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Portfolio Insurance and Other Investor Fashions as Factors in the 1987 Stock Market Crash

October 19, 1987 saw by far the biggest one-day price drop in U. S. stock market history. The price drop was about the same in percentage terms as the *two-day* drop of October 28–29, 1929. In asking what happened in the 1987 crash, the first question should be: What unusual factors in 1987 made the market vulnerable to such a crash? Analysis should begin by asking what was significantly different about 1987; *something* must have been unusually different when compared with other years to allow this to happen. There is probably not an explanation in terms of a single factor alone, but one would think that a few major factors could be identified as exceptional in 1987 when compared with other years.

Probably the most commonly cited and superficially convincing explanation concerns portfolio insurance in financial markets, which had been growing rapidly in importance over the few years before the crash. Of the various reports on the stock market crash, that of the Presidential Task Force on Market Mechanisms (Brady Commission) [1988] gave the greatest importance to portfolio insurance in causing the crash.¹ In their “executive summary” [1988, p. v.] they said that:

The precipitous market decline of mid-October was “triggered” by specific events: an unexpectedly high merchandise trade deficit, which pushed interest rates to new

1. The Brady Commission defined portfolio insurance with the words: . . . ‘portfolio insurance’ is designed to allow institutional investors to participate in a rising market yet protect their portfolio as the market falls. Using computer-based models derived from stock options analysis, portfolio insurance vendors compute optimal stock-to-cash ratios at various stock market price levels. But rather than buying or selling stocks as the market moves, most portfolio insurers adjust the stock-to-cash ratio by trading index futures.” [1988, p. 7].

high levels, and proposed tax legislation which led to the collapse of the stocks of a number of takeover candidates. This initial decline ignited mechanical price-insensitive selling by a number of institutions employing portfolio insurance strategies and a small number of mutual fund groups reacting to redemptions. The selling by these investors, and the prospect of further selling by them, encouraged a number of aggressive trading-oriented institutions to sell in anticipation of further market declines. These institutions included, in addition to hedge funds, a small number of pension and endowment funds, money management firms, and investment banking houses. This selling, in turn, stimulated further reactive selling by portfolio insurers and mutual funds.

The mechanism they referred to has been called a "cascade effect." An initial price decline starts a vicious circle by causing portfolio insurers to sell, causing further price declines, causing portfolio insurers to sell again, and so on. More sophisticated information-based theories resembling these cascade theories, which collapse the successive stages of the cascade simultaneously, have been offered by Sanford Grossman [1987] and Hayne Leland [1987].

Other major studies of the crash seemed to give less prominence to portfolio insurance as a cause of the crash, but nonetheless described it as an important factor. For example, the Securities and Exchange Commission [1988] concluded that "futures trading and strategies involving the use of futures were not the 'sole cause' of the market break," but were "a significant factor in accelerating and exacerbating the declines."

1. *Portfolio Insurance as a Force in Financial Markets*

Why do these studies conclude that portfolio insurance was an important factor in the decline on October 19 1987? Figures cited in support of this argument are the percent of volume accounted for by portfolio insurance. The Brady Commission [1988, p. 36] estimated that for October 19, 1987:

Out of total NYSE sales of just under \$21 billion, sell programs by three portfolio insurers made up just under \$2 billion . . . In the futures market, portfolio insurer sales amounted to the equivalent of \$4 billion of stocks, or about 34,500 contracts, equal to over 40 percent of futures volume, exclusive of locals' transactions; \$2.8 billion was done by only three insurers.

But in what sense is portfolio insurance likely to be a cause? What is ultimately new and different that has caused institutional investors to adopt portfolio insurance schemes?

Portfolio insurance does represent a *technological* innovation. The inno-

vation was the development of the theory of dynamic trading strategies. These strategies allow investment managers to create, under certain assumptions, various instruments that may not be traded, or traded subject to large transactions costs or regulations. Such strategies allow us to create a European put on a stock index. Technological advances are factors that we ought to consider first in trying to understand changes in human behavior. Technological advances are sudden and irreversible, and may eventually impinge upon nearly everyone. In contrast, if there are changes in tastes or opinions, these changes may often affect only subgroups of the population and may be transient.²

The technological advance represented by the invention of portfolio insurance as we know it can be dated from the Black-Scholes option pricing paper [1973], which showed how to create a synthetic option by a dynamic trading strategy involving a share of stock and cash. The term “portfolio insurance,” referring to a dynamic trading strategy, apparently appears first in print in an article by Hayne Leland in 1980.³

Portfolio insurance, because of the rapid growth of its adoption by institutional investors just before the crash, does qualify as something unique to 1987. It ought to be explored in the search for an explanation for the very different behavior of the market in that year. However, the technological advance represented by dynamic trading strategies is not of the kind that would seem to create changes in investor behavior of sufficient magnitude to cause something like the stock market crash we observed. Ultimately, the technological advance allows us to *optimize* our trading strategies. But even without any knowledge of the theory of dynamic trading strategies, an intuitive portfolio manager with the same objectives might well roughly *approximate* such portfolio strategies, though not optimally.

What the dynamic portfolio strategies tell you to do if you want a floor on the percentage loss on your portfolio is to sell stocks when the price goes down, to reduce your exposure to total risk. One hardly needs a computer to know that selling stocks will indeed reduce one’s exposure. When you get down to it, the invention of portfolio insurance is a considerably less breath-taking achievement than many people seem to think. The inventors

2. Other innovations that might be described as technological are the creation in 1982 of index futures markets themselves and the institution in 1984 of the SuperDot system on the NYSE that allows sellers to sell a basket of stocks quickly and efficiently. These innovations created a new market for baskets of stocks, and allowed efficient arbitrage between this new market and the NYSE.
3. The term ‘portfolio insurance’ had been used before 1980 to refer to insurance policies against default on bonds and to insured mutual fund redemption value programs, though apparently without the current association with optimal dynamic trading strategies.

of portfolio insurance themselves have, in fact, noted that the insurance may be described as nothing more than a rationalization of policies already in existence. Leland [1980, p. 582] wrote that:

Some 'rules of thumb' such as 'run with your winners, cut your losses,' and 'sell at a new high, buy at a new low,' will be shown to approximate the optimal dynamic trading strategies for certain types of investors.

It would appear that the theory of portfolio insurance should be significant in a way that is similar to Bayesian statistics. Bayesian statistics offers an attractive theoretical foundation for mathematical statistics, but in practice has not led to major changes in the way most people do statistical inference. The reason seems to be that people do not know what their priors are, nor what their loss functions are. By analogy, one would expect that the theory of portfolio insurance would have limited impact because people do not know what assumptions to make about the random character of asset returns, nor do they know just what they want to optimize.

Since portfolio insurance is just a rationalization of practices already used in the market, we should not use figures on percent of volume accounted for by portfolio insurance as measures of the impact of the invention of portfolio insurance. It may well be that institutional investors who adopted portfolio insurance are ones who would have done something similarly anyway in the absence of the new portfolio insurance schemes. In that case, the only change wrought by portfolio insurance would be the professionalization of activities already undertaken, some fine-tuning of the activities.

By professionalizing and quantifying a practice that was formerly intuitive and judgmental, portfolio insurers may actually be allowing other players in the market to have a better understanding of how to profit from any market irregularities caused by this behavior, and thereby to offset them. Indeed, the "tactical asset allocation" systems developed recently are often described as the opposite of portfolio insurance and as offsetting the effects of portfolio insurance.

The institution of portfolio insurance may make visible in a new way certain behaviors that had been already around, or behaviors whose importance had increased in 1987 independently of the invention of portfolio insurance. Stop-loss behavior has indeed been around a long time, as suggested by the age of such institutions as stop-loss orders or puts on individual stocks. Portfolio insurance appears even in 1987 still to have been a small part of stop-loss behavior among investors. My own questionnaire survey [1987] of investors right after the crash confirms this. Of all

institutional investors, 10.2 percent claimed that they had some form of stop-loss policy, but only 5.5 percent said they used portfolio insurance. Of wealthy individual investors, 10.1 percent also had stop-loss policies; certainly not explicit portfolio insurance schemes.

Of course, the volume of portfolio insurance selling on October 19 may also reflect that stop-loss behavior increased as a result of the publicity that portfolio insurance had received, and of the publicity campaign launched by entrepreneurs who found a new way, by selling portfolio insurance, to profit from such stop-loss behavior. If this is so, then portfolio insurance is best thought of as an investor fad that, like other fads, has caused an important change in investor behavior. Since the change is not best thought of as the result of a technological innovation, its effect is likely to be transient or to be transformed so that it cannot be predicted by the original optimizing models that initially gave rise to the fad.

2. Portfolio Insurance as a Fad

The dynamics of such a fad might then be best understood in terms of the kinds of contagion models that sociologists have used to explore fads and rumors (e. g., Bartholomew [1982]). The speed with which a fad develops depends on an "infection rate," the rate at which news is spread, and a "removal rate," the rate at which people stop spreading interest. John Pound and I [1987] have attempted to learn by survey about the parameters of this process for individual and institutional investors.

The number of references to portfolio insurance in the literature has been roughly growing exponentially, as would be suggested by contagion models where the epidemic is in its early stages. A computer search using ABI/INFORM (a data base of business periodicals) showed one reference to portfolio insurance in 1980, one in 1981, none in 1982, 1 in 1983, four in 1984, six in 1985, 41 in 1986, and 36 in 1987 before the crash. (In the three months following the October 19 crash there were 29 references.)

This apparent learning curve in portfolio insurance is hardly what one would expect from models in finance that depict investors as following complicated optimization strategies, and responding instantaneously to information. If investors were responding instantaneously to information, we should have seen portfolio insurance come in with a bang in 1972 (when first drafts of the Black-Scholes paper were circulated, and when it was very clear how to create a synthetic option). Of course, the SuperDot system was not available then, nor the index futures markets, but the basic idea of portfolio insurance could have been (and has been) implemented without these. One trades in stocks, rather than futures and adopts more widely-spaced trigger points, reflecting the higher transactions costs.

3. *Other Social Trends at Work in Producing the Crash*

If the growth of portfolio insurance is due to a fad, then portfolio insurance should have no more than equal standing, *a priori*, as a candidate explanation for the crash among all the other fads and fashions in investor thinking and behavior that are less quantified or tangible.

As with most economic analysis, when we are not dealing with a technological innovation it is going to be very hard to pin down what are the *exogenous* shocks that drive the stock market. We can however note some phenomena that correlate with movements in the stock market, phenomena that are suggestive of the nature of the exogenous shocks.

In my questionnaire survey [1987] of investors right after the crash, I asked some open-ended questions, asking people to give their interpretations of the crash itself, and I asked those who said they thought they could forecast the market why they felt they could do so. In the answers, I was struck at how often people, both individuals and institutional investors, said that they had an intuitive or gut feeling about the future course of the market. Some personal sense of perspective that people find difficult to articulate seems to be behind individual opinions.

A theme in the popular press that appeared frequently before the crash was that the bull market had gone on a long time, that the market was overpriced, and that there were varying opinions of whether or not it would soon end. Charts of stock prices before the crash were interpreted as showing a continuing bull market since 1982. "When will it end?" was the question. This question had the effect of framing issues so as to suggest that a definitive reversal might come.

A crash theme had wide currency in popular discourse before the actual crash in 1987. Let me begin with an anecdote. The October 1987 issue of *The Atlantic*, on display on newsstands at the time of the crash, had the following in big bold letters on the cover page: "America is about to Wake Up To a Painful New Economic Reality, Following the Biggest Binge of Borrowing and Spending in the History of the Nation." These words introduced Peter G. Peterson's article in that issue, "The Morning After." In the table of contents, the following abstract appeared:

Any way one looks at it, the arithmetic is cruel and inescapable: the consumption binge of the 1980s has inflicted enormous damage on the U. S. economy, and we are about to be punished for it. Whether a crash can be avoided remains to be seen.

That this anecdote indeed reflects a theme of some currency in investor attitudes is revealed in my survey of investors right after the crash. I asked at one point for respondents to rate on a one to seven scale how important each of various news stories "was to you personally on October 19" (out of

a list of the top ten news stories that I found on October 19 and the preceding week), and at the end of the list of news stories was the category "other" with a space to fill in a news story not on my list. I classified the answers to the "other" question into themes, and the most common single theme was a "too much indebtedness" theme, mentioned by 33 percent of the 90 individual investors who wrote something and 20 percent of the 55 institutional investors who wrote something. In contrast, I found that not a single individual investor from the 605 respondents and only three institutional investors from among the 284 respondents mentioned the news story singled out by the Brady Commission (in the executive summary quoted above) as one that triggered the market crash—the "proposed tax legislation which led to the collapse of the stocks of a number of takeover candidates."

Let us consider one more anecdote. Ravi Batra's book *The Crash of 1990* was a best seller in 1987. Should we regard the timing of this success as a coincidence? Why did this book strike a sympathetic chord at this time? Publishers find it hard to predict which books will become best sellers. For unknown reasons, his book sounded plausible to many readers. My survey provides concrete evidence that crashes were very much on people's minds just before the crash. In my survey, about a third of all individual investors and a half of all institutional investors reported thinking or talking about events of 1929 on the few days *before* the crash.

4. Conclusion

I asserted at the opening of this paper that analyses of the crash of 1987, and of circumstances that allowed a stock market crash of such magnitude to happen then, ought to start out by seeking factors that made 1987 significantly different from prior years. It is possible, of course, that the year was unusual in that a *number* of factors all chanced to work in the direction of increasing volatility, but it is still helpful to discuss what may have been most important.

Cascade effects of portfolio insurance might be one important factor, but the simple story does not settle the issue, as the Brady Commission report suggests. I have emphasized here an alternative factor that has not been mentioned except as an aside in the major studies, and might well be more to the point than the cascade story. The additional element is the peculiar mind set of investors, caused partly by the public interpretation of the unusual conformation of price rises over the past five years. We might describe this mind set as an increased awareness of the possibility of a crash. It may, in fact, be an important cause of the popularity of portfolio insurance.

The mind set of 1987 appears to be associated, at least in the United

States, with views about borrowing, the government debt, and the *perception* that portfolio insurance was affecting markets. One cannot know if these associated perceptions caused awareness of the possibility of a crash, or whether they are just views expressed by business leaders reacting to the sustained bull market and the market's consequent 'overpricing'.

In contrast, the *proximate* cause of the crash on October 19 appears to be a response to price declines. The big price declines in the preceding week left people wondering: Is this "it"? Because of their unusual mind set, many responded to price declines this time by assuming "it" was happening.

Some will naturally object that if such a simple explanation of the crash were right, then we should have been able to predict the crash. That would be the wrong conclusion; evidence for a particular kind of thinking among investors may well predict the volatility of the market, but not necessarily predict the day of the crash or the magnitude of the biggest one-day decline.

It probably sounds convincing that any socially transmitted mental set for interpreting price movements (in particular an increased awareness of the possibility of a crash), marks a really important difference between 1987 and earlier years. It is possible that what was unusual about 1987 was essentially unrelated to such a popular mind set. It is conceivable that people were reacting to prices and other information no differently in 1987 than in other years, but that their unchanging behavior tended to produce widely-spaced crashes randomly, in response, perhaps, to a pattern of price movements that rarely occurs as a result of random decisions of market participants. That this may be so is suggested by the experiments of Vernon Smith and his colleagues [1987, 1988]. In their experiments, subjects traded with each other via computer terminals and were unable to communicate except indirectly through their buying and selling decisions. Sometimes bubbles appeared in these experimental markets, sometimes not, and yet the "fundamentals" and social environment were always the same.

The importance of social-psychologically induced changes in mind set in producing market crashes has not been established because psychological factors have not been properly measured. Research must be undertaken on a continuing basis in order for us to understand the sociology of major market moves (and everyday moves as well). One barrier to such research is the division of expertise among the social sciences. Most economists and market analysts are reluctant to undertake such work because they are unfamiliar with research methods used by sociologists, anthropologists, and social psychologists; methods such as surveys, content analyses, and experiments in small groups. These social scientists, on the other hand, find it difficult to undertake such research because they are unfamiliar with the economic theory and cannot handle the very important rational and

optimizing component to behavior in financial markets. It is difficult to coordinate research among researchers who use very different methods and who would have to educate each other before research could proceed.

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Discussion

Stock Market Crash

Albert Kyle reported evidence on the breakdown of trading that occurred in the market after 12:30 on October 19. There were many unexploited, near arbitrage opportunities. For instance, he cited extended differences between cash and futures prices for the Standard and Poor's (S&P) Stock Index. He also stressed that during the week following the crash, prices were very volatile. For example, the price swings in the S&P 500 stock

futures index were as volatile on October 20 as they typically would be over the course of one year.

Robert Hall responded by arguing that the volatility and non-functioning of the market as highlighted by Kyle did not appear to be a causal factor of the crash. As he put it, "If a strategic terrorist attack had disabled the market for a week, and this was all that happened, then we would not have expected prices to necessarily move up or down." So, in his view the high volume that may have subsequently disabled the market can be separated from the impulse that started the crash. This observation led Stanley Fischer to question whether or not the market congestion after the crash directly affected the price at which the market finally stabilized.

Although no one offered an explanation as to why the crash actually took place on the nineteenth, as opposed to the sixteenth or the twentieth, many people suggested explanations of why such a large one day drop was possible. David Romer sketched a model of how a market made up of rational, imperfectly informed small agents might undergo a free fall. In his model, each agent guesses the (future) price of the market using the current market price and her own information. In this type of world, even though individuals may doubt the market price, they place little weight on their own beliefs. Once the price decline begins, the agents might revise their beliefs, see that others shared the same skepticism, and the plunge is on. As Albert Kyle noted, the advent of portfolio insurance may have expedited the learning by quickly absorbing the buy orders that supported the market. Kenneth French pointed out that in fact little portfolio insurance was actually exercised, and that the phenomena of decline was also associated with a number of sell orders that were placed at very low prices.

Benjamin Friedman also wondered whether an explanation based on crowd psychology was possible. He noted that managers of large investment funds have strong disincentives to deviate from each other's patterns; these managers are rewarded on a "double-relative" basis, where they are compared to each other, rather than some absolute standard. He was surprised that none of the panelists focused on these facts as important background elements of the crash.

Robert Merton suggested that the role of technology should not be overlooked. He drew an analogy between today's financial system and the situation that would have prevailed if today's air traffic load had been pushed onto the air traffic system of 20 years ago. For instance, he pointed out that Fidelity was a major seller and that it was likely that many of their sell-orders were generated using a relatively new 24-hour touch-tone order system. Previously, the same volume of orders could not have been placed. He argued that technology, broadly defined, had fundamentally changed the way the market operated and effectively introduced a new form of

uncertainty into the system. Given a change in the level of uncertainty, real effects should be expected.

He speculated that one real effect was that some members of the investment community became reluctant to continue participating in the markets. He felt that the use of portfolio insurance meant that there were times when no one was willing to take the other side of automated transactions. Fischer Black responded that this should lead to reduction in the use of portfolio insurance. Merton said that this would only be a short-run solution, that the longer-term imbalance was still there; closing the market 20 years ago, so that the back rooms could catch up, was an analogous short-term solution to a longer-term problem that now has been corrected.

Several other people questioned whether the real effects from the crash were as big as would have been expected in October. Martin Eichenbaum felt that quantity choices by firms do not seem to have changed. James Poterba agreed, citing evidence from a Dun and Bradstreet survey that found that very few firms have decided to change their capital investment plans as a result of the crash. Stanley Fischer pointed out that since the Stock market was at roughly the same level in January 1987 and 1988, the Dun and Bradstreet evidence was not necessarily an indictment of the q theory of investment, so long as firms planning is not done continuously.

The session closed with each panelist stating whether or not they felt limits rules on price fluctuations would have made a difference. Fischer Black said he changed his mind on this point as a result of the preceding discussion, and now thought that they might have helped by keeping more people in the market. Kenneth French disagreed, feeling that the regulation would have not helped, but more likely would have been a hindrance. Robert Shiller felt that limits might help one time, but the next time trading was closed a shadow market would be in place and trading would continue elsewhere.