

ON THE FEASIBILITY OF INSURERS' INVESTMENT POLICIES

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ABSTRACT

This article calls attention to a difficulty with insurers' investment policies that seems to have been overlooked so far. There is the distinct possibility that insurers cannot satisfy the demands of different stakeholders in terms of expected returns and volatility. While using the capital asset pricing model as the benchmark, this article distinguishes two groups of stakeholders that impose additional constraints. One is "income security" in the interest of current beneficiaries and older workers; the other is "predictability of contributions" in the interest of contributing younger workers and sponsoring employers. It defines the conditions for which the combination of these constraints results in a lack of feasibility of investment policy. Minimum deviation from the capital market line is proposed as the performance benchmark in these situations.

INTRODUCTION AND MOTIVATION

The performance of an insurer's investment policy is crucial for the company's success with its stakeholders, especially in the life and pension business. Therefore, it is astonishing that an important difficulty characterizing pensions seems to have been overlooked so far in the relevant literature. There is the definite possibility that no investment policy exists that simultaneously satisfies the demands of the different stakeholders in terms of expected returns and volatility. These stakeholders are shareholders, current beneficiaries of pension policies, and current contributors and sponsors. Using the shortfall concept in combination with the capital asset pricing model (CAPM), this article will show that their demands can reduce the set of insurers' feasible investment policies to measure zero, in particular when there is a drop in the funding ratio.

The importance of insurers' investment policy is documented by the experience of the past few years. While during the 1990s pension funds were able to please their

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contributors and sponsors with contribution holidays, the end of the bubble in 2000 has caused them to turn around, imposing benefit curtailments and contribution hikes. A whole generation of workers saw the very cornerstone of their lifetime economic plans shattered.

The plan of this contribution is as follows. Following the lead of Kraus and Ross (1982), the CAPM is used as the starting point in the section "The CAPM as the Point of Departure"; however, the CAPM is known to neglect the risk tolerance of investors. Risk tolerance will be introduced in the section "Shortfall Constraint No. 1: Income Security for Older Workers and Retirees" through a shortfall constraint indicating the acceptable probability of the rate of return (ROR) on investment falling below a given threshold value. This first shortfall constraint reflects the situation especially of all the (current) beneficiaries and older workers who have little opportunity to make up for any loss in their pension claims. However, there is still another party concerned, addressed in the section "Shortfall Constraint No. 2: Smoothing of Contributions." The employer, acting as a sponsor but also as an agent on behalf of younger workers who look forward to a long period of contribution payments, are concerned with insureds' surplus, i.e., excess of assets over liabilities. Reflecting this second group of stakeholders, a second shortfall constraint needs to be satisfied. The section "Combining the Two Shortfall Constraints" contains a demonstration that insurers with a low funding ratio cannot pursue an investment policy that is feasible in the sense of satisfying both shortfall constraints. At least one of the two groups of stakeholders must be prepared to bear more risk. In the concluding section, it is argued that the CAPM continues to provide a useful benchmark for insurers' investment policies in spite of its shortcomings.

THE CAPM AS THE POINT OF DEPARTURE

The CAPM shows the combination of expected ROR and risk (usually measured as the variance of ROR), which a firm must offer in order to attract capital and thus ensure its economic survival. The model can be applied to a private insurance company or any supplier of old age provision instruments that is quoted on the stock exchange. It conforms to the view of an insurer as a financial intermediary rather than a production entity (as advanced by Brockett et al., 2005; see also MacMinn, 2005). The basic CAPM formula for some firm i is

$$Er_i = r_f + \beta_i (Er_M - r_f), \quad \text{with } (Er_M - r_f) > 0. \quad (1)$$

Here, Er_i denotes the expected value of ROR on the equity issued by firm i ; r_f , the risk-free interest rate; β_i , the slope of the regression $r_i = \alpha_i + \beta_i \cdot r_M + u_i$ (u_i : stochastic error term); and Er_M , the expected value of ROR on the capital market. Since most firms' ROR on equity move more or less parallel with ROR on the capital market ($\beta_i > 0$), equity of firm i makes a limited contribution to risk diversification. Accordingly, the corporation must pay its shareholders a risk surcharge on the risk-free rate of interest.

The CAPM can now be modified to be applicable to an insurance company, whose two main activities are the underwriting of risks and the investment of capital (for an early application incorporating tax issues, see Hill, 1979; for a critique from an

actuarial point of view, see Gold, 2005). The following development follows closely Kraus and Ross (1982), neglecting their extension to dynamic cash flows in order to focus on the crucial issue of feasibility of investment policies in view of conflicting stakeholder interests. With regard to capital investment, the assumption is that share k (the so-called funds generating factor) of premium income is not used up for losses and administrative expense during the period considered and thus can be invested. The higher the mean duration of liabilities (i.e., the later losses are settled on average), the higher value of k . The company's equity augmented by this factor can thus be invested at an expected ROR equal to Er_P , the ROR on the insurer's portfolio. The contribution of underwriting to expected profit $E\Pi$ is $(P - EL)$, with P denoting premium income (considered nonstochastic for simplicity) and EL , denoting the discounted expected value of future liabilities. The expected value of profit is therefore given by (see, e.g., Zweifel and Eisen, 2003, ch. 6.2.2):

$$E\Pi = (K + kP) Er_P + (P - EL). \quad (2)$$

The expected ROR on the portfolio (after multiplication by $1/K$, where K denotes equity) thus amounts to

$$Er_K := \frac{E\Pi}{K} = \left(1 + k \frac{P}{K}\right) Er_P + \frac{P - EL}{P} \cdot \frac{P}{K}. \quad (3)$$

The difference between premiums received and losses paid plus administrative expense relative to premiums is the combined ratio. This quantity is nothing but the ROR on underwriting, such that

$$Er_U := \frac{P - EL}{P}. \quad (4)$$

Using (3) and (4), the overall ROR of an insurance company can be written as the weighted average of the expected ROR on capital investment and on underwriting of risk,

$$Er_K = \left(1 + k \frac{P}{K}\right) Er_P + \frac{P}{K} \cdot Er_U. \quad (5)$$

The insurer considered must be able to offer investors the same ROR as any arbitrary stock company of comparable exposure to risk. Therefore, one has

$$Er_K = r_f + \beta_K (Er_M - r_f). \quad (6)$$

By equating (5) and (6), the expected ROR (Er_P) can be determined that the company must attain through its investment policy,

$$\left(1 + k \frac{P}{K}\right) \cdot Er_P + \frac{P}{K} \cdot Er_U = r_f + \beta_K (Er_M - r_f). \quad (7)$$

Solving for Er_P , one obtains

$$Er_P = \frac{1}{1 + k\frac{P}{K}} \left[r_f + \beta_K (Er_M - r_f) - \frac{P}{K} Er_U \right]. \quad (8)$$

This condition determines the expected ROR that an insurer must attain with its investment policy in order to be competitive on the capital market. This benchmark value depends on the following parameters.

1. The higher the funds generating factor k , the lower the required value of Er_P . The longer the lag between premiums received and losses settled, the more time is left for generating returns on the capital investment, implying that the returns per period can be lower. Conversely, if beneficiaries were to decide to retire earlier than originally planned (without any curtailment of benefits EL), k drops, and there is pressure for the investment policy to achieve a higher ROR.
2. The higher the beta of the company (β_K), the higher Er_P . If the equity of the insurance company contributes only little to risk diversification of investors, because it largely follows the movements of the capital market (β_K high), it must accordingly offer a higher risk surcharge on the risk-free rate of interest. This demand calls for an increase in the expected ROR to be achieved by the insurer's investment policy.
3. The higher the expected ROR in underwriting of risks Er_U , the lower Er_P . Thus, a favorable combined ratio relaxes demands imposed on investment policy. Although insurers often fail to achieve a combined ratio of one or more, Equation (8) indicates that they do not necessarily lack competitiveness on the capital market. It is still possible for them to attract investors; however, their investment policy must achieve a higher ROR on average.

Conclusion 1: The CAPM can be used to derive requirements for an insurers' investment policy if quoted on the stock exchange. The expected ROR that must be attained decreases with both the funds generating factor and the expected ROR on the underwriting business but increases with the beta of the company.

However, condition (8) also indicates that given unfavorable results in underwriting ($Er_U < 0$), there can be a demand on the insurer's investment policy to exceed the ROR on the capital market (Er_M). In this situation, the company will be tempted to pursue an active investment policy (empirical evidence supporting this notion is presented by Collins, Geisler, and Shackelford, 1997; see their EARNINGS variable, which corresponds to r_U). This can be achieved in two ways. First, it can change the asset allocation defined in terms of the most important categories (government bonds, commercial bonds, equity, real property) from their long-run values (market timing). Second, it can increase the weight of particular corporation within a given category of stocks (stock picking).

Yet Ibbotson and Kaplan (2000), analyzing the investment performance of pension funds in the United States, have found that the ROR of an investment policy is largely determined by asset allocation in terms of main categories. Moreover, pension funds seem unable to beat the market benchmark through either market timing or stock

picking. This seems to hold internationally; in the case of Switzerland, e.g., Drobetz and Köhler (2002) come to the conclusion that pension funds pursuing an active asset allocation policy fell short of a purely passive one that sticks to an initial allocation by asset categories. Chances to exceed the expected ROR on the capital market by pursuing an active investment policy therefore appear to be dim.

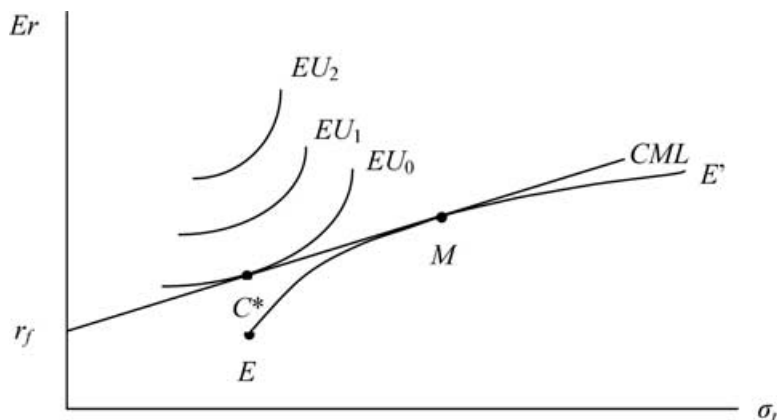
SHORTFALL CONSTRAINT NO. 1: INCOME SECURITY FOR OLDER WORKERS AND RETIREES

The insurance-CAPM of Equation (8) is incomplete on two accounts: (1) It neglects the fact that the investment policy of an insurance company typically is carried out on behalf of individuals that do not dispose of fully diversified portfolios. As shown by Brown (1990), this fact creates a clientele effect (causing a departure from the Fisher Separation Theorem) in that retired beneficiaries exhibit especially marked risk aversion. This is due to an increased importance of liquidity constraints, which in turn reflect their inability to raise additional income. Moreover, (2) the insurance-CAPM does not take into account that employers as sponsors as well as most of employees are interested in a smoothing of their contributions (see the section "Shortfall Constraint No. 2: Smoothing of Contributions" below for details). Both considerations pose constraints on the insurers' investment policy. This section is devoted to consideration (1).

In Figure 1, the efficient frontier of a portfolio is given by EE' . If there is also an investment alternative in a risk-free asset, the investor can attain a point on the capital market line (CML), which originates at r_f and runs tangential to EE' . This point of tangency M represents the market portfolio, i.e., a fully diversified portfolio. The investor's risk aversion (or conversely, risk tolerance) is represented by indifference curves (with expected utilities $EU_2 > EU_1 > EU_0$) that together with CML determine the optimal allocation between risk-free and risky assets (point C^*).

This representation reflects the assumption that an unbounded variance or standard error of ROR (σ_r) is acceptable as long as the expected ROR is high enough, in keeping with the Fisher Separation Theorem. However, this assumption cannot be maintained

FIGURE 1
Optimal Asset Allocation, Standard Case



for a pension fund. As argued by Brown (1990), clientele effects are to be expected. Indeed, Milligan (2005) provides evidence showing that while housing property and consumer durables together continue to make up more than one-half of total assets held by Canadian households, (the present value of) pension income sharply increases in importance after age of 55. This causes an increased risk to retired households of being exposed to liquidity constraints should pension income fall. Moreover, beneficiaries who are close to retirement or already receiving pension payments cannot make up for an unexpectedly low ROR by paying additional contribution. Their future income thus strongly depends on the success of the insurer's investment policy.

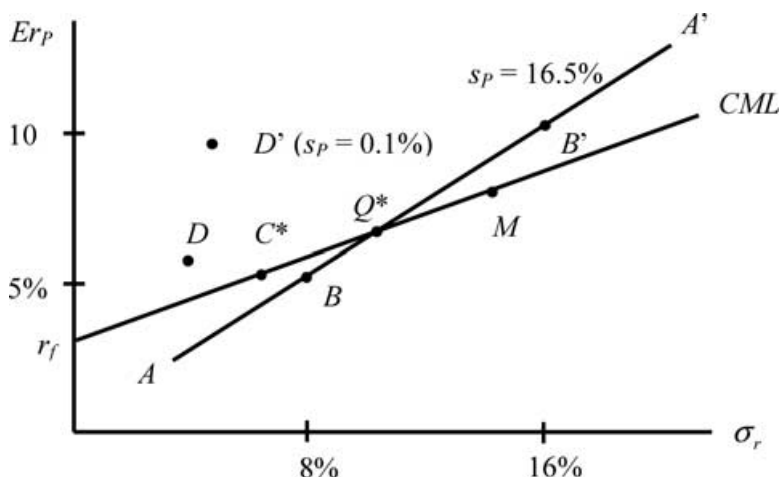
For incorporating risk aversion of stakeholders, the practitioners of investment counselling have been using the shortfall concept (see e.g., Leibowitz, Kogelman, and Bader, 1992, and the literature cited there). The term "shortfall" indicates the likelihood of ROR remaining below a certain benchmark value. For example, one standard error away from expected value, this probability is 0.165. When both expected value and standard error are doubled ($m = 2$), the probability of shortfall s_P remains unchanged at 0.165 under the normality assumption. Generally, one has (Cummins and Nye, 1981)

$$\Pr[r_P \leq (mEr_U - m \cdot \sigma_r)] = s_P = \text{const.} \quad (9)$$

For example, in Figure 2, $Er_U = 5$ percent and $\sigma_r = 8$ percent (point B). Therefore, the probability of a ROR being -3 percent or less is $s_P = 0.165$. The shortfall probability is the same for a portfolio with $Er_U = 10$ percent and $\sigma_r = 16$ percent ($m = 2$, point B'). Thus, the locus of all combinations of expected ROR and standard error compatible with a given shortfall probability of $s_P = 0.165$ is the straight line AA' .

This locus reflects the first shortfall constraint of an insurers' investment policy. Above AA' , this probability is lower since the higher expected ROR with an unchanged

FIGURE 2
The Shortfall Constraint for Income Security



standard error shifts the density function of returns toward more favorable outcomes without changing its shape. This also means that the boundary AA' runs higher if the beneficiaries of the pension scheme are more risk averse, to the extent that they, for example, require the shortfall probability at the benchmark -3 percent to be less than 0.165. Accordingly, AA' would have to go through a point like D of Figure 2. In the following, the argument is based on the constraint "income security" to be reflected by the straight line AA' . In that case, point Q^* with its mix of risky and riskless assets can be said to be optimal from the point of view of beneficiaries, with the following properties.

1. As can be gleaned from Figure 2, the market portfolio M does not qualify as a rule. While it does offer a higher expected ROR, it implies a shortfall probability that is not acceptable.
2. Conversely, Q^* does not coincide with the original optimum C^* of Figure 1. This is the consequence of the fact that risk aversion is a property relating to the entire density or distribution function of a stochastic variable, while the concept of shortfall applies only to a segment of the distribution (Hadar and Russell, 1969).
3. However, a more marked risk aversion does result in a more conservative policy. For if the straight line AA' were to go through point D , for example, the point of intersection with the capital market line Q^* would move towards the origin, i.e., toward low values of σ_r .
4. An extremely low probability of shortfall imposed is not compatible with a feasible investment policy. In Figure 2, AA' would go through point D' (e.g., for $s_p = 0.001$). However, this implies that there is no intersection with CML anymore, implying that investment policy would have to beat the capital market line, which is not possible on the longer run.

Conclusion 2: If an extremely low shortfall probability is postulated on behalf of retired beneficiaries and older workers, the investment policy of the insurer would have to beat the capital market line, an impossibility on the longer run. In the case of feasible shortfall probabilities, investment policy must change in favor of lower volatility, combined with lower expected ROR.

The difference between Conclusions 1 and 2 is that in Conclusion 1, investment policy is on the CML by assumption and is thus feasible. This feasibility can be lost in Conclusion 2 as a consequence of the first shortfall constraint on behalf of current beneficiaries and older workers who want to have income security.

SHORTFALL CONSTRAINT NO. 2: SMOOTHING OF CONTRIBUTIONS

There are stakeholders of a pension scheme who are not primarily interested in the security of pension income but rather smoothing (or at least predictability) of contributions to be paid. This objective is of importance to at least two groups. One is the younger workers who face the risk of having to pay additional contributions in the case of financial disequilibrium. Having invested their human capital (i.e., their dominant component of total assets in most cases) with the employer, they are not diversified enough to easily make up for the increased financial burden. The alternative for the pension fund would be to curtail payments to retirees, a recourse of last resort (for reasons given in the section "Shortfall Constraint No. 1: Income Security for

Older Workers and Retirees”). The other stakeholders with an interest in contribution predictability and smoothing are employers. This statement of course clashes with the theoretical result that a management who acts in the interest of fully diversified owners should decide in a risk-neutral manner (see Mayers and Smith, 1988). Thus, predictability and smoothing of contributions should be of no interest to employers even though as sponsors they may have to participate in a financial restructuring of the scheme. However, there are several reasons for employers to be concerned about predictability and smoothing. For one, as shown by Allen, Bernardo, and Welch (2000), they (and the owners of the company) stand to benefit from smoothing for tax reasons. And as soon as management is a less than perfect agent of owners, it has a number of reasons to be risk averse with regard to the performance of the pension fund. First, managers may be covered themselves by the same fund. Second, inability to come up with additional funding to bail out the fund may get them into conflict with special regulation safeguarding the solvency of pension funds. And third, since possibly thousands of employees see their old age provision at risk, this inability will likely receive news coverage, giving rise to undesirable reputation effects.

In order to avoid a financial disequilibrium, there must be a surplus of assets (A_t) over future liabilities (L_t). The concept of “surplus” has the advantage compared to “capital” that it leaves open the question of its allocation between shareholders and the insured. However, while most shareholders of an insurance company are sufficiently diversified for not being too much affected by a possible insolvency, employers are far less diversified with regard to employee benefit schemes. They therefore will evaluate fluctuations of surplus under the influence of risk aversion. This holds even more true of current workers as contributors.

In order to retain the analogy with capital investment as much as possible, the ROR on surplus is defined as follows (Ezra, 1991),

$$\begin{aligned} r_S &= \frac{S - S_{-1}}{A_{-1}} = \frac{A - A_{-1}}{A_{-1}} - \frac{L - L_{-1}}{L_{-1}(A_{-1}/L_{-1})} \\ &= r_P - \frac{1}{F} r_L, \quad \text{with } r_P := \frac{A - A_{-1}}{A_{-1}} \end{aligned} \quad (10)$$

$F := A_{-1}/L_{-1}$ funding ratio.

The change of surplus over time therefore is compared with the value of assets in the preceding period (subscripts t are dropped for simplicity). The second equality sign relates this change to changes in assets (A) and liabilities (L). By multiplying this by $1 = L_{-1}/L_{-1}$, liabilities can be expressed in terms of relative change as well. The relative change of the value of assets corresponds to the ROR on the portfolio (r_P). In full analogy, the relative change in liabilities can be seen as the ROR on liabilities (r_L). However, in contradistinction to Equation (4), current premium income is already accounted for in assets, and the expected value of liabilities or payments is not regarded as constant anymore. For this reason, the ROR on liabilities r_L is not equated to the (negative of) ROR on risk underwriting r_u .

Equation (10) shows that the ROR on surplus equals the difference between the ROR of assets and liabilities only if $F = 1$, i.e., if the funding ratio of liabilities over assets in

the preceding period was exactly 100 percent. If F is below 100 percent, any increase of liabilities serves to lower the ROR on surplus r_S more than proportionally. Since F is predetermined, it can be treated like a constant in the expectation operator, and one obtains

$$Er_S = Er_P - \frac{1}{F}Er_L, \text{ implying } Er_P = Er_S + \frac{1}{F}Er_L. \quad (11)$$

Solving for Er_P , one sees that the ROR of investment policy cannot be set freely anymore as soon as the ROR on surplus has to attain a certain value.

The same considerations with regard to F can be used to calculate the variance of r_S ,

$$\begin{aligned} \text{Var}(r_S) &= \text{Var}(r_P) - \frac{2}{F}\text{Cov}(r_P, r_L) + \frac{1}{F^2}\text{Var}(r_L), \\ \text{implying } \text{Var}(r_P) &= \text{Var}(r_S) + \frac{2}{F}\text{Cov}(r_P, r_L) - \frac{1}{F^2}\text{Var}(r_L). \end{aligned} \quad (12)$$

Solving for $\text{Var}(r_P)$ indicates again that the variance (standard error σ_P , respectively) of the ROR on the investment portfolio is constrained as soon as $\text{Var}(r_S)$ must satisfy a certain condition. Such condition results from the requirement that the ROR on surplus must not exceed a certain shortfall probability. In analogy to Equation (9), the expected value Er_S and the standard deviation σ_S of the ROR of surplus must remain in a fixed proportion for r_P not to fall short of a certain limit with a given probability (e.g., 0.165 percent again for an expected value Er_P of 3 percent and a volatility of 10 percent).

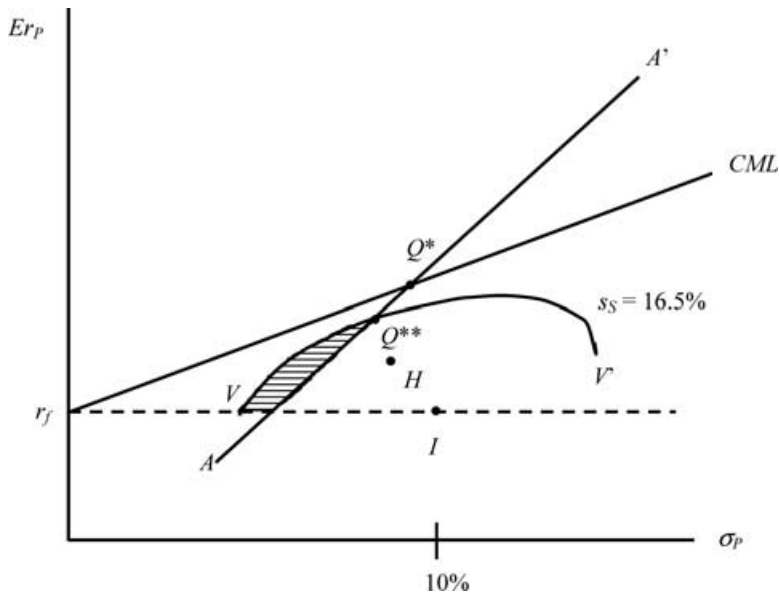
The restriction “predictability of contributions” determines not only the set of feasible combinations $(Er_S, \sigma(r_S))$, but because of (11) and (12) also the combinations (Er_P, σ_P) of investment policy. Leibowitz, Kogelman, and Bader (1992) derive a frontier VV' in (Er_P, σ_P) -space whose relevant portion originates at the level of the risk-free rate of interest r_f but ends above r_f (see Figure 3). The shape of this frontier is reminiscent of the efficient frontier EE' of Figure 1. This is not surprising because when constructing the efficient frontier, the problem was to determine a portfolio that yields the maximum expected value of ROR for a given volatility. In Figure 3, the predetermined shortfall probability requires that for a given volatility of surplus a certain expected value of ROR has to be attained (e.g., for a fixed $p_S = 0.165$). The translation of this requirement into (Er_P, σ_P) space therefore must yield a similar frontier as EE' in Figure 1.

Four properties of this second constraint merit emphasis.

1. The frontier VV' runs below the efficient frontier EE' (not shown in Figure 3), at least for realistic values of the shortfall probability. As shown by Berketi (1999) for life insurers in the United Kingdom, a smoothing requirement may reduce the expected ROR by up to 20 percent. And contrary to the first shortfall constraint, the capital market line CML cannot be reached by any feasible investment policy anymore. This difference is due to the fact that the frontier VV' , unlike EE' , is not the result of an optimization but satisfies a constraint that emanates from the risk aversion of sponsors and contributors. However, if this constraint is relaxed

FIGURE 3

Adding the Shortfall Constraint for Predictability and Smoothing of Contributions



by assuming unrealistically high accepted probabilities of shortfall, it becomes possible for VV' to locally run above EE' and CML . Of course, investment policy is feasible in this case; it would simply realize some point on CML that implies a lower probability of shortfall than exogenously imposed.

2. Any frontier of the type VV' reflects an assumption with regard to the mean duration of liabilities, e.g., 10 years. If the duration of assets is chosen to be the same, immunization of surplus against risk is achieved. The shortfall probability relating to surplus s_S is 0 in this case. This causes VV' to shrink to a point (marked I in Figure 3); investment policy then results in a specific volatility of the ROR on assets (assumed to be 10 percent in Figure 3; see Leibowitz, Kogelman, and Bader, 1992). This investment policy is feasible but does not attain the capital market line (which may serve as the ultimate benchmark, see the concluding section).
3. Variation of the funding ratio F also greatly modifies the shape of the boundary VV' . As Equation (11) shows, a smaller value of F causes the attainable expected ROR on surplus to fall. Moreover, it follows from Equation (12) that a reduction of F dominates the last term sooner or later; as a consequence, the variance of ROR on surplus must increase. These two effects in combination make the restriction “predictability of contributions” more binding. As shown by Leibowitz, Kogelman, and Bader (1992), the feasibility set defined by VV' shrinks; moreover, VV' also moves away from the origin. The reason for this second shift is that in order to be able to attain a higher ROR as indicated by Equation (12), a much higher degree of volatility must be accepted. In all, the insurer’s investment policy increasingly falls short of the capital market line when the funding ratio falls.
4. If sponsors and beneficiaries impose a lower shortfall probability at the r_P threshold (–3 percent as before), then VV' would have to run through a point like H .

Therefore, it would move downward and become tighter. In this case, the capital market line cannot be attained anymore either.

Conclusion 3: Imposing a shortfall probability on the surplus is above all in the interest of younger contributors and sponsors. While the investment policy remains feasible in principle, its performance falls short of the capital market line especially if the funding ratio becomes low.

COMBINING THE TWO SHORTFALL CONSTRAINTS

This section is devoted to the characterization of an insurer's investment policy that seeks to satisfy both "income security for older workers and retirees" and "predictability of contributions." The set of feasible policies is represented by the shaded area in Figure 3. Each point of the area corresponds to a mix of equity and fixed income securities, resulting in the pertinent combination of expected ROR and volatility of ROR. These points lie above the straight line AA' , where the probability of shortfall regarding the portfolio ROR is 16.5 percent or less. They also lie below the boundary VV' , where the probability of shortfall regarding the surplus ROR is 16.5 percent or less.

Now an investment policy strictly in the interest of current beneficiaries and older workers ("income security") would prescribe moving on the line AA' as far as possible toward the capital market line CML , optimally reaching point Q^{**} . Typically, it would be even more conservative (i.e., with smaller variance of portfolio ROR and hence smaller share of equities) than if the restriction "predictability of contributions" could be disregarded (point Q^*). Conversely, the pursuit of a policy merely in the interest of the sponsors would result in a movement along the VV' boundary toward the capital market line CML . Depending on the precise shape of VV' , this can again result in point Q^{**} or some point between V and Q^{**} . In the latter case, investment policy would become still more conservative than the alternative attuned to "income security."

However, there is no guarantee for the solution set to be nonempty. As shown in Conclusion 1, an extremely low shortfall probability imposed on the portfolio ROR already suffices to undermine the feasibility of the insurer's investment policy (the boundary AA' running above the capital market line). This danger becomes relevant especially when policy has to satisfy both shortfall constraints. It is the greater (see Figure 3),

- The lower the value of the shortfall probability with regard to the portfolio ROR that is accepted by older workers and current beneficiaries.
- The lower the shortfall probability with regard to surplus ROR that is accepted by current contributors and sponsors.
- The lower the funding ratio F .

After a ROR on global investments in equity of almost 15 percent in 1999, ROR plunged to -9 percent in 2000 and even -11 percent in 2001, with only a partial recovery to -3 percent in 2002. This was not balanced by bond performances of -4, 4, 2, and 15 percent, respectively (MSCI, 2005), causing the funding ratio of the U.S. pension funds to drop to 0.81 in 2002 (Pension Benefit Guaranty Corporation, 2004). Even

though equity markets have since recovered somewhat, low funding ratios create a big difficulty for insurers' investment policy: possibly, there simply does not exist a policy anymore that satisfies the requirements of both current and imminent beneficiaries on the one hand and of contributors and sponsors on the other.

Several strategies for solving this problem are available. The first is for the insurer to simply point out that a series of years with low portfolio ROR is still compatible with the selected shortfall probability. Although basically correct, this argument is unlikely to be credible with the interested public (indeed, this quandary illustrates the basic weakness of the shortfall concept). Next, the insurer may admit to the tension between the requirements imposed on its investment policy but suggest living with it. However, this typically runs into difficulties because current beneficiaries and older workers both push for a conservative investment policy (as indicated by point Q^* of Figure 3 as soon as the constraint VV' can be disregarded). Contributors and sponsors in their turn will urge the insurer to pursue a more risky policy (this would mean a shift of the boundary VV' away from the origin of Figure 3).

A third strategy is to reverse the drop of the funding ratio. One way to achieve this immediately is for the insurer to curtail its liabilities by partly reneging on the claims of current beneficiaries. Such a measure has the important drawback of disappointing expectations held by an entire generation of workers, who have few opportunities to make up for their loss of income. Alternatively, the insurer may reduce liabilities incurred with future beneficiaries. Since the drop of the portfolio ROR is the cause of the problem, the measure of choice is to decrease the guaranteed rate of interest with which contributions are credited. For instance, in 2003 Swiss life insurers were successful in getting the government to lower this guaranteed rate from 3.5 to 3 percent per annum. This serves to restore a measure of flexibility to insurers' investment policy at least with regard to younger contributors and sponsors (the VV' boundary of Figure 3 is shifted up and out toward the capital market line CML).

A fourth strategy aims at relaxing the constraints imposed on the insurer's investment policy. However, current beneficiaries are unlikely to accept a higher shortfall probability, which would translate into an increased volatility of their incomes (which they have difficulty to counteract). By way of contrast, sponsors and younger contributors (who have more opportunity to adjust) may buy the argument that recent experience shows that there will always be a nonzero probability of shortfall and that investment policy cannot be successful unless the pertinent benchmark is lowered.

Similar as they may seem, these strategies are not equivalent with regard to one important aspect. As long as insurance companies administer pension funds on their own account, their investors are affected by the choice of policy. The CAPM application laid out in the section "The CAPM as the Point of Departure" shows that the insurer must pursue an investment policy that attains the capital market line of Figure 1 in order to act in the investors' interest. However, satisfying merely the constraint "security of income" in favor of older workers and current beneficiaries has the decisive advantage of permitting the capital market line to be reached (point Q^* of Figure 3). Conversely, respecting the constraint "predictability of contributions" while neglecting the other, the insurer does not have a guarantee to be on CML , especially if its funding ratio F is low (see Conclusion 3).

Conclusion 4: Especially in the case of a drop in the funding ratio, the feasibility of an investment policy designed to satisfy both the constraints “income security” and “predictability of contributions” is not assured. Moreover, the strategies available for dealing with this problem are not equivalent with regard to the insurer’s competitiveness on the market for capital.

FINAL REMARKS

Public interest in insurers’ investment policies is intense because their performance has very immediate consequences for the income and welfare of both beneficiaries and contributors. Interestingly, what seems to have been overlooked so far is the distinct possibility that there is no investment policy that simultaneously satisfies the demands of those two groups of stakeholders. While the CAPM provides a first benchmark of performance, it appears to be insufficient because of its neglect of risk aversion on the part of current beneficiaries, many of whom lack the wealth and expertise necessary for risk diversification. It also neglects possible risk aversion on the part of sponsors, who are not much diversified in terms of their liabilities accruing through their pension funds. Subject to the constraints imposed by these two clienteles, insurers’ investment policies may well run into problems especially when the funding ratio (i.e., the ratio of assets to liabilities carried over from the previous period) is low. The competing requirements imposed by the stakeholders simply cannot be satisfied anymore in this situation.

One solution to this dilemma could be to win the consent of sponsors and contributing workers to assume more risk by accepting a higher probability of shortfall with regard to the ROR on the surplus of the scheme. Being risk averse, these stakeholders will have to find their new optimum in terms of risk and expected return, which may well call for a costly restructuring of their remaining assets and liabilities. This is likely to meet with resistance and even protest as well. For measuring the insurer’s performance in pursuing this strategy, the distance of the risk-return combination achieved from the capital market line (*CML* in Figure 3) may serve as the indicator. In this way, the CAPM approach remains useful for benchmarking in spite of its imperfections noted in the introductory section.

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