

# MS&E 235, Internet Commerce

Stanford University, Winter 2007-08

Instructor: Prof. Ashish Goel, Notes Scribed by Shrikrishna Shrin

## Lecture 9: Information Markets

Information markets (a.k.a. prediction markets and idea futures) are markets whose primary purpose is to aggregate information, instead of to hedge risk or entertain<sup>1</sup>.

Consider a market that predicts who is going to win the Republican primary elections. People can bet on who they think is going to win by paying a certain amount (say \$1) and they get a certain payoff if the candidate they have voted for wins the election or a payoff of zero if their candidate loses. The money collected through the bets placed on the losing candidates is equally distributed among those who placed bets on the winning candidate. This ensures that people who bet on outcomes with a lower probability of occurring (based on popular belief) get a higher payoff if they win the bet.

Such a market is often used for horse betting and is known as a parimutuel market. The payoff in such markets is not fixed.

### Iowa Electronic Market

In the Iowa Electronic Market (IEM), the payoff of a bet is fixed (\$1).

At the outset, you pay \$1 to obtain a "Yes" stock and a "No" stock. If you hold onto both stocks, after the result is known, you will get back your dollar with certainty. However, you can also trade these stocks on the market based on current prices of the respective stocks. If "Yes" happens, people who have bet on a "Yes" will get \$1. If a "No" happens, people who have bet on a "No" will get \$1. Therefore, the payoff is fixed. Informally, If the probability of a "Yes" is high, then  $C_Y$  should be high. Similarly, if the probability of a "Yes" is low, then  $C_Y$  should be low. Formally, the price relates to the median belief, as outlined later.

$$C_Y + C_N = 1$$

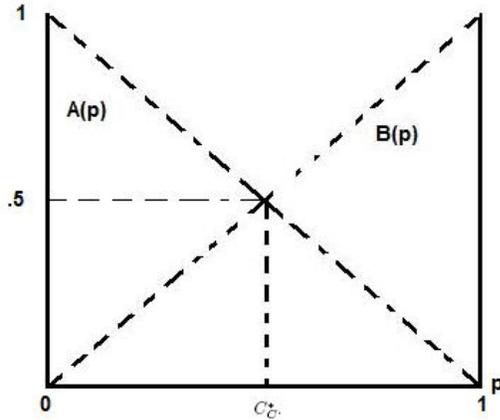
If  $C_Y + C_N > \$1$ , then you can sell both for an amount greater than \$1 and eventually pay \$1 to the winner of the bet. If  $C_Y + C_N < \$1$ , you can buy both and obtain \$1 with certainty. There is an opportunity for structural arbitrage if  $C_Y + C_N \neq 1$  and the way people use the exchange will eliminate such arbitrage opportunities ensuring that  $C_Y + C_N = 1$ .

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<sup>1</sup><http://hanson.gmu.edu/infomkts.html>

## Determining the market clearing price

The system/market will settle at the price that corresponds to the median belief. Let there be stocks  $C$  and  $O$  representing two possible outcomes. Now let  $C_C$  and  $C_O$  be the probabilities of each outcome occurring. Suppose,  $C_C > p$  where  $p$  is your belief of the chance of  $C$  occurring, you would sell  $C$  and hold onto  $O$ . On the contrary, if  $C_C < p$ , you would hold onto  $C$  and sell  $O$ .



$A(p)$  is the fraction of users who think that the probability of a win on  $C$  is above  $p$  (ie.  $C_C > p$ ).  $B(p)$  is the fraction of users who think that the probability of a win on  $C$  is below  $p$  ( $C_C < p$ ). Since  $A(p) + B(p) = 1$ , at the point of intersection,  $A(p) = B(p) = 1/2$ . This point where  $A(p) = B(p)$  is the median belief and the corresponding price is the market clearing price as the number of people who want to hold onto only stock  $C$  is equal to the number of people who want to hold onto only stock  $O$ . Let the clearing price be denoted by  $C_C^*$ . The system is in equilibrium at price  $C_C^*$ . If a user owns  $k$  stocks of a particular type, he/she is counted  $k$  times while determining the median.