

Insider Trading and Prediction Markets

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Abstract

Rules limiting insider trading may encourage investment, but they may also discourage exploration of new less-decentralized corporate information processes, such as prediction and decision markets. I review standard corporate information processes and insider trading rules, outline possible improvements that prediction markets might offer, and consider ways we might change insider trading rules to allow both more flexible innovation of information processes and better-encouraged investment.

I. Introduction

Many have argued that insider trading laws encourage investment in public corporations by assuring investors that they are not trading against other investors with vastly superior information. I will suggest that this benefit, even if real, now comes at the cost of discouraging innovation in our corporate informational institutions, and that this is a needless cost, since there are better ways to encourage both investment and institutional innovation.

The regulators who shape insider trading laws do track changes in corporate institutions and environments in order to adapt insider trading law accordingly. However, regulators, though well-meaning, face an uphill battle: in order to adapt insider trading law effectively, these regulators must predict the ways in which corporate institutions *could* change in response to the opportunities offered by alternative laws. Our regulatory institutions are simply not suited to this task. In addition to the difficulty of conducting accurate counterfactual and predictive analyses, the attendant costs may simply be too high--and the benefits too small--to make this a problem even worth addressing from the regulators' point of view.

Prediction markets are a new information technology that seems to offer great promise in reforming corporate information institutions. We can imagine several concrete ways in which prediction markets may greatly improve the cost and performance of corporate information collection and decision making. Although the full

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potential of prediction markets is yet unknown, it is clear that insider trading laws, as currently constituted, present a substantial barrier to their wider adoption. This, in short, illustrates one area in which insider trading laws could discourage institutional innovation.

In this paper I will first summarize the key features of both our standard corporate information institutions and current insider trading laws. I will then outline possible improvements that prediction markets might offer. Finally, I will elaborate on the barriers that current insider trading laws impose, and consider some ways those laws might be adapted to reduce this problem.

II. Corporate Information Institutions

In the modern publicly-traded firm, share owners delegate control to a board of directors, who in turn delegate all but a few key decisions to the chief executive officer (CEO), the locus of firm coordination. Because the successful coordination of corporate activities often entail huge gains for the firm, the CEO's time and attention becomes an extremely valuable and limited resource. This justifies careful selection of a high quality CEO who is given strong financial incentives.

The need to take full advantage of this precious locus of control dominates the organizational design of firms. Because the CEO can be intimately familiar with only a few other people, the CEO generally oversees "insiders" who coordinate particular areas within the firm. (The high opportunity cost of the limited time and attention of these insiders likewise justifies their careful selection and strong financial incentives.) Like the CEO, these insiders can know only a few other people intimately; these insiders select yet more "coordinators," who control over even smaller areas. This process of downstream delegation and area specialization may continue indefinitely, depending on the size and nature of the firm. We thus get the usual hierarchy of firm control.

Focusing on a prescribed area of the firm's operations, coordinators can, to some extent, ignore corporate activity that proceeds as expected without needing further coordination. Coordinators within an area instead focus on changes which could result in better coordination. A coordinator must therefore monitor activity in and near his area for signs of such changes. He must also listen to proposals for changes, design alternative changes and ways to effect them, negotiate change details, and propose changes to more central loci of coordination.

In order to get the most from each coordinator's limited time and attention, the firm employs many specialists to aid the job of coordination. The tasks of these coordination specialists include: managing coordinator schedules and other administrative processes, conducting preliminary low level meetings so that high level meetings can go smoothly, collecting and presenting summary statistics, researching particular change ideas, preparing and reviewing presentations and reports, and evaluating lower level job candidates. The coordination specialists, in short, perform duties essential to the coordinator's prescribed area of operations that do not require the

coordinator's direct attention. Most significant to the firm, the introduction of new kinds of coordination specialist can dramatically improve efficiency by freeing up coordinators' limited attention for other tasks.

Information is a key input needed to achieve coordination. Many kinds of relevant information are relatively easy to acquire, especially with modern technologies of computation and communication. The standard "information processing" approach, for example, has people fill out forms. The coordination specialist, using this standard approach, collects the information from these forms—which includes everything from personal information, to consumer complaints, to basic market research--and then rearranges, aggregates, and distributes the results. Over time, improvements in information processing technology have allowed firms to use this information more effectively.

But the most important pieces of firm information cannot be so readily obtained. The firm needs information on key corporate issues that no simple form, or combination of forms, can provide. What will sales be next quarter, and how will that depend on price, marketing, personnel, and product features? What would be the cost and sales of potential new products? What will competitors and manufacturers of complementary goods or services do next? What would increase the efficiency and reliability of manufacturing or distribution? What projects will be completed when, and how does that depend on project definitions? Who would be good at what job? Who wants what job? Who will propose what changes, and what would it take to get their support?

The answers to such vital questions sit inside people's heads, but because this knowledge confers important strategic advantages, simply asking people to fill out a form is a completely inadequate method to acquire or distribute this information. While organizations would probably benefit if they could get everyone inside to reveal their expectations and intentions to each other, organizations do not have very effective mechanisms to achieve this goal. People can lie about their expectations and intentions, and it can be very hard to tell if they are lying. Furthermore, even when a coordinator can get someone to give him an honest answer, that coordinator will usually not want to honestly share that answer with others around him. The problem, in other words, is that, not only do people have knowledge, they are aware that their knowledge has strategic value.

Coordinators thus have a natural tendency to keep the key information they acquire "close to their vest." In fact, much of the coordination activity within a firm seems to consist of careful strategic dances in which people are slowly enticed to reveal some of these expectations and intentions to each other. Coordinators try to structure information flows within their areas so as to minimize uncontrolled leaks to outsiders while preserving access for those with a "need to know." Indeed, managers often say it is easier to find out what is going on at competitor firms than at other divisions of their own firm (Hatter and Trapasso 2007).

The net result is that key information about a firm's core coordination activities tends to be limited to insiders and a few coordination specialists. Since firms also need to coordinate with suppliers, customers, producers of complementary goods, competitors, and regulators, some key information will also need to be shared with these other groups. Obviously, firm coordinators are even more careful to limit how much key information they share with these outside groups.

Outside observers of a firm (and low-level employees within the firm not privy to insider information) will thus form expectations based on rather limited information. And yet these expectations are of great importance to a firm. These expectations influence the demand of customers, the morale and efforts of employees, the cooperativeness of suppliers and complementers, the good will of lenders, and, most importantly, the willingness of investors to purchase shares in the firm.

An important consideration for each visible corporate action is therefore how it will be interpreted by wider audiences. We should expect many aspects of firm organization and coordination to function primarily to demonstrate that the organization is expert, well-informed, and well-coordinated. Some widely visible aspects of firm procedures may exist purely as a matter of show and not because they substantially improve coordination within the firm. Furthermore, some decisions will be made not because coordinators think coordination will improve, but because coordinators anticipate that a wider audience will believe that improved coordination would result (Brandenburger and Polak 1996).

III. Insider Trading Regulation

Speculators emerge anytime people trade a durable identical item with low transaction costs. The speculators attempt to profit by buying low and selling high, and so walk away with cash. Anyone who can find a systematic way to predict future prices can profit in this way, and the higher the volume of trade for non-speculative reasons, the more profits can be gained by speculative trade. The net result is that, in high volume markets, current prices embody so much information about future prices that it is very hard to find useful information on future prices beyond current prices.

Bonds and shares of public corporations are durable identical items that can be traded with low transaction costs and are traded in large volumes. Stock and bond market prices therefore embody a great deal of information about future firm profits. Since such prices are public, they help to coordinate expectations about firm activities among the wider world of employees, suppliers, customers, lenders, and investors. Of course, prices clearly encode only a few expectations about a few key dimensions of the firm's future performance. Many other dimensions remain and price analysis alone can not account for them.

The willingness of ordinary people to invest in a company via stock and bond markets depends on the rate of return they can expect, which in turn depends on two main factors: price accuracy and adverse selection. First, an ordinary person is more willing to

invest in firms when prices are more accurate. Accurate prices give clearer signals about which firms are more profitable, allowing the investor to better select the profitable firms for investment. Second, in trades with an elite, often better-informed, trader, an ordinary person will lose on average. This adverse selection in trading profits reduces ordinary people's desire to trade.

Net trading may thus be hurt by an asymmetry in the information available to ordinary traders on one hand and elite traders on the other. If elite traders had ample capital to meet the demand for firm investment, or if information about firm profits was spread evenly across ordinary people, there would be no problem. However, this is certainly not the case. Elite trading may also harm the firm in other ways. For example, elite traders may reveal information to markets that the firm would rather keep secret, or elite traders might sabotage the firm in order to profit from being the first to know about the firm's diminished real value.

If elite traders hurt firms on net, but did not substantially affect third parties, then it would make sense to let each firm decide whether to allow elite traders to trade its assets. Assuming sufficient freedom of contract, firms would seem to have sufficient means to deal with the problem. Firms could disseminate information widely enough to reduce or even eliminate the informational advantage of elite traders. Firms also could prohibit their stocks and bonds from being traded on exchanges which include elite traders. Firms could exercise control over people with whom they form contractual relations, such as employees. For this class, a firm might include contract terms that prohibit any dealings with elite traders.

For many years public corporations did not avail themselves of such opportunities to discourage elite traders. In 1934, Congress responded to the 1929 stock crash by prohibiting the use of "any manipulative or deceptive device" in trading securities, and authorized the Securities and Exchange Commission (SEC) to create "rules and regulations as the Commission may prescribe as necessary or appropriate in the public interest or for the protection of investors" (Bainbridge 2001).

In the name of encouraging investment, the SEC has used its authority over the years to slowly strengthen rules against "insider trading," and to require more structured disclosure by firms (Bainbridge 2001). In the last two decades European firms have been required to follow similar rules. Detailed rules now describe the kinds of information firms must declare on standardized annual, quarterly, and monthly reports. Firms are forbidden to provide any substantial information to investors not previously or simultaneously disclosed in public press releases.

Generally, any person who obtains any substantial information about a firm unavailable to the public at large, and who has gained the information from someone within, or otherwise connected to, the firm, is forbidden from trading that firm's assets. People are excused only if they committed to these trades before they learned this information. Corporate executives, directors, and large shareholders can not sell short,

nor may they sell for a profit within six months of buying, and they must report their trades to the SEC within two business days.

Insider trading rules appear to have had a substantial effect on behavior. Corporate insiders now diligently report their trades; companies are now careful to follow the letter, if not the spirit, of disclosure rules. For example, Enron executives were convicted not of their failure to disclose, but of making it difficult for analysts to find relevant documents (Gladwell 2007). Companies are very cautious about revealing important information to anyone; they require a substantial need to know, are careful to get approval, and keep detailed records. Companies are now in the habit of declaring certain periods of time, such as right after an annual report is released, as relatively safe times for employees to trade.

On the other hand, it is clear from price movements that only a tiny fraction of price relevant information about companies is revealed near the times when companies officially disclose information. Even then, most of that information is embodied in prices *before* the official disclosure. It also seems reasonably clear that there is still a great deal of inequality in how well informed traders are. Bid-ask spreads give us direct estimates of the average information contained in each trade, and the rates of return achieved by ordinary people suggest that their trades are based on below average information.

Another aspect of the information asymmetry between ordinary and elite traders is the ability of the elite trader to utilize information. For example, hedge funds can consistently beat the market average, at least before their costs of analysis and administration are taken into account. While they may not beat the average after these costs are considered, the people they traded with were losers on average nonetheless. The endowments of Ivy League universities get much higher than average returns (Rupp 2007). Both of these groups are obviously more knowledgeable than average. Also, it seems clear that corporate insiders who declare their trades do in fact have substantially better information about their firms than ordinary people: they earn about 0.40% per month in excess returns (Jeng, Metrick, and Zeckhauser 1999).

We clearly have many elite traders in our stock markets, and we forgo opportunities to reduce unequally informed trading, such as by forbidding stock analysts from buying and selling in stock markets. Nevertheless, some data suggest that our insider trading rules encourage net investment (Bhattacharya and Daouk 2002). Other data suggests that insider trading rules lower the value of firms with high agency costs (Durnev and Nain 2007). Thus, it is possible, though hardly obvious, that our insider trading laws provide a net benefit to firms, compensating for their (as yet unexplained) reluctance to use alternative private mechanisms to deal with the problem of information asymmetry between ordinary and elite traders.

IV. Prediction Markets

As we mentioned above, speculative markets display a powerful ability to induce speculators to collect information and combine it into an aggregate estimate of future

prices. For example, stock markets aggregate information about which firms are the best investments. It is hard to find relevant information that such market prices do not embody simply because there exists a profit incentive to find neglected information (Lo 2000; Strumpf and Rhode 2004). Speculative markets work well not only because they reward accuracy and punish error, but also because they encourage self-selection of participants. People who realize they are not as well informed as average traders tend to stay away. People who do not realize they are not well informed lose and then go away.

Remarkably, in every known head-to-head field comparison between speculative markets and other forward-looking institutions, the speculative markets have been at least as accurate. More often than not, they prevail. Orange juice futures improve on National Weather Service forecasts (Roll 1984), horse race markets beat horse race experts (Figlewski 1979), Oscar markets beat columnist forecasts (Pennock, Giles, and Nielsen 2001), gas demand markets beat gas demand experts (Spencer 2004), stock markets beat the official NASA panel at identifying the company responsible for the Challenger accident (Maloney and Mulherin 2003), election markets beat national opinion polls (Berg, Nelson, and Rietz 2003), and corporate sales markets beat official corporate forecasts (Chen and Plott 2002).

Historically this information aggregation ability has been consistently observed in conventional markets. Recently, some have started to create “prediction markets” expressly to produce these informational effects (Wolfers and Zitzewitz 2004; Spann and Skiera 2003; Pennock et al. 2001; Hanson 1990, 1995). Such markets are being used to estimate things like product sales, project completion dates, disease rates, the effectiveness of software security, and election outcomes. Speculative markets can also directly estimate outcomes *conditioned* on particular decisions or events. For example, prediction markets have been used to predict which U.S. party’s candidate will become president, given the particular candidate nominated by each party; in addition, prediction markets have been used to forecast changes in the global economy, conditioned on the advent of a bird flu epidemic (Hanson 1999; Berg and Rietz 2002).

Prediction markets tend to be very low volume markets, as they usually have few “hedging” traders. However, this does not prevent them from having informative prices. Prediction markets only need enough volume to induce a few people who have relevant information to trade and thereby reveal their information.¹ People may want to trade in these markets for financial or social reasons. They might expect to profit financially, either because they disagree or because someone has subsidized trading there. They might trade in order to express a point of view, to share their feelings with a larger community, or even to acquire the right to brag about their accuracy.

While the cost to create a prediction market is generally independent of the topic, the value of such a market can depend greatly on the topic. Thus, the best applications of predictive market technology involve topics with the highest value. There has been interest in creating prediction markets on high value topics such as major government

¹ With good trading institutions, markets can function even with very few traders.

policies and major large industry trends. Anti-gambling laws, commodity trading regulations, and security trading regulations all make it expensive to create real money markets on these topics. Commodity and security regulation are primarily designed with high volume markets in mind, making them largely unsuitable for low volume prediction markets.

There have been two primary responses to this legal barrier. First, there have been some public play money markets on popular topics. For example, the Hollywood Stock Exchange is a play money market where thousands forecast which movies and movie stars will do well. The Foresight Exchange focuses on scientific and technical claims, which users themselves introduce. Without the financial incentives that real money trading can offer, such markets are limited to topics where strong social incentives to trade can be found.

The other response to legal barriers has been to focus on markets within organizations. Even within organizations, play money markets are the easiest to create under the usual scenario of a low budget and weak management support. Such “morale markets” have been created within several companies, such as Google, where ordinary employees in their free time trade on topics that ordinary employees find fun and interesting. Higher management does not suggest topics for these markets, or pay attention to who wins and loses. Management seems to allow morale markets primarily as a way to track general opinion, to improve morale by making employees feel their voice is heard, and simply to participate on the prediction markets fad.

A. Decision Markets

Where management support is stronger, more serious “decision markets” are being tried. These markets tend to be on topics chosen by management to be useful inputs to important decisions, and trading in them is often limited to a small group of managers or related experts. Traders often have a stronger incentive to participate in these markets, either because real money is on the line, because management pays attention to who wins or loses, or because market prices may influence important decisions. These real money markets avoid gambling and other regulations because the organization pays everyone’s stakes: no one contributes their own cash to trade.

Results from these decision market trials have been mixed. Sometimes uninteresting topics are chosen. Sometimes the group is too small or insufficient incentives are offered to get enough of them to participate or the consequences of losing are too weak to make the market more than a voting mechanism. With enough participation and incentives to win, markets are accurate, but sometimes other information mechanisms are relatively efficient, making markets only marginally more accurate than other sources.

Sometimes even decision markets that substantially improve accuracy on important topics are felt to be too disruptive to corporate culture. People complain that it is hard for ordinary managers to understand how to trade, and that market prices

distribute key information to an uncomfortably wide audience. The problem of understanding how to trade can be overcome with education and better trading interfaces. The problem of distributing information too widely can be overcome by mechanisms that hide the market consensus from traders. On the other hand, the fact that information distribution is even perceived as a problem points to larger issues.

As we discussed earlier, in standard corporate institutions key information is usually held very “close to the vest,” in part to satisfy insider trading rules, but more fundamentally because such information has great strategic value to those who hold it. So, naturally, managers feel threatened by any mechanism that would distribute key information more widely, effectively surrendering their strategic advantage.

From the point of view of the firm as a whole, however, mechanisms that can distribute key information more widely offer great efficiency advantages. The time and attention of firm coordinators is a crucial scarce firm resource, which is now devoted, in great measure, to slowly and painfully extracting key information from other coordinators. Firms ought to want coordinators to reveal their key information to each other, provided this information could stay safely inside the firm.

Decision markets may well be just such a mechanism for greater distribution of key information. With widespread use of decision markets, not only might managers need to spend less time creating and extracting key information from each other, but a new class of coordination specialists might form to take over many of these tasks. Most market information might come from trades by people other than precious coordinators.

Instead of spending their time thinking about which projects have what potential, or who would be good at what job, or trying to read other coordinators’ opinions on such things, firm coordinators could instead simply accept decision market prices at face value. Coordinators could thus focus their attention on those determinations that they are best suited to make: what questions to ask decision markets, how to reward market winners, and how to maximize opportunities for firm coordination in general.

Front line employees and top managers are now the groups most interested in prediction markets while mid-level managers are less enthusiastic. This makes sense if prediction markets are a disruptive technology that, by distributing key information, can put mid-level managers at a strategic disadvantage relative to their peers. Front line employees, on the other hand, may use prediction markets to more easily contribute to key corporate decisions. These strategic problems indicate that prediction markets need high level management support to be adopted. If that support is wanting, adoption of prediction markets may be delayed.

Delay might not be bad for a firm. CEOs must be cautious about adopting such a disruptive technology, as firms that adopt disruptive technologies too quickly often suffer as a consequence. There are many details still to work out in adapting prediction markets and other corporate institutions to each other, and each firm may well prefer that other firms first work out these details, and thus learn from their competitors’ mistakes.

Furthermore, even if a disruption benefits the firm overall, it may not benefit the CEO himself if he is not well suited to run the new model firm. In short, even if decision markets can fulfill all of their promise, their development and adoption may entail much trial and error.

V. Insider Trading Rules and Prediction Markets Conflict

Familiar insider trading regulations have been chosen to match our familiar corporate information institutions. In our familiar institutions, firms try hard to limit key corporate information to a few corporate insiders. Regulators, in order to encourage investment, traditionally have tried to reduce trader information inequality by placing strict limitations on the trades of a few corporate insiders. And since key corporate information must eventually be revealed to markets, regulators have focused on forcing this revelation to happen via the channel of official corporate disclosures to the public.

Corporations are now exploring many “wisdom of the crowd” technologies, including wikis, blogs, collaborative filtering, link-popularity-based-search, and prediction markets (Surowiecki 2004; Sunstein 2006). These approaches involve a wide community of people in a more decentralized and less structured processes of creating and sharing information. While these approaches all have potential applications to the problem of asymmetric corporate information, they also run afoul of familiar insider trading laws to a greater or lesser degree.

A firm that included its entire membership in a decentralized, less structured, process to manage key corporate information would not only risk serious internal disruption and external information leaks, it would make everyone in the know a vital corporate insider. In order to protect insider information, each person involved must thus exercise discretion in his or her trades of firm stock. Each person would also have a solemn duty to keep protected information from leaving the firm. While wisdom of crowd technologies takes important advantages from synergies from overlapping topic areas, most such overlaps would be forbidden here. Unless the information process was clearly prevented from sending information signals across the firm boundary, it would violate disclosure rules.

Insider trading rules are one of the reasons that managers have given for not applying prediction markets to the highest value corporate topics. Simple cost benefit analysis suggests we apply prediction markets to the highest value topics we can find. In a corporation, those high value topics are the key corporate decisions, such as the decision to merge, to introduce products, to set price points, to move into new geographic regions, or even to change the CEO (Hanson 2006). It would be straightforward to directly ask decision markets whether such choices would be good for the firm’s stock value.

Since one of the main advantages of prediction markets is that they do not require one to know who has more relevant knowledge, one could reasonably want to open

participation in such markets to a large group, such as all employees. But allowing all employees access to key corporate information could create an insider trading nightmare.

VI. Potential Resolutions

How can we resolve this conflict? An obvious, simple, and robust approach would be to return the choice of regulating insider trading to individual firms. It is hard to identify an externality that would justify putting this decision into regulator hands. The most plausible story I can imagine is that boards of directors might ignore what is good for stockholders and just do what is good for insiders. If we did not find this story very plausible, we could just let firms decide how to weigh any costs from discouraging investment via adverse selection against any benefits of using prediction markets to improve corporate information and coordination efficiency. This solution, though compelling, seems politically infeasible for now.

Another relatively robust approach has been suggested repeatedly over the years:

A [2003] blue-ribbon commission convened to address recent financial scandals and subsequent decline in investor confidence recommended that insiders be required to preannounce sales of stock in their companies. The commission's call for insiders to preannounce their sales echoes proposals made over a decade ago in the legal press, law reviews, and the U.S. Congress that would require preannouncement of all trades (Huddart, Hughes, and Williams 2004).

A general version of this proposal would offer ordinary people much *more* protection from adverse selection in trades than current insider trading laws. It would also allow individuals and organizations much *more* flexibility in choosing their information policies, flexibility that they could use to explore decision markets and other new decentralized information processes.

The general proposal would be to classify traders into ordinary traders and several levels of elite well-informed traders (WIT), and to only allow trading between levels when the more informed trader has announced his specific intended trade ahead of time. In well-functioning markets, even an hour might be plenty of notice. Such a rule would largely eliminate adverse selection between levels; adverse selection would mainly remain between traders of the same level.

Those who had to preannounce their trades would find it somewhat harder to use markets to hedge their risks (Huddart et al. 2004), but being labeled a WIT should be much less constraining than being labeled an insider under today's insider trading rules. WITs could be allowed to become as well informed as desired, and to disclose information selectively to others (within their WIT level). There would be much less need for formal disclosure rules.

Under this proposal, WITs would have the option to form their own special markets to trade with each other, or to flag offers in a general market outside their WIT level, to warn less informed traders. A WIT label could be applied not only to corporate insiders, it could also be applied to well-informed outsiders such as hedge funds, University endowments, or congressmen.

If there were public real money prediction markets about a firm, a third approach would be to allow a WIT to make any trades that were orthogonal to stock value. When there are many assets related to a stock, there is a large space of possible trades that should leave the price of the stock unchanged. If each WIT were freely allowed to make all such trades, they could thereby reveal a wide range of information in prediction markets, without creating adverse selection for ordinary people trading stock.

If there were a private prediction market about a firm, with prices not visible to the public, a fourth approach would be to make public the implications of that prediction market for stock prices. Part of that private market would include a stock price, and that price would be continuously announced to the public. People who were able to trade in that private market would have to, perhaps an hour in advance, declare their intention to make a particular regular stock trade. This internal market might be shut down periodically to facilitate regular stock trades.

There seems to be a number of approaches that could allow the wide use of prediction markets within firms that also keep ordinary people from suffering inefficient adverse selection in stock trades. But the status quo insider trading rules are not conducive to any of these approaches.

VII. Conclusion

The attention of CEOs and other corporate coordinators is a precious resource, much of which is now spent generating and exchanging expectations and intentions about important corporate actions. Prediction markets promise to delegate much of these tasks to coordination specialists, freeing coordinators to attend to other coordination issues. A long hard road must be traversed before innovation can realize this promise and it will not happen very soon.

Nevertheless, it is important to consider how current regulations may discourage this innovation process, by making it hard to involve a larger community of people in key corporate information processes. We can identify several other approaches to such regulation which seem both friendlier to wider use of corporate prediction markets and more effective at reducing the adverse selection in trades that can discourage investment. Regulators should give more consideration to such alternatives.

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