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In emerging stock markets, the issue of stock price manipulation by intermediaries often arises. Numerous accounts of emerging stock markets today share this concern. Khwaja and Mian (2005) use a unique trade level dataset to show that when market intermediaries (brokers) in a Pakistani stock exchange trade on their own behalf, they earn at least 50 to 90 percentage points higher annual returns, and these abnormal returns are earned at the expense of outside investors. Zhou and Mei (2003) note that China's worst stock market crime was the result of a scheme implemented in collusion with brokers. They argue that manipulation by brokers is common in many emerging stock markets. Khanna and Sunder (1999), in a case study of the Indian stock market, state that "brokers were often accused of collaborating with the company owners to rig share prices in pump and dump schemes". Furthermore, according to a survey conducted by the Times of India in October 2005, a majority of market participants in India believe that brokers manipulate prices. In fact, in 2005, the Securities and Exchange Board of India barred 11 brokers for engaging in price manipulation.

A number of studies have examined the issue of stock price manipulation by speculators who are not in the role of intermediaries. Allen and Gale (1992) show that it is possible for an uninformed trader to manipulate prices if the investors attach a positive probability to the manipulator being an informed player. Jarrow (1992) and Hart (1977) have analyzed manipulation in a dynamic asset pricing context and show that under certain conditions speculators can make profits. However, a theoretical framework for understanding manipulation when the manipulator is in the role of an intermediary is lacking, even though anecdotes abound. Consequently, a number of key questions remain unanswered. Firstly, anecdotal manipulation schemes involving brokers such as the pump and dump[1] schemes require a continuous supply of irrational investors who, like sheep, follow each other only to be slaughtered. Assuming a relentless supply of irrational investors who keep on placing themselves at the mercy of manipulating brokers, especially when the stakes are very high, seems unreasonable. Secondly, reputation is a key asset in a market where brokers compete for business. How can manipulating brokers, if they indeed manipulate, maintain their credibility (reputation) and clientele in the face of competition from other brokers? Thirdly, mature markets do not seem to suffer from the manipulation schemes typically associated with emerging markets.[2] What allows mature markets to function seemingly free of this type of manipulation?

In this paper, we present a market microstructure model, which uses a 3-player coordination game set-up developed in Han Joon (2007). This paper should be thought of as an initial attempt at understanding the systematic price manipulation by brokers. Specifically, it provides several simple models in which an intermediary can successfully

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[3]See Khwaja and Mian (2005)

[2]Aggarwal and Wu (2006) present evidence of stock market manipulations in the United States. Their data suggests that manipulators are plausibly brokers.

manipulate demand in equilibrium without losing credibility. The models presented here are general and are not limited to emerging markets; hence they provide conditions under which manipulation is checked. Those conditions are more likely to be met in developed markets.

In the basic model, there are three players, an individual investor, an institutional investor, and a stock broker. There is a positive probability that the institutional investor has superior information. If it does, then it trades accordingly. However, if it does not, then it prefers to mimic the individual investor. The individual investor never has superior information so (s)he always prefers to mimic the institutional investor. That is, in the absence of superior information, both types of investors prefer to follow each other.[3] The individual investor does not observe the type of the institutional investor, however, the broker does. The broker, whose primary preference is to preserve its credibility (which will be lost if the individual investor determines that the broker has lied), sends a signal about the intentions of the institutional investor to the individual investor. The conditional preference of the broker is to manipulate demand. After the signal has been received and has become public knowledge, both types of investors choose their demand levels simultaneously. The main result is that if the institutional investor does not have superior information, then the broker can manipulate demand in equilibrium while maintaining its credibility. Two features of this model must be noted. Firstly, the institutional investor is assumed to have superior information with positive probability. This is a common assumption in financial market literature, often justified by appealing to the superior resources (both material and human) that an institutional investor has for market research. Secondly, in the absence of superior information, it is assumed that both types of investors prefer to follow each other. This assumption is in the spirit of Keynesian beauty contest. Keynes (1936) compared the stock markets to newspaper beauty contests in which the prize goes to the reader whose choice most resembles the average pick. In stock markets, a similar phenomenon is observed since the price of a stock depends on the average market belief about that stock. If everybody believes that the stock price will go up, then it goes up, and a person betting in the opposite direction loses terribly. So, unless there is sufficient reason (superior information) to justify a lone sail, it is preferable to follow others.

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[3]This assumption is in accordance with a Keynesian beauty contest. Keynesian beauty contest is a concept developed by John Maynard Keynes and introduced in Chapter 12 of his book, General Theory of Employment Interest and Money (1936), to explain price fluctuations in equity markets. The Keynesian beauty contest is the view that investment is impacted by expectations about what other investors think, rather than expectations about the fundamental profitability of a particular investment. Keynes observed that investment strategies resembled a contest in a London newspaper of his day that featured pictures of a hundred or so young women. The winner of the contest was the newspaper reader who submitted a list of the top five women that most clearly matched the consensus of all other contest entries. A naïve strategy for an entrant would be to rely on his or her own concepts of beauty to establish rankings. A better strategy for each contest entrant would be to try to second guess the other entrants' reactions. Instead of judging the beauty of people, substitute alternative investments. Each potential entrant (investor) now ignores fundamental value (i.e., expected profitability based on expected revenues and costs), instead trying to predict "what the market will do."

In this model, what the broker signals affects its payoffs. This property distinguishes it from the cheap talk games of Farrel and Gibbons (1989a), Farrell and Rabin (1996), Battaglini (2002), Farrell and Gibbons (1989b), Stein (1989), Baliga and Morris (2002), and Aumann and Hart (2003) since in cheap talks, signals do not matter for payoffs so the receivers do not have to believe what the senders say. Here, the broker's payoff depends on its report as well as the actions of the other players. This is done by assuming that the broker wants to preserve its credibility by accurately forecasting the actions of the institutional investor. Ironically, this intention of the sender for its credibility deprives the investors of their favorite outcome. In addition, the present model differs from the signaling games developed by Spence (1973), Cho and Kreps (1987), and van Damme (1989) in that the broker reports about the intentions of another player (the institutional investor). In signaling games, senders signal their own types or their own intention about their future actions (see also Bhattacharya (1979); Milgrom and Roberts (1986); Banks and Sobel (1987); Manelli (1997)).

The model is then enriched to allow for competition between brokers and to allow for a specific broker bias. Conditions are specified under which manipulation is mitigated. Compared to mature markets, those conditions are much less likely to hold in emerging markets. Hence, as predicted by the model, broker manipulation anecdotes abound in emerging markets and not much so in mature markets.

The Basic Model

The basic model has a 3-player coordination game framework as in Han Joon (2007). Here, the three players are the individual investor (S), the institutional investor (L), and the stock broker (B). S and L have their own types. L can be optimistic, neutral, or pessimistic. S is always neutral. The optimistic type has superior information that the market will go up so it prefers to invest with optimism (I). The pessimistic type has superior information that the market will go down so it prefers not to invest (N), and the neutral type does not have superior information either way so its primary preference is to mimic the other player and the secondary preference is to invest with caution (C).[4] The following inequalities describe the preference of optimistic and pessimistic types of L:

$$u_{L(optimist)I}(.) > \max \left\{ u_{L(optimist)C}(.), u_{L(optimist)N}(.) \right\} \tag{1}$$

$$u_{L(pessimist)N}(.) > \max \left\{ u_{L(pessimist)I}(.), u_{L(pessimist)C}(.) \right\} \tag{2}$$

These inequalities show that the optimistic type of L prefers to play I irrespective of what S does and the pessimistic type of L prefers to play N irrespective of what S does.

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[4]Of course, investing with caution implies investing less money compared to investing with optimism.

The following inequality describes the primary preference of neutral type of L:

$$\min\{u_{L(neutral)CC}, u_{L(neutral)NN}, u_{L(neutral)II}\} >$$
$$\max\{u_{L(neutral)CN}, u_{L(neutral)CI}, u_{L(neutral)NI}, u_{L(neutral)NC}, u_{L(neutral)IN}, u_{L(neutral)IC}\} \qquad (3)$$

This inequality shows that a neutral type of L prefers outcomes in which its actions are matched by S over outcomes in which its actions are not matched by S.

The secondary preference of neutral type of L:

$$u_{L(neutral)CC} > \max\{u_{L(neutral)II}, u_{L(neutral)NN}\} \qquad (4)$$

This inequality shows that conditional on successfully mimicking S, the neutral type of L prefers to play C over I or N.

The following inequalities describe the primary and secondary preference of S respectively (S is always of type neutral):

$$\min\{u_{sCC}, u_{sII}, u_{sNN}\} > \max\{u_{sCN}, u_{sCI}, u_{sNI}, u_{sNC}, u_{sIN}, u_{sIC}\} \qquad (5)$$

$$u_{sCC} > \max\{u_{sII}, u_{sNN}\} \qquad (6)$$

The probability of L being optimistic is $o \in (0,1)$, of being pessimistic is $p \in (0,1)$, and the probability of being neutral is $1 - o - p$. In this model, uncertainty is only about the type of institutional investor. The broker reports on the institutional investor's intention. That is, either it's going to invest with optimism (I), or invest with caution (C) or that it will not invest (N).

This game proceeds as follows. At stage zero, Nature chooses L's type. Only L and B detect L's type. At stage one, B reports either I, C, or N to S. What B has reported becomes common knowledge. At stage 2, both S and L simultaneously choose I, C, or N. After all the actions are taken, payoffs are realized.

Regarding preferences, the broker has a primary preference for maintaining its credibility in the eyes of the individual investor and a secondary preference for manipulating individual investor's demand. The broker will lose credibility if it fails to correctly forecast the actions of the institutional investor. Suppose B says L will invest with optimism (play I), however, if L does not actually play I then B will lose its credibility in the eyes of S. That is, whenever the broker turns out to be wrong, it will lose its credibility; an outcome that the broker would want to avoid. The broker's objective is to manipulate demand while correctly forecasting the actions of the institutional investor so that its credibility will not be lost in the eyes of the individual investor.

The following inequality describes the broker's primary preference of credibility:

$$\min\{u_{III}, u_{ICI}, u_{INI}, u_{CCC}, u_{CIC}, u_{CNC}, u_{NIN}, u_{NCN}, u_{NNN}\} > \max\{u_{IIN}, u_{ICN}, \tag{7}$$
$$u_{INN}, u_{IIC}, u_{ICC}, u_{INC}, u_{CII}, u_{CNI}, u_{CCI}, u_{CNN}, u_{CCN}, u_{CIN}, u_{NNI}, u_{NCI}, u_{NII}, u_{NIC}, u_{NCC}, u_{NNC}\}$$

Here u_{ICI}, is the payoff to B if B signals I, S plays C, and L plays I. Other entries in the above inequality are similarly read.

Conditional on meeting its primary preference (of being right in predicting L's action), B prefers outcomes in which the individual investor follows its signal (so that B can manipulate). This is described in the following inequality:

$$\min\{u_{III}, u_{CCC}, u_{NNN}\} > \max\{u_{ICI}, u_{INI}, u_{CIC}, u_{CNC}, u_{NIN}, u_{NCN}\} \tag{8}$$

In the absence of B, it is easy to see that there is one pure-strategy-- Perfect Bayesian equilibrium if L's type is optimistic in which both S and L play I. Similarly, if L's type is pessimistic; both S and L play N in equilibrium. If L is neutral then the game in the absence of B has three pure-strategy Perfect Bayesian equilibria. They are both play I, both play C, and both play N. CC (both play C) outcome is preferred by both players. How does introducing B in this game change the outcomes? Theorem 1 provides an answer.

Theorem 1 *Pure-strategy Perfect Bayesian equilibria exist and, in the absence of superior information, the broker can manipulate equilibrium outcomes without losing its credibility with respect to accurate forecasting.*

Proof. Here every pure strategy of each player is examined. L observes both the nature's move (its own type) as well as B's signal. Each type of L has 27 strategies; however, for the optimistic type 26 strategies are dominated by the strategy I since an optimistic type always prefers to play I (inequality 1). Similarly, for the pessimistic type 26 strategies are dominated by the strategy N since a pessimistic type always prefers to play N (inequality2). That leaves us with 27 undominated strategies for the neutral type of L and 1 undominated strategy each for other types of L.

B observes nature's move. B has 27 pure strategies. 24 of them are eliminated by iterated dominance since B cares about correctly forecasting the actions of L (inequality 7) and optimistic type of L always plays I and the pessimistic type of L always plays N. We are left with 3 pure strategies for B.

Next, if B signals C, and both S and L play either I or N then B would have an incentive to deviate (inequality 7) implying that a strategy combination in which B signals C, and both S and L play either I or N in response cannot be an equilibrium.

By inspection, we arrive at the following pure-strategy Perfect Bayesian equilibria:

$$[B:\{I\,|\,optimist, C\,|\,neutral, N\,|\,pessimist\}; S:\{I\,|\,I, C\,|\,C, N\,|\,N\}; \\ L(neutral):\{I\,|\,I, C\,|\,C, N\,|\,N\}; L(optimist):I; L(pessimist):N]$$ (I)

$$[B:\{I\,|\,optimist, I\,|\,neutral, N\,|\,pessimist\}; S:\{I\,|\,I, C\,|\,C, N\,|\,N\}; \\ L(neutral):\{I\,|\,I, C\,|\,C, N\,|\,N\}; L(optimist):I; L(pessimist):N]$$ (II)

$$[B:\{I\,|\,optimist, N\,|\,neutral, N\,|\,pessimist\}; S:\{I\,|\,I, C\,|\,C, N\,|\,N\}; \\ L(neutral):\{I\,|\,I, C\,|\,C, N\,|\,N\}; L(optimist):I; L(pessimist):N]$$ (III)

$$[B:\{I\,|\,optimist, I\,|\,neutral, N\,|\,pessimist\}; S:\{I\,|\,I, I\,|\,C, N\,|\,N\}; \\ L(neutral):\{I\,|\,I, I\,|\,C, N\,|\,N\}; L(optimist):I; L(pessimist):N]$$ (IV)

$$[B:\{I\,|\,optimist, I\,|\,neutral, N\,|\,pessimist\}; S:\{I\,|\,I, N\,|\,C, N\,|\,N\}; \\ L(neutral):\{I\,|\,I, N\,|\,C, N\,|\,N\}; L(optimist):I; L(pessimist):N]$$ (V)

$$[B:\{I\,|\,optimist, N\,|\,neutral, N\,|\,pessimist\}; S:\{I\,|\,I, I\,|\,C, N\,|\,N\}; \\ L(neutral):\{I\,|\,I, I\,|\,C, N\,|\,N\}; L(optimist):I; L(pessimist):N]$$ (VI)

$$[B:\{I\,|\,optimist, N\,|\,neutral, N\,|\,pessimist\}; S:\{I\,|\,I, N\,|\,C, N\,|\,N\}; \\ L(neutral):\{I\,|\,I, N\,|\,C, N\,|\,N\}; L(optimist):I; L(pessimist):N]$$ (VII)

Note that in all equilibria, when B signals I, both S and L play I and when B signals N, both S and L play N. In equilibrium (I), B correctly signals the type of L, and S acts in accordance with the signal. That is, if B signals I, S plays 1, if B signals N, S plays N and if B signals C, S plays C. In the remaining equilibria, B incorrectly signals the type only when L is neutral. In that case, if B signals I then in the outcome both S and L play I. However, if B signals N then in the outcome both S and L play N. Hence, in the absence of superior information (when L is of neutral type) B can manipulate the equilibrium outcomes without losing its credibility with respect to accurate forecasting. ■

It is easy to see how a manipulation scheme can work. Suppose L's type is neutral, that is, the institutional investor does not have superior information. Suppose that B wants the stock price to rise (B may have taken a long position on its own account), it will signal I and in the outcome both S and L will play I. In contrast, if B wants the stock price to fall (due to a short position), it will signal N and in the outcome both S and L will play N. This is consistent with Khwaja and Mian (2005), a study that uses a unique trade level dataset to show that when market intermediaries (brokers) in a Pakistani stock exchange trade on their own behalf, they earn at least 50 to 90 percentage points higher annual returns and these abnormal returns are earned at the expense of outside investors.

Broker Bias

Brokers make money when people invest in the market. Arguably, brokers have a bias. They want more investment to come into the market. Next, we introduce this bias in the model. Specifically, conditional on successfully meeting its primary and secondary preference, the broker prefers an outcome in which more investment comes into the market. Consequently, another restriction is added to B's preference in addition to inequalities 7 and 8:

$$u_{III} > u_{CCC} > u_{NNN} \tag{9}$$

How does this bias change equilibrium? Theorem 2 provides an answer.

Theorem 2. *Pure-Strategy Perfect Bayesian equilibria exist in which, in the absence of superior information, the broker can manipulate demand to get its favorite outcome without losing its credibility with respect to accurate forecasting.*

Proof. By a similar argument as given in the proof of theorem 1, we arrive at the following pure-strategy Perfect Bayesian equilibria:

$$[B : \{I \,|\, optimist, I \,|\, neutral, N \,|\, pessimist\}; S : \{I \,|\, I, C \,|\, C, N \,|\, N\};$$
$$L(neutral) : \{I \,|\, I, C \,|\, C, N \,|\, N\}; L(optimist) : I; L(pessimist) : N] \tag{I}$$

$$[B : \{I \,|\, optimist, I \,|\, neutral, N \,|\, pessimist\}; S : \{I \,|\, I, I \,|\, C, N \,|\, N\};$$
$$L(neutral) : \{I \,|\, I, I \,|\, C, N \,|\, N\}; L(optimist) : I; L(pessimist) : N] \tag{II}$$

$$[B : \{I \,|\, optimist, I \,|\, neutral, N \,|\, pessimist\}; S : \{I \,|\, I, N \,|\, C, N \,|\, N\};$$
$$L(neutral) : \{I \,|\, I, I \,|\, C, N \,|\, N\}; L(optimist) : I; L(pessimist) : N] \tag{III}$$

In these equilibria, if L's type is neutral, B always signals I and both S and L always play I in response. Hence, the broker gets its favorite outcome in the absence of superior information. The secondary preference of investors is not met.

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Broker Competition

Next, broker competition is allowed in the model in the form of a second broker. In the modified model, there are 4 players; two brokers, an individual investor (S), and an institutional investor (L). At stage zero, nature chooses L's type. Only L and the two brokers, B1 and B2, detect L's type. At stage one, B1 reports either I, C, or N. What B1 has reported becomes common knowledge. At stage two, B2 reports either I, C, or N. Again, what B2 has reported becomes common knowledge. At stage 3, both S and L simultaneously choose I, C, or N. After all the actions are taken, payoffs are realized.

Regarding brokers' preferences, just like in the basic model and the broker bias model, the primary preference of the brokers is to preserve their credibility. The conditional preference of the brokers depends both on broker bias as well as broker competition. The individual investor, if it pays attention to brokers' signals, is additionally assumed to be conservative, meaning that if the signals conflict than the lesser signal will be followed by the individual investor. As an example, if B_1 signals I and B_2 signals C then the individual investor, if it decides to pay attention to the signals, will act on C. The following inequalities describe relevant cases of broker competition:

Severe Competition

In this type of competition, each broker prefers an outcome in which its prediction holds true whereas the prediction of the other broker is wrong; even if it means that, as a result of conflicting signals from the brokers, the institutional investors will not invest. The following inequality describes the relevant cases for B_2:

$$\min\{u_{2ICC}, u_{2INN}, u_{2CNN}, u_{2CII}, u_{2NII}, u_{2NCC}\} > \max\{u_{2III}, u_{2CCC}, u_{2NNN}\} \quad (10)$$

Here, u_{2ICC} is the payoff to B_2 if B_1 signals I, B_2 signals C, and the institutional investor plays C. That is, the prediction of B_2 holds true whereas the prediction of B_1 turns out to be false. Other payoffs of B_2 are read similarly.

The following inequality describes the relevant cases for B_1:

$$\min\{u_{1CIC}, u_{1NIN}, u_{1NCN}, u_{1ICI}, u_{1INI}, u_{1CNC}\} > \max\{u_{1III}, u_{1CCC}, u_{1NNN}\} \quad (11)$$

Here, u_{2ICC} is the payoff to B_1 if B_1 signals C, B_2 signals I and the institutional investor plays C. That is, the prediction of B_1 holds true whereas the prediction of B_2 turns out to be false. Other payoffs are read in the same fashion.

Moderate Competition

In this type of competition, each broker prefers an outcome in which its own prediction turns out to be correct whereas the prediction of the other broker turns out to be incorrect provided that the institutional investor does not entirely abstain from the market as a result of signals from the brokers. That is, each broker wants at least some investment (at least C) from the institutional investor to remain in the market. This is in contrast with severe competition in which each broker is willing to tolerate complete abstention of the investor for the sake of being right when the other broker is wrong. The following inequalities describe the relevant cases:

$$\min\{u_{2ICC}, u_{2CII}, u_{2NCC}, u_{2NII}\} > \max\{u_{2III}, u_{2CCC}\} \qquad (12)$$

$$\min\{u_{2III}, u_{2CCC}\} > \max\{u_{2INN}, u_{2CNN}, u_{2NNN}\} \qquad (13)$$

$$\min\{u_{1CIC}, u_{1ICI}, u_{1CNC}, u_{1INI}\} > \max\{u_{1III}, u_{1CCC}\} \qquad (14)$$

$$\min\{u_{1III}, u_{1CCC}\} > \max\{u_{1NIN}, u_{1NCN}, u_{1NNN}\} \qquad (15)$$

Broker Bias

The following inequalities describe the possible cases of broker bias:

$$\min\{u_{1III}, u_{1ICI}, u_{1INI}\} > \max\{u_{1CIC}, u_{1CCC}, u_{1CNC}\} \qquad (16)$$

$$\min\{u_{1CIC}, u_{1CCC}, u_{1CNC}\} > \max\{u_{1NIN}, u_{1NCN}, u_{1NNN}\} \qquad (17)$$

$$\min\{u_{2III}, u_{2CII}, u_{2NII}\} > \max\{u_{2ICC}, u_{2CCC}, u_{2NCC}\} \qquad (18)$$

$$\min\{u_{2ICC}, u_{2CCC}, u_{2NCC}\} > \max\{u_{2INN}, u_{2CNN}, u_{2NNN}\} \qquad (19)$$

Here, u_{1ICI} is the payoff to B_1 if B_1 signals I, B_2 signals C, and L plays I. Similarly, is the payoff to B_2 if B_1 signals C, B_1 signals I and L plays I. These inequalities show that conditional on maintaining its credibility, each broker prefers an outcome in which more institutional investment comes into the market.

The broker bias inequalities $u_{2III} > \max\{u_{2ICC}, u_{2NCC}\}$ $u_{2CCC} > \max\{u_{2INN}, u_{2CNN}\}$, $u_{1III} > \max\{u_{1CIC}, u_{1CNC}\}$, and $u_{1CCC} > \max\{u_{1NIN}, u_{1NCN}\}$ directly contradict the severe competition inequalities min $\{u_{2ICC}, u_{2NCC}\} > u_{2III}$, min $\{u_{2INN}, u_{2CNN}\} > u_{2CCC}$, min $\{u_{1CIC}, u_{1CNC}\} > u_{1III}$, and min $\{u_{1NIN}, u_{1NCN}\} > u_{1CCC}$. Also, the broker bias inequalities $u_{2III} > \max\{u_{2ICC}, u_{2NCC}\}$ and $u_{2III} > \max\{u_{1CIC}, u_{1CNC}\}$ directly contradict the moderate competition inequalities $\min\{u_{2ICC}, u_{2NCC}\} > u_{2III}$ and min $\{u_{1CIC}, u_{1CNC}\} > u_{1III}$. So, there are four possible cases; competition is severe and it dominates bias, competition is moderate and it dominates bias, bias dominates severe competition, and bias dominates moderate competition. The following theorem describes the main result of this section:

Theorem 3. *If the investors are conservative, competition is moderate, and it dominates broker bias then there is a unique Pure-Strategy Perfect Bayesian equilibrium, in which, in the absence of superior information, investors' favorite outcome is realized.*

Proof: Start by proposing the following strategy for S:

$$\{I\mid II, N\mid NN, C\mid IC, C\mid CI, N\mid NI, N\mid IN, N\mid NC, N\mid CN, C\mid CC\}$$

In this strategy, if both B_1 and B_2 send the same signal, I, N, or C, S plays I, N, or C respectively. However, if the signals are in conflict, lesser investment signal is followed (S is conservative). That is, if B_1 signals I but B_2 signals C then S plays C (third entry in the above set).

If L is optimistic then it always play I, if pessimistic then it always plays N. However, if L is neutral than it prefers to mimic S. Propose the following strategy for neutral L:

$$\{I\mid II, N\mid NN, C\mid IC, C\mid CI, N\mid NI, N\mid IN, N\mid NC, N\mid CN, C\mid CC\}$$

In order to figure out the best response of B_1, consider the following: B1 has 27 possible strategies. Its primary preference of credibility eliminates 24 of them leaving only 3 strategies that are not dominated. These three strategies are:

$$\{I\mid optimistic, I\mid neutral, N\mid pessimistic\}$$

$$\{I\mid optimistic, C\mid neutral, N\mid pessimistic\}$$

$$\{I\mid optimistic, N\mid neutral, N\mid pessimistic\}$$

If nature picks L's type to be neutral, B_1 cannot report I since B_2 will then report C since in moderate competition $u_{2\,ICC} > u_{2\,III}$. Consequently, S and L will play C and B_1 will lose its credibility. Similarly, if L's type is neutral, B_1 cannot report N since B_2 will then report N also, resulting in both investors abstaining from the market. In moderate competition, B_1 and B_2 prefer that at least some investment (at least C) from L remains in the market. That guarantees that if B_1 signals C then B_2 will also signal C. That leaves only one possible strategy for B_1 that can be played in pure strategy equilibrium: $\{I\mid optimistic, C\mid neutral, N\mid pessimistic\}$

Given the strategies of the other three players, the best response of B_2 is to signal C if L's type is neutral and B_1 has signaled C or I since in moderate competition $u_{2\,ICC} > u_{2\,III}$ and $u_{2\,ICC} > u_{2\,III}$. The best response strategy of B_2 is:

$$\{I\mid optimisticI, N\mid pessimisticN, C\mid neutralC, C\mid neutralI, N\mid neutralN\}$$

It is straightforward to see that the proposed strategies for S and L are the best responses of S and L to each other as well as to B_1 and B_2. Hence, the strategy profile considered constitutes Nash equilibrium.

To see that this equilibrium is unique: Since brokers 'primary preference is credibility, they will always report truthfully if nature chooses L's type to be either optimistic or pessimistic. That means, any strategy in which S ignores broker signals cannot be

played in pure-strategy equilibrium simply because it cannot be the best response when nature picks L's type to be either optimistic or pessimistic. This observation combined with the conservative nature of investors' limits their strategy space to a singleton. ∎

In this equilibrium, in the absence of superior information (when L is neutral), both the brokers signal C and the favorite outcome of the investors is realized (S and L both play C).

Corollary 1 *If bias dominates competition then, in the absence of superior information, the broker signaling first can manipulate the outcome.*

Proof If L's type is neutral, B_1 will signal I and B_2 will follow suit since when bias dominates, and $u_{2III} > u_{2ICC} > u_{2INN}$ and $u_{1III} > u_{1CCC} > u_{1NNN}$. ∎

Corollary 2 *If competition is severe and it dominates bias then, in the absence of superior information, both investors will abstain from investing in the market.*

Proof If L's type is neutral, it follows directly from severe competition inequalities that B1 will signal N and B_2 will also signal N since if either broker signals anything else, it will lose its credibility. Both the investors will play N. ∎

The results indicate that competition has a mitigating effect on intermediary manipulation. If competition is moderate then the most favored outcome of investors in the absence of superior information, which is to invest with caution, is realized. That is, the brokers cannot manipulate the outcome to their advantage in that case. If the competition is severe, then the investors abstain from the market in the absence of superior information so neither the brokers nor the investors get their favored outcome. If bias dominates competition then the brokers get their favorite outcome in the absence of superior information. It is easy to extend theorems 1, 2 and 3 to the case when broker(s) imperfectly observe L's type. Similarly, instead of brokers moving in a sequence, brokers may be allowed to move simultaneously without changing the results.

Do emerging markets differ significantly from mature markets along the dimension of competition? Indeed, they do. Many emerging markets are still not demutualized. As one example, the Karachi Stock Exchange, the premier stock exchange in Pakistan, is still a mutually owned company. This mutual ownership by brokers severely limits competition apart from raising governance concerns. No wonder, broker manipulation stories abound in emerging markets and not much so in developed markets.

Conclusion

This paper puts forward simple models of stock price manipulation in which manipulators are in the role of intermediaries. Main findings are that an intermediary

can manipulate outcomes in equilibrium without losing credibility. However, enough competition has a mitigating effect on manipulation and the investors' favorite outcome is realized. Nevertheless, if broker competition exceeds a certain threshold then, in the absence of superior information, it results in investors abstaining from the market entirely, so neither the investors nor the brokers get their favorite outcome in this case. In any case, if the broker bias for more investment dominates, the brokers get their favorite outcome at the expense of investors. The results indicate that encouraging broker competition may be a solution to the intermediary manipulation problem in emerging markets since competition checks broker bias. In this respect, **demutualization of stock exchanges is a step in the right direction**.

The results are important for three reasons. Firstly, it is an initial attempt at making sense of broker manipulation through rational economic models. Manipulation anecdotes abound, however, a model that predicts manipulation by brokers where all players are rational is lacking. Secondly, the role of competition in mitigating this type of manipulation has been highlighted. Competition among brokers reduces manipulation in these models. Thirdly, brokers make money when people invest in the market. This built in bias neutralizes competition by providing a powerful incentive for collusion, a finding with important governance implications.

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Abstract

We set out to study stock price manipulation when the manipulator is in the role of an intermediary (broker). We find that in the absence of superior information, the broker can manipulate equilibrium outcomes without losing its credibility with respect to accurate forecasting. The result extends to the case when the broker prefers more investment to come into the market. However, when moderate competition among brokers is introduced, then the investors get a favored outcome. When competition exceeds a certain threshold, neither the brokers nor the investors get their respective favored outcomes. In any case, if the broker bias for more investment dominates competition, the brokers get their favorite outcome at the expense of investors.