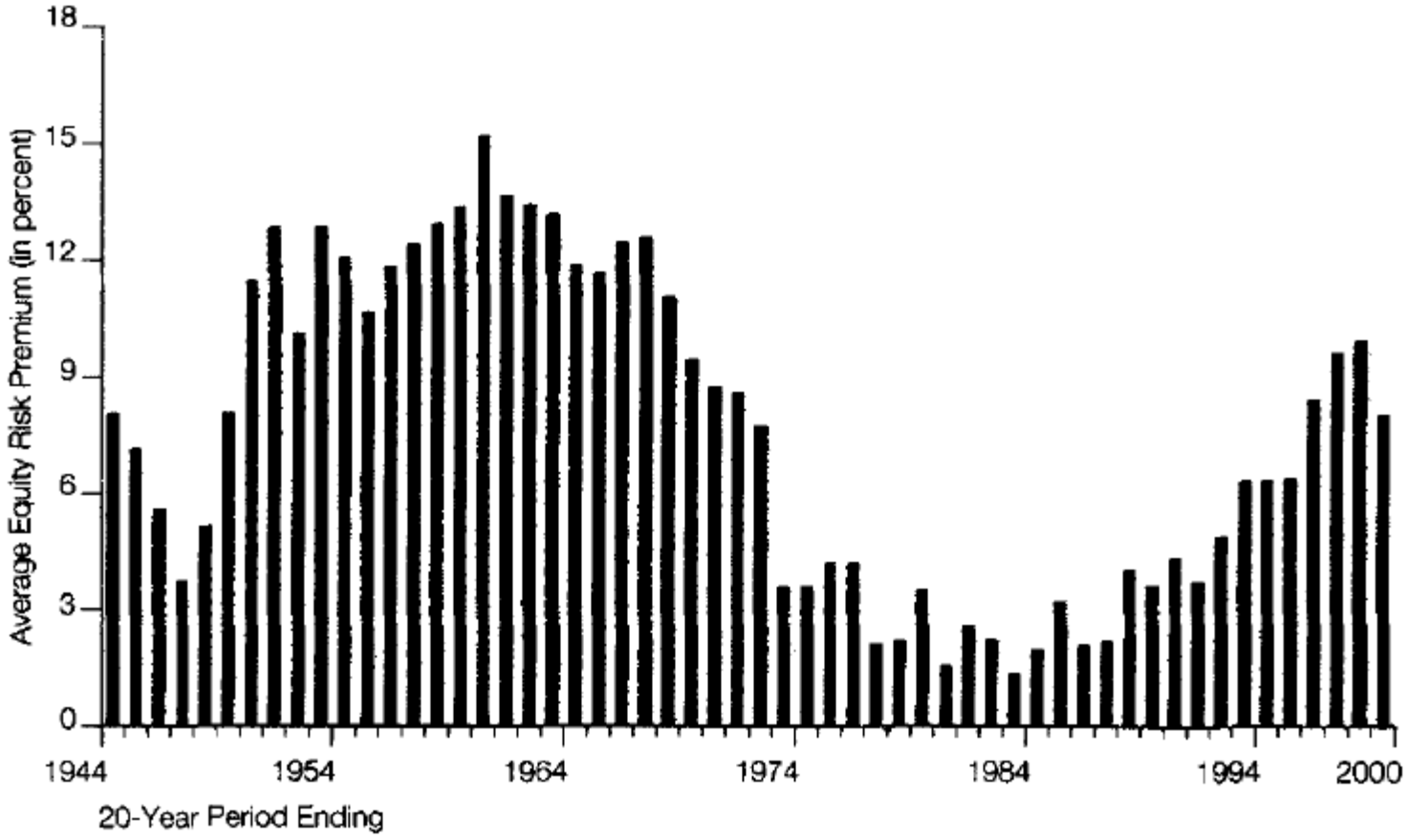


Fig. 2. Equity risk premium over 20-year periods, 1926–2000. Source: Ibbotson (2001).

Potential Explanation 1

- Maybe we are not observing some people's wealth, especially those who are not investing in stock at all

- e.g. If only ½ of the population is investing in the stock market, then the proportion of wealth in stock is 60% instead of 30%

- Unaccounted Wealth

$$0.6 = \frac{0.07}{A \cdot 0.15^2}$$

- Now A is only ~5

- But we will need a really huge amount of unaccounted wealth to a “reasonable” ARA of ~1

Potential Explanation 2

- Maybe investors don't think in the way expected utility requires them to.

- Suppose instead investors
  - Are shortsighted—consider only short term gains and losses
  - Making a loss is more painful than not making an equivalent gain

Myopic Loss Aversion

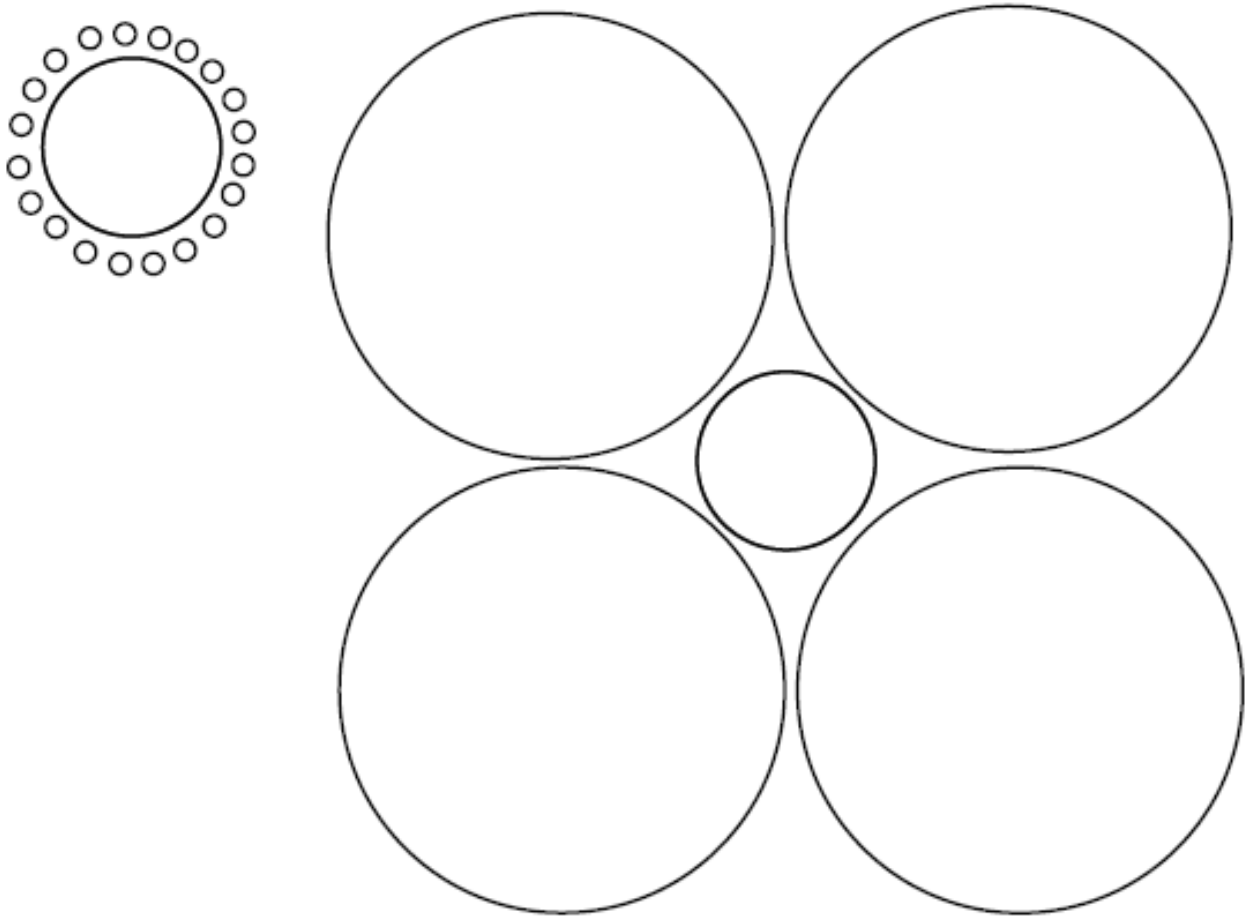
- We call such investors *myopic loss averse*. "Myopic" refers to their shortsightedness and "loss averse" refers to their hate of loss.
- In the eyes of myopic loss averse investors, the stock market is much more undesirable because
- They only look at short term, which makes investing in stock more risky
- They are very risk averse of their hate of loss.

Why would we think consumers are myopic?

- At some point investors have to calculate their gains and losses.
- "I gain/loss $*X* on my stocks this year" is a much more natural thinking than "average stock return is 11%"
- Tax filing each year is a nature point for such calculations. For a fund manager, report due date

Evidence on Loss Aversion

What Circle is Bigger?



Why Gains and Losses?

- Human perceptions are comparative.
- Easy to tell which of two buckets of water is warmer
- Hard to tell their absolute temperature
- Similarly, gains and losses in wealth are more pronounced than the absolute change.

Experiment: Candies and Mugs

- An experimenter randomly assign subjects to three groups. To Group 1 he gave a candy bar, to Group 2 he gave a mug, while to Group 3 he gave nothing

- He then tells the first two groups that they can exchange what they were given for the other good. To Group 3 he allows them to pick whatever they wanted out of the two.

Experiment: Candies and Mugs

- If we expect people to like mugs more than candies, there should be a lot exchange from the group that was given candies and very few from the group that was given mugs. Vice versa if people prefer candies.

- Actual:

Group	Want Mug	Want Candy
1: Given Candies	11%	89%
2: Given Mugs	90%	10%
3: Given Nothing	56%	44%

Experiment: Candies and Mugs

- This observed pattern is called endowment effect.

- Interpretation: If they get the candy, subjects who got a mug felt losing the mug as a loss, whereas subjects who were given nothing to start with only see that as a forgo gain

“Remember how I said I was happiest when we had nothing?”

Modeling Loss Aversion

A loss should decrease utility more than the increase from an equivalent-sized gain.

$$U(x,r) = \begin{cases} x - r & if\ x \geq r \\ v \cdot (x - r) & if\ x < r \end{cases}$$

Where *r* is the reference point used to determine gain or loss, and $v > 1$.

Modeling Loss Aversion

- *v* is estimated to be approximately 2.
- Loss is twice as painful as a forgo gain

We will leave the question of what the reference point should be for later

Another Experiment

- Which or the following would you prefer?
  - Losing $500 for sure, versus
  - Losing $1000 with probability ½ and losing nothing with probability ½

Another Experiment

- What about these two?
  - Gaining $500 for sure, versus
  - Gaining $1000 with probability ½ and gaining nothing with probability ½

Risk Averse over Gain/Risk Seeking over Loss

- Most people would behave in a risk averse manner over gains and in a risk seeking manner over losses

- Looking it in another way, this is the same as saying every unit of additional gain worth less than before, while additional loss feel less painful than before.
  - Diminishing Sensitivity

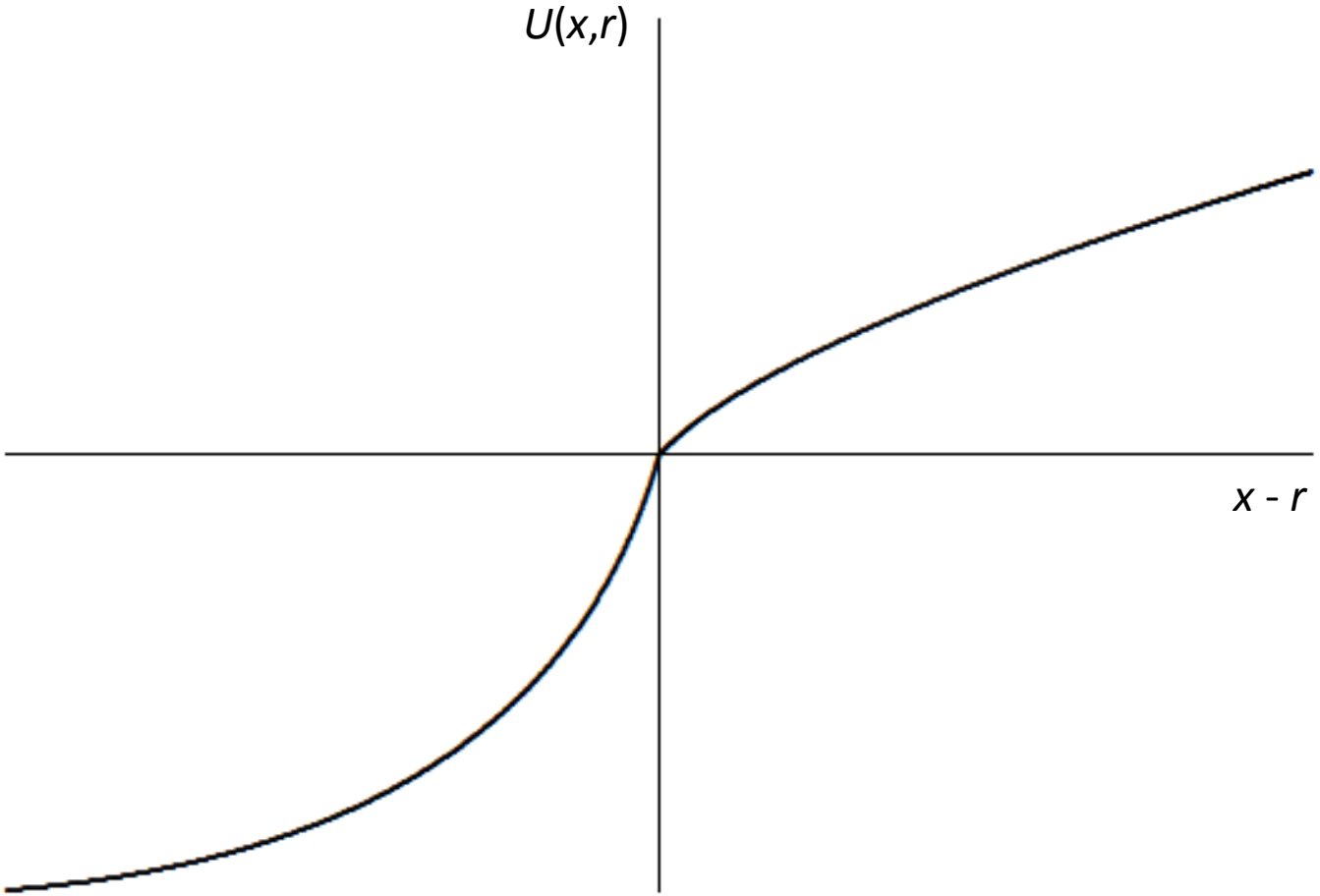
Risk Averse over Gain/Risk Seeking over Loss

$$U(x,r) = \begin{cases} u^{+}(x-r) & if\ x \geq r \\ v \cdot u^{-}(x-r) & if\ x < r \end{cases}$$

Where u^{+} is a concave function and u^{-} is a convex function.

e.g. u+(y) = ln(1 + y) and u-(y) = - ln(1 - y)

Adding things up so far…



Yet Another Experiment

- Which or the following would you prefer?
  - $3000 for sure, versus
  - $4000 with probability 0.8 and $0 with probability 0.2

Yet Another Experiment

- What about this pair?
  - $3000 with probability 0.25, versus
  - $4000 with probability 0.2 and $0 with probability 0.8

What's so special about the two pairs?

- Both pairs involves getting $3000 at 1.25 times the chance of getting $4000
  - In a published experiment, 80% pick the $3000 for sure from the first pair
  - 35% pick $3000 from the second pair

Violation of Expected Utility

- In expected utility, the decision maker should only care about the 1.25 times difference

- The experiment suggest that people are very sensitive to change in probability from 1 to a smaller number, but much less so for changes from one moderate probability to another, even if the change is proportionately identical

As if we don't have enough experiments yet…

- Which or the following would you prefer?
  - $5000 with probability 0.001, versus
  - $5 for sure

Another Experiment after another

- What about this pair?
  - Losing $5000 with probability 0.001, versus
  - Losing $5 for sure

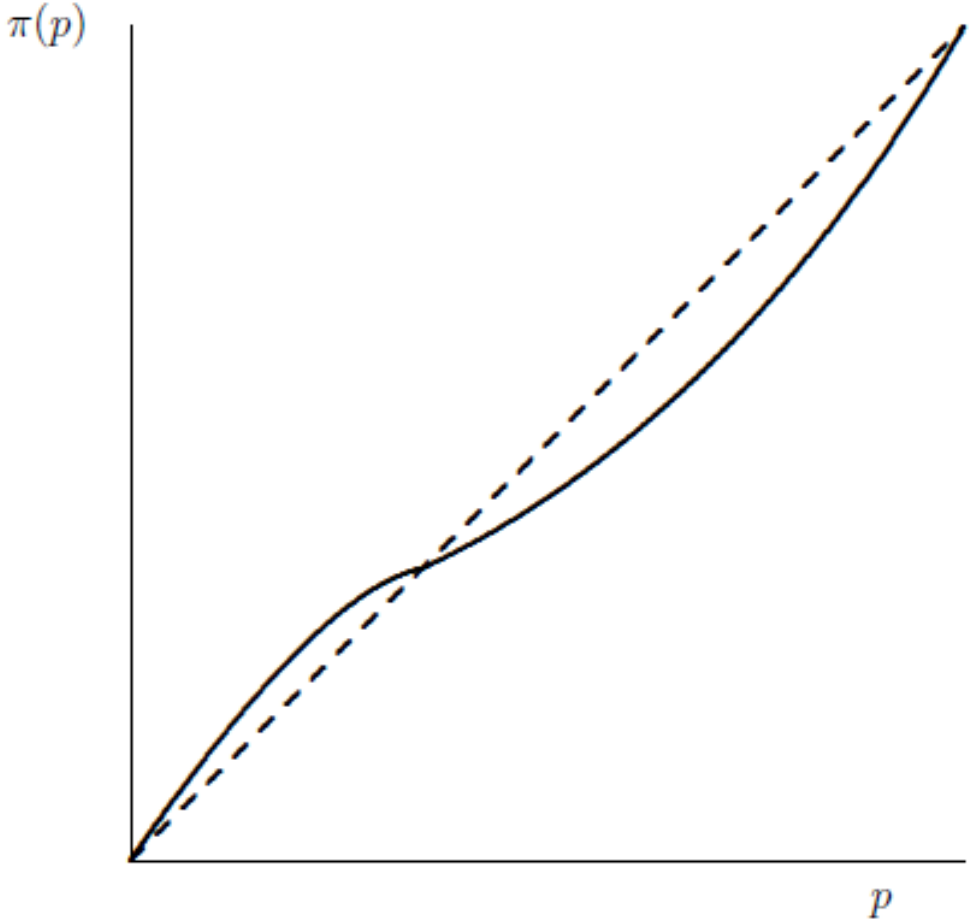
(Kind of boring now…are we done yet?)

- In another published experiment,
  - 72% pick getting $5000 with a 0.001 chance from the first pair
  - 83% pick losing $5 for sure from the second pair

- Wait, isn't people suppose to be risk averse over gain and risk seeking over loss?

Estimated Probability Weightings

Lesson:
People tends overweight small probabilities and underweight large ones.



Prospect Theory

The three components combined,

1. Loss Aversion
2. Risk averse over gain/risk seeking over loss
3. Overweighting small probabilities/underweighting large probabilities

Is called Prospect Theory.

Myopic Investors

- Prospect theory alone is not sufficient to generate the equity premium puzzle
  - Consider the gain/loss utility from 50-year stock return
- For stock return to be volatile, it must be evaluated in a relatively short time frame
  - I.e. myopic investors

Back to Equity Premium Puzzle

- To figure out how much gain/loss utility investors get from investing in stock, we need to know how volatile stock return is
  - We need the distribution of returns from investment in stock
- How to do so?
  - Using realized returns?
  - Estimate by simulation—repeatedly and randomly drawn from realized returns

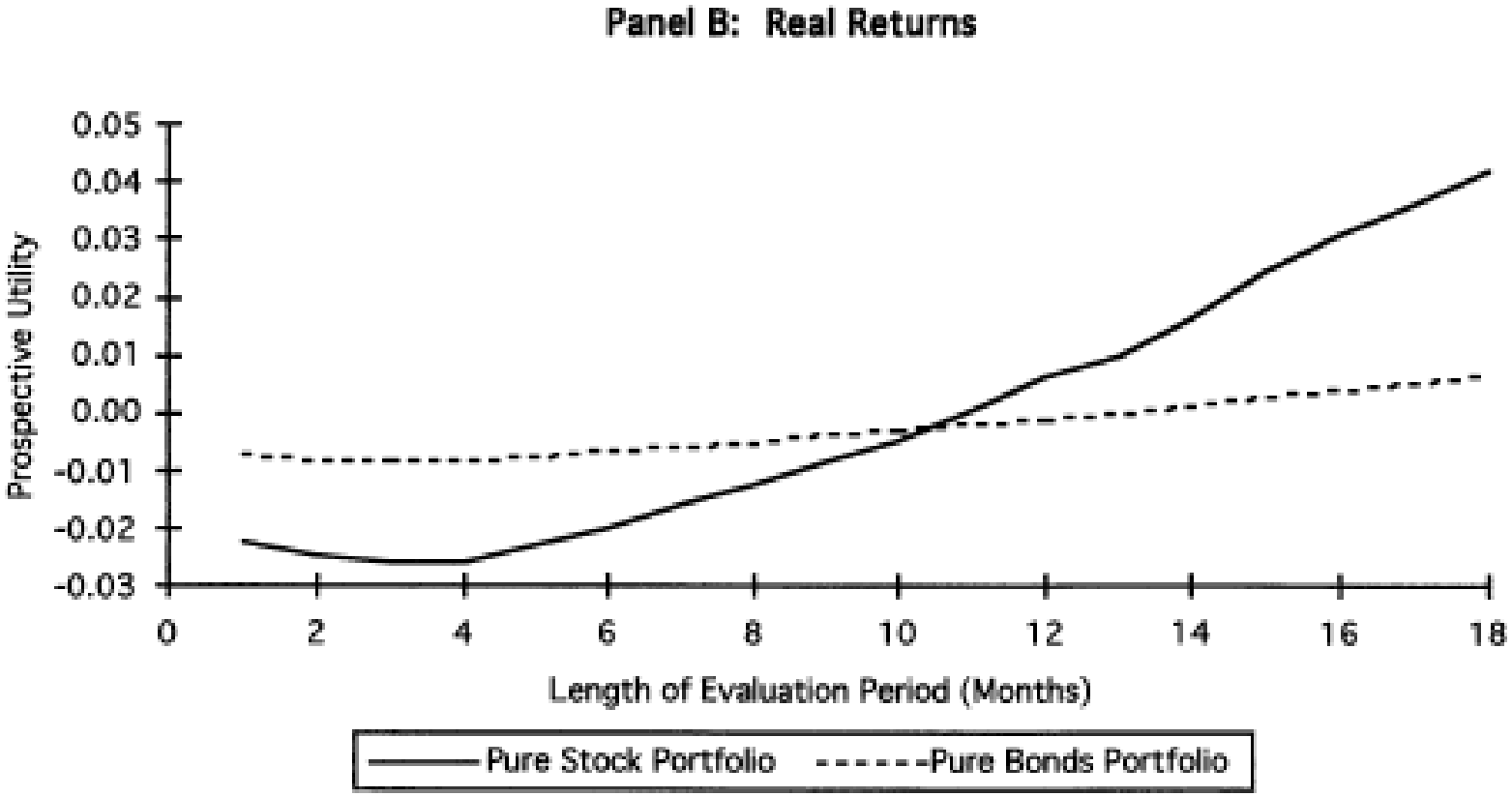
Benartzi and Thaler 1995 QJE

- Benartzi and Thaler. 1995. "Myopic Loss Aversion and the Equity Premium Puzzle", *The Quarterly Journal of Economics*

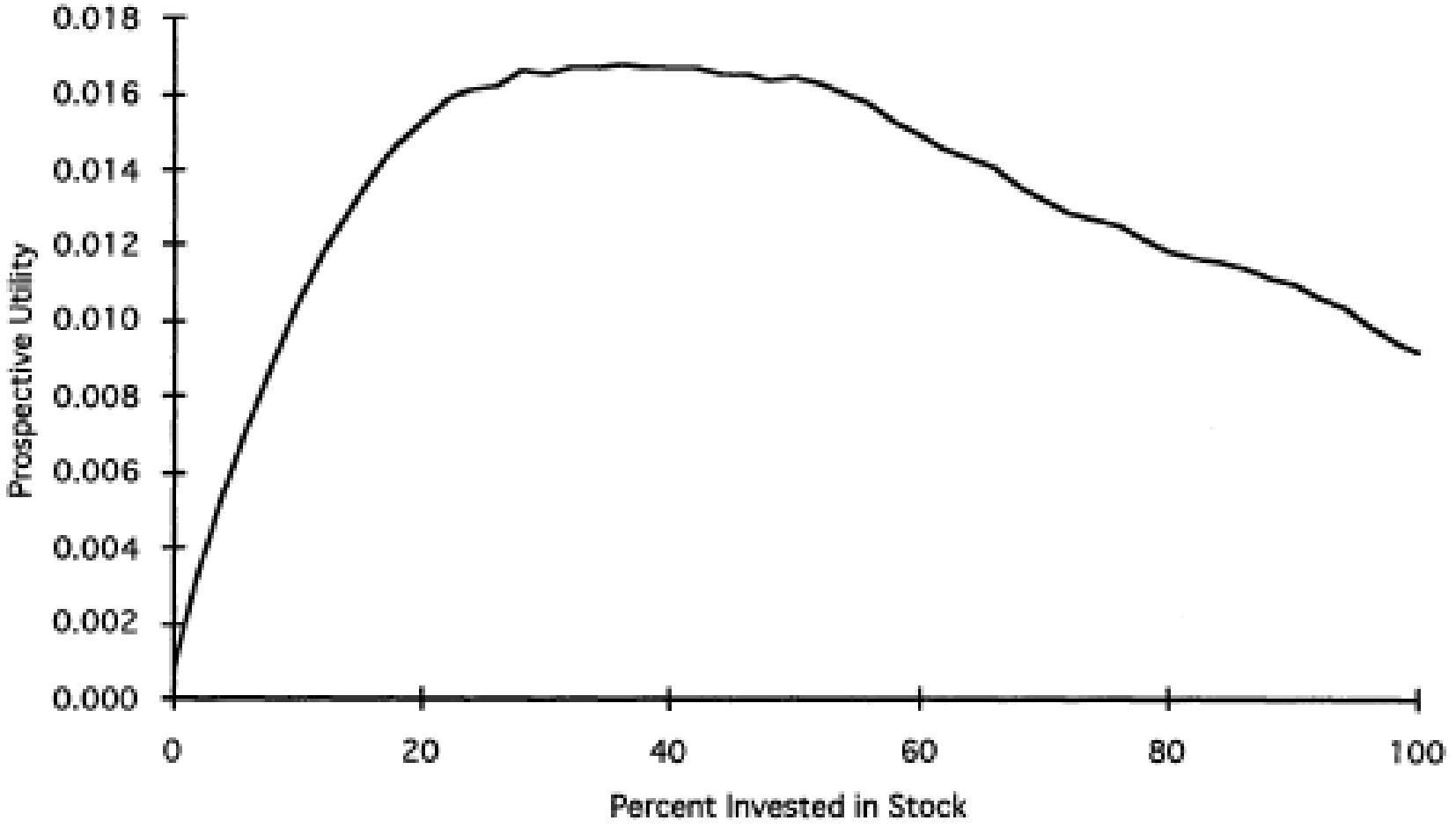
- 100,000 draws for each possible investment length
  - 1 month, 2 months,…
  - Data: CRSP (Center for Research in Security Prices). Used in almost all U.S. equity research

- Calculate the utility a myopic loss-averse investor would get under each investment length
  - The shorter the length, the more risky

Prospective Utility Estimations



Prospective Utility Estimations



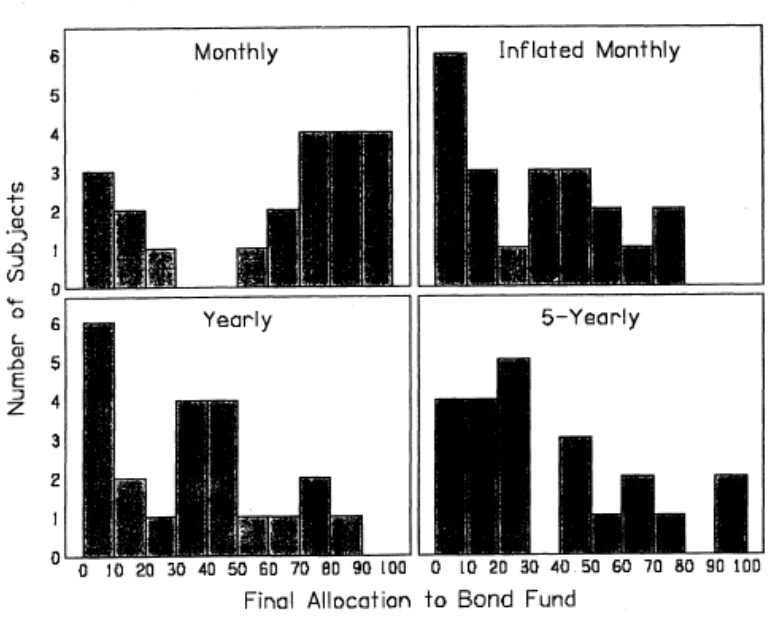
Experimental Studies of MLA and EPP

- Benartzi and Thaler (1995) show that MLA can explain EPP, but this does not mean that MLA is in fact the reason behind EPP

- Want to show that equity premium is larger when investors' evaluation period is shorter (i.e. they get more myopic)
  - Laboratory experiments

Thaler et al 1997 QJE

- Thaler et al. 1997. "The Effect of Myopia and Loss Aversion on Risk Taking: An Experimental Test", *The Quarterly Journal of Economics*
- Experiment subjects allocates their budget across two assets, a "stock" and a "bond"
- Different subjects were required to make investment decisions of different lengths
  - "Monthly", "Yearly" and "5-Yearly"

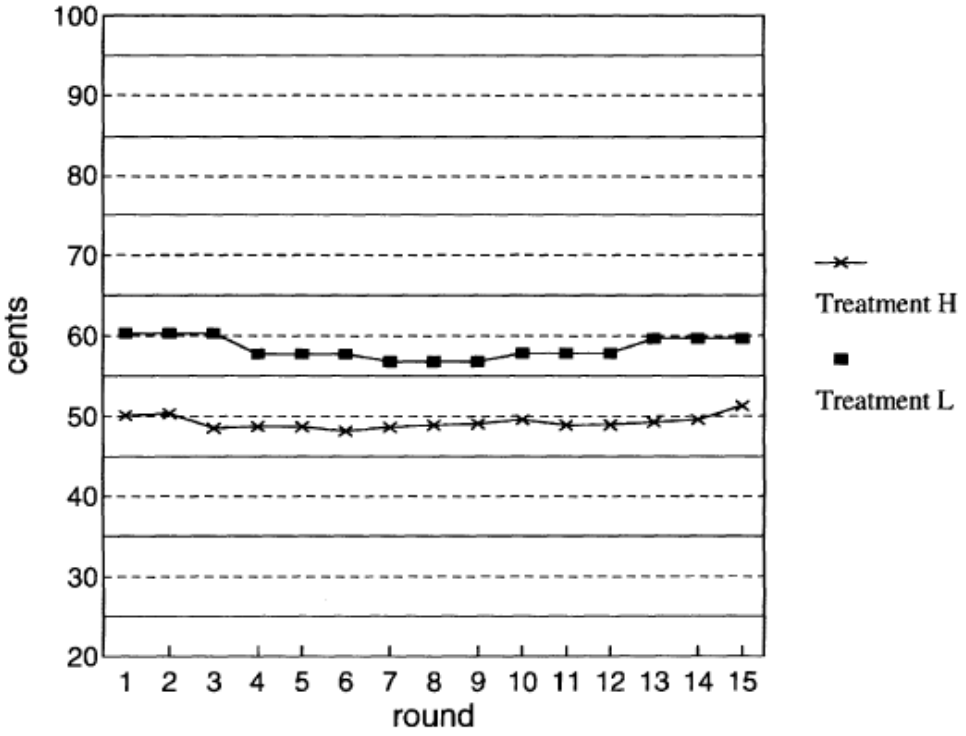


ALLOCATIONS TO BOND FUND

Feedback group	*n*	Percent allocation to bond fund: Mean	*SD*	*SE*
		A. Final decision		
Monthly	21	59.1	35.4	7.73
Yearly	22	30.4[b]	25.9	5.51
Five-yearly	22	33.8[b]	28.5	6.07
Inflated monthly	21	27.6[b]	23.2	5.07

Gneezy et al 2003 JF

- Gneezy et al. 2003. "Evaluation Periods and Asset Prices in a Market Experiment", *The Journal of Finance*
- Experiment subjects trade an asset that pays 150 cents with 1/3 chance and 0 with 2/3 chance
- Different subjects trade at different frequency
  - Treatment H: every round
  - Treatment L: every 3 rounds



Some Other Applications of Ref-Dep.

1. Labor Supply

   Suppose a worker is in the following situation,

   - She can freely choose how many hours she works every day
   - There are frequent temporary changes in her hourly wage.

Labor Supply

What would you expect the worker to do?

e.g. If wage is $5/hr on Day 1 and $10/hr on Day 2

- 8 hrs per day gives $120
- 6 hrs on Day 1 and 9 hrs on Day 2 also gives $120, but one less hour of work

→ Work more on days with higher wage.

Labor Supply

Study on Cab Driver in NYC

- Fixed rent for the cab
- Wage varies frequently because of weather, subway breakdowns, etc.

Finding: Cab driver work fewer hours when wage is high.

Labor Supply

Potential Explanation: Ref-Dep. Preference

- Suppose a cab driver's reference point is her average daily income
- If she works the same number of hours each day, the loss in wage when wage is low is more painful than the pleasant of gain in wage when wage is high.
- So she tends to work more when wage is low, and doesn't necessarily work more when wage is high

Some Applications of Ref-Dep. Preferences

2. Sticky Price

Neoclassical economics assumes prices adjust instantly, but we all know they don't

What could be the reason?

Sticky Prices

Explaining with Ref-Dep. Preference

- Suppose customers' reference point is the current price
- Customers lose more utility from a price hike, compared to the gain in utility from a equal-sized price drop
- So demand is kinked—steeper drop when price goes below the current price

Sticky Prices

Assume our seller is a monopoly

- Remember how to find the monopoly price?
- Conclusion: there is a range of cost around the current cost in which the seller would charge the same price.

What Should the Reference Point be?

Sticky Price: Status Quo

- Very common assumption
- Relatively easy to approximate
- But not necessarily realistic in some cases

What Should the Reference Point be?

Let's say you are selling your old textbook back to the Bookstore, will you see the forgoing of the book as a "loss"?

- Doesn't seem right. After all you expect to sell your book.

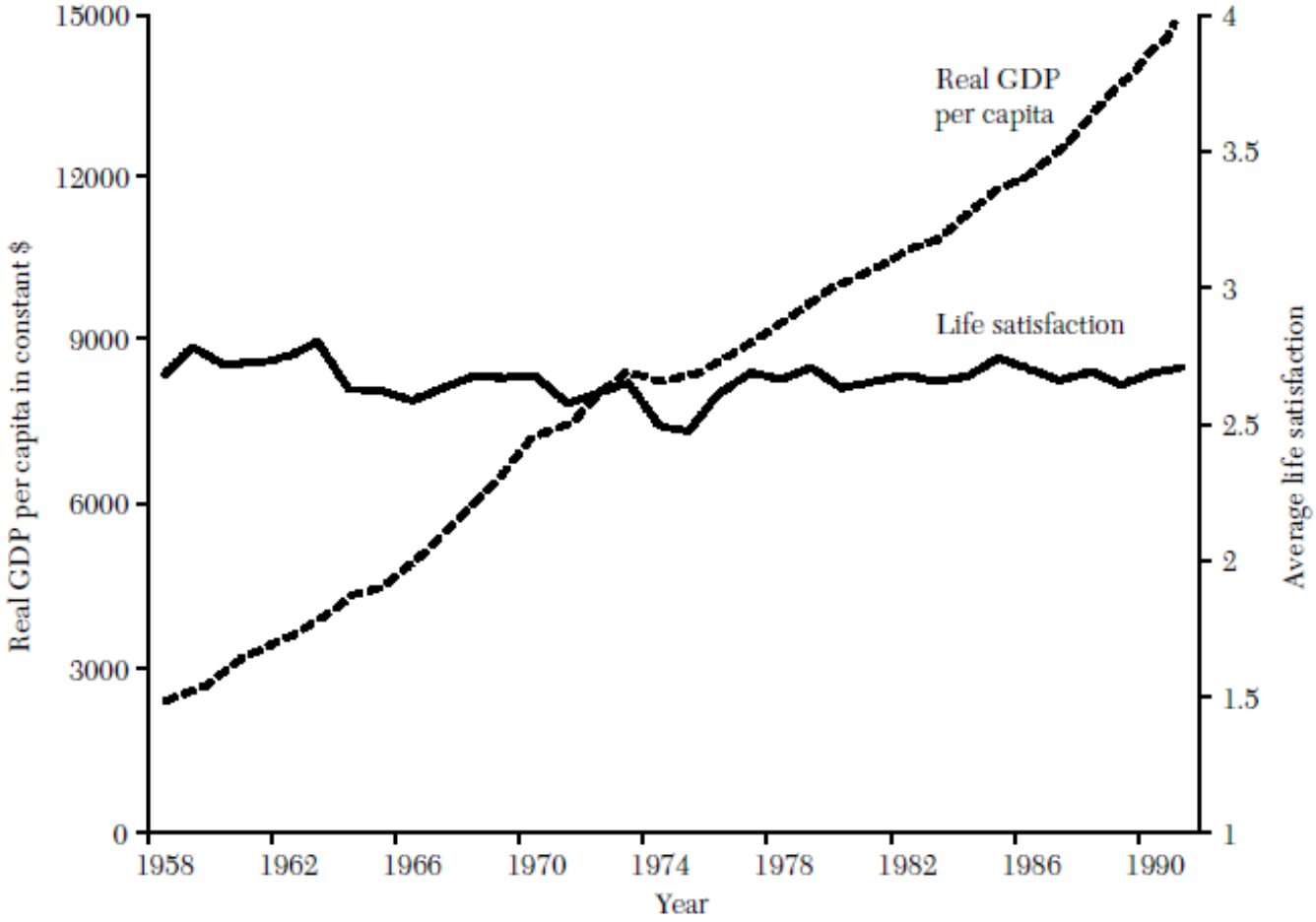
Another candidate: Expectation

Expectation as Reference Point

Suppose you fully expect to be able sell your textbook, but then it turns that you cannot

- You probably feel a loss in not being able to get the money you would have gotten were you able to sell the textbook
- Retaining the book is more like a gain

Happiness Index



Happiness Index

- Are people not getting happier because they come to expect higher income?

- Or are they being so because everyone else is richer also?

"Researchers say I'm not happier for being richer, but do you know how much researchers make?"