

Will Increased Regulation of Stock Index Futures Reduce Stock Market Volatility?

By Sean Beckett and Dan J. Roberts

On October 19, 1987, the Dow Jones Industrial Average plunged 508 points, the worst single-day loss ever for U.S. stocks. This episode, along with others, has caused policymakers and the public in general to focus their attention on stock market volatility. Many believe that large swings in stock prices have occurred more often and have become larger in recent years.

Some people blame stock index futures for the perceived increase in stock market volatility. Stock index futures might contribute to stock market volatility in two ways. First, futures and stock trading might interact to worsen individual stock market disruptions, such as the October 1987 collapse. Second, futures trading

might produce a market environment generally more susceptible to stock market disruptions. Many studies have analyzed the interactions between futures and stocks in individual stock market collapses. This article is one of relatively few concerned with the second, more general way in which futures might increase stock market volatility.

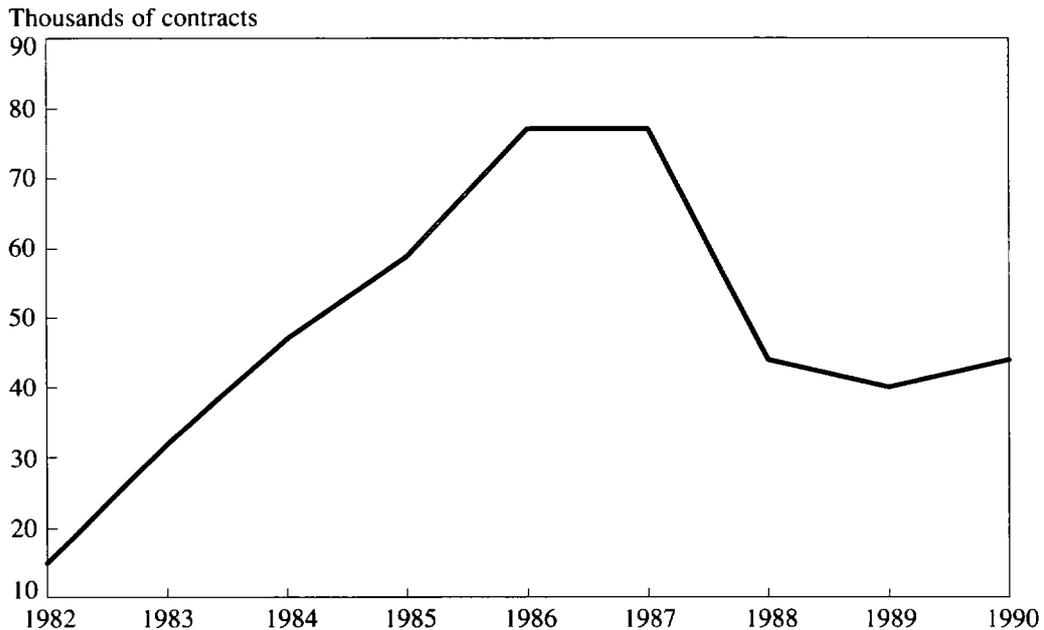
To reduce the effect of futures on stock market volatility, regulations aimed at reducing the general level of futures activity have already been adopted or have been proposed. While these regulations may or may not reduce stock market volatility, they certainly will impose costs on participants in the stock index futures market. Because the regulations are costly, it is important to find out whether the stock index futures market actually contributes to stock market volatility.

This article finds that futures market regulations intended to reduce futures trading are

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Chart 1

Volume of Stock Index Futures Trading



Note: This chart displays the typical daily stock index futures volume from April 21, 1982 through July 31, 1990. Futures volume is measured by the median daily number of S&P 500 futures contracts traded.

Source: Data Resources Inc., Lexington, Mass.

unlikely to reduce stock market volatility. The first section of this article describes the market for stock index futures and explains why futures are blamed for stock market volatility. The second section discusses the costs of current and proposed futures market regulations. The third section presents evidence that stock index futures have not increased stock market volatility, whether measured by the frequency or the size of large swings in stock prices.

I. Stock Index Futures and Stock Market Volatility

Stock index futures are one of the most successful financial innovations of the 1980s. Two characteristics of stock index futures make

them popular with investors. First, the price of these futures is closely related to the value of the stock market as a whole. Second, they are relatively inexpensive to trade. These two characteristics make stock index futures useful in a variety of investment programs. However, these characteristics also lead some observers to blame stock index futures for stock market volatility.

What are stock index futures?

A financial futures contract is an agreement to buy or sell a financial asset, such as a Treasury bond or a specified amount of a foreign currency, at a given time in the future. The price of the future transaction is determined when the

agreement is made. Stock index futures are financial futures contracts in which the underlying financial asset is a basket of stocks. The several different stock index futures contracts are distinguished by the basket of stocks underlying the contract. The most popular of these is the Chicago Mercantile Exchange's contract based on the Standard & Poor's 500 Composite Stock Price Index.

No money is exchanged when a futures contract is traded. A futures contract is simply an agreement to make an exchange in the future. As it turns out, however, assets are not exchanged even in the future. Instead, buyers and sellers of stock index futures contracts are required to settle their positions by taking offsetting positions. For instance, investors who buy S&P 500 contracts must settle their positions by selling contracts by the original contracts' delivery date.¹

An example may help clarify this process. The price of the S&P 500 futures contract is quoted as an index, in units that are comparable to the actual S&P 500 stock price index. The real price paid for an S&P 500 futures contract is \$500 times the value of the index. Thus, if the index value is 300, an investor would pay \$150,000 to buy one futures contract (\$500 times the index value of 300). Sometime before the expiration date of the contract, the investor must offset this position by selling a contract at whatever the futures index value happens to be. For the purpose of this example, assume the investor sells a contract to offset his initial purchase when the futures index has increased to 303. At this index value, the investor would sell the contract for \$151,500 (\$500 times 303). Thus, the investor would make a profit of \$1,500 (\$500 times the three-point change in the futures index value).

Stock index futures were introduced in mid-1982 and were an immediate success (Chart 1). By 1984, the dollar value of S&P 500 contracts traded exceeded the dollar volume of stocks

traded on the New York Stock Exchange (Merrikk 1987). Trading volume peaked in 1986 and 1987, when the median number of contracts traded each day was 77,000.² Volume declined after the stock market collapse in October 1987. In recent years, futures trading volume has averaged around 40,000 contracts a day.

Why are stock index futures popular?

Stock index futures are popular among investors because they are an economical substitute for buying and selling a diversified portfolio of stocks. Futures prices are tied to the values of diversified portfolios rather than to the prices of individual stocks. As a result, investors can buy or sell futures rather than buying or selling many different stocks. Trading futures is more economical than buying or selling many different stocks because the transactions costs of futures are low.

Investors who buy stock index futures contracts receive similar gains and losses as if they bought an equivalent amount of stock. The gains and losses are similar because the price of a futures contract is highly correlated with the price of the basket of stocks in the index that underlies the contract (Cornell and French 1983). In the example above, the 1 percent increase in the futures price, from 300 to 303, reflects a comparable increase in the value of the S&P 500 index. Thus, investors who buy contracts benefit if stock prices rise after they purchase their futures contracts. These investors receive the increase in the value of the index when they offset their position by selling contracts. Similarly, investors who sell contracts benefit if stock prices fall after they sell their futures contracts. To offset their position, these investors purchase contracts at the new, lower price.

Another important feature of stock index futures is their low transactions costs. Trading stock index futures contracts is less expensive

than trading the equivalent basket of stocks because brokers' fees and margin requirements in the futures market are relatively low (Kling 1986). The brokerage cost at a discount broker of establishing and settling a position in an S&P 500 index futures contract is only \$32. Since the value of a contract is \$500 times the value of the index, this fee represents just over 0.02 percent of the underlying value of the contract when the S&P 500 index is 300. Brokerage fees for an equivalent stock purchase are many times higher.

The initial margin requirement for futures trading is also relatively small. A margin is the minimum amount of money an investor must pay to buy securities.³ The margin on an S&P 500 index futures contract used for hedging is currently \$8,000—less than 5.5 percent of the contract when the S&P 500 index is 300. Investors can earn interest on their initial margin by using U.S. government securities to meet the margin requirement. In contrast, the margin requirement for stock purchases is 50 percent of the value of the purchase, and the margin must be paid in cash.⁴

How are stock index futures used?

The characteristics that make stock index futures popular also make them well suited to a number of different investment uses. Portfolio managers can sell stock index futures to hedge the value of a diversified stock portfolio against changes in the value of the stock market as a whole (Morris 1989). As stock prices change, losses (profits) on the stocks will be largely offset by profits (losses) on the futures contracts because futures prices are closely related to the value of a broad market index. For example, if stock prices fall, the value of the stock portfolio falls. At the same time, the price of the futures contract falls. When portfolio managers buy futures to offset their initial futures contract sales, they make a profit because they pay less

than they received when they originally sold the futures. This profit on the futures trades can help offset the loss on the stocks and thus reduce the change in the value of the total portfolio.⁵

Many investment strategies require portfolio managers to adjust the proportion of stocks in the portfolio over time. Portfolio insurance, asset allocation, and market-timing strategies are just a few of the investment approaches that involve frequent changes in stock holdings (Petzel 1989). Portfolio managers frequently choose to make these adjustments by buying or selling futures rather than stocks.

Another investment strategy involving stock index futures is index arbitrage. This strategy is a form of program trading in that it involves the purchase or sale of a group of stocks.⁶ While the price of stock index futures is highly correlated with the value of the underlying stock index, occasionally the price of the futures contract diverges from its usual relationship to the value of the stocks. These episodes provide arbitrageurs with opportunities to profit. For example, assume the price of the futures contract rises, while the price of stocks does not change. In this situation, arbitrageurs can guarantee a profit by selling the relatively expensive futures contract and buying the relatively inexpensive stocks. This arbitrage continues until the usual relationship between futures and stock prices is restored.

Finally, stock index futures are an attractive asset to stock market speculators. The availability of futures makes it possible for speculators to take positions that would not be economical if they had to buy or sell shares directly.

Why are stock index futures blamed for stock market volatility?

Stock market volatility can be divided into two types, normal volatility and jump volatility

(Beckett and Sellon 1989). Normal volatility refers to the ordinary ups and downs in stock prices. Jump volatility, on the other hand, refers to occasional and sudden extreme changes in prices. The leading example of jump volatility is the market collapse in mid-October 1987. However, the market has endured many stock price jumps besides those in October 1987.

The type of stock market volatility that concerns legislators, regulators, and market makers is jump volatility.⁷ Jumps in stock prices over a few hours or a day can temporarily disrupt capital markets and strain market mechanisms. In the most extreme example of jump volatility, the October 1987 market collapse, many stocks stopped trading for several hours. The execution of trades of other stocks also was delayed sometimes for hours, leaving investors with little idea of the prices that would prevail when their trades were executed. In addition, losses suffered by many stock market specialists threatened their continued participation in the market (U.S. Presidential Task Force on Market Mechanisms 1988).

Jump volatility also raises concerns about individual investors' access to, and participation in, the market. An increase in jump volatility may make it more important for investors to employ sophisticated strategies to protect the value of their portfolios. While institutional investors possess the expertise in, and the access to, futures and options markets necessary to execute these strategies, some observers fear that individual investors do not have the same expertise and access. As a result, these observers fear that individual investors will simply leave the stock market in reaction to an increase in jump volatility.⁸

The features of stock index futures that make them popular—low transactions costs and a close relationship to the value of the stock market—also explain why futures are blamed for volatility. For example, these features increase speculative activity. To the extent

speculative activity tends to increase the volatility of futures prices, this futures market volatility then spills over into the stock market. In addition, low trading costs ensure that the fads and panics that occasionally afflict financial markets find little or no resistance in futures markets. The shifting moods of the financial community are translated immediately into violent oscillations in futures prices and then into stock prices.

Program trading is also believed to increase jump volatility. Some observers fear stock price jumps can set off a cascade effect, that is, a free-fall in stock prices that feeds on itself.⁹ According to this view, a sudden drop in stock prices can trigger computer-driven futures trading strategies that drive stock index futures prices down. The drop in futures prices then feeds back to the stock market, and the cycle begins again.

II. Costs of Regulations That Reduce Futures Market Activity

Many people believe stock index futures contribute to jump volatility in the stock market. To reduce the effect of futures on jump volatility, regulations that reduce the general level of futures activity have been adopted or proposed. These regulations reduce futures activity because they make futures trading more costly.

One type of regulation that has already been adopted is circuit breaker rules. Circuit breakers are rules that temporarily suspend trading if price movements exceed certain thresholds. Proponents of circuit breakers believe that suspending trading prevents panics by giving traders time to reevaluate market conditions and to bolster their liquidity and credit (Morris 1990). Thus, one reason for circuit breakers is they halt trading during an incipient panic. Another reason for circuit breakers, however, is to reduce the general level of futures activity.¹⁰

One cost of circuit breakers is they make

futures trading riskier. Circuit breakers raise the possibility that investors may not be able to trade at some time in the future. Because circuit breakers are triggered by events that cannot be predicted accurately, investors cannot effectively protect themselves against the possibility of these trading halts. From the point of view of investors, this uncertainty makes it riskier to trade in futures.

Another cost of circuit breakers is they can expose clearing houses to increased credit risk by implicitly extending margin credit to some traders (Moser 1990). Traders in futures are required to make additional margin payments when they suffer losses. If trading is halted because of a circuit breaker, the adequacy of margins is evaluated at the price of the last recorded trade. While trading is halted, the true market price, that is, the price that would prevail in the absence of the circuit breaker-imposed trading halt, may change substantially. Thus, some traders have trading losses that are not recognized while trading is halted. When trading resumes, if the losses are so large that these traders cannot fulfill their contracts, the clearing house may be forced to assume the failed traders' obligations.

Circuit breakers also may inadvertently increase stock market volatility. When circuit breakers are close to being triggered, market participants may buy or sell futures frantically to avoid being locked in. This panic trading may increase futures market volatility which, in turn, will increase stock market volatility. In addition, if circuit breakers suspend futures trading but not stock trading, stock market volatility may increase as frustrated futures investors shift their trading to the stock market (Morris 1989).

A regulation that has been proposed to reduce the volume of futures trading is higher margin requirements. Higher margins directly increase the transactions cost of trading futures by increasing the amount of money investors

must post to make trades.¹¹ These increased costs reduce all futures trading, including hedging. The general reduction in trading represents a loss of liquidity to the market. In addition, the reduction in hedging makes investors more vulnerable to swings in the value of stocks than they would be if margins were lower and they hedged more completely.

III. Do Stock Index Futures Cause Stock Market Volatility?

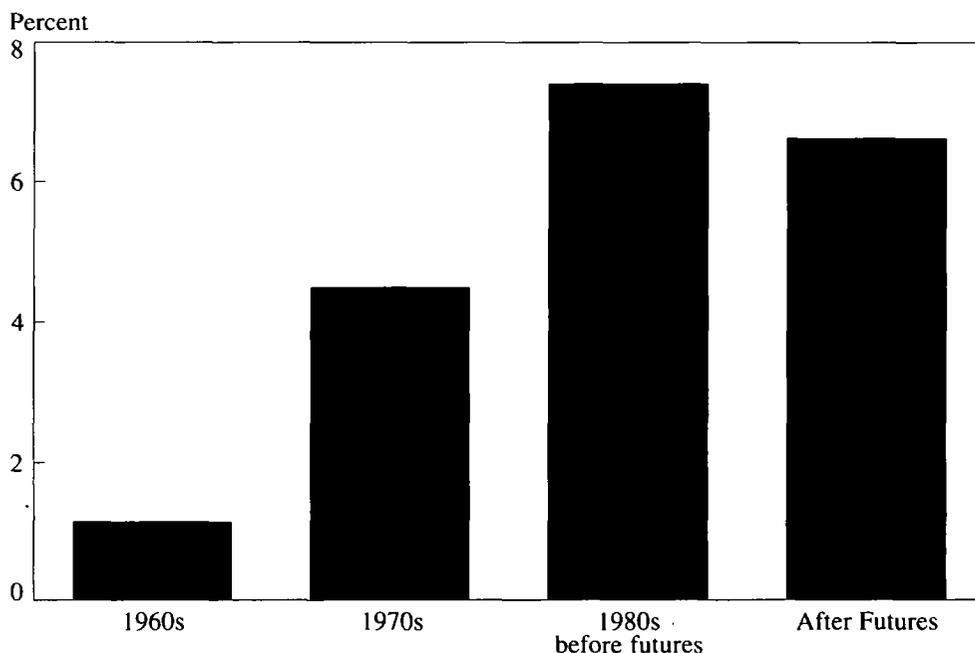
Futures market regulations that reduce the overall level of futures market activity thus impose substantial costs on investors. Imposing these costs is justified by the belief that reducing futures trading reduces jump volatility in the stock market. But without persuasive evidence that futures are responsible for stock market volatility, regulations intended to reduce volatility by reducing the overall level of futures trading are inadvisable.¹²

Have stock index futures increased the frequency of stock price jumps?

One way stock index futures might increase jump volatility is to make stock price jumps more likely. Researchers measure jumps by setting a band within which stock price movements are considered normal or ordinary. Movements outside the band are identified as jumps because they are considered exceptional. For example, some researchers identify jumps in daily data as price changes in excess of 1 or 2 percent, either up or down (Schwert 1990).

Using a statistical technique designed to highlight unusual values, this article defines a daily jump as any day in which the S&P index rises or falls more than approximately 1.75 percent.¹³ At current price levels, this represents about a 40-to-50-point or more move in the Dow.¹⁴ From July 1962 through August 1990, 4.5 percent (317 days) of all daily changes in the

Chart 2
Frequency of Jumps in Daily Stock Returns



Note: This chart displays the frequency of stock price jumps in different periods. The frequency of jumps is measured by the number of daily jumps in the S&P 500 index divided by the number of trading days in the period. The bar labeled "1960s" includes data from July 3, 1962, through the end of the 1960s. The bar labeled "1970s" covers the entire 1970s. The bar labeled "1980s before futures" includes data from the beginning of 1980 through April 20, 1982. The bar labeled "After Futures" includes data from April 21, 1982 - the first day of trading for the S&P 500 futures contract - through August 10, 1990.

Source: Standard and Poor's Corporation.

S&P 500 stock index were jumps. Forty-six percent of these jumps represented declines in the stock index. The median jump involved a change of slightly more than 2 percent, either up or down, in the S&P 500 index.

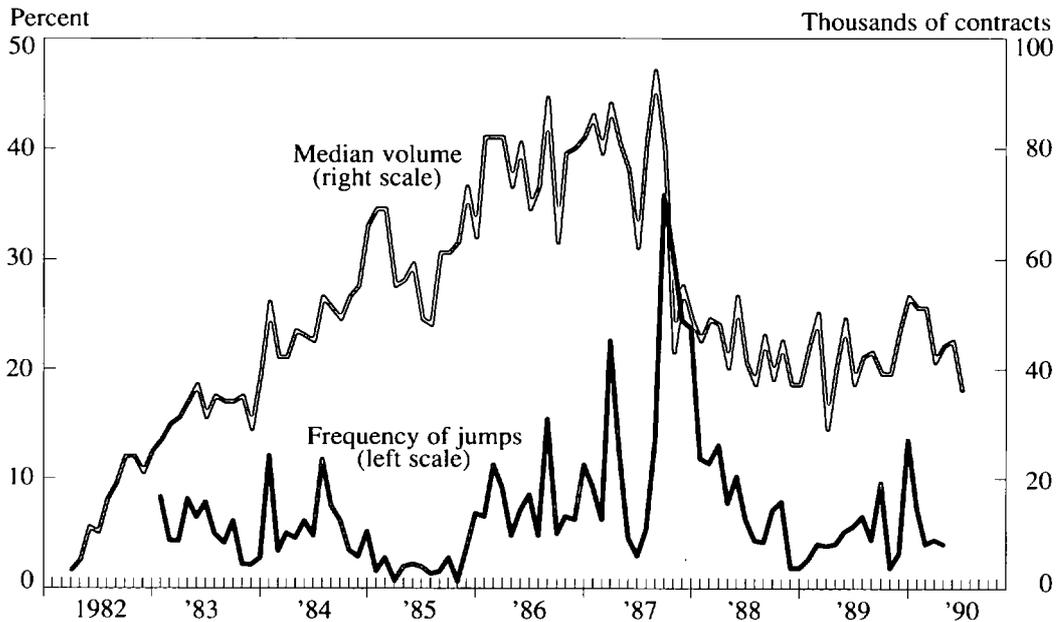
At first glance, the futures market appears to have made stock price jumps more likely because jumps in stock prices have been more frequent since stock index futures began trading. Trading in S&P 500 stock index futures began on April 21, 1982. From 1962 through April 20, 1982, 3.6 percent of daily returns were jumps. From April 21, 1982, through August 1990, 6.6 percent of daily returns were jumps. In other words, stock price jumps have

been almost twice as frequent since the introduction of futures as in the preceding 20 years.

Closer examination, however, shows the increase in the frequency of jumps cannot be attributed to stock index futures because the frequency of jumps began increasing well before futures began trading (Chart 2). In the 1960s, only 1.1 percent of daily returns were jumps. By the early 1980s, jumps represented 7.4 percent of daily returns. In fact, compared with the early 1980s, stock price jumps have become slightly less frequent since the advent of stock index futures trading. Thus, it is not plausible to attribute the slow, steady increase in the frequency of jumps since the early 1960s

Chart 3

Futures Volume and the Frequency of Stock Price Jumps



Note: This chart displays monthly measurements of stock index futures volume and the frequency of stock price jumps. Futures volume is measured by the median daily number of S&P 500 futures contracts traded. The frequency of stock price jumps is measured by the number of hourly jumps in the S&P 500 index divided by the number of trading hours in the month.

Source: Data Resources Inc., Lexington, Mass. (for futures volume) and Tick Data Inc., Lakewood, Colo. (for S&P 500 index).

solely, or even mainly, to the futures market.

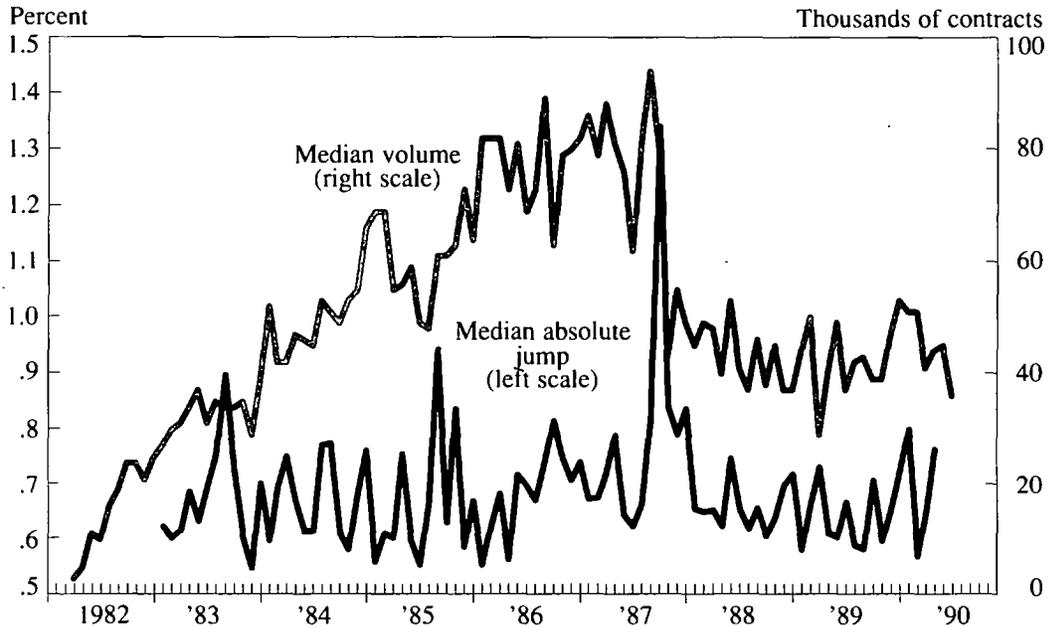
Even though the frequency of jumps has decreased compared with the early 1980s, jump volatility might be even lower if stock index futures were not available. One way to test whether the futures market contributes to jump volatility is to see if jumps are more frequent when futures activity is high. If stock index futures are a source of additional jump volatility, then volatility should be high when futures activity is generally high and low when futures activity is generally low.

As it turns out, trading volume—the most common measure of futures activity—appears to be unrelated to the frequency of jumps. Chart 3 displays monthly observations of futures trad-

ing volume and hourly stock price jumps.¹⁵ For this comparison, hourly jumps are a more appropriate measure of volatility than daily jumps.¹⁶ The volume of futures trading grew steadily from 1982 then peaked in 1986-87 at around 77,000 contracts a day. In contrast, the frequency of hourly jumps showed no upward trend. In October 1987, the frequency of jumps rose sharply without a corresponding rise in futures volume. Both volatility and volume fell sharply after October 1987. Since the stock market collapse, there has been no upward or downward trend in either volatility or volume. Thus, the only period over which a close relationship appeared to exist is the several months of decline in volume and volatility just

Chart 4

Futures Volume and the Size of Stock Price Jumps



Note: This chart displays monthly measurements of stock index futures volume and the size of stock price jumps. Futures volume is measured by the median daily number of S&P 500 futures contracts traded. The size of stock price jumps is measured by the median hourly absolute percentage change in the S&P 500 index within each month.

Source: Data Resources Inc., Lexington, Mass. (for futures volume) and Tick Data Inc., Lakewood, Colo. (for S&P 500 index).

following the October 1987 collapse.

The lack of relationship between futures volume and the frequency of jumps apparent in Chart 3 is confirmed by statistical analysis. One statistic that measures the relationship between two variables is the correlation coefficient. The correlations between daily and hourly stock price jumps and futures trading volume are small, indicating little or no association between futures trading volume and the frequency of stock price jumps.¹⁷ The correlation between daily stock price jumps and futures volume is only 0.14 and is not significantly different from zero at the 5 percent level. The correlation between hourly stock price jumps and futures volume is also small, 0.17. However, this cor-

relation is significantly different from zero at the 5 percent level.

The statistical significance of the relationship between futures volume and hourly stock price jumps disappears, however, when other factors that might affect volatility are taken into account. One problem with correlation coefficients is they ignore the impact of other variables that may be important. For example, stock market volatility may exhibit seasonal variation reflecting end-of-year tax-related trading strategies or the time pattern of dividend payments. In addition, stock market volatility today may be influenced by recent episodes of volatility. In other words, once volatility is high, it may stay high for a while. To test for these

possibilities, the frequency of jumps was regressed on its own recent past and seasonal factors along with the volume of futures trading. When these other factors were taken into account, the relationship between jumps and futures volume was no longer statistically significant.¹⁸

Have stock index futures increased the size of stock price jumps?

Another way that stock index futures might increase jump volatility is to increase the size of stock price jumps when they do occur. However, the size of the typical stock price jump has not increased markedly since futures began trading. From the beginning of 1962 through April 20, 1982, the median daily jump involved a 2.1 percent change in stock prices, either up or down. Since April 20, 1982, the typical jump has increased only 0.2 percent to 2.3 percent.

Even though the typical jump has not grown larger since stock index futures trading began, jumps might be even smaller if futures were not available. If stock index futures are responsible for this type of increase in jump volatility, then jumps should be larger when futures activity is generally high and smaller when futures activity is generally low.

As it turns out, however, the size of the typical hourly jump in stock prices appears to be unrelated to the volume of futures trading. Chart 4 shows that the median absolute hourly stock price jump essentially has been flat except for the October 1987 market collapse. In contrast, the volume of trading grew until October

1987, dropped sharply just after the market collapse, and has been flat ever since.

A correlation analysis confirms the impression given by the chart. The correlation between the size of daily stock price jumps and futures volume is only 0.03. The correlation between the size of hourly stock price jumps and futures volume is 0.11. Neither of these correlations is significantly different from zero.¹⁹

IV. Conclusion

The high correlation between stock index futures prices and stock prices, combined with the low cost of futures trading, has led some observers to blame high levels of stock index futures activity for recent bouts of volatility in the stock market. Circuit breakers were adopted partly to reduce futures activity in order to reduce stock market volatility. Higher margins also have been proposed to reduce futures activity. However, circuit breakers and higher margins impose costs on investors and may have adverse effects on the functioning of financial markets. Thus, reducing futures market activity to reduce stock market volatility makes sense only if futures trading is responsible for volatility.

This article finds little or no relationship between stock market volatility and either the existence of, or the level of activity in, the stock index futures market. As a result, while circuit breakers and higher margins may be useful for other reasons, their depressing influence on the volume of futures trading is unlikely to reduce stock market volatility.

Appendix

This article uses a statistical method designed to highlight potential outliers—abnormally small or large values—to identify stock price jumps. The method consists of constructing a band based on a robust measure of the dispersion of the observations in the sample. Observations that fall outside this band are identified as jumps.

The upper and lower ends of the band are calculated as follows:

$$\text{upper end of band} = 75\text{th percentile} + 1.5 \left(\frac{\text{interquartile range}}{\text{range}} \right)$$

$$\text{lower end of band} = 25\text{th percentile} - 1.5 \left(\frac{\text{interquartile range}}{\text{range}} \right)$$

The interquartile range is the difference between the 75th and 25th percentile of the distribution of stock returns. These percentiles are calculated for the entire sample of returns. The frequency of jumps is calculated as the number of jumps divided by the number of observations.

A similar measure of jumps is used and described in Beckett and Sellon 1989. This

measure is particularly well suited to analyzing data that are approximately normally distributed except in the tails of the distribution. Stock returns fit this description exactly. The value 1.5 in the formulas above controls the frequency of jumps. For a normally distributed variable, this measure identifies less than 1 percent of a large sample as jumps.

This measure has the advantage of being able to identify multiple jumps when the maximum number of jumps is not known in advance. Because jumps are restricted to lie outside the interquartile range, up to half the observations could, in theory, be identified as jumps. Since the quartiles are the only order statistics used in constructing the cutoffs, the breakdown point of this measure is 25 percent; that is, up to a quarter of the observations could be replaced by arbitrary values without affecting the measure. This is a high breakdown point for a measure of dispersion. A detailed study of this measure and its statistical properties can be found in Hoaglin, Iglewicz, and Tukey 1987.

Endnotes

¹ Physical delivery rarely occurs in most futures contracts, whether financial or commodity. In the case of stock index futures contracts, delivery is prohibited and cash settlement required because of the difficulty of assembling the precise basket of stocks that underlies the contract.

² The median volume is the 50th percentile of the observed volumes; that is, half the observed volumes are less than the median and half are greater. As a measure of the central tendency or average value, the median is less sensitive to a few unusual observations than is the arithmetic mean.

³ For stock purchases, the margin is the down payment on a loan used to buy the stock. For futures purchases and sales, the margin is essentially a performance bond the

investor posts to guarantee he will fulfill his side of the contract.

⁴ There are some exceptions and qualifications to the requirement that margins for stock purchases are paid in cash. Sofianos 1988 provides a thorough description of margin requirements.

⁵ An additional reason that stock index futures contracts are particularly useful for hedging is that short sales of stocks are often difficult and costly. Investors sell stocks short by borrowing shares and then selling the borrowed shares. Thus, to sell stocks short, investors must find current shareholders willing to lend their shares. This requirement limits the volume of short sales to the amount

of existing shares. In addition, it can be difficult and time-consuming to find the desired number of shares to borrow.

In contrast, it is easy and economical to take the equivalent position by selling futures contracts. When a futures contract is sold, the seller is simply agreeing to sell the underlying asset at some future date. Since futures contracts are settled in cash rather than shares of stock, sellers never have to obtain the shares of stock. Thus, the amount of futures contracts that can be sold is limited only by the availability of buyers.

⁶ The New York Stock Exchange defines a program trade as the simultaneous purchase or sale of at least 15 stocks with a total trade value greater than \$1 million. See Duffee, Kupiec, and White 1990 for an examination of program trading.

⁷ Most researchers have found that normal volatility in U.S. stock markets has, with the exception of the Great Depression, been stable since the mid-19th century (Schwert 1990; Shiller 1989).

⁸ Former Treasury Secretary Donald Regan expressed this viewpoint forcefully in testimony at a U.S. Senate hearing (1988). He said, "The public has every reason to believe that the present game is rigged. It is. Many would be better off in a casino since there people expect to lose but have a good meal and a good time while they're doing it."

⁹ Following the October 1987 market collapse, the Brady Commission (U.S. Presidential Task Force on Market Mechanisms 1988) identified some types of program trading as a contributing factor to the collapse. The Brady Commission also concluded that links forged by program trading between the futures and stock market have made the stock market vulnerable to disruptions emanating from the futures market. In the *Interim Report of the Working Group on Financial Markets*, another study of October 1987, then-chairman of the SEC David Ruder concurred that "certain futures-related trading strategies [i.e., program trading] have resulted in a dramatic increase in the size and velocity of institutional trading which, in turn, has resulted in substantially increased price volatility."

¹⁰ The Brady Commission (U.S. Presidential Task Force on Market Mechanisms 1988) emphasized this role of circuit breakers. Their report points out that circuit breaker mechanisms counter the illusion of liquidity by formalizing the economic fact of life...that markets have a limited capacity to absorb massive one-sided volume.... This makes it less likely in the future that flawed trading strategies will be pursued to the point of disrupting markets and threatening the financial system." (U.S. Presidential Task Force on Market Mechanisms 1988, p.66)

In other words, circuit breakers force investors to realize

there will be times in the future when they will not be able to carry out some futures-related trading strategies. As a result, these investors will be less aggressive in pursuing these strategies in the present. Thus, the portion of futures trading due to these strategies will decline as a result of circuit breakers.

¹¹ Noting that margins in the futures market are low compared with margins in the stock market, the Brady Commission proposed that margins be "harmonized" across markets. The Commission reasoned that the apparent disparity in margin requirements encourages excessive futures trading. David Ruder, in the *Interim Report of the Working Group on Financial Markets*, also called for higher margins on futures, in part to "decrease derivative market speculative activity."

¹² Circuit breakers and higher margins might be ineffective even if stock index futures contribute to stock market volatility (Edwards 1988). In this case, of course, the regulations are inadvisable. This article, however, argues against regulations intended to reduce futures trading on the grounds the evidence does not support the notion that stock index futures are linked to stock market volatility. Of course, statistical evidence on the general relationship between futures activity and stock market volatility cannot determine whether futures trading was related to a specific historical event, such as the October 1987 market collapse.

¹³ The precise cutoffs for jumps are daily S&P 500 returns greater than 1.7865 percent or less than -1.7367 percent. The statistical technique used to determine these cutoffs is described in the appendix.

¹⁴ The New York Stock Exchange places restrictions on index arbitrage whenever the Dow Jones Industrial Average moves 50 points or more from its closing value on the previous trading day. While the exchange did not use the statistical method employed in this article in designing its restrictions, this exchange rule indicates that this statistical method highlights stock movements that the exchange also recognizes as potentially destabilizing.

¹⁵ Chart 3 displays monthly observations of the median daily volume of trading of S&P 500 index futures contracts and the frequency of hourly jumps in the S&P 500 index. Monthly observations are used because the hypothesis under examination relates the frequency of price jumps to changes in the general level of activity in the futures market. The median daily volume for the month is an indicator of the general level of activity in the futures market. Thus, the data displayed in Chart 3 show whether months with higher-than-average futures trading activity are also months with a higher-than-average frequency of jumps.

A related question, not considered in this article, is

whether stock price jumps and high futures volume occur at precisely the same time. This question is concerned not with volatility, but with the ways new information is incorporated in securities prices. This latter question is addressed more appropriately with daily or hourly, rather than monthly, observations. Karpoff (1987) surveys studies that test whether increases in trading volume are related to price changes and discusses the significance of these studies.

¹⁶ It is difficult to appraise the relationship between daily stock price jumps and futures trading from a chart of monthly observations because there are many months with no daily jumps. The data on hourly stock prices cover the period from February 1983 through May 1990. Thus, the hourly data are available only after stock index futures began trading. For this reason, only daily stock price jumps could be used to assess whether stock price jumps increased after futures were introduced. In these data, hourly returns greater than 0.5386 percent or less than -0.5151 percent are considered jumps.

¹⁷ Correlations were calculated between monthly observations of the median daily volume of S&P 500 stock index futures trading and the frequency of daily and hourly jumps in the S&P 500 index. The correlation coefficient is Kendall's tau, a nonparametric statistic that takes on values between minus one and one. Values near minus one or one indicate pairs of variables with a strong association. Values

near zero indicate pairs of variables with little or no association.

¹⁸ This result is obtained by regressing the log of the monthly frequency of hourly stock price jumps against 12 lagged values of stock price jumps, monthly dummy variables, and the log of the median monthly volume of daily futures trading. The regression is estimated using data from February 1984 through May 1990. The coefficient on the trading volume variable is 0.57 indicating that a 1 percent increase in trading volume is associated with a 0.57 percent increase in the frequency of jumps. This regression has an R-square of 0.55 and an F-statistic of 2.61 with 24 numerator and 51 denominator degrees of freedom.

This regression is representative of an extensive regression analysis performed to see if any relationship between futures trading activity and jump volatility could be discovered. A second measure of futures activity—the open interest in S&P 500 stock index futures contracts—was included. This analysis confirmed the lack of association between futures trading and jump volatility reported in this article. Details of this analysis are available on request.

¹⁹ Correlations were calculated between monthly observations of the median daily volume of S&P 500 stock index futures trading and the median absolute daily and hourly jumps in the S&P 500 index. As before, the correlation coefficient is Kendall's tau.

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