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THE STOCK MARKET CRASH OF 1987: WHAT ALL THE FUSS WAS ABOUT?

Merton H. Miller and Mark L. Mitchell*

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Abstract

* University of Chicago and Harvard University, respectively. We thank Larry Berlin for excellent research assistance. Mitchell thanks Merrill Lynch for financial support.

I. Introduction

On October 19, 1987, the U.S. stock market experienced the largest one-day decline in its history —the S&P 500 declined 20.5%. The massive decline did not occur solely in the U.S., as stock markets in some countries realized larger relative declines in value. The stock market crash led to a great outcry by the financial press, practitioners, and many academics against the efficiency of financial markets. To these observers, the crash defies rational capital markets. They point to the fact that new information did not enter the market during the crash period, and hence conclude that the stock market is irrational. For example, Shleifer and Summers (1990), state that "the stock in the efficient markets hypothesis—at least as it has traditionally been formulated—crashed along with the rest of the market on October 19, 1987. Its recovery has been less dramatic than that of the rest of the market."

While many researchers during the past ten years have amassed numerous insights about the 1987 crash, much controversy still remains about the actual cause. This overview paper summarizes the research on the crash, and then shows that in contrast to the generally accepted wisdom on the street and the views of many academics, the crash is consistent with stock market efficiency.

II. A Brief Summary of the Events of October 19, 1987

The U.S. Crash

A large volume of sell orders awaited the opening of U.S. markets on October 19, 1987. Specifically, there was $500 million of sell orders on the automated order system alone at the NYSE prior to the open. According to the Brady Report, index arbitrageurs and

portfolio insurers accounted for most of the sell orders. Many of these orders had been placed over the weekend following the large decline in stock prices during the prior three days. There were also large sell orders placed on the floor of the exchange at the opening of the market. The huge order imbalance delayed the opening of more than 200 NYSE stocks.

Whereas there was considerable delay in opening stocks at the NYSE, the futures markets in Chicago immediately reflected the selling pressure. For example, the S&P 500 futures contract opened down in excess of 7% from the close on Friday. As shown in Figure 1, the S&P 500 futures traded at a large discount to the underlying stocks, other than for a short period during late morning. Figure 1 also illustrates the continual decline of the futures and stock market throughout the day, precipitated by sell orders that greatly swamped buy orders. By the close of trading, the S&P 500 futures (index) had declined 28.6% (20.5%).

On Tuesday, October 20, the stock market experienced a relatively small rebound (S&P 500 index increased 2.6%), but volatility was extremely high throughout the day. After opening with a large increase, the stock market at 10:00 a.m. began to reverse as the S&P 500 futures contract moved to a steep discount. During the next two hours, the stock market dropped 25%, the largest decline ever over such a short period. A major problem was the lack of index arbitrage buying due to the NYSE disconnecting the primary linkage between the cash and futures markets.[1] At roughly noon, the CBOE and the CME suspended trading in response to the large number of NYSE stocks that had been closed for trading and because the officials at the Chicago exchanges thought that the NYSE was about to shut down. During the

[1] The NYSE announced that member firms could not use the DOT system for index arbitrage. This led to further delinking of the markets. The big problem was that the discounts became bigger, thus suggesting that stocks should fall further. It certainly reduced the demand for buying stocks.

day, there were serious concerns about financial failures of many clearing firms and other financial services firms. The turnaround began in the afternoon contemporaneous with the announcement of numerous stock repurchase programs by large corporations. The rebound continued on the 21st as the S&P 500 increased nearly 9%.

The International Crash

The U.S. was certainly not the only stock market to crash on October 19 (Roll, 1988, provides a comprehensive discussion of the international crash of 1987). Table 1 displays stock returns for 22 countries during October 19-21. Except for South Africa (gold stocks increased in response to investors shifting out of stocks into other assets), all of the countries' stock markets declined on October 19. The world stock market (excluding the U.S.) declined 6.8% and 5.0% on an equal- and value-weighted basis, respectively. Interestingly, most of the other stock markets had closed or were about to close before the United States market opened for trading on October 19. This rules out the possibility that the actual crash in U.S. stocks on October 19 caused the other markets to fall earlier that day. However, as we will subsequently discuss, the U.S. market began to drop substantially the prior week, especially on Friday afternoon after the other markets had already closed.

Stocks in other countries dropped more on October 20 than on the 19th. Excluding the U.S., the world market dropped 10% and 12% on an equal- and value-weighted basis, respectively. This drop on October 20 was likely due to the U.S. crash on the 19th, given that most of the world markets had already closed when the crash took place. Similarly, the world markets began to rebound on October 21, following a small U.S. rebound on October 20.

The Stock Market Crash, Not the Market Crash

Accounts of the crash stress only the loss of wealth in the stock market. No mention is made of other securities. However, 30-year Treasury bonds increased more than 3% on October 19, the largest daily increase in several years. Similarly, shorter-term Treasury securities increased in value. Investors made massive shifts toward lower risk securities.

Prior to the crash, the total value of equities was $2.8 trillion. Corporate debt amounted to $2.0 trillion and government securities (federal and local) was $3.9 trillion. Thus, equities accounted for only one-third of the total public securities in the U.S. Assuming a 2% increase in the value of the non-equity securities[2] yields an overall market decrease of 5%. Notwithstanding that a 5% decrease is an extremely large decline for the market, it puts into perspective the fact that the 20% drop that garnered everyone's attention was for only a subset of the overall market. A larger overall market decline could occur, for example, in response to the outbreak of a war, in which case the values of all securities, rather than just equities, would likely drop in value. Of course while it is important to note that only equities crashed on October 19, this fact does not explain what caused investors to change their assessment of the future so as to result in an overall equity market decline of 20%. The next section provides theoretical explanations for large changes in equity values.

[2] We simply assume 2% given (a) the 3% increase in the 30-year actively traded Treasury bonds and (b) incomplete price data for all the various government and corporate debt securities.

III. The Determinants of Stock Prices

Rational Models Based on Fundamental Factors

Rational models of equity valuation based on fundamental factors express stock prices as the expected present value of future cash flows to stockholders. With constant cost of equity capital and with infinite time-horizon cash flows, the price of firm *i* is equal to:

$$P_{i,t} = E_t[\sum CF_{i,t+1}/(1 + R_i)^t]$$

A common approach to estimate the firm's cost of equity capital is to use a standard asset pricing model [Sharpe-Lintner (1964, 1965) CAPM, Merton (1973) ICAPM or Ross (1976) APT] of the general form:

$$R_i = R_f + \Sigma\beta_j F_j$$

where R_f is the risk-free rate, F_j is the set of expected values of systematic risk factors that explain stock returns, and β_j reflects stocks' sensitivities to those risk factors.

According to the equity valuation model, stock prices increase (decrease) in response to increases (decreases) in expected cash flows and decreases (increases) in equity costs of capital. The efficient market hypothesis (see Fama, 1991) states that prices reflect all available information. Thus when expected cash flows and equity costs of capital change, stock prices immediately move to incorporate the new information. The model would predict that the 20% drop in equity values on October 19, 1987 should be the result of an unanticipated decrease in cash flows or increase in the cost of equity. And it would seem that if market efficiency were to hold, one should be able to identify the shock to fundamental factors that led to the largest daily decline ever in U.S. stock prices.

If cash flows are expected to grow at a constant rate, G, the above stock price

valuation formula collapses into the growing perpetuity formula (see Gordon, 1962):

$$P_{i,t} = E_t[CF_{i,t+1}/([R-G)].$$

The perpetuity model illustrates the huge impact that small changes in cash flows and costs of capital equity can have on stock prices. Suppose the average firm has a 12% cost of equity and a 6% annual forecasted growth rate of equity cash flows. A 1 percentage-point increase in the cost of equity simultaneous with a 0.50 percentage-point decrease in the growth rate of equity cash flows would reduce stock prices by 20%. This is the case because cash flows and costs of capital tend to be persistent over time—an economic shock that shifts expectations in cash flows and discount rates often does so on a long-term basis (see Mandelbrot, 1966, for the original formal discussion).

Thus while it might first seem that one should be able to identify the shocks to fundamentals factors that can cause such a dramatic price decline, the above analysis suggests that that these shocks do not necessarily have to be dramatic themselves. This analysis is consistent with the empirical evidence on market efficiency. There is strong empirical support of these rational models—stock returns are good predictors of subsequent real activity (Fama, 1981). Yet, researchers have considerable difficulty linking large stock price movements to changes in fundamental factors (e.g., Cutler, Poterba and Summers, 1989). We suggest that the reason is simply because the shocks do not have to be large themselves and therein lies the difficulty in identifying the shocks.

Notwithstanding the fact that identifying the actual shock can be difficult even in a world in which markets are efficient, it also not need be the case that the economy experience a downturn subsequent to the stock market crash. We offer two explanations. First, while

stock returns are good predictors of subsequent real activity, it is the case that stock returns correlate highly with bond returns (see Keim and Stambaugh, 1986, and Fama and French, 1989). The standard explanation is that cash flow and cost of capital shocks affect bonds and stocks similarly. However, as we indicated in the prior section, this was not the case on October 19 as only stock prices declined in value. Thus, the predicted reduction in future business activity is much less than in the case of a negative shock that also reduces bond prices by 20%. Second, the negative shock may have simply provided new information to investors suggesting that their prior expectations of future cash flows/equity costs of capital were incorrect. Again, there need not be a subsequent decline in overall business activity.

Irrational Models

The efficient market hypothesis, anchored by Fama's (1965) seminal paper showing that stock prices approximate a random walk, has been subjected to countless empirical tests during the past three decades. According to Jensen (1978), "the efficient markets hypothesis is the best established fact in all of social sciences." While the early tests were extremely supportive of market efficiency, many researchers during the past twenty years, beginning in large part with Shiller (1981), began to provide empirical evidence of anomalous stock returns they interpret that stock prices movements cannot be fully explained by fundamental factors. As a consequence of these anomalies, numerous irrational models of stock prices have been proposed as alternatives to the efficient market hypothesis.

The irrational model of stock prices (see the 1990 review article by Shleifer and Summers) holds that some investors base their demands for stocks on various sentiments and

whims rather on solely on the fundamental factors. According to the irrational models, sentiments are correlated across the investors and do not cancel each other out, thereby leading to large swings in stock prices away from fundamental values. The investor sentiment can be so strong that it is prohibitively costly for rational investors to counter such swings in price movements.

As we noted in the introduction, proponents of irrational models of investor behavior claim that the stock market crash of 1987 rejects market efficiency due to the absence of negative new information regarding fundamentals at the time of the crash. A common explanation is that stock prices were too high prior to the crash due to speculative bubbles and the crash occurred in response to positive feedback trading initiated by portfolio insurers. For some unexplainable reason, investor sentiment dramatically changed for the worse and the crash resulted. The theory does not provide any predictions about the level of the stock market after the crash with respect to fundamental values. That is, notwithstanding that investor sentiment drove stock prices to levels higher than that warranted by fundamentals, the crash may have driven prices even farther away from fundamental values, albeit in the opposite direction.

The Crash and Rational vs. Irrational Models of Stock Prices

The efficient market explanation for the crash is that a negative shock to fundamental factors reduced investors' demands for stocks. In contrast, irrational models of investor sentiment claim that there was no change to investors' expecations fundamental factors. In spite of the sharply distinctive explanations of the crash resulting from these models, it is not simply a matter of identifying the fundamental factor or factors that caused the crash. The

problem is, as Fama has pointed out in numerous articles, stock market efficiency is not testable per se as market efficiency must be jointly tested with an asset-pricing model. That is, an apparent anomaly may simply be the result of a poorly-specified model rather than that of market inefficiency. With respect to the market crash, a failure to identify the negative fundamental shock does not reject market efficiency as a matter of fact. Likewise, since one does not know (and will never know) the true underlying fundamental values, identifying a negative fundamental shock does not necessarily reject the irrational models as it cannot be known whether the market correctly reacted to the shock. Notwithstanding that it is impossible to prove or disprove market efficiency (investor sentiments), we can still draw inferences based on the available information as to which model provides a better description of the stock market crash of 1987. In the next section, we examine shocks to *known* fundamental factors that may have caused or triggered the crash.

IV. Shocks to Fundamental Factors During the Crash Period

Most accounts of the crash downplay links between fundamental factors and the crash. Specifically, commentators argue that there was no release of new information on October 19 or the prior weekend that could imply a market decline in excess of 20%. As noted in the prior section, however, a large decline in equities can be triggered by a small change in cash flows/discount rates. This section describes the publicly-known shocks to fundamental factors taking place during the pre-crash period (beginning on October 14) that may have triggered the crash.

Trade Deficit

At 8:30 a.m. on October 14, the U.S. Commerce Department announced that the August merchandise trade deficit declined to $15.7 billion from $16.5 billion in July. However, analysts were predicting an August trade deficit of $15 billion. Several sources, including the Brady Report, suggest that the market decline of 2.95% (S&P 500) on October 14 partly stemmed from this announcement.

Mitchell and Netter (1989, hereafter M&N) provide evidence that the higher-than expected trade deficit can explain only a small part of the stock market decline on October 14. They examine the stock market impact of 21 trade-deficit announcements from April 1987 to December 1988. While they document a negative relation between unexpected changes in the trade-deficit and the stock market, the regression model indicates that the stock market decline on October 14 far exceeds that predicted by the model. Inspection of the raw data reveals the same conclusion—the absolute value of the unexpected component of the trade deficit on October 14 is the fourth smallest of the 21 announcements, whereas the absolute value of the market return on October 14 is the second largest of the 21-trade announcement days.

Takeover Tax Legislation Proposals

M&N (1989) argue that takeover tax legislation proposed on the evening of October 13, 1987 and approved two nights later accounts for much of the 10.44% stock market decline during the three days prior to the crash. The primary takeover tax measure eliminated the deduction of interest with respect to all takeovers or to stock repurchases of greater than 50% of the shares over a three-year period. Other measures focused more specifically on taxing

hostile takeovers. Indeed, the Committee directly stated the intention to alter the tax code to restrict hostile takeovers:

> The committee believes that corporate acquisitions that lack the consent of the acquired corporation are detrimental to the general economy as well as to the acquired corporations, employees, and community. The committee therefore believes that it is appropriate not only to remove tax incentives for corporate acquisitions, but to create tax disincentives for such acquisitions.[3]

In light of current economic conditions, the bill would likely have a major impact on stock prices. First, due to factors such as financing innovations, relaxed antitrust attitude and deregulation, takeover and leveraged restructuring activity was at an all-time high, especially for large firms. During 1982-89, half of the largest U.S. 1,000 firms received a takeover bid (Mitchell and Mulherin, 1996), a rate of takeover activity several times the norm as large firms had rarely been takeover targets in prior decades. Second, takeover premiums were high (35-40%) and contributed significantly to the 1980s bull market. In addition many of the non-targets incorporated takeover premiums in their prices as well (Mitchell and Mulherin). Third, takeovers during this period were largely debt financed and thus would be greatly affected by takeover restrictions linked to interest expense deductions.

M&N identify five dates when news about the takeover components of the tax bill became public. Prior to October 13, there was no mention of the takeover restrictions. At 5:33 pm on October 13 Dow Jones reported that Democrats on the Ways and Means Committee were about to agree on the tax bill but made no mention of takeovers. Democrat members of the Committee in a closed caucus one hour later agreed on a bill that included the takeover measures. Two evenings later, the full Committee approved the bill. Following the

[3] See U.S. House Reports (1987, p. 1086).

crash, Wall Street firms began lobbying to eliminate the takeover measures. After the market closed on October 28, Daniel Rostenkowski, Chairman of the Committee, indicated in congressional testimony that he would consider altering the takeover components of the bill. Rostenkowski strengthened his remarks the next evening with a formal statement that he would alter, though not drop all of the takeover measures. During the next six weeks, Rostenkowski did not deviate from his position. Dow Jones reported on December 15 that the tax bill still contained some takeover components. The next day during negotiations with the Senate, the House agreed to formally drop almost all of the takeover restrictions.

The stock market moved substantially on all the days contemporaneous to the release of new information about the takeover tax measures. The S&P 500 declined 2.95% and 5.16% on October 14 and 16 corresponding to the public release of the takeover legislation going forward.[4] And on October 29, 30, and December 16 when Congress backed away from the proposed legislation, the S&P 500 increased 4.93%, 2.87% and 2.17%, respectively. The first four events became public after the close of trading each of the days. During early trading (first hour-and-a-half), the S&P 500 moved in the same direction as for the full day, declining 1.39% and 1.18% on October 14 and 16, and increasing 2.23% and 2.99% on October 29 and 30, respectively. The December 16 announcement occurred at 11:58 a.m.—the S&P 500 increased 0.80% during the next hour of trading.

Takeover stocks responded relatively more to the tax bill. The takeover-target portfolio consists of 19 NYSE and AMEX stocks that had received a bid by October 13 that had not yet been substantially completed. On October 14 and 16, the abnormal return to the takeover

[4] See the M&N paper for the levels of significance associated with these stock market returns. In virtually all cases, the returns are more than two standard errors from zero.

portfolio was -1.43% and -5.25%, respectively, whereas it was 5.00%, 4.39%, and 1.79% on October 29 and 30 and December 16, respectively. The intraday abnormal returns to the takeover portfolio indicate a similar pattern.

Other Fundamental Factors

During the week and especially the weekend prior to the crash, U.S. Treasury Secretary James Baker strongly hinted that the U.S. might allow the dollar to weaken in response to the increase in interest rates in West Germany. Baker worried that West Germany was endangering the monetary stabilization agreement the G-7 had instituted earlier in the year. The link between Baker's comments and the stock market crash is that a cheaper dollar would require higher interest rates in the U.S. in order to support the cheaper dollar. Consistent with this argument, the 30-year U.S. Treasury bond yield increased from 9.9% to 10.2% on October 14. However, on October 19 after Baker considerably strengthened his criticism of German monetary policy, the U.S. Treasury bond yield actually decreased rather than increased. Of course as we indicated earlier, the decrease in the U.S. Treasury bond yield was due to an enormous movement out of stocks into fixed-income securities.

There were also ongoing concerns about the budget deficit and tensions in the Persian Gulf. However, there was virtually no known new information released during the pre-crash period regarding these concerns that could arguably cause a large decrease in equity values.

Assessment of the Fundamental Factors

During the weekend prior to the crash, there was no obvious information with respect

to fundamental factors that can be empirically shown to cause the crash on October 19. While it could be argued that Baker's weekend press comments about the dollar could lead to a stock market downtown, it is not likely that his comments, certeris paribus, would trigger a crash.

While there is no direct evidence that fundamental factors caused the crash itself, considerable evidence does exist that shocks to fundamental factors caused the stock market downturn during the three prior trading days. As described below, this linkage is important in light of the huge market decline during the pre-crash period and the absence of any trading days between the pre-crash decline and the crash itself.

M&N provide the most substantive evidence on the primary cause of the pre-crash decline. As discussed above, the timing of the takeover tax announcements corresponds very closely to overall market movements as well as to takeover stock returns. The M&N thesis has not been universally accepted—see Roll (1989) for example. While Roll agrees that the takeover tax story is "the better supportive evidence that a particular event in the United States triggered the worldwide crash.....though indeed intriguing, depends on a chain of difficult-to-prove propositions. If the U.S. tax bill caused the worldwide crash, we must accept (1) that heavier taxation of takeovers would cause all stocks to be affected; (2) that the U.S. decline on October 14-16 induced an even larger crash on October 19, although tax bill news had already been fully disseminated earlier; and (3) that a stock price decline in the U.S. resulting from a proposed tax bill caused at least at large a decline on average in other countries."

We address Roll's critiques. Roll elaborates further on the first proposition stating: "why would even the complete elimination of takeovers, not just a marginally higher tax, cause a 20 percent decline in the market value of all stocks." The thesis of the M&N paper is

that the antitakeover proposals caused the pre-crash market decline. However, M&N do not make the claim that the tax bill itself caused the crash, but rather suggest that the 10% decline during October 14-16 triggered the crash, a point that we elaborate later in this paper. The issue is whether the takeover tax proposal could cause a decline in equity values of 10%. In light of the huge takeover premiums to large firms during the 1980s and the implicit takeover premiums in other firms, a 10% decline is likely. The mass of empirical evidence accumulated during the past 15 years suggest that takeovers create considerable value via not only synergies and economies of scale, but also via the reduction of agency conflicts. The takeover tax proposals would essentially stop hostile bust-up takeovers financed by debt, and thus the implicit takeover premiums for all large stocks would be expected to decline.

Strong supportive evidence that the takeover tax proposals led to the 10% drop during October 14-16 is that the stock market increased 10% during the three-day period (October 29-30, December 16) when the government relaxed and eventually dropped the takeover tax measures.[5] As stressed by M&N, the 10% decline during October 14-16 was the largest one-, two-, or three-day decline in nearly 50 years. However, though not pointed out by M&N, it is equally important to note that the market increase during the two-day period, October 29-30, when the government relaxed the tax measures, is the second largest increase over any one- or two-day period in over 25 years, other than the recovery from the crash on October 20-21. This large increase is especially pertinent since there was no other information forthcoming on these days that could be expected to generate a large increase in the overall market.

Finally, Roll questions in his third point why a U.S. decline due to a tax bill should

[5] The recovery is smaller in absolute amounts given the crash. The market value of the S&P 500 declined $233 billion on October 14-16 and increased $166 billion on October 29-30 and December 16.

cause as large a decline in other countries. However, the large decline in the other countries did not take place until October 19. During October 14-16, the rest of the world (proxied by the Goldman Sachs FT-Actuaries World Index) declined only about 1%, providing additional support of the notion that the 10.4% decline during October 14-16 was a U.S. phenomenon.

To summarize, the takeover tax bill contributed substantially to the stock market decline on October 14-16. Of course, the trade deficit news and U.S. Treasury Secretary Baker's comments regarding the devaluation of the dollar likely had some negative impact as well. Indeed, it was a conjunction of these negative shocks that caused the stock market decline during October 14-16. Thus, while there is no clear link between fundamental factors and the crash on October 19, the link is robust with respect to the very large stock market decline during the three days preceding the crash.

V. Portfolio Strategies and Trading Mechanisms

Several reports attribute the crash to portfolio insurance and index arbitrage. A common argument is that the crash originated in Chicago due to portfolio insurers selling index futures in response to declining stock prices on Friday. The Chicago sell-off then shifted to New York via index arbitrage, thereby causing a further wave of declining stock prices, which led to a subsequent wave of futures sales by portfolio insurers—a downward cascade of futures and stock prices throughout the day. Of course this notion, often referred to as the cascade theory, has been disputed by other reports of the crash. This section discusses the role of portfolio insurance, index arbitrage, and other market and trading mechanisms in the crash of 1987.

Overview of Portfolio Insurance and Index Arbitrage

Portfolio insurance is a hedging strategy that allows for greater risk taking when portfolio values are high. The investor shifts funds into equities (cash and bonds) following increases (decreases) in the value of her portfolio. The goal is to guarantee a minimum portfolio value—for example, a pension fund can use portfolio insurance to require a value of at least that of the fund's liabilities. Many investors crudely follow this strategy by simply buying (selling) stocks when the market is increasing (decreasing). Of course, liquid markets and low transactions costs are necessary to efficiently employ portfolio insurance. Stock index futures contracts allow investors to implement formal dynamic portfolio insurance programs without the high costs of actual stock transactions. According to Leland (1988), "more than 80% of assets under portfolio insurance use futures to alter their allocation of assets."

Prior to the crash, more than $60 billion of assets was covered by portfolio insurance. Beginning with the stock market decline on October 14, portfolio insurers began selling large amounts of securities, in accordance with the strategy of guaranteeing a fixed level of return. According to the Brady Report, portfolio insurers sold the equivalent of $530 million, $965 million, and $2.1 billion in stocks on October 14, 15, and 16, respectively, concentrating their selling activity in the futures markets. In spite of nearly $4 billion in sales by portfolio insurers during October 14-16, their models actually indicated that nearly three times this amount should have been sold in light of the 10.4% stock market decline.

Portfolio insurers were not the only major sellers of stocks during the pre-crash period. Mutual funds placed huge sell orders due to large redemption requests by consumers in

response to the market decline. It is likely that many of these customers were employing plain vanilla portfolio-insurance type strategies. A third group of market participants, hedge funds for example, anticipated the large selling programs by portfolio insurers and mutual funds, and thus began also to sell large amounts of securities.

The selling activity by portfolio insurers resumed on October 19. Portfolio insurer sales amounted to $6 billion with $4 billion in the futures market and $2 billion in the stock market. These sales accounted for 15% of total volume on the futures and stock market. While this amount of sales by portfolio insurers is very large in absolute terms, it is still small (0.20%) relative to the total value of stocks prior to October 19 of roughly $3 trillion.

With respect to the goal of guaranteeing a certain level of value, portfolio insurance did not fare well during the crash. Specifically, huge divergences between future and stock prices and greatly increased transactions costs reduced the ability of portfolio insurance strategies to hedge investors' portfolios.

As noted above, portfolio insurers use stock index futures contracts to employ the formal dynamic hedging strategies due to the much lower costs of using futures contracts vis-a-vis actual stock transactions. Given the lower trading costs of stock index futures, the futures market often responds much quicker than the actual stock market to the release of new information. When the price of the futures contracts diverges from the underlying index of stocks, index arbitrage takes place via selling (buying) stocks in the index and buying (selling) the future contract index, thereby stabilizing both markets by linking the prices in each.

Furbush (1989) studies index arbitrage activity during the period of October 14-20. He examines the relation between the basis spread (divergence in the price of the futures

contract and the price of the underlying index) and the amount of index arbitrage. For the period beginning October 14 and ending after the morning session on October 19, Furbush documents a strong relation between the basis spread and the level of index arbitrage activity during a subsequent five-minute interval. As predicted, index arbitrageurs respond to the divergence in futures and cash prices and their trading activity reduces the basis spread, thereby actually stabilizing the markets over this period. However, the relation between the basis spread and index arbitrage declines after October 15, and it is nonexistent on the afternoon of October 19 and on October 20 even though the basis spread was quite large (and negative when it should have been positive).

Did Portfolio Insurance Cause the Crash?

As noted above, portfolio insurers began to markedly reduce their stock exposures on October 14 after stocks declined contemporaneous with the announcements of the trade deficit figures and takeover tax proposals. However, portfolio insurers employing formal dynamic hedging strategies found that they were unable the next few days to reach the level of asset allocation called for by their portfolio strategies. Of course this failure of portfolio insurers to quickly reach new asset allocation levels is not necessarily due to using formal hedging strategies, as these investors would have had similar problems employing plain-vanilla strategies during the decline in stocks on October 14-19. Notwithstanding the difficult problems that portfolio insurers had with achieving optimal asset allocation at a low cost, this section discusses the extent to which portfolio insurance programs actually caused the crash itself. Specifically, did the crash result from the large volume of portfolio insurance

programmed sell transactions in place on October 19 as a consequence of the 10.4% stock market decline during October 14-16 caused by fundamental factors?

The Cascade Theory

When the stock market drops, portfolio insurers employing a formal dynamic hedging strategy will sell stock index futures to reduce their exposure to stocks. If this sale of futures causes the price of the futures contract to decline relative to the underlying stocks, index arbitrageurs will then sell the stock, driving stocks down further. The decline in the stock market triggers a subsequent wave of programmed selling by portfolio insurers and thereby repeating the process over and over again—this phenomenon is known as the cascade theory and was touted by the Brady Report and the SEC Report as a leading cause of the crash.

The best supposed evidence in support of the cascade theory is that the normally positive basis of futures vis-a-vis stocks turned negative on October 19, 1987. To illustrate, see Figures 1 and 2 that display the relation between the futures index and the underlying index on October 19 versus October 14. The October 14 graph indicates the typical relation between the futures price and the underlying index, namely that the futures price is normally above the cash index. That is, you don't put up cash when you commit to the futures and thus there is an interest savings. There is a dividend loss, however, but with dividend yields less than interest rates, the net effect is the futures price above the cash price. The October 19 graph displays an entirely different picture. The futures prices opens much lower (7%) than the underlying stock index suggesting that the futures is pulling the stock market down. Consistent with the cascade theory, the subsequent decline in the stock market is said to cause

another round of programmed sales in the futures markets by portfolio insurers, and hence the futures price stays well below the price of the underlying cash index for most of the day.

Assessment of the Cascade Theory

While the steep discount of the futures price relative to the cash index throughout the day on October 19 is consistent with the cascade theory, the discount is also consistent with alternative explanations as we discuss in this section. First, it should be pointed out that while many commentators argue that the selling started in Chicago and moved to New York, the selling wave actually hit both markets simultaneously. It's just that the structure of the two markets is different, and thus gave the appearance that the crash hit Chicago first and went from there to New York. The delayed reaction of the stock market decline is simply due to the delayed opening of many NYSE stocks caused by a huge imbalance of sell orders accumulated over the weekend. Specifically, the NYSE prices on Monday morning were stale as they reflected the afternoon quotes from Friday. At the NYSE when there is a major imbalance at the opening that would cause prices to gap, the specialist delays the opening while he tries to round up counterparties on the opposite side. Meanwhile, the quote vendors keep reporting last transactions prices and indexes are calculated based on the last transactions prices. In stark contrast, the prices on the futures exchanges immediately changed at the open to reflect the selling pressure.

While the crash hit both markets simultaneously, arbitrage of the large gap between the futures price and the cash price could not take place as investors were not able to trade Monday in New York at Friday's prices. Unable to locate buying interest after some delay,

the specialists opened the stocks at their trading level, the 7% down level already realized in the futures market. Rather than open all the stocks at one time, the specialists chose to open them one by one, and thus it was an hour and a half before the futures price and the cash price converged to their normal relation. Subsequently, the futures once again fell below the cash market and stayed below for the rest of the day. We describe below the three reasons for why index arbitrage did not step in and reduce the basis spread during the crash—transactions costs, nonsynchronous trading, and stale prices. These reasons will illuminate the failure of the cascade theory to explain the crash via the steep discount in the futures price.

The transactions costs of index arbitrage include the bid-ask spread, futures margins, commissions, interest-rate risk, the up-tick rule and so forth. According to Macey, Mitchell, and Netter (1989), the up-tick rule hindered index arbitrage during the crash. When a divergence occurs in the prices of the cash and future markets, index arbitrageurs react immediately. When negative news arrives, the index futures often trades at a temporary discount to the cash index given the quicker response by the futures market. In this scenario the index arbitrageur buys futures and sells the underlying stocks. However, due to the uptick rule, the arbitrageur must wait for an uptick in order to short sell those stocks she does not own. Obviously, the ability to sell short becomes difficult when most of the stocks in the index are declining. While the arbitrageur does not necessarily have to sell or short sell all of the securities in the index, not doing so increases the riskiness of the arbitrage. Likewise, index arbitrageurs can become long in all the stocks so as to bypass the up-tick rule, but this is costly as well. Given these constraints, it became more costly for index arbitrageurs to link the markets, thereby exacerbating the breakdown between the markets on October 19.

Non-synchronous trading also played a role in the huge price divergence between the futures and cash markets. The non-synchronous trading problem is due to the fact that the reported cash index does not always reflect the true current value of the index. That is, the reported index will lag the true value of the underlying stocks when any of the stocks have not recently traded even though their true values may have changed. This phenomenon was especially true on October 19 as numerous stocks did not trade for long intervals of time, even as the market dropped substantially. For example, at 10:40 a.m. stocks accounting for 37% of the S&P 500's value had not yet traded. Harris (1989) creates an adjusted cash index that corrects for the non-synchronous trading and finds that he is able to explain part of the large basis spread that existed during the crash. Thus, index arbitrageurs had less incentive to link the futures and cash markets than the reported index would imply. Nonetheless, even after Harris accounts for non-synchronous trading, the basis spread is still relatively large.

As described in the ensuing paragraphs, Kleidon (1992) provides strong evidence that the primary cause of the steep futures discount was a shortage of capacity at the NYSE. The capacity shortage resulted in the selling of stocks at prices that did not reflect current information. Consequently, the trading of stocks at stale prices, prices at which the investor would not have agreed to trade at given current information, accounted for the steep basis spread between the futures and the cash index.

Prior to the crash, the NYSE was in the process of upgrading its internal infrastructure, installing an electronic order entry system for example. As of October, the NYSE had had only equipped the electronic order system to handle market orders. In contrast, limit orders were still routed through a printer and then manually delivered to the specialist. Whereas

market orders generally outnumber limit orders, October 19 was the exception as there were twice as many limit orders as market orders that day. The inability of the NYSE to handle the large number of limit orders resulted in significant delays between the submission and the execution of orders. This delay led to the execution of stale limit buy orders.

As indicated earlier, the futures market responded first to the selling pressure. In New York, however, trading was delayed in numerous stocks, and in addition, long queues began to develop at the specialists' posts. As futures prices continued to fall, many of the orders in New York became stale. That is, specialists executed limit buy orders placed earlier at prices higher than the true current prices in light of the decline in futures prices. Consequently, the execution of the stale limit buy orders kept the trading price at a higher level than would have been in the absence of execution delays—hence, the existence of the large basis spread between the futures prices in Chicago and the underlying cash index in New York. A big problem was that when market participants at the trading post recognized that the stale limit buy orders resulted in high traded prices, they increased (decreased) their willingness to sell (buy) stocks. They decreased their willingness to buy stocks since their market orders would take place at the high prices. Consequently, the queue of buy orders began to dry up.

Kleidon (1992) reconstructs the cash index accounting for stale prices and is able to account for most of the large basis spread between the futures prices and the underlying cash index on October 19. Thus, the large basis error was not arbitrageable as it was simply due to the inadequate capacity at the NYSE in the event of a large increase in selling pressure.

Kleidon and Whaley (1992) present further evidence suggesting that the large basis spread was largely due to the order processing problems at the NYSE. In the aftermath of the

crash, some reports argued that a serious problem during the crash was the breakdown of the normal linkage between markets. However, these reports primarily focused on the delinkage between the cash and futures markets. Kleidon and Whaley, however, examine the relation among all the markets during the crash period. They examine the relation between the cash, futures, and options markets and find that: (1) both the futures and the options market showed substantial breakdowns with the cash market and (2) the futures and options markets operated in unison during the crash. Kleidon and Whaley then go on to empirically link the breakdowns with the cash market to the NYSE limit order routing system which allowed for limit orders to be executed at stale prices.[6]

To summarize our assessment of the cascade theory, the evidence in support of the cascade theory is that the normally positive basis of futures vis-a-vis stocks turned negative during the crash period. However, in actuality, the futures and options markets performed rather well. The problem was with the stock market in New York. Since the futures market was able to respond so much quicker than the stock market, many uninformed investors assumed, correctly given their information set, that the lower futures prices relative to the stock prices signaled that stocks must fall further. That is, the long backlog of unfilled sell limit orders resulted in stale stock prices, that were way too high relative to the prices in the futures market. Consequently, many investors placed sell orders, in effect applying a traditional portfolio insurance strategy. Thus, the discount in futures prices, thought to be in

[6] The obvious breakdown took place between the S&P 500 futures price and the prices of the underlying stocks. However, Blume, MacKinley, and Terker (1989) show that there was also a breakdown in the linkage among individual NYSE stocks themselves—S&P 500 stocks declined 7.4 percentage points more than NYSE non-S&P 500 stocks on October 19, and the S&P 500 stocks rebounded to the level of the non-S&P 500 stocks the next day. Blume, et.al. link the price discrepancy to order imbalances. Specifically, there was relatively more selling pressure on S&P 500 stocks on October 19, and this selling pressure reduced those stocks more than would have been had the NYSE been able to absorb the added selling pressure.

support of the cascade theory, was actually an illusion due to stale prices on the NYSE resulting from inadequate capacity.

Portfolio Insurance and Imperfect Information

While investors have always been able to institute informal portfolio insurance programs such as stop-loss strategies, there is no question that stock index futures contracts have greatly lowered the cost of portfolio insurance via dynamic formal strategies and investors have responded accordingly by increasing their quantity demanded for portfolio insurance. And as the stock market increased throughout the mid-1980s, portfolio insurers altered their asset allocation towards stocks. Specifically, these investors purchased stocks not because of expectations regarding fundamentals per se, but rather because of portfolio insurance strategies. The issue, therefore, is whether this asset allocation shift towards equities caused stock prices to temporarily exceed levels implied by fundamentals.

Jacklin, Kleidon, and Pfleiderer (1992) provide a theoretical examination to determine whether portfolio insurance led to inflated share values. While our discussion below parallels their paper, we note that their work was actually preceded by similar papers written by Grossman (1988), Brennan and Schwartz (1989) and Gennotte and Leland (1990). Our choice of the Jacklin et.al. paper is simple due to the fact that it builds on the earlier papers.

As we indicated above, the decline in the cost of portfolio insurance via the introduction of stock index futures led to an increase in the quantity demanded of portfolio insurance. As stock prices increased substantially in the months prior to the crash, portfolio insurers purchased more equities than they would have in the absence of portfolio insurance.

Clearly, these purchases were informationless trades. However, other market participants may have misinterpreted these trades as informed trades. To the extent that the market was unaware of the exact proportion of portfolio insurance in the marketplace, an unexpected increase in stock purchases by portfolio insurers may have resulted in stock prices temporarily exceeding the level implied by fundamentals.

The stock market would eventually learn of the new level of portfolio insurance and then reassess the information prior thought to have been behind the earlier trades. This reassessment could potentially take a long time to the extent that portfolio insurers do not explicitly convey the amount of insurance utilized. However, a large and sudden drop in equity values could immediately convey the magnitude of portfolio insurance currently employed in the market. That is, a sudden large drop in equities would precipitate sell programs by portfolio insurers and the amount of these sell programs would give a rough approximation of the amount of assets utilizing portfolio insurance programs.. The market decline triggers a huge selloff by portfolio insurers which arguably then provides new information to market participants, namely that prior buying pressure was not due to informed trading but rather to uninformed trading. The new information regarding the higher than expected amount of portfolio insurers in the stock market causes investors to reduce their estimates of equity values and hence the market falls further to its new equilibrium value.

The above described scenario, formally expressed by Jacklin et.al. and other researchers, resembles the events of October 1987. As discussed in Section IV, the stock market dropped 10% during October 14-16 contemporaneous with a negative fundamental shock to equity values, namely the planned restriction and taxation of corporate takeovers and

leveraged restructurings. The stock market had not decreased by such a large amount over as short a period of time in nearly fifty years. This huge decline in the stock market triggered a massive wave of sell programs by portfolio insurers. By the weekend, it became increasingly apparent as to the unexpectedly huge amount of assets under portfolio insurance programs. This information caused market participants to adjust downward their estimates of equity values and hence arguably caused the stock market crash on Monday, October 19.

As shown in Section III, small shocks to the cost of capital and expected growth rate of cash flows can cause large changes in equity values. Our example indicated that a 1 percentage-point increase in the cost of equity simultaneous with a 0.50 percentage-point decrease in the growth rate of equity cash flows would reduce stock prices by 20%. Thus, to the extent that the massive wave of selling by portfolio insurers caused market participants to alter their expectations of cost of capital and growth rate accordingly, the stock market crash is the outcome. And again it is important to note that the discussion is with respect to the stock market crash and not to the overall crash. Portfolio insurers held relatively large amounts of equity securities and their retreat from these positions reduced the market's expectation of the value of future equity cash flows rather than just cash flows per se.

It is important to note the distinction between the information analysis and the cascade analysis. In the information analysis as described above, the market was temporarily overvalued due to investors perceiving the large purchases of equities by portfolio insurers as informed trading. Once the market receives the information regarding the actual magnitude of the amount of equity assets under portfolio insurance programs, the market responded immediately by reducing the valuation of equities. This analysis simply assumes that the

market does not have perfect information at all times and does not at suggest that investors are irrational as asserted by many commentators and researchers. The cascade theory holds that in response to a stock market decline, portfolio insurers sell futures to reduce their exposures to stocks. The heavy selling by portfolio insurers causes a decline in futures, thereby leading index arbitrageurs to sell stocks which drives stock prices further causing a new wave of selling by portfolio insurers. The cascade theory assets that equity values continue to spiral downward as the cycle repeats itself. As we showed earlier in this section, there is little empirical support for the cascade theory.

Finally, we note that some researchers have suggested that since the crash occurred throughout the world and thus in countries in which portfolio insurance programs were not widespread as in the United States, the apparent link between portfolio insurance and the crash is missing. However, this logic is not necessarily true. That is, to the extent that the huge sell programs initiated by portfolio insurers revealed new information to the stock market regarding expected future cash flows and discount rates, and to the extent that international stock markets are linked, the international crash of October 1987 is actually consistent with the information portfolio insurance explanation.

VII. Managerial Responses to the Crash

Many corporations responded to the crash by announcing share-repurchase programs. In addition, officers and directors of corporations significantly increased their stock transactions during the crash period. This section analyzes the actions of decisions by corporate insiders during the crash period.

Stock-Repurchase Announcements

Nearly 600 firms announced stock-repurchase programs during the two weeks following the crash. This number contrasts with the 350 repurchase announcements during 1987 prior to October 19. Numerous reports of the crash state that the market turnaround on the afternoon of October 20 was led by firms announcing stock-repurchase programs. The SEC Report indicates that share repurchase activity by S&P 500 firms accounted for more than 5% of trading volume on October 20 (5%, 9%, and 9% on October 21, 22, and 23, respectively). In addition, the SEC Report states that the S&P 500 index increases during the hour after heavy stock-repurchase activity by S&P 500 firms.

Netter and Mitchell (1989) examine the stock price response to the stock-repurchase announcements in the wake of the crash. We will focus on their results for the 350 NYSE and AMEX firms that announced stock-repurchase programs during October 20-30. The average proportion of shares outstanding announced in the repurchase programs is 5.6%. Indeed, if the firms that announced these programs actually bought back all the shares in the programs, the number of shares of all exchange-listed firms would have dropped in excess of 1%.

While there are many explanations generally given for share repurchase programs, those announced after the crash are for presumably only one reason—the crash on October 19. The enormous number of repurchase announcements is consistent with the notion that share prices of many firms were temporarily mispriced due to the high volatility. While insiders should have no more information about the overall market decline than other investors, managers should have a better idea as to whether their own stocks reflected the correct risk-

adjusted values. To assess this notion, Netter and Mitchell examine the abnormal performance of the repurchase firms over the period of October 19 through the day prior to the repurchase announcement. They document abnormal performance of -2.36 percent (significant at the .001 level) during the crash-pre-repurchase window. The stock price rebounds at the repurchase announcement——abnormal return of 2.78 percent (significant at the .001 level) on the announcement day. The overall results support the notion that managers recognized the mispricing during the volatile crash period, and that the market immediately responded to managements' signal of the undervaluation. These findings are especially important with respect to the claims that complete chaos existed during the crash period.

Insider Transactions

Numerous corporate engaged in stock transactions immediately after the crash [see Netter and Mitchell (1989) and Seyhun (1990)]. Netter and Mitchell posit that the high volatility during the crash caused temporary mispricing of some stocks for which insiders would likely spot before uniformed investors. Accordingly, insiders should buy (sell) stocks that realized negative risk-adjusted returns during the crash. The empirical evidence supports this notion. For a sample of 570 exchange-listed firms for which insiders purchased stock in the wake of the crash, the pre-purchase abnormal return during the crash period was -3.6% and the abnormal performance subsequent to the insider purchases was 4.6%. The abnormal performance of stocks in which insiders sold shares yields the mirror image of the above numbers. Overall, insiders were able to determine if their crash risk-adjusted stock prices were correct, and if not, these insiders were able to profit from the mispricing.

Consistent with the Netter and Mitchell results, Seyhun (1990) also finds that stocks that fell on a risk-adjusted basis during the crash period were more likely to be purchased by insiders, and these stocks subsequently rebounded after the insider purchases.

Overall, corporate insiders responded as predicted to the crash of October 1987. They recognized mispricings in their own stocks and reacted accordingly with respect to insider transactions and share repurchases. Moreover, it is important to note that the mispricing in the respective stocks did not last very long as the stock price abnormal performance generating the insiders' responses was reversed soon after the insiders reacted. This evidence is consistent with a rational stock market, albeit a market with imperfect information, rather than a market controlled by irrational behavior.

VIII. The Long-run Impact of the Crash

Historically, the stock market has been a reasonable predictor of subsequent real business activity. However, the crash of 1987 did not precede an immediate decline in economic activity as many commentators thought would happen in light of prior stock market crashes. That is, most of the largest stock market declines took place during the Great Depression period of 1929-1937. Indeed, the Great Depression began subsequent to the crash of October 1929 when the stock market during more than 25% during a one-week period. Leading candidates for the cause of the 1929 crash include restrictive monetary policy (Friedman and Schwartz, 1963) and restrictive antitrust policy (Bittlingmayer, 199?).

The absence of a major recession or depression following the crash of October 1987 is consistent with the research as discussed in this paper. First, the proposed restrictions on

takeovers and leveraged restructurings which was associated with a 10% stock market decline was also associated with a 10% stock market increase when the government dropped the proposed legislation. Thus, there should not be a subsequent downturn in the economy due to the October 14-16 pre-crash stock market decline. Second, to the extent that the crash was due to the market learning of the magnitude of informationless portfolio insurance programs in place, a subsequent downturn in the economy should not take place. The stock market may have been temporarily overvalued in light of not having full information about portfolio insurance programs, and the correction of this overvaluation should not lead to a recession.

Volatility increased substantially during the crash period. However, this increase in volatility was not prolonged as Schwert (1990) shows that volatility after the crash returned to its normal level much quicker than after prior large decreases in the stock market. Schwert also points that the quick movement to normal volatility levels is consistent with the lack of subsequent major problem with the financial system or downturn in the economy, unlike prior periods in which volatility increased substantially around large stock market declines. Indeed, a recent follow-up paper by Schwert (1997) shows that stock market volatility has been unusually low during the ten years after the crash relative to the historical record.

IX. Concluding Comments

When asked to comment on the crash of 1987, many academics sounded the death knell for the efficient market hypothesis. According to Robert Shiller: “The efficient-market hypothesis is the most remarkable error in the history of economic theory. This is just another nail in its coffin.” Lawrence Summers states that: “If anyone did seriously believe that price

movements are determined by changes in information about fundamentals, they've got to be disabused of that notion by Monday's 500-point movement."[7]

Our view is that the empirical evidence does not support their claims of the death of the efficient market hypothesis. We do not claim that markets are perfect but rather that prices generally move toward their equilibrium values. Stocks are constantly mispriced, sometimes by a relatively large amount, perhaps due to market participants whom have overestimated the benefits of portfolio insurance. But they move back to equilibrium eventually. It is also worth reiterating that any test of stock market efficiency is a joint test, that is, a test of the equity valuation model as well. And since we still do not understand all the dynamics of equity valuation, it is rather difficult to immediately dismiss the efficient markets hypothesis as a viable theory.

We argue that the crash began with a fundamental trigger, namely the proposal by the U.S. government to restrict corporate takeovers. The evidence is rather strong that the proposed antitakeover measures contributed substantially to the 10% stock market decline during October 14-16. Furthermore, as triggers for crashes go, the proposed tax changes were not that unusual. Remember the mini-crash of October 13, 1989. The takeover deal for United Airlines fell through and the market dropped 6 percent in less than 2 hours. The market, rightly, sensed that the great takeover boom of the 1980s finally was over.

The 10.4% decline during October 14-16 was the largest one-, two-, or three-day decline in almost 50 years. Indeed, had the October 19 crash not occurred, there would have been several commissioned studies of the October 14-16 crash. It is not simply coincidental

[7] Quotes from "Efficient-Market Theorists Are Puzzled by Recent Gyrations in Stock Market" *Wall Street Journal*, October 23, 1987.

that the two crashes were not separated by any trading days. The pre-crash crash was of such a large magnitude that it certainly led to huge changes in asset allocation strategies. As is neglected in virtually all of the crash studies, equities are just one component of the assets that investors hold. Though scourged by many commentators, portfolio insurers were simply attempting to apply strategies of guaranteeing minimum levels of return, not theoretically unlike any classical strategy of selling stocks in declining markets. Granted these strategies did not work very well, but this was largely due to the fact that the market decline was so large and swift. That is, once the market learned of the amount of equities purchased due to portfolio insurance programs rather than to private information it immediately devalued equities even before portfolio insurers could carry out their sell programs.

In spite of the high volatility during the crash period, corporate managers were able to recognize mispricings in their own stocks and then act accordingly to eliminate such stock mispricings. This evidence is consistent with the market efficiency model rather than the irrational market model.

The market will crash again. We just don't know when. It might not be for another 100 years. Or it could be tomorrow. When investors decide that a revaluation of stock prices is in order, there is little that governments or stock exchanges can do to stop the change in prices. It is best that the government or stock exchanges create a trading environment that provides liquidity and alleviates any uncertainties caused by the market mechanisms themselves. That is, the role of the government and stock exchange is to provide an environment in which stock prices can quickly change to the new level.

Table 1
The International Crash of 1987

Panel A displays daily returns (local currencies) for the stock markets of nations that compose the Goldman Sachs World Index for October 19-21, 1987. *Panel B* displays the performance of the Goldman Sachs World Index (excluding the United States) in local currencies and dollar adjusted terms for both the value weighted and equal weighted indexes. Weights are based on market values of the prior day. The Weight Column displayed is based on October 16, 1987 market values.

	Panel A: International Market Returns on Oct 19- 21, 1987			
Country	Weight	Oct 19	Oct 20	Oct 21
United States		(20.00)	3.78	9.67
Ireland	.0018	(5.95)	(14.82)	2.28
Netherlands	.0190	(11.45)	(7.49)	10.96
Switzerland	.0183	(12.51)	(2.99)	5.70
United Kingdom	.1640	(10.16)	(11.27)	6.03
Hong Kong	.0154	(10.81)	closed	closed
Japan	.5585	(2.37)	(15.35)	10.01
Malaysia	.0012	(11.58)	(14.99)	0.02
Singapore	.0026	(13.76)	(25.31)	closed
Australia	.0247	(3.55)	(25.52)	1.16
New Zealand	.0035	(3.99)	(15.30)	4.09
Austria	.0010	(2.64)	(3.87)	(0.80)
Belgium	.0083	(10.30)	(1.02)	7.22
France	.0288	(9.33)	(0.37)	3.33
West Germany	.0504	(7.10)	(5.06)	6.67
Italy	.0257	(6.19)	(4.83)	3.85
Spain	.0145	(1.53)	(6.31)	(1.21)
South Africa	.0137	2.30	(8.43)	(4.63)
Mexico	.0015	(1.42)	(12.03)	(13.93)
Canada	.0323	(9.13)	(9.88)	10.94
Denmark	.0027	(2.91)	(8.36)	3.63
Norway	.0009	(8.56)	(20.37)	12.04
Sweden	.0054	(6.81)	(7.20)	4.83

	Panel B: Goldman Sachs World Index (excluding the United States) Performance Oct 19-21, 1987		
	Oct 19	Oct 20	Oct 21
Equal Weighted, Local Currency	(6.81)	(10.03)	3.28
Equal Weighted, Dollar Adjusted	(6.14)	(11.13)	2.94
Value Weighted, Local Currency	(4.98)	(12.03)	6.42
Value Weighted, Dollar Adjusted	(4.22)	(13.28)	6.21

Table 2

Chronology, source of news and corresponding event date for analysis of U.S. House Ways and Means Committee proposed changes to tax treatment of takeovers, leveraged buyouts and other financial restructurings.

Tuesday evening October 13: Democrats on the House Ways and Means Committee agree to a tax proposal that includes changes in the treatment of takeovers, leveraged buyouts and other financial restructurings. Reported in the *Wall Street Journal* on October 14.

Corresponding event date: October 14

Thursday evening October 15: The full House Ways and Means Committee approve the tax bill including changes in the treatment of takeovers in a 23-13 straight party-line vote. Reported on the *Broadtape* and in the *Wall Street Journal* on October 16.

Corresponding event date: October 16

Wednesday afternoon October 28: Committee Chairman Rostenkowski, in House testimony, indicates that the antitakeover tax provisions could be changed. Reported on the *Broadtape* at 2:08 on October 28 (the market had closed at 2:00) and in the *Wall Street Journal* on October 30.

Corresponding event date: October 30

Thursday evening October 29: Chairman Rostenkowski strengthens his remarks from the day earlier, releasing an official statement that he would agree to a "reasonable compromise" on the antitakeover tax provisions. Reported in the *Wall Street Journal* on October 30.

Corresponding event date: October 30

Wednesday morning December 16: Representative Tom Downey, a member of the Ways and Means Committee, tells reporters that almost all of the antitakeover tax provisions had been dropped during negotiations with Senators. Reported on the *Broadtape* at 11:58 on December 16 and in the *Wall Street Journal* on December 17.

Corresponding event date: December 16

Table 3

Panel A shows daily and intraday returns to the Standard & Poors 500 on the five dates when the market could first trade on news about the House Ways and Means Committee's proposed changes in the tax treatment of takeovers.. *T*-statistics based on the variance calculated from returns for 150 trading days ending October 13 are in parentheses. *Panel B* shows daily portfolio abnormal returns, intraday abnormal returns and percent negative abnormal returns for the portfolio of stocks in play on October 13, 1987 for the same dates. *T*-statistics based on control period variance are in parentheses. For the Intraday Portfolio *T*-statistics based on cross-sectional variance are in parentheses.

	Panel A: S&P 500 returns on event dates				
	Oct. 14	Oct. 16	Oct. 29	Oct. 30	Dec. 16
Daily return[d]	-2.95% (-2.86)[c]	-5.16% (-5.00)[c]	4.93% (4.77)[c]	2.87% (2.78)[c]	2.17% (2.11)[b]
Intraday return[e]	-1.39% (-2.21)[b]	-1.18% (-1.88)[a]	2.23% (3.56)[c]	2.99% (4.77)[c]	0.80% (2.80)[c]
	Panel B: *In-play portfolio returns on event dates*				
	Oct. 14	Oct. 16	Oct. 29	Oct. 30	Dec. 16
Daily portfolio return	-1.43% (-2.03)[b]	-5.25% (-6.92)[c]	5.00% (6.13)[c]	4.39% (5.62)[c]	1.79% (2.42)[b]
Intraday portfolio return[f]	-0.31% (-1.60)	-2.51% (-6.15)[c]	3.65% (4.03)[c]	4.02% (4.21)[c]	--[g]
Number of firms in the takeover portfolio	17	17	15	15	15

[a]Significant at the 10% level for two-tailed test.
[b]Significant at the 5% level for two-tailed test.
[c]significant at the 1% level for two-tailed test.
[d]On December 16 the S&P 500 return after the announcement (11:58 a.m.) until the close was 2.01% with *t*-statistics (2.80)[c], [2.19][b] and {1.98}[b].
[e]Intraday return is the S&P 500 return from the close the day before to 11:00 a.m. on October 14, 16, 29 and 30; and on December 16 the intraday return is the S&P 500 return from 12:00 to 1:00 p.m.
[f]Intraday return is calculated on October 14,16,29 and 30 as the percentage change in each stock price from the price on the last trade on the NYSE the previous day to the first trade after 11:00 a.m.
[g]Intraday transactions were not available for December 16.