

EVENTS THAT SHOOK THE MARKET

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I. Introduction

Although it is obvious that stock prices respond to events, it is not easy to match particular events to particular changes in stock prices. For example, Cutler, Poterba, and Summers (1989) chose the 50 largest daily changes in the Standard and Poor's 500 Stock Index (S&P 500) from 1946 through 1987 and attempted to find an explanation of each change in the next day's *New York Times*. They found few cases in which it could be said with any confidence that a particular event led to the change. A problem with studies like this is that the daily interval may be too long, since many events can take place in a 24-hour period.

In this article, tick data on the S&P 500 futures contract and newswire searches are used to match events to stock price changes. The tick data are used to create 1- to 5-minute price changes. Although it is somewhat arbitrary what one takes as a "large" price change, for purposes of this study, "large" is taken to be a 1- to 5-minute change greater than or equal to .75% in absolute value. The standard deviation of the 1,918,678 1-minute price changes computed in this study is .048%, and the standard deviation of the 1,688,955 5-minute price changes is .112%. A change of .75% is thus a very large change.

Given each large change, newswires were searched to see if an event could be found that led to the change. Table A1, located in the appendix, lists the large price changes and the events that were found. This article

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Tick data on the Standard and Poor's 500 Stock Index (S&P 500) futures contract and newswire searches are used to match events to large 1- to 5-minute stock price changes. Sixty-nine events that led to large stock price changes are identified between 1982 and 1999, 53 of which are directly or indirectly related to monetary policy. Many large stock price changes have no events associated with them.

is essentially a discussion of table A1. There are 4,417 trading days in the dataset (between April 21, 1982, and October 29, 1999), and in 220 of these days at least one large price change occurred, that is, a 1- to 5-minute change greater than or equal to .75% in absolute value. Events were found for 69 of these days.

Knowledge of the 69 events in table A1 may prove useful in other studies. Each of these events is big in that it changed the total value of U.S. equities by a large amount rapidly. This information may be useful in examining changes in individual stock prices, both absolute and relative to price changes of other stocks. From a macroeconomic perspective, the events are macro shocks, and knowledge of these shocks may be useful in examining various macroeconomic questions.

It is important to stress that this study is purely descriptive. No attempt is made to explain why a particular event led to the large price change, why other similar events did not lead to large price changes, why many large price changes have no events associated with them, and so on. The main contribution of this article is simply to list the 69 events.¹

It is also important to stress that, with a very few exceptions, it is almost certain that each of the 69 events listed in table A1 caused the particular price change. The events can thus be interpreted as “facts.” For example, it is almost certain that the 5-minute price decrease of .79% on July 16, 1982 was essentially all due to the 4:10 P.M. money supply announcement (see line 8, table A1). There would likely have been, of course, a price change had there been no announcement, since the price generally changes each minute, but with a standard deviation of .112%, a typical price change is very small relative to a change of .79%. For all intents and purposes, one can attribute all of the price change to the money supply announcement.

A way of thinking about the events is the following. Consider asking stock brokers a few minutes after the occurrence of one of the price changes in table A1 that is associated with an event what led, if anything, to the change. The main point here is that, almost without exception, the brokers would say the event. Some events may have been missed—more will be said about this later—but there is little doubt that each of the 69 events chosen led to the particular price change.

The remainder of this article is as follows. The construction of table A1 is

1. There do not appear to be other studies in which events have been identified in the way that I have done in this article. Berry and Howe (1994) and Mitchell and Mulherin (1994) examine the effects of the amount of news per unit of time on stock prices and trading volume. Niederhoffer (1971) examines the effects of world events on daily stock prices. Boyd, Jagannathan, and Hu (2001) examine daily S&P 500 changes around days in which there is an employment announcement. French and Roll (1986) examine the volatility of individual stock prices during trading and nontrading hours. Wood, McNish, and Ord (1985) examine the behavior of a minute-by-minute market return index. Harris (1986) examines the behavior of portfolio returns over 15-minute intervals. A number of studies have examined the effects of announcements on daily changes in stock prices, and these studies are discussed in Section IV.

discussed in Section II, and the results are discussed in Sections III and IV. Section V concludes.

II. The Construction of Table A1

The price of a S&P 500 futures contract follows closely the value of the S&P 500 index. Since the S&P 500 index includes most U.S. stocks by market value, the price of an S&P 500 futures contract is a good indicator of the total value of U.S. equities. Tick data are available for the S&P 500 futures contracts from April 1982 on.² For “Regular Trading Hours” (RTH), the tick data per day begin at 10:00 A.M. prior to September 30, 1985 and at 9:30 A.M. after that.³ The RTH data end at 4:15 P.M., which is 15 minutes after the regular market has closed. Beginning in 1994, the contracts were traded after hours on the GLOBEX market, and tick data are available for these trades as well. These data begin at 4:30 P.M. and end at 9:15 A.M. the next day. The GLOBEX market is closed Friday night and all day Saturday. It opens at 6:30 P.M. Sunday night.

For this study, the RTH data begin on April 21, 1982 and end on October 29, 1999. Data are missing for the last half of December 1991—the 1991 data end December 13. The GLOBEX data begin on January 4, 1994 and end on October 29, 1999. Data are missing for the last half of 1998—the 1998 GLOBEX data end July 31. Many government announcements of macroeconomic data occur at 8:30 A.M., and since the GLOBEX market is open at this time, it can respond immediately to these announcements. Had the GLOBEX market been in existence back to 1982 and tick data been available, it is likely that many more large price changes and associated events would have been found. It is also likely that a number of large price changes and associated events would have been found in GLOBEX data for the last half of 1998 had the data been available.

The 1-minute price change was taken to be the price of the last trade in the current minute interval less the price of the last trade in the previous minute interval (all changes in percentage terms). The 2-minute price change was taken to be the price of the last trade in the current minute interval less the price of the last trade in the minute interval 2 minutes ago, and so on through the 5-minute price change.

Table A1 lists the following (a large change is always a change greater than or equal to .75% in absolute value): (1) all large 1-minute price changes, (2) all large 2-minute price changes except when at least one of the two 1-minute price changes is large, (3) all large 3-minute price changes except when at least one of the three 1-minute price changes is large or at least one

2. The tick data were purchased from the Futures Industry Institute, which obtains the data from the Chicago Mercantile Exchange.

3. All times in this article are Eastern even though the RTH and GLOBEX markets are in the Central time zone.

of the two 2-minute price changes is large, (4) all large 4-minute price changes except when at least one of the four 1-minute price changes is large or at least one of the three 2-minute price changes is large or at least one of the two 3-minute price changes is large, and (5) all large 5-minute price changes except when at least one of the five 1-minute price changes is large or at least one of the four 2-minute price changes is large or at least one of the three 3-minute price changes is large or at least one of the two 4-minute price changes is large. This procedure finds all the large 1- through 5-minute price changes without duplication. The most actively traded contract on the particular day was used for these calculations. As can be seen from table A1, there was a total of 1,159 changes chosen.

The “end time” in table A1 is the time at the end of the k -minute change, where k ranges from 1 to 5. “Volume” is the total number of ticks in the k -minute interval, and “average volume” is the average number of ticks per minute.

The next step was to see which event, if any, led to the large and rapid change. The Dow Jones Interactive service on the internet was used for this purpose. This service allows one to search for news reports by time of day. The following four news services were searched: *Dow Jones News Service*, *Associated Press Newswire*, *New York Times*, and *Wall Street Journal*.

For example, the first case in table A1 is for June 24, 1982, where at 3:28 P.M. the price had fallen by .85% in the last 5 minutes. For this case, the news services were searched for news reports between 3:00 P.M. and 4:00 P.M. to see what happened about 3:23 P.M. that led to the large change. In this case, no news report was found that seemed likely to have led to the change.

In the next case in table A1, an event was found, which was the 4:10 P.M. announcement that M1 was down \$2.3 billion. In the 2 minutes following this announcement, the price rose .82%. Although the regular stock market is closed at 4:00 P.M., the RTH market does not close until 4:15 P.M., and so the RTH market has time to respond to the money supply announcements.

In some cases, an event was found that seemed almost surely to have led to the price change but for which no exact time could be found. In these cases “?time” is used in table A1 to denote that the exact time of the event was not found. For the October 9, 1990 change, it is not completely clear that the Brazilian event in fact led to the change, and this is indicated by a “(?)” in the table. For the August 1, 1997 change, it is unclear which of the three events listed led to the change, and this is also indicated by a “(?)” in the table.

An important government announcement each month is the employment report. This report is released at 8:30 A.M., and it contains data from both the household survey and the establishment survey. The main variable of interest from the household survey is the unemployment rate, and the main two variables of interest from the establishment survey are the number of jobs (called “payrolls”) and average hourly earnings. The variable that gets the most at-

tion is the payroll variable, and so the payroll announcement is listed in table A1. The “event” is, however, the entire employment report.

To save space in table A1, not all large changes following an initial large change are listed for a particular day, especially on highly volatile days. When some changes are omitted, it is always indicated how many changes are omitted.⁴

III. Discussion of Table A1

Although, as discussed in Section I, it is almost certain that each of the 69 events listed in table A1 caused the particular price change, it may be that some events have been missed (aside from the missing RTH and GLOBEX data). The most likely error is an event for which there was no news report. Less likely is a news report that was listed in the search but that was not noticed as an important event. The number of events missed is likely to be small, probably fewer than 10. Remember, however, that many more large price changes and events would likely have been found had the GLOBEX market been in existence prior to 1994.

Assuming that the number of events that have been missed is small, table A1 shows that there are many large price changes that are not due to identifiable events. There are, for example, no events associated with any of the large number of large price changes in October 1987. Regarding the price changes with no events, consider the thought experiment about stock brokers mentioned in Section I. For the price changes with no associated events in table A1, what would stock brokers say a few minutes after the change? The argument here is that, except for the few events that might have been missed in the newswire searches, the brokers would not come up with a unique event. Some might say there was no event, and some might mention something nonspecific like “profit taking,” “renewed confidence,” “interest rate fears,” and the like.⁵

It should be stressed that the events that have been found are not necessarily surprises in the sense of an actual value differing from an expected value, although most of them probably are. Consider, for example, a payroll announcement. Say that market participants believe that there are three possible outcomes regarding the payroll change: 100,000 jobs, 300,000 jobs, and 500,000 jobs. Assume that market participants weight each possibility equally, so that the expected value is 300,000. Assume also that the participants expect that the Federal Reserve will leave the funds rate unchanged if the outcome

4. A complete table of all of the changes is available in pdf format at <http://www.fairmodel.econ.yale.edu>. Click “table 1A” after the title of the article.

5. On days on which there was at least one large price change but no event was found, I examined summary stock market articles at the end of the day to see if an event had been missed. No additional events were found this way—only vague or general discussions of why the market went up or down that day.

is 100,000 or 300,000 but will raise the funds rate if the outcome is 500,000. Assume, finally, that participants expect the S&P 500 price to be 1,430 if there is no funds rate change and 1,400 if there is one. The expected value of the price is thus 1,420, which, if the participants are risk neutral, will be the price before the announcement. In this case, even if the actual payroll value is equal to the expected value (300,000), the stock price will change (from 1,420 to 1,430). Simply relieving uncertainty may thus change stock prices even if the announced value is equal to the expected value. The events that have been found are thus not necessarily surprises.

The main results from table A1 are the following. First, the breakdown of the 69 events is as follows:

- Twenty-two events are money supply or interest rate announcements or testimony by monetary authorities. In 1982, the focus was on money supply announcements, and after that it was on the Federal Funds rate;⁶
- fourteen events are payroll announcements (employment reports);
- eleven events are CPI or PPI or employment cost index announcements;
- six events concern other macroeconomic announcements (NAPM, retail sales, durable goods, new homes);
- five events concern Iraq;
- four events concern congressional issues;
- three events concern Brazil or Mexico;
- three events concern particular corporations (GM and IBM); and
- one event is fear of Larry Summers.

The 31 nonmonetary macroeconomic announcements (payroll, CPI, PPI, employment cost, and other) are indirectly related to monetary policy in that these announcements may change people's expectations about future monetary policy. If, for example, there is a large payroll increase, people may think it is more likely that the Fed will tighten in the future because of fear of inflation. If these 31 announcements are added to the 22 direct monetary policy events, this gives 53 of the 69 events that are directly or indirectly related to monetary policy.

Second, the largest response by far was to the cut in the Federal Funds rate at 3:14 P.M. on October 15, 1998. The first five 1-minute price changes following this announcement were .89%, 1%, 1%, 1.29%, and 1%. This is roughly a 5% increase in 5 minutes. The announcement of this rate cut was unusual in that it did not follow a normally scheduled Federal Open Market Committee meeting.

Third, the large price changes are not close to being spread evenly across years. Between 1982 and 1993, before the introduction of the GLOBEX market, the number of days of large price changes per year are, respectively,

6. In October 1982, the Fed announced that it would, in the future, put less emphasis on monetary aggregates than it had been doing since late 1979 and go back to focusing more on interest rates. After this, money supply announcements became much less newsworthy, and table A1 shows that the last M1 announcement that had a large impact on the market was on November 5, 1982.

43, 2, 2, 0, 12, 33, 6, 4, 18, 8, 3, and 1. Between 1994 and 1999, the number of days are, respectively, 5, 0, 12, 26, 22 (GLOBEX data for the last half of 1998 missing), and 23 (through October).

Finally, as noted above, many large price changes have no events associated with them.

IV. Implications for Other Studies

It seems clear that no simple model of stock price determination can explain the facts in table A1. There have, for example, been hundreds of important macroeconomic announcements between 1982 and 1999, and only a small fraction have led to a large stock price change. An adequate model would need to explain why the particular events in table A1 led to large price changes, while many other seemingly similar events did not. There is also the problem from a model-building perspective in that there are many large price changes for which there appear to be no obvious causes.

A number of statistical studies have examined the effects of announcements on daily changes in stock prices (i.e., the change from the close of one day to the close of the previous day). The daily percent change in a stock index is regressed on estimates of the “surprise” components of announcements, and the components are tested for their statistical significance. The surprise component of an announcement is the difference between the announced value and an estimate of its expected value. The expected value is usually either taken from a survey or is a prediction from an autoregressive equation.

This literature generally finds that surprise monetary announcements are significant but that little else seems to matter. Schwert (1981), Pearce and Roley (1985), and Hardouvelis (1987) find surprise monetary announcements significant, and McQueen and Roley (1993), after controlling for different stages of the business cycle, find inflation surprises sometimes significant. Jain (1988) finds surprise monetary and CPI announcements significant. The results in table A1 suggest that, if anything is to be found significant in explaining stock prices, it is likely to be monetary announcements, which is what the literature tends to find. The “facts” in table A1 thus provide some support to the statistical results using daily data, but they also suggest that an adequate model of stock price determination is likely to be more complicated than the models that have been used so far for the statistical tests.

As noted in Section I, Cutler, Poterba, and Summers (1989) chose the 50 largest daily changes in the S&P 500 index from 1946 through 1987 and attempted to find an explanation of each change in the next day’s *New York Times*. Of the 50 changes, 17 occurred between 1982 and 1987, which are years included in table A1. It is interesting that 5 of these 17 changes occurred on days not listed in table A1, that is, on days in which there was not at least one large 1- to 5-minute price change. Of the 12 changes that occurred on days that are listed in table A1, none of the price changes has an event associated with it. Table 1 lists the 12 changes and the *New York Times*

TABLE 1 12 Large Daily S&P 500 Price Changes

Day	Percent Change	<i>New York Times</i> Explanation
8/17/82	4.76	Interest rates decline.
8/20/82	3.54	Congress passes Reagan tax bill; prime rate falls.
11/30/82	3.22	"Analysts were at a loss to explain why the Dow jumped so dramatically in the last two hours."
9/11/86	-4.81	Foreign governments refuse to lower interest rates; crackdown on triple witching announced.
10/16/87	-5.16	Fear of trade deficit; fear of higher interest rates; tension with Iran.
10/19/87	-20.47	Worry over dollar decline and trade deficit; fear of United States not supporting dollar.
10/20/87	5.33	Investors looking for "quality stocks."
10/21/87	9.10	Interest rates continue to fall; deficit talks in Washington; bargain hunting.
10/22/87	-3.92	Iranian attack on Kuwaiti oil terminal; fall in markets overseas; analysts predict lower prices.
10/26/87	-8.28	Fear of budget deficits; margin calls; reaction to falling foreign stocks.
10/29/87	4.46	Deficit reduction talks begin; durable goods orders increase; rallies overseas.
10/30/87	3.33	Dollar stabilizes; increase in prices abroad.

SOURCE.—Cutler, Poterba, and Summers (1989, table 4).

explanation that Cutler et al. (1989, table 4) found. It is clear that none of the explanations in table 2 are obvious causes of the stock price changes. The results in table A1 are consistent with this in that no events could be found to explain the large price changes on these days.

Haugen, Talmor, and Torous (1991) examined daily changes in the Dow Jones Industrial Average between 1897 and 1988. They computed a measure of volatility using the daily data and choose periods of increased and decreased volatility. For the 217 periods of increased volatility that were chosen, they identified events for 28 of them. For the 224 periods of decreased volatility, they identified 18 events. Again, it is difficult with daily data to find events, which is probably the main reason that they found so few events over such a long period of time.

Fleming and Remolona (1997) examine 5-minute price changes for the 5-year U.S. Treasury note for the period August 23, 1993–August 19, 1994. They chose the 25 largest 5-minute price changes over this period, and they found that each of these changes was preceded by a macroeconomic announcement. Of these 25 changes, 17 were on days for which S&P 500 futures data exist. Data for these 17 days are presented in table 2. The 5-minute bond price change is presented (taken from table 3 in Fleming and Remolona 1997) along with the 5-minute S&P 500 futures price change.⁷

7. In certain specific cases, slightly different time intervals from the FR intervals were used. For the 8:30 A.M. announcements, 8:29 A.M.–8:34 A.M. instead of 8:30 A.M.–8:35 A.M. was used, since,

TABLE 2 5-Minute Bond and Stock Price Changes

Day	Bond Interval	Bond Change (%)	Stock Interval	Stock Change (%)	Announcement
1/07/94	8:30 A.M.–8:35 A.M.	.282	8:28 A.M.–8:33 A.M.	.07	8:30 A.M.: Employment
2/04/94	8:30 A.M.–8:35 A.M.	.315	8:29 A.M.–8:34 A.M.	.15	8:30 A.M.: Employment
2/04/94	11:05 A.M.–11:10 A.M.	–.259	11:04 A.M.–11:09 A.M.	–.09	11:05 A.M.: Federal Funds rate
2/11/94	8:30 A.M.–8:35 A.M.	.223	8:29 A.M.–8:34 A.M.	.31	8:30 A.M.: PPI, retail sales
4/13/94	8:30 A.M.–8:35 A.M.	.224	8:29 A.M.–8:34 A.M.	.10	8:30 A.M.: CPI, retail sales
5/06/94	8:30 A.M.–8:35 A.M.	–.536	8:28 A.M.–8:33 A.M.	–.14	8:30 A.M.: Employment
5/11/94	1:40 P.M.–1:45 P.M.	–.223	1:40 P.M.–1:45 P.M.	–.37	1:42 P.M.: 10-year-note auction results
5/12/94	8:30 A.M.–8:35 A.M.	.384	8:29 A.M.–8:34 A.M.	.43	8:30 A.M.: PPI, retail sales
5/17/94	2:35 P.M.–2:40 P.M.	.221	2:25 P.M.–2:30 P.M.	.33	2:26 P.M.: Federal Funds rate
			2:35 P.M.–2:40 P.M.	.00	
5/27/94	8:30 A.M.–8:35 A.M.	–.343	8:29 A.M.–8:34 A.M.	–.20	8:30 A.M.: GDP
6/03/94	8:40 A.M.–8:45 A.M.	–.265	8:40 A.M.–8:45 A.M.	–.23	8:30 A.M.: Employment
7/08/94	8:30 A.M.–8:35 A.M.	–.440	8:29 A.M.–8:34 A.M.	–.30	8:30 A.M.: Employment
7/12/94	8:30 A.M.–8:35 A.M.	.222	8:29 A.M.–8:34 A.M.	.28	8:30 A.M.: PPI
7/14/94	8:30 A.M.–8:35 A.M.	.253	8:29 A.M.–8:34 A.M.	.11	8:30 A.M.: Retail sales
7/29/94	8:30 A.M.–8:35 A.M.	.407	8:29 A.M.–8:34 A.M.	.31	8:30 A.M.: GDP
8/05/94	8:30 A.M.–8:35 A.M.	–.590	8:29 A.M.–8:34 A.M.	–.35	8:30 A.M.: Employment
8/16/94	1:45 P.M.–1:50 P.M.	–.266	1:16 P.M.–1:21 P.M.	.23	1:17 P.M.: Federal Funds rate
			1:45 P.M.–1:50 P.M.	–.09	

SOURCE.—Bond results and announcement information are taken from table 3 in Fleming and Remolona (1997).

NOTE.—No stock trades at 8:29 A.M. on 1/07/94 and 5/06/94.

The stock price changes in table 2 are, in general, fairly large, although not nearly as large as .75%, the table A1 cutoff. It is remarkable that, in every case except the last one, the bond and stock price changes are in the same direction. The direction is the same in the last case if the same time 1:45 P.M.–1:50 P.M. is used but not if 1:16 P.M.–1:21 P.M. is used for the stock price. As Fleming and Remolona (1997, p. 32) point out, bond and stock prices need not move in the same direction following an announcement, since stock prices depend on expectations of both earnings and interest rates, whereas bond prices depend only on expectations of interest rates. The fact that they do move in the same direction suggests that the announcements mostly affect interest rate expectations.

Finally, Gwilym, McMillan, and Speight (1999) examine 5-minute stock price changes for the U.K. market using FTSE-100 data. The data are for the January 24, 1992–June 30, 1995 period. Among other things, their data show that trading volume is higher around announcement times than otherwise. The results in table A1 are consistent with this conclusion. For example, note that, in general, volume is quite high around the 8:30 A.M. announcements in the table.

V. Conclusion

As mentioned in the introduction, this study is purely descriptive. By focusing on very short time intervals, it has been possible to associate particular events with particular stock price changes, something which is generally not possible to do using daily data. Sixty-nine events have been identified between 1982 and 1999 that led to a 1- to 5-minute S&P 500 futures price change greater than or equal to 0.75% in absolute value. Knowledge of these events may prove useful in both macroeconomic studies and studies of individual stock prices.

The results in table A1 suggest that stock price determination is complicated. Many large price changes correspond to no obvious events, and so many large changes appear to have no easy explanation. Also, of the hundreds of fairly similar announcements that have taken place between 1982 and 1999, only a few have led to large price changes (i.e., those in table A1), and it does not appear easy to explain why some do and some do not.

at least in the S&P 500 futures data, an 8:30 A.M. announcement affects the 8:30 A.M. price. For the June 3, 1994 8:30 A.M. employment announcement, Fleming and Remolona used 8:40 A.M.–8:45 A.M., and this was also done here. There was very little change in the price before 8:40 A.M. For the 2:26 P.M. announcement of the Federal Funds rate on May 17, 1994, Fleming and Remolona used 2:35 P.M.–2:40 P.M. In table 2, both the stock price changes for 2:25 P.M.–2:30 P.M. and 2:35 P.M.–2:40 P.M. are presented. Finally, for the 1:17 P.M. announcement of the Federal Funds rate on August 16, 1994, Fleming and Remolona used 1:45 P.M.–1:50 P.M., and in table 3, both the stock price changes for 1:16 P.M.–1:21 P.M. and 1:45 P.M.–1:50 P.M. are presented.

Appendix A

TABLE A1 1- to 5-Minute Price Changes Greater than .75% in Absolute Value

Day	k	k-Minute Change		Average		Event
		End Time	Size	Volume	Volume	
1	6/24/82	5	3:28 P.M.	-.85	23	4.6 None
2	6/25/82	2	4:11 P.M.	.82	13	6.5 4:10 P.M.: M1 down \$2.3 billion.
3	7/6/82	4	3:36 P.M.	.79	25	6.3 None
4	7/8/82	5	3:09 P.M.	.78	39	7.8 None
5	7/9/82	3	4:11 P.M.	.86	21	7.0 4:10 P.M.: M1 down \$3.7 billion.
6	7/9/82	3	4:12 P.M.	.99	22	7.3 —
7	7/13/82	4	12:21 P.M.	.77	17	4.3 12:20 P.M.: IBM profits \$1.68 vs. \$1.37 year ago.
8	7/16/82	5	4:14 P.M.	-.79	43	8.6 4:10 P.M.: M1 up \$5.9 billion.
9	8/11/82	4	2:36 P.M.	.79	33	8.3 2:30 P.M.: Retail sales up 1.0%.
10	8/13/82	2	4:13 P.M.	.78	20	10.0 4:10 P.M.: M1 up \$2.0 billion.
11	8/17/82	4	2:20 P.M.	.87	22	5.5 None
12	8/19/82	4	10:16 A.M.	.79	20	5.0 None
13	8/19/82	5	2:08 P.M.	-.88	32	6.4 ?time: Rumor a major U.S. bank in trouble over Mexican loans. N.Y. Fed denied rumor about 2:30 P.M.
14	8/19/82	2	2:09 P.M.	-.78	15	7.5 —
15	8/19/82	5	2:14 P.M.	.79	46	9.2 —
16	8/19/82	4	2:29 P.M.	.93	33	8.3 —
17	8/19/82	5	2:31 P.M.	.79	38	7.6 —
18	8/19/82	5	2:32 P.M.	.88	34	6.8 —
19	8/19/82	5	2:33 P.M.	.93	31	6.2 —
20	8/19/82	4	2:34 P.M.	.79	23	5.8 —
21	8/19/82	1	2:38 P.M.	-.88	13	13.0 —
22	8/19/82	1	2:40 P.M.	.88	12	12.0 —
23	8/19/82	3	2:48 P.M.	-.78	21	7.0 —
24	8/19/82	3	2:49 P.M.	-.83	17	5.7 —
25	8/20/82	5	3:21 P.M.	.77	29	5.8 None
26	8/23/82	5	3:36 P.M.	.85	30	6.0 None
27	8/23/82	4	3:37 P.M.	.76	24	6.0 —
28	8/23/82	5	3:40 P.M.	.80	24	4.8 —
29	8/24/82	3	1:41 P.M.	-.78	17	5.7 1:40 P.M.: GM mid-August sales down to 81,597 from 134,949.
30	8/24/82	5	3:19 P.M.	-.77	42	8.4 None
31	8/24/82	5	3:22 P.M.	-.77	43	8.6 —
32	8/24/82	5	3:23 P.M.	-.82	41	8.2 —
33	9/2/82	3	2:56 P.M.	.77	13	4.3 None
34	9/3/82	4	10:04 A.M.	.78	29	7.3 None
35	9/3/82	3	10:21 A.M.	.78	33	11.0 —
36	9/3/82	3	10:23 A.M.	.90	39	13.0 —
37	9/3/82	5	12:43 P.M.	.78	22	4.4 —
38	9/3/82	5	1:07 P.M.	-.82	34	6.8 —
39	9/3/82	5	1:08 P.M.	-.78	33	6.6 —
40	9/3/82	3	1:39 P.M.	.82	10	3.3 —
41	9/3/82	4	1:58 P.M.	-.82	20	5.0 —
42	9/3/82	5	3:25 P.M.	.82	24	4.8 —
43	9/14/82	5	3:34 P.M.	-.88	32	6.4 3:27 P.M.: Rostenkowski said tax boost needed for defense budget.
44	9/14/82	4	3:35 P.M.	-.84	29	7.3 —
45	9/23/82	5	11:12 A.M.	-.77	27	5.4 ?time: Five Fed presidents testify before Congress.
46	9/30/82	5	3:38 P.M.	-.79	36	7.2 None
47	10/1/82	3	4:12 P.M.	-.84	24	8.0 4:10 P.M.: M1 up \$.4 billion.
48	10/8/82	4	2:27 P.M.	-.77	17	4.3 None
49	10/8/82	1	2:28 P.M.	.88	6	6.0 —
50	10/8/82	2	4:05 P.M.	.85	19	9.5 —
51	10/8/82	2	4:07 P.M.	-.96	19	9.5 —
52	10/8/82	3	4:10 P.M.	.77	37	12.3 4:10 P.M.: M1 down \$2.7 billion.
53	10/8/82	3	4:11 P.M.	.92	42	14.0 —
54	10/11/82	1	2:55 P.M.	-.82	4	4.0 None

TABLE A1 (Continued)

	Day	<i>k</i>	<i>k</i> -Minute Change			Event
			End Time	Size	Average Volume	
55	10/11/82	4	3:46 P.M.	.82	37	9.3 —
56	10/13/82	3	12:37 P.M.	-.78	22	7.3 None
57	10/13/82	3	2:09 P.M.	.79	23	7.7 —
58	10/13/82	3	3:23 P.M.	.86	24	8.0 —
59	10/13/82	3	3:24 P.M.	1.01	36	12.0 —
60	10/13/82	2	3:27 P.M.	.98	23	11.5 —
61	10/13/82	2	3:29 P.M.	-.90	16	8.0 —
62	10/13/82	4	3:56 P.M.	.79	18	4.5 —
63	10/22/82	4	4:13 P.M.	-.85	59	14.8 4:10 P.M.: M1 up \$3.2 billion.
64	10/26/82	4	2:58 P.M.	-.78	23	5.8 None
65	10/26/82	3	2:59 P.M.	-.82	15	5.0 —
66	10/26/82	5	3:20 P.M.	.82	36	7.2 —
67	10/27/82	5	2:59 P.M.	.77	33	6.6 None
68	11/2/82	4	3:34 P.M.	-.83	32	8.0 None
69	11/5/82	2	11:46 A.M.	-.80	17	8.5 None
70	11/5/82	2	11:47 A.M.	-.98	11	5.5 —
71	11/5/82	3	3:14 P.M.	.77	27	9.0 None
72	11/5/82	2	4:10 P.M.	-.77	12	6.0 4:10 P.M.: M1 up \$2.7 billion.
73	11/5/82	2	4:11 P.M.	-.84	12	6.0 —
74	11/16/82	4	3:15 P.M.	.81	35	8.8 ?time: Larry Speakes reported to have said Fed will reduce discount rate. Denied at 3:33 P.M..
75	11/16/82	4	3:16 P.M.	.77	33	8.3 —
76	11/16/82	4	3:17 P.M.	.77	34	8.5 —
77	11/22/82	5	10:17 A.M.	-.77	37	7.4 None
78	11/30/82	5	2:53 P.M.	.79	40	8.0 None
79	11/30/82	5	2:54 P.M.	.82	38	7.6 —
80	12/1/82	5	2:27 P.M.	-.82	40	8.0 None
81	12/1/82	4	2:28 P.M.	-.82	38	9.5 —
82	12/1/82	5	2:32 P.M.	-.78	41	8.2 —
83	12/2/82	4	2:38 P.M.	-.75	24	6.0 2:30 P.M.: New home sales down .4%.
84	12/6/82	4	3:26 P.M.	.75	39	9.8 None
85	12/6/82	4	3:27 P.M.	.86	43	10.8 —
86	12/7/82	5	2:55 P.M.	-.83	41	8.2 None
87	12/8/82	5	2:48 P.M.	-.77	32	6.4 None
88	12/9/82	3	3:24 P.M.	-.85	23	7.7 ?time: Howard Baker withdrew capital gains bill.
89	12/14/82	5	1:38 P.M.	-.80	33	6.6 None
90	12/14/82	2	2:02 P.M.	-.77	9	4.5 —
91	12/14/82	4	3:27 P.M.	-.84	30	7.5 —
92	12/15/82	5	10:59 A.M.	-.80	28	5.6 10:56 A.M.: Murray Weidenbaum testified that deficit an obstacle to recovery.
93	12/17/82	4	12:00 P.M.	.77	7	1.8 None
94	12/21/82	2	3:40 P.M.	.77	18	9.0 None
95	12/22/82	5	3:21 P.M.	-.78	27	5.4 None
96	12/28/82	3	2:56 P.M.	-.80	18	6.0 None
97	1/4/83	5	3:02 P.M.	.76	37	7.4 None
98	1/6/83	5	12:09 P.M.	.80	50	10.0 None
99	5/30/84	4	2:37 P.M.	.80	38	9.5 None
100	8/6/84	5	10:33 A.M.	.89	70	14.0 None
101	1/8/86	3	3:48 P.M.	-.79	48	16.0 None
102	1/8/86	3	3:49 P.M.	-.90	63	21.0 —
103	1/8/86	4	3:53 P.M.	.77	63	15.8 —
104	1/17/86	4	9:58 A.M.	-.76	38	9.5 9:54 A.M.: IBM profits \$4.36 vs. \$3.55 year ago.
105	2/7/86	3	12:02 P.M.	-1.03	47	15.7 12:00 P.M.: Three-judge panel ruled part of Gramm-Rudman law unconstitutional.
106	2/7/86	2	12:07 P.M.	.75	33	16.5 —
107	9/11/86	4	11:36 A.M.	-.88	59	14.8 None
108	9/11/86	4	11:53 A.M.	.78	58	14.5 —
109	9/12/86	4	10:05 A.M.	-.76	33	8.3 None (9 more through 12:16 P.M.)
119	9/15/86	5	9:36 A.M.	.78	44	8.8 None
120	9/18/86	4	9:45 A.M.	.86	40	10.0 None

TABLE A1 (Continued)

	Day	k	k-Minute Change			Event
			End Time	Size	Average Volume	
121	9/19/86	2	3:31 P.M.	-.78	36	18.0 None
122	9/25/86	4	11:01 A.M.	-.76	46	11.5 None
123	9/25/86	5	11:03 A.M.	-.83	50	10.0 —
124	10/3/86	5	11:08 A.M.	-.87	63	12.6 None
125	10/3/86	2	11:09 A.M.	-.76	21	10.5 —
126	10/3/86	3	11:11 A.M.	-.80	25	8.3 —
127	10/3/86	3	11:17 A.M.	.76	28	9.3 —
128	10/6/86	2	10:06 A.M.	.75	31	15.5 None
129	12/11/86	4	11:15 A.M.	-.95	46	11.5 None
130	12/11/86	2	11:16 A.M.	-.79	28	14.0 —
131	1/23/87	4	2:35 P.M.	-.76	52	13.0 None (14 more during day)
146	3/9/87	5	9:35 A.M.	-.86	74	14.8 None
147	3/9/87	5	9:36 A.M.	-.81	73	14.6 —
148	3/30/87	5	9:46 A.M.	-.85	54	10.8 None
149	3/30/87	4	9:47 A.M.	-.78	42	10.5 —
150	3/30/87	3	9:48 A.M.	-.95	31	10.3 —
151	4/13/87	5	3:37 P.M.	-.81	53	10.6 None
152	4/27/87	4	12:26 P.M.	.76	52	13.0 None
153	4/27/87	4	12:27 P.M.	.78	43	10.8 —
154	4/27/87	4	12:42 P.M.	.76	47	11.8 —
155	4/27/87	5	12:44 P.M.	.80	67	13.4 —
156	4/27/87	5	12:45 P.M.	.80	61	12.2 —
157	4/27/87	5	12:46 P.M.	.87	66	13.2 —
158	5/11/87	4	4:00 P.M.	-.84	48	12.0 None
159	6/2/87	5	10:07 A.M.	-.91	70	14.0 None
160	6/10/87	5	3:09 P.M.	-.75	45	9.0 None
161	6/30/87	2	4:14 P.M.	-.77	36	18.0 None
162	10/16/87	5	11:25 A.M.	-.83	42	8.4 None (12 more during day)
175	10/19/87	1	9:33 A.M.	.76	7	7.0 None (123 more during day)
299	10/20/87	1	9:31 A.M.	1.78	5	5.0 None (161 more during day)
461	10/21/87	1	9:31 A.M.	1.26	7	7.0 None (82 more during day)
544	10/22/87	1	9:31 A.M.	-3.47	5	5.0 None (109 more during day)
654	10/23/87	1	9:31 A.M.	-1.23	4	4.0 None (33 more during day)
688	10/26/87	1	9:32 A.M.	-1.50	9	9.0 None (22 more during day)
711	10/27/87	1	9:31 A.M.	.84	9	9.0 None (22 more during day)
734	10/28/87	2	9:37 A.M.	.80	10	5.0 None (22 more during day)
757	10/29/87	1	9:32 A.M.	1.27	6	6.0 None (7 more during day)
765	10/30/87	4	9:47 A.M.	.79	28	7.0 None (5 more during day)
771	11/2/87	4	9:34 A.M.	-.78	38	9.5 None
772	11/2/87	5	9:36 A.M.	-.78	50	10.0 —
773	11/3/87	2	9:35 A.M.	.80	19	9.5 None (18 more during day)
792	11/4/87	4	9:46 A.M.	.77	38	9.5 None
793	11/4/87	3	9:47 A.M.	.77	26	8.7 —
794	11/5/87	4	9:35 A.M.	.81	38	9.5 None
795	11/6/87	4	11:41 A.M.	.78	38	9.5 None
796	11/9/87	5	2:34 P.M.	-.83	52	10.4 None
797	11/10/87	5	9:35 A.M.	-.88	48	9.6 None
798	11/10/87	4	9:36 A.M.	-.88	39	9.8 —
799	11/10/87	5	10:10 A.M.	-.82	51	10.2 —
800	11/19/87	2	4:02 P.M.	-.75	29	14.5 None
801	12/1/87	4	4:00 P.M.	-.77	64	16.0 None
802	12/8/87	4	3:58 P.M.	.85	43	10.8 None
803	12/10/87	3	3:39 P.M.	-.76	38	12.7 None
804	12/14/87	4	9:37 A.M.	.78	65	16.3 None
805	12/15/87	5	3:31 P.M.	.75	59	11.8 None
806	1/8/88	4	3:39 P.M.	-.76	60	15.0 None (4 more through 3:49 P.M.)
811	1/11/88	2	9:52 A.M.	-.82	21	10.5 None (7 more through 10:16 A.M.)
819	1/15/88	3	9:43 A.M.	-.78	31	10.3 None
820	1/21/88	5	10:15 A.M.	-.82	59	11.8 None
821	4/14/88	4	2:30 P.M.	-.86	58	14.5 None (6 more through 2:41 P.M.)

TABLE A1 (Continued)

	Day	<i>k</i>	<i>k</i> -Minute Change			Average Volume	Event
			End Time	Size	Volume		
828	4/21/88	5	3:08 P.M.	-.81	64	12.8	None
829	10/13/89	3	3:04 P.M.	-.75	27	9.0	None (6 more through 3:44 P.M.)
836	10/16/89	1	9:31 A.M.	1.20	10	10.0	None (18 more during day)
855	10/17/89	5	11:17 A.M.	-.79	58	11.6	None
856	10/17/89	5	11:25 A.M.	.88	37	7.4	—
857	10/17/89	5	11:26 A.M.	.88	41	8.2	—
858	10/24/89	4	10:24 A.M.	-.78	56	14.0	None (9 more during day)
868	1/12/90	3	9:33 A.M.	-.86	22	7.3	None
869	1/12/90	4	2:36 P.M.	-.90	40	10.0	—
870	1/12/90	4	2:41 P.M.	.84	47	11.8	—
871	1/24/90	3	9:39 A.M.	-.83	25	8.3	None
872	1/24/90	3	9:40 A.M.	-.77	24	8.0	—
873	1/24/90	1	9:41 A.M.	.77	7	7.0	—
874	7/23/90	5	10:30 A.M.	-.75	58	11.6	None
875	7/23/90	4	10:32 A.M.	-.77	49	12.3	—
876	7/23/90	2	10:33 A.M.	-1.10	19	9.5	—
877	7/23/90	5	10:54 A.M.	.91	43	8.6	—
878	8/3/90	4	9:47 A.M.	-.85	31	7.8	?time: Iraq invaded Kuwait.
879	8/3/90	3	9:48 A.M.	-.85	19	6.3	—
880	8/3/90	3	9:49 A.M.	-1.13	22	7.3	—
881	8/3/90	5	9:55 A.M.	.97	34	6.8	—
882	8/3/90	2	1:49 P.M.	-1.11	14	7.0	—
883	8/3/90	4	2:01 P.M.	.88	19	4.8	—
884	8/3/90	5	2:04 P.M.	.86	28	5.6	—
885	8/6/90	5	10:27 A.M.	.84	31	6.2	None
886	8/17/90	3	12:16 P.M.	-.78	40	13.3	12:11 P.M.: Pentagon recommended maybe calling up reserves.
887	8/21/90	1	11:16 A.M.	.77	13	13.0	11:13 A.M.: Iraq's Aziz says ready to discuss Gulf situation.
888	8/23/90	3	9:46 A.M.	.96	16	5.3	None
889	9/20/90	4	10:25 A.M.	-.82	59	14.8	None
890	9/27/90	4	10:59 A.M.	-.77	50	12.5	None
891	10/1/90	4	12:18 P.M.	.76	43	10.8	None
892	10/1/90	4	12:19 P.M.	.78	38	9.5	—
893	10/2/90	5	9:39 A.M.	.78	54	10.8	None
894	10/9/90	4	3:45 P.M.	-.79	47	11.8	3:39 P.M.: (?) Brazil's central bank president sees rescheduling needed.
895	10/10/90	3	3:28 P.M.	-.88	39	13.0	None
896	10/12/90	3	11:55 A.M.	.77	31	10.3	11:51 A.M.: Opposition party in exile says Iraqi leaders considering Kuwait withdrawal.
897	10/15/90	3	10:45 A.M.	-.82	42	14.0	None
898	10/15/90	2	10:46 A.M.	-.82	29	14.5	—
899	12/4/90	5	3:33 P.M.	.99	45	9.0	?time: British TV reports Iraq makes new offer on Kuwait.
900	12/4/90	2	3:34 P.M.	.84	20	10.0	—
901	12/18/90	2	3:27 P.M.	.84	29	14.5	None
902	12/18/90	3	3:29 P.M.	.88	23	7.7	—
903	1/4/91	2	12:12 P.M.	.83	20	10.0	None
904	1/9/91	2	1:57 P.M.	-.92	22	11.0	None
905	1/9/91	1	1:58 P.M.	-1.50	10	10.0	—
906	1/9/91	1	1:59 P.M.	-1.56	6	6.0	—
907	1/9/91	1	2:00 P.M.	.94	5	5.0	—
908	1/9/91	1	2:02 P.M.	.94	9	9.0	—
909	1/9/91	2	2:04 P.M.	-.78	14	7.0	—
910	1/14/91	4	3:19 P.M.	.84	44	11.0	None
911	1/16/91	1	12:43 P.M.	.84	12	12.0	None
912	1/17/91	2	9:44 A.M.	-.93	13	6.5	None
913	1/17/91	4	9:47 A.M.	-.93	29	7.3	—
914	4/30/91	2	9:32 A.M.	.87	28	14.0	9:30 A.M.: Fed cut discount rate to 5.5%.
915	5/10/91	5	3:25 P.M.	-.78	54	10.8	None
916	11/15/91	4	3:41 P.M.	-.81	34	8.5	None
917	11/15/91	4	3:46 P.M.	.76	21	5.3	—

TABLE A1 (Continued)

	k-Minute Change						Event
	Day	k	End Time	Size	Volume	Average Volume	
918	11/15/91	4	3:47 P.M.	.76	27	6.8	—
919	11/19/91	5	10:47 A.M.	-.81	57	11.4	None
920	1/2/92	5	4:05 P.M.	.77	68	13.6	None
921	7/2/92	4	10:21 A.M.	-.82	62	15.5	Time: Fed cut discount rate to 3.0% from 3.5%; anemic employment report earlier.
922	7/2/92	4	10:22 A.M.	-.87	58	14.5	None
923	10/5/92	5	10:21 A.M.	-.78	57	11.4	None
924	10/5/92	3	10:26 A.M.	-.83	33	11.0	—
925	10/5/92	3	10:27 A.M.	-.78	24	8.0	—
926	10/5/92	3	11:16 A.M.	-.86	27	9.0	—
927	2/16/93	5	10:43 A.M.	-.79	55	11.0	None
928	3/2/94	1	5:15 A.M.	-1.52	4	4.0	None
929	3/31/94	5	10:55 A.M.	-.78	52	10.4	None
930	3/31/94	5	10:57 A.M.	-.76	45	9.0	—
931	3/31/94	4	11:07 A.M.	.75	27	6.8	—
932	10/13/94	4	8:33 A.M.	.75	70	17.5	8:30 A.M.: PPI down .5%; core up .1%.
933	11/15/94	3	2:38 P.M.	-.83	38	12.7	2:37 P.M.: Fed raised discount rate to 4.75% from 4.0%.
934	11/22/94	4	3:51 P.M.	-.81	47	11.8	None
935	2/26/96	5	3:27 P.M.	-.76	79	15.8	None
936	2/26/96	5	3:28 P.M.	-.76	70	14.0	—
937	3/8/96	4	8:33 A.M.	-.79	110	27.5	8:30 A.M.: Payrolls (jobs) up 705,000; largest increase in 12 years.
938	3/8/96	1	8:34 A.M.	-.75	17	17.0	—
939	3/8/96	2	3:03 P.M.	-.80	21	10.5	None
940	3/8/96	4	3:27 P.M.	.77	31	7.8	—
941	3/8/96	4	3:28 P.M.	.77	26	6.5	—
942	4/10/96	4	3:43 P.M.	-.76	46	11.5	None
943	5/3/96	4	8:30 A.M.	.78	89	22.3	8:30 A.M.: Payrolls up 2,000.
944	5/3/96	4	8:31 A.M.	.89	120	30.0	—
945	5/3/96	3	8:32 A.M.	.96	137	45.7	—
946	5/3/96	3	8:35 A.M.	-.77	172	57.3	—
947	6/7/96	2	8:31 A.M.	-.93	94	47.0	8:30 A.M.: Payrolls up 348,000 jobs.
948	6/7/96	3	8:33 A.M.	-.84	123	41.0	—
949	6/7/96	3	8:34 A.M.	-.93	124	41.3	—
950	7/11/96	3	1:44 P.M.	-.79	20	6.7	None
951	7/15/96	4	3:29 P.M.	-.85	40	10.0	None
952	7/16/96	4	12:22 P.M.	-.84	40	10.0	None (7 more during day)
960	8/2/96	2	8:31 A.M.	1.02	91	45.5	8:30 A.M.: Payrolls up 193,000 jobs.
961	9/6/96	1	8:30 A.M.	-.81	61	61.0	8:30 A.M.: Payrolls up 250,000.
962	9/13/96	3	8:32 A.M.	.84	123	41.0	8:30 A.M.: CPI up .1%; core up .1%. Also retail sales data.
963	12/11/96	5	2:12 A.M.	.80	31	6.2	None
964	1/23/97	4	3:46 P.M.	-.84	27	6.8	None
965	1/23/97	5	3:48 P.M.	-.76	35	7.0	—
966	1/23/97	5	3:55 P.M.	-.75	41	8.2	—
967	1/23/97	4	4:00 P.M.	.76	37	9.3	—
968	1/29/97	3	8:31 A.M.	.76	91	30.3	8:30 A.M.: Durable goods down 1.7%.
969	2/5/97	3	3:40 P.M.	.76	23	7.7	None
970	2/26/97	4	10:04 A.M.	-.97	35	8.8	10:00 A.M.: Greenspan testimony; angst about stock market.
971	2/26/97	2	10:05 A.M.	-.86	14	7.0	—
972	3/7/97	1	8:30 A.M.	-.81	48	48.0	8:30 A.M.: Payrolls up 339,000.
973	3/7/97	2	8:32 A.M.	.75	87	43.5	—
974	3/27/97	4	3:37 P.M.	-.87	30	7.5	None
975	3/27/97	4	3:45 P.M.	.75	26	6.5	—
976	4/15/97	3	8:31 A.M.	.78	115	38.3	8:30 A.M.: CPI up .1%; core up .2%.
977	4/15/97	3	8:32 A.M.	.99	182	60.7	—
978	4/29/97	2	8:31 A.M.	1.09	106	53.0	8:30 A.M.: Employment cost index up .6% in first quarter.
979	5/20/97	4	2:17 P.M.	.82	51	12.8	2:15 P.M.: Fed kept rates unchanged.
980	6/6/97	1	8:31 A.M.	-.88	77	77.0	8:30 A.M.: Payrolls up 138,000.
981	7/9/97	4	3:38 P.M.	-.75	43	10.8	None
982	7/18/97	4	10:08 A.M.	-.80	44	11.0	None

TABLE A1 (Continued)

	Day	<i>k</i>	<i>k</i> -Minute Change			Average Volume	Event
			End Time	Size	Volume		
983	8/1/97	3	10:11 A.M.	-.94	24	8.0	10:00 A.M.: (?) New orders up 1.2%; strong NAPM report; Michigan sentiment revised up.
984	8/8/97	2	8:29 A.M.	-.89	39	19.5	None
985	8/8/97	3	8:32 A.M.	.76	65	21.7	—
986	8/13/97	4	8:31 A.M.	.79	164	41.0	8:30 A.M.: PPI down .1%; core down .1%. Also retail sales data.
987	8/13/97	4	8:32 A.M.	.85	226	56.5	—
988	8/13/97	4	8:33 A.M.	1.04	265	66.3	—
989	8/13/97	3	8:34 A.M.	.84	192	64.0	—
990	8/13/97	5	10:22 A.M.	-.82	64	12.8	None
991	8/13/97	3	10:23 A.M.	-.77	38	12.7	—
992	8/13/97	3	10:24 A.M.	-.77	34	11.3	—
993	8/22/97	5	3:53 P.M.	.83	57	11.4	None
994	9/2/97	2	10:03 A.M.	.84	22	11.0	10:00 A.M.: NAPM 56.8 vs. 58.6 last month.
995	10/3/97	2	8:31 A.M.	.77	97	48.5	8:30 A.M.: Payrolls up 215,000.
996	10/10/97	1	8:30 A.M.	-.82	73	73.0	8:30 A.M.: PPI up .5%; core up .4%.
997	10/27/97	3	1:52 P.M.	-.85	28	9.3	None
998	10/27/97	4	1:55 P.M.	-.80	42	10.5	—
999	10/27/97	2	1:56 P.M.	-.80	13	6.5	—
1,000	10/27/97	2	3:12 P.M.	-1.17	20	10.0	—
1,001	10/27/97	2	3:13 P.M.	-.96	22	11.0	—
1,002	10/27/97	4	3:23 P.M.	-.96	27	6.8	—
1,003	10/27/97	3	3:24 P.M.	-.85	18	6.0	—
1,004	10/28/97	3	6:48 A.M.	-.75	42	14.0	None
1,005	10/28/97	4	9:42 A.M.	.82	27	6.8	None
1,006	10/28/97	4	10:13 A.M.	.87	40	10.0	None (15 more during day)
1,022	10/30/97	5	10:02 A.M.	.88	45	9.0	None
1,023	11/7/97	5	9:35 A.M.	-.86	52	10.4	None
1,024	11/7/97	5	9:40 A.M.	.76	44	8.8	—
1,025	12/5/97	5	8:30 A.M.	-.82	129	25.8	8:30 A.M.: Payrolls up 404,000.
1,026	12/5/97	2	8:31 A.M.	-.92	151	75.5	—
1,027	12/23/97	5	3:56 P.M.	-.79	51	10.2	None
1,028	4/30/98	2	8:31 A.M.	.87	154	77.0	8:30 A.M.: Employment cost index up .7% in first quarter. Also GDP data released.
1,029	8/4/98	4	3:43 P.M.	-.93	39	9.8	None
1,030	8/4/98	4	3:46 P.M.	-.80	34	8.5	—
1,031	8/5/98	4	9:43 A.M.	-.88	22	5.5	None
1,032	8/5/98	4	3:45 P.M.	.93	41	10.3	None
1,033	8/27/98	3	11:38 A.M.	-.84	29	9.7	None
1,034	8/27/98	4	11:41 A.M.	-.84	46	11.5	—
1,035	8/27/98	5	2:47 P.M.	.84	36	7.2	None
1,036	8/27/98	5	2:48 P.M.	.84	40	8.0	—
1,037	8/28/98	5	11:49 A.M.	.77	47	9.4	None
1,038	8/28/98	5	11:50 A.M.	.86	45	9.0	—
1,039	8/31/98	4	10:09 A.M.	-.96	31	7.8	None
1,040	8/31/98	4	3:07 P.M.	-.77	47	11.8	None (10 more during day)
1,051	9/1/98	2	9:32 A.M.	.94	19	9.5	None (21 more during day)
1,073	9/2/98	3	9:37 A.M.	.75	30	10.0	None
1,074	9/2/98	5	3:49 P.M.	-.80	58	11.6	—
1,075	9/3/98	4	9:35 A.M.	-.82	37	9.3	None
1,076	9/3/98	5	10:30 A.M.	.93	47	9.4	—
1,077	9/3/98	5	10:56 A.M.	-.77	45	9.0	—
1,078	9/3/98	4	3:42 P.M.	.77	37	9.3	—
1,079	9/4/98	5	2:50 P.M.	-.76	39	7.8	None
1,080	9/4/98	5	3:39 P.M.	.76	48	9.6	—
1,081	9/4/98	5	3:41 P.M.	.85	45	9.0	—
1,082	9/10/98	5	3:36 P.M.	-.80	49	9.8	None
1,083	9/10/98	3	3:42 P.M.	.76	37	12.3	—
1,084	9/11/98	4	9:46 A.M.	.87	49	12.3	None
1,085	9/11/98	4	9:48 A.M.	.77	51	12.8	—

TABLE A1 (Continued)

	Day	k	k-Minute Change			Event
			End Time	Size	Average Volume	
1,086	9/11/98	5	9:50 A.M.	.77	69	13.8 —
1,087	9/11/98	3	9:53 A.M.	.77	36	12.0 —
1,088	9/11/98	2	10:03 A.M.	.92	20	10.0 —
1,089	9/11/98	4	2:50 P.M.	.82	34	8.5 —
1,090	9/11/98	4	2:51 P.M.	.82	37	9.3 —
1,091	9/16/98	5	3:43 P.M.	.81	40	8.0 None
1,092	9/29/98	2	2:17 P.M.	-.89	18	9.0 2:17 P.M.: Fed cuts funds rate 25 basis points.
1,093	9/29/98	2	2:18 P.M.	-1.08	18	9.0 —
1,094	9/29/98	3	2:20 P.M.	-.84	30	10.0 —
1,095	10/1/98	5	11:19 A.M.	-.79	51	10.2 None
1,096	10/2/98	5	10:18 A.M.	-.90	47	9.4 None
1,097	10/2/98	4	12:41 P.M.	.80	42	10.5 None
1,098	10/2/98	5	2:52 P.M.	.75	45	9.0 None
1,099	10/2/98	4	3:15 P.M.	.75	30	7.5 None
1,100	10/5/98	4	3:37 P.M.	.78	31	7.8 None
1,101	10/5/98	4	3:42 P.M.	.80	33	8.3 —
1,102	10/5/98	4	3:43 P.M.	.75	30	7.5 —
1,103	10/7/98	5	10:12 A.M.	.91	41	8.2 None
1,104	10/7/98	5	3:06 P.M.	.76	41	8.2 None
1,105	10/7/98	4	3:26 P.M.	-.75	44	11.0 None
1,106	10/7/98	5	3:41 P.M.	.91	48	9.6 None
1,107	10/8/98	3	9:50 A.M.	-.78	32	10.7 None (8 more during day)
1,116	10/9/98	4	10:14 A.M.	-.77	31	7.8 None
1,117	10/15/98	1	3:15 P.M.	.89	11	11.0 3:14 P.M.: Fed cuts funds rate and discount rate 25 basis points (not a normal FOMC meeting).
1,118	10/15/98	1	3:16 P.M.	1.00	11	11.0 —
1,119	10/15/98	1	3:17 P.M.	1.00	9	9.0 —
1,120	10/15/98	1	3:18 P.M.	1.29	10	10.0 —
1,121	10/15/98	1	3:19 P.M.	1.00	8	8.0 —
1,122	10/15/98	1	3:21 P.M.	-1.19	8	8.0 —
1,123	10/15/98	1	3:22 P.M.	-1.29	7	7.0 —
1,124	10/15/98	5	3:44 P.M.	.80	36	7.2 —
1,125	10/15/98	5	3:45 P.M.	.80	34	6.8 —
1,126	10/15/98	5	3:46 P.M.	.80	36	7.2 —
1,127	11/17/98	2	2:19 P.M.	.83	19	9.5 2:15 P.M.: Fed cuts funds rate and discount rate 25 basis points.
1,128	11/17/98	2	2:20 P.M.	1.14	17	8.5 —
1,129	1/15/99	5	7:31 A.M.	-.78	198	39.6 None
1,130	1/15/99	4	8:10 A.M.	.77	102	25.5 8:10 A.M.: <i>Estado de São Paulo</i> said Brazilian central bank will not intervene on foreign exchange market.
1,131	1/15/99	5	8:12 A.M.	.81	125	25.0 —
1,132	1/15/99	5	8:16 A.M.	.82	159	31.8 —
1,133	1/31/99	1	5:57 P.M.	.85	9	9.0 None
1,134	2/23/99	5	10:04 A.M.	-.82	68	13.6 10:00 A.M.: Greenspan testimony; economy may be stretched.
1,135	3/5/99	2	8:31 A.M.	1.05	152	76.0 8:30 A.M.: Payrolls up 275,000.
1,136	4/16/99	4	9:48 A.M.	-.78	47	11.8 None
1,137	4/19/99	5	1:17 P.M.	-.86	54	10.8 None
1,138	5/12/99	1	9:47 A.M.	-.81	17	17.0 ?time: Rubin to announce resignation; Summers is successor.
1,139	5/12/99	1	9:48 A.M.	-.81	12	12.0 —
1,140	5/12/99	1	9:50 A.M.	.88	12	12.0 —
1,141	5/18/99	4	2:14 P.M.	-.80	41	10.3 2:11 P.M.: Fed let rates stand; adopted tightening bias.
1,142	6/1/99	5	10:05 A.M.	-.85	54	10.8 10:00 A.M.: NAPM 55.2 vs. 52.8 last month.
1,143	6/4/99	3	8:33 A.M.	-.88	191	63.7 8:30 A.M.: Payrolls up 11,000.
1,144	6/13/99	1	5:35 P.M.	-.77	2	2.0 None
1,145	6/15/99	1	4:19 P.M.	-1.01	3	3.0 None
1,146	6/16/99	3	8:30 A.M.	.79	170	56.7 8:30 A.M.: CPI unchanged; core up .1%.
1,147	6/30/99	2	2:17 P.M.	.96	24	12.0 2:15 P.M.: Fed raised funds rate 25 basis points; adopted neutral bias.

TABLE A1 (Continued)

Day	k	k-Minute Change				Event	
		End Time	Size	Volume	Average Volume		
1,148	6/30/99	3	2:19 P.M.	.89	31	10.3	—
1,149	8/6/99	2	8:30 A.M.	-.83	151	75.5	8:30 A.M.: Payrolls up 310,000.
1,150	9/3/99	1	8:30 A.M.	.89	150	150.0	8:30 A.M.: Payrolls up 124,000.
1,151	9/10/99	1	8:31 A.M.	.80	93	93.0	8:30 A.M.: PPI up .5%; core down .1%.
1,152	9/15/99	1	8:30 A.M.	.81	106	106.0	8:30 A.M.: CPI up .3%; core up .1%.
1,153	10/5/99	2	2:12 P.M.	-.93	32	16.0	2:12 P.M.: Fed let rates stand; adopted tightening bias.
1,154	10/5/99	2	2:13 P.M.	-.80	27	13.5	—
1,155	10/8/99	1	8:30 A.M.	.75	126	126.0	8:30 P.M.: Payrolls down 8,000.
1,156	10/13/99	2	4:21 P.M.	-.77	5	2.5	None
1,157	10/13/99	1	4:22 P.M.	-.84	1	1.0	—
1,158	10/15/99	1	8:30 A.M.	-.95	150	150.0	8:30 A.M.: PPI up 1.1%; core up .8%.
1,159	10/20/99	1	4:27 P.M.	1.21	3	3.0	None

NOTE.—CPI = consumer price index; core excludes food and energy. PPI = producers price index; core excludes food and energy. Percentage changes are at monthly rates except for the change in the employment cost index, which is at a quarterly rate. NAPM = National Association of Purchasing Managers. Dash (—) = a big change following the first big change for that date. The first big change is either an event (which is listed) or just a big change with no event identified (none). When qualifying big changes for a particular date are not presented in the table, the number of these is identified as “more during day,” e.g., (8 more during day).

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