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Can analyst predict stock market crashes?

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Abstract

The frequency of financial market turmoil has been rising over the past two decades. While the incidence of market turmoil has increased, the performance of analysts during tumultuous times has not received much attention in the literature. This paper examines whether the accuracy of analyst forecasts on stock returns varies during tumultuous times. Our results indicate that analysts' forecast performance during stock market crashes drops significantly.

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1. Introduction

Prior studies on analysts' forecasts mainly focus on the association between analyst forecast dispersion (AFD) and security returns (Miller, 1977) under normal market conditions. Chen et al. (2002) incorporate AFD into the Fama-French model (Fama and French 1992, 1993, and 1996) and find evidence that stocks with higher AFD earn significantly lower future returns than otherwise similar stocks. Diether et al. (2002) argue that the dispersion in analysts' forecasts cannot be used as a proxy for risk. Sadka et al. (2007) find that analysts tend to agree with each other in bull markets, but diverge in opinions in bear markets.[2] Thus far, studies on the analyst forecast performance during market crashes are very limited. This paper examines the quality of analysts' forecasts surrounding stock market crashes in the U.S.. Our results indicate that analysts produce inaccurate forecasts during the tumultuous times. The remaining of this paper is structured as follows. Section 2 presents the data and methodology. Section 3 examines the performance of analyst forecasts issued in different periods. Section 4 concludes the paper.

2. Data and Methodology

Our data are obtained from the Institutional Brokers Estimate System (I/B/E/S), the Center for Research in Security Prices (CRSP), and Standard and Poor's Compustat datasets. The I/B/E/S Detail History File contains individual analyst's estimates from more than 200 brokerage houses and 2000 analysts, and the I/B/E/S Summary History File consists of chronological snapshots of consensus level data taken from the I/B/E/S Detail History File[3] on a monthly basis.

In this paper, we modify the Bry and Boschan (1971) algorithm (BB) and use the magnitude of the drop of stock prices in the initial phase to identify stock market crashes.[4] The BB algorithm suggests that, for any stock index, there is a peak at t if

$$P_t = \max\{ P_{t-6}, \ldots, P_{t-1}, P_t , P_{t+1}, \ldots, P_{t+6}\},$$

and there is a trough at t if

$$P_t = \min\{ P_{t-6}, \ldots, P_{t-1}, P_t , P_{t+1}, \ldots, P_{t+6}\},$$

[2] Other studies on analysts' forecasts include Easton and Sommers (2007), Bushman et al. (2005), Johnson (2004) and Ajinkya and Gift (1985).

[3] Since the I/B/E/S Detail History File provides a better coverage of published estimates in the history, in Section 3 we use the I/B/E/S Detail History File to examine the analyst forecast error before stock market crashes.

[4] Bry and Boschan (1971) use a nonparametric approach to partition a time series into two half cycles. Pagan and Sossounov (2003) adopt the Bry-Boschan (BB) algorithm to define the bull-bear cycles of the market. See also Chong et al. (2011).

where P_t denotes the value of the stock index at day t. After identifying the peaks and troughs, we impose the following criterion to determine whether it is a market crash.

Criterion 1 All the three indices fall by more than 30% during the crashes.

Under Criterion 1, two crashes are identified in our sample, namely, the 1987 stock market crash and the tech-bubble burst in 2000-2002. The Asian Financial Crisis in 1997-1998 has a relatively minor impact on the U.S. stock market (all the indices drop by less than 20%). Thus, it is excluded from our analysis. After identifying the two stock market crashes, Criterion 2 is applied to determine the starting and ending dates of the crash periods.

Criterion 2 **a.** At the beginning of a crash, at least two of the indices reach a two-year high, and at least two of them fall by more than 15% in the following two months.
b. At the end of a crash, at least two of the indices reach a two-year low, and at least two of them rise by more than 15% in the following two months.

Criterion 2 imposes condition on the acuteness of index fluctuation on the starting and ending dates of the crash. The results are reported in Table 1.

Table 1: Identification of stock market crashes

	DJ		Nasdaq		SP500	
	Starting	Ending	Starting	Ending	Starting	Ending
1987 crash	1987.8.17	1987.11.30	1987.8.17	1987.11.30	1987.8.17	1987.11.30
Index	2709.5	1766.74	421.15	260.87	335.9	223.92
Peak/Trough	Yes	Yes	No	Yes	Yes	Yes
% Fall(-)/Rise in 2 months	-28.00	10.84	-30.95	22.00	-26.11	15.80
Duration	3.5 month		3.5 months		3.5 months	
% Index change in total	-34.79		-38.06		-33.33	
00-02 tech-bubble burst	2000.3.20	2002.9.30	2000.3.20	2002.9.30	2000.3.20	2002.9.30
Index	11112.72	7528.4	4691.61	815.4	1527.46	800.58
Peak/Trough	No	Yes	Yes	Yes	Yes	Yes
% Fall(-)/Rise in 2 months	-7.32	18.17	-33.89	36.93	-19.70	17.00
Duration	2.5 years		2.5 years		2.5 years	
% Index change in total	-32.25		-82.62		-47.59	

Note: The benchmark for stock market crashes is set to be a 30% drop for all three indices. The starting and ending dates for the crashes are determined by Criterion 2, which states that at least two of the indices reach a two-year peak (or trough), and fall (or rise) more than 15% in the following 2 months.

Note from Table 1 that the duration of the 1987 stock market crash is only three and a half months, while the tech-bubble burst lasts for two and a half years. The starting and ending dates of the two crashes are uniquely identified. Note also that the Nasdaq is more volatile than the other two indices during the tech-bubble burst.

3. Analyst Forecast Accuracy

In our sample, we exclude firms that do not report their earnings in U.S. dollar. 0.72% of the observations are removed accordingly. Moreover, in order to evaluate analyst forecast accuracy in the short run, we drop long-run estimates whose report date exceeds one year from the estimation date. About 40% of the observations are dropped. In addition, observations that have missing values for the actual EPS or estimated EPS (which account for only 1.66% of the dataset), and observations whose estimation date is beyond the forecast end date (mostly fiscal yearend) are also discarded.[5] Finally, we drop 0.67% of the observations whose actual EPS or estimated EPS is smaller than 0.01.[6] In summary, except for the exclusion of the long-run estimates, the accumulative percentage of the observations deleted from the original Detail History File is only 3.86%. We define the analyst forecast error (AFE) as

$$\text{AFE} = \frac{|\, EstimatedEPS - ActualEPS \,|}{|\, ActualEPS \,|}.$$

We examine the quality of forecasts issued before the crashes for groups with different duration between the estimation date and the forecast end date. The average AFE is computed within each group. For the two market crashes identified in Section 2, Table 2 and Table 3 report the summary statistics of the average AFE of the forecasts issued three months before the crashes, during the crashes, and for the windows that cover the crashes. For the 1987 stock market crash, our window is from August 1986 to the end of 1988. The duration is 29 months. For the tech-bubble burst, the window covers the 60-month period from the 1999 to the 2003. The average AFEs are derived from grouping the duration between the estimation date and the forecast end date. For example, for the “Distance 1, 3 m Before” group, we include all

[5] This case is rare (which accounts for only 0.81% of the whole sample), but the deletion of such observations is necessary, because many U.S. companies issue their earning reports several months after the fiscal yearend, during which analysts may release revisions of their previous forecasts based upon the information disclosed near the fiscal yearend. Given that the fiscal year has passed and analysts may hold substantive information in this period, it is inappropriate to compare these forecasts with those made before the fiscal yearend. Under this consideration, we only use estimates made before the fiscal yearend.

[6] Most of these EPS values belong to companies that have experienced large stock splits before the report date. In the case where a company is involved in a large stock split, I/B/E/S will report both the actual EPS and estimated EPS as zero, and it is not possible to obtain forecast errors for these observations.

estimates issued in month 1, 2, and 3 before the crash begins, and their forecast end dates should be in month 2, 3, and 4, respectively. The average AFE is then calculated as the simple average of all these qualified estimates for this group.

Table 2: Summary Statistics of the Average AFE by Grouping the Duration between the Estimation date and the Forecast End Date (1986.8 - 1988.12)

Distance	Statistics	Window	3 m Before	During the Crash
0	Mean (%)	0.685	0.372	0.676
	Std. Dev.	5.737	0.838	2.406
1	Mean (%)	0.593	0.601	0.799
	Std. Dev.	3.662	3.076	5.600
2	Mean (%)	0.530	0.578	0.782
	Std. Dev.	3.759	1.923	7.187
3	Mean (%)	0.777	0.761	0.921
	Std. Dev.	5.462	2.022	8.560
4	Mean (%)	0.777	0.910	0.903
	Std. Dev.	4.600	2.035	5.589
5	Mean (%)	0.803	1.101	0.708
	Std. Dev.	5.208	7.862	2.118
6	Mean (%)	1.185	1.642	0.837
	Std. Dev.	7.918	11.123	2.390
7	Mean (%)	1.191	1.859	0.796
	Std. Dev.	9.578	16.047	2.134
8	Mean (%)	1.158	0.940	0.942
	Std. Dev.	9.061	2.873	3.342
9	Mean (%)	1.169	1.035	0.964
	Std. Dev.	7.692	2.336	2.357
10	Mean (%)	1.144	0.786	0.745
	Std. Dev.	8.101	1.457	2.261
11	Mean (%)	1.197	0.594	1.428
	Std. Dev.	9.642	1.517	5.563
12	Mean (%)	1.284	0.990	1.066
	Std. Dev.	7.740	2.439	4.560

Table 3: Summary Statistics of the Average AFE by Grouping the Duration between the Estimation date and the Forecast End Date (1999.1 - 2003.12)

Distance	Statistics	Window	3 m Before	During the Crash
0	Mean (%)	0.189	0.275	0.176
	Std. Dev.	0.875	1.028	0.739
1	Mean (%)	0.214	0.154	0.220
	Std. Dev.	1.341	0.435	1.489
2	Mean (%)	0.203	0.211	0.214
	Std. Dev.	0.949	0.538	0.936
3	Mean (%)	0.280	0.223	0.317
	Std. Dev.	1.123	0.428	1.131
4	Mean (%)	0.386	0.292	0.446
	Std. Dev.	2.323	0.889	2.989
5	Mean (%)	0.391	0.345	0.438
	Std. Dev.	1.625	1.246	1.770
6	Mean (%)	0.552	0.701	0.626
	Std. Dev.	2.184	2.867	2.345
7	Mean (%)	0.644	1.137	0.769
	Std. Dev.	2.435	4.025	2.945
8	Mean (%)	0.624	0.904	0.710
	Std. Dev.	2.394	3.360	2.636
9	Mean (%)	0.758	0.655	0.918
	Std. Dev.	2.924	2.542	3.482
10	Mean (%)	0.894	0.776	1.149
	Std. Dev.	3.000	3.011	3.715
11	Mean (%)	0.818	0.838	1.056
	Std. Dev.	3.365	3.849	4.244
12	Mean (%)	0.716	0.289	0.889
	Std. Dev.	3.224	0.896	1.729

Note from Tables 2 and 3 that analysts generally issue low-quality earning forecasts during a crash when the estimation date is close to the forecast end date (0-4 month-distance groups), and when the estimation date is over eight months prior to the forecast end date (9-12 month distance groups). This is especially the case in the 2000-2002's TBB (for most distance groups), and in the 0-4 month-distance groups for the 1987's case.

Since the impacts of the 1987 crash are largely reflected in the actual earnings released at the yearend of 1987 and in the early months of 1988, we also investigate analysts' forecast quality based on estimates made three months before the crash, with the duration between the estimation date and forecast end date of five to seven months. For these groups, Table 2 shows that analysts' performance three months before the crash is poor. Both the mean values and the standard deviations of the AFEs of the forecasts issued three months before the crash are considerably higher compared with

the other groups. Comparing the AFE between the two crashes in Tables 2 and 3, it is found that analysts provide much better forecasts in 2000 than in 1987.

Next, we recalculate the AFEs in Table 2 using primary estimates only. Diluted EPS estimates from companies that have experienced stock splits between the estimation date and the actual EPS report date are excluded. As a result, 20.40% of the observations are removed from the 1987 sub-sample and 99.56% of the observations are removed from the 2000-2002 sub-sample. Since more than 99% of the observations from the 2000-2002 sub-sample are deleted, we do not analyze this subsample here. The results are reported in Table 4.

Table 4: Summary Statistics of the Average AFE by Grouping the Duration between the Estimation date and the Forecast End Date and Using Primary Estimates Only (1986.8 - 1988.12)

Distance	Statistics	Window	3 m before	During the crash
0	Mean (%)	0.833	0.349	0.871
	Std. Dev.	6.840	0.768	2.791
1	Mean (%)	0.749	0.956	1.152
	Std. Dev.	5.464	5.014	9.020
2	Mean (%)	0.754	0.765	1.065
	Std. Dev.	6.036	3.640	9.055
3	Mean (%)	1.096	1.160	1.573
	Std. Dev.	8.038	5.629	12.600
4	Mean (%)	1.143	0.902	1.496
	Std. Dev.	7.490	2.185	10.038
5	Mean (%)	1.202	1.981	0.768
	Std. Dev.	9.200	15.02	2.225
6	Mean (%)	1.980	3.096	0.830
	Std. Dev.	15.850	2.977	2.190
7	Mean (%)	1.878	3.228	0.889
	Std. Dev.	16.366	27.467	2.693
8	Mean (%)	1.753	0.975	1.007
	Std. Dev.	14.547	2.859	3.709
9	Mean (%)	1.842	1.116	1.026
	Std. Dev.	17.565	2.470	2.866
10	Mean (%)	2.085	0.776	0.887
	Std. Dev.	18.994	1.201	2.822
11	Mean (%)	2.132	0.699	1.531
	Std. Dev.	17.459	2.325	5.559
12	Mean (%)	1.695	1.040	1.138
	Std. Dev.	13.417	2.589	5.197

Table 4 shows that the performance of forecasts three months before the crash is poor for distance groups of five to seven months, as reflected by a sudden increase in the mean values and the variances.

4. Conclusion

Most of the existing studies examining the analyst forecast performance do not take the underlying market conditions into account. While financial markets have become more volatile in recent years, it is important to examine the performance of analysts' forecasts surrounding stock market crashes in depth. This paper investigates the performance of analysts' forecasts issued surrounding the 1987 stock market crash and the tech-bubble burst in 2000-2002. It is found that the performance of analysts has slightly improved over time. However, it is generally observed that analysts issue poor-quality earning forecasts during market turmoil, especially when the estimation date is close to the forecast end date, or when it is over eight months prior to the forecast end date.

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