TOWARDS AN OBJECTIVE MEASURE OF *GHARAR* IN EXCHANGE

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This paper develops a framework for analyzing *gharar* based on economic aspects of game theory. The framework is consistent with *Sharī'ah* maxims as well as individual *gharar* transactions widely studied in classical *fiqh* resources. In addition, the framework brings insights into explaining different *fiqhi* positions on controversial *gharar* contracts. When extended to contemporary practices, the measure helps understanding the logic of instrument design, and where violation of Islamic rules exactly lies. The moral, ethical, and social aspects of this framework show the deep consistency between Islamic rules of exchange and general Islamic principles of human behavior.

1. Introduction

Although the legal aspects of *gharar* are well established in Islamic jurisprudence, researchers in Islamic finance constantly face the dilemma of defining the concept and its precise meaning. For example, Zaki Badawi (1998, p. 16) writes: "The precise meaning of *Gharar* is itself uncertain. The literature does not give us an agreed definition and scholars rely more on enumerating individual instances of *Gharar* as substitute for a precise definition of the term." Frank Vogel (1998, p. 64) expresses a similar tone: "As with *riba*, *fiqh* scholars have been unable to define the exact scope of *gharar*." These claims might well be exaggerating, but they point to the need for further contemporary formulation of the subject.

This paper is an attempt to develop an objective criterion to identify and measure *gharar* in exchange. It is shown that a *gharar* transaction is equivalent to a zero-sum game with uncertain payoffs. The measure helps economists view *gharar* within an integrated theory of exchange under uncertainty, so that it can be easily communicated to non-Muslim economists. Further, it provides a quantitative measure of *gharar* that can potentially be applied to innovative risky transactions. A

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Shari'ah-based measure is also developed, and the two criteria are shown to coincide and integrate each other.

2. Concepts And Definitions

2.1 Game

This term is used in game theory for a variety of settings and arrangements among two or more players. In this paper it means an exchange between two persons, the objective of which is to gain economic profits. In *fiqh* terminology, it is for-profit *mu'awadha* (معاوضة بقصد الربح).

In daily life the term "game" is used to describe a contest (مسابقة) rather than anexchange (معاوضة). The difference between the two should be clear: An exchange implies a transfer of wealth from one party to the other in return for utility or a certain asset. In contests no exchange takes place; each player is seeking his own benefit through his own performance. The two meanings get mixed when gambling is considered. More on this point later.

2.2 Zero-sum Game

This is a game in which whatever one party gains is what the other loses. As such, zero-sum games are rare in practice because magnitude of gains need not match that of losses, and the utility function of one party differs from that of the other. Thus we are not interested in such games *per se*; rather, we are interested in the general case where a player's payoffs cannot *increase* without *reducing* the other player's payoffs. Such games are called "strictly competitive games," where preferences of each party are diametrically opposed to the other's, so one party can win only if the other loses. Game theorists, however, show that, from a strategic point of view, any two-person strictly competitive game is equivalent to a two-person zero-sum game, so that the former can always be expressed in a zero-sum form (Friedman, 1990, pp. 79-80; Binmore, 1994, pp. 276-277). From now on, we use the term "zero-sum game" to indicate strictly competitive games, without implying that utilities of the two parties are identical.

Another way to describe a zero-sum game is that all outcomes of the game are Pareto optimal. There is no outcome in the game that both players prefer. No room for cooperation between players in such games (Friedman, 1990, pp. 20-21).

Strictly competitive games are sometimes called pure conflict games, constant-sum-games, or perfect-negative-correlation games.

Non zero-sum games are games that include win-win, win-lose and lose-lose outcomes. Some games include only win-win and lose-lose outcomes. These are called pure cooperative or pure coordination games. (These should not be confused with games that allow binding commitments, also called cooperative games, as compared to non-cooperative games, whereby agents are motivated rather by self interest. Our focus here is on the latter type.) Games with mixed outcomes (win-win, win-lose) are sometimes called mutual-dependence, mixed-motive, or bargaining games (Schelling, 1980, pp. 88-89).

2.3 Normal Exchange

Simple exchange of goods or services under certainty can be beneficial for both parties. As micro economic theory shows, both parties gain from exchange as long as both are utility (or profit) maximizers. This is achieved when marginal utility of the good for the buyer is greater than or equal to its price, and the marginal cost for the seller is less than or equal to the price. Otherwise, exchange does not take place.

If, for any reason, the price turns out to be greater than the buyer's marginal utility, but exceeds the seller's marginal cost, the buyer loses while the seller wins. Similarly, if the price turns out to be less than the marginal cost, but exceeds the buyer's marginal utility, the buyer wins but the seller loses. Still yet, both parties might lose when the price is higher than the marginal utility of the buyer, and lower than the marginal cost of the seller. Therefore, exchange is a game in which players might possibly end with win-win, win-lose, or loses-lose outcomes.

In the light of this discussion, we can view the set of Islamic rules and regulations concerning exchange as conditions for promoting cooperative behavior and avoiding conflict of interests. This is not to say that only cooperative games are permissible. A necessary requirement for a transaction to be permitted is the possibility of cooperation, as in nonzero-sum games. It is left to players to achieve cooperation in such games through rational decision making. Strictly competitive games, however, exclude this possibility by design, and thus, no matter how rational players are, one can win only at the expense of the other.

2.4 Risk

Economists usually differentiate between the terms "risk" and "uncertainty." According to Knight (1921), risk describes situations in which probabilities of different events can be "objectively" measured. Uncertainty describes situations where such measurement is infeasible. However, according to Takayama (1993, p. 258), if *subjective*

probabilities are used instead, and axiomatic approach is employed, the distinction between risk and uncertainty "seems to have become mostly irrelevant." Throughout this paper the terms "risk" and "uncertainty" are used interchangeably. Our interest, however, is in how Islam views risk.

In general, risk as such, like hardship (مشقة), is not desirable for its own sake. Hardship is desired only when involved benefits more than offset associated hardship. Similarly, risk becomes desirable only when it stimulates productive efforts and value-adding activities. However, this does not mean that any decision to take risk is prohibited. *Mudharabah* involves considerable risk, yet it is perfectly Islamic. Thus there must be something more than uncertainty or risk that influences the desirability of a given transaction. As we show below, it is the payoff structure that makes the difference.

3. *Gharar* And The Zero-Sum Measure

Fuquaha make it clear that gambling is a game in which one party wins while the other loses (ابن قدامة ١٣/٤٠٨ ، الضرير، ص ٦٢٢). Since gambling represents the pure form of *gharar*, it is natural to argue that *gharar* contracts in general have the same property. That is, a *gharar* transaction is simply a zero-sum game with uncertain payoffs.

Among the early explanations of *gharar* is that of Imam Malik. In *Muwatta'*, he states: "Included in *gharar* and risky transactions is the case in which a man whose camel is lost, or his slave has escaped, the price of which is (say) fifty dinar, so he would be told by another man: I will buy it for twenty dinars. Thus if the buyer finds it, the seller loses thirty dinars; if not, the buyer loses twenty dinars" (الأصبحي [٢]، ص ٦٦٥).

Ibn Taymiah clearly explains: "*Gharar* describes things with unknown fate (مجهول العاقبة) Selling such things is *maysir* and gambling. This is because when a slave runs away, or a camel or a horse is lost, his owner would sell it conditional on risk, so the buyer pays much less than its worth. If he gets it, the seller would complain: you have 'gambled' me (قميرتني), and got the good with a low price. If not, the buyer would complain: you've gambled me and got the price I paid for nothing. This will lead to the undesired consequences of *maysir*, which is hatred and enmity, besides getting something for nothing (أكل المال بالباطل), which is a sort of injustice. So *gharar* exchange implies injustice, enmity and hatred." (ابن تيمية [٢]، ص ١١٦).

Ibn al-Qayyim writes: "*Gharar* is the possibility of existence and non-existence. Its sale is forbidden because it is a sort of gambling, which is *maysir*. Allah forbade it because of eating other's wealth for nothing, and this is injustice that Allah has forbidden. It becomes gambling when one party gets a reward (benefit) while the other might not get it, so this becomes illegal, like the sale of runaway slave, ... [I]t is sold for less than its price. If it is found, the seller regrets, if not, the buyer regrets." (ابن القيم [٢]، ٨١٥/، ٨٢٤).

3.1 Risk and the Payoff Structure

It should be emphasized that Islam does not prohibit a contract just because it involves risk. Only when risk is a channel to make one party profits at the expense of the other that it becomes *gharar*. Ibn Taymiah makes this clear: "It is well known that Allah and his Messenger (ﷺ) did not prohibit every kind of risk. Nor all kinds of transactions that involve the possibility of gain or loss or neutrality are prohibited. What is prohibited among such kinds is eating wealth for nothing, even if there were no risk, not that risk as such is prohibited."

وأما المخاطرة فليس في الأدلة الشرعية ما يوج تحريم كل مخاطرة بل قد علم أن الله ورسوله لم يحرما كل مخاطرة ولا كل ما كان مترددا بل أن يغنم أو يغرم أو يسلم وليس في أدلة اشرع ما يوجب تحريم جميع هذه الأنواع لا نصا ولا قياسا ولكن يحرم من هذه الأنواع ما يشتمل على أكل المال بالباطل والموجب للتحريم عند الشارع أنه أكل مال بالباطل كما يحرم أكل المال بالباطل وإن لم يكن مخاطرة لا أن مجرد المخاطرة محرم

(ابن تيمية [١]، ٥٧٦)

This statement makes it clear that, although risk as such is undesirable, the reason gharar is prohibited is that it involves eating wealth of others for nothing (أكل المال بالباطل), not mere risk. A zero-sum game expresses exactly this concept, because the winner in such games gains by taking away from the payoff of the other party, forcing him to lose.

3.2 *Gharar* and Delusion

If risk is not the reason for prohibiting *gharar*, why is it that the Prophet (ﷺ) mentions the word "*gharar*"? The reason is that no rational person

would accept to engage into a game in which he will certainly lose. He does so only if it is not known a priori who will win and who will lose. Given the possibility of gain, each party *hopes* that he will be the winner, and that what makes it *gharar*.

Taking a risk with the hope of wining is not unethical; in fact it is essential for human life. However, such hope becomes unethical when it necessarily means the wish that someone else loses, since there is no way that both can win in zero-sum games.

We now might be able to understand the essence of the term *gharar*. In Arabic, it means risk that implies delusion and deception (الضرير، ١٩٩٠). Interestingly, *qimar* (قمار) also implies deception (Rosenthal, 1975, p.2). Since risk *tempts* the two parties to play a zero-sum game, this temptation is a sort of delusion that is implied by *gharar*.

3.3 Enmity and Conflict of Interest

The Qur'an explains the reason behind prohibiting *maysir* and gambling: "Satan only wants to plant enmity and hatred among you through wine and *maysir*" (المائدة ٩١). Ibn Taymiah relates enmity to the payoff structure: "In a *gharar* sale, one party obtains something, while the other is under risk, which leads to regret of one of them, and their dispute."(ابن تيمية [٢]، ص ١٦٦).

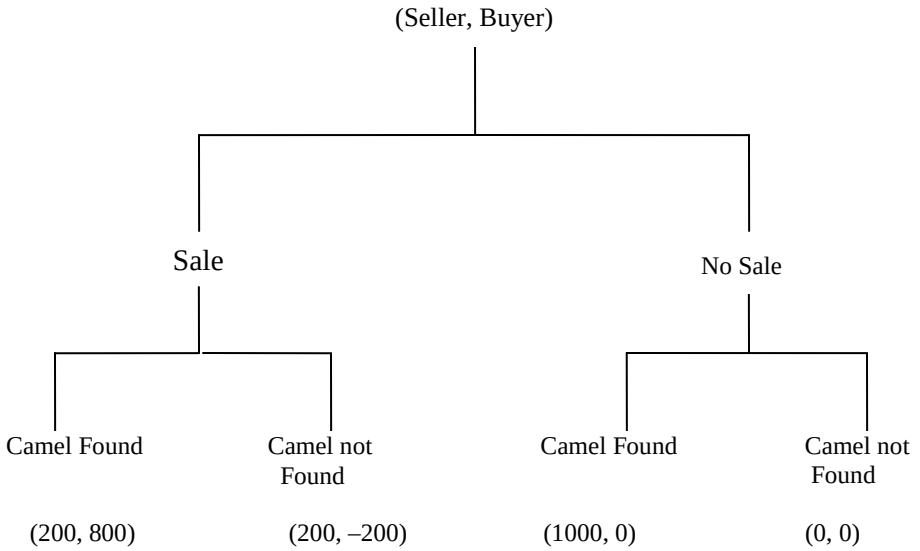
Zero-sum games, by definition, are games in which interests of both parties are in direct opposition. It represents a fertile ground for hatred and enmity. Thus, the above framework is consistent with the Qur'anic view of the matter.

According to Vogel (1998, p. 91), there are two views on why *gharar* is prohibited. One is to avoid "enmity," in which case a broad scope of risky transactions becomes valid. The other is that it is prohibited to avoid "ignorance or non-existence." This view implies a restrictive scope of valid transactions. A zero-sum criterion falls within the former view, yet it encompasses the essential features of the latter, as will be shown later.

3.4 Measure of Loss

A crucial aspect of the zero-sum measure is that it is based on gains and losses of each player. How can we decide on the criterion by which one is considered losing or gaining? For example, it might be argued that seller of a lost camel does not lose anything. Since the camel is already lost, he does not lose by selling it. In fact, his level of wealth is higher than without sale even if the camel is found. So how can he be a loser?

The answer is that he loses a potential gain that he was entitled to *had he not sold the camel*. To clarify this point, suppose the camel is worth 1000 dinar, and that the camel is found by pure chance. Suppose that the seller believes the chance of finding the camel is 20%. Then he will not accept a price less than 0.2(1000) = 200. If the chance is 40%, then he will ask for 400 instead. Why? Because this is what the seller is giving up. What the buyer benefits from the contract is what the seller gives up as a forgone profit. Had the owner not sold the camel, he could have found it himself and enjoyed its full market price. So if the camel is found, the seller loses the difference between its market value, which he was entitled to, and the price he received, i.e. 200 –1000 = –800, which is exactly the same amount that the buyer wins. If the camel is not found, the seller wins the price, 200, that the buyer loses. So it is a zero-sum game where one party wins only at the expense of the other. To elaborate, consider the following decision tree.



Numbers in parentheses denote payoffs for the seller and the buyer, respectively. If the owner does not sell and the camel is found, he gets 1000, the value of the camel. If it is not, he gets nothing. If he decides to sell he gets 200 regardless of the camel being found or not. The buyer, however, gets 800 (= 1000 – 200) if the camel is found, but gets –200 if it is not.

To compute wins and losses, simply subtract payoffs for each player in case of no sale from those in case of sale. So for the seller, net payoff if the camel is found is 200 – 1000 = – 800. If the camel is not found, net payoff is: 200 – 0 = 200. Similar computations for the buyer lead to the following table of *net* payoffs:

	Seller	Buyer
Found	–800	800
Not Found	200	–200

This clearly shows how sale of a lost camel is a zero-sum game, even in the absolute sense (payoffs always add to zero).

Note that the seller was entitled to this profit, and it is not merely a forgone opportunity. Losing an opportunity for profit is costly, but losing profit that you were entitled to is even more costly. This difference has been supported by several experimental studies documenting "loss aversion" (Tversky and Kahneman, 1986, 1991). Loss aversion implies that "displeasure of losing a sum of money exceeds the pleasure of winning the same amount" (*ibid*, 1986, p. 74). This means that the disutility of losing 800 by the seller if the camel is found counts more than its absolute value.

3.5 Regret Theory

Losing entitled profit is closely related to the concept of "regret," developed by Loomes and Sugden (1982) and Loomes (1988), as an approach to decision under uncertainty. Regret is defined as the difference between the payoff when decision *d'* (to sell) is taken as compared to decision *d*□(not to sell), given the state of the world *i* (the camel is found or not found). If the camel's owner decides to sell (at a discounted price) and the camel is found, he regrets losing ownership and the full price of the camel. If the camel is not found, the buyer regrets the paid price. By taking regret into account, therefore, the seller is considered a loser because he was entitled to a higher level of wealth.

3.6 Formal Measure

To sum up, measure of loss is based on the difference between payoffs obtained when the contract is signed and those if it is not, for each state of the world. The contract is the sole reason for this difference, and thus

gains and losses are attributed to it. A player considers himself a winner if, given the state of the world, this difference is positive. We might describe this aspect symbolically as follows.

Let y_i^A (d) denotes the payoff for player A in state i, if decision d (to exchange with player B is taken. If not, his payoff will be x_i^A(d'). Let V_i^A (d') = y_i^A - x_i^A be player's A net payoff from exchange. In state i, player A wins if $V_i^A \geq 0$. Player B wins if $V_i^B \geq 0$. The exchange is considered a zero-sum game when the following conditio n holds:

(1) $V_i^A \geq 0$ if, and only if, $V_i^B < 0$, $\forall i$.

3.7 Measure of *Gharar* in Nonzero-sum Games

Nonzero-sum games are games with mixed outcomes: win-win, win-lose, or lose-lose. In such games it is unclear a priori whether players intend to play a cooperative or a competitive game. In this regard *fiqh* scholars state three conditions for tolerable risk. According to these conditions, involved risk must be:

1. Negligible (الغرر يسير).
2. Inevitable (لا يمكن اتحرز منه).

3. Unintentional (غير مقصود).

(See : الضرير ص ٥٨٧-٦١٢ ، حسان ص ٤٦٤-٤٦٩).

The first condition is equivalent to saying that probability of failure is sufficiently small. It also implies that the magnitude of loss should be limited. As the magnitude of potential loss rises, the degree of certainty necessary to consider such loss diminishes, as al-Ghazali points out. (الغزالي، ٤/ ٤٩٢-٤٩٣)

The second is stating that the game allows for win-win outcomes, so that a beneficial exchange can be performed. However, this beneficial exchange cannot be achieved without assuming the risk of failure, and thus risk becomes inevitable.

The third condition can be rephrased as requiring that win-win outcomes are preferred to win-lose outcomes. If a player's objective is to win in cases where the other player loses, then he is seeking the zero-sum part of the game. If the objective is to seek the win-win outcome, then this is a beneficial transaction. But how can we measure the objective of a game?

A simple approach is to apply expected utility rule, where utility of each outcome is weighted by its probability. Let p_i be the probability of state *i*. Let ω indicates the set of states in which both players win. Let ω' indicates the set of states in which player *A* wins when player *B* loses. For player *A*, define:

$$(2) \quad \Gamma_A(d) = \sum_{i \in (i)} p_i y_i^A - \sum_{i \in (i)'} p_i y_i^A$$

where y_i^A is as defined earlier. Γ*A* (*d*) represents "net value of cooperation" for player *A* from exchange *d* . It reflects the difference between expected return from cooperation and that from competition. We can state that player *A* seeks a beneficial exchange when Γ*A* > 0. That is, when the expected payoff of win-win outcomes is preferred to that of win-lose outcomes. Conversely, player A is considered seeking the zero-sum part of the game when Γ*B* ≤ 0

By appropriately quantifying these measures researchers can assess whether a transaction contains a "high degree of *gharar*" (غرر كثير), or if it is

intended by the traders (غرر مقصود). A modern approach to measure *gharar* thus can be developed.

If both parties are seeking the win-lose outcome, it becomes a *gharar* transaction. If only *A* does, and *B* is unaware of that, say because of informational asymmetry regarding probability distribution, it becomes a deception (تغرير). In this case player *A* might be ethically (ديانة) accountable, though the court might not rule the contract void.

If *B* is aware of *A*'s objective, he will not accept to engage into such a game except on the same ground as *A* does, i.e. only if $\Gamma_B \leq 0$ (e.g. *B* will offer a lower price to compensate for possible loss). The reason is that, for player *B*, there is no incentive to cooperate if *A* refuses to do so. Since *A* prefers to compete rather than to cooperate, *B* will respond in a reciprocal manner. This is supported by reciprocal behavior documented in experimental economics (e.g., Fehr et al., 1997).

Note that equation (2) is general enough to include zero-sum games. In such games, $\omega = \phi$ so that $\Sigma_{i\epsilon(i)} p_i y_i^h \equiv 0, h = A, B;$ that is, expected utility of win-win outcomes is always zero, so that Γ is always negative.

4. Sharī'ah-Based Measure of *Gharar*

The zero-sum measure is clearly based on economic understanding of exchange. Here we seek a criterion stated by *Sharī'ah* rules and maxims. Not surprisingly, but contrary to a common belief, there exists a well defined and clear measure of *gharar* in *Shari'ah*: It is the established *hadith* "liability justifies utility or return"(الخراج بالضمان).

4.1 Liability Justifies Return

Generally speaking, almost all unlawful transactions violate this maxim, including *gharar*. The term "liability" in the *hadith* by its nature involves risk. It means assuming the risk of loss or damage of the asset such that it is no more beneficial or utilizable.

The "liability justifies utility" maxim establishes the principle of "justice" in Islamic economics. Rights and obligations must be balanced, and this balance is essential for proper economic incentives. It can be easily seen that eating other's money for nothing necessarily implies imbalance between rights and obligations for each party. That is, the zero-sum structure is unjust, as Ibn Taymiah points out.

4.2 Classification of *Gharar*

This maxim implies two fundamental properties of normal exchange:

(1) Exchanged utility is certain, and
(2) Both the right to use the utility and the obligation to bear its liability are held by the same agent.

Examination of *gharar* contracts shows that violation of one of these two conditions, *but not both*, renders the transaction illegal. This implies that there exist two classes of *gharar* transactions:

1. When the utility exchanged is uncertain at the time of contracting, while its liability is assumed by the buyer. Examples include sale of a lost camel or runaway slave, pebble sale, and sale of diver's or hunter's hit. The utility of exchanged asset in such sales is uncertain at the time of contracting, but the buyer bears the liability the moment he pays the expected price. Rights and obligations of each party are imbalanced as ex post value of the asset diverges from expected price. So if the camel is found, the buyer's utility would exceed his liability; if not, liability exceeds utility. The opposite is true for the seller.

2. When the connection between utility and liability is broken, so the owner becomes entitled to the utility without assuming its liability, which is another form of imbalance between rights and obligations. An example is the commercial insurance contract, whereby liability of insured asset is exchanged for a premium. The insured party (policy holder) enjoys the asset's utility without assuming its liability, thus his rights and obligations are unbalanced. Further discussion of this contract is presented later.

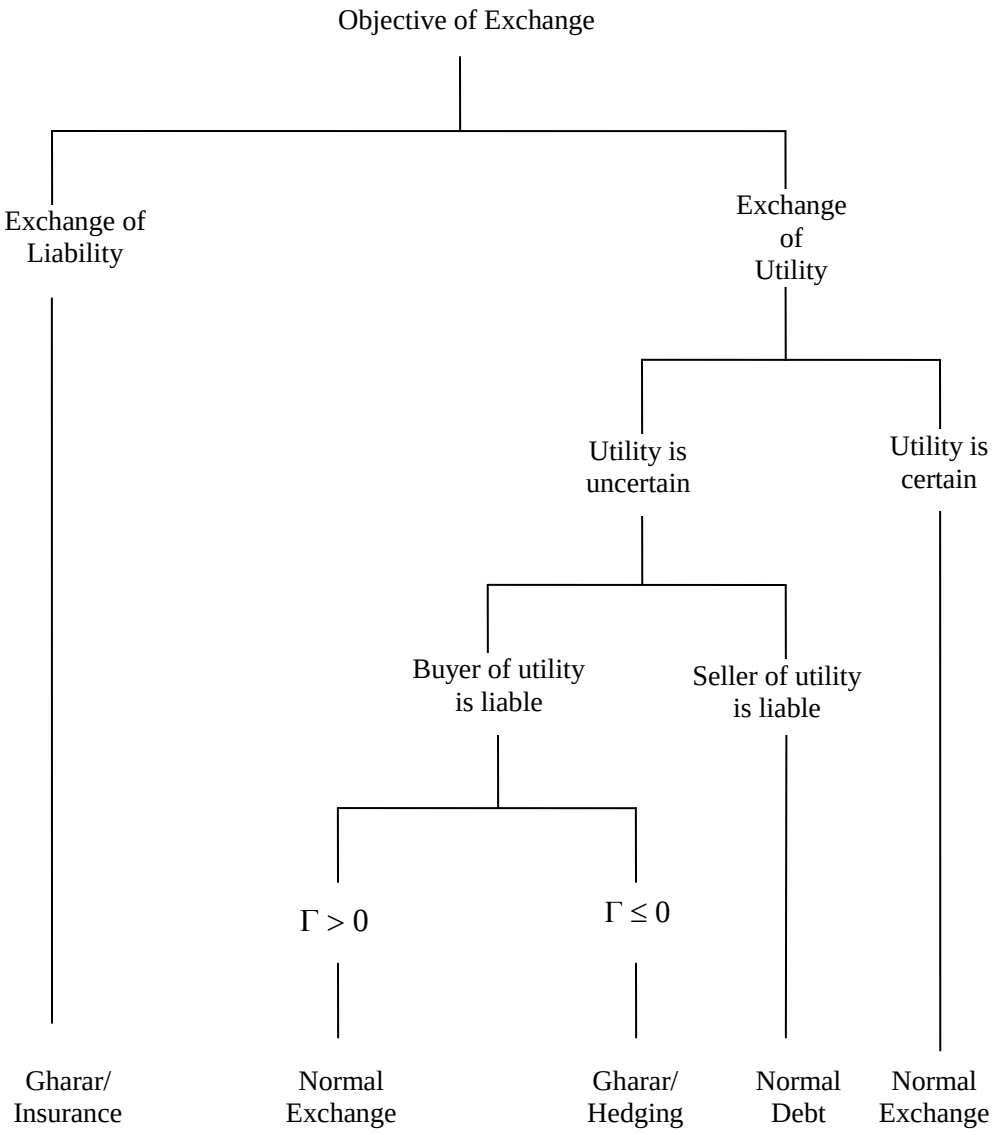
The difference between this class and the former is that, in the second, the original asset or utility is kept in the hand of its owner, and no transfer of ownership takes place. The owner therefore enjoys any upside gain in its value. In contrast, in the first category, the seller is giving up any gain in the asset's value.

These two categories coincide with "hedging" and "insuring" in modern terms. According to Bodie and Merton (1998), hedging is to reduce one's exposure to a loss by giving up of the possibility of a gain. Insuring means paying a premium to avoid losses without giving up gains. "When you hedge, you eliminate the risk of loss by giving up the potential for gain. When you insure, you pay a premium to eliminate the risk of loss and *retain* the potential for gain." (pp. 224, 225). Thus the first class of *gharar* coincides with hedging, while the second coincides with insurance.

4.3 Logical Deduction of Classes of *Gharar*

We can deduct the two classes mentioned earlier as follows:

The objective of a given exchange is either exchange of liability or exchange of utility. The former is *gharar* (insurance). If utility is exchanged, it is either certain or uncertain. The former is normal exchange. If exchanged utility is uncertain, its liability is held by either the seller or the buyer. The former is a debt contract (including *salam*), while the second is *gharar* (hedging), given □ □ 0(See the following graph).


Objective of Exchange
Exchange of Liability
Exchange of Utility
Utility is uncertain
Utility is certain
Buyer of utility is liable
Seller of utility is liable
Γ > 0
Γ ≤ 0
Gharar/ Insurance
Normal Exchange
Gharar/ Hedging
Normal Debt
Normal Exchange

4.4 The Zero-sum Measure

The two classes of *gharar* mentioned above can be inferred from the structure of risk preferences of the two parties involved in exchange. Generally speaking, an agent might be (or, more accurately, behaves *as if* he is) risk averse, risk neutral, or risk taker. Since, in zero-sum games, what one wins is what the other loses, the payoff function of one player is the negative of the other (Binmore, 1992, p. 238). So if one party is risk averse, so that his payoff function is concave, the other must be risk taker, and his payoff function will be convex. (The negative of a concave function is convex.) If one is risk neutral (with a linear payoff function) the other must also be risk neutral. (The negative of a linear function is also linear.) So either both players are risk neutral, or one is risk averse while the other is risk taker.

In the first class of *gharar*, whereby an uncertain asset like a lost camel is exchanged, each party is facing the possibility of gain or loss. The seller gains if the camel is not found, but loses if it is found. The opposite is true for the buyer. Although it is customary to view the seller as a hedger and the buyer as a speculator, by taking regret into account, each is effectively speculating. Each party "hopes" that luck will be on his side. The two parties are facing risk symmetrically, so they can be viewed *as if* they are risk neutral. (The second derivative of the payoff function might be close to zero for both parties).

In case of insurance, it can be shown that the insured party faces less risk than the seller of a lost camel. Both are giving up uncertainty in exchange for certainty, but the insured gives up only potential losses, while the seller gives up potential losses *and* potential returns. The insured therefore is taking less risk than the seller. By the same token, the insurer is taken greater risk than the buyer of an uncertain asset, as the buyer faces potential returns and losses, while the insurer faces potential losses only. Consequently, the insurer is taking greater risk than the insured. It follows that the first class of *gharar* can be modeled with symmetric risk preferences, while the second class can be modeled with asymmetric risk preferences. The two types of risk distribution therefore are consistent with the above mentionedtwo classes of *gharar*.

Therefore, the *Sharī´ah* based measure of *gharar*, as implied by "liability justifies return" maxim, neatly coincides with the zero-sum measure, as well as with contemporary finance.

5. Survey of Some *Gharar* Contracts

This section surveys major contracts considered in classical *fiqh* sources as *gharar*. It can be seen that, generally, scholars take different positions on nonzero-sum contracts, while they unanimously forbid zero-sum games. We start first with nonzero-sum games.

5.1 *Ja'alah*

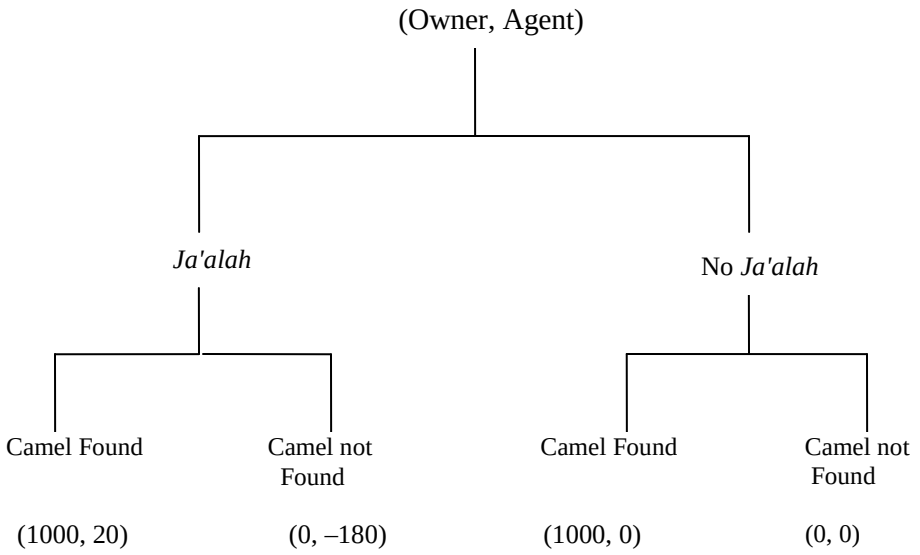
Ja'alah is a contract in which a principal hires an agent for performing a certain task, e.g. searching for a lost camel. If the task is successful (the camel is found), the principal pays the agent an agreed upon wage. If not, the agent gets nothing. The majority of scholars accept *ja'alah*, while the Hanafi school considers it as *gharar*. (الجميلي، ١٩٨٦)

To analyze *ja'alah* within the framework of exchange, we can view it as a labor contract (*ijarah*) whereby wage payment is conditioned on successful performance. That is, *ja'alah* is a conditional *ijarah*, as scholars point out (الضرير، ص ٤٨٨-٤٨٩).

Let us start from the successful outcome. If the camel is found, the owner will pay the agent a certain amount, w, depending on how much the owner values the agent's labor, l . Valuation reasonably depends on the contribution of search to probability of success. So if search improves likelihood of success by 20%, labor can be valued at .2(1000) = 200. Suppose that owner's valuation is $v(l)$ □ 200 Suppose further that search costs the agent $c(l) \geq 180$.

Obviously, wage will be determined such that $c(l)$ □ w □ $v(l)$. Assume that the two parties agree on w □ 200. If the camel is found, exchange of labor takes place. The owner's utility becomes $v(l) - w$ □ 0, while the agent's utility is $w - c(l)$ □ 20, and thus both parties benefit from such an exchange. If the camel is not found, the agent loses his labor while the owner gets nothing. Now consider the value of the camel. If the camel is found, the owner gains its market value, 1000, otherwise he gets nothing. The following tree presents the payoffs.

For the owner, if the camel is found, he gets 1000 (the value of the camel) minus 200 (price of search) plus 200 (value of search) = 1000. If the camel is not found the owner's payoff is 0. For the agent, if the camel is found he gets 200 (value of search) minus 180 (cost of search) = 20. If not, he loses 180.



From the decision tree we can compute net payoffs matrix:

	Owner	Agent
Camel Found	0	20
Camel not Found	0	–180

Therefore, *ja'alah* allows both parties to win if search is successful, so cooperation is feasible in such a game. This is in contrast to *gharar* sale where there is no room for cooperation, as discussed earlier.

5.1.1 *Sharī'ah* Ruling

In the light of this discussion we might understand the different positions of *fiqh* scholars on *ja'alah*. The Hanafi school considers *ja'alah* as *gharar*, while the other three schools (Maliki, Shafi'i, and Hanbali) consider it permissible. The Hanafi scholars looked at the case when performance is not successful, whereby the agent loses, and, even worse, the principal might benefit from the agent's effort. Since this is a win-lose outcome, they therefore considered *ja'alah* as gharar. The majority looked at the cooperative outcome whereby both parties can win. Maliki scholars, however, were aware of the possibility of the win-lose outcome, and thus

required that agent's work shall not benefit the principal if the final outcome is not achieved. An example is digging a water well, whereby the principal might benefit form digging even if water is not found. (ابن رشد [٢]، ١٨٠/٢) The Shafi'is do not require the same, and allow *ja'alah* for such types of work (النووي، ٢٧٤/٥), while Hanbalis appear neutral (البهوتي، ٤٦٨/٢- ٤٦٩. Thus the three schools do not agree on excluding the win-lose outcome, but they all make it clear that *ja'alah* is acceptable because both parties can benefit from it, i.e. because of the win-win outcome.

Consequently, if the objective of the contract is the cooperative outcome, *ja'alah* shall be acceptable, as the majority of scholars believe. If, on the other hand, the win-lose outcome is more likely, so that the zero-sum part of the game dominates, the game becomes more of a *gharar* transaction, consistent with the Hanafi's position. The zero-sum measure therefore is rich enough to allow for different *fiqh* opinions, yet informative enough to discriminate among these positions.

5.2 *Bay' al-'Urboun*

Bay'al-urboun is a sale contract with a down payment or *'urboun*. By paying *'urboun*, the buyer has the right to complete the transaction, in which case the down payment applies towards the price, or to cancel the deal, whereby he loses the down payment. Muslim scholars have different views on *bay' al-urboun*. Hanbali school accepts it while the other main three reject it (Al-Suwailem, 1996).

The majority of scholars consider *'urboun* as a *gharar* sale because of the unsuccessful outcome. If the transaction is not concluded, the buyer loses the down payment paid to the seller for nothing. They consider it a sort of "eating wealth of others for nothing" (الضرير، ص ١٠٣-١٠٤), which is purely a zero-sum outcome. The Hanbali position can be rationalized the same way *ja'alah* is. Since the contract becomes a normal exchange if the transaction is completed, in which case both parties can win, it shall be acceptable as long as the objective is to achieve that cooperative outcome. If the objective is the competitive outcome, it is more of a *gharar* sale, and thus shall be forbidden. In other words, *'urboun* is a nonzero-sum game and thus can be evaluated based on a suitable measure of its value of cooperation.

We can see therefore why *fiqh* schools take different positions on this contract. Later (Section 6), we see how we can evaluate the relative applicability of each *fiqh* position regarding *'urboun* to some modern transactions.

5.3 Sale of Immature Fruit

Zayd bin Thabit reported: "People used to trade fruits at the time of the Prophet, peace be upon him. When time of harvesting comes a seller would say: It failed to mature, it was infected. So people engaged in disputes. When such disputes became widespread, the Prophet (ﷺ) said: "Don't sell until maturity appears," as a recommendation to cut down disputes." (Bukhari ; الضرير، ص ٣٦١-٣٦٢).

Sale of fruit (*bay' al-thimar* بيع الثمار) has been extensively discussed in the literature. It involves a risky payoff where it is possible to have a win-win or a win-lose outcome. If fruit matures normally, it becomes a normal exchange where both parties benefit. If not, the seller wins the price while the buyer loses the fruit. Deciding which outcome becomes the objective of traders depends on likelihood of maturity, which is an empirical matter. If immaturity is highly likely, exchange tends to produce win-lose outcomes more than the win-win ones. So probably this is why the Prophet (ﷺ) intervened only after disputes became widespread, indicating that the transaction became a zero-sum game, and consequently prohibited it.

This implies that if, for some types of fruits or crops, it becomes evident that immaturity after a certain stage is rare, then subsequent exchange of such crops shall not be considered as *gharar*. That is, "appearance of maturity" (بدو الصلاح) is an empirical concept, which can be measured using proper measurement techniques, as indicated earlier. This dimension of *gharar*, therefore, is flexible and might vary depending on the environment, available technology, type of fruit or crop, etc. Hence the zero-sum measure can be applied uniformly to all risky games. Those games that appear to be more cooperative than competitive (i.e. □ > 0) have better chances to be accepted, and vice versa.

5.4 Sale of Hidden Fruit

Selling existing but unseen fruit, like carrots or onions still hiding in soil, is an example of a nonzero-sum game, and is subject of controversy among Muslim scholars. Maliki and Hanafi schools allow such sale, while Shafi'i and Hanbali don't.

Insightful reasoning for acceptance comes from Ibn Taymiah, stating that experts are able to infer the quality of hidden fruits from its visible parts, and thus can decide whether the transaction is for the benefit of the two parties or is it *gharar*. "Reference in all matters is to the pious among

the experts" (ابن تيمية [٢]، ص ١٢٤-١٢٥). Ibn al-Qayyim goes a step further: "To consider this (particular transaction) as *gharar* is not to the *faqih* (as such). It is experts who decide whether it is *gharar* and gambling or not." (ابن القيم [١] ، ٤/٢-٣)

Further, Ibn Taymiah reasons, such transaction is essential for normal life. If such fruit has to be extracted prior to exchange, it might get spoiled before being sold. Soil provides a normal preserving environment for the fruit.

These two points translate into two criteria: Probability of success, and utility of the outcome. When experts decide it is more likely that the fruit is mature and free from disease, they are assessing the probability of the successful outcome. Viewing such exchange as essential is equivalent to saying that the utility generated is high. A single measure combining the two is the expected utility measure, as implied by the formula of presented earlier.

5.5 Gambling

The most obvious form of pure *gharar* is gambling, which is clearly a zero-sum game with risky payoffs. Usually, gambling describes games of chance rather than games of skill.

Although gambling is usually motivated by pleasure, the same payoff structure is found in other risky transactions motivated by "real" incentives. We know that *maysir* was practiced among Arabs to help the needy and give the poor (هارون، ١٩٨٧). Yet the Qur'an openly condemned such behavior. Hence, intentions alone, whether to seek pleasure or to help the needy, do not justify the payoff structure of gambling and *maysir*. The distinction between gambling and *gharar* transactions therefore is reduced, and economists are aware of the common structure found in both. In fact, according to Goodman (1995, pp. x-xi), the increasing growth of gambling business in recent years is viewed within the "broader context of a troubling shift in the American economy–*the growing tendency to rely on economic ventures of chance, as opposed to those involving skill and real work*" (emphasis added).

5.5.1 Gambling vs. Contests

It is insightful to review the position of majority of Muslim scholars on for-profit contests of skill. If players are providing the prize, then the majority of scholars require the participation of a neutral player (محلل), who

does not contribute to the prize; otherwise it becomes *qimar* or gambling (المصري، ص ١٠٨). This can be understood only if gambling is a zero-sum game, so the presence of a neutral player makes it a nonzero-sum game, and therefore acceptable. Further, if one player commits a prize but the other doesn't, then the majority of scholars consider such a game acceptable, since it does not involve gambling (الشثري، ص ٧٣-٧٤). Again, it is clear that if only one player commits the prize, it is no longer a zero-sum game, since the committed party may win, in which case the other party does not lose. Thus many legal details of contests can be understood within this framework.

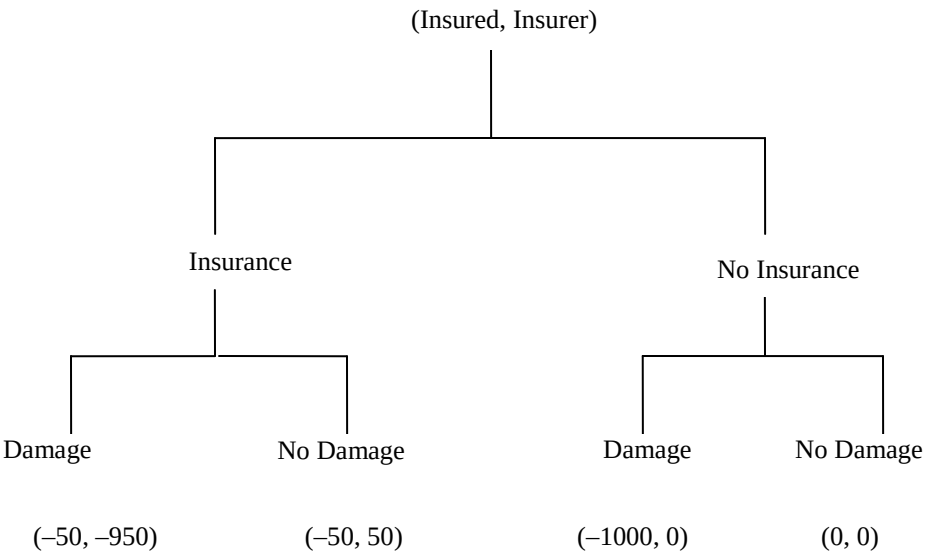
5.5.2 Lotteries vs. Stock Markets

In many respects, stock markets are viewed as gambling casinos. As we shall see later, many practices in these markets are considered *gharar*, and therefore bear a strong resemblance to gambling. A legitimate question, however, arises concerning the difference between buying a lottery ticket and buying a share in the stock market. A clear difference is that a lottery is a zero-sum game: The winner of a lottery wins only at the expense of the others. In a stock market, all participants might win when economic conditions are favorable. Collective winning in a lottery is impossible, but feasible in a stock market. Thus the former is a zero-sum game but the latter is not.

5.6 Insurance

Insurance is an exchange of liability for a premium. One party pays the other for assuming the risks of a certain asset, such that if it is damaged the owner is compensated for it. According to Arrow (1971, p. 134), insurance is an "exchange of money for money, not money for something which directly meets needs." Since it is an exchange of the same countervalue (money), the difference between the premium and compensation will be necessarily for the benefit of one party at the expense of the other. However, the contract is designed such that only chance decides who is the winner. If damage actually occurs, it will cost the insurance company more than the premium, and the company clearly is worse off, while the insured becomes better off than not contracting. If damage does not occur, the insured loses the premium to the benefit of the insurance company. There is no outcome in insurance contract in which *both* parties become better off ex post than not contracting, and thus preferences of the two parties are in direct opposition.

To see how insurance is a zero-sum game, consider the following example. Suppose an agent wants to insure a machine for 1000. Suppose the insurance premium is 50. If the machine is damaged, the insurance company shall pay the agent 1000 – 50 = 950. If not, it keeps the premium. The following tree shows the payoffs in different states.



If damage occurs, the agent is better off being insured. If damage does not occur, he is better off not to be insured, as he loses the premium for nothing. Net payoffs for each party is as follows:

	Insured	Insurer
Damage	950	–950
No Damage	–50	50

There is no outcome in which both parties win. If one gains by signing the contract, the other must lose. Consequences of this conflict of interest in the insurance contract are well studied by economists, as the following subsection explains.

5.6.1 Moral Hazard and Adverse Selection

When would a person be better off signing an insurance contract? Obviously, if he thinks that damage is not negligible. But this means that high risk persons will seek insurance more than low risk ones, which is against the interest of the insurer. This is the well-known adverse selection problem. But conflict of interest does not end here. Suppose that the person has signed the insurance agreement. If, later on, the utility of the insured asset becomes less than its insurance value, the insured will be better off if damage occurs. The same will happen if productivity of the asset declines, because of depreciation for example, or if the market value of the asset drops below the insurance value. In all these cases, the insured will be better off if damage occurs. This is the well-known moral hazard problem. Thus we can see how conflict of interest stimulates undesired behavior, leading to economic inefficiency.

Because of moral hazard and adverse selection, economic studies show that insurance market ceases to be efficient, and "optimality will not be achieved either by the competitive system or by an attempt by the government to simulate a perfectly competitive system." (Arrow 1971, p. 220; also see: Varian, 1992, pp. 455-457). Moral hazard, according to Arrow, is the most important factor explaining the limitation of insurance as a mechanism for risk shifting (*ibid*, p. 142). Under full insurance, "productive activity and risk-bearing can be divorced," but such system is "bad because it reduces incentives" for risky enterprises (*ibid*, pp. 138, 143).

5.6.2 *Sharī'ah* Ruling

Against widespread conception, insurance is *not* a new contract. It has been studied by *fuqaha* about 1200 years ago. *Fuqaha* call it *mu'awadha ala-dhaman* (معاوضة على الضمان). Ash-hab (أشهب) an early follower of Imam Malik, explains:

> It is not acceptable that a person says to another: guarantee (or insure) this good for me to a certain date, and I pay you so and so. This is because ... it is gambling and *gharar*. If the insurer knows that the good will be damaged or spoiled he would not have accepted to insure it even for twice as much as he is paid. And if the insured knows that the good will be safe he would have not accepted to insure it for even a dirham. Don't you see that if the good is not damaged the insurer

> would get the insured's money for nothing, while if it is damaged he becomes liable for its value for no ownership nor benefits he obtains? (الأصبحي [١]، ٤/ ٢٨)

Ibn Rushed, the grandfather, reports that it is a matter of consensus that *dhaman* shall not be exchanged for a premium (ابن رشد [١]، ٧/٢٢٧).

5.7 Forward Contract

In a forward contract the seller and the buyer agree to carry out exchange at a predetermined price and quantity in a future date. As such, forward contract has been known to Muslim scholars for a long time, and they unanimously consider it illegal (حماد، ١٩٩٠). Forwards are used to hedge against deviations of the spot market price from a predetermined level.

Consider currency forwards, a typical hedging arrangement. A seller agrees to sell £1 for $2 at a later date. The objective is to protect himself from variations in exchange rates. Clearly, if the spot exchange rate at the specified date goes up to $2.2, the seller loses $.2 per sterling to the benefit of the buyer. Conversely, if the spot exchange rate drops to $1.7, the seller gains $.3 per sterling at the expense of the buyer. Hence, variations in the exchange rate will benefit one party but hurt the other. Of course, the rate might stabilize around the agreed upon level, but if both parties expect it to be stable, there would have been no reason to engage into the contract in the first place. The objective of the contract is to hedge against price risk, so if an investor is quite certain about future price path he might carry the entire transaction unhedged (Teweles and Jones, 1987, p. 5). Given the contract is signed, this means that the two parties are seeking hedge against price variations. But these variations can only help one party at the expense of the other. Thus, forward can be viewed as a zero-sum game with risky payoffs.

In general, a forward can be viewed as a reciprocal insurance arrangement. The seller insures the buyer against upward deviations, while the buyer insures the seller against downward deviations. This is clear in currency forwards, but it is also true for commodities forwards, where one party guarantees the price while the other guarantees the quantity. The reason is that total expenditures on the deal is fixed and guaranteed by both parties. For example, a producer might order 1000 unit of a certain input commodity, for 20 each, with a total cost = 20,000. After the contract is signed, he discovers a new technology that allows him to attain the same level of output with 30% less of inputs, i.e. with only 700 units.

Given total costs, this translates into 30% reduction in price, from 20 to 14 (700 x 20 = 1000 x 14). The cost of 6000 is borne by the buyer, and the seller is totally insured against it.

Therefore, the seller insures the buyer against upside deviations; in exchange, the buyer insures the seller against downside deviations. This shows that forward is a zero-sum game: If price changes one party wins but the other loses.

5.7.1 Islamic Forwards

What about *salam* and deferred payment sale? These are also exposed to price risk. Are they also zero-sum games?

Unilateral forward or delayed sale involves physical exchange of one countervalue, and thus is considered as a type of normal sale. In contrast, a forward contract is not accounted for as a sale or exchange in the balance sheet or income statement. It is a hedging mechanism against variations in price. In fact, a forward can be performed as a pure insurance arrangement without any physical exchange. At maturity date the seller can simply compensate the buyer for upside shift in spot price, and let the buyer obtain the commodity from the spot market. If the spot price at maturity goes down, the buyer pays the seller the difference. This clearly shows that the primary objective of a forward is hedging not physical exchange.

5.7.2 Benefits of Exchange

In a delayed sale (whether *salam* or deferred price payment), there is a physical exchange of one countervalue. This real exchange affects the structure of the payoffs for the two players, 'and' thus makes it differ from forwards.

In a deferred payment sale, *ba'i al 'ajel*, actual delivery to the buyer benefits both the buyer and the seller. For the seller, it helps reducing the inventory, establishing a market share, and more important, entitles the seller for a higher price than the spot market. This is not necessarily true in a forward contract, where the fixed price usually is the spot price at time of contracting (Vogel and Hayes, 1998, p. 223). Hence, the deferred payment sale allows the seller to hedge against future price variations by raising the deferred payment sale price above spot price, and this guarantees the seller a minimum level of profits. In forwards, the hedge is implemented through reciprocal insurance, in which no party is guaranteed any profit upfront.

The buyer benefits from physical delivery by utilizing the goods throughout the duration of the contract, allowing him to generate income to repay the debt. Besides, the possibility of default of the seller is eliminated altogether, as compared to a forward arrangement.

Actual delivery therefore does have economic significance, and this significance represents a cushion against price variations. A price rise in *ba'i al 'ajel* benefits the buyer, but does not *necessarily* result in a net loss for the seller, because of the benefits explained above, not the least of which is the price premium due to deferred payment. The opposite is true for the buyer in case of a price fall. This means that these benefits of exchange provide a range within which spot price at maturity might fluctuate, yet both parties still benefit from the contract, producing win-win outcomes. This is in contrast to forward where the predetermined price is the only value that spot price at maturity can take that presents a win-win outcome.

In a *salam* contract, the actual upfront payment of the price by the buyer relieves his balance sheet as accounts payable decrease, and entitles him to a lower price than the spot market. For the seller, he benefits from the financing facility, as well as eliminating the possibility of default of the buyer, as compared to a forward agreement. These benefits extend the space of win-win outcomes to a range of values that spot price at maturity can take, rather than being a single point as in forward contract.

5.8 *Riba*: Interest-based Debt

Debt contracts have the distinguishing property that principal can be utilized only if it is totally consumed. This makes repayment inherently uncertain. Once the principal is consumed, there is no guarantee it will come back, let alone the additional interest. However, such uncertainty involves the possibility of generating returns that might or might not exceed the principal and interest due, especially if loan is used for investment purposes. The hope that realized return will exceed defined liability is what makes the borrower accept to pay 1200 in exchange for 1000, and it is the same reason, as we saw before, that makes a speculator accept a *gharar* contract. If realized returns exceed interest, the borrower wins but the lender loses. If not, the borrower loses but the lender wins.

5.8.1 *Riba* as an Insurance Mechanism

Arrow (1971, p. 134) considers "the closest analog [to insurance] in ordinary economic theory is a bond or a note, an exchange of money now for money later." Stiglitz (1994, p. 186) argues that (interest-based) credit can be viewed as "a special form of insurance relationship: the lender provides an insurance policy, such that if the borrower's resources are less than the amount owed, the lender agrees to pay the borrower the difference (which the borrower then immediately repays to the lender)." But the analogy is not totally satisfactory. Here we present a more intuitive view, where the lender is viewed as the insured, rather than the insurer. To make things clear, consider the following table:

	Insured	*Lender*
Subject	tangible asset	fungible asset
Risk of subject	born by insurer	borne by borrower
Benefits	utility of the insurance premium	interest generated returns

Hence, the premium that the lender pays is the foregone (uncertain) benefits of the loan. These forgone benefits are the opportunity cost for the lender. If realized returns obtained by the borrower are high, the premium that the lender is paying becomes high, and vice versa. That is, if the borrower becomes better off because of high returns, the lender becomes worse off. Thus, *riba* contract can be viewed as a zero-sum game with uncertain payoffs.

5.8.2 *Riba* and *Gharar*

Advocates of interest frequently argue that interest is justified as a compensation for the forgone profits. But this reasoning only reinforces the above argument. *Riba* becomes an exchange of a known price (interest) for an unknown quantity (forgone profits), which is a perfect example of *gharar*. This shows that *riba* and *gharar* are in fact two faces of the same coin, which establishes the consistency and integrity of Islamic rules of exchange.

6. Applications of the Zero-Sum Measure

Here we present some modern financial arrangements, and see how the zero-sum measure applies to them.

6.1 Options

An option on a certain asset is either the right, but not the obligation, to buy the asset (a call option), or the right to sell the asset (a put option) at a predetermined price and within some predetermined time period upon payment of a stated fee (Ingersoll, 1994). Options bear a strong family resemblance to insurance policies and are often bought and sold for the same reasons (Francis, 1991).

At the surface, a call option looks very similar to *bai' al-urboun*, discussed earlier. Minor modifications of both the option contract (make the premium part of the security price) and of *bay al-urboun* (define a maturity date, or *ajal*) would make the two identical. But is this enough to conclude the permissibility of options?

There is a fundamental difference between a financial option and *urboun*. *Urboun* can be viewed as a "real option" (see Dixit and Pindyck, 1994), in which the decision to exercise the option depends on real variables affecting the buyer's payoffs rather than the asset's price. A consumer might buy an option on a car, say, not to monitor its price, but to have enough time to examine it and see whether it fits his needs. If so, it is a normal exchange in which both parties win (محيي الدين، ص ٤٤٤).

A financial option, on the other hand, is bought to monitor the price of the underlying asset; if it appreciates the option is exercised, otherwise it is killed. Price movements, however, cannot make both parties better off. If price appreciates, the buyer (of a call option) wins; if not, the seller wins. This is so because price enters the payoff function of each party with opposite signs. In any financial option therefore there is a winner and a loser; there is no way that both can win. A real option on the other hand does not exclude the possibility of mutual gain, since the payoffs of players are independent of each other.

It is clear therefore that both types of options imply uncertainty, but a real option has the possibility of mutual gain, whereas this possibility is excluded from a financial option. The latter therefore is a zero-sum game, while the former is not. Given the different views of *fuqaha* regarding *urboun*, the permitting view of the Hanbali school can be applied to real options, while the majority's view can be applied to financial options. This shows how the zero-sum measure can reconcile different *fiqhi* positions by bringing insights into the payoff structure and nature of the contract considered.

6.2 Revenue Sharing

Musharakah is considered the most desirable form of financing in Islamic economics. The widely adopted form is profit-sharing, where profit, defined generally as the difference between revenues and costs, is shared between the financier and the entrepreneur according to an agreed upon percentage.

Another form of *musharakah* is to share revenues rather than profits. This is based on the well known arrangement *muzara'ah* (sharecropping

مزارعة). Scholars realize that the farmer might incur some costs, but these costs are not deducted from the final product; they are the farmer's responsibility (see: ابن قدامة ٧/ ١٤٩-١٥٠، ٥٣٦، ٥٣٩). This creates the possibility of win-lose outcomes when the farmer's share in output is less than the costs he spent. Yet share cropping is permissible because it allows for mutual gain. Interests of the two parties are in harmony so both are better off to win together.

Granted, the same principle can be applied to current business financing. A financier would advance, say, 1000 to a company whose average annual revenues, say, is 900. Revenue sharing is arranged as follows. The financier obtains 1/3 of revenues for 4 years. This is equivalent to 300 annually, or 1200 for the whole period in expected terms. Since revenues are uncertain, the financier is not guaranteed even his capital. Revenues might decline in one year to 600, so the financier's share in that year drops to 200. Or it might rise to 1200, where financier's share reaches 400, and so on

What makes revenue sharing preferred to profit sharing?

First, revenues are much easier to observe and measure than profits. Accounting practices allow for varieties of cost measures that can be used to reduce final profits. Islamic financiers frequently complain about the improper practices in hiding profits, and thus are very reluctant in applying *musharakah* for this reason. Sometimes the bank is able to control company's revenues, but not its costs. Second, revenue sharing imposes restrictions on the company's spending, and creates incentives for it to contain its costs. The result is better performance and thus better return for both parties. The company on the other hand benefits from keeping the bank out of examining all details of its work, thus avoids unnecessary disclosure of inside information.

Some researchers consider revenue sharing as *gharar*. The reason is that, because costs are not shared, the company might end up with losses while the financier obtains positive profits. For example, the company's costs might be 800. Using the above numbers, this means that net profits for the company will be (2/3)(900) – 800 = –170. This means that the two parties are not bound to win together and lose together. A possibility for win-lose outcome is created by using revenues rather than profits as a subject of sharing.

This possibility cannot be denied, but cannot be escaped either. Profits do not have a definite measure. Some consider gross profits, some net

income, while some consider a proprietary measure by excluding certain costs items from income statement. Effectively, any measure of profits creates the possibility of win-lose outcomes due to the sophisticated accounting procedures.

More important, the mere possibility of a win-lose outcome is not sufficient to describe an arrangement as *gharar*. Just as in share cropping, revenue sharing aligns the interests of the two parties, so both are better off to reach win-win outcomes. It becomes *gharar* only if it is in the best interest of each party to win when the other loses.

7. Significance of the Zero-Sum Measure

7.1 Pareto Optimality

An important result of characterizing *gharar* as a zero-sum transaction is derived from Pareto criterion. Since playing a zero-sum game cannot make both parties better off, this means that it is Pareto optimal *not* to play such a game. This result shows that avoiding *gharar* contracts cannot make rational economic agents worse off. Thus it can be safely argued that applying Islamic measures imposes no loss of efficiency. Although the Pareto criterion has been criticized as a measure of welfare, it is reasonable to suppose that the desired welfare state must be at least Pareto optimal (Sen, 1987, p. 35).

7.2 Life is not a Zero-sum Game

Most situations in practical life are nonzero-sum games. There are plenty of instances where parties in conflict can end in win-win situations. Pure conflict is only a special case, while instances in which conflict (win-lose) and cooperation (win-win) coexist are more common than otherwise (Shelling, 1980, ch. 1, 4). In such situations, people usually prefer cooperation and coordination to conflict (Bierman & Fernandez, 1998, pp. 18-19; Schelling, ch. 3). That is, they prefer to choose the win-win part of the game, rather than the win-lose part, even if the winner in the latter might gain more than in the former. Thus prohibiting *gharar* is not harmful to economic life; in fact it is beneficial in shifting the focus of economic agents from direct opposition to possible cooperation.

Some view business as war: "It is not enough to succeed. Others must fail." But this view of the world is certainly not realistic. Axelrod (1984, p. 190) writes: "We are used to thinking about competitions in which there is only one winner, competitions such as football or chess. But the world is rarely like that. In a vast range of situations mutual cooperation can be better for *both* sides than mutual defection." Brandenburger and Nalebuff

(1996, pp. 3-5) write: "there are few victors when business is conducted as war. The typical result of a price war is surrendered profits all around. ... In fact, most businesses succeed only if others also succeed. ... It's a mutual success rather than mutual destruction. It's win-win. ... In business, your success doesn't require others to fail–there can be multiple winners. ... You don't have to blow out the other fellow's light to let your own shine."

By viewing life as a zero-sum game, the whole society becomes a zero-sum society, where a continuous war is taking place among its members (Thurow, 1980). In the end, there is no winner in such an environment, and all fighters eventually lose.

7.3 The Winner-take-all Society

When the zero-sum structure extends to a group of players, rather than only two, it becomes like a lottery: Thousands compete for a single prize, and the winner takes it all while the rest is doomed to lose.

Frank and Cook (1995) explain how western societies are becoming more of a "winner-take-all" societies. In such an environment, opportunities are distributed unequally such that only few can win, and those who do get the lion's share of the pie. This has the undesired effect of concentrating wealth in the hands of the few, while the majority suffers poverty.

Although the authors do not mention the zero-sum structure as such, they show how the economy is becoming more like sports, which are merely zero-sum games: "In effect, the reward structure common in entertainment and sports–where thousands compete for a handful of big prizes at the top–has now permeated many other sectors of the economy." The authors argue that "cooperative agreements to reduce the size of the top prizes and curb some forms of competition need not lead to socialist squalor. On the contrary, such agreements are the key to a more equitable *and* prosperous future" (p. viii).

7.4 Relative vs. Absolute Payoffs

Rationality requires a player to maximize his own payoffs according to his own value system, regardless of other players (Binmore, 1992, p. 237; Schelling, 1980, p. 4). In a zero-sum environment, in contrast, payoffs are relative across players: Those who win only do when others lose. As Axelrod (1984) points out, relative performance measures lead to envy, and envy leads to attempts to rectify any advantages the other player has attained. "Asking how well you are doing compared to how well the other

player is doing is not a good standard unless your objective is to destroy the other player. ... When you are not trying to destroy the other player, comparing your score to the other's score simply risks the development of self-destructive envy." (p. 111). Rawls (1971) notes that envy becomes pervasive in societies where the social system is regarded as "a conventionally established and unchangeable zero-sum game" (p. 538). Choi (1993, p. 137) writes: "The more the social production process is viewed as a zero-sum game, the higher the envy barrier. If the social pie is seen as fixed in size, one individual's gain in distribution is another person's loss."

A zero-sum environment, therefore, embraces unethical behavior. This is true no matter how noble or honorable players in fact are. Direct opposition of interests in such games forces rational players to consider relative rather than absolute performance, so they behave *as if* they were envious. Nothing prevents envy in this case from flourishing as a consequence of such behavior. By prohibiting zero-sum contracts, Islamic rules therefore set up the proper environment for cooperative and ethical behavior.

7.5 Asymmetric Information and Conflict of Interests

Although informational asymmetry is a fact of life, contract design can either mitigate or exacerbate this problem. When payoff functions of the two sides of the contract are in direct opposition, it is in the best interest of each party to hide information from the other in order to defeat him. According to Schelling (1980), players intentionally deceive their types and prevent information on their intentions to be signalled to the other player, to the extent of adopting randomized strategies. "So the 'rational strategies' pursued by the two players in a situation of pure conflict ... should not be expected to reveal what kind of behavior is conducive to mutual accommodation, or how mutual dependence can be exploited for unilateral gain" (p. 84). "With a minimax solution, a zero-sum game is reduced to a completely unilateral affair. One not only does not need to communicate with his opponent, he does not even need to know who the opponent is or whether there is one. A randomized strategy is dramatically anti-communicative; it is a deliberate mean of destroying any possibility of communication, especially communication of intentions, inadvertent or otherwise. It is a mean of expunging from the game all details except the mathematical structure of the payoff, and from the players all communicative relations" (p. 105). Binmore (1992, pp. 352-353) points that "rational players with a sequence of two-player, zero-sum games to play will act so as to ensure that their past play will not help the opponent

predict their future play. This is because, whatever is good for one player in a two-player zero-sum game is necessarily bad for the other." As information becomes more asymmetric, moral hazard and adverse selection problems only get worse.

Cooperative agreements, on the other hand, promote communication between players thus reducing informational asymmetry. "In the pure-coordination game, the player's objective is to make contact with the other player...; in the minimax strategy of a zero-sum game–most strikingly so with randomized choice–one's whole objective is to avoid any meeting of minds, even an inadvertent one." (Schelling, 1980, p. 96.) Better communication between players improves economic efficiency since full information environments allow first best solutions to be attained.

7.6 Honesty vs. Rationality

Rationality requires profit maximizing, and there is nothing wrong in that. A nonzero-sum game provides players with a structure in which all can win, yet each is behaving rationally. That is, mutual benefit can be obtained without compromising rationality. Honesty with others in such setting does not contradict rationality, and thus we can rightfully ask players to be honest and not to deceive others.

In zero-sum games, however, this is impossible. By maximizing his own payoffs, each party in such games necessarily hurts the other, and there is no way that one can be honest with others. The reason, as explained earlier, is that they are in direct opposition. Being honest means that one will provide his opponent the chance to win only at his expense. Rationality and honesty in zero-sum games cannot coexist

A good example is insurance contract. Pauly (1968) shows how moral hazard arises in such contracts, and consequently optimality of insurance will not be achieved. Kenneth Arrow (1971, pp. 221-222) comments:

> One of the characteristics of a successful economic system is that the relations of trust and confidence between principal and agent are sufficiently strong so that the agent will not cheat even though it may be "rational economic behavior" to do so. The lack of such confidence has certainly been adduced by many writers as one cause of economic backwardness
>
> The lesson of Mr. Pauly's paper is that the price system is intrinsically limited in scope by our inability to make factual distinction needed for optimal pricing under

> uncertainty. Nonmarket controls, whether internalized as moral principles or externally imposed, are to some extent essential for efficiency.

There is no question that honesty is essential for efficiency; the question, however, arises as to what extent should we expect trust and honesty to control economic behavior in order to achieve efficiency. According to Arrow, there is no limit to such control, and honesty is required even if it is against "rational economic behavior." But this is not a realistic view. Demanding absolute honesty at the expense of self interest is self defeating, since honest players in a zero-sum environment will be always losing and therefore be excluded from the game, so only dishonest players are left. "We may hope that trust will come about as a by-product of a good economic system (...), but one would be putting the cart before the horse were one to bank on trust, solidarity and altruism as the preconditions for reform." (Elster and Moene, 1989, p. 5.) We need a system that establishes the balance between honesty and rationality, and Islamic principles achieve this balance. By eliminating zero-sum transactions and establishing a nonzero-sum environment, agents are provided the opportunity to maximize their payoffs without necessarily hurting their counterparts. In this environment, honesty can be as rewarding as dishonesty, and agents can attain maximum payoffs without compromising moral values. This balance is a distinguishing feature of Islamic principles in general, and of Islamic economics in specific.

7.7 Ex ante vs. Ex post

Theoretically, many *gharar* contracts can be mutually beneficial but only ex ante, i.e. at the time of contracting. But this by no means implies that they are still so after uncertainty is revealed or ex post. For example, at time of contracting the buyer of a lost camel might believe that probability of success is 0.2, so that expected value of the camel is 200, and this might be an acceptable price for both parties. But ex post the value is either 1000 or zero, so one party wins the difference while the other loses it. Many analytical tools used in main stream economics are designed only for ex ante optimality. "*Ex post*, the wonderful unanimity for a Pareto-improving redistribution (that is, one which increases everyone's expected utility) no longer exists." (Eeckhoudt and Gollier, 1995, p. 219).

Alternative schools of economic thought place greater weight on the ex post aspect of decision. For example, the transaction cost approach

emphasizes the ex post institutions of contract, with special attention to private ordering and selfenforcing, as compared to court ordering and legal-enforcement (Williamson, 1985, p. 18; also see below). Modern evolutionary theory, including evolutionary games studies how economic behavior develops through long sequences of trials and errors. Accordingly, choice emerges via ex post natural selection. Amartya Sen (1998) argues that evolutionary ex post selection approach can compliment "reflective" or ex ante selection emphasized by main stream economics.

The inconsistency between ex ante and ex post optimality is closely related to the concept of dynamic or time inconsistency (Cukierman, 1994; Machina, 1989, p. 1637). If it is not in the interest of an agent to carry out his commitment ex post, then such commitment is not credible from an economic point of view. That is, breach of promise becomes a "rational" decision. A good example is the forward contract.

As explained earlier, a forward contract serves as a hedge or insurance arrangement. A farmer can sell future crop for a prespecified price to hedge against fluctuations in spot price at time of delivery. This arrangement, however, is prone to time inconsistency, and it is for this reason that futures markets developed. Smith (1994, p. 182) puts it in a clear language:

> Consider the prototypal farmer who … expects to reap a certain quantity of wheat at harvest time, but fears a fall in its price. To hedge against the risk of a fall in price, she negotiates a forward contract with a miller, by which she agrees to deliver a fixed amount of wheat of a specified quality at the time of harvest at a predetermined (forward) price. Now suppose that the spot price of wheat falls before the harvest. *The miller would like to escape from the forward contract*, since she could now purchase the wheat at a lower price. The farmer is unwilling to let her do so, however, since the forward contract guarantees him the higher price at harvest. The miller hunts for a third party to whom she can sell the contract, a speculator who would be willing to bet that spot prices will rise by harvest time. (Emphasis added).

By selling the forward contract in a standardized form, futures market is created.The problem with forward, as compared to *salam*, is that *any* deviations of the spot price from the contract price will make either party

willing to "escape from the contract." In *salam*, in contrast, the upfront payment allows the buyer to gain from the discounted price, while the seller benefits from the financing facility. These benefits counter-affect possible fluctuations in spot price, thus reducing the problem of dynamic inconsistency.

The gap between ex ante and ex post optimality is what makes the decision maker regret his decision. By imposing dynamic consistency, regret therefore is minimized, and contracts have better chances to be honored. By eliminating strictly competitive games, Islamic rules produce dynamically consistent economic relationships, where both parties can benefit ex ante *and* ex post.

7.8 Self-enforcement vs. Legal Enforcement

Except for spot exchange, any agreement is simply a promise to deliver or to pay in a future date or conditional on a certain event. Such promises must be credible, or otherwise the agreement will not be honored (Baird et al., 1994, p. 51) Credible agreements are those in which it is in the best interest of both parties to execute it ex post. Such agreements are called self-enforcing agreements (Williamson, 1985, p. 168). Absent of legal enforcement, a dynamically inconsistent contract cannot be fulfilled. A buyer of a lost camel would not be willing to pay 200 if, just after signing the agreement, he finds that the camel has already died. The same argument applies to the seller if the camel is found safe. Similarly, it is not in the best interest of an insurance company to compensate a policy holder for an amount that is ten times the premium paid. Left to its own interest, therefore, insurance company will prefer not to pay. In the long run, of course, breaching promises is self-defeating; but short run gains do influence economic behavior and, in the long run, can lead to unstable solutions.

Both *gharar* and non-*gharar* contracts have to conform to their respective legal requirements at the time of agreement. The difference, however, emerges after the contract has been signed. *Gharar* contracts are dynamically inconsistent, and therefore it is not in the best interest of both parties to fulfill the contract; they have to rely on the legal institution to enforce it. Non-*gharar* contracts in contrast can be fulfilled by self-interest of involved parties. Although legal enforcement is necessary in both environments, *gharar* contracts are less dependent on self-interests and more dependent on legal enforcement.

A good example is found at the time of the Prophet (ﷺ), when disputes on selling immature fruit became widespread and drew the

attention of the Prophet (ﷺ), as explained earlier. Such disputes arouse because one party was taking away the other's money for nothing, which is a zero-sum transaction. After imposing he condition that fruit shall be sold only after maturity appears, likelihood of win-win outcomes dominated, and therefore disputes must have been reduced effectively. This clearly shows that, other things equal, *gharar* contracts impose higher legal costs than Islamic contracts.

7.9 Cooperation vs. Competition

Economists define a *game of chance* as a game in which payoffs depend on events uncontrollable by players, while in a *game of skill*, in contrast, payoffs are controllable. Although both types involve uncertainty, skill improves likelihood of success and thus such games are value-creating.

However, creating value requires cooperation between players, while distribution of value induces competition. "Business is cooperation when it comes to creating a pie and competition when it comes to dividing it up." (Brandenburger and Nalebuff, 1996, p. 4.) "Trading partners derive mutual benefits from cooperation in production from which their incomes are ultimately derived, but they compete over proceeds of production because what one gets the other cannot have. But there may be a trade off. ... The trade-off can be seen, in effect, as one between short-term self-interest in the share of the pie and a longer-term interest shared with others in the size of the pie." (Burchell and Wilkinson, 1997, p. 219.)

This implies that value-creating games, or games of skill, should be modeled as cooperative games rather than as competitive games. It is therefore improper to play value-creating games in a zero-sum setting. Some *gharar* contracts might involve skill, like search for a lost camel or sale of a diver's hit. However, a *gharar* contract is structured to reward luck and skill on equal terms, providing no incentive for optimal effort. Such setting makes the party facing risk rely more on costless luck than on costly skill. A buyer of a lost camel assumes all risks of the camel, both controllable and uncontrollable, and thus he becomes more sensitive to uncontrollable events than the agent in *ja'alah*. Modeling skill games in a strictly competitive framework therefore diminishes realized value due to substitution of luck for skill. A cooperative model creates optimal incentives for skill and thus allows for the full potential value to be realized.

7.10 Risk and Stability in Islamic Economy

A widely held view is that cooperative arrangements, like *musharakah* or *ja'alah*, are suitable for high-risk environments, while *riba* and direct sale are suitable for less risky ones. Although this might be true in some cases, it is not always so. To see this, consider the following question: When would an owner of a lost camel choose *ja'alah* over sale? Similarly, when would a financier choose *riba* over *mudharabah*? One determinant of the choice problem is the probability of success. It can be shown that, other things equal, if the owner or lender is sufficiently confident in success, each is better off choosing cooperative (*ja'alah* or *mudharabah*) over competitive agreements. In this way he can enjoy the upside returns that cannot be shared under fixed price compensation.

The design of cooperative games *exposes* the two parties to risk of failure, but this does not imply that, in equilibrium, risky projects are chosen. To the contrary, because of this exposure, the two parties will voluntarily choose the project with the lowest probability of failure. In risky competitive games, in contrast, one party is shielded from risk, while the other faces the entire risk, and thus he is better off ex ante carrying the riskiest project. This conflict of interest between the two parties leads to the well known problem of moral hazard. Several studies show that *riba*, for example, involves conflict of interest. These include Townsend (1979), Stiglitz and Weiss (1981), and Williamson (1986), among others. Bernanke and Gertler (1989) show how conflict of interest can lead to dynamic business cycles. Thus *gharar* contracts, because of conflict of interest, promote risky behavior (i.e. moral hazard) and therefore feeds aggregate instability of the economy.

Today's economy is a high risk economy. It is becoming more and more like a giant financial market, and the traditional distinction between real and financial economies is disappearing (Mandel, 1996). Despite the proliferation of riskmanagement tools and instruments, volatility and instability are increasing rather than decreasing (Bernestein, 1996, p. 329; *The Economist,* 10/22/99, pp. 97-98). From our point of view, a major factor behind the higher tendency for taking risk is the zero-sum structure embedded in many derivatives and financial instruments. Eliminating *gharar* therefore is a necessary step towards achieving economic stability.

8. Conclusion

The Islamic principle behind most illegal contracts is eating others' money for nothing. A zero-sum exchange reflects precisely this concept: It is an exchange in which one party gains by taking away from the other party's payoff, leading to a win-lose outcome. However, a rational agent will not accept to engage into a certainly losing game; only if loss is uncertain and gain is probable, that such game is played. Hence uncertainty or risk is what tempts rational agents to engage into an exchange which they know in advance that only one will gain from it while the other must lose. This temptation is best described by the term *gharar*, which means deception and delusion. It follows that a *gharar* contract is characterized as a zero-sum game with uncertain payoffs. This paper argues that such measure well defines *gharar* transactions.

The paper also develops a *Sharī´ah*based measure derived from the *hadith*: Liability justifies return or utility (الخراج بالضمان). It is shown the these two measures coincide and integrate each other. A quantitative formula is developed to examine *gharar* in nonzero-sum games, which helps formalizing conditions of unacceptable risk or excessive *gharar* mentioned by *fiqh* scholars.

An examination of well known *gharar* contracts shows how the zero-sum measure is satisfied. The measure helps explaining why *fuqaha* take different positions on controversial nonzero-sum contracts, while unanimously prohibit strictly zero-sum contracts. Extending the measure to modern applications generates interesting results on how a certain contract, like the option contract, might or might not be *gharar*, depending on the structure of payoffs for the two players.

The economic significance of the zero-sum measure provides insights into the Islamic view of economic behavior. Elimination of zero-sum arrangements can be viewed as a paradigm governing Islamic principles of exchange. Not only this paradigm is internally consistent, it is also consistent with rationality as defined by Neoclassical economics. Consequently, modern analytical tools are readily available for Muslim economists without compromising Islamic principles

There is much to be studied and analyzed, and I hope that this paper presents a proper starting point for building a coherent theory of exchange in Islamic economics.

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