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Market Aftershocks? A Seven-Day Update The Global Impact of the Japan Earthquake As Seen Through the Lens of Axioma's Daily Risk Models

Anthony Renshaw, PhD

A seven-day update of Axioma's first article¹ on the impact of events in Japan on markets worldwide shows the initial trends continuing to play out. Non-Japanese markets continue to recover from their lows on March 14 and remain well de-correlated from the events in Japan², while Japan's domestic market remains challenging.

The initial response of the market was, of course, to reduce its exposure to Japan. As the situation began to improve or at least stabilize following March 14, investors who were short on volatility in Japan started to increase their exposure to and risk in Japan.

The situation merits continued close observation, at least until control of the Fukushima nuclear plant is regained. Positive news from Japan is likely to be followed by strong re-investment in that market.

[1] Market Aftershocks? The Global Impact of the Japan Earthquake as Seen Through the Lens of Axioma's Daily Risk Models
http://www.axioma.com/downloads/MarketAfterShocks_Japan_20010318_v2.pdf
[2] The market movements in response to Japan were not driven by any particular industries, so there was little contagion to other markets as a result of the high level of industry-industry correlations. See Link(correlations piece) for details.





Market Aftershocks? A Seven-Day Update

The Global Impact of the Japan Earthquake

as Seen Through the Lens of Axioma's Daily Risk Models

By Anthony Renshaw, PhD

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1. Introduction

This article is a seven-day update of Axioma's first article¹ examining how the events in Japan have played out in markets worldwide, as seen by Axioma's risk models.

Overall the trends observed in the first piece continue to play out: that is, non-Japanese markets continue to recover from their lows on March 14. In contrast, Japan's market has seen only a modest improvement since March 14.

As noted in the earlier article, because Axioma's risk models are updated daily, we are able to observe market developments as they occur, in contrast with conventional risk models in which the covariance matrix is updated on a monthly basis. The returns-timing or returns-synchronization correction incorporated in Axioma's global risk models ensures that the reported country-country correlations using daily returns data are accurate. Without such a correction, correlations between Japan and the US would be seriously underestimated due to the different trading hours of these two markets².

¹ Available at http://axioma.com/downloads/MarketAfterShocks_Japan_20010318_v2.pdf.

² For a detail description of this phenomenon and Axioma's Returns-Timing correction, see http://axioma.com/downloads/Axioma_ReturnsTiming_ShortVersion20101116.pdf.

2. The Global Perspective

Figure 1 shows the cumulative return of the market return for 10 Axioma fundamental factor risk models since the beginning of February. For the multi-country models, we report the Market Factor return, whose factor exposure for all assets is one. For the single-country models, we report the cumulative return of the average return of all industries. The seven multi-country models are North America (AXNA), Global (AXWW2), European (AXEU2), Global Ex US (AXWWxUS), Asia Pacific (AXAP), Asia Pacific Ex Japan (AXAPxJP), and Emerging Markets (AXEM2). The three single-country models are the US (AXUS2), Great Britain (AXGB), and Japan (AXJP2)³.

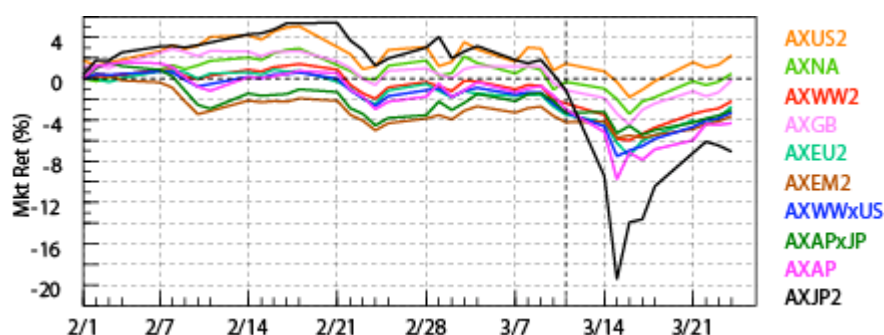


Figure 1. The cumulative return of the market for 10 Axioma fundamental factor risk models since the beginning of February. AXUS2 = US; AXNA = North America; AXWW2 = Global; AXGB = Great Britain; AXEU2 = European; AXEM2 = Emerging Markets; AXWWxUS = Global Ex US; AXAPxJP = Asia Pacific Ex Japan; AXAP = Asia Pacific; AXJP2 = Japan. Colors for each model are shown at right. The earthquake occurred on 3/11, which is indicated by the heavy dashed line. Japan’s market was closed for a holiday on 3/21. All dates indicate market close.

The Japanese equity market experienced sharp declines starting 3/11 and continuing through 3/15. On 3/16, the market finally rebounded. Other markets exhibited similar patterns, albeit of significantly smaller magnitudes. So far, non-Japanese markets – US, North America, Europe – have been the least affected by events. Nevertheless, the one-percent-plus drops experienced by US markets on 3/15 were unnerving.

³ The factor returns are the same for the short and medium horizon models.

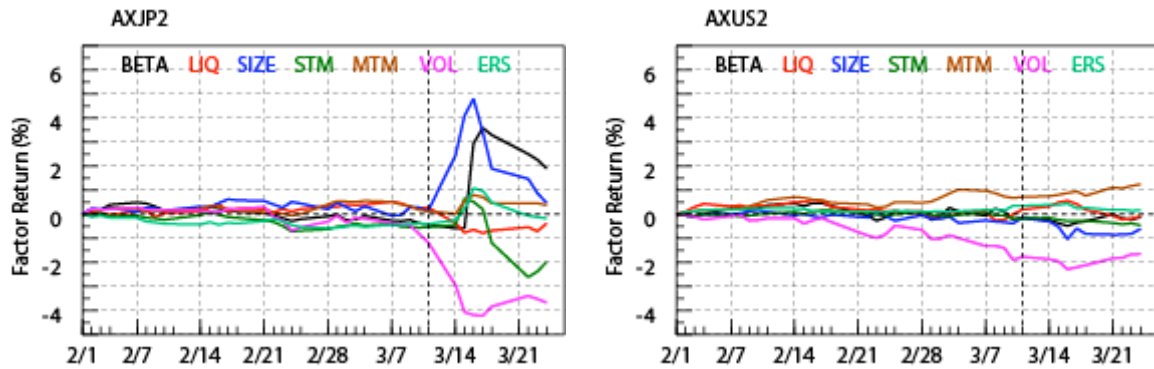


Figure 2. The cumulative return of the technical style risk factors for the Japanese (AXJP2) and US (AXUS2) fundamental factor risk models. The technical factors are market sensitivity (BETA, black), liquidity (LIQ, red), size (SIZE, blue), short-term momentum (STM, dark green), medium-term momentum (MTM, brown), volatility (VOL, pink), and exchange-rate sensitivity (ERS, aquamarine). Corresponding colors are shown on the graph.

In Fig.2, we compare the cumulative factor returns of the seven technical factors in the Japanese (AXJP2) and US (AXUS2) fundamental factor risk models over the same time frame. The seven factors are market sensitivity (BETA, black), liquidity (LIQ, red), market capitalization (SIZE, blue), short-term momentum (STM, green), medium-term momentum (MTM, brown), volatility (VOL, pink), and exchange-rate sensitivity (ERS, aquamarine).

In Table 1, we show the daily factor returns for the seven technical factors over the last eight trading days for the Japanese risk model.

Date	SIZE	LIQ	STM	MTM	VOL	BETA	ERS
3/14	2.3%	-0.7%	0.1%	-0.1%	-1.8%	-0.2%	0.2%
3/15	1.6%	-0.4%	1.1%	0.5%	-1.2%	0.0%	0.5%
3/16	0.7%	0.1%	-0.1%	0.3%	-0.1%	3.5%	0.9%
3/17	-1.3%	-0.1%	-0.3%	-0.1%	0.0%	0.6%	-0.1%
3/18	-1.5%	0.1%	-1.4%	-0.3%	0.4%	-0.3%	-0.5%
3/22	-0.4%	0.1%	-1.4%	0.0%	0.5%	-0.8%	-0.5%
3/23	-0.6%	-0.2%	0.2%	0.0%	-0.1%	-0.2%	-0.1%
3/24	-0.4%	0.3%	0.4%	-0.1%	-0.2%	-0.4%	-0.1%

Table 1. The daily factor returns from the technical style risk factors for the Japanese fundamental factor risk model (AXJP2). Returns in excess of +/-1% are highlighted in yellow. March 21 was a holiday in Japan.

In Japan, the largest initial movements since the earthquake were the size factor, which surged, and volatility, which plummeted. These initial returns indicate that large caps performed considerably better than small caps on 3/14, and low volatility stocks out-performed high volatility stocks. Of course, this is relative performance. Given the large decline in the Japanese

market, large cap and low volatility stocks undoubtedly declined, but their declines were significantly less than those of small cap and high volatility stocks.

Since then both market sensitivity and short-term momentum surged and fell, while size fell and volatility was flat. Although it is too early to be certain, it seems as though the Japanese market may be reaching a less volatile state.

The US factor returns have been relatively unaffected compared with the Japanese factor returns. The largest single day US factor returns were size (-0.5% on 3/16, +0.4% on 3/17) and volatility (-0.3% on 3/16).

Tables 2 and 3 report the changes in country volatility and country correlations to Japan using the country-focused⁴ global risk model (AXWW2-MH) on the day before the earthquake, 3/10, a 3/15, and 3/24. Figures 3 and 4 show times series of this same data for a small subset of countries.

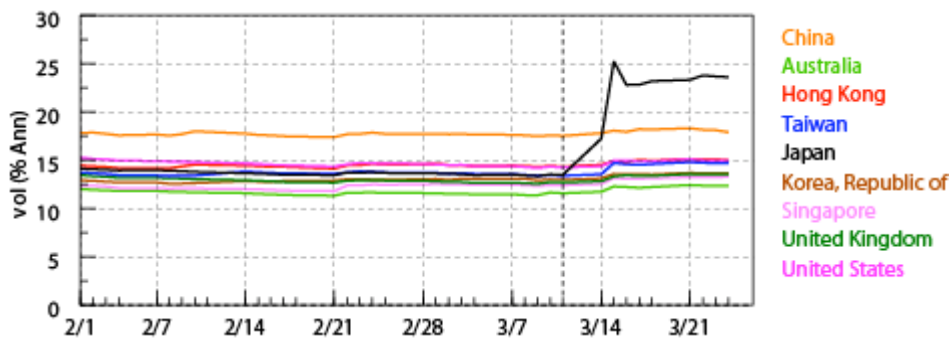


Fig. 3. Country volatilities for selected countries using Axioma’s global fundamental factor risk model AXWW2 (country-focused).

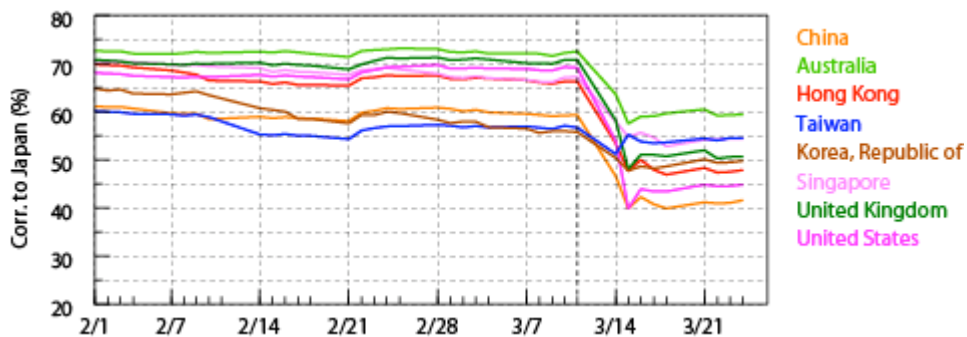


Fig. 4. Correlations of selected countries to Japan using Axioma’s global fundamental factor risk model AXWW2 (country-focused).

⁴ Axioma’s risk models can report risk in three distinct ways: country-focused, in which the market return is included in the country factor returns, risks, and correlations; industry-focused, in which the market return is included in the industry factor returns, risks, and correlations; and market-focused, in which the market return is reported separately from the industry and country factors.

	Country	Country Volatility on 3/10 (%Ann)	Country Volatility on 3/15 (%Ann)	Country Volatility on 3/24 (%Ann)	Volatility Change (%Ann)		Country	Country Volatility on 3/10 (%Ann)	Country Volatility on 3/15 (%Ann)	Country Volatility on 3/24 (%Ann)	Volatility Change (%Ann)
1	Japan	13.5%	25.2%	23.6%	10.1%	35	Denmark	12.8%	13.5%	13.5%	0.7%
2	Estonia	18.0%	19.8%	20.4%	2.4%	36	Philippines	15.0%	15.6%	15.6%	0.7%
3	Egypt	22.9%	23.2%	25.4%	2.4%	37	Norway	13.5%	14.3%	14.2%	0.6%
4	Lithuania	14.1%	16.7%	16.3%	2.2%	38	Italy	14.8%	15.4%	15.5%	0.6%
5	Cyprus	18.8%	20.4%	20.2%	1.4%	39	Korea Republic of	13.0%	13.6%	13.6%	0.6%
6	France	13.3%	14.0%	14.6%	1.3%	40	Venezuela	10.9%	11.4%	11.5%	0.6%
7	Greece	21.8%	23.3%	23.1%	1.3%	41	Slovakia	10.2%	10.7%	10.8%	0.6%
8	Taiwan	13.5%	14.7%	14.7%	1.3%	42	South Africa	11.5%	12.0%	12.1%	0.6%
9	Germany	12.0%	13.0%	13.2%	1.2%	43	United States	14.3%	15.0%	14.9%	0.6%
10	Pakistan	16.2%	16.6%	17.4%	1.2%	44	Hong Kong	14.4%	14.9%	15.0%	0.6%
11	Switzerland	11.8%	12.6%	13.0%	1.1%	45	Croatia	12.9%	13.4%	13.5%	0.6%
12	Netherlands	12.8%	13.5%	13.8%	1.0%	46	Bahrain	9.0%	9.4%	9.5%	0.6%
13	Mauritius	12.4%	12.8%	13.4%	1.0%	47	Poland	11.6%	12.2%	12.2%	0.5%
14	Israel	12.6%	13.2%	13.6%	1.0%	48	Jordan	9.6%	10.1%	10.2%	0.5%
15	Austria	13.7%	14.5%	14.7%	1.0%	49	Hungary	15.4%	15.9%	16.0%	0.5%
16	Colombia	13.5%	14.1%	14.5%	1.0%	50	Canada	10.4%	10.9%	11.0%	0.5%
17	Mexico	11.8%	12.4%	12.7%	0.9%	51	Slovenia	12.4%	12.8%	12.9%	0.5%
18	Sweden	14.9%	15.5%	15.7%	0.9%	52	Botswana	11.3%	11.8%	11.8%	0.5%
19	Singapore	12.4%	13.2%	13.3%	0.9%	53	Oman	11.6%	12.0%	12.0%	0.5%
20	Finland	14.0%	14.7%	14.9%	0.8%	54	Turkey	17.9%	18.7%	18.4%	0.4%
21	Peru	13.5%	13.9%	14.4%	0.8%	55	Malaysia	10.9%	11.4%	11.4%	0.4%
22	United Kingdom	12.7%	13.3%	13.6%	0.8%	56	Kuwait	12.5%	12.7%	12.9%	0.4%
23	Belgium	13.3%	14.0%	14.2%	0.8%	57	Indonesia	16.0%	16.2%	16.4%	0.4%
24	Argentina	17.3%	17.7%	18.1%	0.8%	58	Thailand	13.9%	14.3%	14.2%	0.4%
25	Latvia	11.6%	12.2%	12.3%	0.8%	59	India	18.9%	19.2%	19.3%	0.3%
26	Czech Republic	12.4%	13.1%	13.2%	0.7%	60	China	17.6%	18.1%	17.9%	0.3%
27	Russian Federation	13.2%	13.7%	13.9%	0.7%	61	Morocco	10.2%	10.5%	10.5%	0.3%
28	Australia	11.7%	12.3%	12.4%	0.7%	62	Spain	15.9%	16.2%	16.2%	0.3%
29	Iceland	10.7%	11.3%	11.4%	0.7%	63	Bulgaria	15.9%	16.1%	16.2%	0.3%
30	Luxembourg	10.1%	10.7%	10.8%	0.7%	64	Sri Lanka	15.1%	15.3%	15.3%	0.3%
31	Ireland	14.7%	15.1%	15.4%	0.7%	65	Qatar	15.4%	15.6%	15.6%	0.3%
32	Brazil	12.1%	12.9%	12.8%	0.7%	66	Romania	16.9%	17.3%	17.2%	0.2%
33	Chile	12.6%	13.2%	13.3%	0.7%	67	Portugal	17.1%	17.3%	17.3%	0.2%
34	New Zealand	11.9%	12.4%	12.5%	0.7%	68	United Arab Emirates	14.9%	15.1%	15.0%	0.2%

Table 2. The country volatilities on 3/10, 3/15, and 3/24 using Axioma's global fundamental factor risk model AXWW2 (country-focused).

	Country	Country Correl. To Japan on 3/10	Country Correl. To Japan on 3/15	Country Correl. To Japan on 3/24	Correl. Change		Country	Country Correl. To Japan on 3/10	Country Correl. To Japan on 3/15	Country Correl. To Japan on 3/24	Correl. Change
1	Kuwait	19.5%	19.2%	21.4%	1.9%	35	Hungary	61.2%	44.3%	46.3%	-14.9%
2	Estonia	38.0%	42.9%	38.6%	0.6%	36	France	73.0%	55.0%	57.9%	-15.1%
3	Lithuania	50.3%	54.2%	50.5%	0.2%	37	Ireland	60.2%	45.1%	44.8%	-15.4%
4	Japan	100.0%	100.0%	100.0%	0.0%	38	Belgium	69.6%	51.2%	53.7%	-15.9%
5	Sri Lanka	25.3%	27.1%	22.7%	-2.6%	39	Indonesia	42.5%	26.2%	26.6%	-15.9%
6	Taiwan	57.1%	55.2%	54.5%	-2.6%	40	Netherlands	73.1%	54.3%	57.1%	-16.0%
7	Bulgaria	30.2%	28.1%	24.5%	-5.7%	41	Croatia	55.1%	36.4%	39.1%	-16.1%
8	Latvia	54.7%	48.2%	48.8%	-5.9%	42	Luxembourg	72.4%	54.4%	56.3%	-16.1%
9	Korea Republic of	56.0%	47.7%	49.8%	-6.2%	43	Portugal	44.6%	27.1%	28.2%	-16.4%
10	Colombia	41.8%	30.4%	35.0%	-6.8%	44	Iceland	75.2%	56.1%	58.4%	-16.8%
11	Qatar	38.6%	30.4%	31.2%	-7.4%	45	Bahrain	67.5%	44.7%	50.4%	-17.1%
12	United Arab Emirates	38.7%	28.6%	31.0%	-7.7%	46	China	59.2%	39.9%	41.6%	-17.6%
13	Jordan	50.4%	39.0%	42.0%	-8.3%	47	Venezuela	69.9%	49.3%	51.8%	-18.0%
14	Argentina	46.6%	39.7%	38.3%	-8.4%	48	Hong Kong	66.3%	47.7%	47.9%	-18.4%
15	Egypt	32.6%	28.6%	23.7%	-9.0%	49	Israel	55.3%	33.7%	36.9%	-18.4%
16	Sweden	60.0%	46.9%	50.7%	-9.2%	50	Chile	55.2%	32.3%	36.5%	-18.7%
17	Pakistan	24.9%	19.3%	13.8%	-11.0%	51	Malaysia	62.9%	41.4%	44.1%	-18.7%
18	Peru	47.1%	37.5%	36.0%	-11.1%	52	South Africa	64.1%	45.8%	45.0%	-19.1%
19	Norway	64.5%	50.1%	53.2%	-11.3%	53	Slovakia	78.0%	55.5%	58.5%	-19.5%
20	Oman	60.7%	45.6%	49.1%	-11.6%	54	Mauritius	53.2%	34.8%	33.4%	-19.8%
21	Germany	68.9%	56.2%	57.1%	-11.8%	55	Thailand	50.5%	29.1%	30.6%	-19.9%
22	Morocco	39.3%	28.4%	27.4%	-11.9%	56	New Zealand	70.4%	49.0%	50.4%	-20.0%
23	Austria	66.5%	51.7%	54.2%	-12.3%	57	United Kingdom	70.8%	48.0%	50.7%	-20.1%
24	Singapore	67.1%	54.8%	54.4%	-12.7%	58	Poland	61.9%	38.7%	41.7%	-20.2%
25	Romania	52.6%	38.9%	39.8%	-12.8%	59	Canada	66.7%	40.9%	45.2%	-21.5%
26	Australia	72.2%	57.5%	59.4%	-12.8%	60	Turkey	48.5%	22.3%	26.5%	-22.0%
27	Finland	63.0%	45.3%	49.6%	-13.4%	61	Botswana	67.6%	41.9%	44.8%	-22.8%
28	Slovenia	50.8%	39.3%	37.4%	-13.4%	62	Philippines	47.7%	24.5%	24.4%	-23.3%
29	Denmark	66.7%	49.4%	53.0%	-13.7%	63	Czech Republic	76.1%	48.1%	52.6%	-23.6%
30	Switzerland	71.7%	55.7%	58.0%	-13.8%	64	United States	69.3%	39.9%	44.9%	-24.4%
31	India	31.0%	18.9%	17.0%	-14.0%	65	Cyprus	38.7%	13.5%	13.4%	-25.3%
32	Russian Federation	58.4%	44.9%	44.1%	-14.4%	66	Greece	36.3%	9.4%	8.7%	-27.6%
33	Spain	57.0%	36.8%	42.5%	-14.5%	67	Mexico	69.5%	38.4%	41.7%	-27.8%
34	Italy	63.7%	45.2%	49.0%	-14.6%	68	Brazil	52.9%	19.4%	23.9%	-29.0%

Table 3. The correlations of different countries to Japan on 3/10, 3/15, 3/24 using Axioma's global fundamental factor risk model AXWW2 (country-focused).

The changes in country volatility are, of course, largest for Japan. While most of the other countries also experienced increases in country volatility, these increases have been modest in comparison.

Almost all countries have shown a substantial de-correlation with Japan over the last two weeks. The two exceptions are Taiwan and the Republic of Korea, each of which have shown only modest declines in correlation but remain well correlated with Japan. Hong Kong, on the other hand, shows performance much closer to the United States than it does to Taiwan.

The data suggests that the events in Japan have been largely contained within Japan, with perhaps some spillover to Taiwan.

3. The Perspective from Japan

Table 4 shows the changes in industry volatilities reported by the Japanese fundamental factor risk model (AXJP2-MH) between 3/10, 3/15, and 3/24. Table 5 shows the changes in correlation of each industry to the market sensitivity factor, which we use as a proxy for the Japanese market.

	Industry	Industry Volatility on 3/10 (%Ann)	Industry Volatility on 3/15 (%Ann)	Industry Volatility on 3/24 (%Ann)	Volatility Change (%Ann)
1	Containers & Packaging	14.8%	35.5%	32.5%	17.7%
2	Media	15.2%	35.6%	32.3%	17.1%
3	Computers & Peripherals	15.6%	33.5%	31.7%	16.1%
4	Electric Utilities	14.4%	34.9%	29.9%	15.5%
5	Construction Materials	19.4%	26.1%	34.5%	15.1%
6	Hotels Restaurants & Leisure	12.7%	31.3%	27.3%	14.6%
7	Distributors	14.2%	31.7%	28.7%	14.5%
8	Metals & Mining	17.6%	34.0%	32.1%	14.5%
9	Food & Staples Retailing	13.0%	30.9%	27.4%	14.4%
10	Commercial Services & Supplies	13.8%	30.2%	28.0%	14.3%
11	Energy	16.5%	28.8%	30.7%	14.2%
12	Road & Rail	13.2%	30.1%	27.2%	14.1%
13	Electrical Equipment	16.0%	31.9%	30.0%	14.0%
14	Trading Companies & Distributors	16.8%	31.9%	30.7%	13.9%
15	Diversified Consumer Services	12.3%	28.9%	26.2%	13.9%
16	Gas Utilities	13.4%	29.6%	27.2%	13.9%
17	Real Estate Management & Developm	17.5%	34.3%	31.3%	13.7%
18	Multiline Retail	16.1%	33.1%	29.8%	13.7%
19	Chemicals	16.2%	32.9%	30.0%	13.7%
20	Biotechnology & Life Sciences	14.2%	30.4%	27.8%	13.7%
21	Pharmaceuticals	13.6%	30.6%	27.2%	13.6%
22	Leisure Equipment & Products	14.5%	31.1%	28.0%	13.5%
23	Health Care Providers & Services	14.1%	31.4%	27.6%	13.5%
24	Specialty Retail	13.9%	31.2%	27.3%	13.4%
25	Transportation Infrastructure	15.2%	30.9%	28.5%	13.3%
26	Internet & Catalog Retail	13.9%	29.8%	26.9%	13.0%
27	Software	14.8%	30.9%	27.7%	13.0%
28	Beverages & Tobacco	13.7%	30.2%	26.7%	12.9%
29	Food Products	12.8%	29.2%	25.6%	12.8%
30	Electronic Equipment Instruments	16.1%	31.4%	28.8%	12.7%
31	Industrial Conglomerates	13.6%	28.9%	26.2%	12.6%
32	Construction & Engineering	14.6%	18.2%	27.1%	12.5%
33	Airlines	13.8%	29.0%	26.2%	12.4%
34	Telecommunication Services	14.4%	30.2%	26.7%	12.3%
35	Professional Services	15.2%	29.9%	27.5%	12.3%
36	Household Durables	14.2%	29.2%	26.4%	12.2%
37	Paper & Forest Products	15.5%	28.2%	27.7%	12.2%
38	IT Services	16.5%	31.4%	28.2%	11.7%
39	Machinery	16.4%	29.8%	28.0%	11.6%
40	Office Electronics	15.7%	29.0%	27.1%	11.4%
41	Textiles Apparel & Luxury Goods	14.6%	28.8%	26.0%	11.3%
42	Diversified Financial Services	20.1%	33.3%	31.4%	11.2%
43	Household & Personal Products	13.1%	27.2%	24.2%	11.1%
44	Internet Software & Services	17.9%	31.9%	28.9%	11.1%
45	Real Estate Investment Trusts (RE	16.8%	28.5%	27.7%	10.9%
46	Banks	17.6%	30.9%	28.4%	10.8%
47	Air Freight & Logistics	14.8%	27.7%	25.6%	10.8%
48	Auto Components	17.9%	31.6%	28.7%	10.8%
49	Building Products	15.1%	25.4%	25.2%	10.1%
50	Communications Equipment	15.9%	27.2%	25.4%	9.6%
51	Automobiles	17.4%	29.8%	26.7%	9.4%
52	Health Care Equipment & Technol	13.6%	25.4%	22.4%	8.8%
53	Semiconductors & Semiconduct	19.4%	29.1%	28.2%	8.8%
54	Capital Markets	22.6%	33.5%	31.1%	8.5%
55	Insurance	23.3%	32.4%	31.2%	7.9%
56	Marine	20.2%	30.0%	27.7%	7.5%
57	Consumer Finance	26.2%	33.0%	31.8%	5.5%

Table 4. The industry volatilities in the Japanese fundamental factor risk model (AXJP2-MH) on 3/10, 3/15, and 3/24.

	Industry	Industry Correl To MktSens on 3/10	Industry Correl To MktSens on 3/15	Industry Correl To MktSens on 3/24	Correlation Change		Industry	Industry Correl To MktSens on 3/10	Industry Correl To MktSens on 3/15	Industry Correl To MktSens on 3/24	Correlation Change
1	Construction & Engineering	57.0%	55.2%	50.5%	-6.5%	30	Professional Services	50.0%	43.4%	17.6%	-32.4%
2	Construction Materials	51.6%	49.4%	42.2%	-9.4%	31	Beverages & Tobacco	48.7%	40.4%	16.1%	-32.6%
3	Real Estate Investment Trusts (REITs)	39.0%	37.1%	23.5%	-15.5%	32	Telecommunication Services	53.4%	43.9%	20.6%	-32.8%
4	Consumer Finance	40.7%	40.5%	22.4%	-18.3%	33	Paper & Forest Products	39.6%	36.8%	6.6%	-33.0%
5	Communications Equipment	52.7%	46.9%	30.9%	-21.7%	34	Airlines	57.2%	47.1%	23.8%	-33.3%
6	Electric Utilities	32.2%	27.3%	10.2%	-22.0%	35	Internet & Catalog Retail	47.6%	40.4%	14.2%	-33.4%
7	Health Care Equipment & Technology	53.0%	46.3%	30.8%	-22.2%	36	Electrical Equipment	58.5%	49.0%	24.9%	-33.6%
8	Internet Software & Services	42.2%	37.9%	19.9%	-22.3%	37	Chemicals	56.8%	47.5%	21.8%	-35.0%
9	Building Products	54.0%	49.1%	31.3%	-22.7%	38	Electronic Equipment Instruments &	59.3%	49.6%	24.3%	-35.0%
10	Energy	51.5%	46.1%	28.6%	-22.9%	39	Textiles Apparel & Luxury Goods	54.2%	46.2%	19.1%	-35.1%
11	Capital Markets	49.9%	47.0%	26.5%	-23.3%	40	Specialty Retail	48.7%	40.0%	13.6%	-35.1%
12	Gas Utilities	47.7%	39.1%	23.9%	-23.8%	41	Pharmaceuticals	47.4%	38.3%	12.2%	-35.1%
13	Insurance	38.2%	37.6%	14.1%	-24.1%	42	Road & Rail	50.9%	40.4%	15.4%	-35.4%
14	Marine	47.1%	44.6%	22.9%	-24.1%	43	Metals & Mining	57.9%	48.9%	22.0%	-36.0%
15	Automobiles	55.7%	50.1%	29.4%	-26.3%	44	Food Products	50.3%	41.0%	13.8%	-36.5%
16	Diversified Financial Services	48.1%	44.2%	20.0%	-28.1%	45	Real Estate Management & Develop	52.1%	45.0%	15.1%	-37.0%
17	Health Care Providers & Services	45.8%	38.6%	16.8%	-29.0%	46	Leisure Equipment & Products	54.6%	44.9%	16.9%	-37.7%
18	Air Freight & Logistics	54.7%	47.4%	25.5%	-29.2%	47	Distributors	55.5%	45.2%	17.7%	-37.8%
19	Banks	48.7%	43.6%	19.3%	-29.4%	48	Office Electronics	55.0%	47.6%	16.7%	-38.3%
20	Software	45.8%	39.8%	15.6%	-30.2%	49	Hotels Restaurants & Leisure	55.5%	43.4%	17.1%	-38.4%
21	Trading Companies & Distributors	58.4%	49.8%	28.2%	-30.2%	50	Transportation Infrastructure	50.0%	42.5%	11.0%	-39.0%
22	Machinery	59.8%	52.0%	29.0%	-30.8%	51	Food & Staples Retailing	52.9%	42.0%	13.9%	-39.0%
23	Auto Components	54.9%	48.6%	24.0%	-30.9%	52	Media	50.9%	40.6%	8.9%	-42.0%
24	Household & Personal Products	49.3%	41.0%	18.4%	-31.0%	53	Containers & Packaging	53.4%	41.3%	10.9%	-42.5%
25	Biotechnology & Life Sciences	55.1%	45.4%	23.9%	-31.2%	54	Commercial Services & Supplies	55.9%	45.4%	13.4%	-42.5%
26	IT Services	49.7%	43.3%	18.4%	-31.4%	55	Computers & Peripherals	51.3%	42.3%	8.6%	-42.7%
27	Household Durables	55.8%	47.5%	24.2%	-31.6%	56	Diversified Consumer Services	49.5%	39.3%	6.6%	-43.0%
28	Semiconductors & Semiconductor E	56.5%	52.3%	24.8%	-31.7%	57	Multiline Retail	52.3%	42.5%	9.2%	-43.0%
29	Industrial Conglomerates	58.0%	47.2%	26.1%	-31.9%						

Table 5. The correlations of different industries to the market sensitivity factor in the Japanese fundamental factor risk model (AXJP2-MH) on 3/10, 3/15, and 3/24. The market sensitivity factor is used as a proxy for the Japanese market.

Virtually all of Japan’s industries have been hit hard by the effects of the earthquake, as evidenced by sharply higher industry volatility and sharply reduced correlation to the Japanese market. In our article of 3/15, we noted that only two industries appeared to have weathered the storm: Construction Materials and Construction & Engineering. However, in the past week, the volatility of Construction Materials continued to rise, and is now the fifth largest change since 3/10. Construction & Engineering also rose in volatility, but the total change between 3/10 and 3/24 was typical.

Broadly speaking, it is hard to identify any industry that has not been substantially affected by recent events.

4. Concluding Comments

These are challenging times for portfolio managers in general and for those with exposure to Japan in particular. The immediate post-crisis market decline has rebounded, so the initial “panic” sell-off appears to be behind us. However, Axioma’s risk models indicate that

essentially all of Japan's industries have been substantially affected, and it is unclear how long it will take for business in Japan to return to normal.

From a global perspective, the economic damage so far seems to have been largely contained within Japan itself, despite the market gyrations of earlier this week. And the rapid de-correlation of most country returns from those of Japan suggests that this containment will persist.