Causes of Changing Financial Market Volatility

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Financial market prices, prices of stocks, bonds, foreign exchange, and other investment assets, have shown striking changes in volatility through time. For each of these kinds of assets there are years when prices show enormous unpredictable movements from day to day or month to month, and there are years of stable, uneventful markets. Why does volatility change from year to year, and what (if anything) should be done about it by government regulators and self-regulatory organizations? The striking increase in stock market volatility since around the time of the stock market crash, October 19, 1987, makes these questions seem especially relevant now. Many people in the investing public are upset about the increased volatility, and are writing letters to congressmen, agency heads, and industry leaders to do something.

The problem for those who formulate policy is that very little is known about the causes of changes in volatility of financial prices. This paper tries'to state what we know concretely about causes of changes in financial market volatility, discusses some of my own research on causes of the stock market crash of 1987, and presents a view of volatility in financial markets that is relevant to policy decisions to deal with the volatility.

Changes in volatility through time

The stock market

The current episode of stock market volatility is hardly unique.

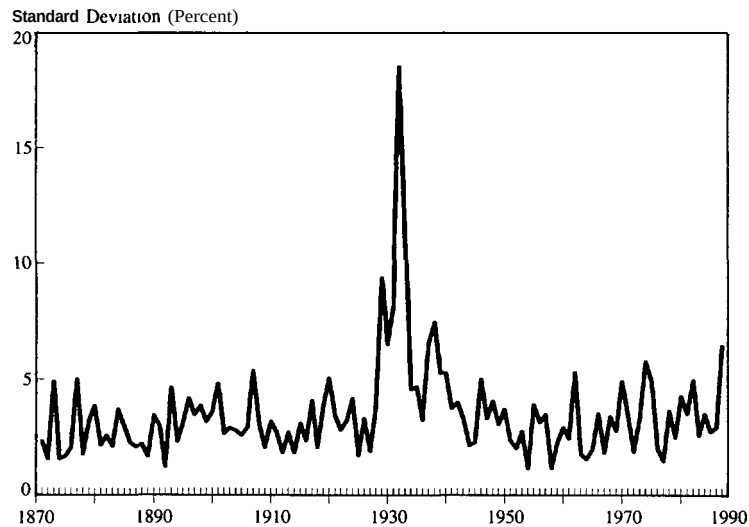
There have been repeated episodes of high stock market volatility throughout stock market history.

The stock market drop on October 19, 1987 was the biggest one-day price change ever in percentage terms. The Dow Jones Industrial Average fell 22.6 percent in one day. The drop was almost twice as big as the next biggest one-day drop, on October 28, 1929. However, the overall pattern of volatility in 1987 and 1988 is not so unique in history.[1]

Chart 1 shows the changing volatility of stock prices, as measured by the standard deviation of percentage changes in the nominal Standard and Poor Composite Stock Price Index, from 1871 to 1987.

Chart 1

Volatility of Stock Market Prices, 1871–1987



Notes: For each year, the standard deviation of month to month percentage changes is shown for the Standard and Poor Composite Index. The estimated standard deviation is based on twelve monthly observations for each year. See Appendix for source of data.

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1 Note that the *two-day* drop, October 28-29, 1929, is still the biggest two-day drop (as measured by the Dow Jones Industrial Average) in history. The biggest month-to-month percentage change in the monthly Standard and Poor Composite Index was between July and August of 1932, when the index increased 50.3 percent. This price increase, which is almost twice as big in absolute value as the biggest month-to-month price drop ever, seems to be largely forgotten. The concentration of attention on 1987 as a unique year in stock market history is to some extent an artifact of the one-day interval chosen.

The figure shown for each year is the standard deviation (estimated from 12 observations) of the 12 monthly stock price changes for the year.[2] Note that the volatility of stock price changes was higher in the years 1929 through 1933 and 1937 and 1938 than it was in 1987. Note also that there were many other years in which volatility was almost as high as in 1987. The tendency for discussion of volatility to single out the record-breaking one-day stock market drop on October 19, 1987 obscures the real dimensions of volatility over all the year.

Other speculative markets

As shown in Chart 2, other speculative markets show substantial changes in volatility through time, and these changes are largely unrelated to the changes in stock price volatility.

An index of raw industrial commodity prices shows very high volatility at the beginning of the sample, low volatility through most of the 1950s and 1960s, and higher volatility in the late 1970s and 1980s. This overall pattern does not match up well at all with the pattern of volatility of stock prices.

The dollar-pound exchange rate was very stable in the period of fixed exchange rates, except for a couple of large movements at times of devaluations of the pound (from $4.03 to $2.80 in 1949 and from $2.80 to $2.40 in 1967). If one takes account of the devaluations, there is not any striking change in overall volatility over the sample. There has been a gradual uptrend in volatility since the period of floating rates began in 1971, with short-run variations that do not correspond to those in stock prices.

Long-term bond yields were extremely variable around the time of the Federal Reserve's new operating procedures, instituted in 1979 and abandoned around 1982. This period of high volatility does not correspond to periods of really high volatility in stock prices or exchange rates, though commodity prices did show high volatility then.

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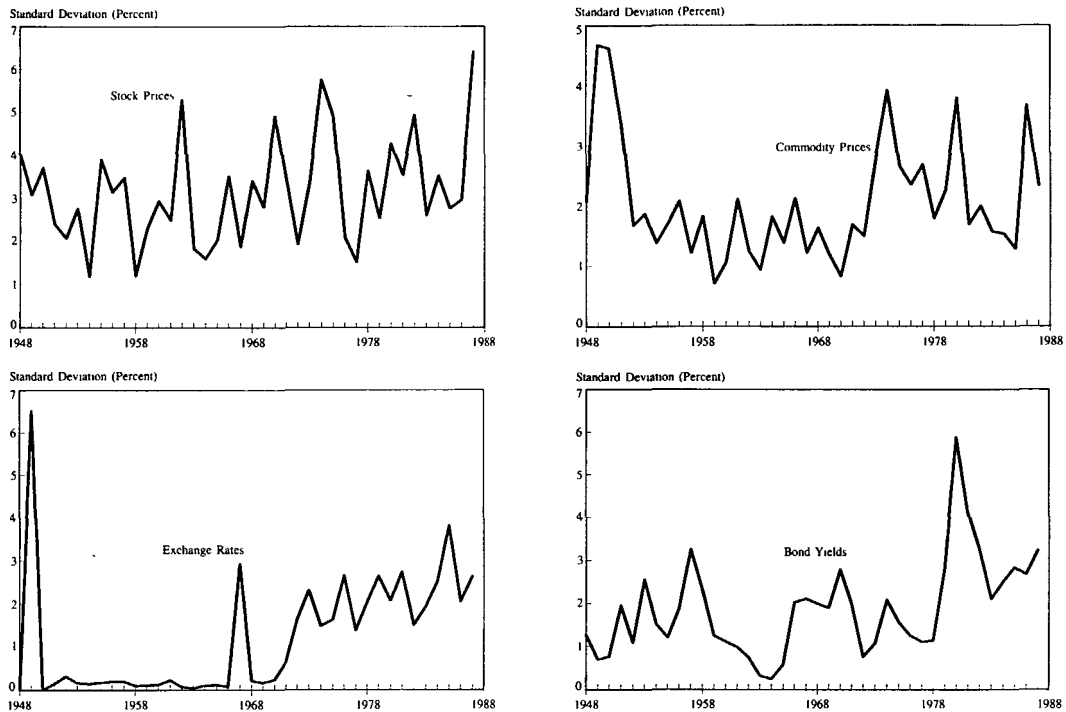
2 Data starting 1918 are monthly averages of daily closing prices; before 1918 are averages across stocks of midpoint and high and low price for each stock. The standard deviations shown are therefore downward biased measures of the standard deviation of the point-to-point price change. For a Wiener process, the standard deviation of the unit interval change in the unit average is 0.816 (the square root of ⅔) times the standard deviation of the unit interval change in the Wiener process.

Chart 2

Volatility in Various Speculative Markets, 1948–1987



Notes: For each year, the standard deviation of month to month percentage changes is shown for the following data series: stock prices (as in Chart 1), commodity prices (raw industrials), exchange rate (US/UK), and long-term bond yields (Moody's Aaa). The estimated standard deviation is based on twelve monthly observations for each year. See Appendix for source of data.

Background economic variables

It would be natural to expect that the changes in volatility through time in speculative markets would correspond to changes in volatility in real nonfinancial variables. Efficient markets theory would lead us to suspect this, since the theory says that prices in speculative markets are driven by fundamentals. But even other theories, let us say psychological theories, would tend to suggest that there is a relation between volatility in speculative markets and volatility of other macroeconomic variables.

G. William Schwert (1987) has done a time series analysis of the volatility of U.S. stock prices 1859-1986 and compared this volatility through time with other macroeconomic variables.[3] He concluded that stock volatility is not "closely related to the volatility of other economic variables," and referred to this conclusion as a "puzzle." He found that the volatility of inflation, money growth, industrial production and business failures is high during war periods, yet the volatility of stock returns is not particularly high during those periods. He pointed out that "there were many 'financial crises' or 'bank panics' during the 19th century in the U.S. that seem to be associated with very high and volatile short-term interest rates, yet there is no obvious effect on the level of stock price volatility."[4]

Standard deviations of percentage changes in industrial production, short-term interest rates, the price level and housing starts are plotted in Chart **3.** The patterns of changing volatility show little relation to the pattern of volatility in the speculative markets, except for the fact that there is some correspondence between the volatilities of short-term interest rates and long-term interest rates.[5]

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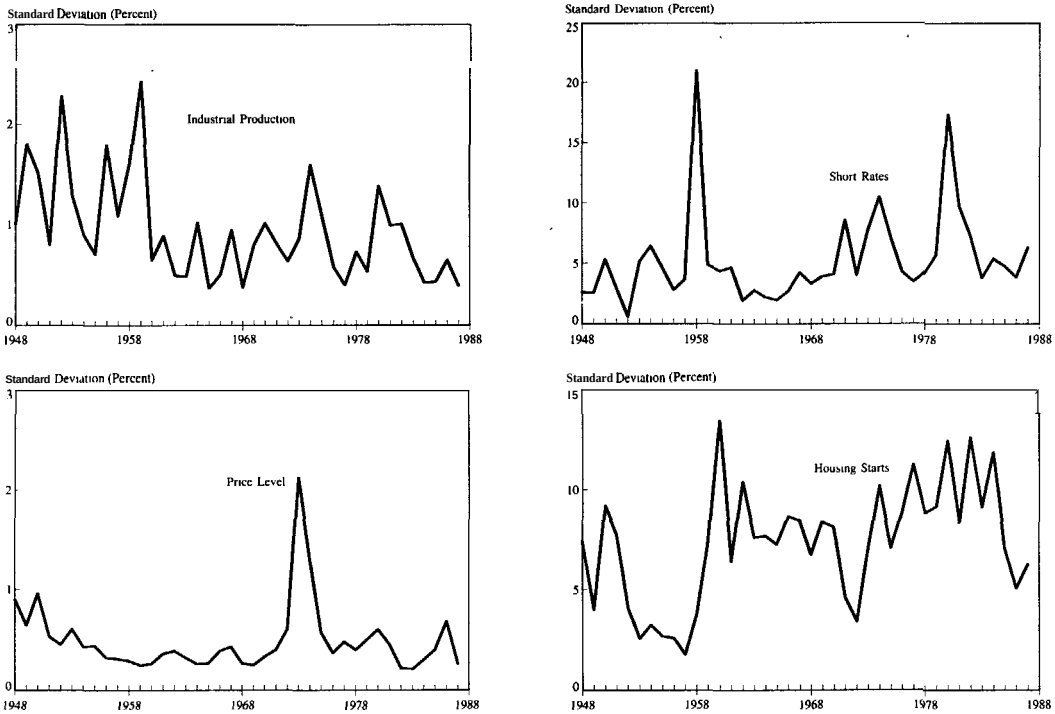
3 See also Officer (1973).

4 Schwert (1987), p. 27. Shapiro (1989) noted the lack of change in volatility between pre- and post-depression samples, and inferred that the volatility of the aggregate economy must not have changed.

5 The sharp spike in the volatility of the inflation rate in 1974 is due to the dismantling of price controls in early 1974, as well as an oil price shock then. The sharp spike in the volatility of short-term interest rates in 1958 is due to the fact that short rates dropped precipitously in the recession to very low levels: 1.50 percent in July. Then an increase to 1.96 percent in August marked a 31 percent increase in interest rates in one month.

Chart 3

Volatility of Background Economic Variables, 1948–1987



Notes: For each year, the standard deviation of month to month percentage changes is shown for the following data series: industrial production, short term interest rates (commercial paper), price level (PPI), and housing starts. The estimated standard deviation is based on twelve monthly observations for each year. See Appendix for source of data.

Interpretation

Two striking facts emerge from the plots. First, volatility seems to change dramatically through time for typical financial and macroeconomic variables. Second, there seem to be as many patterns of volatility changes as there are variables explored here.

Volatility shows no reliable uptrend through time. It is true that for all four speculative markets represented in Chart 2, volatility is higher in 1987 than it was on average over 1952-87. (The standard deviations in Chart 2 were 104 percent higher for stocks, 24 percent higher for commodities, 129 percent higher for the exchange rate, and 66 percent higher for bonds.) But there has been so much year-to-year noise that this does not signal an uptrend. The background economic variables did not show high volatility in 1987.

Proposals to deal with high volatility

Volatility in speculative markets seems to be viewed by the public as a legitimate concern of government regulators, and so any increase in volatility in markets tends to be accompanied by public demands on regulators. Thus, the increased volatility of exchange rates after the freeing of the dollar generated proposals to return to fixed exchange rates, and the increase in volatility in interest rates following the 1979 new operating procedures of the Federal Reserve produced demands that they stabilize interest rates. However, at the present time, with the vivid event of the stock market crash of 1987 on everyone's minds, most reform proposals concern the stock market, and I will concentrate attention on it here.

Influential proposals

Two proposals have been the centerpiece of recent discussion: trading halts and increased margin requirements on futures contracts. Neither of these proposals is likely to have a big effect on volatility.

Trading halts. The Brady Commission (1988) proposal most relevant to reducing volatility was its proposed "circuit breakers" that could stop trading in crisis times. The Reagan-appointed Working Group (1988) also approved such trading halts, but on a limited basis. All that group proposed relevant to volatility reduction was a one-

hour trading halt after a big market drop, 250 or 400 points on the Dow. These trading halts would hardly ever be invoked; the crash, itself, last October would be the only time in history that these halts would have been triggered.

Margins on futures contracts. It has long been noted that the advent of futures markets in effect provided a loophole around the margin requirements imposed by the 1934 Securities Exchange Act, and many people would like to see the margins on futures regulated by a government agency and, presumably, increased. David Ruder, Securities and Exchange Commission commissioner, was the dissenting member of the Working Group who wished to see margin requirements raised on stock index futures. But he is proposing only modest increases in margin requirements, to the 20 to 25 percent range. The Intermarket Coordination Act of 1988 introduced by Senator William Proxmire sets up an agency that would manage such margin requirement changes. Another proposed bill, the Securities Futures Market Credit Protection Act, would have the Federal Reserve impose margin requirements on stock index futures and options. Although neither the Brady Commission nor the bills in Congress explicitly calls for higher margin requirements on futures contracts, but rather the coordination of margin requirements across markets; arguments for the proposals make sense only if the intention is to raise margin requirements on futures contracts.

More radical proposals

Active use of margin requirements to stabilize markets has also been proposed. David Ruder, in his March 31 testimony before the Senate Banking Committee, said that "the Commission stated that the costs or benefits of more limited margin changes—such as increasing initial margin requirements in times of extreme downward price volatility for futures sales only—could be considered."[6] This is a very radical proposal, in that it would put the SEC or other agency in the business of actively stabilizing the stock market.

There are other proposals to deal with the large volatility in stock markets. The most radical of these is the abolition of futures markets

6 Ruder (1988), p. 22.

altogether. Donald Regan strongly made this proposal to the Senate Banking Committee May 11, 1988. Others are seen as supporting such a proposal. Louis Lowenstein, professor of law at Columbia University, said, "Futures markets are worse than useless. They distort the process by which capital markets are supposed to allocate resources to their most productive uses. They divert attention from the business fundamentals that are the market's proper concern."[7] James Tobin said (earlier) of such futures contracts, "The country cannot afford all the markets that enthusiasts may dream up."[8] The abolition of futures markets is probably not a viable proposal, as closing down a major industry is unlikely to be achieved for such a dubious benefit.

Rather than abolish futures markets, one might try to cut these markets off from the cash markets by abolishing the arbitrage between the two markets. The "collar" imposed by the New York Stock Exchange, which closes down the DOT system for index arbitrage when the market makes a 50-point move, is a step in this direction. A number of major firms have dropped index arbitrage at customer insistence. Proposals to inhibit index arbitrage are inherently weak. It may be possible to make index arbitrage more difficult, and so the prices on the futures and cash market may be less closely linked, but there will undoubtedly be someone who will try to arbitrage the markets so long as markets are free.

Portfolio insurance was blamed by the Brady Commission as an important contributor to the crash. Portfolio insurance is too ill-defined a scheme to be effectively abolished. If one tried to do it, it might only be driven underground, so to speak.[9] Portfolio insurance is only a formalization of stop-loss behaviors already in evidence long ago. Portfolio insurance is a sort of fad that increased stop-loss behavior. But stop-loss behavior is in the mind of traders, and not something that can be regulated so long as people are 'not barred from selling.

Other proposals are to discourage big investors from trading. The Brady Commission emphasized that the crash was caused by a few

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7 Lowenstein (1988), p. 11.

8 J. Tobin (1984), p. 10.

9 Of course, portfolio insurance has shown signs of drying up on its own in the aftermath of the crash.

big investors. Following up on this, Roberta S. Karmel, partner of Kelley, Drye and Warren, in a New York *Times* Op-Ed piece May 18, 1988, blaming the big traders, proposed declaring index arbitrage and portfolio insurance imprudent investment strategies, or taxing short-term profits of tax-exempt, institutions.

The nature of the evidence that the proposals might help

There is a remarkable dearth of solid research about the effectiveness of these proposals to reduce the large stock market volatility we have seen lately. All the proposed measures seem to have going for them is a rough sort of intuitive plausibility. For all we know, adopting them might even increase, not decrease, volatility, or reduce economic efficiency rather than enhance it.

The problem in evaluating these proposals is most importantly the absence of an agreed-upon theory of financial fluctuations. Lacking this and recognizing that any controlled experiment would likely take centuries to provide reliable evidence—we cannot know the effects of the proposals on stock market volatility.

What can we say objectively about these proposals? How can we evaluate, for example, whether margin requirements are effective? One way that has been used in the literature is to regress volatility of stock prices on the level of margin requirements. Such regressions explaining stock price volatility are of some possible value, but will not resolve whether extending high margin requirements to futures contracts will now reduce the volatility. The margin requirement changes may have been in response to changes in other variables, or otherwise correlated with them. Hardouvelis (1988), who has undertaken a careful study by regression methods using U.S. data since 1931, claims to have found that margin requirements help reduce volatility.[10] He attempted to correct for the reverse causation possibil-

10 Official margin requirements were, of course, zero in the part of his sample from 1931 through most of 1934, before the 1934 Securities Exchange Act took effect, and volatility in the stock market was extremely high then. Thus, he finds a spurious "effect" of margin requirements on volatility, when in fact, causality runs from volatility to margin requirements. When he truncates his sample to start in 1935, he finds margin requirements are just barely significant at the 5 percent level. His significance levels are perhaps unreliable, since he corrects for only the 12-month moving average induced autocorrelation of residuals, not the apparent year-to-year autocorrelation that extends further.

ity by including lagged volatility measures and other variables in the regression, on the theory that margin requirements may be set in response to volatility. Including lagged volatility means that he is no longer exploring a link between volatility and margin requirements, but between an incremental unexplained volatility and margin requirements.[11] There is also always the possibility in such multiple regression contexts that the margin requirement enters the regression only because it proxies for something else. For example, Hardouvelis found that the Fed tends to impose high margin requirements when the stock market is high relative to its average value over the past five years. He argued that since high stock prices are associated with low volatility, the apparent effect of margin requirements may be spurious. He attempted to deal with this problem by including stock prices relative to trend in the regressions explaining volatility. But of course if there is any error in his measure of the variables entering the Fed reaction function, the estimation problem may yet persist. If we don't know what enters the Fed reaction function, we have a fundamental estimation problem.

Even if margin requirements do reduce volatility, they may do so in a bad way, by making markets less efficient and slower to respond to genuine information.

Similar difficulties attend efforts to demonstrate the effectiveness of trading halts in reducing volatility. In an effort to evaluate these measures, some scholars have compared the experience of countries that have imposed trading halts with those that do not. For example, the Hong Kong stock market was closed for days in 1987, **and** the drop in stock prices there was slightly greater than in the U.S. However, in considering the effects of world-wide crashes like that in 1987, closing a regional market may not have much significance. People in Hong Kong were probably watching the U.S. market. Such data does little for us in evaluating the effects of a major change in U.S. stock market policy.

In any event, major stock crashes are rare events, whose genesis may well be qualitatively different from normal day-to-day moves in stock prices. There just aren't enough data to tell reliably the effects

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11 With a lagged dependent variable in the regression, a recursive substitution argument shows that he is relating the current level of volatility to long distributed lags of margin requirements and other variables.

of the proposed measures at times of market crashes. More generally, the effects of the measures may depend qualitatively on how people perceive the measures, e.g., what kind of policy stance they think that they signal or what people think the reaction of other people will be to the measures. The effectiveness of the measures may change from time to time if these perceptions change.

As for the proposals to inhibit trading by big traders, the Brady Commission did document the amount of concentration of sales in the hands of big investors. But this concentration was not overwhelming. Moreover, any such statistics do not tell us who is at fault in causing the market crash. The question is why no one stepped in to buy when the market was dropping fast, and why no one bid the price of stocks back up to their former levels within months after the crash. Blame cannot be pinned on any one group.

The efficient markets hypothesis

The only people who really sound like they might know what they're talking about regarding the proposals are those in the efficient markets camp who oppose the proposals. The efficient markets hypothesis, which has been very influential for the last couple decades, asserts that prices "efficiently incorporate all public information" about fundamentals, fundamentals being economic variables that ought by rational calculation to affect securities prices. If prices reflect such genuine information, then the increased volatility we've seen is for good reason, a lot of important information flowing into the market, and ought not to be tampered with.

The efficient markets theorists have long sounded persuasive; there are superficially appealing arguments for the notion and a lot of scholarly statistical work that claims to support it. There is, of course, an important element of truth to the efficient markets hypothesis: it is not easy to get rich quickly, and so any trading rule that is proposed to do this should be eyed with a lot of suspicion. But we must be careful not to overgeneralize from this truth. Suppose that the volatility of stock market prices does vary through time for reasons unrelated to any economic fundamentals. This need not imply that there is a trading rule that will produce rapid wealth with little risk, so that the rule might well be overlooked by many people. One may

indeed find it difficult to even demonstrate at conventional significance levels the statistical significance of the departure from market efficiency.[12]

Recent criticisms of the efficient markets hypothesis

Beginning with papers by LeRoy and Porter (1981) and Shiller (1981), a literature has emerged arguing that financial markets may be too volatile to be accounted for in terms of efficient markets hypothesis. These original papers have been subjected to a lot of criticism (notably by Flavin in 1983, Kleidon in 1986, and Marsh and Merton in 1986). A second generation literature has grown up that is not vulnerable to these initial criticisms.[13]

The excess volatility discerned in these papers has more recently been given a new name by Fama and French (1988). They call it the forecastability of long-period returns. Poterba and Summers (1987) have shown a positive correlation of returns over short time intervals, and negative over long intervals, another characterization of excess volatility of prices.

These papers are rejections of specific efficient markets models, and do not necessarily call into question the general paradigm of market efficiency. But since they do test major specific efficient markets models that people presumed had a lot of evidence going for them, it is certainly appropriate to consider also some non-efficient markets alternatives.

Causes of the current period of high stock market volatility

Much of the public discussion of the current period of high volatility has focused on factors that are unique to the present time, as if the present volatility were unprecedented in history. The premise of many of the recent studies—that we should look only at current events or even just at the time of the crash around October 19, 1987—is faulty.

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12 See Shiller (1979) and (1984), Perron and Shiller (1985) and Summers (1986).

13 See Campbell and Shiller (1988 a,b); Mankiw, Romer and Shapiro (1986); Scott (1985); and West (1987).

Much of the discussion has, in fact, been focused on technological innovations, inventions that altered the environment that one faces in financial markets. There are three such inventions commonly singled out: stock index futures markets, program trading to arbitrage the cash and futures markets, and portfolio insurance.

The stock index futures market, the Standard and Poor Composite Index Futures contract, was established in 1982, and has grown rapidly since. The dollar value of the daily volume on the Standard and Poor Composite Index Futures exceeds the dollar volume of stocks traded on the New York Stock Exchange on most days.

Program trading for index arbitrage links together the stock index futures markets and the cash markets. It is hard to see that this trading should itself be blamed for stock market volatility. Given that we have two different markets for much the same product, someone will arbitrage them to guarantee that one price reigns.

A third factor is portfolio insurance. Portfolio insurance was effectively invented in 1972 when Black and Scholes circulated the first draft of their paper on options pricing (1973). That paper made it very clear how to do portfolio insurance, although the concept was not clearly delineated until Hayne Leland's article (1980). The growth of portfolio insurance took off in the mid-1980s. I argued elsewhere (1988) that the growth of portfolio insurance ought not to be regarded as the normal consequence of a technological innovation, coming as it did so late after the invention. Rather, the popularity of portfolio insurance should be regarded as an investor fad like many other investor fads. It may also be regarded as a symptom of nervousness about the "overpricing" of the market that emerged in the mid-1980s.

All of the above technological innovations probably played a role in the volatility of stock markets in 1987-88, but probably not primarily as innovations per se. Rather, it was the perception that these innovations were influencing markets that contributed substantially to the volatility.

Survey evidence

I have done a substantial amount of survey research (some jointly with Karl Case, William Feltus, and John Pound) to understand investor behavior.

Right after the stock market crash of October 19, 1987, I sent out

questionnaires asking people what they were thinking on that day. I sent out 1,000 questionnaires to institutional investors and received 284 responses. I sent out 2,000 questionnaires to individual investors and received 605 responses.

I interpret my survey results (1987) about the crash on October 19 as indicating that no news event, other than the news of the crash itself, precipitated the crash. Rather, the dynamics of stock market prices seem to have more to do with the internal dynamics of investor thinking, and the medium of communications among large groups of investors is price. In a period when there is a widespread opinion that the market is under or overpriced, investors are standing ready to sell. It takes only a nudge in prices, something to get them reacting, to set off a major market move.

The story told by investors, themselves, on days of big market moves does not bear a very strong resemblance to the story that seems to be on the minds of many advocates of the proposals to reduce volatility. The latter story seems to be one that attributes unusual stock price movements to a small group of investors who are gamblers or risk lovers, and who are vulnerable to sharp swings of optimism and pessimism, euphoria or panic. Discourage them by margin requirements from taking large positions, and we will quiet down the market. Close markets for a while when they are panicking and their composure may return. But it is not clear that the proximate causes of sudden moves of the stock market are the accompanying sudden mood swings among investors. The suddenness is certainly largely due to the fact that investors are trying to outsmart each other, trying to be the first to move. Those investors whose behavior would not be influenced by margin requirements or market closings are perhaps just as likely to act suddenly at a time of a big market move.

Decisions to buy or sell do not seem to be related very strongly to feelings that the market is over or underpriced. In my questionnaire survey of investors undertaken right after the crash of October 19, 1987, I found that about 90 percent of investors who bought or sold on that day, both institutional and individuals, reported thinking the market was overpriced right before the crash. Decisions to buy or sell on October 19 or on preceding days bore very little relation to opinions about over or underpricing of the market.

Professional investors do seem to be using futures markets for speculative purposes. A poll of pension fund managers conducted

by ***Institutional Investor*** magazine **(1985)** asked them why they trade in stock index futures markets. The most common answer was "as a quick and low-cost way to adjust equity exposure in expectation of big market moves," chosen by **55.6** percent of respondents. Hedging or arbitrage played a much smaller role in their activity. Note the wording: "in expectation of" means that they are trying to beat the market and this means they are speculating.

Interpretation

I interpret my survey results about the crash on October **19** as indicating that no news event, other than the news of the crash itself, precipitated the crash. Rather, the dynamics of stock market prices then seemed to have more to do with the internal dynamics of investor thinking. Of course, if people did not communicate, then their changes in thought patterns would not coincide in time. But people do communicate a great deal. There are both a fast mode of investor communication and a slow mode. The fast mode of communications among large groups of investors is through price. Some investors react very quickly to price changes. The slow mode, which tends to set patterns of reaction rather than cause behavior on a particular hour of the day, is interpersonal conversation and the communications media.

The reason that a big stock price drop occurred on Monday, October 19, and not on some other date is likely to be due to the reaction of U.S. investors to the price decline on the previous Friday, October **16.** This preceding price decline was, itself, likely to be a reaction to a price decline on Thursday, October **15,** which was a reaction to a price decline on Wednesday, October **14.** The interesting question is why the reactions tended to build at this time, rather than decline in intensity. The answer to this question may be phrased in terms of the mental set of investors then or to a chance occurrence of other disturbances which caused unusual attention to be drawn to the price declines. One thing is certain: the price declines became a media event that commanded widespread public attention, and part of the answer to this question must concern the behavior of managers of news media.

It is, of course, risky to generalize from a study of the stock market crash to conclusions about the variability of stocks through time. It is also wrong to generalize from research about the aggregate stock

market to reach the conclusion that prices of individual stocks are largely influenced by noise; news about fundamentals and information-based changes in predictions for future earnings probably do dominate price movements for certain individual stocks or other individual financial assets. More research combining notions of market efficiency with behavioral work is needed.

Implications for policy

The above analysis of recent stock market volatility might suggest, since market psychology is taken to play an important role in this volatility, that some policy intervention by the government or the self-regulatory organizations might be a good thing. However, the same analysis does not allow for any certainty about the probable effects of policy. Policies intended to reduce volatility might actually increase volatility; policies intended to improve economic efficiency might hinder it.

Margin requirements on stock index futures discourage certain groups of people equally from buying or selling in futures markets, namely those people who find it difficult to put up margin. It's not clear how these people differ from others who are undeterred by margin requirements. The simple idea behind these margin requirement proposals is that reckless speculators, who might have fueled the bull market just prior to the October 1987 crash, are those who will be deterred from buying. But other effects are possible, and I have not been able to find any objective research to disentangle the possible effects. Imposing margin requirements on futures contracts might also deter others from offsetting the effects of reckless speculators.

The Committee of Inquiry appointed by the Chicago Mercantile Exchange to study the crash asserted in its Preliminary Report that comments about higher margin requirements on index futures would have made the October 19 crash worse. The report said,

> The largest amount of selling, as we have seen, was by pension funds, trusts, and other institutional portfolio holders . . . these institutions do not operate with leverage and could generally meet even very large margin

> requirements. Increased margins would affect primarily the individual speculative accounts and these . . . were actually net buyers by and large on both days (October 19 and 20).[14]

Whether or not this analysis of the effects margin requirements would have had then is convincing, it does show the difficulty of the questions involved in judging what the effects of increased margin requirements would be.

Putting higher margin requirements on stock index futures means that the speculation may be less "quick and low cost". This might mean that the market would tend to be stabilized. But it could work the other way. Futures markets are also used in order to prevent other activities of portfolio managers from affecting their overall equity position. In the ***Institutional Investor*** poll, ***14.8*** percent of respondents reported that they use the futures markets "as an occasional hedge against active managers' portfolios," 29.6 percent "as a hedge against equity holdings that have to be liquidated in changing overall asset mix," and 18.5 percent "to maintain equity exposure during transitions, while new managers are being selected or getting their cash allocations invested." These investors are using stock index futures to ***offset*** the effects of their decisions on their overall demand for equities. Making it harder for them to do this would tend to exacerbate market volatility. Which of these effects will predominate if higher margins on index futures are instituted? No one knows.

In fact, it seems that the kind of judgment error that a "bull market" like that of the late 1920s or the late 1950s-early 1960s represents may not be just to expect that the aggregate market will continue to go upward. Most investors are not investing just in index portfolios; most are picking specific stocks that strike them as good investments. Periods of great enthusiasm for stocks may be periods when people are very interested in picking individual stocks, and confident of their own abilities to make such choices. One is attracted to a speculative position not just because one thinks the aggregate market will go up, but also because one has an exciting investment

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14 See **Miller et.al. (1987).**

concept that one wishes to pursue. Some people will try to offset their individual investments with futures markets sales, so as not to raise their overall equity exposure too much. Therefore, any discouragement from dealing in futures markets might possibly make speculative bubbles more prominent than otherwise.

Of course, policymakers must decide on a response to the market volatility now, and are forced to rely on poorly informed judgments as to the probable effects of policy. In the future, the accumulation of research from both a conventional and a behavioral standpoint may help their judgments become somewhat more informed.

Appendix: Data Sources (Monthly)

A. Speculative Prices

Stock Prices,: The Standard and Poor Composite Index, monthly average starting 1918; before that, based on midpoint of high and low prices for individual stocks for the month.

Commodities Prices: CRB (BLS Formula) Spot Market Index, Raw Industrials, Commodity Research Bureau, Inc., 1967=100, monthly, not seasonally adjusted.

Exchange Rate: Monthly average of Daily US/UK exchange rate, cents per pound, not seasonally adjusted.

Bond Yields: The Moody AAA Corporate Bond Yield Average.

B. Background Economic Variables

Industrial Production: Industrial Production Total Index, 1967=100 seasonally adjusted, Board of Governors of the Federal Reserve System.

Short Interest Rate: 6-month prime commercial paper rate (4-6 month before November 1979) bank discount rate, Board of Governors of the Federal Reserve System.

Price Level: Producer Price Index, all commodities, not seasonally adjusted, 1967=100, U.S. Department of Labor, Bureau of Labor Statistics.

Housing Starts: New privately owned housing units started, thousands of units, U.S. Department of Commerce, Bureau of the Census. Data for years 1946-58 represent nonfarm housing starts, 1959 includes farm and nonfarm housing starts.

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