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Equity Issuance of Health Care Firms after the 2007 Market Crash and the 2010 Affordable Care Act

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Abstract

We provide an empirical analysis of 195 initial public offerings (IPOs) and 547 seasoned equity offerings (SEOs) of health care firms that issued between 2008 and October 2016. This period represents eight years after the US financial crisis of late 2007 and also includes all equity issuances since the passage of the Affordable Care Act of late 2010. We compare and contrast our results with those of Brau and Holloway (2009) who study health care equity issuances from 1970-2008. We find that global health care issues in both the IPO and SEO markets are significantly over-represented in both the post-crash (2008-2010) and post-ACA years (2011-2016) vis-à-vis the overall equity markets. Consistent with prior studies, we show the existence of first-day underpricing in both IPOs and SEOs, along with poor long-run abnormal stock returns. We estimate cross-sectional multivariate regression models to explain the underpricing and long-run returns.

Key Words: Health care finance, initial public offerings, seasoned equity offerings, IPOs, SEOs

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1. Introduction

The topic of health care equity issuance has been previously studied by Brau and Holloway (2009) when they analyzed a sample of initial public offerings (IPOs) and seasoned equity offerings (SEOs) from 1970-2008. An IPO is when a privately held firm issues public equity for the first time. An SEO is when a public firm (one that has already completed an IPO) issues public equity again to raise additional funds. In general, Brau and Holloway (2009) find that the three new issues "phenomena" documented in the extant financial economic literature exist in health care IPOs as well. The three phenomena are namely: initial underpricing, negative long-run performance, and hot issue markets.

Of the three subjects, initial underpricing has received the most attention among academics (e.g., see Logue, 1973 and Ibbotson, 1975 for seminal articles on underpricing). Underpricing is when the first trading price in the secondary market (or the first-day closing price in the secondary market) is greater than the offer price of the IPO or SEO. The offer price is the price at which the investment bank that is underwriting the offer sells the original shares into the primary market. The primary market then can resell shares into the secondary market, which begins the public trading on an exchange such as the New York Stock Exchange or the Nasdaq electronic market. Professor Jay Ritter's website (https://site.warrington.ufl.edu/ritter/files/2016/02/Initial-Public-Offerings-Underpricing-2016-01-08.pdf) provides updated statistics on IPOs from Loughran and Ritter (2002) which report that from 1980-2015 the average underpricing has been 18% for the 8,178 firms that went public. The dollar amount of this underpricing, frequently called "money left on the table," equates to over $153 billion during this time period. The Brau and Holloway (2009) study of health care IPOs shows an average underpricing of 16.7%, in line with the historical underpricing of the general market reported by Ritter. For SEOs, Brau and Holloway report an average underpricing of 6.3%.

Poor long-run IPO performance, typically measured over one, three, and five-year periods has been documented for decades (e.g., see Ritter (1991) for a seminal article). In updated statistics provided on his website (https://site.warrington.ufl.edu/ritter/files/2016/03/Initial-Public-Offerings-Updated-Statistics-on-Long-run-Performance-2016-03-08.pdf), Ritter reports that IPOs from 1980-2014 experience a raw return of 22.1%, but if an abnormal return is computed, IPOs over this period return either a -6.3% or -17.8% (negative) return depending on the benchmark. An abnormal return is computed by subtracting out a benchmark return that is designed to capture a similar amount of risk as the IPO. When compared to investments of similar risk, IPOs perform significantly worse in the long run. For SEOs, Ritter (https://site.warrington.ufl.edu/ritter /files/2015/04/Seasoned-Equity-Offerings-from-1970-2011-Tables-2013-06.pdf) reports that SEOs perform poorly when risk is controlled for with one-year -3.7%, two-year -7.6%, and three-year -3.3% abnormal returns. For health care equity issuances, Brau and Holloway (2009) find negative returns for both IPOs and SEOs over three and five year periods (IPOs: 3-year -28.3%; 5-year -51.4%; SEOs: 3-year -20.1%; 5-year -47.2%).

The third topic, hot issues markets, shows that IPOs and SEOs come in waves, measured both by the number of issuers as well as the amount raised (e.g., see Ibbotson and Jaffe (1975) for a seminal article on hot issue markets). Perhaps the best example of a wave was the .com bubble of the mid to late 1990s where hundreds of firms went public each year and where average underpricing reached 71% in 1999 (https://site.warrington.ufl.edu/ritter/files/2016/03/Initial-Public-Offerings-Updated-Statistics-2016-03-08.pdf). Brau and Holloway (2009) also report health care equity issuance waves that highly correlate with the general market.

In this paper, we extend the work of Brau and Holloway (2009) by examining equity issuances that have occurred since the financial crisis towards the end of 2007. In the general market, the average annual number of IPOs from 2004-2007 was 162 and fell to only 21 in 2008. The period of 2008-2012 experienced the lowest five-year average number of IPOs during any five-year period from 1980-2015. While the rest of the financial market was reeling from the 2007 crash, it is of interest to see if the health care market followed suit. Two primary developments may set the health care market apart. First, medical and biotechnological developments continued to blossom during this period of time. For example, in 2007, the entire genome for a single individual (James Watson) was published for the first time (Wadman, 2008). This type of biotechnology innovation may drive the need for equity expansion even during the economic downturn. Second, the Patient Protection and Affordable Care Act (commonly known as ACA or Obamacare) went into effect on March 23, 2010. ACA has changed many aspects of the health care industry (Fox, 2012) and may drive more equity issuances by health care firms (Borchin and Golec, 2016).

Examining 195 IPOs and 547 SEOs that went public between 2008 and October 2016 in this current study, we find empirical evidence to support all three IPO phenomena. Specifically, we find a hot market for global health care IPOs relative to the total annual number of US IPOs as well as a US wave of unscaled issues over our sample. Our sample of IPOs and SEOs experience an average underpricing of 22% over our testing period. In the long-run, our sample of issues experiences a statistically significant negative 7% return over the year after the issue.

The remainder of the paper is outlined as follows. Section two contains the data sample explanation and figures containing frequency distributions for global and US new issues. Section three reports the empirical methods and results for the underpricing and long-run abnormal return phenomena. The fourth section summarizes and concludes.

2. Data

A major difference between this current paper and Brau and Holloway (2009, referred hereafter as BH) is that this paper reports statistics for all health care IPOs and SEOs (both international and US market) whereas BH report on only IPOs and SEOs that made it through certain filters. For example, BH begin with the universe of IPOs and SEOs according to Securities Data Company's New Issues Database (SDC) but then require firms to match on two other databases – the Center for Research in Security Prices (CRSP) as well as Standard and Poor's Compustat database. The matching on CRSP and Compustat removed any non-US market issuing firm because these two databases only report data for US-listed firms. BH conduct analysis on 345 IPOs from 1970-2008. Our first tests include 571 health care global issues during the same period of time, which is how many firms were in the BH SDC sample prior to applying their filters. For SEOs, BH use 336 firms whereas our current study begins with 777 global

during the 1970-2008 period. We include this complete data because we are interested in the percentage of health care IPOs and SEOs relative to the entire market of equity issuances. Figure 1 reports the frequency data using global issue data.

Figure 1. Frequency Distributions by Year of Global Issues

Issue Yr	Total (IPO+SEO)	IPOs	SEOs	IPOs/Total	SEOs/Total
1970	10	5	5	1.40%	5.70%
1971	14	3	11	0.80%	3.70%
1972	13	8	5	1.40%	1.80%
1973	0	0	0	0.00%	0.00%
1974	0	0	0	0.00%	0.00%
1975	0	0	0	0.00%	0.00%
1976	3	0	3	0.00%	3.80%
1977	2	1	1	2.90%	2.20%
1978	1	0	1	0.00%	1.10%
1979	2	1	1	1.20%	1.20%
1980	11	1	10	0.40%	4.20%
1981	14	4	10	0.90%	4.20%
1982	14	2	12	0.90%	6.50%
1983	46	33	13	3.70%	2.40%
1984	23	18	5	3.30%	4.00%
1985	27	13	14	2.60%	5.20%
1986	22	18	4	1.90%	1.10%
1987	23	16	7	2.50%	2.80%
1988	8	6	2	2.60%	1.90%
1989	14	8	6	3.90%	3.60%
1990	25	9	16	5.20%	10.50%
1991	77	41	36	11.20%	11.00%
1992	67	47	20	9.20%	4.60%
1993	43	19	24	3.00%	4.00%
1994	65	36	29	6.30%	4.20%
1995	57	28	29	4.90%	5.80%
1996	81	42	39	5.00%	6.60%
1997	60	35	25	5.70%	3.90%
1998	33	17	16	4.30%	3.10%
1999	28	14	14	2.60%	3.50%
2000	67	29	38	6.80%	12.20%
2001	100	19	81	14.40%	23.50%
2002	53	14	39	8.80%	12.10%
2003	30	6	24	4.50%	6.20%
2004	58	21	37	6.90%	9.30%
2005	62	17	45	6.10%	9.30%
2006	62	10	52	3.90%	10.60%
2007	67	16	51	6.40%	11.50%
2008	66	14	52	25.90%	18.40%
2009	70	12	58	15.80%	6.70%
2010	55	7	48	3.60%	5.40%
2011	69	14	55	7.80%	8.50%
2012	64	21	43	11.70%	5.70%
2013	85	15	70	6.00%	7.40%
2014	126	39	87	13.40%	10.60%
2015	117	39	78	17.30%	10.10%
2016	90	34	56	31.20%	11.00%
Total	2,024	752	1,272		
			Pre-ACA/crash	4.20%	5.90%
			Post-crash	15.10%	10.20%
			p-value	0.2793	0.3837
			Post-ACA	14.60%	8.90%
			p-value	0.0121	0.0234

The first column in Figure 1 reports the year the IPO or SEO was issued into the market (first sold). The second column reports the number of total equity issuances (IPOs + SEOs). The third column is the number of IPOs for each year and the fourth column is the total number of SEOs per year. The first four columns of data are all obtained from SDC. The fifth column divides the third column (number of health care IPOs per year) by the total number of IPOs in all industries that were issued in that year in US markets. The all industry IPO data is obtained from 1970-2014 through Jay Ritter's IPO data page and SDC for 2015 through October 31, 2016. The last column is the fourth column (number of health care SEOs per year) divided by the total number of SEOs in all industries for each year. The all industry SEO data is obtained for 1970-2004 from Jay Ritter's SEO data page and SDC for 2005 through October 31, 2016. We use US IPO and SEO counts for standardization because the SDC database varies in which countries are captured in each year and a global denominator would lead to inconsistent comparisons.

Two potential hypotheses are that the financial crisis and the ACA have increased the equity requirements for health care firms. In this article, we do not dig deep into these hypotheses, but as a first cut, we perform a two-tailed difference in means test, with unequal variance, between the IPOs issued from 1970-2007 (*Pre-crash*) and from 2008-2010 (*Post-crash*). The test is reported in the bottom panel of Figure 1 and shows that health care IPOs made up 4.2% of the total IPOs on average each year compared to the *Post-crash* average of 15.1%. This nearly four-fold increase is clearly economically significant, but because there are only three years in the *Post-crash* sample there is not enough statistical power for the p-value to be significant. For SEOs, *Pre-crash* average is 5.9% compared to *Post-crash* of 10.2%, almost a doubling of the percentage of health care issues. These results suggest a need for capital by health care firms after the financial crash.

The last two rows of Figure 1 report that for *Post-ACA* (2011-2016), health care IPOs made up 14.6% of the total IPOs on average each year compared to the 4.2% of *Pre-ACA* years. The difference in means test indicates a p-value of 0.0121, meaning we are 98.79% sure that the means are not the same and conclude the difference is statistically significant. These statistics indicate that there was a significant difference in the percentage of health care IPOs before and after the ACA. We cannot assign causation with these tests, only correlation. The final test for the SEO sample indicates *Pre-ACA* average of SEOs is 5.9% compared to *Post-ACA* average of 8.9%. Though a smaller increase compared to IPOs, the difference is significant beyond the 5% level with a p-value of 0.0234.

Having examined the frequency distributions for global health care issues, we now turn our attention to the subsample of firms that only issued in the US markets. The sample below in analogous to BH in this manner. Figure 2 reports the data in a similar fashion as Figure 1.

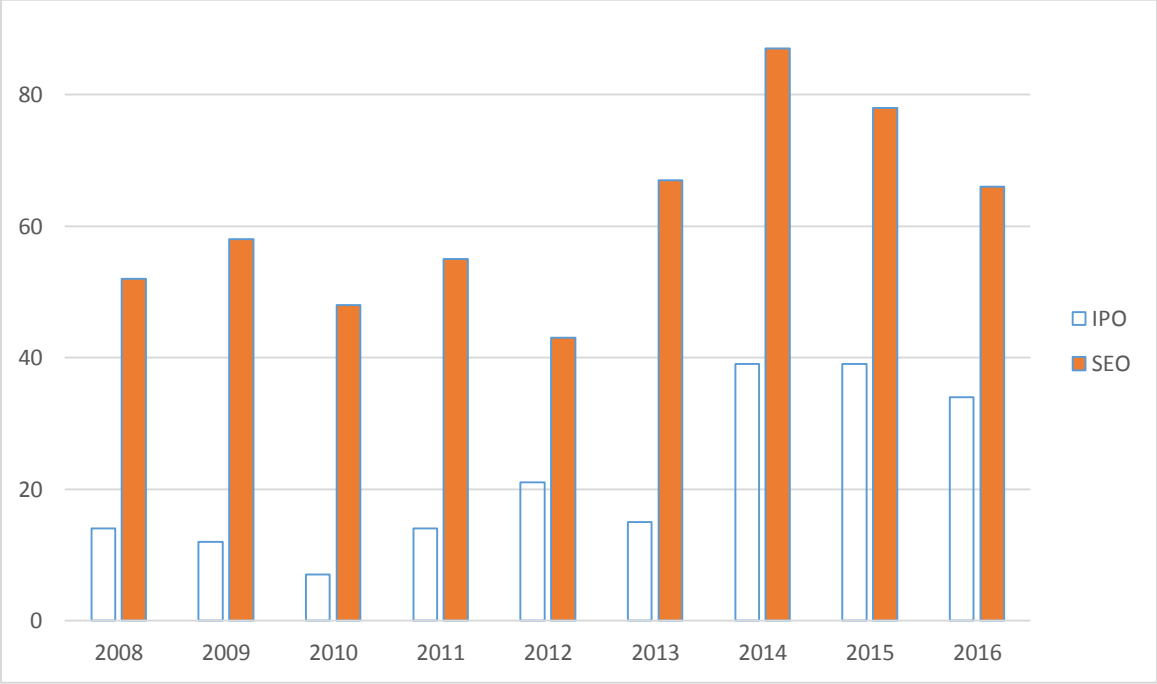
Figure 2. Frequency Distributions by Year of US Market Issues

Issue Yr	Total (IPO+SEO)	IPOs	SEOs	IPOs/Total	SEOs/Total
1970	5	0	5	0.00%	5.70%
1971	12	1	11	0.30%	3.70%
1972	7	2	5	0.40%	1.80%
1973	0	0	0	0.00%	0.00%
1974	0	0	0	0.00%	0.00%
1975	0	0	0	0.00%	0.00%
1976	3	0	3	0.00%	3.80%
1977	2	1	1	2.90%	2.20%
1978	1	0	1	0.00%	1.10%
1979	2	1	1	1.20%	1.20%
1980	11	1	10	0.40%	4.20%
1981	13	3	10	0.70%	4.20%
1982	12	0	12	0.00%	6.50%
1983	41	28	13	3.20%	2.40%
1984	18	13	5	2.40%	4.00%
1985	26	12	14	2.40%	5.20%
1986	20	16	4	1.70%	1.10%
1987	22	15	7	2.40%	2.80%
1988	8	6	2	2.60%	1.90%
1989	14	8	6	3.90%	3.60%
1990	24	8	16	4.70%	10.50%
1991	70	35	35	9.50%	10.70%
1992	58	39	19	7.70%	4.40%
1993	34	16	18	2.60%	3.00%
1994	40	21	19	3.70%	2.70%
1995	42	22	20	3.90%	4.00%
1996	48	26	22	3.10%	3.70%
1997	28	17	11	2.80%	1.70%
1998	17	9	8	2.30%	1.50%
1999	5	3	2	0.60%	0.50%
2000	15	6	9	1.40%	2.90%
2001	36	11	25	8.30%	7.30%
2002	7	1	6	0.60%	1.90%
2003	4	1	3	0.80%	0.80%
2004	9	1	8	0.30%	2.00%
2005	13	3	10	1.10%	2.10%
2006	11	1	10	0.40%	2.00%
2007	11	5	6	2.00%	1.40%
2008	6	1	5	1.90%	1.80%
2009	16	4	12	5.30%	1.40%
2010	13	1	12	0.50%	1.40%
2011	14	3	11	1.70%	1.70%
2012	7	0	7	0.00%	0.90%
2013	21	6	15	2.40%	1.60%
2014	29	8	21	2.70%	2.60%
2015	24	5	19	2.20%	2.50%
2016	20	7	13	6.40%	2.60%
Total	839	367			
			Pre-ACA/crash	2.10%	3.10%
			Post-crash	2.50%	1.50%
			p-value	0.7901	0.0005
			Post-ACA	2.60%	2.00%
			p-value	0.7164	0.0414

The results in Figure 2 for US market firms are surprising given the previous global market frequencies. The bottom panel again reports difference in means tests for IPOs and SEOs during the various subperiods. Note that the difference in average health care IPO standardized by total number of US IPOs in a given year does not significantly change during any of the periods (i.e., 2.1% *Pre-ACA/crash*; 2.5% *Post-crash*; 2.6% *Post-ACA* with no significant p-values). The results for the SEOs are even more surprising. Health Care issues actually represent a significantly smaller average *Post-crash* number of SEOs (1.5%) and *Post-ACA* (2.0%) vis-à-vis *pre-ACA/crash* (3.1%) with p-values of 0.0005 and 0.0414, respectively. This frequency data suggests that firms issuing in US markets (95% which are US firms) required the same amount of public equity via IPOs and even less from SEOs.

Recall that one of the three equity issuance phenomena is the hot markets pattern. The discussion above demonstrates (and shows through the difference tests) that the *Post-crash* and *Post-ACA* periods both demonstrate the hot issue hypothesis. In the general IPO and SEO markets, the number of issues plummeted the year after the 2007 crash. Global health care issues however actually experienced a relative hot market during that time. In 2008, health care IPOs accounted for 25.9% of the total market for IPOs and 18.4% for SEOs. Figure 3 below visually demonstrates a hot market wave over the updated period of 2008-2016.

Figure 3. Frequency of Health Care IPOs and SEOs



2.1 Industry Statistics

For comparison, we use the same industry codes as BH and report them for all equity issuances (IPOs and SEOs combined in Figure 4).

Figure 4. Frequency Distributions by Industry

		Pre-ACA		*Post-ACA*		
SIC	**SIC NAME**	**Number**	**Percent**	**Number**	**Percent**	**% Diff**
8011	*Offices and Clinics of Doctors of Medicine*	142	11.1	31	4.2	-6.9
8021	*Offices and Clinics of Dentists*	20	1.6	14	1.9	0.3
8031	*Offices and Clinics of Doctors of Osteopathy*	1	0.1	3	0.4	0.3
8041	*Offices and Clinics of Chiropractors*	2	0.2	0	0.0	-0.2
8042	*Offices and Clinics of Optometrists*	10	0.8	4	0.5	-0.2
8049	*Offices of Health Practitioner*	10	0.8	1	0.1	-0.6
8051	*Skilled Nursing Care Facilities*	115	9.0	26	3.5	-5.4
8052	*Intermediate Care Facilities*	9	0.7	0	0.0	-0.7
8059	*Nursing and Personal Care*	30	2.3	20	2.7	0.4
8062	*General Medical and Surgical Hospitals*	222	17.3	182	24.7	7.3
8063	*Psychiatric Hospitals*	26	2.0	2	0.3	-1.8
8069	*Specialty Hospitals, Except Psychiatric*	30	2.3	29	3.9	1.6
8071	*Medical Laboratories*	219	17.1	154	20.9	3.8
8072	*Dental Laboratories*	12	0.9	4	0.5	-0.4
8082	*Home Health Care Services*	118	9.2	26	3.5	-5.7
8092	*Kidney Dialysis Centers*	15	1.2	1	0.1	-1.0
8093	*Specialty Outpatient Clinics*	75	5.9	34	4.6	-1.2
8099	*Health and Allied Services*	226	17.6	207	28.0	10.4

Figure 4 reports how each of the various health care industries have changed since the BH study sample period. The largest decrease in equity issuances comes from offices and clinics of doctors of medicine (SIC = 8011) which experienced a 6.9% decrease in issuances. Home health care services (SIC = 8082) experienced a 5.7% decrease, followed by skilled nursing care facilities (SIC = 8051) that had a 5.4% decrease. Industries with the largest percentage increases were health and allied services (SIC = 8099) with a 10.4% increase, general medical and surgical hospitals (SIC =8062) with a 7.3% increase and medical laboratories (SIC = 8071) with a 3.8% increase.

The general observation from this data is that equity issuances, before and after the ACA, are different in terms of frequency of issue and type, within the health care industry. In the remainder of the paper, we replicate tests performed in BH to explore how the later years of 2008-2016 compare to the BH sample years of 1970-2008. We include the year 2008 because we desire to capture all of the issuances after the market crash of late 2007 (sometimes referred to as the financial meltdown). In the BH sample, the year 2008 only included one IPO and 8 SEOs,

which was only 1.3% of their total sample and should not significantly impact comparisons made by this paper.

3. Empirical Tests and Findings

We use the same econometric approach as BH to test the second two new issues phenomena. The second phenomenon we evaluate is first-day underpricing. Initial returns are our measure of underpricing and are calculated as follows:

Initial Return = [First-day close price/Offer price] – 1

To explain the initial IPO returns, we apply the following regression to the samples. Variables are explained in Figure 5.

$$\text{Initial Return} = \alpha + \beta_1 \textit{IPO Flag} + \beta_2 \textit{Size} + \beta_3 \textit{Sales} + \beta_4 \textit{Age} + \beta_5 \textit{Underwriter Rep} + \beta_6 \textit{VC} + \beta_7 \textit{Overhang} + \beta_8 \textit{Demand} + \beta_9 \textit{Big 6 Auditor} + \beta_{10} \textit{Health Care Spending} + \beta_{11} \textit{Dual Class} + \beta_{12} \textit{Prior IPOs} + \beta_{13} \textit{International Offer} + \varepsilon$$

Figure 5: Explanation of Variables

Variable	Description
IPO Flag	IPO or SEO
Size	Size of issuance (shares issued * offer price)
Sales	Total pre-issuance revenues
Age	Firm age (Issuance Year − Founding Year)
Underwriter Rep	Ritter underwriter prestige scores
VC	Venture capital funding
Owner Decrease	Total decrease of insider shareholding
Overhang	1 – (Secondary shares offered/Total shares offered)
Demand	Demand for the issuance
Big 4 Auditor	Use of reputable auditor
Units	Offerings in which warrants are attached
Health Care Spending	Health care industry spending
Dual Class	Whether dual class stock exists
Prior IPOs	Number of IPOs in the previous month
International Offer	Whether the issuance distribution was international

For citations on why these specific explanatory variables were chosen, please see BH. Variables requiring descriptions beyond those found in Figure 5 are explained as follows:

Our definition of *Overhang* differs from BH who define it as the quantity of shares outstanding prior to the offer minus the number of secondary shares all divided by the total shares offered in the IPO. Due to data constraints, we simplify the measure to be one minus the quantity of secondary shares offered divided by total shares offered. *Demand* for the issue is considered high if the final offer price is greater than or equal to the mid-filing price. Reputable

auditors (*Big 4 Auditor*) are considered to be any of the Big 4 auditors—Deloitte and Touche, Ernst & Young, KPMG, and PWC—or their predecessors. Health care spending is reported by the Centers for Medicare and Medicaid Services (CMMS) and represents the national health expenditure accounts for the various services in the equation (to include all sources of funding: private health insurance, Medicare, Medicaid, out-of-pocket spending, etc.). Following Brau and Heywood (2008), *Health Care Spending* is calculated by the CMMS as:

Health Care Spending = hospital care + physical & clinical services + dental services + nursing home care + other medical professional service.

The third phenomenon we examine is long-run performance. Consistent with Loughran and Ritter (1995), we calculate the return as

$$R = \prod_{t=start}^{\min[T,delist]} (1 + r_{it}) - 1$$

where *start* is the date of the post-issue closing price and min[*T, delist*] is the earlier of the last day of trading or the end of a six-month or one-year period.

To explain the long-run returns, we calculate abnormal returns as

$$AR = \prod_{t=start}^{\min[T,delist]} (1 + r_{it}) - \prod_{t=start}^{T} (1 + r_{mt})$$

where r_{mt} is the raw return on the market in month *t* using the CRSP equally-weighted market index.

We focus on 6-month and one-year long-run returns due to data constraints. BH used 1, 3, and 5-year long-run returns because they matched with the CRSP database and use only US markets. Because they matched with CRSP, they lost a large proportion of their dataset. To preserve our data sample, we focus on only SDC firm data and are constrained to one-year abnormal returns. Figure 6 below reports the summary statistics for the sample.

Figure 6. Summary Statistics for Complete Sample

Variable	N	Mean	Median	Std Dev	Pr > |t|	Minimum	Maximum
Initial Return	642	-0.15	-0.06	0.69	<.0001	-1.0	5.3
Abnormal Return - 6 Mos	507	0.03	-0.06	0.56	0.2758	-1.3	2.0
Abnormal Return - 1 Yr	463	-0.07	-0.16	0.58	0.0115	-1.6	2.0
IPO Flag	738	0.26	0.00	0.44	<.0001	0.0	1.0
Size	738	22,782	32	237,756	0.0094	0	5,827,600
Sales	578	675	43	3,111	<.0001	-0.4	33,820
Age	532	16.86	14.40	11.84	<.0001	0.08	48.12
Underwriter Rep	736	1.93	0	3.19	<.0001	0.00	9.00
VC	738	0.04	0	0.20	<.0001	0.00	1.00
Owner Decrease	24	10.57	9.50	8.32	<.0001	-2.20	26.20
Overhang	617	0.96	1	0.14	<.0001	0.05	1.00
Demand	738	0.71	1	0.45	<.0001	0.00	1.00
Big 4 Auditor	738	0.24	0	0.43	<.0001	0.00	1.00
Units	703	0	0	0	na	0	0
Health Care Spending	738	2,888	2,880	301	<.0001	2,403	3,351
Dual Class	738	0.04	0	0.18	<.0001	0	1
Prior IPOs	738	9.32	9.00	6.54	<.0001	0	27
International Offer	738	0.77	1	0.42	<.0001	0	1

For brevity, we report the entire sample in one figure which includes all IPOs and SEOs for which we have data. We leave careful inspection of the figure to the reader but point out a few interesting statistics. The average underpricing is measured as the *Initial Return* is 22%, which is higher than the historical data for all equity issuances reported earlier of 18%. The performance in underpricing, to include both IPOs and SEOs, demonstrates a strong reception by the secondary markets once the new shares begin to trade. The long-run returns also fit the pattern of the IPO phenomena. Over six-months, the average is insignificant at 3%, however the median abnormal performance is -6%. The median controls for outlier homerun issues by measuring the central tendency. Over the one-year period, which is one of the traditional periods used in the new issues literature (e.g., Ritter, 1991), we see a -7% abnormal return on average and a median of -16% with a difference in mean p-value of 0.0115. IPOs make up 26% of the sample with 24% using a big four auditor and only 4% having venture capital backing. Because SDC reports that none of the equity issues included warrants (the variable *Units*) and because SDC is sparsely populated for *Owner Decrease*, we do not use these variables in our subsequent regressions.

The next figure reports the regression models for the underpricing of the combined sample. We report three models in an attempt to expand the sample size and provide some robustness. Statistically significant coefficients are reported in bold.

Figure 7. Regressions with Initial Return (Underpricing) as Dependent Variable

	1. Initial Return	2. Initial Return	3. Initial Return
Intercept	0.590	1.068	0.696
	(0.2184)	(0.0056)	(0.1012)
IPO Flag	0.269	0.163	-0.024
	(0.0066)	(0.0426)	(0.7796)
Size	-0.223	-0.232	-0.238
	(0.0202)	(0.0146)	(0.0238)
Sales	-9.640	-14.050	-21.560
	(0.5981)	(0.4329)	(0.2781)
Age	-0.003		
	(0.4506)		
Underwriter Rep	0.015	0.037	0.047
	(0.2717)	(0.0027)	(0.0006)
VC	-0.186	-0.068	-0.188
	(0.2314)	(0.6483)	(0.2571)
Overhang	-0.006	0.010	0.088
	(0.9855)	(0.9686)	(0.7626)
Demand	-0.518	-0.642	
	(<.0001)	(<.0001)	
Big 4 Auditor	-0.131	-0.218	-0.181
	(0.2002)	(0.0101)	(0.0534)
Health Care Spending	-118.180	-273.250	-297.120
	(0.3597)	(0.0055)	(0.0065)
Dual Class	-0.271	-0.327	-0.364
	(0.0785)	(0.0202)	(0.0199)
Prior IPOs	0.014	0.009	0.011
	(0.0127)	(0.0374)	(0.0278)
International Offer	-0.214	-0.105	-0.212
	(0.0107)	(0.1526)	(0.009)
R-Square	0.237	0.28	0.11
Adj R-Sq	0.202	0.26	0.087
Pr>F	<.0001	<.0001	<.0001
Sample Size	299	442	442

The first model has a sample size of 299 firms, the second of 442, and the third also of 442. We are able to expand the sample size by dropping the *Age* variable in the second model and both *Age* and *Demand* in the third model. The first model has six independent variables that have statistically significant explanatory power. *IPO Flag* shows that IPOs have nearly 27% more underpricing than SEO firms, consistent with the general market. *Size*, as measured by millions in proceeds, has a negative correlation in line with the hypothesis that larger issues typically proxy for higher quality and less risk in the offering. The *Demand* variable is the

opposite of what we see in the general new issues market, but it is consistent with the health care market as reported in BH. This result indicates that the less the underwriter adjusts the offer price prior to the issue, the larger the underpricing once trading begins (and vice versa). *Dual Class* issues have a negative correlation indicating that when more than one class of share is offered, the offer is less well-received on the first day of trading. The *Prior IPOs* variable gives additional evidence for the hot markets phenomena. A greater number of issues in the month prior to the issue in question results in greater underpricing indicating momentum in issue timing. The final variable *International Offer* is negative, indicating that relative to US based firms, international firms are not received as well on the first day of the issue. The adjusted R-square metric shows the model explains 20.2% of the variability in underpricing which is statistically significant beyond the 0.01 level and consistent with BH.

When we enlarge the sample in the second model, the variables *Underwriter Rep*, *Big 4 Auditor*, and *Health Care Spending* both become statistically significant and *International Offer* loses significance. The *Underwriter Rep* variable shows that by using a higher quality underwriter, the issues is better received on the first day of trading. Using a *Big 4 Auditor* decreases underpricing which may be a sign of lower uncertainty in the issue pricing because of superior auditing skills and reputation. The *Health Care Spending* variable reports that with more funding going towards health care the level of underpricing is significantly less. Note that the adjusted R-square increases to 26% by expanding the sample size by removing *Age*.

The final model checks robustness by removing the *Demand* variable, which cuts the explanatory power of the model down to an adjusted R-square of 8.7%. This large drop in the *Demand* variable is why we chose this specific robustness test as *Demand* is known to have very significant predictive power (Hanley, 1993). Compared to Model 2, the IPO dummy variable (*IPO Flag*) loses significance and *International Offer* becomes significant again.

Turning to analysis of the long-run returns, we focus on Figure 8.

Figure 8. Long-run Returns Regressions

	1. One-Year Return	2. One-Year Return	3. One-Year Return
Intercept	-1.730	-2.211	-2.166
	(0.026)	(0.0003)	(0.0003)
IPO Flag	0.072	0.061	0.078
	(0.5683)	(0.5423)	(0.4194)
Size	0.140	0.140	0.140
	(0.5506)	(0.5218)	(0.5373)
Sales	-10.390	-16.560	-16.110
	(0.6043)	(0.359)	(0.3714)
Age	-0.005		
	(0.2727)		
Underwriter Rep	-0.004	-0.006	-0.006
	(0.8258)	(0.6778)	(0.6459)
VC	0.021	-0.002	0.003
	(0.9077)	(0.9898)	(0.9833)
Overhang	0.085	0.071	0.065
	(0.8147)	(0.7986)	(0.8155)
Demand	-0.104	0.050	
	(0.3335)	(0.5027)	
Big 4 Auditor	-0.105	0.021	0.019
	(0.4172)	(0.8356)	(0.8572)
Health Care Spending	695.140	819.150	813.360
	(0.0105)	(0.0001)	(0.0001)
Dual Class	-0.039	-0.211	-0.200
	(0.8601)	(0.2241)	(0.2474)
Prior IPOs	-0.005	-0.010	-0.010
	(0.5617)	(0.1292)	(0.1319)
International Offer	-0.060	-0.126	-0.116
	(0.5514)	(0.1354)	(0.1625)
R-Square	0.073	0.088	0.087
Adj R-Sq	0.016	0.051	0.053
Pr>F	0.2265	0.0059	0.004
Sample Size	225	310	310

The three long-run analyses reported in Figure 8 are similar to those in Figure 7 except the dependent variable is the one-year abnormal returns, or each firm's performance above or below a market benchmark for the one year following the issue. We report one-year returns to be consistent with the prior literature as discussed above. The six-month long-run abnormal returns show qualitatively similar results and are available upon request. Of all the possible explanatory variables, the only variable with statistical significance is the *Health Care Spending* factor. The more spending in the health care industry the better firms perform over one year at a very high level of significance (p-values of 0.0105 and 0.0001). The R-squares and adjusted R-squares look relatively small compared to the underpricing regressions in Figure 6, but the second two

models demonstrate approximately 5% explanatory power, which is fairly typical in explaining equity issuance abnormal stock returns in the long run (e.g., Ritter, 1991 reports adjusted R-square of 7%).

4. Discussion and Conclusion

The purpose of this study has been to examine health care new issues (both IPOs and SEOs) over the years that have followed the study of Brau and Holloway (2009). These years, 2008-2016 provide an interesting experiment in financial markets. In late 2007, the US (and world) experienced a major financial crisis as the real estate bubble and associated derivative securities collapsed. The years 2008-2010, which we call the *Post-crash* years, allow us to examine health care issuances immediately after a financial market shock. A health care specific shock was the passage of the Affordable Care Act in 2010. The years 2011-2016 allow us to examine heath care new issues during the period after the ACA.

In general, our results are consistent with those of the Brau and Holloway study. In their analysis of US health care issues from 1970-2008 they find support for all three new issues phenomena as well – hot markets, underpricing, and poor long-run returns. We also find these patterns using the extended data period of 2008-2016; however, unlike Brau and Holloway we study global IPOs. Seventy-seven percent of the firms in our sample are international health care firms which issued equity abroad. Thus, the current paper not only expands the sample period of Brau and Holloway to include *Post-crash* and *Post-ACA* years, it also expands the sample to include global IPOs.

This paper has been descriptive in nature. We have tested for correlation, but not for causation. We report a correlation in issuing volume with the *Post-crash* and *Post-ACA* years, but we cannot conclude that either event caused the relationship with equity issues. Future research should focus on using these two events as instruments to carefully measure the impact of the financial crisis and ACA on health care IPOs and SEOs to include a more careful look at stock price performance in the years following.

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