Triggering the 1987 Stock-Market Crash:
Antitakeover Provisions in the Proposed House Ways and Means Tax Bill?

by

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and

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During the three trading days immediately prior to the October 19, 1987 stock market crash, U.S. stock prices declined by a greater percentage than during any one, two or three-day period since 1940. Contemporaneously, the House Ways and Means Committee introduced a tax bill that would have limited the interest deductions associated with debt used to finance corporate takeovers, going-private transactions and recapitalizations. We provide evidence suggesting that the stock market, especially takeover stocks and risk arbitragers, reacted negatively to news of the bill's progress. An analysis of international markets reveal the U.S. decline was unmatched by the rest of the world during this period. A positive response by the stock market, especially takeover stocks and risk arbitragers, to later news of fading Congressional support for the bill provides additional evidence that the bill had a significant impact. The overall evidence suggests that the antitakeover restrictions in the proposed House bill were a fundamental economic event contributing to the greater than ten percent market decline during October 14-16, which arguably triggered the October 19 crash.

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1.   Introduction

On Wednesday morning, October 14, 1987, the U.S. stock market began its most extreme one-week decline in history, culminating in the crash on Monday, October 19 when the Dow Jones Industrial Average fell 508 points (22.6%). Questions about the crash fall into two main groups. First, which fundamental economic factors triggered the large stock-market decline? Second, which institutional and structural factors inherent in the trading strategies of investors and the structure of the equities, futures, and options markets exacerbated the decline? This paper addresses the first question.

We argue that the October 19 crash was partially triggered by the market decline of over 10% from October 14-16. Surprisingly, to date, none of the numerous market crash studies document that the October 14-16 decline exceeds any one, two, or three day decline since May 13-14, 1940, when German forces broke through the French armies during World War II. Given the magnitude of the October 14-16 decline, a study of the market crash is not complete without an in-depth understanding of the source of the pre-crash decline.

While several events and economic conditions are candidates for the cause of the devaluation of security prices during October 14 through October 16, we provide evidence which suggests that the takeover-tax bill introduced on the evening of October 13 and approved on the evening of October 15 by the House Ways and Means Committee was one identifiable cause.[1] This bill would have placed restrictions takeovers and other corporate restructurings through limitations on interest deductions for debt used to finance takeovers as well as other tax advantages associated with changes in corporate control. In addition to the introduction and committee approval of the bill, we identify three announcements associated with its withdrawal -

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[1]   Both the Brady Report (1988) and the SEC Division of Market Regulation Report (1988) recognize the takeover-tax bill as having a negative impact on the stock market during this pre-crash period.

- two during the week following the crash and the third in December. The market declined significantly on the two event days when market participants could first trade on news of the takeover-tax bill's progress and increased significantly on the three event days in response to news of decreased Congressional support. Further, intraday market movements reveal that on all five event dates the market moved significantly in the predicted direction during intraday trading immediately following the announcements.

The returns of firms that were in play and the trading behavior of risk arbitragers provide supporting cross-sectional evidence of the importance of the tax bill on stock prices. The evidence shows that the net-of-market returns associated with a portfolio of in-play firms were significant on all five events dates in the predicted direction. Analogous significant abnormal price movements also occurred during intraday trading immediately following the announcements. Additionally, we present evidence that risk arbitragers responded negatively to news that the bill was progressing and positively to news that Congress was backing off from the bill.

We also discuss other events and structural factors that may have caused the October 14-16 market decline. The evidence indicates the higher-than-expected trade deficit announcement on October 14 contributed to the decline that day, but we find no significant events on the other four event dates. Finally, we show that while the crash on the 19th was worldwide, the decline in the U.S. market during October 14-16 greatly exceeds the small coexistent decline in the rest of the world's markets.

The organization of the paper is as follows. Section 2 briefly describes the takeover-tax bill and its predicted impact on the economy. Section 3 discusses the five announcements regarding the bill, while section 4 presents the empirical results. Section 5 discusses possible

confounding events that occurred on the event dates and presents an analysis of international

market movements. In Section 6 we argue the October 14-16 market decline triggered the

October 19 crash. Section 7 summarizes and draws conclusions from the results.

2.   Potential impact of Congressional takeover-tax bill

The tax bill introduced by the House Ways and Means Committee in October 1987

contained several proposals that would impact the market for corporate acquisitions and financial

restructurings, especially hostile takeovers.[2] The bill would have eliminated deductions for

interest expenses exceeding $5 million a year on debt incurred in the acquisition of the majority

of the stock of another firm or the repurchase of a majority of a firms' own stock. Interest

deductions on any debt used to finance a hostile takeover attempt of over 20% of a target's stock

or assets would have been prohibited. The bill would have reduced the ability of a bidder in a

takeover to finance the acquisition through sale of the target's assets by requiring a recognition

of the gain when the target's assets are sold after an acquisition.[3] Finally, the bill would require

a hostile bidder to treat an acquisition as a purchase of assets with an immediate taxable

recognition of the difference between the target's basis and the purchase price.[4]

The current U.S. tax code treats interest payments as a cost of doing business. The

proposed interest restrictions would not only have limited takeovers, but also going-private

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[2]   See the Omnibus Budget Reconciliation Act of 1987, Sections 10138-10140 and Sections 10142-10144.

[3]   Specifically, the bill would have prohibited the use of mirror subsidiaries to sell a division or subsidiary without a basis step-up and an immediate taxable recognition of the gains.

[4]   The bill also included a 50% nondeductible excise tax on profits from greenmail payments. In explaining the motivation for including antitakeover provisions in the tax bill, the House Ways and Means Committee states, "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 welfare of the acquired corporation's employees and community. The committee therefore believes it is appropriate not only to remove tax incentives for corporate acquisitions, but to create tax disincentives for such acquisitions."

transactions and recapitalizations, such as stock buybacks.[5] Since the bill did not include any

provision to encourage new equity creation (for example, eliminating the double taxation of

dividends), the net impact of restricting interest deductions would have been to increase the total

cost of capital to corporations. Additionally, the debt restrictions would have increased the

agency costs of free cash flow (see Jensen (1986)) since debt bonds managers to pay out cash

flows to claimholders rather than using the cash for negative net present value projects.

By reducing the ability of an acquirer financing a takeover through target asset sales, the

bill would have restricted "bust-up" takeovers. Jensen's (1986) free cash flow theory of

takeovers suggests that hostile bust-up takeovers promote economic efficiency by undoing value-

reducing acquisitions made by target firms. Consistent with Jensen's theory, Mitchell and Lehn

(1988) find that firms that undertake value-reducing acquisitions are more likely to become

takeover targets than firms that make value-increasing acquisitions. Mitchell and Lehn conclude

that their results "suggest that one source of value in many corporate takeovers, especially hostile

takeovers, is recoupment of target equity value that had been lost because of the targets' poor

acquisition strategies prior to the reception of their bids."

The potential effects of the bill as written were wide ranging. Restrictions on corporate

takeovers would greatly reduce the significant economic gains to target shareholders from these

transactions; on average the net-of-market stock price of target firms increases 25% to 35% upon

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[5]   A simple example illustrates the impact of eliminating deductions for interest
expenses exceeding $5 million a year. Data from the Office of Economic Analysis at the SEC
indicate that debt accounted for 76% of the financing for tender offers from June 1987 through
June 1988. Applying this mix of financing to a $1 billion acquisition, the annual interest
expenses on the $760 million debt would be $76 million, using a 10% rate of interest. Under the
proposed interest provision, additional taxes of $24.1 million (34% (corporate income tax rate)
of $71 million) would be paid annually. Assuming a 10% discount rate, the value of the target
company would be 24.1% less than under the current tax law. For a hostile acquisition, all
interest deductions would be prohibited; here the decline in value would be 25.8% (34% of $76
million). Note these estimates assume the debt will not be worked down quickly. Where the
debt will be redeemed rapidly, then the decline in value will be much less.

the announcement of the proposed takeover.[6] In addition, since takeovers may reduce agency

costs arising from the separation of ownership and control of public corporations, the proposed

changes would reduce the value of most firms as well as firms actually "in play". While synergy

gains and reduced agency costs would still motivate takeovers and restructurings, the proposed

bill would have reduce the relative attractiveness of these investments as compared to less

economically beneficial investments treated more favorably by taxes. The bill, by denying

interest deductibility for takeovers, while retaining interest deductibility for other borrowing,

would have biased investment away from takeovers even if, absent the tax factor, the takeovers

were the highest net present value projects.

3.   **Chronology of takeover-tax bill**

We use the Dow Jones News Service Broadtape to identify the day and exact time that

news about the antitakeover provisions of the House Ways and Means tax bill became public.[7]

In October 1987, the House Ways and Means Committee was writing a major tax-bill to decrease

the deficit. Our review of the Broadtape reveals no mention before October 13 of proposals in

the Committee to change the tax treatment of takeovers in discussions of possible avenues for tax

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[6]   Recent studies of returns to shareholders in takeovers include Bradley, Desai and Kim (1988) and Jarrell and Poulsen (1988). See Jensen and Ruback (1983) and Jarrell, Brickley, and Netter (1988) for a review of the empirical evidence on takeovers. Jensen (1988) estimates overall target stockholder gains from takeover activity during 1977-86 were $346 billion.

[7]   A comprehensive chronology of the antitakeover provisions of the tax bill with all citations is available on request.

increases.[8] Therefore, we assume that the news that became public on the evening of October 13 was relatively unanticipated by the market.[9]

At approximately 6:30 P.M. on Tuesday evening, October 13, Democrat members of the Ways and Means Committee, in a closed caucus, agreed to tax increases that included the takeover-tax proposals. The next important development in the tax bill occurred on the evening of Thursday October 15 when the full House Ways and Means Committee approved the takeover-tax bill. We treat the full Committee approval as an event because it ended the uncertainty on whether the bill would be sent to the House. On October 15 when the Committee approved the bill it was clear, at least at the Committee level, that the Democrat leadership intended to press the takeover-tax provisions.

Immediately following the crash, investment banking firms, citing the potential role of the proposed takeover-tax as a cause of the crash, began lobbying to eliminate the antitakeover provisions of the House tax bill. At 2:08 P.M. Wednesday October 28, Representative Rostenkowski, Chairman of the Ways and Means Committee, testifying before the House Rules Committee, indicated that he was not wedded to the tax provision that would limit breaks for

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[8]   We also find no mention of the proposed revisions of the tax treatment of takeovers in the New York Times, Wall Street Journal or Congressional Quarterly Weekly Report prior to October 14. An article in Congressional Quarterly Weekly Report discussing meetings on October 7 and 8 by the House Ways and Means Committee did not mention any proposed changes in the tax treatment of takeovers. See Wehr (1988) p. 2440.

[9]   For several years there had been Congressional proposals to change the tax treatments of takeovers. For example, Representative Dorgan of the House Ways and Means Committee introduced on July 23, 1987 a tax bill almost identical to the antitakeover proposals adopted by the Ways and Means Committee in October. However, these earlier proposals were not viewed as seriously as the October bill approved by the Ways and Means Committee, which was part of a deficit reducing comprehensive tax package.

corporate mergers and acquisitions.[10] The next evening October 29, Rostenkowski strengthened his remarks from the day before in a formal statement that he would agree to modify, though not drop, the takeover-tax provisions. During the next month and a half Rostenkowski maintained his willingness to modify the tax rules on takeovers but refused to drop all of the provisions. The Broadtape reported on December 15 that the modified tax bill still had some tax tighteners on takeovers. However, on December 16 at 11:58 A.M., the Broadtape reported that most of the antitakeover provisions in the original House bill had been dropped during negotiations between House and Senate conferees. The provisions eliminating the use of mirror subsidiaries to carry over the basis in the sale of assets were retained.[11]

4. Stock market effects of takeover-tax bill announcements

4.1 Restatement of hypotheses

Under the hypothesis that the antitakeover provisions of the House Ways and Means tax bill would have reduced shareholder wealth, the market should have declined on October 14 and 16 and increased on October 29 and 30 and December 16. Some of the price change on the first four event dates should have occurred during early trading since the first opportunity to trade on the antitakeover news was at the open. Analogously, on December 16 some of the market reaction should have occurred immediately after noon since the news came across the Dow ticker at 11:58 A.M. Since the tax provisions would have had a greater impact on companies that were actually in play during this period, these stocks, adjusted for market risk, should have experienced even greater price changes than the overall market during both full day and intraday

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[10]   This week the market closed at 2:00 P.M. so Rostenkowski's statement occurred after the market had closed.

[11]   The 50% excise tax on greenmail payments was kept as well.

trading. Similarly, risk arbitragers should have responded negatively on the first two event dates

and positively on the latter three event dates.

4.2   Market response to takeover-tax bill announcements

4.2.1   Daily market returns

Panel A of Table 1 displays the overall market (proxied by the S&P 500 Index)

movements on the five event dates; these market movements are consistent with the hypothesis

that the antitakeover provisions of the House proposal had a negative impact on the stock

market.[12] The S&P 500 declined 2.95% on October 14 and 5.16% on October 16. On October

29 and 30 after reports that Chairman Rostenkowski might be flexible on the antitakeover

provisions, the S&P 500 increased 4.93% and 2.87% respectively. On December 16, the day it

was announced House conferees had decided to abandon the antitakeover provisions, the S&P

500 increased 2.17%. Most of the positive return to the S&P 500 on December 16 occurred after

the 11:58 A.M. announcement; the S&P 500 return from noon until the close on this day was

2.01%.

Time-series S&P 500 returns data from pre- and post-event periods and cross-sectional

S&P 500 returns data on the event dates provide variance estimates to test statistical significance.

The source of the pre-event time-series data is the 150 trading days preceding October 14, 1987

and the source of the post-event time-series data is the 150 trading days following December 16,

1987. The post-event time-series data allows for a permanent increase in the variance of stock

returns due to the market crash. While the post-event time-series variance will reflect a

permanent variance increase, it does not address the potential problem of increased variance

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[12]   We also proxy the market using the CRSP Index and the NYSE Composite but
the results are not sufficiently different to warrant presentation. Availability of the intraday S&P
500 returns motivate reporting the S&P 500 results.

during the event period. We use measures suggested by Brown and Warner (1985) to correct for increases in the variance during the event window: (a) double the variance based on non-event time-series data; (b) a variance estimate based on cross-sectional returns during the event period; and (c) non-parametric tests.

In Table 1, t-values based on the pre-event period variance (t_b in the text) are in parentheses, t-values based on the post-event period variance (t_a in the text) are in brackets and t-values based on doubling the pre-event period variance (t_d in the text) are in braces. Using the pre- and post-event period variances, the S&P 500 return is statistically significant at greater than the 10% level on all five event dates: t_b=-2.86 and t_a=-2.32 on October 14, t_b=-5.00 and t_a=-4.06 on October 16, t_b=4.77 and t_a=3.88 on October 29, t_b=2.78 and t_a=2.26 on October 30, and t_b=2.11 and t_a=1.71 on December 16.

To account for the possibility of increased variance during the event period, we double the pre-event period variance estimate. The transformed t-values are: t_d=-2.02 on October 14, -3.54 on October 16, 3.38 on October 29, 1.97 on October 30 and 1.49 on December 16.[13] Doubling the pre-event variance estimate results in failing to reject the null hypothesis of zero abnormal performance only on the fifth event date, December 16. However, as mentioned earlier, most (2.01%) of the positive S&P 500 return on December 16 (2.17%) occurred after the

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[13]   We also compute variance estimates from shorter and longer periods surrounding the crash: (a) 50, 100 and 200 trading days prior to October 14, 1987 (b) 50 and 100 trading days following December 16, 1987 and (c) 50, 100 and 150 trading days following October 30, 1987. In all the tests based on pre-event variance estimates and almost all of the tests based on post-crash variance estimates the S&P 500 returns on the takeover-tax event dates are significant. For the four October event dates, using the post-crash variance estimates, all S&P 500 returns are significant except some based on the variance estimate constructed from 50 trading days after October 30. Using this measure, statistical significance drops below the 10% level for the October 14 and 30 returns (the t-statistics are -1.47 and 1.43 respectively). The December 16 full day return is not significant using most of the post-crash variance estimates, but the post-announcement (12:00-close) return on December 16 is significant based on all post-crash variance estimates constructed from post-noon data.

11:58 A.M. announcement. If we double the variance estimate from the 150 day pre-event period for the same intraday period (noon until the close), the 2.01% return on December 16 after the announcement is significant at the .05 level.[14]

An examination of the individual S&P 500 firms' returns on the takeover-tax event dates provides support for the statistical tests using non-event time-series data. First, most all of the S&P 500 firms experience negative returns on October 14 (459, 91.8%) and October 16 (478, 95.6%) and positive returns on October 29 (455, 91%) and October 30 (416, 83.2%) and December 16 (387, 77.4%). We compute a cross-section variance estimate for the 500 firms on all event dates. For every event date, t-values based on the cross-section variance estimate rejects the null hypothesis of zero abnormal performance at the .001 level. Doubling the cross-section variance estimates does not significantly reduce the significance levels. The nonparametric Wilcoxon Signed Rank test also rejects the null hypothesis of zero abnormal stock market performance at the .001 level for all event dates.

4.2.2. Intraday market returns

Announcements about the antitakeover provisions on the first four event dates occurred after the market had closed on the prior trading day. To the extent investors became immediately aware of the antitakeover provisions of the tax bill and their implications, the market response to these four announcements should have occurred during early trading. Panel A of Table 1 reports the S&P 500 return from the close on the day of the announcement through 11:00 A.M. for the first four event dates. The market moved as predicted during early trading on each of these four days: -1.39% and -1.18% on October 14 and 16, and 2.23% and 2.99% on October 29 and 30.

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[14]   We use two tailed tests throughout the paper, however, since we predict signs for all tests, one-tailed tests would be appropriate. Using one-tailed tests, all the S&P 500 returns under all variance estimates are statistically significant.

To test the statistical significance of these intraday market movements, we again use time-series S&P 500 intraday returns data (close through 11:00 A.M.) from 150 day pre- and post-event periods to provide variance estimates. The early-trading S&P return is statistically significant with respect to both control periods for the four October event dates, with the exception of the return on October 16 based on the post-event variance estimate: t_b=-2.21 and t_a=-1.95 on October 14, t_b=-1.88 and t_a=-1.65 on October 16, t_b=3.56 and t_a=3.12 on October 29, and t_b=4.77 and t_a=4.18 on October 30.[15]

The S&P 500 return during the hour after the December 16 announcement that the antitakeover tax provisions had been dropped from the House tax bill provides further support for the hypothesis that the overall market reacted to the takeover-tax bill. The December 16 news was reported over the Broadtape at 11:58 A.M., and as reported in Table 1, during the hour after this announcement, the S&P 500 increased 0.80%. Both t-values, based on variance estimates calculated from 12:00 to 1:00 trading in the 150 day pre- and post-event periods, are statistically significant with t_b=2.80 and t_a=2.85.[16]

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[15]   We check the robustness of the significance tests by constructing intra-day variance estimates from the same variety of control periods discussed in footnote 12 for close to 11:00 A.M. returns. For the four event dates the S&P 500 return is statistically significant based on all pre-event variance estimates. Using post-crash variance estimates the intraday S&P 500 returns on October 29 and 30 are significant on all event dates. Significance is lost for the October 16 intraday S&P 500 return (the t-statistics remain over one with one exception) under all post-crash variance estimates and the significance of the intraday S&P 500 return on October 14 drops below 10% for all variance estimates constructed from post-October 30 returns and for the variance estimates error constructed from returns for 50 days after December 16 (the t-statistics are all over one).

[16]   We also check the robustness of these results by constructing variance estimates for the control periods described in footnote 12. The December 16 intraday return (12:00 to 1:00) is significant using each of the alternative variance estimates except when the return is compared to the variance estimate calculated from the 50 trading days after October 30.

Again we also double the pre-event intraday returns variance estimate to account for the possibility of increased variance during the event period. The transformed t-values are: $t_d= -1.56$ on October 14, $t_d=-1.33$, on October 16 $t_d=2.51$ on October 29, $t_d=3.36$ on October 30 and $t_d=1.98$ on December 16. Here, doubling the pre-event variance estimate eliminates statistical significance for the intraday trading on the first two event dates.

4.2.3. Cumulative market returns

Cumulative returns illustrate the overall magnitude of the stock market response to the proposed takeover restrictions. The cumulative S&P 500 return on October 14 and 16 is -8.11% ($t_b=-5.56$, $t_a =-4.51$, $t_d=-3.93$). Many argue that the market decline on October 15 (-2.33%) was also due to information about the takeover restrictions.[17] While the October 13 6:30 P.M. announcement was a surprise, the approval by the Committee on the evening of October 15 was closely followed by Wall Street. According to Yardeni (1987), takeover stocks suffered large losses at the end of the day on October 15 due to anticipation of the Committee's approval of the bill later in the evening. Conceivably, prior to the close of trading on October 15, some market participants became aware of the upcoming Committee approval or had received sufficient information to revise their probability estimates of the bill going forward. The cumulative S&P 500 return during October 14 through 16 is -10.44% ($t_b=-5.84$, $t_a=-4.74$, $t_d=-4.13$). The cumulative return over the three event days when Congress indicated a relaxation of the antitakeover provisions in the bill -- October 29, 30, December 16 -- is 9.97% ($t_b=5.58$, $t_a=4.53$, $t_d=3.95$). The cumulative S&P 500 returns are statistically significant regardless of the variance estimate used. In value terms, shareholders recouped much but not all of the October 14-16

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[17]   See Burrough and Ricks (1987).

decline on the latter three event dates. 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.

4.3 Abnormal stock-market performance of takeover portfolio

4.3.1 Description of takeover portfolio

To analyze the effects of the antitakeover provisions of the tax bill on takeover targets, we construct a portfolio of nineteen takeover stocks from NYSE or AMEX listed firms that were "in play" during October 1987. This portfolio consists of firms that during August, September, or October there had been a 14D or 13D filing or a bidder had made a proposal for a tender offer. We excluded in play firms where the takeover was substantially completed by October 13 and thus exempt from the provisions of the bill which applied to distributions made after October 13.[18]

4.3.2 Methodology for assessing abnormal performance

We estimate the abnormal return to the takeover portfolio on each of the takeover-tax event dates using the CRSP (Center for Research in Security Prices) daily stock returns data. Since the event dates are the same for all stocks we estimate portfolio returns to account for cross-sectional dependence in the abnormal returns. On each of the five event dates the daily abnormal return (AR_{pt}) for the takeover portfolio, which includes the firms in the portfolio on that date[19], is:

$$AR_{pt} = R_{pt} - (A_p + A_p R_{mt}),$$

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[18]   We also report in the Appendix firms that were in play at this time but are excluded from our sample because the takeover was substantially completed by October 13.

[19]   The size of the portfolio varies on the event dates since we exclude firms on event dates where major firm-specific news occur. The appendix lists the reason for excluding firms.

Where

R_{pt} = rate of return on the portfolio of in-play firms included on event day t,

R_{mt} = rate of return on the S&P 500 Index on event day t[20], and

A_p, A_p = ordinary least squares estimates of market model parameters estimated over the control periods of 120 days ending October 13, 1987 for the portfolio composed of the firms included on date t.

To perform other tests, we also estimate the market model parameters, A_i and A_i, for the individual firms in the takeover portfolio from the same control period. We then calculate individual firm abnormal returns on each of the five event dates to test how many were negative. Additionally, to determine the immediate market response of the firms in the takeover portfolio to the antitakeover provisions, we calculate intraday abnormal returns using the individual firm market model estimates and data on individual transactions from the Securities Industry Automation Corporation (SIAC) tapes. The SIAC tapes contain the time-ordered record of every common stock transaction on the NYSE and AMEX and regional exchanges. The intraday return on each October event date is the percentage change in each stock price from the price of the last trade the prior day to the first trade after 11:00 A.M. on the event date. We average the firm intraday abnormal returns, AR_{it}, across the N_t firms included on that date to calculate the intraday portfolio AR.

4.3.3 Risk-adjusted takeover portfolio returns

Panel A of Table 2 reports the takeover portfolio AR on each of the five event dates. The data support the hypothesis that takeover targets would be more sensitive to the antitakeover provisions of the tax bill than the overall market. On all five event dates the takeover portfolio

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[20] The S&P 500 represents the market to maintain consistency since the market movements presented in the previous section are based on S&P 500 returns.

AR has the expected sign and is statistically significant at the .05 level.[21] The ARs and corresponding t statistics are: -1.43% (t=-2.03) on October 14, -5.25% (t=-6.92) on October 16, 5.00% (t=6.13) on October 29, 4.39% (t=5.62) on October 30, and 1.79% (t=2.42) on December 16. Analagous to our tests of the S&P 500 movements, we double the variance estimate to account for increased variance during the event period. The transformed t-statistics are shown in brackets in Panel A of Table 2. The ARs remain statistically significant at the .10 level, except for October 14.

Panel B of Table 2 displays the intraday MARs. They indicate that in early trading the stock prices of the firms in the takeover portfolio responded significantly to the takeover-tax news. We use the cross-sectional variance estimate on each event date to construct the t-statistics since we have no comparable control-period intraday data. The intraday MARs are: -0.31% (t=-1.60) on October 14, -2.51% (t=-6.15) on October 16, 3.65% (t=4.03) on October 29, and 4.02% (t=4.21) on October 30. All of these intraday MARs have the predicted sign and with the exception of October 14 the intraday MARs are all statistically significant. As before, we double the variance estimate to account for increased variance during the event period; the corresponding t-value are reported in brackets in Panel B of Table 2. This adjustment has little influence on the results.

Non-parametric tests indicate the impact of the takeover-tax announcements on the takeover portfolio firms is widespread. Panel A of Table 2 reports the non-parametric results for

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[21]   The standard error for the AR is

$$I_{ar} = (I_{>>}(1 + 1/N + (R_{mt} - R_m)_{>>}/CSSR_m)\}$$

where $I_{>>}$ is the estimated residual variance for the estimation period, N is the number of observations in the estimation period, R_m is the estimation period mean of the market return, and $CSSR_m$ is the corrected sum of squares of the market return during the event window. See Brown and Warner (1985) and Cantrell, Maloney and Mitchell (1989) for a discussion of testing statistical significance of abnormal performance.

the daily AR's. For 14 (82.4%) of the 17 firms included in the October 14 portfolio, the AR is negative, and for 16 (94.1%) of the 17 firms in the October 16 portfolio, the AR is negative. In contrast, the AR is positive for 14 (93.3%) of the 15 firms in the October 29 portfolio, 12 (80%) of the 15 firms in the October 30 portfolio and 13 (86.7%) of the 15 firms in the December 16 portfolio. The Wilcoxon Signed Rank test rejects the null hypothesis of zero abnormal performance at the .01 level for every event date. Significance levels are shown in braces.

The nonparametric results from the intraday ARs, reported in Panel B, also support the hypothesis that the in-play firms stock prices were sensitive in early trading to news about the takeover tax. The intraday AR is negative for 10 (58.8%) and 16 (94.1%) of the 17 firms in the intraday October 14 and 16 portfolios, respectively. In contrast on both October 29 and 30, 14 (93.3%) of the 15 firms experience positive ARs. Again, the Wilcoxon Signed Rank test rejects the null hypothesis of zero abnormal performance at the .01 level, except for the intraday October 14 portfolio.

4.3.4   Takeover-portfolio performance during the market crash

To test the effects of the crash and any continuing impact of the tax bill on takeover stocks we cumulate the takeover portfolio abnormal returns, beginning on October 14 and ending on October 28, the day Rostenskowski first indicated flexibility (after the market had closed). Whereas the number of firms in the event day portfolio vary due to exclusion of some firms on some of the event dates, here we look at the full portfolio of 19 in-play firms. The cumulative portfolio abnormal return is -10.32% (t=-9.31) at the close on October 16. The takeover portfolio continued its abnormal decline beyond the 16th. On Monday the 19th, the portfolio abnormal return is -13.82% (t=-10.77). Some of this decline may be attributed to the crash itself,

but some might have been the market's continued reaction to the tax bill. On October 19, selling of takeover stocks contributed to the market's decline. By the end of the crash week, the cumulative portfolio abnormal return is -24.98% (t=-13.01), virtually unchanged from the October 19 level. By October 28, the last trading day before Rostenkowski began backing away from the proposed taxes, the cumulative portfolio abnormal return is -31.90% (t=-14.27).

4.4. Effects of the takeover-tax bill on risk-arbitrage activity

The actions of risk-arbitragers should be sensitive to factors affecting the probability of takeovers going forward since risk arbitragers obtain positions in the stocks of potential and actual takeover targets.[22] At our request, the NYSE provided risk-arbitrage data collected from member firms.[23] The data consists of the daily aggregate value for each of 20 anonymous major risk-arbitrage departments' buys and sells for all 22 trading days during October 1987. Risk-arbitrage data surrounding the December 16 announcement was not provided.

Table 3 displays the risk-arbitrage data. In addition to reporting separately the value of stock bought and sold by risk arbitragers, Table 3 reports the total value of shares bought and sold (buys + sells), and the value of buys relative to sells (buys/sells).[24] The data indicate that the total value of buys and sells by risk arbitragers heightened during the pre-market crash period (October 14-16) and remained relatively high during the crash week. While sells by risk

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[22]   See Larcker and Lys (1987) and Wyser-Pratte (1982) for discussions of risk arbitrage and the major role played by merger arbitrage in the actions of risk arbitragers.

[23]   The data are deemed by the NYSE to be confidential in their entirety and confidential treatment has been requested by the NYSE via a letter dated February 10, 1981, which has been filed pursuant to 17 CRF 200.83(e) with the Freedom of Information Act Officer at the SEC.

[24]   We use the buy/sell ratio computed from the total daily buys and sells of all 20 firms instead of the buy/sell ratio averaged across the 20 firms because some of the firms did not sell stocks on some days. Therefore, on those dates their buy/sell ratios are infinite, thus biasing the average buy/sell ratio.

arbitragers account for the bulk of the increased arbitrage activity during this period, the value of shares purchased by arbitragers increased as well during October 14 through 23.

To test whether arbitragers responded to news about the antitakeover provisions of the House tax bill, we focus on the data in Columns 5 and 6 of Table 3. We use these two measures of risk arbitrage activity, which reflect both buys and sales, as proxies for the relative attractiveness of takeover investments by risk arbitragers. We compare these two measures on the event dates vis-a-vis a comparison period. For the first two event dates, October 14 and 16, when the House Ways and Means Committee introduced and approved the proposed bill, the comparison period is October 1-13, a period during which takeover activity was less threatened. This comparison period does not include data after October 16 since the threat of takeover restrictions remained relatively high at least through October 28. For the latter two event dates in October, the 28th and 29th, when Rostenskowski indicated flexibility on the antitakeover provisions of tax bill, the comparison period is October 20-28. This comparison period does not include October 1-19 since: (a) October 1-13 was a period when takeover activity was not threatened and hence not unlike October 29 and 30; (b) October 14-16 encompasses the first two event dates; and (c) October 19 is the crash date.

Panel A of Table 4 displays comparisons of the buy-sell differential and the buy/sell ratio on the first two event dates, October 14 and 16, with the corresponding measures from October 1-13 (9 trading days). Using both measures of takeover attractiveness, the data support the hypothesis that risk arbitrage activity during this period responded negatively to news about the antitakeover provisions of the tax bill. The mean daily buy-sell differential during October 1-13 was $986,273. On October 14 and 16 the buy-sell differential became negative -- sells exceeded purchases by $2,821,781 on October 14 and by $2,141,720 on October 16. The buy-sell

differential on both October 14 and 16 is significantly different (.01 level) from the mean buy-sell differential for the comparison October 1-13 period. There are no days during October 1-13 when the buy-sell differential is as negative as on either October 14 or 16. Additionally the mean daily buy-sell differential during October 14-16, -\$2,982,303, is significantly different from the mean daily buy-sell differential during October 1-13 at the .01 level.

The results are similar using the buy/sell ratio. The mean daily buy/sell ratio during October 1-13 is 1.283. On October 14 and 16, the buy/sell ratios are 0.686 and 0.877, respectively. For these event dates, the buy/sell ratios are significantly different from the mean buy/sell ratio from the comparison October 1-13 period at the .01 and .05 level, respectively. Furthermore, the buy/sell ratio on October 14 is lower than the buy/sell ratio on all 9 trading days encompassing October 1-13 and the buy/sell ratio on October 16 is lower on all but one of these dates. The mean daily buy-sell ratio during October 14-16 is significantly lower than the mean daily buy-sell ratio during October 1-13 at the .01 level.

Evidence presented in Panel B of Table 4 suggests the attractiveness of takeover investments increased on October 29 and 30 in response to announcements by Rostenkowski that the takeover-tax bill might be weakened. The mean daily purchase-sell differential during the comparison period, October 20-28 is -\$5,903,061. On October 29 and 30 the buy-sell differential is -\$87,304 (statistically different from the comparison period at the .01 level) and -\$1,473,594 (statistically different from the comparison period at the .01 level), respectively. For both event dates, the buy-sell differential is less negative than on any date during the comparison period. Additionally, the mean daily buy-sell differential during October 29-30 is significantly different from the corresponding measure during the comparison period at the .01 level.

The mean daily buy/sell ratio during the comparison period of October 20-28 is 0.463. On October 29 and 30 the buy/sell ratio is 0.979 (statistically different from the comparison period at the .01 level) and 0.709 (statistically different from the comparison period at the .01 level), respectively. The buy/sell ratio on October 29 is higher than the buy/sell ratio on any of the days during the comparison period and the buy/sell ratio on October 30 is higher than all but one of these dates. Thus, while the attractiveness of takeover investments fell after the crash, it increased in response to Rostenkowski's announcements that some of the bill's restrictions would be loosened.

5.   Contributing factors to the October 14-16 decline

Other events and economic conditions on October 14-16 have been cited as triggering the crash on October 19. In Addition to the takeover-tax bill, fundamental factors frequently cited as triggers include a higher than expected trade deficit, rising interest rates, and increased worries about the federal budget deficit and a possible recession. Analysts have claimed that one or more of these factors, in combination with institutional and structural factors, caused the severe decline. In this section we review the other fundamental factors and the structural factors that could have affected the market on October 14-16, thus leading to the crash.

5.1   October 14 trade-deficit announcement

At 8:30 A.M. on October 14, 1987, the Commerce Department released the merchandise trade-deficit figures for August 1987. Although the $15.68 billion trade deficit for August was smaller than the July deficit of $16.47 billion, it had declined by a smaller amount than was generally expected (analysts surveyed by the Dow Jones Capital Markets Reports had predicted a

deficit of $15 billion). Several sources attribute part of the stock market decline on October 14

to the higher-than-expected trade deficit. [25]

We test whether the stock market decline on October 14, 1987 can be explained solely by

the higher-than-expected component of the announced trade deficit figures by examining the

market impact of twenty one trade-deficit announcements from April 1987 (February 1987 trade

deficit) through December 1988 (October 1987 trade deficit).[26] We estimate regression

equations explaining S&P 500 returns over three different periods on the 21 trade-deficit

announcement days with two explanatory variables. The first regression explains the full day

S&P 500 returns on the 21 announcement dates. Since trade deficit figures are released prior to

the market's open, we also estimate regressions to capture a more immediate market reaction:

the S&P 500 return between the close on the prior day and 11:00 A.M. and the S&P 500 return

between the close the prior day and 10:00 A.M.[27] The first explanatory variable is the

unexpected component of the trade deficit, measured as the relative difference between the actual

deficit and analysts' forecasts (taken from the Wall Street Journal and New York Times) of the

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[25] See, for example, the Brady Report (1988). Hershey (1987) reported that the trade deficit announcement was viewed unfavorably by the market because it indicated the government might have to lower the value of the dollar to reduce the deficit. This in turn could require an increase in yields on Treasury bills in order to attract foreign investors to finance the Federal debt. An alternative explanation for a negative stock price reaction to an unanticipated increase in the trade deficit is the fear of protectionist legislation as a response.

[26] We do not use data from months earlier than April 1987 because of a change in the procedure used by the Commerce Department to report the figures. Under the early system a preliminary trade-deficit figure was released two weeks before the official announcement and thus the official release likely had a smaller impact on the stock market since the deviation between the actual and the predicted trade deficit would be smaller.

[27] Jain (1988) finds that most of the stock market reaction to the surprise component of periodic macroeconomic announcements occurs within one hour.

trade deficit. The second explanatory variable is an intercept dummy variable for the October 14 trade-deficit announcement.[28]

Table 5 displays the regression results with t-statistics shown in parentheses. For all three regressions, the coefficient on the unexpected change in the trade-deficit is negative and statistically significant. Unexpected decreases (increases) in the trade deficit have a positive (negative) impact on the stock market. The coefficient for the October 1987 dummy variable is negative in all three equations, though not statistically significant in the close-to-11:00 equation. The negative coefficient on the October 14 dummy variable indicates that some factor other than the higher-than-expected trade deficit contributed to the negative S&P 500 return on October 14, especially in full day trading. Additional evidence from these data suggesting the decline on October 14 was not totally due to the trade deficit announcement is that the full day S&P 500 return on October 14 is larger in absolute terms than all but one of the other twenty trade-deficit announcement dates, while the relative change between the predicted and actual trade deficit is the fourth smallest of the twenty-one announcements.[29] Of course, the fact that we are unable to determine that the stock market decline on October 14, 1987 was not "solely" or "totally" due to the trade deficit announcement does not foreclose the theory that the announcement had some effect.

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[28]   We use an intercept dummy for October 14 because the effect of the takeover tax news would have impacted the market directly and would not have changed the relationship between the trade deficit and the market (slope).

[29] The S&P 500 return between the close the prior day and 10:00 A.M. and between the close the prior day and 11:00 A.M. is the 5th and 4th largest in absolute terms of the 21 trade-deficit figures, respectively.

5.2   Other news items

In the period from October 14 through 16, the only surprise macroeconomic news other than the trade-deficit announcement was an increase in interest rates on October 14.[30] The interest rate increase was not independent from the trade-deficit announcement, since traders feared that government actions to lower the deficit could increase interest rates (see Herschey (1987)). Interest rates also rose slightly on October 15, but fell on October 16. It is unlikely, however, that the market decline from October 14 through 16 was predominantly due to fears of further interest rate increases. On October 15, Treasury Secretary Baker said that the Federal Reserve Board had made it clear that inflationary expectations were overblown, thus it is unlikely the Fed was about to raise the discount rate. Also, on October 15, Manuel Johnson, Vice Chairman of the Federal Reserve Board said fears of inflation were exaggerated, stating "The fundamentals do not give the markets a reason to panic."[31] Additionally, there was little unexpected news forthcoming about other fundamental factors frequently cited as triggering the crash (such as the budget deficit).[32]

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[30]   On the morning of October 16, Iran attacked a U.S. flagged oil tanker, raising Persion Gulf tensions.

[31]   See Kilborn (1987). At the same time, Secretary Baker hinted the U.S. might let the dollar fall to pressure West Germany to lower interest rates. The impact of this statement on U.S. markets is unclear. To the extent that lowering the value of the dollar would cause inflation, the market reaction might be negative. If the market believed Baker's would induce West Germany to lower interest rates, the reaction could be positive.

[32]   A review of the Wall Street Journal on the post-crash event dates reveals that the only new significant macroeconomic news on these three event dates was declining oil prices on December 16. To test the effect of oil price changes on December 16 we examine a sample of 35 oil producer stocks (SIC code 1311) and find on average their stock prices increased 1.94% on December 16. Since this increase in share prices is only slightly less than the market increase it is unlikely there was a large market effect from the falling oil prices.

5.3   Trading strategies as triggers for the crash

Certain portfolio trading strategies, including index arbitrage and portfolio insurance, have been cited by the Brady Report (1988) and SEC Division of Market Regulation Report (1988) as exacerbating the market decline on October 14-16 and the crash on October 19. These reports suggest that the decline began with fundamental factors but was worsened by certain types of program trading.[33] Structural and institutional factors, including types of program trading, may have contributed to the October 14-16 decline as well as the crash on October 19. The evidence suggests, however that a major identifiable economic trigger of the market decline on October 14-16 was the announcement of the antitakeover provisions of the House tax bill.

Index arbitrage is a trading strategy of buying (selling) stocks in an index and selling (buying) the futures contract for that index when stock prices in the index are low (high) relative to their fair value with the futures price. Index arbitrage links the futures and the cash markets. If either market responds to news more quickly than the other, then index arbitrage may be profitable.[34] Index arbitrage does not destabilize the markets but instead occurs at the same time as the markets react to some event that has changed the underlying value of securities.[35] On the event dates, the presence of index arbitrage was an indication of factors, such as the takeover-tax

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[33]   The study conducted by the Division of Economic Analysis and the Division of Trading and Markets of the U.S. Commodity Futures Trading Commission (1988) disputes the alleged harmful effects of portfolio insurance and index arbitrage related trading at the time of the crash.

[34]   Kawaller, Koch, and Koch (1977) examine the intraday price relationship between the S&P 500 futures and S&P 500 index and find that futures price movements lead index movements by 20 to 45 minutes while index movements rarely affect futures beyond one minute.

[35]   Fama (1988) asserts that on October 19 and 20 restricting the access of arbitragers to the program trading system and breaking the links between the futures and the equities market added "to the informational chaos of high volatility periods." Fama suggests that in such periods it is important to facilitate arbitrage and not to restrict it as proposed by some regulators.

news, that triggered a revaluation of equities. The SEC Division of Market Regulation Report

(1988) asserts that from October 14-16 there were significant price declines first evident in index

futures and followed by the cash market. The SEC Division of Market Regulation Report (1988)

finds "a significant amount of arbitrage stock selling occurred on the NYSE in relatively

concentrated intervals during almost every period of stock price decline over these three days."[36]

For example, the report notes that on October 14 there was significant arbitrage stock selling in

the four periods of significant price decline, including the period of the open to 10:00 A.M. On

October 16 the SEC Division of Market Regulation Report finds the effects of arbitrage stock

selling occurred periodically with the most pronounced period at the end of the session.[37]

The other type of program trading most cited as a cause of the crash is portfolio

insurance, which is a trading strategy that attempts to allow an equity portfolio to increase in

value as the market rises while insuring the value of the portfolio will not fall below a floor value

if the market falls. Portfolio insurance involves, in part, selling futures (or stocks) after prices

have fallen and buying futures (or stocks) after prices have increased. Portfolio insurance can be

destabilizing since the trading is not based on fundamentals and the trading strategy reinforces

the movement of the market.[38] To the extent that price pressure from portfolio insurance is not

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[36]   See SEC Division of Market Regulation Report (1988) pp. 2-9. The report
attributes a part of the stock price decline to index arbitrage rather than the view that index
arbitrage arises after some factor has changed the underlying value of securities and either the
futures or equity market has responded more quickly.

[37]   The SEC Division of Market Regulation Report (1988) states near the close on
October 16 there was a substantial amount of stock selling related to the expiration of futures and
options, which contributed to the severe price decline in late trading.

[38]   The destabilizing influence of portfolio insurance vary according to the specific
strategy used. Grossman (1988) argues portfolio insurance that uses synthetic options adds to
volatility more than portfolio insurance using a put option on a stock index because when traders
use dynamic strategies to synthesize options the market loses valuable information on the extent
of portfolio insurance in the market.

offset by other traders, it can exacerbate a market decline. Theoretically we cannot rule out the effects of portfolio insurance as contributing to the market decline on October 14-16. However, the market decline from October 14-16 was not triggered by portfolio insurance, since portfolio insurance does not start a decline although it may magnify a decline. So even if portfolio insurance contributed to the fall in stock prices in this period it is necessary to identify the fundamental factor or factors that triggered the decline. Additionally, portfolio insurance can not explain market movements on our latter three event dates.

5.4   International Market Movements

Roll (1988) argues the crash did not begin in the U.S. since many other world markets experienced a severe decline on October 19 before the U.S. markets opened. He recognizes the U.S. decline during October 14-16 may have precipitated international declines on October 19, but at the same time notes that other world markets also declined during October 14-16. Roll (p.22) concludes that "the overall pattern of intertemporal price movements in the various markets suggests the presence of som underlying fundamental factor . . . but . . . seems inconsistent with a U.S.-specific macroeconomic event."[39]

A decline by the rest of the world during October 14-16 that is insignificantly different from the contemporaneous U.S. decline, would be inconsistent with our hypothesis that the proposed takeover tax bill was a cause of the October 14-16 U.S. decline since the bill did not directly impact foreign firms. To test whether the U.S. decline during October 14-16 is different from the international decline, we compare the performance of the S&P 500 Index with two

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[39]   Roll's paper primarily investigates whether U.S. institutional structures caused the crash. He does not find empirical support for the argument that program trading, portfolio insurance, specialists, and other U.S. market structures are responsible for the crash.

measures of a value-weighted world index representing 22 countries, excluding the U.S.[40] The

world index is denominated in local currency for one measure and U.S. dollars in the other.

Table 6 displays the U.S. versus the non-U.S. world market movements during October

14-16. On October 14, the first takeover-tax event date, while the S&P 500 Index declined

2.95%, both measures of the world index actually increased -- local currency world index, .29%

and U.S. dollar world index, .84%.[41] The difference between the U.S. decline and the world

increase (both measures) on October 14 is statistically significant. We derive the variance

estimates from the returns for each of the indexes for 150 trading days preceding October 14.

We also double the variance estimate to account for possible increases in the variance of returns

during the event period. The difference between the U.S. decline and the world increase on

October 14 remains statistically significant, using the double variance.

The U.S. market declined 2.33% on October 15 -- this decline is significant based on the

first variance estimate, but not if the variance estimate is doubled. The world market declined as

well, 1.09% (local currency) and .77% (U.S. dollars), but the decline is not statistically

significant. The difference between the U.S. decline and the world decline on October 15 is

insignificant.

On October 16, the second takeover tax event date, the S&P 500 declined 5.16%, while

the world index declined only an insignificant .4% (local currency) and .6% (U.S. dollars). The

difference between the U.S. decline and the world decline is statistically significant, using both

the variance and the double variance.

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[40]   The data source is "FT-Actuaries World Indices" from Goldman Sachs. Roll uses
the same data.

[41]   Roll points to significant declines on October 14 by France, Spain and The
Netherlands. However, these markets constitute only 8% of the non-U.S. world index.

Overall, during October 14-16, while the U.S. market declined 10.44%, the world market only fell 1.34% (local currency) and .6% (U.S. dollars). The difference between the U.S. decline and the world decline is statistically significant at the .01 level even after doubling the pre-event variance estimate. This data demonstrates that the U.S. decline during October 14-16 greatly exceeds the decline by the rest of the world. Consequently, to the extent the October 14-16 decline triggered the October 19 crash, it resulted from economic events affecting the U.S. markets such as the proposed takeover tax bill.[42]

7. Triggering the crash

A combination of fundamental and structural factors caused the October 19, 1987 stock market crash. Since there was no major news over the weekend, October 17-18, that can account for a fall in equity values by over 20% on the 19th, structural factors must have played a pivotal role in causing the crash. However, to understand the crash completely, one must consider the fundamental factor that initially started the market decline. The market decline on the 19th began before the market opened or as Grossman and Miller (1988, p. 631) state, "some precipitating trigger before the 19th caused a massive liquidity event . . . at the opening of the markets on the 19th." Greenwald and Stein (1988) note that at the NYSE open on October 19, specialists faced a large excess of sell orders over buy orders which delayed openings of the stock of many large companies and increased uncertainty. The futures market also started down immediately. Leland and Rubinstein (1988, p.46) report the December S&P 500 futures contract

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[42]   The SEC Division of Market Regulation Report (1988) reports partial correlation coefficients for relative daily and intraday price movements of the DJIA and several foreign indexes during the period October 12 through October 23, 1987. The coefficients indicate that the U.S. market led, but did not follow, foreign markets during this period. These results support the above findings which suggest the U.S. had a significantly greater impact on foreign markets than vice versa.

opened down 6.5%, noting a 6.5% decline would have been the largest one-day market decline since the 1929 crash. Matters worsened as the day went on.

Why did the markets open down on the 19th? We suggest it was a continuation and a magnification of the 10.44% S&P 500 October 14-16 decline. An examination of the daily S&P 500 returns reported by CRSP, which contains daily data back to July 2, 1962, reveals no one, two, or three day periods with a fall in the S&P 500 of over 10% until October 14-16, 1987. While we do not have S&P 500 data prior to July 1962, a dataset recently compiled by Mulherin and Gerety (1988) allows us to examine the Dow Jones Composite Index as far back as 1900.[43] We examine the DJ Composite prior to July 1962 and find that it has not declined over 10% during a one, two or three day period since May 13-14 1940 when German tanks broke through the French armies, sealing France's fate in World War II. Not even the bombing of Pearl Harbor, John F. Kennedy's assassination, or the market break of May 1962 produce a market decline as large as that experienced on October 14-16, 1987.[44]

Since a decline of over 10% is so rare, the October 14-16 decline must be related to the crash, especially since it preceeded the crash with no trading days in between. Either fundamental factors caused the entire October 14-19 decline or the October 14-16 decline was a trigger for the October 19th crash. Our data do not show that the tax bill caused the crash on the 19th, so indeed structural factors must have been important. But our data show the importance of the proposed antitakeover provisions of the tax bill as a cause of the October 14-16 decline.

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[43] The correlation coefficient between the S&P 500 and the DJ-65 during 1962-87 is 0.95.

[44] During the market break of 1962, labeled severe by the NYSE and the SEC, the DJ 65 declined 9.02% from the 24th through the 28th. This decline was large enough to prompt studies by both the NYSE and the SEC.

Furthermore, the probability that the October 14-16 decline is unrelated to the crash on the 19th is close to zero.

The mechanism of the crash is beyond the scope of this paper. However, the following suggests how the October 14-16 decline might have triggered the crash, especially since the NYSE opened down on the 19th. First, there was selling pressure from portfolio insurance and those anticipating portfolio insurance sales. Gammill and Marsh (1988, p.39) hypothesize the 10% decline in the market from October 14-16 led to a demand by insured investors to reduce equity exposure by $12 billion. However, by the close on October 16, portfolio insurers had sold only $4 billion in equities, and the unfilled sell orders were an overhang in portfolio insurance selling ready to hit the market at the open on October 19. Leland and Rubinstein (1988) claim several institutional investors who were aware of this overhang tried to sell early on the 19th before the portfolio insurance sales, adding to the downward price pressure. Second, the October 14-16 decline was a news event itself, or as Leland and Rubinstein (1988, p.45) state, "one piece of news, the prior behavior of the market itself, was new." Wary investors uncertain about the U.S. decline and the world decline that had begun earlier on the 19th contributed to selling pressure present at the open. Finally, investors were still reacting negatively to the tax news, as evidenced by the negative abnormal returns on the takeover portfolio on the 19th.[45]

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[45] While the market did recover 200 points on the 20th indicating that a portion of the 500 point decline on the 19th can be attributed to structural, not fundamental factors, the market did not rebound entirely from the over 20% decline on October 19. Harris (1988) argues the failure to rebound can be attributed in part to the realization by portfolio managers that they had understated the costs and overvalued the benefits of portfolio insurance. Traders learned that illiquidity could occur and therefore the market revalued stocks downward. The crash itself provided information that stocks were overvalued.

8.   Conclusion

The stock market crash on October 19, 1987 began in the three trading days before the crash, October 14-16, when the value of the stock market fell more then 10%, the greatest three day decline since 1940. While numerous fundamental factors have been proposed as triggering this decline we provide evidence showing that the takeover-tax bill introduced on the evening of October 13 by Democrats on the House Ways and Means Committee and approved on the evening of October 15 by the full committee was a fundamental economic event contributing to the greater than ten percent market decline during October 14-16, which arguably triggered the October 19 crash.

Table 1

Daily and intraday returns to the S&P 500 on the takeover-tax event dates. The t-values based on variance calculated from returns for 150 trading days ending Oct. 13 are in parentheses, the t-values based on variance calculated for returns for 150 trading days after Dec. 16 are in brackets, and the t-values based on doubling the pre-event period variance are in braces.

	Panel A: S&P 500 returns on event dates				
	Oct. 14	Oct. 16	Oct. 29	Oct. 30	Dec. 16
Daily return[d]	-2.95%	-5.16%	4.93%	2.87%	2.17%
	(-2.86)[c]	(-5.00)[c]	(4.77)[c]	(2.78)[c]	(2.11)[b]
	[-2.32][b]	[-4.06][c]	[3.88][c]	[2.26][b]	[1.71][a]
	{-2.02}[b]	{-3.54}[c]	{3.38}[c]	{1.97}[b]	{1.49}
Intraday return[e]	-1.39%	-1.18%	2.23%	2.99%	0.80%
	(-2.21)[b]	(-1.88)[a]	(3.56)[c]	(4.77)[c]	(2.80)[c]
	[-1.95][a]	[-1.65]	[3.12][c]	[4.18][c]	[2.85][c]
	{-1.56}	{-1.33}	{2.51}[b]	{3.36}[c]	{1.98}[b]

Panel B: Takeover-tax events

Tuesday evening Oct 13: Democrats on the House Ways and Means Committee agree to tax proposal.
Thursday evening Oct. 15: The House Ways and Means Committee approves the tax bill.
Wednesday afternoon Oct. 28 at 2:08 P.M. (market was already closed): Rostenkowski indicates flexibility.
Thursday evening Oct. 29: Rostenkowski makes an official statement that he may compromise.
Wednesday morning Dec. 16 at 11:58 A.M.: House tax conferees decide to abandon nearly all of the corporate takeover-tax provisions contained in the House passed budget reconciliation bill.

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[a] significant at the 10% level of significance for two-tailed test.
[b] significant at the 5% level of significance for two-tailed test.
[c] significant at the 1% level of significance for two-tailed test.
[d] on Dec. 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 Oct. 14, 16, 29, 30 and on Dec. 16 the intraday return is the S&P 500 return from 12:00 to 1:00.

Table 2

Daily portfolio returns and intraday mean abnormal returns (MAR) for the portfolio of takeover stocks on the takeover-tax event dates and cumulative abnormal returns for the full portfolio of takeover stocks in the period around the crash. The market models used to estimate abnormal returns are calculated from returns for 150 trading days ending on Oct. 13. T-statistics based on control period-variance are in parantheses and t-statistics based on doubling the control period variance are in brackets. Significance levels of a Wilcoxon Signed Rank test are in braces.

	Panel A: Daily portfolio abnormal returns				
	Oct. 14	Oct. 16	Oct. 29	Oct. 30	Dec. 16
Daily Portfolio Return	-1.43% $(-2.03)^b$ [-1.44]	-5.25% $(-6.92)^c$ $[-4.89]^c$	5.00% $(6.13)^c$ $[4.33]^c$	4.39% $(5.62)^c$ $[3.97]^c$	1.79% $(2.42)^b$ $[1.71]^a$
Number of firms in the takeover portfolio	17	17	15	15	15
Number of firms in the takeover portfolio with a negative AR	14 {0.001}	16 {0.001}	1 {0.001}	3 {0.002}	2 {0.005}

	Panel B: Intraday mean abnormal returns				
	Oct. 14	Oct. 16	Oct. 29	Oct. 30	Dec. 16
Intraday MAR^d	-0.31% (-1.60) [-1.13]	-2.51% $(-6.15)^c$ $[-4.35]^c$	3.65% $(4.03)^c$ $[2.85]^b$	4.02% $(4.21)^c$ $[2.98]^c$	____e
Number of firms in the takeover portfolio with a negative AR	10 {0.225}	16 {0.001}	1 {0.001}	1 {0.001}	

a   significant at the 10% level of significance for two-tailed test.
b   significant at the 5% level of significance for two-tailed test.
c   significant at the 1% level of significance for two-tailed test.
d   intraday return is calculated on Oct. 14, 16, 29, 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.
e   intraday transactions data were not available for Dec. 16

Table 3

Aggregate value of shares purchased, aggregate value of shares sold, total (buys + sell), buys-sells, and buy/sells for 20 anonymous major risk arbitrage firms during October 1987.

Date	Purchases	Sells	Purchases + Sells	Purchases - Sells	Purchases /Sells
Oct 1	5,700,317	4,263,355	9,963,672	1,436,962	1.337
Oct 2	6,285,153	4,172,205	10,457,358	2,112,948	1.506
Oct 5	7,297,001	3,341,671	10,638,672	3,955,330	2.184
Oct 6	6,639,611	6,884,778	13,524,389	(245,167)	0.964
Oct 7	5,492,209	3,220,574	8,712,783	2,271,635	1.705
Oct 8	5,887,567	5,644,011	11,531,578	243,556	1.043
Oct 9	6,744,308	6,247,844	12,992,152	496,464	1.079
Oct 12	3,802,068	5,058,878	8,860,946	(1,256,810)	0.752
Oct 13	5,341,697	5,480,155	10,821,852	(138,458)	0.975
Oct 14	6,163,458	8,985,239	15,148,697	(2,821,781)	0.686
Oct 15	9,997,694	13,981,097	23,978,791	(3,983,403)	0.715
Oct 16	15,307,237	17,448,957	32,756,194	(2,141,720)	0.877
Oct 19	16,338,055	24,366,591	40,704,646	(8,028,536)	0.671
Oct 20	7,317,522	20,560,920	27,878,442	(13,243,398)	0.358
Oct 21	7,370,794	13,723,930	21,094,724	(6,353,136)	0.537
Oct 22	3,838,097	10,737,754	14,575,851	(6,899,658)	0.357
Oct 23	5,711,170	7,723,035	13,434,205	(2,011,865)	0.739
Oct 26	2,465,054	6,781,362	9,246,417	(4,316,308)	0.364
Oct 27	2,589,691	7,634,976	10,224,667	(5,045,285)	0.339
Oct 28	4,147,463	7,599,241	11,746,704	(3,451,778)	0.546
Oct 29	4,109,858	4,197,162	8,307,020	(87,304)	0.979
Oct 30	3,584,629	5,058,222	8,642,851	(1,473,594)	0.709

Table 4

A comparison of buy - sell differences and buy/sell ratios between control periods and takeover-tax event dates for 20 risk arbitrage departments during October 1987.

Panel A: Introduction and Approval of Antitakeover Provisions

	Comparison Period		Event Dates	
	October 1-13	October 14	October 16	October 14-16
Mean Daily Buys-Sells	986,273	-2,821,781 $(-7.56)^c$	-2,141,720 $(-6.21)^c$	-2,982,303 $(-5.94)^c$
Mean Daily Buys/Sells	1.283	0.686 $(-4.22)^c$	0.877 $(-2.87)^b$	0.759 $(-3.50)^c$

Panel B: Reducing the Antitakeover Provisions

	October 20-28	October 29	October 30	October 29-30
Mean Daily Buys-Sells	-5,903,061	-87,304 $(4.57)^c$	-1,473,594 $(3.48)^b$	-780,449 $(3.75)^c$
Mean Daily Buys/Sells	0.463	0.979 $(9.78)^c$	0.709 $4.66)^c$	0.844 $(3.49)^b$

[b] significant at the 5% level of significance for two-tailed test.
[c] significant at the 1% level of significance for two-tailed test.

Table 5

Regression results explaining daily and early trading (close until 10:00 A.M. and close until 11:00 A.M) S&P 500 returns with the percentage deviation between the actual and the predicted trade deficit and a dummy variable for October 14, 1987 for the release of trade deficit figures from April 1987 - December 1988. T-statistics are in parentheses.

Explanatory Variables	Dependent Variable		
	Daily S&P 500 Return	Close until 11:00 A.M., S&P 500 Return	Close until 10:00 A.M., S&P 500 Return
Constant	0.1156	0.2324	0.3675
Percentage deviation between actual and predicted trade deficit	-0.0677 (-2.72)[b]	-0.0486 (-3.09)[c]	-0.0620 (-4.34)[c]
October 14 dummy	-2.760 (-1.83)a	-1.384 (-1.45)	-1.614 (-1.78)[a]
R^2	0.386	0.403	0.542
Number of observations	21	21	21

[a] significant at the 10% level of significance for two-tailed test.
[b] significant at the 5% level of significance for a two-tailed test.

Table 6

Daily returns on various world indexes on the takeover tax event dates in the week before the market crash. The t-values based on variance from 150 trading days ending October 13 are in parentheses and based on double the pre-event period variance are in brackets.

Index	Oct. 14	Oct. 15	Oct. 16	Oct. 14-16
US (S&P 500)	-2.95	-2.33	-5.16	-10.44
	$(-2.86)^c$	$(-2.26)^b$	$(-5.00)^c$	$(-5.84)^c$
	$\{-2.02\}^b$	$\{-1.60\}$	$\{-3.54\}^c$	$\{-4.13\}^c$
World (denominated in local currency)	0.29	-1.24	-0.40	-1.34
	(0.35)	(-1.50)	(-0.48)	(-0.94)
	$\{0.25\}$	$\{-1.06\}$	$\{-0.34\}$	$\{-0.66\}$
US-World (denominated in local currency)	-3.24	-1.09	-4.76	-9.05
	$(-2.45)^b$	(-0.82)	$(-3.60)^c$	$(-3.95)^c$
	$\{-1.73\}^a$	$\{-0.58\}$	$\{-2.55\}^b$	$\{-2.79\}^c$
World (denominated in US dollars)	0.84	-0.77	-0.67	-0.60
	(0.87)	(-0.79)	(-0.70)	(-0.35)
	$\{0.61\}$	$\{-0.56\}$	$\{-0.47\}$	$\{-0.25\}$
US-World (denominated in US dollars)	-3.79	-1.56	-4.49	-9.84
	$(-2.68)^c$	(-1.10)	$(-3.16)^c$	$(-4.01)^c$
	$\{-1.89\}^a$	$\{-0.78\}$	$\{-2.24\}^b$	$\{-2.83\}^c$

[a] significant at the 10% level of significance for two-tailed test.
[b] significant at the 5% level of significance for two-tailed test.
[c] significant at the 1% level of significance for two-tailed test.

Appendix

Takeover Portfolio

Alexanders
Bell & Howell
Dayton Hudson
Decision Industries
Dyncorp
GAF
Gillette
Hudson General
Irving Bank
Kansas City Southern
Mead
Newmont Mining
Santa Fe Southern
Singer
Std. Brands Paint
Telex
Tesoro Petroleum
US Gypsum
Zayre

Reasons firms in play on October 14, 1987 were excluded totally or partially from takeover portfolio.

Excluded Firm	Reason for Exclusion and Exclusion Dates
Allegis[a]	Its restructuring was substantially completed by October 14.
Argonaut Group[a]	Terms already set by October 13.
Bell & Howell	Agree to buyout on December 15; excluded on December 16.
Brockway[a]	Terms already set by October 13.
Bundy[a]	Terms already set by October 13.
Canrad[a]	Terms already set by October 13.
Decision Industries	Bidder agrees to raise offer on December 16; excluded on December 16.

Dyn Corp.	Received several proposals to be acquired in week of October 26. In early November the Board agreed to an LBO. Thus, only October 14-16 event dates were included.
Financial Corp. of America[a]	Terms already set by October 13.
Gates Learjet[a]	Terms already set by October 13.
G. Heilemen Brewing[a]	Terms already set by October 13.
Gillette	Revlon Group announces on October 14 it will let bid expire. Thus October 14-16 were excluded. However, the firm remained in play.
Hawaiian Air[a]	Terms already set by October 13.
Holly Sugar[a]	Numerous confounding events occurred throughout the periods around each of the event dates.
Hubbard Milling[a]	Terms already set by October 13.
Newmont Mining	Delaware court decision on October 15 deals a heavy blow to Pickens' bid. Thus, only included on October 14.
Rexham[a]	Rexham agrees to acquisition on October 15.
Salomon Brothers[a]	Several confounding events throughout the event periods. In addition, Salomon Brothers was directly affected by the takeover-tax proposals since they are a player in the takeover market and was thus excluded on all dates.
Singer	Bilzerian Partners announces on October 29 they have a stake and are considering takeover. Thus, only included on October 14-16 and December 16.
Southland[a]	Terms already set by October 13.
Tesoro Petroleum	On October 14 there were two large block purchase of Tesoro stock by potential bidders. Thus Tesoro is excluded on October 14.
TWA[a]	This is a cleanup offer by Icahn for the approximately 26 percent of the shares he did not already own. Thus, there is no control premium in the share price.

[a] Denotes excluded on all event dates.

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