Large-Trader Impact and Market Regulation

Based solely on the scale of his operations and the sequence and timing of his trades, a large trader may, under certain market conditions, be able to undertake manipulative trading strategies. In a simple market consisting only of stock and cash, the large trader may be able to profit by (1) cornering a market and squeezing the shorts or (2) creating a price trend and then reversing his sales or purchases. In a market that includes derivative securities, as well as stock and cash, the large trader may be able to profit by using derivatives to implement a market corner or by creating a trend-following strategy that takes advantage of asynchronies between the spot and derivatives markets.

While current disclosure requirements virtually eliminate opportunities to corner a market, herd effects in the stock market and lack of synchrony between stock and derivative markets may be exploited by manipulative trading strategies. Unfortunately, such manipulative strategies are difficult, if not impossible, to detect. The only useful approach to countering manipulation is therefore prevention, rather than detection.

The best preventive remedy is to improve market efficiency. Efficiency could be increased, and market manipulation curtailed, by eliminating position limits in derivatives, by developing a comprehensive margin system, by coordinating various market circuit breakers and by eliminating restrictions on index arbitrage.

In two recent papers, Jarrow examines the conditions under which a large trader—that is, any investor whose trades change market prices—can manipulate the market through trading strategies. This article summarizes and synthesizes the implications of these papers and generalizes the analysis to encompass any informationless trading strategy that provides an expected risk-adjusted profit based solely on the scale of the trader’s operations and the sequence and timing of his trades.

Jarrow’s first paper examines two examples of possible market-manipulation trading strategies. The first—a market corner followed by a short squeeze—is an obvious manipulative strategy in the absence of regulatory or other constraints. The second—buying or selling to establish a trend and then reversing the position to trade against the trend—depends on the past sequence of the trader’s holdings. One example would be a strategy that takes advantage of differences in intertemporal price sensitivity attributable to noise traders following positive-feedback (trend-following) investment strategies. Many market observers believe they have detected such patterns.

Jarrow’s second paper extends the analysis to a market with a derivative security. Jarrow concludes that a derivative market can provide additional opportunities for manipulation when it is out of synchrony with the underlying spot market. While changes in public policy could reduce the opportunities for manipulation, the appropriate changes are at variance with several current policies and with some recent proposals.

The current article defines market manipulation and relates it to the special cases developed in the two Jarrow papers and to the popular perception of what constitutes market manipu-
Glossary

Price-Taker: A small buyer or seller who accepts the price prevailing in a market because his or her activity is too small to affect the price.

Index Arbitrage: The practice of taking risk-offsetting positions in two or more related markets (cash securities, index futures, index options or index futures options) with the object and expectation of profiting from a change in price relationships.

Market Corner: A circumstance in which a large trader owns or otherwise controls more than 100 per cent of the floating supply of a security or the deliverable supply of a commodity.

Short Squeeze: An attempt by a large trader to use a dominant position in a market or the advantage of a market corner to force short sellers to repurchase shares at a temporarily and artificially elevated price.

Herd Effect: The tendency of investors to behave like a herd of sheep or other animals, acting in concert without independent thought.

Derivative Securities: Securities or contracts that derive their value from or whose prices are related in some way to the price or value of other securities, indexes, contracts, etc.

Fair-Value Spread: The specific value of the difference between (1) the nominal value of a futures contract and (2) the price of the underlying cash securities portfolio that permits an investor who is long the cash portfolio and short the futures to earn the risk-free rate of return.

that would also be available to small investors (price-takers); and

(3) there is no chance of loss to the trading strategy.

The first two conditions are essential. The third condition greatly simplifies the mathematics, but it can be relaxed.

The first condition requires that the trading activity be expected to increase the wealth of the trader at the liquidation date of the activity. It is important to measure change in wealth at the liquidation date, rather than at some time during the trading activity, when major changes represent only paper profits (or losses), not real profits. By definition, any large trader's actions affect security prices and may create changes in paper wealth; the extent to which these paper wealth changes are permanent can be determined only after liquidation. In the futures markets, traders say that the success of a manipulative strategy cannot be demonstrated until the position is liquidated and the trader succeeds in "burying the corpse."

The second condition recognizes that some trades that move prices and result in wealth increases are not by nature manipulative. A price-taker, for example, can be expected to increase wealth with arbitrage transactions, which will realign prices.

The third condition merits the most attention. Jarrow's analysis assumes that there is no chance of loss to the trading strategy. This is not intuitive to most observers who have witnessed or believe they have witnessed manipulative strategies at work. Nor is it a necessary condition for successful market manipulation. A necessary third condition could be better stated as follows:

(3a) in the absence of information that suggests a trading strategy will yield a positive, risk-adjusted return on liquidation, the trader undertakes it anyway, expecting to profit from advantages related to size and intertemporal differences in market impact.

This restated condition asserts, first, that the strategy is independent of information. Second, it asserts that the trader uses the strategy because he feels the strategy itself creates the expectation of profit. Unless this condition is satisfied, there is no basis for considering the trading activity manipulative. The appendix provides
mathematical expressions of these conditions and relates condition (3a) to the Jarrow papers.

Some examples should help to clarify this definition of manipulation and put it in perspective. Index arbitrage (which attempts to profit by trading on price discrepancies between cash securities and a corresponding index futures contract) is not manipulative on several counts. First, index arbitrage usually violates condition (2) because it is motivated by an arbitrage opportunity. While the strategy is not available to very small investors, it is available to a large number of investors who clearly lack the resources to undertake a manipulative strategy in large, highly liquid markets. Furthermore, apart from the arbitrage opportunity, index arbitrage is an informationless trade with a negative expected value (given transaction costs).

In discussing this definition of market manipulation with market participants, economists and attorneys, we have encountered two types of disagreement. First, some want to ignore condition (1)—the requirement that results be measured after liquidation. But would-be manipulators often fail because they neglect to "bury the corpse." We cannot imagine any other way to measure the success of market manipulation other than after liquidation.

Second, other market observers remind us that this definition is not the same as the legal definition of manipulation. Our response to this point is that the legal definition of manipulation has been "padded" with offenses that can better be described as fraud. We can find no historical example that, failing to meet our trading strategy definition, could not be prosecuted as fraud.7

Market Manipulation in a Simple Market

Jarrow's "Market Manipulation" paper raises two key questions. First, under what market conditions is manipulation possible? Second, what do market manipulation trading strategies look like? Answers to both questions would help regulators prevent and possibly detect manipulation.

We could refer to the large trader who might or might not be able to manipulate and who might or might not intend to manipulate as a speculator. But that term is a loaded one for many readers. Instead, we refer to this large trader as a yama.

Yama is the Japanese word for "mountain." By using it to designate our large trader, we hope to avoid some connotations and to highlight the need for evidence that manipulation is both possible and intended. The yama's trades move prices; as the yama buys (sells) shares, their price goes up (down). We assume that, without the yama's trades, the market is devoid of arbitrage opportunities; this last condition ensures the satisfaction of condition (2).

We consider an economy in which trading takes place only in stock and a money market account. Jarrow identifies two types of manipulative trading strategies that exist in such an economy. First, the yama can corner a market and then squeeze the shorts. This type of manipulative strategy was probably more frequent in the generation or two before serious regulation of the securities markets began in the 1930s.

To implement a market-cornering strategy, the yama must own more than 100 per cent of the available shares, since a true corner is possible only if the shorts have borrowed their shares from the yama.8 When the yama calls in the shorts, the market system breaks down. By squeezing the shorts, the yama can generate certain profits, barring regulatory intervention. (A market corner is such a high-profile event that regulatory intervention is a virtual certainty in today's markets.)

The second possible manipulative strategy requires the yama to create a trend by continuing purchases or sales. The yama then reverses his holdings, expecting a reduced market impact on the reversal. This strategy assumes asymmetry in market price reactions to the yama's trades.

Consider a yama who attempts to run up the market price of a company's shares. He can do this by entering a sequence of large buy orders, creating an upward price trend. If other market participants react positively, but with a lag, the yama can unload his shares near the peak and make positive profits at liquidation. This strategy can work if the market continues to rise, as momentum investors continue to buy after the yama stops purchasing and starts selling. This trend-following pattern has been described as the herd effect. If the herd effect is absent from a market, a manipulative trading strategy will not work.9 In recent years, episodes of market volatility have been consistent with the presence of a herd effect.

Numerous market phenomena can generate herd effects and timing differences in price sensitivity to the yama's trades. Anticipation of
required portfolio insurance transactions, for example, could permit a yama to start a market trend with the expectation that orders from portfolio insurers will keep it in motion and permit him to close out his position at a net profit. To the extent that technical analysts in the aggregate become enamored of a certain trading pattern and adopt a response that could be characterized as trend-following, a yama could find an opportunity for manipulation by painting the tape with an appropriate pattern of trades.

A related issue is whether institutions with infinite horizons have an advantage over individuals with finite horizons when it comes to market manipulation. The root question is whether the ability to put off liquidation to some time in the future has value. In fact, the answer to this question is no. In “Market Manipulation,” Jarrow proves there is no advantage to being an institution with a long time horizon.

Adding a Derivative Security
Most market participants would intuitively agree with Easterbrook that futures markets, particularly financial futures markets, are difficult to manipulate. They would also agree that the existence of a futures market makes manipulation of the underlying market more difficult. Jarrow examines this question in detail in “Derivative Securities Markets.”

Jarrow assumes that the derivative security is redundant—that is, hedgeable with stock and a money market account alone. We further assume here that regulations prohibit owning more than 100 per cent of a company’s shares, and that the stock market does not exhibit a herd effect. These assumptions make impossible market manipulation with stock and money market positions alone; the addition of derivatives, however, makes manipulative trading strategies possible.

Jarrow identifies two types of manipulative trading strategies based on the use of derivatives. The first is a market corner and short squeeze facilitated by using the derivative market to avoid the constraint on aggregate shareholdings. If the yama owns 50 per cent of the underlying shares, he can put a manipulative strategy in place by purchasing call options that give him the right to buy an additional 60 per cent of the underlying equity shares. The yama potentially owns 110 per cent of the outstanding shares. At maturity, the yama exercises the options, even if they are out-of-the-money. Investors who are short the calls need to purchase stock to cover their obligations, but not enough shares are available. The yama is able to sell his shares at premium prices. His position in the shares never exceeds 100 per cent (although this is perhaps a technicality that a regulator might deal with summarily). The publicity and regulatory attention this strategy would attract makes it as improbable in a real securities market as Jarrow’s earlier corner strategy.

But consider a yama who is able to trade in underlying and derivative markets, where the price moves in response to his trades take place at different rates. Note that the yama has two distinct markets in which to purchase or sell the stock: The yama can buy or sell the underlying stock, or the yama can create a synthetic position in the stock through a dynamic trading strategy using the money market account and the derivative security.

If manipulation across these two markets is to succeed, the markets must be out of synchrony. That is, if the yama purchases the stock directly in the stock market, the price moves more or less than it would if he had bought it in the derivative market. If the two markets are out of synchrony, the price adjustment caused by the creation of the synthetic stock eventually catches up to what it would have been if the yama had taken the entire position in the stock itself. The arrival of the derivative security’s maturity date, for example, might effect synchrony. If lack of synchrony exists, the yama can manipulate by using both underlying and derivatives markets.

One manipulative trading strategy that relies on lack of synchrony calls for buying both the stock and the derivative security simultaneously. The underlying stock is purchased in anticipation of a lagged increase in the stock price in response to the purchase of the derivative. After the stock price rises, both positions are liquidated with the expectation of a lag in the stock price decline in response to the derivative’s sale. If the yama follows these simple procedures, the strategy can generate profits.

The yama who follows this strategy has been described as “self-frontrunning,” or trading in anticipation of the market impact of his own trades. Because the trades may be made simultaneously, the phrase “self-frontrunning” is somewhat misleading. However, if prices in one market systematically lag prices in the other, an
opportunity for manipulation exists. The widespread perception that futures markets make manipulation of the underlying market more difficult is correct—if the markets are free of barriers that prevent the maintenance of synchrony.

Monitoring the yama’s position over time and studying the short-term behavior of prices might provide an indication of the potential for manipulation. As we will see, however, even frequent occurrences of a trading pattern similar to that outlined above do not provide incontrovertible evidence of manipulative intent or even the opportunity for a manipulative trading strategy.

Detecting Manipulation
The profit test of condition (1) cannot prove that manipulation is possible, let alone intended. The yama’s wealth may grow by virtue of good luck or legitimately obtained information, which good judgment develops into a profitable trading strategy without manipulative intent or manipulative opportunity.

The arbitrage test of condition (2) is no more definitive. The economics of arbitrage differ so greatly across market participants that ex post detection is uncertain. Furthermore, some trades that do not promise a clear-cut arbitrage profit at the time they are initiated are taken with the expectation that the investor can, in effect, obtain additional arbitrage spread by laying off the position under particularly advantageous circumstances.

For example, a trader may need a spread of 3/16 to cover costs on an arbitrage transaction. If he can put a trade on for 1/8 on one side of fair value and close the arbitrage position 1/8 on the other side of fair value, he will more than cover his required spread, even if neither side of the trade carried an expectation of profitability from return to a fair-value spread. Trading techniques that rely on the arbitrage spread swinging to the other side of fair value are common in highly liquid markets. These techniques improve efficiency and reduce opportunities for manipulation. They also make it more difficult to determine when arbitrage is a factor and, correspondingly, when manipulation may be involved.

The information component of condition (3a) is also not amenable to ex post testing. Examining a trading pattern rarely gives a regulator insight into the actual or perceived information that may have led the yama to initiate a position. Even if a position is taken with manipulative intent, any investment professional can describe fictitious fundamental or technical analysis that formed the basis of the transactions.

The core test of condition (3a) is that of profit expectation without information and based only on the yama’s access to sufficient wealth. There is no absolute assurance that the yama will earn a profit on each manipulative attempt. The yama following a manipulative strategy can be confident only that he will earn a manipulative profit on average. Something may go awry from time to time; the expected response of other traders may not materialize, or the trading strategy may not be executed as planned.

Greenmail attempts are probably the outstanding manipulative innovation of the early to mid-1980s. The greenmailing yama purchased a substantial block of shares in a corporation, suggested plans for a hostile takeover, saw share prices rise on takeover speculation, and then greenmailed frightened management into purchasing his shares at the higher price. His profitable exit left remaining shareholders to suffer as the shares subsequently declined.12

Greenmail provides an excellent example of the uncertainty of manipulative success and the difficulty of detecting manipulation. The strategy usually worked, and the greenmailer banked his profits, complaining that he would rather have taken over the company. If management, knowing more about the company’s prospects than the would-be greenmailer, did not elect to purchase his shares, however, the greenmailer faced a difficult choice. He could follow through with the raid or liquidate his position in the market, having revealed the size of his holdings—and probably his change of heart—to all market participants. The life of a greenmailer and any other manipulator is not always easy, and profit is not assured in real-world markets.

Like all successful and unsuccessful manipulators, the greenmailer has an explanation for every eventuality. If he collects greenmail, he is cooperating with management in the interest of saving jobs, or yielding to the difficulty of completing the acquisition. If he completes the takeover, no one can doubt his resolve. If he liquidates his position at a loss, the loss itself is protection against criticism, although an expe-
sive protection. Other outcomes have their own explanations.

The manipulative aspects of greenmail, although impossible to detect or prove, led to regulatory responses designed to end the practice. The vulnerability of many corporate managements to greenmail nevertheless proved to be so great that the practice ended only with court decisions restricting corporate repurchase of shares under circumstances that resemble greenmail.

**Prosecuting Market Manipulators**

Greenmail is unusual among recent activities that fall under the rubric of manipulation because the profit from greenmail can be pure trading profit. The greenmailer profits by buying stock in the market and selling it in the market—preferably to the issuer, but still in the market. Greenmail clearly falls under our definition of manipulation.

None of the manipulation charges in the Boesky or Milken cases was based on an attempt to garner a trading profit. In each instance, prosecutors alleged an element of fraud. In many cases, the trading activity *per se* generated a loss, which offset part of the gain from the fraudulent act.

Transgressions prosecuted as manipulative acts include fraudulent acts performed in a market context, combined with incidents of what we would term market manipulation. This article provides no insights that contribute to the elimination of fraud; nor do the policy implications we discuss later detract from any effort to find and punish fraud. Although our manipulative acts are harder to find and more difficult to prosecute than fraud, they are no less a threat to fair markets.

In their quest to maintain fair markets, regulators have access to accurate and timely information on trades in virtually any market. The quality of audit trails is good and improving yearly. Yet even with all this information at their disposal, it is virtually impossible for regulators to state unequivocally that a particular trading strategy is manipulative unless they come upon the proverbial "smoking gun"—evidence of an element of fraud. An economic proof of non-fraudulent manipulation is probably impossible. Without proof of manipulative intent or fraud (e.g., documents, wiretaps or testimony from cooperating conspirators), the legal proof is also doubtful.

Regulators examine market behavior closely but have little to show for their efforts. The option exchanges have diligently searched for evidence that manipulators have tried to "cap" or "peg" a stock price at an option's expiration. The search has been essentially in vain.

The only useful approach to countering manipulation is prevention, not detection. Securities and Exchange Commission (SEC) regulations, particularly those under Section 10 of the Securities Exchange Act of 1934, proscribe certain activities as *per se* violations of the prohibition against manipulation. Such regulations usually impose rules for market structure or define a class of what we characterize as fraud. These rules cannot handle subtle forms of manipulation. To the extent these rules reduce market synchrony, they may even have the unintended effect of permitting other manipulative activities.

Rather than look for intent or even for repeated exploitation of manipulative opportunities, effective regulation has little choice but to use market forces to reduce opportunities to implement manipulative strategies and/or to increase the cost of failed manipulation. This approach will lead to fairer markets for all investors and, almost as important, it should increase the *perception* that the markets are fair and not stacked in favor of the yama.

**Policy Implications**

The underlying theme of our analysis is that manipulation is possible only when market structure departs from the perfect markets described in traditional economic theory. The answer to limiting manipulative opportunity lies in improving market efficiency.

In many cases, the appropriate regulatory response to the possibility of manipulation is clear and in place. In other cases, changes in regulatory strategy are indicated.

Table I lists the manipulative trading opportunities described by Jarrow and the techniques that regulators have used to deal with these problems. We examine each opportunity in terms of the way it is regulated today and the ways that regulation might be changed to reduce the possibility of manipulation.

**Corners**

Market corners followed by short squeezes are extremely rare in U.S. markets. Virtually every significant market in securities, futures
Table 1  Manipulative Strategies and Regulatory Responses

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Typical Regulatory Response</th>
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<tbody>
<tr>
<td><strong>Market with Stock</strong></td>
<td>Require position disclosure</td>
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<tr>
<td>A. Corner and short squeeze</td>
<td>Force position reduction</td>
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<tr>
<td></td>
<td>Establish settlement price for purchase by shorts</td>
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<td></td>
<td>General antimanipulative powers</td>
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<td></td>
<td>Investigate herd effect</td>
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<td></td>
<td>Examine suspicious trading patterns</td>
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<td></td>
<td>Apply per se regulations under Section 10 of the Securities</td>
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<td></td>
<td>Exchange Act if possible</td>
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<tr>
<td></td>
<td>Prosecute on the basis of repetitive patterns or evidence</td>
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<tr>
<td></td>
<td>of intent</td>
</tr>
<tr>
<td><strong>Market with Stock plus Derivative</strong></td>
<td>Same as A above plus:</td>
</tr>
<tr>
<td>A. Corner partly with derivatives and short squeeze</td>
<td>Derivative position reporting</td>
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<tr>
<td></td>
<td>Position and/or exercise limits</td>
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<tr>
<td></td>
<td>Special derivative trading restrictions when deemed</td>
</tr>
<tr>
<td></td>
<td>appropriate</td>
</tr>
<tr>
<td>B. Take advantage of differential rates of price</td>
<td>Same as B above plus:</td>
</tr>
<tr>
<td>change to trade, then exit profitably</td>
<td>Restrictions on intermarket trades and positions, which</td>
</tr>
<tr>
<td></td>
<td>may have the opposite effect from the regulator's</td>
</tr>
<tr>
<td></td>
<td>intention*</td>
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</table>


and spot commodities collects and disseminates accurate information on large participant positions. Every participant in the stock market, for example, is required to report a position in any stock that exceeds 5 per cent of the outstanding capitalization and to update this report when the position changes. Although there is a slight lag between the time a position is taken and the time the position report is available to the public, the low percentage ownership that must be reported and the widespread dissemination of this information make it extremely difficult to believe that a stock market corner and a short squeeze could be implemented without the aid of incompetence or fraud.14

In the unlikely event of a real or apparent corner, nearly every regulated market has a mechanism for dealing with the problem. The regulator can force the investor who appears to have attained or to be attaining a corner to liquidate some of his position or the regulator can determine a fair settlement price that eliminates manipulative profits. In short, once a manipulative position that might lead to a corner is large enough to be visible, well defined regulatory responses are available.

We cannot resist an example that illustrates that the market is the strongest ally of the astute regulator. The classic alleged attempt at a market corner in our generation occurred in the silver markets of 1979–80. Although some of the losses incurred by the alleged manipulators resulted from regulatory responses, the ultimate disciplinarian was the market itself. As the price of silver rose to unprecedented heights, British families sold antique tea services to be melted down, and an awesome quantity of silver from India made its way to the West. The elasticity of supply was staggering. In this and other instances, the most effective regulator has proved to be the market itself. If regulatory authorities work toward harnessing market forces and encouraging structures that are designed to eliminate manipulative opportunities, their jobs will be much simpler.

**Derivatives Markets**

Occasionally, regulators institute harsh measures when more subtle techniques might be more effective and less disruptive. Rather than rely on position reporting (disclosure), for example, regulators impose position limits in derivative markets. Although all the U.S. derivatives markets have some type of a position limit, the limits are most restrictive in agricultural commodity futures markets and securities option markets.

While supply limitations in agricultural markets may make some position limits necessary to avert inadvertent corners, a more effective way to deal with large positions in financial derivatives is to rely on the integration of the derivative and underlying markets and to eliminate separate position limits for the derivative mar-
kets. A yama trading in securities markets is required to report the number of underlying shares behind his option position, in addition to the report of the number of shares owned beneficially, making 13D and 13F reports a meaningful reflection of each holder's entire stake in the underlying security. Separate and arbitrary derivative position limits reduce market liquidity and, consequently, provide opportunities for manipulative strategies that take advantage of nonsynchronous pricing in related markets.

Another regulatory change that would help to eliminate opportunities to follow manipulative trading strategies is to encourage arbitrage between markets. Index arbitrage and stock/option arbitrage would improve synchrony between markets and make stock/index derivative manipulation more difficult—probably impossible. Efforts to control and limit index arbitrage transactions, option position limits and rules that, until recently, severely limited a New York Stock Exchange (NYSE) specialist's use of options to hedge the risk of a stock position reduce the efficiency of stock/futures and stock/option interfaces and create opportunities for manipulative trading strategies.15

The Herd Effect

Episodes of unexpected intraday stock market volatility, which have been the focus of policy in recent years, appear to reflect the herd effect more than any other phenomenon. Under ordinary circumstances, careful analysis of trading patterns should lead technical traders and fundamental investors to trade against outsized intraday market moves. Unfortunately, the exchanges have responded to this volatility by instituting a bewildering and frequently changing series of "circuit breakers." The SEC, among others, has expressed skepticism that these circuit breakers will have the desired effect in their current form. In fact, the existing circuit breakers may give the yama who can time his trading to take advantage of the rules a significant advantage over the small trader.

There is a better way. If the investing public and the regulatory authorities are not confident that market participants will soon develop trading strategies to take advantage of and eliminate large intraday moves, the only effective mechanism for reducing manipulative opportunity is to coordinate the circuit breakers. If all markets shut down at the same time, lack of synchrony will be reduced. Any advantage to starting a price trend will be limited, and fundamental or value investors will have time to prepare for market reopenings. The uncertainty of reopening price levels will reduce the enthusiasm of trend followers.

As reluctant as the NYSE and many value investors may be to admit that the primary price-discovery mechanism for the overall market is in the S&P 500 futures pit in Chicago, any effective circuit breaker must be based on the price of this contract. When the S&P 500 futures price hits a predetermined level, all trading in stocks, stock index futures, index options and stock options should halt for a predetermined period. After the halt, the markets should reopen as they do each morning, using existing opening procedures to determine market-clearing prices. The halt should eliminate much of the panic, give value-oriented investors an opportunity to plan and implement their strategies, and help the market mechanism itself reduce the intraday volatility that has caused so much concern.

The obvious need for coordinated circuit breakers based on the S&P 500 futures price supports the argument for combining regulation of the cash and derivative markets under the same agency. The SEC, the "logical" agency, has taken a legalistic, rather than an economic, view of market regulation. The result is reflected in obstacles to market efficiency that create manipulative opportunities.

The SEC has not done a good job of dealing with derivatives. As one current commissioner has said, "SEC regulation of options . . . has been far from our finest hour."16 A former commissioner even ascribed some of the responsibility for the 1987 market crash to heavily-handed (although well meaning) regulation of the options market.17 This record and the current jurisdictional contretemps with the Commodity Futures Trading Commission (CFTC) suggest that the Federal Reserve may be the oversight agency of choice, despite that body's reluctance to take on the task.

The oversight role is critical, because the nominal regulators of the securities and derivatives markets have no monopoly of responsibility for legal, regulatory, tax and other impediments to market efficiency that can open the door to manipulative strategies. Table II lists some of the more obvious problem areas. Many of these provisions, such as the 30 per cent rule
Table II  Market Imperfections and Restrictions that Increase Manipulation Opportunities

<table>
<thead>
<tr>
<th>Restriction</th>
<th>Why it is a Problem</th>
<th>In effect since</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Tax Provisions</strong></td>
<td></td>
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</tr>
<tr>
<td>1. Mutual fund 30 percent rule: less than 30 percent of a mutual fund’s gross income (before deduction of losses) can come from disposition of stock or securities held for less than three months</td>
<td>Prevents mutual funds from taking short-term gains under some circumstances. Reduces their participation in derivative markets</td>
<td>1930s</td>
<td>Amend Section 851 (b) (2) of the Internal Revenue Code</td>
</tr>
<tr>
<td>2. Transaction tax</td>
<td>Increases transaction costs, reducing attractiveness of arbitrage trades</td>
<td>Proposed</td>
<td>Avoid</td>
</tr>
<tr>
<td><strong>B. Margin Rules</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Absence of cross-margining across related markets</td>
<td>Investor’s margin deposits for one market do not collateralize position in another market</td>
<td>Inception of markets</td>
<td>A comprehensive risk-based margin system covering all financial and commodity markets should be developed</td>
</tr>
<tr>
<td>2. Concern for adequacy of margin deposits and safety of creditor or clearing corporation</td>
<td>Investors who are concerned avoid a market, trade more in another market, creating asynchrony</td>
<td>Inception of securities and futures markets</td>
<td>A comprehensive risk-based margin system covering all financial and commodity markets should be developed</td>
</tr>
<tr>
<td><strong>C. Divided Regulation Responsibility</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Circuit breakers are not coordinated across markets</td>
<td>Trading halts and price limits that are not coordinated reduce synchrony, creating manipulation opportunities</td>
<td>October 1987 crash</td>
<td>Coordinate circuit breakers off of the S&amp;P 500 futures contract</td>
</tr>
<tr>
<td>2. Many investors cannot participate in futures and options markets</td>
<td>Incomplete participation forces some investors to use the less attractive market, creating arbitrage opportunities that may not be closed because of other restrictions</td>
<td>Opening of derivative markets</td>
<td>Simplify procedures for stock and cash commodity accounts to trade derivatives. Modify state trust and Prudent Man rules to a risk test</td>
</tr>
<tr>
<td><strong>D. Ill-Conceived Impediments to Market Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Derivative market position limits</td>
<td>Reduce synchrony</td>
<td>Opening of derivative markets</td>
<td>Eliminate</td>
</tr>
<tr>
<td>2. Restrictions on stock specialists’ use of options</td>
<td>Reduce synchrony</td>
<td>1930s</td>
<td>Recent changes are excellent but remaining restrictions should be eliminated</td>
</tr>
<tr>
<td>3. Restrictions on index arbitrage</td>
<td>Reduce synchrony</td>
<td>Summer 1990</td>
<td>Eliminate</td>
</tr>
</tbody>
</table>

On mutual fund investment income, may have been designed for laudable purposes, but they have outlived any usefulness to become impediments to market efficiency and hidden taxes on the small investor. Others, such as the separation of margin structures, are a result of historical development and the unique requirements of separate markets. Today’s evolving structure needs something different. Reconciling the need for market efficiency with other objectives will not be easy, but it will be less difficult if turf battles give way to a spirit of cooperation.

**Conclusion**
Although some of the implications for policy may seem counterintuitive, or at least noncon-
ventional, these conclusions flow inevitably from our analysis. The evolving regulatory and market structure has been and continues to be adequate to deal with the more egregious and obvious manipulative trading strategies (for example, corners followed by short squeezes and greenmail), but the regulation of stock option markets and the relationships between cash, futures and option markets cry out for regulatory change.

Many of today’s regulations (including position limits on stock and stock index option contracts) are based on historical ad hoc attempts to deal with a perceived regulatory risk. Others (circuit breakers and restraints on stock index arbitrage) are a response to public or financial industry outcry. As well meaning as these regulatory efforts may be, they increase opportunities for manipulative trading strategies.

If, as we suggest, the detection of manipulative intent and opportunity is virtually impossible after the fact, the only regulatory avenue open is to improve the efficiency of the markets in order to prevent manipulation. Increased efficiency will reduce opportunities for intermarket manipulative strategies based on nonsynchronous pricing. Although detailed regulation of some smaller markets dominated by a few large traders may be necessary, our analysis suggests a prima facie case for a new approach to the elimination of market manipulation in most financial markets.

Appendix: Extended Market-Manipulation Trading Strategies

This appendix employs the notation, the economic structure and the assumptions (A.1)–(A.4) of Jarrow. The purpose is to extend the analysis to include market-manipulation trading strategies with potential losses.

We let the large trader’s preferences be characterized by an expected utility function over terminal real wealth. Let $U:R→R$ represent this function. It is assumed that $U$ is twice continuously differentiable with $U'(r) > 0$ and $U''(r) ≤ 0$ for all $r ∈ R$.

The large trader’s decision problem is to choose $(α_t, β_t; t ∈ T)$ to maximize $E[U(V_T)]|F_0$. Of course, real wealth, denoted by $V_T$, depends on the particular strategy $(α_t, β_t; t ∈ T)$ chosen.

To isolate trading strategies based on market power and not information, we impose the following additional assumption:

No Information-Motivated Trades by the Large Trader. (A.4)*

For all $(α_t, β_t; t ∈ T) ∈ Φ$ and all $t ∈ T$,

$$E\left\{ \frac{U'(V_T)g_t(ω; α_t(ω), α_{t-1}(ω), \ldots, α_0(ω))}{E[U'(V_T)|F_{t-1}]} \left| F_{t-1}\right. \right\} = g_{t-1}(ω; E[α_t|F_{t-1}])$$

$$E[ω, α_{t-1}(ω), \ldots, α_0(ω)] \text{ a.e. } P. \quad (1)$$

This assumption states the following: Given the information set $[F_t; t ∈ T]$, the price at time $t-1$ (based on the anticipated demands at time $t$, $E[α|F_{t-1}]$) is an “equilibrium” price to the large trader, acting as if he were a price-taker. Expression (1) is the first-order condition of optimality for a price-taker. That is, not taking into account the influence of his actions on the price at time $t-1$, the large trader views the price at time $t-1$ price as “fair.”

If $α_t(ω) = α_{t-1}(ω)$ a.e. $P$, then Expression (1) reduces to:

$$E\left\{ \frac{U'(V_T)g_t(ω; α_t(ω), α_{t-1}(ω), \ldots, α_0(ω))}{E[U'(V_T)|F_{t-1}]} \left| F_{t-1}\right. \right\} = g_{t-1}(ω; E[α_t|F_{t-1}])$$

$$E[ω, α_{t-1}(ω), \ldots, α_0(ω)] \text{ a.e. } P. \quad (2)$$

In this form, we see that Assumption (A.4)* implies assumption (A.4) of Jarrow’s “Market Manipulation”; that is, that there are no arbitrage opportunities without the large trader (based on his information set). Hence Assumption (A.4)* is a proper generalization of the previous assumption to risky trades.

Given Assumptions (A.1)–(A.3) and (A.4)*, we define a market-manipulation trading strategy to be any $(α_t, β_t; t ∈ T) ∈ Φ$ such that:

$$E[U'(V_T)|F_0] > E[U(V_T)|F_0] \quad (3)$$

where $V_T$ represents the large trader’s real wealth under a trading strategy with zero holdings in the assets for all times and states.

In words, any trading strategy under Assumptions (A.1)–(A.3), (A.4)* that increases the large trader’s preferences above not trading is manipulative. The reason is that under Assumptions (A.1)–(A.3), (A.4)*, there is no motivation to trade based on information or arbitrage opportunities alone.

By the remark following condition (2), we see that the manipulative trading strategies in
“Market Manipulation” are special cases of the definition given above. They are the special case corresponding to “riskless” trades.

The key proposition proven here is that Assumption (A.5), the “no herd effect” assumption, is sufficient to preclude the existence of these manipulative trading strategies. (This generalizes Proposition 3 in Jarrow’s paper.)

**Proposition 3**

Given Assumptions (A.1)–(A.3), (A.4)* and (A.5), let \( g_\omega(\omega, r) \) be continuously differentiable in \( r \) for all \( \omega \in \Omega \); then, there are no manipulative trading strategies as defined above with \( \omega \leq \omega \) a.e. \( P \) and all \( \omega \).

**Proof:** We prove the proposition for \( T = 3 \). The generalization to arbitrary \( T \) is straightforward. The proof finds the optimal trading strategy using dynamic programming and shows that it consists of zero trades for all times and almost all states.

For simplicity, we suppress the “\( \omega \)” argument in \( g_\omega(\omega, \alpha(\omega)) \) and write it as \( g_\omega(\alpha) \). Furthermore, it is easy to see that for any \( \{a_t, \beta_t \in \mathbb{R}\} \in \Phi \):

\[
V_3 = \alpha_2 g_2(0) - \alpha_2 a_1 g_2(\alpha_2) - \alpha_1 - a_0 g_1(\alpha_1) - a_0 g_0(\alpha_0).
\]

At time \( T = 2 \), consider choosing \( \alpha_2 \leq \alpha \) such that \( E[U(V_3)]F_2 \) is maximized. The necessary condition for an interior maximum, differentiating with respect to \( \alpha_2 \), is:

\[
E[U(V_3)]g_2(0) - g_2(\alpha_2) - \alpha_2 a_1 g_2(\alpha_2) - \alpha_1 - a_0 g_1(\alpha_1) - a_0 g_0(\alpha_0) = 0.
\]

Adding and subtracting like terms, we can re-write this as:

\[
E[U(V_3)]g_3(0) - g_2(0) + g_2(\alpha_2) - (\alpha_2 - a_1) g_2(\alpha_2) - \alpha_2 a_1 g_2(\alpha_2) - \alpha_1 - a_0 g_1(\alpha_1) - a_0 g_0(\alpha_0) = 0.
\]

Under Assumption (A.4)*, the first term is zero, yielding

\[
E[U(V_3)]g_2(0) - g_2(\alpha_2) - \alpha_2 a_1 g_2(\alpha_2) - \alpha_1 a_2 g_2(\alpha_2) = 0.
\]

Since \( [g_2(0) - g_2(\alpha_2) - (\alpha_2 - a_1) g_2(\alpha_2)] \) is \( F_2 \) measurable, this implies the necessary condition:

\[
g_2(0) - g_2(\alpha_2) = (\alpha_2 - a_1) g_2(\alpha_2) \text{ a.e. } P.
\]

Let \( \alpha^*_2 < N \) satisfy Condition (5). This is possible because \( g_2\prime(\alpha_2) > 0 \) and \( \text{sign}(g_2(0) - g_2(\alpha_2)) = -\text{sign}(\alpha_0) \) by Assumption (A.3).

Let \( T_3(\alpha_2, \alpha_0) = E[U(V_3)|F_2] \), following \( \{\alpha_0, \alpha_1, \alpha_2^*, \alpha_3 = 0\} \).

At time 1, choose \( \alpha_1 \leq \alpha \) such that \( E[T_2(\alpha_1, \alpha_0)|F_1] \) is maximized. The necessary condition for an interior maximum is, differentiating with respect to \( \alpha_1 \):

\[
E[U(V_3)]g_2(\alpha_2^*) - g_1(\alpha_1) - (\alpha_1 - a_0) g_1(\alpha_1) + E[\alpha_2^*|F_1] = 0.
\]

Adding and subtracting like terms yields:

\[
E(U(V_3))g_2(\alpha_2^*) - g_1(E[\alpha_2^*|F_1]) + [g_1(E[\alpha_2^*|F_1]) - g_1(\alpha_1) - (\alpha_1 - a_0) g_1(\alpha_1)] + E[\alpha_2^*|F_1] = 0.
\]

By Assumption (A.4)* and the fact that the second bracketed term is \( F_1 \) measurable, this condition reduces to:

\[
g_1(E[\alpha_2^*|F_1]) - g_1(\alpha_1) + (\alpha_1 - a_0) g_1(\alpha_1) \text{ a.e. } P.
\]

Let \( \alpha_2^* < N \) satisfy (6). Again this is possible. Let \( T_1(\alpha_0) = E[T_2(\alpha_2^*, \alpha_0)|F_1] \). At time 0, choose \( \alpha_0 \) such that \( E[T_1(\alpha_0)|F_0] \) is maximized. Again, the necessary conditions for an interior maximum are:

\[
E[U(V_3)]g_1(\alpha_1^*) - g_0(\alpha_0) - \alpha_0 g_0(\alpha_0) = 0.
\]

Adding and subtracting like terms, using (A.4)*, yields:

\[
g_0(E[\alpha_1^*|F_0]) - g_0(\alpha_0) = \alpha_0 g_0(\alpha_0) \text{ a.e. } P.
\]

Hence Expressions (5), (6) and (7) are the necessary conditions for an interior maximum. Note that \( \alpha_0(\omega) = \alpha_2(\omega) = \alpha_2(\omega) = 0 \) is a solution to Conditions (5)–(7). That it is a maximum follows easily from the strict concavity of \( U \).

Next we show it is the unique solution to Conditions (5)–(7). First consider any other solution \( (\alpha_0^*, \alpha_1^*, \alpha_2^*) \) with \( \alpha_2^* > 0 \). Since \( g_0(\alpha_0^*) > 0 \), by Assumption (A.3) and (7), we get \( E[\alpha_2^*|F_1] > \alpha_2^* \). Thus there exists \( \alpha_0 E F_0 \) with \( P(\alpha) > 0 \) such that \( \alpha_1(\omega) > \alpha_2^* \) for all \( \omega E A \). By Condition (6), this implies, with (A.3), that \( E[\alpha_2^*|F_1] > \alpha_2^* \). Hence there exists \( B E F_1 \) with \( B C A \) and \( P(\beta) > 0 \) that \( \alpha_2^*(\omega) > \alpha_2^*(\omega) \) for all \( \omega E B \). This contradicts (5).
Next consider any solution \((a_0^*, a_1^*, a_2^*)\) with \(a_0^* < 0\). By (7), this implies \(E(a_1^*|F_0) < a_0^*\). Thus there exists \(A \in \mathbb{F}_0\) with \(P(A) > 0\) such that \(a_1^*(\omega) < a_0^*\) for all \(\omega \in A\). By Condition (6), this implies that \(E(a_2^*|F_1)(\omega) < a_1^*(\omega)\) for all \(\omega \in A\). Hence there exists \(B \in \mathbb{F}_1\), with \(P(B) > 0\), such that \(a_2^*(\omega) < a_1^*(\omega)\) for all \(\omega \in B\). This contradicts (5).

Combined, these show \(a_0^* = 0\). Condition (7) therefore implies \(E(a_1^*|F_0) = 0\) as well.

Next suppose there exists \(A \in \mathbb{F}\) with \(P(A) > 0\) such that \(a_1^*(\omega) > 0\) for all \(\omega \in A\). Then \(a_1^*(\omega) > a_0^*\) for all \(\omega \in A\). This was previously shown to yield a contradiction. Hence \(a_1^*(\omega) = 0\) a.e. \(P\).

By Condition (6), \(E(a_2^*|F_1) = 0\) a.e. \(P\). Suppose \(a_2^*(\omega) > 0\) for some \(B \in \mathbb{F}_1\) with \(P(B) > 0\). This was previously shown to yield a contradiction. Hence \(a_2^*(\omega) = 0\) a.e. \(P\). This completes the uniqueness proof.

Finally, we show that no maximum exists with \(a_0^* = N\) or \(a_1^*(\omega) = N\) for all \(\omega \in A \in \mathbb{F}_1\) with \(P(A) > 0\) or \(a_2^*(\omega) = N\) for all \(\omega \in B \in \mathbb{F}_2\) with \(P(B) > 0\).

Suppose \(a_0 = N\), then

\[
\frac{d}{d\alpha_0} E(T_1(\alpha_0)|F_0) \big|_{\alpha_0 = N} < 0,
\]

which implies a boundary solution is not optimal. Next, consider \(a_1(\omega) = N\) for some \(\alpha \in A \in \mathbb{F}_1\) and all \(\omega \in A \in \mathbb{F}_1\) with \(P(A) > 0\). Given any \(a_2^* \leq N\), again

\[
\frac{d}{d\alpha_1} E(T_2(\alpha_1, \alpha_0)|F_1)(\omega) \big|_{\alpha_1 = N} < 0
\]

for all \(\omega \in A\), contradicting a boundary solution. Finally, let \(a_2(\omega) = N\) for all \(\omega \in B \in \mathbb{F}_2\) with \(P(B) > 0\). We have

\[
\frac{d}{d\alpha_2} E(U(V_2)|F_2)(\omega) \big|_{\alpha_2(\omega) = N} < 0
\]

for all \(\omega \in B\), contradicting a boundary solution. This completes the proof.

**Footnotes**

1. R. Jarrow, “Market Manipulation, Bubbles, Corners, Short Squeezes” (Cornell University, April 1990) and “Derivative Security Markets, Market Manipulation, and Option Pricing Theory” (Cornell University, April 1990).
3. Ibid.
5. A small trader who is a price-taker cannot engage in a manipulative trading strategy because his trades do not affect price. A large trader, by virtue of his size, will move market prices. It is the large trader’s activities that are of interest in any discussion of market manipulation.
6. In fact, condition (3a) subsumes both conditions (1) and (2) as special cases. Condition (1) is subsumed as the expected value is positive after liquidation in condition (3a). Condition (2) is subsumed because an arbitrage opportunity can be viewed as trading on the information in prices.
8. In today’s markets, a variety of legal and regulatory constraints may prevent the transfer of certain segments of a company’s capitalization. Tax laws, insider trading regulations, provisions of employee stock option programs and a variety of other complications can reduce the supply of stock significantly below 100 per cent of the outstanding shares. Judging when a corner has been attained is more difficult than in the distant past, but position reporting requirements make secret acquisition of control a rarity.
9. In “Market Manipulation,” Jarrow has a sufficient condition upon the price process, which implies that the herd effect does not occur. The appendix to this article generalizes this analysis to our extended definition of market manipulation.
11. We ignore here the possibly sizable penalty of transaction costs.
12. The slow to medium-speed accumulation and the rapid (one-trade) liquidation is a classic example of a manipulative trading pattern described in Jarrow, “Market Manipulation,” *op. cit.*
13. Regulators often focus on what they have come to call “mini-manipulations.” B. Becker and J. P. Burns (“The Regulation of Derivative Products” (Securities and Exchange Commission, February 25, 1991)) define mini-manipulation as “an attempt to influence, over a relatively small range, the price movement in a stock to benefit a previously established derivatives position.” The manipulative “gain” may come from something as obscure as a reduction in required margin or an increase in the size of a trader’s annual bonus; but most mini-manipulation incidents involve the exercise of an option or the expiration or settlement of an option or futures contract. Because the window of mini-manipulative opportunity is narrow and well watched by regulators, these episodes seem to be declining in frequency and importance. In contrast to a pure market manipulation like greenmail or triggering a technician’s signal, successful mini-manipulation requires the yam to conceal the position the trade is bene-

Footnotes concluded on page 72.
calculated for a larger sample, and over a longer time, by Brinson, Hood and Beebower, "Determinants of Portfolio Performance," *op. cit.*

10. All quarterly return numbers can be annualized by taking the fourth power of the return relatives and subtracting one.

11. Had we used standard deviation instead, we would have measured the variation around the mean and accorded greater weight to extreme observations. We believe measuring the deviations from zero (MAD) provides a better sense of potential future outcomes and is therefore a good measure of the potential impact of different types of decisions.


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**Gastineau and Jarrow footnotes concluded from page 51.**

14. One of the few corners of recent years occurred when two registered representatives allegedly purchased 108 per cent of a small company's floating shares in a variety of customer accounts. Somehow, the size of the position escaped the attention of the firm's compliance officers, and a corner occurred. See E. J. Savitz, "Eternal Limbo? The Amex Has Yet to Reopen Trading in Chase Medical," *Barron's,* May 8, 1989.

15. In early 1991, the Securities and Exchange Commission approved an NYSE rule change that greatly increases stock specialists' flexibility in using options.


