FINM3407 - Behavioural Finance

Tutorial 6 Heuristics and Its Implications

Note: This topic has more questions than can be covered in a 2-hour session. The questions to be covered by your tutor are indicated by an asterisk (*); the rest questions should be viewed as extra practice problems.

In this tutorial, we are going to cover the following topics: Application to Managerial Overconfidence and Stata related questions.

There are a few references reading for these two relevant topics:

AckertDeaves Chapters 5 and Chapter 8

- **Part One: Application of Heuristics and Biases**

1*. Differentiate the following terms/concepts:

a. Primacy and recency effects

A primacy effect is the tendency to rely on information that comes first when making an assessment, whereas a recency effect is the tendency to rely on the most recent information when making an assessment.

b. Salience and availability

The salience of an event refers to how much it stands out relative to other events, whereas the availability refers to how easily the event is recalled from memory.

c. Fast-and-frugal heuristics and bias-generating heuristics

Fast and frugal heuristics require a minimum of time, knowledge and computation in order to make choices. Often they lead to very good choices. Sometimes however heuristics go astray and generate behavioral bias.

d. Autonomic and cognitive heuristics

Autonomic heuristics are reflexive, autonomic, non-cognitive, and require low effort levels. Cognitive heuristics require more deliberation. Autonomic heuristics are appropriate when a very quick decision must be made or when the stakes are low, whereas cognitive heuristics are appropriate when the stakes are higher.

2*. Which description of Mary has higher probability?

a. Mary loves to play tennis.

b. Mary loves to play tennis and, during the summer, averages at least a game a week.

Explain your answer. Define the conjunction fallacy. How does it apply here? Assume for the purpose of illustration that the probability that someone loves to play tennis is .2; the probability that someone plays tennis once or more a week during the summer is .1; and the probability of one or the other of these things is .22.

$P(A \cup B) = P(A)+P(B)-P(A \cap B)$

or

$P(A \cap B) = P(A)+P(B)- P(A \cup B)$

Pr(loves tennis) = .2

Pr(loves tennis AND averages 1wk+)

= Pr(loves tennis) + Pr(averages 1wk+) - Pr(loves tennis OR averages 1wk+)

= .2 + .1 - .22 = .08

The second probability has to be less because it has one more requirement (not only do you have to love tennis, but you also have to play regularly, but some tennis lovers might just be too busy to do this).

When people commit the conjunction fallacy (the belief that the joint probability is more likely than one of its components), they will think the second (joint) event is more likely because it sounds logical that someone who loves tennis will also play regularly.

3. *** Suppose you have invested in two different stocks, Stock A and Stock B. Based on historical data, the probability that Stock A will increase in value over the next year is 0.6. For Stock B, the probability is 0.5. The probability that both stocks will increase in value over the next year is 0.3. What is the probability that at least one of the two stocks will increase in value over the next year?**

Answer:

We can use the formula for the probability of the union of two events A and B:

$P(A \cup B)=P(A)+P(B)-P(A \cap B)$

In this case, $P(A)=0.6$ (probability that Stock A will increase), $P(B)=0.5$ (probability that Stock B will increase), and $P(A \cap B)=0.3$ (probability that both will increase).

Plugging these into the formula:

$P(A \cup B)=0.6+0.5-0.3=0.8$

The probability that at least one of the two stocks will increase in value over the next year is 0.8, or 80%.

4. ***Rex is a smart fellow. He gets an A in a course 80% of the time. Still he likes his leisure, only studying for the final exam in half of the courses he takes. Nevertheless when he does study, he is almost sure (95% likely) to get an A. Assuming he got an A, how likely is it he studied? If someone estimates the above to be 75%, what error are they committing? Explain.**

Hint: Here is a useful YouTube video to explain Bayes' theorem.

Bayes' Theorem of Probability With Tree Diagrams & Venn Diagrams - YouTube

*P(studied|A) = P(A|studied) * [P(studied)/P(A)]*

*= .95 * (.5 / .8) = .59375*

The "sample" is that he got an A. Without knowing this you would have said the probability that he studied was .5. You rightfully shifted the probability upwards based on the sample, but you moved it too much. You should have stayed closer to the base rate, so you have committed base weight underweighting.

Another example of this is, when watching sports and noticing that someone is playing better than they normally do, believing that they have permanently improved.

5. *What is the relationship between intersection (i.e., P(A∩B)) and conditional probability (i.e., P(A|B))?
Hint: A useful YouTube video to watch. Please watch the first 5 mins of this video.

Answer:

The relationship between intersection and conditional probability can be defined mathematically as follows:

$P(A \cap B)=P(A|B) \times P(B)$

Here:

- $P(A \cap B)$ is the probability of both events A and B happening, i.e., the intersection of A and B.
- $P(A|B)$ is the conditional probability of A happening, given that B has already happened.
- $P(B)$ is the probability that event B happens.

You can also express $P(A|B)$ in terms of $P(A \cap B)$ and $P(B)$:

$P(A|B)=P(A \cap B)/P(B)$

Provided $P(B)>0$.

This relationship shows how conditional probabilities can be understood in terms of the intersection of events. It also allows you to determine one type of probability when given the other and the marginal probability of B.

Below is an example:

Let's say we have a standard deck of 52 playing cards, and we're interested in the following two events:

- Event A: Drawing a red card (hearts or diamonds, 26 in total)
- Event B: Drawing a face card (king, queen, jack, 12 in total)

First, we calculate the individual probabilities for each event:

- $P(A)=26/52=0.5$
- $P(B)=12/52=3/13$

Now, let us consider the intersection of the two events $A \cap B$ (i.e., drawing a red face card). There are 6 red face cards in a deck of 52 cards (2 red suits x 3 face cards each).

So, $P(A \cap B)=6/52=3/26$.

To find the conditional probability of drawing a red card (Event A) given that we have drawn a face card (Event B), we use:

$P(A|B)=P(A \cap B) / P(B)=[3/26] / [3/13]=1/2$

So, if we know that we have drawn a face card, the probability that it is also red is 1/2.

This example shows the mathematical relationship between conditional probability $P(A|B)$ and the intersection $P(A \cap B)$, using the formula:

$P(A \cap B)=P(A|B) \times P(B)$

In our example, 3/26=1/2×3/13, confirming the relationship.

6. ***Imagine you are a portfolio manager looking at historical data for Stock C and Stock D in your portfolio. You find that the probability Stock C will have a positive return in a given month is 0.70. The probability Stock D will have a positive return in the same month is 0.60. However, if Stock C has a positive return, the probability Stock D will also have a positive return increase to 0.80.**

   What is the conditional probability that Stock C will have a positive return given that Stock D has a positive return?

Answer:

We need to find P(C|D), the conditional probability that Stock C will have a positive return given Stock D has a positive return.

First, let's find the joint probability P(C∩D) that both Stock C and Stock D have positive returns.

$P(C \cap D)=P(D \cap C)=P(D|C)\times P(C) =0.8\times 0.7=0.56$

Now, we can find P(C|D) using Bayes' Theorem:

$P(C|D)=P(C \cap D)/P(D)=0.56/0.6=0.93$

The conditional probability that Stock C will have a positive return given that Stock D has a positive return is 0.93.

7. **Why are two people who witnessed the same event last month likely to describe it differently today?**

Memory is very imprecise. The common view that past experiences have somehow been written to the brain's hard-drive and are then retrieved, even if at considerable effort, is not the way our brain works. In fact, memory is reconstructive. Therefore people in remembering some event will reconstruct it in different ways.

8. **How do gambling fallacy and clustering illusion relate to representativeness? Provide examples from sports. In what way are they different?**

Representativeness exists when one thinks that A should look like B. A can be the sample and B the distribution, or vice-versa. A belief in a hot hand is thinking the conditional distribution should look like the sample. But sometimes it seems that people think the reverse, namely that the sample, however small, should look like the distribution, in the sense that essential features should be shared. A hot hand often comes into play in sports when people don't know for certain the skill level of an athlete, and the extent to which it may change. Gambler's fallacy is likely to exist when the underlying distribution (e.g., cards or dice) is well-known.

- **Part Two: The Impact of Heuristics and Biases on Financial Decision-making**

1*. Differentiate the following terms/concepts:

a. Good company and good stock

A good company has positive attributes such as a strong management team. A good stock is one you expect to outperform in the future. If markets are efficient there are no good or bad stocks.

b. Momentum-chaser and contrarian

A momentum-chaser buys stocks that have performed well in the past. A contrarian buys stocks that have not performed well in the past.

c. International diversification and domestic diversification

Portfolio theory teaches us that diversification pays off. If we stick with domestic securities, this is domestic diversification. If, as we should, we move to foreign securities as well, this is international diversification.

d. Anchoring and herding

Anchoring means sticking with maintained or prior views. Herding is going with the crowd. One could imagine a group of anchored analysts. In response to some new information several change their views. Others may herd (i.e., follow these analysts) even without studying the new information.

2*. In a regression of perceived long-term investment value (LTIV) on size (S), book to market (B/M), and management quality (MQ), the following coefficients (all significant) were estimated:

$$LTIV = -0.86 + 0.15\log(S) + -0.11\log(B/M) + 0.85MQ$$

Discuss what can be learned from this regression (which appears in Shefrin, H., and M. Statman, 1995, "Making sense of beta, size, and book-to-market," *Journal of Portfolio Management* 21 (no. 2), 26-34).

In this regression, value as a long-term investment is regressed on size, book-to-market, and management quality. Management quality strongly impacts perceived investment value. This does not make sense because all positive attributes should already be embedded in stock price. Additionally, size and book-to-market, even after accounting for their impact on management quality, independently influence investment value. Big firms are viewed as good investments, and growth companies are viewed as good investments. In other words, big high-growth firms are viewed as representative of good investments. Interestingly, the empirical evidence points in the exact opposite *direction. It is small-cap value firms that have historically outperformed. Indeed, the tendency for individuals to use representativeness in this context may have contributed to the small-firm and value anomalies.*

3. Home bias has a potential information-based explanation. Discuss

One reason why investors may favor local markets – where local is interpreted as either domestic or close-to-home but within the same country – is because they may possess, or may feel that they possess, informational advantages. Gains from being geographically close to a company may appear in improved monitoring capability and access to private information. One paper established that mutual fund managers, consistent with familiarity bias, tend to favor local investments, that is, they tend to buy firms headquartered within a 100-mile (or 161-kilometer) radius of their head office. Specifically, they conclude that the average manager invests in companies that are located within 160-84 kilometers, or 9-11%, closer to her than the average firm she could have held.

Research has shown a payoff to local investing. Fund managers on average earn 2.67% per year more on local investments, while local stocks avoided by managers underperform by 3% per year. Moreover, they find that those better able to select local stocks tend to concentrate their holdings more locally. There is even evidence that retail investors are able to benefit from local investing. Based on a dataset of retail investors, local investments outperform remote investments by 3.2% per year.

4*. In Canada there are two official languages, French and English. Some Canadian corporations are headquartered in Quebec where French is the official language. Most however are headquartered outside Quebec where English is dominant. Would you expect Quebecers to invest more in Quebec companies, and non-Quebecers to invest more in companies based outside Quebec? Also, do you think the first language of the CEO might matter in accounting for investor preferences? Explain.

We would expect to see the same as in the study using Finnish data where the two languages/ethnicities were Swedish and Finnish. Specifically, we would expect to see English-speaking investors preferring companies based outside of Quebec and French-speaking investors preferring companies based inside of Quebec. Similarly, we might expect to see a preference on the part of English-speaking investors for English-speaking CEOs (and the same for French-speaking investors).

5. Anchors are ubiquitous in financial markets. Give some examples.

Many examples could be given. One is the current level of stock prices. Many people accept the current level as valid and only see changes in it as being justified if new information arrives. This is true whether or not the market as a whole is arguably undervalued or overvalued.