Behavioral Finance

Omission Bias

Duke UNIVERSITY

“Irrational” Decision-Making

Now that we have examined some classical economic assumptions about how people *should* behave, let’s explore a variety of theories about how people *do* behave; especially ways in which human behavior consistently and predictably defies the classical economics axioms.

Once you have completed this section, you will understand:

- Why anticipation of future regret, and a preference *not* to act but to let nature take its course, can drive us to make irrational decisions

- Why our risk-taking tendencies can vary considerably, depending on whether our investment portfolio is out-performing or under-performing

- Why Prospect Theory, a utility model proposed by psychologists Kahnemann & Tversky in the 1970s, reflects human behavior far more accurately than the so-called “Rational” model that we looked at earlier.

Regret Theory

A flu epidemic has hit your community. This flu can be fatal for children under the age of three. The probability of a child getting the flu is 1 in 10, and 1 in 100 children who get the flu will die from it. This means that, statistically speaking, 10 out of each 10,000 children in your community will die.

A vaccine for this type of flu has been developed and tested. The vaccine eliminates any chance of getting the flu. The vaccine, however, has potentially fatal side effects. Suppose that the vaccine has a 0.05% fatality rate; that is, the vaccine itself is fatal in 5 out of every 10,000 cases. You have a two-year old daughter. Will you choose to vaccinate her?

Please decide for yourself before moving on.

Regret Theory & Omission Bias

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Many people respond NO to this question, despite the fact that the child has a better survival rate *with* the vaccine than without it.

- Regret Theory posits that we make some decisions in response to the extent of our *anticipated regret* if the decision subsequently goes against us.

- Anticipated regret may be intensified by Omission Bias: we would prefer not to be the *active agent* of our child becoming fatally ill.

  - If she becomes ill from the vaccine, we blame ourselves because we gave it to her
  - If she simply catches the disease in the community, the disease can be blamed on an “act of God”

Omission Bias Case Study

See the Lecture: Omission Bias Case Study

FIRST LAW OF ROBOTICS
"A robot may not harm a human being, or, through inaction, allow a human being to come to harm."

Isaac Asimov's robots are programmed to believe that action (harming a human) and inaction (allowing one to come to harm) are equivalent evils. We humans, however, tend to view a negative *action* as far worse.

Omission Bias Case Study

(1) If you were a parent in the 1950s, which version of the vaccine would you prefer your child to receive:

   (a) The Salk vaccine that occasionally *fails to protect* your child against contracting polio in the community, or

   (b) the Sabin vaccine that, in even more occasional circumstances, *gives* your child polio?

(2) How might your answer change depending on how many other families in your community are giving their children one or other vaccine?

(3) Do you know the technical term for the benefit unwittingly provided by earlier generations of children on the current generation, because they were given the Sabin rather than the Salk vaccine?

Omission Bias Case Study

(1) If you were a parent in the 1950s, which version of the vaccine would you prefer your child to receive:

   (a) The Salk vaccine that occasionally *fails to protect* your child against contracting polio in the community, or
   (b) the Sabin vaccine that, in even more occasional circumstances, *gives* your child polio?

Omission bias suggests that parents might have preferred the inactive Salk version that occasionally fails to protect, rather than the active Sabin which causes the disease in even more rare cases

(2) How might your answer change depending on how many other families in your community are giving their children one or other vaccine?

The more children receiving the *active* vaccine, the less likely that your child could catch polio in the community, and thus the safer you will feel with the *in*active version

(3) What is the technical term for the benefit unwittingly provided by earlier generations of children on the current generation, because they were given the Sabin rather than the Salk vaccine?

Herd Immunity

Omission Bias & Herd Immunity

Current regulations in many western communities ensure that herd immunity is maintained by requiring all children to be inoculated against certain infectious diseases prior to attending kindergarten (e.g. measles, mumps, rubella, pertussis, TB)

Each vaccination carries a very low level of risk (lower than the risk of detrimental effect from the disease itself)

Thus, these days parents therefore have a perverse incentive *not* to inoculate their children, provided they can be sure that all *other* children *are* inoculated.

Do you know what we call this incentive?

Omission Bias & Herd Immunity

The incentive for parents to refrain from giving their child a vaccine that carries a tiny medical risk, knowing that their child will not catch the disease in the community because all the other children have been inoculated, is called Free Riding

Further evidence for Omission Bias may be found in the history of litigation against vaccine manufacturers:

- We are inclined to hold vaccine manufacturers responsible for any harmful effects of the vaccine itself, but *not* if the vaccine fails to protect against the disease.

- In 1987, for example, the pharmaceutical company Lederle set aside 70% of the price of its Sabin (active) polio vaccine as a reserve against law suits.

- No vaccine manufacturer has ever been sued for failure to *prevent* the disease with the Salk (*in*active) version.

Regret Theory

For many years, for so long, in fact, that he practically forgot that he had them, Mr. Duke has owned $20,000 worth of shares in a certain company. One day he remembers them, and considers whether it's worth hanging on to them or whether he should sell them. He notes that they have exactly maintained their value over the years, so he decides to keep them – that is, to do nothing.

A few months later, the company unexpectedly fails and his shares are no longer worth anything. Mr. Duke realizes that he has lost $20,000.

His friend Mr. Brown has also owned shares worth $20,000 in a company; and he, too, had almost forgotten that he possessed them. One day, he remembers the shares and considers whether to keep or sell them. He notes that they have maintained their value throughout the years, so he decides to get rid of them and invest in a company that promises a greater return. A few months later, the company whose shares he had sold unexpectedly markets a new product and the value of that company's shares doubles. Mr. Brown realizes that he has $20,000 less than he might have had, if he had not sold the shares that he had owned for so many years.

Both men started in the same position, and both came to the same conclusion ($20,000 less than they might have had) but the two men feel different levels of regret. Who feels *more* regret?

Please make a note of your answer

More on Risk Aversion

Please choose between Option A ($50 for certain) and Option B (an equally weighted gamble of either $100 or $0). Which do you prefer?

Option A

$50	For certain

Option B: flip a coin

$0	If heads
$100	If tails

Please choose between A & B

What happens if we increase the stakes a little?

Option D

$500	For certain

Option D: flip a coin

$0	If heads
$1,000	If tails

Please choose between C & D

More on Risk Aversion

Which did you choose between A & B? On average, the majority of respondents select A, choosing the sure $50 in favor of the gamble which has the same expected value but is risky.

People who select B are being risk-"seeking" rather than risk averse. If you selected B, it may be that you simply take pleasure* in the occasional gamble, provided the stakes are low enough that you won't feel inordinate regret if you end up with $0.

Between C & D, the vast majority of people prefer C, the sure thing. The enjoyment of a gamble is typically not strong enough to offset the desire to walk away with a sure $500, and the anticipated regret if you choose D but the coin flip goes against you.

For reasonable sized gambles, most of us are indeed risk averse where financial gains are concerned.

*Economists sometimes call this additional, non-pecuniary reward for gambling "psychic utility", and thus explain how choosing the gamble is still theoretically consistent with risk-aversion.

Risk-Seeking Behavior

Now suppose that you have been kidnapped. Your (rather unusual) kidnapper tells you that you can choose between the following two options to obtain your freedom. (Assume that you have sufficient financial resources to make good on your agreement in either case):

Option A

Pay the kidnapper $500

Option B

Toss a fair coin

- Pay $0 if Heads
- Pay $1,000 if Tails

Risk-Seeking Behavior

Suppose you have been kidnapped, and your kidnapper tells you that you can choose between the following two Options to obtain your freedom:

Option A	*Option B*
Pay the kidnapper $500	Toss a fair coin • Pay $0 if Heads • Pay $1,000 if Tails

Did you pick A or B? If you selected B, your choice is consistent with the vast majority of respondents to this and other similar gambles where *losses* (rather than gains) are concerned.

The simple fact is that, when we are looking at a decision in a LOSS frame, we almost always become risk-*seekers*, rather than selecting options consistent with risk aversion.

This Risk Seeking over Losses is such a strong and consistent human behavior pattern that it is extraordinary that classical economics models simply ignore it, and assume that risk aversion always holds.

Now let's examine another robust human tendency that is completely ignored in "standard" economics…

Loss Aversion

Here's a different type of game. In this situation, you aren't choosing between gambles with different levels of risk – you are choosing whether to play the game at all.

In this game, you toss a fair coin: if it lands Heads, you *win* $2,000; but if it lands Tails, you *lose* $1,000. Would you like to play this game? If you DO choose to play, you may play it only *once*.

Would you like to play this game?

WIN $2,000	If heads
LOSE $1,000	If tails

Do you want to play this game?

Loss Aversion

Would you like to play this game (just once)?

WIN $2,000	If heads
LOSE $1,000	If tails

Do you want to play this game?

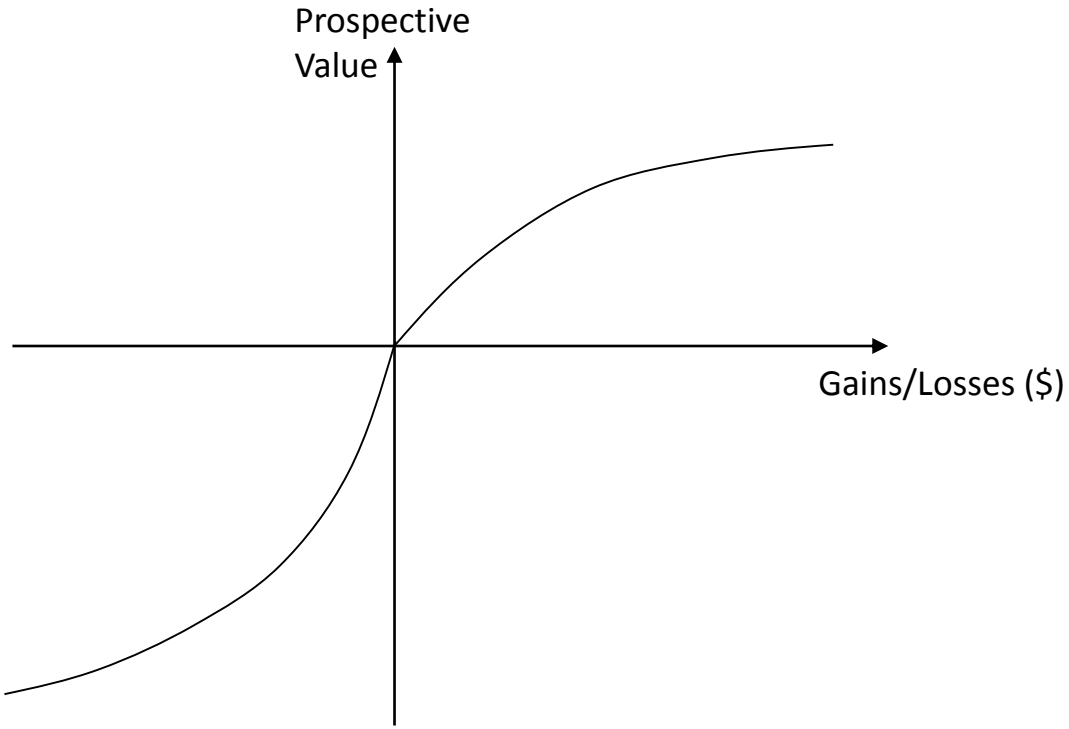
The *expected value* of this game is clearly positive:

½ * $2,000 – ½ * $1,000 = $500

Nonetheless, many people say they would prefer not to play this game at all. This reflects Loss Aversion: our negative response to *losses* is greater than our positive feelings about gains; even if the size of the gain is greater than the size of the loss.

The sense that Losses loom larger than Gains is another persistent emotional response pattern that is completely ignored by classical economics.

Prospect Theory



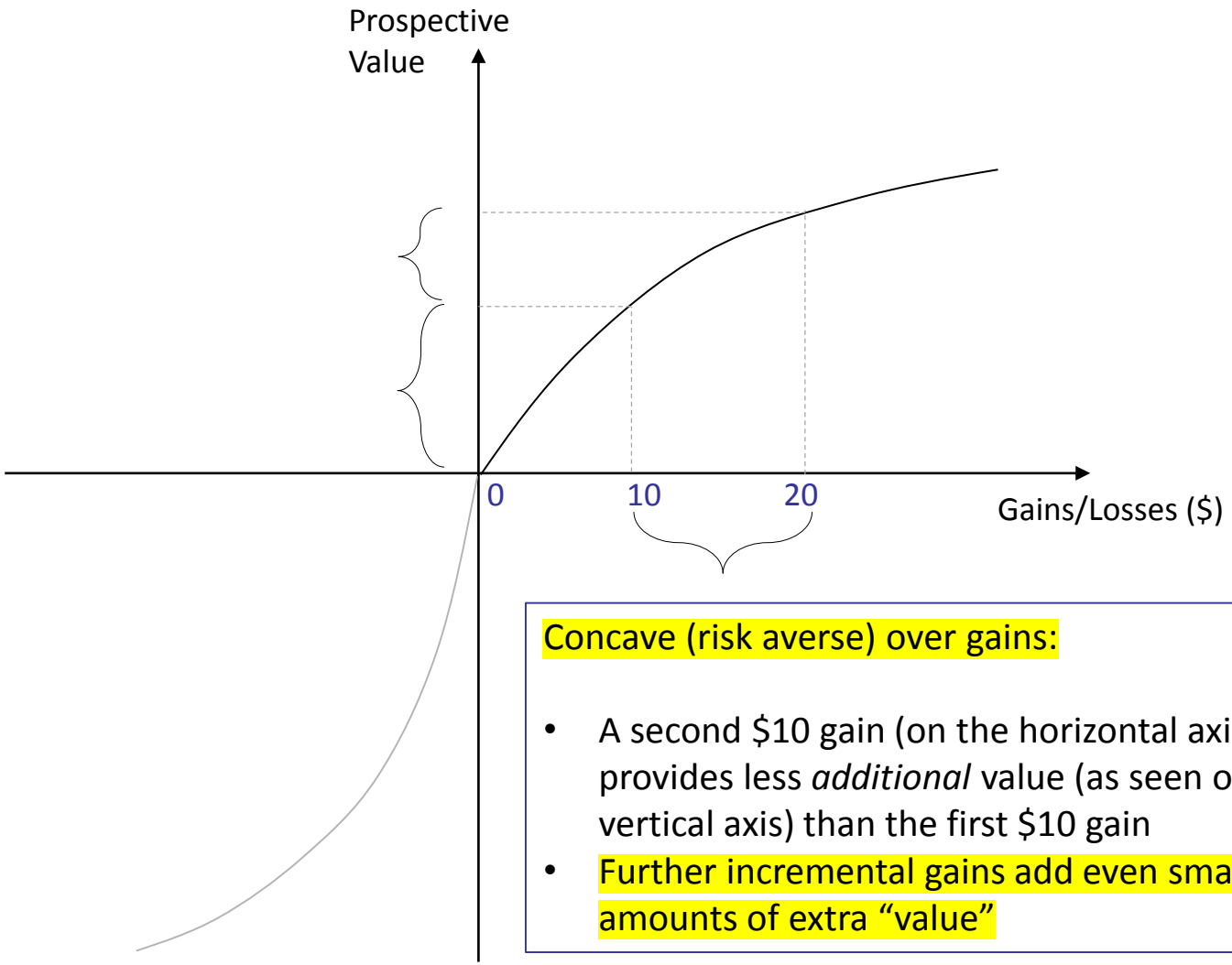
We will use the "Prospect Theory"* utility function as a more realistic model of how we respond to gains and losses:

- risk aversion over gains (just like expected utility)
- risk *seeking* over losses (*unlike* expected utility)
- loss aversion (*unlike* expected utility)

*Proposed by psychologists Daniel Kahnemann & Amos Tversky in the 1970s
Provides insights on human behavior that are not reflected in expected utility theory

Prospect Theory

Risk Averse over Gains



Concave (risk averse) over gains:

- A second $10 gain (on the horizontal axis) provides less *additional* value (as seen on the vertical axis) than the first $10 gain
- Further incremental gains add even smaller amounts of extra "value"

Note: graph is not precisely to scale

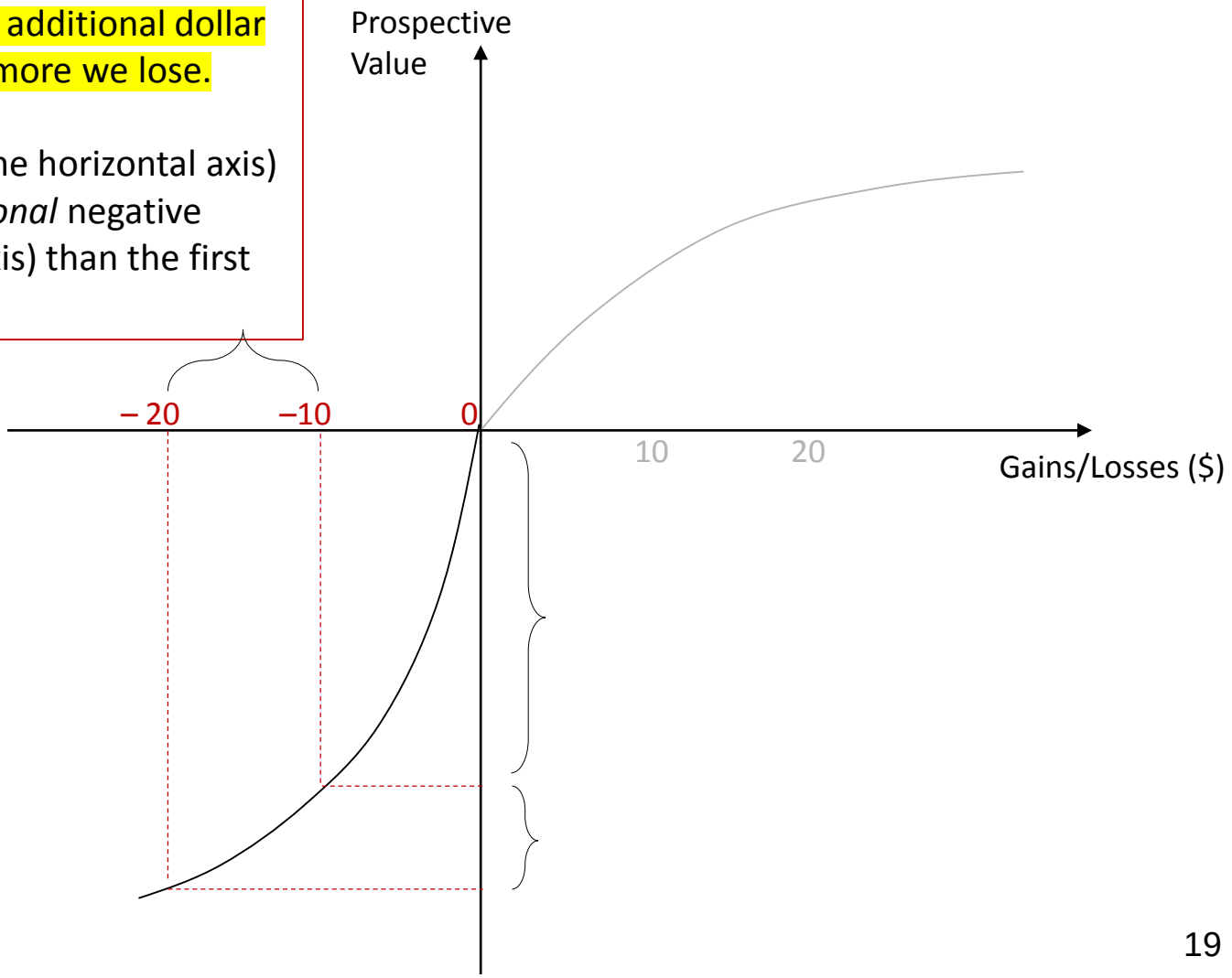
Prospect Theory

Risk Seeking over Losses

Convex (risk *seeking*) over losses:

The *incremental* pain of additional dollar losses gets smaller the more we lose.

A second $10 loss (on the horizontal axis) translates to less *additional* negative value (on the vertical axis) than the first $10 loss.



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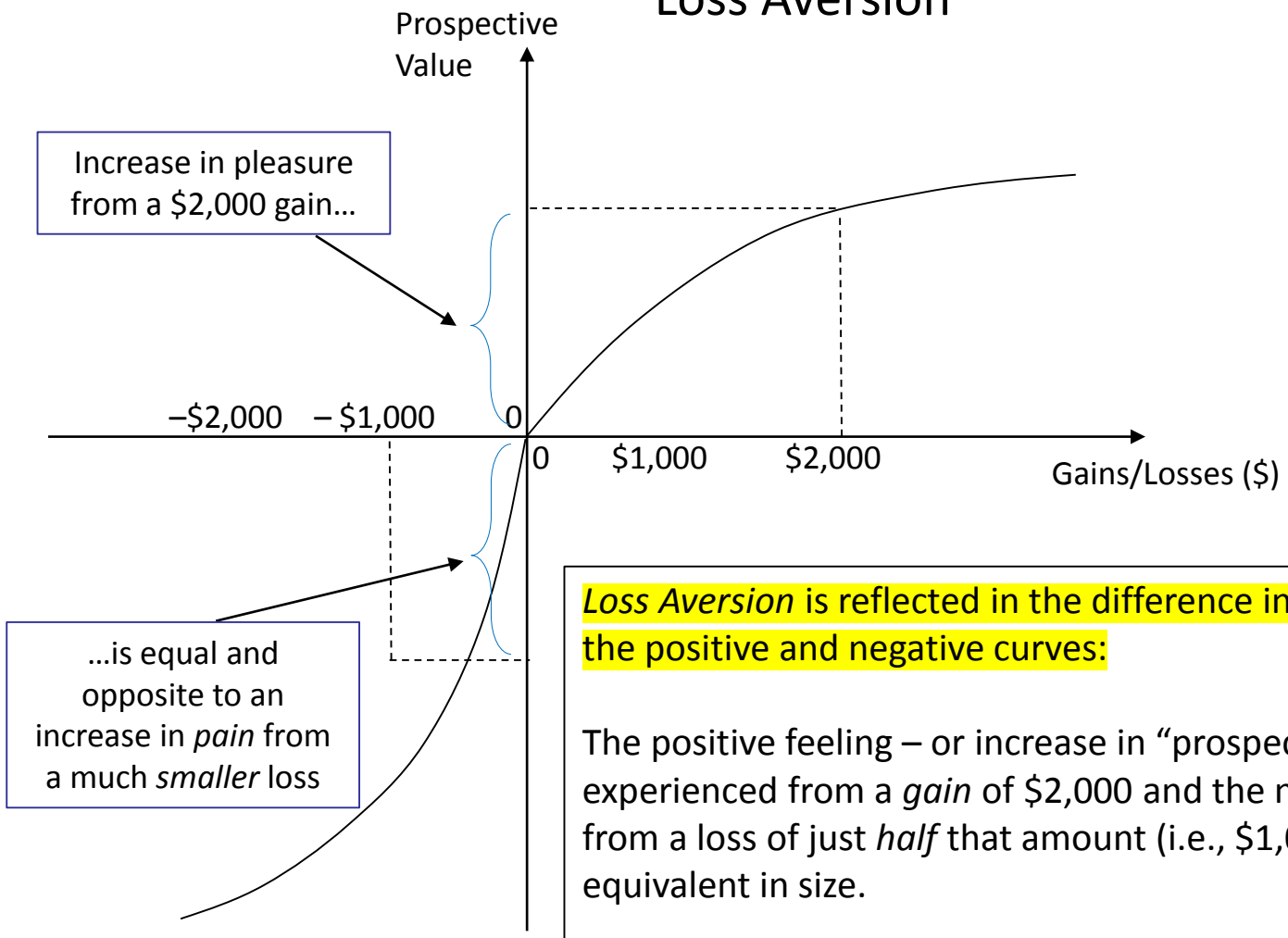
Prospect Theory

Loss Aversion



Loss Aversion is reflected in the difference in the *slopes* of the positive and negative curves:

The positive feeling – or increase in "prospective value" – experienced from a *gain* of $2,000 and the negative feeling from a loss of just *half* that amount (i.e., $1,000), are equivalent in size.

Equivalently, we can say that we feel greater pain from a loss than we feel pleasure for an equal-sized gain

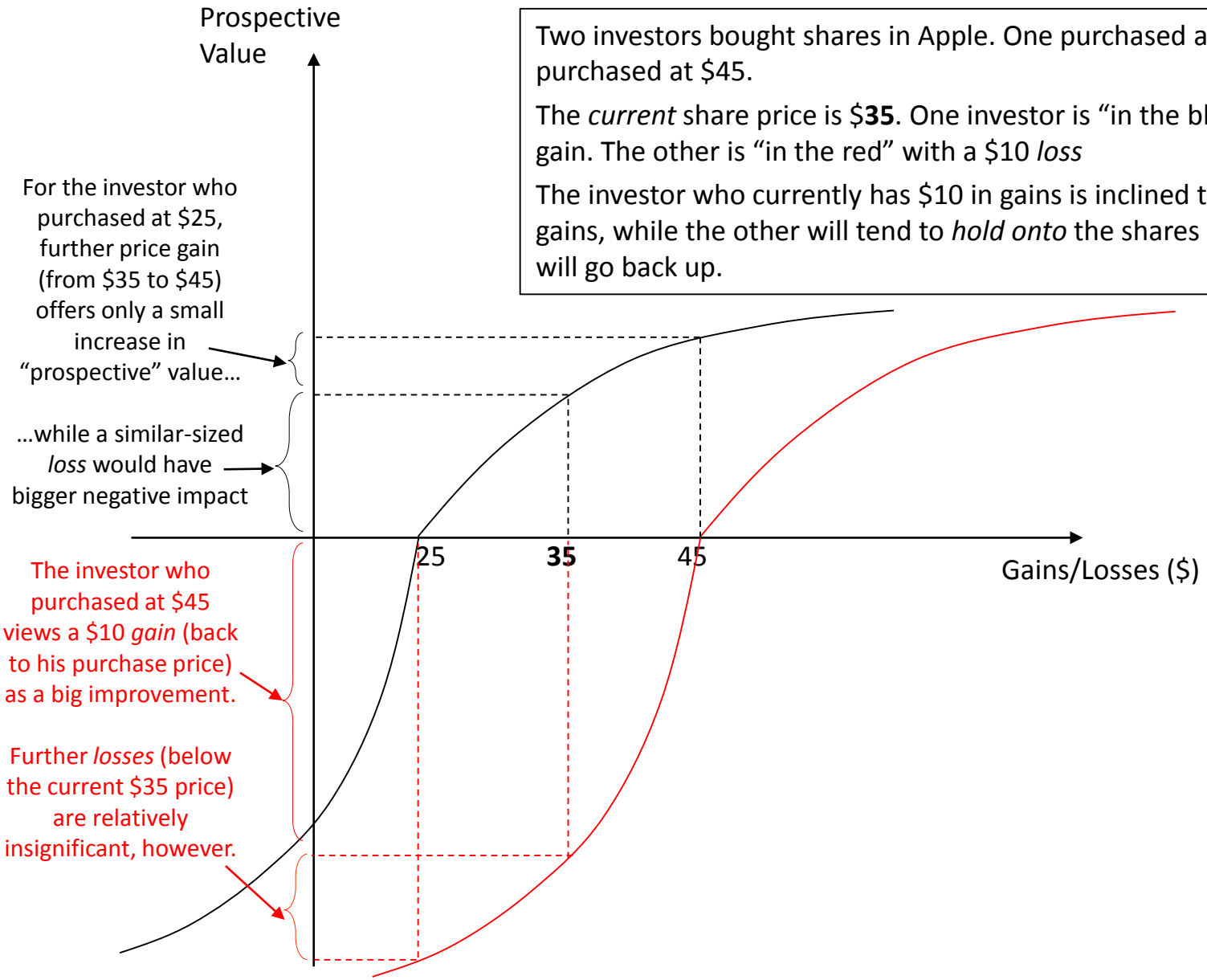
Prospect Theory

Reference Points

Two investors bought shares in Apple. One purchased at $25, the other purchased at $45.

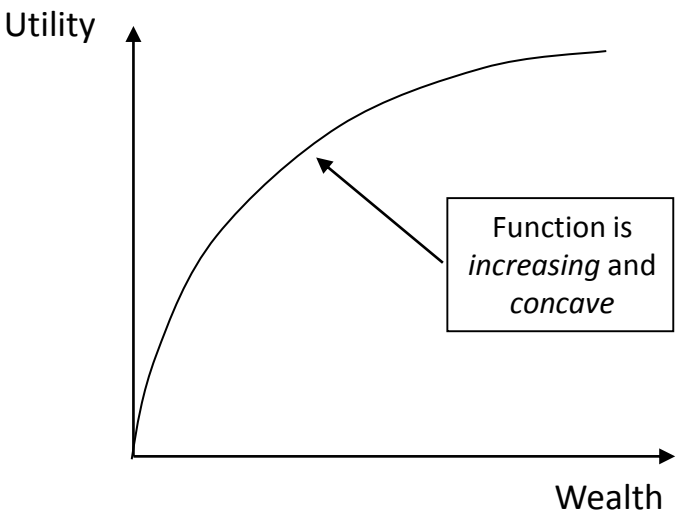
The *current* share price is $**35**. One investor is "in the black", showing $10 gain. The other is "in the red" with a $10 *loss*

The investor who currently has $10 in gains is inclined to *sell* to realize these gains, while the other will tend to *hold onto* the shares in the hope that they will go back up.



Expected Utility (EU) versus Prospect Theory (PT)

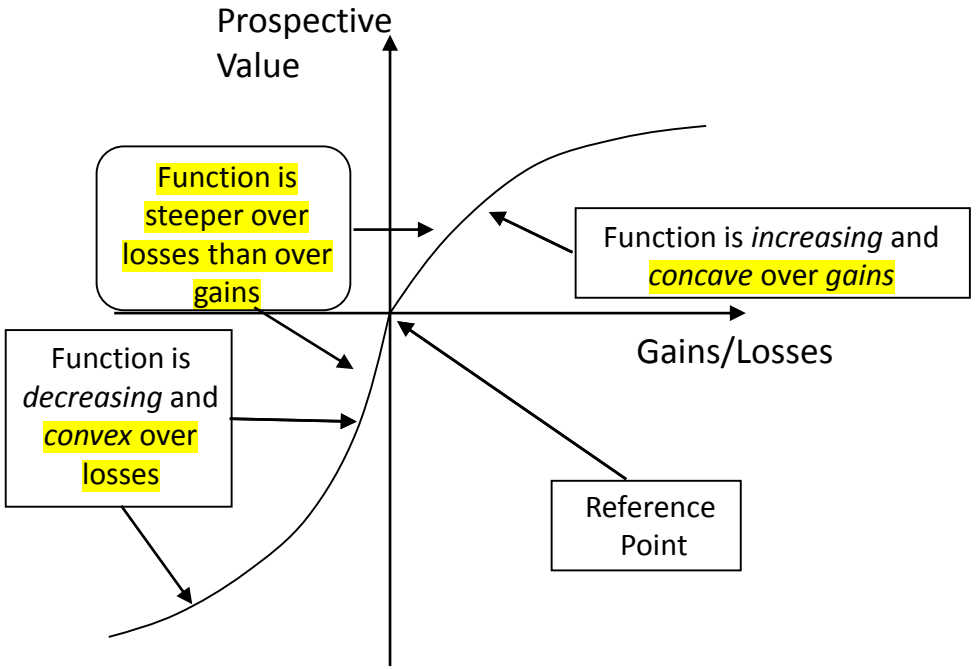
Expected Utility Theory



- Utility is measured as a function of absolute wealth
- Marginal (incremental) utility decreases as wealth increases (risk aversion)

See the Lecture: Expected Utility vs. Prospect Theory

Prospect Theory

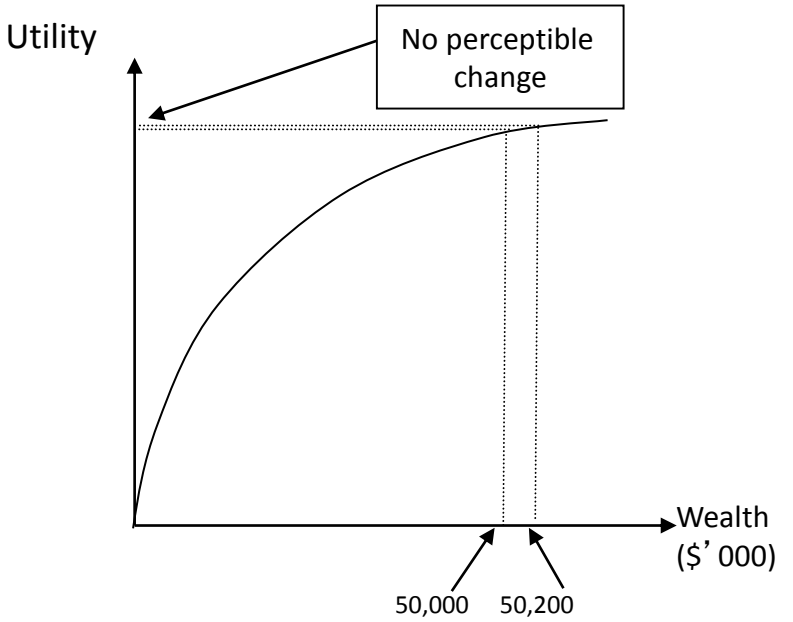


- Value is measured over gains and losses relative to a reference point
- Marginal (incremental) value decreases over gains but increases over losses (risk aversion for gains, risk seeking for losses)
- Value function is steeper over losses than over gains (loss aversion)

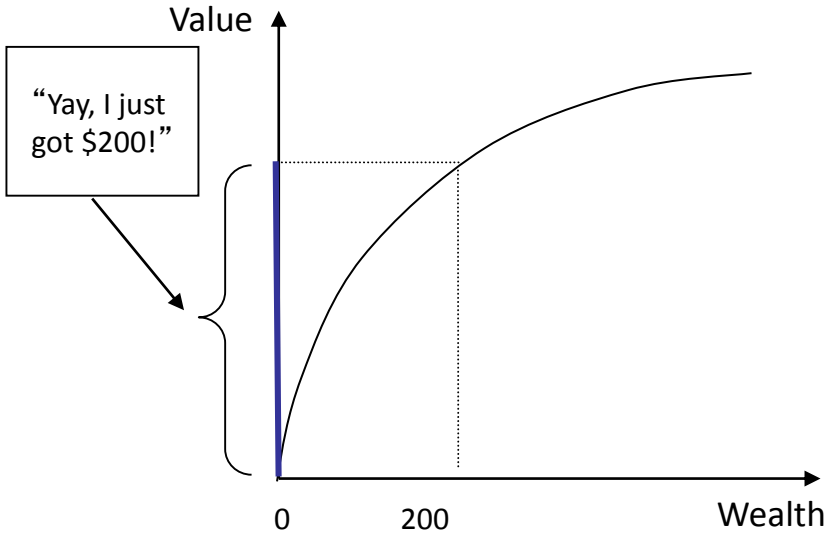
Gains and Losses vs Absolute Wealth

Classical economics assumes that people treat increases as an increment to their existing total wealth, and perceive an appropriate utility gain on that basis.

So a $200 gain, for someone with a net worth of $50,000, would have negligible impact on their happiness



A more realistic interpretation would be that someone with a net worth of $50,000 doesn't think about the $200 as a 0.4% increase, but simply as $200 that they didn't have 5 minutes ago…



Prospect Theory & the Disposition Effect

In Game 1, you are given $30,000. It's yours to keep. Then you are asked to choose between the following two possibilities:

(A) Receive an additional $10,000 for sure
(B) Toss a coin: if it comes up Heads, you get an additional $20,000; if tails, you get nothing.

Which option do you prefer: (A) or (B)?

In a completely separate Game 2 (i.e., you should not think of these as sequential games), you are given $50,000; again, yours to keep. Then you are asked to choose between the following two possibilities:

(C) A guaranteed *loss* of $10,000
(D) Toss a coin: if it comes up heads, you lose $20,000; if tails, you lose nothing.

Now which option do you prefer: (C) or (D)?

Disposition Effect

Game 1: you are given $30,000. It's yours to keep. Then you are asked to choose between the following two possibilities:

(A) Receive an additional $10,000 for sure
(B) Toss a coin: if it comes up Heads, you get an additional $20,000; if tails, you get nothing.

Game 2: you are given $50,000. Then you are asked to choose between the following two possibilities:

(C) A guaranteed *loss* of $10,000
(D) Toss a coin: if it comes up heads, you lose $20,000; if tails, you lose nothing.

If you picked (A) in the first game, and (D) in the second, you are in very good company: this pair is the most commonly selected combination

Note, however, that the outcomes in the combination (A) and (C) are identical: in both cases, you walk away $40,000 richer.

Similarly, (B) and (D) are identical: together, they generate a 50% chance of either $30,000 or $50,000.

This preference "switch" is known as the **Disposition Effect**. Why do so many people "flip" their preferences? If they selected (A) in Game 1, why not stick with (C) (which has identical outcomes in all scenarios) in Game 2?

The Disposition Effect and Investing

The Disposition Effect is the tendency for individuals to be risk averse over gains, but risk seeking over losses.

- In the context of investing, this means we are inclined to *sell* our winning investments, but *hold onto* investments that are falling in value.
- When investing in the financial markets, we should try to reverse both of these tendencies

1. We should *Run Gains*
   - Over the long run, risky investments go up on average
   - Hence we should *run gains*, not sell them to convert the gains into cash

2. We should *Cut Losses*
   - We are inclined to hold onto losing positions, in the hope that the price will go back to where we purchased it and we can sell without realizing the loss
   - But there is nothing special about the price at which you personally purchased the position (stock prices have no "memory"); so clearly it's irrational to use your (arbitrary) purchase price as a level at which to sell
   - Furthermore, if you need to liquidate some risky positions to obtain cash, it is better for tax purposes to sell losers (or a combination of winners and losers) to prevent paying capital gains tax. Uncle Sam will subsidize your loss!

How to avoid “Risk Seeking over Losses”

“Many clients…will not sell anything at a loss. They don’t want to give up the hope of making money on a particular investment, or perhaps they want to get even before they get out. The “get-evenitis” disease has probably wrought more destruction on investment portfolios than anything else…”

* * * *

“When you suggest that the client close at a loss…The words that I consider to have magical power in the sense that they make for a more easy acceptance of the loss are these: ‘Transfer your assets.’ ”

Quote from Leroy Gross (1982), The Art of Selling Intangibles (A manual for stockbrokers)