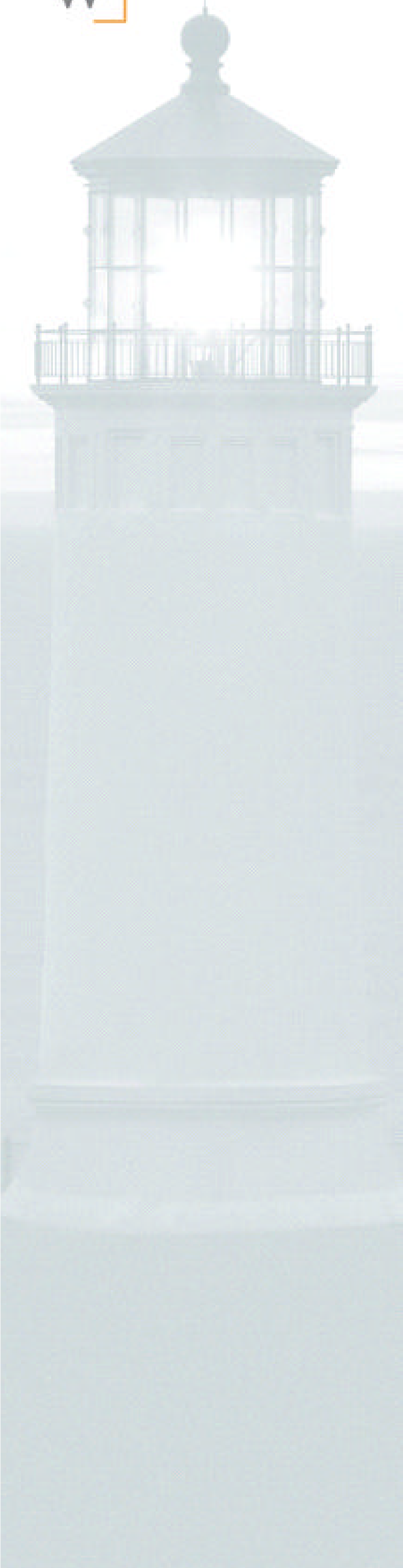
WILSHIRE



Wilshire Consulting

Commitment-Driven Investing (CDI): LDI as We "C" It

Julia K. Bonafede, CFA, Senior Managing Director
Steven J. Foresti, Managing Director
Dimitry Mindlin, ASA, MAAA, PhD, Managing Director
(310) 451-3051
jbonafed@wilshire.com
sforesti@wilshire.com
dmindlin@wilshre.com

April 27, 2007

Table of Contents

Section **Page**

Introduction 1

Dawn of a New Era in Investing: "Blinded by the Light" 1

Historical Background: "The Calliope Crashed to the Ground" 1

The Current LDI Landscape 3

The "Now What?" Scenario: "Very Unpleasing Sneezing and Wheezing" 4

Investing vs. Discounting 5

The Roots of the Accounting Bias 7

Commitment-Driven Investing (CDI): LDI As We "C" It 9

A Comprehensive Risk Management Framework 9

What's in a Measurement? 11

Asset-Liability Valuation (ALV) 12

Optimization, Not Simulation! 13

CDI: Managing Long- and Short-Term Objectives 15

Immunization 15

Cash Flow Matching 19

Conclusion 20

Appendix A: The Nuts and Bolts of Asset-Liability Valuation 22

ALV: General Case. 25

Appendix B: "Blinded by the Light" by Bruce Springsteen 26

Introduction

Dawn of a New Era in Investing: "Blinded by the Light"[1]

We've all seen the light; asset allocation decisions should be expanded from an asset-only framework to one that considers benefit and spending commitments. This is an uncontroversial view that is now almost universally shared. In fact, a dissenting opinion would be difficult to find. However, as the sun rises over this consensus view and sheds its light on the dawn of a new era in asset allocation, many investors and their managers have been blinded by the light. Opinions regarding the role that financial commitments should play in the asset allocation process differ. Much of the ambiguity revolves around the overused term "liability." Is the generically named "liability" a series of future benefit commitments or an accounting measurement of its present value? If it's accounting based, is it ABO, PBO, VBO, TBO, HBO, UFO, ELO, BTO, Tivo[2] or something else all together? This paper will provide the historical context that has led to this renaissance in liability-based investing, review the objectives of some of the narrow liability-driven investing (LDI) offerings that have been presented as solutions by Wall Street and institutional investment managers, and put forth Wilshire Consulting's views on an appropriate and comprehensive approach to commitment-driven investing ("CDI").

Historical Background: "The Calliope Crashed to the Ground"[3]

Many proponents of LDI solutions point to the recent experience by defined benefit (DB) pension plans during the 2001/2002 market environment as evidence that asset allocations are "broken" and a fix is needed. The centerpiece of evidence, the so called "smoking gun," is the historical volatility of funding ratios. The funding ratio for pension plans is an accounting observation that compares a plan's assets to its "liabilities." In this calculation, "assets" are represented by either the market value or actuarial value of assets; while "liabilities" reflect a present value measurement of a plan's benefit commitments. For example, Exhibit 1 graphs the funding ratios of corporate DB plans within the S&P 500 Index over the past seven years. The steep decline in the early years of the graph, where the aggregate funding ratio falls from 125% in 2000 to a mere 83% in 2002, paints a picture of pension funding instability. How can funding levels deteriorate by so much in just two years? The argument put forth is that this "roller-coaster ride" of funding levels is a clear sign that assets are not being structured appropriately. Since a pension plan is designed to fund future benefits, assets should be invested relative to that

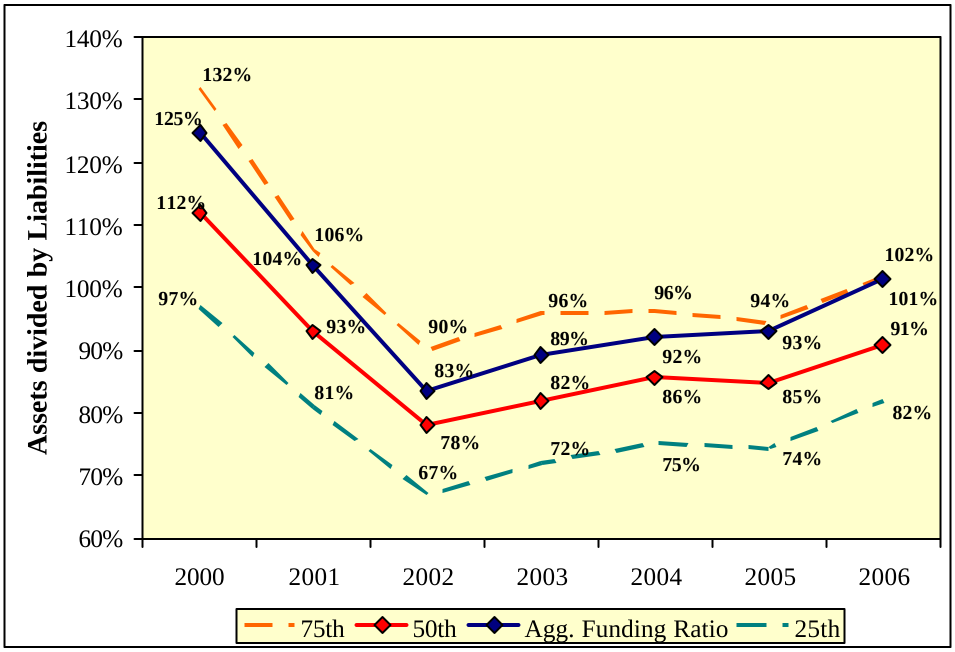
[1] Springsteen, Bruce; "Blinded by the Light", "Greetings from Asbury Park, NJ", 1973 (see Appendix B for lyrics).

[2] We are obviously having some fun with this list, as not all of these abbreviations are accounting liability measurements. ABO, PBO, VBO and TBO (Accumulated, Projected, Vested and Total Benefit Obligations) are accounting measures, while HBO (Home Box Office) is a premium cable channel, UFO is an unidentified flying object, ELO (Electric Light Orchestra) and BTO (Bachman-Turner Overdrive) are rock bands from the 70's, and Tivo (not really an abbreviation after all) is a digital video recorder that is perhaps the greatest invention since sliced bread.

[3] Springsteen, Bruce; "Blinded by the Light", "Greetings from Asbury Park, NJ", 1973 (see Appendix B for lyrics).

"liability benchmark" and should, therefore, track it more closely, keeping funding ratios stable over time.

Exhibit 1
Historical Funding Ratios (Corporate Plans)



Source: Wilshire Consulting

While this argument seems completely reasonable on the surface, it has several major short-comings. The LDI explanation begins and ends very logically, but takes a sneaky turn in the middle. Here is a brief summary of how it often goes:

1. The goal of a pension plan is to fund future liabilities.
2. Assets should be structured to increase the likelihood of meeting these liabilities.
3. Therefore, the true benchmark for asset performance is the fund's liability benchmark.
4. The solution is a "liability-driven" investment strategy that allocates assets to mimic the characteristics and behavior of a plan's liabilities (as defined in accounting statements), thereby lowering risk.

Did you see it? Did you catch the clever "slight of hand" in the argument as it moved between points two and three? Points one and two are right on target as they recognize a plan's commitments, but notice how this future stream of promised benefits was quickly simplified into a single accounting value represented by a "liability benchmark" in point three. So what's the big deal? Practitioners who support LDI products typically create a "liability benchmark" by assuming that a plan's future benefit stream is known with certainty and then discounting the stream by a yield curve-based discount rate or series of discount rates. In other words, they measure pension commitments in the same manner as one would value a nominal bond (i.e. discount its future cash flows by current interest rates). Why does the seemingly innocuous term "liability" create such a problem when substituted for "commitment" in the debate? The term commitment captures the very nature, complexity and economic reality of a pension plan: funding a stream of future benefits that are usually not known with complete certainty (i.e. they are contingent on other factors, such as inflation). Introducing the term "liability" moves the discussion from the realities of a pension fund to the fascinating world of accounting standards. We have now arrived at the crux of the issue. If one accepts that assets should be managed to behave like "liabilities" and these "liabilities" behave like bonds, where does that drive our investment decision? What asset behaves like a bond? A bond!

The Current LDI Landscape

While the logic behind an LDI approach is hardly new, it was resurrected during a time that has been dubbed "the perfect storm" (2000 – 2002). The fact that conventional measurements of the financial health of many pension plans had changed from "healthy" to "ailing" over a relatively short period of time has compelled many stakeholders of pension plans to question the existing risk management framework. The ostensible simplicity and plausibility of the "liabilities behave like bonds, assets must behave like liabilities, therefore assets must behave like bonds" logic coupled with the backdrop of the "perfect storm" frenzy have made many asset managers believe that LDI products will be "the next big thing." Consequently, numerous firms have either created or significantly expanded their LDI departments. Despite this massive investment in research and organizational expansion, we have yet to meet a proponent of LDI who can offer a sensible explanation as to why interest rate risk is the primary risk pension plans must manage. As a consequence, there is a tremendous amount of industry confusion and little action.

As it stands now, the main shortcoming of the typical LDI solution is that it is product driven and the product, being bond-like, over-emphasizes interest rate risk. There are two problems with this simplification. First, while there is nothing wrong with investing in bonds or even a very high concentration of bonds, as they offer a very high level of expected risk-adjusted return, they provide relatively low levels of absolute return. Accepting low levels of return, albeit at a lower level of expected asset risk, will increase the expected cost of running a pension plan and will result in larger, but more stable contributions. More importantly, measuring pension liabilities like bonds is an unnecessary and incorrect oversimplification that can introduce significant risks to plans structured according to this philosophy. A primary driver of bond market volatility is interest rate behavior, so a pension plan that is valued like a nominal bond is assumed to have similar reactions to changes in interest rates, but this assumption is dubious at best. In the following section, we will discuss one particular market environment that could be particularly troubling to the typical off-the-shelf LDI solution.

The "Now What?" Scenario: "Very Unpleasing Sneezing and Wheezing"[4]

Interest rate movements have a dramatic effect on bond valuations. When rates rise, bond prices go down; when rates fall, bond prices go up. Since pension *accounting* liabilities are calculated via a discounting procedure that is closely related to a relevant yield curve, the same relationship exists between pension *accounting* liabilities and the relevant yield curve.[5] The primary goal of most LDI approaches is to manage interest rate risk. In other words, the strategies are designed to ensure that a plan's assets will move similarly in both direction and size to movements in *accounting* liabilities that result from fluctuating interest rates. This condition is often referred to as interest rate immunization (we'll expand on this later and will discuss other related concepts, such as dedication). The argument concludes that if assets and "liabilities" are moving in concert, future funding levels and contributions will be much more stable and predictable. While this may be true, the lower levels of expected returns from an immunization strategy suggest that this stable level of future contributions will likely be at a much higher level than could be expected otherwise. But, as we mentioned above, these higher costs are only one factor in the story. The larger concern is the problem of managing assets against accounting targets rather than managing them to meet the economic reality of having sufficient funds to pay future benefit commitments. The typical LDI approach, by over-emphasizing interest rate risk, causes plans to be structured to fulfill an accounting artifact, rather than their pension obligations.

In reality, the typical commitment made to employees through a defined benefit pension plan has little, if anything at all, to do with changes in interest rates. Benefit formulas are based on factors such as years of service and ending salary. A plan participant will find nothing in their plan package materials to suggest that their benefit calculation is tied to the level of interest rates. Whether rates are 5%, 10% or 20% when the participant retires, their benefit stream will be indifferent.[6]

The one (indirect) connection between a participant's benefit and interest rates is based on the impact that inflation has on both of these values. Interest rates are directly affected by inflation as lenders demand a yield that is expected to protect them from a dollar's loss of value to inflation over time. Therefore, higher than expected inflation pressures yields higher, while lower than expected inflation accommodates lower interest rates. Similarly, wage inflation and general inflation are very highly correlated, so high levels of inflation lead to high levels of wages, a factor in the typical benefit calculation, which ultimately lead to higher levels of benefits (and vice versa for low levels of inflation). This triangular relationship between interest rates, unexpected inflation and future benefit streams is an under-appreciated risk in off-the-shelf LDI approaches.

---

[4] Springsteen, Bruce; "Blinded by the Light", "Greetings from Asbury Park, NJ", 1973 (see Appendix B for lyrics).

[5] The actuarial discount rate used by public sector plans is not directly based on market interest rates, but rather is intended to represent a plan's expected long-term return on assets. Therefore the accounting liabilities of public plans are much less sensitive to changes in market interest rates, making the LDI approach less compelling.

[6] Cash balance plans are an exception, as their crediting rates are explicitly connected to interest rates.

To highlight this risk, imagine an environment of rising inflation with no end in sight, which we'll refer to as the "Now What?" scenario. Higher than expected wage inflation leads to higher than expected benefit commitments, which, to be met, require larger than expected assets. Now let's consider our LDI portfolio and evaluate how it might behave during this rising inflation environment. Thanks to our LDI immunization strategy, our funding level stays very well insulated during this period. Sure our fund's value has likely declined as higher interest rates, brought on by rising inflation, drove bond prices down, but the good news is that our accounting liabilities also dropped significantly in value, so we look OK on paper. But how do we look off paper; in the real world where we've made commitments to real people? Wages have gone up beyond the levels we expected, so future benefit payments are higher than what we had previously anticipated. Wait a minute; assets are down, promises are up; why is it we still look OK on paper? Welcome to the accounting bias! Accounting measurements of the pension commitment went down because they are now being discounted by the higher level of current interest rates that were brought about by high levels of expected inflation. The economic reality, however, is that we now owe more, not less, to our participants. "Now What?"

Conversely, in an environment of falling inflation, future wages and benefit payments are lower than anticipated and asset values are higher than anticipated. Sounds great, but we still look just OK on paper. Once again, welcome to the accounting bias.

This discussion is not to suggest that other asset mixes would have gone up in a period of rising inflation, but by recognizing the role that inflation has in a pension plan's risk, a more comprehensive risk management approach to the asset allocation process would have revealed the valuable contribution of investments that mitigate a portion of that risk and could have insulated the value of assets from the ravages of inflation. The LDI approach, on the other hand, ignored this possibility and subjected the plan to a "double whammy;" falling assets with rising commitments. As a result, a product that was promoted as "the low risk strategy" actually delivers a "double whammy" on the downside and a "double bonus" on the upside, which are not the attributes of a low risk hedging strategy. Therefore, there must be a logical deficiency somewhere between the basics of pension investing and conclusions about the riskiness of the LDI approach. We uncover the roots of this deficiency in subsequent sections.

Investing vs. Discounting

To fully appreciate the difference between investing and discounting, we have to get back to the basics of the concept of present value. Think of an asset value A_{PV} invested in a certain portfolio; "PV" in the subscript stands for "present value" indicating that these assets are at the present. For future reference, we call this portfolio BOP ("Best Optimal Portfolio"); at this point, the actual structure of the portfolio is irrelevant. After one period of time, the market value of BOP is A_{FV}; "FV" in the subscript stands for "future value" indicating that these assets are in the future. To measure the asset value change, we define the investment return as the ratio of the difference of the future and present values over the present value:

$$R = \frac{A_{FV} - A_{PV}}{A_{PV}} \qquad (1)$$

This equation establishes a relationship between A_{PV}, A_{FV}, and R - if we know any two of the three variables, we can calculate the third. In particular, if the present value and the return are known, then simple transformations of definition (1) produce the following equation for the future value:

$$A_{FV} = A_{PV}(1 + R) \qquad (2)$$

While formulas (1) and (2) are mathematically equivalent, they represent fundamentally different concepts. Definition (1) is a backward-looking measurement of asset price changes. In contrast, equation (2) is a forward-looking calculation of the future value. If the return R is known with certainty, then, according to (2), the future value is known with certainty as well. If BOP's return is uncertain, then the future value is uncertain as well. A standard method of dealing with this uncertainty is to specify forward-looking capital market expectations (see Exhibit 2), calculate the risk/reward characteristics of the return, and use (2) to generate the distribution of A_{FV}. The characteristics of the future value are very important; the analysis of its distribution is a standard approach to all kinds of financial problems.

Exhibit 2
Wilshire 2007 Capital Market Assumptions

	Stocks			Bonds		Alternatives	
	US	Dev ex US	Emg Mkt	Core Bond	High Yield	REITs	Prvt Mkts
Expected Return (%)	8.25	8.25	8.25	5.25	6.75	5.75	11.75
Expected Risk (%)	16.00	18.00	24.00	5.00	10.00	15.00	29.00
Correlations:							
US Stock	1.00						
Dev ex-US Stock	0.77	1.00					
Emerging Mkt Stock	0.65	0.65	1.00				
Core Bond	0.29	0.05	0.00	1.00			
High Yield Bond	0.48	0.28	0.35	0.39	1.00		
US RE Securities	0.35	0.25	0.30	0.15	0.30	1.00	
Private Markets	0.73	0.61	0.60	0.30	0.31	0.35	1.00

If the future value and the return are known, then a simple transformation of equation (2) produces the following equation for the present value:

$$A_{PV} = \frac{A_{FV}}{1 + R} \qquad (3)$$

Once again, while formulas (1), (2), and (3) are mathematically equivalent, they represent fundamentally different concepts. As was mentioned above, equation (2) is a forward-looking calculation of the future value. In contrast, equation (3) presents the concept of discounting, which gives us the present asset value required to be invested in BOP in order to accumulate the known asset value, $A_{FV,}$ in the future. It is as obvious as it is imperative to recognize that any discounting procedure in (3) is driven by investing - there is no discounting without investing. As long as the assets are invested in BOP, we must use the return generated by BOP in (3). If we use any other return in (3), we necessarily assume that the assets are invested in a portfolio that generates this return. In general, if the return, R, is known with certainty, then the present value is known with certainty as well. If the return, R, is uncertain, then the asset value, $A_{PV,}$ required to be invested in BOP in order to accumulate A_{FV} is also uncertain.

The Roots of the Accounting Bias

Astonishingly, while definition (1) and equation (2) are universally accepted, their mathematically identical triplet – equation (3) – isn't so fortunate. For a pension plan with a given policy portfolio, conventional actuarial and accounting reports contain multiple present values calculated using different discounting procedures. As we just discussed, it means that the present values presented in those reports are based on multiple assumptions about the plan's asset allocation, even though the plan's policy portfolio is perfectly known. These present values have proven to be rather controversial.

The discounting procedures utilized in conventional actuarial and accounting reports have become the subject of intense criticism in various publications lately. A conventional actuarial report, for example, normally utilizes a fixed discount rate that is equal (or somewhat close) to the policy portfolio's expected return. As we just discussed, this discounting procedure assumes that the assets are invested in a portfolio that delivers a riskless return equal to the discount rate. In most cases, such a portfolio does not exist. Also, certain actuarial and accounting reports utilize discounting procedures that are based on "smoothed" yield curves. The assumption is, therefore, that the assets are invested in a portfolio that delivers a "smoothed" yield curve based return. Needless to say, such a portfolio doesn't exist either.

The use of "nonexistent" investment returns when calculating conventional liabilities presents an easy target for criticism. Among other "offenses," these liabilities are alleged to facilitate the inefficient management of pension plans. To fix this problem, most publications have proposed to reform pension accounting in accordance with the "marked-to-market" paradigm. The suggestion put forth is that reformed "market" based liabilities would provide better guidance for the investing of pension assets, which would be "driven" to better investment products.

According to many authors, "marked-to-market" accounting liabilities are highly sensitive to changes in interest rates – they essentially behave like bonds. Some have also expressed expectations that "marked-to-market" pension accounting would become a catalyst to a massive shift of pension assets to bond-like LDI products. There appears to be a belief that "marked-to-market" accounting would give the "liabilities behave like bonds, assets must behave like liabilities, therefore assets must behave like bonds" logic the credibility and recognition it deserves.

To accept these views, one would have to believe that better accounting rules would help to make better asset allocation decisions. In other words, a shift towards "marked-to-market" accounting would reveal certain valuable characteristics of LDI products that are otherwise concealed, making such products much more attractive. To embrace this theory would be a remarkable fusion of an area of inherently backward-looking endeavors – accounting – to an area of inherently forward-looking endeavors – asset allocation. It remains to be seen if this interpretation and use of accounting has any substance behind it.

The most interesting part of the story is the rationale behind the claim that "marked-to-market" accounting liabilities behave like bonds. The following discussion provides essential steps in this reasoning. Traditionally, the role of accounting is to record past economic events. Conventional accounting reports are not designed to depict the risk surrounding reported values. Instead, they frequently portray uncertainty as management's best estimate and report it as a single value. While future pension asset returns and benefit payments are highly uncertain, the desire to "account" for them in a conventional manner using single "known value" measurements often times leads to treating them as perfectly "known values." In particular, we have to produce "certain" point estimates of future payments, which, in reality, are contingent cash flows of uncertain timing and magnitude. To discount these cash flows to the present and generate "known value" measurements, requires one to assume that pension assets are invested in a way that guarantees future investment returns with certainty – as we just discussed, there's no discounting without investing. High quality zero-coupon bonds are the only asset class that delivers such returns. The fact that high quality bonds are not long enough to provide "known" returns for the discounting of all future payments (high quality bonds with maturities longer than 30 years are extremely scarce; future payments usually stretch much farther than 30 years), requires another artificial assumption about "known" returns beyond 30 years.

To summarize, the bond-like characteristics of pension liabilities come primarily from the convenient application of traditional backward-looking accounting concepts to future cash flows of uncertain timing and magnitude and "accounting" for them in a conventional way as "known values." This ambition results in a peculiar mindset that produces dubious conclusions about the financial health of pension plans and their prudent management. We discussed this mindset in prior sections and called it the "accounting bias."

An attempt to expand traditional accounting concepts beyond the limits of their applicability requires the following three assumptions.

A. Future benefit payments are perfectly known.
B. Yield curves can be extended indefinitely.

C. Assets are invested in the matching high quality bond portfolio that exists due to assumptions A and B.

If these assumptions were valid, pension accounting would have been perfectly transparent. Unfortunately, the future is uncertain and, therefore, not nearly as transparent as some would suggest. In reality, assumptions A and B can be considered reasonable for terminated plans only. For the purposes of this paper, we define a "terminated" plan as one that can be completely settled via purchasing a group annuity contract with a highly rated insurance company. For a terminated plan, the ultimate benefit amounts and retirement dates must be perfectly known; allowing an insurance company to assume the longevity risk. An accounting statement that shows the price of the annuity contract (the liability) and the market value of assets carries great weight – it shows whether or not the plan has enough money to be settled. In other words, the issue of solvency – having enough cash to terminate the plan today - is the only meaningful part of pension accounting. For the purposes of an accounting statement, a pension plan is "virtually" terminated and its assets are compared to the price of a group annuity contract with a highly rated insurance company.

The issue of short-term solvency is important to a number of stakeholders of pension plans. While it might be desirable for a pension plan to be permanently solvent, a higher level of solvency usually comes with higher long-term cost and, possibly, with lower long-term safety of benefits. The risk of insolvency should be managed along with many other risks pension plans face. Prudent management of pension plans may require finding a sensible compromise between different and sometimes conflicting objectives.

By virtue of overemphasizing the importance of accounting liabilities, the proponents of LDI products essentially argue that all pension plans should place greater significance on short-term solvency risk than on funding future commitments. This is a major issue for discussion, but a thorough treatment of this issue is outside the scope of this paper. While the emphasis on solvency may be unquestionably appropriate for some plans (e.g. frozen plans), most pension plans require a careful examination of the trade-off between the risks and costs of running the plan.

Commitment-Driven Investing (CDI): LDI As We "C" It

A Comprehensive Risk Management Framework

If the benefit stream doesn't behave like a bond, and we believe that asset-liability models should produce asset allocation policies that fund present and future benefit payments, how is this all supposed to work?

Let's go back to our goals.

- ✓ The goal of a pension plan is to fund its commitments.
- ✓ Assets should be managed to increase the likelihood of meeting these commitments.

Therefore, the true benchmark for asset performance should be one that satisfies the objectives of the constituents of the plan: participants and shareholders/taxpayers.

1. The main objective of plan participants is to maximize the safety of promised retirement benefits, or, in other words, to maximize the likelihood that the "check is in the mail."
2. The main objective of shareholders or taxpayers is to fund promised retirement benefits at the lowest cost.

Thus, it stands to reason that the role of the policy portfolio is to minimize the cost of running the plan at a given level of benefit security or, stated differently, maximizing the probability of meeting benefit commitments at a given level of cost. The centerpiece of our analysis should then be the actual benefit stream that is calculated based on the eligibility requirements and benefit formula in place for a particular plan. All actuarial and accounting liabilities start out with this object. All liabilities represent measurements of this object. Any liability satisfies a particular objective and reveals a particular property of the benefit stream, but may be inadequate for another objective that requires the analysis of other properties of the stream. Outside of the area of compliance with relevant regulations, there is no need to restrict ourselves to a particular discounting procedure for the stream before we've determined the policy portfolios we wish to consider. We analyze the benefit stream in its entirety – nothing is lost, nothing is hidden.

Let's bring up once again the four point "LDI explanation" we discussed in the introduction to this paper.

1. The goal of a pension plan is to fund future liabilities.
2. Assets should be structured to increase the likelihood of meeting these liabilities.
3. Therefore, the true benchmark for asset performance is the fund's liability benchmark.
4. The solution is a "liability-driven" investment strategy that allocates assets to mimic the characteristics and behavior of a plan's liabilities (as defined in accounting statements), thereby lowering risk.

The "slight of hand" in this logic is based on the unfortunate fact that the term "liability" has two entirely different meanings – it represents the benefit stream in points one and two and the present value of the benefit stream in point three. To avoid this kind of confusion, we have to assign different terms to the benefit stream and its present values. Going forward, the stream of benefit payments promised to plan members is a "pension commitment." The term "liability" is reserved for conventional actuarial and accounting reports. Let's reframe our "LDI discussion" in the context of our new wording conventions.

1. The goal of a pension plan is to fund pension commitments.
2. Assets should be managed to maximize the likelihood that the money will be readily available whenever needed.

3. Equally important, assets should be managed to minimize the cost of providing pension benefits.
4. The solution is a "commitment-driven" investment strategy that allocates assets to simultaneously minimize the risk and cost of the plan.

This is the foundation of Commitment-Driven Investing (CDI). It is important to mention at this point, that framing LDI in this manner does not mean that the health of financial statements should be sacrificed in the short- or medium-term. Less volatile fixed income strategies can, and in certain instances should, be employed to help mitigate financial statement volatility. The difference between the investment products currently being offered to plan sponsors and the CDI framework is that we try to satisfy both goals without destabilizing the plan in the long run by redirecting our strategic asset allocation to potentially lower return assets in order to mitigate short-term financial statement volatility.

What's in a Measurement?

We measure certain and uncertain objects in the past, present and future. The primary reason for the existence of various measurements of all kinds of things is, outside of sheer unadulterated curiosity, that measurements help us make better decisions. Some objects allow precise measurements as "known values." As an example of a "known value" measurement, the total lease payment for the office space a particular company paid last year is a precise measurement of a known object (the lease agreement). Another example of a "known value" measurement, the price of a zero-coupon Treasury bond that pays $100 in ten years is a precise measurement of a certain future event (getting $100 in ten years).

Other objects are inherently uncertain and do not allow direct and precise measurements. For example, the probability of rain tomorrow is a risk measurement – it is a measurement of the uncertainty of the underlying future event (the occurrence of rain tomorrow). Another example, the future investment return on a portfolio of risky assets is uncertain. However, given the assumptions about expected returns, standard deviations, and correlations between asset classes, we can measure the riskiness of the portfolio. The standard deviation of the portfolio return is a risk measurement – it is a measurement of the uncertainty of the underlying object (the future value of the portfolio). This risk measurement is very useful in an optimization procedure (mean-variance optimization) that allows us to distinguish between diversifiable and non-diversifiable risks and identify efficient portfolios.

In a variety of endeavors, we measure not only tangible known objects, but uncertain future ones as well. As far as the defined benefit system is concerned, pension plans face numerous risks that must be measured and managed. Unfortunately, neither accounting nor actuarial valuations contain risk measurements. Instead, the uncertainties of pension commitments and asset returns are depicted as single "known values."

The need for better risk measurements and risk management tools is greater than ever. The principles of Commitment-Driven Investing are well-suited to produce the measurements needed for the efficient management of cost and risk. The valuation that produces these new risk measurements and conventional actuarial/accounting valuations are fundamentally different. Therefore, this unique valuation deserves a new name, and we call it Asset-Liability Valuation (ALV).[7] As was mentioned before, the term "liability" here doesn't specify any particular single concept but does indicate that financial commitments are taken into account directly. Appendix A contains a more detailed description of the mechanics of ALV.

Since we have stated that the role of the policy benchmark must satisfy the dual objectives of minimizing the cost of contributions while maximizing the safety of benefits, it is important to have a robust measure of the probability of success. Along with the novel ALV alternative to approaches that rely upon measurements of the present value of the benefit stream we recommend an innovative framework for managing risk. This alternative approach is Commitment-Driven Investing, as described previously.

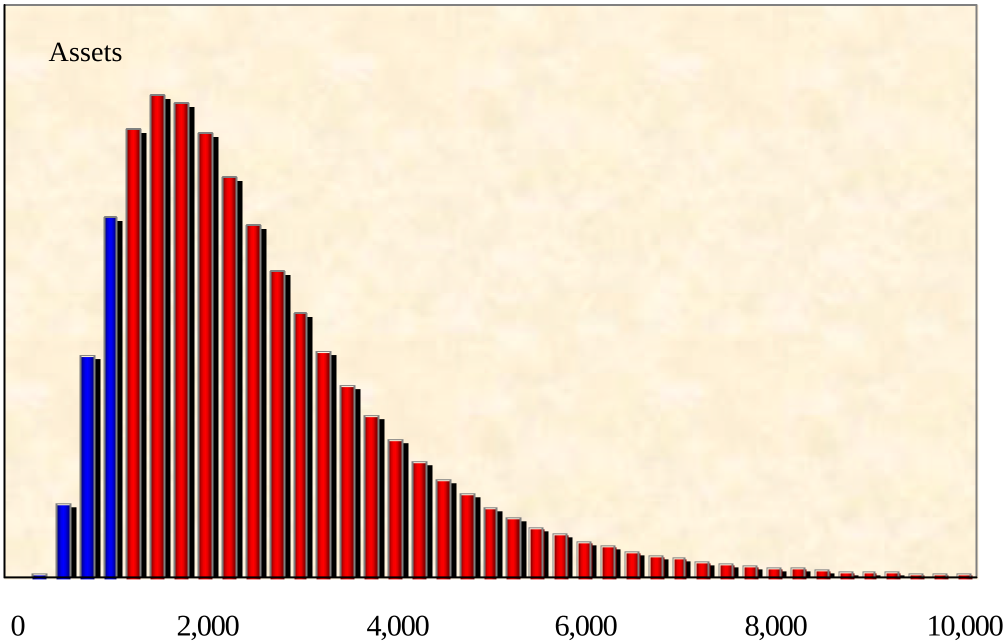
Asset-Liability Valuation (ALV)

ALV is an analytical framework that provides important pension risk measurements. One of the strengths of ALV is that it "pre-experiences" all possible investment outcomes implied in capital market assumptions by analyzing asset return and risk with the periodicity of the benefit stream. In other words, capital market assumptions are used to measure the probability of all portfolio mixes meeting future benefit commitments at a given level of cost.

As shown in Exhibit 3, this distribution of assets required to meet future commitments will contain information about the best-case and worst-case scenarios based on experiencing these market returns and the probability that the plan will need to accumulate additional funds to meet this obligation.

[7] Wilshire Associates, Inc. (2005) *The Role of the Policy Portfolio*.: Mindlin

Exhibit 3
Distribution of Required Assets to Fund Commitments



By setting the discount rate as a random variable, we now have a near-infinite number of possible investment outcomes derived from the combinations of asset classes and total returns implied by our capital market assumptions. This is not a simulation, as we can narrow down this investment universe by identifying optimal asset mixes through a deterministic closed-form process.

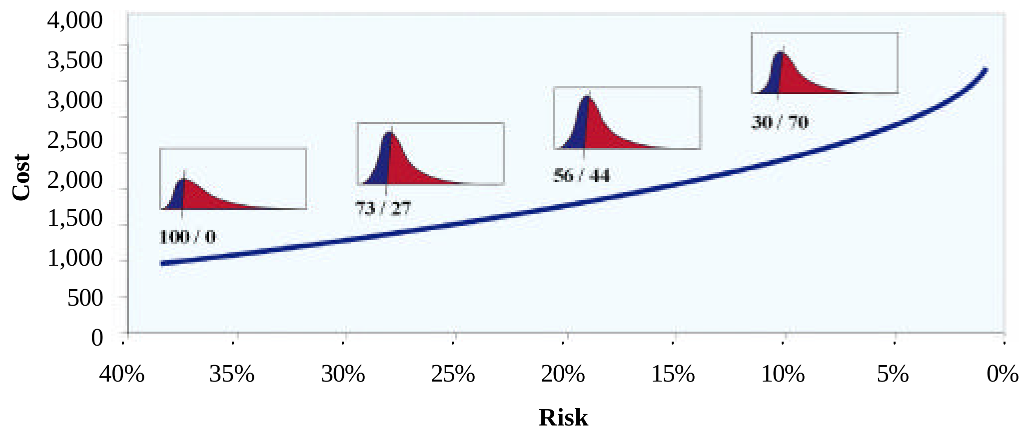
Optimization, Not Simulation!

The preceding section described the role of pension commitments in driving asset allocation decisions. Unlike asset-only approaches, which require only forecasts of asset behavior, a comprehensive asset-liability valuation process analyzes more information to generate efficient portfolios. Instead of forming policies based on their expected return and risk, we are looking for policies that meet our dual objectives of safety of benefits and minimizing the risk of having to make contributions due to lack of sufficient funds.

This additional information includes a correlation matrix of asset returns, standard deviations of return and one final, but important ingredient: a second correlation matrix that describes the relationship between asset class returns and the expected inflation characteristics of the particular plan's benefit stream. The first three components are generic to the properties of each asset class used. The last component is unique to each plan sponsor and directs the optimizer to produce asset mixes that satisfy our two objectives.

ALV leads to better information on which to make allocation decisions. As shown in Exhibit 4, we can now plot the cost-risk efficient frontier.

Exhibit 4
Cost-Risk Efficient Frontier



U.S. Equities	0.62	0.46	0.35	0.18	0.15
U.S. Bonds	0.00	0.09	0.19	0.35	0.38
Int Equities	0.38	0.27	0.21	0.12	0.11
TIPS	0.00	0.18	0.25	0.35	0.37
Geometric Return	0.0815	0.0742	0.0692	0.0598	0.0582
StDev of Return	0.1676	0.1234	0.0985	0.0611	0.0560
Arithmetic Return	0.0941	0.0812	0.0737	0.0616	0.0597
RAMean	2,325	2,409	2,542	2,947	3,039
RAStDev	1,545	1,135	952	700	666

The cost-risk frontier defines risk as the probability of a successful outcome (i.e. assets are sufficient to fund benefits), versus the traditional efficient frontier that measures risk as the standard deviation of expected return. The y-axis on the cost-risk frontier describes the present value of assets required to fund a particular plan's benefit commitment. The x-axis describes the range of probabilities that the given asset mix will fund the obligation. The intersection of the points on each axis creates the frontier. Each intersection is a policy mix that has its own distribution of outcomes. The policy mix has been produced to minimize the extreme values, or tails, of negative outcomes. The negative outcomes are indicated in red; therefore the policy mix produces more positive outcomes than negative ones.

The final feature of the cost-risk frontier is that there is a specific policy mix on the frontier where the cost (level of contributions) is too high to justify investing in the policy mix on the frontier. At that point it is more cost effective to immunize a portion of the portfolio.

Let's summarize where we are before we move to a discussion of short-term versus long-term investing within a CDI framework.

1. CDI helps plan sponsors manage the risk of funding the pension commitment,
2. CDI defines risk as the probability of shortfall,
3. CDI recognizes the inflation characteristics embedded in a plan's unique benefit stream, and
4. CDI calculates optimal solutions over multiple time periods that are specific to a particular plan.

CDI: Managing Long- and Short-Term Objectives

"He said take a right at the light, keep goin' straight until night, and then boy, you're on your own"[8]

As we've previously discussed, different measurements can be utilized to satisfy particular objectives. The idea of hedging or "immunizing" liabilities has been in the mainstream for many years.[9] The trade-off exists, especially for corporate defined benefit plans, to minimize contribution rate volatility in the short-term while at the same time ensuring that pension fund assets can grow to meet future obligations. As was mentioned earlier, managing a pension plan to satisfy both shareholders and beneficiaries can often put the sponsor at cross-purposes due to competing interests.

In order to reduce the expected volatility of contributions in the short-term, the sponsor is naturally driven to fixed income instruments. Cash flows are known and there is an abundance of Treasury securities and derivative instruments with suitable maturities to provide a safe, cash producing solution to "hedge" this volatility.

There are two structured portfolio strategies available to bond managers that are candidates for hedging a liability stream: Multi-period Immunization and Cash Flow Matching.[10]

Immunization

Immunization generally refers to the creation of a fixed income portfolio that is structured to insulate the investor against interest rate risk. This practice assumes that the yield curve is flat and that any changes in the yield curve are parallel. This strategy typically matches the investment horizon of a single liability with the duration of the

[8] Springsteen, Bruce; "Blinded by the Light", "Greetings from Asbury Park, NJ", 1973 (see Appendix B for lyrics).
[9] F.M. Redington, "Review of the Principle of Life Office Valuation," Journal of the Institute of Actuaries (1952), pp. 286-340.
[10] Fabozzi, Frank J., *Bond Markets, Analysis and Strategies*, Second Edition, Chapter 22.

portfolio. A pension benefit stream does not fit this definition of a liability as each beneficiary has a unique cash flow which is then aggregated for the entire fund over a very long time horizon depending on the mix of active versus retired employees.

One of the inherent problems with immunization is the blanket assumption that all shifts in the yield curve are "parallel." These types of curve shifts rarely represent the norm and recent history has the yield curve inverted due to short rates being raised by the Fed and other macro-economic factors depressing the middle and long end of the curve to create an inversion. This type of yield curve environment exposes the sponsor to unexpected interest rate risk from non-parallel movements of the yield curve and therefore unintended volatility in the portfolio. As a result, this strategy requires frequent rebalancing and a trade-off between transaction costs and tracking error as the duration of the liability stream changes at a different rate than the portfolio. There is always the possibility that a benefit payment will not be satisfied due to the timing of a liability cash flow and the immunization status of the portfolio.

In order to "hedge" a benefit stream using a multi-period immunization approach, a portfolio that satisfies the following conditions must be present: (1) the portfolio's duration must equal the duration of the liabilities, (2) the distribution of durations of individual portfolio assets must have a wider range than the distribution of liabilities;[11] (3) the present value of the cash flow from the bond portfolio must equal the present value of the liability stream.

In virtually every immunization-based LDI strategy being pitched to plan sponsors today the following assumptions are made:

1. Pension liabilities should be valued like any other corporate obligation (i.e. with a discount rate that produces a present value). This present value is highly correlated to interest rates and therefore using a blend of high grade corporate yields as a discount rate is most appropriate.

2. The main objective of a plan sponsor is to manage funding status which is defined as the ratio of the market value of assets to the market value of liabilities (the present value calculation above). Therefore risk is defined as surplus volatility or the variance of the funding status.

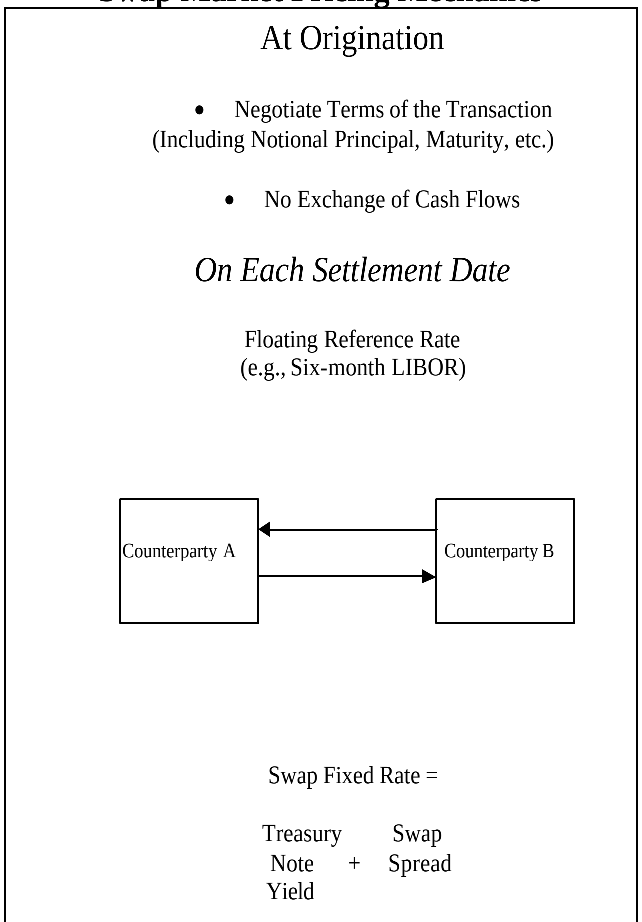
Purveyors of these strategies concede that there may be other risks imbedded in the "liability stream" that are not interest rate sensitive such as inflation risk but since these risks are minimal compared to interest rate risk, bond-like instruments are "good enough." As can be seen from the assumptions described above, an immunization strategy is designed for hedging the "accounting" liability previously discussed.

The typical LDI strategy offered to plan sponsors utilizes a series of interest rate swaps whose duration matches the duration of the liability stream. In the typical interest rate

[11] Fong and Vasicek, "A Risk Minimizing Strategy for Multiple Liability Immunization."

swap trade the sponsor pays a LIBOR-based floating rate to a swap dealer and the swap dealer pays a fixed rate to the sponsor based on the swap curve on the pricing day. Exhibit 5 depicts the characteristics of the transaction. This type of trade solves the dual problem of hedging out interest rate risk and thus lowering surplus volatility while leaving the resident asset allocation in tact.

Exhibit 5
Swap Market Pricing Mechanics



Source: The Research foundation of the Institute of Chartered Financial Analysts

The problems with this type of overlay are many and include the following:

1. The typical plan sponsor holds a diversified mix of assets that is predominantly weighted by equity exposure. The interest rate swap overlay effectively hedges the volatility associated with the accounting liability but does very little to hedge asset volatility.

2. The historical correlation between equities and fixed income varies when measured over multiple time periods and while it is straightforward to measure this correlation historically it is difficult to forecast this behavior. Exhibit 6

depicts the variability in the correlation of the return behavior of the Dow Jones Wilshire 5000[SM] and Lehman Aggregate indices.

Exhibit 6
3 Year Rolling Correlation: Dow Jones Wilshire 5000 with Lehman Aggregate

Source: Wilshire Compass

3. In order to more effectively hedge the impact that interest rate movements have on surplus volatility, the magnitude of the interest rate swap should equal the duration contribution of the *total* assets (percent exposure times duration) not just that of the liabilities. This contribution will vary widely over time causing the surplus to be under or over-hedged due to the unpredictability of future correlations.

Unless a plan sponsor is willing to sharply reduce asset volatility in the portfolio by removing or reducing exposure from equities and other asset-classes that have unstable reactions to changes in interest rates, LDI products that use interest rate swaps can actually increase surplus volatility over various market cycles. As an example, let's create a hypothetical plan that has a 100% funded ratio with $6 billion in both market value of assets and accounting liabilities. Exhibit 7 displays the duration contributions from the plan's mix of assets, accounting liabilities, and from the interest rate swap notional exposure required to bring its net duration to zero.

Exhibit 7
Sample Plan: Duration Match

Class	Weight	Duration	Duration Contribution
US Stock	45%	0	0.0
Non-US Dev Stock	20%	0	0.0
Core Fixed	35%	6	2.1
Liability	-100%	12	-12.0
Swap	83%	12	9.9
Net Duration			0.0

In this example, the durations of fixed income assets and accounting liabilities have been assumed as six and twelve years, respectively, while the duration of stocks, whose measure is not fully supported by academic research, is assumed to be zero. In order to neutralize surplus volatility for the total fund, the swap must be overlaid on the entirety of plan assets, thus requiring the swap portfolio's notional value to be $4.98 billion, or 83% of plan assets. The sheer magnitude of such a position should be noted, as its practical implementation may be prohibitive to plans of this size. Exhibit 8 describes the expected behavior of the sample plan with and without the swap overlay portfolio for various periods with differing correlation levels between equities and fixed income.

Exhibit 8
Sample Plan: Expected Surplus Risk

	Equity / Fixed Income Correlation				
	(0.25)	0.00	0.25	0.50	0.75
Surplus w/o Swap	15.26%	14.00%	12.62%	11.06%	9.24%
Surplus with Swap	10.78%	10.72%	10.66%	10.60%	10.54%

In four out of the five levels of equity to fixed income correlation, surplus volatility with the swap is indeed expected to be lower than without the swap. However, as the right-most column of Exhibit 8 reveals, it is important to recognize that during time periods with high correlation between equities and fixed income, surplus volatility is actually expected to be higher with the swap overlay strategy. Given the uncertainty of forecasting this correlation and the magnitude of the swap that is required over these variable time periods, these immunization-based swap portfolios can bring unexpected risk to the plan at considerable cost.

Cash Flow Matching

Also known as dedicating a portfolio, cash flow matching strategies utilize a bond portfolio, usually including Treasury Bonds and Strips, whose cash flows are designed to match the anticipated benefit payments of the plan. Moving backwards, bonds are selected with the appropriate characteristics so that each benefit stream payment is matched by the bond portfolio's coupon payments until every payment is satisfied. No rebalancing is required because each cash flow is exactly matched. There are no duration requirements either.

The downside is that the cost of running a dedication strategy is often higher than an immunization strategy as more funds must be set aside to match the benefit stream, which is particularly undesirable for under-funded portfolios. The trade-off between multi-period immunization and dedication is the near elimination of interest rate risk.

Both of these strategies are limited by the universe of fixed income securities with maturities greater than 30 years. The typical on-going pension fund has a much longer time horizon than this universe and therefore these tools are useful only for narrowly defined segments of the benefit stream and ideally only for the retired, or frozen, segments where benefit payments are certain. Using these strategies for active employees whose future benefit payments have very little inherent interest rate risk is akin to using a scale to measure how tall you are.

A proper marriage using total return strategies with inflation-protection properties in combination with hedging short-term benefit payments can offer plan sponsors the ability to control financial statement risk while allowing fund assets to grow to meet future, and uncertain, benefit payments. CDI can provide a framework for measuring the trade-off between minimizing volatility for the purposes of managing financial statements and the cost of funding benefit commitments in the long-term. The point is to minimize the cost of running the plan at a given level of benefit security or, stated differently though producing the same efficient frontier, maximizing the probability of meeting benefit commitments at a given level of cost.

Conclusion

The concept of Liability-Driven Investing (LDI) has received a tremendous amount of attention recently. While Wilshire Consulting embraces the core catalyst fueling this focus: that the allocation of pension assets should be driven by a plan sponsor's commitments, we have serious concerns regarding the specific direction most LDI approaches have taken. The vast majority of LDI solutions over-simplify the role of asset allocation decisions by limiting their primary objective to an analysis of accounting measurements as the basis for determining the liability. As a consequence, these approaches routinely over-emphasize interest rate risk by valuing benefit commitments like bonds. As we discussed, these strategies, which are put forth as reducing risk, can in fact expose a plan sponsor to risks that are more directly in conflict with their core objective – maximizing the safety of meeting future commitments.

In contrast, the allocation of pension assets is at its core an exercise in risk management that requires a more comprehensive analysis. Wilshire Consulting's approach to LDI, which we more appropriately label Commitment-Driven Investing, recognizes this reality in a more robust framework. By focusing on a plan's true objectives, maximizing the safety of benefits and minimizing the cost to fund those benefits, and by presenting allocation alternatives in the context of cost versus risk, CDI provides decision makers vital information in the most straight forward way possible.

"Mama always told me not to look into the sights of the sun
Oh but mama that's where the fun is"[12]

[12] Springsteen, Bruce; "Blinded by the Light", "Greetings from Asbury Park, NJ", 1973 (see Appendix B for lyrics).

Appendix A: The Nuts and Bolts of Asset-Liability Valuation

Asset-Liability Valuation: A Simple Case

In this section, we consider an example of a pension plan that has made a commitment to make a single payment of $100 in ten years. The plan's market value of assets is $60. The policy portfolio is U.S. equities: 50%, international equities: 15%, and U.S. fixed income: 35%. The policy portfolio is rebalanced annually to its initial allocation. Therefore, the portfolio returns for the next ten years can be modeled as independent identically distributed random variables. We also assume that the distribution of the portfolio returns is lognormal.[13]

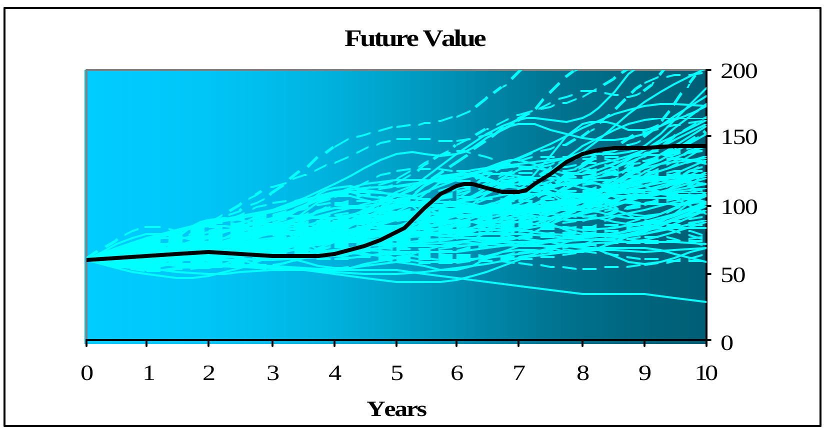
Our objective is to determine how much risk the plan is taking with this policy portfolio. To illustrate the problem, let's simulate the portfolio returns for the next ten years. Exhibit 9 presents a sample ten year return scenario.

Exhibit 9
Sample Return Scenario

Year	1	2	3	4	5	6	7	8	9	10
Return	5.42%	4.33%	-5.22%	2.83%	24.19%	42.95%	-4.52%	26.39%	2.84%	0.66%

The black line in Exhibit 10 represents the growth of the initial $60 year by year. The asset value at the end of ten years is $142.63. The annualized return over ten years is 9.04%. The light blue lines represent another 99 scenarios of portfolio returns over the next ten years. At the finish line, some of them are above and some of them are below the promised $100.

Exhibit 10
Scenario of Return Paths



[13] Unlike pension commitments for most plans, there is a matching asset for this particular commitment - a zero-coupon Treasury bond that pays $100 in ten years. If the 10 year rate is 4.5%, then the price of this bond is $64.39 (=100/1.045^{10}). An additional contribution of $4.39 (= $64.39 - $60.00) is required now if it is desirable to eliminate the riskiness of the plan entirely.

We can certainly analyze the number of scenarios above and below \$100, but there is a more important point here. If we are at the end of the ten year period, it is too late to do anything about the riskiness of the policy portfolio. We are lucky that the investment returns in the scenario shown in Exhibit 9 have been sufficient to accumulate not only the promised \$100 but a sizable surplus of \$42.63 (= \$142.63 - \$100) as well. What if we weren't so lucky? Do we know how much risk has been taken to get that lucky?

Let's get back to the present and try to measure the riskiness of the policy portfolio at the present as related to the commitment to pay \$100 in ten years. Under the scenario from Exhibit 9, how much money is required to fund this commitment precisely? The answer is so important that we spell it out below – it is the commitment amount \$100 divided by the growth of \$1 over ten years, namely

$$\frac{100}{(1+0.0542)(1+0.0433)(1-0.0522)(1+0.0283)(1+0.2419)(1+0.4295)(1-0.0452)(1+0.2639)(1+0.0284)(1+0.0066)}=42.07$$

Since \$42.07 is less than \$60.00, our existing assets are sufficient to fund the commitment for this particular return scenario. But how typical is this scenario? To answer this and related questions, we could analyze our sample scenarios. But random samples are notoriously unstable; it takes a large number of observations to reach credible conclusions; but most importantly, sample returns merely illustrate pre-selected policy portfolios, but provide little help in finding optimal portfolios.

Fortunately, there is no need to simulate in order to solve this problem. Similar to the calculation of the required assets under the Exhibit 9 scenario \$42.07, the amount of money (*RA)* required to fund \$100 in ten years is equal to the following.

$$RA=\frac{100}{(1+R_1)\cdot\ldots\cdot(1+R_{10})} \qquad (4)$$

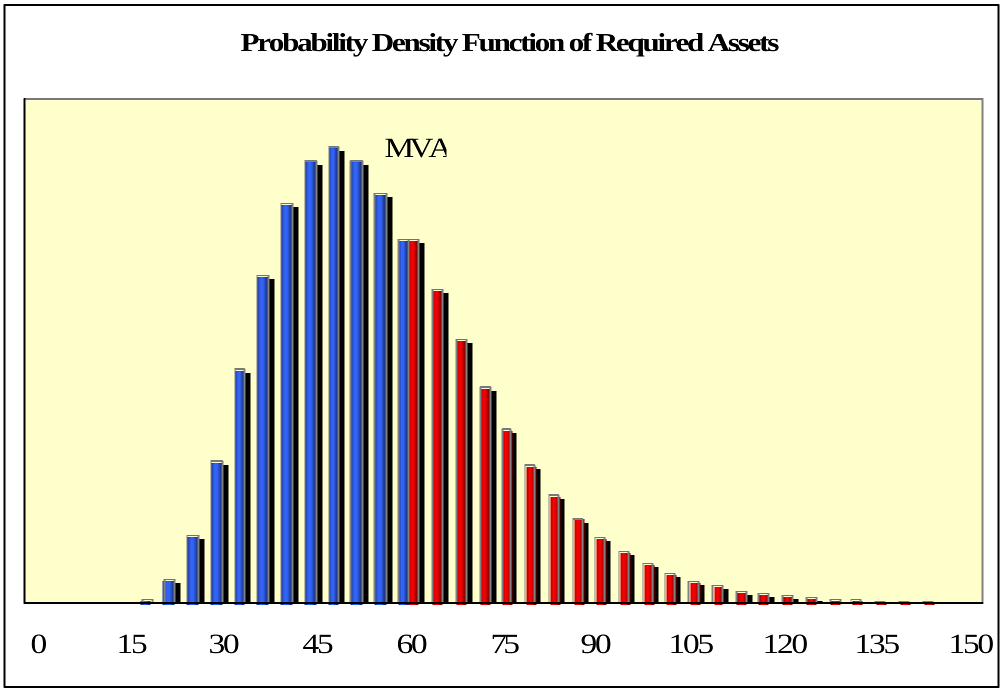
where R_1, … , R_{10} are independent identically distributed policy portfolio returns. Stochastic simulation is not required for the analysis of independent identically distributed random variables; similarly, stochastic simulation is not required for the analysis of the riskiness of *RA*.[14] We call *RA* the **required assets** associated with the given commitment and policy portfolio.

Under the capital market assumptions presented in Exhibit 2, the policy portfolio has an expected geometric return of 7.50% and a standard deviation of 10.78%. Since we assume that the portfolio return is distributed log-normally, *RA* is also distributed log-normally and has a mean of 50.98 and a standard deviation of 16.45. The probability that the existing assets (\$60) are sufficient to accumulate \$100 in 10 years is 75%. Exhibit 11

[14] Independent identically distributed random variables are the central concept of classic probability theory; they have been analyzed for centuries. For example, the famous theorem of de Moivre-Laplace that states that the number of heads in n coin tosses is approximately normally distributed for large n was first published in 1733.

shows the probability density function for the *RA* associated with the given commitment and policy portfolio. The blue part represents the possible outcomes that are favorable to the plan – they require no more money than the plan already has. The red part represents the outcomes for which the existing asset value is insufficient and additional contributions are required.

Exhibit 11
Required Assets (*RA*) Distribution



These values – a probability of 75% that the $60 asset value will be sufficient to fund the commitment as well as the mean (50.98) and standard deviation (16.45) of the *RA, as* defined in (4), are measurements of the riskiness of the plan calculated at the present; they represent initial results of the ALV. Plan management is in a better position to make informed decisions about the appropriateness of the existing policy portfolio and the necessity of additional contributions.

There are many more questions to answer for this plan. For example, is there a way to change the policy portfolio to get a better probability of success than 75%? If plan management is willing to contribute $1, what is the highest probability of success that can be achieved by optimizing the policy portfolio? What if the additional contribution is $2? The policy portfolios that answer these questions lay on the cost-risk efficient frontier, which belongs to a more advanced part of ALV.[15]

[15] For more details about cost-risk efficient frontiers, see Mindlin, D. "Introduction to Asset-Liability Valuation", Wilshire Associates Inc., 2006.

ALV: General Case.

The principles of Commitment-Driven Investment are applicable to a wide variety of financial commitments made by institutions and individuals. These commitments range from the simplest one discussed in the prior section to the most sophisticated cash flows with multiple volatilities. For example, a pension plan that wishes to ensure its solvency may have a commitment to have enough money to terminate the plan. The corresponding *RA* is the following:

$$RA = \frac{L}{(1+R)}$$

where L is the price of termination at the end of the year and behaves like a long bond. A plan may have a longer term perspective - to pay several years of benefit payments and have a residual value at the end of those years. The corresponding *RA* is the following:

$$RA = \sum_{k=1}^{m} \frac{B_m}{(1+R_1)\cdot \ldots \cdot (1+R_m)} + \frac{L}{(1+R_1)\cdot \ldots \cdot (1+R_m)}$$

where $B_1, \ldots, B_m$ are the benefit payments for the first m years that may be contingent upon several factors including wage and/or consumer inflation; *L* is the residual value that can behave like a bond, be a fixed amount, or something else. A plan may have a long term perspective – to make a commitment to pay all benefit payments for the existing population and, possibly, to several cohorts of new entrants. The corresponding *RA* is the following:

$$RA = \sum_{k=1}^{n} \frac{B_n}{(1+R_1)\cdot \ldots \cdot (1+R_n)}$$

where n is so large that all promised benefits will have been paid after n years; $B_1, \ldots, B_n$ are the benefit payments that are based upon several factors including wage and/or consumer inflation.

Regardless of the structure of a particular commitment, *RA* represents the amount of money required to fund the commitment. ALV presents a variety of risk measurements related to the goal of funding the commitment and generates the cost-risk efficient frontier related to the commitment.

Appendix B: "Blinded by the Light" by Bruce Springsteen

Madman drummers bummers and Indians in the summer with a teenage diplomat
In the dumps with the mumps as the adolescent pumps his way into his hat
With a boulder on my shoulder feelin' kinda older I tripped the merry-go-round
With this very unpleasing sneezing and wheezing the calliope crashed to the ground
Some all-hot half-shot was headin' for the hot spot snappin' his fingers clappin' his hands
And some fleshpot mascot was tied into a lover's knot with a whatnot in her hand
And now young Scott with a slingshot finally found a tender spot and throws his lover in the sand
And some bloodshot forget-me-not whispers daddy's within earshot save the buckshot turn up the band

And she was blinded by the light
Cut loose like a deuce another runner in the night
Blinded by the light
She got down but she never got tight, but she'll make it alright

Some brimstone baritone anti-cyclone rolling stone preacher from the east
He says: "Dethrone the dictaphone, hit it in its funny bone, that's where they expect it least"
And some new-mown chaperone was standin' in the corner all alone watchin' the young girls dance
And some fresh-sown moonstone was messin' with his frozen zone to remind him of the feeling of romance

Yeah he was blinded by the light
Cut loose like a deuce another runner in the night
Blinded by the light
He got down but she never got tight, but he's gonna make it tonight

Some silicone sister with her manager's mister told me I got what it takes
She said I'll turn you on sonny, to something strong if you play that song with the funky break,
And go-cart Mozart was checkin' out the weather chart to see if it was safe to go outside
And little Early-Pearly came in by her curly-wurly and asked me if I needed a ride,
Oh, some hazard from Harvard was skunked on beer playin' backyard bombardier
Yes and Scotland Yard was trying hard, they sent a dude with a calling card,
he said, do what you like, but don't do it here
Well I jumped up, turned around, spit in the air, fell on the ground
Asked him which was the way back home
He said take a right at the light, keep goin' straight until night, and then boy, you're on your own

And now in Zanzibar a shootin' star was ridin' in a side car hummin' a lunar tune
Yes, and the avatar said blow the bar but first remove the cookie jar we're gonna teach those boys to laugh too soon
And some kidnapped handicap was complainin' that he caught the clap from some mousetrap he bought last night,
Well I unsnapped his skull cap and between his ears I saw
a gap but figured he'd be all right

He was just blinded by the light
Cut loose like a deuce another runner in the night
Blinded by the light
Mama always told me not to look into the sights of the sun
Oh but mama that's where the fun is

Source: brucespringsteen.net (http://www.brucespringsteen.net/songs/BlindedByTheLight.html)

Important Information