

Firm Characteristics and Stock Returns during 2008 Financial Crash

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ABSTRACT

The purpose of this paper is to study the characteristics of firms that reported positive price movements during the 2008 crash. In the last decade, the stock market had two crashes; the first one occurred in year 2000 and the second one occurred in year 2008, where the stock market lost more than 50% of its value and shook the global economy. The study highlights the financial characteristics of those firms that reported positive price movements during the 2008 crash period, tests their significance, and attempts to explain their underlying reasons. The study employs both fundamental and market measures. In particular, we study if there is a significant difference between the financial structure of health sector and other sectors, and among the groups of firms within the health sector.

Keywords: Market crash, Stock price movement, Stock return, Financial characteristic

JEL Classification: G01, G10, G14.

Introduction

In the last decade, investors were confronted with two traumatic experiences with the occurrence of two stock market crashes. As a consequence, they lost more than 40% of their investments in the first crash (year 2000) and more than 50% of their investments in the second one (year 2008). These market crashes had devastating effects on all industries at all levels and shook the global economy (Nofsinger, 2001). During the same period, many firms reported positive price movements despite the negative factors that overwhelmed the financial market. In an effort to help investors to be better informed, the paper aims at examining the financial structure of these firms with a positive price movement by highlighting their unique characteristics and testing their significance.

Literature Review

Many studies discussed the causes of stock market crash and provided different explanations. Pattanaik (2009) argued that the deregulation of the global financial services industry is one of the main causes of the 2008 crash. Dell'Arcia et al. (2008) believed the longer-lasting boom

factor and the high inflation with the lower growth were among the main factors that resulted in the crisis. Demyanyk and Hemert (2008) highlighted the classic lending boom-bust scenario, where the fluctuation of the subprime mortgage market, along with the unsustainable growth in credit expansion had led to the collapse of the financial markets. Rogers (2008) underscored the effect of the rapid development of free market globalization following the economic recession after the financial crisis. He added that as a consequence, globalization produced two conflicting results; the first is a boost in the economic growth (benefit); the second is deepening the wealth-poverty gap (detriment). Roll (1989) suggested that a crash occurs because of the revised expectations of the worldwide economic activity. Taylor (2009), however, referred the main cause of year 2008 crisis to the abundance of credit because of the unusually low interest rate policy set by the Federal Reserves (FEDS). Di-Martino et al (2007) gave emphasis to the fact that with the decline in the subprime market in late 2006, lending institutions began to anticipate the looming problems; they tightened their lending policies and businesses were not able to obtain loans to expand or even survive the weak economy.

The study on the impact of crashes on stock return includes Roll (1988), King and Wadhvani (1990), Malliaris and Urrutia (1992), Arshanapalli and Doukas (1993), Meric and Meric (2000), Pan et al. (2001), Yang et al. (2003), Hon et al. (2004), Coudhry (2005), Fernandez (2008), Nikkinen et al. (2008). These studies mainly focus on the factors causing crashes and the volatility and co-movements of markets during and after crashes (Wang *et al.*, 2009). However, the impact of crashes on stock return of companies from different industries has not drawn wide attention. In this paper, we attempt to investigate how the stock return from different industries reacts to the crisis in 2008. Wang *et al.* (2009) have studied similar problem for the crisis during 1968 to 2007. In their paper, they study how a stock market crash affects individual stocks and whether stocks with different financial characteristics are affected differently. To determine if industry classification affected stock returns during crashes they use four industry dummy variables, which include consumer durables and non-durables industries, the business equipment, telephone, and television transmission industries, the manufacturing and energy industries, the healthcare, medical equipment, and pharmaceutical industries. They have found that the latter two industries do not appear to have been affected as severely as the former two industries in crashes. Moreover, they have shown that health industry stocks lost less value in that crash compared with stocks from other industries.

Financial Performance

In assessing firms' financial performance, there is a wide variety of measures used. Allouche *et al.* (2008) used ROA, ROE, ROCE as well as the financial structure of 1,271 Japanese companies to test the firms' performance. Similarly, the results of a study done by Onaolapo and Kojala (2010) showed evidence that a firm's capital structure surrogated by debt ratio had a negative impact on the firm's performance (ROA and ROE). Gompers *et al.* (2003) tested the relationship between corporate governance, equity returns, and the firm's value using financial measures along with other non-financial measures. They concluded that corporate governance is positively correlated with equity returns and firm's values. Berger and Ofek (1995), in a study about the firms' performance, found a positive correlation between return on assets (ROA) and

return on capital employed (ROCE). Dastgir and Velashani (2008) found that comprehensive income is a good measure of a firm's performance.

Bettis and Hall (1982), Densetz and Lehn (1985), Habib and Victor (1991), Gorton and Rosen (1995), Mehran (1995), Ang, Cole and Line (2000), Margaritis and Psillaki (2006), Rao et al (2007), Zeitun and Tian (2007) used ROA and ROE as performance proxies in their studies. Dastgir and Velashani (2008) reported that Earnings Per Share (EPS) is positively correlated with a firm's performance and argued that EPS is also a measure of shareholder value.

Additionally, some firm characteristics are significant determinants for stock performance in crashes. Fama and French (1992, 1993) have shown that size and the book-to-market ratio are significant proxies for risk in order to help explain asset returns in addition to CAMP beta. Fama and French (1992, 1993), Xu and Malkiel (2003) and Angelidis and Tessaromatis (2008) suggest that company specific idiosyncratic risk factors can become significant determinants of capital asset prices during stock market crashes that cause sudden changes in volatility. Amihud (1990) demonstrates that the decline in liquidity contributed significantly to the decline in stock prices in the 1987 stock market crash. Wang *et al.* (2009) have included the variables such as Capital Asset Pricing Model (CAPM) beta, size, market-to-book ratio, and short/long term debt, cash-flow, profitability, and liquidity ratios and have shown that certain firm characteristics are significant determinants for stock performance in some crashes while they are not in other crashes.

The purpose of this paper is to investigate the uniqueness of the financial structure of the health sector firms during the crash period of year 2008. The study tests if there is a significant difference between the financial structure of health sector and other sectors, and among the groups of firms within the health sector.

Research Methodology

The study examines the financial structure of health sector and studies the differences between the public-listed firms in the health sector and those of other economic sectors. Analysts, practitioners and academicians used financial ratios in assessing stock returns in financial markets. This study uses a combination of accounting measures and market measures, which are return on equity (ROE), return on assets (ROA), price earnings (P/E), and price/book value (P/BV).

The firms in our study are first divided into two groups; the first group consists of firms that reported positive price movements (PPM) during the 2008 crash period; the second group is made of firms that reported negative price movements (NPM) during the same period. Public firms of both groups are then divided into the following nine sub-groups based on the type of the economic sector: (1) Consumer Discretionary, (2) Consumer Staples, (3) Energy, (4) Financial, (5) Health Care, (6) Industry, (7) Information Technology, (8) Material, and (9) Others (includes Transportation, Utilities, and Tele-Communication Services). Next, health sector firms of both groups are divided into the following eleven sub-groups based on the type of health services they provide: (1) Health Insurance, (2) Biotechnology, (3) Health Care Distributors, (4) Health Care Equipment, (5) Health Care Facilities, (6) Health Care Services, (7) Health Care Supplies, (8)

Health Care Technology, (9) Life Science Tools, (10) Managed Health Care, and (11) Pharmaceuticals. First, the financial measures of all sectors are then summarized and their mean and standard deviation computed. The significance of the difference of the financial measures of among PPM firms and NPM firms is then tested using controlled experiments across the various sectors at 1%, 5%, and 10% level of significance. Then, we apply the same methodology to the subgroups within health care sector. Similarly, the financial measures are summarized; their means and standard deviations are computed; and the significance of the difference of the financial measures of among PPM firms and NPM firms is tested.

The data used is a secondary type and is taken from Compustat. The original number of firms listed is 9,859, after extreme outliers were removed from the study, the number of firms that remained in the study is 9,344. "Outliers" are defined as those firms with an ROA less than -100% and a ROE less than -200%. As the initial analysis to capture the price movement during the 2008 downturn, data of these companies were taken from two time frames i.e. January 01, 2008 and December 31, 2008.

Data Analysis

Performances by Sector

Out of a total of 9,344 firms in the nine economic sectors under our study, financial (31.5%), consumer discretionary (15.6%), information technology (14.4%), and health care (9.8%) constitute the four largest economic sectors (see Table 1). As Table 1 depicts, and as expected during the financial crisis of 2008, majority (87-93%) of firms in these economic sectors showed negative stock price movements during the period under study.

Table 1- Number and Percentage of PPM and NPM

Sector	PPM (+)		NPM (-)		Total	
	# of firms	Percent age	# of firms	Percent age	# of firms	Percentage
Consumer Discretionary	172	11.8	1283	88.2	1455	15.6
Consumer Staples	42	10.7	352	89.3	394	4.2
Energy	41	7.9	480	92.1	521	5.6
Financial	248	8.4	2696	91.6	2944	31.5
Health Care	107	11.7	808	88.3	915	9.8
Industry	101	11.7	763	88.3	864	9.2
Information Technology	113	8.4	1230	91.6	1343	14.4
Material	61	12.1	444	87.9	505	5.4
Others	30	7.4	373	92.6	403	4.3
Overall	915	9.8	8,429	90.2	9344	100.0

*For the following tables, '+' represents PPM and '-' represents NPM.

Testing the significance of the difference between stocks with PPM and NPM among the nine economic sectors is conducted at 1%, 5%, and 10% levels of significance. Table 2 reflects the mean values for the two groups of firms across the nine economic sectors, using four measures -- P/E, price/book value, ROA, and ROE, and Table 3 shows the corresponding values for standard deviation for the two groups of firms across all the economic sectors, again using the same four measures.

Table 2 –Performance measured by Mean

Sector	P/E		Price/ BV		ROA		ROE	
	+	-	+	-	+	-	+	-
Consumer Discretionary	29	24	5	1	174	-213	3	-19
Consumer Staples	23	22	3	2	5	-4	12	2
Energy	32	35	4	3	5	0	5	-1
Financial	23	31	2	1	3	0	11	4
Health Care	31	40	4	1	-9	-18	-12	-67
Industry	25	39	2	39	3	3	8	12
Information Technology	84	41	4	1	13	4	-38	-4
Material	20	25	4	4	0	1	-1	0
Others	20	41	2	1	5	0	15	8
Overall	26	33	7	1	32	-36	3	-8

Table 3 – Riskiness measured by Standard Deviation

<i>Sector</i>	P/E		Price/ BV		ROA		ROE	
	+	-	+	-	+	-	+	-
<i>Consumer Discretionary</i>	25	20	23	14	1932	3587	53	399
<i>Consumer Staples</i>	13	14	3	4	19	21	85	102
<i>Energy</i>	40	78	7	29	30	27	37	63
<i>Financial</i>	42	90	1	2	8	9	13	48
<i>Health Care</i>	42	79	44	23	29	36	43	652
<i>Industry</i>	125	133	5	133	9	15	37	41
<i>Information Technology</i>	84	71	8	20	135	196	76	104
<i>Material</i>	16	52	10	75	18	45	38	50
<i>Others</i>	9	140	1	24	4	15	13	38
<i>Overall</i>	34	86	97	25	820	1480	36	280

The results from testing the differences between the means of the four measures (i.e., P/E, P/BV, ROA, and ROE) of the two groups among the economic sectors are summarized in Table 4. The testing is done using Z distribution of comparing the means. The three critical values of two-tail-test at three levels of significance are $Z = \pm 2.58$, that is very strong evidence (Alpha = 1%); $Z = \pm 1.962$, that is strong evidence (Alpha = 5%); and $Z = \pm 1.65$, that is significant evidence (Alpha = 10%).

Table 4 – The difference of the Mean between PPM and NPM measured by Z test

Economic Sector	Market Measures		Fundamental Measures	
	P/E	P/BV	ROA	ROE
Consumer Discretionary	2.65***	2.18**	2.18**	1.83*
Consumer Staples	0.22	2.83***	2.96***	0.67
Energy	-0.34	0.65	1.04	0.85
Financial	-2.66***	9.34***	4.41***	5.78***
Health Care	-1.84*	0.69	2.93***	2.36**
Industry	-1.04	1.79*	0.61	-0.96
Information Technology	5.21***	3.84***	0.62	-4.39***
Material	-1.65*	-0.10	-0.42	-0.15
Others	-2.84***	0.90	4.97***	2.10**
Overall	-4.80***	1.76*	2.16**	3.56***

Note: *** alpha = 0.01 (very strong evidence), ** alpha = 0.05 (strong evidence), * alpha = 0.10 (significant evidence)

The results show that when comparing the mean using P/E measure, healthcare shows a "significant evidence" of difference between the two groups of firms, though not as strong as sectors such as Information technology, consumer discretionary, and financial. The test statistic of the overall sector shows that the difference between the two groups is extremely strong with a value equal to -4.80. In terms of the P/BV's means of the two groups, however, the health care sector does not exhibit any significant difference, though the test statistic for the overall sector is statistically different with a Z value of +1.76. In terms of the ROA's mean, health care, along with financial, consumer staples, and "others" are among the sectors that demonstrate "very strong evidence" of significant difference between the two groups of firms, the overall sectors show a "strong evidence" of statistical difference with a Z value of +2.16. Finally, looking at the means of return on equity ratio (ROE), health care exhibits "strong evidence" of significant difference between the two groups, whereas the ROE's means for the two groups in the overall sector show a "very strong evidence" of statistical difference with a Z value of +3.56.

By employing four measures (i.e. P/E, P/BV, ROE, and ROA), our results show evidence that means between firms with positive price movements and those with negative price movements are indeed significantly different across several economic sectors (see Table 4). Health sector, in particular, shows a very strong statistical difference between these two groups of firms especially when using the fundamental measures such as ROA or ROE.

Using ROA to compare the means, firms in the health sector that showed negative price movements not only performed worse than their counterparts in most economic sectors (except for consumer discretionary), those that showed positive price movements actually performed the worst among firms in this category across all economic sectors (see Table 2). Using the ROE's measure, firms in the health sector that showed negative price movements not only performed the worst but also had the highest risk among firms in this category across all economic sectors. Likewise, firms in the health sector that showed positive price movements also performed worse

than their counterparts in most economic sectors (except for information technology) (see Table 3). What caused the phenomenal under-performance and high level of riskiness of the health sector as compared to other economic sectors during the financial crisis of 2008?

Performances within Health Sector

We will now focus on the analysis of the eleven types of services in the health sector. Firms in the health sector makes up 9.8% of the total 9,344 firms in the nine economic sectors (see Table 1). Out of a total of 915 firms in the health sector, approximately 88% of them show negative price movements during the period under study as compared to only 12% showing positive price movements during the same period. Out of the eleven service types, the three largest ones, namely Biotechnology (26%), Health Care Equipment (20.1%), and Pharmaceuticals (16.2%) make up more than 60% of the health care firms under study (see Table 5).

Table 5 - Health Sector: Number and Percentage of PPM and NPM

Health Sector	PPM (+)		NPM (-)		Total	
	# of firms	Percentage	# of firms	Percentage	# of firms	Percentage
Life & Health Insurance	3	8.1	34	91.9	37	4.0
Biotechnology	31	13.0	207	87.0	238	26.0
Health Care Distributors	4	14.3	24	85.7	28	3.1
Health Care Equipment	25	13.6	159	86.4	184	20.1
Health Care Facilities	5	8.3	55	91.7	60	6.6
Health Care Services	9	11.4	70	88.6	79	8.6
Health care Supplies	3	6.4	44	93.6	47	5.1
Health Care Technology	4	11.1	32	88.9	36	3.9
Life Science Tools	8	11.1	64	88.9	72	7.9
Managed Health Care	2	8.7	21	91.3	23	2.5
Pharmaceuticals	16	10.8	132	89.2	148	16.2
Health Industry	107	11.7	808	88.3	915	100.0

Using the same techniques as discussed in the previous section, the testing of the significance of the difference between stocks with PPM and NPM among the eleven types of services in the health sector is conducted at 1%, 5%, and 10% levels of significance. Table 6 and Table 7 show the mean values and standard deviations respectively for the two groups of firms across the eleven types of services within the health sector, using the same four measures (P/E, price/book value, ROA, ROE) as before.

Table 6 - Health Sector: Performance measured by Mean

Activities	P/E		Price/ BV		ROA		ROE	
	+	-	+	-	+	-	+	-
Life & Health Insurance	20	24	3	2	2	1	8	10
Biotechnology	26	24	-2	2	-20	-37	-29	-219
Health Care Distributors	23	28	3	8	5	-4	13	-6
Health Care Equipment	51	76	6	2	-7	-13	-10	-26
Health Care Facilities	14	23	1	1	-1	0	-2	9
Health Care Services	23	28	4	2	8	-1	13	21
Health care Supplies	24	33	13	2	-25	-2	-36	-3
Health Care Technology	21	55	8	0	13	-8	19	6
Life Science Tools	34	43	7	1	-20	-14	-24	-20
Managed Health Care	13	18	2	1	3	2	4	11
Pharmaceuticals	23	28	6	-2	-10	-21	-13	-41
Health Industry	31	40	4	1	-9	-18	-12	-67
Stock Market	26	33	7	1	32	-36	3	-8

Table 7 - Health Sector: Riskiness measured by Standard Deviation

Activities	P/E		Price/ BV		ROA		ROE	
	+	-	+	-	+	-	+	-
Life & Health Insurance	6	27	1	17	1	1	4	7
Biotechnology	21	27	85	17	34	49	59	1280
Health Care Distributors	11	21	2	26	7	21	21	46
Health Care Equipment	79	155	7	6	25	27	38	76
Health Care Facilities	0	15	1	1	6	15	14	34
Health Care Services	7	17	3	4	8	18	11	92
Health care Supplies	5	40	13	2	39	25	46	39
Health Care Technology	2	39	5	6	13	32	19	108
Life Science Tools	10	31	4	5	38	25	43	42
Managed Health Care	3	5	1	1	5	12	12	16
Pharmaceuticals	18	29	7	49	34	36	43	100
Health Industry	42	79	44	23	29	36	43	652
Stock Market	34	86	97	25	820	1480	36	280

Applying the same methodology of comparing the means and using the same critical values of the two-tail-test at three levels of significance as in the previous section, the results from testing the differences between the means of the four measures (i.e., P/E, P/BV, ROA, and ROE) of the two groups among various firms in the health sector is summarized in Table 8.

Table 8 - Health Sector: The difference of the Mean between PPM and NPM measured by Z test

Health Activities	Market Measures		Fundamental Measures	
	P/E	P/BV	ROA	ROE
Life & Health Insurance	-0.69	0.34	1.63	-0.77
Biotechnology	0.47	-0.26	2.43**	2.12**
Health Care Distributors	-0.72	-0.93	1.63	1.35
Health Care Equipment	-1.24	2.71***	1.10	1.65*
Health Care Facilities	-4.45***	0.00	-0.30	-1.42
Health Care Services	-1.62	1.80*	2.63***	-0.69
Health care Supplies	-1.35	1.46	-1.01	-1.21
Health Care Technology	-4.88***	2.95***	2.44**	0.61
Life Science Tools	-1.72*	3.88***	-4.44***	-0.25
Managed Health Care	-2.10**	1.35	0.23	-0.76
Pharmaceuticals	-0.97	1.74*	1.21	2.02**
Health Industry	-1.83*	0.69	2.93***	2.36**

Note: *** alpha = 0.01 (very strong evidence), ** alpha = 0.05 (strong evidence), * alpha = 0.10 (significant evidence)

The results show that when using the P/E measure to compare the means, Health Care Technology and Health Care Facilities are among those that show "very strong" significant difference (i.e., at 1% level) between the two groups of firms, follows by Managed Health Care at 5% significance level, and Life Science services, at 10% level (see Table 8). Using the price/book value measure, Life Science Tool, Health Care Technology, and Health Care Equipment are among the services that yield "very strong" statistical difference between the two groups, follows by Health Care Services and Pharmaceuticals at 10% significance level. Looking at the ROA measure, Life Science Tools, and Health Care Services yield "very strong" statistical difference between the two groups of firms, follows by Health Care Technology, and Biotechnology with "strong" statistical difference at 5% significance level. Finally, comparing the means using the ROE measure, Biotechnology and Pharmaceuticals exhibit statistical difference at 5% significance level, with Health Care Equipment showing significant difference at 10% level.

On closer examination of various firm types in the health sector, Health Care Technology and Life Science Tools in particular, show very strong statistically different results from other firm types, especially when comparing their means using the measures of P/E, Price/Book Value, and ROA (see Table 8). In this regards, four other firm types also stand out, namely Biotechnology (using ROA and ROE), Health Care Equipment (using P/BV and ROE), Health Care Services (using ROA and P/BV), Pharmaceuticals (using P/BV and ROE).

We will now examine the performance and riskiness of the health sector by service type. It is interesting to note that almost all types of firms with positive price movements had better fundamental measures (i.e., ROA, and ROE) than those with the negative price movements (Table 6). This is true when using the ROA measure, 8 out of 11 firm types conformed to this pattern, with the clear exception of Life Science Tools and Health Care Supplies. When using

ROA's measure, however, only 5 out of 11 firm types conformed to this pattern, again with the exception of Life Science Tools, Health Care Supplies, and a few others. All the six sub-groups (Health Care Technology, Life Science Tools, Biotechnology, Health Care Equipment, Health Care Services, and Pharmaceuticals) that showed strong statistical difference between means of two types of firms using various measures also conformed to this pattern (except for Life Science Tools). When using fundamental measures, both Life Science Tools and Health Care Supplies seem to stand out as contradictory sub-groups, their firms that showed positive movements performed worse than their firms with negative price movements, and the former actually showed higher risk than the latter firms (see Table 7). In addition, firms with positive price movement had lower P/E ratio than those with negative price movement; their performance was certainly contradictory to the market expectations.

Table 7 further reflects the standard deviation (i.e. riskiness) of the four measures by firm type in the health sector. Regardless of the activity type or measure, as expected, riskier firms (firms with larger values of standard deviations) had negative price movements and less risky firms (firms with lower values of standard deviations) had positive price movements most of the time. This is certainly true with firms among the six sub-groups (Health Care Technology, Life Science Tools, Biotechnology, Health Care Equipment, Health Care Services, and Pharmaceuticals) mentioned earlier, again with the exception of Life Science Tools.

In addition, using fundamental measures, Biotechnology, Health Care Technology, and Pharmaceuticals particularly stand out as sub-groups that had higher risk than the rest of the health industry. Interestingly, majority of these firm types fall into a sub-sector in the health industry typically known as Biopharmaceuticals (BP for short). According to Lazonick and Tulum (2011), the growth of the BP industry up to the point of 2008 financial crisis has been unsustainable due to two reasons: (1) the willingness of stock market investors to absorb the initial public offerings (IPOs) of such BP venture even before a commercial product is generated, if at all; (2) the research support of such industry has been heavily funded and subsidized by the U.S. governments than from business finance. While it is true that speculators in the stock market bet on the movement of a BP stock based on news relating to R&D contracts and clinical trials (McNamara and Baden-Fuller, 2007), a few US regulations (particularly the Bayh-Dole Act of 1980, and the Orphan Drug Act of 1983) also served to encourage new ventures in biotech (e.g. R&D alliances in biotechnology), and facilitate knowledge transfer through federally funded research, have indeed fueled the creation and growth of new technology firms (Mowery et al., 2004). In addition, due to the sizable funding from National Institute of Health (NIH) (e.g. \$30.9 billion in 2010) and the Federal subsidies through the Orphan Drug Act (ODA) of 1983, several leading biotech companies have achieved significant growth through the development and marketing of pharmaceutical drugs with orphan status (Lazonick and Tulum, 2011; Lazonick, 2011). Unfortunately, such government subsidies and government funded knowledge base (through NIH), and patent protection provided by ODA, will continue to entice the venture capitalists to invest in an industry marked by unusually long product development cycles with highly uncertain prospects for commercial success. Furthermore, especially in the past decade, in order to boost stock prices, the executives of U.S. business corporations, BP industries included, encouraged by Wall Street, have become increasingly involved in the practice of allocating substantial corporate resources to buy back their own corporate stocks (Lazonick,

2010, Ch 6). The pharmaceutical industry has been opposing Congressional regulation of drug prices on the ground that high prices fund R& D expenditure. Yet between 1997 and 2010, leading BP companies such as Amgen repurchased their own stocks with values equal to 103% of R&D expenditure, Pfizer 64%, Johnson and Johnson 56%, and Merck 53% (Lazonick, 2011). Between 2000 and 2009, three of the largest Managed Health Care were among the top 50 stock re-purchasers in the U.S. -- UnitedHealth Group (#24) with \$25.2 billion in buybacks (96% of net income), Wellpoint (#39) with \$17.5 billion (2%), and Aetna (#49) with \$10.4 billion (125%). Until the financial crisis of 2008, such business model brought in sizable funds to BP industry through venture capital, R&D alliances, and issuing of public equities despite the overall unprofitable drug development (Lazonick and Tulum, 2011). However, the question remains whether the current business model of BP industry is sustainable enough to survive another future financial crash.

Conclusions

Although many studies discussed the causes of stock market crash and provided different explanations, the role of stock and firm financial characteristics in explaining the impact of crashes on individual stock returns has not received much attention. Inspired by the study by Wang *et al.* (2009), we attempt to investigate how the stocks return from different industries react to the crisis in 2008. We found that firms in the health sector not only performed the worst but also had the highest risk among firms in this category across all economic sectors.

After a closer look at the health care sector, we found that almost all types of firms with positive price movements had better fundamental measures except for Life Science Tools and Health Care Supplies. In these two subgroups, their firms that showed positive movements performed worse than their firms with negative price movements, and the former actually showed higher risk than the latter firms.

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