Managing the Man Overboard Moment

Making an Informed Decision After a Large Price Drop

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- A key part of successful investing is the ability to keep emotions in check in the face of adversity.

- A particularly challenging situation is when a stock in your portfolio drops sharply, an event that precipitates what has been called a "man overboard" moment.

- This report provides analytical guidance if one of your stocks declines 10 percent or more, relative to the S&P 500 Index, in one day. Such drops tend to evoke strong emotional reactions and make sound decision-making difficult.

- We provide the base rates for more than 5,400 such events in the past quarter century. We refine the base rates by separating earnings announcements from non-earnings announcements and by introducing factors including momentum, valuation, and quality.

- We provide a checklist to guide you as you decide whether to buy, hold, or sell the stock.

Introduction

A key part of successful investing is the ability to keep emotions in check in the face of adversity. One example, the focus of this report, is when one of the stocks in your portfolio drops sharply. If you are the portfolio manager, you might feel frustrated, upset about the hit to returns, and worried about the business implications. If you are the analyst, you might feel anger, disappointment, and shame. None of those feelings are conducive to good decision making.

This kind of event precipitates what has been called a "man overboard" moment.[1] These moments demand immediate attention, are stressful, and require swift action. In an investment firm it is common for a number of professionals to stop what they are doing in order to discern a suitable course of action.

The use of a checklist is one approach to making good decisions under pressure. In his superb book, *The Checklist Manifesto*, Dr. Atul Gawande describes two types of checklists.[2] The first is called DO-CONFIRM. Here you do your job from memory but pause periodically to make sure that you have done everything you're supposed to do. The second is called READ-DO. Here, you simply read the checklist and do what it says. READ-DO checklists are particularly helpful in stressful situations because they prevent you from being overcome by emotion as you decide how to act.

You can think of your emotional state and the ability to make good decisions as sitting on opposite sides of a seesaw. If your state of emotional arousal is high, your capacity to decide well is low. A checklist helps take out the emotion and moves you toward a proper choice. It also keeps you from succumbing to decision paralysis. A psychologist studying emergency checklists in aviation said the goal is to "minimize the need for a lot of effortful analysis when time may be limited and workload is high."[3]

The goal of this report is to provide you with analytical guidance if one of your stocks declines 10 percent or more, relative to the S&P 500, in one day. More directly, we want to answer the question of whether you should buy, hold, or sell the stock following one of these big down moves.

Exhibit 1 shows the number of such observations from January 1990 through mid-2014. There were more than 5,400 occurrences in all, with clusters around the deflating of the dot-com bubble in the early 2000s and the financial crisis in 2008-2009. The bubble periods contain about 40 percent of the observations. These sharp drops happen frequently enough that they deserve a thoughtful process to deal with them but infrequently enough that few investment firms have developed such a process.

Exhibit 1: Number of Observations of 10%+ Relative Stock Price Declines, January 1990-June 2014
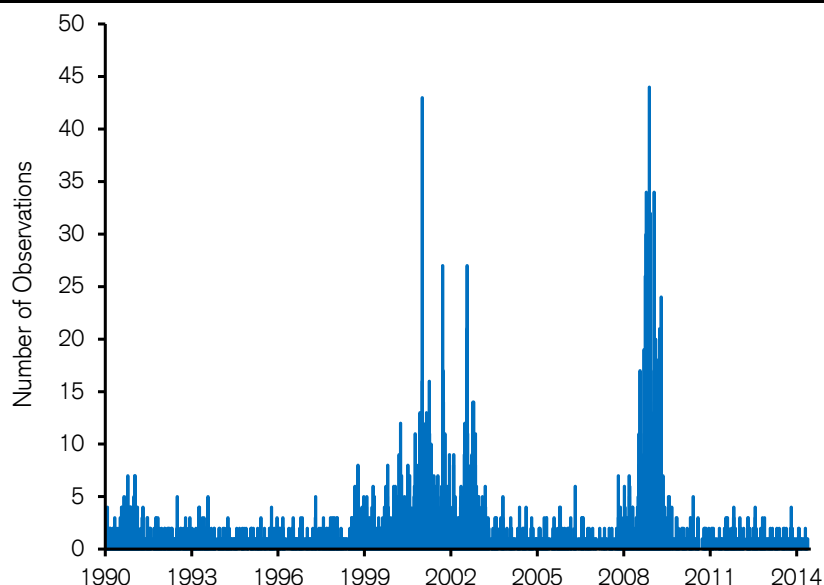
Source: Credit Suisse HOLT.

Structure of the Analysis

There are two broad approaches to making a decision. You can rely on the specific circumstances of a particular situation as well as your own experience. This is known as the inside view. Or you can examine a larger reference class to understand the base rates. This is known as the outside view.[4]

For example, if you are forecasting the returns for the stock market in the next year you can use the inside view to come up with an estimate based on current valuation, sentiment, and your own gut feel. Or you can use the outside view and examine how the stock market has done over the years. Both the inside and outside view are useful, and there is a specific way to combine the two to allow for an effective forecast.[5] But research in decision making suggests that we naturally rely more on the inside view than we should.[6] In fact, it is common for investors to be unaware of the base rates that are relevant in their decisions.

We use base rates to show how stocks perform after they have dropped sharply. To do this, we calculate the "cumulative abnormal return" for the 30, 60, and 90 trading days after the time of the decline. An abnormal return is the difference between the total shareholder return and the expected return. A stock's expected return reflects the change in a broader stock market index, the S&P 500 in our case, adjusted for risk. The cumulative abnormal return, then, is simply the sum of the abnormal returns during the period that we measure.

We refine the large sample into relevant categories in an effort to increase the usefulness of the base rates.[7] The first refinement is to segregate earnings and non-earnings announcements. Earnings releases constitute about one-quarter of our sample. Non-earnings announcements include releases of information that are scheduled, such as same-store sales updates, as well as unanticipated announcements, including a change in management or an earnings warning. In general, the cumulative abnormal returns following disappointing earnings releases are worse than for other announcements.

The second refinement is the introduction of three factors—momentum, valuation, and quality—that consider corporate fundamentals and stock market measures. All companies receive a score for each factor. The scores are relative to a company's peers in the same sector. You can find a detailed definition of the factors in Appendix A, but here's a quick summary:

- **Momentum** predominately considers two drivers, change in cash flow return on investment (CFROI®*) as the result of earnings revisions, and stock price momentum. Good momentum is associated with rising CFROI and strong stock price appreciation.

- **Valuation** reflects the gap between the current stock price and the warranted value in the HOLT® model. Valuation also incorporates adjusted measures of price-to-earnings and price-to-book ratios. Together, these metrics help assess whether a stock is relatively cheap or expensive.

- **Quality** captures the company's recent level of CFROI and whether the company has been able to consistently make investments that create value. Firms with high CFROIs and strong value creation score well on quality.

The final refinement is a separation between the full sample and the periods excluding the bubbles. We show the full sample including all events in exhibits 2 and 3, and the narrower sample excluding the bubble periods in exhibits 12 and 13. The bubble periods correlate with high volatility in the market, as measured by the Chicago Board Options Exchange Market Volatility Index (VIX). When you compare the full sample to the ex-bubble sample for earnings announcements, you will see that the average stock price changes for the equivalent branches are directionally the same more than 80 percent of the time. For the other events, the directional overlap is close to 90 percent.

The upside of adding refinements is that you can find a base rate that closely matches the case you are considering. The downside is that the sample size (N) shrinks with each refinement. We have tried to maintain healthy sample sizes even in the end branches, and we display the Ns along the way so that you can assess the trade-off between fit and prior occurrences.

We are almost ready to turn to the checklist and numbers, but we need to cover one additional item. All of our summary exhibits show the average, or mean, stock price return. That average represents a full distribution of results. For most of the distributions, the median return—the return that separates the top half from the bottom half of the sample—is less than the mean, which suggests the distributions have a right skew.

Further, the standard deviations of most of the distributions are in the range of 35-45 percent. While our summary figures show a tidy average, recognize that the figure belies a rich distribution. Appendix B shows the distributions for a handful of events. The base rate data can be extremely helpful in making a sound decision even if the outcome is probabilistic.

We're now ready to turn to the checklist and the numbers that show the base rates.

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The Checklist

You come into the office and one of the stocks in your portfolio is down 10 percent or more relative to the S&P 500. Here's what you do:

☐ **Earnings or non-earnings.** Determine whether the precipitating announcement is an earnings release or a non-earnings disclosure and go to the appropriate exhibit;

☐ **Momentum.** Check the HOLT Lens™ screen to determine if the stock had strong, weak, or neutral momentum going into the announcement. You can either go to the momentum section of the exhibit or continue;

☐ **Valuation.** Check to see if the valuation is cheap, expensive, or neutral. You can either go to the section in the exhibit that combines momentum and valuation or continue;

☐ **Quality.** Check to see if the quality is high, low, or neutral. Go to section in the exhibit that incorporates all of the factors.

We have two detailed case studies that we'll present in a moment, but let's run through an example to see how this works. The first item is to determine whether the announcement was a scheduled earnings release or not. Let's say it was an earnings event. That means we would refer to the data in exhibit 2.

Step two is to assess the momentum. We'll assume that momentum is strong. If you look at the left side of the exhibit you'll see the section that reflects momentum. If you focus on the results of the companies with strong momentum, you'll see a few figures. You'll notice that the 408 stocks in that reference class declined 14.9 percent, on average, the day of the event. You'll also see that those stocks modestly underperformed the market, with a cumulative abnormal return of -1.6 percent, in the prior 30 trading days.

You'll also see that the stocks in that class struggled in the subsequent quarter, with cumulative abnormal returns of -1.5 percent in the next 30 trading days, -1.9 percent in 60 trading days, and -0.6 percent in 90 trading days. We selected 90 trading days as the extent of this analysis because we felt it is a sufficient amount of time for an investment team to thoroughly reassess the stock's merit. We designed the READ-DO checklist to provide immediate guidance.

We now turn to valuation, which you can find in the middle of the exhibit, to see if we can sharpen the analysis. Let's assume the valuation was expensive. If we look 60 days out, we see that the 167 stocks in this group have an average cumulative abnormal return of -4.5 percent.

As a final check, we consider quality, which you can find on the right of the exhibit. Let's say quality is high. We've now shrunk our sample size to 62, and see that the 60-day cumulative abnormal return is -3.5 percent.

Exhibit 2: Earnings Event – Cumulative Abnormal Returns

Momentum

Momentum	Days -30	Event	N =	+30	Days +60	+90
Strong	-1.6%	-14.9%	408	-1.5%	-1.9%	-0.6%
Neutral	-2.8%	-14.7%	434	0.8%	2.4%	4.0%
Weak	-1.0%	-14.9%	600	2.7%	5.1%	8.4%

Valuation

Strong Momentum:

Valuation	Days -30	Event	N =	+30	Days +60	+90
Cheap	-2.6%	-14.4%	123	-0.6%	1.4%	3.6%
Neutral	-1.0%	-14.6%	118	-1.3%	-1.6%	-1.4%
Expensive	-1.2%	-15.4%	167	-2.4%	-4.5%	-3.2%

Neutral Momentum:

Valuation	Days -30	Event	N =	+30	Days +60	+90
Cheap	-4.6%	-15.2%	162	2.9%	5.0%	7.1%
Neutral	-1.8%	-14.4%	146	0.8%	2.4%	4.8%
Expensive	-1.7%	-14.4%	126	-1.7%	-1.0%	-0.9%

Weak Momentum:

Valuation	Days -30	Event	N =	+30	Days +60	+90
Cheap	-3.4%	-15.1%	299	3.7%	5.5%	10.9%
Neutral	0.8%	-14.8%	177	0.5%	3.3%	3.5%
Expensive	2.3%	-14.7%	124	3.5%	6.8%	9.4%

Quality

Strong Momentum – Cheap:

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-4.2%	-14.2%	42	-1.1%	0.8%	4.6%
Neutral	-0.9%	-14.6%	23	-3.1%	3.2%	4.5%
Low	-2.2%	-14.5%	58	0.7%	1.1%	2.5%

Strong Momentum – Neutral:

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-2.4%	-15.9%	44	-0.2%	3.4%	3.6%
Neutral	-1.2%	-13.5%	29	-1.7%	-4.0%	-5.0%
Low	0.6%	-14.1%	45	-2.3%	-5.0%	-4.0%

Strong Momentum – Expensive:

Quality	Days -30	Event	N =	+30	Days +60	+90
High	0.4%	-14.8%	62	-3.2%	-3.5%	-3.1%
Neutral	-3.1%	-17.0%	49	-0.7%	-3.7%	-5.3%
Low	-1.3%	-14.6%	56	-2.9%	-6.3%	-1.4%

Neutral Momentum – Cheap:

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-5.9%	-16.8%	51	7.2%	10.2%	11.4%
Neutral	-3.7%	-14.6%	59	0.8%	4.1%	7.7%
Low	-4.3%	-14.5%	52	1.2%	0.9%	2.3%

Neutral Momentum – Neutral:

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-3.1%	-14.6%	43	-0.3%	1.6%	6.7%
Neutral	-0.5%	-14.6%	38	1.4%	5.4%	5.7%
Low	-1.7%	-14.2%	65	1.1%	1.2%	3.0%

Neutral Momentum – Expensive:

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-3.3%	-14.3%	48	-4.1%	-4.8%	-0.7%
Neutral	-1.2%	-13.9%	39	-2.2%	3.1%	6.2%
Low	-0.2%	-14.9%	39	1.6%	-0.5%	-3.1%

Weak Momentum – Cheap:

Quality	Days -30	Event	N =	+30	Days +60	+90
High	-1.4%	-16.1%	79	5.5%	7.7%	14.1%
Neutral	-2.3%	-15.3%	111	2.2%	4.1%	10.4%
Low	-5.9%	-14.3%	109	3.9%	5.4%	9.2%

Weak Momentum – Neutral:

Quality	Days -30	Event	N =	+30	Days +60	+90
High	2.5%	-13.7%	59	-2.5%	1.3%	1.3%
Neutral	-0.7%	-14.8%	38	-0.9%	7.3%	9.0%
Low	0.2%	-15.5%	80	3.3%	2.9%	2.5%

Weak Momentum – Expensive:

Quality	Days -30	Event	N =	+30	Days +60	+90
High	1.3%	-15.6%	34	0.8%	8.8%	11.0%
Neutral	6.9%	-15.7%	33	4.7%	9.5%	9.1%
Low	0.1%	-13.5%	57	4.5%	4.1%	8.7%

Source: Credit Suisse HOLT.
Note: The abnormal return for the event reflects only the day of the event.

Exhibit 3: Non-Earnings Event – Cumulative Abnormal Returns

Momentum | Valuation | Quality

Strong

Momentum	Days -30	Event	N =	+30	+60	+90
Strong	-4.6%	-13.8%	1,041	3.7%	4.9%	6.2%

Valuation	Days -30	Event	N =	+30	+60	+90
Cheap	-8.5%	-13.7%	280	5.1%	10.1%	14.3%
Neutral	-5.0%	-14.2%	289	4.7%	6.8%	7.9%
Expensive	-2.0%	-13.7%	472	2.2%	0.8%	0.4%

Quality	Days -30	Event	N =	+30	+60	+90
High	-11.7%	-13.8%	99	4.9%	9.9%	16.7%
Neutral	-8.1%	-15.7%	83	3.2%	6.5%	9.7%
Low	-5.5%	-11.8%	98	7.0%	13.4%	15.6%
High	-8.4%	-14.0%	79	5.3%	7.7%	10.2%
Neutral	-7.3%	-15.1%	109	3.5%	6.8%	2.7%
Low	0.2%	-13.4%	101	5.5%	6.0%	11.6%
High	-4.5%	-13.4%	225	1.9%	-2.8%	-3.2%
Neutral	4.8%	-14.4%	107	2.9%	3.0%	-0.3%
Low	-3.0%	-13.5%	140	2.1%	4.7%	6.8%

Neutral

Momentum	Days -30	Event	N =	+30	+60	+90
Neutral	-5.9%	-14.4%	1,067	4.7%	9.4%	11.3%

Valuation	Days -30	Event	N =	+30	+60	+90
Cheap	-9.3%	-14.6%	395	7.5%	17.1%	18.7%
Neutral	-4.6%	-13.8%	328	6.4%	9.8%	12.2%
Expensive	-3.1%	-14.6%	344	-0.2%	0.1%	2.0%

Quality	Days -30	Event	N =	+30	+60	+90
High	-14.1%	-15.3%	140	7.9%	21.7%	20.9%
Neutral	-13.9%	-15.2%	121	8.9%	13.6%	20.5%
Low	-0.2%	-13.4%	134	5.8%	15.4%	14.6%
High	-5.5%	-13.5%	127	3.0%	7.5%	9.8%
Neutral	-5.7%	-14.3%	93	5.1%	10.6%	11.5%
Low	-2.6%	-13.8%	108	11.5%	11.8%	15.5%
High	-7.0%	-14.5%	132	-2.5%	-4.5%	-3.7%
Neutral	3.8%	-14.8%	83	1.0%	2.5%	5.4%
Low	-3.6%	-14.6%	129	1.5%	3.3%	5.7%

Weak

Momentum	Days -30	Event	N =	+30	+60	+90
Weak	-6.2%	-14.2%	1,867	11.1%	17.0%	18.8%

Valuation	Days -30	Event	N =	+30	+60	+90
Cheap	-9.5%	-14.3%	1,008	13.9%	19.1%	22.1%
Neutral	-2.6%	-14.4%	457	4.9%	11.2%	12.0%
Expensive	-2.0%	-13.8%	402	11.2%	18.5%	18.1%

Quality	Days -30	Event	N =	+30	+60	+90
High	-11.0%	-15.1%	282	10.4%	14.9%	23.0%
Neutral	-5.8%	-13.8%	295	15.9%	23.3%	26.0%
Low	-10.9%	-14.2%	431	14.7%	18.9%	18.8%
High	-8.7%	-14.6%	127	4.6%	11.2%	11.7%
Neutral	2.1%	-13.8%	154	6.6%	14.4%	15.5%
Low	-2.4%	-14.7%	176	3.7%	8.4%	9.1%
High	-4.5%	-12.8%	127	18.1%	25.7%	27.1%
Neutral	-1.3%	-14.8%	98	10.3%	22.3%	24.7%
Low	-0.6%	-14.0%	177	6.9%	11.2%	8.1%

Source: Credit Suisse HOLT.
Note: The abnormal return for the event reflects only the day of the event.

Case Studies

We now turn to two case studies that provide detail about the analysis.

Symantec Corporation

Symantec Corporation announced that it fired its president and chief executive officer, Steve Bennett, after the stock market closed on March 20, 2014. The following day, March 21, the stock declined from $20.905 to $18.20, or 12.9 percent. The S&P 500 was down 0.3 percent. This was a non-earnings event.

Since we use cumulative abnormal return (CAR) for all of the stock performance data, it is worth taking a moment to explain the methodology. We calculate daily abnormal return using a simplified market model, which compares the actual return of a stock to its expected return. The expected return equals the total shareholder return of the benchmark, the S&P 500, times the stock's beta. The abnormal return is the difference between the actual return and the expected return.

We calculate beta by doing a regression analysis with the S&P 500's total returns as the independent variable (x-axis) and Symantec's total returns as the dependent variable (y-axis). We use monthly total returns for the prior 60 months. Beta is the slope of the best-fit line. Exhibit 4 shows that the beta for Symantec for the 60 months ended February 2014 was about 0.8. This is the beta we use for our calculations of daily abnormal returns during the month of March 2014.

Exhibit 4: Beta Calculation for Symantec

Monthly Returns
March 2009 - February 2014

$y = 0.812x - 0.005$
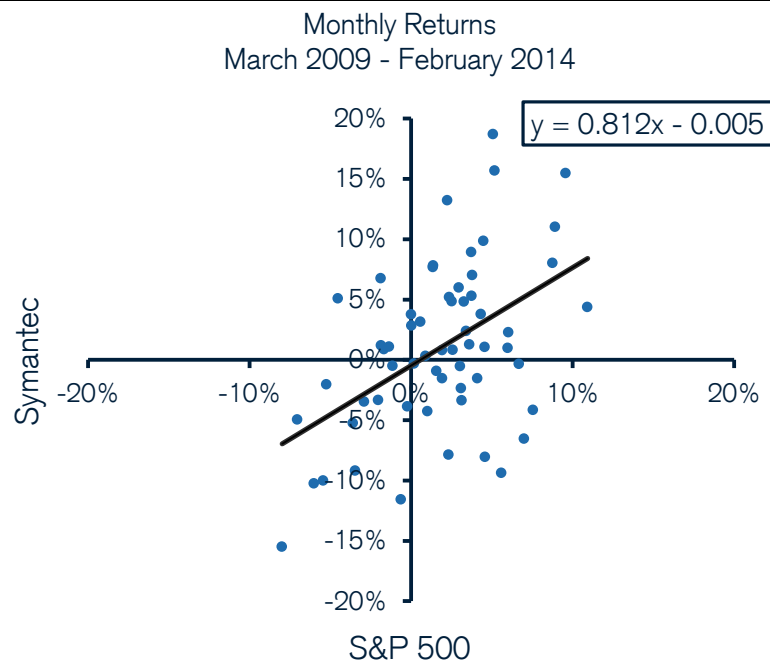
Source: Credit Suisse.

Using the 30 trading days following the event, we calculate a CAR of 9.3 percent as follows:

CAR = Actual return – expected return
      = 10.3% - (Beta * Market Return)
      = 10.3% - (0.8 * 1.2%)
CAR = 10.3% - 1.0% = 9.3%

Exhibit 5 shows the chart of the stock's performance for the 30 trading days prior to the event through 90 trading days following the event. The top line shows the stock price itself. The middle line is the cumulative abnormal return. We reset the cumulative abnormal return to zero on the event date. The bars are the daily abnormal returns. It's evident that buying Symantec on the day after this event would have yielded good returns in the subsequent 90 days. Let's go through the checklist to see how we would have assessed the situation in real time.

Exhibit 5: Symantec Stock Price and Cumulative Abnormal Returns (February 6 – July 30, 2014)
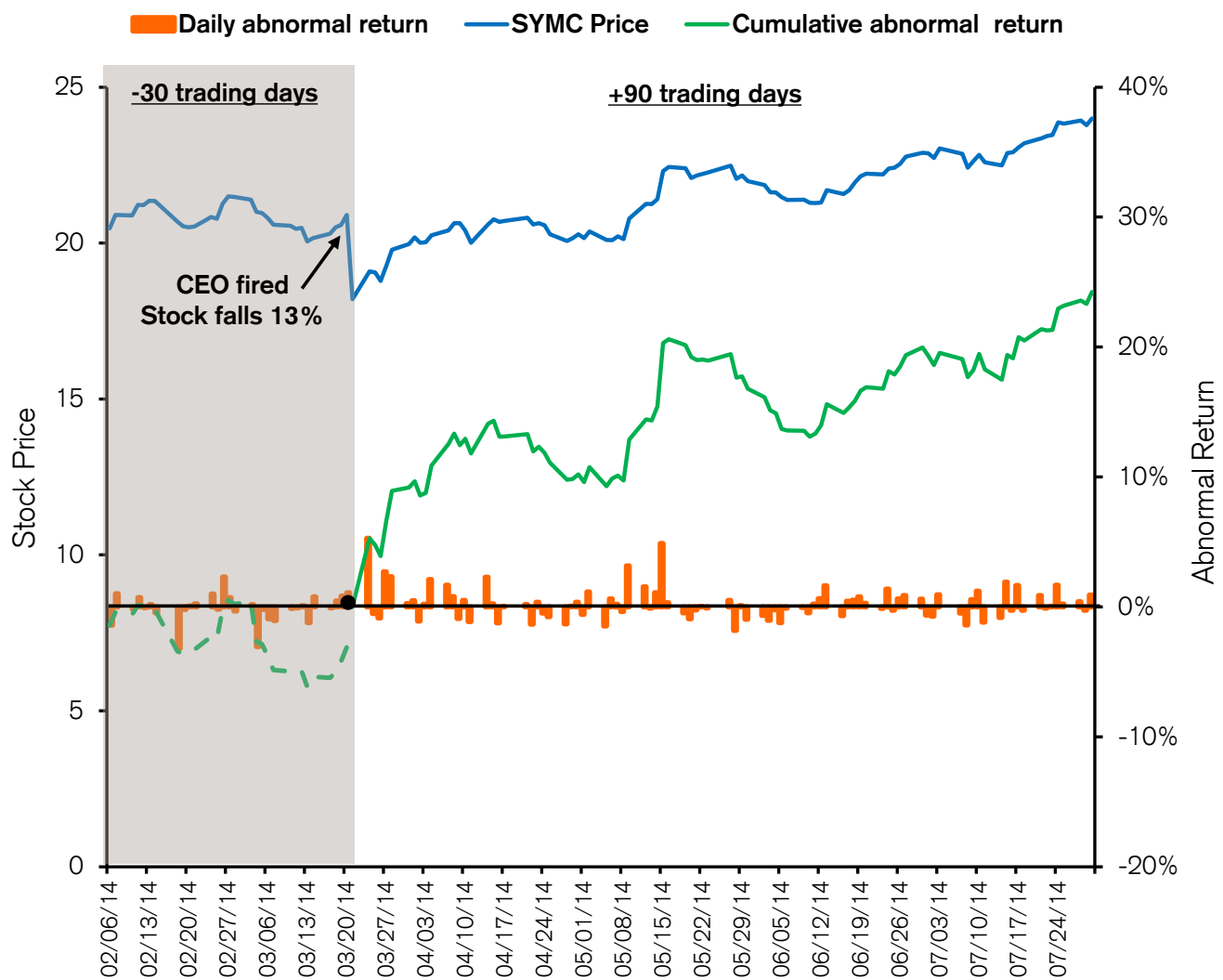
Source: Credit Suisse.

The first item on the checklist is the determination of whether the event was a scheduled earnings release. We know that this is an event not related directly to an earnings announcement, so we refer to exhibit 3 for guidance.

The next step is determining how the stock scores with regard to momentum, valuation, and quality through HOLT Lens. (Please contact your HOLT or Credit Suisse representative if you do not have access to Lens and would like to use it.) At the welcome page, search for the company of the stock under consideration. This takes you to the homepage for that company, which includes a Relative Wealth Chart. Toward the top of the page you will find a link called "Scorecard Percentile." If you click on it, you will see numerical scores, from 0 to 100, on momentum, valuation, and operational quality, among other items. For the purposes of this analysis, a score of 66 or more reflects strong momentum, cheap valuation, and high quality. A score of 33 or less means weak momentum, expensive valuation, and low quality. Numbers from 34 to 65 are neutral for the factors. Exhibit 6 shows you what this screen looked like for Symantec.

Exhibit 6: Symantec's Factor Scores

SYMANTEC CORP Scorecard Analysis

Overall Percentile		69
Investment Style	Contrarian	
Operational Quality		71
Momentum		23
Valuation		80
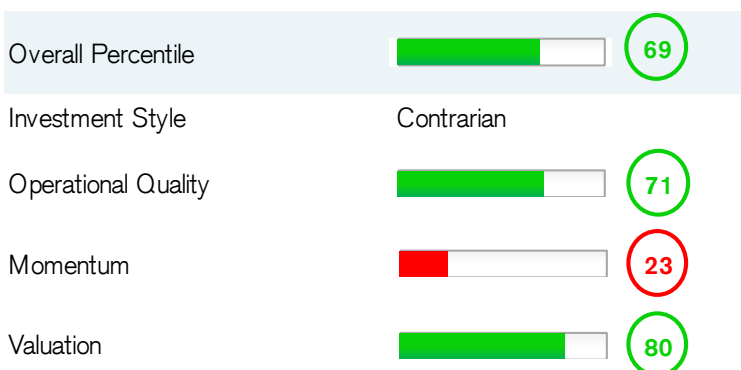
Source: HOLT Lens.

We see that momentum is weak (23), valuation is cheap (80), and quality is high (71). This allows us to follow the relevant branches in exhibit 3. Exhibit 7 extracts the branches that are relevant for Symantec.

Exhibit 7: The Branches that Lead to Symantec's Appropriate Reference Class

| Momentum							Valuation							Quality						
	Days -30	Event	N =	+30	Days +60	+90		Days -30	Event	N =	+30	Days +60	+90		Days -30	Event	N =	+30	Days +60	+90
														High	-11.0%	-15.1%	282	10.4%	14.9%	23.0%
Weak	-6.2%	-14.2%	1,867	11.1%	17.0%	18.8%	Cheap	-9.5%	-14.3%	1,008	13.9%	19.1%	22.1%							

Source: Credit Suisse HOLT.

The cumulative abnormal returns are consistently positive for each branch of the tree for all of the time periods we measure. The final branch, with a sample size of 282 events, shows a 10.4 percent CAR for 30 days, 14.9 percent for 60 days, and 23.0 percent for 90 days. In this case, the base rates would suggest buying the stock on the day following the decline.

We can compare those base rates with what actually happened. The CAR for Symantec shares was 9.3 percent in the 30 trading days following the event, 15.4 percent for 60 days, and 24.2 percent for 90 days. The line for CAR in exhibit 5 also shows these returns.

While the results are consistent with the base rate, we must reiterate that the averages belie a more complex distribution. Exhibit 8 shows the distribution of stock price returns for the 282 companies in Symantec's reference class. For each of the return distributions that follow the event (+30, +60, and +90 days), the mean, or average, was greater than the median. The standard deviations are high at about 35 percent for 30 days, 40 percent for 60 days, and 45 percent for 90 days.

Exhibit 8: Distributions for Non-Earnings Events that have Weak Momentum, Cheap Valuation, High Quality
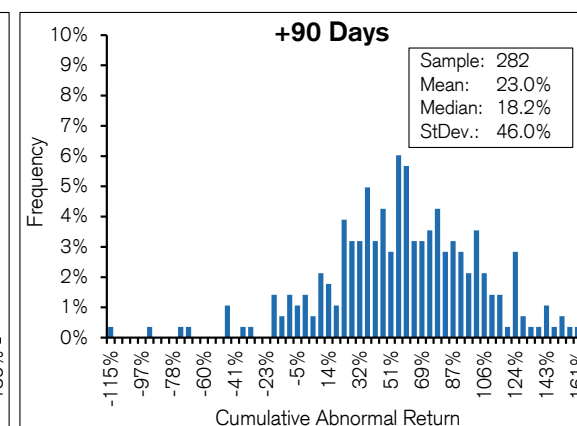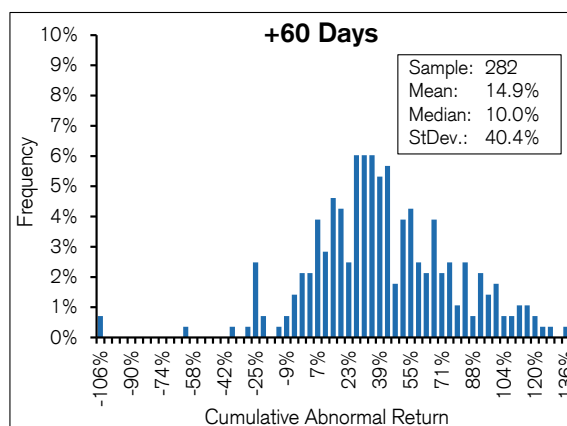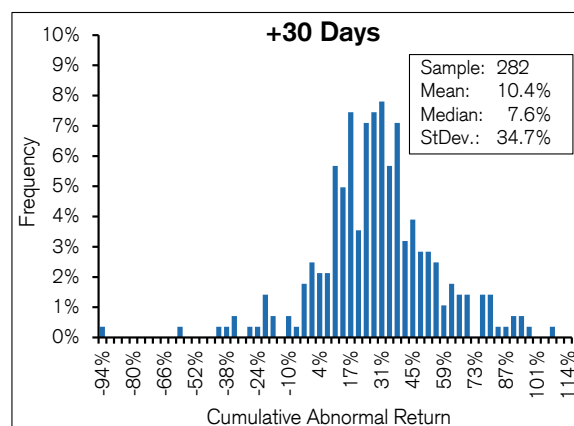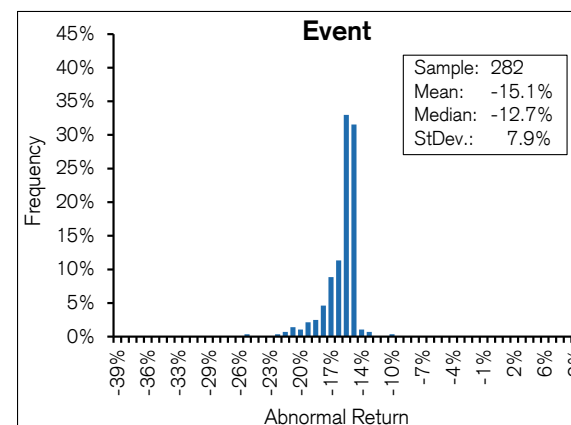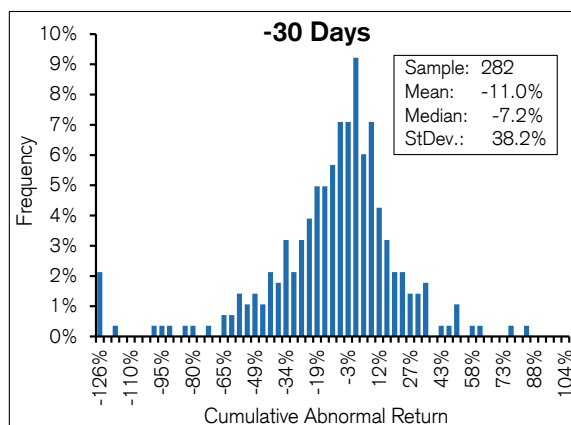
Source: Credit Suisse HOLT.

Tenet Healthcare Corporation

Before the stock market opened on the morning of November 4, 2008, Tenet Healthcare Corporation reported disappointing earnings. This was a scheduled earnings event and the stock declined 36.7 percent. The S&P 500 was up 4.1 percent.

Exhibit 9 shows the chart of Tenet Healthcare's stock performance for the 30 trading days prior to the event through 90 trading days following the event. The top line starting on the left shows the stock price, which not only drops precipitously on the day of the disappointing earnings release but also shows a steep decline before the announcement (-25.2 percent cumulative abnormal return). The stock continued to drift lower after the release. The bars in the middle of the exhibit are the daily abnormal return, and the line at the bottom is the cumulative abnormal return. This is a case where selling Tenet Healthcare stock, notwithstanding the weak results, would have made sense. Let's go through the checklist to see how we would have assessed the situation as it occurred.

Exhibit 9: Tenet Healthcare Stock Price and CAR (September 23, 2008 – March 17, 2009)
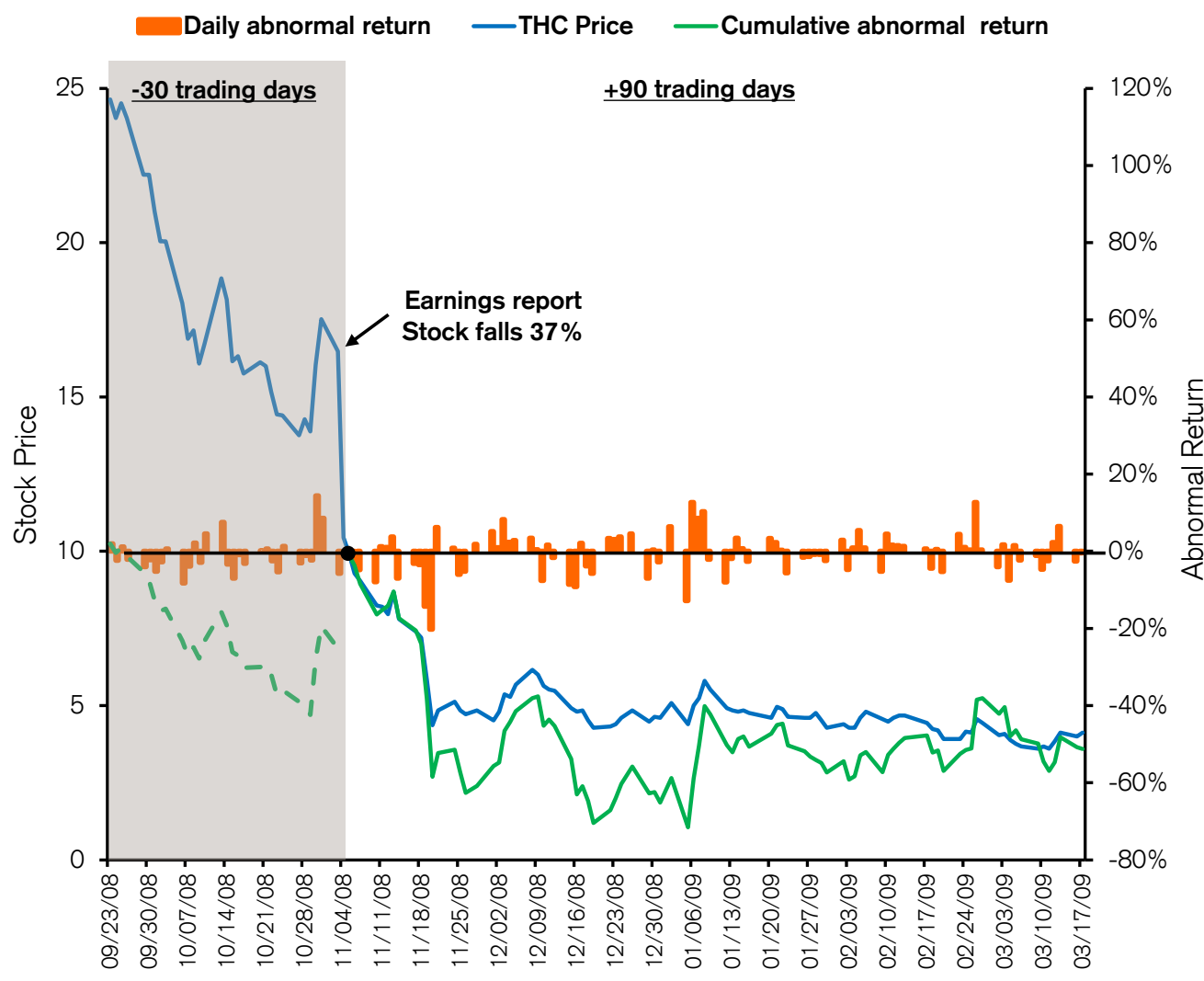
Source: Credit Suisse.

The first item on the checklist is the determination of whether the event was an earnings release. We know that it was scheduled, so we refer to exhibit 2 for guidance.

The next step is to determine the scores with regard to momentum, valuation, and operational quality. To do so, we go to the link, "Scorecard Percentile," on HOLT Lens. Exhibit 10 shows the scores.

Exhibit 10: Tenet Healthcare's Factor Scores

TENET HEALTHCARE CORP Scorecard Analysis

Overall Percentile	8
Investment Style	Momentum Trap
Operational Quality	4
Momentum	66
Valuation	9
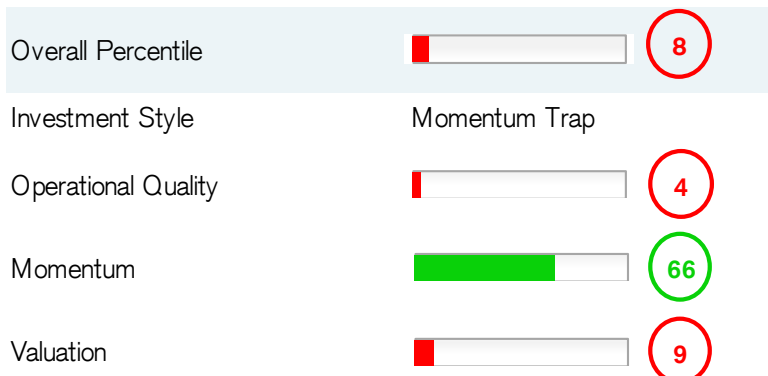
Source: HOLT Lens.

For Tenet Healthcare, we see that momentum is at the low end of strong (66), valuation is expensive (9), and quality is low (4). Despite Tenet Healthcare's weak stock price in the short term, the overall momentum score remained strong because of excellent stock price results, relative to peers, in the 52 weeks leading up to the announcement. While the momentum factor barely qualified as strong, scores for valuation and quality are unattractive. Exhibit 11 shows the branches in exhibit 2 that are relevant for Tenet Healthcare.

Exhibit 11: The Branches that Lead to Tenet Healthcare's Appropriate Reference Class

Momentum

	Days -30	Event	N =	+30	+60	+90
Strong	-1.6%	-14.9%	408	-1.5%	-1.9%	-0.6%

Valuation

	Days -30	Event	N =	+30	+60	+90
Expensive	-1.2%	-15.4%	167	-2.4%	-4.5%	-3.2%

Quality

	Days -30	Event	N =	+30	+60	+90
Low	-1.3%	-14.6%	56	-2.9%	-6.3%	-1.4%

Source: Credit Suisse HOLT.

The cumulative abnormal returns are consistently negative for each branch of the tree for all of the time periods we consider. The final branch, with a sample size of 56 events, shows a -2.9 percent CAR for 30 days, -6.3 percent for 60 days, and -1.4 percent for 90 days. In this case, the base rate would suggest selling the stock on the day following the decline.

We can compare these base rates with what actually happened. The CAR for Tenet Healthcare's shares was -60.9 percent in the 30 trading days following the event, -54.4 percent for 60 days, and -51.2 percent for 90 days. Exhibit 9 reflects these returns. Once again, note that there is a distribution of returns for that reference class, and the best we can do is make a probabilistic assessment.

Summary

The goal of this analysis is to provide you with useful base rates in the case that you see a sharp drop—a "man overboard" moment—in one of the stocks in your portfolio. These base rates are meant to offer some guidance in determining whether you should buy, sell, or do nothing the day following the event. You should keep this report handy, and when an event occurs you can pull it out and follow the steps in the checklist. The results contained here are a useful complement to fundamental analysis.

Because these events tend to be infrequent, most investors don't have a systematic approach, or data, to make a sound judgment. Further, large price drops almost always evoke a strong emotional reaction, which complicates the process of decision making even more.

Our examination of exhibits 2 and 3 suggests that the following characteristics are consistent with buy and sell signals:

Buy. For earnings releases, there is a clear and convincing buy signal for stocks with weak momentum prior to the event. This buy signal is strengthened if the stock has a cheap valuation and is of high quality.

The buy signal for stocks with weak momentum is even more pronounced for non-earnings events than it is for earnings releases, although these stocks had worse shareholder returns leading up to the event. This signal is stronger for stocks that have a cheap valuation, and is further amplified if the companies are of high or neutral quality. Symantec, the subject of our first case study, was a non-earnings event with weak momentum, cheap valuation, and high quality, and hence the data suggested a buy.

Sell. For earnings releases, momentum alone does not indicate a strong buy or sell pattern. But there is a fairly strong sell signal for stocks that have the combination of strong momentum and expensive valuation. The sell signal holds for stocks with strong momentum, expensive valuation, and any quality score. Tenet Healthcare, our second case, had strong momentum, expensive valuation, and low quality—factors that suggested selling the shares.

For non-earnings events, the cumulative abnormal returns following an event are largely positive. But we must note that these stocks as a group performed poorly prior to the event, down more than five percentage points relative to the market. There are a couple of combinations that suggest selling the stock. The strongest sell signal is for companies that combine strong or neutral momentum, expensive valuation, and high quality. Strong or neutral momentum and expensive valuation alone do not indicate a sell signal.

Making decisions in the face of uncertainty is always a challenge, but it is inherent to investing. Deciding what to do with a stock following a sharp decline is particularly difficult because emotions tend to run high after those events. This report provides grounding in the form of base rates in an effort to better inform decisions.

Exhibit 12: Ex-Bubble Earnings Event – Cumulative Abnormal Returns

Momentum

	Days -30	Event	N =	+30	Days +60	+90
Strong	-1.5%	-14.7%	322	-1.4%	-2.0%	-1.1%
Neutral	-2.9%	-14.2%	320	0.0%	-0.4%	1.4%
Weak	-0.9%	-14.6%	436	1.4%	1.9%	3.9%

Valuation

Strong:

	Days -30	Event	N =	+30	Days +60	+90
Cheap	-3.1%	-14.2%	100	-0.5%	-0.3%	0.9%
Neutral	-1.9%	-14.8%	93	-1.2%	-1.5%	-0.2%
Expensive	0.0%	-15.0%	129	-2.2%	-3.8%	-3.3%

Neutral:

	Days -30	Event	N =	+30	Days +60	+90
Cheap	-4.9%	-14.2%	120	-0.4%	-0.8%	2.5%
Neutral	-1.8%	-14.2%	109	0.9%	0.9%	2.2%
Expensive	-1.5%	-14.1%	91	-0.7%	-1.4%	-1.1%

Weak:

	Days -30	Event	N =	+30	Days +60	+90
Cheap	-4.3%	-14.5%	215	3.2%	2.8%	6.8%
Neutral	1.0%	-14.8%	125	-1.0%	-0.5%	-1.0%
Expensive	4.3%	-14.5%	96	0.6%	3.1%	4.1%

Quality

Strong — Cheap:

	Days -30	Event	N =	+30	Days +60	+90
High	-3.9%	-13.8%	34	-0.2%	-2.4%	0.0%
Neutral	-3.9%	-15.2%	17	-6.5%	-0.3%	2.7%
Low	-2.2%	-14.1%	49	1.5%	1.1%	0.9%

Strong — Neutral:

	Days -30	Event	N =	+30	Days +60	+90
High	-2.6%	-16.0%	37	-0.2%	4.1%	4.0%
Neutral	-3.6%	-13.7%	20	-1.3%	-3.2%	-1.6%
Low	-0.2%	-14.1%	36	-2.1%	-6.2%	-3.8%

Strong — Expensive:

	Days -30	Event	N =	+30	Days +60	+90
High	0.9%	-14.8%	45	-1.1%	-1.9%	-0.6%
Neutral	-1.3%	-16.7%	36	-2.3%	-2.5%	-8.0%
Low	0.0%	-13.9%	48	-3.1%	-6.5%	-2.4%

Neutral — Cheap:

	Days -30	Event	N =	+30	Days +60	+90
High	-6.9%	-15.0%	40	0.1%	-0.5%	2.5%
Neutral	-3.2%	-14.1%	44	1.0%	0.8%	5.2%
Low	-4.6%	-13.5%	36	-2.6%	-2.9%	-1.0%

Neutral — Neutral:

	Days -30	Event	N =	+30	Days +60	+90
High	-1.1%	-14.9%	32	-1.4%	-1.7%	-2.4%
Neutral	-1.3%	-14.0%	29	1.7%	4.2%	7.2%
Low	-2.7%	-13.9%	48	2.0%	0.7%	2.2%

Neutral — Expensive:

	Days -30	Event	N =	+30	Days +60	+90
High	-3.1%	-14.3%	38	-2.6%	-3.1%	3.0%
Neutral	-0.6%	-13.7%	25	0.0%	2.5%	2.0%
Low	0.0%	-14.2%	28	1.3%	-2.6%	-9.4%

Weak — Cheap:

	Days -30	Event	N =	+30	Days +60	+90
High	-6.3%	-15.0%	53	3.8%	6.3%	0.7%
Neutral	-2.6%	-14.9%	84	2.0%	2.2%	6.4%
Low	-4.6%	-13.7%	78	4.1%	1.2%	4.5%

Weak — Neutral:

	Days -30	Event	N =	+30	Days +60	+90
High	2.7%	-14.2%	39	-1.5%	1.8%	3.8%
Neutral	-0.8%	-14.2%	29	-3.8%	-2.0%	-1.2%
Low	0.7%	-15.5%	57	0.9%	-1.2%	-4.3%

Weak — Expensive:

	Days -30	Event	N =	+30	Days +60	+90
High	3.7%	-15.5%	23	-3.9%	2.5%	2.0%
Neutral	8.0%	-15.5%	26	1.6%	4.8%	3.5%
Low	2.5%	-13.5%	47	2.4%	2.4%	5.4%

Source: Credit Suisse HOLT.

Exhibit 13: Ex-Bubble Non-Earnings Event – Cumulative Abnormal Returns

Momentum

	Days -30	Event	N =	+30	Days +60	+90
Strong	-2.6%	-14.5%	631	2.1%	2.1%	1.5%
Neutral	-4.7%	-15.0%	605	0.7%	1.8%	3.0%
Weak	-5.4%	-15.1%	921	5.0%	8.0%	8.0%

Valuation

Strong Momentum

	Days -30	Event	N =	+30	Days +60	+90
Cheap	-8.8%	-15.3%	153	4.4%	10.3%	12.8%
Neutral	-1.5%	-14.6%	169	3.7%	3.5%	3.1%
Expensive	-0.1%	-14.0%	309	0.1%	-2.8%	-4.9%

Neutral Momentum

	Days -30	Event	N =	+30	Days +60	+90
Cheap	-8.9%	-15.4%	202	2.1%	4.8%	7.9%
Neutral	-4.9%	-14.1%	189	0.6%	1.9%	2.9%
Expensive	-0.5%	-15.3%	214	-0.3%	-1.1%	-1.3%

Weak Momentum

	Days -30	Event	N =	+30	Days +60	+90
Cheap	-8.9%	-15.0%	473	6.2%	9.3%	8.1%
Neutral	-3.6%	-15.2%	255	1.2%	4.9%	7.3%
Expensive	0.7%	-15.0%	193	7.2%	9.0%	8.6%

Quality

Strong Momentum

	Days -30	Event	N =	+30	Days +60	+90
High	-6.8%	-14.2%	50	5.1%	8.1%	11.6%
Neutral	-14.4%	-18.3%	48	-0.1%	4.3%	6.3%
Low	-5.8%	-13.7%	55	7.7%	17.5%	19.5%
High	-4.2%	-15.0%	47	3.8%	2.7%	2.8%
Neutral	-1.8%	-15.3%	67	5.0%	7.3%	3.4%
Low	1.0%	-13.5%	55	2.1%	-0.5%	3.0%
High	-2.8%	-13.4%	153	-0.1%	-7.6%	-8.0%
Neutral	5.7%	-15.8%	65	3.3%	5.7%	-0.4%
Low	0.5%	-13.6%	91	-1.8%	-0.7%	-2.8%

Neutral Momentum

	Days -30	Event	N =	+30	Days +60	+90
High	-10.8%	-16.0%	73	2.8%	6.0%	6.5%
Neutral	-9.0%	-15.7%	70	2.8%	6.2%	11.4%
Low	-6.4%	-14.4%	59	0.3%	1.7%	5.4%
High	-7.2%	-13.7%	73	-0.5%	0.4%	0.8%
Neutral	-1.9%	-14.0%	55	-0.2%	3.1%	4.4%
Low	-4.8%	-14.7%	61	2.6%	2.6%	4.0%
High	-2.3%	-15.7%	74	-4.3%	-8.8%	-11.0%
Neutral	4.9%	-15.5%	52	2.6%	4.7%	5.0%
Low	-2.1%	-14.8%	88	1.2%	2.1%	3.0%

Weak Momentum

	Days -30	Event	N =	+30	Days +60	+90
High	-8.9%	-16.1%	143	5.2%	8.9%	9.5%
Neutral	-7.6%	-14.1%	143	4.8%	9.3%	10.3%
Low	-9.7%	-14.8%	187	7.9%	9.6%	5.2%
High	-8.8%	-16.8%	73	1.7%	7.1%	9.4%
Neutral	2.9%	-14.3%	81	1.9%	7.0%	11.8%
Low	-5.0%	-14.8%	101	0.5%	1.7%	2.2%
High	-2.0%	-14.6%	45	3.4%	4.6%	1.7%
Neutral	4.5%	-16.9%	45	11.8%	16.9%	18.7%
Low	0.2%	-14.4%	103	6.9%	7.5%	7.2%

Source: Credit Suisse HOLT.

Appendix A: Definition of the Factors

Momentum: Momentum is a gauge of market sentiment. Stocks that score well have rising levels of expected CFROI as the result of upward earnings revisions, positive stock price momentum, and good liquidity.

- **CFROI Key Momentum, 13-week (60%)** - CFROI Key Momentum measures change in the level of expected CFROI following revisions in consensus earnings per share.
- **Price Momentum (52-week) (30%)** - Price Momentum is based on the percentage change in market value over the past 52 weeks.
- **Daily Liquidity Average (10%)** - Daily Liquidity Average reflects the number of shares traded in the last quarter, divided by 63 trading days, multiplied by the stock price at the end of the most recent week, divided by market capitalization.

Valuation: Valuation assesses the difference between the stock's warranted value, based on the HOLT framework®, and the stock's current market price. Stocks with the most upside are cheap, and those with the least upside, or downside, are expensive.

- **Percentage Change to Best Price (50%)** - Percentage Change to Best Price measures the difference between HOLT's warranted value and the current stock price. By using a discounted cash flow approach that standardizes financial figures, the HOLT model generates values that allow for the comparison of firms across regions, sectors, and accounting standards.
- **Economic P/E (30%)** – Economic P/E is HOLT's version of a price-to-earnings ratio. You can compare Economic P/E across companies and industries because the value-to-cost ratio is divided by CFROI, normalizing results. Specifically, Economic P/E = (Enterprise Value / Inflation Adjusted Net Assets) / CFROI
- **Value-to-Cost Ratio (10%)** – Value-to-Cost Ratio is analogous to price/book value, but reflects a number of adjustments that reduce volatility and better reflect firm value. These include inflation adjustments for old plant and inventory in gross investment, capitalized research and development (R&D), capitalized operating leases, the reflection of the contingent claim for stock options in debt, pension debt, preferred stock, and liabilities related to capitalized operating leases. The Value-to-Cost Ratio = (Market Value of Equity + Minority Interest + HOLT Debt) / Inflation Adjusted Net Assets
- **Dividend Yield (10%)** – Dividend Yield is the dividends paid in the last 12 months divided by the most recent share price.
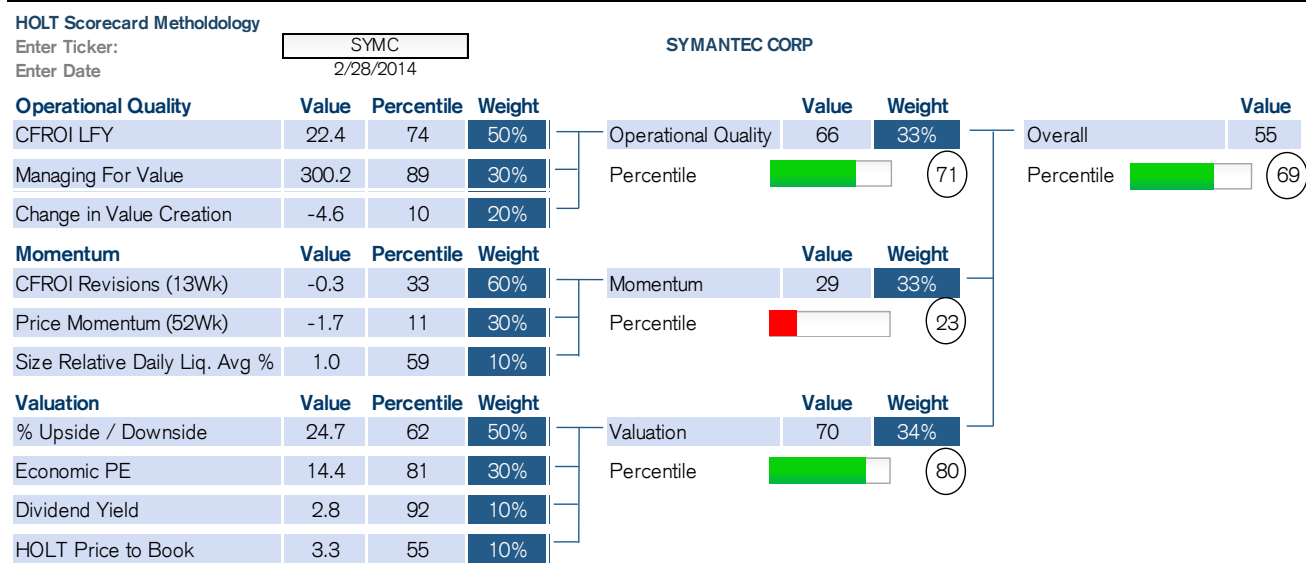
Quality: Quality measures a company's record of generating cash and managing growth, independent of expectations about the future. Firms that score well have high CFROIs and have shown the ability to grow profitable businesses or the willingness to shrink unprofitable ones.

- **CFROI Last Fiscal Year (50%)** - CFROI Last Fiscal Year is the ratio of gross cash flow to gross investment and is expressed as an internal rate of return. We use the CFROI for the last reported fiscal year.
- **Managing for Value (30%)** - Managing for Value equals the spread between CFROI and the Discount Rate, multiplied by the inflation-adjusted gross investment. This allows us to determine whether the company's growth creates value and is sustainable. Growth in businesses that earn a CFROI in excess of the cost of capital is value creating, while growth in businesses with a negative spread destroys value.
- **Change in Value Creation (20%)** - Change in Value Creation measures the improvement in "economic profit" in the most recent fiscal year. A positive value indicates that the company either increased the spread between CFROI and the discount rate, or grew in a business with a positive spread. Change in Value Creation = (CFROI – Discount Rate * Growth Rate) – Prior Fiscal Year Spread.

Once on HOLT Lens, you can find the scores on the homepage of each company by clicking on "Scorecard Percentile." For more detail on the scores, you can select "More Information." You will see a screen similar to exhibit 14.

The factor scores come from the end of the most recent month prior to the event. For instance, since the date of the event for Symantec was March 21, 2014, the factor scores are as of February 28, 2014. The factor scores do not capture the impact of the event itself. Similarly, the HOLT Scorecard on the day of the event does not reflect the stock's price decline.

Exhibit 14: Detailed Breakdown of Symantec's Factor Scores

HOLT Scorecard Metholdology
Enter Ticker: SYMC
Enter Date: 2/28/2014

SYMANTEC CORP

Operational Quality	Value	Percentile	Weight		Value	Weight		Value
CFROI LFY	22.4	74	50%	Operational Quality	66	33%	Overall	55
Managing For Value	300.2	89	30%	Percentile		71	Percentile	69
Change in Value Creation	-4.6	10	20%					

Momentum	Value	Percentile	Weight		Value	Weight
CFROI Revisions (13Wk)	-0.3	33	60%	Momentum	29	33%
Price Momentum (52Wk)	-1.7	11	30%	Percentile		23
Size Relative Daily Liq. Avg %	1.0	59	10%			

Valuation	Value	Percentile	Weight		Value	Weight
% Upside / Downside	24.7	62	50%	Valuation	70	34%
Economic PE	14.4	81	30%	Percentile		80
Dividend Yield	2.8	92	10%			
HOLT Price to Book	3.3	55	10%			

Source: HOLT Lens.

Since the Scorecard updates daily, it does not align perfectly with the base rates we show. That said, the Scorecard reflects the event the following day.

Appendix B: Distributions of Stock Price Changes

This appendix reviews the distributions that apply to Symantec, one of our case studies. These distributions reflect non-earnings announcements and contain all events, including the bubble periods. We also provide some statistical properties for each distribution, including the sample size, mean, median, and standard deviation.

Exhibit 15 shows all the cases with weak momentum and displays five distributions of cumulative abnormal returns, including the 30 trading days prior to the event, the event itself, and the cumulative abnormal returns for the 30, 60, and 90 trading days subsequent to the event. This is the first branch of the Symantec case study.

Exhibit 16 shows weak momentum and cheap valuation, which trims the sample size by nearly one-half. Here again we include the 30 trading days prior to the event, the event itself, and the cumulative abnormal returns for the 30, 60, and 90 trading days after the event. This is the second branch of the Symantec case study.

Exhibit 17 shows the final branch in the Symantec case study: weak momentum, cheap valuation, and high quality. The sample size is just over one-quarter of the prior branch. You can see the 30 trading days prior to the event, the event itself, and the cumulative abnormal returns for the 30, 60, and 90 trading days after the event.

Please contact us if there are any other distributions and statistical properties you would like to see.

Exhibit 15: Distributions for the First Branch of the Symantec Case Study
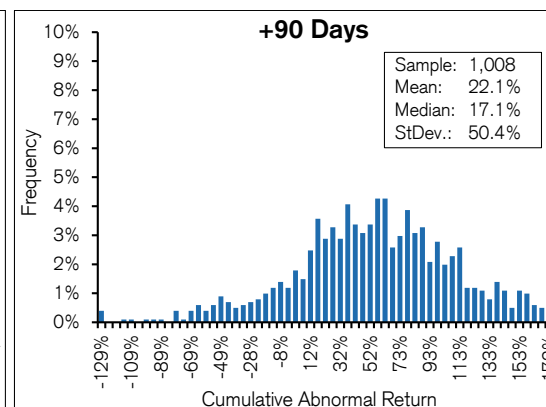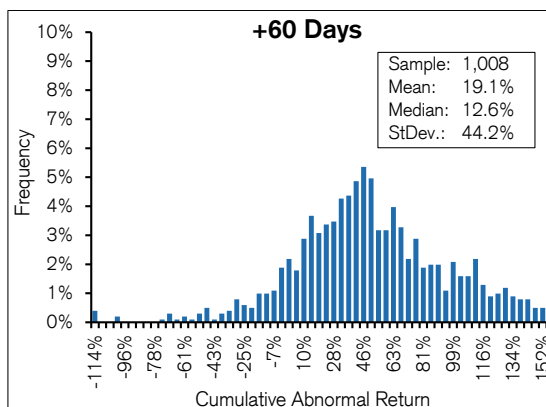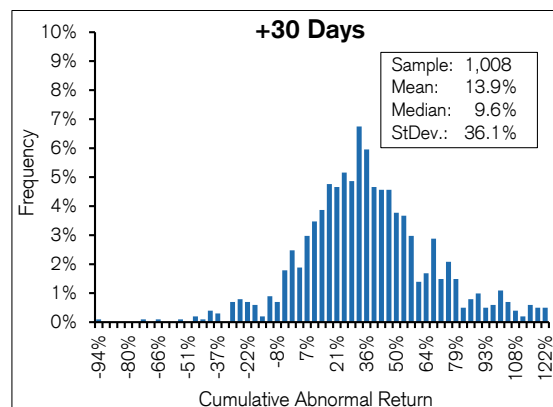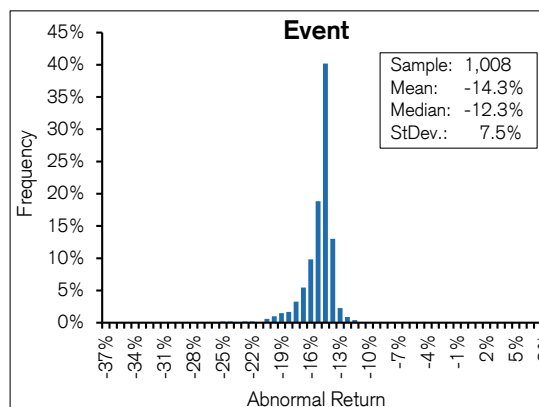
Weak Momentum

-30 Days

Sample:	1,867
Mean:	-6.2%
Median:	-5.4%
StDev.:	34.1%

Event

Sample:	1,867
Mean:	-14.2%
Median:	-12.3%
StDev.:	7.3%

+30 Days

Sample:	1,867
Mean:	11.1%
Median:	7.0%
StDev.:	33.7%

+60 Days

Sample:	1,867
Mean:	17.0%
Median:	12.2%
StDev.:	40.6%

+90 Days

Sample:	1,867
Mean:	18.8%
Median:	13.7%
StDev.:	46.5%
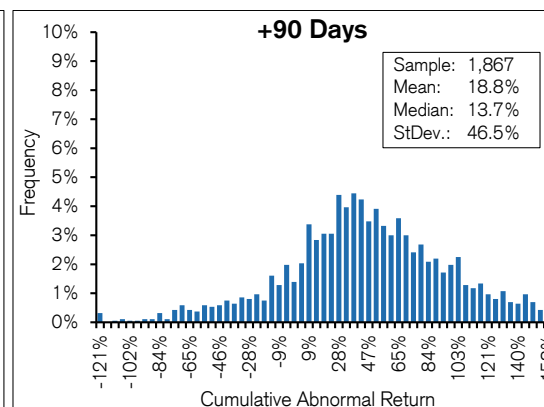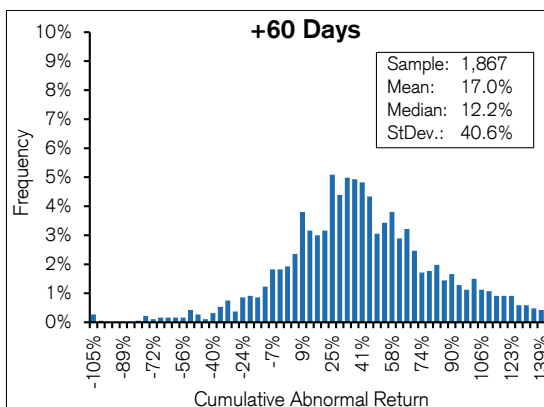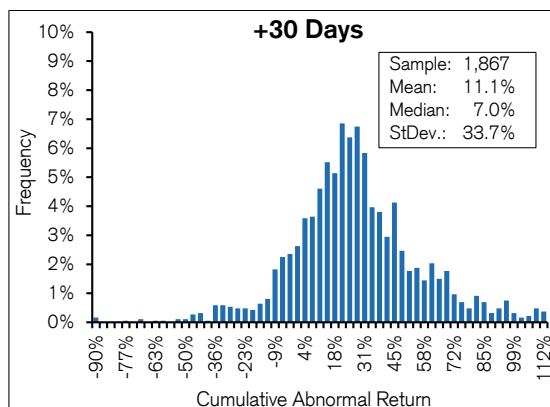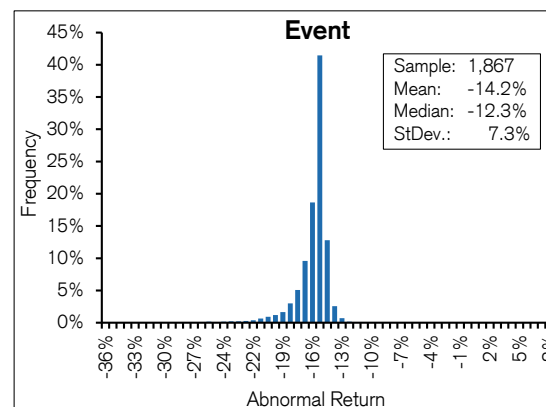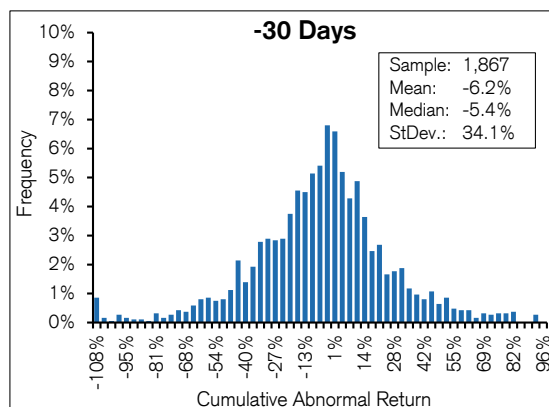
Source: Credit Suisse HOLT.

Exhibit 16: Distributions for the Second Branch of the Symantec Case Study
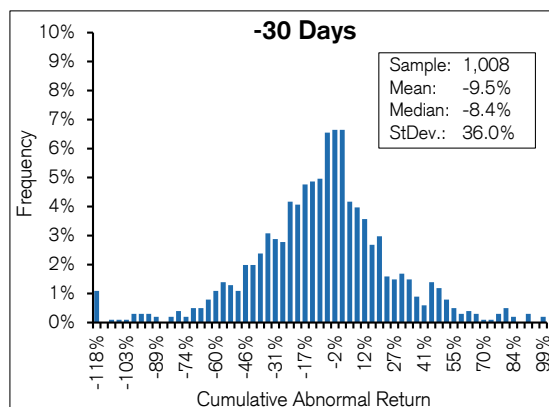
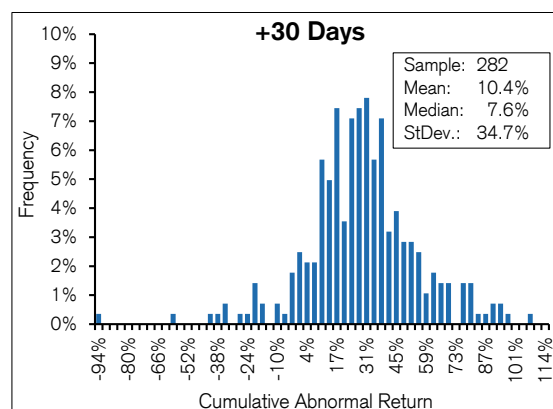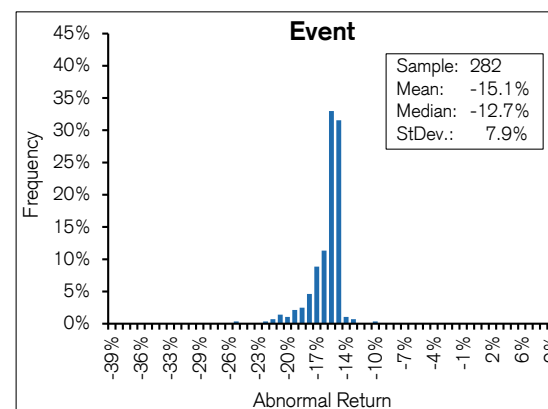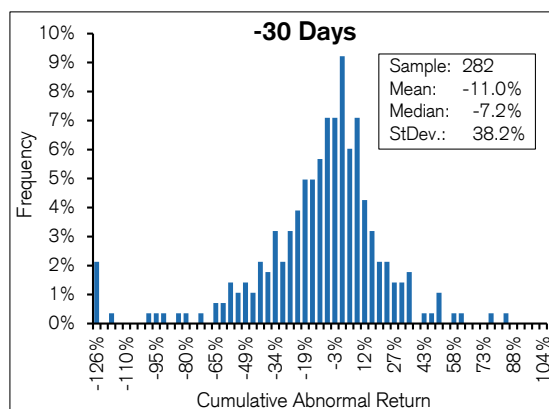## Weak Momentum, Cheap Valuation

Exhibit 17: Distributions for the Third Branch of the Symantec Case Study

Weak Momentum, Cheap Valuation, High Quality

-30 Days

Sample:	282
Mean:	-11.0%
Median:	-7.2%
StDev.:	38.2%

Event

Sample:	282
Mean:	-15.1%
Median:	-12.7%
StDev.:	7.9%

+30 Days

Sample:	282
Mean:	10.4%
Median:	7.6%
StDev.:	34.7%

+60 Days

Sample:	282
Mean:	14.9%
Median:	10.0%
StDev.:	40.4%

+90 Days

Sample:	282
Mean:	23.0%
Median:	18.2%
StDev.:	46.0%
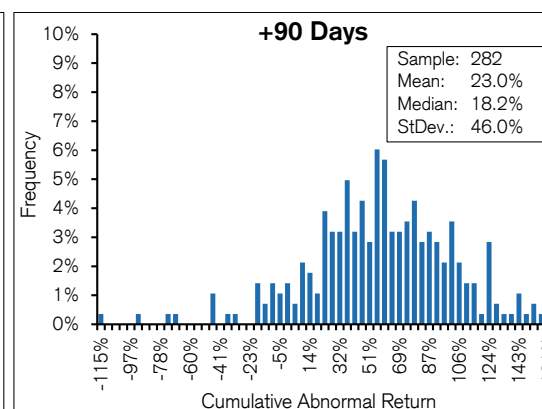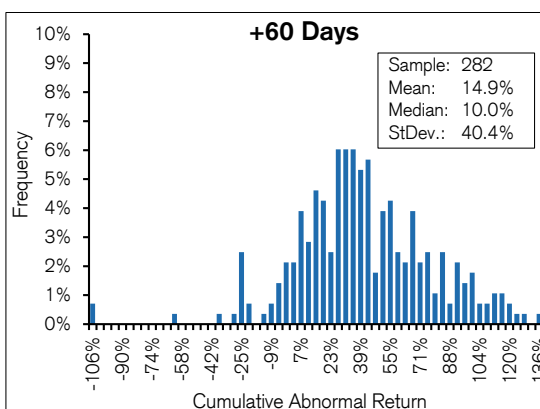
Source: Credit Suisse HOLT.

Appendix C: A Quick Survey of the Academic Literature

There is a rich literature on abnormal price changes following large stock price moves. Much of this academic work was done in the mid-1980s through the mid-1990s. We found no papers that trace the steps we follow:

1. Observe relative price declines of 10 percent or more;

2. Sort based on scheduled earnings and non-earnings events;

3. Introduce factors to refine the reference classes;

4. Observe cumulative abnormal returns by reference class.

These studies are equivocal. Most do show statistically significant reversals after sharp one-day drops. But some of the potential explanations for the rebound, including stock market seasonality, changing risk, size effects, and the role of bid-ask spreads, call into question whether the price action reflects a true inefficiency. The papers we consulted include the following:

Atkins, Allen B., and Edward A. Dyl, "Price Reversals, Bid-Ask Spreads, and Market Efficiency," *Journal of Financial and Quantitative Analysis*, Vol. 25, No. 4, December 1990, 535-547.

Bremer, Marc, Takato Hiraki, and Richard J. Sweeney, "Predictable Patterns after Large Stock Price Changes on the Tokyo Stock Exchange," *Journal of Financial and Quantitative Analysis*, Vol. 32, No. 3, September 1997, 345-365.

Bremer, Marc, and Richard J. Sweeney, "The Reversal of Large Stock-Price Decreases," *Journal of Finance*, Vol. 46, No. 2, June 1991, 747-754.

Brown, Keith C., W.V. Harlow, and Seha M. Tinic, "Risk Aversion, Uncertain Information, and Market Efficiency," *Journal of Financial Economics*, Vol. 22, No. 2, December 1998, 355-385.

Cox, Don R., and David R. Peterson, "Stock Returns following Large One-Day Declines: Evidence on Short-Term Reversals and Longer-Term Performance," *Journal of Finance*, Vol. 49, No. 1, March 1994, 255-267.

De Bondt, Werner F.M., and Richard Thaler, "Does the Stock Market Overreact?" *Journal of Finance*, Vol. 40, No. 3, July 1985, 793-805.

Jegadeesh, Narasimhan, "Evidence of Predictable Behavior of Security Returns," *Journal of Finance*, Vol. 49, No. 1, March 1994, 255-267.

Jegadeesh, Narasimhan, and Sheridan Titman, "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency," *Journal of Finance*, Vol. 48, No. 1, March 1993, 65-91.

Lehmann, Bruce N., "Fads, Martingales, and Market Efficiency," *Quarterly Journal of Economics*, Vol. 105, No. 1, February 1990, 1-27.

Savor, Pavel G., "Stock returns after major price shocks: The impact of information," *Journal of Financial Economics*, Vol. 106, No. 3, December 2012, 635-659.

Endnotes

[1] Thanks to Ian McKinnon of Sandia Holdings LLC, the first person we heard use this phrase, for allowing us to use it in the title of this report.

[2] Atul Gawande, *The Checklist Manifesto: How to Get Things Right* (New York: Metropolitan Books, 2009), 122-128. For checklists related to investing, see Mohnish Pabrai, Guy Spier, and Michael Shearn, "Keynote Q&A Session on Investment Checklists," *Best Ideas 2014, Hosted by John and Oliver Mihaljevic*, January 7, 2014. See http://www.valueconferences.com/wp-content/uploads/2014/12/ideas14-pabrai-spier-shearn-transcript.pdf.

[3] Barbara K. Burian, "Emergency and Abnormal Checklist Design Factors Influencing Flight Crew Response: A Case Study," *Proceedings of the International Conference on Human–Computer Interaction in Aeronautics*, 2004.

[4] Daniel Kahneman and Dan Lovallo, "Timid Choices and Bold Forecasts: A Cognitive Perspective on Risk Taking," *Management Science*, Vol. 39, No. 1, January 1993, 17-31.

[5] Daniel Kahneman and Amos Tversky, "On the Psychology of Prediction," *Psychological Review,* Vol. 80, No. 4, July 1973, 237-251.

[6] Maya Bar-Hillel, "The Base-Rate Fallacy in Probability Judgments," *Acta Psychologica*, Vol. 44, No. 3, May 1980, 211-233.

[7] Dan Lovallo, Carmina Clarke, and Colin Camerer, "Robust Analogizing and the Outside View: Two Empirical Tests of Case-Based Decision Making," *Strategic Management Journal,* Vol. 33, No. 5, May 2012, 496-512.

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