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The Relationship Between Expected Return and Discount Rate for the Social Security Investment Commission

Final Report

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Asset allocation
Future value of plan assets
Going concern
Plan deficit
Investment strategies
Immunization strategy
Long-term government bonds
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Duration
Actuarial assumptions
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Abstract

The purpose of this paper is to focus attention on the relationship between the expected rate of return and the discount rate, both of which are key factors affecting the funded status of the Social Security Pension Fund. A fundamental understanding of this relationship is crucial to the investment plan of the SSIC. To accomplish this purpose, I will present a simple example of how a public pension plan works using non-technical terms as much as possible. Section 1 presents a few basic concepts and definitions. Section 2 presents strategies for investing plan assets. Section 3 presents a simplified example of how a pension fund operates and Section 4 draws conclusions. Aside from the financial aspects of investing plan assets, the paper highlights the ethical considerations the sponsor should consider when making fine judgments relative to investing the public's money.

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Executive Summary

The example presented here clearly shows that if a sponsor allocates assets in any manner other than for the expectation of achieving a return at least equal to the discount rate, plan assets will be misallocated with either too little risk or too much risk. A more subtle message of this example is the interrelationship between the plan sponsor, who is charged with the responsibility of investing plan assets, and the actuary, who is charged with the responsibility of determining whether the plan has sufficient assets set aside today to meet promised benefits in the future. Ultimately, the sponsor determines both the expected return via the asset allocation decision and the appropriate discount rate against which the public will judge its investment program. As a consequence, the sponsor controls the timing of when the funding problem is addressed.

By controlling the timing of when to fund promised benefits, the sponsor has an ethical responsibility of determining what is fair. Should the sponsor place more of a financial burden for funding future benefits on the current generation or a future generation is a difficult issue. My purpose here is not to address the ethics of this issue but it is, instead, to focus attention on the financial aspects of how a public pension fund works in order to allow the plan sponsor to better understand the ethical issues. To the best of my knowledge, the 2001 Law places no specific funding requirement on the plan other than an "…estimation of the value of the outstanding liabilities" (see Article 15, Chapter Two, Law No. (19) for the year 2001). As a consequence, whether the funding of promised benefits occurs now or in the future is based on a judgment of fairness, the financial ability of the employer and employee to contribute to the plan, and the reasonableness of actuarial assumptions used to evaluate the financial soundness of the plan.

Body of the Report

Introduction

The purpose of this paper is to focus attention on the relationship between the expected rate of return and the discount rate, both of which are key factors affecting the funded status of the Social Security Pension Fund. A fundamental understanding of this relationship is crucial to the investment plan of the SSIC. To accomplish this purpose, I will present a simple example of how a public pension plan works using non-technical terms as much as possible. Section 1 presents a few basic concepts and definitions. Section 2 presents strategies for investing plan assets. Section 3 presents a simplified example of how a pension fund operates and Section 4 draws conclusions. Aside from the financial aspects of investing plan assets, the paper highlights the ethical considerations the sponsor should consider when making fine judgments relative to investing the public's money.

A Few Basic Concepts and Definitions

Important variables affecting the funded status of a plan are:

1. Discount rate
2. Expected rate of return
3. Salary growth rate
4. Contribution rate (annual pension expense)

1. Discount rate—The discount rate reflects the probability of default of the ultimate party responsible for payment of promised benefits, which presumably is the Government of Jordan, and is used to calculate the present value of future pension obligations.[1] This rate is intended to represent the rate at which projected Pension Benefit Obligations (PBOs) could be settled by purchase of an annuity contract, usually from an insurance company. A variety of measures can be used to determine the proper discount rate including the current annuity rate, government

[1] Another perspective on the discount rate is that it represents an opportunity cost, which is the rate that the plan sponsor could receive when investing plan assets at a risk level comparable to the plan's asset allocation. I recommend not using this definition as it is not as conservative as the definition given above.

(Jordan) bond rate, or the rate available on high-quality fixed-income securities. In the absence of reasonably liquid long-term Jordanian bonds, I suggest adding a risk premium of 2 percent to the 10-year US Treasury bond rate to determine an appropriate discount rate. I think of the discount rate as the rate used for calculating the present value of plan liabilities given a future value of those liabilities.

2. Expected rate of return—The expected rate of return, E(R), on plan assets is the long-term expected return. The plan sponsor and actuary work together to establish an acceptable E(R) in one of two ways: (1) determine the risk tolerance of the sponsor, make the asset allocation decision based on that risk assessment, and observe the expected rate of return as a byproduct of this process, or (2) set E(R) equal to or greater than the discount rate and force the asset allocation decision to produce this set rate. I think of E(R) as the rate used to calculate a future value of plan assets given a present value of those assets.

3. Salary growth rate—The rate of growth of a participant's salary that drives Projected Benefits Obligations (PBOs). To calculate Accumulated Benefit Obligations (ABO), the assumption is that pension benefits accrue to current and former employees based on current salaries without any projection of growth. Whereas PBO assumes a "going concern," ABO assumes termination of the plan. Thus, PBO is generally the better measure of the present value of future liabilities.

4. Contribution rate (annual pension expense)—The annual pension expense depends on three estimates:

1. Service cost—an estimate of the value of future benefits earned during the current year
2. Net interest cost—the interest on outstanding PBO (using the same discount rate) less the expected return on plan assets
3. Amortization costs—spreading out over future periods of any plan deficit (t = 0) and underwriting gains or losses due to inaccurate actuarial assumptions

Investment Strategies for Plan Assets

For purposes of discussion, let's assume that future benefits are not indexed to inflation, that the plan is fully funded at t = 0 (no deficit to amortize) based on past contribution rates, and that the actuarial assumptions of salary growth and expected return are perfectly accurate. Under such strict conditions, the annual contribution rate is sufficient to fund annual increases in future benefit costs and the sponsor would have an incentive to follow an immunization strategy. In an immunization strategy, the sponsor would select the interest rate on long-term government bonds as the rate for discounting future benefits and invest plan assets in zero-coupon government bonds of the same duration[2]. If interest rates decline, the current value of the future benefits (plan liabilities) would increase but this increase would be offset by a like increase in the value of plan assets. Such a duration matching immunization strategy would eliminate volatility in the contribution rate but would only work if the status of the plan is fully funded at t = 0 and the actuarial assumptions are perfectly accurate.

If, however, the plan's status is under funded to begin with (t = o), an immunization strategy would simply lock in the deficit over time and the SSC's current contribution rate would have to rise in order to fund the deficit[3]. Since the contribution rate is currently too low (see 4th Actuarial Study, Table 60, page 127)[4] and the political environment does not appear conducive to a large rate increase, the plan must fund both the current deficit and make up for future projected deficits at the same time. The only way to do this is for the SSIC not to immunize but, instead, invest a portion of plan assets according to a growth strategy whereby the expected return is reasonably greater than the discount rate. Although no guarantee, such a growth strategy would provide the plan with an opportunity to fund year-to-year increases in projected benefits and, simultaneously,

[2] The sponsor would actually estimate a stream of future benefits and invest in a series of zero-coupon bonds with durations matching those of the promised benefits.
[3] Although in this paper I refer to the SSC as controlling the contribution rate, in actuality the Council of Ministers is the responsible body (see Article 15, Chapter 2, Law No. (19) for the year 2001.
[4] According to the 4th Actuarial Study, either the current contribution rate (15% at the time) or the expected rate of return is too low to finance future benefits for the next 75 or 100 years (see Table 60, page 127). For example, at a contribution rate of 15 percent, the expected rate of return would have to equal 11.5 percent in order to finance future benefits for the next 75 years. The Study clearly shows a tradeoff between the expected rate of return and the contribution rate.

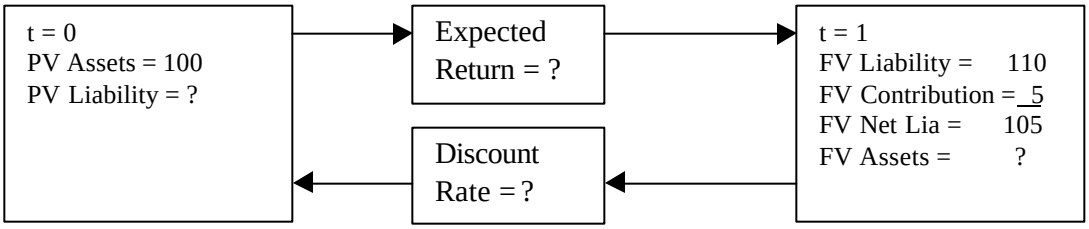
reduce the current deficit over time. An important assumption here is that expectations are reasonable and that actual returns align with expectations over time. A growth strategy also has the benefit of taking advantage of the historical trend where equities have outperformed bonds over long periods of time. By not increasing the contribution rate or not allocating assets such that the expected rate of return would be greater than the discount rate, the SSC would pass along the funding problem to a future generation.

In the second part of the paper (to be presented later), I introduce a more detailed example that traces the retirement plan for a 30-year old Jordanian employee until age 60, when he retires, and then another 15 years until his projected death. This analysis provides a deeper understanding of the expected rate of return/discount rate relationship using more technical accounting and actuarial concepts, and reinforces the conclusion that the SSIC should adopt an asset allocation strategy that provides an expected return greater than the discount rate. My recommendation is that the SSIC target a return equal to the discount rate plus a premium of 3–4 percent. The plan's relatively high risk tolerance is the prime motivator of this recommendation. Over time, the expectation is that the premium earned will eliminate the current under funded status of the plan. At the same time, the SSIC should not expose plan asset to such a high level of risk that the promise of paying future obligations is jeopardized.

An Example[5]

Suppose that the sponsor of a public pension plan has assets today of JD100, has projected a future liability 1 year from now of JD110 at which time the plan will terminate, and intends to contribute JD5 to the plan at the end of the year. What is the funded status of the plan today? In other words, is the JD100 the plan has set aside today sufficient to meet the projected liability one year from today? The graphic below shows the problem.

[5] Please note that I have taken certain liberties in presenting this example. While the accounting treatment and actuarial details of the example may not be technically correct, the financial concepts are correct.



To answer this question, the sponsor relies on the actuary to calculate the present value of the future liability against which to compare the plan's present value of assets. If the present value of assets equals or exceeds the present value of the future liability, the plan is either fully funded or over funded. If, on the other hand, the present value of assets is less than the present value of the future liability, the plan is under funded and the government would be forced to make up any actual deficit a year from now.

For Scenario 1, let's suppose that the actuary uses a discount rate of 5 percent to calculate the present value of the JD110 future liability. In this case, the present value of the projected liability is JD100 and the plan is fully funded, at least it is as of today[6].

Scenario 1:

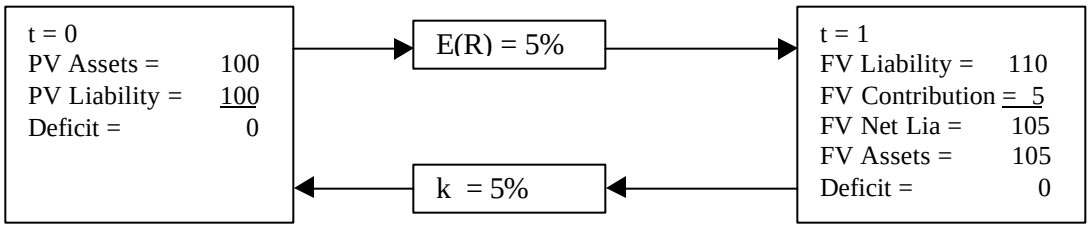
Discount Rate, k = 5 %

Expected Return, E(R) = 5%

Plan Assets Today = 100

[6] By using a discount rate higher than 5 percent, the sponsor could make the plan appear over funded, or by using a discount rate lower than 5 percent, the sponsor could make the plan appear under funded. In other words, the sponsor controls the plan's funded status with the stroke of a pen simply by changing the discount rate. While such a practice is not an uncommon, it is also unethical.

Funded Status:



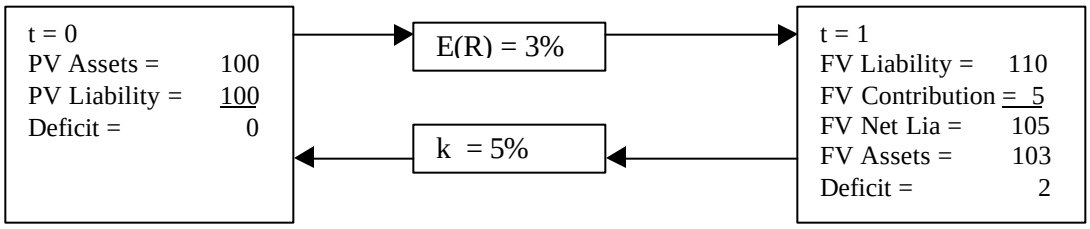
Calculations for Scenario 1 indicate that the PV Liability equals 100 (105/1.05) and that the FV Assets equals 105 (100 x 1.05). In this case, the plan is fully funded both at present and in the future, assuming that expected returns are actually realized. The crucial point is that the expected return, which is determined by the asset allocation, equals the discount rate. Let's see what happens if the two are not equal.

Scenario 2:

Discount Rate, k = 5 %
Expected Return, E(R) = 3%
Plan Assets Today = 100

Calculations for Scenario 2 indicate that the PV Liability equals 100 (105/1.05) since the discount rate still equals 5 percent, but FV Assets now equals 103 (100 x 1.03), again assuming that the expected return is actually realized.

Funded Status:



In Scenario 2, the plan appears fully funded at present but we can see that it is actually under funded in the future by JD2. The crucial point is that when the expected return is less than the discount rate, the fund will not be fully funded in the future at the time when the plan sponsor is responsible for paying out the promised benefit. In this case, the deficit must be covered by: (1) a government loan, (2) an increased contribution by the plan sponsor, or (3) a decrease in promised benefits. If we assume that actions (2) and (3) are not feasible, at least in the short run, the only course of action is (1). Hopefully, the plan sponsor will see this possibility at t = 0 and take corrective action by allocating assets in such a way as to increase the expected return to 5 percent, assuming that such a risk is tolerable.[7]

To extend this example, let's now assume that the sponsor has set aside only JD95 at the present. Let's further assume the following scenario:

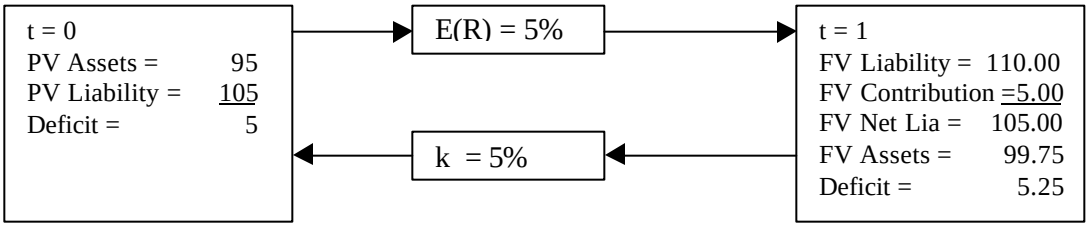
[7] While the sponsor has no guarantee that such action will produce the desired result at least in the short run, the assumption is that actual investment results will meet expectations in the long run if those expectations are reasonable. Perhaps an obvious question is: Why would a sponsor misallocate assets at t = 0 to expect a 3 percent return when a 5 percent return is reasonable. The answer is that the sponsor has a short-term perspective of the issue, which is usually driven by political considerations. By not taking a long-term perspective, the sponsor is effectively passing off the problem to someone else at t=1. In the real world, the sponsor may be able to pass off the problem for many years into the future and, perhaps, even many generations into the future. Such action is the classic short-term gain traded for a long-term loss and is referred to as an intergenerational transfer of wealth. While an intergenerational transfer of wealth may

Scenario 3:

Discount Rate, k = 5 %
Expected Return, E(R) = 5%
Plan Assets Today = 95

In Scenario 3, we can see that the plan is under funded by JD5 at t = 0 and JD5.25 at t = 1.

Funded Status:



The reason this occurs even though k equals E(R) is because the sponsor has not saved sufficient assets at t = 0 when only JD95 is in the account. Although setting the two rates equal to each other is appropriate when the sponsor has set aside sufficient assets at t = 0, as we saw in Scenario 1, Scenario 3 shows us that such a strategy is inappropriate if the sponsor must make up for any deficit existing at t = 0. Given this situation, the sponsor must allocate plan assets in such a way as to expect a return sufficiently greater than the discount rate to make the plan solvent at t = 1. At the same time, the sponsor cannot set the expected return so high as to make the associated risk unacceptable. In Scenario 3, the sponsor would have to allocate assets in expectation of receiving a return of 10.5 percent, which is a premium of 6.5 percent above the discount rate. If the sponsor does this and if actual investment results equal expectations, the sponsor will have JD105 at t = 1 and be financially able to meet promised benefits without any trouble.

not be apparent in a political setting, an informed observer will recognize that the sponsor is being irresponsible.

Conclusions

The above example clearly shows that if a sponsor allocates assets in any manner other than for the expectation of achieving a return at least equal to the discount rate, plan assets will be misallocated with either too little risk or too much risk. A more subtle message of this example is the interrelationship between the plan sponsor, who is charged with the responsibility of investing plan assets, and the actuary, who is charged with the responsibility of determining whether the plan has sufficient assets set aside today to meet promised benefits in the future. Ultimately, the sponsor determines both the expected return via the asset allocation decision and the appropriate discount rate against which the public will judge its investment program. As a consequence, the sponsor controls the timing of when the funding problem is addressed.

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