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Principles and Methodology of Solvency Valuation of Pension Funds

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August, 2007

PRINCIPLES AND METHODOLOGY OF SOLVENCY VALUATION OF PENSION FUNDS

TECHNICAL ASSISTANCE FOR POLICY REFORM II

CONTRACT NUMBER: 263-C-00-05-00063-00

BEARINGPOINT, INC.

USAID/EGYPT POLICY AND PRIVATE SECTOR OFFICE

AUGUST 2007

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SO 16 < OR ACTIVITY TITLE AND ASSOCIATED NUMBER>

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Concept of Solvency Valuation

It is imperative that all private pension funds be solvent. To be solvent means that:

The assets of the pension fund equal or exceed the liabilities of the fund determined on a market basis.

In order to guarantee solvency of private pension funds, it is necessary that the draft private fund laws introduces the concept of solvency margin in the form of additional asset requirement. In order for the laws to be effective, **solvency assets and liabilities** must be defined in a manner that is:

- **Clear and easy to determine**
- **Not subject to maneuver**

Solvency assets must be calculated on a market basis. Book values are not acceptable. Trading assets should be based on market trading values. Non-trading assets should be based on discounted cash-flow using market yields. Real estate should be based on market appraisals.

Solvency liabilities are calculated for each participant of the pension fund as the present value of benefit earned by the participant to-date, based on current pay and current service. Because the benefit earned only reflects current pay and service, a definite amount is determined. This benefit is payable upon retirement. The present value of this benefit is calculated by discounting it from retirement to current age by an interest rate, prescribed each month by EISA. This present value of benefit is called the solvency liability for the participant. Since the interest rate is uniformly prescribed for all pension funds, the solvency liability thus determined is not subject to any maneuver. The solvency liabilities of a pension fund are the sum of the solvency liabilities for the individual fund participants. The interest rate prescribed by EISA to discount retirement benefits is of critical importance in the calculation of solvency liabilities, and must be chosen carefully. In principle, the interest rate should reflect the long term investment return which is achievable under the economic climate on the date that the interest rate is determined. Theoretically, the solvency liabilities thus determined represent the price for which an insurance contract can be bought to cover the pension obligations of the pension fund. The solvency liabilities thus determined is considered to be determined on a market basis. A proxy for the long term investment return used in Canada is the average yield of Canadian government bonds with a maturity date longer than ten years. This proxy interest rate is used for the first fifteen years of discount. 6% interest rate is used for discounts beyond the first fifteen years..

The solvency assets should then be compared to the solvency liabilities. The ratio of solvency assets to solvency liabilities is called the funded ratio. To guarantee security of the retirement benefits, the funded ratio should not be allowed to drop below 100%. An additional layer of assets equal to 10% of the solvency liabilities may provide a

necessary margin to guarantee the 100% funded ratio. Such layer of assets is called the solvency margin of the plan.

It is in nobody's interest if the actuary ignores the solvency rules described above, and take comforts on the basis that the current laws allow pension funds to reduce benefits or increase future contributions when there are not enough assets to cover the liabilities. It is important to note that while the current laws allow reduction of both future and past benefits, the draft laws only allow reduction of future benefit accruals. If the solvency rules are ignored, and no corrective measures are taken on insolvent plans, there is no protection for the retirement benefits for those participants of the future retirees of the pension fund. Allowing the funds to pay high benefits to a retiring executive and thereafter reducing the accrued benefits of the rank and file is tantamount to robbing the poor to pay the rich. This completely defeats the purpose of a pension fund. We are not aware of other countries allowing such practices.

A pension plan with solvency deficiency is not allowed to provide benefit increases to executive which will further increase the solvency deficiency. Lump sum distributions are also limited to the percentage funded of the pension fund. The solvency deficiency must also be amortized by additional contributions.

Background

We understand that majority of private pension funds in Egypt are funded by participant contributions only. These plans are intended to provide a defined benefit upon retirement based on the pay of the participant just before retirement. In a sense, the retirement benefits are purchased by the participants using their own money. The security of these retirement benefits is of paramount concern for the Government, EISA, and all pension professionals.

However, an analysis of a random sample of Pension funds in 2003 revealed that a sizeable portion of these plans were underfunded on a solvency basis, even though they were showing a surplus on an ongoing funding basis. High benefits were paid to retiring executives even though the fund would show a solvency deficiency if a solvency valuation were performed.

In fact most pension funds did not perfrom a solvency valuation, and the regular on-going plan valuation was often manipulated to show a surplus. This led to severe underfunding of the plans coupled with excessive distributions to senior executives, with detrimental effect on the benefit security of the rank and file.

In an attempt to stop such abuses, we propose the introduction of solvency valuation in the valuation of pension funded, and the solvency rules be strictly enforced. It may be appropriate to mention that solvency valuation requirement is universally accepted. It is a major component of the actuarial valuation of pension plans in the United States, Canada, and the United Kingdom.

This paper explains the principles and methodology of the solvency valuation, and discusses the required funding and benefit restrictions of a pension fund with a solvency deficiency.

Principles of Solvency Valuation

The basic solvency requirement of a pension fund is:

> On the date of the solvency valuation, market assets must equal or exceed the liabilities determined on a market basis.

To put it in another way: If the pension fund was terminated on the valuation date, there would be enough assets to pay the full benefit entitlement to all fund participants.

This requires a separate calculation from an ongoing valuation. The principal purpose of an ongoing valuation is to assess the long term financial obligation of the sponsor of a pension fund. Under this valuation, the retirement benefit of each participant is projected to his retirement date, and then discounted back to the valuation date. This projected total fund obligation is offset by the present value of future contributions to produce the ongoing valuation liability. All such projections are performed using actuarial assumptions recommended by the actuary. By skillful manipulation of actuarial assumptions, the value of future contributions can be artificially exaggerated, resulting in grossly understated ongoing valuation liabilities and cost.

The solvency valuation assumes that the pension fund is terminated as of the valuation date. Thus the solvency valuation puts a market value on all assets and liabilities. Nothing is projected. The asset is valued according to the market trading value of each asset item. The retirement benefit for each participant is calculated based on the participant's pay and service on the date of the solvency valuation. This retirement benefit is discounted back to the date of the solvency date using an interest rate prescribed by EISA. No actuarial assumptions such as salary increases, mortality, disability, or termination are used in the calculation. As such, the solvency methodology is easy to understand and apply, and not subject to individual manipulation. The solvency valuation is intended to provide a logical and effective remedy to a drastic situation whereby there is a solvency deficiency.

The following table provides a brief comparison of the two valuation methods

	On-going Valuation	Solvency Calculation
Assets	Averaging allowed	Strictly market
Actuarial Method	Much flexibility	Accrued benefit Method
Benefits	Projected to retirement – project pay/service	No projection – benefit to-date
Interest Rate	Average expected return over many years	Market return for long-term instrument
Cost Shown	Average cost – including future contributions	No averaging – accumulated cost to-date

Solvency Assets

Because of the very nature of Solvency valuations, all assets and liabilities are determined on the assumption that the plan termination is terminated on the date of the solvency valuation.

All assets are determined on a market basis. Book values are not allowed.

Trading assets, which includes stocks and bonds which can be bought and sold on organized markets, are valued based on market trading values.

Non-trading assets, which include mortgages and private placements, are valued based on discounted cash-flow using market yield.

Real estate is valued based on market appraisals.

Solvency Liabilities

A solvency liability is calculated for each fund participant. It is equal to present value of the retirement benefit earned by the participant to the date of the solvency valuation. The retirement benefit is calculated using the pay and service of the participant on the valuation date. The present value is determined based on the discounted value of the benefit payable at the retirement of the participant, or such other earlier date as is allowed under the plan in the situation of a plan termination. The interest rate used in the discounting process is prescribed by EISA, reflecting the expected long-term investment return of the market.

The solvency liability for the pension fund is equal to the sum of the solvency liabilities for the individual fund participants.

Each calculation is rigidly defined, so that different professionals will get the same results for the same plan. In this way, the solvency valuation is not subject to individual manipulation.

The detailed methodology is shown in the following pages.

Solvency Methodology

The determination of the solvency liability for each participant involves the following stages:

1. Determine the accrued benefit (AB) of the fund participant, based on
    a. Plan provisions
    b. Participant pay and service to-date
2. Determine the present value factor (PVF), based on
    a. Years of deferment
    b. Market interest rate as prescribed by EISA
3. Solvency liability = AB x PVF
4. Solvency liability must be set to be greater than the participant's contributions plus interest

1. Determination of the accrued benefit (AB)

In order to determine the accrued benefit for the fund participant, we must examine the plan provisions, and the fund participant statistics. This information is provided by the plan sponsor for the actuarial valuation.

Plan provisions specify the amount of lump sum benefit payable to the participant on his retirement (B), the amount of lump sum benefit payable to the participant on account of his contributions (CB), and the required age and service for unreduced retirement benefits (ura). It also specifies the interest guarantee for participant contributions.

Participant statistics provide information on the age when participant joined the fund (ea), the current benefit service (bs), the number of years when the participant contributed to the plan (cs), the current age of the participant (aa), and the accumulated contribution plus interest to-date (CI).

The accrued benefit (AB) and accrued benefit due to the participant's contributions (CAB) are determined based by prorating the current service over the total service from the age when the participant joined the plan to the date for unreduced retirement benefits. These accrued benefits are payable on the date when the participant is eligible for unreduced retirement benefits, and are determined as follows:

$$\mathbf{AB = B \times bs/(ura - ea)}$$

$$\mathbf{CAB = CB \times cs/(ura\text{-}ea)}$$

2. Determination of the present value factor (PVF)

Because the benefit is not payable until the date for unreduced retirement benefits, there is an interest discount during the years of deferment (dy = ura – aa). In order to determine the interest discount, we must first determine the interest rate assumptions. In principle, the interest rate must reflect market situation in the near term. Since the market situation changes continuous, the near term interest rate changes every month. For uniformity, this interest rate should be prescribed by EISA. It should have two segments: a short to median term rate operating for, say 15 years, and an ultimate rate operating thereafter. A common index used for the interest rate i_1 for the first 15 years is

the average of long term government bond yield. After the 15 years, a stable interest rate i_2 of 5% or 6% is commonly used. No mortality decrement is assumed during the deferment period. Based on these assumptions, the present value factor (PVF) is calculated as follows:

Scenario 1: Years of deferment dy < = 15

$$\mathbf{PVF = 1 / (1 + i_1)^{dy}}$$

Scenario 2: Years of deferment dy > 15

$$\mathbf{PVF = 1 / (1 + i_1)^{15} \times (1 + i_2)^{(dy - 15)}}$$

3. Determination of the solvency liabilities

Solvency liability for AB = AB x PVF

Solvency liability for CAB = CAB x PVF

where the solvency liability for CAB must be set to be greater than the value of fund participant's contributions plus interest (CI).

Impact of Solvency Deficiency

An initial solvency valuation is required for all pension funds on the first date of the fiscal year of the pension fund on or after the effective date of the solvency rules. In that valuation, the solvency liability calculated according to the rules described in the previous sections is compared to the market value of assets on valuation date. If market assets are greater than the solvency liabilities, there is no solvency deficiency. The pension fund is only required to perform an actuarial valuation once every three years, and there is no restriction on benefit increase and lump sum distribution, as long as such benefit increase and lump sum distribution will not cause the pension fund to develop a solvency deficiency. If market assets is less than the solvency liabilities, the plan has a solvency deficiency. The plan must perform an actuarial valuation every year. Furthermore,

Initial solvency deficiency ISD = Initial solvency liability – market assets

This initial solvency deficiency must be made up by special solvency payments ISP, which must be added to the regular contributions.

Minimum ISP = ISD / 5

Maximum ISP = ISD

The ISP may be paid shared between the plan participants and the plan sponsor. The amount of ISP paid by the plan sponsor is tax deductible.

In each solvency valuation, a funded ratio FR of a plan, defined as the ratio of market assets divided by the solvency liability, is also calculated.

Funded ratio FR = market assets / solvency liability

A pension fund is underfunded if funded ratio is less than 1 There are two penalties imposed on each underfunded pension fund.

(1) An underfunded pension fund may not provide full distribution of retirement and other benefits. There are two alternatives for distribution:

   1. Actual distribution = full distribution x FR
   2. Plan sponsor contributes the distribution shortfall

   Such sponsor contribution is tax deductible.

(2) An underfunded pension fund may not provide early retirement window or other benefit increases which will further decrease the funded ratio of the pension fund. In particular, the plan sponsor of an underfunded pension plan is not allowed to bestow excessive lump sum retirement or severance benefits to senior executives. Such increases need prior approval of EISA. One requirement for such approval is for the plan sponsor to first make an additional contribution to the pension fund to totally eliminate the potential increase in funding deficit.

   Notice that, the funding requirements under this penalty is different from the requirements to make up the initial solvency deficiency. While the initial solvency deficiency may be amortized, this increase in funding deficit requires

immediate full payment. Furthermore, while the special payments for initial solvency deficiency may be shared between the plan sponsor and the pension participants, the funding deficit payments must be completely paid by the plan sponsor.

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