# Pensions and Capital Structure: Why Hold Equities in the Pension Fund?

John Ralfe,*[1] Cliff Speed,[†] and Jon Palin[‡]

## Abstract

This paper considers the pension plan as part of the capital structure of the sponsoring employer. This enables lessons from financial theory concerning capital structure to be used to answer the question, "What assets should a pension fund hold?" The standard Modigliani-Miller framework is expanded on to consider the implications of corporate tax. This leads to the conclusion that bond investment for pension plans has tangible advantages over holding risky assets (e.g., equities). The paper considers a case study of the pension plan of the Boots Company, a U.K. pharmacy retailer with a pension fund of around £2.3 billion ($3.5 billion), where these ideas were put into practice. Finally, the paper discusses the value released to shareholders and the extra security members of the pension fund have derived from putting theory into practice.

## 1. Introduction

For the last 40 years, U.S. and U.K. pension funds have invested the majority of their assets in equities: the average equity allocation for a U.K. pension fund in 2002 was 73% (Hewitt, Bacon, and Woodrow *Pensions Pocket Book* 2003). However, in November 2001 the Boots Company final salary plan, with £2.3 billion of assets, turned its back on equities. The Boots plan announced it had sold all of its equities and short-term bonds in the 15 months to July 2001 and was 100% invested in long-dated AAA sterling fixed and inflation-linked bonds.

Why do pension plans hold the majority of assets in equities? Two justifications are usually offered.

- Equities are considered to match salary related liabilities and thus allow pension assets to grow in line with pension liabilities. Statistical analysis has demonstrated that this relationship does not hold in the United Kingdom, as pointed out by Smith (1998). This was confirmed by the U.K. actuarial profession when asked by the Accounting Standards Board (ASB) to consider what discount rate should be used for discounting pension liabilities for Financial Reporting Standard 17 (FRS 17).
- Equities outperform bonds in the long run. Equities are riskier than bonds, since they have lower priority over a company's operating assets. Because of the higher risk it is a truism to say that equities are *expected* to outperform bonds. This outperformance has been borne out historically, over long periods, especially in the United States and United Kingdom, which have the longest uninterrupted series of data (though not, of course, in Japan, the second largest world economy.) The truism that equities are expected to outperform bonds in the long run supports the proposition that the longer the time horizon, the *more* likely that equities will outperform bonds. This is then often misinterpreted as "the risk of holding equities versus bonds decreases the longer the time horizon." The "long-term" nature of pension funds, compared with other investors, seems to clinch the argument for pension funds holding equities. Pension funds can apparently be rewarded versus other investors for their ability to take a

* John Ralfe is of John Ralfe Consulting, 24 Devonshire Rd., West Bridgford, Nottingham, United Kingdom NG2 6EU, e-mail: JohnRalfe@JohnRalfe.com.

[†] Cliff Speed, F. F. A., works at Hewitt Bacon & Woodrow, Prospect House, Abbey View, St. Albans, Hertfordshire AL1 2QU United Kingdom, e-mail: cliff.speed@hewittbaconwoodrow.com.

[‡] Jon Palin is of Hewitt Bacon & Woodrow, Prospect House, Abbey View, St. Albans, Hertfordshire, United Kingdom AL1 2QU, e-mail: jon.palin@hewittbaconwoodrow.com.

[1] John Ralfe was head of corporate finance at Boots plc until December 2002 and, during this time, he was instrumental in the move of the pension plan's assets from equities into bonds.

long-term view. This argument is fatally flawed; there is no free lunch for those with a long time horizon. The risk of an equity portfolio *increases* over time. This is well demonstrated by considering an option to protect against equity downside whose cost increases with term (see Bodie 1995). The economist Paul Samuelson went further, describing it as a "blunder if not a crime" (p. 16) for a fiduciary trustee to believe that equities' risk decreases over time.

Equity investment for pension funds looked to have served pension funds well throughout the 1980s and 1990s as they accumulated increasing surpluses thanks to bull markets. In recent years this bias to equities has often been supported by actuarial asset-liability studies. These studies show a range of possible outcomes for different measures (e.g., funding level, contribution rate, etc.) at different projection horizons. Based on the probabilities of these measures trustees are asked to make asset allocation decisions.

In this paper we show the fallacy of the plan-centered approach by considering the wider implications of the asset allocation to equities. As can be seen from the Modigliani-Miller (1958) framework, changing asset allocation does not create value. Further, the impact of tax needs to be considered. We follow the approach adopted by Black (1980) and consider the impact different asset allocations have on the ultimate investors in the sponsoring company. We show that, by investing in equities, the pension plan is not doing anything the shareholder cannot do directly and in a more tax efficient way.

The move by Boots has shown how theory can be put into practice. We consider what this decision has meant and discuss the benefits that have arisen from this move.

The paper is set out as follows: We discuss pension liabilities in Section 2, consider pensions in the Modigliani-Miller framework in Section 3, introduce taxation and quantify the possible gain to shareholders in Section 4, consider the particular case of Boots in Section 5, and conclude with Section 6.

## 2. PENSIONS AND CAPITAL STRUCTURE

### 2.1 What Are Pension Liabilities?

A defined benefit (DB) pension is a promise made to an individual to pay an income of a predefined amount during retirement. DB pension promises issued as part of the overall employee remuneration package are part of deferred pay. The pension is an asset for the individual and will provide a retirement income.

Although different funding and regulatory systems exist around the world, the economics of DB plans are the same. Pension promises represent a debt owed by the company to the pension plan members. Pension liabilities are economic liabilities of the company, not the pension plan, as the company has to make good shortfalls in the pension plan.[2] The pension represents a debt owed by the company to the pension fund members.

Although U.K. and U.S. regulation requires separate assets as security for pension promises, this is not a necessary feature—indeed most DB plans in continental Europe are unfunded. The ultimate owners of the company are the shareholders who own the net value after liabilities of the company are met. In simple terms we have an economic contract between the shareholders and the pension plan members.

Although pensions are debt, pension debt is more complex than a conventional bond, for the following reasons:

- The number of payments to be made depends on mortality rates, withdrawal rates, and other demographic features.
- U.K. pensions often increase in payment (and deferral) and these increases are based on indices, most commonly the rate of inflation.
- Pension promises are not readily traded.

These complexities do not alter the underlying economics that pension promises are debt-like for the sponsor.

The view that pensions are debt-like is gaining ground in the investment community. Investment banks have published numerous articles that recognize pensions as debt-like and credit rating agencies are treating unfunded pensions as debt in their analysis.

Since pensions are the equivalent of debt, why do pension funds hold the majority of their assets

[2] In some cases the company may be insolvent and so avoids making good the shortfall. In addition, there is the possibility that legislation may allow the company to cease contributing to the plan and not be held liable for the pensions accrued to date.

in equities? Surely this is equivalent to the company by issuing a long-term bond and investing the proceeds in equities. This gearing on balance sheets to gain equity market exposure is not seen outside of investment trusts. So why should we see this in pension funds? (Following an article in the *Financial Times*, it has become a joke in the United Kingdom that British Airways, which has a market capitalization of £1.4 billion and pension liabilities of over £10 billion, is a badly run hedge fund that happens to own a few aircraft).

We now consider in some detail why there is no gain from issuing debt to invest in equities. As we run through these arguments we can keep in mind pension funds and ask whether special circumstances exist why the analysis would not apply to them.

## 3. MODIGLIANI-MILLER FRAMEWORK (AND PENSIONS)

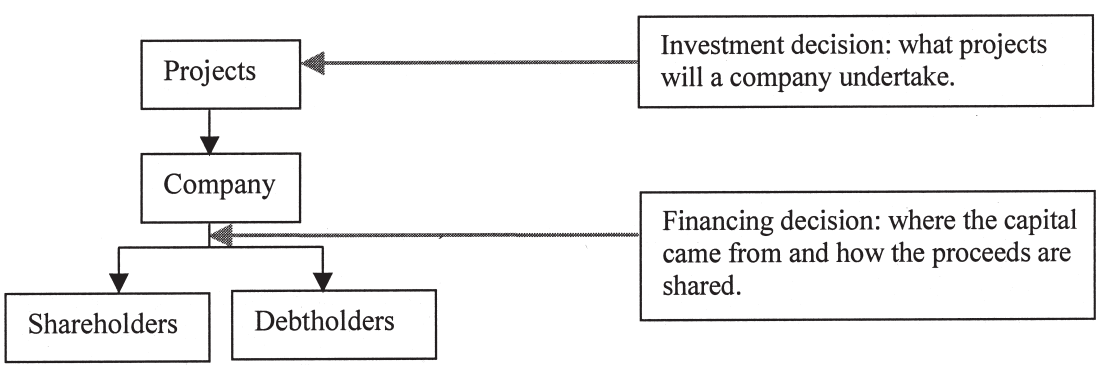
Modigliani-Miller's (MM) first proposition (1958, p. 268) says that the "market value of a firm is independent of its capital structure"—in other words, there is no gain from altering the debt/equity ratio of a firm. The firm generates earnings and cash flows and the capital structure determines how these are split between the shareholders and the debtholders. However, changing the proportions of debt and equity will not alter the actual earnings and cash flows of the firm, but merely alter their distribution. Equities will become more risky as the company issues more debt and gears up its balance sheet, but the combined value, or "enterprise value," of the company does not change. This result has profound implications. In particular, it enables us to separate the financing decisions (where the money comes from) and investment decisions (where a company invests its money) that a firm has to make.

Holding equities in the pension fund is the same as gearing up by issuing debt in the company. In a pension context, proposition one tells us that the asset allocation decision to hold equities or bonds does not alter the value of the company.

The MM proposition is true in an idealized world where there are no market imperfections for example, no taxes, no transaction costs, no agency costs and everyone can lend and borrow at the risk-free rate. MM demonstrated that financing decisions do not affect the value of a firm in this idealized world and that it is the so-called second-order effects such as taxation, agency costs and transaction costs which are the real drivers of value. It is these second-order effects that have been the focus of research. This research has extended the MM framework into a better model of the real world.

One of the key insights of MM was to recognize that a company cannot be looked at in isolation. Investors in a particular company have the full universe of investments available to them; therefore, the risk and return trade-offs available elsewhere in the market are relevant when considering what represents fair compensation to investors in a particular company. Consider a simplistic example of a company set out in Figure 1. The company makes investments in different

Figure 1
**Schematic Representation of a Company**



projects that have positive net present value (NPV). This is where the value of the company derives from.

MM proposition two says that the expected rate of return increases with the riskiness of the debt. So as a company issues more debt the expected return to shareholders increases, but this is just fair compensation for the risk. Following the approach used in Whelan, Bowie, and Hibbert (2002), we consider two companies "NoDebtCo" which is totally financed by equity and "HalfDebtCo" which is 50% financed by debt and 50% financed by equity. These companies are identical apart from their financing. For both companies the total value of their assets is 100, the return earned on assets is 15%, giving them the same profit, and the interest rate payable is 5%. So NoDebtCo has equity outstanding with a value of 100 and no debt, and HalfDebtCo has equity outstanding with a value of 50 and debt outstanding with a value of 50. Table 1 shows the profit and loss accounts.

By construction, the operating profit earned is not affected by the capital structure of the two companies. However, the return to shareholders is either 15% or 25%. Although in this case HalfDebtCo provides a higher return to shareholders, it is a more risky investment; this can be seen in the situation where operating profit falls to 0 in scenario 2. Then the returns are as given in Table 2.

Is the higher return for shareholders in HalfDebtCo a fair compensation for the added risk of investing in HalfDebtCo?

Let's consider an investor who has an equity holding in NoDebtCo with a value of 5. This investor wants a higher return than NoDebtCo's equity is expected to provide and is willing to take additional risks to secure this return. One possibility is for the investor to sell this holding in NoDebtCo and invest in HalfDebtCo.

Table 1
**Profit and Loss Accounts when Operating Profit is 15**

| | NoDebtCo | HalfDebtCo |
|---|---|---|
| Operating Profit | 15 | 15 |
| Interest | 0 | (2.5) |
| Profit After Interest | 15 | 12.5 |
| Return to Shareholders | 15% | 25% |

Table 2
**Profit and Loss Accounts when Operating Profit is 0**

| | NoDebtCo | HalfDebtCo |
|---|---|---|
| Operating Profit | 0 | 0 |
| Interest | 0 | (2.5) |
| Profit After Interest | 0 | (2.5) |
| Return to Shareholders | 0% | (5%) |

Alternatively, the investor could borrow money to buy an additional holding in NoDebtCo. Let's assume that the investor borrows 5 and invests this in NoDebtCo. At time 0 the investor's balance sheet is:

| | | |
|---|---|---|
| Cash | (5) | borrowing |
| NoDebtCo Equity | 10 | |
| Net assets | 5 | |

If NoDebtCo returns 15% as in scenario 1 then the investor's personal balance sheet at the end of the period will look like:

| | | |
|---|---|---|
| Cash | (5.25) | borrowing with interest |
| NoDebtCo Equity | 11.5 | |
| Net assets | 6.25 | |

This gives a return on assets of 25% percent, which is precisely the return that the investor would have received from investing in HalfDebtCo over the period. Similarly, in scenario 2, where equity in NoDebtCo returns 0%, the investor's strategy of borrowing to invest in NoDebtCo delivers a return of –5%, the same as an investment in HalfDebtCo. This, of course, is no coincidence and provides insight into how MM derived their results using no-arbitrage arguments and assuming that investors can all borrow and lend at the same risk-free rate.

MM's results rest on the now familiar arbitrage approach of recognizing that, if two assets have the same payoffs in all situations, they must have the same price. Note that expected returns are not relevant to this argument. We are not making a probabilistic statement. The assessment of the risk and return is left to the market where prices are the mechanism that reflects investors' views of the potential rewards required to accept further risk. In short, $100 of equities is of equal value to $100 of bonds. From this simple statement it follows that value cannot be generated by

switching between bonds and equities in the MM world.

We have now seen a simple example that demonstrates that value cannot be created by altering the capital structure as this can be replicated by an individual rearranging his or her investment portfolio. We have also seen that the extra return from gearing up a firm's balance sheet provides higher expected returns to shareholders but this is fair compensation for the risks they face. Now let's extend our example to cover the case of a company that is preparing to expand. Initially the capital structure is as shown is Figure 2(a).

Suppose the company goes ahead and raises the finance for the new investment opportunity. The intention is that this capital will be invested in new projects that will provide a flow of profits to the parent company and ultimately the shareholders as shown in Figure 2(b). However, before the new investment can get underway there are some regulatory hurdles to clear. The company decides to protect the capital it has raised by investing in debt until the regulatory hurdles are cleared. The interest on this debt will enable the company to meet the interest payments to the new debtholders and not touch the capital raised. From an economic viewpoint, the debt held is an asset and the debt owed to the new debtholders is a liability. These exactly cancel out and so the picture is exactly the same as before the debt was raised. The situation then looks like Figure 3.

However, the regulatory hurdles take longer than expected to be cleared and the prospect of actually starting the venture recedes. All the while the new money is invested in debt. Eventually, it is suggested that if the capital raised was invested in equity then it would deliver an expected return in excess of that required to meet interest payments. The situation would now look like Figure 4.

With the benefit of the MM framework, we realize that the value of the company is not changed by moving the investment from debt to equity. All that happens is that the gearing of the company increases and the equity holders require a higher return to compensate for the risk they now hold.

Of course, our "NewVentureCo" is no such thing; it is just a DB pension plan. The whole MM analysis translates directly into the pension environment.

## 4. THE IMPACT OF CORPORATE TAX

Unfortunately, the real world has many additional complications, not least of which is tax. We now introduce corporate tax into our model and consider the impact on simple profit and loss (P&L) accounts and balance sheets. As we are interested in the economic exposure of the ultimate investors we will show pension gains and losses on the P&L.

For ease of exposition we will consider a fixed interest rate and ignore the effects of personal taxation (although we will comment on personal taxes later). These do not change the structure of the argument.

Let's start by setting up some simple notation:

- D = the debt issued by the company.
- E = the equity of the company.
- **Profit** = the operating profit of the company in the year.
- i = the interest rate.

Figure 2(a)
**Company**

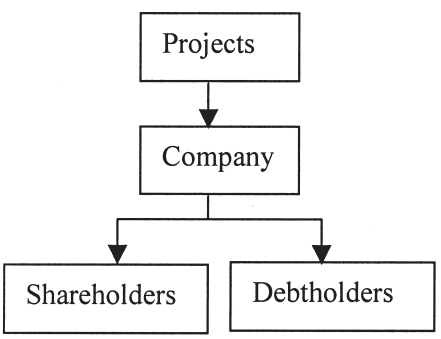



Figure 2(b)
**Company and New Venture**

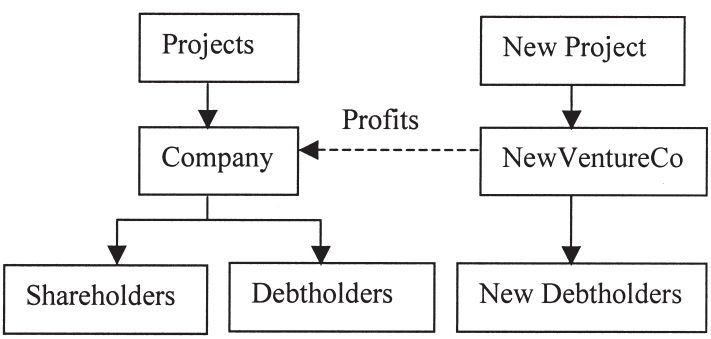
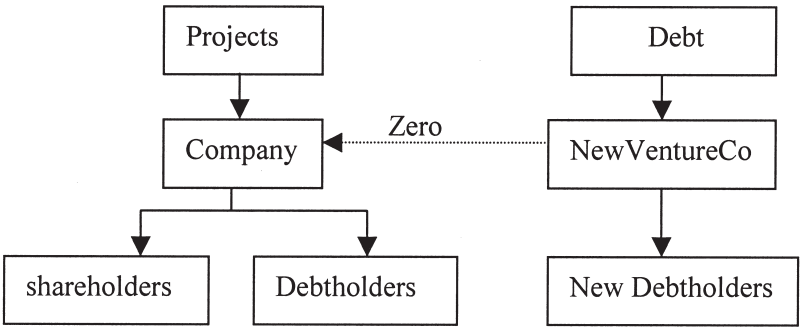


Figure 3
**New Venture with Capital Invested in Debt**




- $\mathbf{r_{eq}}$ = return on the equity market over the year.
- tax = the corporate tax rate.

(Bold text indicates an item that is unknown at the start of the year.)

We will also consider the pension plan. For simplicity we will assume that only two asset classes are available to the pension plan—equities and bonds. We use the notation:

- L = the pension liabilities.
- S = the solvency ratio of the pension plan (a percentage).
- $A_{eq}$ = the percentage of the pension plan assets invested in equities (e.g., the FTSE100 index).

Now we can set out our sample P&L statement as shown in Table 3.

We can now contrast two companies that are identical in every respect apart from their pension plan investment strategy. The first, "EquityPensionCo" invests its pension plan assets in equities ($A_{eq}$ = 100%) and the second "BondPensionCo" invests its pension plan assets in bonds ($A_{eq}$ = 0%). We will assume that both pension plans are 100% solvent at the start of the year (S = 100%).

Table 4 shows us that the impact of investing the pension plan in equities is equivalent to the shareholder borrowing to get exposure to the equity market. Of course, the shareholder could do this directly by borrowing $L \cdot (1 - \text{tax})$ at interest rate i and investing this amount in the equity index. Table 5 shows the return to investor I who invests in EquityPensionCo and to investor II who invests in BondPensionCo and then borrows to invest in the equity index.

Investor II will then have exactly the same return as investor I, the shareholder in EquityPensionCo. Note that this is not a probabilistic statement; it is true for whatever values we

Figure 4
**New Venture with Capital Invested in Equity**

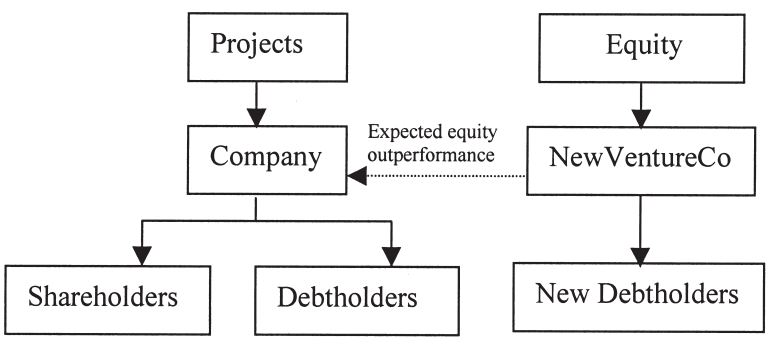


Table 3
**Profit and Loss Statement**

| | | |
|---|---|---|
| (1) | Operating Profit | **Profit** |
| (2) | Pension Fund Gain | $L \cdot (S \cdot A_{eq} \cdot \mathbf{r_{eq}} + S \cdot (1 - A_{eq}) \cdot i - i)$ |
| (3) | Debt Interest | $i \cdot D$ |
| (4) | Pretax Profit (1) + (2) − (3) | $\mathbf{Profit} + L \cdot (S \cdot A_{eq} \cdot \mathbf{r_{eq}} + S \cdot (1 - A_{eq}) \cdot i - i) - i \cdot D$ |
| (5) | Corporate Tax (4) × tax | $tax \cdot (\mathbf{Profit} + L \cdot (S \cdot A_{eq} \cdot \mathbf{r_{eq}} + S \cdot (1 - A_{eq}) \cdot i - i) - i \cdot D)$ |
| (6) | Post-Tax Profit (4) − (5) | $(1 - tax) \cdot (\mathbf{Profit} + L \cdot (S \cdot A_{eq} \cdot \mathbf{r_{eq}} + S \cdot (1 - A_{eq}) \cdot i - i) - i \cdot D)$ |

Table 4
**Comparison of Post-Tax Profit**

| | EquityPensionCo | BondPensionCo |
|---|---|---|
| Post-Tax Profit | $(1 - tax) \cdot (\mathbf{Profit} + L \cdot (\mathbf{r_{eq}} - i) - i \cdot D)$ | $(1 - tax) \cdot (\mathbf{Profit} - i \cdot D)$ |

have for equity returns $\mathbf{r_{eq}}$ and **Profit**. From this perspective it is clear that equity investment via a pension plan adds no value as it merely reproduces something the shareholder can achieve directly.[3] So far the only impact of the tax has been in the amount the shareholder in BondPensionCo must borrow and invest to replicate the exposure of the shareholder in EquityPensionCo.

From an economic viewpoint BondPensionCo is a lower risk investment as it does not have the geared exposure to the equity market. We would expect this to be in the interests of both the shareholders and the members. Firstly it is reasonable to expect that shareholders invest in particular companies because of the specific expertise that company has in its chosen field. If the companies in our example are, say, cheesemakers, shareholders invest in the company to benefit from the company's cheesemaking expertise and not because they think that the cheese makers have a competitive advantage in a totally different area, namely asset management. Similarly members of the pension plan benefit from greater security from a bond based investment strategy, and importantly it reduces the double jeopardy they face of the company becoming insolvent when the pension is insolvent. Individual members can easily take on further investment risk in their individual portfolios if they desire. It is much more difficult for a member to unwind risk taken in pension plans.

It is reasonable to ask whether it is advantageous to take additional risk in BondPensionCo. In effect BondPensionCo has a lower gearing than EquityPensionCo by virtue of removing risk from its pension plan. We will now investigate whether the balance sheet can be rearranged to benefit the shareholders. This is a far from theoretical issue, as the downgrade of BAE Systems in March 2003 was accompanied by comment on the pension fund with Standard & Poor's warning that with unfunded pension liabilities treated as debt, its gearing would rise from about 35 percent to between 55 and 65 percent. Other companies with large pension liabilities have also experienced downgrades; for example, ThyssenKrupp was downgraded to subinvestment grade as a result of its pension liabilities.

To achieve the same returns as the investor in EquityPensionCo the investor in BondPensionCo has to borrow money. We will now consider a third company, GearedBondPensionCo, which is identical to BondPensionCo but, in addition, reorganizes its balance sheet to remove the need for the individual investor to borrow. We can consider GearedBondPensionCo to be BondPensionCo after a capital restructuring. This requires the company to issue new debt of $D_1 = L \cdot S \cdot (1 - tax)$. We assume that the company has the same investment opportunities and, so this new debt is used to

[3] This conclusion was reached by Sharpe (1976) when ignoring tax. Once personal taxes are included we see that a move to bonds is value adding. This is covered later in the paper and in more detail in Tepper (1981) and Black (1980).

Table 5
**Comparison of Total Return**

| Returns From: | Investor I—EquityPensionCo | Investor II—BondPensionCo |
|---|---|---|
| Equity in Co | $(1 - \text{tax}) \cdot (\textbf{Profit} + L \cdot (r_{eq} - i) - i \cdot D)$ | $(1 - \text{tax}) \cdot (\textbf{Profit} - i \cdot D)$ |
| Equity Index | 0 | $r_{eq} \cdot L \cdot (1 - \text{tax})$ |
| Debt | 0 | $-i \cdot L \cdot (1 - \text{tax})$ |
| Total Return | $(1 - \text{tax}) \cdot (\textbf{Profit} + L \cdot (r_{eq} - i) - i \cdot D)$ | $(1 - \text{tax}) \cdot (\textbf{Profit} + L \cdot (r_{eq} - i) - i \cdot D)$ |

repurchase equity. The company's capital structure is now as shown in Table 6.

The P&L for GearedBondPensionCo is shown in Table 7.

For a company with a fully solvent pension plan (S=100%) at the start of the year we have a post-tax profit of

$$(1 - \text{tax}) \cdot (\textbf{Profit} - i \cdot (D + L \cdot (1 - \text{tax})))$$

Now consider the return to investor III, who holds the entire equity of GearedBondPensionCo and invests $D_1 = L \cdot S \cdot (1 - \text{tax}) = L \cdot (1 - \text{tax})$ in the equity index. Table 8 compares his return to that of investor I.

We can see that the capital restructuring in GearedBondPensionCo has led to an increased return to the shareholders of $(1 - \text{tax}) \cdot i \cdot L \cdot \text{tax}$, this is the tax shield. Again it is worth noting that this is not a probability statement but an annually realizable gain whenever tax is payable and is true for all values of $\mathbf{r_{eq}}$ and **Profit**.

For a pension plan with a solvency level of S the gain from the tax shield is $S \cdot (1 - \text{tax}) \cdot i \cdot L \cdot \text{tax}$. To capitalize this perpetual stream of cash flows, we could discount at interest rate i, which would provide a present value of $S \cdot (1 - \text{tax}) \cdot L \cdot \text{tax}$.[4] With a corporate tax rate of 30% this gives a gain to shareholders of 21% of the fund's assets.

The MM framework also answers other questions. For example, does it make sense for a company to borrow on its balance sheet to invest in the pension plan to eliminate the deficit? If the pension fund is to hold the assets in bonds, then to first order no change has occurred as the company is just swapping balance sheet debt for pension plan debt. However, the company runs the risk of destroying shareholder value if the funds are invested in equities. When tax is considered, we see that issuing debt to invest in the pension scheme is a value-creating proposition as the firm borrows at pretax rates and invests in taxable bonds on a tax deferred basis (see Tepper 1981 for details).

## 4.1 Other Considerations

There are, of course, other second-order effects beyond tax, for example, financial distress costs and agency costs. We briefly consider whether these are likely to change the basic result.

Financial distress costs can take many forms, ranging from poor access to credit to difficulty in retaining and recruiting staff. They are large and difficult to quantify. Are these costs more likely to arise from a bond based investment strategy for a pension fund? The reverse is more likely as a significant risk has been removed from the company and there is greater certainty over the future level of contributions required.

Agency costs also take many forms, from the cost to shareholders of management not acting in their interests to fees paid to third parties, including fund managers and consultants. Complex accounting treatment of pensions led to confusion during the equity bull market as to whether value was being created by managers from managing the business, as they were hired to do, or from

Table 6
**Capital Structure for GearedBondPensionCo**

| | |
|---|---|
| Initial Debt | D |
| New debt ($D_1$) | $L \cdot S \cdot (1 - \text{tax})$ |
| Total Debt | $D + L \cdot S \cdot (1 - \text{tax})$ |
| Initial Equity | E |
| Equity Repurchased | $L \cdot S \cdot (1 - \text{tax})$ |
| Total Equity | $E - L \cdot S \cdot (1 - \text{tax})$ |
| Pension Liabilities | L |

[4] Black (1980) argues that the discount rate should be the post-tax rate for a company that is healthy enough to expect to pay taxes in coming years. We have taken a more prudent approach in assessing the capital value of the gain.

Table 7
**Profit and Loss Statement**

| | | |
|---|---|---|
| (1) | Operating Profit | Profit |
| (2) | Pension Fund Gain | $L \cdot i \cdot (S - 1)$ |
| (3) | Debt Interest | $i \cdot (D+L \cdot S \cdot (1 - tax))$ |
| (4) | Pretax Profit (1) + (2) − (3) | $Profit + L \cdot i \cdot (S - 1) - i \cdot (D + L \cdot S \cdot (1 - tax))$ |
| (5) | Corporate Tax (4) × tax | $Tax \cdot (Profit + L \cdot i \cdot (S - 1) - i \cdot (D + L \cdot S \cdot (1 - tax)))$ |
| (6) | Post-Tax Profit (4) − (5) | $(1\text{-}tax) \cdot (Profit + L \cdot i \cdot (S - 1) - i \cdot (D + L \cdot S \cdot (1 - tax)))$ |

taking a bet on capital markets which shareholders could do in their own right. Greater transparency leads to lower agency costs and greater shareholder value.

Treatment of pensions as being debt-like, as has happened in the United Kingdom with the accounting standard FRS 17, is a move toward increased transparency. Similarly, removing an investment mismatch increases transparency. Reducing the risk also reduces the amount of management time that is needed and so frees up precious resource that can be more effectively applied elsewhere. Another gain from bond investment is the lower fees that bond portfolios usually command—a direct saving in the cost of pension provision.

The current system of significant cross-holdings through pension plans also represents a systematic risk to the economy as pointed out by Exley (2001). These cross-holdings have similarities to the Japanese system of "keiretsu," which has been criticized for magnifying the financial troubles in Japan.

The other area that has yet to be taken into account is personal taxation (although previous papers have covered this). Could it be that these overturn the advantages of bond investment? We find that so long as the personal tax rates are higher on bonds than equities the argument still holds—see, for example, Tepper (1981) or Bader (2003). This is the case in the United Kingdom where tax on dividends (32.5%) is lower than capital gains or income tax (40% top rate). Equities are also attractive as they allow the investor to defer paying tax on gains and to offset losses against gains increasing their attractiveness to an individual investor. In the United States, the attractiveness of equities is likely to be increased with proposals to reduce tax rates on dividends. These tax rates support the argument that has gone before.

## 5. THE BOOTS EXAMPLE

In November 2001, the U.K. pharmacy retailer Boots announced that its £2.3 billion ($3.5 billion) pension fund—one of the U.K.'s 50 largest funds, with 72,000 members—had quietly sold all of its equities and moved 100% of its assets into long-dated AAA/Aaa sterling bonds over the 15-month period to July 2001. The bonds are a very close match for the maturity and indexation of U.K. pension liabilities, have a weighted average maturity of 30 years and 25% are inflation-linked.

Boots' rejection of the cult of the equity was based, unashamedly, on financial economics. Boots accepted the conclusion that pension assets and liabilities should be matched and pension funds should hold bonds not equities.

The move to bonds reduced risk for Boots' shareholders and bondholders—the value of pension assets and liabilities should now move in tandem, reducing the risk of a future pension

Table 8
**Comparison of the Return to Investor III and Investor I**

| Returns From: | Investor I | Investor III |
|---|---|---|
| Equity in Co | $(1 - tax) \cdot (\mathbf{Profit} + L \cdot (\mathbf{r_{eq}} - i) - i \cdot D)$ | $(1 - tax) \cdot (\mathbf{Profit} - i \cdot (D + L \cdot (1 - tax)))$ |
| Equity Index | 0 | $\mathbf{r_{eq}} \cdot L \cdot (1 - tax)$ |
| Debt | 0 | 0 |
| Total Return | $(1 - tax) \cdot (\mathbf{Profit} + L \cdot (\mathbf{r_{eq}} - i) - i \cdot D)$ | $(1 - tax) \cdot (\mathbf{Profit} + L \cdot (\mathbf{r_{eq}} - i) - i \cdot D + i \cdot L \cdot tax)$ |
| Investor III—Investor I return | 0 | $(1 - tax) \cdot i \cdot L \cdot tax$ |

deficit, which would require higher company contributions.

Pension members also have less risk as they are no longer reliant on the performance of equities for their pensions. Legal protection for members is weaker in the United Kingdom than in the United States, and there is no equivalent to the PBGC—there are many people in the United Kingdom who have lost their jobs and some, or all, of their pension when their employer went bust. Furthermore, in the United Kingdom the assets that have to be in a pension plan being wound up by even a solvent company fall far short of that required to secure all pension payments.

By selling equities during 2000 and 2001, Boots locked in a surplus that has fixed future contributions at their current level in real terms. The move has also slashed fees and costs to £300,000 a year from £10 million as the bonds are held with no trading and automatic reinvestment of net income.

During 2002, Boots Pensions was able to increase the proportion of inflation paying assets from 25% to 50% through interest rate swaps with maturities up to 2030, giving an even better match for the pension guarantees.

The Boots Company entered a £300-million-share buyback in 2002, made possible by having moved the plan assets to matching bonds. Reducing risk "off balance sheet" in the pension fund allowed Boots to increase risk "on balance sheet." Because the credit-rating agencies recognized the reduction of risk in the pension fund, this share buyback was possible without weakening the credit rating.

This move created huge controversy in the U.K. financial world and received huge press coverage. Many people looked for conventional explanations for the move. Over the following months Boots went out of its way to explain that the move was not driven by the requirements of the controversial new U.K. accounting standard FRS 17, which values pension assets and liabilities on a market basis. However, FRS 17 does allow shareholders, creditors and plan members to see clearly what Boots has done and to see the risks in equity investment. Nor was the move driven by a timing call on the equity market, Boots was lucky to sell equities into a falling equity market at an average FTSE level of 6,000 and buy bonds in a rising market, but the move was not about trying to outguess the market.

It has also been suggested that the maturity of the plan motivated the move, but this is not so. In the Boots plan about half of the plan members are current employees, so the plan is not very mature. Many U.K. and U.S. plans are much more mature.

Can we estimate what value was created by the Boots pension plan's move to matching bonds? The Boots Company was able to increase on-balance-sheet risk through a £300-million-share buyback. At the U.K. corporation tax rate of 30% this represents about £100 million of tax value. The clear "loser" of this £100 million is the U.K. government.

The move into bonds also reduced fund management fees; almost £10 million per annum have been saved. Even using a high discount rate for today's economic circumstances of 8% this gives a multiple of 12.5 times, another £125 million saving for shareholders. The losers of this £125 million are the fund managers.

In total the move has delivered £225 million of value to shareholders—around 10% of the fund's value.

In addition, both the company and pension trustees have drastically reduced the valuable time they have to devote to pension matters, allowing them to concentrate on managing the core business.

In conclusion, the application of financial economics has resulted in benefits to both members and shareholders at the expense of the taxpayer and other third parties. The members have benefited as their pension promise is now more secure and the shareholders have an ongoing gain from a more tax efficient structure where the management are focused on the areas where they can add value.

Harvard Business School now teaches Boots Pension Plan move as a case study.

## 6. CONCLUSIONS

The idea that U.K. and U.S. pension funds should hold matching bonds is the orthodoxy of financial theory going back 20 years. Conventional wisdom that equities outperform bonds and that this outperformance reduces pension costs crucially ignores risk. The equity risk premium is a reward

for risk, not a "free lunch." Pension fund risk has been opaque to U.K. and U.S. shareholders, creditors, and plan members because of poor accounting and disclosure requirements. Pension plan risk is becoming more apparent in the United Kingdom with the increased transparency of FRS 17. Shareholders, creditors and pension plan members will expect pension risk to be properly managed.

All U.K. companies have reported under the first stage of the new accounting standard FRS 17 over the last year, with most showing deficits. The aggregate shortfall in U.K. pension funds has been estimated at £100 billion. Shareholders and the credit rating agencies are starting to ask questions.

The world has also been reminded that equities are not a one-way bet. When equity markets were rising inexorably it was easy to ignore those people challenging the cult of the equity. With world equity markets significantly below their peaks, minds are concentrated wonderfully. From today's current absolute levels, the equity market could go up or it could go down, just like flipping a coin. Meanwhile, pension liabilities have increased substantially over the last decade as long-term interest rates have fallen.

The International Accounting Standards Board and the FASB are moving toward FRS 17-type accounting for pensions. As this happens, the greater transparency will prompt shareholders, creditors, and members in other countries to question "why equities in the pension fund?"

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## REFERENCES

BADER, LAWRENCE N. 2003. "The Case Against Stock in Corporate Pension Funds," *Pension Section News* (February): 17–19.

BLACK, FISCHER. 1980. "The Tax Consequences of Long-Run Pension Policy," *Financial Analysts Journal* 36: 21–28.

BODIE, ZVI. 1995. "On the Risk of Stocks in the Long-Run," *Financial Analysts Journal* (May/June): 18–22.

EXLEY, C. J. 2001. "Pensions funds and the UK economy." Joint Institute and Faculty of Actuaries Finance and Investment. Online at http://www.gemstudy.com/defined_benefit_pensions.htm. Presented to the Joint Institute and Faculty of Actuaries Finance and Investment Conference, Guernsey, 25th June 2001.

MODIGLIANI, FRANCO, AND MERTON H. MILLER. 1958. "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review* 48: 261–97.

SAMUELSON, PAUL. 1994. "The Long-Term Case for Equities," *Journal of Portfolio Management* (Fall).

SHARPE, W. 1976. "Corporate Funding Pension Policy," *Journal of Financial Economics* 3: 183–93.

SMITH, A. D. 1996. "Salary Related Cash Flows: Markets Based Valuation." Paper presented at the "Institute of Mathematics and its Applications/Institute and Faculty of Actuaries Conference on Actuarial Valuations, Accounting Standards and Financial Economics," Jan. 20. Online at http://www.gemstudy.com/defined_benefit_pensions.htm.

TEPPER, I. 1981. "Taxation and Corporate Pension Policy," *Journal of Finance* 36: 1–13.

WHELAN, S. F., D. C. BOWIE, AND A. J. HIBBERT. 2002. "A Primer in Financial Economics," *British Actuarial Journal* 8(1): 40–42.

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