

TRIGGERING THE 1987 STOCK MARKET CRASH Antitakeover Provisions in the Proposed House Ways and Means Tax Bill?*

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We present evidence that a tax bill containing antitakeover provisions proposed by the U.S. House Ways and Means Committee on October 13, 1987 and approved by the Committee on October 15 was the fundamental economic event causing the greater than 10% decline in the stock market on October 14–16, which arguably triggered the October 19 crash. The bill, which eventually passed without most of the antitakeover provisions, would have limited the deductibility of interest on debt incurred to finance corporate takeovers, leveraged buyouts and recapitalizations, and imposed other restrictions on hostile takeovers.

1. Introduction

On Wednesday, October 14, 1987, the U.S. stock market began the most extreme one-week decline in its 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, what fundamental economic factors triggered the large stock-market decline? Second, what institutional and structural factors inherent in the trading strategies of investors and the market structures of the equities, futures, and options markets exacerbated the decline? This paper addresses the first question.

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We examine the market decline of more than 10% that occurred from October 14–16, immediately preceding the October 19 crash. Surprisingly, 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. Given the size of the October 14–16 decline, and the possibility that it triggered the crash, a study of the market crash is not complete without understanding the source of this precrash decline. Although several events and economic conditions are candidates, we provide evidence that proposed tax changes restricting takeovers introduced in the U.S. House Ways and Means Committee on the evening of October 13 and approved on the evening of October 15 were a major cause. This bill would have restricted 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 tax bill, we identify three announcements associated with its withdrawal, 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 bill's progress and increased significantly on the three event days in response to the news of decreased Congressional support. Further, on all five event dates the market moved significantly in the predicted direction during trading immediately following the announcements.

The returns of firms that were 'in play' as potential takeover targets and the trading behavior of risk arbitrageurs provide supporting cross-sectional evidence of the importance of the takeover restrictions in the tax bill for stock prices. The abnormal returns associated with a portfolio of in-play firms were significant on all five event dates in the predicted direction. Analogous significant abnormal price movements occurred during trading immediately following the announcements. In addition, we present evidence that risk arbitrageurs responded negatively to news that the bill was progressing and positively to news that Congress was backing off.

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

The organization of the paper is as follows. Section 2 briefly describes the corporate control components of the tax bill and their predicted impact on the economy. Section 3 discusses the five announcements regarding the bill, and section 4 presents the empirical results. Section 5 discusses possible confounding events and presents an analysis of international market movements. In

section 6 we suggest how the October 14–16 market decline could have triggered the October 19 crash. Section 7 summarizes and draws conclusions from the results.

2. Potential impact of House Ways and Means Committee's proposed changes in tax treatment of corporate control transactions

The tax bill introduced by the House Ways and Means Committee in October 1987 contained several proposals to change the corporate tax code that would have affected the market for corporate acquisitions and financial restructurings, especially hostile takeovers.¹ The bill eliminated deductions for interest expenses exceeding \$5 million a year on debt incurred to acquire the majority of another firm's stock or to repurchase a majority of a firm's own stock over a three-year period. The proposed legislation eliminated the ability of an acquirer in an acquisition to use mirror subsidiaries to dispose of assets of the target firm without a recognition of the corporate level gain.² Additionally, the bill contained several provisions specifically designed to restrict hostile takeovers. Interest deductions on any debt used to finance a hostile takeover attempt of over 20% of a target's stock or assets would be prohibited.³ The bill would have required a hostile bidder to treat an acquisition of stock as a purchase of assets with an immediate corporate taxable recognition of the difference between the target's basis in its assets and the purchase price. The proposal also included a 50% nondeductible excise tax on profits from green-mail payments.

The House Ways and Means Committee made it clear their intention was to change the tax code to restrict takeovers stating:⁴

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.

¹See H.R. 3545, Budget Reconciliation Act of 1987, sections 10138–10140 and 10142–10144.

²This provision closed a perceived loophole in the Tax Reform Act of 1986, which had eliminated the *General Utilities* doctrine. See Doernberg and Abrams (1987, p. 178) for a discussion of mirror subsidiaries.

³SEC Commissioner Joseph Grundfest (1987) in a letter to Chairman Rostenkowski, lobbying against the bill, noted that this provision would allow private parties to confer tax benefits since target firms would define 'hostile' bidder. The letter also states that the bill could reduce Treasury revenue (by reducing the number of acquisitions and premiums paid which are subject to taxation) and encourage foreign acquisition of U.S. firms (since debt would be deductible to foreign firms).

⁴See U.S. House Reports (1987, p. 1086).

The committee's claim that the interest deductibility on debt encourages takeovers is not valid.⁵ The current tax code does not differentiate between debt incurred to finance a takeover and debt incurred to finance an internal expansion of the firm. Thus, while tax incentives do not exist for borrowing for acquisitions over other investments, eliminating the deductibility of interest expenses for debt incurred in takeovers would reduce the number of takeovers. The proposed interest restrictions would not only have limited takeovers, but also leveraged buyouts and recapitalizations, such as stock repurchases or debt-for-equity swaps.

A simple example can illustrate the impact of eliminating deductions for interest expenses exceeding \$5 million a year. Data from the Office of Economic Analysis at the Securities and Exchange Commission 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% 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).⁶

By imposing a tax penalty on takeovers, especially hostile takeovers, the proposed bill would have had wide ranging detrimental effects on stock prices. Restrictions on corporate takeovers would reduce the economic gains to target shareholders from these transactions; on average, the stock price of a target firm increases 25% to 35% when a proposed takeover is announced.⁷ 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 (1989) find that firms undertaking value-reducing acquisitions are more likely to become bust-up takeover targets than firms making value-increasing acquisitions and 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.

⁵See Gilson, Scholes, and Wolfson (1988) for a discussion of the tax treatment of acquisitions.

⁶Note these estimates assume the debt will not be worked down quickly. The decline in value is much less when the debt is redeemed rapidly.

⁷Recent studies of returns to shareholders in takeovers include Bradley, Desai, and Kim (1988) and Jarrell and Poulsen (1989). 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 1977-1986 were \$346 billion.

In addition, 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 use them for projects with negative net present value.⁸ In sum, since takeovers and the threat of takeovers reduce agency costs arising from the separation of ownership and control of public corporations, the proposed changes, if enacted, would have lowered the value of most firms as well as firms actually in play.

3. Takeover-tax bill chronology

We use the *Dow Jones Broadtape* and the *Wall Street Journal* to identify the day and exact time that news about the antitakeover provisions of the tax bill became public. In October 1987, the House Ways and Means Committee was writing a major tax bill to decrease the deficit. Our review of the *Broadtape* and the *Wall Street Journal* reveals no mention before October 14 of proposals in the committee to change the tax treatment of takeovers. We also find no mention of the proposed revisions of the tax treatment of takeovers in the *New York Times* or *Congressional Quarterly Weekly Report* prior to October 14. An article in the *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.⁹ At 5:33 on October 13, the *Broadtape* reported that the Democrats on the House Ways and Means Committee were near an agreement on a tax package but made no mention of changes in the tax treatment of corporate control transactions.

One hour after the October 13 *Broadtape* story at 5:33, Democratic members of the House Ways and Means Committee in a closed caucus agreed to tax increases that included the takeover-tax proposals.¹⁰ On October 14 the *Wall Street Journal* outlined the proposals.¹¹ 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 version incorporating the antitakeover provisions. The *Broadtape* and the *Wall Street Journal* reported the results of the full committee vote on October 16.¹²

⁸Lehn and Poulsen (1989) demonstrate empirically the importance of free cash flow in explaining the motivation for going-private transactions, which are usually highly leveraged.

⁹See Wehr (1987, p. 2440). The *Broadtape* reported on October 8 the Democrats had agreed on tax changes that would raise \$6.3 billion in revenues and would resume their meeting October 13.

¹⁰There had been previous Congressional proposals to change the tax treatments of takeovers. For example, Representative Byron Dorgan of the House Ways and Means Committee proposed on July 23, 1987 legislation almost identical to the antitakeover provisions adopted 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 and not just antitakeover proposals.

¹¹See Langley (1987a).

¹²See Langley and Birnbaum (1987) and Burrough and Ricks (1987).

Immediately following the October 19 crash, investment banking firms, citing the potential role of the proposed antitakeover tax provisions as a cause of the crash, began lobbying to eliminate the provisions from the House tax bill.¹³ The first public notice the lobbying had begun to show an impact occurred on Wednesday, October 28, when Representative Dan Rostenkowski, Chairman of the Ways and Means Committee, testifying before the House Rules Committee and in the later comments to reporters, indicated that the antitakeover-tax provisions could be changed. Chairman Rostenkowski's statement was reported on the *Broadtape* at 2:08 p.m. on October 28 and in the *Wall Street Journal* on October 29.¹⁴ The next evening, October 29, Chairman Rostenkowski strengthened his remarks in a formal statement that he would agree to modify, though not drop, the takeover-tax provisions. The statement was reported in the *Wall Street Journal* on October 30.¹⁵

During the next month and a half Chairman 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. The takeover restrictions were finally dropped on the morning of December 16 and Representative Tom Downey announced to reporters that in negotiations between Senate and House conferees the House had abandoned almost all of the corporate takeover-tax provisions in the original bill. The announcement was reported on the *Broadtape* at 11:58 a.m. December 16 and in the *Wall Street Journal* on December 17.¹⁶ The provisions eliminating the use of mirror subsidiaries in an acquisition to dispose of assets of the target firm without a recognition of the corporate level gain and the 50% excise tax on greenmail payments were retained.

Based on the above analysis we identify five event dates where major new information about the proposed takeover restrictions reached the market. The five dates, October 14, 16, 29, and 30 and December 16 are summarized in table 1. Because of the high degree of uncertainty and stock market volatility during the crash period, we focus primarily on the first day that investors could trade on each major news announcement regarding the takeover restrictions. October 14 was the first day investors could trade on news of the introduction of the bill the previous evening. The full committee vote on the evening of October 15 made it clear that, at least at the committee level, the Democratic leadership intended to press the takeover-tax provisions. Investors were able to first trade on the full committee vote on October 16. In

¹³See Langley (1987b).

¹⁴ : *Wall Street Journal* (1987). That week the market closed at 2:00, so Chairman Rostenkowski's statement occurred after the market had closed.

¹⁵See Langley (1987c).

¹⁶See Birnbaum and Yang (1987).

Table 1

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

Tuesday evening October 13: Democrats on the House Ways and Means Committee agreed to 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 approved the tax bill including changes in the treatment of takeovers in a 23–13 straight party-line vote. Reported on *Broadtape* and in *Wall Street Journal* on October 16.

Corresponding event date: October 16

Wednesday afternoon October 28: Committee Chairman Rostenkowski in House testimony indicated that the antitakeover tax provisions could be changed. Reported on *Broadtape* at 2:08 on October 28 (market was closed at 2:00) and in *Wall Street Journal* on October 29.

Corresponding event date: October 29

Thursday evening October 29: Chairman Rostenkowski strengthened 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 House Ways and Means Committee, told reporters that almost all of the antitakeover tax provisions had been dropped during negotiations with Senate members. Reported on *Broadtape* at 11:58 on December 16 and in *Wall Street Journal* on December 17.

Corresponding event date: December 16

regards to Chairman Rostenkowski's statements on October 28 and 29, after the market had closed, that he would be flexible, investors could first trade on October 29 and 30, respectively. Since Representative Downey's December 16 statement that most of the takeover restrictions had been dropped occurred during the morning of December 16, investors could trade on his announcement that day.

4. Stock market effects of proposed tax restrictions on takeovers

4.1. Restatement of hypotheses

Under the hypothesis that the antitakeover provisions of the House Ways and Means tax bill reduced shareholder wealth, the market should have declined on October 14 and 16 and increased on October 29 and 30 and December 16. Much 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

Table 2

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. The *t*-values based on variance calculated from returns for 150 trading days ending October 13 are in parentheses, the *t*-values based on variance calculated for returns for 150 trading days after December 16 are in brackets, and the *t*-values based on doubling the preevent period variance are in braces.

	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 [-2.32] ^b {-2.02} ^b	-5.16% (-5.00) ^c [-4.06] ^c {-3.54} ^c	4.93% (4.77) ^c [3.88] ^c {3.38} ^c	2.87% (2.78) ^c [2.26] ^b {1.97} ^b	2.17% (2.11) ^b [1.71] ^a {1.49}
Intraday return ^e	-1.39% (-2.21) ^b [-1.95] ^a {-1.56}	-1.18% (-1.88) ^a [-1.65] {-1.33}	2.23% (3.56) ^c [3.12] ^c {2.51} ^b	2.99% (4.77) ^c [4.18] ^c {3.36} ^c	0.80% (2.80) ^c [2.85] ^c {1.98} ^b

^aSignificant at the 10% level for two-tailed test.

^bSignificant at the 5% level for two-tailed test.

^cSignificant at the 1% level for two-tailed test.

^dOn 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.

^eIntraday return is the S&P 500 return from the close the day before to 11:00 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.

came across the *Broadtape* at 11:58. Since the provisions had the greatest impact on companies that were actually in play during this period, those stocks adjusted for market risk, should have experienced even greater price changes than the overall market over the entire day and trading after the announcement. Similarly, risk arbitragers should have responded negatively on the first two event dates and positively on the latter three.

4.2. Market response to proposed tax restrictions on takeovers

4.2.1. Daily market returns

Table 2 displays the movements of the overall market [represented by the Standard and Poor's (S&P) 500 index] 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.¹⁷ The S&P 500 declined 2.95% on October 14 and 5.16% on October 16. On October 29

¹⁷We also use the Center for Research in Security Prices (CRSP) index and the New York Stock Exchange (NYSE) composite index as proxies for the market, but the results are not sufficiently different to warrant presentation. Availability of the intraday S&P 500 returns motivates reporting the S&P 500 results.

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 that House conferees had decided to abandon the antitakeover provisions, the S&P 500 increased 2.17%. Most of the positive return on December 16 occurred after the 11:58 announcement; the return from the noon until the close was 2.01%.

Time-series S&P 500 returns data from pre- and postevent periods and cross-sectional returns data on the event dates provide variance estimates to test statistical significance. The source of the preevent time-series data is the 150 trading days preceding October 14, 1987, and the source of the postevent time-series data is the 150 trading days following December 16, 1987. The postevent time-series data allow for a permanent increase in the variance of stock returns due to the market crash. This does not address the potential problem of increased variance during the event period, however. 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 nonevent time-series data; (b) a variance estimate based on cross-sectional returns during the event period; and (c) nonparametric tests.

In table 2, t -values based on the preevent-period variance (t_b in the text) are in parentheses, t -values based on the postevent-period variance (t_a in the text) are in brackets, and t -values based on doubling the preevent-period variance (t_d in the text) are in braces. Using the pre- and postevent-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 preevent-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 16.¹⁸ Doubling the preevent variance estimate results in failing to reject the null hypothesis of zero abnormal performance only on the fifth event date, December 16. As mentioned earlier, however, most (2.01%) of the positive S&P 500 return on December 16 (2.17%) occurred after the 11:58 announcement. If we double the

¹⁸We also compute variance estimates from shorter and longer periods surrounding the crash: (a) 50, 100, and 200 trading days prior to October 14, (b) 50 and 100 trading days following December 16, and (c) 50, 100, and 150 trading days following October 30. In all the tests based on preevent variance estimates and almost all of the tests based on postevent variance estimates the S&P 500 returns on the event dates are significant at the 10% level. For the four October event dates, using the postevent 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 postevent variance estimates, but the postannouncement (12:00–close) return on December 16 is significant based on all postevent variance estimates constructed from postnoon data.

variance estimate from the 150-day preevent period for the same intraday period (noon until the close), the 2.01% return on December 16 after the announcement is significant at the 0.05 level.

An examination of the individual S&P 500 firms' returns on the event dates provides support for the statistical tests using nonevent time-series data. First, most of the S&P 500 firms experience negative returns on October 14 (459, 91.8%) and on October 16 (478, 95.6%), and positive returns on October 29 (455, 91%), 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 reject the null hypothesis of zero abnormal performance at the 0.001 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 at the 0.001 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 the prior trading day. To the extent investors became immediately aware of the provisions and their implications, the market response to those four announcements should have occurred during early trading. Table 2 reports the S&P 500 return from the close on the day of the announcement through 11:00 on the event day 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.

To test the statistical significance of these intraday market movements, we use time-series S&P 500 intraday returns data (close the previous day through 11:00) from 150-day pre- and postevent periods to provide variance estimates. The early-trading S&P 500 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 postevent 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 30.¹⁹ The S&P 500 return during the hour after the December 16 announce-

¹⁹ We check the robustness of the significance tests by constructing intra day variance estimates from the same variety of control periods discussed in footnote 18 for close-to-11:00 returns. For the four event dates the S&P 500 return is statistically significant based on all preevent variance estimates. Using postcrash variance estimates the intraday S&P 500 return on October 29 and 30 is always significant. Significance is lost for the October 16 intraday S&P 500 return (the t -statistics remain over one with one exception) under all postcrash variance estimates, and the significance of the intraday return on October 14 drops below 10% for all variance estimates constructed from post-October 30 returns and for the variance estimates constructed from returns for 50 days after December 16 (the t -statistics are all over one).

ment that the antitakeover provisions had been dropped from the House tax bill provides further support for the hypothesis that the overall market reacted to the bill. The *Broadtape* reported the December 16 news at 11:58, and as reported in table 2, during the next hour, the S&P 500 rose 0.80%. Both t -values, based on variance estimates calculated from 12:00 to 1:00 trading in the 150-day pre- and postevent periods, are statistically significant, with $t_b = 2.80$ and $t_a = 2.85$.²⁰

Again we double the preevent 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 preevent 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. While the announcement on the evening of October 13 was a surprise, the committee's actions until the approval on the evening of October 15 were closely followed by investors, affecting trading.²¹ According to Yardeni (1987), takeover stocks suffered large losses on October 15 in anticipation of the committee's approval of the bill later in the evening. Conceivably, some market participants became aware of the upcoming committee approval before the close of trading or received sufficient information to revise their probability estimates of the bill going forward.

The cumulative S&P 500 return during October 14–16 is -10.44% ($t_b = -5.84$, $t_a = -4.74$, $t_d = -4.13$). The cumulative returns for the three event days when Congress indicated a relaxation of the antitakeover provisions in the bill – October 29 and 30 December 16 – is 9.97% ($t_b = 5.58$, $t_a = 4.53$, $t_d = 3.95$). The cumulative S&P 500 returns for the October 14–16, October 29–30, and December 16 windows are statistically significant at the 1% level, regardless of the variance estimate used. In value terms, shareholders recouped much

²⁰We also check the robustness of these results by constructing variance estimates for the control periods described in footnote 18. 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.

²¹See Burrough and Ricks (1987).

but not all of the October 14–16 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 16.²²

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 19 takeover stocks from New York Stock Exchange (NYSE) or American Stock Exchange (AMEX) firms that were in play during October 1987. This portfolio consists of firms that were the target of an outstanding offer on October 13. We exclude in-play firms for which the takeover was substantially completed by October 13 and thus exempt from the provisions of the bill, which applied to distributions made after October 13.²³

4.3.2. *Method for assessing abnormal performance*

We estimate the abnormal return to the takeover portfolio on each of the takeover-tax event dates using the Center for Research in Security Prices (CRSP) 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,²⁴ is

$$AR_{pt} = R_{pt} - (\hat{\alpha}_p + \hat{\beta}_p R_{mt}),$$

²²The rebound may not have been complete because some of the provisions in the bill were retained and because the market believed that Congress might reconsider the proposals at a later date. If so, the market's perception was correct; in 1989 several Congressional committees, including the House Ways and Means Committee, held hearings about eliminating the interest deduction for debt incurred in leveraged buyouts. In addition, a small part of the difference between the October 14–16 decline and the increase on October 29–30 and December 16 may have been due to the effect of the trade-deficit announcement on October 14, discussed in section 5.1.

²³The appendix lists the 19 firms in the takeover portfolio, along with firms that were in play at this time but excluded from the sample because the takeover was substantially completed by October 13.

²⁴The size of the portfolio varies on the event dates since we exclude firms on event dates where major firm-specific news not directly related to the takeover tax occurs. 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 ,²⁵ and

$\hat{\alpha}_p, \hat{\beta}_p$ = market-model parameters estimates from the estimation period 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, α_i and β_i , for the individual firms in the takeover portfolio from the same estimation period. We then calculate individual-firm abnormal returns on each of the five event dates to test the percent positive or negative. In addition, 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 previous day to the first trade after 11:00 on the event date. Intraday transactions data were not available for December 16. 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 3 reports the takeover portfolio abnormal return (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 would the overall market. On all five event dates the takeover portfolio AR has the expected sign and is statistically significant at the 0.05 level.²⁶ The AR s and corresponding t -statistics are: -1.43% ($t = -2.03$) on October 14,

²⁵We use the S&P 500 index as the market to maintain consistency since the market movements presented in the previous section are based on S&P 500 returns.

²⁶To assess the statistical significance of the takeover portfolio abnormal returns, we divide the AR by the square root of its estimated forecast variance

$$\sigma_{ar} = \left\{ \sigma^2 \left[1 + 1/N + (R_{mt} - \bar{R}_m) / CSSR_m \right] \right\}^{1/2},$$

where σ^2 is the estimated residual variance for the estimation period, N is the number of observations in the estimation period, \bar{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. Note we account for the large market movements in the crash period since the third term in parentheses adjusts for market movements on the event dates.

Table 3

Daily portfolio abnormal returns, intraday abnormal returns, and percent negative abnormal returns for the portfolio of stocks in play on October 13, 1987 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. On each date the portfolio excludes firms with firm-specific news on that date. Panel A contains the daily portfolio abnormal returns. *T*-statistics based on control-period variance are in parentheses and *t*-statistics based on doubling the control-period variance are in brackets. Significance levels of Wilcoxon signed rank test of percent negative are in braces. Panel B contains intraday portfolio abnormal returns. *T*-statistics based on cross-sectional variance are in parentheses and *t*-statistics based on doubling the cross-sectional variance are in brackets. Significance levels of Wilcoxon signed rank test of percent negative are in braces.

<i>Panel A: Daily portfolio abnormal returns</i>					
	Oct. 14	Oct. 16	Oct. 29	Oct. 30	Dec. 16
Daily portfolio AR	-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}
<i>Panel B: Intraday portfolio abnormal returns</i>					
	Oct. 14	Oct. 16	Oct. 29	Oct. 30	Dec. 16
Intraday portfolio AR ^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}	

^aSignificant at the 10% level for two-tailed test.

^bSignificant at the 5% level for two-tailed test.

^cSignificant at the 1% level for two-tailed test.

^dIntraday 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.

^eIntraday transactions data were not available for December 16.

–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 16.²⁷ As with 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 3. The AR s are statistically significant at the 0.10 level, except on October 14.

Panel B of table 3 displays the intraday portfolio abnormal returns. They indicate that in early trading 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 AR s 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 AR s have the predicted sign and with exception of October 14 are all statistically significant. As before, we double the variance estimate to account for increased variance during the event period; the corresponding t -values are reported in brackets in panel B of table 3. This adjustment has little influence on the results.

Nonparametric tests indicate that the impact of the takeover-tax announcements on the takeover portfolio firms is widespread. Panel A of table 3 reports the nonparametric results for 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.²⁸ 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 0.01 level for every event date. Significance levels are shown in braces.

The nonparametric results from the intraday AR s, reported in panel B, also support the hypothesis that the stock prices of in-play firms were sensitive in early trading to news about the antitakeover tax provisions. The intraday AR is negative for 10 (58.8%) and 16 (94.1%) of the 17 firms in the intraday October 14 and 16 portfolio, respectively. In contrast, on both October 29 and 30, 14 (93.3%) of the 15 firms experience positive AR s. Again, the Wilcoxon signed rank test rejects the null hypothesis of zero abnormal performance at the 0.01 level, except for the intraday October 14 portfolio.

4.3.4. *Takeover portfolio performance during October 14 to December 16*

We also examine the performance of the takeover portfolio for the entire period when the proposed takeover tax provisions were under consider-

²⁷Commentators have argued that the proposed takeover restrictions drove takeover stocks down on October 15. The takeover portfolio AR is –3.01 ($t = -4.21$) on October 15.

²⁸The AR is negative for 14 of the 17 firms (82.4%) on October 15 (see footnote 27).

ation – October 14 to December 16. Whereas the number of firms in the event day portfolio vary due to the exclusion of some firms on some of the event dates, here we use the full portfolio of 19 in-play firms. From October 14 through October 16 the continuously compounded cumulative portfolio abnormal return is -10.73% ($t = -8.70$). The takeover portfolio continues its abnormal decline through Monday the 19th; the cumulative portfolio abnormal return is -26.72% ($t = -13.29$). At the end of the crash week, the cumulative portfolio abnormal return is -28.37% ($t = -10.60$), virtually unchanged from the October 19 level. On October 30, after Chairman Rostenkowski's statements, the cumulative portfolio abnormal return is -24.55% ($t = -8.26$). Over the next six weeks the value of the portfolio changed very little and on the close on December 16, the day most of the provisions were dropped, the cumulative portfolio abnormal return is -24.92% ($t = -3.49$).²⁹

The pattern of abnormal returns over the whole period is relatively flat except on the event dates. The exception is the poor abnormal performance of the portfolio on October 19, where the abnormal return is -16% , statistically significant at the 0.01 level. Much of the October 19 decline may be attributed to the crash since in-play firms would have been especially sensitive to the uncertainty generated by the crash. Some of the October 19 decline, however, may have been a continued reaction to the tax bill.

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

The actions of risk arbitrageurs should be sensitive to factors affecting the probability of takeovers going forward, since arbitrageurs obtain positions in the stocks of potential and actual takeover targets.³⁰ At our request, the NYSE provided risk-arbitrage data collected from member firms.³¹ The data consist of the daily aggregate value of buys and sells for each of 20 anonymous major risk-arbitrage departments for all 22 trading days in October 1987. Risk-arbitrage data surrounding the December 16 announcement were not provided.

Table 4 displays the daily values of the risk-arbitrage data. In addition to reporting separately the value of stock bought and sold by risk arbitrageurs,

²⁹The portfolio did not completely rebound after the tax provisions were dropped in part because the crash had introduced uncertainty into the funding for takeovers. Note the magnitude of the nonmarket-adjusted decline in the value of the takeover portfolio: the continuously compounded cumulative raw returns for the portfolio of takeover stocks was -16% from October 14 to October 16 and -42% from October 14 to October 19.

³⁰See 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 arbitrageurs.

³¹The data are deemed by the NYSE to be confidential in their entirety and confidential treatment has been requested by the NYSE in a letter dated February 10, 1988, which has been filed pursuant to 17 CFR 200.83(e) with the Freedom of Information Act Officer at the SEC.

Table 4

Aggregate value of shares purchased, aggregate value of shares sold, total (buys + sell), buys – sells, and buys/sells for twenty major risk-arbitrage firms during October 1987. All values are measured in millions of dollars.

Date	Buys	Sells	Buys + sells	Buys – sells	Buys /sells
Oct. 1	\$5.70	\$4.26	\$9.96	\$1.44	1.34
Oct. 2	6.29	4.17	10.46	2.11	1.51
Oct. 5	7.30	3.34	10.64	3.96	2.18
Oct. 6	6.64	6.88	13.52	-0.25	0.96
Oct. 7	5.49	3.22	8.71	2.27	1.71
Oct. 8	5.89	5.64	11.53	0.24	1.04
Oct. 9	6.74	6.25	12.99	0.50	1.08
Oct. 12	3.80	5.06	8.86	-1.26	0.75
Oct. 13	5.34	5.48	10.82	-0.14	0.98
Oct. 14	6.16	8.99	15.15	-2.82	0.69
Oct. 15	10.00	13.98	23.98	-3.98	0.72
Oct. 16	15.31	17.45	32.76	-2.14	0.88
Oct. 19	16.34	24.37	40.70	-8.03	0.67
Oct. 20	7.32	20.56	27.88	-13.24	0.36
Oct. 21	7.37	13.72	21.09	-6.35	0.54
Oct. 22	3.84	10.74	14.58	-6.90	0.36
Oct. 23	5.71	7.72	13.43	-2.01	0.74
Oct. 26	2.47	6.78	9.25	-4.32	0.36
Oct. 27	2.60	7.63	10.22	-5.05	0.34
Oct. 28	4.15	7.60	11.75	-3.45	0.55
Oct. 29	4.11	4.20	8.31	-0.09	0.98
Oct. 30	3.58	5.06	8.64	-1.47	0.71

table 4 displays the total value of shares bought and sold (buys + sells) and the value of buys in relation to sells (buys/sells).³² A cursory examination of the data indicates the total value of buys and sells by risk arbitragers rose during the pre-crash period (October 14–16) and remained relatively high during the crash week. Although sells by risk 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 though 23.

To test whether arbitragers responded to news about the antitakeover provisions of the House tax bill, we focus on the buy – sales (column 5) and buys/sales (column 6) data in table 4. We use these two measures of risk-arbitrage activity as proxies for the relative attractiveness of takeover investments by risk arbitragers. We compare these two measures on the event dates with the measures in a comparison period. For the first two event dates,

³²We 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.

Table 5

A comparison of buy-sell differences and buy/sell ratios between control periods and the four dates in October 1987 when the market could first trade on news about the House Ways and Means Committee's proposed changes in the tax treatment of takeovers for twenty risk-arbitrage departments during October 1987. All values measured in millions of dollars.

<i>Panel A: Pre-crash events</i>				
	Comparison period	Event dates		
	Oct 1-13	Oct. 14	Oct. 16	Oct. 14-16
Buy-sells	\$0.99	\$ - 2.82 (- 7.56) ^b	\$ - 2.14 (- 6.21) ^b	\$ - 2.98 (- 5.94) ^b
Buy/sells	1.28	0.69 (- 4.22) ^b	0.88 (- 2.87) ^a	0.76 (- 3.50) ^b

<i>Panel B: Post-crash events</i>				
	Comparison period	Event dates		
	Oct. 20-28	Oct. 29	Oct. 30	Oct. 29-30
Buy-sells	\$ - 5.90	\$ - 0.08 (4.57) ^b	\$ - 1.47 (3.48) ^a	\$ - 0.78 (3.75) ^b
Buy/sells	0.46	0.98 (9.78) ^b	0.71 (4.66) ^b	0.84 (3.49) ^a

^aSignificant at the 5% level for two-tailed test.

^bSignificant at the 1% level for two-tailed test.

October 14 and 16, the comparison period is October 1-13, when takeover activity was less threatened. For the latter two October event dates (29 and 30), when Rostenkowski indicated flexibility on the antitakeover provisions of the tax bill, the comparison period is October 20-28.

Panel A of table 5 displays comparisons of the buy-sell differential and the buy/sell ratio on the first 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 arbitrageurs responded negatively to the introduction and approval of the antitakeover provisions of the tax bill. The mean buy-sell differential during October 1-13 is \$0.99 million. On October 14 and 16 the buy-sell differential is negative - sells exceeded buys by \$2.82 million on October 14 and by \$2.14 million on October 16. The buy-sell differential on both October 14 and 16 is significantly different (0.01 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 16.³³ In addition, during the entire period from when the takeover restrictions were

³³On October 15, the buy-sell differential, -\$3.98 million, is significantly different from the buy-sell differential during October 1-13 (see footnote 27).

introduced until they were approved, October 14–16, the mean buy–sell differential, $-\$2.98$ million, is significantly different from the mean buy–sell differential during October 1–13 at the 0.01 level.

The results are similar using the buy/sell ratio. The mean buy/sell ratio during October 1–13 is 1.28. On October 14 and 16, the buy/sell ratios are 0.69 and 0.88, respectively. For these event dates, the buy/sell ratios are significantly different from the comparison period ratio at the 0.01 and 0.05 level, respectively. Further, the buy/sell ratio on October 14 is lower than the buy/sell ratio on all trading days during October 1–13 and the buy/sell ratio on October 16 is lower than on all but one of those dates.³⁴ The mean buy/sell ratio during October 14–16 is significantly lower than the mean buy/sell ratio during October 1–13 at the 0.01 level.

Panel B of table 5 suggests that the attractiveness of takeover investments increased on October 29 and 30 in response to announcements by Chairman Rostenkowski that the antitakeover provisions in the tax bill might be weakened. The mean daily buy–sell differential during the comparison period, October 20–28, is $-\$5.90$ million. On October 29 and 30 the buy–sell differential is $-\$.087$ million and $-\$1.47$ million (both statistically different from the comparison period at the 0.01 level), respectively. For both event dates, the buy–sell differential is less negative than on any date during the comparison period.

The mean buy/sell ratio during the comparison period of October 20–28 is 0.463. On October 29 and 30 the buy/sell ratios are 0.979 and 0.709 (both statistically different from the comparison period at the 0.01 level), respectively. The buy/sell ratio is higher on October 29 than on any day during the comparison period and higher on October 30 than all but one of the comparison-period dates. Thus, while the attractiveness of takeover investments fell after the crash, it increased in response to Chairman Rostenkowski's announcement that some of the tax bill's restrictions would be loosened.

5. Factors contributing to the October 14–16 decline

Other events and economic conditions during October 14–16 have been cited as triggering the crash on October 19. In addition to the tax bill, fundamental factors frequently cited include a higher-than-expected trade deficit, rising interest rates, and increased worries about the government deficit and possible recession. Analysts have claimed that one or more of these factors combined with institutional and structural factors to cause 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.

³⁴The buy/sell ratio on October 15, 0.715, is significantly lower than the mean buy/sell ratio during October 1–13 (see footnote 27).

5.1. October 14 trade-deficit announcement

At 8:30 on October 14, the Commerce Department released the merchandise trade-deficit figures for August 1987. Although the \$15.68 billion 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 the stock-market decline on October 14 to the higher-than-expected trade deficit.³⁵

We test the validity of this explanation by examining the market impact of 21 trade-deficit announcements from April 1987 (February 1987 trade deficit) through December 1988 (October 1988 trade deficit).³⁶ We estimate regression equations explaining S&P 500 returns over two 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 11:00.³⁷ The first explanatory variable is the unexpected component of the trade deficit, measured as the percentage difference between the actual deficit and analysts' forecasts (taken from the *Wall Street Journal* and *New York Times*). The second explanatory variable is an intercept dummy variable for the October 14 trade-deficit announcement.

Table 6 displays the regression results, with *t*-statistics shown in parentheses. For both regressions, the coefficient on the unexpected change in the trade deficit is negative and statistically significant. Unexpected increases in the trade deficit have a negative effect on the stock market, and unexpected decreases have a positive effect.

The coefficients for the October 1987 dummy variables suggest that the higher-than-expected trade deficit on October 14 contributed little to the October 14 market decline. The October 14 dummy is negative in both equations, although not statistically significant in the close-to-11:00 equation. The negative coefficients on the October 14 dummy variables indicate that

³⁵See, for example, the Report of the Presidential Task Force (1988). Hershey (1987) reports 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.

³⁶We 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 probably had a smaller impact on the stock market.

³⁷Jain (1988) finds that most of the stock market reaction to the surprise component of macroeconomic announcements occurs within one hour.

Table 6

Regression estimates of the relation between daily and early-trading (close the previous day until 11:00) S&P 500 returns and the percentage deviation between the predicted and the actual trade deficit and a dummy variable for October 14, 1987. Sample includes the release of trade deficit figures from April 1987 to 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
Constant	0.1156	0.2324
Percentage deviation between predicted and actual trade deficit	0.0677 (2.72) ^b	0.4859 (3.09) ^c
October 14 dummy	-2.760 (-1.83) ^a	-1.384 (-1.45)
R^2	0.386	0.403
Number of observations	21	21

^aSignificant at the 10% level of significance for two-tailed test.

^bSignificant at the 5% level of significance for two-tailed test.

^cSignificant at the 1% level of significance for two-tailed test.

some factor other than the higher-than-expected trade deficit contributed to the negative S&P 500 return on October 14. For the full-day equation the value of the dummy coefficient is -2.76 , suggesting that the higher-than-expected deficit cannot explain 93.4% of the 2.95% S&P 500 decline on October 14. The dummy coefficient, -1.38 , for the early trading equation indicates that the trade deficit on October 14 can explain virtually none of the close-to-11:00 return of -1.39% . Therefore, the low *t*-statistics for the dummy variables appear to be due to the standard errors of the estimates and not the means.

Additional evidence from these data suggests that little of the decline on October 14 was due to the trade-deficit announcement. The difference between the predicted and actual trade deficit on October 14 is the fourth smallest of the 21 announcements. In contrast, the full-day S&P 500 return on October 14 is the second largest in absolute terms of the 21 trade-deficit announcement dates and the S&P 500 return between the previous day's close and 11:00 is the fourth largest in absolute terms of the close to 11:00 return on the 21 announcement dates.

5.2. Other news items

During October 14–16, the only surprise macroeconomic news other than the trade-deficit announcement was an increase in interest rates on October 14. Commentators suggested 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 Hershey (1987)].³⁸ In addition, there was little unexpected news forthcoming about other fundamental factors frequently cited as triggering the crash (such as the budget deficit or Persian Gulf tensions).³⁹

5.3. *Trading strategies as triggers for the crash*

Certain trading strategies, such as index arbitrage and portfolio insurance, have been cited by the Report of the Presidential Task Force (1988) and Division of Market Regulation of the SEC [SEC 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.⁴⁰ While structural and institutional factors may have been important in turning the October 14–16 decline into the October 19 crash, the evidence suggests that index arbitrage and/or portfolio insurance are not the causes of most or all of the precrash market decline.⁴¹

Index arbitrage is a trading strategy of buying stocks in an index and selling the futures contract for that index when the stock prices in the index are lower than the futures prices, and vice versa. Index arbitrage links the futures and the cash markets. If either responds to news more quickly than the other, index arbitrage may be profitable.⁴² Index arbitrage does not destabilize the markets, but instead occurs at the same time as the markets react to some

³⁸Interest rates also rose slightly on October 15, but fell on October 16. Beginning on October 15 and through the weekend Treasury Secretary Baker began to indicate the U.S. might let the dollar fall to pressure West Germany to lower interest rates, see Mossberg (1987). Commentators have suggested Baker's statements on October 17 and 18 contributed to the crash on October 19.

³⁹A review of the *Wall Street Journal* on our postcrash 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 that on average their prices increased 1.94% on December 16. Since this increase in share prices is only slightly less than the market increase, it is unlikely that there was a large market effect from the falling oil prices.

⁴⁰The 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 program trading at the time of the crash.

⁴¹See Harris (1989a) and Furbush (1989) for more thorough analyses of the effects of index arbitrage and portfolio insurance at the time of the crash.

⁴²Kawaller, Koch, and Koch (1987) 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, whereas index movements rarely affect futures beyond one minute.

event that has changed the underlying value of securities.⁴³ On the event dates, the presence of index arbitrage was an indication of factors, that triggered a revaluation of equities. The SEC Report asserts that from October 14 to 16 there were significant price declines first evident in index futures and followed by the cash market. The SEC Report 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'.⁴⁴ For example, the report notes that on October 14 there was significant arbitrage stock selling in the four periods of significant price decline, including from the open-to-10:00 period. On October 16, the SEC Report finds that the effects of index-arbitrage stock selling occurred periodically, with the most pronounced period at the end of the session.⁴⁵

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 that the value will not fall below a floor 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. This strategy can be destabilizing, since the trading is not based on fundamentals and reinforces the movement of the market.⁴⁶ If the price pressure exerted by portfolio insurance is not offset by other traders, it can exacerbate a market decline. Theoretically, we cannot rule out portfolio insurance as contributing to the October 14–16 market decline. This strategy, however, does not start a decline; even if it magnified the October 14–16 fall in stock prices, it is still necessary to identify a fundamental factor that triggered the decline. Moreover, Furbush (1989) empirically finds there was little portfolio insurance selling on October 14 or 16.

⁴³Fama (1989) asserts that on October 19 and 20 restricting the access of arbitrageurs to the program trading system and breaking the links between the futures and equities markets 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.

⁴⁴See SEC Report (1988, pp. 2–9). The report attributes a part of the stock-price decline to index arbitrage rather than put forward the view that index arbitrage arises after some factor has changed the underlying value of securities and either the futures or the equity market has responded faster than the other.

⁴⁵The SEC Report (1988) states that 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.

⁴⁶The destabilizing influences 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, valuable information on the extent of portfolio insurance in the market is lost.

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 some of the other world markets also declined during October 14–16. Roll concludes (p. 22) that

the overall pattern of intertemporal price movements in the various markets suggests the presence of some underlying fundamental factor...but...seems inconsistent with a U.S.-specific macroeconomic event.⁴⁷

A decline in the rest of the world's markets during October 14–16 that is insignificantly different from the contemporaneous U.S. decline would be inconsistent with our hypothesis that the proposed antitakeover provisions in the tax bill caused the decline in the United States since the bill did not affect foreign firms directly. To test whether the U.S. decline is different from the international decline, we compare the performance of the S&P 500 index with the FT-Actuaries World–U.S. Index.⁴⁸ This index consists of the exchanges of 22 countries and is value-weighted. We report two measures of the index – one is denominated in local currency and the other in U.S. dollars.

Table 7 displays the U.S. versus non-U.S. world market movements during October 14–16. On October 14, the first event date, while the S&P 500 index declined 2.95%, both measures of the world index actually increased – the local currency world index by 0.29% and U.S. dollar world index by 0.84%. The difference between the U.S. decline and the world increase (both measures) 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 remains statistically significant.

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 0.77% (U.S. dollars), but the decline is not statistically significant. The difference between the U.S. decline and the world decline is insignificant.

⁴⁷Roll's paper primarily investigates whether U.S. institutional structures caused the crash. He provides empirical evidence rejecting the argument that program trading, portfolio insurance, specialists, and other U.S. market structures caused the crash.

⁴⁸The data source for the world minus the U.S. index is the FT-Actuaries World Indices compiled by the *Financial Times*, Goldman Sachs & Co., and Wood Mackenzie & Co., Ltd. Roll uses the same data.

Table 7

Daily returns on various world indexes on October 14 to October 16, 1987, when the market could first trade on news about House Ways and Means Committee proposed changes in the tax treatment of takeovers. The *t*-values based on variance from 150 trading days ending October 13 are in parentheses and those based on double the preevent period variance are in brackets.

Index	Oct. 14	Oct. 15	Oct. 16	Oct. 14–16
U.S. (S&P 500)	-2.95 (-2.86) ^c {-2.02} ^b	-2.33 (-2.26) ^b {-1.60}	-5.16 (-5.00) ^c {-3.54} ^c	-10.44 (-5.84) ^c {-4.13} ^c
World (denominated in local currency)	0.29 (0.55) {0.25}	-1.24 (-1.50) {-1.06}	-0.40 (-0.48) {-0.34}	-1.34 (-0.94) {-0.66}
U.S.–world (denominated in local currency)	-3.24 (-2.45) ^b {-1.73} ^a	-1.09 (-0.82) {-0.58}	-4.76 (-3.60) ^c {-2.55} ^b	-9.05 (-3.95) ^c {-2.79} ^c
World (denominated in U.S. dollars)	0.84 (0.87) {0.61}	-0.77 (-0.79) {-0.56}	-0.67 (-0.70) {-0.47}	-0.60 (-0.35) {-0.25}
U.S.–world (denominated in U.S. dollars)	-3.79 (-2.68) ^c {-1.89} ^a	-1.56 (-1.10) {-0.78}	-4.49 (-3.16) ^c {-2.24} ^b	-9.84 (-4.01) ^c {-2.83} ^c

^aSignificant at the 10% level for two-tailed test.

^bSignificant at the 5% level for two-tailed test.

^cSignificant at the 1% level for two-tailed test.

On October 16, the second event date, the S&P 500 declined 5.16%, while the world index declined only an insignificant 0.4% (local currency) and 0.6% (U.S. dollars). The difference between the U.S. decline and the world decline is statistically significant, even with doubling the variance.⁴⁹

Overall, during October 14–16, while the U.S. market declined 10.44%, the world market only fell 1.34% (local currency) and 0.6% (U.S. dollars). The difference between the declines in the U.S. and the world is statistically significant at the 0.01 level even after we double the variance estimate. These data demonstrate that the U.S. decline during October 14–16 greatly exceeded the decline by the rest of the world. Consequently, if the October 14–16

⁴⁹A major storm in England on October 16 severely hampered trading in the London market as a power outage shut down the London Stock Exchange computer network. The London Stock Exchange did not compute any stock indices for October 16; consequently the FT-Actuaries World Indices assumed the U.K. index did not change. Unofficial estimates suggested that the U.K. index would have declined about 1%. Based on its weight of 0.16 a 1% decline on the U.K. index would change FT-Actuaries World-U.S. Index denominated in U.S. dollars from -0.67 to -0.88 on October 16. This change does not impact any of the significance tests we report.

decline triggered the October 19 crash, the evidence suggests a U.S.-based event as the trigger.⁵⁰

Our finding that the U.S. decline from October 14 through October 16 was much greater than the corresponding decline in world markets is not dependent on the movements of the largest world markets. We find similar results when we estimate the movements of the world markets based on an equally weighted non-U.S. world index we constructed from the FT-Actuaries World Indices. Denominated in U.S. dollars the equally weighted world index declined on October 14, 15, and 16 (0.06%, 1.00%, and 0.97%, respectively), but the world decline on each day was less than the corresponding U.S. decline.⁵¹ Further, on October 14, only one country out of 22 had a decline greater than the U.S.; on October 15 only four markets declined more than the U.S.; and none of the 22 world markets declined more than the U.S. on October 16.⁵² In the entire October 14 through 16 period, the equally weighted world index fell 2.03%, while the U.S. market fell 10.44%. The U.S. decline was significantly greater than the equally weighted world decline at the 0.01 level even after doubling the preevent variance.

6. Triggering the crash

A combination of fundamental and structural factors caused the 1987 stock market crash. Since there was no significant news over the October 17–18 weekend that could have caused equity values to fall over 20% on the 19th, structural factors must have played a pivotal role. To understand the crash completely, however, one must consider the fundamental factor that started the market decline. The 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

⁵⁰The SEC Report (1988) reports partial correlation coefficients for daily and intraday price movements of the Dow Jones Industrial Average and several foreign indexes during the period October 12–23, 1987. The coefficients indicate that the U.S. market led, and did not follow, foreign markets during this period. These results support the above findings that suggest the U.S. had a significantly greater impact on foreign markets than vice versa.

⁵¹The *t*-statistics based on the preevent variance for the world market movements are statistically significant at the 0.05 level for October 15 and 16 and October 14 through October 16. The U.S. decline was significantly greater than the world decline at the 0.05 level on October 14 and at the 0.01 level on October 16. The equally-weighted results are essentially the same when we calculate the world index denominated in local currency and when we use double the preevent variance. These, and any other results that we mention but do not report, are available upon request.

⁵²Mexico had a greater decline than the U.S. on October 14 and Mexico, Ireland, France, and Belgium declined more than the U.S. on October 16. These are all small markets and their declines were partially dependent on the U.S. market movement on October 14.

on October 19, specialists faced a large excess of sell over buy orders that 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 that the December S&P 500 futures contract opened down 6.5%. Matters worsened as the day went on.

We suggest the more than 10% market decline from October 14–16 may have triggered the down opening and subsequent drop on October 19. 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 period with a fall in the S&P 500 of over 10% until October 14–16, 1987. Although we do not have S&P 500 data prior to 1962, a data set compiled by Mulherin and Gerety (1989) allows us to examine the Dow Jones Composite Index as far back as 1900.⁵³ Before July 1962, the market had 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 produced a market decline as large as that experienced on October 14–16, 1987.⁵⁴

The mechanism of the crash is beyond the scope of this paper, but since a decline of more than 10% is so rare, the October 14–16 decline seems to be related to the crash, especially since no trading days intervened between the two events. The following suggests how the October 14–16 decline might have triggered the crash. First, there was selling pressure from portfolio insurance and those anticipating portfolio insurance sales. Gammill and Marsh (1988, p. 39) hypothesize that the October 14–16 decline led insured investors to demand a \$12 billion reduction in their exposure. By the close on October 16, however, portfolio insurers had sold only \$4 billion in equities, and the unfilled sell orders were an overhang 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 at the open. Finally, investors may still have been reacting negatively to the tax news,

⁵³The correlation coefficient between the S&P 500 and the DJ-65 during 1962–87 is 0.95.

⁵⁴During the market break of 1962, labeled severe by the NYSE and 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.

as evidenced by the negative abnormal returns on the takeover portfolio on the 19th.⁵⁵

7. Conclusions

The stock market crash on October 19, 1987 began the preceding three trading days, October 14–16, when the market fell by more than 10%, the largest three-day decline since 1940. Although numerous fundamental factors have been proposed as triggering this decline, we provide evidence 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 had a major impact on security prices and is the leading candidate as the trigger for the crash.

We identify five event dates when the market could first trade on news about the proposed tax legislation. We find a negative reaction by the stock market to the news the bill was progressing and a positive reaction by the market to the news Congress was backing off from the proposals. Additionally, we provide cross-sectional evidence of the importance of the proposed legislation. We find that in-play firms were more sensitive than the overall market to the news about the bill's progress and that the trading of risk arbitragers was affected by the proposals. We also demonstrate that while U.S. markets moved significantly when the bill was proposed, international markets did not. This pattern suggests that a U.S.-specific factor affected trading on the event dates.

Economists have accumulated a vast amount of evidence on corporate takeovers indicating that on average takeovers create economic efficiency by reallocating resources to their highest-valued uses. Additionally, takeovers and the threat of takeovers help control the agency costs arising from the separation of ownership and control. Despite the beneficial aspects of takeovers, the recent surge of leveraged takeovers has revived calls for ending the deduction of interest payments for acquisition. During the first quarter of 1989, five Congressional committees scheduled hearings on leveraged takeovers. Our evidence suggests that eliminating interest deductions for acquisitions and restructurings would significantly impair the market for corporate control and economic efficiency.

⁵⁵The market did not fully rebound from the greater than 20% decline of October 19. Harris (1989b) argues that the failure to completely 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. See also Netter and Mitchell (1989).

Appendix*Takeover portfolio:*

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

Reasons firms in-play on October 13, 1987 were excluded totally or partially from takeover portfolio:

<u>Excluded firm</u>	<u>Reason for exclusion and exclusion dates</u>
Allegis ⁵⁶	Restructuring substantially completed by October 14.
Argonaut Group ⁵⁶	Terms already set by October 13.
Bell & Howell	Agrees to buyout on December 15, excluded on December 16.
Brockway ⁵⁶	Terms already set by October 13.
Bundy ⁵⁶	Terms already set by October 13.
Canrad ⁵⁶	Terms already set by October 13.
Decision Industries	Bidder agreed 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 board agreed to a leveraged buyout. Thus only October 14–16 event dates included.
Financial Corp. of America ⁵⁶	Terms already set by October 13.
Gates Learjet ⁵⁶	Terms already set by October 13.
G. Heilemen Brewing ⁵⁶	Terms already set by October 13.
Gillette	Revlon Group announced on October 14 it will let bid expire. Thus October 14–16 excluded. However, the firm remained in-play.

⁵⁶Denotes excluded on all event dates.

Excluded firm	Reason for exclusion and exclusion dates
Hawaiian Air ⁵⁶	Terms already set by October 13.
Holly Sugar ⁵⁶	Numerous confounding events occurred throughout the periods around each of the event dates.
Hubbard Milling ⁵⁶	Terms already set by October 13.
Newmont Mining	Delaware court decision on October 15 dealt a heavy blow to Pickens' bid. Thus, included on October 14 only.
Rexham ⁵⁶	Rexham agreed to acquisition on October 15.
Salomon Brothers ⁵⁶	Several confounding events throughout the event periods. In addition, directly affected by the takeover-tax proposals, since a player in the takeover market; hence excluded on all dates.
Singer	Bilzerian Partners announced on October 29 it has a stake and is considering a takeover. Thus, included only on October 14–16 and December 16.
Southland ⁵⁶	Terms already set by October 13.
Tesoro Petroleum	Two large block purchases of Tesoro stock by potential bidders. Excluded on October 14.
TWA ⁵⁶	Cleanup offer by Icahn for the approximately 26% of the shares he did not already own. Thus, there is no control premium in the share price.

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