JOURNAL OF HEALTH CARE FINANCE

Summer 2016

The Affordable Care Act and the Risk and Return on Hospital Stocks

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Abstract

We empirically examine the effect of the Affordable Care Act on the risk and return of publically traded hospital stocks. Our methodology uses the single-index model of stock excess returns amended to control for events related to the passage and implementation of health-care reform. We test for changes in ex-post alpha, beta, and firm-specific risk. We find a reversal effect with alphas at first decreasing upon the bill's passage, then increasing upon the 2012 Supreme Court decision. We find a similar reversal effect for market risk, with betas, at first increasing then decreasing. Overall we find ACA produced positive alphas with marginal statistical significance and less diverse betas mirroring that of the market. Finally, we find health-care reform had no significant effect on firm-specific risk.

I. Introduction

Signed into law on March 23, 2010, the Affordable Care Act (ACA) is the most significant legislation affecting health care in the United States since the creation of Medicare in 1965[1]. ACA affects all aspects of health care and greatly enhances the role of government. The goals of health-care reform were to expand insurance coverage, control costs, and enhance quality of care.

ACA's goal of universal insurance coverage is accomplished in three ways: 1) requiring individuals to purchase insurance, the individual mandate; 2) requiring employers to provide coverage for employees, the employer mandate; and 3) expanding Medicaid eligibility. It is estimated that one-half of newly insured will come from Medicaid expansion, noting that not all states participated in expansion.

Health-care reform affects the profitability of hospitals in two fundamental ways. First, expanded insurance coverage should increase demand for hospital services while reducing the incidence of nonpayment. Second, provisions aimed at reducing growth in Medicare spending by linking reimbursements to quality metrics create revenue uncertainty, with exposure based on the mix of publically and privately insured patients[2].

Economic theory predicts an increase in the number of insured will shift hospital demand curves outward. Do we have any evidence this occurs? Dafny and Gruber (2005) found expansion of public insurance programs for children in the nineties increased demand for hospital services. Finkelstein (2007) found introduction of Medicare explained half of the ensuing increase in real health-care spending. Card, Dobkin, and Maestas (2008) found becoming Medicare eligible leads to increases in demand for health-care services. Anderson, Dobkin, and Gross (2012) found a significant reduction in demand for hospital services as young people were removed from their

[1] The Affordable Care Act is actually two bills – the Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation Act of 2010. A running gag line is that nobody has read the ACA due to its length. Fortunately, several excellent summaries have been published. Newhouse (2010) reviews ACA stressing its effect on individuals, whereas Orient (2010) reviews the bill from a physician's perspective. Harrington (2010) presents an excellent overall summary of the bill.

[2] On this point, Kaufman (2011) argued ACA puts hospital revenues at risk, contingent on intangibles such as physician communication skills.

parents' insurance. Kolstad and Kowalski (2012) found the 2006 insurance reforms in Massachusetts increased coverage by 36% and reduced inpatient admission to emergency rooms.

Empirical research on the equity-market effects of health-care reform is scarce. In an event study of ACA, Ababneh and Tang (2013) found hospital stocks initially fell upon the bill's signing, but later rose on the 2012 Supreme Court decision. Using prediction market data, Milani (2010) found an inverse relationship between hospital value and the public insurance option, suggesting reform would lower hospital stocks. Unrelated to ACA, Tresl, Payne and Karels (2014) found significant positive historical alphas for a broad health-care industry index. We extend, Ababneh and Tang (2013) and Tresl, Payne and Karels (2014) by formally testing various hypotheses about the effects of reform on hospital stock risk and return using the single-index model amended to include indicator variables to control for events surrounding reform. Specifically, we test for changes in ex-post i) alpha or abnormal returns, ii) beta or systematic risk, and iii) firm-specific or non-systematic risk attributable to ACA.

The remainder of the paper is organized as follows. Section II presents our hospital stock universe, followed by a discussion on the single-index model methodology in Section III. Sections IV and V present our results for abnormal returns, and market and firm-specific risks, respectively. Section VI presents some conclusions.

II. Hospital Stock Universe

Yahoo Finance's Industry Center lists over one thousand hospitals operating in the United States as of 2015. However, the overwhelming majority operate as not-for-profit. In addition, due to mergers, financial distress, and limited trading history, our publically traded hospital universe included only five stocks as reported in Table 1[3].

Table 1: Hospital Stock Universe

Company	Ticker	Market Capitalization
Universal Health Services, Inc.	UHS	$ 11.2 billion
Community Health Systems, Inc.	CYH	$ 5.8 billion
Tenet Healthcare Corp.	THC	$ 4.6 billion
Lifepoint Hospitals Inc.	LPNT	$ 3.2 billion
AmSurg Corp.	AMSG	$ 3.0 billion

Universal Health Services (UHS) is the largest health management company in the United States operating hospitals in the south and southwest as well as behavioral health centers nationwide. In 2014, 24% of total revenue came from Medicare and 30% from Medicaid. UHS acquired Psychiatric Solutions in 2010, Ascend Health in 2012, and Cygnet Health Care Limited in the United Kingdom in 2014. UHS's 2015 debt-to-capital ratio was 41%, the smallest in our stock universe.

[3] Specifically, HCA Holdings, Inc. (HCA) was acquired by CYH. Concord Medical Services Holdings (CCM) operates hospitals in China and two stocks, Dynaq Healthcare, Inc. (DYH) and SunLink Health Systems, Inc. (SSY) were traded as penny stocks in 2014. Select Medical Holdings (SEM) had insufficient data for a common sample.

Community Health Systems (CYH) is the country's largest system of non-urban hospitals operating predominately in southern and western states. In 2014, CYH acquired Health Management Associates, doubling the number of hospitals and revenue, but at the expense of debt increasing to 80% of capital. In 2014, CYH obtained 24.7% of revenue from Medicare, and 10.8% from Medicaid. Approximately half the states in which CYH operates did not expand Medicaid.

Tenet Healthcare Corporation (THC) operates acute-care hospitals and outpatient centers in large urban markets in southern and western states. Tenet offers limited health plans, and operates Conifer Health Solutions which provides business services to health-care providers. Tenet acquired Vanguard Health Systems in 2013, adding twenty-eight acute-care hospitals, increasing Tenet's debt-to-capital ratio to 94%. In 2014, 21.9% of revenue came from Medicare and 9.4% from Medicaid. Seventy-five percent of Tenet's beds are in states that have not expanded Medicaid.

Lifepoint Hospitals Inc. (LPNT) operates rural community hospitals located in southern and western states. In 2014, 25.7% of revenue came from Medicare, 11.7% from Medicaid. LPNT has entered into a strategic partnership with Duke University, allowing expansion into new markets. LPNT's debt-to-capital ratio for 2015 was 49%, relatively low to peers. In eight states where LPNT operates, Medicaid expansion has yet to occur.

AmSurg Corp. (AMSG) is the country's leading provider of gastrointestinal endoscopy and ophthalmology surgery procedures. AMSG's ambulatory surgery center business model provides care at typically one-half the cost of traditional hospital care. In July, 2014 AMSQ acquired Sheridan Healthcare, a leading provider of outsourced physician services to hospitals, doubling company revenues. AMSG received 25% of 2014 revenue from government programs for ambulatory services and 17.5% for physician services.

Table 2 reports annual rates of return on our hospital stock universe and the S&P 500 index over the 10-year period 2005-2014 based on monthly data obtained from Yahoo Finance. Returns over 2005-2007 show large variability relative to the market, followed by dramatic volatility over 2008-2009. In 2009, with the exception of AMSG, hospital stocks earned double digit returns, each exceeding that of the market. In the post-ACA period, 2012-2014, mean returns are impressive, with most hospital stocks performing a multiple over the S&P 500 each year.

Table 2: Mean Annualized Rates of Return (%)

YEAR	UHS	CYH	THC	LPNT	AMSG	SP500
2005	9.7	30.5	-28.3	-0.9	-15.8	6.0
2006	17.7	-4.9	-9.4	-10.7	0.6	12.8
2007	-7.4	0.9	-31.6	-12.5	16.3	3.5
2008	-30.3	-92.8	-148.6	-26.4	-14.8	-48.6
2009	49.0	89.3	154.5	35.4	-5.8	21.1
2010	35.9	4.9	21.6	12.2	-5.0	12.0
2011	-10.6	-76.2	-26.6	1.1	21.8	0.0
2012	22.3	57.5	45.9	1.6	14.2	12.6
2013	52.2	24.5	26.0	33.6	42.5	25.9
2014	31.7	31.7	18.5	30.8	17.6	10.8

III. Research Methodology

To empirically investigate how health-care reform affected the risk and return on hospital stocks, we estimated the single-index model of stock returns amended to include indicator variables tracking events related to the passage and implementation of ACA. The single-index model

decomposes the risk of any stock into market and firm-specific components and provides the framework for the testing of several null hypotheses concerning reform.

The single-index model regression equation relates the excess rate of return on a stock to that of the market as proxied by the S&P 500:

$$1) \quad r_i - r_f = \alpha + \beta(r_M - r_f) + \varepsilon$$

where,

- r_i = rate-of-return on stock *i*
- r_f = risk-free rate of return
- r_M = rate-of-return on S&P 500
- α = security's alpha, or abnormal return
- β = security's beta, or sensitivity to market risk premium
- ε = firm-specific surprise, or residual return.

The model explains the excess return on a given stock, defined as the actual return net the risk-free rate, as a linear function of the excess return on the market. The alpha or intercept term, α, is the non-market risk premium and is interpreted as an abnormal return in the context of the Capital Asset Pricing Model (CAPM). Finding and trading significant alphas is the goal of active portfolio managers. According to CAPM, the equilibrium value of alpha is zero.

Beta, β, measures the sensitivity of a stock's excess return to that of the market, and when multiplied by the market's excess return represents the stock's market risk premium. Accordingly, beta measures the systematic risk exposure of a stock, noting the market beta is unity. The regression error term represents firm-specific surprises and its standard deviation represents firm-specific risk. According to CAPM, firm-specific risk is diversifiable and is theoretically absent from the market portfolio.

Our methodology amends the model to include two indicator, or dummy, variables allowing us to estimate changes in model parameters based on events surrounding reform. The first indicator variable is OBAMA taking on value of 1 for the period 3/24/2010–12/31/2014, and 0 otherwise. The second indicator variable, SCOTUS, controls for the Supreme Court 2012 ruling upholding reform and takes the value 1 on and after June 28, 2012, 0 otherwise. We estimate two versions of the amended model. The first version uses an intercept-interaction variables to conduct alpha analysis. The second uses a slope-interaction version to conduct risk analysis.

IV. Alpha Analysis

To investigate how ACA affected ex-post alphas, or abnormal returns, we estimated the following intercept-interaction version of the single-index model:

$$2) \quad r_i - r_f = \alpha_0 + \alpha_1 OBAMA + \alpha_2 SCOTUS + \beta(r_M - r_f) + \varepsilon.$$

The regression function, equation 3), shows how the indicator variables interact with the intercept term. Specifically, the coefficient on OBAMA, α_1, measures change in alpha after the 2010 bill signing, whereas the coefficient on SCOTUS, α_2, measures the change in alpha attributable to resolving constitutionality of ACA.

$$3)\ E(r_i - r_f) = \begin{cases} \alpha_0 + \beta(r_M - r_f) & OBAMA = 0, SCOTUS = 0 \\ (\alpha_0 + \alpha_1) + \beta(r_M - r_f) & OBAMA = 1, SCOTUS = 0 \\ (\alpha_0 + \alpha_2) + \beta(r_M - r_f) & OBAMA = 0, SCOTUS = 1 \\ (\alpha_0 + \alpha_1 + \alpha_2) + \beta(r_M - r_f) & OBAMA = 1, SCOTUS = 1. \end{cases}$$

Several null hypotheses concerning alpha are of interest[4]. First, individual null hypotheses that each ACA event had no effect on alpha are H_0: $\alpha_1 = 0$ and H_0: $\alpha_2 = 0$. Second, the joint null of no change in alpha is H_0: $\alpha_1 = \alpha_2 = 0$. Failure to reject these nulls would imply health-care reform produced no significant changes in alpha. Finally, we tested the null that the complete sample alpha, including before ACA, was zero, H_0: $(\alpha_0 + \alpha_1 + \alpha_2) = 0$. Failure to reject this null implies ACA had no alpha.

Table 3 presents estimation results for equation 2) using daily data over the period 1/02/2009-12/31/2014. Our estimation period starts after the 2008 financial crisis and ends after the individual insurance mandates were fully implemented in 2014. Our results are presented in percentage terms.

Table 3: Alpha Analysis (%)

Stock	a_0	a_1	a_2	$a_0 + a_1 + a_2$
UHS	.14	-.15	.11	.11
CYH	.23*	-.34*	.15	.03
THC	.45**	-.51**	.13**	.06*
LPNT	.09	-.11	.05	.03
AMSG	-.10	.12	.00	.03

** (*) statistically significant at 5% (10%) level

Estimated alphas before ACA, a_0, are positive for all stocks except AMSG, with THC significant at the 5% level and CYH significant at the 10% level. For THC, the annualized alpha is 112%, noting the usual caveats about annualizing daily data. Nevertheless, the positive pre-ACA alphas suggest investors had favorable return forecasts for hospital stocks consistent with investors anticipating benefits arising from health-care reform.

The estimated coefficients on OBAMA, a_1, were negative in four of five cases with THC and CYH statistically significant at the 5% and 10% level, respectively. Reductions in alpha were largest for THC and CYH, both with relatively large debt burdens, whereas the smallest decrease was for LPNT who serves rural community markets. The increase in alpha for AMSG, although insignificant, is consistent with AMSG's business model being relatively amenable to reform.

[4] It should be noted we use the term alpha in an ex-post sense, i.e., they are not based on ex-ante security analysis.

Nevertheless, the market's initial reaction to health-care reform produced a mean negative change in alpha of .20, although only two of five coefficients were statistically significant.

The estimated coefficients on SCOTUS, a_2, are all positive, with THC statistically significant at the 5% level. The positive coefficient estimates suggest that when constitutional uncertainties regarding ACA were resolved, markets reacted positively with a mean increase in alpha of .09. Accordingly, we find a reversal effect with alpha at first declining and then increasing. The finding of a reversal effect in abnormal returns confirm Ababneh and Tang (2013) who found negative alphas on passage of ACA, followed by positive alphas after the Supreme Court decision.

Based on average estimates of α_1 and α_2, the net change in the mean alpha is negative. We tested the joint null hypothesis that both indicator-variable coefficients are zero: H_0: $\alpha_1 = \alpha_2 = 0$. We failed to reject the null for all firms at the 5% significance level. Accordingly, we find no significant change in alpha attributable to the two events surrounding health-care reform.

Finally, was there any alpha in hospital stocks over the complete sample period including before passage of ACA? The complete sample alpha is given in the regression function when OBAMA = SCOTUS = 1 and is the sum of estimated alphas reported in column 5 of Table 3. The estimated overall alpha for each stock was positive, with the largest estimates for UHS and THC. In particular, the annualized complete-sample alpha for THC was approximately 15%. We tested the null hypothesis of no overall alpha H_0: $(\alpha_1 + \alpha_2 + \alpha_3) = 0$, and found, with the exception of THC, we could not reject the null hypothesis at the 5% level of significance. The finding of positive complete-sample alphas, although only THC is significant, suggest investors expected health-care reform to benefit hospital stocks.

V. Risk Analysis

Table 4 reports systematic risk analysis based on estimating the following slope-interaction version of the single-index model:

$$4) \quad r_i - r_f = \alpha + \beta_0\left(r_M - r_f\right) + \beta_1 OBAMA \times \left(r_M - r_f\right) + \beta_2 SCOTUS \times \left(r_M - r_f\right) + \varepsilon.$$

The regression function, equation 5), shows how indicator variables interact with the slope term:

$$5)\ E\left(r_i - r_f\right) = \begin{cases} \alpha_0 + \beta_0\left(r_M - r_f\right) & OBAMA = 0, SCOTUS = 0 \\ \alpha_0 + \beta_0\left(r_M - r_f\right) + \beta_1 OBAMA \times \left(r_M - r_f\right) & OBAMA = 1, SCOTUS = 0 \\ \alpha_0 + \beta_0\left(r_M - r_f\right) + \beta_2 SCOTUS \times \left(r_M - r_f\right) & OBAMA = 0, SCOTUS = 1 \\ \alpha_0 + \beta_0\left(r_M - r_f\right) + \beta_1 OBAMA \times \left(r_M - r_f\right) + \beta_2 SCOTUS \times \left(r_M - r_f\right) & OBAMA = 1, SCOTUS = 1. \end{cases}$$

The coefficient on OBAMA, β_1, measures change in beta upon ACA's passage, whereas the coefficient on SCOTUS, β_2, measures the change in beta attributable to resolving constitutionality of reform. Individual nulls are no change in systematic risk, H_0: $\beta_1 = 0$ and H_0: $\beta_2 = 0$, against two-tailed alternatives. Joint nulls are no change in beta, H_0: $\beta_1 = \beta_2 = 0$. Failure to reject this null would suggest reform had no overall effect on market risk exposures. Finally,

we tested whether the complete sample beta, including the pre-ACA period, is unity, H_0: $\beta_0 + \beta_1 + \beta_2 = 1$.

Table 4: Beta Analysis				
Stock	b_0	b_1	b_2	$b_0 + b_1 + b_2$
UHS	.86**	.18**	-.07	.96
CYH	1.26**	.12	-.38**	1.01
THC	1.22**	.22	-.34*	1.10
LPNT	.85**	.20**	-.16*	.89
AMSG	.93**	.09	-.08	.99
** (*) statistically significant at 5% (10%) level				

As reported in Table 4, the average estimated pre-ACA beta, b_0, was 1.02 with CYH and THC having the largest betas, consistent with the relatively large returns for these stocks 2012-2014 reported in Table 2. In all cases we could reject the null hypothesis of no market risk exposure at the 5% level of significance.

The estimated changes in beta upon reform, b_1, are uniformly positive, with an average increase of .16, although we could reject the null hypothesis of no change at the 5% level of significance for only UHS and LPNT. Accordingly, the initial reaction to reform was to increase market risk exposures of hospital stocks as measured by beta.

The estimated coefficients on SCOTUS, b_2, were negative in all cases, with an average decrease in beta of .20. This suggests that once the constitutional issues surrounding reform were resolved, markets reacted by lowering market risk exposures. We rejected H_0: $\beta_2 = 0$ for CYH at the 5% level, and THC and LPNT at the 10% level. Once again we find a reversal pattern, this time with systematic risk exposure. Specifically, betas at first increase, only later to fall after the Supreme Court 2012 ruling.

Did reform produce any significant change in beta? We tested the joint null hypotheses of no change in beta, H_0: $\beta_1 = \beta_2 = 0$. We rejected the joint null at the 10% level of significance for CYH and LPNT. The net change in beta for CYH was negative, whereas for LPNT it was positive. Accordingly, health-care reform had a mixed and marginal effect on hospital betas, and some evidence exists reform may have lowered market risk exposures.

Column 5 of Table 4 reports complete sample betas defined when OBAMA = SCOTUS = 1. As reported in Table 4, the overall betas are less diverse than pre-ACA betas and they move toward unity. In addition, the finding of a reversal effect in betas suggests the null hypothesis that the complete sample beta, including the pre-ACA period, was one, H_0: $\beta_0 + \beta_1 + \beta_2 = 1$. We failed to reject the joint null of beta of one for each stock at the 5% level of significance. Accordingly, our results show the lasting effect of reform may be less diverse business models and market risk exposures of one.

Finally, we tested the null of no change in firm-specific risk using a one-tailed F-test based on estimating equation 1), before and after passage of ACA. Our prior was ACA would increase firm-specific risk since ACA challenges existing business models. We failed to reject the null

hypothesis of no change in firm-specific risk at the 5% level of significance for all stocks. What explains the finding of no increase in firm-specific risk? One argument is health-care reform has increased government regulation, in turn, limiting management's ability to affect their bottom line.

VI. Conclusion

The debate over health-care reform has been lively, but little equity-market research on its effects have been documented. Our contribution is to estimate the effect of the Affordable Care Act on the risk and return of publically-traded hospital stocks. We employ the single-index model of excess returns amended to include indicator variables tracking events surrounding health-care reform. We test whether ACA had any ex-post alpha, led to significant changes in betas, and had any effect on firm-specific risks.

We found a reversal effect with alphas, at first, decreasing upon reform, and then increasing after the Supreme Court 2012 decision. Similarly, we found beta at first increased upon the bill's passage, only later to decrease. Overall, we found reform produced positive but largely insignificant alphas and betas less diverse and near one. In addition, we found no evidence health-care reform significantly increased firm-specific risk of hospital stocks. Accordingly, we conclude that health-care reform was largely positive for investors in hospital stocks.

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