

WHY DID THE NIKKEI CRASH? EXPANDING THE SCOPE OF EXPECTATIONS DATA COLLECTION

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Abstract—Why did the Japanese stock market lose most of its value between 1989 and 1992? To help us answer this and related questions, we have collected parallel time series data from market participants in both Japan and the United States 1989–94 on their expectations, attitudes, and theories. Substantial variability within countries through time in these data and, notably, dramatic differences across countries in expectations were found. While no unambiguous explanation of the Japanese crash emerges from the results, we do find a clear relation of the crash to changes in Japanese price expectations and speculative strategies.

THE Nikkei stock price average in Japan, after rising dramatically through the 1980s, fell from 38915.9 on December 29, 1989 to 14309.4 on August 18, 1992, a decline of 63.2% (see figure 1). In real terms, using the Japanese consumer price index to correct for inflation, the decline between these two dates was 65.8%. This stock market crash was not worldwide; in the United States over the same interval of time stock prices rose. Despite the magnitude and importance of the drop in the Nikkei, we know nothing solid about the origins of this event. Data about fundamentals of the Japanese economy provide no unambiguous reason for the crash. Thus, the Nikkei crash must have taken the form of a change in expectations or attitudes, about which there is little concrete to say beyond the fact that the Nikkei dropped.

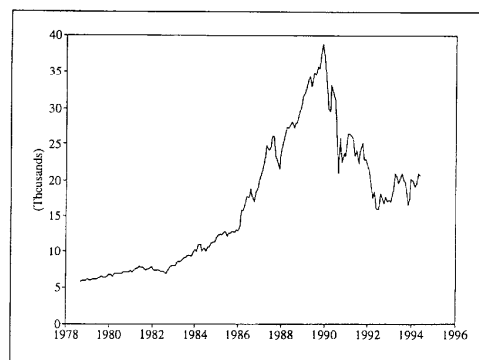
The Nikkei crash is examined here as a study for the development of research methods that can give us a better understanding of such events. We report here on our collection of detailed time series data in Japan and the United States on expectations and understandings of speculative markets, before, during and after the crash of the Nikkei. We began our study before the crash partly because of a conjecture (expressed by some observers of the Tokyo market) that a crash might happen there. The questions for which we produced time series data on answers are unusual, and, we think, suggest some new methodology for studying financial markets. Some of our questions are intended to produce detailed accounts of expectations, over various horizons including long-term horizons. Other questions posed to our respondents in the surveys are of a rather more interpretive nature than are

questions in most surveys, for example, questions about their speculative motives for holding stocks or their expectations about what would happen in the market *if* something else happened. All data are collected on a consistent basis about these expectations through time and across countries.

Time series data, data collected on a consistent basis at regular intervals for an extended period of time, are of fundamental importance to statistical analysis. Any such long systematic time series can be analyzed in connection with all other time series that are available over the same period. Experience with time series data, and a consensus on their meaning, develops gradually as the data series are extended.¹

We do not expect to be able to offer a good understanding of the sources of the Nikkei crash from an analysis of the short (less than five-year's span) time series we have produced for Japan and the United States. Our primary objective here is to establish that various expectations and attitudinal variables were changing over the time, and that the Japanese variables departed substantially from the corresponding variables measured in the United States, where the stock market behavior was quite different. We will also, however, offer some tentative interpretation of the Nikkei crash with the benefit of our data.

FIGURE 1.—NIKKEI 225 STOCK PRICE AVERAGE, END OF MONTH, SEPT. 1979 TO JUNE 1994



Source: Nikkei Shinbun.

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¹In contrast, the post-event studies of stock market crashes that are typically conducted after the fact have relatively little power to discover what was changing importantly at the time of the crash.

I. A Preliminary on Fundamentals in Japan

The crash in the Nikkei was followed by a sharp drop in the earnings of the constituent companies in Japan, so that the price-earnings ratio based on results rose, despite a decline at the time of the crash in the Nikkei, in 1994 well above pre-crash levels: see figure 2. It is natural to hypothesize, then, that the crash in the Nikkei was due to new information about the outlook for earnings, information hitting the market before the actual drop in earnings. This simple hypothesis, however, may not be entirely satisfactory. The price-earnings ratio based on expected earnings (see also figure 2) declined about as much as the price-earnings ratio based on results between the peak and trough of the market.² There was virtually no decline between the end of 1989 and the end of 1990, a time interval during which most of the decline in the Nikkei occurred, in one-year-ahead forecasted earnings in Japan as compiled by I/B/E/S Inc.³

From publicly available data, we do not know whether market participants were reacting to information in 1990 about a less encouraging *long-run* outlook for earnings. We also do not know whether market participants were thinking in 1991 and 1992 that the decline in earnings since the crash is expected to be reversed, and that it was a temporary business-cycle-related decline that may not last more than a few years. If this was their expectation at the time, then the earnings decline would not appear adequate to explain a major crash in prices. Note that the sharp earnings declines reported in Japan near the end of our sample resulted in the sharp run-up of price-earnings ratios in 1994, rather than yet another

large drop in prices. Movements in the stock markets of the world are not tightly related to earnings movements.

Of course, we do not deny that fundamentals play an important role in forming the level of the Nikkei. It is easy to count up facts that are consistent with the movement of the Nikkei for a limited period. It is hard, however, to find those which are consistent throughout a long period.

For example, the rise of Japanese long-term interest rates from July 1989 to September 1990 may be pointed out as a suspect in the crash. The rise is reflected in the consecutive increases in the discount rate from 2.5% in May 1989 to 6% at the end of August 1990. Thus, one might argue that the change in the attitude of the Bank of Japan toward a tight monetary policy is a cause of the crash.⁴ However, the fact does not explain why the Nikkei continued rising sharply during 1989 despite the rapid rise of the interest rates, and why the crash began at the beginning of 1990. Historically, stock markets do not show any consistent behavior in response to sudden tightening of monetary policy; note for example, that the sudden tightening in monetary policy in the United States in 1994, roughly comparable in magnitude to the tightening in Japan in 1989-90, produced no overall U.S. stock market decline.

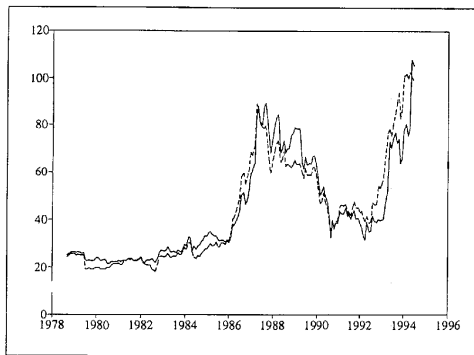
II. Existing Time Series Data for the Japanese and United States Stock Markets

Few time series data are collected regarding stock market expectations. Governments are the main provider of high-quality time series data on an uninterrupted and intertemporally consistent basis. Yet the Japanese and U.S. governments apparently collect no such series on expectations in the financial markets. In the industry, there are some attempts to collect time series data on stock market expectations, but none of these attempts matches the scope of our study.

In Japan, there appears to be only one published price expectations survey. *The Nikkei Financial Daily* reports every Saturday the results of a survey of 5 securities companies, 3 banks, 7 institutional investors and 3 foreign companies, in which are given the number of respondents who expect that the markets will be more bullish, more bearish, or neutral compared with the current week. This is their only published expectations question, the number of respondents is quite small, and their time series goes back only to October, 1987. The Quick Research Corporation has been sending a questionnaire to about 300 securities companies and institutional investors in Japan every month since April 1994; they ask about 1-, 3- and 6-month ahead expectations for the Nikkei average. Their results are reported to subscribers by fax, but have not been published yet.

For the United States, there is the very long time series data, extending back to 1952, of Livingston, which is analyzed by DeBondt (1991). Livingston asked his panel of about 40 economists to forecast the Standard and Poor In-

FIGURE 2.—PRICE-EARNINGS RATIO OF TOKYO STOCK EXCHANGE 225 STOCKS, BASED ON RESULTS (SOLID LINE) AND BASED ON EXPECTATIONS (DASHED LINE), MONTHLY, SEPT. 1978 TO JUNE 1994



Source: Nikkei Shinbun.

² The Nikkei Shinbun price-earnings ratio based on expected earnings is a average across firms of price-earnings ratios, where the denominator of the ratio for each firm is expected earnings as reported by the firm itself. The horizon of these expectations differs across firms.

³ See *Wall Street Journal*, March 17, 1994.

⁴ Ueda (1992) expresses this view.

dex at horizons of seven and thirteen months. From the early eighties and until its bankruptcy, Drexel, Burnham Lambert tabulated the results of a few expectations questions about the stock market under the direction of Richard Hoey. For the past six years, Money Market Services, Inc. of New York has collected one-week and one-month expectations for the Dow Jones Industrial Average and for the Standard and Poor Composite Index. All of these are surveys of experts only, not intended to be surveys of market participants. The American Association of Individual Investors has been sending out for the past few years weekly postcard questionnaires to their members, inquiring about their opinion as to the outlook for the market. As far as we have been able to determine, existing surveys ask only a few questions about the market, and do not try to devise batteries of questions that get at the reasons for market behavioral patterns.

III. Our Surveys

We tabulate here responses in both Japan and the United States in a number of mail surveys we conducted from 1989 to 1994. We created a biannual series of answers; questionnaires were mailed roughly every six months. For the Japanese sample, we mailed to almost all of the major Japanese financial institutions, which consist of 165 banks, 46 insurance companies, 113 securities companies, and 45 investment trust companies.⁵ No non-financial corporations are included in the sample. The U.S. institutional investors were selected at random each time from the section "Investment Managers" from the *Money Market Directory of Pension Funds and their Investment Managers* (McGraw Hill). In each mailing, about 400 questionnaires were sent, yielding responses from about a third. Mailing dates in Japan were July 3, 1989 (1989-II), November 9, 1989 (end 1989), March 6, 1990 (1990-I), August 10, 1990, February 2, 1991, September 9, 1991, March 27, 1992, September 11, 1992, March 19, 1993, August 4, 1993 and February 28, 1994. First mailing dates in the United States were July 5, 1989, January 17, 1990, July 27, 1990, January 31, 1991, August 20, 1991, January 31, 1992, August 20, 1992, February 12, 1993, August 6, 1993, and February 28, 1994. In the United States, a second questionnaire and letter were sent out three weeks after the first mailing to those who had not responded yet.

In all but the 1989-II and 1990-I questionnaires, the first portions of the questionnaires, which included the questions reported here, were nearly identical both through time and across the two countries, except, of course, for translation into English or Japanese. The responses thus enable us to make accurate comparisons across countries and through time.

A. Questions about Expectations

We asked respondents to give forecasted changes in the Nikkei 225 (Nikkei Dow) and the Dow Jones Industrial Av-

⁵ These numbers vary slightly over time; the numbers given are for 1989-II and 1992-I surveys.

TABLE 1.—EXPECTATIONS QUESTIONS

A. Expectations for Japanese Economy				
Date	Nikkei 225 Index at Time of Survey	I-1 Japanese Expected One-Year Growth in Nikkei Index (%)	I-2 U.S. Expected One-Year Growth in Nikkei Index (%)	I-3 Japanese Ten-Year Expected Japanese Corporate Earnings (Annual Rate) (%)
1989-II	33631	9.49	-7.67	5.02
1989 end	35894	13.02	—	—
1990-I	32616	10.84	-9.14	—
1990-II	26490	8.22	-8.76	5.01
1991-I	24935	19.33	0.94	4.68
1991-II	23332	18.36	-2.52	4.25
1992-I	18436	20.85	0.33	3.95
1992-II	18066	27.69	6.47	4.65
1993-I	19048	14.08	3.22	4.76
1993-II	20322	15.85	1.02	3.64
1994-I	20091	16.27	1.34	3.70
Test of Time Constancy:		$F(10,1237)=$ 10.82 $p = 8.29 \times 10^{-18}$	$F(9,687)=$ 9.19 1.06×10^{-13}	$F(8,1045)=$ 6.19 7.87×10^{-8}
B. Expectations for United States Economy				
Date	Dow Jones Industrial Average at Time of Survey (DJIA)	I-1 Japanese Expected One-Year Growth in DJIA (%)	I-2 U.S. Expected One-Year Growth in DJIA (%)	I-3 U.S. 10-Year Expected Growth in U.S. Corporate Earnings (Annual Rate) (%)
1989-II	2554	8.48	3.49	5.57
1990-I	2553	12.57	-0.26	5.16
1990-II	2716	4.28	1.65	4.63
1991-I	2902	11.26	6.17	5.02
1991-II	3043	8.55	7.82	5.52
1992-I	3245	3.41	6.51	5.68
1992-II	3257	0.89	4.49	2.50
1993-I	3343	0.35	2.01	5.50
1993-II	3579	0.83	0.56	4.98
1994-I	3831	0.88	2.75	5.56
Test of Time Constancy:		$F(9,961)=$ 14.53 $p = 0.00$	$F(9,1154)=$ 4.65 4.53×10^{-6}	$F(9,1315)=$ 13.36 1.19×10^{-20}

Note: Index values are for close of first market day 10 or more days after first mailing date for questionnaire. *F*-statistics test null hypothesis that values are constant through time.

erage for horizons of 3 months, 6 months, 12 months, and 10 years. The question on the questionnaires was

I-1,2 "How much of a change in percentage terms do you expect in the following (use + before your number to indicate an expected increase, a - to indicate an expected decrease, leave blanks where you do not know): [FILL IN ONE NUMBER FOR EACH]"

After this question there were spaces to fill in the expectations for the various horizons and the two countries. The mean answers for the one-year horizon are shown in table 1; expectations in both countries for both countries are presented. The results confirm that the expectations do change through time both for the United States and Japan; the *F*-statistics (table 1) for the null hypothesis of constancy through time of expectations are all highly significant.

We also see in the answers to the table 1 questions confirmation that there are striking differences between U.S. and Japanese expectations, even for the same markets. The Japanese were uniformly more optimistic in their short-run expectations for the Japanese market than were the Americans. At a horizon of one year, there was usually a spread on the order of 20 percentage points between the Japanese and U.S. forecasts for the Japanese market; the spread was never less than 10 percentage points.⁶ There is a strong correlation between the U.S. and Japanese forecasts for the Nikkei, the correlation coefficient between the average answers for questions I-1 and I-2 for the Nikkei as shown in table 1 is 0.83. Respondents in both countries became relatively optimistic or pessimistic at about the same time, but there was always the enormous spread between their expectations.

What can we make of the stunning differences between the expectations in the two countries for the Nikkei? Investors on both sides of the Pacific Ocean have access to much of the same information, and they can talk to each other, they can listen to each others' pundits. Why should their expectations differ depending on which country is their home? Perhaps the difference has something to do with personal daily talk among investors or with some irrationality related to patriotism or wishful thinking; see Shiller (1995).

These remarkable differences in expectations between U.S. and Japanese respondents have some potential use in explaining other puzzles. Consider, for example, the puzzle posed by French and Poterba (1990), that there is very little cross-border stocks investment between the United States and Japan. Our results suggest a possibly simple explanation: investors in each country are relatively more optimistic about the stock market in their own country. For another example, consider the Feldstein-Horioka (1980) puzzle that aggregate investment in each country tends to be highly correlated with aggregate savings in that country; that people may be optimistic about their own country certainly must be

⁶ At a horizon of ten years, on the other hand, there was much less discrepancy between the Japanese and U.S. forecast for the Nikkei and in the most recent survey it was the U.S. respondents who were more optimistic about this long-run outlook for the Nikkei.

relevant to understanding that puzzle. More research could be done to establish the potential validity of such notions, if longer time series become available.

We also asked for expected long-term earnings growth rates. The question was:

I-3 "What do you think the rate of growth of real (inflation adjusted) corporate earnings will be on average in the US over the next 10 years?"

Annual percentage rate: _____ %"

The ten-year horizon was chosen as a proxy for the kind of long-term expectations for earnings growth that are thought to influence price-earnings ratios. Asking directly for long-term expectations represents a significant new departure. In studying the reasons for high Japanese price-earnings ratios, French and Poterba (1991), lacking our data, used forecasted ten-year growth rates for Japanese gross national product provided by a single forecasting company; our survey data are a much more direct measure of the relevant expectations.

We see a fairly steady decline since 1989-II in these long-run expected growth rates in Japan (table 1). Such a gradual decline, other things equal, might be expected to have produced a correspondingly gradual decline in price-earnings ratios in Japan.

It should be noted that many researchers feel that the expectations data collected by surveys such as these are by necessity inferior to expectations inferred or derived from market prices. Consider, for example, the expectations for future stock price index changes that can be inferred from prices in the stock index options markets. It is possible to infer from options prices not only implied variances of price changes but also implied skewness of subjective distributions of price changes. There are thus, in market prices, implicit expectations of the probabilities of a market decline. Thus, for example, Bates (1991) was able to analyze whether the stock market crash of 1987 was expected. One might think that these probabilities or market expectations are inherently better than probabilities or expectations that people write down on survey forms. People who will go so far as to take a position in an options market are likely to think more carefully about the probability of a crash; their judgment is considered rather than hasty. Moreover, the sample size, the number of people whose expectations have an impact on the implied volatility, is enormously greater with the implied volatilities than with the survey data. When dealing with an entire options market, then, the results may in fact be considered not a sample at all, but the universe for that market.

In fact, however, these arguments that the implied volatilities or other market-derived expectations data are the final word on actual public expectations disregard the fundamental sociological fact that the expectations that are relevant for market behavior diffuse across different subpopulations of the investing public at different rates, and that attention of certain subpopulations shifts from one market to others. Surely, the prices in the options markets reflect the consid-

ered opinions of all people who are currently trading in these markets, but these people are hardly, by any stretch of the imagination, a random sample of all people who might sell stocks at the time of crash. Suppose we are interested in a theory of a crash wherein a small price drop acts as a trigger for a stock market crash, so that people, fearing a crash, thereby produce the very crash they feared. With such a theory, we would generally expect that most of these people may never have given careful consideration to the probability of a crash, are not closely involved with options markets and many may even have inconsistent or wrong theories of these markets. We will not know what they are thinking unless we ask, and the opportunity is lost forever if we wait beyond the length of people's short-term memories, or until after a major event that changes their patterns of thinking.

B. Qualitative and Scenario Questions

Our qualitative and scenario questions were questions aimed to be more in the mode of thinking of individual market participants, worded in everyday language. The hope was to pose questions in such a way that the questions represent categories of thought already in many respondents' thinking, not questions that would be difficult to answer. Katona (1975) argued, based on years of survey research, that most people do not have expectations for economic variables, and are forced to construct the expectations when surveyors ask for their expectations. Asking for their expectations may be a useful exercise, but it may sometimes fail to reveal people's concerns and understandings. We want now to know how our respondents interpret market phenomena, not to try to construct forecasts for us. We are applying here to economics the basic concepts of interpretative social science (Rabinow and Sullivan (1979)), that stresses the importance in explaining human behavior of people's own interpretations of events.⁷

We asked, in questions II-1 and II-2, whether the market is overpriced, that is, high relative to fundamental value.

II-1. "Stock prices in Japan, when compared with measures of true fundamental value or sensible investment value are: 1. Too low. 2. Too high. 3. About right. 4. Do not know."

II-2. "Stock prices in the United States, when compared with measures of true fundamental value or sensible investment value, are: 1. Too low. 2. Too high. 3. About right. 4. Do not know."

These questions were included because we learned that the

concept of an overpriced market was very much on people's minds at the time of the stock market crash of October 1987. At the time of this crash, when investors in the United States and Japan were asked in a questionnaire survey to explain the cause of the crash in their own words, and the responses coded, the most important theme in their answers was that the market was overpriced (Shiller (1989), Shiller, Kon-Ya and Tsutsui (1991)).

Table 2 gives the proportion of respondents choosing answer 2 (too high) in each survey. We see here that the U.S. investors were consistently more likely to think that the market prices are too high, and were dramatically more likely to think this about the Japanese market. In 1989-II, 73.5% of U.S. respondents thought the Japanese market was overpriced, while only 26.6% of the Japanese did. Most Japanese became temporarily of the opinion that their market was too high right after the Japanese market had its spectacular 4.5% drop on February 26, 1990: the 1990-I survey of Japanese investors (before most of the dramatic downturn in the Nikkei had occurred) shows that 61.1% of them felt that the Japanese market was overpriced. But in 1990-II, a comparison of the United States and Japanese responses after most of the enormous decline in the Tokyo stock market and after the Iraqi oil crisis shows a return to nearly the same pattern as in 1989-II, with Americans strongly tending to think that the Japanese market is overpriced and the Japanese respondents again dramatically less likely to think so.

A common element in the popular notion of a speculative bubble is that during the expansion phase, or bull market, increasing numbers of investors are buying stocks because they think that prices will go up for a while longer, and hope to exit before the bubble bursts. Conversely, a bear market may be caused by increasing numbers of investors who think that the market will continue to go down for a while, and who are waiting for the recovery to enter the market. It is not obvious how to prove whether our respondents are thinking this way. The questions discussed in the preceding section about expectations at various horizons might reveal such thinking if the horizons asked about match-up with the dates at which the market is expected to turn, but we will probably not be so lucky as to choose the right horizons to ask about. We cannot ask for expectations at all horizons without exhausting respondents. Moreover, when asked to forecast the stock price index at a number of horizons, respondents may not even register their opinions about market dynamics: it may be too hard for them to translate their opinions into numbers. People may give us conventional or safe forecasts, even if they are themselves invested in thinking about market turns. People may have complicated vague impressions about the outlook for the market, even impressions that put them into two minds about the market, so that they may give different-sounding answers to similar questions that are posed differently.

A more interpretive method for deriving evidence on this speculative behavior can be had by asking whether respon-

⁷This is the first step that Sternberg (1987), in his proposed methodology for implicit theories research, called "behavioral listings." He, of course, expects his method to be applied to subjects in a psychology laboratory, not to the world financial markets; it is easier for psychologists to obtain large enough quantities of data to make a rapid transition to his second step of "prototypical analysis," where the popular theories and models are fleshed out.

TABLE 2.—QUALITATIVE AND SCENARIO QUESTIONS

Date	Stock Price Index	II-1 (2) Stock Prices Too High Japan (%)	II-2 (2) Stock Prices Too High U.S. (%)	II-3 (1) Advise Stocks Now Despite Expected Drop (%)	II-4 (1) Advise Against Stocks Despite Expected Rise (%)	II-5 (1) See Excitement about Stocks (%)	II-6 (2) Trend Last 6 Months Was Speculative (%)	II-7 (1) If Prices Dropped 3% Would Expect Rise Next Day (%)	II-8 Probability of Crash Next 6 Months (%)
A. Answers from Japanese Respondents									
1989-II	33631	26.6	0.0	39.1	23.7	37.2	14.9	42.8	14.6
1989 end	35894	32.1	9.4	—	—	—	—	—	13.7
1990-I	32616	61.1	0.8	—	—	—	—	—	—
1990-II	26490	21.3	11.1	7.3	55.3	41.3	38.2	29.1	31.7
1991-I	24935	16.8	10.4	9.8	35.8	34.4	26.4	28.1	18.6
1991-II	23332	13.9	19.2	14.0	23.1	23.7	25.4	39.7	19.7
1992-I	18436	22.5	36.6	7.0	62.0	28.7	22.5	20.8	28.1
1992-II	18066	11.7	32.4	11.2	39.4	25.0	33.3	22.5	27.9
1993-I	19048	33.3	31.0	15.5	23.6	41.9	24.3	39.1	20.1
1993-II	20322	38.5	33.9	17.6	18.4	30.0	16.9	37.2	17.4
1994-I	20091	30.4	33.5	19.3	20.3	27.7	14.6	33.8	15.8
Test Time Constancy:		$\chi^2(10)=$ 118.2 $p = 1.16 \times 10^{-20}$	$\chi^2(10)=$ 167.8 7.75×10^{-31}	$\chi^2(8)=$ 73.5 9.96×10^{-13}	$\chi^2(8)=$ 112.8 1.01×10^{-20}	$\chi^2(8)=$ 21.7 5.41×10^{-3}	$\chi^2(8)=$ 40.13 3.02×10^{-6}	$\chi^2(8)=$ 26.19 9.75×10^{-4}	$F(9,1322)=$ 8.35 3.38×10^{-12}
B. Answers from United States Respondents									
1989-II	2554	73.5	18.7	34.4	24.6	55.5	19.1	33.3	14.9
1990-I	2553	81.0	37.9	16.0	86.3	41.1	41.2	34.8	22.0
1990-II	2716	82.6	39.2	11.1	53.7	43.5	36.9	18.6	23.7
1991-I	2902	67.2	35.4	26.4	34.7	54.8	36.9	22.9	17.3
1991-II	3043	71.0	47.1	17.6	38.4	44.1	21.1	36.2	14.4
1992-I	3245	65.9	46.6	19.2	32.3	48.3	14.8	37.9	19.6
1992-II	3257	54.8	44.4	12.3	44.9	45.9	18.1	31.4	19.7
1993-I	3343	55.7	42.1	27.5	32.8	54.1	18.8	29.5	20.3
1993-II	3579	55.2	42.5	30.7	22.0	45.2	13.2	37.0	20.8
1994-I	3831	55.9	42.4	19.2	42.7	50.8	21.0	33.6	16.2
Test Time Constancy:		$\chi^2(9)=$ 61.59 $p = 6.61 \times 10^{-10}$	$\chi^2(9)=$ 38.33 1.52×10^{-5}	$\chi^2(9)=$ 45.35 7.95×10^{-7}	$\chi^2(9)=$ 170.14 5.76×10^{-7}	$\chi^2(9)=$ 13.37 0.15	$\chi^2(9)=$ 72.06 6.00×10^{-12}	$\chi^2(9)=$ 23.14 5.90×10^{-3}	$F(9,1393)=$ 3.38 4.14×10^{-4}

dents would advise staying in the market for the time being, even though they expect the market to drop, and conversely. Without specifying the horizon of the associated forecasts, we allow the respondent to reveal directly whether he or she is thinking in terms of short-term speculative advantage. Respondents were asked about their own countries, questions II-3 and II-4:

II-3 “Although I expect a substantial drop in stock prices in [the US, Japan] ultimately, I advise being relatively heavily invested in stocks for the time being because I think that prices are likely to rise for a while. 1.

True 2. False 3. No Opinion”

II-4 “Although I expect a substantial rise in stock prices in [the US, Japan] ultimately, I advise being less invested in stocks for the time being because I think that prices are likely to drop for a while.

1. True 2. False 3. No Opinion”

These questions, in contrast to the expectations questions displayed above, are directly connected with investing strategy, and the stress on investing strategy in these questions may call forth a different type of expectation. These ques-

tions have been criticized as too long and too complicated; when a respondent answers "False" to II-3 we do not know whether a decline is not expected or whether a decline is expected but stocks are not thought likely to rise for a while. People who criticize our questions along these lines seem to be assuming that the question is designed to elicit well-defined expectations, while in fact the question is designed to discover whether respondents are familiar with a sort of popular theory. We worked a great deal on the wording of this question, but could not find a better way to ask respondents about their bubble-enforcing attitudes. (We did ask them too about the date of the presumed peak or trough in the market, to allow them more precision in answering.)

The proportions choosing answer 1 are shown in table 2. It is striking that quite often most of both the U.S. and Japanese respondents answered "true" to one of questions II-3 or II-4. Thus, in a sense, most of our investors appear to be either relatively in the market hoping to get out before it drops or relatively out of the market hoping to get in before it rises, suggesting that the market is indeed a very "bubbly" place. The answers also reveal that strategies differed very much among investors; suggesting the importance of thinking about heterogeneity among investors. Of course, the tendency to answer "true" may be exaggerated by selection bias: those who have striking views about the outlook for the market may be more likely to fill out our questionnaire.

In the answers to these questions, we do see a change in the behavior of Japanese investors before and after the debacle in Japanese stock prices. Between 1989-II and 1990-II, when most of the Nikkei crash occurred, we see dramatic changes in the Japanese answers to these equations; there was substantially less evidence of a positive bubble mentality, as indicated by fewer "True" answers to II-3 later. This evidence is consistent with the notion that the Japanese stock market debacle might have been caused by changed *short-run* expectations for prices.

Question II-5 was directed at learning directly about a concomitant of the kinds of speculative booms that were widely reported about the booms preceding the 1929 crash and other booms: just that people seemed to be very excited about stock market investing:

II-5 "Many people are showing a great deal of excitement and optimism about the prospects for the stock market in the [United States, Japan] and I must be careful not to be influenced by them. 1. True. 2. False. 3. No opinion."

That people were getting excited about investing is so much a part of the story people tell of these booms; if people are getting excited, one might think they would know it and could report it to us. The proportions of respondents who answered "True" about their own country are shown in table 2. Time variation shows no clear relation in Japan to the Nikkei crash; moreover, our rejections of the null hypotheses that the proportions are constant through time are least

significant for this question, when compared with all other questions we report here (see the χ^2 statistics in table 2). Of course, the lack of relation of this answer to the Nikkei crash and lack of statistical significance may be because of the words "I must be careful not to be influenced by them." Some respondents may have answered "false" even when they agree with the former part of the question because they do not agree with the later part.

Question II-6 asked respondents whether the trend in stock prices over the past six months was due to fundamentals or to investor psychology:

II-6 "What do you think is the cause of the trend of stock prices in [the United States, Japan] in the past six months? 1. It properly reflects the fundamentals of the U.S. economy and firms. 2. It is based on speculative thinking among investors or overreaction to current news. 3. Other 4. No opinion."

Respondents were asked about their own countries only. The proportions choosing response 2 in each country are given in table 2. In Japan, the proportion selecting answer 2 was relatively high from 1990-II to 1993-I. This period corresponds approximately to the high proportion of the answers "too low" in question II-1 above in Japan. Thus, it is suggested that they think that the Nikkei became too low because of speculative thinking among the investing public in this period. In Japan, the percentage who chose, for II-6, answer 1 (fundamentals) was higher than the percentage who chose answer 2 (speculative thinking) at all times except for 1990-II, the time of the most rapid decline in the Nikkei shown in the tables. We should note that, based on our experience, investors seem to put much more importance on psychology when asked to explain big moves in short periods of time. Just after the biggest one-day stock market crash in history, October 19, 1987, 64% of U.S. institutional investors (and 68% of U.S. individual investors) (Shiller (1989)) and 73% of Japanese institutional investors (Shiller, Kon-Ya and Tsustui, (1991)) thought that the crash was due to investor psychology. Just after the 6.9% one-day drop in the Dow Jones Industrial Average on October 13, 1989, 77% of U.S. investment professionals⁸ and 83% of Japanese institutional investors chose psychology as an explanation for the drop.

Question II-7 was phrased to get at a possibly time-varying parameter in a feedback mechanism that feeds past price movements into current changes in demand and hence into price movements, by asking how a past price change affects people's expectations for the future:

II-7 "If the [Dow, Nikkei] dropped 3% tomorrow, I would guess that the day after tomorrow the Dow would: 1. Increase. 2. Decrease. 3. Stay the same. 4. No opinion."

⁸See Robert Shiller and William Feltus, "Fear of a Crash Caused the Crash," *New York Times*, October 29, 1989.

Table 2 shows the proportion in each country who chose "Increase;" respondents were asked about their own country only. We note the striking fact that the proportion expecting an increase was highest in Japan in 1989-II, right before the peak in the market.

Stock market crashes are often thought to be caused by a feedback mechanism, as initial price decreases engender pessimistic expectations and hence more price decreases, but if we hold such a theory we must explain why the feedback is not causing crashes every day. We would have an explanation if we understood how response patterns change through time. Changes in response patterns to price changes may be documented by changes in answers to this question. Our statistics show less significance in this sample than was the case with most of the other questions, but time variation in the proportion expecting to increase after an initial decrease was significant at conventional levels. This suggests that it may be useful to continue collecting such data. Of course, much more research is needed to know how to interpret such feedback mechanisms. Further survey work should inquire about other technical theories and trading rules (such as those concerning resistance levels, moving averages, etc.) to see how feedback might change through time.

Question II-8 asks respondents for their subjective probability of a stock market crash:

II-8 "What do you think is the probability of a catastrophic stock market crash, like that of October 28, 1929 or October 19, 1987, in the next six months? (An answer of 0% means that it cannot happen, an answer of 100% means it is sure to happen.) Probability: _____ %"

Such subjective probabilities have obvious relevance to any theories that stock market crashes are caused by fears of crashes. Fear of a crash was at its highest (see table 2) in Japan in our survey immediately after the most precipitous drop in the Nikkei, 1990-II. This fact seems to be consistent with the notion that the Japanese investors think the Nikkei became too low by speculative thinking in these periods, as argued above.

Time variation in the answers to all questions except II-5 is highly significant in both countries. There is even highly significant time variation in both countries in answers to question II-8 about the risk of a sudden crash in this sample period when there was no important one-day stock market crash.

IV. Why Did the Nikkei Crash?

Our objective here was partly to illustrate a methodology that might allow us to understand events like the Nikkei crash, and to demonstrate the variability through time of the expectations and other parameters we assessed. Our surveys cannot be expected to provide a complete understanding of the causes of the crash in the Nikkei. A complete under-

standing cannot be obtained without first explaining such mysteries as the cause of the run-up of the Nikkei before 1989, or the Japanese tendency for very high (by world standards) price-earnings ratios; our surveys were not designed to elucidate such matters. Nor do our surveys enable us to evaluate the ultimate reasons why expectations and attitudes changed through time, or the role in these changes of all of the factors the media have stressed in connection with the crash, such things as expectations of the recession that depressed Japanese corporate earnings after the crash in the Nikkei, the increasing value of the yen, and policy actions of the Bank of Japan and the Ministry of Finance.

But our results do give us information about the kinds of changes in expectations that were associated with the crash in the Nikkei. We found that Japanese expectations for long-run earnings growth (question I-3, table 1) in Japan became gradually less optimistic over the period 1989 to 1994. The earnings growth expectations did *not* surge up in response to the decline in actual Japanese earnings after 1990, which suggests that our respondents did not view the decline in earnings as temporary. We did not directly ask whether respondents viewed the decline in earnings as temporary, and so it is hard to say what they were thinking on this matter when answering a question about long-run earnings growth; they may not have given long-run earnings growth from the low current base of earnings.⁹ Still, our results may be regarded as consistent with the notion that the overall drop in the Nikkei, the drop between the peak of the market at the end of 1989 and today, might well be viewed as nothing more than a response to the decline in earnings that was viewed as essentially permanent. The simplest story of the Nikkei crash is that it is just another example of a market's overreaction to earnings: it has been documented before for the United States that much of the volatility of stock prices has this form, as if people often fail to see that earnings movements may be transient, and do not expect them to be in any sense mean reverting (see Shiller (1989) Barsky and De Long (1993)).

Still, the rough story of prices overreacting to earnings does not explain everything. The earnings expectations data do not help us to explain the relatively sudden initial crash of the Nikkei itself, the crash that occurred between the peak of the market in 1989 and the end of 1990. What changed rather suddenly and strikingly at the time of the crash were speculative attitudes, attitudes towards price movements, not earnings growth or expectations of earnings growth.

The initial crash in the Nikkei between 1989-II and 1990-II was accompanied by substantial changes in speculative factors as documented in our questions. Questions II-3 and II-4 (table 2) show marked changes between 1989-II and

⁹In our 1994-II Japanese survey, conducted after this paper was written, we asked for three-year expectations in addition to the ten-year expectations in question I-3. The average annual expected real earnings growth was 7.57% over the next three years, versus 3.88% over the next ten years. This suggests that part of the earnings decline was thought of as temporary, to be reversed in a relatively short period.

1990-II in opinions about whether it is advisable to buy for the short run. In 1989-II we saw the greatest proportion ever, 39.1%, of Japanese who thought that this was a time when it was advisable to buy only for the short run; one year later this proportion had dropped to 7.3%. Over the same interval, the proportion who advised against stocks in the short run despite an expected rise went up from 23.7% to 55.3%. These changes in response to questions about short-run speculation are important evidence for a speculative element in the Nikkei crash.

Just before the crash of the Nikkei, in 1989-II, we see in answers to II-7 the highest proportion ever, 42.8%, of Japanese who thought that if prices dropped 3% in one day then the market would rise the next day. This impression of stability for the market may have encouraged the high prices that the Nikkei reached just before the crash. By early 1992, this proportion had fallen in half, to 20.8%. The relative lack of confidence in the resiliency of the market would seem to encourage downward feedback loops, where price declines encourage further price declines, and such loops may well have been part of the decline in the market.¹⁰

There was a sudden, sharp, upspike in 1990-I, just before the biggest one-semester decline in the Nikkei in our sample, in the proportion of Japanese respondents who thought that the market was too high (question II-1, table 2). In 1990-II, the date of the questionnaire immediately after the biggest six-month decline in the Nikkei, the highest proportion ever reported that they thought the trend in the last six months was speculative (question II-6, table 2).

These results paint a picture of a speculation-induced initial crash, from 1989 to 1990, in Japan. Still, the picture is not entirely clear. We do not know to what extent it was information of some sort about future earnings that stimulated the initial crash; the information may have prompted changes in expectations for the behavior of the market even though there were little changes in expected earnings growth. We also cannot yet understand why answers to certain of our questions showed little relation to the crash.

One fact that tempers our willingness to interpret the Japanese results in relation to the Nikkei crash is that when one looks at U.S. data for the same time period, there are sometimes important changes in answers to questions, even though the U.S. market did not crash. For example, responses to questions II-3 and II-4 showed just as dramatic movements in the U.S. as they did in Japan between 1989-II and 1990-II, even though the United States market expe-

rience was relatively uneventful. This result should help clarify why it is important to collect parallel time series in different countries.

On the other hand, it is in the comparisons with the United States that we see the most striking evidence that something crudely speculative was at work in driving the Nikkei. It is hard to imagine how we can reconcile the fact that those in Japan usually thought that the Nikkei would rise in the next year about 20% more than those in the United States thought it would with any rational expectations model of the stock market. *Somebody* was exhibiting bad judgment if opinions differed so strikingly depending on where one sits.

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¹⁰For a discussion of the theory of feedback loops in price changes, and the implication of such theory for the serial correlation properties of price changes, see Shiller (1990).