Chapter I

General Introduction

1.1 General introduction of the ultimatum game

This research will be based on an experimental bargaining game which is called the Ultimatum Game. The Ultimatum Game itself is one of the most studied games all around the economical and psychological world. Neo-classical economics requires all agents to be rational. In fact, agents will be expected to choose pareto-optimal outcomes whenever they are reachable by undominated strategies. Human behavior, however, tells a different story. People reject a sure payment if they can punish another person by whom he felt being treated unfairly. Thus, people are driven by other motives besides the outcome, such as envy, justice and intention. By telling the story we nevertheless believe that "the common behavior of ultimatum game is rational."

The Ultimatum Game involves two players taking the proposer side and the responder side, respectively. The game is to bargain over the division of a certain fixed amount of money. The proposer offers a division of the money into two shares. The responder can not influence that decision. However the responder is always able to make a decision whether to accept or reject the offer. If the responder accepts then the money is divided between the players according to the proposer's offer, but if the responder rejects neither player can get anything.

So the most rational solution for the game is that the proposer offers the least feasible share which the responder would accept. Any smaller offer also owns a greater chance to be rejected.

"Anyway, the experimental data for the game is very inconsistent with the theoretic equilibrium findings. In 1983 Güth, Schmittberger and Schwarze did the first experimental study on Ultimatum game; the mean offer was around 37% of the share. Since then several other studies have been conducted to examine this gap between experiment and theory. Almost all the studies showed that humans disregard the rational solution in favor of some notion of fairness. The average offers are in the region of 40-50% of the pie. About half of the responders reject offers below 30%."

A few stylized facts are established in the literature and found to be "quite robust" [Falk and Fischbacher 2006]. They can be summarized as follows.

(1) There are "practically no offers" above 50%

(2) The "modal offer" is between 40-50%

(3) Offers close to 50% are "practically never rejected"

(4) Offers below 20% are "extremely rare"

(5) Rejection rate for offers below 20% is "rather high"

For instance:

Consider Figure 1-1 for one version of the Ultimatum Game Extensive Form which allows the proposer to chose only between two different possible offers, a totally fair one (No 1), and an unequal assigning the major bulk to himself (No 2). It is a more specific example of the bargaining. It may not be very difficult for a rational enough people to make a choice to averse the risk, and guarantee the best profit return from the choice of sharing. Most people will definitely agree to go for option "NO. 1" if they are still sober. (Later on we will do a survey on this situation.) However, lots of external complications will change the thoughts and choices of people. These external behaviors of people may essentially change the outcome in this simple extensive form.

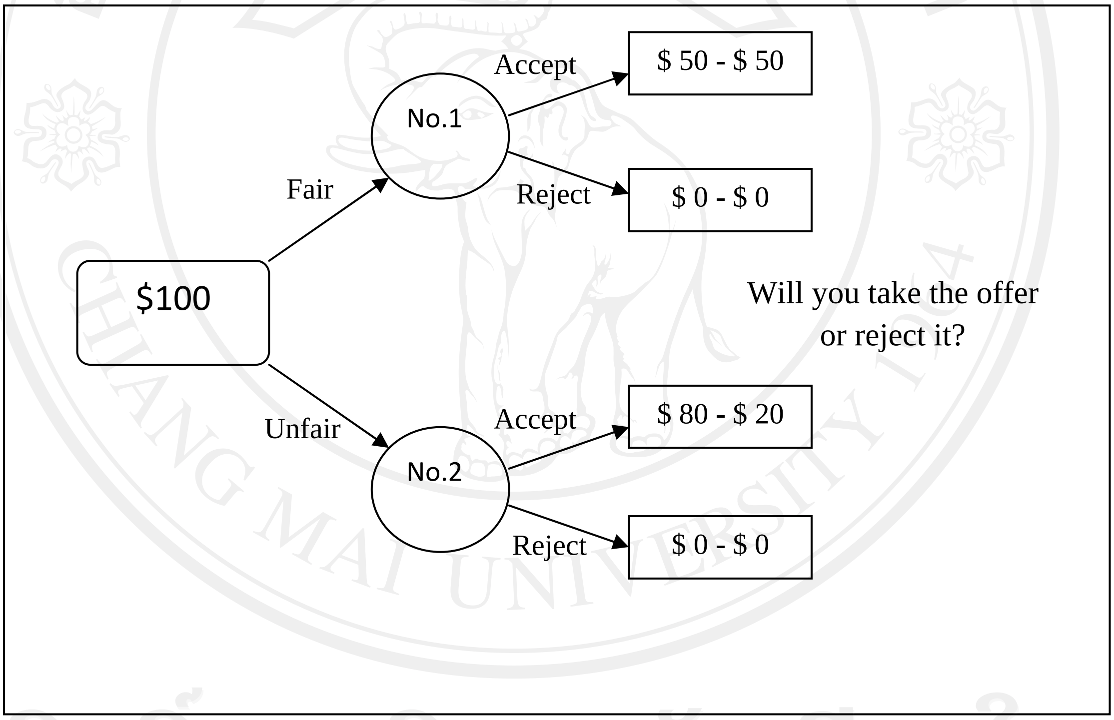

Figure 1-1 The Ultimatum Game Extensive Form 1

Now, let's assume that there are 2 people ready to share that $100. In case NO.1, the proposer offered a fair share of "50 - 50". No doubt the responder will happily take the offer if he is rational enough. What if the proposer offered $30 to the responder to keep; will the responder still take the offer? During the study of the UG over the past 20 years, normally the outcome is very analogical. Usually the proposer is going to offer an amount around 40%, because they considered it as fair. As for the responders, most of them can not be very rational as the offer goes less than 20%, then they will reject.

However a few years ago, Prof. Joseph Henrich [Emory University, Atlanta, USA] ran the UG experiment over 15 different cultural background group of people. The amount for different group of people to bargain over is usually the income that they can make for 1-2 days. Surprisingly he found out that the higher educated people are usually very generous; they usually offered the amount over or equal to 50% to make others to accept the offer. More importantly, people from different background act very differently and the outcome is way to disparate from the economists' guesses. Even the stingiest people offered over 25%. Thus as we can see some notions will easily change individuals' actions for dealing with the offers, such as greedy, envy, selfish, stingy, generous, benevolence, cooperation, reciprocity and so on.

Consider another example though. In Figure 1-2 the diagram are slightly different from Figure 1-1. In this case option "NO. 1" is still the fairest offer that the proposer can choose, but it is no longer 50-50. So in Figure 1-2 a relatively unfair option 80-20 is now the fairest option to go.

In Figure 1-2 the choice now is a little tougher for both players. As for a rational mind, people will always accept the offer however little it is, but in respect that human brains contain much more emotions that so far has not been represented in decision theory, proposers usually go for an "unfair" option (NO.2); even if a more fair offer(NO.1) was available.

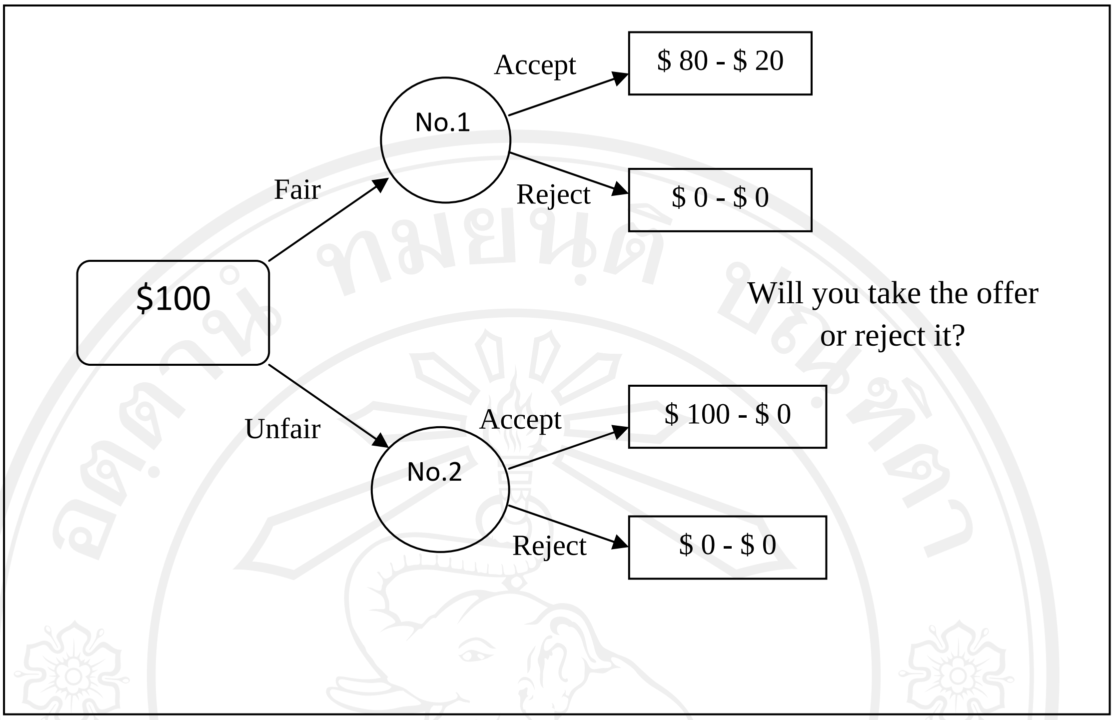

Figure 1-2 The Ultimatum Game Extensive Form 2

As proposer of course, it's always important to predict the acceptance level of the responder and to achieve the best profit value. When a proposer makes high offer it is either a taste for fairness or fear of rejection. Here in Figure 1-2, an equitable distribution is not available, so it is much easier for the responder to feel unsatisfied and consequently reject. Because the fear of losing all the money, the proposers usually go for option NO.1. Nonetheless, if the both players are familiar with each other the problem is no longer tricky; more than 80% of the players will kindly accept the offer without even thinking about. This may possibly be related to the Mudita (Benevolence), which is presented in the following article.

We see from this example that acceptance rates do not only depend on the outcome of the two players, but also on the available alternatives. The acceptance rate for the 80:20 offer was much higher, when it was the most fair alternative (Figure 1-2), then when it was the least fair (Figure 1-1). This kind of context dependence excludes a model which is solely based on “consequentialist” preferences depending only on the outcome. Empirically, consequentialism, the doctrine that the actual outcome only counts, is found violated.

However, we find that no patterns in values, risk-taking attitude and motives which could explain this effect. Rather, the finding fits into the category of established contextual effects leading to rationalization of the responder's behavior. This leads to the conclusion that the proposed dependency on intentions, although clearly reproducible with stated preferences, is less stable than the theory of reciprocity might suggest. Moreover, probit regression analysis re-establishes fairness as the primary explanative variable for the acceptance rate in real-money games.

In the Ultimatum Game exists a unique Sub-game Perfect Nash Equilibrium solution to this problem: $D = (\pi - \varepsilon , \varepsilon)$.

In game theory, a Sub-game Perfect equilibrium (or Sub-game Perfect Nash equilibrium) is a refinement of a Nash equilibrium used in dynamic games. A strategy profile is a Sub-game Perfect equilibrium if it represents a Nash equilibrium of every subgame of the original game. More informally, this means that if (1) the players played any smaller game that consisted of only one part of the larger game and (2) their behavior represents a Nash equilibrium of that smaller game, then their behavior is a Sub-game Perfect equilibrium of the larger game.

A common method for determining Sub-game Perfect equilibria in the case of a finite game is backward induction. Here one first considers the last actions of the game and determines which actions the final mover should take in each possible circumstance to maximize his/her utility. One then supposes that the last actor will do these actions, and considers the second to last actions, again choosing those that maximize that actor's utility. This process continues until one reaches the first move of the game. The strategies which remain are all Sub-game Perfect equilibria. However, backward induction cannot be applied to games of imperfect or incomplete information because this entails cutting through non-singleton information sets. Backward induction also requires that there be only finitely many moves. It cannot, therefore, be applied to games of infinite length.

The set of Sub-game Perfect equilibria for a given game is always a subset of the set of Nash equilibria for that game. In some cases the sets can be identical.

There exists win-win situation, both defected situation, and also situations been chosen just for punishing another player's selfishness.

	Cooperate	Defect
Cooperate	5 : 5	-10 : 0
Defect	0 : -10	-5 : -5

Figure 1-3 Choice Situation

The Ultimatum game provides an intuitive example of a game with fewer Sub-game Perfect equilibria than Nash equilibria. The Ultimatum Game is viewed as a simple game with only 2 players very few actions and only single round to go.

Like in the figure 1-3, if and only if the two players are cooperating with each other then they are definitely heading for a win - win situation which means each player is able to make at least 50% satisfaction. So it is always rational for both players to be calm and keep rational while making decisions to ensure to avoid the risk of losing. No matter who in the game is trying to take advantage of others, he may also take the total punishment or maybe luckily the other player will be generous and let the greedy one to take advantage. So that unilateral defect will tear up the basic fairness of the game, which will lead to a failure of the cooperation to the game as well, in this case whoever wanted to take advantage can be seem as losing 100% of satisfaction but the other player loses nothing. Last but not least, if both players are defecting, then the unilateral loss will be cut down, and both of them will have to share the lossses and find themselves in a lose – lose situation, thus each player can be seem as losing 50% of satisfaction utility.

1.2 Definition

As it is in this experimental Ultimatum Game, for choosing the optimal consumption is the way economists should be concerned about. As the players for the game especially the responders, they must be very decisive and sober.

To keep following the origin of absolute fairness will become impossible since Figure 1-2; at here, there is not precise fairness no more it can be only relatively fair. So compare with take nothing to punish the other party, to get something in return is essentially rational. I is of mutual advantage to accept in option NO.1. Even 20% of the total interest is still much better than take nothing in return no matter how much the psychological satisfaction will be for himself.

Anyway, for option NO.2 more than 95% of the responders are going to turn it down even if they may be in a close relationship to the proposer. The responders are usually considering the most unfair option (Figure 1-2: NO.2) as cheat, and whenever someone feels like to be cheated it's usually hard to make them to be rational.

From study of "A Theory of Reciprocity" written by Armin Falk and Urs Fischbacher we can generally predict the acceptance probabilities of the Ultimatum Game experiment.

The chart below (figure 1-4) shows the responders' acceptance over the proposers' offers. By the chart, it's easy to see that the responders' acceptance rate are positively correlated to the proposal (amount of money has been offered). If the proposers' offers are greater or equal to 50%, then the responders are expected never to reject the offer. There is generally accept point around 0.4 (40% of the total interest), which means if any offer higher than this point then the offer will be accepted anyhow. "The lower the offer, the higher is the willingness of a reciprocally motivated responder to punish the proposer by rejecting the offer." [Theory of Reciprocity Result from Armin Falk and Urs Fischbacher]. Vice versa, if the proposer want to guarantee acceptance of his offer, then she shall at least propose an offer which is greater than 40%.

Nevertheless, peoples' behaviors are very uncertain and inconstant, so are the choices of them. As a matter of fact the study of individual's behavior is not only economical but also blends elements from psychology, sociology and social anthropology. Meanwhile people's behavior are influenced by: demographics, psychographics (lifestyle), personality, motivation, knowledge, attitudes, beliefs, feelings, etc. "Behavior concern with individual's need individual's actions in the direction of satisfying needs leads to one's behavior of every individual depend on thinking." [http://en.wikipedia.org/wiki/Consumer_behaviour] As for the behavior of an individual, it can be very complicated and complex. Individual behavior is an extremely difficult notion to predict and most of the times it's almost unpredictable. This goes very interesting if we combine the almost fixed Ultimatum Game with the uncertain and flexible motion of any individual; the changing factor promises no certainty of outcomes.

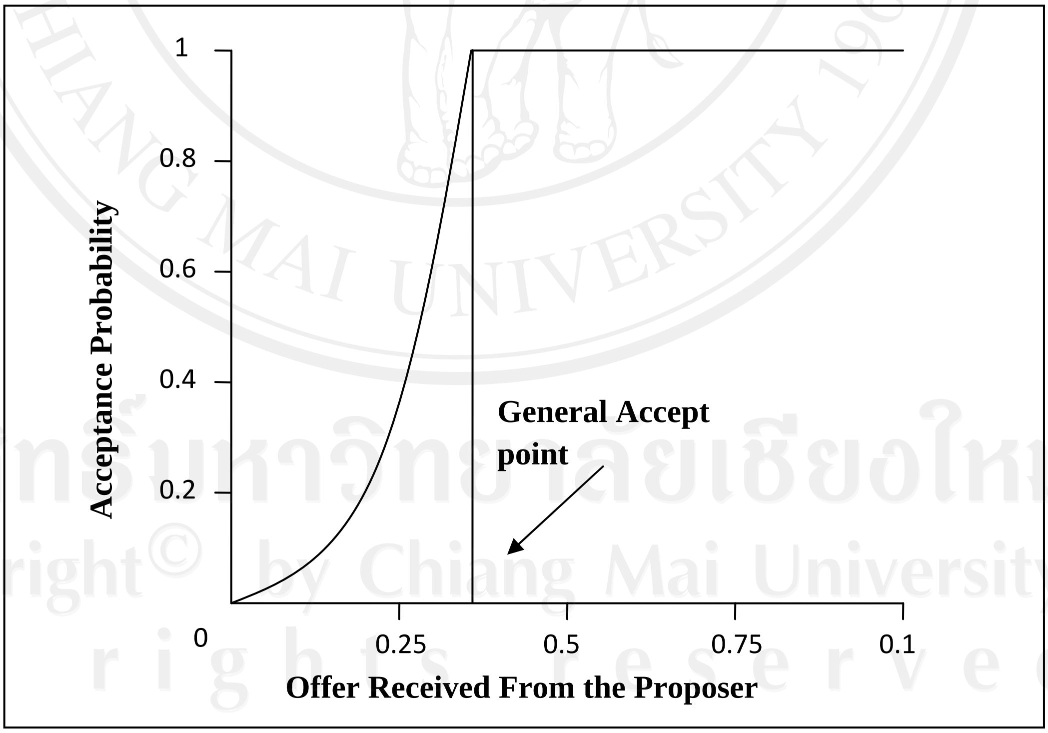

Figure 1-4 Theory of Reciprocity Result From Armin Falk and Urs Fischbacher

The hypotheses of this research are:

1. The experiment will follow the pace of Falk and Fischbacher's Reciprocity theory, in accordance with the predictions.
2. If there is any kind of discrepancy in any aspect from the theoretical game and the real game.
3. There is one or many major vector that will definitely change the outcome of the game or remodel the behavior of players.
4. The offers are turned down only because that they are small.

As goals of this study; firstly we intended to measure the utility function of some individuals representing their risk preferences, then put the utility function into an Ultimatum Game situation. To achieve this goal, a very precise method for utility measurement will be necessary, and it will be discussed in the following chapters.

Secondly the data for building up the models which are needed for measure the utility can be provided by an experimental survey study. In fact the survey can also provide more information that how peoples' behaviors will affect the choices for the Ultimatum Game situation. Later on we shall combine the results together to see if our study fits all the previously studied literature.

Thirdly we are going to find out the most suitable theory to explain the reciprocating behavior in the Ultimatum Game; also to find out the most suitable modeling software for solving the problem.