



CONFIDENTIAL

Health Care Cost Spiral and Potential Market-Based Solutions

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Introduction

As is widely known, the management of Health Care costs – both in the United States and around the world – is among the single biggest challenges facing both the domestic and global capital economy. An enormous body of statistics support this assertion, and, as a point of introductory contextualization, consider the following graphics:

Figure 1: Total Government Outlays by Spending Category

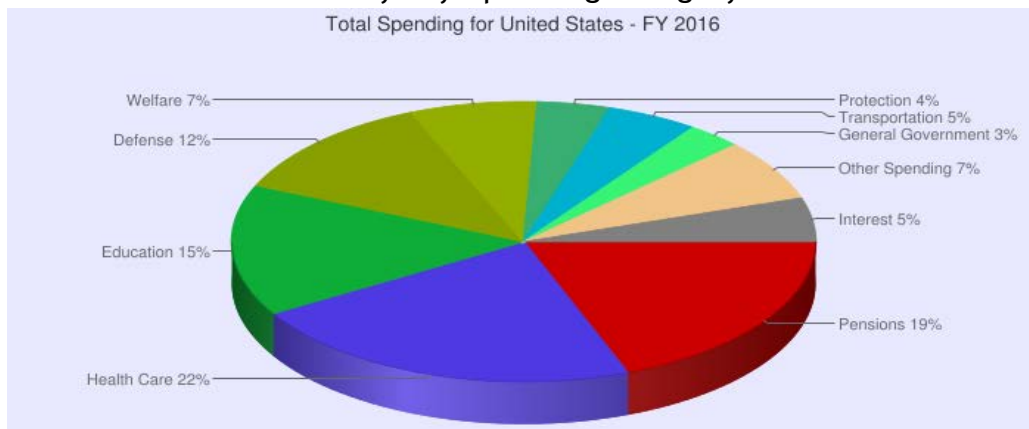


Figure 2: Historical and Projected Growth in Health Care Costs: 2006 – 2020

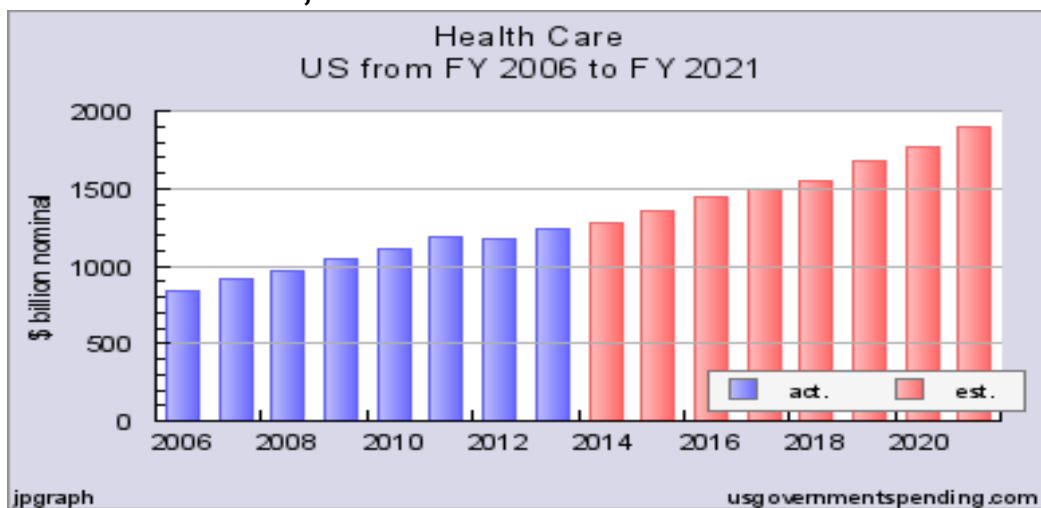


Figure 1 illustrates that Health Care outlays represent the single largest burden on the aggregate budgets of state, local and federal governments – more than defense spending, public pensions and other entitlements. Figure 2 reinforces the grim reality that these costs are rising at an accelerating rate.

Moreover, as is widely known, the burden of Health Care cost is not borne exclusively by government agencies. According to a December 2, 2015 article in the New York Times, total outlays exceeded \$3 Trillion in 2015, and are expected to expand at an accelerated

rate for at least the next couple of years. Per Capita expenditures *for all Health Care-related costs*, came in at approximately \$9,500 in 2015, and represented 17.5% of U.S. Gross Domestic Product.

All signs point to an alarming continuance in these increases – until the end of the decade and perhaps beyond. The aging of the U.S. population, the care implications of longer life expectancies, expansion of Medicaid/Affordable Care Act subsidies, supply/demand imbalances across the entire Health Care sector and other economic factors all point towards higher costs – both in aggregate and on individuals and corporations – for a period likely to extend for years to come.

To date, the financial markets have failed to offer well-adapted risk transference mechanisms to address these vexing issues. Economic agents seeking to hedge against rising Health Care costs (or, for that matter, significant reductions in these outlays) can only avail themselves of a finite set of sub-optimal tools to do so. For example, these entities may seek to manage their risks through investments (long or short) in health-care related companies, ranging from hospital owners/managers, pharmaceutical corporations, medical device manufacturers, health insurers, etc.

However, as indicated above, these risk management strategies are, at best imperfectly adapted to the challenge at hand. If the goal of the exercise is to insure against adverse outcomes tied to changing health care costs, then an approach which involves crafting a portfolio of Health Care related stocks: a) forces the agent to accept risks not part of the objective function (e.g. market risk, earnings risk, credit risk, etc.); and/or b) compels the construction of a complex and costly portfolio dynamic, with less success certainty than is consistent with optimal risk allocation.

Poliwogg believes that many of these issues can be eliminated, or, at minimum, alleviated through the development of a series of disease/treatment-specific cost indices, which could be traded on open markets -- in the form of futures contracts, Exchange-Traded Products (ETPs) and/or Over-the-Counter (OTC) instruments. These indices would be designed to track with precision the treatment costs of certain chronic conditions, based upon data sourced from the wealth of information contained in the databanks of large Health Care/insurance institutions. The creation of this suite of indices would enable economic agents directly impacted by cost changes (commercial agents and consumers) to meticulously hedge against adverse treatment cost outcomes, and would also allow for informed speculation among professional investors as to future cost trajectories.

This paper sets forth the argument for the creation of a series of indices and associated financial products designed to enable investors to speculate upon the future costs

associated with the treatment of certain chronic diseases. In addition, these products would provide a financial framework that enables economic agents directly impacted by these costs to manage risks associated with inevitably and inexorably changing cost conditions.

Introductory Focus: Type II Diabetes

While we believe a vast array of health care issues lend themselves to better management through market mechanisms, we feel that certain treatment (and therefore disease) types are a closer match to market protocols than are others. Specifically, for reasons explained in further detail below, the following characterizations of disease and treatment are best adapted to indexation:

- A stable and identifiable diagnosed population.
- An extended period of treatment for most disease sufferers.
- The presence of identifiable direct and indirect (i.e. co-morbidity) costs.
- An identifiable universe of providers and consumers of treatment services.

While many illnesses fit these criteria, many do not. For example, costs associated with coronary sufferers are, by definition less well-behaved, due to such factors as higher morbidity rates, shorter treatment periods and other dynamics. Stated differently, the treatment constructs that lend themselves most directly to marketization are ones that involve fluid, extended, non-binary medical responses.

Based upon this criteria, Poliwogg, *while believing the indexing concept ultimately applies to a wide range of health cost constructs*, has selected to place its introductory focus on Type II diabetes. In doing so, it considered the following set of characteristics (among others).

- *The population of sufferers, and associated treatment costs are immense.* According to the American Diabetes Association (ADA), as of 2012, there were 29 million diagnosed cases in the United States alone, and the number of undiagnosed cases is estimated to be nearly as large. As we will demonstrate later in this document, at an annual approximate cost of \$1,500 for direct treatment, and over \$15,000 when co-morbidity costs are factored in, this places total yearly direct treatment outlays at nearly \$45 Billion, and all-in annual care expenses at \$450 Billion. Moreover, as current insurance standards place a maximum outlay on each insured sufferer, we estimate current *excess costs – growing at an alarming rate, to be in excess of \$8,000 per year, or in aggregate, to be approximately \$250 Billion/year.*

It should be noted here that the direct diabetes treatment expense for a single sufferer is equivalent to the entire average per capital outlay for all medical expenses, and the total cost of treatment is 10 times the Health Care expenditure for the average American.

- *To place these numbers in perspective*, according to the U.S Energy Information Association, the country consumes approximately 19 million barrels of crude oil each day, or nearly 7 million barrels a year. At an average price of \$50/barrel, the entire Crude Oil market on an annual basis is roughly \$350 Billion. Energy market participants of course have myriad financial tools through which to manage exposures (futures, ETFs, swaps), etc. and can also freely adjust their production and consumption patterns based upon cost vectors. By contrast, demand for diabetes treatment is entirely inelastic (diabetes sufferers are compelled to seek and obtain treatment, irrespective of the costs to them and others), yet there are no market mechanisms in place to confront the attendant risk factors.
- *The diagnosis process is straightforward, the treatment program identifiable, and (as further discussed below) sufficient data exists to create a robust index.*
- *The treatment programs tend to be fluid and extended, leading to a prolonged and stable cost function that is very compatible with indexation.* The ADA estimates 1.4 million new diagnosed cases a year, and only 200,000 – 300,000 attributable deaths. A simple extrapolation of these figures suggests an average treatment (and associated cost burden) period of at least 5 years.
- *There exists an immense body of data at the sub-aggregate level, including such demographic breakdowns as age, gender, ethnicity, etc.* Accordingly, a focus upon the aggregate cost of the disease lends itself to the opportunity of the development of a wide range of sub-indices.

For these reasons and others, Poliwogg believes that the prospect of tackling the challenges of diabetes costs through marketization and indexation is not only an enormous commercial opportunity, but also one that if properly executed could evoke significant socioeconomic benefits.

Our execution approach is set forth in further detail in the following sections.

Data Sources and Definitions

As a critical first step in the marketization process, Poliwogg has entered into an arrangement with Blue Health Intelligence (BHI) – a joint venture owned by the constituent companies of the Blue Cross/Blue Shield network. BHI has the largest and most comprehensive, conformed healthcare database of integrated medical and pharmacy claims. Working with BHI’s universe of 60 million insured participants, we have identified a sample of over 1 million diabetes sufferers who have received continuously covered treatment for a period of at least a year.

Using this data, we have created two monthly cost indices – one associated with direct treatment of the disease; the other capturing the full cost of insuring diabetes sufferers (i.e. including co-morbidity treatment costs).

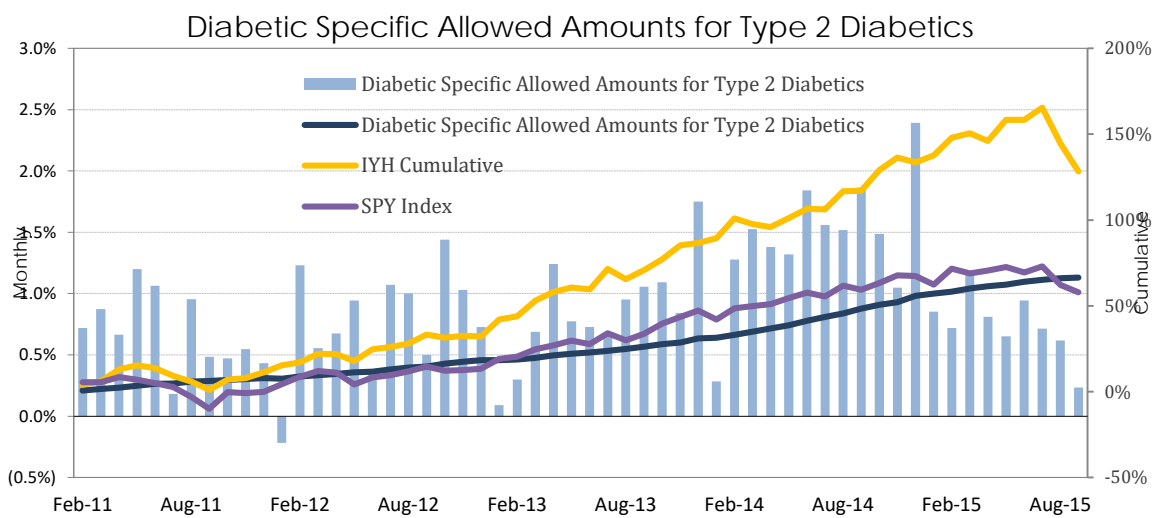
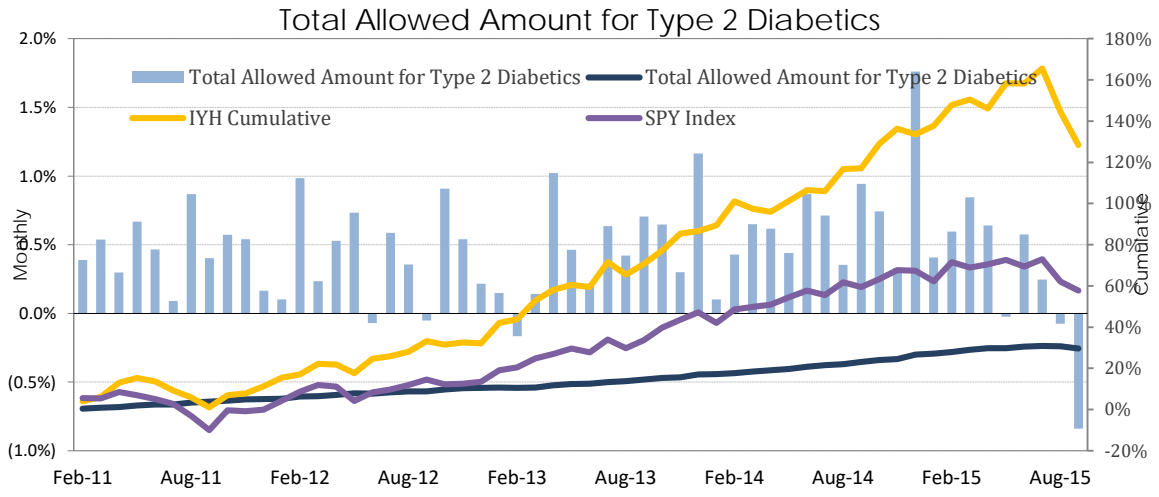
The specific definitions and criteria for inclusion in the index sample are provided in Appendix A (PLACE BHI DEFINITION PAPER THERE).

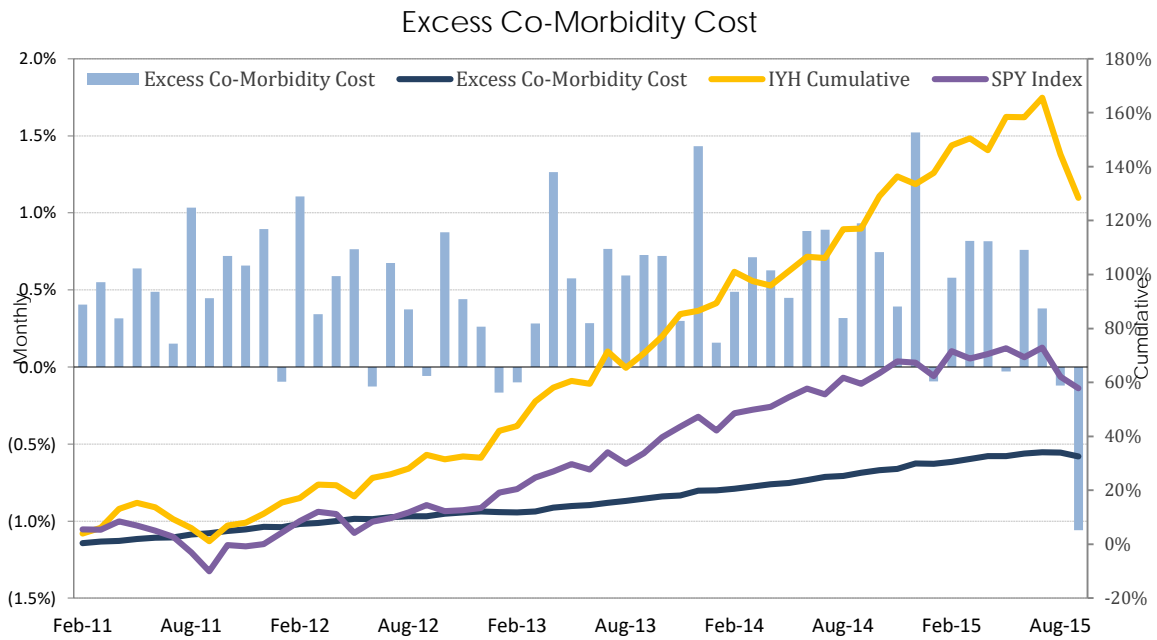
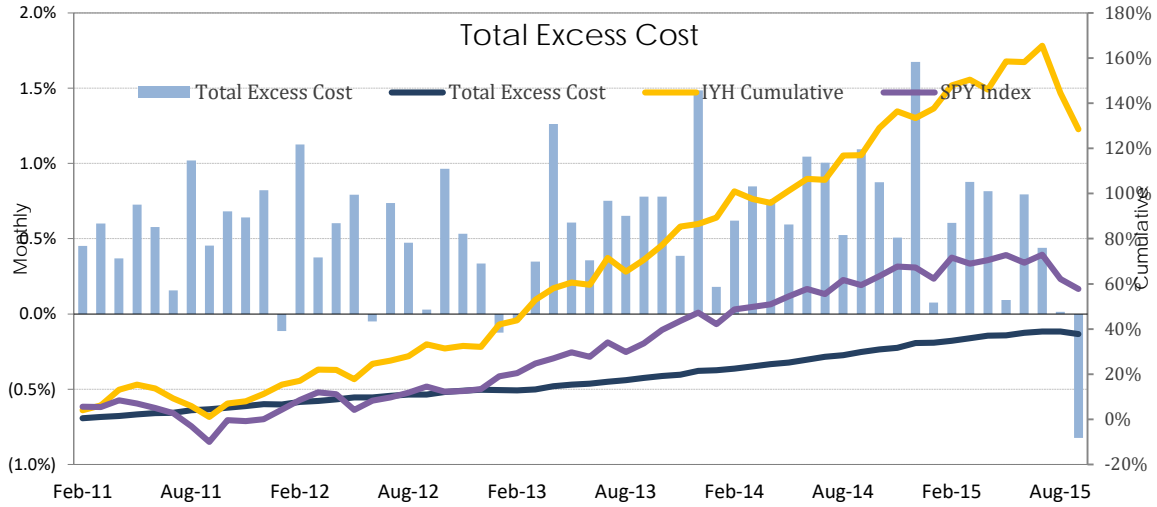
Poliwogg believes that this exercise has enabled it to create an authentic and reliable prototype index for each cost category mentioned immediately above.

Test Results

Our sample covers the period between February, 2011 through September, 2015, and again features two sets of data streams: one for direct, per capita treatment costs, and one for total treatment outlays per patient. We broke this down further to reflect the breakdown between *allowed* costs and *excess* costs. *In each case, the monthly data points reflect the average monthly cost for patient treatment over the preceding year.*

We adopted an analytical approach under which we used this data to create the dual financial indices and undertook a basic performance analysis, the results of which are embodied in the following charts and graphs:





The following tables summarize the performance statistics for these 4 data streams:

Allowed Costs Statistical Matrix:

Feb 11 - Sep 15					
Returns Since Incpt.	Total Allowed Amount for Type 2 Diabetics	Diabetic Specific Allowed Amounts for Type 2 Diabetics	S&P 500	IYH	
Cumulative	29.7%	66.5%	57.8%	128.4%	
Avg Monthly Return	0.53%	1.19%	1.03%	2.29%	
Largest Monthly Return	1.8%	2.4%	10.8%	7.5%	
% of Positive Months	50	55	35	38	
Annualized Return	5.7%	11.5%	10.3%	19.4%	
Risk Metrics		Fund	S&P 500	HFRIWI	
Sharpe Ratio	4.27	6.89	0.90	1.66	
Volatility	1.3%	1.7%	11.4%	11.7%	
Sortino Ratio	14.31	115.23	2.36	4.89	
Downside Volatility	0.4%	0.1%	4.3%	4.0%	
Maximum Drawdown	0.9%	0.2%	17.0%	14.0%	
Benchmark Comps					
Alpha SPX	5.7%	11.8%			
Beta SPX	0.00	-0.01			
Correlation SPX	0.01	-0.08			
Alpha IYH	5.7%	11.5%			
Beta IYH	-0.00	0.02			
Correlation IYH	-0.01	0.32			

Excess Cost Statistical Matrix:

Returns Since Incpt.	Total Excess Cost	Excess Co-Morbidity Cost	S&P 500	IYH	
Cumulative	37.8%	32.5%	57.8%	128.4%	
Avg Monthly Return	0.67%	0.58%	1.03%	2.29%	
Largest Monthly Return	1.7%	1.5%	10.8%	7.5%	
% of Positive Months	51	47	35	38	
Annualized Return	7.1%	6.2%	10.3%	19.4%	
Risk Metrics					
Sharpe Ratio	4.86	4.13	0.90	1.66	
Volatility	1.5%	1.5%	11.4%	11.7%	
Sortino Ratio	18.22	12.21	2.36	4.89	
Downside Volatility	0.4%	0.5%	4.3%	4.0%	
Maximum Drawdown	0.8%	1.2%	17.0%	14.0%	
Benchmark Comps					
Alpha SPX	7.1%	6.2%			
Beta SPX	0.00	0.00			
Correlation SPX	0.02	0.03			
Alpha IYH	7.1%	6.1%			
Beta IYH	-0.00	0.00			
Correlation IYH	-0.02	0.00			

This analysis points to the following observations:

- The direct/excess and total cost series are well-behaved in that there are clear and discernable pricing patterns associated with each.
- Of significant note, both of our prototype indices rose significantly over the sample period.
- Both series show stable and extremely low latency of volatility.
- The upward cost path notwithstanding, both indices show movement in both positive and negative directions.
- The correlations of both indices to both broad-based market indices and the IYH Healthcare ETF are either low or the statistical equivalent of zero.

Perhaps the most direct and unambiguous inference one can draw from this analysis is as follows: Had these indices been available during the sample period, then those bearing the brunt of the diabetes treatment costs would have been in a position to hedge these liabilities through the establishment of long index positions, and materially diminished the impact of the rising cost structure.

Economic/demographic trends, including aging populations, rising entitlements, longer life expectancies (which extend both the incidence and treatment period for diseases such as diabetes) point towards a continuing upward path for the cost curve. Conversely, we can comfortably assume that given the billions of dollars spent each year – by governments and private associations – on treatment/cure research and development, as has been the case with other chronic illnesses (e.g. Hepatitis Type C; AIDs, others), eventually, more cost effective treatment options, and even an outright cure for diabetes will eventually emerge.

This brings us to an essential point of our argument – the near-certainty of a two-way value path for the indices contemplated. Those who have understood our arguments thus far should be aware that Poliwogg feels that the major appeal in the concept does not lie in an anticipated continuous upward trajectory in the cost structure. Rather, it derives from our firm belief that these costs, over time, will fluctuate. In turn, this insures the presence of essential elements of a two sided market, a topic we will cover in further detail in the following section.

Range of Natural Market/Liquidity Considerations

Poliwogg has felt, from the outset of the initiative, that the presence of economic agents whose natural interests lie on opposite sides of the index construct is a necessary condition for market success. One can clearly envision the range of economic buyers of

the index – largely those entities that are impacted adversely by a rising cost structure. These include, among others:

- Insurance Entities.
- Individual Disease Sufferers.
- Federal, State and Local Entitlement Providers.
- Corporations Impacted by Higher Costs

In general, few would argue with the assertion that the capital economy as a whole would benefit from contained or lower costs, but a careful consideration of the paradigm clearly reveals that this is not unilaterally true for all economic agents. There is a material and identifiable group of entities who would experience adverse consequences to material declines in treatment costs. An incomplete inventory of these would feature:

- “For Profit” Treatment Providers.
- Pharmaceutical/Medical Device Manufacturers/Distributors.
- “For Profit” Hospitals.
- Insurance Entities Who Benefit from Rising Costs.
- Others.

As a generalization, it’s fair to say that in an economic superstructure that generates \$300 billion in annual expenditures, any combination of developments that reduces these streams is likely to generate losses somewhere in the financial dynamic. Those who would suffer such losses provide a natural constituency of short interest for our contemplated indices.

Finally, we believe that the indices offer robust opportunities for speculation. Investors specializing in the field of Healthcare/ Life Sciences are likely to embrace exposure to the indices any time their value diverges from what internal investment models indicate. These speculations can take the form of outright risk assumption on the hypothesis that an index is not priced to fair value, various arbitrages between index levels and securities pricing for companies involved in the business, and other portfolio construction paradigms.

Finally, we believe that the construct lends itself to attracting a universe of market makers/liquidity providers. Large market making institutions should be able to find opportunity in the prospect of taking the other side of trades initiated and liquidated by direct economic agents and speculators. Over the near term, we will be seeking to strike partnerships with entities that naturally fill these roles.

By identifying a comprehensive trading architecture that features agents with natural interests on each side of the market, combined with a system that draws the interests of speculative investors, and as further enhanced by the presence of liquidity providing market makers, Poliwogg envisions a robust and highly scalable market opportunity. Moreover, we believe that if we are successful, the index market stands to add significant efficiencies to the Health Care delivery system in general. With the ability to speculate upon and hedge against unknown future cost outcomes, the system facilitates more efficient flow of capital to the development of better therapies. This is the way markets are intended to work. The opportunity is abundant, and the time is now.

Finally, the same vision we have set forth for managing diabetes treatment costs can be applied to a wide range of other illnesses, including but not limited to Alzheimer's Disease, various forms of cancer and others. As the diabetes project reaches critical mass, we will turn our attentions to applying similar tools to these challenges.

In the meantime, we invite interested parties to contact us with questions and comments.