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TAXES, INSURANCE, AND CORPORATE PENSION POLICY

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by

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ABSTRACT

The passage of ERISA in 1974 has significant impact on corporate pension plans in the U.S. In this paper, the special tax treatment and regulation of the defined-benefit private pension plans under ERISA are discussed, and the joint effects of taxation and insurance on corporate pension policies are analyzed.

I wish to thank Chris Barry, Jim Bodurtha, John Boyd, Pat Hendershott, Ed Kane and Rene Stulz for helpful comments. I am also grateful to the participants in seminars at Southern Methodist University, The Ohio State University, University of Illinois and University of Wisconsin-Madison.
Taxes, Insurance, and Corporate Pension Policy

I. Introduction

Since the passage of the Employee Retirement Income Security Act (ERISA) in 1974, considerable attention has been given to the study and development of optimal strategies for corporate pension management. The pension liabilities have now become parts of corporate liabilities under ERISA, therefore, the management of corporate pension plans has become an integral part of corporate management of financial managers. The corporate pensions are subject to special tax treatments in the Internal Revenue Code and are subject to various regulations under ERISA. Therefore, it is very important to analyze and understand the complex trade-offs among various explicit and implicit benefits and costs before some useful strategy recommendations can be suggested for corporate pension management. Without a comprehensive analysis of these complex trade-offs, any policy recommendations could be biased and nonoptimal.

Several important contributions in the area of corporate pension management have been developed in finance literature and some specific recommendations on corporate pension policies have been derived. For instance, Sharpe (1976) has shown that in the absence of taxes and under the current structure of a fixed insurance premium charged by the PBGC, the "insurance effect" calls for an optimal policy with a minimum plan funding and a maximum investment in risky assets. On the other hand, Black (1980) and Tepper (1981), have argued that in the absence of default risk and pension insurance, the "tax effect" calls for a maximum plan funding and investing the pension fund totally in highly taxed assets such as bonds. Although these analyses have greatly
enhanced our understanding of the major problems and issues associated with
corporate pension plans, their antipodal recommendations on pension policies
are based upon partial and incomplete analyses, and hence are not generally
acceptable.

The purpose of this study is to analyze the complex features of taxes
and regulation on corporate pension plans in the U.S. labor market. The
pension assets and pension liabilities are integrated into corporate assets
and corporate liabilities for the purpose of examining changes in the
ownership rights of claims to assets caused by the enactment of ERISA.
Contingent-claim analysis is used to determine the economic value of
pension claims and to study the implications of ERISA on corporate pension
policies.

The paper is organized as follows. In Section II, the tax provisions
as well as the major provisions of ERISA for corporate pension plans are
described. Section III uses the augmented balance sheet of General Motors
to illustrate the importance of pension assets and liabilities in the
corporate financial structure. The tax effects on corporate pension policies
derived in the previous studies are summarized in Section IV. In Section V,
we employ contingent-claim analysis to determine the economic value of the
pension claims before and after ERISA. Some general properties about the
value of pension claims are also described. The insurance effects on pension
policies are described in Section VI. The joint implications of taxes and
insurance are discussed in Section VII. The final section contains a brief
summary of the study.
II. Taxes and Regulations On Corporate Pension

A. Tax Provisions For Corporate Pension

It is well recognized that the special tax status of corporate pension plans is one of the major factors that a firm offers pensions to its employees. Therefore, it is useful for us to briefly summarize the major tax provisions for the qualified pension plans in order to clarify the impact of taxation on the corporate pension policies. The major tax provisions for the qualified pension plans, as specified in the Internal Revenue Act of 1942, include,

1. An employer's contribution to a pension plan on behalf of an employee is not taxable as income to the employee until it is realized as a pension payment. Thus, it is a tax deferral for the employee.

2. The investment income of a pension plan is tax exempt. Therefore, this provision constitutes a tax deferral for the employee because the investment income is not taxed until it is distributed and realized as pension income.

3. The employer's contributions to a pension plan are immediately deductible from business income.

In addition to these three broad tax provisions, the special tax treatment of the Individual Retirement Accounts (IRAs) should be noted. The provisions in ERISA allowed anyone who is not a participant in a qualified pension plan to set up an IRA and make contributions up to $1,500 a year that are excludable from the current taxable income until it is distributed from an IRA. Furthermore, the investment income earned by an IRA is not taxed until it is distributed. The special tax treatment of the IRAs was recently liberalized in The Economic Recovery Tax Act of 1981. The 1981 Tax Act has made IRAs available to everyone and increased the maximum excludable contributions to $2,000 a year.
Finally, there are other tax provisions that are relevant in the discussions of tax effects on corporate pension plans. These relevant tax provisions are:

1. The corporate pension accruals are not counted as part of the payroll tax base.
2. The corporate pension accruals are not credited to the social security benefit base.
3. The social security benefits are tax exempt.

Therefore, contrary to the argument that a pension plan and an IRA are equivalent in providing tax shelter, we know that a pension plan provides a shelter from payroll taxes that an IRA does not. When an employee receives a deferred benefit such as pension accrual rather than an equivalent amount of wages, both the employee and the employer avoid their share of the payroll taxes on the wages. Thus, there is a net tax advantage provided by a pension plan.

B. Major Provisions Of ERISA

The enactment of ERISA in 1974 has greatly changed the corporate pension system in the U.S. The defined benefit pension plans are now regulated by the provisions of ERISA that include the establishment of the benefit insurance program and rules on pension coverage and minimum vesting and funding standards. Some of the major provisions will be reviewed in the following.

1. ERISA established the Pension Benefit Guaranty Corporation (PBGC) within the Department of Labor. The PBGC is a quasi-governmental agency which insures and regulates pension plans. The premiums for the pension benefit insurance are currently $2.60 per employee per year and are paid by the employers or the pension plans.

The Guaranty Corporation was empowered by ERISA to monitor corporate pension plans, and if necessary to terminate a pension plan. A corporate pension plan
can be terminated due to any of the following reasons:

(1) if it has failed to meet the minimum funding requirement;
(2) if it is unable to pay benefits when due;
(3) if it has been administered improperly; or
(4) if its continuation is likely to increase the Guaranty Corporation's liabilities unreasonably.

ERISA also specified that if a pension plan were terminated for any of the above reasons, the Guaranty Corporation had the power to place a lien on the sponsoring firm's assets up to 30 percent of the company's net worth.\textsuperscript{6/} This lien would be senior to all unsecured liabilities of the company except wages.

2. ERISA imposed some minimum funding standards. Prior to ERISA, pension plans only had to comply with IRS standards in order to be qualified. The IRS standards required that the current accruals and the interest on the unfunded liabilities be funded. ERISA required that pension liabilities due to past service must be amortized over a period not exceeding 40 years for existing plans and 30 years for new plans. In addition, any increased liabilities which arise with a liberalization of pension benefits must be amortized over 30 years.

A pension plan must be examined by an actuary at least once every three years, and any experienced gains or losses which arise from the actuary examination must be amortized over a 15-year period. Failure to meet these funding standards would make the company subject to a 5 percent nondeductible penalty tax, and if the funding deficiency was not corrected in 90 days an additional nondeductible penalty tax equal to 100 percent of the deficiency would be assessed.

3. ERISA imposed fiduciary responsibility for pension plan administrators.
The pension plan managers are required to act solely in the interest of plan participants, and they could be liable for losses that result from any violation of the "prudent man" rule. ERISA also imposed rules on reporting and disclosure. It mandated plan audits, actuarial evaluations, and an itemized listing of pension assets. It also required that certain types of information be given directly to the plan participants.

Therefore, the above provisions of taxes and insurance regulation indicate that ERISA has maintained the tax advantage for employers to provide pension plans and made pension benefits more certain for plan beneficiaries. A more certain pension benefit means a lower cost for firms to provide the deferred compensations. Under ERISA, firms have gained this benefit of lower cost of providing the deferred compensations by paying an explicit price of nominal fees for insurance and an implicit price of subjecting themselves to some regulatory taxes imposed by the Guaranty Corporation.

III. Importance of Pension Plans In Corporate Financial Structure

The change in the legal status of pension liabilities under ERISA and the rapid growth of pension plans in the postwar period have made pension plans the major component of corporate financial structure. Prior to ERISA, pension liabilities were not liabilities of the firm. Upon the termination of a pension plan, the beneficiaries only had the legal claims on the assets of the pension fund; if pension funds were not sufficient to cover the accrued liabilities, the beneficiaries of the plan would not have recourse to the general assets of the company. However, the pension liabilities have now become parts of corporate liabilities under ERISA, and the management of corporate pension plans has become an integral part of corporate management of financial managers.

The rapid growth of pension plans have made pension assets and pension
liabilities the important components of financial structure of large corporations. A recent survey of 470 of the Fortune 500 companies showed that these companies incurred $21.5 billion in pension costs in 1980, which was about 12.6 percent of pretax profits and 8.1 percent of wages and salaries. The pension assets for these companies amounted to about 13 percent of total corporate assets and about 31 percent of net worth. On the liabilities side, the companies had accumulated about $151 billion of vested pension liabilities, which was about 24 percent of outstanding corporate liabilities for these companies.

To see the importance of pension plans in corporate financial structure of a firm, we have constructed an augmented balance sheet for General Motors (GM) as of the end of 1982 in Figure 1 below. At the end of 1982 GM had an actuarial present value of plan benefits obligation of $18.1 billion. With pension assets of about $14.4 billion, the company had "unfunded" pension liabilities of $3.7 billion. The pension assets of the company amounted to about 25.8 percent of its total corporate assets. GM's unfunded pension liabilities at the end of 1982 amounted to about 25.5 percent of the company's net worth in book value. Moreover, the pension liabilities of GM at the end of 1982 were about 41.3 percent of its outstanding corporate liabilities and were about four times of its book value of long-term debt. Therefore, the presence of such a large amount of pension liabilities for the company cannot be ignored by the workers, shareholders, creditors and managers of the company. The management of pension plans should be an important part of financial management decisions and should be of great concern to the financial managers of the major corporations.
### General Motors Augmented Balance Sheet
December 31, 1982
(all figures in billions of dollars)

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities and Common Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pension Fund Assets 14.4</td>
<td>Pension Liabilities 18.1</td>
</tr>
<tr>
<td>Plant and Equipment 21.5</td>
<td>Long-Term Debt 4.5</td>
</tr>
<tr>
<td>Other Long-Term Assets 5.9</td>
<td>Equity 14.5</td>
</tr>
<tr>
<td>Current Assets 14.0</td>
<td>Other Long-Term Liabilities 6.3</td>
</tr>
<tr>
<td></td>
<td>Current Liabilities 12.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>55.8</td>
</tr>
</tbody>
</table>

### IV. Tax Effects On Pension Policy

As mentioned earlier, corporate pension plans have two major tax provisions: (1) the employers' contributions to the pension funds are deductible immediately for tax purpose; and (2) the earnings in the pension funds are not taxed. The special tax status of corporate pension plans is an important factor for firms to offer pension plans to their employees. Furthermore, the special tax treatment of pension plans provides the important influence on corporate pension policies, that include (1) funding policy -- deciding the level of funding the pension funds; and (2) investment policy -- deciding the optimal composition of pension fund assets.

Two important recent papers, by Black [1980] and Tepper [1981], have studied the effects of taxation on corporate pension policies. Black has...
argued that a firm maximizing shareholder wealth should employ the extreme strategies in pension policy to capture the tax advantage under the current tax laws, namely funding the pension with debt issue to the greatest possible extent and investing the entire pension fund in bonds. His plan calls for a change from stocks to bonds in the pension fund and a change from stock to bonds in the firm's capital structure. Black's arguments for the extreme pension policies are based upon the "debt capacity" model. Essentially, he argues that shifting from stocks to bonds in the pension fund will increase the firm's debt capacity or borrowing power, which in turn can be utilized to obtain additional tax subsidies through larger corporate leverage.

Tepper's study of the impact of taxes on optimal corporate pension policy was based upon Miller's [1977] model of capital market equilibrium in the presence of corporate as well as personal taxes under certainty. He argues that a firm should fully fund its pension plans to capture the advantage of tax-deductibility of pension contribution and that the entire pension fund should be invested in bonds to earn the pre-tax interest rates. Thus, Tepper has derived similar recommendations on optimal pension policy based upon a different model of capital market equilibrium. It should be noted that Tepper has argued, based upon Miller's invariance proposition of corporate leverage, that the sources of funding a pension plan are of no significant importance, a result which is different from that of Black's debt capacity model. Of course, if one allows the costs of tax avoidance to be present in Miller's equilibrium, as Barnea et al [1981] have done, then the sources of funding a firm's pension plans will be of importance and a firm's total liabilities (both pension and corporate liabilities) will be uniquely determined.

It should be noted that Black's and Tepper's extreme recommendations on optimal pension policy are based on the "tax effect" alone. They have not
considered the pension default risk and the pension insurance mandated under ERISA. As we shall see later in this paper, an analysis of corporate pension policy without incorporating the "insurance effect" is not complete, and any policy recommendations result from such a partial analysis could be misleading. Furthermore, an extreme investment policy of holding bonds only in a pension fund will limit the fund's ability to hedge against unanticipated inflation in the economy.

V. Value of Pension Claims

To fully understand the financial implications of ERISA on corporate pension plans, it is important to know the economic values of claims on a pension plan before and after the passage of ERISA. Following Sharpe [1976] and Treynor et al. [1976], we shall apply contingent-claim analysis to discuss the economic values of pension claims before and after ERISA and examine the changes of ownership rights to the claims of the assets of defined-benefit pension plans.

A. Pre-ERISA

Before ERISA a pension beneficiary's legal claim was against the pension fund and not the assets of the sponsoring company. It was similar to but not the same as a conventional lender's claim, because a pension beneficiary could not force the company into bankruptcy or liquidation. Applying the simple contingent-claim analysis, the claim of pension beneficiaries at the end of the year can be expressed as

\[
PC(T) = \min \{ PA(T), B(T) \},
\]

where,
\[
PC(T) = \text{economic value of pension claim at the end of the year;}
PA(T) = \text{market value of pension assets at the end of the year;}
B(T) = \text{vested pension liability at the end of the year.}
\]
The pension claim can be viewed in two equivalent ways: (1) the pension fund "owned" the pension assets and had the right to "put" them to the pension beneficiaries in satisfaction of their claim against the pension fund; or (2) the pension beneficiaries "owned" the assets in the pension fund, but the pension managers had the option to "call" the assets in return for paying off the vested pension liability. Therefore, the option pricing formula of Black and Scholes [1973] can be used to determine the economic value of a pension claim. The expression for pension claim in Equation (1) can be written as

\[ PC(T) = \min \left[ PA(T), B(T) \right] \]

\[ = B(T) - \max \left[ B(T) - PA(T), 0 \right]. \] (2)

Therefore, the current value of a pension claim, PC, can be expressed in the following equation:

\[ PC = B - P(PA, B(T), \sigma^2) \] (3)

where,

PC = current value of pension claim;

B = present value of the vested pension benefit, discounted at the riskless interest rate; the contractual value;

\( P(\ ) = \) put option with relevant parameters in parentheses;

PA = current value of pension assets;

\( \sigma^2 = \) variance rate of return on the pension assets.

Viewing the pension claim in this way, the economic value of any pension claim can be shown to consist of two elements, each of which can be analyzed in terms of the financial theory: (1) the "contractual" value of the pension claim, that is the present value of pension claim, discounted at the riskless interest rate; and (2) the so-called "pension put" on the assets in the pension fund, with an exercise price equal to the vested pension benefit at the end of the year, B(T).
From Black and Scholes' option pricing formula, we know that the expression for the pension put is

\[
P(P_A, B(T), \sigma^2) = -P_A \cdot N \left\{ \frac{-\ln \left( \frac{P_A}{B(T)} \right) - \left( r + \frac{\sigma^2}{2} \right) T}{\sigma \sqrt{T}} \right\} + B \cdot N \left\{ \frac{-\ln \left( \frac{P_A}{B(T)} \right) - \left( r - \frac{\sigma^2}{2} \right) T}{\sigma \sqrt{T}} \right\}
\]

(4)

where,

\[N(.) = \text{the cumulative standard normal distribution};\]

\[r = \text{the riskless rate of interest}.
\]

Some general characteristics of a pension put are as follows:

\[
\frac{\partial P}{\partial P_A} < 0 \quad (5a)
\]

\[
\frac{\partial P}{\partial B(T)} > 0 \quad (5b)
\]

\[
\frac{\partial P}{\partial \sigma^2} > 0 \quad (5c)
\]

Therefore, we know the following results:

\[
\frac{\partial P_C}{\partial P_A} > 0 \quad (6a)
\]

\[
\frac{\partial P_C}{\partial B(T)} > 0 \quad (6b)
\]

\[
\frac{\partial P_C}{\partial \sigma^2} < 0 \quad (6c)
\]
The above results indicate that the value of pension beneficiaries' claim increases if either the value of the pension assets or the vested pension benefit increases; the value of pension claim decreases if the risk of pension assets increases. Figure 2 shows how the value of a pension claim is related to the pension put and the assets in the pension fund. As the pension claim approaches its due date (which is the same event as the pension put approaching its expiration date) the value of the claim net of the pension put approaches the kinked line shown in the figure. On the other hand, the longer until the pension claim falls due (which is the same event as the pension put having longer time to the expiration), the more gradual will be the option curve for the pension put and therefore the less the pension claim net of the pension put will be worth for any given value of the pension assets.

![Figure 2. Value of Pension Put and Pension Claim](image-url)
B. Post-ERISA

As we have discussed earlier, ERISA established PBGC which monitors corporate pension plans and insures pension benefits for beneficiaries. Furthermore, the PBGC has the power to place a lien on the company's assets up to 30 percent of its net worth if a pension plan were terminated for the reasons specified in ERISA. In other words, the PBGC has exchanged a certain claim against itself with a complex option against the company from the pension beneficiaries. This change of ownership rights of claims to the assets of the firm has significant impact on pension policies as well as other corporate financial management policies.

The pension claim of the PBGC at the end of the year can be expressed as follows:

\[
PPC(T) = \min \left[ PA(T) + \max \left( 0.3( CA(T) - F(T) ), 0 \right), B(T) \right]
\] (7)

where,

- \( PPC(T) \) = the PBGC's pension claim at the end of the year;
- \( CA(T) \) = value of corporate assets at the end of the year;
- \( F(T) \) = the face value of corporate liability (unsecured debt).

The pension claim of the PBGC in Equation (7) is a complex option, and its value can be determined using the option pricing technique. To clarify the general characteristics of this complex option, let us define an asset \( H \) which pays nothing until the end of the year \( T \) and pays \( PA(T) + \max \left( 0.3( CA(T) - F(T) ), 0 \right) \) at time \( T \). Let \( H( PA, CA, F ) \) be the current value of asset \( H \), and \( C( CA, F(T) ) \) be the current value of a European call option on the corporate assets, \( CA \), with an exercise price \( F(T) \). Then, we can see that:

\[
H( PA, CA, F ) = PA + 0.3C( CA, F(T) )
\] (8)
In other words, the current value of asset H is equal to the sum of the current value of the pension assets and 30 percent of a call option on corporate assets with exercise price equal to the face value of the unsecured debt of the company. With these results, we can express the pension claim of the PBGC as a function of the value of asset H:

$$PPC(T) = \min \{ H(T), B(T) \}.$$ (9)

Therefore, the present value of the PBGC's pension claim can be expressed as follows:

$$PPC = B - P(H, B(T))$$ (10)

Equation (10) shows that the value of the PBGC's claim is equal to the contractual value of pension claim (i.e., the present value of vested pension liabilities, discounted at the riskless interest rate) minus the value of a put option on asset H. Some of the general properties of the PBGC's claim can be obtained using the known properties of simple put and call options. Let the current value of the pension claim of the PBGC be $$PPC(\text{PA}, \text{CA}, B(T), F(T))$$, we know the following results:

$$\frac{\partial PPC}{\partial \text{PA}} = -P_H \frac{\partial H}{\partial \text{PA}} > 0$$ (11a)

$$\frac{\partial PPC}{\partial \text{CA}} = -P_H \frac{\partial H}{\partial \text{CA}} > 0$$ (11b)

$$\frac{\partial PPC}{\partial B(T)} = e^{-rT} - \frac{\partial P}{\partial B(T)} > 0$$ (11c)

$$\frac{\partial PPC}{\partial F(T)} = -P_H \frac{\partial H}{\partial F(T)} < 0$$ (11d)
\[ \frac{\partial \text{PPC}}{\partial \rho_{cp}} < 0^{10/} \]

where \( \rho_{cp} \) is the correlation coefficient between returns on CA and PA.

The above results indicate that the value of the pension claim increases if the value of the pension assets or the value of the corporate assets increases. The value of the pension claim also increases if the vested pension liabilities increase, but it decreases if the face value of the unsecured debt of the company increases, because a higher face value for corporate debt implies a decrease in the net worth value for the PBGC.

As shown in Equation (3), the value of the participants' pension claim pre-ERISA is equivalent to a certain claim on the vested pension benefit combined with a short position in a pension put on the pension assets; while as shown in Equation (10), the post-ERISA value of the PBGC's pension claim is equivalent to a certain claim on the vested pension benefit combined with a short position in a pension put on asset H. Therefore, the post-ERISA value of the pension claim has increased from the pre-ERISA value by 30 percent of the value of a call option on the corporate assets with exercise price equal to the face value of the unsecured debt. An interesting question is who bears the cost of this difference. Since the Guaranty Corporation has been charging a fixed insurance premium on all defined-benefit pension plans, it can be seen that shareholders of the firms with unfunded pension plans gained at the expense of those with fully funded pension plans. How much welfare loss the shareholders of the firms with fully funded pension plans had experienced from the passage of ERISA is an interesting empirical question.\textsuperscript{11/}
VI. Insurance Effects on Pension Policy

Sharpe [1976] has shown that in the absence of taxes and given the current structure of a fixed insurance premium charged by the PBGC, the "insurance effect" calls for an optimal pension policy that involves with a minimum funding and investing more of the pension funds in the risky assets to maximize the default risk. It should be pointed out that Sharpe's analysis of pension claim based upon the option pricing model is closer to the situation before ERISA, because he uses the pension assets, and not the combined corporate and pension assets, as the underlying assets for the pension put. In other words, his analysis is similar to our discussion in Section V.A. Pre-ERISA, rather than that in Section V.B. Post-ERISA. However, the implications of insurance effect on pension policy derived by Sharpe are similar to what we discuss here.

The general properties of the value of the PBGC's claim described in Equations (11a) - (11e) provide useful information about insurance effects on pension policy. If we consider only the insurance effects, the optimal pension policy calls for a minimum funding of the pension plans. Reducing the value of the corporate assets by means of increasing dividend payments to the shareholders will reduce the value of the PBGC's pension claim—an interesting linkage between dividend and pension policies. In addition, an increase in the amount of corporate liabilities will decrease the value of pension claim and result in an increase in the wealth to the shareholders. Finally, an increase in the correlation coefficient between corporate assets and the pension assets (that is, a decrease in the diversification among corporate and pension assets) will also result in a wealth gain for the shareholders.

The above results are based on the assumption of a fixed insurance premium
charged by the PBGC. If the Guaranty Corporation charges a variable insurance premium that reflects the fair value of its contingent liabilities, then the policy implications described above will not necessarily be applicable. Even under the current structure of a fixed explicit premium, the PBGC does impose an implicit premium of monitoring corporate pension plans. Therefore, if the PBGC exerts its regulatory power diligently, few pension plans can obtain abnormal gains at the expense of the Guaranty Corporation.\textsuperscript{12/}

As in the case of tax effects on pension policy, looking at the insurance effects on pension policy alone is not complete, and it might result in some misleading recommendations for corporate pension managers. After ERISA, the decisions on plan funding, asset allocation, and benefit accrual are of great importance to the workers, shareholders, financial managers, creditors and the PBGC. These decisions are based upon the complex trade-offs among various explicit and implicit benefits and costs within the tax and regulatory environment. Moreover, pension plan policies have become the integral parts of general corporate financial management decisions. Thus, it is important to integrate the "tax effect" and the "insurance effect" together and discuss their joint effects on pension as well as corporate debt policies.

VII. Implications for Pension and Debt Policies

As we have discussed, the tax effect, in the absence of default risk and pension insurance, calls for a maximum plan funding and a maximum holding of bonds in pension funds. However, full-funding policy is not consistent with empirical evidence. Mumy and Manson [1982] have observed a steady rise in the average level of underfunding for the period 1973 through 1978. In their sample of 200 firms the average ratio of total unfunded vested benefits to total assets had increased from 3.9 percent in 1973 steadily to 5.4 percent in 1978. The current tax laws do give the firms the incentive to fund their
pension plans fully, since pension contributions made by employers are deductible immediately. Then, why do we observe underfunding among firms? Since the insurance effect calls for a minimum funding, one can presume that the insurance effect dominates the tax effect for some firms and they obtain benefits from underfunding that offset the known tax advantages.

How about the portfolio allocation policy? The "tax effect" calls for investing the pension funds totally in bonds; while the "insurance effect" calls for investing mainly in risky assets such as stocks. Again, neither one of these two extreme policies has been applied in the real world. As Tepper [1981] has pointed out, equities accounted for approximately 50 percent of pension investments in 1981, and they have ranged from a low of 19 percent in 1950 to a high of 74 percent in 1972. It is possible that consideration of both effects by firms have resulted in non-corner solutions. Furthermore, the tax effects on pension policy in the previous studies were derived based on the assumption of perfect certainty. In the presence of uncertainty, factors other than the tax factor such as diversification service or inflation-hedging could also be important in portfolio allocation decisions.

Our discussion focuses on the implications of the "tax" and the "insurance" effects on pension policies. Other factors undoubtedly influence pension policies. Bulow et al. [1982] have argued that a plan could remain underfunded for long periods of time if the following two conditions were met: (1) workers negotiated their wages and benefits as a group, and (2) workers possessed firm-specific human capital. Furthermore, after ERISA the pension assets and pension liabilities are integrated into corporate assets and corporate liabilities, the pension policies can not be carried out without checking their possible effects on the firm's overall investment and financing decisions. For example, underfunding decision can be made a part of the overall corporate
borrowing decision. Underfunding is equivalent to borrowing directly from the workers and thus provides the firm with an additional source of internal capital, that usually has a lower transaction cost and greater flexibility. Having alternative sources of financing is especially valuable to firms in a period of relatively tight credit in the economy such as the 1973-79 period when the Regulation Q was in effect.

VIII. Conclusions

The passage of ERISA has significant impact on corporate pension plans. Under ERISA, defined-benefit pension plans are required to be enrolled in the pension benefit insurance program of the PBGC and to pay some fixed premium. In addition, the pension plans are subject to various regulatory constraints such as rules regulating the uses of the assets in the pension funds, rules constraining the way the assets in the pension funds are managed, and rules requiring audits and reports to government agencies and the plan participants. However, the defined-benefit pension plan has remained a viable alternative to other types of pension plans, such as defined-contribution pension plans that are not under the regulations of ERISA. This shows that the increased costs of ERISA have been balanced with explicit as well as implicit benefits such as tax advantages for employers to retain the defined-benefit pension plans.

The management of corporate pension plans has become an important part of the general corporate management decisions. Efficient pension-plan management requires a good understanding of the complex tax and regulation environment. We have analyzed in this paper some tax and insurance effects from pension policies. We have argued that, because extreme strategies on pension policy derived in previous studies were based on a partial and
incomplete analysis, they are not generally acceptable.

To analyze the differential effects of taxation and insurance on the value of pension claims in a unified model and to examine their relative effects on pension policy are important areas for further study. Empirical evidence on trends in the relative importance of pensions in the workers' total compensation would be of special interest. The financial impact of ERISA on wealth transfers among security holders has important policy implications that deserve careful study. Finally, searching for ways to improve the effectiveness of corporate pension insurance programs under ERISA would be an important topic for more research.
Footnotes

1. Mumy and Manson [1982] have reported that among the three incentives for offering the pension plans: (1) the tax incentive; (2) the productivity incentive; and (3) the incentive to expand internal capital market, that they had examined, the tax incentive accounts for virtually all of the incentive to give pensions.

2. The Revenue Act of 1942 required that a pension plan be nondiscriminatory in terms of coverage, contributions and benefits to qualify for the tax-exempt status. The Internal Revenue Code of 1954 specified that the qualified plans must satisfy four requirements: (1) The plan must be for the exclusive benefit of the employees and/or their beneficiaries; (2) the sole purpose of the plan must be either to give the employees a share of the employer's profits or to provide them with retirement income; (3) the plan must be a permanent one, made in writing and communicated to the employees; (4) the plan must not discriminate in favor of corporate officers, stockholders, or highly compensated employees.

3. Logue [1979] has argued that pensions and IRAs are equivalent in providing tax shelter, therefore, the productivity incentive is the major factor for giving pensions.

4. A detailed discussion of the important provisions of ERISA can be found in Treynor et al.[1976].

5. The PBGC guarantees the payment of vested pension benefits even if a plan terminates with insufficient funds. ERISA has imposed a limit on the amount of basic benefit insured by the PBGC, which is adjusted annually to reflect increases in the social security wage base. The maximum amount of basic benefit was $750 a month originally, but it was increased to $1,381 a month by 1982.

6. The PBGC has now specified that a company's market (rather than book) value is the best measure of its net worth and has listed various factors that can be used to establish a firm's fair market value. Net worth is usually calculated as of the plan termination date, but to prevent abuse of the insurance program, the PBGC has the right to establish the net worth record date as many as 120 days before the actual plan termination.


10. Note that this result is based upon the log-normal distribution assumption. See Stulz and Johnson [1983].
11. Some preliminary empirical results in Kang [1983] have shown that firms with underfunded pension liabilities had experienced excessive positive risk-adjusted returns on common stocks, while firms with fully funded pension liabilities had experienced excessive negative risk-adjusted returns on common stocks from the passage of ERISA. These results seem to support the hypothesis that the "insurance effect" had dominated the "tax effect" around the time ERISA was passed and enacted.

12. See Buser et al. [1981] for discussions of explicit and implicit premiums charged by the FDIC on the bank deposit insurance.
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