

Ops Notes: Thinking, Fast and Slow

Daniel Kahneman's [*Thinking, Fast and Slow*](#) is one of the best books on how the human mind really works. His findings show that human beings are constantly making cognitive mistakes and incorrectly interpreting reality. Our brains have evolved to be highly efficient at certain tasks while also highly prone to errors in others.

Kahneman explores the world of biases, heuristics, and other mental gymnastics we instinctively employ to package our complex world into something simple, consumable, and oftentimes flat out *wrong*.

Understanding Kahneman's research is vital to becoming an effective market operator. It'll also help you improve your thinking in every other area of life.

The Economist called the book "Profound" and said "As Copernicus removed the Earth from the centre of the universe and Darwin knocked humans off their biological perch, Mr. Kahneman has shown that we are not the paragons of reason we assume ourselves to be."

That sums it up well.

And with that, here's the complete breakdown of this fantastic book that explores the inner-workings of the human mind.

Key Takeaways

- Humans use two cognitive systems when thinking — "System 1" and "System 2"
- "System 1" is our default mode of thinking. It operates automatically and is quite efficient in making quick judgements based on heuristics and pattern recognition.
- "System 2" is our rational brain. It requires more conscious effort to use.
- System 1 and 2 interact and affect one another continuously, but not always effectively.
- Because humans like to "know" and abhor "not knowing", we're instinctively drawn to oversimplified narratives to describe a complex reality. These narratives are often wrong.
- We seek cause and effect relationships to explain complex random events where the cause can't be known.
- We tend to overweight the importance of our own experiences and consider rare events likely and likely events rare.

- A number of cognitive tendencies such as the “[endowment effect](#)” and “[loss aversion](#)” make us terrible at evaluating risk and estimating value.
- We tend to assess the importance of issues by the ease at which they’re retrieved from memory. This is largely influenced by the media and our environment.
- Conclusion: We’re horrible at understanding a complex reality. Many of the things we think we know are false and based off faulty logic. Simply put, we instinctively practice shoddy thinking. But this can be improved through awareness of our biases and conscious effort to overcome them.

The Two Systems

Our brains are controlled by two cognitive characters, a “System 1” and “System 2”. System 1 operates automatically. It’s the process at work while we’re driving, eating, walking, talking on the phone, etc. System 2 is our rational mind. It operates more cautiously and doesn’t trigger automatically. It thinks deeply about things and tries to prevent System 1 from jumping to conclusions. The actions performed by System 1 are involuntary and can’t be turned off. It uses a toolbox of heuristics and biases to operate. System 2 evaluates these tools. These systems provide continuous feedback to one another and sometimes override each other.

- System 2 requires attention and focus. It’s associated with the experience of agency, decision making, and concentration. System 2 is disrupted when attention is drawn away from the task at hand.
- System 1 is quick and automatic and doesn’t take any effort or voluntary control to operate.
- System 2 can change System 1 through conscious effort that alters the automatic functions of memory and focus.
- System 2 thinking generally takes over when System 1 is confronted with difficult tasks/problems that it can’t solve.
 - System 2 has the final word in major decision making.
 - System 2 is in charge of self-control. One of its primary functions is to overcome the detrimental impulses of System 1.
 - System 2 is too slow and inefficient to completely take over for System 1. The best we can hope for is to improve System 2’s cognitive functioning. This will help it recognize when System 1 makes mistakes and thereby improve System 1’s processes.

Development and Characteristics

Our cognitive functions evolved in an environment where having the ability to rapidly orientate and respond to threats vastly boosted our odds of survival. It's under this setting that the fast-responding System 1 developed.

- Our physiology and cognitive functioning naturally adheres to the laws of the economy of action (law of least effort). In this law, effort is a cost. The acquisition of new skills is a cost and is instinctively weighed against its benefits.
- Laziness in thought and action is our default. Doing the minimum necessary to survive is our base. Our body and mind instinctively resist any action or thinking that goes beyond this necessary base.
 - We're able to choose our actions, but we have little control over the effort we apply to them. Effort is determined by the necessity of the task at hand.
 - Multitasking has a high cost and leads to predominantly System 1 superficial thinking.
- System 2 is the only one that can set and follow rules and make deliberate thoughtful choices. Importantly, it can also program the mind to follow instructions that override our habitual responses.

Here's an example of the law of least effort at work:

A bat and ball cost \$1.10 total. The bat costs one dollar more than the ball. How much does the ball cost?

What's your answer?

You probably answered ten cents. That's the answer most people quickly respond with. But if you do the math, you can see that's wrong. The answer is five cents.

The reason so many get this basic math question wrong is because of System 1. Calling on System 2 takes energy and the brain doesn't want to use it if it doesn't have to. If the problem/task seems easy enough, then the brain will just go with its gut: System 1. But in this case, the law of least effort and System 1 produced the wrong answer.

It's been shown that consciously practicing System 2 thinking and not always accepting our System 1 response can improve our overall intelligence. Doing so also improves the efficacy of System 1 responses.

The Associative Pattern Machine

System 1 likes to find repeating patterns to help it cope and process reality. When dealing with two discrete facts, it assumes they're connected. The ideas we hold create nodes in a large cognitive network called associative memory. This network links causes to effects and objects to their properties and categories.

Many times initial data points in a set will color our future judgement. Because of our need to find patterns, our brains think a set of data points are more intimately related than they actually are. For example, when looking at a company's latest earnings, if the first data point we see paints a rosy picture that excites us, then we become cognitively primed to look for other reinforcing data. We also subconsciously dismiss data that doesn't confirm our initial cognitive response.

This is a form of priming which is a powerful subconscious cognitive function that affects not only the way we think, but also the way we act.

For example, what do you think of when you see SO_P. Probably not much, but what if you first see the word "EAT". Now when you look at SO_P, you'll probably complete it as "SOUP". But what if instead of "EAT", you first saw the word "SHOWER". Then you'd probably complete the word as SOAP.

The influence of priming over our thoughts and actions is powerful. One study primed participants with words associated with the elderly such as "wrinkled" and "Florida". Researchers then found that participants walked slower and acted older following the study.

The 3 Biases:

1. **Confirmation Bias:** The common cognitive misconception that our opinions are the result of a lifetime of rational objective analysis. The *truth* is that our opinions are the result of a lifetime of paying attention to things that confirm our initial beliefs, while ignoring that which challenges them. Think about how you consume news. If you're a Republican you probably watch Fox and if you're a Democrat you turn on CNN. Neither option challenges your previously held beliefs. We consistently filter out what doesn't confirm our thinking because we don't like the idea that we could be wrong.
2. **Hindsight Bias:** Also called the "I knew-it-all-along effect", this is our inclination after an event to view the event as having been predictable. According to Wikipedia:

"It is a multifaceted phenomenon that can affect different stages of designs, processes, contexts, and situations. Hindsight bias may cause memory distortion, where the

recollection and reconstruction of content can lead to false theoretical outcomes. It has been suggested that the effect can cause extreme methodological problems while trying to analyze, understand, and interpret results in experimental studies. A basic example of the hindsight bias is when, after viewing the outcome of a potentially unforeseeable event, a person believes he or she “knew it all along”. Such examples are present in the writings of historians describing outcomes of battles, physicians recalling clinical trials, and in judicial systems trying to attribute responsibility and predictability of accidents.”

And from Kahneman: “Hindsight bias has pernicious effects on the evaluations of decision-makers. It leads observers to assess the quality of a decision not by whether the process was sound but by whether its outcome was good or bad.”

3. **Outcome Bias:** Judging the quality of a decision by its eventual outcome without comparing it to all the other possible outcomes. An example of outcome bias is putting over half your portfolio in a single volatile stock and believing it was a good idea because the stock happened to double. If you continued to do this with every risky stock, you would eventually go bust. Oversizing your positions is a statistically bad move.

The 12 Effects:

1. **The Halo Effect:** We assume if a person is good at A, they’ll be good at B, C and D as well. It’s the human tendency to make faulty assumptions based off limited and unrelated data by extrapolating our beliefs/impressions.
2. **The Framing Effect:** People respond to the same choice in different ways depending on how it’s presented (framed). For example, 93% of PhD students registered early when a penalty fee for late registration was emphasized. But only 67% did so when the same late fee was presented as a discount for earlier registration.
3. **The Lady Macbeth Effect:** A person’s response to a cleanliness priming cue is increased after having felt shame. In an experiment, groups of participants were asked to recall a good or bad past deed. They were then asked to fill in the letters of three incomplete words: “W__H”, “S__P” and “SH__ER”. Participants who recalled a bad deed were 60% more likely to respond with cleansing-related words such as “wash” “soap” and “shower”.
4. **The Endowment Effect:** People often demand more to *give up* an object than they would pay to acquire it in the first place. Simply put, people value a good more once it’s their property than they do before they own it.

5. **The Ideomotor Effect:** The process whereby a thought or image stimulates a reflexive or automatic physical response, often without the knowledge of the person. For example, most people automatically gag when they see a picture of something gross.
6. **The Mere Exposure Effect:** The more exposure we have to a stimulus, the more we tend to like it. In other words, familiarity breeds more positive responses than negative ones. So if you're courting a member of the opposite sex, make sure you're around them a lot. It'll greatly increase your odds of winning them over.
7. **The Anchoring Effect:** Our first impressions of something tend to linger and affect later perceptions and decisions. This is a case of System 1 influencing the decision making of System 2. When you haggle with a dealer for a used car, the initial price offered is the standard for the rest of the negotiation. A price discussed that's lower than the initial offer, even if it's still higher than what the car is actually worth, seems a lot more reasonable because of the anchoring effect.
8. **The Regression Effect:** We assume and make predictions thinking trends will continue, but in reality most things have a tendency to regress towards their mean. Consider the following. Your kid does bad in school this semester. You ground him. Next semester his grades improve. It must be because you grounded him right? Maybe... or maybe not. He may have just had a one-off bad semester and could now be reverting back to his average performance. This would show an improvement, but may not be the result of your actions.
9. **The Above-Average Effect:** People consistently judge themselves to possess higher ability than they actually do. It's called *average* for a reason — most people fall under it.
10. **The Possibility Effect:** Changes in the probabilities of gains/losses do not affect people's subjective evaluations in linear terms. For example, a move from a 50% chance of winning a prize to 60% has a smaller emotional impact than a move from 95% to 100% (certainty). Conversely, the move from 0% (certainty) to 5% is more attractive than a change from 5% to 10%. People overweight small probabilities. This explains lottery gambling — a small expense with the possibility of a big win.
11. **The Certainty Effect:** People tend to select the more certain of two prospects even though that choice may not be more rewarding. It just needs to ensure a *good* outcome with certainty. Would you rather get \$5 for sure, or take a 50% shot at \$20? If you pay attention to expected value then you would take the \$20 gamble. But most people would actually go for the \$5 because it's certain.
12. **The Disposition Effect:** The tendency of investors to sell shares that increased in value, while keeping shares that fell in value. Simply put, investors hate losses and will

gamble to avoid experiencing them (ie, hold onto a losing position in the hopes it comes back). Conversely, investors enjoy locking in gains. They become risk-averse with winners.

The Four Fallacies:

1. **The Sunk-Cost Fallacy:** People's decisions are tainted by the emotional investments they accumulate. The more they invest in something, the harder it becomes to abandon it, even if abandoning it means a larger return in the future. Kahneman explains that since all decisions involve uncertainty, the brain has evolved an automatic and unconscious system for judging how to proceed when a potential for loss arises. He says organisms that placed more urgency on avoiding threats than they did on maximizing opportunities were more likely to pass on their genes. This resulted in losses becoming a more powerful behavioral motivator than the promise of gains.
2. **The Narrative Fallacy:** Popularized by Nassim Taleb in the [Black Swan](#), this fallacy addresses our limited ability to look at a sequence of facts without weaving an explanation into them and forcing a logical link between them. This propensity can go wrong when it increases our impression of understanding.
3. **The Planning Fallacy:** Underestimating the duration needed to complete most tasks. If you think something takes 3 weeks to finish, it may actually require a month.
4. **The Conjunction Fallacy:** The common assumption that multiple specific conditions are more probable than a single general one. For example, Kahneman writes "Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations."
 - a. Which is more likely?
 - i. Linda is a bank teller?
 - ii. Linda is a bank teller and is active in the feminist movement.
 - b. 85% of respondents choose answer ii.
 - i. Kahneman argues that most people get this problem wrong because they use the representativeness heuristic to judge: Option 2 seems more "representative" of Linda based on the description of her, even though it's mathematically less likely.

The 6 Illusions

- 1. The Focusing Illusion:** Placing too much importance on one aspect of an event, thereby causing an error in accurately predicting a future outcome. We tend to focus on notable differences and exclude those that are less conspicuous when making predictions about happiness or convenience. For example, when people were asked how much happier they believe Californians are compared to Midwesterners, both Californians and Midwesterners said Californians must be considerably happier. But in reality there was no difference between the actual happiness rating of the two. People focused on and attached too much weight to the sunny weather and ostensibly easy-going lifestyle of California. They devalued and underrated other aspects of life and determinants of happiness, such as low crime rates and safety from natural disasters like earthquakes (both of which large parts of California lack).
- 2. The Control Illusion:** Overestimating our ability to control events. People believe they have a higher chance of winning the lottery if they pick their numbers versus if they're chosen at random.
- 3. The Moses Illusion:** Listeners or readers fail to recognize an inaccuracy or inconsistency in a text. Here's a question: can a man marry his widow's sister? Most people answer yes. But the answer is no. If a man has a *widow* then he's clearly already dead. And as far as I know, dead people don't get married...
- 4. The Validity Illusion:** Overestimating your ability to interpret and accurately predict an outcome when analyzing a set of data. This illusion is intensified when a perceived pattern is visible in the data. Job interviewers tend to fall into this trap. They see a diverse resume of a candidate and believe their success will transfer to a new job. The candidate then goes on to fail, even though his success seemed assured.
- 5. The Skill Illusion:** The belief that skill, not chance or luck, accounts for the accuracy of predictions of things that are by their nature, unpredictable.
- 6. The Truth Illusion:** The more often we hear a statement, the more likely we are to believe it's true — regardless of the underlying facts. If I keep telling you that "Oslo is the capital of Finland." over and over again, you're more likely to believe it's true over time, even though it's flat out wrong.

The Two Neglects

1. **Denominator Neglect:** Focusing on the relative frequencies of numerators, while paying inadequate attention to denominators. If you have a choice to buy a lottery ticket from a pile where 1 out of 10 is a winner or where 9 out of a 100 are winners, which do you choose? If you chose from the second pile then you're suffering from denominator neglect. You paid too much attention to the numerators (1 vs 9) which resulted in choosing a pile with a lower chance of success (10% vs 9%).
2. **Duration Neglect:** People's judgments of the unpleasantness of painful experiences depend very little on the duration of those experiences. These judgments are instead primarily impacted by the peak (when the experience was the most unpleasant). From Wikipedia:

Kahneman and Fredrickson with other collaborators had subjects place their hands in painfully cold water. Under one set of instructions, they had to keep their hand in the water for an additional 30 seconds as the water was slowly heated to a warmer but still uncomfortably cold level, and under another set of instructions they were to remove their hand immediately. Otherwise, both experiences were the same. Most subjects chose to repeat the longer experience. Subjects apparently judged the experience according to the peak–end rule (in other words, according to its worst and final moments only), paying little attention to duration.

Conclusion: A summary of this book doesn't do it justice. It needs to be read in its entirety, especially by those involved in markets. Understanding the way your mind works allows you to be more cognizant of its quirks and tendencies for faulty thinking. This awareness raises the probability that you can think more slowly (System 2) and improve your overall cognition, and at the very least it'll make you more humble and accepting of other's opinions.

Now watch the following short video ([link here](#)) and see if you can correctly count how many times the basketball is passed.