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## Do Health Care Investments Hedge Health Care Liabilities?

Abstract: We examine whether health care equity investments hedge health care liabilities. In contrast with conventional wisdom, we find them uncorrelated and, thus, poor hedges.

Investment pools are frequently designed to pay health care expenses. Companies and governments pay post-retirement health care benefits, often out of their pension investment pool or an affiliated trust. Non-profits, including over one hundred hospital conversion foundations worth billions of dollars, regularly finance health programs. (Hospital conversion foundations are formed when a non-profit hospital sells to a for-profit entity.) Finally, individual investors hold Archer Medical Savings Accounts and Health Savings Accounts, both designed to finance personal health care expenditures.

It is reasonable to wonder if health care investments are well-suited to these health-oriented investment pools. The thought is a liability-driven investment (LDI) approach; the underlying reasoning assumes that the health-oriented investments and the present value of health care expenses, a liability, would vary together. If medical care suddenly becomes more expensive (increasing the liability), the hope is that the investments correspondingly increase. Our title poses the question “Do health care investments hedge health care liabilities?” By “hedge” we mean: Does the health care investment co-move with (vary directly with) the health-related liability? See Reilly, Johnson and Smith (1970) and Bodie (1976) for a similar inquiry on how stocks might hedge overall inflation. Under liability-driven investment, if the health-related liability and health-related investment co-move, then an optimized portfolio will up-weight the liability-hedging asset.

Health care liabilities are large and growing. Further, retiree medical liabilities are nontrivial relative to pension liabilities. For example, General Motor’s liability for post-retirement medical

benefits was \$50 billion in 2006. The medical liability component represents 37 percent of General Motor's total post-retirement benefit liabilities and is much larger than its equity market capitalization. Recently, GM entered into an agreement to transfer the post-retirement medical liability to a UAW-administered VEBA, or voluntary employees' beneficiary association, which will be pre-funded with \$35 billion. Medical liabilities affect governments as well; actuaries at Aon Consulting estimate that state and local governments' post-retirement health-care liabilities total \$1.1 trillion.

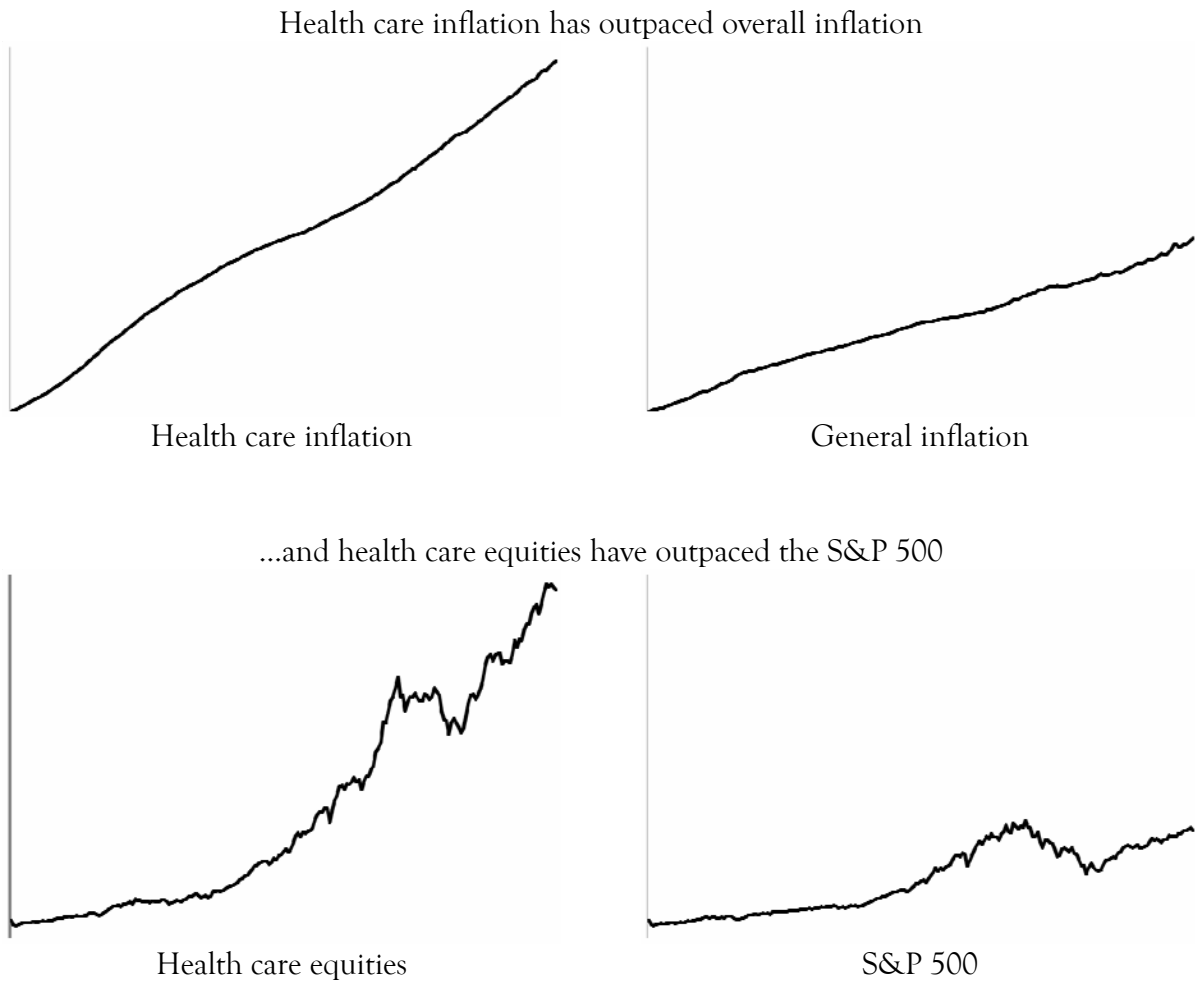
Medical liabilities are important to many types of investors. Starting in 2006, public-sector pensions must recognize a post-retirement health benefit liability under GASB 43 and GASB 45. FASB 106 applies similarly to corporations. Just as pension accounting recognition encourages pensions to contemplate liability-driven investment, accounting recognition of "other post-employment benefits" may encourage health-oriented liability-driven investing. Even individuals, while not forced by accounting standards to formally recognize a medical liability, cannot deny the reality of needing to pay for prospective future medical expenses.

Medical inflation is substantially higher than overall inflation. In the twenty years ending January 2004, U.S. medical care costs increased 186 percent while non-medical inflation increased only 75 percent. Many companies expect medical inflation to continue to outpace other inflation; IBM, for one, uses actuarial assumptions of 8 percent health care inflation and only 4 percent wage inflation. The current *Medicare Trustee's Report* (2006) projects medical expenses rising 2.3 percent faster than the consumer price index.

Exhibit 1 shows that medical inflation has dramatically outpaced general inflation and that health care equity investments have dramatically outpaced broader equity investments. Exhibit 1

graphically demonstrates the intuition behind what we characterize as folk wisdom among finance professionals. This conventional wisdom is that health care investments are well-suited to health-oriented investment pools because of their sensitivity to the health sector. Investment managers are aware of this sensitivity—one of the authors saw a manager presentation for a medical office building investment pool that stressed the connection to medical inflation and medical liabilities. Further, in June 2007, CalPERS, the giant California pension, announced its intention to invest \$700 million in a private equity fund that targets companies developing solutions to counter the increasing costs of health care.

## Exhibit 1



Data covers September 1987 through May 2006.

Both inflation scales and both equity scales are comparable, but the inflation and equity scales are not comparable.

## Our approach

Kneafsey (2003) poses and answers the question: “What is the investor’s problem?” The answer is to fund a stream of liabilities. For most investors, these liabilities are linked, in greater or lesser degree, to inflation. Medical inflation is often a particular concern. The asset-liability optimization (ALO) literature of Sharpe and Tint (1990); Leibowitz, Bader and Kogelman (1996); Ryan (1999); and Waring (2004) emphasizes building an investment pool that addresses investor-specific inflation.

Asset-liability optimization and liability-driven investment are responses to the sensitivity of liabilities to changes in inflation rates. GM, for example, assumes 9 percent health care inflation going forward. The footnotes to GM's 2006 financial statements note further that a 1 percent increase in health care cost trends represents an increased liability of \$6 billion (over a base of \$50 billion) and would result in an annual expense increase of \$502 million (over a base of \$4½ billion). If an investment were correlated with this liability, it could offset unanticipated growth in health care inflation and the health care liability.

Accordingly, we evaluate whether health care investments hedge liabilities affected by health care inflation. We investigate this question along a number of avenues. First, we simply consider whether health care investment returns are correlated with health care inflation. Second, we expand that analysis to consider whether a "Hedged Health Care Index" reflecting pure exposure to health care investment returns is correlated with health care inflation. Lastly, we follow Bodie (1976) in considering unanticipated health-care inflation shocks to see if they are related to health care investment returns.

For individuals, the interest in whether health care investments hedge medical expenses is three-fold. First, individuals may have Medical Savings Accounts and Health Savings Accounts dedicated to paying health-care expenses. Under U.S. tax law, these investment vehicles allow tax-free compounding when withdrawals are used for medical care expenses. Second, individuals' financial well-being is dependent on the success of institutional investors', particularly pensions', ability to meet the growing health-care liability. If a retiree's company abrogates a commitment to pay for post-retirement health care benefits, the retiree is in for a financial shock. Third, individual's consumption baskets are skewed toward medical care late in life. Amble and Stewart

(1994) analyze an experimental CPI for the elderly who consume proportionally more medical care; using their data, Jennings (2006) shows medical care expenditures expanding from 5 percent of expenditures for workers to 19 percent for homeowner retirees. Fidelity Investments (2007) estimates a 65-year-old couple retiring in 2007 will need approximately \$215,000 to cover medical costs in retirement.

### **Correlation analysis**

We investigate the relationship between health care inflation and health care costs by using health care specialty mutual funds. Health care mutual funds have been around at least twenty years and are a publicly-available investable vehicle. Because they are investable, we see them as a better benchmark than a health care equity index that was created after the fact and backfilled.

(Additionally, health care index funds are a recent phenomenon. See Bailey (1992) on the importance of investability.) In January 2007, there were 208 health care specialty funds in the Morningstar database. Unfortunately, many have short return series. For tractability, and because they had long return histories, we initially focus on two health-oriented mutual funds—Vanguard Health Care (VGHGX) and Fidelity Select Health Care (FSPHX). Data on Morningstar Principia begins in October and February 1987, respectively, for the two funds.

We use monthly returns over the common period (October 1987 through May 2006). We compare these returns to the medical care component of CPI-U, the Consumer Price Index for All Urban Consumers, using data from *www.bls.gov*. Medical care is one of eight main CPI components.

Our analysis shows medical care inflation is essentially uncorrelated with the return series on our two health care investments. Exhibit 2 shows the correlations with the Vanguard and Fidelity



health care funds were -0.01 and 0.03, respectively. These correlation values mean these health care equity investments are not good ways to hedge exposure to future medical expenses.

**Exhibit 2**

		Medical CPI	Overall CPI-U	VGHCX	FSPHX
Medical care inflation	Medical CPI	1.00			
Overall inflation	Overall CPI-U	0.26	1.00		
Vanguard Health Care	VGHCX	-0.01	-0.10	1.00	
Fidelity Select Health Care	FSPHX	0.03	-0.12	0.92	1.00

In focusing on two of the largest and longest-lived funds, we may raise questions of a latent survivorship bias. That is, we used hindsight to pick these two funds that had been successful and survived while the laggards closed. We believe, however, our results are generalizable. When we examined three health care index series, we obtained similarly uncorrelated results. (The three index series were Morningstar’s Health Care Sector Total Return Index of health care stocks for January 1992 to May 2006, Morningstar’s Specialty-Health Category Returns of health care mutual funds for October 1987 to May 2006 and the value-weighted health care industry series of stock returns from Kenneth French’s data library for February 1947 to May 2007.)

We believe our statistical results are robust. Spearman rank correlations, which would dampen the effect of outliers, are similar to the ordinary Pearson correlations. We “de-smoothed” (see Scherer, 2004, p. 16) the medical care inflation series to take out any autocorrelation-related smoothing arising from the CPI construction methodology; again, the health care investments were uncorrelated with health care inflation. Third, the annual series gives similar results. Further, when we bifurcate the monthly time series into two equal-length sub-periods, they cross-validate and the conclusion still holds. Finally, we evaluate whether U.S. health care *expenditures* (instead of inflation) are correlated with health care equities, we find the correlation is essentially zero.

## A Hedged Health Care Index

Giliberto (1993) creates what he calls a “Hedged REIT Index” in an attempt to isolate the real estate component of REIT returns. His Hedged REIT Index separates real estate factors in REIT returns from noisy stock market factors. To do so, he simply subtracts beta-adjusted total market returns from REIT returns to isolate the real estate factor.

Following his approach, we compute a “Hedged Health Care Index.” This Hedged Health Care Index similarly reflects pure exposure to medically-related returns and eliminates much stock market noise. Following Giliberto (1993), we subtract beta-adjusted S&P 500 returns from the returns of each of our two health-oriented mutual funds. (We compute the beta by regressing returns for the health-care funds on the S&P 500 for the preceding 36 months.) The result is two Hedged Health Care Indices.

Again, our analysis shows medical care inflation is essentially uncorrelated with the return on our Hedged Health Care Indices. Exhibit 3 shows the correlations between medical care inflation and two versions of this Hedged Health Care Index were  $-0.07$  and  $-0.02$ . These values mean the uniquely-medical part of health care investment returns is a poor hedge of future medical inflation. This result supports our correlation analysis result.

### Exhibit 3

		Medical CPI	Overall CPI-U	HHCI-1	HHCI-2
Medical care inflation	Medical CPI	1.00			
Overall inflation	Overall CPI-U	0.09	1.00		
Hedged Health Care Index based on VGHCX	HHCI-1	-0.07	-0.02	1.00	
Hedged Health Care Index based on FSPHX	HHCI-2	-0.02	-0.08	0.81	1.00

Giliberto (1993) computed his Hedged REIT Index using a difference in two indices—a REIT index and market index returns. Here we compute our Hedged Health Care Index using a

difference in actively-managed health care investment returns and market index returns. While our Hedged Health Care Index includes some fund-specific noise, the main effect is to isolate health care returns. As an indication of the veracity of our Hedged Health Care Indices, note that the correlations between the Vanguard and Fidelity versions is 0.81. This indicates significant commonality—namely, exposure to medically-related equity returns. Further, when we repeat the exercise with value-weighted health care industry returns from Kenneth French’s data library for the period February 1947 to May 2007, we obtain a -0.01 correlation between the beta-adjusted Hedged Health Care Index and medical inflation. This result supports our Exhibit 3 analysis.

**Unanticipated shocks: Applying Bodie (1976) to health care inflation.**

Bodie (1976) examines a more general version of our question. Instead of focusing on health care investments, he considers the broader question of whether common stocks are an effective hedge against inflation. Using a number of econometric specifications, he determines that the real return on equity is negatively related to unanticipated and anticipated inflation. In short, common stocks are not effective inflation hedges. His finding, and similar studies, gives some credence to our (perhaps counterintuitive) health-care-specific results.

Bodie emphasizes that if an investment is to hedge against inflation it must be responsive to unanticipated inflation. He models anticipated inflation using “adaptive expectations”—what we now call a Stein estimator. Like Bodie we construct a Stein (shrinkage) estimator of expected inflation where today’s inflation expectation is based on last month’s expectation plus a partial update of new inflation information.

$$expectation_t = expectation_{t-1} + \theta [actual_{t-1} - expectation_{t-1}] \quad (1)$$

We use a range of  $\theta \in [0.1, 1.0]$  to allow for new inflation information to be incorporated into expectations at different speeds. We then use these inflation expectations to compute unanticipated inflation.

When we evaluate whether unanticipated shocks in health care inflation are related to health care investment returns, we find they are not. Across a range of  $\theta$  information-incorporation speeds, the conditional correlations ranged between 0.00 and 0.03. This means health care investment funds are not good ways to hedge exposure to surprises in medical inflation.

In addition to examining whether unanticipated medical inflation was related to overall health care equity returns, we compared unanticipated medical inflation to our two Hedged Health Care Indices. Again, they did not show a notable relationship. Across a range of  $\theta$  information-incorporation speeds, the conditional correlations ranged between  $-0.10$  and  $-0.03$ . This means the uniquely-medical part of health care investment returns is not a good way to hedge exposure to surprises in future medical expenses.

### **Conclusion and investment implications**

In contrast with the folk wisdom of many finance professionals that health care investments are well-suited to health-oriented investment pools, our results show these investments to be poor hedges against health care inflation. Accordingly, health-aware investors should not overweight health care investments. Health care stocks are not the answer to soaring health care costs.

In drawing this conclusion, we examined the question from a number of angles. First, we showed health care investment returns are uncorrelated with health care inflation. Second, we show that a Hedged Health Care Index, reflecting pure exposure to health care investment returns, is also uncorrelated. Lastly, we show unanticipated health-care inflation shocks are uncorrelated

with both health care investment returns and the Hedged Health Care Index. An Appendix adds theoretical support for our empirical findings using a simple valuation model. All confirm the conclusion that investors with health care liabilities should not overweight health care investments.

In fact, ordinary TIPS seem to provide better hedging of health care inflation. Return for a moment to Exhibits 2 and 3; note that ordinary CPI-U has a much higher correlation with medical inflation than health care equities. Since TIPS reflect changes in CPI-U, they provide better hedging of health care liabilities than health care equities.

Our finding that health care investments are poor hedges against health care inflation might have an explanation in the composition of the two time series. For example, health care equity funds sometimes favor pharmaceutical companies and biotechnology while the inflation data is dominated by professional medical services. While it might be possible to design a health care portfolio to more closely reflect the inflation weightings, our analysis focused on existing, investable health care vehicles. We will leave it to others to see if a better hedge can be designed. Given a widespread need to fund rising medical expenditures, such a hedge is certain to be well-received by managers of investment pools. Existing vehicles are a poor hedge.

## Appendix: Should we have known this? Examining valuation models

In hindsight it may seem obvious that the folk wisdom among finance professionals about health care equities providing a good hedge against health care inflation was wrong. To see this, consider a simple Gordon-growth valuation model:

$$Price_0 = \frac{Payouts_1}{r - g} \quad (2)$$

Most analysts would assume that the required return,  $r$ , includes a component related to inflation. We will model this as having both a general inflation component,  $i_g$ , and an incremental component for the medical care inflation differential,  $i_{hc\Delta}$ . Additionally, there is a real risk free component,  $r_{rf}$ , and a risk premium,  $RP$ .

$$r = r_{rf} + i_g + i_{hc\Delta} + RP \quad (3)$$

Similarly, the rate at which payouts (dividends plus buybacks) grow includes an inflation component. This is because equation (3) is for nominal returns. Again, we model this as having both a general and a medical care inflation component. Finally, there may be a further intrinsic growth component,  $g_{intrinsic}$ .

$$g = g_{intrinsic} + i_g + i_{hc\Delta} \quad (4)$$

If we substitute equations (3) and (4) into equation (2), we obtain:

$$Price_0 = \frac{Payouts_1}{r_{rf} + i_g + i_{hc\Delta} + RP - g_{intrinsic} - i_g - i_{hc\Delta}} \quad (5)$$

$$Price_0 = \frac{Payouts_1}{r_{rf} + RP - g_{intrinsic}} \quad (6)$$

Equation (5) shows the inflation components cancel. If we make the reasonable assumption that changes in medical care inflation will not affect dividends and buybacks in the next year, we

should not expect inflation effects to influence the price of health care equities. Provided the intrinsic, non-inflationary component of growth,  $g_{intrinsic}$ , is not related to health-specific factors, we should not expect health care stocks to hedge health care liabilities.

To those who claim that health care equities' extraordinary returns are due to a health care demand effect (perhaps related to an aging population) and not an inflation effect, we would emphasize that this would require an unanticipated change in intrinsic growth,  $g_{intrinsic}$ , in equation (6). Anticipated changes would already be priced.

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