

Publication

September 2006

Back to Black (and Tepper too)

By Jim Moore

“My message is simple: Almost every corporate pension fund should be entirely in fixed dollar investments. A pension fund has special tax status, but this tax status has no value if the pension fund is invested in stocks. On the other hand, a pension fund’s special tax status has great value if the pension fund is invested in short-term paper, long-term bonds or insurance contracts.”

—Fischer Black¹

More than a quarter century after Fischer Black first recommended pension funds invest almost exclusively in fixed income, the reaction by most pension professionals is the same as it was then: “He’s nuts. Everyone knows that stocks outperform bonds in the long run and investing in stocks will reduce my funding costs.” Of course, Black too realized that over the long run stocks will almost surely outperform bonds, but his pioneering work on option pricing told him the *risk-adjusted* expected returns on stocks and bonds must be equal. Otherwise, there is an arbitrage. When Black combined this insight with those of Jack Treynor, who saw that *economically* assets and liabilities of the plan are assets and liabilities of the sponsor² despite the legal separation of the pension trust, he realized that something else must dictate optimal asset allocation.

Bill Sharpe had followed a similar line of inquiry to come up with his own answer four years earlier³. He focused on the benefit insurance of the newly created Pension Benefit Guarantee Corporation (PBGC) and the government’s inability to correctly price the protection—thus giving an undervalued put to corporate plan sponsors. If the put is under-priced and the *price* is independent of asset allocation, Sharpe reasoned that it would behoove the sponsor to maximize the *value* of the put by investing entirely in equities as options increase in value as the assets underlying the option increase in volatility. By this logic, sponsors should double up and use levered equity strategies that are even more volatile. Thankfully there are a few real world controls on this theory that have dissuaded sponsors from taking this approach. The first is fiduciary liability—no sponsor wants to run the legal risk of being an “imprudent man” under ERISA (the Employee Retirement Income Security Act of 1974), and an all-equity portfolio or something more aggressive might well be viewed as somewhat less than prudent. The second, and arguably more important aspect of PBGC insurance, is that in order to collect, the sponsor would almost certainly need to declare bankruptcy. The option thus probably has little value to most shareholders of healthy companies.

Black’s insight lies in the second line of his opening paragraph. In addition to creating the PBGC, ERISA codified tax benefits for pension plans. Assets inside the plan are tax-free (until the assets are withdrawn from the plan). Assets outside the plan are taxed at the corporate tax rate. If the taxation of the two asset classes, stocks and bonds, differs, the more highly taxed asset class, bonds, should be held in the pension

¹ Fischer Black, “The Tax Consequences of Long-Run Pension Policy,” *Financial Analysts Journal*, July-August 1980.

² Jack Treynor writing as Walter Bagehot, “Risk in Corporate Pension Funds,” *Financial Analysts Journal*, January-February 1972.

³ William Sharpe, “Corporate Pension Funding Policy,” *Journal of Financial Economics*, June 1976.

Publication
September 2006

plan. Black also realized that there is an additional tax benefit that the firm can capture: the interest it pays on its corporate debt is tax-deductible. Combined with the intuition that equities are a form of leveraged assets—some other companies’—this gives you the Black Arbitrage:

1. Sell equity holdings from the pension plan and replace them with debt.
2. Effectively do the offsetting trade outside the plan by selling debt and buying stocks. Preferably, but not necessarily, your own.
3. Reap the benefits of the tax deductibility of your corporate debt.

At the same time Black was working on his paper at MIT, Irwin Tepper of Harvard Business School was tackling the same problem, but from a slightly different angle.⁴ Tepper took the shareholder’s point of view. The tax arbitrage strategy he came up with is coined Tepper Arbitrage. If the shareholder faces different tax rates on stocks and bonds and bonds are taxed more heavily, the same logic applies—it works without the company issuing debt so long as the shareholder’s optimal asset allocation includes both stocks and bonds. The shareholder should hold bonds where he faces the least tax—indirectly through corporate pension plans. There the shareholder gets the pass-through benefit of holding bonds taxed at the long-term capital gains rate rather than at the higher ordinary income tax rate. In his taxable account he holds more equities. The tax status of the pension plan is an asset of the corporation and therefore, ultimately, its shareholders. Figure 1, below, summarizes the steps to affect the Black and Tepper Arbitrages.⁵

Figure 1

Black Arbitrage	
<u>Action</u>	<u>Impact</u>
1. Plan sells \$1 of stock and buys \$1 of bonds.	0
2. Sponsoring corporation issues $\$(1 - \tau_c)$ of new bonds and purchases an equal amount of its outstanding stock reducing corporate taxes. τ_c : corporate tax rate, cpn: tax-deductible coupon on issued debt	$\tau_c (1 - \tau_c) \text{ cpn}$
3. Annual benefit to shareholder per dollar shifted: τ_{ps} : personal tax rate on equities	$(1 - \tau_{ps})(1 - \tau_c) \text{ cpn}$
Tepper Arbitrage	
<u>Action</u>	<u>Impact</u>
1. The pension plan gains the return on bonds (r_b), but gives up the return on equities (r_e).	$r_b - r_e$
2. Value to shareholder in (1) is reduced by corporate taxes and personal taxes on equities. Shareholder’s simultaneously shift $\$(1 - \tau_c)$ from bonds to equities in their personal portfolios.	$(1 - \tau_{ps})(1 - \tau_c) (r_b - r_e)$
3. Shareholders earn additional personal equity returns and give up bond returns. After tax, where τ_{pb} is the personal tax rate on bonds	$(1 - \tau_c) (r_e - r_b)$ $(1 - \tau_{ps})(1 - \tau_c)r_e$ $-(1 - \tau_{ps})(1 - \tau_c)r_e$
4. Combining the loss within the corporation (2) with the gain in the shareholder’s account (3) gives the net gain to the shareholder.	$(\tau_{pb} - \tau_{ps})(1 - \tau_c)r_b$

⁴ Irwin Tepper, “Taxation and Corporate Pension Policy,” *Journal of Finance*, March 1981. There is a bit of a debate about who really was first. Black published first, but in the *FAJ*, a practitioner-oriented journal where the editorial process turns more quickly than the academic-oriented and more prestigious *JoF*, the journal of the American Finance Association. Both authors cite the other’s work.

⁵ Summary taken from Jeremy Gold and Nick Hudson, “Creating Value in Pension Plans – Gentlemen Prefer Bonds,” *Journal of Applied Corporate Finance*, 2003.

Publication

September 2006

Gold and Hudson re-visited Black and Tepper, summarizing the earlier analysis and applying current tax rates to ascertain the degree of value created by affecting the Black and Tepper arbitrages. Under current tax rates, they estimate the value created for the benefit of shareholders to be between 27% and 32% of the dollar amount switched from stocks to bonds.⁶

It is important to differentiate the Black/Tepper Arbitrages from more traditional asset-liability management or liability-driven investment approaches. Asset-liability management is primarily about determining acceptable risk-return tradeoffs for a plan sponsor acting as agent for its stakeholders (shareholders, bond holders, and plan participants). Black/Tepper arbitrages are about creating value for shareholders, and arguably bond holders and plan participants as well, by taking advantage of tax reduction strategies afforded by the pension plan. Gains created are attributable to differences in tax rates and are not associated with additional risk taking.

Higher limits on tax-deductible contributions in the recently adopted Pension Protection Act just increased the magnitude of the possible value creation for shareholders through Black/Tepper arbitrages. And yet, we see very few defined benefit pension plans invested solely or even predominantly in fixed income assets and even fewer explicitly tying the asset allocation to corporate capital restructuring around the tax arbitrage. Why not? Corporations have been creative about using other strategies to reduce their tax burdens, and the relevance of tax-linked capital structure strategies is well established as some of the major real-world reasons that the Modigliani-Miller Theorem⁷ fails in practice. In no particular order, the main barriers to the adoption of these tax-linked strategies are: other provisions of ERISA, current pension accounting (FAS 87), the inability to capture the enacted tax arbitrage explicitly as an asset of the plan, uncertainty in rating agency treatment, and historically heavy reliance on classic mean-variance frontier optimization paradigm and its descendents.

Tweaking the Primitives and the Paradigm

Classic asset allocation descends from Markowitz and almost invariably focuses on traded assets. More recent work for pensions extends the framework to explicitly include liabilities as a short position. The efficient frontier in the extended framework trades off the expected excess return of riskier assets against the risk reduction that bonds may provide as hedging instruments. The Tepper and Black arguments look at the problem from different financial perspectives—corporate finance and tax

⁶ Gold would argue that the value created is higher still citing the connection between market risk and firm default risk – “A corporation’s own beta increases bankruptcy risk and financial distress costs. Eliminating that beta exposure increases shareholder value.” The underlying logic behind this should resonate with those who have implemented portable alpha strategies in their pension funds. As equity market beta is easily borne or hedged, its value is commensurate with the risk taken to bear it. Bearing it needlessly creates no value and stripping it from alpha – manager skill at either the corporate or financial portfolio level – allows the alpha generation to be valued accordingly: highly if it is large and sustainable, lowly if it is negative or small and erratic.

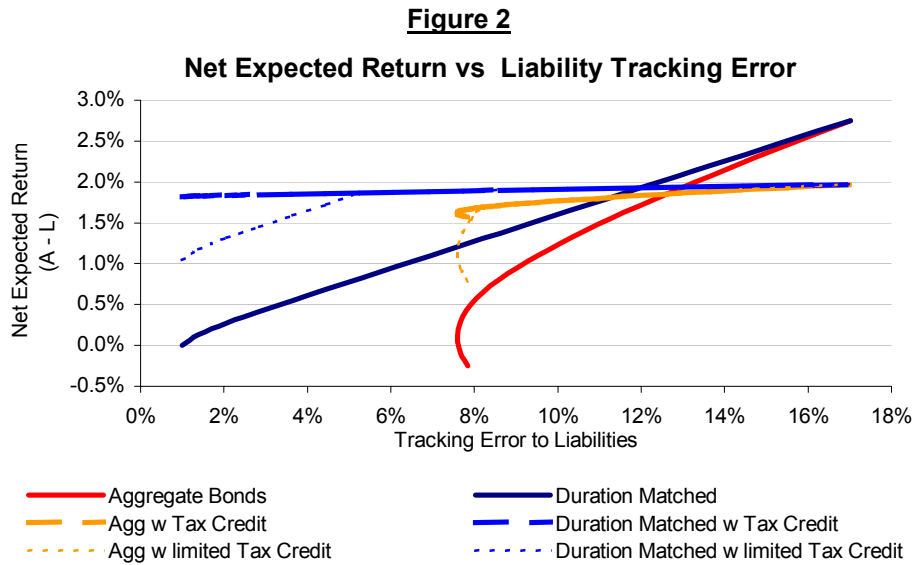
⁷ The Modigliani-Miller Theorem essentially states that the value of a company is independent of its financing structure (i.e., whether the company finances itself by issuing debt or equity is irrelevant). Only when external factors such as taxes or possible bankruptcy costs are introduced can an optimal capital structure be determined.

Publication
September 2006

optimization. What happens if we bring the untraded (but valuable) tax asset into the efficient frontier picture?

Figure 2 illustrates the value of bringing the tax credit into the framework using the annual tax savings from implementing the Black Arbitrage.⁸ The graphic shows the expected excess return of asset portfolios over existing liabilities versus the annual tracking error of the excess return. The solid lines present the tradeoff without considering the tax benefits for a simple asset allocation choice set with bond and equities either using a market aggregate index or duration-matched portfolio.⁹ The familiar upward slope of the frontiers reflects the tradeoff between additional expected excess return as one increases equity allocation against additional tracking error to the liabilities. The duration-matched frontier shows a better risk-return tradeoff with lower levels of tracking error for given excess return levels.

Hypothetical example for illustrative purposes only. The information in the following chart does not represent the past or future performance of any PIMCO product.



⁸ The illustration makes the following assumptions. The plan is fully funded in cash terms (assets = present value of liabilities). Expected returns and volatilities are as follows:

	Expected Return	Annual Volatility
Aggregate Fixed Income	5.50%	5.0%
Duration Matched Fixed Income	5.75%	11.2%
Equities	8.50%	14.0%
Liabilities	5.75%	12.0%

Equity-bond return correlation is assumed to be 0.15.

Liabilities are assumed to have a duration of 14 years.

Cost of issuing debt is 6.50% per annum and the combined federal and state tax rate is 40%.

⁹ Those readers unfamiliar with excess return or surplus frontiers may wish to read "Changing Paradigms in Asset Allocation for Pension Plans," http://www2.pimco.com/pdf/Changing_Paradigms-Moore.pdf

Publication

September 2006

The heavy dashed lines represent the value of incorporating the Black Arbitrage. As a starting point, we assume an asset allocation of 70% equities and 30% fixed income. For each dollar moved to fixed income the sponsor implements Black's strategy outside the plan. Given the assumed cost of debt, 6.5%, and combined state and federal corporate income tax rates, 40%, the annual value to the firm of each \$100 moved is \$2.60 ($6.5\% \times 40\% = 2.6\%$). If the value is transferred into the plan, this neutralizes much of the assumed equity risk premium (3% over fixed income), flattening the efficient frontier. The net return for bearing the additional tracking error of equities is a relatively meager 40 basis points. If the example were constructed using the higher interest rates and tax rates in force at the time Black wrote his paper, the net return for bearing equity risk could very well have been negative despite higher anticipated equity risk premia.

The lighter dashed lines show a constrained example where the tax benefit disappears when the equity allocation is reduced to 30%. This can be thought to illustrate a number of possible constrained cases. Perhaps the marginal tax benefit disappears as the firm's tax shield is exhausted at this point.¹⁰ Alternatively, the firm or rating agencies may feel that debt issuance and share repurchase beyond this point is unwarranted as more highly levered firm-specific risk dominates the systemic risk of equities.¹¹

Why the Black Arbitrage and not the Tepper Arbitrage? The Black approach can be self-contained within the sponsoring corporation and should deliver value even without action at the shareholder level. Conceptually, the Black Arbitrage can be thought of as similar to an intra-company loan. The pension "subsidiary" is loaning the value of its tax shield to the parent corporation. The annual value of this loan is then transferred back to the plan as reflected in the graphs.

OK, But What's Missing From the Picture?

The theory is great and the economics are sound; the problems lie in the rules and the measurement. In addition to the perceived lower cost of equities, FAS 87 incentivizes taking additional risk as expected return runs through the income statement without commensurate reflection of the risk. Unless structured as a security, it may be difficult to reflect the value of the tax arbitrage in the pension expense calculation.¹² This creates a bit of a paradox as lower-risk earnings attributable to the pension plan via the tax arbitrage may not be attributed to the plan and are reflected elsewhere in the earnings statement, while high-risk expected returns are run through income with no offset to adjust for their risk.

A second impediment may be a logical flaw in interpreting ERISA's call for diversification. Is an investment in U.S. Treasuries that match the risk characteristics of legally binding obligations to plan participants diversified? Some who take a strict legal interpretation of ERISA would say no. However, it is almost certainly safer than a

¹⁰ A possible case here might be an intellectual property-based company who structures its finances to keep onshore profits to a minimum while maximizing the value of assets in lower tax jurisdictions.

¹¹ Black saw this as a possibility and argued that at such a point a sponsor could buy the equity market rather than its own stock. However, it is hard to imagine companies actually doing this, especially if they might have to run market gains and losses through their income statements.

¹² In truth, if included in pension income, the value of the tax arbitrage should be deducted from the tax savings shown on the tax line else there is a double counting.

Publication

September 2006

hodgepodge of U.S. and international equities, illiquid private equity, and hedge funds with maybe a smidge of bonds.

It is true that the Black Arbitrage requires the firm to be a taxpayer to extract value in the trade, but this is where the Tepper Arbitrage comes in. While firms who do not pay taxes may have no advantage they can exploit directly, rebalancing on their part is beneficial to their taxable shareholders. If the process is well communicated, to maintain preferred asset allocations, shareholders will rebalance by selling their taxable bonds and buying equities. It will not be as earnings friendly, but clever and earnest CFO's and investor relations' officers can surely make the case to shareholders.

Another concern is the possible havoc created in the equity and bond markets by wholesale shifts in asset allocations. Equity markets are large with multiple participant groups. Corporate defined benefit pension plans, whose holdings are large on an absolute dollar basis, are still a relatively small fraction of total equity market capitalization. If the Black and Tepper Arbitrages are implemented, sponsoring corporations or shareholders will buy much of the equities sold by pension plans. Much of the debt purchased by firms enacting the Black Arbitrage would logically come from others mitigating pricing distortions in bond markets. In the long run, a case could be made that *true earnings quality will increase* and equities would command higher P/E multiples. If this does occur, ultimately the Treasury may see higher capital gains taxes offset reduced corporate taxes.

Perhaps the best argument against a 100% bond allocation is that while pension liabilities look more like fixed income instruments than any other asset class, bonds are not a perfect hedge. Actuaries do not have perfect foresight of mortality, turnover, timing of retirement, or choice of benefit form. Some *diversified* risk assets in the portfolio may lead to the optimal tradeoff among return seeking, asset-liability matching, and value creation. However, this uncertainty is not nearly sufficient to justify the 70/30 norm. A more realistic mix that balances the various elements may look more like a 30/70 mix where there is substantially greater diversification in the risk assets.

Final Thoughts

The defined benefit world is changing rapidly. The new buzz-acronym of LDI (Liability Driven Investments) has spawned a slate of conferences, articles, and questions. Many sponsors are revisiting how they think about asset allocation and this is long overdue. Taking liabilities into consideration is the first step, but we should honor the contributions of Black and Tepper by including their work into our mental framework and asset allocations. Ultimately, plan participants, shareholders, and society will be the richer for it.

About the Author:

James F. Moore, PhD, is a Senior Vice President and product manager for Long Duration and Pension products. He joined PIMCO in 2003 from Morgan Stanley where he was in the Corporate Derivative and Asset Liability Strategy groups. At Morgan Stanley, Dr. Moore was responsible for asset-liability, strategic risk management and capital structure advisory work for key clients in the Americas and Pacific Rim. Previously, he was associated with Enhance Reinsurance, the Wharton Financial Institutions Center and William M. Mercer Co. While at Wharton, Dr. Moore taught courses in investments and employee benefit plan design and finance. He has eleven years of investment experience and holds bachelor's degrees in applied mathematics and economics from Brown University and a PhD from The Wharton School of the University of Pennsylvania with concentrations in finance, insurance and risk management.

Publication

September 2006

Past performance is no guarantee of future results. This article contains the current opinions of the author but not necessarily those of Pacific Investment Management Company LLC. Such opinions are subject to change without notice. This article has been distributed for educational purposes only and should not be considered as investment advice or a recommendation of any particular security, strategy or investment product. Information contained herein has been obtained from sources believed to be reliable, but not guaranteed.

This article contains hypothetical information for illustrative purposes only.

No representation is being made that any account, product, or strategy will or is likely to achieve profits, losses, or results similar to those shown. Hypothetical or simulated performance results have several inherent limitations. Unlike an actual performance record, simulated results do not represent actual performance and are generally prepared with the benefit of hindsight. There are frequently sharp differences between simulated performance results and the actual results subsequently achieved by any particular account, product, or strategy. In addition, since trades have not actually been executed, simulated results cannot account for the impact of certain market risks such as lack of liquidity. There are numerous other factors related to the markets in general or the implementation of any specific investment strategy, which cannot be fully accounted for in the preparation of simulated results and all of which can adversely affect actual results.

Each sector of the bond market entails risk. The guarantee on Treasuries, TIPS and Government Bonds is to the timely repayment of principal and interest, shares of a portfolio that invest in them are not guaranteed. With corporate bonds there is no assurance that issuers will meet their obligations. Investing in non-U.S. securities may entail risk as a result of non-U.S. economic and political developments, which may be enhanced when investing in emerging markets. There is no guarantee that these or any other investment techniques will be effective under all market conditions. This material is not intended to provide, and should not be relied on for, accounting, legal or tax advice. You should consult your tax or legal advisor regarding such matters.

No part of this article may be reproduced in any form, or referred to in any other publication, without express written permission of Pacific Investment Management Company LLC, 840 Newport Center Drive, Newport Beach, CA 92660. ©2006, PIMCO.