METHOD FOR CALCULATING TRADE SIZE

FIELD OF THE INVENTION

[0001] This invention relates to a method of calculating a trade size, and more particularly to a method of calculating a trade size which enhances expected utility of the trade.

BACKGROUND OF THE INVENTION

[0002] Expected utility addresses betting preferences of people with regard to uncertain outcomes (i.e., gambles), expressed by a function of the return, the probabilities of occurrence, and risk aversion, (as well as the different utility of the same return to people willing to assume different levels of risk). Expected utility has proved useful to explain some popular choices that seem to contradict an expected value criterion, which is a simpler theory which takes into account only the sizes of the return and the probabilities of occurrence.

[0003] In the presence of risky outcomes, a decision maker could use the expected value criterion as a rule of choice. That is, the higher expected value investments are simply the preferred ones. For example, suppose there is a gamble in which the probability of getting a $100 return is 1 in 80, but the alternative, and far more likely, outcome, is getting nothing. In this case, the expected utility of this gamble is $1.25 (100 x 1/80). Given the choice between this gamble and a guaranteed payment of $1, straight application of the expected criterion theory would have a person choose

the $100-or-nothing gamble. However, under expected utility theory, some people would be risk averse enough to prefer a sure thing, even if it had a lower expected value. Expected utility addresses a level of risk a person is willing to take.

[0004] In trading of securities and other tradeable assets, the largest bets should yield the largest return. However, the largest bets also present a risk of tremendous losses, and most traders are not willing to assume that much risk. Further, the nature of trading is that large losses can swamp many smaller trades for gains. Knowledge of this point can further decrease the amount of risk a particular trader is willing to assume.

[0005] It would therefore be desirable to provide a method for enhancing a trader's expected utility of a series of trades, rather than expected return.

SUMMARY OF THE INVENTION

[0006] In accordance with a first aspect, a method for calculating a size of a trade comprises selecting a database of estimated returns of a traded asset, selecting a utility function representative of utility of a given return to a trader of the traded asset, using a computer to calculate a function of expected return which is based upon the database of estimated returns and the utility function, determining the size of the trade where the function of expected return is a maximum.

[0007] From the foregoing disclosure and the following more detailed description of various embodiments it will be apparent to those skilled in the art that the present

invention provides a significant advance in the methods of calculating a trade size. Particularly significant in this regard is the potential the invention affords for providing a method for trading which reduces downside risks. Additional features and advantages of various embodiments will be better understood in view of the detailed description provided below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Fig. 1 shows the steps in the process of calculating a trade size which maximizes expected utility.

[0009] Fig. 2 shows a representative profile of data in a database of estimated returns for a traded asset.

[0010] Fig. 3 shows a representative utility function vs. a return of a traded asset.

[0011] Fig. 4 shows a representative function of expected return where an optimal trade size occurs at the curve maximum.

[0012] Fig. 5 shows example distributions comparing the trader's return using the function of expected return with the trader's return where the function of expected return is not used.

[0013] It should be understood that the appended drawings are not necessarily to scale, presenting a somewhat simplified representation of various features illustrative

of the basic principles of the invention. The specific design elements of the method disclosed here will be determined in part by the particular intended application and use environment. Certain features of the illustrated embodiments have been enlarged or distorted relative to others to help provide clear understanding. In particular, thin features may be thickened, for example, for clarity of illustration. All references to direction and position, unless otherwise indicated, refer to the orientation illustrated in the drawings.

DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS

[0014] It will be apparent to those skilled in the art, that is, to those who have knowledge or experience in this area of technology, that many uses and design variations are possible for the method of calculating trade sizes disclosed here. The following detailed discussion of various alternate features and embodiments will illustrate the general principles of the invention with reference to a method suitable for use for traders of tradeable assets such as publicly traded securities including stocks, bonds, commodities, and also derivatives, etc. Other embodiments suitable for other applications will be apparent to those skilled in the art given the benefit of this disclosure.

[0015] Turning now to the drawings, Fig. 1 shows a representative example of a method for determining a preferred trade size in accordance with one embodiment which takes into account the expected utility to a trader, expressed here as a function of expected return. The trader selects a database of estimated returns for the trading asset, such as, for example a publicly traded security. Further, the trader

selects a utility function to account for an amount of risk a trader is willing to assume. Note that this method does not identify a preferred trade size to generate the largest return. Using only expected values, generating a large return simply means making the largest bets. However, it is apparent the largest losses will also come from the largest bets. The utility function is included to calculate the function of expected return which takes into account the amount of trader's risk. The function of expected return can be calculated in numerous ways. For example, the product of the database and the utility function can be integrated. Others ways for calculating the function of expected return will be readily apparent to those skilled in the art given the benefit of this disclosure.

[0016] Once the function of expected return has been calculated, the maximum for a given size of a trader's trade may be ascertained. The maximum indicates the amount of a trade that a trader should trade for the particular tradeable asset for an assumed level of risk. This optimal amount of trade may be later modified by feedback to either the database or to the utility function as discussed in greater detail below.

[0017] The database of estimated returns of the traded asset is selected by the trader. This database can comprise actual historic returns of the traded asset or a model of estimated returns. The model of estimated returns can comprise, for example a subset of the historic returns over a selected period of time, or a limited amount of historic returns such as those within a certain standard deviation. Other filters of historic data will be readily apparent to those skilled in the art given the benefit of this disclosure. Alternatively, the model of estimated returns can comprise

data not modeled on historical data, including, for example, accounting for value at risk (VAR), or limitations on position size. In the example database of Fig. 2, the database of estimated returns follows a generally bell curve shaped distribution, with the probability of a given return peaking around a central value and dropping steadily as the value of the return decreases or increases. The database may be updated with additional information and/or new limiting parameters. For example, this database may be updated in line with a trader's knowledge of the asset and the environment of the asset in which he trades in. Using this updated database, the function of expected return may be recalculated to generate a new optimum size of a trade.

[0018] The database of estimated returns can comprise, for example a continuous function such as a probability density function. Also, one or more predetermined levels where the trade is reversed can be accounted for by the database. For example, the probability density function can account for a probability of reaching a take-profit and/or a stop-loss for a given trade. Other feedback which changes the database can also be used with which the function of expected return is recalculated and the size of a further trade at a new maximum is determined.

[0019] Fig. 3 shows, as a dotted line, a plot of expected value where the relationship between the utility of a trade and the expected return is generally linear. The utility function can generate a negative utility when the trade is for a loss and a positive utility when the trade is for a gain. In accordance with a highly advantageous feature, the utility function has less than a linear relationship with the return. Moreover, the negative utility for losses can increase at a rate faster than the positive

utility for gains increases. As shown in Fig. 3, the risk becomes more of a drag on the return, reflecting a real world situation where a large trade is undesirable to many traders because of the unacceptable risk of a large loss.

[0020] One example of a suitable utility function is the following:

$U(x) = 1 - e^{-(x/K)}$, where

x = profit or loss on a trade

U(x) = utility of the trade expressed as a function of the profit or loss of the trade x; and

K = capital at risk in the trade.

[0021] K is a positive value. A plot of this utility function would look similar to Fig. 3. Other suitable utility functions, both continuous and non-continuous, for use in calculating the function of expected return will be readily apparent to those skilled in the art given the benefit of this disclosure.

[0022] As with the database, feedback may also be applied to the utility function. The feedback can represent a change in the value to the trader of the traded asset after the trade has been made, and is used to create an updated utility function which is in turn is used to recalculate the function of expected return and determine the size of a further trade where the recalculated function of expected return is at a new maximum.

[0024] The step of calculating the function of expected return may be performed on a device such as a computer, which can be a stand alone or networked computer, a

laptop, a hand held device, for example. The database of estimated returns, as well as the selected utility function may be stored on the computer as well. Alternate databases of estimated returns and alternate utility functions, either for the same tradeable asset or for other tradeable assets, may also be stored on the computer. Further, the database, the utility function and feedback may be adjustable by inputs into the computer.

[0024] Fig. 5 shows a representative beneficial result of applying the method disclosed herein. By accounting for the trader's risk, the probability of severe losses is reduced. In Fig. 5, the trader's probability of return on a trade using this method is advantageously shifted to the right and downward, when compared with trader's returns which do not use the method disclosed herein. This reflects reduced risk but reduced large returns as well. It has been found that avoiding severe losses is highly advantageous, as a trading firm can routinely handle small losses, but severe losses can result in bankruptcy. In Fig. 5, application of the method disclosed herein reduces the maximum loss from 200,000 to 60,000.

[0025] From the foregoing disclosure and detailed description of certain embodiments, it will be apparent that various modifications, additions and other alternative embodiments are possible without departing from the true scope and spirit of the invention. The embodiments discussed were chosen and described to provide the best illustration of the principles of the invention and its practical application to thereby enable one of ordinary skill in the art to use the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such modifications and variations are within the scope of the

invention as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally, and equitably entitled.

CLAIMS

1. A method for calculating a size of a trade, comprising, in combination, the steps of:

selecting a database of estimated returns of a traded asset;

selecting a utility function representative of utility of a given return to a trader of the traded asset;

using a computer to calculate a function of expected return which is based upon the database of estimated returns and the utility function; and

determining the size of the trade where the function of expected return is a maximum wherein the function of expected return is

$U(x) = 1 - e^{-(x/K)}$, where

x = profit or loss on a trade

U(x) = utility of the trade expressed as a function of the profit or loss of the trade x; and

K = capital at risk in the trade.

2. The method of claim 1 further comprising the step of updating the database and recalculating the function of expected return with the updated database.

3. The method of claim 1 further comprising the steps of

applying a feedback to the utility function, wherein the feedback represents a change in the value of the traded asset after the trade has been made, and thereby creating an updated utility function ; and

recalculating the function of expected return with the updated utility function to determine the size of a further trade where the function of expected return is at a new maximum.

4. The method of claim 1 wherein the step of calculating the function of expected return is performed by integrating a product of the database and the utility function.

5. The method of claim 1 wherein the database of estimated returns of the traded asset comprise one of historic returns and a model of estimated returns.

6. The method of claim 5 wherein the model of estimated returns is a probability density function.

7. The method of claim 6 wherein the probability density function accounts for a

probability of reaching one or more predetermined levels where the trade is reversed.

8. The method of claim 5 wherein the model comprises a filter on historic returns.

9. The method of claim 1 wherein the utility function generates a negative utility when the trade is for a loss and a positive utility when the trade is for a gain, and

the negative utility for losses increases at a rate faster than the positive utility for gains increases.

10. The method of claim 1 wherein K is positive.

11. The method of claim 1 further comprising using the computer to store the database of estimated returns of a traded asset and the utility function.

12. The method of claim 1 wherein the utility function is continuous.

13. A device for calculating a size of a trade, comprising, in combination:

a database of estimated returns of a traded asset stored on the device; and

a utility function representative of utility of a given return to a trader of the traded asset stored on the device;

wherein the device calculates a function of expected return based upon the database of estimated returns and the utility function, and determines the size of the trade where the function of expected return is a maximum and wherein the function of expected return is

$U(x) = 1 - e^{-(x/K)}$, where

x = profit or loss on a trade

U(x) = utility of the trade expressed as a function of the profit or loss of the trade x; and

K = capital at risk in the trade.