INTRODUCTION

Consumer behavior is best understood in three steps. The first step is to examine consumer preferences. Specifically, we need a practical way to describe how people might prefer one good (say, good A) to another (good B). Second, we must account for the fact that consumers face budget constraints-they have limited incomes that restrict the quantities of goods that they can buy. The third step is to put consumer preferences and budget constraints together to determine consumer choices. In other words, given their preferences and limited incomes, what combinations of goods will consumers buy to maximize their satisfaction? We will go through each of these steps in turn.

In similar vein, we ask ourselves, how individuals make decisions on how much to consume today (analogous to good A above) as opposed to saving and investing for future consumption (again analogous to good B above). We attempt to answer these questions in the discussion that follows. We start our discussion with an overview of the basic economic principles in consumer behavior.

Some Basic Assumptions

The theory of consumer behavior begins with three basic assumptions regarding people's preferences for one market basket versus another.

1. The first assumption is that preferences are complete, which means that consumers can compare and rank all market baskets. In other words, for any two market baskets A and B, a consumer will prefer A to B, will prefer B to A, or will be indifferent between the two. (By "indifferent" we mean that a person would be equally happy with either basket.) Note that these preferences ignore costs. A consumer might prefer meat to beans but would buy beans because they are cheaper.

2. The second important assumption is that preferences are transitive. Transitivity means that if a consumer prefers market basket A to market basket B, and prefers B to C, then the consumer also prefers A to C. For example, if a Toyota is preferred to a Nissan and a Nissan is preferred to a BMW, then a Toyota is also preferred to a BMW. This transitivity assumption ensures that the consumer's preferences are consistent, and hence rational.

3. The third assumption is that all goods are "good" (i.e., desirable), so that leaving costs aside, consumers always prefer more of any good to less. This assumption is made for pedagogic reasons; it simplifies the graphical analysis. Of course, some goods, such as air pollution, may be undesirable, and consumers will avoid them whenever possible. We ignore these undesirable goods in the context of our current discussion of consumer choice because most consumers would not choose to purchase them.

These three assumptions form the basis of consumer theory. They don't explain consumers'

preferences, but they do impose a degree of rationality and reasonableness on them. Building on these assumptions, we will now explore consumer behavior.

Indifference Curves

We can show a consumer's preferences graphically with the use of indifference curves. An indifference curve represents all combinations of market baskets that provide the same level of satisfaction to a person. That person is therefore indifferent among the market baskets represented by the points on the curve.

Given the three assumptions about preferences discussed above, we know that a consumer can always indicate a preference for one market basket over another or indifference between the two. This information can then be used to rank all possible consumption choices.

(PLEASE REVIEW THE INDIFFERENCE CURVE ANALYSIS THOROUGHLY- why an indifference curve slopes from left to right, why it is convex to the origin, the marginal rate of substitution and the budget lines).

Ordinal versus Cardinal Rankings

Ordinal ranking places market baskets in the order of most preferred to least preferred, but it does not indicate by how much one market basket is preferred to another. This ranking is used in the indifference curve analysis.

By contrast, when economists first studied utility, they hoped that individuals' preferences could be easily quantified or measured in terms of basic units and could therefore provide a cardinal ranking of alternatives. However, it is generally accepted that the particular unit of measurement of utility is unimportant. For example, although we cannot say that consumers of Toyota are twice as happy as they might be on a Nissan, an ordinal ranking is sufficient to help us explain how most individual decisions are made. In the few instances where it is not, we will discuss an alternative approach to describing preferences.

Revealed Preference

We have seen how an individual's preferences could be represented by a series of indifference curves. Then saw how preferences determine choices, given a budget constraint. Can this process be reversed? If we know the choices a consumer has made, can we determine her preferences?

We can, if we have information about a sufficient number of choices that are made when prices and income levels vary. The basic idea is simple. If a consumer chooses one market basket over another, and the chosen market basket is more expensive than the alternative one, then the consumer must prefer the chosen market basket.

The Utility Function

In modern theory, a utility function is simply a convenient device for summarizing the information contained in the consumer’s preference relation – no more and no less. Sometimes it is easier to work directly with the preference relation and its associated sets. Other times,

especially when one would like to employ calculus methods, it is easier to work with a utility function. In modern theory, the preference relation is taken to be the primitive, most fundamental characterization of preferences. The utility function merely ‘represents’, or summarizes, the information conveyed by the preference relation.

(REFER TO YENGWILER TEXT THAT I HAD LEFT IN CLASS FOR A LIST OF APPLICABLE UTILITY FUNCTIONS IN FINANCE. ALSO SEE THE COMPUTATION OF THE ARROW PRATT MEASURES OF RISK AVERSION AS DISCUSSED IN CLASS).

Monotonic Transformation

Once we reveal the consumer’s indifference curve and map, all we need to do is get a function that faithfully represents the indifference curves. There are many (in fact, an infinity of) functions that could work. All the function has to do is preserve the consumer’s preference ranking. A monotonic transformation is a rule applied to a function that changes (transforms) it, but maintains the original order of the outputs of the function for given inputs. For example, star ratings can be squared and the rankings remain the same.

Suppose that X is a 4- and Y a 2-star restaurant.

Square the star rankings.

X now has 16 stars and Y has 4 stars. X is still higher ranked than Y.

In this case, squaring is a monotonic transformation.

Can we conclude that X is now four times better? Of course not. Remember that the star ranking is an ordinal scale so the distance between items is irrelevant. It is a fact that the MRS (at any point) remains constant under any monotonic transformation. This is an important property of monotonic transformations

Von Neumann-Morgenstern expected utility

The first derivation of an expected utility representation of preferences under uncertainty was provided by von Neumann and Morgenstern. They assumed that agents choose among lotteries. A lottery is by definition a random variable with specified payoffs and specified probabilities. The critical assumption of the von Neumann-Morgenstern approach is that agents know the relevant probabilities. Thus the approach is relevant to situations like games of chance where the existence of objective probabilities can be assumed. In settings characterized by what has become known as Knightian uncertainty", meaning settings in which agents cannot specify probability distributions, the von Neumann-Morgenstern approach does not apply since agents are not assumed to be able to characterize the available choices as lotteries.

Suppose W represents the possible outcomes of a football game, namely, win, lose or draw. Suppose an individual attaches probabilities p(W) to these outcomes, that is p(W)= N(W)/T where N(W) equals the number of wins, losses or draws in the season and T = total number of games played. Finally, suppose the individual attaches subjective levels of satisfaction or utility U to win (= 4 units), lose (= 0 units) and draw (= 1 unit) so that U (win) = 4, etc. Then his expected utility from the season's forthcoming games is:

Utility theory in Finance

In portfolio theory too, entities are faced with a set of choices. Different portfolios have different levels of expected return and risk. You know that the higher the level of expected return, the larger the risk. Entities are faced with the decision of choosing a portfolio from the set of all possible risk/return combinations, where when they like return, they dislike risk. Therefore, entities obtain different levels of utility from different risk/return combinations. The utility obtained from any possible risk/ return combination is expressed by the utility function. Put

simply, the utility function expresses the preferences of entities over perceived risk and expected return combinations. A utility function can be expressed in graphical form by a set of indifference curves. Exhibit 2.1 shows indifference curves labeled u1, u2, and u3. By convention, the horizontal axis measures risk and the vertical axis measures expected return. Each curve represents a set of portfolios with different combinations of risk and return. All the points on a given indifference curve indicate combinations of risk and expected return that will give the same level of utility to a given investor. For example, on utility curve u1, there are two points u and u′, with u having a higher expected return than u′, but also having a higher risk. Because the two points lie on the same indifference curve, the investor has an equal preference for (or is indifferent to) the two points, or, for that matter, any point on the curve. The (positive) slope of an indifference curve reflects the fact that, to obtain the same level of utility, the investor requires a higher expected return in order to accept higher risk. For the three indifference curves shown in Exhibit 2.1, the utility the investor receives is greater the further the indifference curve is from the horizontal axis, because that curve represents a higher level of return at every level of risk. Thus, for the three indifference curves shown in the exhibit, u3 has the highest utility and u1 the lowest.

The Set of Efficient Portfolios and the Optimal Portfolio

Portfolios that provide the largest possible expected return for given levels of risk are called efficient portfolios. To construct an efficient portfolio, it is necessary to make some assumption about how investors behave when making investment decisions. One reasonable assumption is that investors are risk averse. A risk-averse investor is an investor who, when faced with choosing between two investments with the same expected return but two different risks, prefers the one with the lower risk.

/data/data/com.infraware.PolarisOfficeStdForTablet/files/.polaris_temp/image1.emf

Source: Fabozzi, 2006.

In selecting portfolios, an investor seeks to maximize the expected portfolio return given his tolerance for risk. Given a choice from the set of efficient portfolios, an optimal portfolio is the one that is most preferred by the investor.

Risk Aversion

The first restriction placed on utility functions is that more is always preferred to less so that U'(W) > 0 where U'(W) = δU (W)/ δW. Now, consider a simple gamble of receiving Ksh.2 for a 'head' on the toss of a coin and Ksh.0 for tails. Given a fair coin the expected monetary value of the risky outcome is Ksh.1."

(1/2)2 + (1/2)0=Ksh.1. Suppose it costs the investor Ksh.1 to 'invest' in the game. The outcome from not playing the game (i.e. not investing) is the Ksh.1 which is kept. Risk aversion means the investor will reject a fair gamble; Ksh.1 for certain is preferred to an equal chance of Ksh.2 or Ksh.0. Risk aversion implies that the second derivative of the utility function is negative U"(W) < O. To see this, note that the utility from not investing U (1) must exceed the expected utility from investing

U (1) > (1/2) U (2) + (1/2) U (0) or U (1) - U (O) > U (2) - U (1)

So that the utility function has the concave shape given in the figure below marked 'risk averter'. It is easy to deduce that for a risk lover the utility function is convex while for a risk neutral investor who is just indifferent to the gamble or the certain outcome, the utility function is linear (i.e. the equality sign applies to equation. Hence we have:

U"(W) < 0 risk averse

U"(W) = 0 risk neutral

U"(W) > 0 risk lover

A risk averse investor is also said to have diminishing marginal utility of wealth: each additional unit of wealth adds less to utility the higher the initial level of wealth (i.e. U"(W) < 0). The degree of risk aversion is given by the concavity of the utility function in the figure below and

equivalently by the absolute size of U"(W). Two measures of the degree of risk aversion are commonly used:

RA (W) = -U" (W)/U'(W)

RR (W) = RA (W). W

RA (W) is the Arrow-Pratt measure of absolute risk aversion, the larger is RA (W) the greater the degree of risk aversion. RR (W) is the coefficient of relative risk aversion. RA and RR are a measure of how the investor's risk preferences change with a change in wealth. For example, assume an investor with Ksh.10000 happens to hold Ksh.5000 in risky assets. If his wealth were to increase by Ksh.10 000 and he then put more than Ksh.5000 in sum into risky assets, he is said to exhibit decreasing absolute risk aversion. (The definitions of increasing and constant absolute risk aversion are obvious.) The natural assumption to make as to whether relative risk aversion is decreasing, increasing or constant is less clear cut. Suppose you have 50 percent of your wealth (of Ksh.100 000) in risky assets. If, when your wealth doubles, you increase the proportion held in risky assets then you are said to exhibit decreasing relative risk aversion. (Similar definitions apply for constant and increasing relative risk aversion.) Different mathematical functions give rise to different implications for the form of risk aversion. For example the function

U (W) = In W

Exhibits diminishing absolute risk aversion and constant relative risk aversion.

Indifference Curves

Although it is only the case under somewhat restrictive circumstances, let us assume that the utility function above for the risk averter can be represented solely in terms of the expected return and the variance of the return on the portfolio. The link between end of period wealth W and investment in a portfolio of assets yielding an expected return, r, is W = (1 +r) Wo where Wo equals initial wealth. However, we assume the utility function can be represented as

U (w) =(r, δ2), U1 (w) > 0, U2 (w) <0, U11, U22< 0

The sign of the first-order partial derivatives (U1, U2) imply that expected return adds to utility while more 'risk' reduces utility. The second-order partial derivatives indicate diminishing marginal utility to additional expected 'returns' and increasing marginal disutility with respect to additional risk. The indifference curves for the above utility function are shown

|  |
| --- |
| We say that the utility function v exhibits constant absolute risk aversion, or CARA, if A does not depend on wealth, A’ (w) = 0. v exhibits decreasing absolute risk aversion, or DARA, if richer people are less absolutely risk averse than poorer ones, A’ (w) < 0. Likewise, v exhibits increasing absolute risk aversion, IARA, if A’ (w) > 0. |