

Comments on the Market Crash: Six Months After

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Six months after the market crash of October 1987, we are still sifting through the debris searching for its cause. The most likely antecedent, very significant new news, is difficult to find. Most of the negative news often cited, such as the rising federal budget and balance of payments deficits, should have been well digested by the market before October 19. With hindsight, it now appears that, unlike the October 1929 crash, the 1987 crash did not presage a general economic decline.

However, one piece of news, the prior behavior of the market itself, was new. In the second week before the crash, the S&P 500 index had fallen 5.2 percent. This decline accelerated in the week preceding the crash when the index fell 9.2 percent culminating with one of the largest one-day declines on record (and the largest in terms of Dow Jones Industrial Average points) of 5.2 percent on Friday, October 16. The market had suddenly exhibited a jump in volatility. This was mirrored in the volatilities implied by the market prices of S&P 500 index options, which increased from 22 percent per annum on October 15 to 30 percent at the close on October 16. Over the weekend, many investors were absorbing the fact that market volatility had at least temporarily increased. Under these conditions, the nervousness of some small investors surfaced in the form of mutual fund redemptions. If you had called one large mutual fund, which offers a telephone transfer service, you would have found the telephones busy at 11:00 p.m. Saturday night. With foreign markets, which begin trading prior to the NYSE, opening down early Monday morning (–2.5 percent in Japan and –10 percent in London), the stage was set for something dramatic.

Unprecedented order imbalances in several large stocks delayed openings on Monday in some cases for as much as two hours. The S&P 500 December futures contract, a much more sensitive barometer of the market under these conditions than

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the S&P 500 index itself, gapped open down 6.5 percent. By that measure the market had already declined by more than on any date since the 1929 crash and the day was just starting. As the 19th wore on, investors witnessed symptoms of market failure and were frightened by rumors that the NYSE would close. They also worried that other investors had come to believe the market was overvalued. Fear fed upon fear as investors en masse rushed to sell their stocks. By the end of the day, the S&P futures contract closed down 29 percent and the S&P index closed down 20 percent on NYSE volume of 604 million shares valued at over \$20 billion. This is a story that belongs as a new chapter in Charles Mackay's *Extraordinary Popular Delusions and the Madness of Crowds*.

But is that what happened? Perhaps, as the Brady Commission report argues, what would have been a relatively minor decline was turned into a rout by the orders of just a few large traders, many of whom were portfolio insurers. These traders use computerized strategies which dictate buying after the market rises and selling after the market declines. The extreme version of this argument maintains that portfolio insurance first pushed the market up because the "insured" investors were willing to buy more stock since they had planned for systematic sales in market declines.¹ In other words, they could afford to take greater risks in rising markets because portfolio insurance offered a disciplined way of avoiding risk in declines. According to this argument, this additional demand in the year prior to the crash accounted for a good part of the 1000 point rise in the Dow Jones Industrial Average.²

Then, as the market went into decline, the insurers began to unwind their positions forcing the market in reverse. But, this time the amount of capital devoted to portfolio insurance strategies had reached a critical mass of about \$60 to \$80 billion, enough for portfolio insurance sales to fuel themselves. With the sudden fall in the market during the last half hour of trading on October 16, many insurers found themselves with an overhang of unfilled sell orders going into Monday. In addition,

¹"The rapid rise in the popularity of portfolio insurance strategies also contributed to the market's rise. Pension fund managers adopting these strategies typically increased the funds' risk exposure by investing more heavily in common stock during this rising market. The rationale was that portfolio insurance would cushion the impact of a market break by allowing them to shift quickly out of stocks." *Report of the Presidential Task Force on Market Mechanisms*, January 1988, page 9.

²Even if one believes that portfolio insurance was a major factor in the precipitous decline of the stock market, we believe it is stretching the imagination too far to extend this theory to explain the market rise in the year preceding the crash. To put the Brady Commission claim in perspective, consider that only \$60 to \$80 billion was being applied to systematic portfolio insurance strategies. Of this, at most \$10 billion at the market peak in August 1987 represents additional commitment to stock by insurers over and above what they would have invested if they had followed their original asset allocation approaches. Indeed, many insurers were implicitly less invested in equities than they otherwise would have been because many simply added a futures insurance umbrella while leaving their cash market asset allocation unchanged. In addition, many insurers had restarted their policies (thus reducing their commitment to stocks) during the market rise to "lock in" gains. All in all, the additional investment in equities due to portfolio insurance at the peak of the market must have been less than 1/3 of 1 percent of total market capitalization. It is very difficult to believe that such a small amount of buying power, based as it was on a passive informationless strategy, could push the DJIA up over a period of a year even 50 points, let alone the total actual increase of about 1000 points.

several smart institutional traders knew about this overhang and tried to exit the market early Monday before the insurers could complete their trades.³ The conjunction of these sell orders arriving nearly simultaneously in the market created the unprecedented opening gap. As the insurers sold and market prices fell, the computer programs of other insurers then triggered further sales causing further declines which in turn caused the first group of insurers to sell even more stock, etc. This in turn generated other sell orders from the same sources and the market experienced the computer-driven meltdown, just as had been predicted a few months earlier by the chairman of the New York Stock Exchange.

An extension of this point of view takes account of the most significant change in U.S. stock markets in the 1980s: Many large investors (not just portfolio insurers) now trade very large blocks of stock or index futures on short notice while the net liquid assets of floor traders has not kept pace. In large part, the willingness to make large trades is due to reductions in the cost of trading following the May 1, 1975, switch from fixed to negotiated commissions. Here are some interesting statistics. The 1986 annual share trading volume on the NYSE had grown 7-fold since 1975. The 1987 share turnover on the NYSE had reached 73 percent, $3\frac{1}{2}$ times greater than in 1975 and block trades represented 50 percent of traded shares, about 3 times greater than their share in 1975. In addition, the introduction of index futures in 1982 and index options in 1983, as well as new technology-based methods of programmed trading, have increased the ease with which portfolios of stocks can be traded as a group. On the other hand, during this period, the net liquid assets of NYSE specialists, as a percent of the dollar value of NYSE trading volume, had fallen by 1986 to one-third of its 1977 level.⁴ In this new environment, it becomes easier for exchanges to become overwhelmed with orders on one side of the market.

Plausible as these two theories of the crash sound—one based on a market panic and the other based on large trader transactions—as we search through the wreckage, we come across other evidence that is difficult to reconcile. Here is a brief list: the crash was international in scope; the U.S. stock market continues to experience a significant increase in volatility, even at a six-month remove; and bid-ask spreads in the stock market remain much greater than before the crash. Most jarring, the U.S. market remained within 1.3 percent of its Black Monday close one week after the crash and has still, as this is written six months later on April 18, 1988, not significantly rebounded. If the crash were caused by either of our two explanations,

³“The activities of a small number of aggressive trading-oriented institutions...posed the prospect of further selling pressure on Monday. These traders could well understand the strategies of the portfolio insurers and mutual funds. They could anticipate the selling those institutions would have to do in reaction to the market's decline. They could see those institutions falling behind in their selling programs. The situation presented an opportunity for these traders to sell in anticipation of the forced selling by portfolio insurers and mutual funds, with the prospect of repurchasing at lower prices.” *Report of the Presidential Task Force on Market Mechanisms*, January 1988, page 29.

⁴For example, the specialist in IBM has capital of \$20 million, representing less than .2 percent of IBM's total stock value of \$13 billion. This is well in excess of the revised post-crash requirements imposed by the NYSE which would only require, in the case of IBM, a holding of .014 percent.

many economists would have expected more of a correction back to pre-crash conditions by now.

In a recent UCLA working paper entitled "Portfolio Insurance and Financial Market Equilibrium," Michael Brennan and Eduardo Schwartz start with a "standard" financial market equilibrium model, inject portfolio insurance investors, and ask, given realistic parameter estimates, how much market volatility would be affected. The standard model is a single-period pure exchange economy with continuous trading during the period but consumption only at the beginning and end. Prices are determined by a representative rational risk averse investor with an additive utility function in current and future consumption who assumes his decisions have no influence on prices. After subtracting current consumption, expectations about end-of-period aggregate wealth evolve according to geometric Brownian motion according to a known drift and variance. A representative portfolio insurer is added to this structure and treated as a "pure automaton" who blindly follows a portfolio strategy, known to the other market participants, which yields an insured position on the market portfolio.

Brennan and Schwartz show that for levels of portfolio insurance as high as 5 percent of total market capitalization, while portfolio insurance trades do increase market volatility, the additional volatility is negligible. The actual amount of assets under systematic portfolio insurance at the end of the second quarter of 1987 was between \$60 and \$80 billion dollars, which compares to a total U.S. equity market capitalization of \$3.6 trillion, or about 2 percent. Compared to total market capitalization, including corporate bonds, non-corporate real estate, and other assets, this percentage would be less than .5 percent. That portfolio insurance or even large trades from other investors could create a single-day 20 percent equity market decline in the absence of significant negative news, even without the other surrounding related events we have mentioned, is wildly at variance with the predictions of standard financial models of equilibrium. To be specific, in the absence of significant news, sales by portfolio insurers should be matched by purchases by other investors who are willing to bear more risk to take advantage of the higher expected returns from somewhat reduced prices. On October 19, it is estimated that portfolio insurance trades in S&P 500 index futures and NYSE stocks amounted to only \$6 billion out of a total of \$42 billion. In contrast, in the standard model, few other investors would have been selling along with the portfolio insurers. Had this happened, October 19th would have probably been just an ordinary day in stock market history.

If we are to believe the market panic theory or the Brady Commission's theory that the crash was primarily caused by a few large traders, we must strongly reject the standard model. That model is based on three important assumptions: (1) rational investor expectations, (2) continuously functioning markets, and (3) continual optimization by all investors.

With rational expectations, in which all investors are fully aware of the strategies followed by portfolio insurers, smart institutional traders could not have expected to profit from front-running. Contrary to rational expectations, investors may have overreacted because they were uncertain about the amount of trading that would be

generated by portfolio insurance. Or they may have interpreted the portfolio insurance trades as information-based, when instead these trades were merely reactive to changes in market prices.

Instead of continuously functioning markets, large sales created an imbalance between supply and demand which led to temporary stock-by-stock closures. This made investors fear that the market mechanism would fail entailing bankruptcies, clearing firm failures, and a total market closure. Understandably, panic could have ensued.

Finally, and most important, contrary to our models, most “investors” have other things on their minds besides the securities markets. Most investors have better things to do; they work during the day and spend time with their families in the evening. Most investors don’t know what stocks are worth, tacitly leaving this valuation up to a small set of professional investors. But only a subset of these stand ready to make active investment decisions. All this means that for the purpose of explaining stock price movements, the stock market should be treated as much smaller than the \$3.6 trillion quoted earlier.

The visible breakdown of these three assumptions on October 19th may also help explain the related events surrounding the crash. The U.S. market did not rebound because there may be only a few truly “valued-based” investors who are willing to put their money down. Most investors are on the sidelines, implicitly confessing incompetence when it comes to security valuation, themselves confused about whether the crash could reflect a fundamental weakness in the economy. To the extent stocks take value from their perceived liquidity and to the extent the events of the week of October 19th revealed that the market was not as liquid as people believed, stocks are not worth as much today as they were prior to the crash. With thinner markets and with heightened uncertainty stemming from concern over rational expectations and the viability of market mechanisms, price volatility and bid-ask spreads have remained much higher than prior to the crash.

While it is difficult to distinguish between the market panic or large trader theories (and they are hardly mutually exclusive), we believe the evidence favors emphasis of the former. The crash of 1987 was not the first. Many nonequity markets, as well as the U.S. stock market itself on previous occasions and all major foreign stock markets during October, have crashed without investors following systematic portfolio insurance. In many of those cases, a cascade of stop-loss orders, an informal type of portfolio insurance, was a contributing factor. To place systematic portfolio insurance in perspective, an October 19, portfolio insurance sales represented only .2 percent of total U.S. stock market capitalization. Could sales of 1 in every 500 shares lead to a decline of 20 percent in the market? This would imply a demand elasticity of .01—virtually zero—for a market often claimed to be one of the most liquid in the world.

Acceptance of the market panic or large trader theories has important implications for both market regulation and the standard model. The sources of breakdown in the standard model each point clearly in the direction of corresponding regulatory mechanisms. Problems deriving from irrational expectations suggest improvements

such as formalized “sunshine” trading which permit investors to distinguish between information-motivated and informationless trades.⁵ The potential of discontinuously functioning markets suggests supplementing our current market-making systems with more frequent single-price auctions with open limit order books. Inertia by most investors holding stocks suggests mechanisms which enlarge the scope of the market to involve greater numbers of investors by improving coordination between underlying and derivative markets and increasing global market integration. Unfortunately, regulatory discussion has centered around “circuit breakers” which are largely at cross-purposes with these objectives.

The standard model must itself be seriously flawed. Even if we can only detect its failure during rare events like October 19th, these events make us suspect the model even during normal times. In addition, enough money changes hands during these rare events that they become much more important in the long run than their frequency alone would indicate. We need to build models of financial equilibrium which are more sensitive to real life trading mechanisms, which account more realistically for the formation of expectations, and which recognize that, at any one time, there is a limited pool of investors available with the ability to evaluate stocks and take appropriate action in the market.

⁵ In a sunshine trade, an investor attempts to preannounce his trading intentions (his identity, order size and timing) several hours prior to the actual trade hoping to deepen the market during the time his trade takes place. Presumably, only non-information based orders would be filled in this way. To formalize this, an exchange would allow posting of sunshine trades on bulletin boards or computer screens on the exchange floor and notice of sunshine trading intentions would be carried via computer to broker-dealers around the world.