US Market Report

After the Storm

Navigating US Equity Markets in the Aftermath of Hurricane Sandy

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Introduction

Hurricane Sandy brought unprecedented flooding to Wall Street and much of lower Manhattan, completely disrupting business life in New York City. Any institutional investor facing the disruption to markets and transport systems, devastation to property and its associated clean up and repairs is likely to ponder the implications of this event for the markets in the coming weeks. In this paper, we look at the recent history of US natural disasters and examine their impact on the cross-section of equity returns.

Institutional investors might expect the hurricane to have an impact on the broad market, as well as pronounced effects in certain industries and sectors, such as insurance, construction, retail, utilities and transportation. Looking at the data, however, we did not detect significant and predictable historical patterns in market, style and industry factor returns following previous US natural disasters.

US Hurricanes and Market Returns

Table 1 shows those US hurricanes during the last 10 years that brought with them the greatest insured losses. These losses can serve as a proxy for the broad economic impact of each event. Hurricane Katrina in 2005 dominates the table with losses near USD 47bn. By contrast, the impact of hurricane Irene in 2011 was relatively minor, with insured losses totaling little more than USD 4bn.

Table 1: Most costly hurricanes in the Unites States since 2000.[1]

Name	Date	Insured loss (in billion of 2011 dollars)
Katrina	August 2005	46.591
Ike	September 2008	13.050
Wilma	October 2005	11.676
Charley	August 2004	8.755
Ivan	September 2004	8.328
Rita	September 2005	6.379
Frances	September 2004	5.382
Irene	August 2011	4.300

Figure 1 highlights these events on a plot of daily returns of the Barra US Equity Model (USE4) USA country factor, which represents the return of a broadly diversified portfolio of US equities. The width of the "cloud" of points around the y-axis at any date indicates the prevailing market volatility at the time. Return outliers can be identified as points outside this cloud. We observe that periods immediately following hurricanes Charley, Ivan, Katrina and Wilma, all of which had sizeable insured losses, did not see substantial increases in market volatility or significant negative outlier returns. While there was market turbulence at the time of hurricanes Ike and Irene, it was largely caused by exogenous factors, such as the financial crisis of 2008 and rising concerns about the health of the Eurozone in late 2011. This can be contrasted to the events following September 11, 2001, which resulted in a broad re-assessment of risk leading to a period of heightened volatility and more numerous return outliers.

Given the large scale impact of hurricane Sandy on the infrastructure of the US east coast, and the resulting closure of financial markets, it may also be tempting to draw parallels to the earthquake and tsunami in Japan in March 2011.[2] Like a terrorist attack, earthquakes and their consequences are by definition unpredictable. In the aftermath of the March 2011 Japanese earthquake, the risk of further damage due to aftershocks and the uncertainties surrounding Japan's nuclear power infrastructure led to higher than normal volatility in the Japanese stock market. Hurricane Sandy, on the other hand, was an anticipated event. The storm and the shutdown of markets were known in advance, allowing investors time to evaluate whether to adjust positions.

[1] Source: Insurance Information Institute (http://www.iii.org/facts_statistics/hurricanes.html).

[2] For an analysis of market impact of the earthquake in Japan, please see https://community.msci.com/docs/DOC-3219 .

Figure 1: Impact of US Hurricanes on broad market returns.

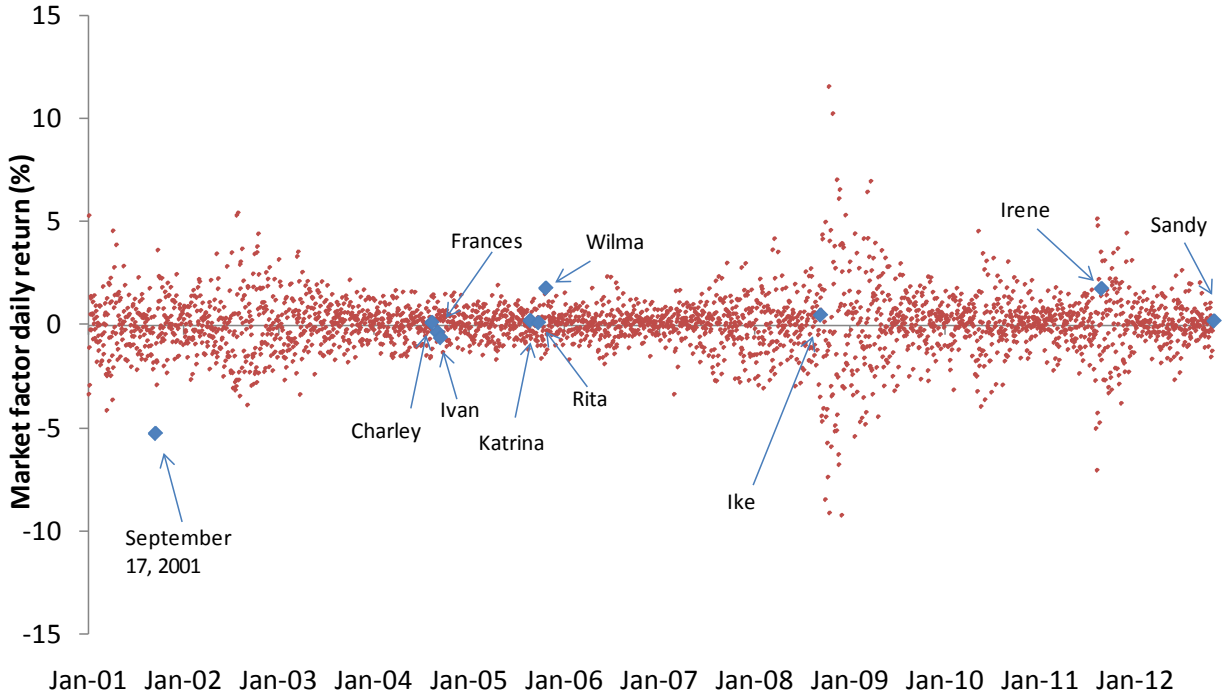
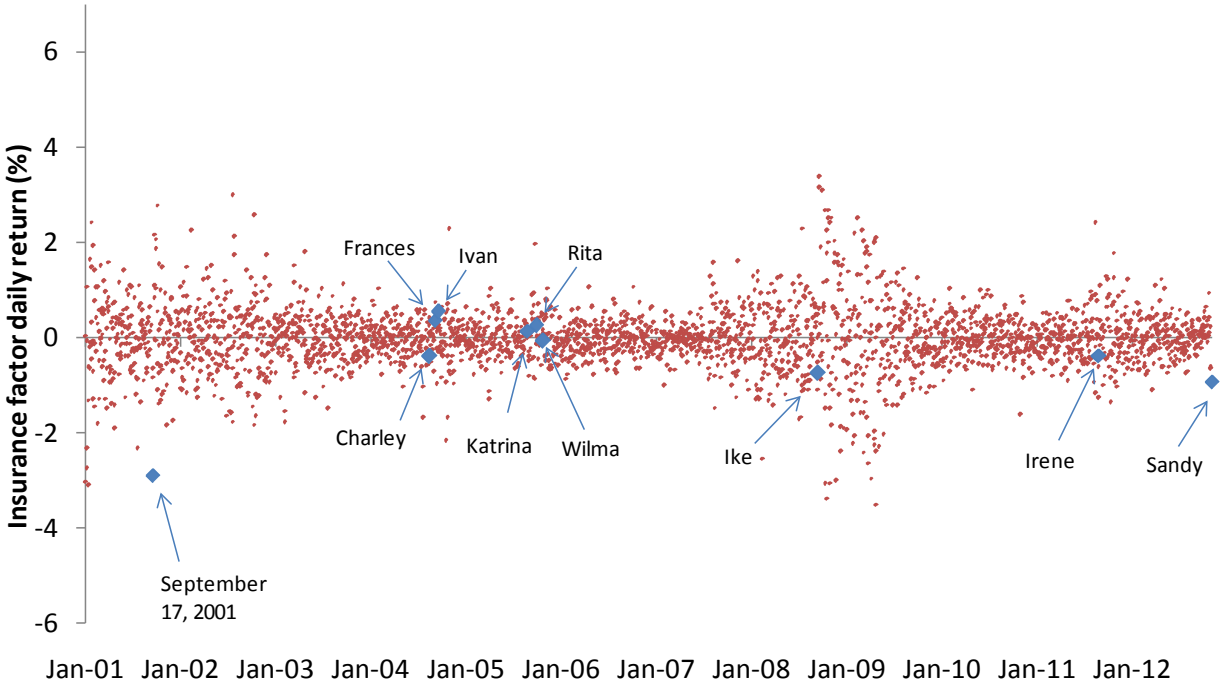


Figure 2 shows the hurricanes on a plot of Insurance industry factor returns from the USE4 model. One can interpret this as a return on a portfolio of insurance stocks, relative to the performance of the broad US market and controlling for the influences of well-known equity premia (size, beta, momentum, value, volatility and others) captured by the style factors of USE4. A natural disaster can have a dual effect on the insurance industry. First, there is a significant wave of claims that immediately follow the disaster; a hurricane causing more damage than expected might lead to larger than expected payouts. This, in turn, may lead to a negative short-run impact on the returns of insurance companies. On the other hand, an unprecedented natural disaster may also lead to recalibration of models of insurance premia, leading to a positive longer-term impact on returns. Comparing the data in Figure 2 with Figure 1, we can see that unlike the broad market, Insurance factor returns do appear to have exhibited outliers around the dates of major hurricanes—Charley, Ivan, Katrina and Wilma. These outliers can be both positive and negative.

At first glance, Figure 2 suggests that we might expect to find the impact of the hurricane is greater on concentrated industry portfolios relative to the broad market. In the following sections, we describe the expected impact on various industries, and assess whether we can detect historical patterns in factor returns following recent US hurricanes.

Figure 2: Impact of US hurricanes on insurance factor returns.



Industry Impact of Hurricanes

In the previous section, we took a first glance at the impact of hurricanes on the returns of insurance stocks. Here, we outline what one might expect to be the impacts of a natural disaster on the returns in other industries.

- **Utilities**
  In the immediate aftermath of Hurricane Sandy, residents of New York City saw the obvious impact on the utilities sector. Significant power outages led utility companies to bring in personnel from around the country to repair the damage and restore services, all at a high cost.
- **Retail**
  Disruption to ground transport and other infrastructure has an obvious impact on retailers. The logistical difficulties of operating in the aftermath may lead to temporary store closures. Postal and power disruption could curtail online shopping during the outage. Moreover, the lateness of the storm this year might affect year-end holiday shopping. Home improvement retailers, on the other hand, might see a positive impact as demand for their merchandise increases.
- **Transportation**
  In the aftermath of Sandy, transport disruption was evident throughout the US east coast. The effect on airlines was particularly strong, as many flights were cancelled. This can result in a potential cost impact to airlines as measures to restore the route systems are taken.
- **Construction**
  Infrastructure damage could lead to a positive impact for construction companies as rebuilding gets underway.

- **Oil**
  Oil refineries were shutdown on the east coast, leading to supply constraints.

Can We Find Patterns in Factor Returns Following US Hurricanes?

The factor returns in Barra Equity Models represent natural dimensions that can be used to decompose the impact of a major event on the cross-section of equity returns. Through the lens of the US Equity Model (USE4) we examine the historical returns of industry and style factors following the five hurricanes with the largest insured losses over the last decade. Table 2 highlights the return patterns for the USE4 USA country factor and a selection of USE4 style and industry factors. We present the cumulative returns over a 10-day horizon and a 30-day horizon following landfall. For comparison, we also present the average daily return and the average absolute daily return. It is worth noting that the returns following hurricane Ike have been significantly influenced by the unfolding of the sub-prime crisis. Hence the effects observed are due, in large part, to a general increase in investor risk aversion as the financial crisis unfolded, rather than solely a direct response to the natural disaster.[3]

Consistent with what we observed in Figure 1, there appeared to be no observable pattern to the USA country factor returns following the major US hurricanes we analyzed. Positive returns were observed in the 10 and 30 days following Wilma and Charley, as well as in the 10 days following Katrina and the 30 days following Ivan. Style factors also behaved consistently with their average performance. Momentum outperformed in the 30 days following US hurricanes, but this outperformance is largely consistent with its average returns. Leverage tended to underperform and Liquidity tended to outperform following the natural disasters; however, this is also the behavior we observe from these factors on average.

The industry factors illustrate the performance of the industry relative to the market and controlling for the premia associated with styles. The Insurance factor tended to have larger than average returns following hurricanes; however, the direction of these returns has not been consistent. The effect on Utilities has largely been negative at both the 10 and 30 day horizons. We observe some inconsistencies here as well—for example the 10-day returns following hurricane Katrina were positive for all Utilities factors. Homebuilding tended to benefit in the 10 days following the hurricanes; however, the outperformance frequently reversed in the 30 days following the event.

Some retailers appear to suffer following natural disasters; however, once again, the effects are frequently inconsistent. The most consistent results are for Food Retail and Personal Products, which appeared to suffer following the major hurricanes. The picture is more varied for other types of retailers. There seemed to be no consistent effect of the disasters on the transportation sector, with the exception of the Automobiles industry, which underperformed. Nevertheless, this is an industry that displays negative returns on average, so the underperformance is not surprising.

[3] In the Appendix, we show how to rescale factor returns to account for the volatility regime at the time of each natural disaster. Our conclusions are unchanged using this alternative methodology.

Table 2: Selected factor returns, USE4.

Factor name	Average daily return	Average daily absolute return	10 day returns					30 day returns				
			Katrina	Ike	Wilma	Charley	Ivan	Katrina	Ike	Wilma	Charley	Ivan
COUNTRY	0.03	0.88	2.39	-3.48	1.99	4.39	-0.15	-1.56	-31.78	5.36	4.69	1.42
STYLES												
Momentum	0.02	0.17	0.83	-0.29	-0.07	-0.79	0.83	1.38	3.47	0.06	0.34	0.99
Leverage	0.00	0.08	-0.06	-1.10	-0.58	-0.01	-0.08	-0.39	-6.08	-0.58	-0.07	-0.12
Liquidity	0.01	0.12	0.20	0.28	0.15	0.59	0.14	-0.08	1.05	0.64	0.68	-0.04
INDUSTRIES												
Insurance	-0.01	0.43	-1.99	7.79	3.23	-0.86	-0.76	2.81	20.20	0.73	-0.85	-2.42
Electrial Utilities	-0.02	0.60	0.25	-3.54	-2.43	-1.32	0.18	1.15	10.68	-3.68	-1.22	4.36
Gas Utilities	-0.02	0.52	0.79	-1.88	-1.81	-1.38	0.60	-0.31	18.63	-3.91	-0.91	0.84
Water and Power	-0.03	0.66	0.82	-5.96	-2.10	-1.13	-2.14	2.47	12.63	-2.88	-2.23	-5.26
Household Durables	-0.02	0.52	0.27	2.42	-2.94	0.28	-1.06	-1.97	-8.27	-3.08	-0.09	-0.51
Homebuilding	0.02	1.18	1.94	3.04	1.12	0.45	0.64	-4.29	-1.70	-4.36	6.95	-2.92
Internet Retail	0.02	0.95	-1.03	0.07	-0.22	-0.55	0.84	-0.30	-3.86	5.41	-0.26	-7.48
Leisure Products, Apparel	0.02	0.83	-5.21	-3.07	4.78	-1.56	-2.23	-4.66	-17.21	3.64	-2.48	2.98
Speciality Stores	-0.02	0.61	-3.02	-1.36	1.23	0.68	-0.71	-7.02	-14.56	-0.98	0.23	-0.33
Speciality Retail	0.02	0.74	-1.95	-1.30	1.64	3.68	2.24	-4.80	-9.33	0.77	7.30	4.28
Personal Products	0.01	0.52	-0.48	-1.56	-2.25	-0.11	-3.58	-3.41	-0.78	-3.26	-4.78	-6.73
Food Retail	0.00	0.51	-1.20	-0.19	-1.61	-0.39	-0.19	-0.19	5.39	-4.04	-3.60	-0.38
Food Products	0.00	0.42	-0.22	-1.07	-3.46	-0.14	-2.14	3.72	10.89	-6.47	-3.82	-1.81
Airlines	-0.02	1.43	-7.96	-0.97	3.20	1.79	-6.86	1.78	79.43	6.65	-11.72	-1.56
Transportation	0.00	0.62	-3.43	-7.38	6.12	0.74	2.21	2.05	-10.90	6.79	5.43	8.25
Road and Rail	0.00	0.65	-3.67	-1.46	3.62	-2.10	1.23	4.04	0.15	2.22	-0.88	5.12
Automobiles	-0.05	0.71	-7.48	-7.79	-1.80	-1.28	-2.53	-12.13	-27.45	-7.80	-8.10	-10.27
Constr. and Farm Machinery	0.00	0.76	2.38	-3.70	0.93	-0.59	5.66	1.54	-21.79	3.93	3.61	-1.56
Industrial Machinery	-0.01	0.44	1.79	-3.80	0.83	-0.51	0.36	-0.22	-13.86	1.53	-1.60	1.04
Building Products	-0.01	0.68	0.04	-0.62	-1.14	-2.11	-1.89	2.41	-7.70	-2.41	-2.38	-2.73
Constr. and Engineering	0.00	0.70	3.80	-4.15	2.33	-0.99	-2.47	7.28	-10.12	3.69	-2.53	3.35
Oil and Gas Equipment	0.02	1.24	3.51	0.24	2.75	-1.42	4.28	1.34	-19.74	6.25	6.54	1.41
Oil and Gas Exploration	0.01	1.00	3.08	7.73	-3.06	-2.49	6.03	5.76	4.95	-0.60	6.95	4.79
Oil, Gas and Fuels	0.01	0.80	6.90	0.68	-2.92	-1.93	4.40	4.18	-3.58	-3.09	6.07	5.80

Note: Average daily returns and absolute daily returns have been calculated using the full history of the USE4 model (30 June 1995 to 31 October 2012). These can be seen as proxies for the expected daily returns and absolute returns of each factor.

Interestingly, the effects on Construction and Oil sectors also appear to be mixed, with some natural disasters being followed by positive returns and others by negative returns. The exception appears to be the Oil and Gas Equipment factor, the return to which was consistently positive in the 30 days following Katrina, Wilma, Charley and Ivan.

Institutional investors faced with an event that dominates the news in the way hurricane Sandy did in recent days naturally ponder whether to make changes in their portfolios. In considering making any such changes, they may analyze the delicate trade-off between the possibility of uncertain higher future expected returns and the certainty of the transaction costs incurred when rebalancing a portfolio. Based

on our analysis above, we conclude that few predictable patterns emerged in the cross-section of equity returns following the five large natural disasters that we reviewed.

Conclusion

Hurricane Sandy caused unprecedented disruption to business life in New York City and led to the first weather related market closure for more than a century. Institutional investors might expect the hurricane to have an impact on the broad market, as well as pronounced effects in certain industries and sectors, such as insurance, construction, retail, utilities and transportation. In this paper, we examined the implications of past natural disasters on the cross- section of equity market returns and risks in the US. Our conclusion is that historically there are few predictable effects of natural disasters on the equity market.

Appendix: Rescaling Past Factor Returns to Current Volatility Regime

As evident from Figures 1 and 2, past natural disasters occurred during a range of volatility environments. Hurricanes Ivan, Charley, Katrina and Wilma occurred during periods of relatively low volatility, while hurricanes Ike and Irene occurred during periods of above average volatility. When comparing the returns to factors in the aftermath of these events, it may be desirable to control for the prevailing volatility environment.

We can do this by rescaling the returns that occurred in the past to the current volatility regime. Specifically, we use the original factor return series $r_{i,t}$ to construct a re-scaled return series

$$\hat{r}_{i,t} = r_{i,t}\left[\frac{\sigma_{i,T}}{\sigma_{i,t}}\right] \quad (1)$$

where $\sigma_{i,t}$ is the factor volatility at time *t* and $\sigma_{i,T}$ is the factor volatility on October 31,2012. The volatilities are estimated using exponential weighting with a half-life of 11 days. Equation (1) converts a return at time *t* into a Z-score using the volatility calculated at time *t*. The Z-score is then converted to a return consistent with the current volatility environment by multiplication with the volatility calculated on October 31, 2012.

We display the rescaled industry factor returns for 10 and 30 days after landfall for hurricanes Katrina, Ike, Wilma, Charley and Ivan on the next page. This gives an alternative view of the magnitude of industry factor returns that might be expected following a natural disaster given the current volatility environment. Our main conclusions are unchanged using this methodology.

Factor name	Average 10 day return	Average 30 day return	10 day returns					30 day returns				
			Katrina	Ike	Wilma	Charley	Ivan	Katrina	Ike	Wilma	Charley	Ivan
OILGSDRL	0.23	0.68	1.39	2.04	1.25	-0.19	5.28	0.87	-7.45	2.89	10.18	4.66
OILGSEQP	0.22	0.67	2.58	0.24	1.63	-1.28	3.56	1.23	-8.41	3.39	5.26	1.42
OILGSEXP	0.13	0.43	2.23	2.75	-1.52	-1.73	4.89	4.82	-0.47	-0.32	5.63	3.81
OILGSCON	0.11	0.33	5.21	0.16	-1.84	-1.65	4.44	3.99	-1.68	-1.80	6.52	5.69
CHEM	0.00	0.00	-0.86	-2.47	0.35	2.99	3.44	-1.25	-3.39	0.76	3.40	1.77
SPTYCHEM	-0.16	-0.50	-1.81	-2.14	-0.02	0.65	1.49	-8.02	-3.12	2.30	0.60	-1.64
CNSTMATL	-0.07	-0.22	9.85	5.82	-4.74	3.17	2.24	10.48	0.96	-8.33	9.85	1.39
CONTAINR	-0.15	-0.46	-2.13	-1.35	2.44	-1.82	-1.55	-7.81	0.15	7.77	-4.78	-4.94
PAPER	-0.12	-0.39	2.52	-2.07	1.50	0.06	2.06	1.66	-12.58	5.67	0.35	-5.17
ALUMSTEL	-0.20	-0.60	2.95	-3.40	1.94	-0.16	2.69	1.09	-11.65	7.90	1.18	-0.68
PRECMTLS	0.26	0.77	4.44	-0.13	-2.88	1.64	5.58	13.23	-2.00	3.73	3.95	3.11
AERODEF	0.01	-0.01	-3.55	-2.85	-3.08	0.17	-0.79	-3.65	-0.35	-3.32	0.96	-3.33
CNSTMACH	0.05	0.15	2.18	-1.40	0.59	-0.46	5.57	1.36	-8.46	3.42	3.59	-0.89
INDMACH	-0.14	-0.42	2.66	-2.22	0.87	-0.68	0.58	0.16	-6.89	1.74	-2.18	1.10
BLDGPROD	-0.19	-0.49	0.13	-0.07	-2.73	-4.86	-4.64	5.29	-5.28	-6.60	-6.12	-6.39
TRADECO	-0.16	-0.48	4.51	-2.08	1.47	-0.27	1.35	4.96	-3.46	3.39	-0.70	-5.08
CNSTENG	-0.03	-0.10	5.44	-1.39	2.04	-1.05	-3.28	8.24	-3.54	3.30	-3.13	4.07
ELECEQP	-0.05	-0.17	1.58	-0.43	1.77	-1.59	0.74	2.44	-3.05	3.73	0.18	1.33
CONGLOM	0.05	0.20	-0.06	-1.84	-0.28	2.10	-4.72	6.43	1.87	6.29	-9.73	-5.74
COMSVCS	-0.10	-0.30	-0.45	-2.40	1.04	0.03	-0.64	-0.92	-4.12	0.49	-0.49	-2.94
AIRLINES	-0.22	-0.65	-7.69	1.29	2.43	1.56	-6.12	0.66	17.97	5.50	-9.81	-1.69
TRANSPRT	-0.02	-0.12	-5.04	-5.12	6.45	0.80	3.21	2.44	-7.79	6.66	7.56	11.84
ROADRAIL	0.01	0.01	-3.94	-0.36	4.10	-2.06	1.45	4.23	0.05	2.68	-0.54	5.71
AUTO	-0.70	-2.05	-12.93	-5.52	-1.67	-1.78	-3.44	-18.65	-17.92	-7.74	-11.33	-13.89
HOUSEDUR	-0.12	-0.38	0.39	1.23	-3.01	0.30	-1.61	-2.75	-2.35	-2.89	-0.13	-1.14
HOMEBLDG	0.09	0.30	2.85	1.59	1.92	0.65	1.44	-5.63	-0.33	-6.05	10.43	-2.86
LEISPROD	-0.19	-0.58	-3.32	1.66	1.57	0.65	1.09	-5.87	-3.23	1.63	2.75	-0.57
LEISSVCS	-0.11	-0.29	-2.13	-0.87	-0.48	0.11	2.51	-3.98	-2.30	-0.84	3.66	4.31
RESTAUR	-0.04	-0.11	-2.61	0.48	0.27	-0.49	2.27	-2.61	-0.75	-0.29	1.32	3.15
MEDIA	0.00	-0.02	-0.62	-2.09	0.35	-1.09	-0.35	-3.17	-5.14	-3.00	-1.55	2.25
DISTRIB	0.01	0.03	-3.09	-0.44	0.41	-0.61	-0.60	-3.90	-2.68	-2.25	0.04	-0.58
NETRET	0.24	0.76	-1.76	0.15	-2.87	-1.05	1.00	0.17	-2.12	4.73	-0.58	-11.38
APPAREL	0.12	0.38	-4.28	-1.22	2.67	-1.05	-1.31	-4.26	-6.70	1.92	-1.67	1.99
SPTYSTOR	-0.15	-0.44	-3.05	-0.39	0.68	0.62	-0.59	-5.72	-2.75	-1.18	0.26	-0.02
SPLTYRET	0.09	0.23	-2.81	-0.44	2.36	4.46	2.66	-5.65	-4.27	0.99	8.67	5.53
PSNLPROD	0.07	0.20	-0.35	-0.60	-1.65	-0.01	-2.51	-2.49	-0.36	-2.47	-3.34	-4.28
FOODRET	-0.03	-0.09	-1.30	-0.38	-1.56	-0.26	-0.11	-0.29	1.47	-4.05	-2.77	-0.43
FOODPROD	-0.02	-0.05	-0.25	-0.55	-2.59	-0.10	-1.87	3.53	4.79	-5.13	-3.79	-1.37
BEVTOB	0.12	0.38	-1.33	-0.73	0.02	-0.89	-1.28	-1.50	0.88	-0.21	-4.60	-0.75
HLTHEQP	0.09	0.28	0.42	-0.47	-0.39	-0.46	-0.31	-2.98	-1.69	0.51	-0.39	-3.73
MGDHLTH	0.03	0.08	2.21	-2.25	-4.59	-1.46	0.51	2.51	2.91	-2.58	1.62	-8.83
HLTHSVCS	0.04	0.12	-0.80	-1.60	-2.08	-1.54	0.55	-1.20	-2.37	-1.47	-2.50	-1.80
BIOLIFE	0.35	1.08	1.70	0.39	0.93	2.95	-0.46	-2.66	3.40	-2.21	2.51	-8.07
PHARMA	0.20	0.59	4.12	-1.51	-1.11	0.88	-2.58	0.00	3.22	-5.27	-1.05	-6.53
BANKS	-0.22	-0.63	-4.60	4.95	2.07	1.01	-3.35	-8.14	11.29	1.73	-1.45	-1.88
DIVFIN	0.02	0.05	-0.42	1.95	1.28	1.71	-0.62	3.14	2.06	2.17	1.41	0.48
LIFEINS	-0.15	-0.46	-1.20	-0.95	2.61	0.52	-1.72	1.71	-3.84	0.71	-0.74	-7.04
INSURNCE	-0.17	-0.51	-3.17	4.21	3.04	-0.92	-0.88	1.27	7.60	0.93	-1.10	-2.78
REALEST	-0.11	-0.33	0.04	0.53	-1.26	1.44	0.16	-2.13	1.99	0.15	0.56	2.81
SEMIEQP	-0.04	-0.14	-1.26	-0.52	-0.85	-1.67	-0.09	-2.25	-2.23	2.30	-2.78	1.36
SEMICOND	0.08	0.24	0.16	0.65	0.62	-0.98	0.11	-2.90	3.16	5.73	-2.52	2.64
INTERNET	0.05	0.17	-0.05	-0.25	0.54	-0.33	0.75	2.77	-0.08	0.55	0.84	2.52
SOFTWARE	0.15	0.45	0.90	-0.67	-1.28	-1.05	0.53	1.35	-2.40	-3.59	-0.01	5.60
COMMEQP	0.11	0.36	1.47	-0.69	-1.03	1.14	-1.45	4.64	1.96	-2.52	0.05	0.36
COMPELEC	0.02	0.09	-1.34	-1.64	-0.20	0.64	0.90	-0.42	-4.75	2.97	0.32	0.85
TELECOM	-0.02	-0.04	-2.35	-2.44	0.71	-1.91	0.14	-0.89	-0.89	1.98	0.21	-0.09
WIRELESS	0.13	0.37	0.91	-1.92	0.53	-1.27	0.88	-4.40	-1.34	2.99	-1.01	3.08
ELECUTIL	-0.08	-0.23	0.17	-1.30	-1.22	-0.85	0.17	0.94	3.07	-1.90	-0.81	4.59
GASUTIL	-0.12	-0.35	0.65	-0.70	-0.99	-1.13	0.52	-0.39	4.08	-2.27	-0.60	0.75
MULTUTIL	-0.13	-0.37	0.63	-2.21	-1.11	-0.55	-1.58	2.06	3.04	-1.58	-1.38	-3.89

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[1] *As of June 30, 2011, based on eVestment, Lipper and Bloomberg data.*