

Regulating Short-Sales*

BY RONEL ELUL

S

hort-selling, the practice of selling a security the seller does not own, is done in an attempt to profit from an expected decline in the price of the security. During the recent financial turmoil, many press accounts blamed short-selling for declines in stock prices and even for the collapse of some firms. In this article, Ronel Elul discusses the issue of short-selling. He notes that research has shown that short-selling plays a valuable role in setting accurate prices for securities but that it can also be used to facilitate market manipulation. This latter consideration may provide justification for restricting short-sales under certain circumstances.

During the recent financial turmoil, many press accounts blamed short-selling for declines in stock prices and even for the collapse of some firms. Regulators in many countries responded by restricting or banning short-sales. This critical attitude to short-selling has been a feature of many financial crises, including the stock market crash of 1929 and even the collapse of the South Sea Bubble in 1720.



Ronel Elul is a senior economist in the Philadelphia Fed's Research Department. This article is available free of charge at www.philadelphiafed.org/research-and-data/publications/.

[philadelphiafed.org/research-and-data/publications/](http://www.philadelphiafed.org/research-and-data/publications/).

Short-selling, or "shorting," is the practice of selling a security or other financial instrument the seller does not own, in the hope of repurchasing it later at a lower price. This is done in an attempt to profit from an expected decline in the price of the security.¹ Since the investor does not own the security he is shorting, he must typically borrow (or, rather, "rent") it

¹ This is not the only way to profit from declines in the price of an asset. Depending on the security in question, an investor may also be able to enter into a short futures contract, which locks in the price at some future date, or to buy a put option, which allows the holder of this option to sell an asset at a specified price in the future. In either of these cases, the investor will profit if the market price ends up below the price he has locked in.

*The views expressed here are those of the author and do not necessarily represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

from someone who does own it. Thus, short-selling is closely linked to the *securities lending* market.

Economists who have studied short-selling have shown that it plays a valuable role in setting accurate prices for securities and in aggregating dispersed information. However, they have also shown that it can be used to facilitate market manipulation. This may provide a justification for restricting short-sales under certain circumstances.

KEY FEATURES OF A TYPICAL SHORT-SALE

Suppose that shares in Highflrier, Inc. currently sell for \$10 a share. An investor believes that the stock is overvalued and would like to profit from this by selling Highflrier short. He borrows 100 shares and then immediately sells them for a total of \$1000. This transaction is typically intermediated through the investor's brokerage house, which buys and sells the securities on his behalf and also often arranges the loan of the shares.

If the investor is correct and the price later falls to \$8 a share, the investor would then buy 100 shares back for \$800, return the shares to their original owner, and make a \$200 profit (minus the transaction fees for borrowing the shares). This practice has the potential for losses as well. For example, if the shares of Highflrier in fact went up to \$25, the short-seller would have to buy back all of the shares at \$2500, losing \$1500.²

² Since the lender often retains the right to "recall" the security, as discussed below, the short-seller may not be able to wait for the price to go back down.

Margin Requirements. The short-seller cannot simply pocket the \$1000 he receives from selling the stock. Rather, Federal Reserve Regulation T requires the short-seller to deposit 150 percent of the proceeds into his *margin account*. In our example, this means the \$1000 proceeds of the short-sale, together with another \$500 (in cash or securities). This margin is designed to protect the broker from losses due to failure by the short-seller to return the security.³ In addition to this *purchase margin*, most exchanges also impose a *maintenance margin* of 25 percent; that is, at any point in time, the value of the margin account must be at least 125 percent of the current value of the securities that have been borrowed. For example, if the stock price rises to \$13 per share, the short-seller would need to add another \$125 to his margin account in order to meet the maintenance margin requirement and avoid having his position closed out.⁴ These margin requirements are costly, since the money cannot be used for other purposes and the short-seller often does not accrue any interest on his margin account. (A valued customer might receive some interest, but typically it will be at below-market rates.)

The Securities Lending Market. Where are the borrowed shares obtained? In the simplest case, the brokerage houses may be able to lend other customers' shares, when those customers have bought their stock on

³ This is most likely to occur if the price of the stock goes up, since, in that case, the short-seller would need to come up with additional cash in order to close out his position.

⁴ Since he initially deposited \$1500 in his margin account, and the securities he has borrowed are now worth \$1300 (so the margin requirement is 125 percent of this, or \$1625).

margin.⁵ If the broker does not have the particular security in its inventory, however, it must turn to outside sources. Institutional investors such as mutual funds, pension funds, and insurance companies often lend shares in their portfolios to short-sellers.⁶ This is particularly attractive for them, since they generally do not anticipate needing to sell those shares. However, they typically retain the right to “recall” the shares at any time.⁷

Institutional investors such as mutual funds and pension funds often lend shares in their portfolios to short-sellers.

The borrowed shares do not come free. The broker will deposit part of the margin that the short-seller posted as collateral with the lender. The interest rate received on this collateral is typically below market interest rates, and this represents the opportunity cost of borrowing the security. This cost is borne by the short-seller because it reduces the interest he receives on the cash in his margin account (if any). Moreover, if the cost of borrowing shares is sufficiently high, not only will the short-seller receive no interest, but he may actually have to pay a fee to borrow the securities.

⁵ Buying on margin means borrowing money (typically from one's broker) in order to buy securities. The securities thus purchased remain in the buyer's margin account, since they serve as collateral for the loan and so are available to the broker for lending.

⁶ This is typically done through “custodian banks,” which hold the institutional investors' shares.

⁷ Pension funds and mutual funds are in fact required to retain the right to recall the securities, according to the provisions of the Employee Retirement Income Security Act (ERISA) and the Investment Company Act, respectively.

Christopher Geczy, David Musto, and Adam Reed document costs in the securities lending market. They find that if the security is not in particular demand by short-sellers, the difference between the market interest rate and that paid on the collateral is small (typically less than 20 basis points). However, if the security is in high demand, the cost of borrowing it may be rather high; that is, the interest rate received by the short-seller will be very

low. In this case the stock is said to be “on special.” Geczy, Musto, and Reed find that, on average, about 7 percent of stocks are on special at any one time. For example, companies involved in mergers often tend to be expensive to short.⁸ In addition, new issues (IPOs) are also not infrequently on special. Furthermore, sometimes it may be virtually impossible to borrow the shares of a particular company – which makes short-selling infeasible.⁹ This inability to short-sell may occasionally lead to a striking mispricing of these stocks, as we discuss below.

Naked Short-Selling. According to the Securities and Exchange Commission's (SEC) regulation SHO,

⁸ In particular, the acquiring company is often on special. The reason is that a standard “merger arbitrage” strategy — often practiced by hedge funds — involves buying shares of the target and shorting shares of the acquirer (since in a successful merger the target's shares commonly rise, and the acquirer's fall).

⁹ This may occur particularly for certain new issues. One reason is that the underwriters (the investment banks that helped issue the stock) are not permitted to lend out the stock for 30 days following the IPO. Also, many IPOs involve the issue of a relatively modest amount of shares.

a broker-dealer¹⁰ cannot accept a short-sale order unless he has “reasonable grounds” for believing that the security can be borrowed; this is known as “locating” the stock.¹¹ But what if the short-seller has not actually located the shares? Or does not actually borrow those shares (because they are expensive)? This is known as *naked short-selling*. Such a strategy may be attractive if the shares are difficult (i.e., expensive) to borrow. If the short-seller obtains and delivers the shares by the settlement date (within three days of the sale, in the U.S.), the naked short-sale is essentially invisible. A naked short-sale may become apparent, however, if the short-seller fails to deliver the stock in time, either by design or due to circumstances beyond his control. Failing to deliver imposes two costs on the short-seller. First, the seller does not receive the sale proceeds (and so forgoes interest). Second, if the buyer demands the physical shares, the seller may be “bought in” immediately.¹² That is, the security will be purchased on the open market by the broker on behalf of the buyer (typically at an unattractive price).

Since naked short-selling can, in principle, lead to the level of short-selling exceeding the actual number of

¹⁰ A broker-dealer is a company or other organization that trades securities for its own account or on behalf of its customers. Although many broker-dealers are independent firms solely involved in providing broker-dealer services, others are business units or subsidiaries of commercial banks, investment banks, or investment companies.

¹¹ The “locate” rules were originally instituted by the various exchanges. In 2004 the SEC adopted Regulation SHO, which instituted a uniform locate requirement, and as discussed below, the SEC has recently tightened these rules further.

¹² See the paper by Richard Evans, Christopher Geczy, David Musto, and Adam Reed for more details on fails and buy-ins.

shares outstanding, some executives of troubled companies have charged that it can also facilitate manipulation.¹³ As discussed below, the SEC has sought to restrict naked short-selling in recent years.

On the other hand, in some cases naked short-selling can in fact facilitate

In the United States, the stock market crash of 1929 led to public attacks on short-sellers, a strident defense by the New York Stock Exchange, many years of congressional hearings, and new regulation.

market liquidity. Market makers¹⁴ in particular will often engage in a modest amount of naked short-selling, since they must stand ready to sell shares even if there is a limited supply of those shares. In recognition of their role, market makers are exempt from some of the requirements to locate a lender before shorting a stock.

REGULATING SHORT-SALES

We have referred to short-sale restrictions, but what form do these regulations take in practice?

History of Short-Sale Regulation. Among the first countries to restrict short-sales was Holland,¹⁵ which banned them in 1610, following the collapse of shares in the East India

¹³ This criticism of short-selling was also made following the crash of 1929 (see the book by J. Edward Meeker). See also the discussion of Owen Lamont’s paper, below.

¹⁴ A market maker is an individual or firm that quotes prices for a security and stands ready to buy and sell (modest amounts) for its own account on a regular basis at those prices. Market makers in equity options also sometimes short-sell the underlying stock, to either hedge or close out a position.

¹⁵ See the book by Meeker for further discussion of the history of short-sale regulations up until the 1930s.

Company. This pattern — the collapse of a share-price bubble followed by attempts to prohibit short-selling — has repeated itself many times. In another example, England banned short-sales in 1733, following the collapse of the South Sea Bubble.¹⁶

In the United States, the

stock market crash of 1929 led to public attacks on short-sellers, a strident defense by the New York Stock Exchange,¹⁷ many years of congressional hearings, and new regulation. One example of this new regulation was the Federal Reserve’s power to set margin requirements.

Another important regulation first adopted during that period was the *uptick rule*, which restricted short-selling to taking place only at an “uptick,” that is, at a price above the previous trade’s price.¹⁸ That is, short-selling was not permitted in a falling market. The uptick rule was adopted by the SEC in 1938 and remained in force until 2007. It was a response to allegations that *bear raids* contributed to the 1929 crash. A bear raid is a strategy in which a trader (or group of traders) attempts to force down the

¹⁶ The law remained in force until 1820 but had little effect on actual market practice.

¹⁷ In particular, Meeker (who was economist to the New York Stock Exchange) explicitly dedicated his 1932 book to the defense of short-selling.

¹⁸ More precisely, a short-sale was permitted at the same price as the previous trade if that previous trade itself represented an uptick.

price of a stock, for example, to cover a short position. This can be done by spreading negative rumors about the target, or alternatively, the traders take on very large short positions, with the large volume of selling itself causing the price to fall. Allegations of bear raids have also been made in the current financial crisis.¹⁹ Even the SEC cited the “market impact of rumors” preceding the collapse of Bear Stearns in enacting its short-sale restrictions in 2008.

Recent Restrictions on Naked Short-Selling and Failures to Deliver.

In recent years, the SEC has enacted rules to restrict naked short-selling and failures to deliver. Regulation SHO (enacted in 2004) instituted a requirement for short-sellers — other than market makers — to be reasonably certain that they have “located” a lender of the stock. In 2008, in response to the financial crisis, these regulations were tightened further. Currently, they (i) require short-sellers in 19 financial stocks to actually *enter* into an agreement to borrow shares before short-selling,²⁰ (ii) explicitly prohibit market participants from deceiving others regarding their ability to borrow or deliver stock by the settlement date,²¹ and (iii) require all “fails” to be closed out on the first trading day following the settlement date.²²

Other Recent Restrictions.

During the recent financial turmoil, many countries have instituted

¹⁹ See, for example, the article “Bringing Down Bear Stearns” in the August 2008 issue of *Vanity Fair*.

²⁰ An “emergency order” promulgated in release number 34-58166 (July 15, 2008).

²¹ SEC Rule 10b-21.

²² SEC Temporary Rule 204T, effective from September 18, 2008 – July 31, 2009. Prior to this, broker-dealers had 13 days in which to close out fails.

outright bans on short-selling stock. In the U.S., on September 19, 2008, the SEC temporarily prohibited short-selling for nearly 1000 stocks whose business related in some way to the financial sector.²³ The ban was unpopular and was allowed to expire after less than a month. Many other countries also banned short-sales of at least some stocks around the same time.²⁴ The SEC also

Another outcome of the current crisis has been a decline in the amount of securities available for borrowing.

recently instituted a requirement that investment managers (including hedge funds) must report their short-sales.²⁵

Another outcome of the current crisis has been a decline in the amount of securities available for borrowing. Some institutional investors have announced that they have curtailed securities lending programs, either because of bad publicity (from accusations that short-sellers were manipulating financial stocks) or because of losses realized from their lending activities.²⁶

²³ Release number 34-58592.

²⁴ For example, the UK, Australia, Korea, and Taiwan. Most of the countries that imposed bans eliminated or relaxed them within several months, although Australia’s ban was extended at least through March 2009.

²⁵ On September 18, 2008, the SEC required institutional investment managers with assets under management of at least \$100 million (including hedge funds) to report their short-sales weekly; this requirement is set to expire on August 1, 2009. Meeker notes that a similar reporting requirement was instituted by the NYSE during the First World War.

THE POSITIVE ROLE OF SHORT-SALES

Despite the public appetite for short-sale regulations, economists have shown that short-sales play an important role in financial markets and that restricting them may have negative effects.

Short-Sale Constraints and Overvaluation. One of the first to argue that restricting short-sales can lead to overvaluation of securities was Edward M. Miller. In particular, Miller showed that if short-selling is restricted and investors have different opinions about the underlying value of the security, its price does not reflect the beliefs of all potential investors but only the opinion of the most optimistic ones. This, he argued, will tend to bias the price of the stock upward. The reason is that those investors who value the stock less are limited in their ability to act on their beliefs when short-selling is not possible.

Aside from restrictions on short-selling, another key assumption that Miller makes is that investors have different beliefs: Some are innately optimistic about the firm, while others are pessimistic. Note that this is not just a matter of the optimists having different information about the firm than the pessimists. There is some empirical support for this connection between differences in opinions and overvaluation. A study by Karl Diether, Christopher Malloy, and Anna Scherbina finds that stocks for which there is wide dispersion in analysts’ forecasts subsequently tend to perform badly, perhaps reflecting overpricing at the time of the forecasts.

²⁶ As reported in the *Wall Street Journal* on October 20, 2008, the losses were incurred because the banks that were managing the programs invested the cash collateral in securities backed by subprime mortgages.

In another study, Michael Harrison and David Kreps argue that the overvaluation may be even more dramatic than that suggested by Miller. They show that restricting short-sales will lead the price of the security to *exceed* the valuation that even the most optimistic investor attaches to it today. The reason is that investors anticipate that, at some point in the future, *someone else* may be even more optimistic about the stock than they are. This is even true for the investor who is most optimistic about the stock's fundamental value *today*.²⁷ He knows that he may be able to sell the stock for more than its fundamental value at some point in the future, and thus he will be willing to pay a little bit more than this value *today*. As for Miller, restrictions on short-sales are necessary for this to occur because otherwise those investors who believe that the asset is currently priced above its fundamental value would sell it short. Like Miller's model, Harrison and Kreps's model also assumes that investors disagree about the value of the asset.

But why would investors disagree about the value of the security? Neither Miller nor Harrison and Kreps specify the reasons for this. However, José Scheinkman and Wei Xiong suggest that one reason may be investor overconfidence. In particular, if investors put more weight on their own information than on others', they may form different opinions about the value of the asset, even when evaluating the same information. Scheinkman and Xiong then show that this can lead to overpricing.

Owen Lamont and Richard Thaler present several cases of

²⁷ The *fundamental value* of a security may be defined as the present value of the security's future cash flows.

overvaluation facilitated by difficulty in short-selling. One very prominent example is that of Palm and 3Com. On March 1, 2000, 3Com sold a small (5 percent) stake in its subsidiary Palm through an initial public offering (IPO) while retaining the rest (this is an example of an *equity carve-out*). The company also announced that it would give the remaining Palm shares to 3Com shareholders by the end of the year in a *spin-off*; in particular, each 3Com shareholder would receive

If investors put more weight on their own information than on others', they may form different opinions about the value of the asset, even when evaluating the same information.

approximately 1.5 shares of Palm. This transaction is illustrated in the figure on page 16.

How did the market price this transaction? On the day of the IPO, Palm closed at \$95 a share, while 3Com closed below \$82. That is, even though each 3Com shareholder had the right to receive 1.5 shares of Palm, 3Com shares traded well below Palm's. This meant that the implied value of 3Com, less the Palm shares that were to be distributed, was actually negative!²⁸ Clearly, Palm's shares were vastly overpriced relative to 3Com's.

How could one exploit this overvaluation? If short-selling Palm were possible, there would be a clear profit opportunity: to buy one share of 3Com and short 1.5 shares of Palm, and use the Palm shares received (by the end of the year) to close out the short position. This would give a profit

²⁸ As Lamont and Thaler point out, this is particularly surprising given that 3Com had ample holdings of cash and profitable ongoing operations.

of $[95 \times 1.5] - 82 = \$60$ today, with a further possible profit from the residual 3Com value after the remaining Palm shares were spun off.

Arbitragers were not able to exploit this mispricing because, as a practical matter, it was very difficult to borrow Palm shares. Thus, the frenzy for tech stocks allowed this overpricing of Palm shares to persist for months.²⁹ However, Geczy, Musto, and Reed argue that Palm is an unusual case. They show that most tech stocks

were not that difficult to short in practice, and so this cannot provide an explanation for the broad-based tech-stock bubble of the late 1990s.

In another paper, Owen Lamont examines a sample of 300 firms that tried to fight short-selling, for example, by publicly attacking short-sellers or by taking legal action. He shows that their stock prices tended to subsequently perform worse than the market, which also suggests overvaluation may be facilitated by impediments to short-selling.

Short-Sale Constraints and the Revelation of Information. A key role of prices in financial markets is to aggregate dispersed information.³⁰ For example, if an investor has negative information about a company's prospects, he may short-sell that stock

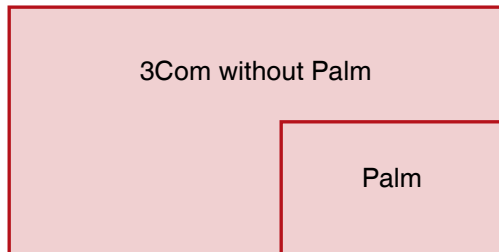
²⁹ Lamont and Thaler show that this overpricing did diminish over time and in most cases was eliminated by the time the actual date of the distribution was announced.

³⁰ An early exposition of this idea is featured in Friedrich Hayek's critique of socialism.

FIGURE

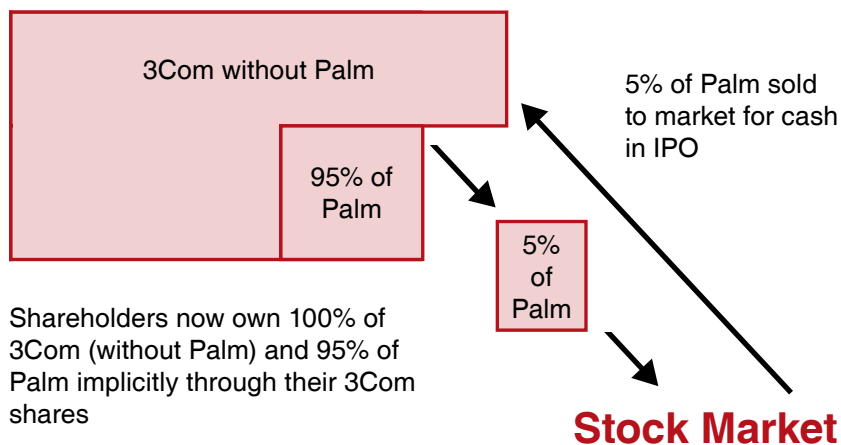
The Palm Equity Carve-Out

Company before carve-out (February 28, 2000)



Shareholders implicitly own 100% of Palm through their 3Com shares.

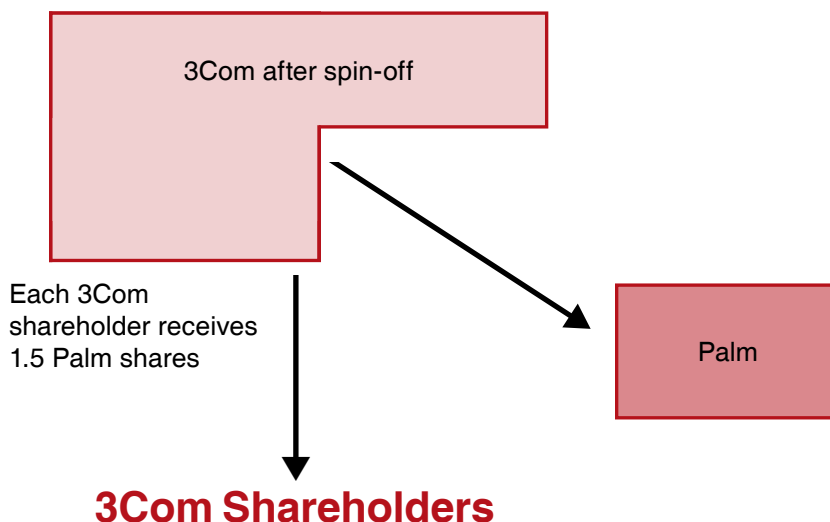
Company following carve-out (March 1, 2000)



Shareholders now own 100% of 3Com (without Palm) and 95% of Palm implicitly through their 3Com shares

Stock Market

Company after spin-off (Before year-end)



Each 3Com shareholder receives 1.5 Palm shares

3Com Shareholders

if there are no restrictions on short-selling. In order to clear the market, the stock price must fall, and this will alert other investors to the fact that the company may be troubled. As Douglas Diamond and Robert Verrecchia demonstrate, this role may be compromised by short-sale restrictions.

Diamond and Verrecchia show that even if short-sales are restricted, prices will not be biased upward; that is, shares will not be overvalued (unlike in the studies by Miller and Harrison and Kreps). The reason is that in Diamond and Verrecchia's model, investors differ only in the information they possess. They are all equally innately optimistic (or pessimistic) about the company's prospects and — had they all had access to the same information — would all come to the same conclusion about the firm's value. While constraints on short-selling do affect the ability of those investors who possess negative information to trade on that information, market participants understand this. So when the market observes thin trading, it will infer that there is a reasonable chance that negative information exists concerning this stock; this will lead to a reduction in its price.

Nevertheless, Diamond and Verrecchia point out that since lack of trade is a less informative signal of low firm quality than actual selling pressure, short-sale constraints will have a negative effect on the *speed* of information transmission: They slow the rate at which information becomes public. Although Diamond and Verrecchia do not model this, this slow transmission of information could lead to inefficient investments by allowing bad firms to survive for longer than they should.

In a recent paper, Arturo Bris, William Goetzmann, and Ning Zhu

compare stock market regulation around the world and find that prices do indeed seem to incorporate negative information more slowly in those countries where short-sales are either not allowed or not practiced, providing empirical support for Diamond and Verrecchia's model.

WHEN DOES RESTRICTING SHORT-SALES MAKE SENSE?

The models presented above highlight the important role played by short-sales. Nevertheless, we do see cases in which governments restrict them. What might be the rationale for doing so?

A paper by Itay Goldstein and Alexander Guembel provides one possible justification for short-sale restrictions.³¹ Their work can be viewed as a model of bear raids, and it also provides an explanation of why restricting short-sales will prevent such raids. They argue that restricting short-sales can prevent manipulation of stock prices by investors. The reason is that, by selling large amounts of stock, a short-seller can force the price of the firm down, because other investors (who are not fully informed about the firm) may interpret this selling pressure as reflecting negative information about the firm's prospects. Once the price has fallen, the short-seller can

³¹ See the article by Yaron Leitner for further discussion of Goldstein and Guembel's model.

close out his position at a profit; thus to the extent that this strategy is self-fulfilling, it will be profitable for the short-seller.


The particular case they study is one in which the low stock price may convince the firm's management that its prospects are poorer than they previously believed, so that the firm forgoes profitable investment opportunities, thereby lowering its value. However, they also discuss another interpretation of their model, one in which the low stock price affects the firm's access to other sources of financing (for example, investors may be reluctant to extend the firm credit or may demand more collateral on outstanding derivative contracts) and may thus force the firm into bankruptcy. This interpretation formalizes the view — expressed in the popular press — that bear raids may have contributed to the recent collapse of some financial institutions (such as Bear Stearns).

Intuitively, this provides a rationale for restricting short-sales. In addition, Goldstein and Guembel point out that, rather than banning short-sales altogether, it may be better to make them more costly in some manner. The reason is that in their model short-selling is more profitable for those who truly have negative information about a firm than for those attempting to manipulate its stock price. Thus, the latter group may be discouraged when short-selling becomes more expensive, without

undermining the market's role in aggregating information about the firm. This is not discussed in their article, but many current regulations have this effect, such as the less favorable tax treatment of short-sale profits (they are considered income rather than capital gains), and restrictions on naked short-selling (since, as we have seen, borrowing stock can be costly).

CONCLUSION

Short-selling plays a valuable economic role in preventing overvaluation of securities and facilitating the incorporation of negative information about a company into its stock price. This role is supported by empirical studies.

But under certain conditions, short-selling can also be used to manipulate the market. By selling large amounts of stock, a short-seller may be able to convince other investors and lenders that the company's prospects are poor, thereby shutting off its access to outside financing and forcing it into bankruptcy. This also provides an argument for regulations that make short-sales more costly or difficult, since such costs make manipulation more difficult, while still allowing those with truly negative information about the company to profit. Further work is also needed on evaluating the tradeoff between the positive and negative effects of these regulations, as well as on better understanding the securities lending market. 

REFERENCES

Bris, Arturo, William N. Goetzmann, and Ning Zhu. "Efficiency and the Bear: Short Sales and Markets Around the World," *Journal of Finance*, 62:3 (June 2007), pp. 1029-79.

Diamond, Douglas W., and Robert E. Verrecchia. "Constraints on Short-Selling and Asset Price Adjustment to Private Information," *Journal of Financial Economics*, 18 (1987), pp. 277-311.

Diether, Karl B., Christopher J. Malloy, and Anna Scherbina. "Differences of Opinion and the Cross Section of Stock Returns," *Journal of Finance*, 57:5, (October 2002), pp. 2113-41.

Evans, Richard B., Christopher C. Geczy, David K. Musto, and Adam V. Reed. "Failure Is An Option: Impediments to Short Selling and Options Prices," *Review of Financial Studies* (forthcoming).

Geczy, Christopher C., David K. Musto, and Adam V. Reed. "Stocks Are Special Too: An Analysis of the Equity Lending Market," *Journal of Financial Economics*, 66 (2002), pp. 241-69.

Goldstein, Itay, and Alexander Guembel. "Manipulation and the Allocational Role of Prices," *Review of Economic Studies*, 75 (2008), pp. 133-64.

Hayek, Friedrich A. "The Use of Knowledge in Society," *American Economic Review*, 35 (1945), pp. 519-30.

Harrison, J. Michael, and David M. Kreps. "Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations," *Quarterly Journal of Economics*, 92:2 (May 1978), pp. 323-36.

Lamont, Owen A. "Go Down Fighting: Short Sellers vs. Firms," NBER Working Paper 10659 (August 2004)

Lamont, Owen A., and Richard H. Thaler. "Can the Market Add and Subtract? Mispricing in Tech Stock Carve-Outs," *Journal of Political Economy* 111:2 (2003), pp. 227-68.

Leitner, Yaron. "Stock Prices and Business Investment," Federal Reserve Bank of Philadelphia *Business Review* (Fourth Quarter 2007).

Miller, Edward M. "Risk, Uncertainty, and Divergence of Opinion," *Journal of Finance*, 32:4 (September 1977), pp. 1151-68.

Scheinkman, José A., and Wei Xiong. "Overconfidence and Speculative Bubbles," *Journal of Political Economy*, 111:6 (2003), pp. 1183-1219.