<table>
<thead>
<tr>
<th>(12) STANDARD PATENT APPLICATION</th>
<th>(11) Application No. AU 2014200706 A1</th>
</tr>
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<tbody>
<tr>
<td>(19) AUSTRALIAN PATENT OFFICE</td>
<td></td>
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<tr>
<td>(54) Title</td>
<td>A METHOD AND SYSTEM OF DETERMINING A WAGER</td>
</tr>
<tr>
<td>(51) International Patent Classification(s)</td>
<td>G06Q 50/34 (2012.01)</td>
</tr>
<tr>
<td>(21) Application No: 2014200706</td>
<td>(22) Date of Filing: 2014.02.10</td>
</tr>
<tr>
<td>(43) Publication Date: 2015.08.27</td>
<td>(43) Publication Journal Date: 2015.08.27</td>
</tr>
<tr>
<td>(71) Applicant(s)</td>
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ABSTRACT

A method and system of determining a wager including the steps of receiving, at a processor, win probabilities for participants in an event; determining, on the processor, permutation probabilities for each participant finishing in any place in the event according to the win probabilities; and determining a required marked-up place market by applying a protected stake market transform, either directly or indirectly, to the permutation probabilities for each participant.
Invention Title:

"A METHOD AND SYSTEM OF DETERMINING A WAGER"

The following statement is a full description of this invention, including the best method of performing it known to me/us:
FIELD OF THE INVENTION

[0001] The invention relates to a method and system of determining a wager. In particular, the invention relates, but is not limited, to a method and system of determining a wager in an event such as racing.

BACKGROUND TO THE INVENTION

[0002] Reference to background art herein is not to be construed as an admission that such art constitutes common general knowledge in Australia or elsewhere.

[0003] A betting market refers to the odds of all participants in an event. A bookmaker strives to accept wagers on the outcome of an event in the right proportions so that they make a profit over time regardless of which outcome prevails. This is achieved primarily by adjusting what are determined to be the true winning odds of the various outcomes of an event in a downward fashion.

[0004] For example, the true winning odds in an event with three participants may be 1-1, 2-1 and 5-1. When these odds are represented as probabilities and added together a ‘base market’ of 100% is achieved, representing a market where no margin favours either a bettor or bookmaker. However, if the bookmaker was to decrease these odds to 4-5, 9-5 and 4-1, respectively, and the probabilities of these odds are added together, a market of approximately 110% is achieved. The amount by which the market exceeds the base market represents the bookmaker’s potential profit.

[0005] Considerable work goes into determining the winning odds for an event and ensuring the bookmaker makes a profit. Normally, major bookmakers employ a team of odds compilers to set their prices. On the other hand, determining the payout for a place, where a return is only given if the participant finishes first or within a predetermined number of positions, is still calculated in a somewhat ad hoc fashion. Typically, the return is based on a fixed proportion
of the win odds by applying a place factor to the win odds. However, this practice is, to an extent, minimising the potential profits of a bookmaker and leaving them open to risk as there is inadequate information on the combination of potential placegetters. Currently, total place markets using unadjusted fractions of win odds can range from 275%, where the bookmaker may not make a profit over time, to 400%, where the bettor is disadvantaged.

[0006] In addition, individual fractional odds are rarely correct. Some bookmakers who are not constrained by the Rules of Racing set their place markets by starting from the fractional odds and directly shortening or lengthening all individual odds to achieve a profit margin. They then make further constraints on the favourites in an event where there are few perceived chances.

OBJECT OF THE INVENTION

[0007] It is an aim of this invention to provide a method and system of determining a wager which overcomes or ameliorates one or more of the disadvantages or problems described above, or which at least provides a useful alternative.

[0008] Other preferred objects of the present invention will become apparent from the following description.

SUMMARY OF INVENTION

[0009] In one form, although not necessarily the only or broadest form, the invention resides in a computer implemented method of determining a wager, the method including the steps of:

receiving, at a processor, win probabilities for participants in a event;

determining, on the processor, permutation probabilities for each participant finishing in any place in the event according to the win probabilities; and
determining a required marked-up place market by applying a protected
stake market transform, either directly or indirectly, to the permutation
probabilities for each participant.

[0010] Typically, the method further includes the step of the processor
initially receiving odds from a marked-up winning market and processing these
odds to determine the win probabilities for the participants in a base market.
 Normally, the base market is the betting market if there was no margin
favouring either a bettor or a bookmaker.

[0011] Preferably, the step of determining the permutation probabilities
includes using an event probability profile calculation.

[0012] Normally, the event probability profile calculation involves calculating
the probability of every outcome in the event and determining the permutation
probabilities.

[0013] Typically, the event probability profile calculation calculates the
probability of every outcome in the event by first determining the probability of a
participant winning and then calculating the permutation probability of each
subsequent participant placing by modifying their win probability with the
permutation probability of a preceding participant. For example, the permutation
probability for a participant finishing third is calculated by modifying their win
probability with the permutation probability calculated for the preceding first and
second participants.

[0014] Preferably, the method also includes the processor summing the
permutation probabilities of the event to ensure they equal one.

[0015] Normally, the method further includes the processor respectively
summing the permutation probabilities of each participant to form base place
probabilities. The base place probability for each participant is the probability of
a participant placing in a market where no margin favours a bettor or
bookmaker. An event concerning only two places returns a 200% base market.
An event with three places returns a 300% base market.
Normally, the step of determining the marked-up place market includes applying the protected stake market transform to the permutation probabilities for each participant via their respective base place probability.

Typically, the base place probabilities are converted to relative odds. The relative odds are made up of an expectation portion and a stake portion.

Normally, the protected stake market transform iterates through the relative odds applying a varying percentage to the expectation portion of the relative odds until the required marked-up place market is found. Typically, the varying percentage applied to the expectation portion of the relative odds allows all expectation portions to be reduced equally.

Alternatively, it will be appreciated by a person skilled in the art, that the iteration through the relative odds may be performed with a binary search to find the required marked-up place market.

In another form, the invention resides in a system of determining a wager, the system including:

- a memory coupled to a processor, wherein the memory includes computer readable program code components configured to:
  - read win probabilities for participants in an event;
  - determine permutation probabilities for each participant finishing in any place in the event according to the win probabilities; and
  - determine a required marked-up place market by applying a protected stake market transform, either directly or indirectly, to the permutation probabilities for each participant.

Typically, the program code components are also configured to receive odds from a marked-up winning market and process these odds to determine the win probabilities for the participants in a base market. Normally, the base market is the betting market if there was no margin favouring either a bettor or a bookmaker.
[0022] Preferably, determining the permutation probabilities includes applying an event probability profile calculation.

[0023] Normally, the event probability profile calculation involves calculating the probability of every outcome in the event and determining the permutation probabilities.

[0024] Typically, the event probability profile calculation calculates the probability of every outcome in the event by first determining the probability of a participant winning and then calculating the permutation probability of each subsequent participant placing by modifying their win probability with the permutation probability of a preceding participant. For example, the permutation probability for a participant finishing third is calculated by modifying their win probability with the permutation probability calculated for the preceding first and second participants.

[0025] Preferably, the program code components are also configured to sum the permutation probabilities of the event to ensure they equal one.

[0026] Normally, the program code components are also configured to respectively sum the permutation probabilities of each participant to form base place probabilities. The base place probability for each participant is the probability of a participant placing in a market where no margin favours a bettor or bookmaker. An event concerning only two places returns a 200% base market. An event with three places returns a 300% base market.

[0027] Normally, the step of determining the marked-up place market includes applying the protected stake market transform to the permutation probabilities for each participant via their respective base place probability.

[0028] Typically, the base place probabilities are converted to relative odds. The relative odds are made up of an expectation portion and a stake portion.

[0029] Normally, the protected stake market transform iterates through the relative odds applying a varying percentage to the expectation portion of the relative odds until the required marked-up place market is found. Typically, the
varying percentage applied to the expectation portion of the relative odds allows all expectation portions to be reduced equally.

[0030] Alternatively, it will be appreciated by a person skilled in the art, that the iteration through the relative odds may be performed with a binary search to find the required marked-up place market.

[0031] Typically, the system also includes a display device. Preferably, the system is also connected via a network to bettors allowing them to place online wagers.

[0032] Further features and advantages of the present invention will become apparent from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] By way of example only, preferred embodiments of the invention will be described more fully hereinafter with reference to the accompanying figures, wherein:

Figure 1 illustrates a system of determining a wager according to an embodiment of the invention; and

Figure 2 illustrates a flow diagram of determining a wager according to an embodiment of the invention with reference to figure 1.

DETAILED DESCRIPTION OF THE DRAWINGS

[0034] Figure 1 illustrates a system 10 of determining a wager according to an embodiment of the invention. The system 10 includes a memory 100, a processor 200, a display device 300, a printer 400 and a network 500.

[0035] The memory 100 includes computer readable program code components. The program code components are in the form of software installed on a computer readable medium, for example on a hard disk, a random access memory (RAM), or any other applicable computer readable medium. The program code components perform the method of the present invention.
The processor 200 carries out the instructions of the computer readable program code components by performing the input and output operations of the system 10. The processor 200 may be made up of multiple processors to improve the efficiency of the system 10.

The display device 300 is adapted to display the information in the memory 100 and the inputs and outputs of the processor 200. The printer 400 is adapted to receive and print information received from the memory 100 or processor 200. The network 500 allows communication between the memory 100, processor 200, display device 300, printer 400 and other devices external to the system 10.

Figure 2 illustrates a flow diagram of a method of determining a wager according to an embodiment of the invention with reference to figure 1.

At step 1000, win odds are stored onto the memory 100. The win odds include a market percentage above 100%. That is, when the wins odds are converted to a relative probability and expressed as a percentage, the sum of these percentages will be above 100%.

At step 2000, the processor 200 receives the win odds and converts the wins odds from their current market percentage to a 100% market, known as a base market, where no margin favours a bettor or bookmaker. For example, if the processor 200 receives scaled winning odds of 4-5, 9-5 and 4-1 relating to three participants with a market place of approximately 110%, the processor 200 will convert these odds to 1-1, 2-1 and 5-1, respectively, representing a 100% base market, and subsequently, to a corresponding probability of 1/2, 1/3 and 1/6. Specifically, this is done using a protected stake market transform, as discussed below.

At step 3000, the winning probabilities representing the 100% base market are further processed by the processor 200 to determine the permutation probabilities of a participant finishing in any place in the event. That is, if there are \( n \) staters in an event, then there are \( n^*(n-1)^*(n-2) \) permutations that cover all possible place payouts when the bookmaker is offering payouts on the first three places. The probability of each permutation is
obtained by the following calculations, known herein as the event probability profile calculation.

[0042] Assume the base market probabilities of each participant winning in an event is \( w_1, w_2 \) and \( w_3 \). The probability of the participant winning the event is known from the base market. To this end, it may be assumed that the permutation probability of a participant finishing first \( (p_1) \) equals \( w_1 \).

[0043] In this regard, the permutation probability of a participant placing second is found by calculating what percentage probability does its win probability become now that we know the value of \( w_1 \). Accordingly, the permutation probability of the participant placing second \( (p_2) \) equals \( \frac{100}{(100-w_1)} \times w_2 \).

[0044] Similarly, the permutation probability of a participant placing third is found by calculating what percentage probability does it win probability become now that we know the values \( p_1 \) and \( p_2 \). Accordingly, the permutation probability of the participant placing third \( (p_3) \) equals \( \frac{100}{(100-(p_1+p_2))} \times w_3 \) and so forth.

[0045] At step 4000, having calculated the probabilities for every permutation, the processor 200 then checks that the sum of all these probabilities equals to 1.0. This is an indicator that the permutation probabilities have been correctly calculated.

[0046] Following this, at step 5000, the permutation probabilities of each participant are respectively summed together by the processor 200. The sum of these respective permutation probabilities, known herein as the base place probabilities, represents the probability of each participant placing in a market where no margin favours a bettor or bookmaker.

[0047] At step 6000, the base place probabilities of each participant is further processed by the processor 200 by applying a protected stake market transform to determine a bookmaker’s place market with a specified margin. A bookmaker’s place market with a specified margin is known herein as a marked-up place market.
The protected stake market transform is based on the theory of a "fair game". In a "fair game", only a bettor's expectation is reduced to achieve the marked-up place market. To illustrate this point, assume betting on an event were a casino game and the dealer sets up the odds on the table at a base market of 100%. In this logic-model game, players are allowed to bet so that the takeout is 100 per runner. There is no mark-up yet.

The dealer's problem is to secure the house margin before the result is known. The sum of the money on the table is 100. Every runner provides a collect of 100. If the dealer changes the game by increasing the stake portion of all wagers by 20%, a 120% market would be achieved. However, a bettor whose base market expectation was 40 now can only win 28 and a bettor whose expectation was 90 now can only win 73. The unfairness of the proportional mark-up is obvious to all players. One has been "taxed" 30% of their expectation whilst the other 19% of their expectation. With extreme favourites, the proportional mark-up method can actually "tax" the entire expectation of a wager. Accordingly, to allow this game to appear fair, all the bettors' expectations are reduced equally to achieve the marked-up place market.

In this regard, the protected stake market transform first determines the relative odds of the base place probabilities. The relative odds are made up of an expectation portion and a stake portion.

Once these relative odds are calculated, they are reduced to obtain the required marked-up place market. That is, the protected stake market transform iterates through the relative odds applying a variable percentage to the expectation portion of the relative odds until the required marked-up place market is found. The varying percentage applied to the expectation portion of the relative odds allows all expectation portions to be reduced equally. In this embodiment, the marked-up place market is defined by the operator as a parameter to the process.

At step 7000, the odds produced by protected stake transform for the marked-up place market are displayed on the display device 300, which may be
in the form of a bookmaker's board. At step 8000, a bettor may place a wager on a participant and, as such, the wager and odds from the marked-up place market may be printed on a ticket, via the printer 400, for the bettor's and bookmaker's records. Alternatively, a bettor may communicate with the system 10, via the network 500, and place an online wager on the basis of the odds from the marked-up place market.

[0053] An advantage of the method and system 10 of determining a wager is that the specific place probability of a participant is calculated. This gives a bookmaker confidence that, no matter what winning probability profile the event displays, the place market accurately reflects the strategy they have defined for the event. Furthermore, given the accuracy of the method, a bookmaker is no longer betting false odds about short priced horses and is able to place better odds about longer priced participants.

[0054] In addition, as the protected stake market transform is adapted to apply a variable percentage to the expectation portion of the relative odds, more accurate odds can be calculated. That is, transforming markets by proportionally modifying the probabilities typically produces "unfair" odds. In most cases these are not significant. However, when the transforms involve very short priced participants the unfairness in this method becomes apparent.

[0055] The method and system 10 of determining a wager also allows new products to be offered by fixed price operators. For example, fixed price quinellas, exactas and trifectas may be offered. An operator may also offer wagers for a participant to run a particular place or multiple participants to run in specific places. The method also accommodates the place and show formats used in USA wagering.

[0056] In this specification, adjectives such as first and second, left and right, top and bottom, and the like may be used solely to distinguish one element or action from another element or action without necessarily requiring or implying any actual such relationship or order. Where the context permits, reference to an integer or a component or step (or the like) is not to be
interpreted as being limited to only one of that integer, component, or step, but rather could be one or more of that integer, component, or step etc.

[0057] The above description of various embodiments of the present invention is provided for purposes of description to one of ordinary skill in the related art. It is not intended to be exhaustive or to limit the invention to a single disclosed embodiment. As mentioned above, numerous alternatives and variations to the present invention will be apparent to those skilled in the art of the above teaching. Accordingly, while some alternative embodiments have been discussed specifically, other embodiments will be apparent or relatively easily developed by those of ordinary skill in the art. The invention is intended to embrace all alternatives, modifications, and variations of the present invention that have been discussed herein, and other embodiments that fall within the spirit and scope of the above described invention.

[0058] In this specification, the terms ‘comprises’, ‘comprising’, ‘includes’, ‘including’, or similar terms are intended to mean a non-exclusive inclusion, such that a method, system or apparatus that comprises a list of elements does not include those elements solely, but may well include other elements not listed.
The claims defining the invention are as follows:

1. A computer implemented method of determining a wager, the method including the steps of:

   receiving, at a processor, win probabilities for participants in a event;
   determining, on the processor, permutation probabilities for each participant finishing in any place in the event according to the win probabilities; and
   determining a required marked-up place market by applying a protected stake market transform, either directly or indirectly, to the permutation probabilities for each participant.

2. The method of claim 1, wherein the method further includes the processor initially receiving odds from a marked-up winning market and processing these odds to determine the win probabilities for the participants in a base market.

3. The method of claims 1 or 2, wherein the step of determining the permutation probabilities includes using an event probability profile calculation that involves calculating the probability of every outcome in the event.

4. The method of claim 4, wherein the event probability profile calculation calculates the probability of every outcome in the event by first determining the probability of a participant winning and then calculating the permutation probability of each subsequent participant placing by modifying their win probability with the permutation probability of a preceding participant.

5. The method of any preceding claim, wherein the method further includes the processor summing the permutation probabilities of the event to ensure they equal one.

6. The method of any preceding claim, wherein the method further includes the processor respectively summing the permutation probabilities of each participant to form base place probabilities.
7. The method of claim 6, wherein the step of determining the marked-up place market includes applying the protected stake market transform to the permutation probabilities for each participant via their respective base place probability.

8. The method of claim 7, wherein the step of determining the marked-up place market includes the protected stake market transform iterating through relative odds of the base place probabilities and applying a varying percentage to an expectation portion of the relative odds until the required marked-up place market is found.

9. The method of claim 8, wherein the varying percentage applied to the expectation portion of the relative odds allows all expectation portions to be reduced equally.

10. A system of determining a wager, the system including:

   a memory coupled to a processor, wherein the memory includes computer readable program code components configured to:

   read win probabilities for participants in an event;

   determine permutation probabilities for each participant finishing in any place in the event according to the win probabilities; and

   determine a required marked-up place market by applying a protected stake market transform, either directly or indirectly, to the permutation probabilities for each participant.

11. The system of claim 10, wherein the program code components are also configured to receive odds from a marked-up winning market and process these odds to determine the win probabilities for the participants in a base market.

12. The system of claims 10 or 11, wherein determining the place probabilities includes using an event probability profile calculation that involves calculating the probability of every outcome in the event.
13. The system of claim 12, wherein the event probability profile calculates the probability of every outcome in the event by first determining the probability of a participant winning and then calculating the permutation probability of each subsequent participant placing by modifying their win probability with the permutation probability of a preceding participant.

14. The system of any one of claims 10 to 13, wherein the program code components are also configured to sum the permutation probabilities of the event to ensure they equal one.

15. The system of any one of claims 10 to 14, wherein the program code components are also configured to respectively sum the permutation probabilities of each participant to form base place probabilities.

16. The system of claim 15, wherein determining the marked-up place market includes applying the protected stake market transform to the permutation probabilities for each participant via their respective base place probability.

17. The system of claim 16, wherein determining the marked-up place market includes the protected stake market transform iterating through relative odds of the base place probabilities and applying a varying percentage to an expectation portion of the relative odds until the required marked-up place market is found.

18. The system of claim 17, wherein the varying percentage applied to the expectation portion of the relative odds allows all expectation portions to be reduced equally.

19. The system of any one of claims 10 to 18, wherein the system also includes a display device.

20. The system of any one of claims 10 to 19, wherein the system is connected via a network to bettors allowing them to place online wagers.