APPENDIXES

APPENDIX A

OCTOBER 6

TRADING CHRONOLOGY FOR OCTOBER 6

On Tuesday, October 6, 1987, the Dow Jones Industrial Average ("DJIA") lost a then-record 91.55 points (3.47%), apparently on little fundamental economic news. The market decline was widely attributed to investor sensitivity to bearish reports by two influential investment advisors, 1/ arbitrage sell programs, 2/ and general concerns over interest rates. 3/

While the price drop was sharpest in the DJIA, each of the U.S. markets experienced similar declines. 4/ The NYSE composite index dropped 4.46 points (2.4%) and declining issues leading advancing issues by 4 to 1 on total NYSE volume of 175,082,030 shares. The Standard & Poors ("S&P") 500 stock index declined 8.86 points (2.7%). Similarly, the composite indexes on the American Stock Exchange ("Amex") and the NASDAQ computerized quotation system for over-the-counter ("OTC") stocks declined 3.89 points (1.1%) and 6.12 points (1.3%), respectively. 5/ The index futures markets also declined sharply, with an 11 point decline (3.3%) in the December expiration S&P 500 index futures ("SPZ") traded on the Chicago Mercantile Exchange ("CME"). Bond prices, on the other hand, climbed abruptly in the last hour of trading, evidently in response to the rapid decline in the DJIA. 6/

I. Summary of Market Movements

While the DJIA declined throughout most of the day, the sharpest movements were at the opening and close when over two-thirds of the decline for the day occurred, largely from price declines in 6 of the 30 index stocks. 7/ Shortly after the opening,

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1/ Newswires carried reports from interviews with Robert Prechter, the Elliot Wave theorist, and Peter Eliades, editor of the Stock Market Cycles News letter. See Smith & Garcia, Stocks Plunge, Partly In Reaction To Sell Signals From Forecasters, Wall St. J., Oct. 7, 1987, at 3.

2/ Garcia, Stocks Plunge; Interest Rate Fears, Computerized Sell Programs Cited, Wall St. J., Oct. 7, 1987, at 65.

3/ Wiggins, Dow Drops a Record 91.55 Points on Interest Rate and Dollar Fears, N.Y. Times, Oct. 7, 1987, at A1.

4/ While the Tokyo Nikkei Index actually had risen 70.7 points (0.27%) on October 6, the London Financial Times - Stock Exchange 100 Share Index declined 17.9 points (0.75%).

5/ Amex trading volume was 10.3 million shares, down 1.6% from the previous day; NASDAQ volume was 158.6 million shares, up 8.8%.

6/ Quint, Bonds Rise Abruptly in Final Hour, N. Y. Times, Oct. 7, 1987, at D1.

7/ These stocks were International Business Machines (IBM) (close at 151, down 5 1/2), Merck (MRK)(201, down 7), Phillip Morris (MO)(113 1/2, down 4), Eastman Kodak (EK)(101 3/8, down 1 7/8), Proctor & Gamble (PG)(99 1/2, down 4), and Du Pont (DD) (118 1/2, down 4 1/4).

the DJIA dropped below 2,620, recovered about 10 points to 2,627.1 at 10:18, and then declined about 46 points until the last half hour of trading. At approximately 3:30, the DJIA decline accelerated, falling over 30 more points to close at 2,548.63.

Each of these movements in the stock market was preceded by similar price movements in the index futures markets. The SPZ futures on the CME mostly traded at a premium to the value of the stocks comprising the index ("cash value") but less than the theoretical value of the SPZ contract. 8/ The SPZ futures traded at or above theoretical value only for brief periods around 9:45 to 9:50, 12:45, 1:15 to 1:20 and 3:50.

II. Breakdown of Trading

As discussed above, while the DJIA declined throughout most of the day, the sharpest movements were at the opening and close, when over 66% of the decline and most of the arbitrage selling on this day occurred.

A. Portfolio Insurance

Portfolio insurance related futures selling does not appear to have been a factor in the SPZ futures trading below theoretical value on October 6. The level of reported portfolio insurance sales of SPZ futures on this day was insignificant, with only 181 contracts sold.

B. Other Index-Related Trading

Almost all of the index arbitrage sales of stock, totaling 16.2 million shares, 9/ were executed as part of SPZ programs. 10/ As discussed above, throughout most of the day, the SPZ contract traded at premiums below theoretical value, at a level sufficient to close pre-existing arbitrage positions at favorable prices but not sufficient to enable arbitrageurs to execute sell programs to establish new positions. In fact, almost all of the index arbitrage reported in the SPZ contract closed previously established buy programs.

Although arbitrage and non-arbitrage program sales accounted for approximately 12% of volume in all NYSE stocks for the day and 16% of volume in the S&P 500 stocks for the day, stock sales associated with these strategies appear to have been significant contributing factors to the decline at the opening and at the close. The following section of the Appendix provides an analysis of the timing and magnitude of index-related trading during key periods of the trading session.

8/ See Chapter One of the Study for a discussion of the theoretical value of a stock index futures contract.

9/ Of this 16.2 million shares of index arbitrage selling, 2.4 million shares (15%) were part of customer programs. Of the total arbitrage selling, only 800,000 shares (4.9%) were sold short. See Tables D-4 and D-5, providing breakdowns of short versus long arbitrage and customer versus proprietary arbitrage for October 6 and October 14-20.

10/ Conversely, most of the index arbitrage buy programs were executed with Major Market Index ("MMI") futures.

1. **Open to 10:00**

Within the first ten minutes, the DJIA declined 22.7 points (0.86%) to 2617.4. Thereafter, the DJIA stabilized trading between 2617.4 and 2625.6. The SPZ futures mostly traded at a premium to cash value but less than the theoretical value of the SPZ contract. As a result, index arbitrage programs sold 860,450 shares between 9:30 and 9:40 and an additional 832,700 shares in the next ten minutes 11/ In addition, non-arbitrage programs sold 322,698 shares from 9:30 to 9:50. Total selling from programs involved over 2 million shares, comprising 11% of NYSE volume in S&P stocks from 9:30 to 9:40 and 17% from 9:40 to 9:50.

2. **10:00 to 11:00**

The DJIA recovered 2.6 points to 2625.9 from 10:00 to 10:11. Thereafter, from 10:17 to 10:42, the DJIA fell 17.1 points (0.65%) to 2608.8, recovering slightly to 2610.3 by 11:00. The SPZ contract traded below theoretical value throughout this period, and index arbitrage programs sold 702,950 shares (22% of NYSE volume in S&P stocks) from 10:00 to 10:10, 669,384 shares from 10:20 to 10:30 (18% of S&P stock volume), and 1.6 million shares from 10:30 to 10:40 (24% of S&P volume). A non-arbitrage program sold an additional 280,000 shares around 10:35, raising the level of total program selling in this ten minutes to 28% of NYSE volume in S&P stocks.

3. **11:30 to 12:00**

From 11:00 to 11:30, the DJIA traded in a five point range, but experienced a sudden 10 point (0.38%) drop to 2597.7 by 11:43, recovering to 2602.6 by 12:00. During the price drop from 11:30 to 11:40, arbitrage programs sold 460,900 shares or 15% of NYSE volume in S&P stocks.

4. **1:40 to 2:20**

At 1:40, the DJIA stood at 2605.7, but fell 21.2 points (0.81%) to 2586.3 around 2:20. The sharpest price decline during this period was from 2:00 to 2:10 when the DJIA dropped 13.7 points (0.52%) and 1.1 million shares were sold in arbitrage programs and 661,600 shares were sold in non-arbitrage programs, together representing 45.9% of NYSE volume in S&P stocks.

5. **3:20 to Close**

The DJIA lost 43.17 points (1.67%) over this period to close at 2548.63. Thus over 47% of the 91.55 point loss for the day occurred within the last 40 minutes of trading. Index arbitrage selling was especially heavy during this period. From 3:30 to 3:40, 1.4 million shares were sold in arbitrage programs and an additional 531,300 shares were sold in non-arbitrage programs, together constituting 41.8% of NYSE volume in S&P stocks. In the next ten minutes, arbitrage selling more than doubled to 3.5 million shares, and, together with 727,600 shares of non-arbitrage program selling, represented 60.5% of S&P stock volume. Finally, from 3:50 to 4:00, arbitrage and non-arbitrage

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11/ In addition, four arbitrage buy programs using MMI futures were executed between 9:33 and 9:58.

programs sold 1.8 million shares and 1.6 million shares, respectively, constituting 46.2% of volume in S&P stocks over this period.

OCTOBER 14

TRADING CHRONOLOGY FOR OCTOBER 14

On Wednesday, October 14, 1987, the U.S. securities markets experienced the first of several record price declines, 12/ culminating by the end of the week in a pullback of 235.48 points in the Dow Jones Industrial Average ("DJIA") -- representing a 17.5% decline from its August 25 high of 2,722.42. This series of back-to-back market drops set the groundwork for the near chaos that overtook the markets on the 19th and 20th.

Trading volume on October 14 on the New York Stock Exchange ("NYSE") exceeded 209 million shares, 13/ a 19.3% increase from the prior week's average daily volume. 14/ The Standard & Poors ("S&P") 500 stock index declined 9.29 points (2.95%) on the day, and the NYSE, Amex, and NASDAQ Composite Indexes declined 4.76 points (2.7%), 3.9 points (1.13%), and 6.53 points (1.5%), respectively.

The leading stock index futures market, the Chicago Mercantile Exchange's market in the S&P 500 futures, similarly experienced a significant price decline on October 14. The December S&P 500 future ("SPZ") closed at 305, down 10.65 points (3.37%).

I. Summary of Market Movements

The price declines on October 14 hit the U.S. markets immediately upon their opening and continued to drive prices down most of the day. On the NYSE, except for a relatively stable period from 10:00 to 12:30, the DJIA suffered a series of declines throughout the day, closing at 2412.7, down 95.46 points (3.81%). During much of the trading day, the premium for the SPZ future was below theoretical value. 15/ Premium values in the Major Market Index ("MMI") futures contract expiring in November traded below theoretical value for most of the day. The near term October MMI futures traded more erratically during the day, at times trading at discounts to cash.

II. Breakdown of Trading

Overall, it appears that while the sell-off on October 14-16 was broad based, institutional selling was the most significant component on each day. The trading information obtained by the Division from the most active broker-dealers on the NYSE indicates that approximately 47% of selling on the NYSE on the 14th was from institutional accounts, with the remaining 26% and 27% from retail and proprietary accounts, respectively.

12/ While the Tokyo Nikkei Index rose 245.8 points (0.93%), the London Financial Times - Stock Exchange 100 Stock Index fell 27.3 points (1.16%).

13/ Declining issues lead advancing issues on the NYSE by 1634 to 290.

14/ Trading volume on the American Stock Exchange ("Amex") was 9.86 million shares, down 9.5% from the prior week's daily average; volume on the NASDAQ computerized quotation system was 145.5 million shares, down 4.2%.

15/ For an explanation of "theoretical" or "fair" value, see Chapter One of the Study.

A. Portfolio Insurance

This preponderance of institutional selling was also reflected in the index futures markets. The CFTC has found that combined net positions (net long and net short) for institutional accounts in aggregate increased from about 2,700 contracts net short on October 9 to nearly 15,000 contracts net short on October 15. 16/ While the Division was able to identify sales of only 1732 SPZ contracts (1.5% of SPZ volume) which were directly attributable to portfolio insurance strategies, approximately 27% of this portfolio insurance related selling was concentrated in the last 40 minutes of trading.

B. Other Index-Related Trading

For the entire trading session, only 29.4 million shares (14% of NYSE volume) represented program selling. Of this activity, 26 million shares were sold in index arbitrage programs, 1.4 million shares in index substitution, and 2 million shares in non-arbitrage programs. 17/ Of the 27.4 million shares of arbitrage-related selling, 13.4 million shares (49%) were for customer programs, and 5.9 million shares (21.6%) were sold short. 18/ The daily aggregate figures, however, fail to describe the effects that highly concentrated arbitrage-related selling had at key periods of the October 14 trading session. The following sections of the Appendix will focus primarily on four trading periods during the day: (1) open through 10:00 (DJIA declined 43.4 points); (2) 12:30 through 1:30 (DJIA declined approximately 24 points); (3) 2:30 through 2:45 (DJIA declined approximately 20 points); and (4) 3:30 through close (DJIA declined 17 points in the last ten minutes of trading). 19/

1. Open to 10:00

During this period, the DJIA moved from 2,508.1, its high for the day, to 2,464.7 for a loss of 43.4 points on NYSE volume of approximately 25,042,280 shares. During this period, the SPZ contract generally traded below theoretical value. 20/ Similarly, both the near term and November MMI contracts traded below theoretical value except

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16/ Interim Report on Stock Index Futures and Cash Market Activity during October 1987 to the U.S. Commodity Futures Trading Commission (November 9, 1987) ("CFTC Interim Report"), at 76.

17/ Only 168,700 shares were sold as part of portfolio insurance strategies.

18/ See Tables D-4 and D-5.

19/ The following program trades were executed throughout the day: (1) an arbitrage sell program for 680,000 shares of stock and 426 MMI contracts and an arbitrage buy program for 440,000 shares and 275 MMI contracts; (2) a non-arbitrage buy programs for 205,000 shares; and (3) a non-arbitrage sell program for 1,480,000 shares.

20/ The discount to theoretical value for S&P 500 Futures contracts fluctuated during this time period from a discount to cash value at the opening to premium values approximately 1.83 to 0.59 points above cash.

around 10:00. 21/ As a result, nine index arbitrage sell programs for 1.7 million shares (6.9% of NYSE volume, and 9.7% of NYSE volume in S&P stocks) were executed during this period. 22/ In addition, 65,100 shares were sold as part of two non-arbitrage programs, one entered at the opening and one at 9:44. Stock sales associated with index arbitrage and non-arbitrage trading comprised approximately 7.2% of NYSE volume and almost 10% of volume in S&P 500 stocks.

2. 12:30 to 1:30

During this period, the DJIA fell to 2,438.4, a decline of 24 points (0.96%), on NYSE volume of 33,211,920 shares. The SPZ contract traded below theoretical value by one point or more over this period, while both the near term October and November MMI contracts traded below fair value, with the near term contract at times trading below cash value. As a result, arbitrage selling increased significantly, 27 arbitrage sell programs 23/ were executed for a total of 7.4 million shares, accounting for 22.3% of NYSE volume and 29.4% of NYSE volume in S&P stocks. 24/

3. 2:30 to 2:50

In this 20 minute period, the DJIA declined to 2425.4, a loss of 10.3 points (0.41%) on NYSE volume of approximately 14.4 million shares. The SPZ futures generally traded below theoretical value during this period, with the discount at times exceeding one point. Nine arbitrage programs were executed during this period, with a total of 3.6 million shares sold, representing 25.5% of NYSE volume and 32.9% of NYSE volume in S&P stocks. 25/

4. 3:30 to Close

In the last half-hour of the trading session, the DJIA declined to 2412.7 (down 17.1 points or 0.68%) on NYSE volume of approximately 23.5 million shares, for a total decline of 95.4 points (3.8%) for the day. The SPZ futures prices, which had approached theoretical value just prior to 3:30, thereafter fell and remained substantially below

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21/ Both of these contracts opened at steep discounts to cash with the MMI contract at one point trading 6 points below cash value.

22/ All of those programs except one closed out pre-existing arbitrage positions.

23/ One sell program of 54,500 shares entered at 12:52 used the Kansas City Value Line ("KVL") futures and another entered at 1:14 involving 533,267 shares used XOC option contracts. All other arbitrage sell programs were executed with SPZ and MMI futures.

24/ Only one non-arbitrage sell program was executed during this period. This program, entered at 12:39, involved the sale of 10,000 shares.

25/ Eight of these programs were executed with SPZ futures with one program of 19,800 shares executed with MMI futures. With the premium in SPZ futures sufficiently below fair value, five of these programs established new arbitrage positions. Four, including the MMI program, closed out established positions.

theoretical value. 26/ As a result, 2.6 million shares were sold (including 248,000 shares sold short) in index arbitrage programs, and an additional 476,200 shares were sold as index substitution. Thus, total arbitrage-related selling represented approximately 13.2% of NYSE volume and 18.2% of NYSE volume in S&P stocks in this final half hour.

26/ A few arbitrage buy programs were executed with MMI futures during this period as both the near term and November contracts traded above theoretical value around 3:30. For the most part, however, the near term October contract traded at a discount to cash and the November contract traded at a premium below its theoretical value.

OCTOBER 15

TRADING CHRONOLOGY FOR OCTOBER 15

On Thursday, October 15, the U.S. markets opened down, 27/ but sustained an erratic recovery throughout much of the day, only to experience a dramatic price plunge in the final 30 minutes of trading. The Dow Jones Industrial Average ("DJIA") lost 57.61 points (2.39%) for the day. This sharp market drop on the close, following the then-record 95 point decline on the 14th, left the DJIA down approximately 5% for the first four days of the week. The Standard & Poors ("S&P") 500 stock index also declined 7.15 points (2.34%), and the composite indexes for the New York Stock Exchange ("NYSE"), American Stock Exchange ("Amex"), and the NASDAQ computerized quotation system for trading over-the-counter ("OTC") stocks declined 3.81 points (2.22%), 4.92 points (1.44%), and 5.77 points (1.35%), respectively. Trading volume on the NYSE increased to 266 million shares (up 27% from October 14), while volume on the Amex rose to 12.8 million shares (a 30% increase) and the NASDAQ system volume was 159.8 million shares (a 9.8% increase). Similar price declines on increasing trading volume also were experienced in the index futures markets. The most heavily used index futures, the December expiration S&P 500 index futures ("SPZ"), traded on the Chicago Mercantile Exchange ("CME"), declined 6.75 points (2.21%) on volume of 125 thousand contracts (10.3% above the prior day's volume).

I. Summary of Market Movements

As discussed above, although the securities and index futures markets experienced a series of minor intra-day price declines and recoveries, in the last half-hour of the trading session the markets were hit with a broad sell-off on increasing volume. The Division's analysis of these market movements has focused on 11 key periods: (1) 9:30 to 10:00 -- the DJIA loses 22.4 points, then rises 9.6 points; (2) 10:00 to 10:10 -- DJIA declines 11.6 points; (3) 10:10 to 11:20 -- DJIA recovers 26.8 points; (4) 11:20 to 11:40--DJIA falls 6.5 points; (5) 11:40 to 12:40 -- DJIA gains 17.4 points; (6) 12:40 to 1:00--DJIA falls 15.3 points; (7) 1:00 to 1:20 -- DJIA recovers 7.5 points; (8) 1:20 to 1:50--DJIA drops 19.7 points; (9) 1:50 to 2:30 -- DJIA recovers 20.5 points; (10) 2:30 to 3:20--DJIA declines 7.0 points; and (11) 3:20 to Close -- DJIA drops 57 points. Each of these key periods was preceded by similar price movements in the index futures markets which resulted in index arbitrage programs.

II. Breakdown of Trading

The Division's analysis of trading data from the most active broker-dealers on the NYSE indicates that the overall breakdown of selling on the 15th was similar to that on October 14. The largest component still was selling from institutional accounts, which comprised approximately 36%, with 24% from retail accounts and 40% from proprietary accounts.

27/ The U.S. markets' declines on October 14 had carried over to foreign markets overnight. On October 15, the Tokyo Nikkei Index dropped 218.2 points (0.82%) and the London Financial Times - Stock Exchange 100 Share Index declined 21 points (0.90%).

A. Portfolio Insurance

The level of SPZ futures selling which the Division was able to attribute to portfolio insurance strategies increased from 1732 contracts on the 14th to 3,609 contracts (2.8% of total CME volume) on October 15. 28/ These futures sales do not appear to have played a significant role in this trading session's price declines, but were a precursor of more substantial portfolio insurance selling in both the futures and stock markets on the 16th, 19th, and 20th. 29/ In addition, there may have been substantial futures selling by traders on the 15th in anticipation of sizeable portfolio insurance related futures sales. 30/

B. Other Index-Related Trading

While total stock selling as part of index arbitrage and index substitution on October 15 involved only 15.8 million shares or 5.8% of NYSE volume, 31/ this concentrated selling hit the stock market during key periods of the day, thereby accelerating price movements. This was particularly true in the final 40 minutes of the trading session, when approximately one-third of the day's arbitrage related selling coincided with the sharpest decline in the DJIA. The following sections provide a detailed breakdown of index-related trading during several of the day's key time periods.

1. 9:30 to 10:00

On October 15, the DJIA opened at 2394.42, down approximately 19 points from the previous day's close. This 0.7% drop in the DJIA was roughly in line with the opening of SPZ futures on the CME, where heavy sell pressure caused the futures to open at 302.9, down 2.1 points or 0.7%. Of this sell pressure in the SPZ, the Division has identified sales of at least 1268 SPZ futures (roughly 7% of SPZ volume from 9:30 to 10:00) which are clearly attributable to portfolio insurance strategies due to the markets' declines over the previous trading sessions.

The SPZ futures briefly traded at a discount to the price of the index component stocks (termed the "cash value") before recovering to slight premiums. These premiums, however, were sufficiently below the contract's "theoretical value" to bring in sell

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28/ The actual level of such selling, however, may be significantly larger, given the difficulties encountered in computing these statistics. See Chapter One of the Study.

29/ The Division's interviews with users of portfolio insurance strategies suggest that the hesitancy by some funds to implement the strategies' indications for futures sales on October 14 and 15, and even the 16th, may have contributed to the last-minute "dumping" of futures and stocks on the 19th and 20th.

30/ See Report of the Presidential Task Force on Market Mechanisms (January 1988) ("Brady Report"), at 15-17.

31/ Of this 15.8 million shares, 3.9 million shares (24.7%) were for customer programs and 4.1 million shares (26%) were sold short. See Tables D-4 and D-5.

arbitrage. 32/ Seven arbitrage programs were entered at the opening, selling 2 million shares of stock (including 226,200 shares sold short). 33/ Four more arbitrage programs were executed by 9:40 to sell 1.5 million shares. 34/ In addition, four non-arbitrage sell programs and three buy programs were entered at the opening. A total of 385,400 shares of stock were sold and 1 million shares purchased in these programs. An additional non-arbitrage sell program involving 283,000 shares of stock was entered at 9:37. In sum, arbitrage and non-arbitrage program selling comprised approximately 30.5% of NYSE volume in S&P stocks from 9:30 to 9:40, and 18.3% from 9:40 to 9:50.

The Major Market Index ("MMI") futures and the Financial News Composite Index ("FNCI") futures intermittently traded sufficiently above theoretical value between 9:40 and 10:00 to result in four arbitrage buy programs for 109,900 shares. 35/ The SPZ futures traded close to fair value until 9:46, when it declined sufficiently below fair value to bring in a sell arbitrage program for 650,000 shares. Around 9:55, the MMI also traded below fair value, resulting in two MMI arbitrage sell programs for 49,900 shares. Arbitrage selling constituted 7.7% of S&P stock volume from 9:50 to 10:00. Three non-arbitrage buy programs involving purchases of 1,144,500 shares also were executed over this period, comprising 7.7% of NYSE volume and 12.7% of volume in S&P stocks from 9:50 to 10:00 while the DJIA recovered 9.6 points to 2399.9 before resuming its decline.

2. 10:00 to 10:10

Between 10:00 and 10:10, when the DJIA dropped to 2388.3, six arbitrage programs involving the sale of 1 million shares were entered. 36/ In addition, one non-arbitrage sell program of 300,000 shares of stock was entered at 10:07. Total program sales of stock comprised approximately 10.9% of S&P stock volume.

32/ For a discussion of index futures theoretical or "fair value," see Chapter One of the Study.

33/ Both near term MMI futures contracts also opened at discounts to the price of the index component stocks. Two of the seven arbitrage programs were executed with MMI futures contracts.

34/ In addition, because a premium to theoretical value existed between the MMI stocks and futures around 9:38, two MMI arbitrage buy programs for 80,000 shares of stock were executed around this time.

35/ The arbitrage involving the FNCI was actually implemented using FNCI options (combinations of puts and calls replicating a futures contract) traded on the Pacific Stock Exchange ("PSE").

36/ Four of these programs were executed with MMI futures with the near term contract trading at a discount to cash value. In addition, all of these programs closed previously established MMI arbitrage positions. One program involving short sales of 177,900 shares of stock was executed using options on the Over-the-Counter stock index. Only one program was executed with SPZ futures although the SPZ contract traded at premiums below fair value throughout this period.

3. 10:10 to 11:20

During this period, the DJIA rose 26.8 points. The SPZ future continued to trade below theoretical value from 10:05 to 10:10. As a result, two arbitrage sell programs were entered at 10:06 and 10:09 for 709,100 shares and an index substitution program was entered at 10:10 for the sale of an additional 632,000 shares. This selling, along with 300,000 shares sold as part of non-arbitrage programs, constituted 16.2% of NYSE volume and 23% of volume in S&P stocks from 10:10 to 10:20. Thereafter, the SPZ futures traded at premiums only slightly below or above theoretical value until approximately 11:20, denying further arbitrage opportunities. Meanwhile, the near term and November MMI futures traded at premiums considerably in excess of theoretical value, resulting in MMI arbitrage programs and arbitrage programs using combinations of puts and calls in the S&P 100 stock index ("OEX") options. Total arbitrage purchases of 1.3 million shares constituted 2.3% of NYSE volume and 3.5% of volume in S&P stocks from 10:10 to 11:20.

4. 11:20 to 11:40

During this period, the DJIA fell 6.5 points, but arbitrage selling does not appear to have played a major role. From 11:20 to 11:30, 22,000 shares were sold in an MMI arbitrage program, 179,900 shares were sold as part of portfolio insurance strategies, and 105,100 shares were sold in other programs -- together constituting only 6.8% of S&P stock volume. Arbitrage and non-arbitrage programs sold only 290,000 shares or 5.3% of S&P volume from 11:30 to 11:40.

5. 11:40 to 12:40

Several arbitrage buy programs were executed while the DJIA gained 17.4 points. Both the SPZ and November MMI futures traded at premiums exceeding theoretical value throughout this period, resulting in the execution of 11 buy arbitrage programs for a total of 1.5 million shares. This arbitrage-related buying constituted 4.2% of NYSE volume and 5.7% of S&P volume, 37/ as the DJIA rose to 2426.0.

6. 12:40 to 1:00

The DJIA fell 15.3 points during this period, but arbitrage selling was minimal. The near term MMI futures traded at a discount to cash from 12:40 to 12:55. From 12:47 to 12:56, three arbitrage sell programs for 128,000 shares were entered as the discount to cash value widened. This selling constituted only 1.5% of NYSE volume and 3.3% of S&P stock volume from 12:50 to 1:00, and only 1.4% of NYSE volume and 1.8% of S&P stock volume from 1:00 to 1:10.

7. 1:00 to 1:20

The DJIA recovered 7.5 points while the SPZ and MMI futures traded at premiums to fair value for most of this period. Four arbitrage buy programs and one non-arbitrage buy program were executed for a total of 226,700 shares (approximately 4% of NYSE volume and 6% of NYSE volume in S&P stocks).

37/ In addition, 285,400 shares were purchased in non-arbitrage programs.

8. 1:20 to 1:50

The DJIA declined to 2398.5 by 1:50 as arbitrage sell programs in the SPZ and MMI futures were entered to close pre-existing positions when the SPZ futures and November MMI futures at times traded at premiums less than theoretical value. 38/ A total of 1.3 million shares were sold in these programs, comprising 10% of S&P volume from 1:20 and 1:30, 19% from 1:30 and 1:40, and 14% from 1:40 to 1:50.

9. 1:50 to 2:30

The DJIA recovered 20.5 points while, during most of this period, the SPZ and MMI futures prices traded slightly above theoretical value. 39/ Twelve arbitrage buy programs with SPZ futures, MMI futures and OEX options were executed for 1,317,950 shares, or 7.1% of NYSE volume and 10.3% of volume in S&P stocks from 1:50 to 2:30. In addition, 1,511,806 shares were purchased in four non-arbitrage buy programs executed during this period. Total program purchases comprised 15.2% of NYSE volume and 22% of volume in S&P stocks from 1:50 to 2:30.

10. 2:30 to 3:20

In this 50 minute period the DJIA declined 7 points. Arbitrage selling during this period exceeded arbitrage buying by more than a 3 to 1 ratio. Arbitrage selling constituted up to 15% of S&P stock volume from 2:30 to 2:40. Four arbitrage programs were executed between 2:30 and 3:00 involving sales of 270,000 shares. These sales comprised 3.6% of NYSE and 5.7% of S&P volume from 2:30 to 3:00 during which time the DJIA declined 5.4 points.

From 3:00 to 3:20, arbitrage selling slightly exceeded arbitrage related buying. Two sell programs involving 105,200 shares were executed with SPZ and MMI futures. These programs were entered around 3:06 and 3:08. Two buy programs involving 79,700 shares also were executed with SPZ and MMI futures, with the orders for these programs entered around 3:13 and 3:15. In addition, one non-arbitrage program for the purchase of 115,800 shares was entered at 3:11 and one non-arbitrage program for the sale of 575,842 shares was entered at 3:15. Over this period, the DJIA lost 6.2 points by 3:13 but recovered slightly thereafter. Total program sales of stock accounted for 9% of NYSE volume and 11.8% of S&P volume. Total program purchases accounted for 2.6% of NYSE volume and 3.3% of S&P volume.

11. 3:20 to Close

The DJIA fell rapidly in the last 40 minutes, closing the day at 2355.09 for a loss of 57.61 points, or 2.39 percent. The SPZ contract traded at premiums below fair value

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38/ In addition, the near term MMI future briefly traded at one point discounts to cash. These values provided opportunities to close established buy programs at favorable prices.

39/ One SPZ arbitrage program in which 250,000 shares were sold short around 1:50 took advantage of a brief drop below fair value while another SPZ arbitrage program involving the sale of 130,000 shares entered at 1:58 closed an existing position.

throughout most of this period. NYSE volume was heavy, with a total of 33,262,450 shares traded.

Both arbitrage and non-arbitrage selling was heavy during this period. A total of 18 arbitrage programs and 6 non-arbitrage programs sold 6,959,302 shares of stock: 3,128,460 shares from 3:30 to 3:50 (20% of NYSE volume / 26% of S&P volume) and 3,702,342 shares from 3:50 to the close (25.6 percent of NYSE volume / 33.7% of S&P volume). Total program selling from 3:20 to 4:00 constituted 21 percent of NYSE volume and 27.6% of NYSE volume in S&P stocks during this period. 40/

40/ In the last 10 minutes, 74,000 shares were purchased in MMI and FNCI arbitrage programs. In addition, 2,400 shares were purchased in a non-arbitrage program.

OCTOBER 16

TRADING CHRONOLOGY FOR OCTOBER 16

Trading on Friday, October 16, 1987, finished off a week of general price declines in the U.S. securities markets, 41/ with the Dow Jones Industrial Average ("DJIA") closing at 2,246.74, down 108.35 points for the day (4.60%) on then-record volume of 344 million shares on the New York Stock Exchange ("NYSE"). 42/ For the week, the DJIA lost 9.49%, down 17.5% since its August 25, 1987 high of 2,722.42. The 16th was the DJIA's first 100 point close-to-close decline, a factor which may have played a role in the market psychology of the next week.

Price declines were experienced on all markets on the 16th. The Standard & Poors ("S&P") 500 stock index declined 15.38 points (5.16%) for the day. In addition, the composite indexes for the NYSE, American Stock Exchange ("Amex"), and the NASDAQ computerized quotation system for over-the-counter ("OTC") stocks declined 8.32 points (4.97%), 12.25 points (3.65%), and 16.18 points (3.83%), respectively, on the 16th. 43/ The price declines in the index futures markets were even sharper on October 16. The most heavily used index futures, the Chicago Mercantile Exchange's ("CME's") contract on the S&P 500 stock index (the December expiration futures, or "SPZ"), declined 16.0 points (5.36%) to close at 282.25, a slight discount to the price of the component stocks ("cash" value).

I. Summary of Market Movements

Despite several minor market rallies during October 16, the overall price declines continued throughout the day and accelerated in the last hour of the trading session. The Division's analysis of the day's market movements has focused on 10 key periods: (1) Open to 10:00 -- the DJIA gained 12 points from 9:30 to 9:45, but lost 14 points between 9:45 and 9:59; (2) 10:00 to 11:00 -- DJIA traded in an 18 point range; (3) 11:00 to 11:30 -- DJIA declined 28 points to 2319; (4) 11:30 to 12:00 -- DJIA gained 22 points to 2341; (5) 12:00 to 1:00 -- DJIA declined 18 points to 2323; (6) 1:00 to 2:00 -- DJIA lost 53 points to 2270; (7) 2:00 to 2:30 -- DJIA recovered 38 points to 2308; (8) 2:30 to 3:00 -- DJIA declined 11 points to 2297; (9) 3:00 to 3:30 -- DJIA declined 23 points to 2275; and (10) 3:30 to Close -- DJIA lost 28 points to close at 2246.7. These price movements on the NYSE were accompanied (and often preceded) by similar movements on the index futures markets, particularly the SPZ futures on the CME. The Division's analysis of the above time periods illustrates the interrelationships of these markets on the 16th.

II. Breakdown of Trading

The trading information obtained by the Division from the most active broker-dealers during the market break indicated that the heavy institutional selling from the 14th and the 15th continued on October 16. Overall, institutional accounts represented

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41/ The Tokyo Nikkei Index closed down 61.5 points (0.23%) on October 16, while the London market was closed for the day due to a severe storm.

42/ On the NYSE, declining issues outnumbered advancing issues by 17 to 1.

43/ Trading volume on the Amex was 18.5 million shares (up 30.4% from the 15th) and for the NASDAQ system was 123 million shares (an increase of 18.4%).

approximately 39% of selling on the NYSE, while retail and firm proprietary accounts represented approximately 26% and 35% of the day's selling.

A. Portfolio Insurance

The analysis by the CME staff of SPZ futures trading on the 16th indicates that most activity appeared to be related to hedging strategies by institutional accounts. 44/ The CME's finding of largely institutional trading in the futures markets on October 16 is consistent with the index related information obtained by the Division and CFTC. This information indicates that the level of SPZ futures selling directly attributable to institutional accounts' portfolio insurance strategies was substantially greater on the 16th than on the 14th or 15th. Specifically, the Division was able to identify sales on October 16 of approximately 9,000 SPZ futures, or 6.3% of total volume.

In addition, the Division identified a small but significant amount of program stock selling during the afternoon of October 16 which can be directly attributed to portfolio insurance strategies. Although this form of selling only constitutes roughly 4.6 million shares on the 16th, its significance is that any portfolio insurance related stock selling arguably indicates real or supposed difficulties in selling a sufficient amount of futures economically. Portfolio insurance strategies, under normal circumstance, use sales of index futures to reduce equity exposure in order to take advantage of the lower transaction costs in the futures markets. The fact that the alternative of more expensive stock sales was used late on October 16 was a precursor of further stock selling on a massive scale on the 19th.

B. Other Index-Related Trading

The index trading information compiled by the Division and the CFTC indicates that significant amount of index arbitrage selling, in fact, hit the NYSE floor in relatively concentrated intervals during each period of stock price decline on the 16th. 45/

44/ See CME, Preliminary Report, at 10-13, 37.

45/ The following chart illustrates this relationship.

Time Period	Arbitrage Selling (Shares)	% NYSE Volume	% S&P Volume	DJIA Movement
9:50-10:00	2.8 million	23.7%	30.4%	- 9.4
11:00-11:30	3.8 million	14.3%	19.5%	-28.4
1:30-1:40	3.1 million	35.2%	51.7%	+ 8.2
1:50-2:00	1.3 million	9.9%	13.3%	-21.2

Although for the day, index arbitrage selling increased to 37.2 million shares or 11.0% of daily NYSE volume, 46/ its effects were most pronounced at the end of the session when the SPZ future developed over a four point discount to cash. From 3:30 to 3:50, when the DJIA lost over 50 points (breaking the 100 point close-to-close record), arbitrage related stock selling comprised over 30% of NYSE volume and 38% of S&P volume.

The Division also identified a substantial amount of stock selling, particularly near the close on the 16th, which is attributable to the futures and options expirations on that day. 47/ For example, one firm's customers sold approximately 1,100,000 shares on the October 16 market close to replace expiring S&P 500 index options traded on the Chicago Board Options Exchange ("CBOE"). Non-program stock selling related to expiring options or futures positions of institutional and retail accounts also may have been significant, but the aggregate selling information compiled by the Division for trading outside of "programs" makes such determinations difficult.

Finally, the Division's review indicates that a significant amount of index-related trading was effected off the NYSE, primarily in the London market, as exchanges-for-physicals ("EFPs"). 48/ The Division identified 5.9 million shares that were sold short in London EFPs on October 16.

The following sections describe in detail the various types of index-related trading in the securities and futures markets during key periods on the 16th.

Time Period	Arbitrage Selling (Shares)	% NYSE Volume	% S&P Volume	DJIA Movement
3:00-3:10	1.8 million	19.8%	25.7%	-21.8
3:30-3:40	0.7 million	7.1%	9.1%	-15.8
3:40-3:50	6.6 million	45.5%	58.9%	-34.4

46/ Of this 37.2 million shares, 18.5 million shares (49.6%) were part of customer programs (including 6.2 million shares sold for index substitution programs) and 5.4 million shares or 14.6% were sold short. See Tables D-4 and D-5.

47/ See Chapter Two of the Study (discussing monthly and quarterly expiration cycles for derivative products).

48/ As used in the Study, EFPs involve simultaneous transactions in a basket of index stocks (a "cash" commodity) and index futures in a noncompetitive transfer of ownership between the parties; one party buys the stocks and simultaneously sells (or gives up a long) futures contract while the other party sells the stocks and simultaneously buys (or receives a long) futures contract. See the discussion of EFP transactions in Chapter Two of the Study.

1. Open to 10:00

The SPZ contract opened at a 2.68 premium to the cash value of the index. Over the first five minutes of trading, the value of the premium declined to less than one point. The Division was able to identify portfolio insurance related sales of 60 SPZ contracts at the opening, 200 contracts between 9:30 and 9:45, and 241 SPZ contracts between 9:50 and 9:59, accounting for approximately 3.2% of SPZ trading during the period.

The October Major Market Index ("MMI") futures, traded on the Chicago Board of Trade ("CBT"), expired on the 16th, and as a result the October and November MMI contracts traded differently during the day. The October MMI contract opened and traded at premiums from one to three points from 9:15 to 9:40. From 9:45 to 9:50 and from 9:55 to 10:00, the October MMI contract traded at a small discount to cash. The November MMI contract, traded above its basis, at times by more than two points, throughout this period. The closest the November MMI contract traded to theoretical value was from 9:50 to 9:55 when the contract traded approximately one point over cash. 49/

The index-related trading information compiled by the Division also indicates that 309,500 shares of stock were sold at the NYSE opening and 53,300 shares between 9:30 and 10:00 as part of portfolio insurance programs. In addition, three index arbitrage sell programs were executed at the opening on October 16, 1987. 50/ These programs involved short sales of 1,286,289 shares of stock. One program was executed with KVL contracts in which 1,065,689 shares of stock were sold short. The other programs were executed with SPZ contracts with a total of 220,600 shares of stock sold short. 51/

From the NYSE opening to 9:45, the DJIA rose 12 points to 2367. During this period, one index arbitrage sell program and two MMI index arbitrage buy programs were executed. 52/ The sell program involved the short sale of 87,100 shares of stock against options on the OTC stock index ("XOC") and was entered at 9:34. The two MMI buy programs were entered at 9:35 and 9:39 and involved a total of 80,000 shares of stock (0.5% of total NYSE volume and 0.7% of NYSE volume in S&P stocks from 9:30 to 9:40).

49/ While all of the other major stock index futures contracts traded at premiums to cash value during the day, the December expiration Value Line futures contract ("KVL"), traded on the Kansas City Board of Trade ("KCBT"), was the only one that traded at a discount to cash value throughout the day. During the period from 9:30 to 10:00, the KVL futures traded at a discount of more than 2 points below cash value.

50/ One non-arbitrage program was executed at the opening which involved the sale of 1.1 million shares.

51/ These programs comprised the portion of arbitrage sell programs that had not been executed on the previous day.

52/ In addition, four non-arbitrage sell programs were reported in this period. A total of 194,000 share were sold in those trades.

From 9:45 to 10:00, the DJIA reversed course, losing 13 points (0.6%). Nine index arbitrage sell programs were executed during this period, involving the sale of 3,010,733 shares (650,000 shares sold short). These programs represented 25% of NYSE volume and 32.6% of NYSE volume in S&P stocks from 9:50 to 10:00.

2. **10:00 to 11:00**

The Division was able to identify portfolio insurance related sales of 966 SPZ contracts, with this selling comprising 4.3% of total volume. The SPZ futures traded over 2.0 points above cash value by 10:50, thereafter dropping to approximately a 1.50 point premium by 11:00.

The October MMI contract traded at small discounts to cash around 10:15 and 10:30 but otherwise traded above theoretical value except around 11:00 when the contract traded at a very slight premium to cash. The November MMI contract traded at a premium to cash value throughout this period. The value of this premium was lowest, at only 1.0 point over cash by 10:25 and highest by 10:40, at 2.0 to 3.0 points over cash.

Six index arbitrage sell programs, one substitution program and one non-arbitrage sell program for 142,000 shares were entered between 10:11 and 10:35. Two of these programs were executed with MMI contracts involving the sale of 64,000 shares of stock. Both of these programs closed pre-existing arbitrage positions. The index substitution program was entered at 10:18 and involved the substitution of 1,294,900 shares of stock for 205 SPZ contracts. In addition, three sell programs were executed using options on the S&P 100 index ("OEX") involving the sale of 439,400 shares of stock. All three of these programs closed pre-existing positions. The remaining sell program consisted of the short sale of 400,000 shares of stock and the purchase of 104 SPZ contracts. In addition, 680,700 shares of stock were sold as part of portfolio insurance strategies.

From 10:11 to 10:36 the DJIA fell 17.5 points from 2360, an intra-period high, to 2342.5, an intra-period low. Total sales of stock associated with programs constituted 33% of NYSE volume in S&P stocks from 10:20 to 10:30, and 16% from 10:30 to 10:40. 53/

3. **11:00 to 11:30**

The Division has identified portfolio insurance related sales of only 379 SPZ futures contracts (3% of total volume) during this period. The premium to cash value in the SPZ contract eroded from 1.5 points at 11:00 to a small discount at 11:25. By 11:30, SPZ contracts recovered trading at a 1.0 premium to the cash value of the index.

The November MMI contract traded at premium values exceeding the theoretical value of the contract throughout this period. The November contract traded closest to

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53/ Three index arbitrage buy programs were entered during this period, one at 9:56, one at 9:58 and one at 10:36. A total of 104,000 shares of stock were purchased and 66 MMI contracts sold in these trades. As a percent of total NYSE volume from 10:40 to 11:00, buying associated with these arbitrage programs comprised less than one percent.

theoretical value at 11:25. The October MMI contract also traded at premiums exceeding theoretical value except at 11:25 when the October contract fell to a discount to cash value.

Three arbitrage buy programs, five sell programs and two index substitution programs were executed during this period. 54/ The buy programs were small involving total purchases of 103,100 shares. Stock sales in index arbitrage and substitution programs equalled 3,695,700 shares. 55/ During this period, the DJIA declined 28 points to 2319. Total program stock sales comprised 13% percent of NYSE volume in S&P stocks from 11:10 to 11:20 and 32% from 11:20 to 11:30.

4. 11:30 to 12:00

Portfolio insurers reported sales of 719 SPZ futures (7.5% of total CME volume) during this period. Despite these sales, SPZ premiums increased from value below theoretical value around 11:30 to 2.0 points greater than theoretical values by 11:40 and thereafter. The October MMI contract traded at premiums in excess of theoretical value throughout the period but traded close to theoretical value at 11:45. The November MMI contract traded above its theoretical value by more than a point throughout the period.

On the NYSE, seven arbitrage buy and three sell programs were entered between 11:26 and 11:55. Five of the buy programs were executed with MMI contracts, and two were executed with SPZ contracts. The total number of shares of stock purchased in these programs equalled 706,300 shares or 2.7% of NYSE volume and 3.9% of S&P volume between 11:30 and 12:00. During this period, the DJIA rose from 2319 to 2341 for a gain of 22 points (0.9%).

5. 12:00 to 1:00

Portfolio insurance related sales involved at least 758 SPZ futures, or 17% of total volume from 12:00 to 12:30 and 10% from 12:00 to 1:00. The SPZ contract traded at a premium throughout this period, from a low value of 0.77 to a high value of 2.46.

The October MMI contract traded at a discount to cash value throughout this period except around 12:25, 12:35 and 12:50. The November MMI contract traded at premiums to cash value which exceeded theoretical value for most of this period. Around 12:05, 12:20 and 12:30, the November MMI contract, however, traded either below or close to theoretical value.

All four of the arbitrage sell programs and one buy program were entered by 12:35. No additional programs were entered from 12:35 to 1:00. The buy arbitrage program involved the purchase of 229,000 shares of stock. Three of the sell programs were executed with SPZ contracts with the other program using MMI futures. Total program selling comprised 24% of NYSE volume in S&P stocks from 12:30 to 12:40 during

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54/ All but one of the arbitrage sell programs were executed with SPZ futures. In addition, 650,000 shares of stock were sold short in two of these programs.

55/ An additional 20,000 shares were sold in a non-arbitrage program in this period.

which time the DJIA lost 8 points. No sell programs were entered from 12:40 to 1:00, and the DJIA recovered 0.7 of a point to 2323.1.

6. 1:00 to 2:00

Portfolio insurance related sales involved at least 1017 SPZ contracts from 1:00 to 1:30, constituting 13.6% of total volume. The SPZ contract traded at premiums to cash throughout this period except briefly around 1:26 and 1:56. The value of SPZ premiums, however, never exceeded 2.5 points during this period and at times were as low as 0.4 points over cash.

The October MMI contract traded alternatively at discounts to cash and premiums in excess of theoretical value during this period. The contract traded at discounts to cash between 1:00 and 1:15, 1:20 and 1:30, and 1:45 and 1:55. The November MMI contract traded at premiums exceeding theoretical value at all times except from 1:00 to 1:10 and 1:25 when the value of the futures contract traded at or below theoretical value.

Index arbitrage program trading was active during this period, hitting the NYSE in several waves. Three MMI arbitrage sell programs were entered between 1:02 and 1:05, for a total of 124,000 shares when DJIA began its downturn from 2323.1. An additional four sell programs were entered between 1:06 and 1:09, involving the sale of 439,350 shares. No index arbitrage programs were entered between 1:10 and 1:20, during which time, the DJIA remained essentially unchanged. Nine arbitrage sell programs and one substitution program were entered between 1:26 and 1:32, for a total of 3,094,579 shares or 51.7% of NYSE volume in S&P stocks between 1:30 and 1:40. 56/. Program selling continued, with an additional four arbitrage sell programs, a substitution program, a portfolio insurance program and four non-arbitrage programs entered from 1:42 to 1:55. 57/ Total program selling comprised 14% of S&P stock volume from 1:40 to 1:50 and 21% from 1:50 to 2:00. Overall, from 1:30 and 2:00, the DJIA declined an additional 29 points to 2270.2.

7. 2:00 to 2:30

Portfolio insurance related sales involved at least 1395 SPZ futures from 2:00 to 2:30, comprising 9.9% of SPZ volume. The SPZ contract traded at premiums exceeding theoretical value during most of this period except at 2:30 when it traded almost one point below theoretical value. The October MMI contract traded at a discount to cash except around 2:05 and 2:15. The November MMI contract traded at premiums which exceeded theoretical value except from 1:15 to 1:20 when it fell to a small discount to cash.

Eleven index arbitrage buy programs and eight sell programs were executed during this period. A total of 424,000 shares of stock were purchased in these buy programs all of which established new arbitrage positions. A total of 1,488,010 shares of stock were sold as part of the sell programs. The sell programs were executed with SPZ,

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56/ One MMI arbitrage sell program for 44,000 shares was entered at 1:24.

57/ One index arbitrage buy program involving the purchase of 280,000 shares of stock also was executed during this period.

FNCI, MMI and OEX contracts. The DJIA recovered 38.2 points during this period from 2270.2 to 2308.4 but stock purchased in index arbitrage buy programs only accounted for approximately one percent of total NYSE volume during this period.

8. 2:30 to 3:00

Portfolio insurance related sales of at least 693 SPZ futures constituted 8% of total volume between 2:30 and 3:00. The SPZ contract traded at brief discounts to cash around 2:32 and 3:00 but otherwise traded at premium values from 0.14 to 1.74.

The October MMI contract traded at premiums greater than theoretical value from 2:35 to 2:50 and at discounts to cash value at all other times. The November MMI contract traded at premiums greater than theoretical value throughout this period.

The DJIA lost approximately 11 points during this period. Seven index arbitrage sell programs and two buy programs were executed during this period. The buy programs were entered at 2:43 and 2:47, and involved total purchases of 80,000 shares of stock. The sell programs were entered between 2:26 and 2:54 (five against SPZ contracts and two against MMI contracts). Total program selling comprised 22% of NYSE volume in S&P stocks from 2:30 to 2:40, rose to 37% from 2:40 to 2:50, and receded to 21% from 2:50 to 3:00.

9. 3:00 to 3:30

Portfolio insurers only sold 309 SPZ contracts, or 2.8 percent of SPZ trading during this period. The SPZ contract traded at premiums exceeding theoretical value only around 3:15. The remainder of the time the contract either traded at premiums below theoretical value or at discounts to cash. The October MMI contract traded at a discount to cash from 3:00 to 3:05 and at premiums exceeding theoretical value during the remainder of this period. The November MMI contract traded at premium values which exceeded its theoretical value throughout the period.

Another series of arbitrage sell programs, with fewer non-arbitrage programs, hit the NYSE during this period. Total program selling comprised 29% of S&P stock volume from 3:00 to 3:10, rising to 44% from 3:10 to 3:20 (when the DJIA fell 23 points to 2274.9, then receding to 19% from 3:20 to 3:30. 58/

10. 3:30 to Close

Portfolio insurance related sales of 1510 SPZ contracts comprised 7.6% percent of total SPZ volume during this period. The SPZ contract traded at discounts to cash from 3:34 to 3:53 and briefly at a premium greater than theoretical value at 3:55 but by 4:00, the SPZ contract again was trading at a discount to cash value.

The October MMI contract traded at both substantial discounts and premiums to theoretical value over this period. The November MMI contract traded at a discount to cash value from 3:40 to 3:50 and by 4:00.

58/ Three buy programs executed in this period comprised total purchases of 124,000 shares of stock and sales of 79 MMI contracts. Two of these programs were entered at 3:11 and one at 3:13.

NYSE volume was heavy during this period with more than 53 million shares of stock traded. Arbitrage-related sales of stock were heaviest as the DJIA dropped over 50 points from 3:30 to 3:50, and abated somewhat as the market recovered points thereafter. Specifically, 650,000 shares were sold by arbitrage programs from 3:30 to 3:40; 5.7 million shares (and an additional 900,000 shares for substitution programs) were sold from 3:40 to 3:50; and 3 million shares (and 1.1 million shares for substitution programs) were sold from 3:50 to the close. In addition, the discount in the futures around 3:30 also apparently caused at least some portfolio insurance users to sell stocks instead of the normally cheaper futures. The Division has identified 1.7 million shares of stock sold as part of portfolio insurance strategies during this period. Total program selling comprised 25% of S&P stock volume from 3:30 to 3:40 and hit a daily high of 68% from 3:40 to 3:50.

OCTOBER 19

TRADING CHRONOLOGY FOR OCTOBER 19

On Monday, October 19, 1987, the nation's securities and index futures markets suffered their worst decline in history. The negative investor sentiment created over the previous week was reflected in a broad-based sell off throughout the day on the 19th, and developed into near panic selling by the end of the trading session.

On the NYSE, massive sell orders inundated specialists and shattered records set just the week before. Daily volume of 608 million shares almost doubled the October 16 record, and the 16th's record 108 point drop in the DJIA was exceeded in the first hour of trading. For the day on the 19th, the DJIA sustained a 22.6% loss, falling 508.32 points to close at 1,738.40. The NYSE composite index declined by 19.2%. The sell-off was so widespread that declining issues led advancing issues by an unprecedented 40-to-1 margin.

This heavy sell pressure was not confined to the NYSE. On the Amex, volume surged to 35.4 million shares, and the exchange's composite index plunged to 282.5, a drop of 41 points or 12.7%. Similarly, the NASDAQ composite index dropped 46 points to close at 360.2, a loss of 11.35%, on volume of 222.9 million shares.

In the derivative markets, the sell-off was equally devastating. The CME's market in the SPZ futures plunged 80.75 points to close at 201.50. This 28.6% decline in the SPZ futures outpaced even the 22.6% drop in the DJIA. The MMI futures declined 23.70% and the most popular index option for retail investors, the CBOE's S&P 100 index ("OEX") contract, experienced a loss of 21% of the value of the underlying index. 59/

I. Summary of Market Movements

The markets' turmoil was evidenced first in heavy selling on foreign markets prior to the opening of trading in the U.S. On the Tokyo Exchange, the Nikkei index closed down 2.35%, and selling gained momentum during the trading session in the London market, with the Financial Times - Stock Exchange 100 Share Index ("FT-SE 100" index) closing down 10.84%.

This heavy sell pressure was evidenced first in U.S. in the index futures markets. On the CME, the SPZ futures opened at 261.50, down 20.75 points from Friday's close. In the stock markets, large sell order imbalances at the NYSE overwhelmed specialists, delaying openings for a number of bellwether stocks, making calculations of most major stock indexes next to impossible. By 10:00, 95 S&P stocks, representing 30% of the index value, were still not open. By 10:30, 11 of the 30 stocks in the DJIA were still closed. While some calculations using prices for stocks already opened showed a 94 point drop in the DJIA by around 10:30, the actual decline was probably closer to 200 points. The markets stabilized somewhat by 11:00, and the SPZ discount receded to a slight premium to cash while the DJIA recovered over 60 points by noon. However, the SPZ discount reappeared and prices on the NYSE deteriorated somewhat between 12:00 and 1:00, and again between 1:30 and 2:15. Finally, a 51 point rally around 2:15 to 2:45 was followed by the SPZ discount spiking to approximately 19 points after 2:50 while a precipitous 252 point plunge in the DJIA resulted in it closing at 1738.40.

59/ Because the October contracts in the MMI futures (and options) expired on October 16, the decline discussed above refers to the November contracts.

Until about 11:00 to 11:30 on the 19th, the difficulty in obtaining firm stock prices and the resulting unreliability of index valuations made trading in the derivative markets chaotic at best. Although the SPZ futures appeared to have opened at over a 20 point discount to cash, most market professionals indicate that they recognized that the actual discount was considerably less because of the number of NYSE stocks which had not opened. Nevertheless, as demonstrated by Tables 2-1 and 2-2, the SPZ discount throughout the remainder of the day was of a different nature than during the week before, with the October 19 discount being chronic and much larger than the prior week's. 60/ While the volatility of the markets on that day made any comparison of futures and stock prices difficult, the trading strategies of market professionals on the 19th clearly were based upon the assumption that there was a significant (if indeterminate) discount in the futures market. As a result, significant numbers of index arbitrage programs were effected throughout the day. In addition, as discussed below, many users of portfolio insurance strategies shifted from futures transactions to directly liquidating their stock portfolios.

II. Breakdown of Trading

It is obviously not possible to reconstruct all selling which occurred on October 19. The data received by the staff indicates that the selling on the NYSE was broad based, with institutions accounting for approximately 50.7%, retail public 33.3% and

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60/ It has been widely noted that the apparent substantial discounts in the futures market on October 19 and 20 were more apparent than real once the number of delayed openings are taken into account. In an effort to evaluate this concern, the Commission's Directorate of Economic and Policy Analysis ("DEPA") analyzed the "reported" S&P 500 value in half-hour increments during October 19 and 20 in comparison to two implied S&P 500 values, i.e., S&P 500A recomputed the S&P 500 value assuming that halted stocks declined in value equal to those stocks which had opened and S&P 500B recomputed the S&P 500 value using the value at which the halted stocks actually did open. See Tables 2-1 and 2-2. These charts demonstrate that between 9:30 and 11:30 on October 19 the "reported" S&P 500 value overstated the degree of the discount. For example, at 10:00 the "reported" S&P 500 value was 273.17, although the SPZ was trading at 261.50. If, however, the reported value is adjusted for the 95 stocks which were not yet opened (representing 38% of the S&P 500) the adjusted S&P 500 value was 259.88. By 11:30 the "reported" value (263.85) had achieved approximate parity with the SPZ (265.50) and the adjusted value (263.33) was roughly equal to the "reported" value, with only 1.8% of the S&P value (12 stocks) not yet open. Thus, from 11:30 on (when all the SPZ 500 stocks were open) the SPZ discounts were real and substantial. Indeed, by 1:30 the SPZ was trading at a 22 point discount to cash. The persistence of these discounts is highlighted by activity on October 20. At 9:30 the SPZ opened at 225.00, by 11:30 it had declined 15.1% to 192, a 30 point discount to cash, even adjusted for the 38 S&P 500 stocks (11.4%) which had not opened. This is not to say that, for purposes of arbitrage trading, the difference between the "reported" and actual S&P value was insignificant on the 19th. Indeed, such differences, in conjunction with wide bid/ask spreads in the futures markets, did impair the ability to effect arbitrage transactions.

proprietary trading 16.0% of the total activity surveyed. 61/ The most consistent source of selling pressure throughout the day also was from institutional accounts, whether for portfolio insurance, mutual fund liquidations, margin liquidations, and selling by foreign accounts. In particular, this institutional selling, when combined with index arbitrage-related selling, almost certainly accounts for the vast majority of opening volume on the NYSE. This early institutional selling, in turn, appears to have developed as a direct result of the market decline of October 14-16.

The most significant factors during the afternoon market downturn appears to have been the convergence of stock selling from index arbitrage and portfolio insurance strategies around 1:30 to 2:00, and continued selling from portfolio insurance strategies thereafter. While the Division's review is unable to provide the same level of specificity for trading in the final hour of the October 19 trading session, it appears that continued institutional selling, combined with the near exhaustion of market-making capacity on the securities and futures markets and the uncertainty created by the number of DOT orders lacking "fill" reports, 62/ all contributed to the panic selling before the close.

The following sections describe several of the factors which appear to have been significant in the market decline on the 19th.

A. Portfolio Insurance

First, portfolio insurance related futures selling was significant throughout the trading day, accounting for at least 16.7% of total SPZ volume. Specifically, while sell pressure directly attributable to portfolio insurance strategies which we have been able to identify represented only 5.6% of SPZ volume from 9:30 to 10:00, it grew to 32% from 10:30 to 11:00, and 25% from 12:00 to 1:00. While futures selling from portfolio insurance providers was not particularly concentrated, this persistent sell pressure appears to have "overhung" the market throughout the day, making a sustained price recovery in the futures difficult. 63/ In addition, significant stock selling pressure hit the NYSE periodically on the 19th in "programs" as part of portfolio insurance strategies. As discussed above, portfolio insurance strategies generally employ sales of futures contracts as the preferred vehicle to reduce equity exposure in a declining stock market because of the futures normally lower transaction costs. Some strategies, however, provide for the alternative of reducing equity through stock sales, either in lieu of futures transactions or as a supplement, if this alternative appears more efficient. The chaotic conditions on the futures and securities markets on the close on

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61/ The Division was able to use the trading information submitted by 20 of the most active broker-dealers during the October market break to account for approximately 378.3 million shares of selling (62.2% of NYSE volume) on October 19. A substantial component not accounted for by these numbers is trading activity by specialists. The percentages of institutional, retail, and proprietary selling cited above and throughout the Chapter and Chronologies are derived from this sampling of broker-dealer data (cross-checked against audit trail data).

62/ *See* Chapter Three.

63/ The daily graphs in Appendix D show the relationship between portfolio insurance futures selling and total SPZ volume on the CME throughout the trading session.

October 16 and the opening on October 19 evidently influenced some users of these strategies to implement this alternative. 64/ The Division identified one major pension fund that sold 27.3 million shares on October 19 to supplement its futures sales (the fund also sold a total of approximately 7,000 SPZ contracts on the 16th and 19th). This selling hit the Exchange floor throughout the day (after 10:30) as 2 million share programs. In fact, had market conditions permitted, the fund's insurance strategy would have indicated sales of at least an additional 27 million shares in the final hours of the 19th. 65/ Overall, the Division's review found that at least 39 million shares of institutional selling hitting the NYSE floor as programs, in fact, were attributable to portfolio insurance strategies -- and that this form of selling was at least as significant (in terms of aggregate sell pressure) as selling programs from index arbitrage strategies.66/

B. Other Futures-Related Trading

The Division's findings concerning the significant level of portfolio insurance futures selling on the 19th is consistent with the CME's analysis of this activity. Overall, the CME found that most of the selling in the SPZ futures on October 19 was institutional in nature. While there was a considerable amount of activity by floor members and more speculative accounts, 67/ this encompassed both buying and selling and, as over the week of the 12th, resulted in most of these accounts maintaining more or less flat positions.

C. Index Arbitrage and Substitution

The discounts between the price for the SPZ futures on the CME and the underlying S&P stocks on the NYSE also brought in significant sell arbitrage programs.

64/ The money managers interviewed by the Division indicated that they recognized at the time that the apparent "discount" in the futures markets on the morning of the 19th was at least partially a function of the failure of many S&P stocks to have opened on the NYSE. Nevertheless, this situation influenced their decision to employ stock sales as a prudent supplement to futures transactions.

65/ Instead, this program was halted shortly after 2:00 on the 19th. Market conditions, however, permitted the sale of an additional 9.9 million shares on the NYSE on October 20.

66/ In combination with index arbitrage and other programs identified, the Division has been able to account for approximately 98.9% of the 79.7 million shares of sell volume routed to the NYSE through DOT by the List system on the 19th. Of the total of 89 million shares of program selling on the 19th identified by the Division (including volume sent through DOT with proprietary systems other than List or sent by phone to the NYSE floor) 77.5 million shares (87%) were sold either as part of portfolio insurance strategies or index arbitrage. The remaining 13% of program selling consists of additional institutional activity.

67/ For example, on October 19 one large speculative account bought almost 5,000 SPZ futures, considering them underpriced. The CME's analysis shows that speculators were both buyers and sellers of futures on the 19th and 20th. See CME Preliminary Report, chart of change in positions of large traders, following p. 28.

Overall arbitrage programs accounted for selling of approximately 37.6 million shares (8.8% of NYSE volume in S&P stocks) on October 19. Of the total arbitrage-related selling on the NYSE, 68/ 9.4 million shares (25%) were sold short, 69/ and 19 million shares (50%) of the 37.6 million shares were sold for customer accounts, including 2.8 million shares sold as index substitution. 70/

While the aggregate amount of arbitrage-related selling was smaller on a percentage basis than during October 14-16, arbitrage programs may have played a significant role in the market decline. Because the discounts which appear during market downturns are calculated and acted upon almost simultaneously by a number of well-capitalized firms and some large institutional investors, arbitrage programs often hit the market as highly concentrated selling pressure which may further speed the drop stock prices.

The periodic sell pressure from portfolio insurance related programs and more concentrated arbitrage sell programs sometimes hit the NYSE simultaneously. Total program selling reached extremely high levels during several market downturns on October 19, accounting for 61% of S&P stock volume from 9:30 to 9:40, 63.4% from 1:10 to 1:20, and over 60% during two intervals between 1:30 to 2:00.

D. Mutual Fund Redemptions

The Investment Company Institute ("ICI") conducted a survey of its members' redemption experience and trading activity during the market break. While the data indicated that redemptions increased on October 16 and 19, only approximately 2% of equity fund shares were redeemed on these days and at most funds redemptions were met from available cash reserves. However, a significant amount of selling involved the liquidations of one major mutual fund complex. This complex sold a total of 25.8 million shares on the day, with orders to sell 17.5 million shares entered before 10:00. 71/ The ICI survey indicates that most mutual funds maintained a sufficient cash

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68/ The only London EFP reported on the 19th also contributed to concentrated arbitrage selling at the opening. That EFP was for 3.25 million shares, which a customer sold short to a major U.S. broker-dealer prior to the NYSE opening. This broker-dealer then sold this position (viewing it as a long position) as part of an index arbitrage program on the NYSE opening.

69/ An additional 3.3 million shares were sold short for two customer accounts as a hedge for short index futures and options positions which were "frozen" pending liquidation.

70/ See Tables D-4 and D-5.

71/ Unlike most program orders, which are sent to the NYSE floor in concentrated packages via the exchange's automated order-routing systems, this fund expected the firms handling the orders to "work the orders" in segments to maximize the prices received to raise cash for redemptions. The impact on stock prices of these sell orders, therefore, is more difficult to quantify for selected 10 minute or 30 minute intervals than is the case for program orders. For example, the fund estimates that slightly less than one-half of its sales entered before 10:00 were executed before 10:00. In addition, the fund has represented that the level of its balance to absorb redemptions occurring over the weekend. This major fund, however, had a policy of being fully invested and, therefore, was forced to effect substantial sales to respond to weekend redemptions as well as contributed additional redemptions on Monday. Data regarding other funds on that day indicated that they were, in the aggregate, net buyers. 72/

E. Margin Calls

Relatively little selling occurred throughout the day as a result of forced liquidations of customer margin accounts. As discussed in detail in Chapter Five, the staff's survey of the 28 most active firms indicates that the responding firms sold at most around 7 million shares (1% of NYSE volume) 73/ on October 19 as liquidations to meet unpaid customer margin calls. It appears reasonable, however, to assume that a significant amount of customer stock positions were sold by customers (as opposed to firms) in order to raise cash for both securities and futures margin calls, although the level of this selling could not be quantified by the firms contacted by the Division. While we are not able to pinpoint the distribution of those sales throughout the day, the staff believes that it is likely that many of those sales occurred at or near the opening of trading.

F. Foreign Selling

Finally, a number of persons interviewed by the staff from the firms' institutional sales and block trading desks indicated that they believed there was substantial foreign selling in the morning of October 19. Although a few firms indicated that there was significant selling by Japanese investors, most firms stressed that the bulk of foreign selling came from European investors, a trend which supposedly had begun earlier in the

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trading on the 19th, under 4.5% of total NYSE volume, was not aberrational since the fund's transactions constituted roughly 3.6% of NYSE volume in October 1987 and ranged up to 4.4% in July 1987. Nevertheless, the magnitude of this fund's sell orders on the 19th and the fact that most of this activity was concentrated on the sell-side indicate that it did play a significant role for the day.

72/ See Letter to David S. Ruder, SEC Chairman, from David Silver, ICI President, dated November 24, 1987. More detailed fund information was separately sent to the Division. The Commission staff conducted limited inspections of 52 non-ICI member funds and found that the redemption and portfolio sales activities of these funds were generally less, percentage-wise, than that reported by the ICI for its member funds.

73/ Firms reported that margin liquidations on the 19th totaled $293 million, but could not determine which types of stocks were sold in these liquidations. Accordingly, the Division is unable to determine what percentage of margin liquidations were NYSE stocks. Even if the assumption was made that all of this $293 million involved NYSE stocks, and a $40 per share price is used, this translates to 7.3 million shares.

month and accelerated on the 19th and 20th. 74/ Quantifying the amount of such foreign selling is extremely difficult because much of the activity is settled through U.S. banks, and, therefore, can not be easily distinguished from activity by U.S. institutions. Nevertheless, through examining settlement information from the Depository Trust Company ("DTC"), the staff identified four major sell programs in U.S. stocks through foreign banks totalling over 9 million shares.

Perhaps as significant as any foreign selling during October 19, was the drying up of foreign buying interest. Traders at one major firm indicated that buying interest from Japan had been a significant support to the market in 1987. On October 19, however, they indicated that any Japanese buying interest entirely disappeared.

III. Timing and Magnitude of Index-Related Trading

The following section of the chronology provides a detailed account of the interaction of the various types of index-related trading strategies during key periods of the October 19 trading session.

A. Open to 10:00

As indicated above, heavy sell pressure on the CME caused the SPZ to open down over 20 points. Of this sell pressure, the Division has identified orders for at least 319 SPZ contracts as part of portfolio insurance strategies, and an additional 767 SPZ contracts were sold between 9:30 and 10:00 by portfolio insurers. These portfolio insurance sales of 1086 SPZ contracts constituted 5.6% of total SPZ volume during this period.

The apparent discount of over 10 points between the SPZ contract and the cash value of the index (and an over 11 point discount to the index's theoretical value) continued through 10:00, creating a theoretical opportunity for sell arbitrage. 75/ The Division identified 10 arbitrage sell programs during this period involving the sale of 4.8 million shares. 76/ The Division also identified ten sell programs which did not involve arbitrage. These additional programs accounted for over 3.5 million shares of selling, including at least 300,000 shares sold as part of portfolio insurance strategies. Total program selling comprised approximately 36% percent of total NYSE volume from the Opening to 9:40 -- or over 61% of NYSE volume in S&P stocks.

74/ In a news account, a trader indicated that the level of selling by both Japanese and European investors required pre-clearance by his firm. See Smith, Swartz & Anders, Black Monday, What Really Ignited the Market's Collapse After Its Long Climb, Wall St. J., Dec. 16, 1987, at 20.

75/ Other stock index futures also opened at discounts to cash value. During the period from 9:30 to 10:00, SPZ contracts continued to trade at more than a 10 point discount to cash value while the discount in the Major Market Index ("MMI") futures contract increased to more than 16 points.

76/ Six of these programs involved short sales of 2,061,400 shares.

B. 10:00 to 10:30

The heavy sell pressure continued on the CME. The Division identified at least 2002 SPZ futures sold as part of portfolio insurance strategies between 10:00 and 10:30, or 13% of total SPZ volume. During this time the discount on SPZ contracts had increased to 18 points, receding to 12 points by 10:30. 77/ In response to these continuing discounts, 13 arbitrage sell programs, totaling over 8 million shares, were executed during this period. 78/ These programs comprised 37% of NYSE volume in S&P stocks from 10:00 to 10:10, and 33% from 10:10 to 10:20.

C. 10:30 to 11:00

Users of portfolio insurance strategies sold at least 3317 SPZ contracts, with these sales of SPZ contracts fairly evenly distributed throughout this period. Portfolio insurance sales equalled 32% of SPZ volume in this half hour. The continued existence of substantial discounts to cash value which existed in the major stock index futures contracts at 10:30 brought in four additional index arbitrage sell programs for 2.1 million shares of stock. 79/ Also during this period, the portfolio insurance related sell programs discussed above began to hit the NYSE, with one program sending "waves" of sell orders of over 2 million shares each for S&P stocks. Two such waves hit between 10:30 and 11:00. Thus, total program selling constituted over 35% of S&P stock volume from 10:30 to 10:40 and 20% from 10:40 to 10:50.

D. 11:00 to 11:50

Portfolio insurance selling involved at least 3151 SPZ contracts, or 22% of SPZ volume from 11:00 to 11:30. 80/ Discounts in the SPZ reappeared during this period with the contract trading from premiums above theoretical value at 11:00 to a 3 point discount at 11:50. Similarly, during this period, the MMI November contracts moved from a 17 point discount at 10:30 to a 3 to 5 point premium. As a result, 13 buy arbitrage programs were executed during this period, eleven using MMI contracts of these premium values, one using SPZ contracts, and one using KVL contracts. The total amount of stock purchased as part of these programs equalled 2.1 million shares. Volume on the NYSE during this period was particularly heavy with over 93 million shares traded. Program purchases comprised 2.3% of total NYSE volume and 3.1% of S&P stock volume.

77/ MMI and KVL contracts also traded at increased discounts to cash values during this period although no portfolio insurance sales were effected in either of these contracts during this period. The MMI traded at an average discount to cash of approximately 17 points and KVL recovered from a 17 point discount to cash value at 10:20 to a 10 point discount.

78/ In two of these programs, 1,473,179 shares of stock were sold short.

79/ In addition, three buy programs were executed using MMI contracts as MMI recovered from a 17 point discount to cash value to a 3 to 5 point premium. The MMI buy programs were entered from 10:54 to 10:55 consisting, in total, of the purchase of 280,000 shares of stock.

80/ Portfolio insurance providers sold an additional 290 SPZ contracts from 11:30 to 11:49.

E. 11:50 to 12:00

From 11:50 to 12:00, users of portfolio insurance strategies sold at least 120 SPZ contracts and an additional 868 contracts at 12:00. The SPZ moved to a discount which by 12:00 exceeded 8 points. 81/ The reappearance of discounts resulted in arbitrage sell programs for approximately 900,000 shares and 2 million shares of selling for portfolio insurance strategies. With an additional 600,000 shares sold in non-arbitrage programs, total program selling constituted over 30% of NYSE volume in S&P stocks between 11:50 and 12:00.

F. 12:00 to 1:00

Portfolio insurance strategies sold at least 2695 SPZ contracts (45.1% of total SPZ volume for this period) from 12:00 to 12:30, during which the SPZ contract remained at an average 5 point discount to cash value. 82/ At least 1100 SPZ contracts (11.9% of total SPZ volume) were sold as part of portfolio insurance strategies between 12:30 and 1:00. The discount to cash value continued to exist in the SPZ contract during this period, although, by 1:00, SPZ was trading at less than a four point discount to cash value. 83/ As a result of the continuing discounts, sell arbitrage programs were executed throughout this period. This selling involved approximately 7 million shares. In addition, approximately 9 million shares of stock were sold in portfolio insurance strategies. Total program selling ranged from a low of 13% of S&P stock volume between 12:30 and 12:40 to a high of 46% between 12:50 and 1:00.

G. 1:00 to 1:30

Portfolio insurance related sales of at least 1868 SPZ contracts comprised 17% of the total SPZ volume from 1:00 to 1:30. Although the SPZ discount initially receded to less than 5 points, it increased to more than 10 points by 1:30. 84/ As a result, arbitrage programs sold around 4.3 million shares, with 492,100 additional shares sold as index substitution. Finally, over 4 million shares were sold as part of portfolio insurance strategies. Total program selling in this half hour rose from 12% of S&P

81/ The MMI contract alternated between small discounts and premiums to cash from 11:30 to 11:50, thereafter trading at an increasing discount to cash value which by 12:00 was approximately 5.00 points.

82/ The KVL and the NYF contracts also traded at consistent discounts to cash value throughout this period although no portfolio insurance sales were executed with these contracts. In contrast, the MMI contract briefly traded at a premium to cash value from 12:05 to 12:15 before falling to a discount by 12:30. No portfolio insurance strategies were implemented using MMI contracts during this period.

83/ In contrast, MMI traded at a slight premium to cash value from 12:50 to 1:00, although the MMI contract traded at a discount to cash value from 12:30 to 12:50.

84/ The discount to cash value in all of the other stock index futures contracts, with the exception of KVL, moved in a manner similar to the SPZ contract during this period.

stock volume between 1:00 and 1:10 to 63% between 1:10 and 1:20, and receded to 46% from 1:20 to 1:30.

H. 1:30 to 2:00

The Division identified sales of at least 2239 SPZ futures (17% of total volume) from portfolio insurance strategies during this period, when the SPZ discount to cash increased to more than 17 points. 85/ Stock selling from arbitrage and substitution programs involved 2.5 million shares and one million shares, respectively. An additional 8.9 million shares were sold as part of portfolio insurance strategies. Total program selling comprised 61% of S&P stock volume from 1:30 to 1:40 and 60% from 1:50 to 2:00.

I. 2:00 to 2:30

Portfolio insurance related sales involved at least 2069 SPZ contracts (21% of total SPZ volume) during this period. Despite portfolio insurance selling, the discount to cash value in SPZ contracts declined to less than 15 points by 2:30 from more than 17 points. In contrast, however, the discount for the MMI futures, in which no portfolio insurance selling was identified, declined to approximately 5 points by 2:30 from over 10 points. Arbitrage-related stock selling abated to less than 800,000 shares, comprising only 5.8% of S&P stock volume from 2:00 to 2:30.

J. 2:30 to 3:00

At least 2179 SPZ futures (23% of total volume) were sold in portfolio insurance strategies during this period. The discount in the SPZ contract had receded to less than 8 points by 2:35 but thereafter steadily increased, trading at a discount in excess of 19 points by 3:00. 86/ Arbitrage and substitution programs sold approximately 1.6 million shares between 2:30 and 3:00, 87/ with an additional 1.7 million shares sold in non-arbitrage programs. 88/ Total program selling rose to 24% of NYSE volume in S&P stocks from 2:50 to 3:00.

K. 3:00 to 3:30

At least 971 SPZ contracts (8.6% of total volume) were sold in portfolio insurance strategies during this period, when the discount in both MMI and SPZ contracts declined by more than 5 points. Arbitrage and substitution programs sold approximately 1.5 million shares and 630,000 shares, respectively, in this half hour. Portfolio insurance strategies sold an additional 1.6 million shares, and other programs sold around 300,000 shares. Volume on the NYSE was particularly heavy during this period (46 million shares in total, 33 million shares for S&P stocks), with total program selling comprising only 12% of S&P stock volume.

85/ Discounts on other stock index futures contracts also increased over this period.

86/ The MMI contract briefly traded at a small premium but by 2:40 was trading at a discount to cash value of approximately 10 points.

87/ Of these sales, 886,000 shares were sold short.

88/ Of these sales, 650,000 shares were sold short.

L. 3:30 to Close

The Division identified at least 2637 SPZ futures sold as part of portfolio insurance strategies from 3:30 to 4:00 and 633 SPZ contracts from 4:00 to 4:15, comprising 15.9% of total SPZ volume during this 45 minute period. The discount in the SPZ contract declined by approximately 8 points by 3:55, closing the day at a 6 point discount to cash value. 89/ Arbitrage programs sold approximately 1.3 million shares from 3:30 to the NYSE close. Much more significant, over 3 million shares were sold as part of portfolio insurance strategies and 4.3 million shares were sold in other programs -- including 2.6 million shares sold short. These short sales evidently were involuntary customer sales to hedge long index futures and options positions in "frozen accounts" for futures/options traders. NYSE volume during this period was extraordinarily heavy with 63 million shares traded. Total program selling constituted over 36% of S&P stock volume from 3:30 to 3:40 and almost 32% from 3:40 to 3:50.

89/ In contrast, the discount on MMI contracts continued to increase after 3:30 falling to a 34 point discount to cash value by 3:50. By 4:00, the discount on the MMI November contract receded by 24 points closing the day at a discount to cash value of less than 10 points.

OCTOBER 20

TRADING CHRONOLOGY FOR OCTOBER 20

Tuesday, October 20, 1987, saw a continuation of the extraordinarily high volume and volatility of Monday. Unlike October 19 however, price movements resemble a roller coaster demonstrating both tremendous nervousness on the part of market participants and the exhaustion of market-making capacity on virtually all stock and derivative markets. As a result the securities and futures markets reached a point, around mid-day, when heavy sell pressure almost overwhelmed market-making capacity in both the securities and futures markets. As a result, trading in a large number of NYSE securities were halted and most derivative markets ceased trading. Around this time, however, the convergence of a number of factors, including news of pending corporate buy-backs of stocks and assurances of sources of liquidity for NYSE specialists, as well as the dissipation of stock selling and the return of intangible bullish investment sentiment, resulted in a remarkable market recovery. The DJIA gained around 118 points (6.8%) from 12:20 to 1:00, maintaining a 102.27 point (5.88%) recovery for the day, closing at 1,841.01 on record NYSE volume of 613.7 million shares.90/ This recovery, however, did not extend to the Amex and NASDAQ markets, which closed down 8.64% and 9%, respectively.

I. Summary of Market Movements

The bearish investor sentiment of the 19th continued to be evident in trading on major foreign markets: the Tokyo Nikkei index closed down 14.90% and the London FT-SE 100 index closed down 12.22%. Notwithstanding downward trends in the foreign markets, prices on both the leading U.S. index futures market (the CME) and securities market (the NYSE) opened sharply higher. The SPZ futures on the CME opened up 23.50 points at 225, and quickly rose another 16 points to 241 by 9:53, trading at a premium to the index stocks of up to 10 points. Trading on the NYSE began with the DJIA rising to 1,935.7, up 197.30 by 10:28.

Heavy sell pressure on the CME, however, caused SPZ prices to decline, trading by about 10:00 at a slight discount to cash as the DJIA peaked. Despite the relatively low level of index arbitrage, 91/ the DJIA fell 227 points by 12:21. As discussed in more detail in Chapter IV of the Study, this renewed sell pressure severely strained market-making capacity on the NYSE. By 12:30, trading had been halted due to order imbalances in 145 NYSE stocks (including 77 stocks in the S&P 500, representing 24.6% of the index value), and the NYSE Chairman informed the Chairman of the Commission that he was considering closing the Exchange. Meanwhile, the combination of continued heavy sell pressure on the CME 92/ and halts in trading for such a significant number of S&P stocks caused the CME to halt SPZ trading. Options and futures exchanges

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90/ This volume figure, which is larger than the often cited volume of 608,120,000 shares, is derived from NYSE audit trail tapes.

91/ The Division's review indicates that the voluntary restrictions placed by the NYSE on member firms' use of the Exchange's automated order-routing systems for both proprietary and customer index-arbitrage program trading resulted in these strategies playing negligible roles on this day.

92/ The SPZ had fallen 57 points from its early peak to 183.00 by 12:15.

halted trading all other index futures and options at this time with the exception of the MMI traded on the Chicago Board of trade ("CBT").

During an interval of about 20 minutes, beginning at approximately 12:30, the MMI Futures staged an extraordinary 90 point rally, rising from a discount of about 60 points to a 12 point premium. At that time the DJIA recovered 126.2 points to 1834.9 by 1:12.93/ While the rise in the MMI may have had a psychological impact on stock prices it appears to have had no direct effect on trading on the NYSE. During that time period only one small arbitrage program was effected employing the MMI.

When the CME then re-opened, the rally on the NYSE faded, with the DJIA falling back 80 points in 27 minutes. The SPZ traded at a discount to cash of more than 16 points, increasing quickly to over 31 points with the onset of the decline in stock prices. Shortly after 2:00, the DJIA staged a third rally of nearly 170 points to 1,920.3 by 3:55, but declined about 80 points to 1,841.01 at the close, up 102.27 points for the day.

II. Breakdown of Trading

A. Portfolio Insurance

Overall, it appears that portfolio insurance futures and stock selling played a significant role on the 20th in dampening price recoveries in both markets. In particular, sell pressure on the CME from portfolio insurance strategies reached its highest level for the October Market Break accounting for at least 28,265 contracts, or 25.5% of total SPZ volume on October 20. This portfolio insurance appears to have been a substantial factor in moving the SPZ price to a discount to cash value a number of times during the trading day. For example while the SPZ opened at a substantial premium to fair value, that premium was dramatically reversed to a slight discount by approximately 10:00. During this period, portfolio insurance strategies accounted for net sales of 4887 contracts, or roughly 25% of SPZ volume during this period. Portfolio insurance strategies accounted for an additional 2,719 net sales of SPZ contracts between 10:00 and 10:30 as the discount to the cash value increased in excess of 16 points and the DJIA began its plunge from the high of 1935.70. For the next hour, while the DJIA declined by over 170 points, portfolio insurance accounted for in excess of 34% of SPZ sell volume.

In addition, the portfolio insurance stock selling which had reached 39.9 million shares on the 19th continued on October 20, but at a reduced level, totaling 10.5 million shares or 1.7% of NYSE volume and 2.4% of S&P volume on the 20th.

93/ As discussed in detail in Chapter Three of the Study, the Division's analysis of index-related trading during this period does not provide any direct evidence to support press allegations that MMI futures were used to manipulate the prices for bellwether NYSE stocks to turn the market around. It is not possible to quantify the effect on market psychology, however, of the price rise experienced at that moment of time in the MMI index.

B. Index Arbitrage

Prior to the opening of trading on October 20, the NYSE requested that its members refrain from using the DOT LIST processing feature to route index arbitrage programs to the NYSE floor. On October 21, the NYSE also requested that firms refrain from effecting proprietary arbitrage programs. As a result, the index futures, and stock markets were effectively decoupled and relatively little index arbitrage was effected the remainder of the week. 94/ Given the relatively low level of index arbitrage reported to the Division, 95/ it does not appear that arbitrage, itself, was instrumental in transmitting futures price movements to the equity market on the 20th. 96/ It may well be that the effect of futures prices on the stock market on this day was more a matter of "market psychology", causing NYSE specialists to reflexively drop prices to eliminate discounts because of their belief that surges of selling would follow any discount. Indeed, in light of the continuing stock liquidations of portfolio insurers and likely additional institutional selling shifted from the futures to the stock market such a response remained understandable.

C. Margin Calls

The level of firm liquidations of customer stock positions to meet outstanding margin calls increased from a value of $292.6 million on October 19 to $425.8 million on the 20th. At most, this would account for approximately 10.5 million shares of selling (1.7% of NYSE volume). 97/ As on the 19th, however, it is reasonable to assume that customers also voluntarily sold a significant amount of stock on October 20 to raise cash for margin calls.

D. Other Trading

The Division's review of trading on the 20th, unlike the analysis of the 19th, has not identified dominant sources of selling pressure during the mid-morning market downturn. Instead, this selling appears to have been broad-based along the lines of October 19, with the largest segment of selling still derived from institutional accounts (45% on the 20th, as opposed to 50.7% on the 19th) and only slightly higher levels of selling from retail and proprietary accounts (37.4% retail, 17.5% proprietary on the 20th

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94/ Effective on November 3, the NYSE permitted programs entered for customer or proprietary accounts to be routed through the DOT system if entered prior to the opening; on November 6, the NYSE announced that commencing November 9, 1987, members firms would be allowed to use DOT to execute orders for program trades throughout the day.

95/ This low level of arbitrage is consistent with the results of the NYSE's monitoring of "program" orders sent through the Exchange's automated order-routing systems.

96/ No EFPs were reported for October 20.

97/ As noted in the discussion of October 19, this maximum number of shares assumes that all selling involved NYSE (versus Amex and NASDAQ) stocks -- an assumption which is almost certainly unrealistic.

versus 33.3% retail, 16.0% proprietary on the 19th). 98/ This selling may have sought to take advantage of the morning's price recovery as an opportunity for liquidations prior to another market drop.

Similarly, the trading information available to the Division does not highlight any particular sources for the resurgence of buying interest that precipitated the mid-day market recovery on the NYSE. Again, this buying appears to have come from all types of accounts (45.9% institutional, 38.1% retail, and 16.0% proprietary). Nor does it appear that buying by corporate issuers on the 20th (although announced for the near future) accounts for a significant segment of this buying interest. Our survey of issuers in the S&P index with outstanding repurchase programs indicates that those issuers only accounted for 21.94 million shares or 3.57% of buying on the NYSE (or 5.14% of volume in S&P stocks). We can not discount, however, the psychological significance of announcements of issuer repurchase programs during October 20. For example, during the critical period between 11:30 and 1:00 that day, 8 issuers in the S&P 500 index announced repurchase programs. 99/

III. Timing and Magnitude of Index-Related Trading

The following section of the chronology provides a detailed breakdown of the interaction of the various types of index-related trading on October 20.

A. Open to 10:00

The Division identified portfolio insurance related sales of at least 4,885 SPZ futures contracts (26% of total volume) from 9:30 to 10:00. The SPZ contracts opened at a premium to the cash value of the index, but by 10:00 prices had declined to the point that the SPZ contracts were trading at approximately cash value. The MMI futures similarly opened at a premium to the cash value of the index which by 10:00 also had declined to cash value even though no portfolio insurance strategies were executed in the MMI during this period. The existence of premiums in MMI and SPZ did not trigger any index arbitrage buy programs, nor were previously established sell programs closed during this period. Moreover, the erosion of premiums in these contracts between 9:30 and 10:00 did not trigger additional sell arbitrage programs nor were pre-existing buy programs closed during this period. Only one index arbitrage sell program involving the short sale of 165,800 shares was executed at the opening. During this period, the DJIA rose from a value of 1738.4 to 1855.4, for a gain of 117 points. Index arbitrage trading accounted for 0.3% of total NYSE volume during this period.

B. 10:00 to 10:30

Portfolio insurance related sales involved at least 2621 SPZ contracts (25% of total volume) during this period. The SPZ contract fell to a discount to cash which by

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98/ The sampling of broker-dealer data used for these percentages accounted for 386 million shares (63% of NYSE volume).

99/ For a more complete discussion of issuer repurchase programs, see Chapter Six.

10:30 was in excess of 16 points. 100/ Two index arbitrage programs sold less than 400,000 shares (including 96,000 shares sold short) during this period, accounting for only 0.8% of NYSE volume in S&P stocks.

C. 10:30 to 11:00

The Division identified portfolio insurance related sales of at least 3084 SPZ contracts (24% of total volume) during this period. Discounts to cash values continued to exist in all major stock index futures contracts over this period. The discount in the SPZ and MMI contracts exceeded 30 points over this period while the NYF contract traded at a discount to cash value in excess of 12 points and the KVL contract traded at more than a 25 point discount to cash. Despite these substantial discounts to cash value in SPZ and MMI contracts, relatively few index arbitrage sell programs were executed. Seven index arbitrage sell programs for less than 900,000 shares were executed during this period as discounts to cash value of SPZ and MMI contracts increased to more than 30 points. An additional 1.1 million shares were sold as part of non-arbitrage programs. Total program selling constituted 4.3% of NYSE volume in S&P stocks for this period.

D. 11:00 to 11:30

Sales of SPZ contracts in portfolio insurance strategies involved at least 4162 SPZ contracts (39% of total volume). All of the major stock index futures contracts remained at substantial discounts to cash values during this period. The SPZ contract traded at a discount in the range of 25 to 40 points below cash value over this period. Similarly, the MMI contract traded at more than a 29 point discount to cash value. NYF contracts traded at discounts in the range of 12 to 20 points below cash value during this period. Despite the existence of substantial discounts in all of the major stock index futures contracts, only about 200,000 shares were sold in arbitrage programs from 11:00 to 11:30 (including approximately 60,000 shares sold short). The Division, however, identified program sales of approximately 6.3 million shares as part of portfolio insurance strategies, and almost 900,000 shares sold as other programs. Total program selling, therefore, comprised almost 17% of S&P stock volume from 11:00 to 11:30 (and almost 29% from 11:20 to 11:30).

E. 11:30 to 12:00

Portfolio insurance related sales involved at least 2061 SPZ contracts (23% of total volume) from 11:30 to 12:00. As in prior periods, however, portfolio insurance strategies also involved purchases of futures -- in this case, 1,337 SPZ contracts. Net sales for this period related to portfolio insurance strategies equalled 724 contracts. From 11:30 to 11:55, discounts on SPZ and KVL declined to 20 points on the SPZ contract and 10 points on the KVL. The discount on the MMI contract, however, never improved during this period, trading at 29 points below the cash value of the index. Further improvements in the value of SPZ and KVL contracts failed to materialize, with the SPZ and KVL contracts trading at 38 and 20 point discounts to cash value,

100/ MMI contracts and NYF futures also traded at significant discount to cash value during this period despite the fact that no portfolio insurance sales were executed with either of these stock index futures contracts during this period.

respectively, by 12:00. Arbitrage programs sold only approximately 480,000 shares during this period, constituting 1.8% of S&P stock volume during this period.

F. 12:00 to 12:30

Users of portfolio insurance strategies sold at least 287 SPZ contracts, amounting to 7% of total SPZ volume for this period. The CME halted trading at 12:13 until 1:05. Prior to this halt, the SPZ contract consistently traded at a 30 point discount to the cash value of the index. Discounts in the MMI and KVL contracts increased until 12:20, with the discount on the MMI contract equal to an unprecedented 59 points. By 12:30, however, both the MMI and the KVL contracts had recovered with the MMI contract trading at a 30 point discount to cash value and the KVL contract trading at a discount which was less than 10 points. No index arbitrage program trades were reported during this period. The DJIA continued to decline, falling to a value of 1710.7 by 12:15. An intra-day low of 1708.7 was reached at 12:21, but by 12:29 the value of the index had recovered to a value of 1714.4. Total volume on the NYSE over this period equalled 38,281,530 shares of stock.

G. 12:30 to 1:00

Trading in the SPZ futures was suspended during this time. The MMI contract traded erratically during this period. At 12:30, MMI contracts were trading at a discount to cash value slightly in excess of 30 points. By 12:40, MMI contracts were trading at the cash value of the index, thereafter trading at a 10 to 12 point premium to 12:50. By 1:00, however, discounts in the MMI reappeared trading at approximately 10 point discounts to cash value to 1:00. A detailed discussion of the CFTC staff's findings regarding trading in the MMI futures during this period and related allegations of possible market manipulation is provided in Chapter Three of the Study. The brief existence of a premium to cash value in the MMI futures from 12:40 to 12:50 resulted in only one index arbitrage program purchasing 40,000 shares of stock and the sale of 25 MMI contracts entered at 12:49 -- constituting less than one-tenth of one percent of NYSE volume from 12:30 to 1:00.

H. 1:00 to 1:30

At least 1,166 SPZ futures were sold in portfolio insurance strategies from the reopening of trading at 1:05 to 1:30, accounting for 16% of total volume. The SPZ contract remained at a discount to the cash although the size of the discount decreased to less than 20 points by 1:30. The MMI contract continued to trade erratically, trading at a 29 point discount to cash by 1:20, but by 1:30 trading approximately at cash value. No index arbitrage programs were executed in this half hour.

I. 1:30 to 2:00

Portfolio insurance related sales of at least 3591 SPZ futures comprised 36% of total volume. The SPZ futures continued to trade at a discount to cash value, with the discount diminishing from approximately 18 points at 1:30 to 10 points by 2:00. The MMI contract traded at a premium from 1:45 to 1:55, falling thereafter to approximately a 10 point discount at 2:00. KVL futures traded at a premium to cash value during this period exceeding 9 points by 1:50. Three index arbitrage buy programs were executed in this half-hour, two using MMI contracts and one using the KVL. The KVL arbitrage program was entered at approximately 1:30, consisting of purchases of 1,129,800 shares of stock and sales of 196 KVL contracts. The MMI index arbitrage buy programs were entered at 1:39 and 1:54, both consisting of purchases of 40,000 shares of stock and sales of 25 MMI contracts. Total arbitrage-related trading accounted for 4% of NYSE volume.

J. 2:00 to 3:30

Users of portfolio insurance strategies sold at least 2732 SPZ futures (42% of total volume) from 2:00 to 2:30, 963 contracts (16% of total volume) from 2:30 to 3:00, and 1477 contracts (27% of total volume) from 3:00 to 3:30. The SPZ contract traded at a discount to cash value in the range of 4 to 11 points from 2:00 to 2:55 increasing by 3:00 to approximately 15 points. The SPZ contract remained at a 15 point discount to cash value until 3:30. The MMI contract, however, traded much closer to the cash value of the index over this period alternating between small discounts and premiums to the cash value of the index. MMI traded at premiums from 2:05 to 2:20, from 2:40 to 2:55 and from 3:20 to 3:25, and at discounts to cash value from 2:00 to 2:05, from 2:20 to 2:40, from 3:00 to 3:20 and from 3:25 to 3:30. Only two index arbitrage buy programs were executed over this entire period. In the aggregate, these programs consisted of the purchase of 128,000 shares of stock and the sale of 80 MMI contracts. One program was entered at 2:44 and the other at 2:55. The DJIA rose from 1751.7 at 2:10 to 1803.2 by 2:30. From 2:30 to 3:00 the DJIA rose an additional 78.6 points from 1803.2 to 1881.8 and by 3:29, the DJIA had gained an additional 32.9 points to 1914.7. NYSE volume from 2:30 to 3:00 equalled 33,276,440 shares of stock. Index arbitrage-related volume, therefore, amounted to less than one half of one percent of total volume from 2:30 to 3:00, and even a smaller percentage of total NYSE over this entire period. No arbitrage-related selling was reported for 2:00 to 3:30 but over 1.6 million shares were sold as part of portfolio insurance strategies, with 1.1 million of this selling constituting almost 22% of S&P stock volume from 2:10 to 2:20.

K. 3:30 to Close

Portfolio insurance sales of 1202 SPZ futures comprised 11% of total volume during this period. Over this period, the SPZ contract sold at a discount to cash value of approximately 15 points or more, closing for the day at a discount in excess of 20 points. The MMI contract also traded at a discount to cash value during this period that by 4:00 exceeded 10 points. MMI closed the day, however, at a small discount to cash value of approximately 3 to 5 points. Five sell arbitrage programs were executed during this period, all using MMI contracts despite the fact that larger discounts to cash value were present in the SPZ. These programs in the aggregate consisted of sales of 648,000 shares of stock. Over a million shares, however, were sold in non-arbitrage programs. Total program selling comprised only 6.0% of S&P stock volume from 3:30 to the close.