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Corporate Pension Plan Management Within the Capital Structure

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We wish to acknowledge the influence that the late Fischer Black's seminal work on pension plans in the 1980s had on this report. Fischer's intuition about financial markets and corporate finance, the rigor of his analysis, and the clarity of his thoughts continue to amaze us. He was far ahead of his time, and we sorely miss his intellectual guidance and wisdom.

Acknowledgements: We would like to thank Tim Bridges, John Eisenberg, Mark Evans, Scott McDermott, Ivan Ross, and Alan Wilmit for their comments and contributions.

Corporate Pension Plan Management Within the Capital Structure

Introduction

A perfect storm of adverse market conditions over the past three years has devastated many corporate defined benefit pension plans. Negative equity market returns have eroded plan assets at the same time that declining interest rates have increased benefit obligations. In extreme cases, this has left corporate pension plans with funding gaps as large as or larger than the market capitalization of the plan sponsor. These events have focussed companies and their investors, perhaps for the first time, on evaluating how pension plan management affects the health of the overall company.[1]

The task is a complicated one. The pension fund and its sponsor are linked directly and indirectly in many ways, not all of which are captured by the commonly studied metrics, which tend to focus on the fund as an isolated entity. In order to fully capture the economic impact of a company's pension plan on the company as a whole, it is necessary to analyze the fund in the context of the company's capital structure. Goldman Sachs has recently developed a framework for analyzing the broad spectrum of corporate finance decisions that are related to a company's capital structure. In this report, we describe how companies can apply this approach in light of their pension plan management decisions, and we illustrate this application using a detailed case study.

First, we evaluate how investment and asset/liability management decisions made by the plan fiduciary, in the interests of plan beneficiaries, affect the shareholders of the overall company. Oddly enough, though the plan fiduciary chooses the investment mix, the beneficiaries themselves are, for the most part, rather insensitive to the investment performance, since their benefit is not affected by investment performance. Economically, the investment performance, both risk and return, is almost entirely experienced by the company's shareholders[2]. Furthermore, a "regulatory penalty" is associated with taking on too much risk. If the plan becomes underfunded, the sponsor may be required to make a cash contribution to the plan, either raising them through financing or diverting the funds from other potentially more profitable uses. Depending upon whether those funds are costly compared with the plan's returns, this "penalty" can be either positive or negative. **We find that dynamic investment strategies, in which asset allocation is adjusted dynamically as the funded status of the plan changes, outperform static strategies.**

The fiduciary is also responsible for managing the net asset/liability interest rate position. Most fiduciaries maintain a mismatch between what are typically short-duration assets and long-duration benefit obligations. In an upward-sloping yield curve environment, a plan implicitly pays a cost of carry to bet on rapidly rising rates - a strategy that has proven disastrous for the past several years. On the level of the overall company, this duration mismatch may be exacerbated because the sponsor typically has medium- to long-duration debt opposite interest-insensitive (zero-duration) assets. **We find that a strategy of receiving fixed and paying floating in a long maturity interest rate swap can both lower funded status risk (by reducing duration mismatch) and increase net return (by earning carry in excess of expected mark-to-market losses), thereby benefiting both plan beneficiaries and, indirectly, the company shareholders.**

Second, we evaluate how funding decisions made by the plan sponsor, in the interest of shareholders, affect the plan and the shareholders of the company. The plan sponsor can directly adjust the assets of the plan simply by deciding, within ERISA requirements, when and how much to contribute to the plan. Higher contributions are clearly good for beneficiaries, but are they good for shareholders? The benefit for shareholders depends primarily upon the difference between the after-tax returns of investing inside the plan or outside the plan. **We find that in most circumstances, because of the tax-deferred growth of assets in the plan, making the periodic contributions necessary to maintain the plan at 100% funded status is optimal.** The plan sponsor can also directly adjust benefit obligations by deciding how much of employees' compensation to pay in the form of deferred pension benefits (service

1. See these Goldman Sachs publications: Gary Lapidus, *Automobiles and Parts, Pension Update* (June 6, 2003); Michael A. Moran and Abby Joseph Cohen, *Pension Accounting and Funding: A roadmap for analysts and investors* (December 17, 2002).
2. This was described more than 20 years ago by Fischer Black in "The Tax Consequences of Long Run Pension Policy", *Financial Analysts Journal* (July/August 1980).

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cost) as opposed to immediate cash compensation. We do not analyze this compensation decision.

Finally, we show how capital structure decisions made by the plan sponsor, in the interest of shareholders, influence and are influenced by all of these other decisions. At first glance, these decisions would seem to have nothing to do with the pension plan. But because both the pension plan and the company's capital structure expose the company to financial market volatility (e.g. interest rate risk), it is important to evaluate these risks together. The optimal strategies may involve coordinating the company's decisions designed to maximize shareholder value in light of the fiduciary's decisions designed to benefit plan beneficiaries. For example, many companies will make contributions to their plans in the coming year, and will have to make multiple related decisions: The sponsor has to decide how much to contribute and how to raise the cash, and the fiduciary has to decide how to invest and manage the new cash in the plan. **We find that a strategy in which (1) the sponsor issues debt and contributes the proceeds to the plan, and (2) the fiduciary invests those proceeds in debt securities similar to the company's debt, benefits the plan by reducing the interest rate mismatch between the plan's asset and liabilities, and produces low risk incremental tax savings for shareholders.**

Pension Plan Analysis in the Goldman Sachs Capital Structure Model

The Goldman Sachs Capital Structure Model is a general framework for analyzing the spectrum of corporate finance and investing decisions, including those concerning pension plan management, that affect or are affected by a company's capital structure[3]. It is based upon two fundamental concepts:

- ***Measuring Economic Performance Using Economic EPS***[SM,4] ***and Economic ROE:*** The model asserts that company management acts purely on behalf of common shareholders, and that the most accurate representations of the return delivered to shareholders are Economic EPS (EEPS) and Economic ROE (EROE). EEPS and EROE are essentially modified forms of EPS and ROE, respectively, in which adjustments are made to both earnings and dilution to more accurately capture economic rather than accounting reality.

- ***Making Decisions Using the Capital Structure Efficient Frontier***[SM,5]***:*** The model asserts that maximizing shareholder value is equivalent to maximizing expected EROE and minimizing EROE volatility. The efficient frontier identifies the strategies with the most "efficient" trade-off between return and risk. Each strategy on the frontier is efficient because it has the highest expected return for its level of risk and the lowest risk for its level of expected return. Company management can choose among strategies on the efficient frontier on the basis of the risk tolerance of its shareholders. Companies can use the model to analyze familiar strategies in a

3. See the July 2002 *Issuer Perspective* publication by Erol Hakanoglu, Emmin Shung, Nikola Miljkovic, and E. Philip Jones, "The Capital Structure Efficient Frontier" for a detailed description of the framework.
4. Economic EPS is a service mark of Goldman, Sachs & Co. and is the subject of pending patent applications.
5. Capital Structure Efficient Frontier is a service mark of Goldman, Sachs & Co. and is the subject of pending patent applications.

Figure 1: Simplified Balance Sheet for Companies with Pension Plans

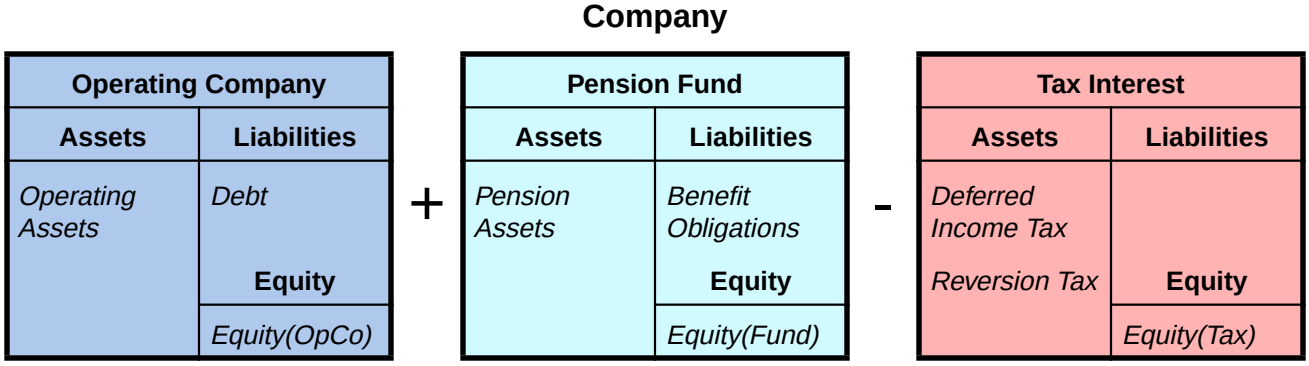

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Figure 2: Economic ROE for Companies With Pension Plans

$$\text{EROE} = \frac{\Delta\text{Equity(OpCo)} + \Delta\text{Equity(Fund)} - \Delta\text{Equity(Tax)}}{\text{Total Equity}}$$

$$\Delta\text{Equity(OpCo)} = \text{Total return on net assets} - \text{Plan contributions} - \text{Income tax}$$

$$\Delta\text{Equity(Fund)} = \text{Asset return} - \text{Interest cost} - \text{Benefit mark to market} - \text{Service cost} + \text{Plan contributions}$$

$$\Delta\text{Equity(Tax)} = \begin{cases} \text{Income tax rate} \times \Delta\text{Equity(Fund)} & \text{if Equity(Fund)} < 0 \\ (\text{Income tax rate} + \text{Excise tax rate}) \times \Delta\text{Equity(Fund)} & \text{if Equity(Fund)} > 0 \end{cases}$$

new context and identify those that lie on the efficient frontier, or to evaluate the economics of new unfamiliar strategies and seek out those that expand the efficient frontier.

We analyze how a pension plan fits into a company's capital structure using the Goldman Sachs Capital Structure Model as follows.

We model the balance sheet of a company with a pension plan by splitting it into two "subsidiaries" as shown in Figure 1: (1) the pension fund, and (2) the rest of the company, which we'll call the "operating company." The company, and therefore its shareholders, has an equity investment in each of these subsidiaries. But whereas the equity in the operating company is wholly owned by the company, the equity in the pension fund is only partially owned by the company.

Because of the tax deductibility of contributions, the company does not have a 100% "interest" in the fund's equity. To see why, consider the economic impact of a $1 increase in the value of the fund's assets. The sponsor benefits because this is $1 less that it needs to contribute to the fund. However, it does not benefit fully from the $1 because it gives up the tax deduction on that contribution (e.g., $0.35 for a 35% marginal income tax rate). Economically, the company is effectively a majority shareholder in the fund and the tax authority is a minority shareholder, with a percentage stake equal to the company's marginal tax rate. In fact, in the unlikely event of the termination of the plan, the tax authority can claim a share of the excess of the fund's assets over its liabilities.[6] We indicate this shared ownership structure by adding this "tax interest" element to the balance sheet. Neither the company nor the tax authority has limited liability. If the assets of the fund fall below its liabilities, then the equity in the fund can fall below zero, and the company and the tax authority are jointly liable to re-capitalize the fund.

We model the return to common shareholders using EROE as shown in the equations in Figure 2. In essence, EROE is the percentage change in total equity. The change in equity of the operating company arises naturally from operating income, but also includes changes in the value of net assets that are not included in earnings - essentially the mark-to-market of those net assets. Both the pretax operating earnings and the mark-to-market are included in the total return on net assets. The change in equity of the pension fund arises naturally from the components of net pension income.

6. In addition, if the plan is terminated while overfunded, the tax authority can claim an additional excise tax on the excess assets when they revert to the sponsor.

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Plan contributions affect all three components of the balance sheet. Contributions increase the equity in the fund, leading to higher expected net pension income. However, equity (and assets) in the operating company is also reduced by plan contributions and income taxes, leading to lower operating income. The tax deductibility of contributions increases after-tax earnings in the operating company, but decreases the company's stake in the earnings of the pension fund. The model quantifies these trade-offs in a way that allows the sponsor to make decisions regarding funding.

Simulation Analysis

We use a forward-looking simulation methodology to measure the expected return and risk performance of the company and to generate the efficient frontier of restructuring strategies. Our methodology is as follows:

1) We generate thousands of scenarios for market variables over a 10-year horizon. Expectations for market variables such as interest rates are those implied by current market conditions, while the volatility and correlation of those variables is based upon historically observed behavior.

2) We simulate each of the company's assets and liabilities, and income and cash flows under each scenario.

3) We compute the EROE under each scenario and collect results to obtain expectation and volatility of EROE across scenarios.

4) We compare the performance of a large set of alternative restructuring strategies on the basis of their impact on the company's EROE.

5) We optimize under company and plan constraints to find the efficient frontier of restructuring strategies.

Case Study: Company XYZ

We illustrate the application of the model through a case study of Company XYZ. In Figure 3, we show the breakdown of XYZ's balance sheet into the operating company, the pension fund, and the tax interest. We assume that XYZ is a taxpayer with a 35% income tax rate.

Figure 3: Simplified Balance Sheet for XYZ

Pension Fund (FYE 2002)

Assets ($MM)		Liabilities ($MM)	
75% Equity	3000	Benefit Obligations	5000
25% Fixed Income	1000		
100% Total	4000	**Equity ($MM)**	
		Equity (Fund)	(1000)
		Funded Status	*80%*

Operating Company (FYE 2002)

Assets ($MM)		Liabilities ($MM)	
Net Operating Assets	20000	Debt	10000
		Equity ($MM)	
		Equity (OpCo)	10000

Tax Interest (FYE 2002)

Assets ($MM)	Liabilities ($MM)	
	Deferred Income Tax	350
	Equity ($MM)	
	Equity (Tax)	(350)

We make the following assumptions regarding the pension fund balance sheet and components of pension income:

- Like many plans, XYZ's pension plan was under-funded as of fiscal year-end 2002, with a funded status of 80%.

- XYZ's pension assets are 75% equity and 25% fixed income. For the base case, we assume that the plan fiduciary maintains this static asset allocation over time. We assume that equity assets will have an average return consistent with the historical return of the S&P500 of 11%, while fixed income assets will have an average return consistent with the historical total return on the Lehman bond index of 7%.

- The value of XYZ's projected benefit obligations changes owing to the passage of time (interest cost) and changes in interest rates (benefit

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mark-to-market[7]). We assume that interest cost is a fixed 5.0% of the pension benefit obligation ($250MM in FY2002), and we assume a duration of 12 years for the purpose of calculating benefit mark-to-market.

- The plan sponsor changes the balance sheet of the plan by compensating employees with pension benefits (service cost) and by contributing funds to the plan. We assume that service cost is a fixed 4.4% of the pension benefit obligation ($220MM in FY2002). We assume that the sponsor makes the minimum contributions required by ERISA, while targeting a funded status of 90%.

- Both the plan's assets and the plan's obligations decrease when benefits are paid to employees, with no resultant change in equity. We assume that benefits paid are a fixed 6.0% of the pension benefit obligation ($300MM in FY2002).

- We assume that XYZ has a 65% interest in the pension plan, with the remaining 35% minority interest held by the tax authority. Unless otherwise indicated, we will assume that the plan will not be terminated by the parent company, meaning the excise tax (typically 50%) will not have a material impact on the tax interest.

We also make a number of simplifying assumptions regarding the operating company:

- For simplicity, we isolate debt on the liability side of the balance sheet and shift other liabilities to net operating assets. To value the equity of the operating company, we use the current market value of the total company[8] rather than the book value because it provides a more accurate representation of the economic value of common shareholders' stakes. Net operating assets are then assumed to be valued as debt liabilities plus equity.

- The pretax income of the operating company has contributions from the total return on its net operating assets (which we assume to be equal to a fixed 12.5%, resulting in a FY2002 increase in operating assets of $2.5BN) and the cost and mark-to-market of its debt (which we determine according to the details of XYZ's debt portfolio).

- The operating company income tax is calculated based upon this pretax income, assuming that contributions made to the fund are fully tax deductible.

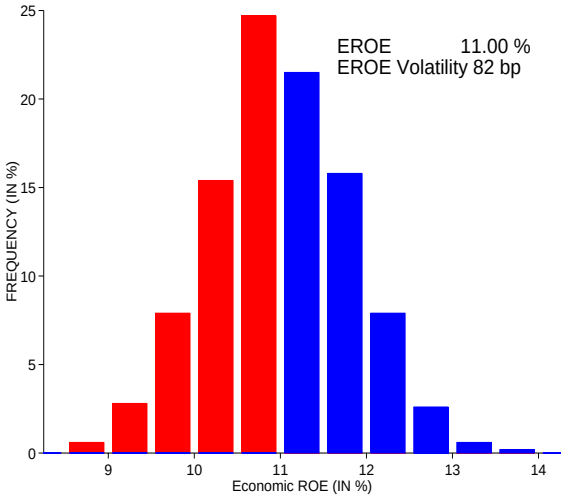
- We assume that contributions to the fund are financed by issuing debt and equity in proportion to the current capital structure.

Analysis of Existing Strategy

As a base case, we evaluate the expected economic performance of the company in light of the pension plan's current investment strategy. Over a 10-year horizon, under its current pension plan strategy, XYZ's cumulative average annual EROE has an expected value of 11.00% and a volatility of 82 bps (see Figure 4 for the full distribution).

In Figure 5, we analyze how different sources of risk contribute to the company's EROE volatility from two perspectives: the macro level (interest rates, equity volatility, and operating uncertainty) and the component level (OpCo, fund, and tax interest). From a market perspective, the risk in XYZ's EROE is balanced among interest rate, equity exposures and operating risk. On the component level, the pension fund and tax interest risk are almost perfectly negatively correlated and are balanced by the operating company risk. Since not all risks are perfectly correlated (see Figure 6), and some risks are

Figure 4: Distribution of EROE



7. Similar to actuarial gain/loss.
8. Net of the amount attributable to the pension plan equity.

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Figure 5: Sources of EROE Volatility

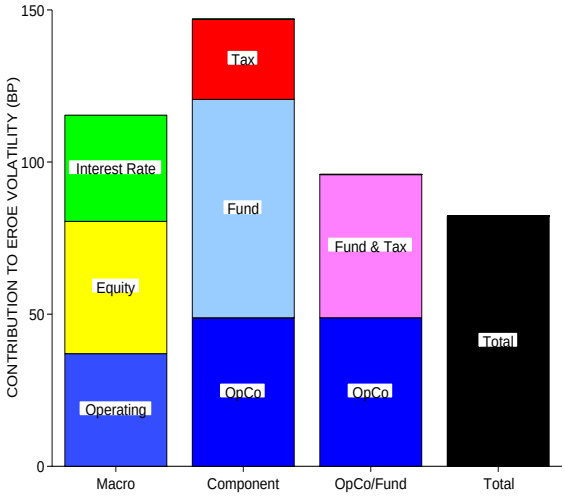


Figure 6: Correlation Heat Map

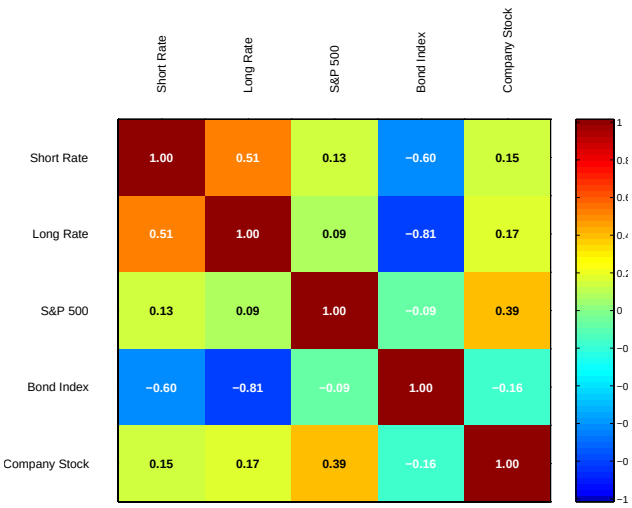
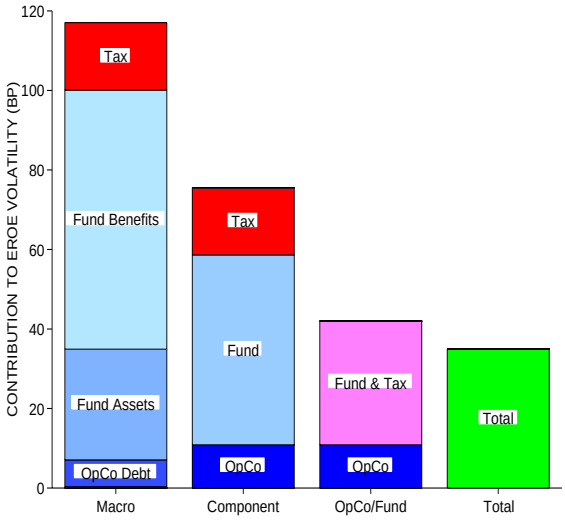


Figure 7: Sources of Interest Rate Risk



naturally hedged by other risks, the total EROE risk is significantly smaller than the sum of the component risks.

In Table 1 and Figure 7, we break out the sources of interest rate risk in more detail. The pension fund is significantly exposed to interest rate movements, reflecting the mismatch in size and duration between its small short-duration fixed income assets and its large long-duration pension liabilities. A portion of that mismatch risk is absorbed directly by the tax authority, but a sizable amount remains. The total interest rate risk of the company is further enhanced by the operating company's long-duration debt portfolio.

Table 1: Duration Mismatch Analysis

	Size	Duration (Years)	Gain/(loss) resulting from 100bp drop in rates
OpCo Assets	$20000MM	NA	NA
OpCo Debt	$10000MM	7.0	($ 700 MM)
Fund Fixed Income Assets	$1000MM	4.5	$ 45 MM
Fund Benefits	$5000MM	12	($ 600 MM)

Analysis of Alternative Strategies

We now evaluate how changes in strategy affect EROE and its risk. We consider

- Pension fund asset management decisions made by the plan fiduciary in the interest of beneficiaries.
- Funding contribution decisions made by the plan sponsor in the interest of shareholders.
- Capital structure decisions made by the plan sponsor in the interest of shareholders.

Pension Fund Asset Management

Pension fund asset management includes any decisions regarding the return / risk characteristics of the assets in the fund, whether implemented through outright purchases and sales, or synthetically through the use of derivatives. The most important of these decisions concern asset allocation and interest rate risk management.

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Figure 8: Asset Allocation Transaction

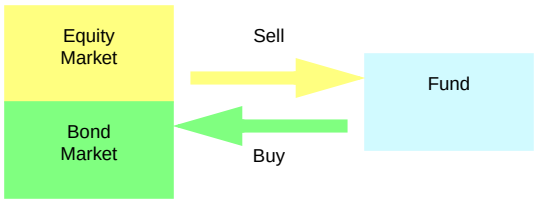
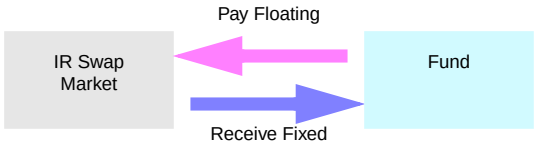


Figure 9: Interest Rate Swap Transaction

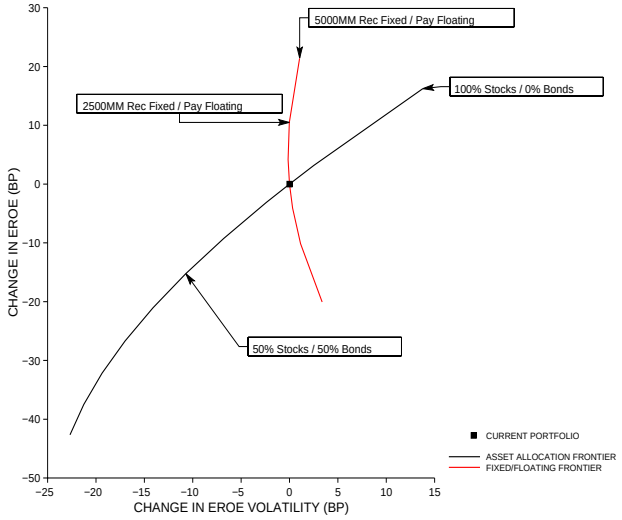


Asset allocation: Asset allocation refers to the high-level process of deciding how much of the plan's assets to invest in each general asset class. This would be followed by the more refined investment process of selecting specific securities within each asset class. While asset allocation generally involves a number of asset classes, for purposes of illustration, we will only consider the trade-off between two asset classes, fixed income and equity. Figure 8 shows a graphical example of a transaction in which the plan changes its asset allocation by buying fixed income assets and selling equity assets.

Interest rate risk management: Interest rate risk management within the context of the pension fund refers to any transactions involving managing the fixed income portfolio from the standpoint of the interest rate sensitivity of the liabilities. Figure 9 shows a graphical example of an interest rate risk management transaction in which the plan receives fixed and pays floating in an interest rate swap.

It is important to realize that in addition to the direct impact on the performance of the fund, pension fund asset management decisions also indirectly affect the operating company. Weak returns or adverse changes in interest rates may cause the plan to be underfunded. If the sponsor is required to make fund contributions, equity capital must be removed from the operating company, resulting in an opportunity cost. Even though the fiduciary's responsibility is to the beneficiaries of the plan, the impact of the fiduciary's decisions is felt most by the shareholders of the company.

Figure 10: Asset Management Frontiers



Asset management frontiers: In Figure 10, we show how changes in the static allocation of assets between equity and fixed income alter the expected EROE and EROE volatility of the company (black line). These changes can be implemented by buying/selling fixed income assets and selling/buying equity assets as shown in Figure 8. For XYZ, the risk/return trade-off between equity and fixed income is balanced and fairly constant over a wide range of allocations.

Figure 10 also shows how changes in the interest rate sensitivity, or duration, of the assets alter the expected EROE and EROE volatility of the company (red line). These changes can be implemented by entering into interest rate swaps in which the plan pays/receives floating and receives/pays fixed as shown in Figure 9. For XYZ, lengthening the duration of the plan's fixed income assets increases the company's expected EROE while reducing EROE volatility. This "duration completion"[9] strategy reduces volatility, because increasing the duration of the assets reduces

9. See the Goldman Sachs Asset Management publication by Kurt Winkelmann, Adam Berger, Scott McDermott, and Yoel Lax, *Duration completion: Enhancing risk and return in pension fund management* (April 2003).

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the mismatch between the long-duration benefit obligations and the assets. Expected EROE increases because long-duration assets are expected to have a higher total return than shorter-duration assets. This excess return, known as the term, or risk, premium, has been observed historically, and is presumably priced in to compensate investors for the higher risk of longer duration securities.

Dynamic pension fund asset management: Static pension fund management strategies, such as the ones described above, are designed to position the pension fund for optimal performance over the long term, under the assumption that the strategy remains the same, or static, over that time. For example, a static strategy might prescribe a 60% equity/40% fixed income asset allocation, and matched asset/liability duration. In practice, however, pension fund asset management decisions are made more dynamically.[10] While the long-term objective may be used as a guide, a fiduciary will reassess its strategy periodically in the context of the prevailing market and the condition of the fund. It will make adjustments both to take advantage of tactical opportunities and to manage the risk of shortfall in the fund. The most familiar example of a dynamic strategy is market timing, though this is not unique to pension funds. Depending upon its prevailing view of expected short term returns in alternative markets, the fiduciary may position the fund to be temporarily overweight or underweight particular asset classes relative to the static strategy, thereby boosting short term returns. Similarly interest rate views may suggest a temporary shift in duration.

A more interesting example of a dynamic strategy that is peculiar to pension funds, depends upon the funded status of the plan. Even if the fiduciary's views on returns and interest rates do not change over time, it may still make sense to adjust the asset allocation and duration of the portfolio dynamically as the funded status of the plan changes. There may be strong disincentives for allowing the funded status of the plan to fall short of certain thresholds (e.g., fully funded). Balancing this shortfall risk against return would require the fiduciary to make adjustments depending upon funded status. For example, when a plan is very much overfunded, a high allocation in equities would not incur much shortfall risk. However, when the plan is in danger of falling below one of the funded status thresholds, it may be more prudent to shift more heavily into fixed income. This dynamic hedging strategy is reminiscent of portfolio insurance.[11] The same objective can also be accomplished through the use of vanilla equity derivatives, such as put options, or more-structured equity derivatives.

A few details make developing a dynamic strategy for pension fund asset management difficult. First, there may be an incentive to make a contribution if after-tax returns available in the fund exceed those available in the operating company. Second, a non-zero expected excise tax on termination would create a strong incentive not to allow the fund to become significantly overfunded. Finally, the drag caused by service costs means that the conservative investment approach of investing in fixed income securities does not immunize the fund against shortfall.

Fund Contributions

Within strict ERISA / Internal Revenue Code limits, a plan sponsor can choose how much to contribute from the operating company to the fund when the plan is under-funded. The sponsor can, for example, set a target funded status. Whenever funding is required, the operating company contributes enough funds to bring the funded status to the target (or more if required by ERISA / Internal Revenue Code). This process is illustrated schematically in Figure 11.

The sponsor's funding policy for the plan can have an important indirect impact on the overall company's performance. A funding policy with a higher/lower

10. Early analyses of dynamic pension fund asset management strategies include Irwin Tepper, "Optimal Financial Strategies for Trusteed Pension Plans", *Journal of Financial and Quantitative Analysis* (June, 1974); and George M. Frankfurter and Joanne M. Hill, "A Normative Approach to Pension Fund Management", *Journal of Financial and Quantitative Analysis* (November, 1981).

11. See, for example, Erol Hakanoglu, Robert Kopprasch, and Emmanuel Roman, "Constant Proportion Portfolio Insurance for Fixed Income Investments", *Journal of Portfolio Management* (Summer 1989); Fischer Black and Erol Hakanoglu, "Simplifying Portfolio Insurance for the Seller", *The Institutional Investor Focus on Investment Management*, Cambridge, MA., Bellinger (1989); and Fischer Black and Robert Jones, "Simplifying Portfolio Insurance", *Journal of Portfolio Management* (Fall 1987).

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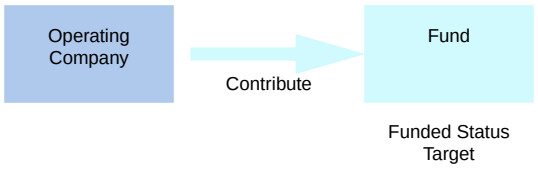
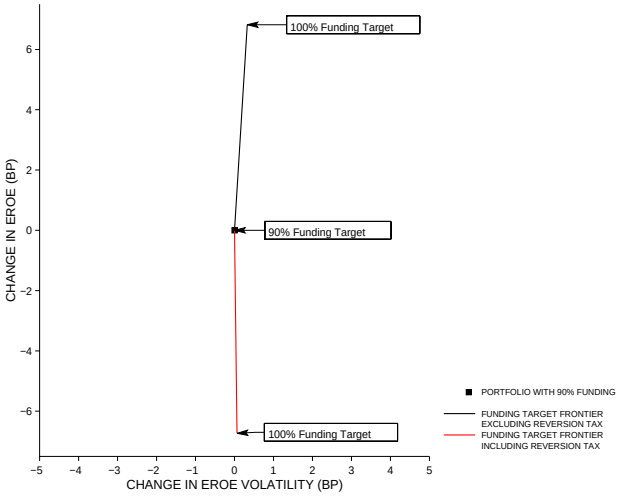
Figure 11: Funding Policy



funded status target leaves less/more assets invested in the operating company and more/less assets invested in the fund. Depending upon the relative after-tax returns of assets in the plan versus the after-tax returns of assets (or after-tax cost of capital) in the operating company, it may be beneficial to make minimal or maximal contributions to the fund. The sponsor, acting in the interests of the shareholders, can choose the optimal funding policy that maximizes EROE while minimizing its volatility.

Funding policy frontiers: In Figure 12, we show how changes in funding policy, specifically in the funded status target, change the expected EROE and EROE volatility of the company. We consider two scenarios with two assumptions: (1) that the company will never experience an excise tax upon termination (black line), and (2) that the company will experience such a tax (red line). Without the excise penalty, shareholders are best served when the plan is maximally funded. The plan is essentially a tax-deferred investment vehicle that is likely to produce better after-tax returns than investments made by the taxable operating company. This reasoning is identical to the reasoning that leads personal investors to contribute maximally to their 401(k) plans before investing in taxable accounts. A non-zero excise tax penalizes overfunding, because the large majority of excess assets in the fund would belong to the taxing authority upon plan termination. In this scenario, shareholders are best served by maintaining the plan at minimal funded status, since the tax-deferred savings are overwhelmed by the high tax rate upon termination. Again, the analogy with 401(k) plans is apt. Investors who believe that their personal tax rates will be much higher when they retire than they are now, will have less incentive to invest in a 401(k) plan, because the "termination" penalty is high compared with the tax-deferred savings.

Figure 12: Funding Policy Frontiers



Capital Structure

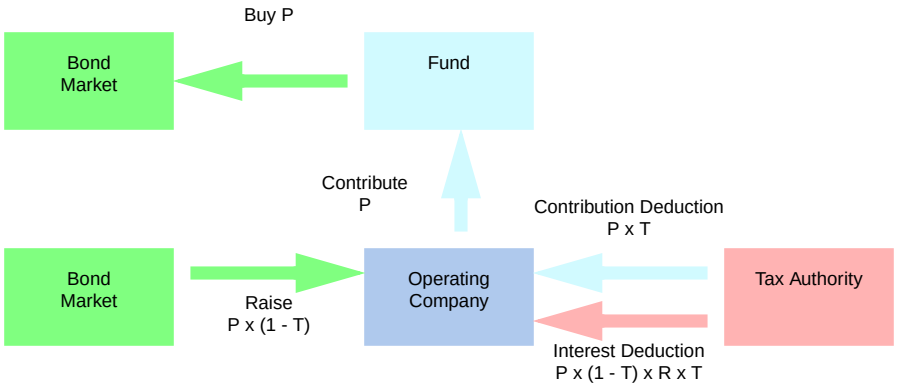
Decisions made by a plan sponsor regarding the capital structure of the company would seem to have little to do with pension plan management. Yet both the pension plan and the company's capital structure expose the company to financial market volatility, so it is important to evaluate these risks together. We have already seen, for example, how the interest rate risk of the overall company depends on the plan's investment assets and benefit obligations as well as the operating company's debt liabilities. Given the fiduciary's asset management decisions, the sponsor can make adjustments to the capital structure to maximize shareholder value. We consider two particularly interesting coordinated transactions: liability relocation and asset relocation.

Fund contributions and liability relocation: Many companies will be required to make contributions to their plans in the coming year, and will have to make multiple related decisions: The sponsor has to decide how much to contribute and how to raise the cash, and the fiduciary has to decide how to invest and manage the new cash in the fund. Many combinations of decisions are possible. To see how closely these decisions are tied together, we study in detail a particular strategy, which we call a liability relocation strategy. In this strategy (illustrated in Figure 13):

- The sponsor issues debt and contributes the proceeds to the plan. The plan also receives a "matching contribution" from the tax authority in the

Corporate Pension Plan Management Within the Capital Structure

Figure 13: Liability Relocation



form of a corporate deduction for the contribution.

- The fiduciary invests the total contribution in debt securities that have ratings and coupons similar to those of the company's debt.

Table 2 shows the change in economic earnings for a single year resulting from a $100 (total received by plan) liability relocation transaction.

Table 2: Liability Relocation

	Fixed Income
OpCo	-$100 x (1-T) x R x (1-T)
Fund	$100 x R
Tax Interest	-$100 x T x R
Total	$100 x (1-T) x R x T

The operating company pays interest on its debt obligation at the rate R and receives a tax deduction on this interest. The fund receives interest income on its invested fixed income assets at a similar rate, but is not taxed on them immediately. Nevertheless, as discussed earlier, shareholders do not benefit dollar for dollar from the interest income because the fund is not fully owned by the company. The net effect is that the company nets the tax deduction on its borrowing.

This would appear to be an elaborate scheme to produce a tax deduction that the company already takes. While it is true that the company enjoys a tax deduction on its borrowing, if the operating company invested the proceeds in fixed income securities, the tax deduction would go right back to the taxing authority. The only way to net the tax deduction is to incur risk. In the liability relocation strategy, this net gain is retained without incurring any risk. First, the interest rate risk and credit spread risk of the company's new debt is almost perfectly neutralized by the company's stake in the fund's new fixed income assets. Second, despite appearances, the company is not more leveraged. Economically the underfunded pension plan is essentially a very senior liability of the company. By issuing debt and funding the plan, the company eliminates this senior liability and replaces it with a more junior liability: unsecured debt. Essentially a liability has been relocated from the fund to the operating company, to the benefit of both plan beneficiaries and shareholders.

Many companies with underfunded plans may already be considering financing contributions to their plans through debt issuance. It is tempting to use those proceeds to invest in equity securities. We caution that such a strategy would be "doubling" the plan's bets on a rising equity market and rising interest rates. While tactically this may be the right time for this view, strategically it would leave the plan even more exposed than it has been in the past several years. Furthermore, unlike the liability relocation strategy, this equity investment strategy does not take full advantage of the tax-deferred growth of assets in the fund.

Asset allocation and asset relocation: The liability relocation strategy is limited to companies that intend to raise funds to make a contribution to their plans, and the size of the transaction is limited to the size of the planned contribution. Companies can still benefit from a related strategy that does not involve making

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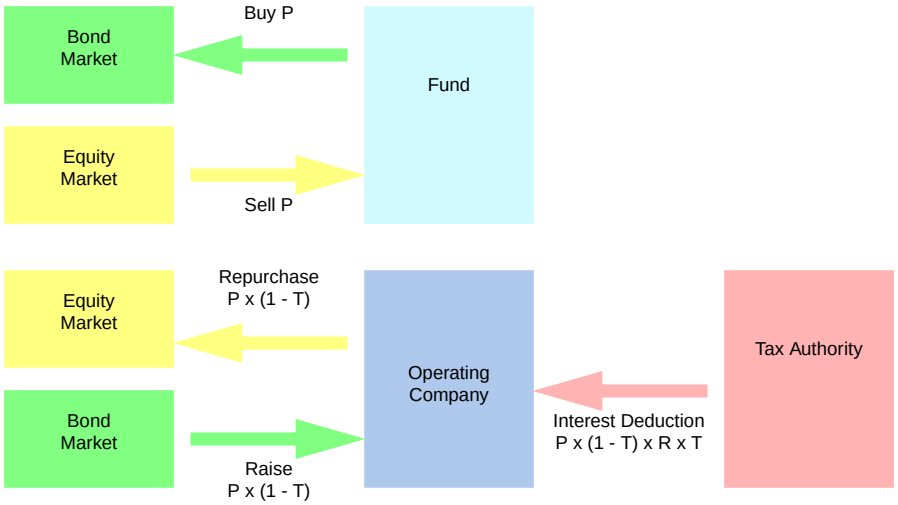
Figure 14: Asset Relocation



contributions to the plan. In this strategy[12], which we call an asset relocation strategy (Figure 14):

- The company issues debt at the operating company and uses the proceeds to repurchase its own equity.

- The fiduciary sells equity assets in the fund and uses the proceeds to invest in debt securities with ratings and coupons similar to those of the company's debt.

The fixed income transactions in this asset relocation strategy are identical to the liability relocation strategy, and they produce the same results as in Table 2. The asset relocation strategy differs from the liability relocation strategy by virtue of the equity transactions (and the absence of a funding contribution). Table 3 shows the change in economic earnings for a single year resulting from the equity portions of the transaction, assuming a $100 transaction (total transacted by the plan).

Table 1: Equity Asset Relocation

	Equity
OpCo	+$100 x (1-T) x R_E
Fund	-$100 x R_M
Tax Interest	+$100 x T x R_M
Total	$100 x (1-T) x ($R_E$ - R_M)

The operating company saves money on its cost of capital at a rate equal to its cost of equity R_E. The fund gives up the market equity return R_M on sold equity assets, and part of that loss of income is shouldered by the minority shareholders. The net impact of the equity transaction is that the company receives a benefit proportional to the outperformance of its shares relative to the market. If its shares return the same as the market (e.g., its beta equals 1), then the equity transaction is essentially a wash, leaving the benefits of the fixed income transaction intact.

The logic for this strategy, and the reason for its name, is that a company's after-tax return can be maximized if taxable assets are located in the fund rather than in the operating company. If there is an increase in the plan's investment allocation away from equities to fixed income and a corresponding shift by the company from investments in fixed income to equities, taxable interest income shifts to the pension fund and unrealized (untaxed) capital gains to the parent without changing net pretax

12. This strategy was proposed more than 20 years ago by Fischer Black and Moray P. Dewhurst in "A new investment strategy for pension funds", *The Journal of Portfolio Management* (Summer 1981).

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Figure 15: Capital Structure Frontiers

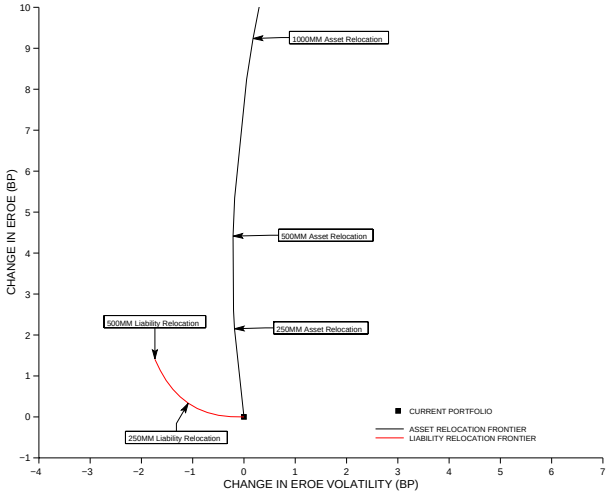
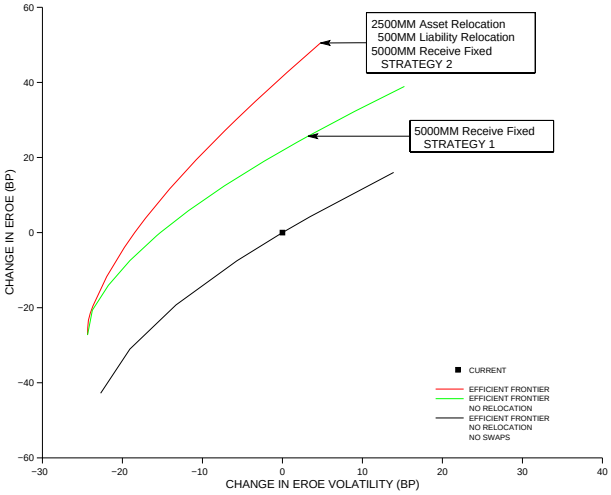


Figure 16: Global Efficient Frontiers



economic exposure to the equity market. Once again the analogy to private investors and their 401(k)'s is appropriate. If investors have already made their asset allocation decisions and have opted to have both equity and fixed income assets, it would be wise to hold all the fixed income assets in the 401(k) plan while holding any excess equities in a taxable account. Fixed income securities benefit more from being located in a tax-deferred account than equity securities do.

Capital structure frontiers: In Figure 15, we show how the liability relocation strategy (black line) and the asset relocation strategy (red line) change the expected EROE and EROE volatility of the company. These frontiers require some interpretation. For the base case (point market Current Portfolio), we had already assumed that XYZ would make any contributions required by ERISA. We further assumed that (1) the company would finance the contribution by issuing debt and equity in proportion to its existing capital structure; and (2) that the fiduciary would invest the funds in fixed income and equity assets in proportion to the existing asset allocation. The liability relocation strategy amounts to a different choice of financing (100% debt) and investing (100% fixed income). Each successive point on the liability relocation frontier corresponds to a strategy in which more and more of the liability relocation strategy is implemented in place of the base-case financing and funding strategy. The asset relocation frontier starts from the current portfolio and successively layers on more and more of the asset relocation strategy. Both strategies produce significant after-tax savings for the overall company while leaving the company's risk essentially unchanged.

Global Optimization

We have considered a number of related decisions regarding pension plan management and capital structure, and we discussed how to optimize each decision individually. But the optimal global strategy is not simply a combination of optimal individual strategies. Combining strategies can significantly expand the efficient frontier. We analyze all restructuring alternatives together to find the globally optimal strategies.

Figure 16 shows a series of global efficient frontiers that progressively incorporate more strategies: asset allocation only (black line), asset allocation and interest rate risk management (green line), and asset allocation, interest rate risk management, and liability and asset relocation (red line). We select several strategies from the efficient frontier and compare them with the existing strategy in Table 4.

Including interest rate risk management transactions significantly enhances the asset allocation efficient frontier. By employing Strategy 1, involving $5BN of receive fixed / pay floating interest rate swaps, XYZ can increase expected EROE without increasing risk.

Including capital structure transactions further

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Table 4: Comparison of Selected Strategies From Global Efficient Frontier

	Current	Strategy 1	Strategy 2
Capital Structure	50% Debt 50% Equity	50% Debt 50% Equity	**61% Debt** **39% Equity**
Immediate Capital Structure Transactions	Issue $162.5 debt Issue $162.5 equity	Issue $162.5 debt Issue $162.5 equity	**Issue $1950MM debt** **Repurchase $1625MM equity**
Immediate Funding Contribution	$500MM Total $325MM Opco $175MM Tax interest	$500MM Total $325MM Opco $175MM Tax interest	$500MM Total $325MM Opco $175MM Tax interest
Fund Asset Allocation	75% Equity 25% Fixed Income	**75% Equity** **25% Fixed Income**	**0% Equity** **100% Fixed Income**
Immediate Fund Asset Rebalancing Transactions	Buy $325 equity Buy $175 fixed income	Buy $325 equity Buy $175 fixed income	**Sell $2500MM equity** **Buy $3000MM fixed income**
Immediate Interest Rate Transactions	None	**$5.0BN Receive fixed interest rate swaps**	**$5.0BN Receive fixed interest rate swaps**
EROE ***FY2002 $ Equivalent***	11.00% *878MM*	+26bp *+$24MM*	+50bp *+$69MM*
EROE Volatility ***FY2002 $ Equivalent***	82 bps *$85MM*	+3bp *+$1MM*	+5bp *+$6MM*

enhances the efficient frontier. By implementing Strategy 2, which is a combination of Strategy 1 and liability and asset relocation transactions, XYZ can increase expected EROE by twice as much as it can when it uses Strategy 1 alone - again without increasing risk.

Conclusion

Pension plan management is a complex activity involving decisions and actions (the sponsor's and the fiduciary's) and interests (the plan beneficiaries' and the investors) of many parties. Consistently and coherently sorting out and comparing the impact of pension fund asset management, funding, and capital structure decisions is essential for effectively managing a corporate pension plan. In this report, we demonstrated the value of a high-level analytical framework for accurately evaluating the economic impact of pension plans on shareholders, and for helping companies and plan fiduciaries make decisions regarding pension plan management. In the current environment, we would encourage companies to consider certain strategic readjustments that boost return to shareholders without significantly increasing risk. Both the duration completion strategy (lengthening the duration of a fund's assets through a receive fixed interest rate swap) and the liability relocation strategy (issuing debt and contributing the proceeds to the plan, which then invests in fixed income assets) achieve these objectives.

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- ***"The New Geometry for Debt-Equity Hybrids"***
- ***"The Capital Structure Efficient Frontier"***
- ***"Inflation Risk Management in Europe"***
- ***"Extracting Value from Yield Curve Steepness"***
- ***"LIBOR-in-Arrears Swaps Capture Value"***
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