Stock Market Manipulation – Theory and Evidence*

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August 14, 2002

*We thank Charles Dale, Amy Edwards, Xinghai Fang, Bruno Gerard, Toshiki Honda, Munenori Nakasato, Tyler Shumway, Jonathan Sokobin, Changneng Xuan, Omri Yadlin, Xin Zhang, Luigi Zingales, and seminar participants at Aoyama Gakuin University, China Securities Regulatory Commission, Hitotsubashi University, Shanghai Stock Exchange, and U.S. Securities and Exchange Commission for discussion and comments. We thank Qin Lei, Kai Petainen and Patrick Yeung for outstanding research assistance. We are responsible for all remaining errors. Wu gratefully acknowledges financial support from the Mitsui Life Financial Research Center.

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Abstract

In this paper we present a theory and some empirical evidence of stock price manipulation in the U.S. We consider what happens when a manipulator can trade in the presence of other traders who seek out information about the stock's true value. In a market without manipulators, these information seekers unambiguously improve market efficiency by pushing prices up to the level indicated by the informed party's information. In a market with manipulators, the information seekers play a more ambiguous role. More information seekers imply greater competition for shares, improving market efficiency, but also increasing the possibility for the manipulator to enter the market. This suggests a strong role for government regulation to discourage manipulation while encouraging greater competition for information. We construct a dataset of manipulated stocks from U.S. Securities and Exchange Commission civil cases against market manipulators. Our empirical findings are consistent with the implications of the theoretical model, including market efficiency. We find that 'potentially informed parties' such as corporate insiders and brokers are likely to be manipulators. Finally, small, illiquid stocks traded on markets with little regulation are most likely to be manipulated.

1 Introduction

Both for developed and emerging stock markets, the possibility that the markets can be manipulated is an important issue for both the regulation of trading and the efficiency of the market. Manipulation can occur in a variety of ways, from insiders taking actions that influence the stock price (e.g., accounting and earnings manipulation such as in the Enron case) to the release of false information or rumors in Internet chat rooms. Moreover, by purchasing a large amount of stocks, a trader can drive the price up. If the trader can then sell shares and if the price does not adjust to the sales, then the trader can profit. Of course, we should expect that such a strategy will not work. Selling shares will depress the stock price, so that, on average, the trader buys at higher prices and sells at lower prices. This is the unraveling problem, and would seem to rule out the possibility of what Allen and Gale (1992) term trade-based manipulation.

In this paper, we reexamine the possibility of trade-based manipulation and its implications for stock market efficiency and the role played by government regulators in facilitating market efficiency. Allen and Gale (1992) have shown that trade-based manipulation is possible when it is unclear whether the purchaser of shares has good information about the firm's prospects or is simply trying to manipulate the stock price for profit. We examine this question in a setting in which there are active information seekers (think of arbitrageurs) trying to ferret out information about the firm's prospects. We consider the following question: what is the impact of manipulators on information seekers and, hence, what is the impact of manipulation on market efficiency? Not surprisingly, we find that the presence of manipulators reduces market efficiency. More surprisingly, we find that more information seekers may worsen market efficiency when there are manipulators present. Thus, the possibility of stock price manipulation may substantially curtail the effectiveness of arbitrage activities, and, in some cases, render arbitrage activities counterproductive. In these situations, the need for government regulation is acute. In particular, enforcement of anti-manipulation rules can improve market efficiency by restoring the effectiveness of arbitrage activities.

We then examine the empirical implications of the model by analyzing SEC litigation releases from 1990 to 2001 on stock market manipulation cases. Our analysis shows that most manipulation cases happen in relatively inefficient markets that are small and illiquid. There are much lower disclosure requirements for firms listed in these markets and they are subject to much less stringent securities regulations and rules. Our theoretical and empirical analysis highlights the importance of the role played by government regulators in achieving market efficiency. An efficient market requires the presence and the trading of many information seekers. Yet the presence of more information seekers makes successful manipulation more likely, thereby reducing market efficiency. To the extent that active enforcement of securities rules and regulations raises the costs of manipulation to the manipulator, this can deter the manipulator from entering the market, even as the number of information seekers increases. In this case, the presence of more information seekers will simply serve to increase market efficiency. Hence, we argue there is an important role for government to actively enforce securities regulations and rules and to vigorously combat manipulative activities. Our empirical analysis also supports other implications of the theoretical model. For example, we find that 'potentially informed parties' such as corporate insiders, brokers, underwriters, large shareholders and market makers are likely to be manipulators. Since they are close to the information loop, it is much easier for them to pose as the informed party in a manipulation scheme.

In the market microstructure literature, it is generally agreed that traders with more information about the value of firms (such as corporate insiders) can profit from trading (Glosten and Milgrom (1985), Easley and O'Hara (1987), and Kyle (1985, 1989)). What about trading strategies that are deemed manipulative by uninformed traders? Most of the above theoretical asymmetric information models assume the existence of liquidity traders who must trade to meet liquidity needs. Informed traders are able to profit from them since they cannot choose when to trade.

Allen and Gorton (1992) argue that it is much more difficult to justify forced purchasing by liquidity traders who have pressing need to buy securities. The natural asymmetry between liquidity purchases and liquidity sales leads to an asymmetry in price responses. If liquidity sales are more likely than liquidity purchases, there is less information in a sale than in a purchase because it is less likely the trader is informed. The bid price then moves less in response to a sale than does the ask price in response to a purchase. This asymmetry of price elasticities can create an opportunity for profitable price manipulation. A manipulator can repeatedly buy stocks, causing a relatively large effect on prices, and then sell with relatively little effect.

In our model, we do not rely on the asymmetry of price elasticities to motivate the possibility of manipulation. Instead, we assume, consistent with Allen and Gorton's (1992) observation, that liquidity traders are willing to sell at prices higher than the current or prevailing price. Moreover, there is no forced buying by liquidity traders in our model. The buying of shares in our model comes from arbitrageurs or information seekers, whose presence allows for the possibility of manipulation.

Allen and Gale (1992) also examine trade-based manipulation. They define trade-based manipulation as a trader attempting to manipulate a stock simply by buying and then selling, without taking any publicly observable actions to alter the value of the firm or releasing false information to change the price. They show that a profitable price manipulation is possible, even though there is no price momentum and no possibility of a corner. The key to this argument is information asymmetry. Traders are uncertain whether a large trader who buys the share does so because he knows it is undervalued (including the possibility of a takeover), or because he intends to manipulate the price. It is this pooling that allows manipulation to be profitable. Our model has a similar result. We differ from Allen and Gale (1992) in that we incorporate information seekers or arbitrageurs into our model and ask what effect they have on the possibility of manipulation.

In a dynamic model of asset markets, Jarrow (1992) investigates market manipulation trading strategies by large traders in a securities market. A large trader is defined as any investor whose trades change prices. A market manipulation trading strategy is one that generates positive real wealth with no risk. Market manipulation trading strategies are shown to exist under reasonable hypotheses on the equilibrium price process. Profitable speculation is possible if there is "price momentum," so that an increase in price caused by the speculator's trade at one date tends to increase prices at future dates. Our model can be viewed as providing a mechanism by which price momentum occurs–our information seekers trade based on what they observe about the large trader's buying activity.[1]

This paper proceeds as follows. In Section 2, we present a model in which there is the possibility of stock price manipulation. In Section 3, we describe our data and present our basic empirical

[1] There exist a large number of papers that examine theoretically and empirically price manipulation in a number of different settings. For example, Kumar and Seppi (1992) investigate the susceptibility of futures markets to price manipulation. Jordan and Jordan (1996) examine Salomon Brothers' market corner of a Treasury note auction in May 1991. Felixson and Pelli (1999) examine closing price manipulation in the Finnish stock market. Mahoney (1999) examines stock price manipulation leading up to the Securities Exchange Act of 1934. Vitale (2000) examines manipulation in the foreign exchange market. Gerard and Nanda (1993) examine the potential for manipulation in seasoned equity offerings. Jarrow (1994) studies the impact that derivative security markets have on market manipulation.

results. Section 4 analyzes the relationship between manipulation, market efficiency and government regulation. Section 5 concludes. Some technical details are provided in the Appendix.

2 Model

We consider a simple model of stock price manipulation. There are four types of investors in our model. First, there is an informed party (superscripted I) who knows whether the stock value in the future will be high (V_H) or low (V_L). We can think of the informed party as being an insider in the firm who has good information about the firm's prospects.

Second, there is a manipulator (superscripted M), who we assume knows that the stock value will be low. The manipulator tries to drive the price of the stock up and then profit by selling at the higher price. In our model, we consider two scenarios. First, the manipulator can take some action such as spreading rumors or engaging in wash sales to increase the stock price. This activity, while generally prohibited, constitutes most cases we observe of stock price manipulation. Second, the manipulator can buy shares and then profit by trying to sell them later at a higher price. The issue for the manipulator is whether such a strategy is sustainable. In general, such a strategy would suffer from the unraveling problem–in meeting the manipulator's demand, the price is driven up so the manipulator buys at a higher price while when clearing the manipulator's supply, the price is driven down so the manipulator sells at a lower price. Allen and Gale (1992) show that this need not happen in general and it may be possible for the manipulator to sustain positive profits. We apply their insights in our context and show that profitable manipulation is possible and, in addition, we show its impact on market efficiency. In our model, the manipulator may also be an insider, but one who does not have good information about the firm's future prospects.

Third, there are N symmetric information seekers (superscripted A_i, $i \in N$). Information seekers seek out information about whether the future stock price will be high or low. One can also think of them as being arbitrageurs. In our model, we limit our information seekers to several types of information. They can observe past prices and volume and they are susceptible to rumors that may be spread. They do not know the identities of buyers and sellers and therefore they are susceptible to the possibility of wash sales. They have no access to fundamental information themselves. Instead, they try to infer from prices, volumes, and rumors whether an informed party is buying the stock, or whether they should be buying the stock as well.

Fourth, there exists a continuum of noise or uninformed traders (superscripted U). These traders do not update or condition on any information. They simply stand ready to sell shares, so their role is to provide liquidity to the market. We model the uninformed traders as providing a supply curve to the market that determines the market price:

$$P(Q) = a + bQ, \tag{1}$$

where P is the market price of the stock, Q is the quantity demanded, and b is the slope of the supply curve. We assume that initially all shares are held by the uninformed traders.[2] If no one wishes to purchase the stock, then the price of the stock is simply a. For completeness, we assume that the total shares outstanding are:

$$\frac{V_H - a}{b}. \tag{2}$$

This implies that if someone wished to buy all of the shares from the uninformed, the price would be V_H. It is important to note that this is not because the uninformed update about the stock's value. Instead, it is simply governed by the uninformed's willingness to sell more if offered a higher price.

The timing of the model is as follows. At time 0, all shares are held by the uninformed. At time 1, either the manipulator or the informed party can enter the market. The manipulator enters with probability γ, and the informed party enters with probability δ.[3] Since the informed party will only enter if the future stock value will be high (V_H), this is equivalent to saying the probability the future stock value is high is δ. Here we assume that the manipulator knows he does not have good information and the future stock value is V_L.[4] With probability $1 - \gamma - \delta$ neither

[2] This is the case for trading based manipulation. In the cases of wash sales and the release of false information or rumors, the manipulator already owns shares and thus comprises part of the supply curve.

[3] This is the case if the manipulator engages in trade-based manipulation. If the manipulator already has a position in the stock, then γ is the probability that the manipulator releases false information or engages in a wash sale.

[4] It is worth noting that the manipulator will not always try to manipulate the stock when the informed party does not enter. Later on we solve for the optimal amount or probability of manipulation. We also show that if the probability of manipulation is too high, then the market will break down in the sense that information seekers will not be willing to purchase shares. This explains why a manipulator who already owns shares may nonetheless choose not to try to manipulate the stock. We also examine how enforcement of government regulations impacts the probability of manipulation. Not surprisingly, greater enforcement reduces manipulation.

the manipulator nor the informed enter and the future stock value is V_L. As a result, we can think of a as being the time 0 price, i.e., the unconditional expected value of final cash flows,

$$a = \delta V_H + (1 - \delta) V_L. \tag{3}$$

The information seekers observe the stock price and the quantity demanded or any relevant rumors or false information at time 1. At time 2, information seekers can buy shares. They will condition the number of shares they purchase on what they observed at time 1.[5] Also at time 2, the manipulator or the informed party can buy or sell shares. At times 1 and 2, the uninformed stand ready to sell shares. At time 3, the fundamental stock price is revealed to be either V_H or V_L.

We make an additional assumption about the informed party. We assume that the informed party dislikes holding shares until time 3. We can think of this in several ways. First, time 3 represents the long-run, when stock prices have adjusted to fundamental values. The long-run may be very long, and thus it may be costly to hold shares for the informed party. Second, if the informed party is an insider, holding a large, undiversified position in the own-firm stock is costly from a portfolio diversification perspective. Though there is no uncertainty in our model, by adding some uncertainty about the distribution of time 3 prices, we can easily motivate a cost to holding shares for the informed party. We model the cost of holding shares until time 3 as a scalar k. If the stock price at time 3 is V_H, the value to the informed party of a share is $V_H - k$. In order for our problem to be meaningful, it must be the case that $V_H - k - a > 0$, otherwise no informed party would ever buy shares at a price greater than or equal to the time 0 price and hold them until time 3. There is no cost for the informed party to holding a share until time 2. Note that there is no such cost to the manipulator to holding shares until time 3 because the manipulator will never hold shares until time 3 when the value of the share will be V_L, conditional on the manipulator entering.

[5] If there is no purchase of shares at time 1, it is natural to assume that the information seekers will short sell the stock at time 2 until its value is driven to V_L (subject to there being a large number of information seekers). Our focus here is on what happens when there is a purchase of shares at time 1.

One may also wonder why the manipulator and the informed party, knowing that the stock value is low, do not short sell to take advanatge of this information. First, with regard to the manipulator, our results would go through if we assumed that the manipulator was uninformed about the true value of the stock. Second, if both the informed party and the manipulator are insiders (as is true in most cases of manipulation), then restrictions on insiders short-selling their own firm's stock will prevent them from taking advantage of their information.

We next consider two cases. First, we examine what happens when an informed party is present as well as information seekers, but no manipulators. Second, we examine what happens when all three are potentially present in the market: the informed party, the manipulator, and the information seekers.

2.1 Equilibrium with information seekers

First, we consider what happens when there are N symmetric information seekers present in the market, but no manipulator. The information seekers condition their demand at time 2 on what they observe at time 1. Here there are two potential equilibria. In the first equilibrium, the informed party purchases shares at time 1 and then sells these shares at time 2 to the information seekers, who purchase additional shares from the uninformed.[6] In the second equilibrium, the informed party purchases shares at time 1 and then both the informed party and the information seekers purchase additional shares from the uninformed at time 2. In general, we think that the first equilibrium represents the usual case, as we discuss below.

Equilibrium 1

The information seekers are in the market at time 2. Given that the information seekers observe the trading activity at time 1, they know that the informed party has good information about the firm's prospects (V_H). Each information seeker also knows that she is competing against the other $N-1$ information seekers for shares. Lastly, the informed party's strategy at time 2 must be optimal given the information seekers' demands for shares. In this equilibrium, the conjectured optimal strategy for the informed party is to sell shares at time 2, which we will then verify as optimal. We denote the aggregate demand of the N information seekers at time 2 as:

$$q_2^A = \sum_{i \in N} q_2^{A_i}, \tag{4}$$

where $q_2^{A_i}$ is each information seeker i's demand at time 2. At time 2, all shares outstanding are available for purchase as the informed party sells her q_1^I shares.[7] Each information seeker i solves

[6] This is the case we focus on when we add manipulators to the market. For this reason, it is also worth thinking about what happens when the informed party already has shares. In this case, the informed party will want to release credible information about the true value of the shares at time 1 and then sell shares at time 2. For now, because there are no manipulators present, any information released is credible.

[7] We show below that as long as there is at least one information seeker ($N \geq 1$), the aggregate number of shares

the following problem at time 2:

$$\max_{q_2^{A_i}} \quad V_H q_2^{A_i} - (a + b(\sum_{i \in N} q_2^{A_i}))q_2^{A_i}. \tag{5}$$

Taking the N first order conditions, imposing symmetry, and solving yields:

$$q_2^{A_i *} = \frac{V_H - a}{(N+1)b}. \tag{6}$$

The aggregate demand from the N information seekers is:

$$q_2^{A*} = \frac{N}{N+1}\frac{V_H - a}{b}. \tag{7}$$

The price at time 2 is:

$$p_2^* = a + b(\sum_{i \in N} q_2^{A_i}) = \frac{NV_H + a}{N+1}. \tag{8}$$

As the number of information seekers becomes large, the aggregate demand converges to all of the shares outstanding and the time 2 price converges to the fundamental value of the stock:

$$\lim_{N \to \infty} q_2^{A*} = \frac{V_H - a}{b} \tag{9}$$

$$\lim_{N \to \infty} p_2^* = V_H. \tag{10}$$

In this sense, *the information seekers push the market to efficiency.* This is true, of course, only if the number of information seekers is large. If the number is small, then the information seekers do not push the market all the way towards efficiency as each tries to extract rents. Only when the number is large is the ability to extract rents circumscribed by the competition from the other information seekers.

Under the conjectured equilibrium, the informed party purchases shares at time 1 and sells at time 2. The informed party chooses the number of shares to purchase at time 1 by solving the following problem:

$$\max_{q_1} \quad p_2^* q_1 - (a + bq_1)q_1. \tag{11}$$

The time 1 quantity demanded by the informed party is:

$$q_1^{I*} = \frac{N}{N+1}\frac{V_H - a}{2b}, \tag{12}$$

demanded by the information seekers at time 2 will exceed the number of shares sold by the informed party, $q_2^A > q_1^I$.

and the price is:

$$p_1^* = a + \frac{N}{N+1}\frac{V_H - a}{2}. \tag{13}$$

The informed party's profits are:

$$\pi^{I*} = \frac{N^2}{(N+1)^2}\frac{(V_H - a)^2}{4b}. \tag{14}$$

In this conjectured equilibrium, the equilibrium strategies are for the informed party to buy q_1^{I*} shares at time 1, for the informed party to sell q_1^{I*} shares at time 2, and for the N information seekers to each buy $q_2^{A_i*}$ shares at time 2. We now examine under what conditions this conjectured equilibrium will, in fact, be an equilibrium. In order for this conjectured equilibrium to be an equilibrium, it must be the case that no party benefits by deviating from the strategies conjectured. Suppose first that the informed deviates by trying to buy additional shares at time 2 rather than sell. Aggregate demand for shares at time 2 is then:

$$\begin{aligned} q_2^{A*} + q_1^{I*} + q_2^I &= \frac{N}{N+1}\frac{V_H - a}{b} + \frac{N}{N+1}\frac{V_H - a}{2b} + q_2^I && (15) \\ &= \frac{3N}{N+1}\frac{V_H - a}{2b} + q_2^I. && (16) \end{aligned}$$

Note that for $N \geq 2$, the total quantity demanded (assuming $q_2^I \geq 0$) exceeds the number of shares outstanding, $\frac{V_H - a}{b}$. In this case $p_2^* = V_H$ and the time 2 demand of the informed party is $q_2^I = 0$. The value to the informed party for holding shares until time 3 is $V_H - k$. The informed party's profits from this deviation are:

$$\frac{N^2}{(N+1)^2}\frac{(V_H - a)^2}{4b} + \frac{1}{2}\frac{N(V_H - a)}{(N+1)b}\left[\frac{(V_H - a)}{(N+1)} - k\right]. \tag{17}$$

The first term is just the profits earned by not deviating from the equilibrium. The second term is the incremental profit from deviating. For N or k large enough, the second term is negative, establishing that the deviation is not profitable and the conjectured equilibrium is, in fact, an equilibrium. Further, each of the information seekers' strategies that we solved for was optimal given all of the other information seekers' strategies and the informed party's strategy, so no information seeker will deviate.

Equilibrium 2

The second equilibrium has the feature that the informed party buys in both periods. Paralleling the development above for the first equilibrium, for this equilibrium to be sustainable, it must be the case that the number of information seekers N or the cost of waiting to time 3 for the informed party k is small enough. For completeness, in the Appendix, we derive the equilibrium. The relevant condition for this equilibrium is that the informed party must prefer to hold shares until time 3 rather than sell them at time 2. From the Appendix, this condition is:

$$V_H - k - p_2^* = \frac{(N+2)(V_H - k - a) - 2kN^2 - 4kN}{2(3 + N^2 + 4N)}. \tag{18}$$

The key point that emerges from this condition is that as long as k is small or N is small, the expression will be positive and the informed party will prefer to purchase shares in both periods. Note that as N increases, eventually the expression switches sign and becomes negative. The informed party will cease buying shares at time 2.

The results here show that information seekers have two opposing effects on the profits of the informed party relative to the benchmark case. First, the information seekers compete with the informed party for shares at time 2. This reduces the informed party's information rents. Second, if the competition is sufficiently intense in the sense that there are a large number of information seekers, then the informed party's strategy will switch and the informed party will sell shares to the information seekers at time 2. This was the first equilibrium derived above. This makes the informed party better off as the informed party no longer incurs the cost of holding shares until time 3. In general, we think of N as being sufficiently large that the first equilibrium represents the usual case.

2.2 Equilibrium with a manipulator

Next we consider what happens when there is also potentially a manipulator present, in addition to the information seekers. For simplicity, we assume that the manipulator only enters if the informed does not enter, conditional on manipulation being profitable. In this case, the manipulator is present with probability γ. The information seekers continue to condition their demand at time 2 on what they observe at time 1. We discuss two possible equilibria: pooling and separating.

Pooling Equilibrium

We begin by conjecturing that the manipulator and the informed party pool in their strategies. That is, we conjecture that they buy the same quantity of shares at time 1 and sell these shares at time 2. This conjectured equilibrium is similar to equilibrium 1 from the previous subsection.[8] If

[8] The alternative interpretation of these results is that both the manipulator and the informed party hold shares

the manipulator and the informed party choose to purchase the same number of shares at time 1, then the information seekers' posterior beliefs that the purchaser of the shares is the manipulator are:

$$\beta = \frac{\gamma}{\gamma + \delta}. \tag{19}$$

Each information seeker i solves the following problem at time 2, conditional on observing a purchase at time 1:

$$\max_{q_2^{A_i}} \quad \begin{array}{l} (1-\beta)\left[V_H q_2^{A_i} - (a + b(\sum_{i \in N} q_2^{A_i}))q_2^{A_i}\right] + \\ \beta\left[V_L q_2^{A_i} - (a + b(\sum_{i \in N} q_2^{A_i}))q_2^{A_i}\right] \end{array}. \tag{20}$$

Taking the N first order conditions, imposing symmetry, and solving yields:

$$q_2^{A_i *} = \frac{(1-\beta) V_H + \beta V_L - a}{(N+1)b}. \tag{21}$$

The aggregate demand is:

$$q_2^{A*} = \frac{N}{N+1} \frac{(1-\beta) V_H + \beta V_L - a}{b}. \tag{22}$$

The time 2 price is:

$$p_2^* = a + \frac{N}{N+1} \left((1-\beta) V_H + \beta V_L - a\right). \tag{23}$$

Each information seeker makes expected profits of:

$$\pi^{A_i *} = \frac{\left((1-\beta) V_H + \beta V_L - a\right)^2}{(N+1)^2 b}. \tag{24}$$

Under the conjectured pooling equilibrium, if either enters, the informed party and the manipulator both purchase shares at time 1 and sell shares at time 2. Both the informed party and the manipulator choose the number of shares to purchase at time 1 by solving the following problem:

$$\max_{q_1} \quad p_2^* q_1 - (a + b q_1) q_1. \tag{25}$$

The time 1 quantity demanded by the informed party and the manipulator is:

$$q_1^{M*} = q_1^{I*} = \frac{N}{N+1} \frac{(1-\beta) V_H + \beta V_L - a}{2b}, \tag{26}$$

and the price is:

$$p_1^* = a + \frac{N}{N+1} \frac{(1-\beta) V_H + \beta V_L - a}{2}. \tag{27}$$

at time 0, release information at time 1 with probabilities γ and δ respectively, and then sell at time 2. The manipulator's information release is false and the informed party's information release is true.

Both the informed party's and the manipulator's expected profits are:

$$\begin{aligned} \pi^{M*} &= \pi^{I*} = \frac{N^2}{(N+1)^2} \frac{\left((1-\beta) V_H + \beta V_L - a\right)^2}{4b} \\ &= \frac{N^2}{(N+1)^2} \frac{\left((V_H - a) - \beta(V_H - V_L)\right)^2}{4b}. \end{aligned} \tag{28}$$

In order for this pooling equilibrium to be sustainable, it must be incentive compatible for the informed party not to deviate and thus separate from the manipulator. Purchasing a different quantity of shares at time 1 but still selling them at time 2 will not be sufficient to break the pooling equilibrium because it is costless for the manipulator to mimic this strategy. Moreover, as the information seekers only observe the quantity and price from time 1, there is no credible way for the informed to commit to holding shares until time 3.[9] Thus, in order for the pooling equilibrium to be sustainable, the incentive compatibility condition reduces to checking that the informed party will want to sell shares at time 2 rather than hold them until time 3. The value to holding shares until time 3 for the informed party is $V_H - k$, so the incentive compatibility condition is:

$$p_2^* = a + \frac{N}{N+1} \left((1-\beta) V_H + \beta V_L - a\right) \geq V_H - k. \tag{29}$$

Rearranging this condition yields the following:

$$N(k - \beta (V_H - V_L)) \geq V_H - a - k. \tag{30}$$

In order to sustain a pooling equilibrium in which both the manipulator and the informed party buy $q_1^{M*} = q_1^{I*}$ shares at time 1 and sell them at time 2, this incentive compatibility condition must be met.

Examining the incentive compatibility condition yields the following comparative statics. First, note that the left hand side of the condition is increasing in k and the right hand side is decreasing in k, implying that the greater the cost of holding shares until time 3, the more likely it is the informed party will pool with the manipulator.

Second, note that the left hand side of the condition is decreasing in β, implying that the greater the conditional probability that the purchaser of shares at time 1 is a manipulator, the less likely

[9] In the case of the release of information, the ability of the manipulator to appear as credible as the informed party is crucial, otherwise the pooling equilibrium cannot be sustained. This also suggests that in many cases, the manipulator cannot credibly release false information and rumor-based manipulation will fail.

it is the informed party will pool with the manipulator. The intuition here is that the greater the probability that the purchaser is a manipulator, the more severe the adverse selection problem for the information seekers, causing them to reduce the number of shares they purchase at time 2. As a result, the price the seller receives at time 2 is lower, making it less likely that the informed will pool with the manipulator.

Third, note that the left hand side of the condition is decreasing in $V_H - V_L$ (while the right hand side will be increasing in $V_H - V_L$). The greater the dispersion between the high value and the low value of the firm, the less likely it is that the informed party will pool with the manipulator. The greater the dispersion, the more valuable it is for the informed party to wait until time 3 and get the high value for the firm.

Fourth, an increase in the number of information seekers N increases the likelihood of pooling. To see this, note that if

$$k - \beta (V_H - V_L) \leq 0, \tag{31}$$

then the incentive compatibility condition cannot be met and the pooling equilibrium will not be sustainable. Conversely, if

$$k - \beta (V_H - V_L) > 0, \tag{32}$$

then the left hand side will be positive and for N large enough, the incentive compatibility condition will be met. Thus, increasing the number of information seekers makes it more likely that the incentive compatibility condition is met and the equilibrium is the pooling equilibrium. Increasing the number of information seekers reduces market efficiency by reducing the revelation of information.

Because of this effect, there is a substantial and important role for government regulation. In the absence of a manipulator, the usual effect of increasing the number of information seekers is to enhance market efficiency by pushing the time 2 price towards its true value. In the presence of a manipulator, this is no longer necessarily true. Our second comparative static result above shows that decreasing the conditional probability β of a manipulator being present increases the likelihood of successful manipulation. However, our expression for the time 2 price,

$$p_2^* = a + \frac{N}{N+1} \left((1-\beta) V_H + \beta V_L - a \right), \tag{33}$$

shows that decreasing the conditional probability of a manipulator being present also increases the efficiency of the time 2 price. Thus, to the extent that government regulation and enforcement decreases the probability of a manipulator being in the market, this leads to greater market efficiency even though it makes manipulation more likely to be successful when manipulation occurs.

Separating equilibrium

We also note the possibility that a separating equilibrium may exist as well. In the separating equilibrium, the informed party purchases shares in both periods. The manipulator will choose not to enter the market. In order to see why and under what conditions such an equilibrium can exist, we use the analysis of Equilibrium 2 from the previous section and the Appendix. Recall that in that equilibrium, the informed party purchases shares at time 1 and then purchases additional shares at time 2. The information seekers, observing the prices and quantities purchased at time 1, infer that the informed party is buying shares and also purchase shares at time 2.

Now suppose that the manipulator may also purchase shares at time 1. Clearly, the manipulator will want to sell these shares at time 2, since the manipulator knows the value of the shares at time 3 is V_L. The manipulator must purchase the same quantity of shares at time 1 as the informed party, $q_1^M = q_1^I = q_1$, because otherwise the information seekers will infer that the purchaser is the manipulator and they will buy no shares at time 2. This quantity from the Appendix is:

$$q_1 = \frac{V_H - k - a}{2b} - \frac{V_H - k - a - 2kN}{2b\left(3 + N^2 + 4N\right)}. \tag{34}$$

The price at which these shares are bought is:

$$p_1^* = \frac{V_H - k + a}{2} - \frac{V_H - k - a - 2kN}{2\left(3 + N^2 + 4N\right)}. \tag{35}$$

What do the information seekers infer from observing a purchase of shares q_1 at time 1? We claim that the information seekers' beliefs are that the purchaser of the shares at time 1 is the informed party with probability 1. To see this, take the information seekers' beliefs as correct. In this case, from the Appendix, the N information seekers each demand

$$q_2^{A_i*} = \frac{\left(N+2\right)\left(V_H - a + k\right) + 2k\left(N+1\right)}{2b\left(3 + N^2 + 4N\right)} \tag{36}$$

shares at time 2. As the manipulator is not holding his shares or buying additional shares, but instead selling his q_1 shares, the price at time 2 is determined by the information seekers' demands:

$$p_2 = a + b(\sum_{i\in N} q_2^{A_i *}) \tag{37}$$

$$= \frac{6a + aN^2 + 6aN + 2NV_H + 4kN + N^2V_H + 3kN^2}{2\left(3 + N^2 + 4N\right)}. \tag{38}$$

For k or N small enough, p_2 will be less than p_1, implying that the manipulator loses money on every share bought. To see this, note that:

$$p_1 - p_2 = \frac{V_H - k - a - 2kN}{N+3}. \tag{39}$$

As a result, the manipulator will not enter the market for k or N small enough, and the beliefs we ascribed to the information seekers are, in fact, correct.

In this section, we have focused on two equilibria–a pooling equilibrium and a separating equilibrium. There are potentially many other equilibria as well that we have not studied. In particular, we have associated the separating equilibrium with low values of two parameters: the number of information seekers N and the cost of holding shares for the informed party k. We have associated the pooling equilibrium with high values of these two parameters. In between high and low values for these parameters exists a range of values for which other equilibria are possible.

We focus on the pooling and separating equilibria because they exhibit the basic forces we wish to study. In the separating equilibrium, manipulation is not possible. This is governed by two factors. First, in order for manipulation to be sustainable, it must be the case that the informed party wishes to sell her shares before the fundamental value is realized. If she is sufficiently patient, then a manipulator will not be able to mimic her strategy. Second, if there are a small number of information seekers, then the best the informed party can do is to hold shares until the fundamental value is realized. In this sense, the information seekers provide a benefit to the informed party. If there are enough information seekers, they will push the time 2 price up to a level at which the informed party is willing to sell rather than incur the cost of waiting until time 3. Up until this point, the information seekers provide the usual service of arbitrage–they incorporate information into the market price and improve the efficiency of market prices.

In the pooling equilibrium, manipulation occurs. The manipulator is able to mimic the strategy of the informed party. In such an equilibrium, the time 2 price cannot converge to the high fundamental value of the stock because the information seekers do not know if the purchaser of shares or releaser of information at time 1 is informed or a manipulator. As we expect, the possibility of manipulation worsens market efficiency. Interestingly, increasing the number of information seekers increases the likelihood that there is manipulation. The intuition for this result is that increasing the number of information seekers makes the informed party more willing to sell shares at time 2 rather than holding them until time 3. Having the informed party sell shares at time 2 is a key condition for allowing the manipulator to enter the market.

2.3 The value of enforcement

We have not modeled government enforcement of anti-manipulation regulations. Without enforcement, recall that the manipulator's profits conditional on entering in the pooling equilibrium are:

$$\begin{aligned} \pi^{M*} &= \frac{N^2}{(N+1)^2} \frac{((V_H - a) - \beta(V_H - V_L))^2}{4b} \\ &= \frac{N^2}{4b\,(N+1)^2} \left[\frac{\delta\,(1-\gamma-\delta)\,(V_H - V_L)}{(\gamma+\delta)} \right]^2. \end{aligned} \tag{40}$$

The manipulator's unconditional profits are therefore:

$$\gamma\pi^{M*} = \frac{\gamma N^2}{4b\,(N+1)^2} \left[\frac{\delta\,(1-\gamma-\delta)\,(V_H - V_L)}{(\gamma+\delta)} \right]^2.$$

The optimal level of manipulation is found by maximizing the unconditional profits with respect to the probability of manipulation γ.[10] This level of manipulation is:

$$\gamma^* = -\delta - \frac{1}{2} + \frac{1}{2}\sqrt{(8\delta+1)}.$$

In this case, the optimal level of manipulation depends only on the likelihood that the informed party enters.[11]

To consider the issue of enforcement, suppose the government pursues a manipulation investigation with probability η, and suppose, for simplicity, that if the government pursues an investigation, it always wins. Here we focus strictly on the pooling equilibrium from above. Suppose further that the government assesses a fine f and that both η and f are independent of the probability that the manipulator enters. In this case, the manipulator's profits are

$$\gamma\pi^{M*} - \gamma\eta f.$$

[10] The second order condition is also satisfied.

[11] Note that this analysis takes the existence of the pooling equilibrium as given.

If the fine f is large enough or the probability of an investigation η is large enough so that:

$$\gamma\pi^{M*} - \gamma\eta f < 0,$$

then clearly the manipulator will not enter. Conversely, if the fine is small enough or the probability of investigation is small enough, so that:

$$\gamma\pi^{M*} - \gamma\eta f > 0$$

for some γ, then the manipulator will not be fully deterred.

To find the optimal manipulation strategy, we take the first order condition of the manipulator's profits with respect to the probability of manipulating γ:[12]

$$\frac{N^2(V_H - V_L)^2}{4b\,(N+1)^2}\delta^2\,(-1+\gamma+\delta)\,\frac{\gamma - \delta + \gamma^2 + 2\delta\gamma + \delta^2}{(\gamma+\delta)^3} - \eta f = 0.$$

In this case, it is immediately clear that the probability of manipulation γ is increasing in the number of information seekers N and the dispersion in the value of shares $V_H - V_L$. The probability of manipulation is decreasing in the probability of enforcement η and the level of the fine f. The impact of δ is now ambiguous. As expected, greater enforcement reduces the likelihood of manipulation, even if it does not completely eliminate manipulation. It is also worth noting that, given an enforcement regime, the informed party has a strong incentive to turn in the manipulator and thereby improve her profitability from trading. Nonetheless, the government may not investigate all such tips, hence the need for the probability of investigation η.

3 Empirical Evidence from Manipulation Cases

3.1 Anatomy of Stock Manipulation Cases

Before our empirical analysis we provide below summaries of three manipulation cases according the Securities and Exchange Commission complaints filed with U.S. district courts.

[12] The second order condition is satisfied as well. To see this, note that the second order condition is the same as above. The second order condition is decreasing in γ. Since γ is smaller with enforcement than without and the second order condition is satisfied without enforcement, it must be satisfied with enforcement as well.

3.1.1 WAMEX Holding Inc.

WAMEX Holdings, Inc. (WAMX) is a New York-based company with its common stock traded on the OTC Bulletin Board.[13] The company had plans to operate an electronic trading system for stocks. From December 1999 through June 2000, Mitchell H. Cushing (WAMX's CEO), Russell A. Chimenti, Jr. (Chief Administrative Officer), Edward A. Durante (a stock promoter), and several others engaged in a market-manipulation scheme which drove WAMX's stock price from $1.375 per share to a high of $22.00 per share.

As part of the scheme, millions of WAMEX shares were transferred to Durante-controlled nominee accounts at Union Securities, Ltd., a Canadian brokerage firm. Durante then instructed his broker for these accounts to execute a series of public trades to create artificial price increases in WAMEX stock.

In addition, the manipulators made false public statements through press releases, SEC filings, and Internet publications concerning, among other things: approximately $6.9 million in funding that WAMEX had supposedly raised "from a private Investment Group", WAMEX's ability to legally operate an electronic stock trading system, and the purportedly "extensive experience" of Cushing and Chimenti in the investment banking industry. The SEC reports that the facts were: WAMEX had only received a fraction of the financing it had reported, all of which came from fraudulent stock sales; WAMEX had never obtained regulatory approval to operate its electronic stock trading system; and Cushing's and Chimenti's investment banking experience consisted of their employment at several boiler rooms in the United States and Austria. Cushing neglected to disclose that he faced arrest in Austria as a result of his fraudulent securities activities there.

Durante also entered into a series of block deals. The block deals involved pre-arranged public market purchases of large blocks of WAMEX stock which were sold at a discount. The block deals apparently misled investors into believing that there was a highly liquid market for WAMEX shares and led to artificially inflated prices. The SEC alleges that as a result of this scheme, Durante and the others were able to sell 6.9 million WAMEX shares into the market for profits of over $24 million.

This particular example illustrates several features common to many cases of stock price manipulation: first, the use of nominee accounts to create artificial volume in a stock; second, the

[13] The information for this case comes from Securities and Exchange Commission (2001b, 2002).

release of false information and rumors; third, the purchase of large blocks of stock to create the impression of information-based trade.

3.1.2 Paravant Computer Systems, Inc.

In June 1996, Duke & Company, a broker-dealer, served as the underwriter for the initial public offering of common stock of Paravant Computer Systems, Inc. in the Nasdaq market.[14] In the IPO, Paravant's common stock was offered to the public at \$5.00 per share. On June 3, 1996, the IPO was declared effective and trading commenced in Paravant securities. During the first day of trading, the price of Paravant's common stock increased to \$9.875 per share.

This dramatic increase occurred because Duke, which served as a market maker for Paravant securities, and Victor M. Wang (CEO of Duke) and his associates (Gregg A. Thaler, Charles T. Bennett, and Jeffrey S. Honigman), artificially restricted the supply of Paravant common stock and created significant demand for the common stock. Wang and Thaler allocated a large percentage of the common stock issued in the Paravant IPO to certain affiliated customer accounts on the condition that these customers immediately flip this common stock back to Duke after the commencement of trading following the IPO. This arrangement ensured that Duke had a large supply of Paravant common stock in its inventory. Prior to the IPO, Bennett and Honigman, as well as other Duke representatives, pre-solicited customers to purchase Paravant common stock once aftermarket trading in Paravant securities commenced to ensure demand for the common stock. Thus, as a result of the artificially small supply of common stock and the artificially created demand, once aftermarket trading commenced, the price of Paravant common stock increased.

On June 4, 1996, after the price of Paravant common stock had increased to prices ranging from \$10.75 to \$13.375 per share, Duke resold the common stock that it had purchased from the affiliated customer accounts, as well as stock Duke did not own (thus taking an enormous short position in the stock), to the retail customers Duke had pre-solicited to purchase common stock. As a result of its manipulative activities in connection with Paravant common stock, Duke generated over \$10,000,000 in illegal profits. The manipulation ceased on June 21, 1996.

In this example, the manipulation is quite straightforward. A market maker and underwriter simply uses its priviledged position to restrict supply while using its brokerage to generate demand

[14] The information for this case comes from Securities and Exchange Commission (1999) and Morgenson (1999).

from retail investors. The market maker is able to sell shares from inventory, thereby profiting at the expense of both the issuer and the retail investors.

3.1.3 Chase Medical Group Inc.

Chase Medical is a Delaware company incorporated in October 1984 with its headquarters and principal place of business in Miami, Florida.[15] The stock of Chase Medical has been traded on the American Stock Exchange since March 1988. Chase Medical is a holding company which operates a network of family practice medical centers in Southern Florida.

The SEC alleges that Vincent John Militano and Milton Sonneberg, two registered representatives associated with Moore & Schley, Cameron & Co., a New York brokerage firm, cornered the market and manipulated the price of the common stock of Chase Medical Group Inc. Accounts in the names of customers of Militano and Sonneberg accumulated approximately 1.4 million out of Chase Medical's 2.6 million outstanding shares. Stanley Chase, chairman of Chase Medical, owns the balance of approximately 1.2 million shares.

The SEC alleges that many of the transactions were not authorized by the customers. As a result of the manipulation, the price of Chase Medical stock was artificially inflated. In the month between late November and late December 1988, the price per share nearly doubled, going from $8.25 on November 28, 1988 to $13.625 on December 23, 1988. During this period, there was no positive news about the company. In fact, on November 16, 1988, the company announced a loss of $.25 per share for the quarter ended September 30, 1988 compared to a profit of $.14 per share for the same period a year earlier.

Many of the Militano and Sonneberg customers failed to make the initial margin payments for the stock, despite the fact that the price of the stock was rising. Some of these unmet margin calls were extended up to 21 weeks and the unmet margin calls amount to approximately $4.5 million.

The SEC also alleges that between July 11, 1988 and December 23, 1988, Moore & Schley crossed 5 million Chase Medical shares off the Amex floor and that many of these trades were executed outside the trading range which then prevailed on the floor. Moore & Schley did not report these trades to the specialist or the tape.

The purpose of these stock purchases was to engineer a short squeeze. Approximately 340,000

[15] The information for this case comes from Securities and Exchange Commission (1989) and Norris (1991).

shares were sold short and could not be covered except through buys from accounts controlled by Moore and Schley on behalf of its customers. The SEC alleged that Militano, Sonneberg, and their associates earned illegal profits of $676,000. In this example, the manipulation consists of a corner, where, in effect, there exist no shares to be traded.

3.2 Data Description

To provide more systematic evidence on stock market manipulation, we collect stock market manipulation cases pursued by the U.S. Securities and Exchange Commission from January 1990 to October 2001. Specifically, we collect all SEC litigation releases that contain the key word "manipulation" and "9(a)" or "10(b)" which refer to the two articles of the Securities and Exchange Act of 1934. We then manually construct a database of all these manipulation cases. Additional information about the cases are collected from other legal databases such as Lexis-Nexis and the Securities and Exchange Commission Annual Reports. There are 142 cases in total. Table 1 reports data on the distribution of cases by year and by the markets in which the manipulated stocks were traded. There was an increase in manipulation cases in 2000 and 2001. This could be due to an upsurge in manipulation activities or intensified enforcement action by the SEC.

For manipulated stocks, we collect daily stock prices, trading volume, and capitalization from January 1989 to December 2001 from the online service Factset. To compare manipulated stocks with market benchmarks, we also collect the daily returns of the composite index, the total capitalization, and total market trading volume of the New York Stock Exchange and the Nasdaq Market from Factset. Since about half of the manipulated stocks were traded in over-the-counter markets such as NASD's OTC Bulletin Board and the Pink Sheets, we collect daily price, volume, and capitalization data for all stocks traded on the OTC Bulletin Board from January 1989 to December 2001.

3.3 Implications for Manipulators

Our theoretical analysis above showed that a key to successful manipulation is the pooling of the manipulator with the informed party. Hence, the manipulator needs to be able to credibly pose as a potentially informed party. There are many ways to do this. For example, one way to credibly pose as an informed party is to be an insider. Others such as brokers, underwriters, market makers, or large shareholders can also credibly pose as potentially informed investors. Table 2 shows results on the distribution of several types of 'potentially informed' parties who were involved in manipulation cases. Corporate insiders such as executives and directors are involved in 47.89% of the manipulation cases. Brokers are involved in 64.08% of the cases. Large shareholders with at least 5% equity ownership are involved in 31.69% of the cases. Market makers and stock underwriters are involved in more than 20% of the manipulation cases. The sum of the percentages across types exceeds 100% because more than one 'potentially informed' type can be involved in any given case. Indeed, most manipulation schemes were undertaken with concerted effort by several parties. This evidence suggests that manipulators are close to the information loop and can thus credibly pose as being informed about the future value of stocks.

Furthermore, it is likely that information seekers actively look for information during important corporate events such as the issuance of stocks or bonds. Thus, the number of information seekers may increase around these events. Hence we expect that manipulations are more likely during these events. We find that about 15% of the manipulation cases are related to the initial public offerings or secondary offerings.

3.4 Implication for Manipulation Schemes

Our model of manipulation occurs in a setting where the manipulator inflates the stock price in the absence of good news. Our analysis of manipulation cases shows that inflating the stock price is indeed the most common type of manipulation. Figure 1 displays the breakdown of manipulation types. We see that 84.51% of manipulation cases involve the inflation of stock prices while less than 1% of cases involve the deflation of stock prices. Stabilization accounts for 2%. For about 13% of cases we do not have enough information to classify the type of manipulation. If we assume that these cases have the same distribution as the others, then over 96% of manipulation cases involve the inflation of stock prices.

Figure 2 shows the distribution of ways to profit in manipulation cases. Since not all activities of the manipulators are reported and identified in the cases, the reported percentages are a lower bound for the true percentages. Manipulators often try to create an artificially high price through wash trades and the use of nominee accounts (40.14% of our cases involve such trades). They trade among accounts owned by essentially the same individual or group. The increased trading volume and price often attract the attention of investors or information seekers. Indeed, for our entire sample of manipulated stocks, the mean daily average turnover during manipulation periods is about 20% higher than that for non-manipulation periods. Investors wonder if there is good news about the stock, without realizing that much of the trading activity does not involve any real change in ownership.

Since information seekers constantly search for investment opportunities, manipulators often resort to propagating false information to encourage information seekers to purchase shares. For our entire sample, 55.63% of all cases involve the spread of rumors. Historically, manipulators have colluded with newspaper columnists and stock promoters to spread false information. With the advent of the Internet, chat rooms and message bulletin boards have become popular means to distribute false information. From January 2000 to October 2001, about 39% of all manipulation cases involved the use of the Internet to spread rumors. Figure 2 also shows that in 54.93% of the cases, manipulators buy and then sell stock in the market to realize a profit (as opposed to situations in which they already own the stock) . Finally, about 13% of the manipulators tried to corner the supply of stock in order to inflate prices as in the Chase Medical case described above.

4 Manipulation, Market Efficiency and Government Regulations

4.1 Implications for Market Efficiency

As shown in Section 2.1, when there are more information seekers in the market, information is quickly reflected in the stock price and the market is more efficient. Yet the presence of information seekers also makes it possible for manipulators to pool with the informed party and profit from trading with the information seekers. In fact, the more information seekers, the easier manipulation is, ceteris paribus. Certainly, the more information seekers trade with manipulators, the more they lose. Hence in a market with many manipulators, information seekers cannot survive if they trade frequently. Therefore market manipulation can drive away information seekers and make the market inefficient. In the extreme, there will be no information seekers and the market is informationally inefficient. With manipulators present in the market, our model predicts that the price at time 2 does not converge to the true value of the stock to be revealed at time 3. Therefore a higher probability of manipulation decreases market efficiency.

Our results in Table 1 show that most manipulation cases occur in markets we think of as being relatively inefficient. For example, 47.89% of all manipulation cases happen in the over-the-counter markets such as the OTC Bulletin Board and the Pink Sheets. Whereas 33.81% of the cases happen in either regional exchanges or unidentified markets, about 17% of the cases occur on the NYSE, AMEX, or Nasdaq National Market combined. Overall, the OTC Bulletin Board, the Pink Sheets, and the regional exchanges are relatively inefficient in the sense that they are small and illiquid. For example, currently the OTC Bulletin Board provides access to more than 3,800 securities and includes more than 330 participating market makers. Yet the daily average volume is still $100 million to $200 million.[16] Our results show that about over 50% of the stocks manipulated are "penny stocks" with very low average trading volume and market capitalization.

We do not know exactly if prices in these markets quickly adjust to all information and hence are informationally efficient. Our results suggest that the relatively frequent occurrence of manipulation and possibly other forms of fraud is likely to lead to inefficiency in these markets. Below we study the role illiquidity plays in stock market manipulations.

4.2 The Liquidity of Manipulated Stocks

We observed above that many manipulated stocks trade in relatively illiquid over-the-counter market. Does illiquidity in a stock imply higher likelihood of it being manipulated? This is plausible since one key element to a successful manipulation is to move price effectively. It is hard to imagine that any manipulator would be able to move a large capitalization and highly liquid stock such as GE by any significant amount without incurring huge cost and taking on enormous risk. To study this issue, we compute the average daily turnover over the manipulation, pre- and post-manipulation periods.

For each manipulated stock we also compute the average daily turnover for a benchmark. To make sure that our results are robust we use three different benchmarks. We then cross-sectionally regress the average daily turnover on a constant and a dummy for manipulation. The dummy

[16] As of November, 2001, the largest company on the OTCBB was Publix Super Markets with a $9 billion market capitalization and $15 billion in revenues. Heroes, Inc., was the smallest, with a $302,000 market capitalization and revenues of $6.5 million. Some 2,000 OTCBB companies have an average market cap of $1 million or less. Some 42% of all trades are made in the top 100 OTCBB securities. The top 500 stocks account for 74% of the total trading volume, and the top 1,000 stocks account for 88% of the total.

variable equals 1 for the manipulated stock and equals 0 for the benchmark. The sample period is from January 1990 to December 2001:

$$turnover = a + b * I\{manipulated\} + e. \tag{41}$$

There are a total 78 manipulated stocks for which we can find trading data. With the matched sample from the benchmark, we have a total of 156 observations in the regressions. The three benchmarks we use are the following: the total U.S. aggregate equity market, the specific market where the manipulated stock was traded, and the specific market plus size matching. We discuss below in detail how we constructed the benchmarks.

As the first benchmark the average daily turnover for the aggregate equity market is constructed as the value weighted average turnover of the NYSE, Nasdaq and OTC Bulletin Board. In Panel A of Table 3 we report the regression results with the aggregate U.S. equity market as the benchmark. We see that the average daily turnover is about 35% to 39% for the three periods for the market benchmark (the intercept a). Yet the coefficients for the dummy variable (b) are significantly negative for all three periods, indicating that the manipulated stocks are much less liquidity than the aggregate market. This also reflects the fact that about 50% of the stocks are traded on OTC and their average turnover is much lower than the aggregate U.S. equity market. The turnover for the manipulated stocks (a+b) is between 2-7% on a daily basis. Finally we note the R-squareds are large and between 74% to 88%, reflecting the fact that there is clear difference in liquidity between manipulated stocks and the aggregate equity market.

Instead of using one aggregate measure for all manipulated stocks, we use as the second benchmark the turnover specific to the manipulated stock where it was traded. For example, if a manipulated stock was traded on the Nasdaq, then we would produce the average daily turnover for the benchmark using the average Nasdaq turnover during, before and after the manipulation period. If a manipulated stock is traded on the OTC, then we would use the OTC Bulletin Board average daily turnover in the matched sample. Panel B of Table 3 reports regression results for the specific market matched sample. The intercept has been reduced significantly for all three periods. They range between 4.0% to 4.7% and statistically significant from zero at the 1% level. This reflects that fact that now we use the much lower average OTC market turnover as the matched sample for all the manipulated stocks traded on OTC. The coefficients for the dummy variable are also much smaller. The coefficient for the dummy variable during the manipulation period is positive and statistically significant at the 5% level. This could be due to the fact that there is often higher than usual trading volume during a manipulation. The coefficient is negative at -2.12% during the pre-manipulation period and it is statistically significant at 5% level. Therefore there is evidence supporting the view that less liquid stocks are more likely to be manipulated. During the post-manipulation period, the coefficient is also negative but it is not statistically significant. The R-squareds are much smaller now and they range from 5% to 8%.

For the third benchmark, we not only match the specific market where the manipulated stock was traded, we also match the size of the stocks. For each manipulated stock we form an equally weighted portfolio by selecting randomly 10 stocks with market capitalization within 10% of that of the manipulated stock from all stocks available in that market. For example, for a manipulated OTC Bulletin Board stock, we would choose 10 stocks with similar capitalization from all available OTC Bulletin Board stocks. We then compute the average daily turnover for the portfolio as the benchmark to be used in the regression. Panel 3 of Table 3 reports the regression results. The results are very similar to those reported in Panel B except for the pre-manipulation period. Now the coefficient for the dummy variable is even smaller and significant at the 5% level. Combined with a smaller intercept this translates into a much smaller turnover for the manipulated stocks: 0.34% compared with 3.26% for the benchmark. We conclude that less liquid stocks are more likely to be manipulated.

4.3 The Return and Volatility of Manipulated Stocks

How did the manipulated stocks perform relative to other stocks during manipulation periods? Since most manipulations involve inflating stock prices as shown in Figure 1, we expect prices to go up on average in a manipulation. However, for some cases manipulators drove up the price which subsequently dropped below the pre-manipulation level before the end of manipulative activities. We show below that the overall effect is still positive during manipulation periods. We also examine if manipulators prefer stocks that have underperformed or outperformed market benchmarks. Finally we study the return performance of manipulated stocks after manipulative activities have stopped to see if they systematically underperform.

To study these issues, we compute the average daily returns over the manipulation periods as well as over the pre- and post- manipulation periods. As before, we also compute the average daily returns for the corresponding period for a market benchmark. We construct the market benchmarks as we did in the previous subsection, except now we compute average daily returns instead of average daily turnovers. We then cross-sectionally regress the average daily return on a constant and a dummy for manipulation. The dummy variable equals 1 for the manipulated stock and equals 0 for the benchmark. The sample period is from January 1990 to December 2001:

$$return = a + b * I\{manipulated\} + e. \tag{42}$$

Table 4, Panel A reports the regression results with the aggregate U.S. equity market as the benchmark. The average daily return is the value weighted average turnover of the NYSE, Nasdaq and OTC Bulletin Board. The average daily return is about 3.92% higher for the manipulated stocks during the manipulation periods, and it is statistically significant at the 1% level. The pre- and post- manipulation average returns for the manipulated stocks are also much higher than the market benchmark, yet they are statistically insignificant.

Panel B reports regression results where the market benchmark is selected using the corresponding market benchmark for the manipulated stock where it is traded. For example, if a manipulated stock is traded on the Nasdaq, then we would generate the average daily return for the matched sample using the average Nasdaq returns. If a manipulated stock is traded on the OTC, then we would use the OTC Bulletin Board average daily return in the matched sample. The coefficient for the manipulation dummy variable has been reduced to 2.90% for the manipulation period but it is still statistically significant at the 1% level. For the pre- and post- manipulation periods, the coefficients are still positive but statistically insignificant. In Panel C, we report the regression results using the sample that matches not only the market but also the size of the manipulated stocks. The results are qualitatively similar to those in Panel B. We therefore conclude that manipulated stocks on average experience an increase in the stock price during the manipulation period. There is no evidence that manipulators prefer either underperforming or outperforming stocks. Finally we do not find that manipulated stocks underperform during the post manipulation period. This last finding is consistent with the idea that investors do not learn about manipulation until long after the manipulation occurs.

We next examine the volatility of manipulated stocks and the results are reported in Table

5. The exercise is similar to that on returns above, except now we use average sample standard deviation as the dependent variable in the regression:

$$volatility = a + b * I\{manipulated\} + e. \tag{43}$$

Panel A shows that the average volatility for manipulated stocks is much higher than that for the average market during manipulation periods. In particular, volatility is 21.10% higher for manipulated stocks and it is statistically significant at the 1% level. This reflects the fact that manipulated stocks often experience dramatic price movements. However, this also reflects the fact that idiosyncratic volatility is diversified away in the market benchmarks.

In Panel B, we report the results using the market specific matched sample. Now volatility is about 16.78% higher for manipulated stocks. There is still a diversification effect for the benchmarks since we use composite indexes for the Nasdaq and the NYSE.

Panel C reports results where the diversification effect has been removed from the benchmarks. In computing the benchmark volatility, we compute the standard deviation for each of the 10 stocks in the portfolio and then take the average. We see that the results are only slightly different from those in Panel B. Now manipulated stocks are, on average, 15.95% higher in volatility during manipulation periods, and this is statistically significant at the 5% level. For the pre- and post-manipulation periods, volatility is higher for manipulated stocks, but the coefficients are not statistically significant. We therefore conclude that manipulated stocks are more volatile during the manipulation period, but there is no strong evidence showing they are more volatile during the pre- and post- manipulation periods.

4.4 The Role of Regulators in Improving Market Efficiency

The markets in which manipulation is more likely to occur also have the feature that there are much lower disclosure requirements for their listed firms, and the firms are subject to much less stringent securities regulations and rules. For example, OTC Bulletin Board stocks were not required to file annual reports with regulators before June 2000. The new disclosure requirements seem to have driven many OTC Bulletin Board stocks to the Pink Sheets, which require virtually no disclosure at all. These are precisely the markets where asymmetric information problems are likely to be the most severe. Thus we argue that the lack of disclosure requirements and regulatory oversight allow manipulators to operate with ease. In particular, it will be easier for manipulators to pool with informed parties. Hence, these markets are likely to be informationally inefficient.

In contrast to the more inefficient markets, the New York Stock Exchange is relatively free from manipulation. Only 2.11% of manipulation cases occur on the NYSE, yet its total market capitalization is much larger than the sum of the market capitalizations of the OTC Bulletin Board, the Pink Sheets, the regional exchanges, and the Nasdaq small cap market.

The above discussion highlights the importance of the role government regulators play in achieving market efficiency. An efficient market requires the presence and the trading of many information seekers. Yet the presence of information seekers makes it possible for manipulators to profit from manipulation activity. This manipulation activity reduces market efficiency. Hence, it is important for government to play an active role in enforcing securities regulations and rules, and to vigorously combat manipulative activities. Without it, markets cannot be efficient.[17]

It is interesting to note that not all small, and relatively illiquid markets are rife with manipulation. From Table 1 we see that the Nasdaq SmallCap Market had only two manipulation cases during our sample. This market has to follow similar disclosure and trading rules as those followed by the Nasdaq National Market. This highlights the importance of regulations and oversight for stock markets, even for small and relatively illiquid ones.

Certainly the SEC has limited resources and pursues only a small number of cases (about 500 total cases a year which includes not only manipulation cases, but also insider trading, fraud and other violations).[18] Figure 3 shows the percentages of the types of penalties imposed by the SEC on

[17]Interestingly, it seems that the SEC and the NASD are in the process of turning the OTC Bulletin Board into a more regulated market place. As part of the transformation, qualifying small issuers will need to meet defined listing standards and pay listing fees. Minimal governance standards will require that companies must have at least 100 shareholders who own at least 100 shares each, and that there be 200,000 shares in the public float. Also, the auditor must be subject to peer review, the company will need to issue an annual report, there will have to be an annual shareholder meeting with proxies and a quorum of at least 1/3rd of the shareholders present in person or by proxy. Listed companies will need at least one independent director and there must be an independent audit committee with a majority of independent directors. Certain transactions will require shareholder approval, and rules will be in effect to prohibit voting restrictions. Our model predicts that with regulators playing an active role in this market, the OTC Bulletin Board will be subject to the action of fewer manipulators; trading volume will increase, and the market will become more efficient.

[18]The total number of cases includes both civil actions and SEC administrative proceedings. According to the 2001 SEC Annual Report, the SEC initiated 485 cases in the fiscal year 2001. There are 236 civil actions and 249 admin-

alleged market manipulators. There may be more than one type of penalty in each particular case. Since some cases are still under investigation, and not all SEC actions are reported and identified in the cases, the reported percentages are a lower bound for the true percentages. We see that the SEC settles a significant portion of the cases (45.77%). 47% of the cases involve monetary penalties such as disgorgement of illicit profit, interest, and fines. Also the SEC frequently imposes or asks the court to impose "Bar from Industry" as a penalty to prevent violators from engaging in similar activities in the future, which accounts for 40.85%. For more serious violations (16.90%), the SEC refers the cases to the Justice Department for criminal prosecution.

5 Conclusion

In this paper we study what happens when a manipulator can trade in the presence of other traders who seek out information about the stock's true value. These information seekers or arbitrageurs play a vital role in sustaining manipulation. Because information seekers buy on information, they are the ones who are manipulated. In a market without manipulators, these information seekers unambiguously improve market efficiency by pushing prices up to the level indicated by the informed party's information. In a market with manipulators, the information seekers play a more ambiguous role. More information seekers imply greater competition for shares, improving market efficiency, but also increasing the possibility for the manipulator to enter the market. This worsens market efficiency from the perspective of price transparency. This suggests a strong role for government regulation to discourage manipulation while encouraging greater competition for information.

We then provide some evidence from SEC actions in cases of stock manipulation. We find that 'potentially informed parties' such as corporate insiders, brokers, underwriters, large shareholders and market makers are likely to be manipulators. More illiquid stocks are more likely to be manipulated and manipulation increases stock volatility. Finally our analysis sheds light on the link between regulatory oversight, the occurrence of market manipulation, and overall market efficiency.

istrative proceedings. Among them, market manipulation cases account for 17 civil actions and 23 administrative proceedings.

Appendix

Here we consider the case in which there is an informed party and information seekers but no manipulator present. We present, for completeness, an alternative equilibrium to the one in the text. In this equilibrium, the informed party buys at both time 1 and time 2 and the information seekers buy at time 2. At time 2, the price of shares as a function of the demand for shares by both the informed and the information seekers is represented by:

$$p_2 = a + b(q_1^I + q_2^I + \sum_{i \in N} q_2^{A_i}). \tag{44}$$

The information seekers choose their demand according to:

$$\max_{q_2^{A_i}} \quad V_H q_2^{A_i} - (a + b(q_1^I + q_2^I + \sum_{i \in N} q_2^{A_i}))q_2^{A_i}. \tag{45}$$

The informed chooses her demand according to:

$$\max_{q_2^I} \quad V_H q_2^I - (a + b(q_1^I + q_2^I + \sum_{i \in N} q_2^{A_i}))q_2^I. \tag{46}$$

Taking the first order conditions of the information seekers and the informed party, imposing symmetry on the information seekers, and solving yields:

$$q_2^{A_i} = \frac{V_H - a + k - bq_1^I}{(N+2)b}. \tag{47}$$

$$q_2^I = \frac{V_H - k - a - kN - bq_1^I}{(N+2)b}. \tag{48}$$

At time 1, the informed party solves:

$$\max_{q_1^I} \quad \begin{array}{l} (V_H - k)\left(q_1^I + q_2^I\right) - (a + bq_1^I)q_1^I \\ -(a + b(q_1^I + q_2^I + \sum_{i \in N} q_2^{A_i}))q_2^I. \end{array} \tag{49}$$

Taking the first order condition and solving yields the following choices of quantities for both the informed party and the information seekers:

$$q_1^{I*} = \frac{V_H - k - a}{2b} - \frac{V_H - k - a - 2kN}{2b\,(3 + N^2 + 4N)} \tag{50}$$

$$q_2^{I*} = \frac{(N+2)\,(V_H - k - a - 2kN)}{2b\,(3 + N^2 + 4N)} \tag{51}$$

$$q_2^{A_i *} = \frac{(N+2)\,(V_H - a + k) + 2k\,(N+1)}{2b\,(3 + N^2 + 4N)}. \tag{52}$$

As a result of these quantity choices, we can derive equilibrium prices at time 1 and time 2 as well as profits for the information seekers:

$$p_1^* = \frac{V_H - k + a}{2} - \frac{V_H - k - a - 2kN}{2\left(3 + N^2 + 4N\right)} \tag{53}$$

$$p_2^* = \frac{2a + aN + 7V_H N + 4V_H - 3kN - 4k + 2V_H N^2}{2\left(3 + N^2 + 4N\right)} \tag{54}$$

$$\pi^{A_i *} = \frac{1}{4}\frac{\left(aN - V_H N - 3kN + 2a - 2V_H - 4k\right)^2}{\left(3 + N^2 + 4N\right)^2 b}. \tag{55}$$

The equilibrium profits for the informed party is a long and complicated expression which we do not reproduce here. It is also not particularly revealing for our purposes. In order to see that the informed party will not deviate from the equilibrium of purchasing shares in both periods, we need only show that the time 2 price is less than the value the informed party gets from holding shares until time 3, $V_H - k$. In this case, the informed party cannot do better by selling shares at time 2. This condition is:

$$V_H - k - p_2^* = \frac{(N+2)\left(V_H - k - a\right) - 2kN^2 - 4kN}{2\left(3 + N^2 + 4N\right)}. \tag{56}$$

The key point that emerges from this condition is that as long as k is small or N is small, the expression will be positive and the informed party will prefer to purchase shares in both periods.

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Table 1 : Distribution of Manipulation Cases

This table reports the distribution of manipulation cases in various markets from 1990 to 2001. 'Nasdaq' denotes NASDAQ National Market System. 'SmallCap' denotes NASDAQ Small Capitalization Market. 'OTC' includes both the OTC Bulletin Board and the Pink Sheets. 'Other' denotes cases that occur on other regional markets and those that cannot be classified to a particular market.

Year	NYSE	AMEX	Nasdaq	SmallCap	Other*	OTC	Unknown	Total
1990	3	0	2	0	4	11	5	25
1991	0	1	0	0	1	0	2	4
1992	0	0	2	0	0	3	7	12
1993	0	0	0	0	0	2	0	2
1994	0	0	0	0	0	1	0	1
1995	0	0	8	0	0	0	1	9
1996	0	0	0	0	1	0	1	2
1997	0	0	0	0	0	5	6	11
1998	0	0	1	0	0	4	2	7
1999	0	0	1	0	0	5	5	11
2000	0	2	0	1	0	19	6	28
2001	0	1	3	1	0	18	7	30
Total	3	4	17	2	6	68	42	142
Total %	2.11	2.82	11.97	1.41	4.23	47.89	29.58	100.00

* Cases in 'Other' are for stocks traded in the following exchanges:

In 1990 - 3 on Pacific Stock Exchange and 1 on Vancouver Stock Exchange;

In 1991 - Boston Stock Exchange;

In 1996 - Alberta Stock Exchange.

Table 2 : Types of People Involved in Manipulation Cases

This table reports the occurance of 'potentially informed' people who are involved in manipulation cases from 1990 to 2001. 'Insider' denotes corporate executives and directors. 'Shareholder' denotes large shareholder with 5% or more ownership in the manipulated stock. Note that more than one type of people may be involved in any case.

Year	Broker	Insider	MarketMaker	Underwriter	Shareholder	Total Case
1990	17	9	0	6	3	25
1991	3	3	0	1	1	4
1992	11	2	2	2	0	12
1993	2	0	0	0	0	2
1994	1	1	0	0	1	1
1995	8	8	7	0	7	9
1996	1	2	0	0	2	2
1997	10	10	1	0	8	11
1998	5	3	0	0	3	7
1999	7	5	1	1	7	11
2000	12	8	2	5	6	28
2001	14	17	1	0	7	30
Total	91	68	14	15	45	142
Total %	64.08	47.89	9.86	10.56	31.69	-

Table 3 : Liquidity of Manipulated Stocks

Model: turnover=a+b*I{manipulated}+e

This table reports the results for regressing the average daily turnover over the manipulation, pre- and post- manipulation periods on a constant and a dummy for the stock that's manipulated. For non-manipulated stocks, we use the average turnover for the same period as the manipulated stock. The results in the Panel A are based on the aggregate of U.S. equity market as the matched sample. Results in Panel B are based on the Nasdaq composite, a constructed OTC composite, and the NYSE composite as the matched sample, depending on where the manipulated stock is traded. Results in Panel C are based on matching the manipulated stock with a portfolios of stocks traded on the same market and with similar sizes. The sample period is from January 1990 to December 2001.

	Manipulation Period	Pre-Manipulation Period	Post-Manipulation Period
A: Aggregate Market Matched Sample			
a	0.35214***	0.35251***	0.39368***
	(0.01051)	(0.00489)	(0.08638)
b	-0.30349***	-0.32917***	-0.31983***
	(0.01879)	(0.01098)	(0.01321)
R^2	73.97%	88.47%	81.93%
B: Specific Market Matched Sample			
a	0.04720***	0.03983***	0.04682***
	(0.01113)	(0.00992)	(0.01126)
b	0.01280**	-0.02123**	-0.01356
	(0.00673)	(0.01190)	(0.01019)
R^2	5.12%	8.27%	4.98%
C: Specific Market and Size Matched Sample			
a	0.03821***	0.03256***	0.04129***
	(0.01019)	(0.01123)	(0.01618)
b	0.01002**	-0.02915**	-0.01165
	(0.00516)	(0.01681)	(0.00896)
R^2	4.98%	7.65%	5.39%

***: 1% significance level; **: 5% significance level; *:10% significance level.

Table 4 : Return of Manipulated Stocks

Model: return=a+b*I{manipulated}+e

This table reports the results for regressing the average daily return over the manipulation, pre- and post-manipulation periods on a constant and a dummy for the stock that's manipulated. For non-manipulated stocks, we use the average return for the same period as the manipulated stock. The results in the Panel A are based on the aggregate of U.S. equity market as the matched sample. The results in Panel B are based on the Nasdaq composite, a constructed OTC composite, and the NYSE composite as the matched sample, depending on where the manipulated stock is traded. Results in Panel C are based on matching the manipulated stock with a portfolios of stocks traded on the same market and with similar sizes. The sample period is from January 1990 to December 2001.

	Manipulation Period	Pre-Manipulation Period	Post-Manipulation Period
A: Aggregate Market Matched Sample			
a	0.00086	0.00099	-0.00035
	(0.01356)	(0.03198)	(0.04593)
b	0.03919***	0.00871	0.01017
	(0.01602)	(0.02392)	(0.06498)
R^2	4.71%	3.28%	1.90%
B: Specific Market Matched Sample			
a	0.01029	0.00511	0.00624
	(0.01205)	(0.02228)	(0.01498)
b	0.02899***	0.00961	0.02064
	(0.01411)	(0.03982)	(0.02260)
R^2	4.92%	3.62%	2.89%
C: Specific Market and Size Matched Sample			
a	0.00295	0.00628	0.00029
	(0.01652)	(0.02015)	(0.03126)
b	0.03125**	0.00297	0.01254
	(0.01687)	(0.03689)	(0.02001)
R^2	4.36%	3.22%	1.96%

***: 1% significance level; **: 5% significance level; *:10% significance level.

Table 5 : Volatility of Manipulated Stocks

Model: volatility=a+b*I{manipulated}+e

This table reports the results for regressing the average daily volatility over the manipulation, pre- and post- manipulation periods on a constant and a dummy for the stock that's manipulated. For non-manipulated stocks, we use the average volatility for the same period as the manipulated stock. The results in Panel A are based on the aggregate of U.S. equity market as the matched sample. The results in Panel B are based on the Nasdaq composite, a constructed OTC composite, and the NYSE composite as the matched sample, depending on where the manipulated stock is traded. Results in Panel C are based on matching the manipulated stock with a portfolios of stocks traded on the same market and with similar sizes. The sample period is from January 1990 to December 2001.

	Manipulation Period	Pre-Manipulation Period	Post-Manipulation Period
A: Aggregate Market Matched Sample			
a	0.01804	0.01486	0.01909
	(0.09002)	(0.12632)	(0.23154)
b	0.21098***	0.05162	0.091561
	(0.09191)	(0.12092)	(0.10935)
R^2	7.76%	6.56%	1.90%
B: Specific Market Matched Sample			
a	0.06181	0.02999	0.05522
	(0.08192)	(0.12009)	(0.17765)
b	0.16776***	0.03765	0.05548
	(0.07961)	(0.08718)	(0.11020)
R^2	7.19%	6.37%	4.27%
C: Specific Market and Size Matched Sample			
a	0.08564	0.05231	0.07856
	(0.09989)	(0.19638)	(0.11837)
b	0.15955**	0.01332	0.04325
	(0.08856)	(0.04459)	(0.08843)
R^2	6.98%	5.92%	3.33%

***: 1% significance level; **: 5% significance level; *:10% significance level.

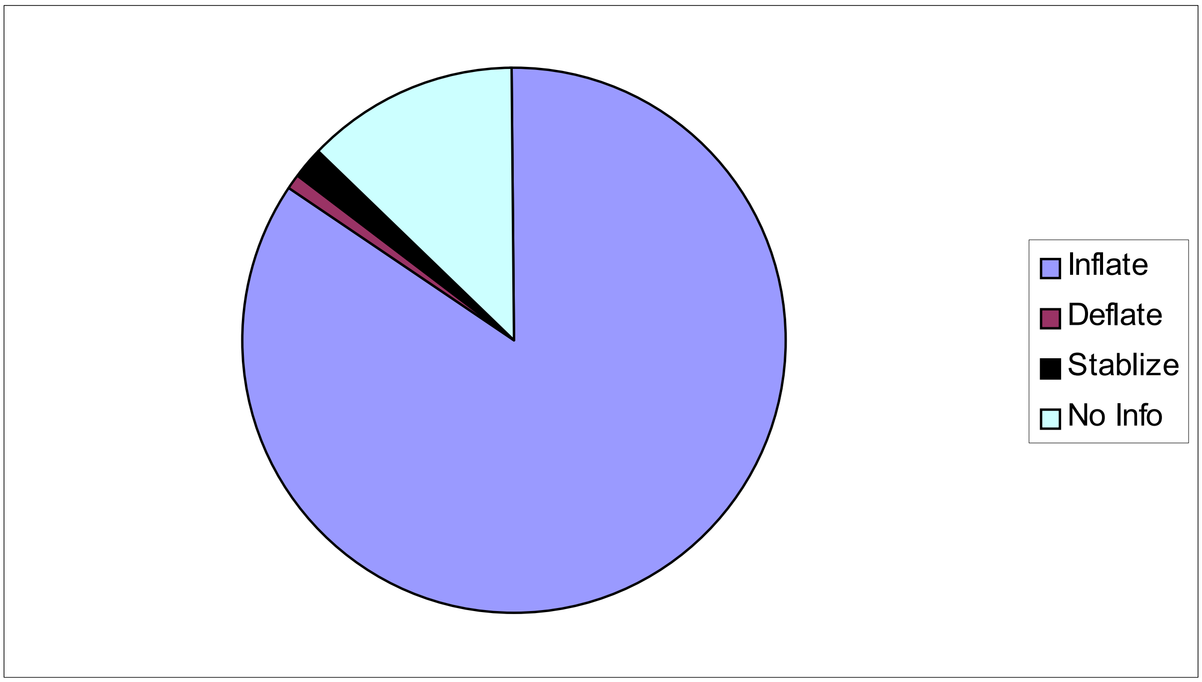

Figure 1: Distribution of Types of Manipulation

This figure shows the distribution of the types of manipulation. ‘No Info’ means we cannot determine from case information whether the manipulator intends to inflate or deflate the stock price. The sample is from January 1990 to October 2001.

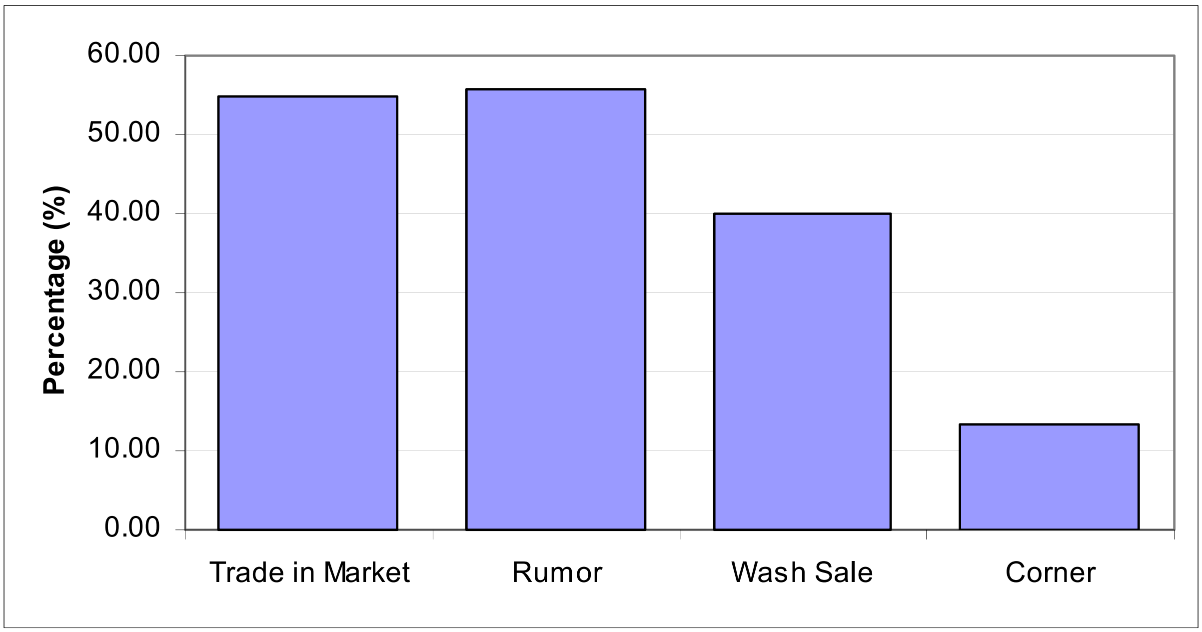

Figure 2: Ways to Profit in Manipulation Case

This figure shows the percentage of the ways market manipulators use to profit from their actions in all cases. There may be more than one way in each particular case. The sample is from January 1990 to October 2001.

Figure 3: SEC Actions Against Manipulations

This figure shows the percentage of the types of penalty imposed by the Securities and Exchange Commision on alleged market manipulators. 'Criminal Suit' means that the SEC referred the more serous cases to the Justice Department for criminal prosecution. 'Monetary Penalty' includes disgorgement of illegal profit, interest and fines. There may be more than one type of penalty in each particular case. The sample is from January 1990 to October 2001.