

Chapter One

BACKGROUND AND DESCRIPTION OF TRADING STRATEGIES

A. Index-Related Trading Strategies

Several important index-related trading strategies have developed over the past few years. This development has resulted in considerable confusion over terminology, particularly concerning "program trading." The term program trading refers to the buying or selling of a large number ("basket") of stocks simultaneously. Thus, program trading is a generic term that encompasses several different index-related trading strategies.

This Chapter describes some of the basic strategies employed by participants in the index markets, including asset re-allocation, hedging, portfolio insurance, and index arbitrage or substitution. It also discusses other forms of "program" trading such as buying or selling "baskets" of stocks without related transactions in futures or options.

1. Asset Re-Allocation and Hedging

Portfolio managers analyze a number of factors, including macroeconomic developments, market conditions influencing the relative value of individual equity and debt instruments, and client requirements in order to design an investment strategy that allocates funds among various instruments, such as equities, debt instruments, cash or cash equivalents, and other investments (such as real estate). Because these factors undergo constant changes and the amount of fund moneys fluctuates, there are periodic re-allocations of assets.

Because an index option or future is a single instrument that can be used as a surrogate for a portfolio of stocks, it can be employed to adjust stock and debt portfolios quickly and at relatively low commission costs. 1/ Using index futures and options can also significantly reduce transaction costs when additional funds are invested. Moreover, under normal market conditions, investors can execute large transactions using a single index product with much smaller market effects than would be possible if the transactions were executed in the separate stocks. 2/

Stock index products also have served as useful vehicles for hedging against market risk. Under normal market conditions, portfolio managers are able to sell index futures, reducing the overall exposure of their portfolios to stock price movements and

1/ For example, a debt portfolio can be converted rapidly to equity by simultaneously selling bond futures and buying stock index futures. The manager thereby has increased the equity exposure of the portfolio without incurring the relatively higher equity transaction costs. Of course, when and if the stock transactions take place, commission costs are incurred.

2/ A 1985 Kidder Peabody study estimated the difference in market impact as follows: market impact of a \$20 million stock trade would be 0.27%; for a similar futures trade, 0.04%. R. Steven Wunsch, Stock Index Futures (1985).

to shift that risk to those more willing to accept it (either speculators or other hedgers with corresponding positions).

2. Portfolio Insurance

"Portfolio insurance" refers to a variety of dynamic hedging strategies used by investors to control market risk in both equity and fixed income portfolios. ^{3/} These strategies are designed to provide protection against loss at a cost of some limitation on the opportunities for appreciation. While it is difficult to generalize about the numerous strategies encompassed by the term portfolio insurance, the core of these strategies is disciplined buying or selling triggered by pre-set parameters relating to substantial market movements (and usually in the same direction as those market movements). In this manner, portfolio insurance strategies are roughly analogous to the use of "stop-loss" orders in individual securities where a sell order is created if the market price of the security falls to the "stop" price. Traditional "stop-loss" orders, however, generally are placed with an exchange specialist, providing him and indirectly the market as a whole, an indication of potential selling activity. Portfolio insurance, on the other hand, is handled by an upstairs firm and does not provide any prior warning of the amount of potential selling activity it represents -- either to the specialist or other market participants.

While portfolio insurance for equity portfolios initially employed the purchase and sale of stocks, today it is usually implemented through the purchase and sale of stock index futures. As stock prices fluctuate, the portfolio is continually rebalanced between a risky component (stocks) and a riskless component (Treasury bills) so that, in theory, the total portfolio value cannot fall below a specified minimum value. By selling stock index futures while holding a portfolio of the stocks comprising the index, a totally hedged position is created. ^{4/} The stock index future is used in this manner to replicate a riskless security. This hedged position (often called "synthetic cash") provides a return similar to Treasury bills. The "insurance" protection comes through a hedging strategy which involves selling futures, and thus increasing the weighting of synthetic cash relative to stocks, as stock values decline. Conversely, as the value of the stock portfolio increases, stock index futures are purchased, increasing the weighting of stocks relative to synthetic cash. Futures are used instead of stocks because of the increased speed and reduced transaction costs in trading a single product in the futures markets. ^{5/}

^{3/} Because of frequent adjustment of the hedge over time and of changes in the value of the portfolio, this strategy also is called "dynamic hedging." For a discussion of the difficulties in categorization of portfolio insurance strategies and how those difficulties complicated the Division's identification of portfolio insurance activity during the October market break, see Section E of this Chapter on methodology.

^{4/} The effectiveness of the hedge is reduced to the extent that price movements in the portfolio do not perfectly track the index.

^{5/} An argument also can be made that portfolio insurance, by reducing downside risk, increases investor willingness to participate in equity markets.

Typically, portfolio insurance seeks to assure a minimum value for the portfolio over a specified time period. For example, a typical insurance program might attempt to assure the maintenance of a minimum of 95% of the current portfolio value. The cost of this protection was estimated to be potentially under performing a rising market by two to four percent.

Two things are required to achieve the goal of maintaining a minimum value of the portfolio: the disciplined selling in a declining market (or buying in a rising market) of a set amount of futures at various trigger points and the presence of a pre-assumed level of liquidity in the futures markets. ^{6/} In this regard, the insurance program is intended to be similar to a long-term index put option with a strike price equal to the ending minimum portfolio value.

Some portfolio insurance strategies have recognized that, under certain market conditions (such as when futures prices are substantially lower than prices for underlying stocks), transactions that would ordinarily be sent to the futures markets would be more economical if sent to the stock market -- usually, the New York Stock Exchange ("NYSE"). Accordingly, some strategies provide their money managers with the flexibility to redirect orders to the stock market if conditions warrant.

One other feature of portfolio insurance strategies should be noted. While these strategies have emphasized disciplined buying and selling as one of their distinguishing features, users are not necessarily "locked into" specific trading patterns. Users of portfolio "insurance" can direct the providers of such "insurance" strategies and brokers to refrain from any transaction regardless of the indications of their computer models. ^{7/}

3. Index Arbitrage

a. Cash Arbitrage

If the value of the stocks in an index is known, it is possible to calculate the theoretical value of a futures contract on that index. The theoretical value of an index future normally is slightly higher than the aggregate prices for the component stocks of the index (termed the "cash" price or value). The theoretical value of the future is a function of four factors: (1) the value of the index itself; (2) the time remaining to expiration; (3) the investor's relative carrying costs for stocks and futures (generally the opportunity cost of the capital employed, which is measured by the relevant interest rate); and (4) the dividends to be paid by the stocks in the index through expiration.

^{6/} It should be noted, however, that most portfolio insurance programs provide some discretion to the money manager to vary the amount of futures contracts sold, depending on market conditions. In addition, some programs have a built in delay factor, deferring all or some futures selling for one or more days after a market movement. This delay factor is intended to reduce the costs imposed on the program by short term rebounds in the market. See discussion in Chapter Two.

^{7/} See discussion in Chapter Two.

When sufficient premiums or discounts to the theoretical value occur, 8/ index arbitrageurs buy in the lower priced market (stock or derivative) and sell in the other, higher priced market. 9/ Because the premium or discount must disappear when the future expires, such arbitrage produces a locked-in, "riskless" profit. The arbitrage will be undertaken when this profit produces a return on the capital employed that exceeds competing money market rates.

These offsetting purchases and sales tend to bring the different prices closer in line by raising values in the market that is relatively underpriced and reducing values in the market that is relatively overpriced. 10/ Perhaps because of the five-year bull market that began in 1982, futures have, until recently, often traded at a slight premium to their theoretical value. Accordingly, the most common index arbitrage has involved the sale of index futures trading above theoretical value and the simultaneous purchase of the stocks comprising the index or a basket of stocks whose performance closely simulates the performance of the index. 11/ When the futures contract expires, these positions are unwound by buying back the index futures and selling the component stocks. 12/ Market conditions often will allow these arbitrage positions to be unwound prior to expiration (by buying back the future and selling the stocks in the basket) because the futures temporarily move to or below their contemporaneous theoretical value.

- 8/ The premium or discount must be sufficient for the arbitrage program to exceed transaction costs.
- 9/ Index arbitrageurs have implemented their arbitrage principally with index futures rather than index options. The most popular index future for this purpose is the S&P 500 future traded on the Chicago Mercantile Exchange ("CME").
- 10/ The theoretical value diminishes as the futures approach expiration. Because some futures, such as the Major Market Index ("MMI") contract, have a monthly expiration cycle, while other futures, such as the Standard and Poors 500 Stock Index, NYSE Composite Index ("NYF"), and Value Line Index ("KVL") contracts, have quarterly expiration cycles, the theoretical values for various futures often are disparate. This factor, among others, sometimes results in arbitrage opportunities appearing in one futures contract but not in other contracts. In fact, there may be times in which a sell arbitrage opportunity appears in one futures contract simultaneous with a buy arbitrage opportunity in another contract.
- 11/ A simplified example would work as follows. Assume on December 1, that the Standard and Poors 500 index future is trading at 319, the composite value of the basket of stocks underlying that index is 315 and the theoretical value of the future is 316. A trader might sell the futures and buy the stocks, capturing the three-point spread between actual and theoretical value (less transaction costs).
- 12/ At expiration, the arbitrageur could also "roll" the futures position forward to the next expiration month if that contract trades at a sufficient premium. In this case, the arbitrageur would buy back the expiring futures previously sold and sell the next series of futures while continuing to hold the long stock position.

Index arbitrage also can be implemented by purchasing index futures selling at a discount to theoretical value and selling the index stocks. If the index shares are held in inventory, this arbitrage is no more difficult than long side arbitrage. If the arbitrageur does not hold a sufficient number of the index shares, he may have to sell short to complete the arbitrage. Because short sales of stock, however, must be executed at a price higher than the last different price ("tick test") to comply with Rule 10a-1 under the Securities Exchange Act of 1934 ("Exchange Act"), implementing the short side arbitrage, particularly in a declining market, can be difficult and risky.

b. Index Substitution

Index substitution is a form of index arbitrage that attempts to profit from pricing discrepancies between the index and the future. Typically, such a strategy is employed by an index fund that seeks to replicate the performance of an index by holding each of the component stocks in proportion to its weighting in the index. When a futures contract is selling at a discount to theoretical value, futures can be "substituted" for stocks to add incremental returns to the index fund by selling stocks and buying futures, and investing the proceeds of the stock sales not needed to establish and maintain the futures position in treasury bills or other short-term money market instruments. The stocks would be repurchased and the futures sold when the discount abates, at or before expiration. This strategy, which may permit the index fund to out-perform the replicated index, involves transactions that are identical to short-side index arbitrage with the significant exception that stock sales are not short sales; therefore, they can be executed on minus or zero-minus ticks (*i.e.*, into a declining market).

B. Use of Automated Systems for Programs

Over the last few years, a number of well-capitalized broker-dealers and large institutional investors have developed the expertise and computer capacity to engage in index arbitrage. Because of the number of potential participants any arbitrage transaction often must be executed within a brief "window of opportunity," which may last only a few minutes. ^{13/} The capacity to route equity orders through an automated system reduces the time required to execute the particular program, and therefore increases the arbitrageur's probability of capturing the premium or discount to the index product. Moreover, the use of automated systems, as opposed to manual execution, lowers the transaction costs associated with executing an arbitrage program. Because a basic understanding of the use by programs of automated order-routing systems of the NYSE is necessary to understand the trading during the October market break, an overview of these systems is provided below. ^{14/}

^{13/} Throughout the first quarter of 1987, the fair value of the S&P 500 future was generally within ± 0.8 percent of the actual value of the index. This narrow spread implies an efficient index/futures relationship where opportunities for arbitrage exist only for brief periods.

^{14/} In contrast, so-called "manual" program execution would involve broker-dealers hand delivering individual orders in each of the stocks which were part of the program.

In 1976, the NYSE implemented its Designated Order Turnaround ("DOT") System to facilitate the routing of small orders. 15/ DOT originally was designed to eliminate the need to send small customer orders 16/ to the member firm floor booth. Through DOT, small market orders could be routed directly from the member firm branch office to the applicable specialist's post. The specialist would then represent the order in the trading crowd and report back an execution to the member firm. 17/ Currently, member firms may route orders of up to 2,099 shares through DOT that are market or marketable limit orders. 18/ DOT also may accept order sizes larger than 2,099 shares (up to 30,099 shares in the more liquid stocks), but there are greater risks as to the timing of the execution of such orders. 19/

In response to increased use of index products, the NYSE developed a system to facilitate rapid transmission of large orders from member firms. The DOT List Order Processing feature ("LIST") is an application of DOT that allows member firms to send orders through DOT in, as its name implies, a list of securities. For program trading strategies such as index arbitrage, LIST enables members to enter buy or sell orders rapidly in a large number of specific securities (up to 500) they previously identified to be included as a part of a package. Indeed, through personal computers located in their offices, member firms can modify their particular package of securities for execution on an intra-day basis. 20/

15/ For a more detailed discussion of DOT, see Chapter Seven.

16/ In 1976, the average size of a trade on the NYSE was 559 shares. By September 1987, the average size had increased to 2,099 shares, and in October 1987, the average size was 2,455 shares.

17/ As discussed more fully in Chapter Four, specialists trade securities at particular locations on the trading floor called "posts." Because all transactions in exchange traded securities must take place at the "post," often other broker-dealers will congregate around the "post" because of their interest in buying or selling securities traded there. These broker-dealers are referred to collectively as the "trading crowd."

18/ A market order is an order to buy or sell a stated amount of a security at the most advantageous price obtainable after the order is represented in the trading crowd at the post. By contrast, a limit order is an order to buy or sell a stated amount of a security at a specified price -- or a better price, if possible -- after the order is represented in the trading crowd. A marketable limit order is a limit order that is immediately executable because the price of the subject security at the time the order is entered is equal to or better than the limit price on the order.

19/ Firms must make special arrangements with specialists for handling these larger orders.

20/ A number of firms have developed their own proprietary automated systems to "pre-package" a variety of programs. The number of individual stocks and order sizes in the programs are designed to fit specific strategies and arbitrage opportunities in different stock indexes.

The capacity of systems such as LIST to send hundreds of stock orders rapidly and efficiently can be utilized for strategies other than index arbitrage. For example, if a fund uses a portfolio insurance strategy that provides for stock sales under certain market conditions, a program to sell a basket of stocks more or less replicating the S&P index may be sent to the NYSE most efficiently via DOT. Similarly, if an index fund wishes to liquidate or increase a portion of its portfolio, the efficiencies of pre-packaged DOT orders may outweigh the benefits of more selective and gradual transactions on a stock-by-stock basis. Again, the LIST system may be used to pre-package and route these orders into DOT.

C. Prior Commission Studies of Index Trading

1. Background Studies

Since the development of the derivative markets for stock indexes in the early 1980s, the Division of Market Regulation ("Division") has produced several reports on the overall effects of derivative index products on the nation's securities markets. In December 1984, just as the use of index products was reaching significant levels, the Commission, together with the Commodity Futures Trading Commission ("CFTC") and the Board of Governors of the Federal Reserve System ("FRB"), published a report entitled "A Study of the Effects on the Economy of Trading in Futures and Options."^{21/} This study analyzed the increasing institutional use of index products to hedge stock portfolios, and concluded, among other things, that earlier fears that index products would divert resources from investments in securities to speculation in the futures markets appeared unjustified.

As the magnitude of trading in the derivative markets increased from 1984 to 1986, so did public concerns over the impact of index products on the securities markets. In particular, the media often attributed price volatility in the stock market to the effects of "program trading." In response, in July 1986, the Commission hosted a Roundtable on Index Arbitrage. The background materials for this conference were made publicly available by the Commission.^{22/} The Roundtable provided a forum for market participants to discuss both the benefits of index products and means to mitigate any adverse effects on stock market volatility, particularly on expirations, without undermining the usefulness of these products. These discussions laid the groundwork for the next round of Commission studies and regulatory initiatives to address market volatility.

2. Expiration Volatility

Subsequent to the Roundtable, the Division has analyzed the effects of index-related trading strategies on price volatility in the stock market in various contexts. One of these contexts has been the price swings often attributed to massive stock

^{21/} FRB, CFTC and SEC, A Study of the Effects on the Economy of Trading in Futures and Options ("Joint Study") (December 1984). The Joint Study includes a discussion of the development and regulation of the stock index derivative markets and an extensive description of the participants and trading techniques.

^{22/} SEC, Roundtable on Index Arbitrage, Background Materials (July 9, 1986). These materials also contain a detailed description of index arbitrage.

buying or selling on expirations -- particularly the quarterly expirations of stock index futures and stock index options and equity options -- days referred to as "Triple Witching Fridays." On several such expirations in 1985 and 1986, the NYSE experienced a last-minute deluge of sell orders (or buy orders) resulting in an abrupt price drop (or rise), which was reversed to a substantial extent at the commencement of trading on the next Monday. The Division has worked with the CFTC and securities and futures markets to encourage the development of remedial measures, including: (1) procedures to disseminate buy or sell order imbalances on NYSE stocks for the purpose of bringing in counterbalancing orders; ^{23/} and (2) encouraging the shift of some expirations to the market opening in lieu of the market close to (i) take advantage of stock opening procedures designed to handle an imbalance, and (ii) provide the stock market the full trading session to minimize the price impact of an influx of buy or sell orders on the opening. ^{24/} While experience with these measures has been limited, they appear to have helped to correct order imbalances and volatility on Triple Witching Fridays.

3. Non-Expiration Volatility

The Division has also reviewed the effects of index-related trading during non-expiration periods when substantial price volatility occurred.

a. September 11 and 12, 1986

On September 11 and 12, 1986 the stock market suffered its sharpest absolute decline in decades on then-record trading volume. ^{25/} Over a two-day period, the Dow Jones Industrial Average ("DJIA") fell 120 points, and a then unprecedented 5 point discount to cash appeared in the Standard and Poor's ("S&P") 500 index future. ^{26/} The media attributed much of this decline to "program trading." The Division, in conjunction with the CFTC, conducted an in-depth review of index-related trading, and, in particular, index arbitrage, on those two days. This review found that the September 1986 price decline appeared to reflect changed investor perceptions of fundamental economic conditions -- primarily, concerns over possibly rising interest rates, which generally create lower expectations of further price rises in stocks.

^{23/} See Securities Exchange Act Release No. 25201 (December 21, 1987), 52 F.R. 48354.

^{24/} See Securities Exchange Act Release No. 25202 (December 21, 1987), 52 F.R. 48355.

^{25/} Volume on Tuesday, September 11, 1986 was 237,569,000 shares -- a record single day volume. On Wednesday, September 12, 1986, volume set another record of 240,490,000 shares.

^{26/} See Division of Market Regulation, Report on the Role of Index-Related Trading in the Market Decline on September 11 and 12, 1986 (March 1987) ("September 1986 Report"), at footnote 15.

While it did not appear that index-related trading artificially changed stock prices, the Division found that index strategies, particularly arbitrage, 27/ were instrumental in the rapid transmission of changed investor perceptions, usually reflected first in futures prices, to individual stock prices. Accordingly, the Division found that index arbitrage may have condensed the time period in which the September 11 and 12 market decline occurred.

b. January 23, 1987

On January 23, 1987, the securities markets experienced extreme price volatility, again on then-record volume of 302 million shares on the NYSE. The DJIA rose 64 points (3%) by 1:39, building upon its then record rise of 51.6 points (2.4%) the day before. Then, in little more than an hour, the DJIA fell approximately 115 points (5.2%). Although the DJIA reversed direction twice after this drop, it closed down 44.15 points for the day.

The Division and the CFTC staff conducted a detailed review of index-related trading on that day. These studies again found the impact of index arbitrage on the January 23 price volatility was essentially the same as on September 11 and 12, 1986--that is, while this trading did not artificially cause the downturn, it may have accelerated price movements in the stock market. 28/ There was at least one significant difference, however, between the two market declines: the September 1986 decline appeared to have been a reaction to fundamental economic news, yet no such news justified the mid-afternoon plunge in prices on January 23.

4. Concerns Over the Cascade Scenario

The Division's September 1986 Report noted that commentators expressed concern that index-related trading strategies could fuel a market decline severe and rapid enough to cause a stock market collapse through the following "cascade scenario:" the scenario begins with index futures prices moving to a sufficient discount (because of fundamental and other factors) to trigger short side index arbitrage, index fund substitution, and unwinding of previously established long arbitrage positions, the resulting block sales of stocks depress the equity market to levels that trigger portfolio insurance programs; these programs, which involve futures sales, further depress futures prices and cause the cycle to repeat itself; the resultant plunge in stock prices triggers stop-loss sell orders in individual stocks, and forces additional liquidations to meet

27/ At the time of the September 1986 market decline, the Division found no evidence that portfolio insurance had reached a level at which it would have played a significant role in the market downturn. The Division noted, however, that there were differing views among market professionals whether the continuing expansion of portfolio insurance use would result in the possible dispersion or convergence of "trigger" points for these strategies. Convergence of these trigger points could increase the chances that these strategies would "fuel" a future market decline. See September 1986 Report, at 22-24.

28/ While the Division reported its findings for January 23, 1987 in a non-public report to the Commission and its Congressional Oversight Committees, the CFTC staff presented its findings in a public report.

margin calls and broker-dealer capital requirements, finally leading to a market collapse. 29/

In its September 1986 Report, the Division noted that the likelihood that this scenario would occur depended on, among other things: the design of portfolio insurance programs, the incidence of the "trigger points" at which programs would generate sell orders, the amount of capital subject to these programs, the extent to which excess funds would be available in regulated entities' and customer accounts to maintain required capital and margin, and prevailing market conditions. Most critical to the scenario was the continued existence of a significant discount in the index futures to the theoretical value of the cash market.

While most market professionals interviewed by the Division in the fall of 1986 acknowledged the possibility of significant market movements up or down, in short time frames, they found the chances of an index-related market collapse remote for several reasons. First, they believed that such a decline would be halted by buying interest as stocks and futures reached lower levels. They believed that index trading strategies do not determine the fundamental values of assets, and at some price stocks would again become attractive to purchasers. Second, they believed that, as futures prices reached lower levels relative to stock prices, portfolio insurance would become increasingly expensive to implement and would likely taper off. Third, they thought that discounted futures purchased in arbitrage or other transactions would tend to stabilize futures prices and mitigate against further arbitrage-related stock sales. Finally, many firms interviewed by the Division believed that portfolio insurance would not be likely to trigger the "cascade scenario" because, as the various strategies matured and found a broader client base, users would implement these strategies at a broader range of times. Such developments would cause the market effects of portfolio insurance to be distributed over a wider range of trading sessions rather than focused at a particular point in time.

In the September 1986 Report, the Division noted that, while these analyses appeared generally sound, "the ability to control substantial stock equivalent positions in index products with a lower investment than is required for the stocks themselves, makes us somewhat less comfortable in th[e] conclusion [that a persistent substantial discount in the futures, the predicate for the cascade scenario, is unlikely] . . . [T]he use of index products may, in rising markets, permit the accumulation of large positions that might be liquidated quickly in falling markets." 30/

D. Methodology of the Division's Market Reconstruction

To reconstruct the trading during the October market break, the Division separately analyzed the heavy volume of trading involving index-related trading strategies, and then placed this in the context of overall trading for firm proprietary, institutional, and retail accounts. This section provides an overview of the Division's

29/ September 1986 Report, at 21; D. Ruder, *The Impact of Derivative Index Trading on the Securities Markets*, Address before the Bond Club of Chicago, dated October 6, 1987, at 16.

30/ September 1986 Report, at 23-24.

data compilation and analyses concerning index-related and overall trading activity. The results of these analyses are discussed in Chapters Two and Three of the Study.

1. Analysis of Index Trading During the Market Break

The methodology for the Division's analysis of index-related trading during the October market break was essentially the same as that used in our prior studies of periods of non-expiration market volatility such as September 11 and 12, 1986, and January 23, 1987. For those studies, the Division staff and the staff of the CFTC's Division of Economic Analysis compiled detailed, program-by-program data from major firms active in index trading and conducted joint interviews with key market participants. In addition, all data submitted by firms were cross-checked against surveillance information supplied by securities and futures self-regulatory organizations ("SROs"). This index-related trading information was then analyzed for its magnitude and timing to determine what effects this type of trading had on market movements. While certain refinements were made in the October market break study, and the scope of the Division's review was necessarily broadened, the basic methodology was not changed.

a. Data Collection

1. Identifying Major Participants

Before data requests were sent to index firms, the Division took steps to ensure that all major market participants would be included in the surveys. While prior studies had identified most firms then active in index trading, we used additional information sources to determine new market entrants. The following information sources were used: (1) data from the CFTC, CME, and Chicago Board of Trade ("CBT") were used to identify parties whose end-of-day positions in the major index futures changed significantly, indicating active trading; (2) CFTC surveillance information identified any active futures traders whose end-of-day positions might have remained "flat" due to balancing buys and sells; (3) data from the NYSE indicated the level of "program" trades that were routed via automated systems (i.e., LIST) to the exchange floor by major member firms during the market break; and (4) NYSE audit trail information^{31/} identified the 30 member firms with the highest trading volume during the market break.

These information sources confirmed our survey sample. Specifically, the information confirmed that the 11 broker-dealers identified in previous studies remained the key participants in proprietary and customer index trading during October 1987. In addition, the four largest providers of the portfolio insurance strategy were included in our survey because of the possibility that portfolio insurance played a significant role in the October market break.^{32/}

^{31/} For a discussion of the uses of audit trail systems, see Chapter Three of the Study.

^{32/} Our survey also included an additional firm with significant changes in index futures positions during the market break. This firm's trading was later identified as "speculative," rather than arbitrage or portfolio insurance related.

ii. Preliminary Information

Immediately after the October market break, the Division and CFTC staffs interviewed in joint conference calls the major market participants to capture their views of the markets while memories were still fresh and to ensure that essential data were maintained and prepared for collection. The participants interviewed included traders and compliance staff at broker-dealers and portfolio insurance providers, as well as major institutional money managers. Preliminary information obtained from these interviews consisted of daily aggregate program activity, including index arbitrage and index substitution, portfolio insurance, and other buy or sell programs.

iii. Detailed Program-by-Program Data

By letters dated October 30, 1987, the Division and the CFTC requested that the major index firms provide the following information for the major program strategies. ^{33/} For index arbitrage and index substitution, the following elements were requested: (1) proprietary or customer designation (initially, the identity of a customer was requested only if the customer was another broker-dealer or was affiliated with a broker-dealer); (2) designation of the basic strategy (opening or closing arbitrage or substitution); (3) time of entry for the stock orders; (4) buy/sell/sell short designations for the stock orders; (5) order entry method for the stock orders (automated systems or by phone calls); (6) the market to which the stock orders were routed (the NYSE, other U.S. or foreign exchanges, or the third market); (7) the identity and entry time for any index futures or options contracts traded as part of the program; and (8) the size of the program in approximate dollar size, number of shares, and number of derivative contracts. ^{34/} Essentially the same information was requested for programs to buy or sell baskets of stock for non-arbitrage strategies. Finally, specific timing information was requested for trading as part of portfolio insurance strategies, whether accomplished through transactions in index futures, index options, stocks, or any combination of these instruments.

b. Categorization of Program Strategies

One difficulty encountered in the Division's market reconstruction was in accurately categorizing various program strategies -- particularly portfolio insurance related trading. Because portfolio insurance incorporates a wide range of disciplined selling techniques, a number of users of these strategies now use other terms (such as "portfolio protection" or "tactical asset allocation") to describe their trading, or characterize it as traditional asset re-allocation or hedging. In addition, the traders at

^{33/} See letters from Richard G. Ketchum, Director, SEC Division of Market Regulation, and Paula A. Tosini, Director, CFTC Division of Economic Analysis, dated October 30, 1987. Sample copies of each of the Division's data request letters, whether sent to SROs, broker-dealers, or other parties, are attached as Appendix E.

^{34/} Elements 1-4 and 7 were included in data requests for prior studies; elements 5 and 6 were added to determine if manual order routing or other markets were used to avoid operational problems in automated systems or NYSE voluntary limitations on the use of these systems for programs.

broker-dealers who execute the stock or index futures transactions for customers using portfolio insurance strategies do not necessarily know the customers' strategies. Therefore, the Division requested broker-dealers to identify separately their customers with the largest transactions in index-futures and stocks, and our staff interviewed these customers to obtain an overall description of their investment strategies and explanations of particular transactions. These interviews allowed the Division to supplement its tally of portfolio insurance-related selling. Nevertheless, it is likely that the Study's analysis undercounts, to some extent, the actual number of such transactions. In a preliminary report prepared for the CME, ^{35/} portfolio insurance transactions were aggregated with other institutional selling. Thus, that report's estimation of portfolio insurance is considerably higher than the Division's. It appears reasonable to assume that the actual number of portfolio insurance transactions lies between our conservative estimate and the CME's more inclusive estimate. ^{36/}

c. Analysis of Program-by-Program Data

The Division's analysis of this detailed information is similar to that used in previous studies with two minor modifications. First, because portfolio insurance related futures sales appear to have played a more significant role in the October market break than on September 11 and 12, 1986, on January 23, 1987, a more detailed analysis of this trading is included. The analysis focuses on trading in the most heavily used contract for this strategy during the market break, the December expiration Standard & Poor's 500 index futures ("SPZ") on the CME. Second, because the vast majority of programs, whether for index arbitrage, index substitution, portfolio insurance, or other strategies, involved concentrated buying or selling of NYSE-listed stocks in the S&P 500 index, program activity is analyzed not only as percentages of total NYSE volume for selected time periods, but as percentages of NYSE volume in S&P stocks.

The Division's index-trading reconstruction focuses primarily on the two most active markets for this activity: the NYSE on the stock side and the CME for index futures. Trading in other index futures is discussed when it reaches significant levels.

^{35/} CME Committee of Inquiry, Preliminary Report to Examine the Events Surrounding October 19, 1987 (December 22, 1987).

^{36/} The Division encountered a similar difficulty in identifying arbitrage-related transactions. For example, some transactions which involved the near simultaneous selling of S&P stocks and buying of S&P 500 index futures were characterized as "adjustments to hedges." While this characterization is not necessarily inaccurate, this type of transaction is nonetheless functionally equivalent to index arbitrage. Accordingly, although these and similar transactions are separately identified in the Composite Chronologies of Index-Related Trading ("Composite Chronologies") in Appendix B, they are aggregated with other arbitrage strategies in the Division's breakdown of trading in Chapter Two and more detailed chronologies of trading contained in Appendix A.

Because relatively few programs used index options, 37/ discussion of this trading is limited.

Essentially, the Division's analysis attempts to identify periods in which significant concentrations of program trading coincided with either initiating or reversing intra-day market movements or accelerating on-going market movements. On the index futures side, this entails measuring the percentage of both total volume and institutional volume (in 30-minute intervals) represented by portfolio insurance related selling. For stock trading, the Division conducts a similar breakdown of total NYSE volume and NYSE volume in S&P stocks (in 30-minute intervals and 10-minute intervals) for index arbitrage, index substitution, portfolio insurance, and other program strategies. 38/

The Division's analysis seeks to address the following issues. First, what role did portfolio insurance related selling have in the continuing futures discounts experienced during the market break? Second, what was the level of index arbitrage and index

37/ The following chart provides a breakdown of program selling on the NYSE involving index futures versus index options on the key dates of the October market break:

<u>Date</u>	<u>Index Futures</u>		<u>Index Options</u>	
	<u>No. of Programs</u>	<u>Shares Sold</u>	<u>No. of Programs</u>	<u>Shares Sold</u>
October 6	72	16,069,087	1	156,200
October 14	100	26,627,038	3	765,667
October 15	63	15,427,921	3	333,900
October 16	98	34,982,075	19	4,182,025
October 19	118	37,481,624	1	29,100
October 20	23	3,322,951	0	0

38/ As indicated above, the program data provided to the Division indicates order entry times; obtaining order execution times for each of the hundreds of orders used in each program often requires manually reconstructing trading by reviewing individual tickets, and was impractical for this Study. Therefore, an average time period for order execution (five minutes -- the time period required for DOT orders) was used for the Division's analysis. For example, orders entered from 2:25 to 2:45 would be compared with volume figures for 2:30 to 2:50. Understanding the Division's use of this assumed lag time in order execution is important, not only to compare the breakdown of program trading contained in Chapter Two and the detailed chronologies (attached as Appendix A) with the individual programs presented in the Composite Chronologies (attached as Appendix B), but to account for slight variances from similar breakdowns of trading in other reports, such as the Report of the Presidential Task Force on Market Mechanisms (January 1988)("Task Force Report").

The Division's review indicated that portfolio insurance related selling in the index futures markets, unlike the program trading on the stock side, was usually evenly distributed within half-hour intervals. Therefore, breakdowns of futures trading in 10-minute intervals were not useful.

substitution stock selling resulting from these futures discounts, and what role did these strategies have in accelerating market declines? Third, how did portfolio insurance futures selling and arbitrage stock selling interact. Specifically, was this interaction along the lines of the "cascade scenario" discussed in the Division's September 1986 Report? ^{39/} Fourth, how much portfolio insurance selling was directed to the stock market instead of the index futures markets? And, fifth, how did this program trading interact with other types of firm proprietary, institutional, or retail trading -- including selling related to mutual fund redemptions and margin calls and liquidations?

2. Analysis of Overall Trading During the Market Break

a. Information from Broker-Dealers

The Division used the NYSE audit trail to identify the most active broker-dealers during the October market break. ^{40/} The Division requested these firms to provide a wide range of information on their activities during October 1987, covering areas such as firm operations (including securities clearing and settlement), financial responsibility (including margin debits, calls, and liquidations), order-routing mechanisms, internationalization issues, and customer complaints. ^{41/} The Division also requested the following breakdown of trading in both stocks and index options and futures: (1) daily aggregate stock and index futures purchases and sales on each trade date in October 1987 for firm proprietary, institutional, and retail accounts; (2) within proprietary trading, a separate breakdown of trading for the accounts designated as index arbitrage, "risk" arbitrage, ^{42/} equity trading (including market making and block positioning), and "other" (all remaining proprietary accounts, such as options trading); and (3) a similar breakdown of purchases and sales in hour intervals on October 16, 19, and 20. Because most firm's clearing systems do not capture order entry or execution times, this last request necessarily involved manually reviewing order tickets. Given the magnitude of trading on these key dates and the time constraints of the Study, the Division subsequently modified its request to include hour-by-hour breakdowns of 15 NYSE stocks which were (i) leading capitalization stocks in the S&P 500 index, (ii) representative tertiary stocks, or (iii) "takeover" stocks. ^{43/} Finally, the Division

^{39/} See September 1986 Report, *supra* note 26, at 21-24.

^{40/} The Division originally identified the 30 most active broker-dealers, but this number was adjusted to delete most NYSE specialists (trading by specialists was separately reviewed by the Division for the Study) and to identify separately firms that traded through the same clearing firm. The final number of firms included in the Division's survey was 28.

^{41/} See sample letter dated November 12, 1987 from Richard G. Ketchum, Director, Division of Market Regulation, contained in Appendix E.

^{42/} "Risk" arbitrage involves buying securities of issuers in which there are announced (or, in some cases, rumored) takeover transactions in order to sell these securities after the price appreciation in these securities from these transactions is realized.

^{43/} These stocks were International Business Machines (IBM), Merck & Co. (MRK), General Motors (GM), American Telephone and Telegraph (T), Exxon Corp. (XON), General Electric (GE), E.I. Du Pont (DD), Sears, Roebuck & Co. (S), Coca Cola (K),

supplemented this information through interviews with a wide range of market professionals actively involved in the various firms' trading activities.

b. Information from Mutual Funds

The Investment Company Institute ("ICI") ^{44/} conducted its own survey of its members' experience with redemptions and overall trading activity during the market break. The ICI not only shared the findings from this survey with the Commission, but sent ICI members a supplemental questionnaire produced by the Division staff. This questionnaire requested trading information similar to that we had requested of broker-dealers, including daily aggregate purchases and sales for October 1987 of NYSE-listed stocks and index futures and options, and hour-by-hour breakdowns for October 16, 19, and 20. In order to supplement these data, the Commission's Division of Investment Management and staff from the Commission's regional offices collected information and conducted a number of examinations to evaluate mutual fund performance in October 1987. This information was incorporated into the Division's trading analysis and in the analysis of the international aspects of the October market break in Chapter Eleven.

c. Major Money Managers

The Division also used the records of institutional holdings in securities, filed with the Commission pursuant to Section 13(f) of the Exchange Act, to identify the leading institutional money managers. These managers, as well as other managers identified as active in the index futures markets, were sent questionnaires requesting a broad range of information, including a breakdown of sizeable liquidations of their funds' stock portfolios or positions in index options or futures during the October market break. ^{45/}

d. Self-Regulatory Organizations

Finally, the Division supplemented its data collection from individual market participants with comprehensive information requests directed to the SROs that oversee the various securities markets. These SRO letters covered a wide range of market issues, including: (1) market-making capacity; (2) financial integrity of member firms and their customer accounts; (3) order-entry and reporting systems; (4) clearing, settlement and other operational problems; and (5) complaints or inquiries from investors, issuers,

Phillip Morris (MO), Digital Equipment (DEC), Bell & Howell (BHW), Dayton Hudson (DH), Harley Davidson (HDI), and Ryland Group (RYL). See sample letter from Richard Ketchum, dated November 30, 1987, contained in Appendix E.

^{44/} The Investment Company Institute is the trade association for the mutual fund and investment adviser industry.

^{45/} Other information requested included: (1) statistics (annual from 1983, monthly for 1987) on the funds' relative level of investment in equities, debt instruments, cash or cash equivalents, and index products; (2) the funds' use, if any, of portfolio insurance strategies; and (3) a general description of shifts in investment strategies (and use of portfolio insurance) as a result of the market break. See letter from Richard G. Ketchum, Director, Division of Market Regulation, dated November 17, 1987 (a sample is contained in Appendix E).

and member firms. 46/ The Division's review of these issues is set forth in Chapters Four to Twelve of the Study.

46/ Copies of these letters are contained in Appendix E.

