Extra-Predictive Applications of Prediction Markets

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Intro

Prediction Markets (PMs) can do more than predict the future. First, applications related to speculation on the market price: Debate-Ending (DE) and Lie-Detection (LD), Whistleblowing (W), and Policy-Advice (PA), and secondly applications which involve use of the tradable shares: Global Insurance (GI), Recreation (RE), and Public-Good Financing (PGF).

Applied Prediction

Ending a Debate

Prediction markets can put an end to public confusion on any issue where the evidence will ultimately settle one way or another (by providing an immediate 'best guess' of that eventual settlement).

"The United States Surgeon General to issue an official statement, linking tobacco cigarette use to lung cancer and chronic bronchitis, on or before Jan 1st, 1966."

This statement turned out to be true.[1] Although common knowledge today, this information was very surprising at the time, implying that statements predicting such an announcement would have been controversial and suspicious. Note the arbitrarily chosen maturity date (1965) and source (US Surgeon General). Those who disagree with the suggested date or source could Author a different Contract to their liking, to the benefit of us all.

"2015-2020 to contain at least two of the warmest years on record, as measured by GISTEMP at http://data.giss.nasa.gov, dtS Global table, column J-D."

Global warming is a hotly debated issue. Those who feel that the earth is warming can profit from that information, at the expense of skeptics. Likewise, those who are skeptical can 'set the record straight' while taking money directly from their ideological opponents.

[1] http://www.cdc.gov/tobacco/Data_statistics/sgr/history/index.htm

This contract has the additional benefit of forcing a clear definition of global warming. Such a definition shifts the focus from politics to information. Those disagreeing with the timing (2015-2020) or source (NASA) have every opportunity to Author a different Contract to their liking.

Detecting Lies

"During his (1989-1993) term as President, George H. W. Bush will not introduce new taxes nor increase tax rates."

"During his (2009-2013) term as President, Barack Obama will close the detention facility at Guantanamo."

Both of these claims turned out to be false. Did either candidate know that he would be unable to deliver on his promise? No one can say for sure, but if this contract were trading at a low price, voters would understand the low quality of the pledge. Can voters make a truly informed decision *unless* there is a PM for every campaign promise?

Whistleblowing

Whistleblowers risk lawsuits, job loss, prison time, and their lives, and yet they are guaranteed nothing in return, even if successful. Can we do better? Recall that PM incentives can prevent lies about a target claim. They can also induce awareness of private but interesting claims.

"The United States Anti-Doping Agency (USADA) to conclude that Lance Edward Armstrong engaged in the use of illicit performance-enhancing drugs ('doping') before January 1st, 2013."

This claim turned out to be true, although it was vehemently denied for years (the reporter who broke the story even facing a libel suit before his evidence was eventually accepted by the public and professionals[2]). Many insiders were later revealed as having known.

"It to be publically revealed that the United States Federal Government collects (and retains indefinitely) all emails sent both by foreign and US citizens."

Snowden could have instead anonymously created this contract, and bet on 'Yes', alerting the public to this issue. Snowden could then continue to buy 'Yes' shares as they were bid down by an incredulous public or a manipulative government. Ultimately, when his documents were released he would make a fortune.

Whistleblowers can also 'bluff', or whistle-blow without ever coming forward, leaking documents, or even obtaining documents. One could, on suspicion alone, anonymously create the relevant market, and leave it to the insiders (who do have access to the privileged information) to betray each other for profit in the face of an apparent failure of their conspiracy. As the market nears maturity, insiders with a financial position might realized they've been tricked, yet decide to leak their own secret

[2] http://www.theguardian.com/media/greenslade/2014/jan/28/lance-armstrong-sundaytimes

documents to avoid a loss (more "innocently", insiders could force their organization make to a public admission).

Policy Advice

Multidimensional contracts not only give the likelihood of two events, but also the relationship between events.[3] This would enable us to ask and answer such questions as:

1. If we adopt NGDP targeting, what is the likelihood of X% inflation?
2. If we go to war, what range of casualties can we expect? What is the worst case scenario?
3. Are we more likely to meet our earnings estimates if we fire our CEO?

Dr. Robin Hanson describes an official governance structure called 'Futarchy'[4] where individuals formally define an after-the-fact measurement of their goals, and then construct multidimensional contracts for decisions related to those goals, and use the decision provided by the market.

Summary of Applied Prediction

Having the power to predict the future, prediction markets will expose lies. Additionally, they discourage lies by actively draining the bank accounts of liars. Those who would like to make a credible-guarantee, such as politicians, can defend their beliefs and profit from skeptics. Those who uncover amazing secrets can force the general public to trade against the secret, and are thereby compensated for their discovery.

Event Derivatives

Buyers in a market for, say, oil, can be separated into 'users' (who need oil to heat their homes), and 'speculators' (who perceive the future opportunity to sell oil at a higher price). Likewise, oil sellers may own an oil refinery ('user'), or they may have downward beliefs about the future price ('speculator'). So far we have focused on the speculators, now we shift the focus to users.

Insurance

For example, one could buy 'Yes' in a Market, not because they believe that this event is likely, but instead to hedge their exposure to the event.

"An MMS 6.0 or greater earthquake to strike the greater New York City area during 2014."

Should this event happen, an owner of 'Yes' would receive an influx of cash to offset any damages done by the hypothetical earthquake.

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[3] For the details on how and why this works, see my Combinatorial BPM.pdf

[4] http://hanson.gmu.edu/futarchy.html

Individuals might "bet" on natural disaster, death of an essential leader, election of a ridiculous leader, a disruptive/industry-killing technological innovation, crippling regulatory activities, pandemic, or other harmful events. This purchasing activity thickens the market and draws in profit-seeking speculators, who produce actuarially fair prices as they compete against each other.

Truthcoin insurance has the advantage of decentralization, and so can insure events such as warfare, nuclear obliteration, supervolcano eruption, etc. where the ability of the insurance-provider to pay anything (or even be found alive) is in question. Conversely, the primary disadvantage to decentralization is moral hazard, specifically that even a non-owner could commit arson on a property and collect nearly the entire value of that property, perhaps even anonymously. For this reason, insurance is unlikely to be offered on outcomes that are easily influenced by the actions of small group of people.

Financial Engineering

Tradable Derivatives are the insurance of the finance world. Prediction Markets are literally binary options, and can be used as such:

"The 5-day average price of the DJIA (INDEXDJX:.DJI) to fall more than 10 percentage points at some point in 2015."

"Price of Gold (NYSE:GLD) to trade above $175 at some point before Oct 1st, 2015."

"International Swaps and Derivatives Association to trigger credit-default swaps on Lenovo (OTCMKTS: LNVGY) any time in March 2015."

"Greece to make all 2015 coupon payments on bonds (GGGB10YR:IND) in full and on time."

This final example is functionally similar to a credit default swap. By revealing the probability of default directly, debt markets would operate with drastically reduced risk. For example, were Greece determined and able to make all debt payments on time, they should theoretically be able to borrow at the risk free rate and escape a debt crisis.

Consider also the opportunities to reduce the volatility of the Bitcoin exchange rate, by allowing individuals to speculate and hedge on different price levels. Markets concerning the solvency of exchanges allow an apples-to-apples cross-exchange price comparison, reducing basis risk for arbitrageurs and thickening the overall exchange rate market.

Recreation

In the United States, it is popular to gamble on the NCAA Men's Division I Basketball Championship. The creation of a fully liquid 1x68 market concerning only the champion team (in other words, not a full bracket) only costs about 6 times as much seed capital as authoring a simple 1x2 binary market[5] (although decision fees are 67 times greater).

This allows everyone to gamble at once, interactively in an environment where money can be made and lost before, after, and during a game. Likely, no entertainment experience can compare. Moreover, a prediction market has (by definition) actuarially fair odds. There is no 'house edge', and with only a 1% trading fee this is possibly the fairest proposition in the history of gambling.

Financing Public Goods

Bitcoin users can already pay for public goods, such as roads, lighthouses, national defense, and research projects, through 'Assurance Contracts' by using the 'ANYONECANPAY' functionality designed by Satoshi.[6] However, this functionality allows users to cancel their pledge (making it unreliable and introducing strategic frictions), and (if successful) merely transfers the pooled funds to an individual (who can abscond with the funds, introducing counterparty risk).

To eliminate these problems, one can build a protocol on top of the PM protocol, called 'Schelling States', which allows trustless dominant assurance contracts (T-DAC).

By definition, public goods are accessible to anyone, and therefore their existence and qualities are publically observable. Operationally, instead of funding a public good with a payment (taxes, pledges, pre-orders, subscriptions, etc.), individuals can lock-in losing PM-trades such that only the provider of the good can make a winning trade and claim the funds.

The funds are collected by creating a special market of dimension 1x(1+N), in which only buying is allowed. Funds can only be sold upon expiration (i.e., can only be redeemed after the outcome is determined, and not on-demand as would otherwise be the case). Contributors then purchase State 1 (the State suggesting the public good was not successfully made), and these purchases become the eventual payment to the provider.

[5] log(68)/log(2) = 6.087

[6] https://en.bitcoin.it/wiki/Contracts#Example_3:_Assurance_contracts

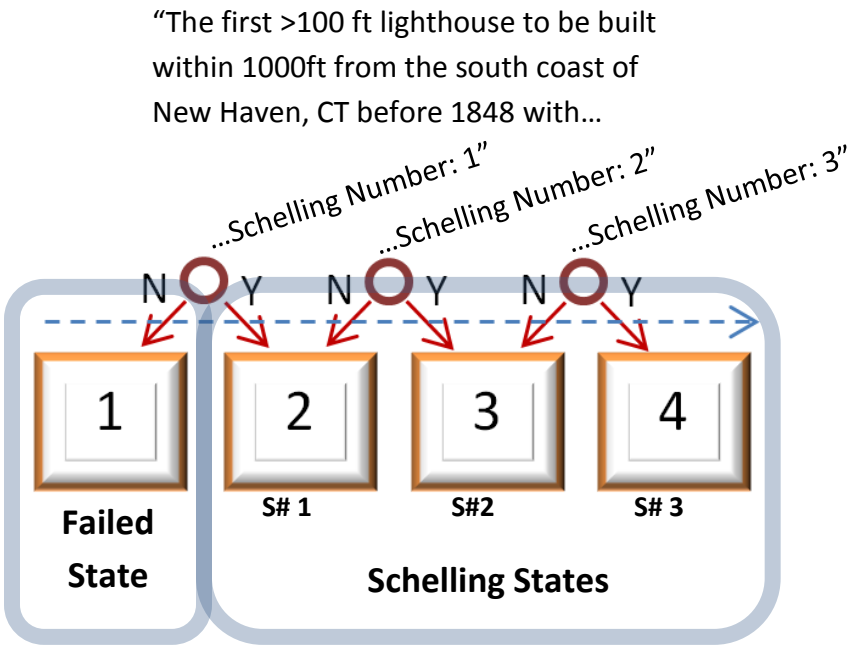

Figure 1. A special market used to finance a lighthouse. Notice 3 nearly identical decisions, partitioning the market into 4 States. A non-construction of the lighthouse would result in State 1 being the Outcome; hence it is the 'Failed' State. Otherwise, the builder/owner of the lighthouse is expected to put a gigantic banner with either a 1, 2, or 3, displayed prominently on the lighthouse in order to control the Outcome and claim the accumulated funds.

A provider verifies that the market contains enough funds to finance the good, builds the good, and is retroactively reimbursed as follows: the provider makes a single gigantic trade on the Schelling State with the lowest price, and endows his good with this State (with a public statement, a huge flag, poster on the interior, etc.). The provider then wins all of the money in this market.

The incentives provided by this scheme are ideal. Entrepreneurs (in the terminology of the Dominant Assurance Contract), can create the market, then purchase the Shelling States uniformly. This ensures that these entrepreneurs will profit if (as they believe) the public good is provided by someone (as entrepreneurs have purchased for <1 a portfolio which will redeem for 1). The public does not have to put forth discussion or effort in deciding which public goods they should consider financing, as profit-seeking entrepreneurs have an incentive to provide them with a menu of projects to choose from.

Contributors have every reason not just to donate, but actually to donate their marginal benefit. If they donate and the project is not built, they profit by winning the prediction market. Moreover, those who donated the most, and the earliest, would have more shares of the Failed State and win more money. Therefore, the contributors who want the project built, yet believe it won't be, actually have the strongest incentives to donate as much as they can, as early as they can. As contributors would never

voluntarily overpay, public goods will only be built if they are actually wanted (unlike the projects financed under a taxation scheme).

Note that speculators cannot sell, but they can purchase the set of mutually exclusive states, which has the same effect on prices. If speculators create efficient markets in this way, the sum of the prices of the Schelling States will represent the probability of the public good's eventual construction (by someone), and the price of State 1 will represent the probability of non-construction.

Also note that, although the Schelling State prices can sum to 1 as a project is visibly completed, the State within the Schelling Set which ultimately wins the market is known only the provider of the public good.

Public Bads, for example "The 'New Haven Lighthouse Point Park' lighthouse to be destroyed before date X" are unlikely to be funded this way, because the Winning State must be made public somehow, and criminals must remain private. Attempts to shift the Schelling-indicator from "Number 1/2/3" to something else, such as "on a Monday/Tuesday/Wednesday evening", have the disadvantage of altering law enforcement in advance of the likelihood and manner of a future crime. Trades made just before the crime would, for free, alert law enforcement to an imminent threat of crime. Such 'tip-off trades' would be made by any profit-seeking members of the crime group themselves. Therefore, (surprisingly and fortunately) this feature cannot fund anonymous goods such as crimes.

Truthcoin markets require seed capital to form, and yet they provide free information to the public in the form of market prices. As such, one could finance the formation of a prediction market with a T-DAC prediction market. This would allow individuals to create markets they are interested in by pooling their funds with like-minded individuals yet without trusting a third party ("Meta-Markets").