FINM3407 - Behavioural Finance

Tutorial 1 Answers – Introduction to Behavioural Finance vs. Traditional Finance

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 two relevant topics: Foundations of Finance I: Expected Utility Theory and Foundations of Finance II: Asset Pricing, Market Efficiency and Agency Relationships.

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

AckertDeaves Chapters 1 & 2

Investments, 12th Edition, By Zvi Bodie and Alex Kane and Alan Marcus Chapter 11

Some Advanced Materials regarding expected utility theory:

Microeconomic Theory (1995) by Mas-Colell, Whinston and Green) Chapter 1 Chapter 3

- **PART ONE: Foundations of Finance I: Expected Utility Theory**

1*. Differentiate the following terms/concepts:

a. Prospect and probability distribution

A prospect is a lottery or series of wealth outcomes, each of which is associated with a probability, whereas a probability distribution defines the likelihood of possible outcomes.

b. Risk and uncertainty

Risk is measurable using probability, but uncertainty is not. Uncertainty is when probabilities can't be assigned or the possible outcomes are unclear.

c. Utility function and expected utility

A utility function, denoted as u(•), assigns numbers to possible outcomes so that preferred choices receive higher numbers. Utility can be thought of as the satisfaction received from a particular outcome.

"Expected utility" is an economic term summarizing the utility that an entity or aggregate economy is expected to reach under any number of circumstances. The expected utility is calculated by taking the weighted average of all possible outcomes under certain circumstances.

d. Risk aversion, risk seeking, and risk neutrality

Risk aversion describes someone who prefers the expected value of a lottery to the lottery itself. Risk seeking describes someone who prefers a lottery to the expected value of a lottery. And

risk neutrality describes someone whose utility of the expected value of a lottery is equal to the expected utility of the lottery.

2*. When eating out, Rory prefers spaghetti over a hamburger. Last night she had a choice of spaghetti and macaroni and cheese and decided on the spaghetti again. The night before, Rory had a choice between spaghetti, pizza, and a hamburger and this time she had pizza. Then, today she chose macaroni and cheese over a hamburger. Does her selection today indicate that Rory's choices are consistent with economic rationality? Why or why not?

Rory's preferences are consistent with rationality. They are complete and transitive. We see that her preference ordering is:

$Pizza \succ spaghetti \succ macaroni\ and\ cheese \succ hamburger$

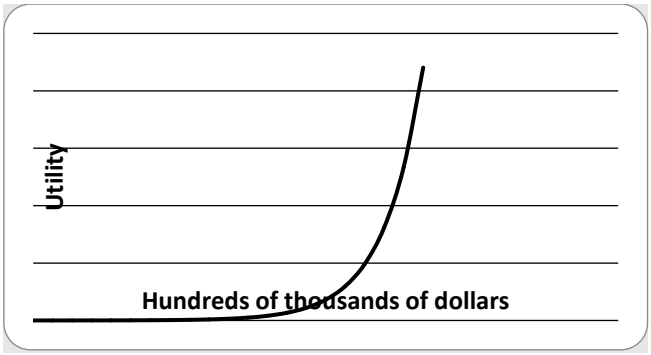
3*. Consider a person with the following utility function over wealth: $u(w) = e^w$, where e is the exponential function (approximately equal to 2.7183) and w = wealth in hundreds of thousands of dollars. Suppose that this person has a 40% chance of wealth of $50,000 and a 60% chance of wealth of $1,000,000 as summarized by P(0.40, $50,000, $1,000,000).

a. What is the expected value of wealth?

$E(w) = 0.4 * 0.5 + 0.6 * 10 = 6.2$

$U(P) = 0.4e^{0.50} + 0.6e^{10} = 13,216.54$

b. Construct a graph of this utility function.



c. Is this person risk averse, risk neutral, or a risk seeker?

Risk seeker because graph is convex.

d. What is this person's certainty equivalent for the prospect?

$e^w = 13,216.54$ *gives* $w = 9.4892244$ *or* $948,922.44$

4. An individual has the following utility function: $u(w) = w^{.5}$ where w = wealth.

a. Using expected utility, order the following prospects in terms of preference, from the most to the least preferred:

P1(0.8, 1,000, 600)

P2(0.7, 1,200, 600)

P3(0.5, 2,000, 300)

Ranking: P2, P3, P1 with expected utilities 31.5972, 31.0209, and 30.1972 for prospects 2, 3, and 1, respectively

Example: $U(w) = 0.8*1000^{0.5} +(1-0.8)*600^{0.5}$

b. What is the certainty equivalent for prospect P2?

998.3830

$U(w_{P2}) = 0.7*1200^{0.5}+0.3*600^{0.5}=31.5972$

$w^{0.5}=31.5972 => (w^{0.5})^2=w=(31.5972)^2=998.3830$

c. Without doing any calculations, would the certainty equivalent for prospect P1 be larger or smaller? Why?

The certainty equivalent for P1 would be smaller because P2 is ranked higher than P1.

5*. Consider two prospects:

Problem 1: Choose between

	Prospect A:	$2,500 with probability 0.33,
		$2,400 with probability 0.66,
		Zero with probability 0.01.
And	Prospect B:	$2,400 with certainty.

Problem 2: Choose between

	Prospect C:	$2,500 with probability 0.33,
		Zero with probability 0.67.
And		
	Prospect D:	$2,400 with probability 0.34,
		Zero with probability 0.66.

It has been shown by Daniel Kahneman and Amos Tversky (1979, "Prospect theory: An analysis of decision under risk," *Econometrica* 47(2), 263-291) that more people choose B when presented with problem 1 and when presented with problem 2, most people choose C. These choices violate expected utility theory. Why?

This is an example of the Allais paradox. The first choice suggests that:

$u(2,400) > 0.33u(2,500) + 0.66u(2,400)$ *or*

$0.34u(2,400) > 0.33u(2,500)$

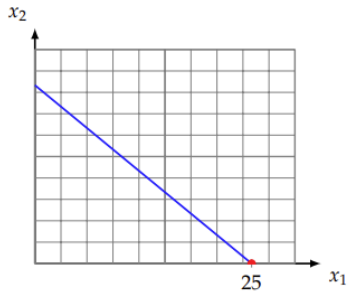
while the second choice suggests just the opposite inequality.

$0.33u(2,500) > 0.34u(2,400)$

6*. Additional Question regarding expected utility: Bill loves maple syrup and makes regular monthly purchases. Each bottle costs $50 (it's a very special maple syrup). You've known Bill for a long time, and have observed, first handed, the ups and downs of his economic situation.

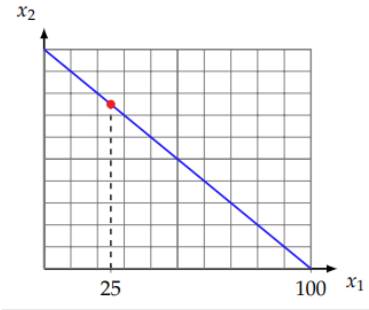
(a) When he was a graduate student, you knew he managed to get by with a (disposable) income of $1,250 per month, and he bought 25 bottles of maple syrup per month. Draw Bill's budget set, with maple syrup (in bottles) indicated in the horizontal axis and 'other stuff' (measured in dollars) in the vertical axis. Mark Bill's optimal consumption bundle.

Let number of maple syrup bottles be x_1, and 'other stuff' be x_2. As we don't know the price of 'other stuff', the slope and vertical intercept of the budget line are arbitrary. Bill's optimum consumption is marked in red in the figure below.



(b) When Bill was appointed a lecturer, his (disposable) income rose to $5,000 per month. The price of maple syrup did not change, and Bill still bought 25 bottles each month. Illustrate his new budget constraint and indicate Bill's optimal bundle on your graph.

Now income has grown so the budget line has shifted out and the horizontal and vertical intercepts have increased. Note that the slope of the budget line does not change. Bill's optimum consumption bundle is marked in red.



(c) Assume that Bill's preferences are quasi-linear with respect to 'other stuff'. Suddenly, Canada has an overabundance of maple syrup and the price drop to $25 per bottle. Can you definitely say that Bill's consumption of maple syrup will go up or down?

Recall that a change in the price of a good has both an income and substitution effect. As Bill's preferences are quasi-linear and from parts (a) and (b), we can see that Bill's demand for maple syrup was not affected by a change in income, we know that Bill's demand for maple syrup does not depend on income. Thus, whether Bill's demand for maple syrup changes with its price is solely dependent on the substitution effect. As the substitution effect always acts in the opposite direction of a price change (as the price of a good - maple syrup - drops, consumers are likely to consume more of the same good – maple syrup), we can say with certainty that a fall in the price of maple syrup will definitely increase Bill's consumption of maple syrup.

- **PART TWO:**

Foundations of Finance II:

Asset Pricing, Market Efficiency and Agency Relationships

1*. Differentiate the following terms/concepts:

a. Systematic and non-systematic risk

Non diversifiable or systematic risk is risk that is common to all risky assets in the system and cannot be diversified. Diversifiable or unsystematic risk is specific to the asset in question and can be diversified.

b. Beta and standard deviation

Beta is the CAPM's measure of risk. It takes into account an asset's sensitivity to the market and only measures systematic, non diversifiable risk. The standard deviation is a measure of dispersion that includes both diversifiable and non diversifiable risks.

c. Direct and indirect agency costs

Agency costs arise when managers' incentives are not consistent with maximizing the value of the firm. Direct costs include expenditures that benefit the manager but not the firm, such as purchasing a luxury jet for travel. Other direct costs result from the need to monitor managers, including the cost of hiring outside auditors. Indirect costs are more difficult to measure and result from lost opportunities.

d. Weak, semi-strong, and strong form market efficiency

With weak form market efficiency prices reflect all the information contained in historical returns. With semi-strong form market efficiency prices reflect all publicly available information. With strong form market efficiency prices reflect information that is not publicly available, such as insiders' information.

2*. Suppose you find that prices of stocks before large dividend increases show on average consistently positive abnormal returns. Is this a violation of the EMH?

Market efficiency implies investors cannot earn excess risk-adjusted profits. If the stock price run-up occurs when only insiders know of the coming dividend increase, then it is a violation of strong-form efficiency. If the public also knows of the increase, then this violates semistrong-form efficiency.

3*. A stock has a beta of 1.2 and the standard deviation of its returns is 25%. The market risk premium is 5% and the risk-free rate is 4%.

a. What is the expected return for the stock?

E(R) = 0.04 + 1.2(0.05) = 0.10

b. What are the expected return and standard deviation for a portfolio that is equally invested in the stock and the risk-free asset?

$E(R_p) = 0.5(0.10) + 0.5(0.04) = 0.07$, $\sigma_p = (0.5)\ (0.25) = 0.125$

c. A financial analyst forecasts a return of 12% for the stock. Would you buy it? Why or why not?

If you believe the source is very credible, buy it as it is expected to generate a positive abnormal (or excess) return.

4. The monthly rate of return on T-bills is 1%. The market went up this month by 1.5%. In addition, AmbChaser, Inc., which has an equity beta of 2, surprisingly just won a lawsuit that awards it $1 million immediately.

a. **If the original value of AmbChaser equity were $100 million, what would you guess was the rate of return of this month?**
b. **What is your answer to (a) if the market had expected AmbChaser to win $2 million?**

a. Based on broad market trends, the CAPM indicates that AmbChaser stock should have increased by: 1.0% + 2.0 × (1.5% – 1.0%) = 2.0%

Its firm-specific (nonsystematic) return due to the lawsuit is $1 million per $100 million initial equity, or 1%. Therefore, the total return should be 3%. (It is assumed here that the outcome of the lawsuit had a zero expected value.)

b. If the settlement was expected to be $2 million, then the actual settlement was a "$1 million disappointment," and so the firm-specific return would be –1%, for a total return of 2% – 1% = 1%.

5*. What is the joint hypothesis problem? Why is it important?

If when testing one hypothesis another must be assumed to hold, a joint-hypothesis problem arises. For us, this is of particular interest when we are testing market efficiency because of the need to utilize a particular risk-adjustment model to produce required returns, that is, to risk-adjust. This would not be a problem if we knew with certainty what the correct risk adjustment model is, but unfortunately we do not. If a test rejects the EMH, is it because the

EMH does not hold, or because we did not properly measure abnormal returns? We simply do not know for certain the answer to this question.

6*. Warren Buffett has been a very successful investor. In 2008 Luisa Kroll reported that Buffett topped *Forbes Magazine*'s list of the world's richest people with a fortune estimated to be worth $62 billion (March 5, 2008, "The world's billionaires," *Forbes*). Does this invalidate the EMH?

Warren Buffett's experience does not necessarily invalidate the EMH. There is the possibility that he is just lucky: given that there are numerous money managers, some are bound to perform well just by luck. Still, many would question this here because Buffett's track record has been consistently *strong.*

7*. You are considering whether to invest in two stocks, Stock A and Stock B. Stock A has a beta of 1.15 and the standard deviation of its returns has been estimated to be 0.28. For Stock B, the beta is 0.84 and standard deviation is 0.48.

a. Which stock is riskier?

Stock A is riskier, though stock B has greater total risk.

b. If the risk-free rate is 4% and the market risk premium is 8%, what is the expected return for a portfolio that is composed of 60% A and 40% B?

$R_p = .6(.132) + .4\ (.1072) = .12208$

c. If the correlation between the returns of A and B is 0.50, what is the standard deviation for the portfolio that includes 60% A and 40% B?

$\sigma_p^2 = (.6)^2(.28)^2 + (.4)^2(.48)^2 + 2*.5(.6)(.4)(.28)(.48) = 9.7\%,\ \sigma_p = 31.2\%$