

# STRATFORD ADVISORY GROUP

## Contemporary Pension Investment Management

### *Part One:* *A Brief Overview of the* *Current Environment*

*Pension plan sponsors are currently experiencing a significant philosophical change, questioning old approaches and traditional investment allocations. A steady 25-year decline in long-term interest rates, equity market weakness during 2000 to 2002, and regulations allowing contribution holidays during the 1990s all contributed to the historically low funded status of U.S. pension plans today. Proposed accounting and funding reform followed, forcing some plan sponsors to freeze plans or consider termination.*

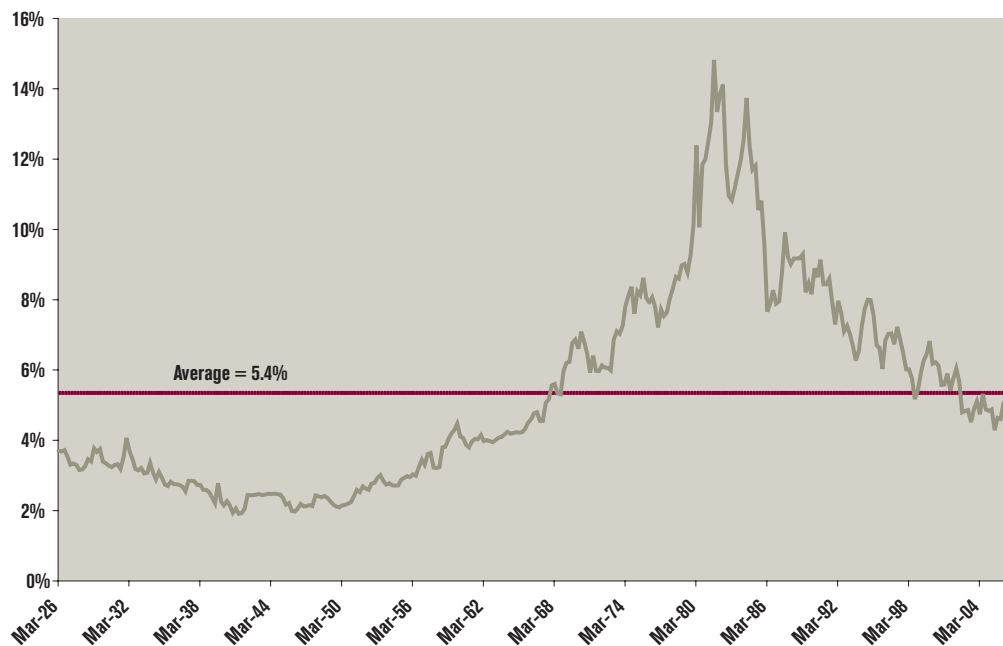
*This paper is the first in a series evaluating these events and the impact they may have on future pension plan management.*

### **What Goes Down May Not Go Up**

Liabilities are valued (discounted) using the yield on high-quality corporate bonds; therefore, a one or two percentage point rise in long-term interest rates would result in declining liability values, offering plan sponsors some well-needed relief. Despite the 20+ year decline in long-term interest rates, current yields are roughly in line with the long-term historical average (see Exhibit One). Long-term government bond yields are based on expected inflation and the required real yield, which is driven by investors' appetite for risk.

Exhibit One:  
Historical Long-Term  
Government Yields  
1926 to March 2006

Long-Term Government Yield ■  
Historical Average ■



## Contemporary Pension Investment Management

### What Goes Down May Not Go Up

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The current real yield on long-term Treasury Inflationary Protected Securities (“TIPS”) is very similar to the average realized real yield on long-term U.S. Treasuries (2.4% and 2.2%, respectively). This suggests that investors’ appetite for risk is somewhat typical, a conclusion supported by current U.S. economic conditions. Current equity market valuations also could be characterized as “average” (see Exhibit Two). In addition, at this time, trailing 12-month U.S. inflation (4.0%) is only slightly higher than historical average realized inflation (3.2%) and the long-term break-even rate implied by TIPS and U.S. Treasuries (2.8%).

Exhibit Two:  
Historical S&P 500 Index  
Price-to-Earnings Ratios  
1977 to May 2006

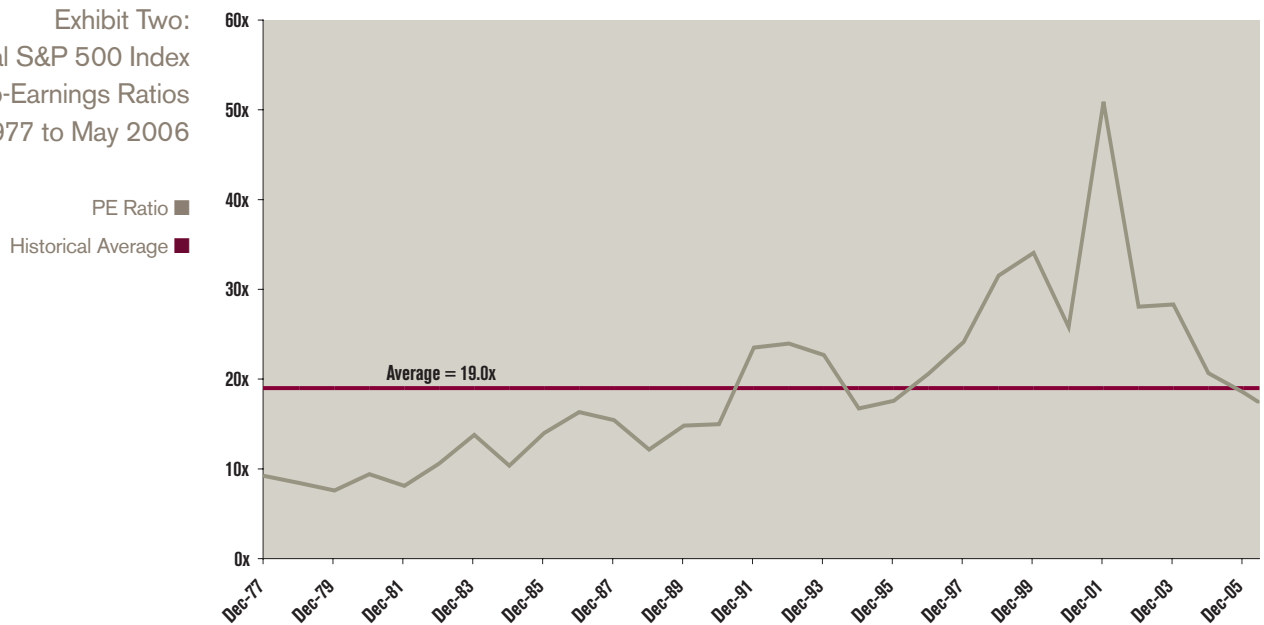
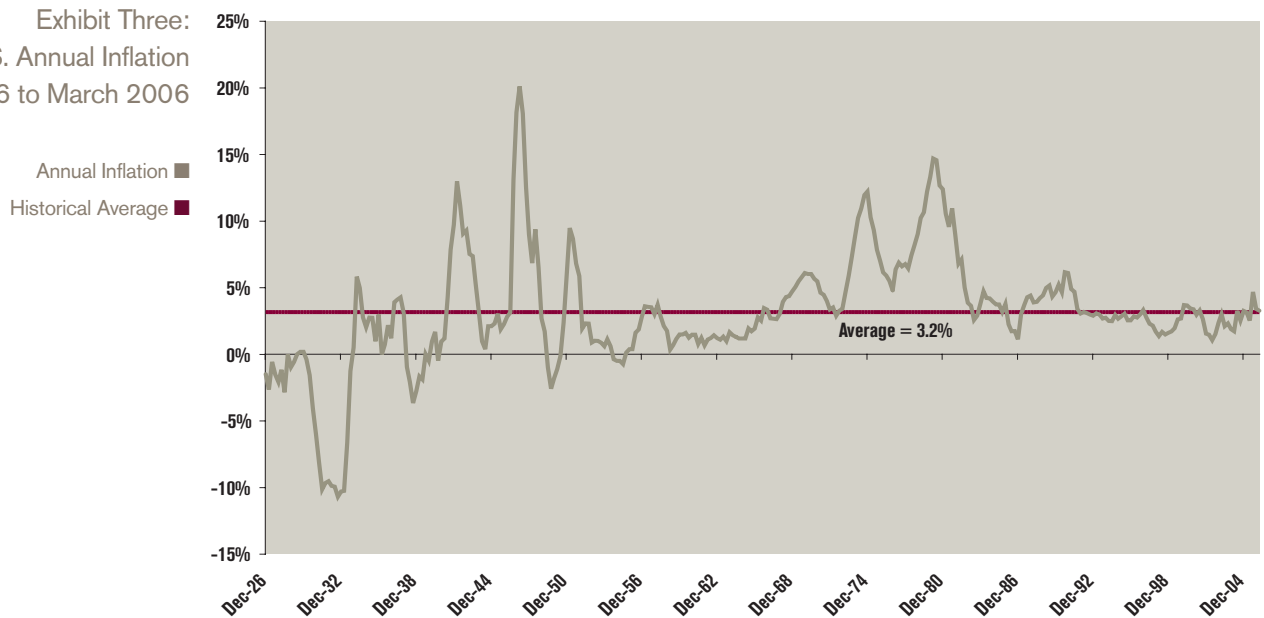
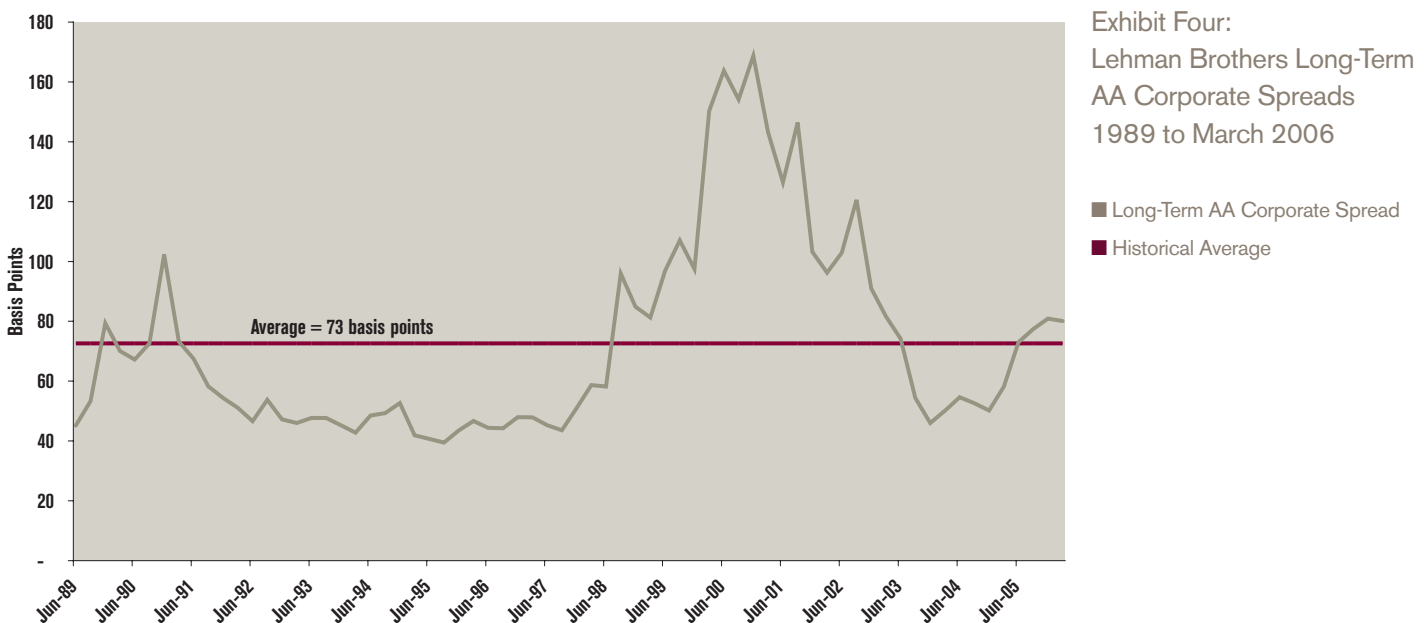


Exhibit Three:  
Historical U.S. Annual Inflation  
1926 to March 2006



## Part One: A Brief Overview of the Current Environment

Since U.S. pension accounting liabilities are valued using the yield on high-quality U.S. corporate bonds, it is relevant to assess current corporate spreads. The bellwether for pension discount rates is the yield on long-term AA-rated corporate bonds. According to the Lehman Brothers Long-Term AA Corporate Bonds Index, current corporate spreads are slightly higher than average (0.80% versus 0.73%, respectively). If the economy slows, spreads may widen slightly from current levels; however, a reoccurrence of 2000 to 2002 (see Exhibit Four) is unlikely given present equity market valuations, the strength of corporate balance sheets, and the health of the U.S. and foreign economies.



While long-term rates declined meaningfully during the last two decades, there is little evidence to suggest a material rise in long-term interest rates from current levels. That said, there are two scenarios that could lead to such an event – 1) a significant increase in expected inflation and/or 2) a significant decline in the demand for U.S. Treasuries. The latter could materialize via a move away from a U.S. dollar-based oil market or a meaningful decline in U.S. imports due to a weaker U.S. dollar.

Current pension reform will lead to new funding requirements, benefit limitations, additional reporting, greater recognition of net pension liabilities on the balance sheet, and more volatile pension expense on the income statement. While greater surplus risk (the difference in the value of plan assets and liabilities) will be the most significant effect of pension reform, higher PBGC premiums are already a reality with the February 8, 2006 passage of the Deficit Reduction Act of 2005.

Congress is expected to pass new funding rules, which will take effect in 2007, while the Financial Accounting Standards Board will be rolling out new accounting rules during the

## U.S. Pension Reform

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## U.S. Pension Reform

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the next several years in two phases. Phase one will impact the way plan sponsors recognize pension assets and liabilities on their balance sheets. Phase two will attempt to reconcile differences between U.S. and non-U.S. pension accounting standards, mainly as it relates to the corporate income statement.

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## Pension Math Made Easy

In the face of rising pension costs and proposed pension reform, many plan sponsors with active plans have considered freezing plan liabilities. The impact that this has on pension cost and the future funded status of most plans is very meaningful.

Pension expense is primarily based on service cost and interest cost. Service cost represents the annual benefit accruals of active employees, while interest cost is the annual accrual of the “liability discount.” A typical pension plan today with a balanced mix of active and retired employees might have an annual service cost of 5% of liabilities and an annual interest cost of 6%. This means that liabilities will grow at an annual rate of 11%, assuming interest rates do not change. Even a plan with 100% equities would not be expected to match this return on an annual basis.

Moreover, the typical plan is only about 80% funded on a projected benefit obligation (“PBO”) basis; i.e., the typical plan has about 80 cents of assets for every dollar of liabilities. This means that assets must grow faster than liabilities each year to maintain the same funded status level (value of assets minus liabilities as opposed to the ratio). If liabilities grow at 11% per year and the plan is 80% funded on a PBO basis, assets must grow at 13.75% (11% divided by 80%). We call this the required growth rate for plan assets. Most plan sponsors assume a return on their pension portfolios of 8% to 9%, leaving a gap of 5% to 6%, which must be made up via cash contributions to the plan.

If the plan is frozen, annual service cost would be eliminated, resulting in a 6% expected annual growth rate of plan liabilities and a required growth rate of assets of only 7.5%. The difference of roughly six percentage points is very meaningful and has forced some cash-strapped plan sponsors to re-think their employees’ retirement vehicles. For some plan sponsors, it may make sense to reduce the richness of the defined benefit plan, while increasing company contributions to the defined contribution plan.

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## Conclusions

Excluding significantly higher inflation or a meaningful reduction in foreign demand for the U.S. dollar, there is no conclusive evidence suggesting that U.S. long-term interest rates will rise markedly in the near future. This leaves plan sponsors with underfunded, active plans in a challenging position.

Pension reform will not offer any relief, but rather, it will lead to more frequent contributions and an increase in the recognition and volatility of pension funded status and pension expense on corporate financial statements. In the next two papers of this series, we will discuss investment approaches and pension plan management techniques that plan sponsors may employ to reduce the impact that pension plans have on corporate financial statements, while improving the funded status of their pension plans.

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## *Contemporary Pension Investment Management*

### *Part Two: Investment Philosophy, Risk Tolerance, and the Pension Lifecycle*

*Defining and measuring pension risk depends on a plan sponsor's objective. In this report, Part Two of our series, we define pension risk as the volatility of the pension funded status (i.e., surplus risk). We evaluate the pension lifecycle, the dynamic drivers of risk tolerance, and the two main sources of surplus risk. The purpose is to set the stage for the implementation discussions of the third and final paper in this series.*

### **Paradigm Shift – Asset Risk to Surplus Risk**

Corporate pension liabilities are valued by discounting the stream of expected benefit payments, using prevailing interest rates. Because of this, liabilities behave like bonds— as interest rates rise (fall), the value of liabilities falls (rises). Most pension plans are very long term, having life spans that on average are similar to that of long duration bonds. Thus, the minimum risk portfolio, which most closely tracks pension liabilities, is primarily composed of long duration bonds.

Most pension plans, however, are not invested entirely in long duration bonds, but a mix of equities and intermediate duration bonds. This is referred to as a “total return” approach since expected return is maximized for a given level of asset volatility. Equities are meant to provide a return in excess of long duration bonds (i.e., liabilities), while intermediate duration bonds are expected to provide a return similar to long duration bonds with significantly less volatility. Historically, plan sponsors have focused on asset volatility as the primary measure of pension risk.

Proposed pension reform calls for more frequent mark-to-market of pension assets and liabilities on corporate financial statements. This change will highlight another form of pension risk – surplus risk – which measures the volatility of the difference in the value of pension assets and liabilities. Surplus risk arises from two asset allocation decisions that plan sponsors make relative to their liabilities.

1) **Equities:** The average historical correlation between stocks and bonds has been slightly positive over the long run and even has been negative for short time periods. Thus, investing pension assets in stocks leads to a meaningful amount of relative volatility between pension assets and liabilities. During the 1990s, surplus risk was mostly positive, as plan sponsors enjoyed a protracted equity bull market; however, during the period of 2000 to 2002, equity markets corrected and bonds rallied, causing plan sponsors to experience the anxiety of negative surplus risk.

2) **Duration:** An investment in intermediate duration bonds (e.g., LB Aggregate Index) is not without surplus risk. Most pension plan liabilities have a duration of 12 to 16 years,

## Contemporary Pension Investment Management

### Paradigm Shift – Asset Risk to Surplus Risk

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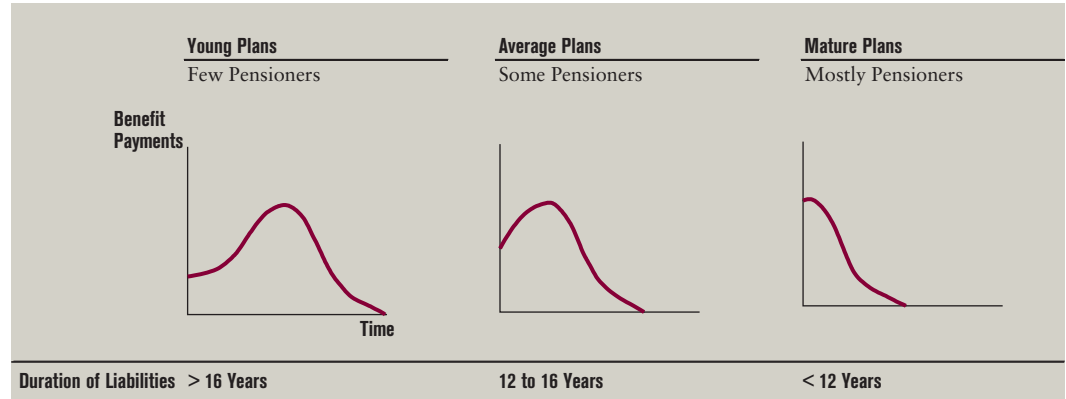
while the typical pension plan bond portfolio has a duration of roughly five years. In a declining interest rate environment, this will lead to a return shortfall of assets versus liabilities. In addition, bonds generally comprise less than half of pension assets, leading to an even greater mismatch between the duration of assets and liabilities. For example, if liabilities have a duration of 12 years and 40% of pension assets are invested in intermediate-term bonds (five-year duration), the difference in the duration of assets and liabilities is 10 years, i.e., 12 years minus (five years times 40%). If interest rates fall one percentage point, the pension funded ratio will decline 10 percentage points.

### Risk Tolerance and the Pension Lifecycle

Pension plans generally age at a predictable rate. Retired participant liabilities typically dominate those of active participants, as retired participants have accrued larger, more near-term benefit balances. When a plan sponsor freezes a plan, the average duration of future projected benefit payments shortens significantly, in effect aging the plan even more.

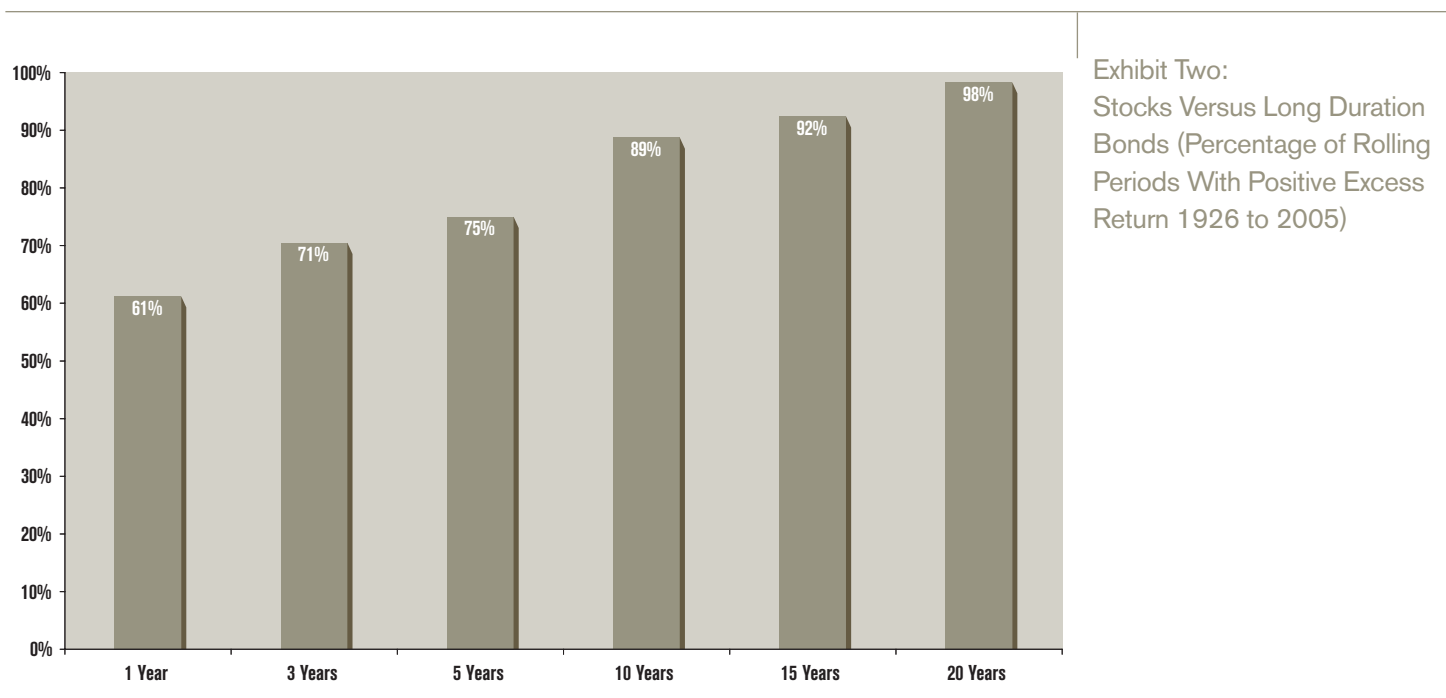
As pension plans age, risk tolerance becomes more conservative. Note that risk tolerance (“the ability to take risk”) is different than risk preference (“the willingness to take risk”). Our discussion of risk focuses on risk tolerance, not risk preference.

Exhibit One:  
Pension Plan Lifecycle



Risk tolerance is based on plan demographics (duration of liabilities), the impact the plan has on corporate financial statements, and the plan’s funded status. The duration of pension plan liabilities decreases as the participant population ages and when liabilities are frozen. Duration is a measure of the average maturity of future benefit payments (i.e., time horizon). As the time horizon of the plan declines, a more conservative portfolio consisting of long duration bonds and fewer stocks is appropriate since the probability of stocks outperforming long bonds (a proxy for plan liabilities) declines for short time periods (see Exhibit Two).

## Part Two: Investment Philosophy, Risk Tolerance, and the Pension Lifecycle



Pension liabilities are measured on a present value basis, which means there is a time element to the value. As the average duration declines, the present value of future liabilities increases; therefore, older plan liabilities tend to get larger before they get smaller. This means that any mismatch between assets and liabilities has a greater impact on corporate financial statements. Thus, plan sponsors should pay greater attention to the relationship between plan assets and liabilities as plans age.

The third component of risk tolerance is the focus of Part Three – funded status. While the future duration and size of pension liabilities are somewhat predictable, future funded status is less so. Future funded status is driven by plan sponsor contributions, investment decisions, and the behavior of capital markets. There are ways to manage the “riskiness” of aging plans by employing practical investment and contribution policies that adapt to current economic conditions.

The pension lifecycle is the primary driver of risk tolerance, as well as plan sponsors’ perception of risk. As pension plans age, plan sponsors should place more emphasis on surplus risk as opposed to asset-only risk. Moreover, proposed pension reform and the current underfunded status of many large U.S. corporate pension plans have forced some plan sponsors to freeze benefit accruals, leading to a further reduction in the duration of plan liabilities. Managing the two main sources of surplus risk, equity and duration exposure, is the primary focus of the third and final paper of this series.

## Conclusions



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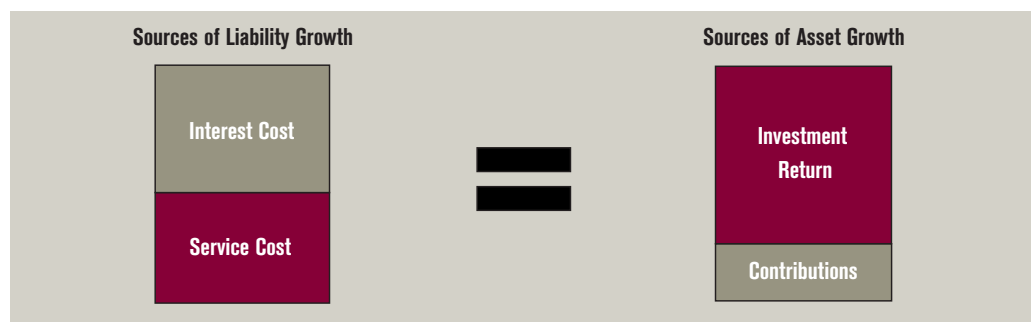
### *Part Three: Taking a More Dynamic Approach*

Plan sponsors are becoming increasingly motivated to focus on surplus risk instead of total return as their pension plans age and new pension reform is adopted. In this, the final paper of our series, we address asset allocation decisions under the “surplus risk regime.”

### **Adopting a Required Return Approach**

Plan sponsors may determine the required growth rate for plan assets by dividing the growth rate of plan liabilities (annual interest and service cost) by the current PBO funded ratio. For example, a plan with a 6% interest cost, a 5% service cost, and an 80% funded ratio has a required asset growth rate of 13.75% to maintain the current funded status (value of assets minus liabilities as opposed to the ratio). The asset growth rate is composed of investment return and employer contributions.

Exhibit One:  
The Pension Balance Sheet



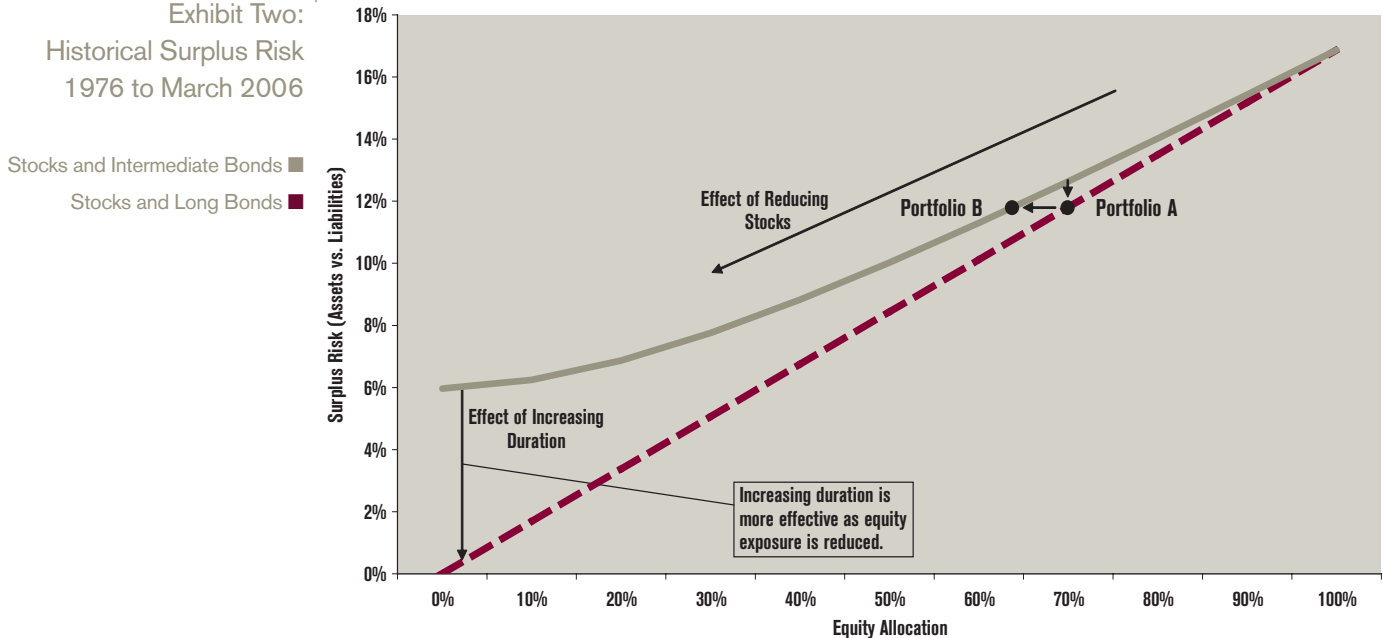
This simple equation contains all of the key factors that drive pension solvency, and therefore, it may be used as a roadmap for investment allocation decisions (specifically, equity and duration exposure). Once the required asset growth rate is known and annual contributions are determined, the expected return on assets is simply the difference. Determining the appropriate equity allocation (the primary source of return) becomes more straightforward.

### **Derisking Plan Assets**

To the benefit of plan sponsors, there is a diversification advantage associated with allocating to equities and bonds at the same time, i.e., surplus volatility resulting from an equity allocation is not correlated with surplus volatility resulting from a short or intermediate duration bond position. Plan sponsors should take a holistic approach in evaluating and ultimately determining these allocations. As illustrated in Exhibit Two, at high levels of equity, extending the duration of the bond portfolio without reducing the exposure to equities has a less substantial impact on reducing surplus risk.

## Contemporary Pension Investment Management

Exhibit Two:  
Historical Surplus Risk  
1976 to March 2006



### Extending Duration

Most U.S. plan sponsors allocate 30% to 50% of pension assets to intermediate duration bonds (e.g., the Lehman Brothers Aggregate Index), with a duration of approximately five years. This approach results in an overall duration of plan assets equal to roughly two years (five years times 40%), which falls significantly short of the typical duration of plan liabilities of 12 to 16 years.

Extending the duration of pension plan assets is one method for reducing surplus risk. This may be achieved three ways: 1) increase the plan allocation to bonds, 2) increase the plan allocation to long duration bonds, and 3) employ a synthetic duration overlay (e.g., interest rate swaps, futures, options, etc.) to match the duration of assets and liabilities.

Increasing the plan's allocation to intermediate bonds is the least effective method for increasing the duration of plan assets; however, it does reduce the equity allocation, which is the most effective means of decreasing surplus risk. Increasing the plan's allocation to long bonds is a more effective way of increasing the duration of plan assets and reducing surplus risk. As shown in Exhibit Two, replacing a 30% allocation to intermediate bonds with long duration bonds (Portfolio A) is equivalent to reducing equity exposure to 60% and maintaining an intermediate bond portfolio (Portfolio B). In addition, the higher equity exposure yields a greater expected return on assets.

Employing a synthetic duration overlay is the most effective way to increase the duration of plan assets; however, it does not meaningfully reduce surplus risk without a corresponding reduction in the equity allocation, especially when stocks represent more than 50% of assets (see Exhibit Three).

### Part Three: Taking a More Dynamic Approach

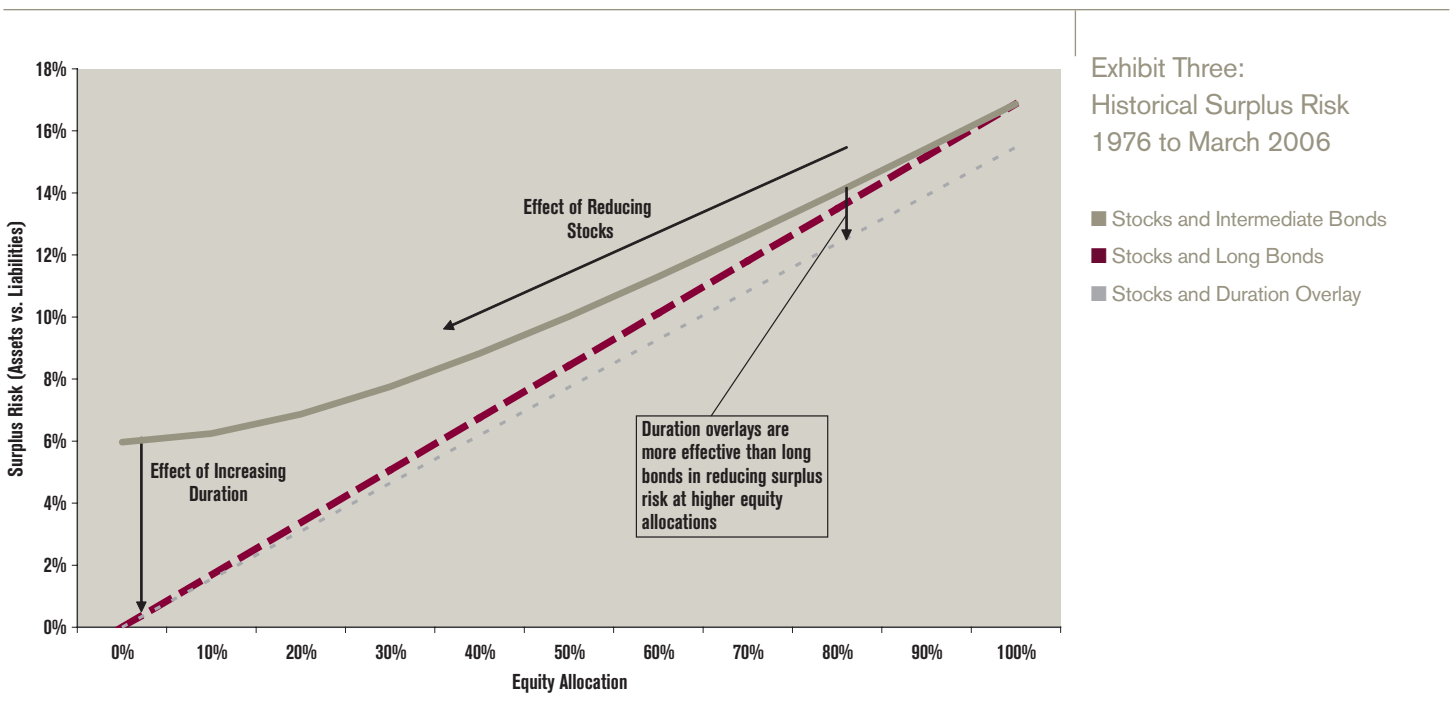


Exhibit Three:  
Historical Surplus Risk  
1976 to March 2006

Extending the duration of plan assets reduces surplus risk; however, many plan sponsors are reluctant to do so after experiencing declining long term interest rates during the last 20+ years. As we demonstrated in Part One, empirical data suggest that long term interest rates are not abnormally low given current economic conditions. While we do not suggest that clients employ a tactical duration allocation based on interest rate forecasts, we do acknowledge that there is “regret” and “career” risk associated with extending the duration of plan assets to match that of plan liabilities. Furthermore, our research shows that extending duration does not significantly reduce surplus risk at equity allocations above 50%.

A dollar cost average approach is perhaps the most appropriate and practical. As the funded ratio of the plan improves over time or if liabilities are frozen, the required growth rate on assets declines. In a surplus risk minimization strategy, this should lead to a reduction in equity exposure. As equities are reduced, the duration of assets may be increased to lower surplus risk (i.e., equity exposure and duration mismatches are both reduced at a gradual rate). The approach hedges the regret of interest rates rising significantly and it allows for a modest reduction in equity exposure, as the corporation can afford a lower return on plan assets.

**Conclusion**

Managing the two sources of surplus risk (equity and duration exposure) is a complex endeavor, which mandates its own paper in this series. In Part One, we analyzed empirical data that supports the current level of long-term government yields and investment grade corporate bond spreads. Part Two introduced several risk management principles that drive pension investment philosophy. Finally, Part Three offered plan sponsors a dynamic investment process that adapts to current risk tolerance, funded status, economic conditions, and capital market expectations based on a simple set of pension accounting rules. Exhibit Four summarizes this process.

Exhibit Four:  
A Dynamic Approach to  
Derisking a Pension Plan

