

Intensive Pension Training for Egypt

February 2007

Lecture 1 – Retirement Benefit Plans: Defined Benefits vs Defined Contributions

By Michael Sze, PhD, FSA, CFA

Retirement Benefits

- Three principal sources of retirement income
 - Government benefits: social security
 - Private retirement plans
 - Individual savings
- Social security will be discussed later
- Current focus is on private retirement plans
- Will wrap up with a discussion which includes individual savings

Private Retirement Plans

- Primary objective: to provide retirement income
 - A **stream of payment**, starting upon retirement, and ending upon death of
- Two main types of retirement plans
 - Defined contribution (DC) plan: provides a definite amount of contribution each year (**now**)
 - Defined benefit (DB) plan: provides a definite amount of retirement benefit upon retirement (**future**)
- Each must be analyzed in relation to the primary objective

Defined Benefit Plans

- For each year of service
- Employee earns an additional amount of retirement benefit
- Benefit based on pay and service at retirement
 - Benefit starts at retirement
 - Benefit increases each year with inflation
 - Payable as long as the employee lives
- Other benefits may also be provided
 - E.g. death, disability, and termination

Defined Contribution Arrangements

- Each year employer and employee contribute into the employee's individual account
- Account grows with investment returns
- Money in the account is used to provide pension after retirement

Strengths of a Defined Benefit Plan

- Benefit is more predictable
- Benefit is adjusted for inflation:
 - Before retirement: through pay increases
 - After retirement: through regular increases
- More flexibility on early retirement
 - Often with employer subsidy
- Spousal protection: death benefits
- Disability protection: disability benefits
- Termination benefits: lump sum amount on termination

Weaknesses of a Defined Benefit Plan

- Benefits based on pay and service on retirement or termination
- For young employees who terminates, the benefit and lump sum values are small
- Employees don't understand nor appreciate the benefits, until they get close to retirement
- Employees do not feel they have enough control over the benefits

Strengths of Defined Contribution Arrangement

- Definite amount of money contributed into individual account each year
- Individual accounts are comparable to individual savings accounts
- Some plans allow employees to make investment decisions
- On death, disability, or termination, employee or spouse receives account balance
- Employees understand and appreciate better, and feel more in control

Weaknesses of Defined Contribution Arrangements

- These defined contribution accounts are for much different purpose than the savings account
- They are a device to provide retirement income
- Major risk factors include:
 - Low investment returns: insufficient fund
 - Long life: out live the retirement fund
 - High annuity purchase price: low benefit
 - Inadequate early retirement, disability, death benefits
- For higher ages, contributions not enough to cover retirement benefit cost
- High cost to cover inflation

Best Retirement Arrangement

- Differs for each person
- Depends on age, health, family situation, financial status, and expected retirement age
- Balancing act between expectation and risk
- Young employees often choose DC for control, easy to understand, and portability
- Older employees often choose DB for security, predictability, and inflation protection

Analysis of Retirement Plans

- Two important ingredients to analyze
 - The benefit provided
 - The value of the benefits
- DC plan provides the value
 - At risk: benefit after retirement
- DB plan promises a future benefit
 - At risk:
 - Uncertain value
 - Promise kept

Risk Factors of DC Plan

- Investment return
- Annuity purchase rate
- Current age of person
- Projected retirement/benefit payment age
- Amount of current savings
- All these will be analyzed in the exercise this afternoon

Risk Factors of DB Plan

- Termination before retirement
 - Retirement benefit promise: based on final average pay at retirement
 - On termination, only get deferred pension
 - Deferred pension based on current pay
- Not funding enough
 - No money to guarantee retirement benefits
 - Some countries requires sponsor guarantee
- Plan termination
 - Don't get projected benefit to retirement

Typical Provisions of DB Retirement Plans

- Plan sponsor, administrator, effective date
- Eligibility and membership
- Benefit entitlement upon retirement, termination, disability, death, and plan termination
- Vesting and portability
- Contribution obligation
- Funding deficiency
- Surplus distribution
- Disclosure and access to information

Plan Administrator

- Typically, the plan administrator is the plan sponsor, or person/committee delegated
- Plan administrator is ultimate responsible for all matters of the retirement plan
- Some work may be delegated to other professionals
- Things to remember:
 - You can delegate away the work
 - You cannot delegate away the responsibility
- Fiduciary responsibility lies with the administrator

Eligibility and Membership

- Retirement plan should cover a large cross-segment of employees
- Can require minimum service: to eliminate employees terminating shortly
- Can require full-time status: to eliminate part-time or seasonal workers
- Definition of full-time may become complicated

Benefit Entitlement

- Basic benefits and ancillary benefits
- Basic benefits are payable upon normal retirement
- Ancillary benefits include
 - Early retirement benefits
 - Termination benefits: vesting and portability
 - Disability benefits
 - Death benefits
 - Plan termination benefits
 - Bridging benefits

Basic Retirement Benefits

- Typically based on years of service
- May also reflect pay
- Three may types of basic retirement benefits
 - Flat benefits
 - Career average pay benefits
 - Final average pay benefits

Flat Benefits

- Reflects service only
- Employee earns a \$ amount (e.g. \$30) of benefit for each year of service
- This benefit commences upon retirement, and payable for life of the employee
- May be subject to early retirement reduction, and optional form of payments
- This type of benefits are common for plans covering hourly workers
 - May be subject to union negotiation
 - Regular benefit increases after each negotiation

Career Average Pay Benefits

- Benefits reflect the current year pay
- Employee earns an additional benefit each year equal to a % of pay for that year
- These benefits accumulate over the career of the employee, payable upon retirement
- May be subject to early retirement reduction, and optional form of payments
- Benefit inadequate if there is no increases
- Career average update at regular intervals
 - All past benefits updated to reflect recent average pay

Final Average Pay Benefits

- Most common for salaried employees
- Benefits reflect service, and highest average of several years of pay before retirement
- May be subject to early retirement reduction, and optional form of payments
- May incorporate periodic post-retirement increases

Early Retirement Benefits

- Actuarial reduction to reflect
 - Early commencement
 - Longer payout period
- Early retirement subsidy lower reduction
- Characteristic features:
 - Unreduced benefits after 30 years service
 - Unreduced benefits after age 60 with 20 year service
 - Unreduced benefits after 80 age-plus-service points
 - 3% benefit reduction for each year of early commencement

Bridge Benefit

- Typical social security benefit starts at normal retirement age, 65 or older
- Current retirement trend: employees are retiring earlier, substantially before age 65
- To even out the total retirement income before and after age 65: a flat \$ bridge benefit
 - Starts upon early retirement
 - End at age when social security benefit starts
 - May be paid for by employee through reduction in retirement benefit, or
 - Employer paid by requiring no benefit reduction

Vesting

- Non-forfeiture of retirement benefits after some eligibility requirements
- Protection of benefits for terminating employees
- Eligibility requirements:
 - Past: typically requires age 45 and 10 year service
 - Recent: no age requirement, service requirement decreasing to 2 years
- Reflects change in perspective about retirement benefits
 - Past: paternalistic attitude of employer
 - Recent: deferred pay

Portability

- Terminating employees may ask for the earned benefits to be transferred
 - To the employees' new employers
 - In a lump sum to some savings account
 - Taken in cash
- Many of these provisions are subject to the law of the country:
 - To protect the retirement benefit
 - May not allow cash payment until retirement

Disability Benefit

- Payable upon total and permanent disability of employee
- Definition of “total and permanent disability” is controversial
- Typical benefits:
 - Accrued benefit to-date, or
 - Projected benefit assuming working until retirement
 - Typically no early retirement reduction
- Payable for life, or until recovery
- Very costly, and subject to abuse

Death Benefit

- Pre-retirement death benefit
 - Typically equal to the accrued benefit of employee,
 - May be subject to early retirement reduction
 - May allow lump sum cash out
- Postretirement death benefit
 - Typically in the form of joint-and-survivor option, or
 - Guaranteed retirement payout period

Plan Termination Benefits

- Upon plan termination, employees do not have chance to work until normal retirement
- Many jurisdictions require subsidized early retirement provisions in such circumstances
- Many union negotiated plans have additional benefits payable only on plan terminations
- Special treatments: underfunded plans, surplus plans

Funding Provisions

- Specifies the responsibilities of the employer and the employees to make contributions
- It will describe:
 - The expected % of contributions from each party
 - The additional contribution obligations on unfunded liabilities
 - The comparison of value of benefits to the value of the contributions upon termination, death, retirement

Funding Deficiency

- This is typically measured on two separate bases:
 - Ongoing plan basis
 - Plan termination basis
- $\text{Unfunded liability} = \text{Actuarial value of benefits} - \text{assets}$
- Different funding requirements for ongoing and for plan termination unfunded
- We shall discuss these in greater details in the next lecture

Surplus

- Plan surplus = Assets – Actuarial Liability
- Actuarial liability is determined on several bases:
plan surplus on several bases
 - Ongoing funding surplus
 - Plan termination surplus
- Surplus arises from good experience, over-contribution
- Uses of surplus
 - As margin for future bad experience
 - Contribution holiday
 - Distribution to employees
 - Refund to employer

Disclosure Requirement

- Reporting to the government
 - Periodic actuarial report
 - Annual trustee report on assets
 - Summary of employee data and contributions
- Reporting to employees
 - Summary of plan provisions
 - Annual statements
 - Plan and trust documents on demand

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Lecture 2 – Funding Methods for Defined Benefit Pension Plans

By Michael Sze, PhD, FSA, CFA

Overview

- Review the concept DB retirement plan
- Present Value of Projected Benefits (PVB)
- Major Actuarial Cost Methods
 - Accrued Benefit Method (AB)
 - Entry Age Normal Method (EAN)
 - Aggregate Method (AGG)
 - Frozen Initial Liability Method (FIL)
 - Attained Age Normal Method (AAN)
 - Individual Level Premium Method (ILP)

Concept of DB Retirement Plan

- Retirement income is basically a stream of payments
 - Commences upon retirement of employee
 - Payable as long as the person lives
 - May have spousal benefits upon death of employee
- Basic principle of funding
 - Retirement income is in the future
 - Funding must occur during active career of employee
 - Funding methods are different ways to spread that cost into the different years of active career

Present Value of Benefits (PVB)

- PVB is actuarial discount value of the total projected benefits the employee will earn if he/she works until retirement
- Steps to calculate the PVB
 - 1. Calculate the projected benefit, based on projected pay, projected service.
 - Benefit is payable for many years after retirement
 - 2. Calculate the present value of this benefit at retirement age
 - 3. Calculate the discounted value of 2. to current age

Major Actuarial Cost Methods

- Accrued Benefit Method (AB)
 - Spread PVB strictly according to service
- Entry Age Normal Method (EAN)
 - Spread PVB according to present value of service
 - May or may not reflect pay increases in the spread
- Aggregate Method, Frozen Initial Liability Method, Individual Level Premium Method
 - Variations of the EAN

Accrued Benefit Method (AB)

- Cost is calculated for each individual employee:
 - Total cost for projected benefit is pvb
 - The normal cost (nc) is just pvb/ts
 - ts is the number of years from the date the employee is hired to the date of retirement
 - Past service liability, also called the actuarial liability (al) is just $nc \times s$
 - Where s is service of employee on valuation date
- PVB , NC , and AL for the entire plan are just sums of these items for all employees

AB (Continued)

- Alternative method to calculate al
- Instead of determining the pvb for total projected benefit, based on total projected service (ts)
 - Determine the present value for accrued benefit based on service to-date s
 - This should be equal to the al determined above
 - Here al still reflect projected pay of the employees
- The method of determining AL above can also be applied to accrued benefits without pay projection
- This is called the accrued benefit value (ABV)

AB (Continued)

- NC is the cost of the retirement plan for each year of service
- In particular, NC is the cost for the current year
- There should be contribution to cover the NC
- AL is the accumulated NC for all past years
- There should have been contributions to cover AL
- These contributions together with investment return constitutes assets (A) in the plan

AB (Continued)

- If every thing happens according to expectation, then $A = AL$
 - We say that the plan is fully funded
- If things do not happen according to expected (e.g. investment return less than expected), $A < AL$
 - Unfunded Liability (UL) = $AL - A$
 - This must be amortized over a number of years
 - Amortization payment must be paid in addition to NC
- If $A > AL$, the plan has surplus (Surp)
 - Surp = $A - AL$
 - Surp may be used to reduce contribution requirements

AB (Continued)

- Causes for Unfunded Liability/Surplus
 - Contributions higher/lower than required
 - Benefit increases
 - Actuarial assumption changes
 - Plan experience different from the actuarial assumptions (called actuarial gains/losses)
 - Actuarial gains/losses will be discussed in greater detail in the next lecture
- UL/Sur affects the required contribution: through amortization payments

Entry Age Normal Method

- This is the method to spread each individual pvb over present value of all service (past & future)
- The cost is calculated for each individual employee
 - Each year of service has weight of 1
 - Each future year is discounted back to current date by interest and survivorship
 - Each past year is grossed up with interest and reciprocal of survivorship probability
 - $pvts = \text{Sum of present values of services}$
 - $pvfs = \text{Sum of present values of future services}$
 - $eannc = pvb / pvts$
 - $eanal = pvb - eannc \times pvfs / pfts$
- PVB, AL, NC for entire plan is just sum of these for all employees

Entry Age Normal Method by Compensation (EANC)

- The EAN in the previous slide spreads the PVB by service
- For pay related plans, it is more common to spread the PVB by compensation
- For each individual employee, calculate pvtc by
 - applying salary scale and other factors to the compensation (c) each year in the calculation of pv
 - $pvtc = \text{Sum of pv of compensation for each year}$
 - $Pvfc = \text{Sum of pv of compensations for future years}$
 - $eancnc = pvb \times c / pvtc$
 - $eancal = pvb - eancnc \times pvfc / pvtc$
- For the entire plan, PVB, AL, NC are just sum of the individual cost items

EAN (Continued)

- After the AL and NC have been calculated according to EAN or EANNC
 - The UL, Surp, and required contributions are calculated in the same manner as under AB
- For same plan and same employees:
 - $ABNC < EANNC$ for young employees
 - $ABNC > EANNC$ for older employees
 - The cross over point is typically between 40-45
 - $ABAL < EANAL$

Aggregate Cost Method (AGG)

- In AB and EAN, the NC is first calculated for each individual and then summed up
- In AGG, the NC is determined for the entire plan
- PVB, PVFS or PVFC, TC are calculated as the sum of the individual items
- No AL and UL are calculated under this method
- $NC = (PVB - A) \times TC / (PVFS \text{ or } PVFC)$
- All cost for benefit increases, actuarial assumption changes, actuarial gains/losses are spread over future years

Frozen Initial Liability Method (FIL)

- This is a hybrid between the EAN and the AGG
- In the initial year
 - AL, and NC are calculated using EAN
 - Unfunded frozen initial liability (UFIL) = AL
- In each subsequent years
 - UFIL is updated interest + NC – contribution
 - New NC = $(PVB - A - UFIL) \times TC / PVFC$

FIL (Continued)

- Basically, for FIL, the actuarial gains/(losses) are spread over future years
- When there are benefit increases, or assumption changes
 - The cost impact is calculated using EAN
 - This is added to the UFIL as another layer
- Each layer of UFIL has its own amortization schedule
- Each year, the required contribution consists of the NC + amortization payments

Attained Age Normal Method (AAN)

- This is exactly like FIL, except that the UFIL is determined using AB

Individual Level Premium Method (ILP)

- This method is often used for funding benefits through an insurance contract
- For each individual, at the time that a benefit is created,
 - The pvb is determined
 - Based on total service ts and pay without projection
 - This is spread over future service
 - $nc = pvb / pvfs$
 - This nc is kept constant for future years
 - Each benefit increase, including that caused by pay increase, results another layer of nc
- There is no AL under this method
- NC for the entire plan is sum of nc for all employees

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Lecture 3 – Actuarial Valuation for Defined Benefit Pension Plans

By Michael Sze, PhD, FSA, CFA

Agenda

- Funding of pension plans
- The valuation process
 - collect, review & reconcile data
 - set valuation assumptions
 - perform computer analysis
 - reconcile results with last valuations
- Key sections of the actuarial valuation report
- Using the valuation report
- How do we use this information?

Funding of Pension Plan

Remember!



- Pension benefit:
 - a stream of future payments
- Funding:
 - regular contributions to ensure security of the benefit payments

Funding of Pension Plan

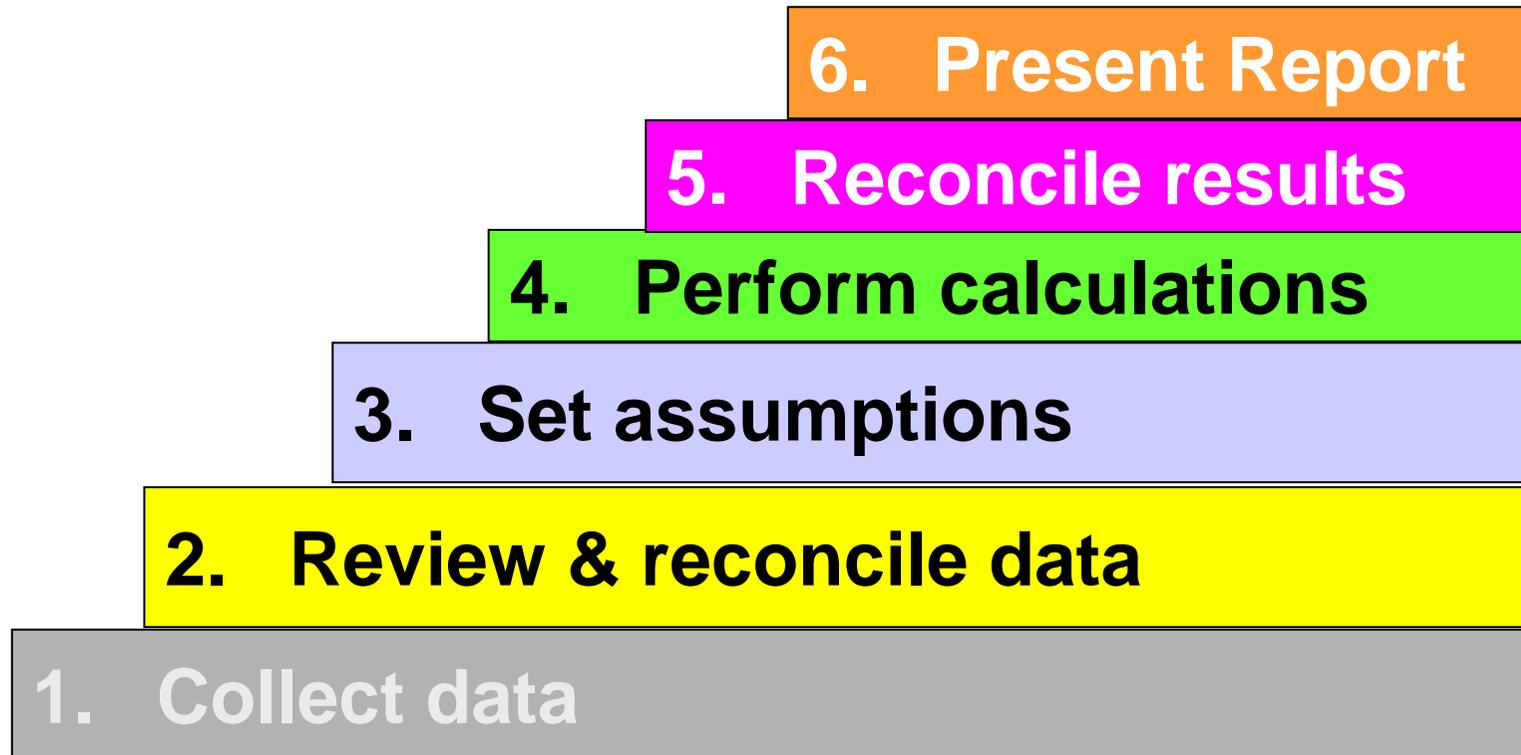
Factors to determine Contributions

- How generous are the benefits
- Employee population statistics
- When will employees retire
- How long will they live
- Expected investment return
- How much safety margin is built in to the process

**Substantial leeway here so
Administrator must exercise judgment**

Valuation Process

Steps in the Valuation Process



Data Collection

Sources of Information Gathered

Plan Provisions:

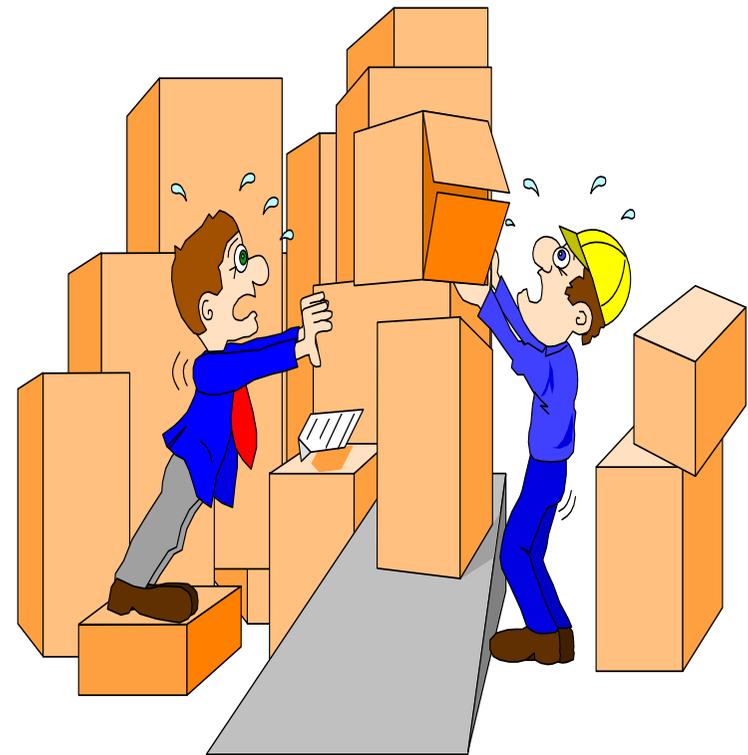
Plan sponsor, plan lawyer

Member Data:

Plan sponsor, union, recordkeeper

Asset Information:

Plan sponsor, trustee,



Data Review & Reconciliation

Reconciling what data?



Text: Ensure all amendments are covered, including all new ones

Member: Ensure employee information is accurate; reconcile data against last year; check to ensure pay and service increases are reasonable

Asset: Reconcile asset balance from last year to this year; check to make sure necessary contributions are made and payments are reasonable

Data Reconciliation

	Actives	Deferred	Retired	Total
1/1/2000	192	133	38	360
Changes:				
Deaths	(1)	(3)	(4)	(8)
Disability	(1)		1	0
New	11			11
Retirement	(3)	(4)	7	0
Termination	(25)	9		(16)
Data Error		2		2
Net Results	(19)	4	4	(11)
1/1/2001	173	137	39	349

Setting the Valuation Assumptions

- This process is a joint effort of management and actuary
- The assumptions must have a reasonable, prudent, expectation of future development
- The assumptions may be subject to regulatory constraints

Major Actuarial Assumptions

Ongoing plan assumptions

Assuming plan continues indefinitely

- Interest discount rate:
 - expected long-term investment return for the plan
- Pay increases:
 - expected future pay increases
- Post-retirement benefit increases:
 - inflation indexation
- Retirement age:
 - expected age for future retirements

Major Actuarial Assumptions (cont'd)

Solvency assumptions

Test funded status of the plan on a termination basis

- Interest discount rate:
 - reflects market economy on valuation date
 - prescribed according to long-term bond rate
 - substantially lower than going concern interest rate
- Retirement age:
 - age that produces the highest liability

**In many cases, solvency costs
may drive pension funding**

Valuation Process

How do these translate into contributions?

Assets – accrued liability

Positive = **Surplus**

Negative = **Unfunded Liability**

Pension contribution

Surplus

- implies lower contribution

Unfunded Liability

- implies normal cost + amortization payment

Key Sections of Valuation Report

Executive Summary

- Most important page; study it carefully
- Major items of the funding valuation
 - Employee data,
 - Ongoing normal cost, accrued liability, assets, surplus or unfunded liability
 - Solvency liability, solvency assets, solvency surplus or deficits
 - Funding contributions
- Comparison against the last year

Key Sections of Valuation Report

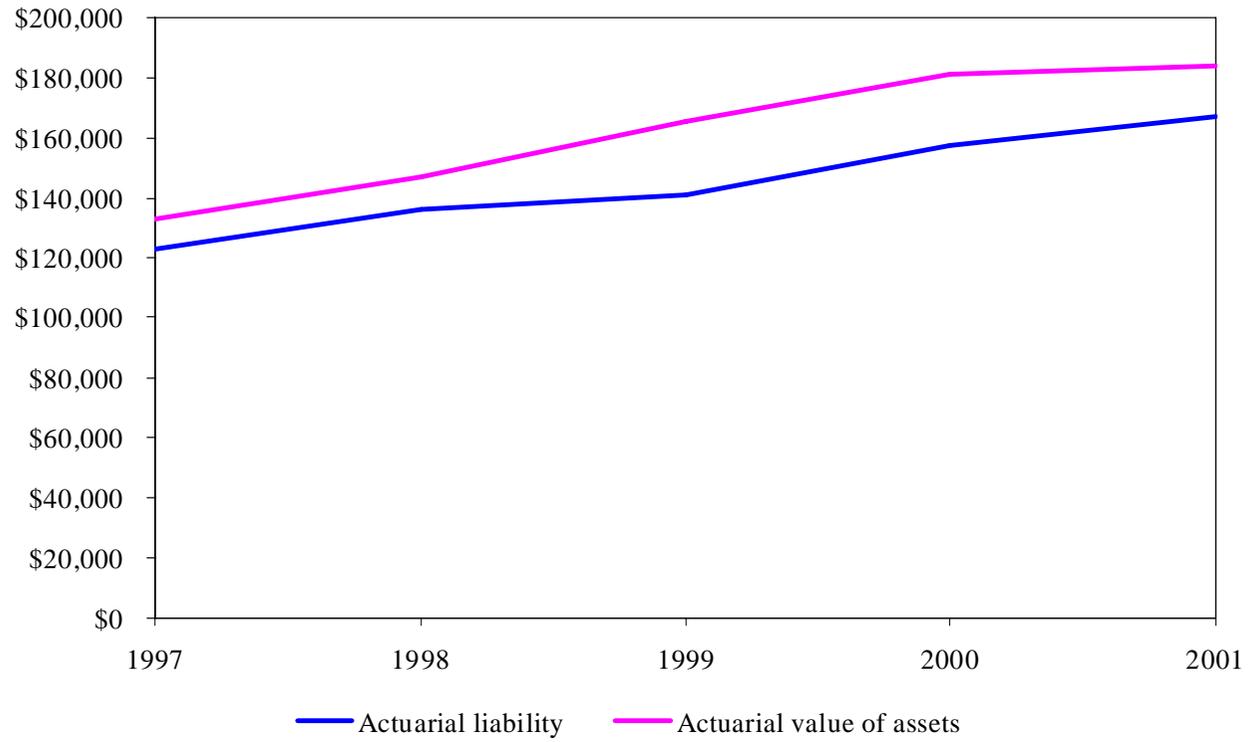
Other Sections

- Use other sections of the report for details on:
 - Development of liabilities and contribution
 - Experience analysis
 - Employee data
 - Actuarial method and assumptions
 - Plan provisions
 - Cost certificate
 - Employer certificate of data and plan provisions

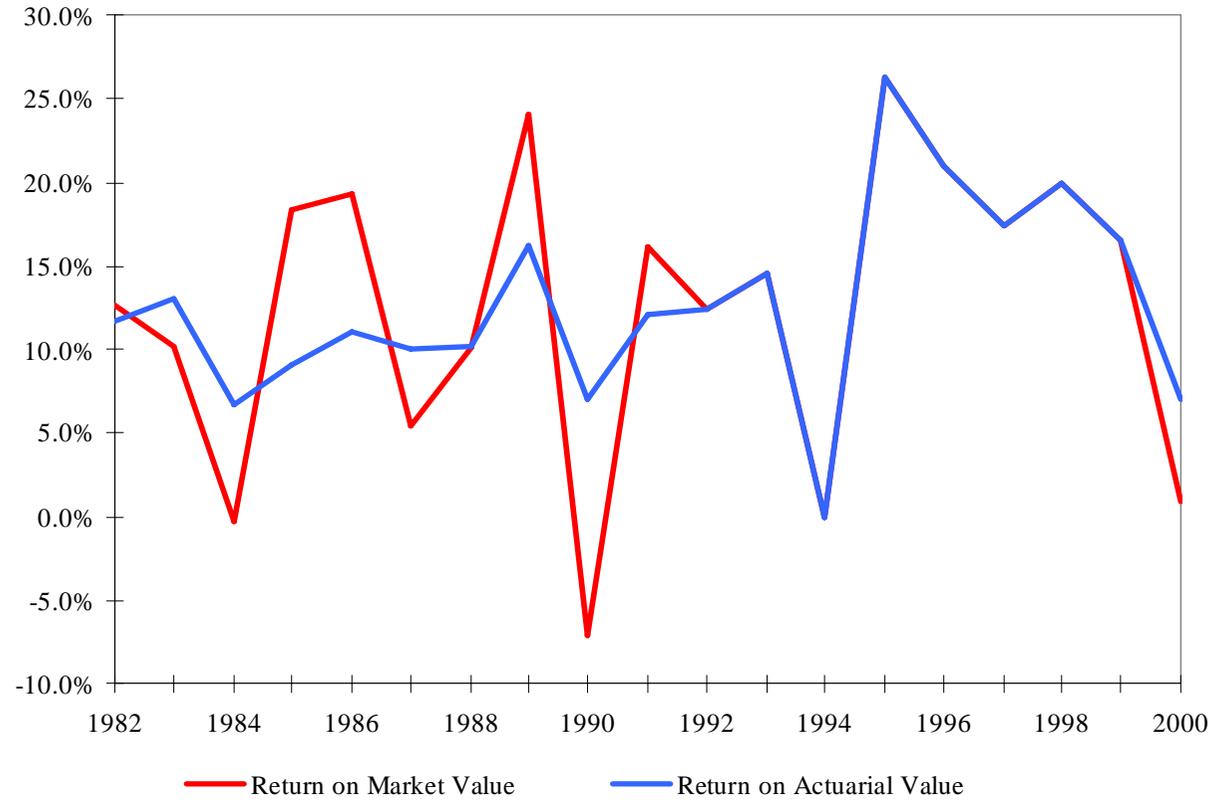
Funding Requirements

	December 1, 2001	December 1, 2000
Funding Liabilities		
Actuarial liability		
Actives and others	\$ 33,318,283	\$ 28,108,374
Terminated vesteds	32,134,031	34,990,938
Retirees	101,818,177	94,715,002
Total	\$ 167,270,491	\$ 157,814,314
Actuarial value of assets	183,971,270	181,048,224
Unfunded actuarial liability/(surplus)	\$ (16,700,779)	\$ (23,233,910)
Normal cost	\$ 5,823,092	\$ 3,687,214
Contributions, 12/31		
Minimum required	\$ 5,826,841	\$ 0
Maximum deductible	\$ 37,039,345	\$ 21,200,538
Personnel Information		
Participant count		
Actives	6,784	6,683
Terminated vesteds	1,364	1,713
Retirees	2,177	2,046
Total	10,325	10,442
Valuation payroll	\$ 366,743,000	\$ 340,293,000

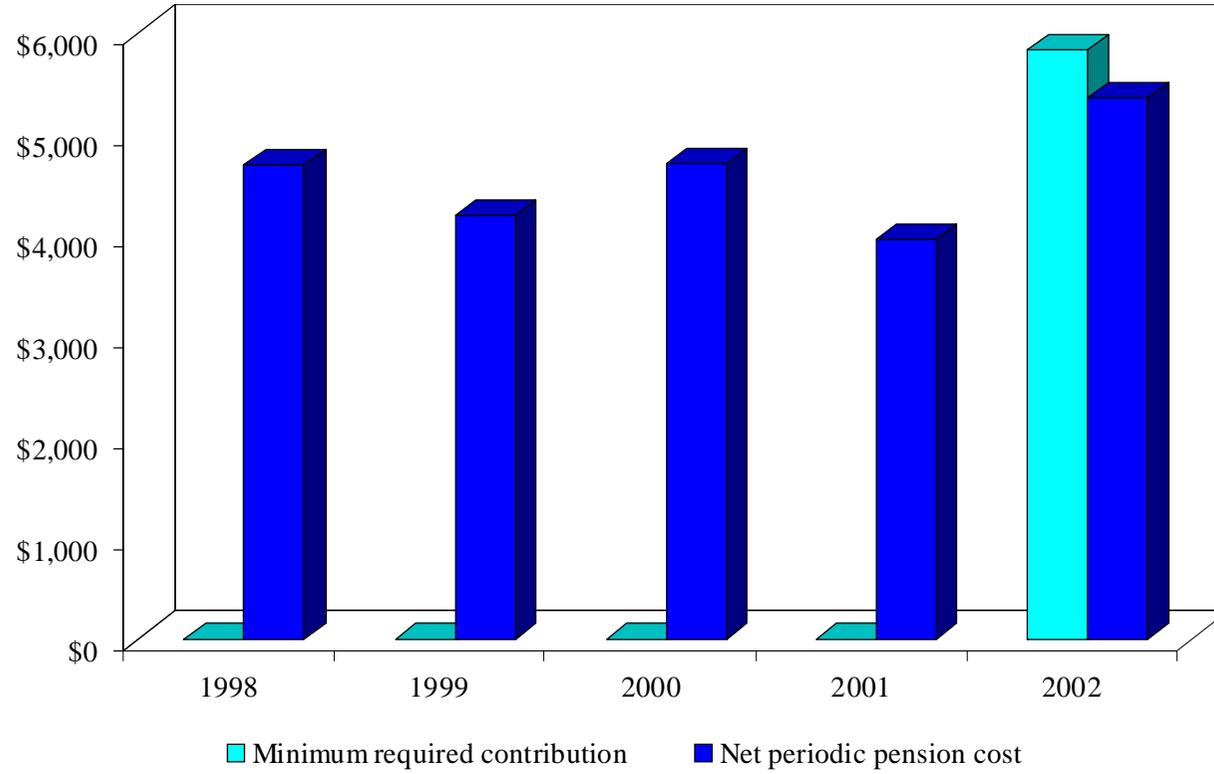
Assets and Liabilities That Determine Funding Requirements as of the Beginning of the Plan Year



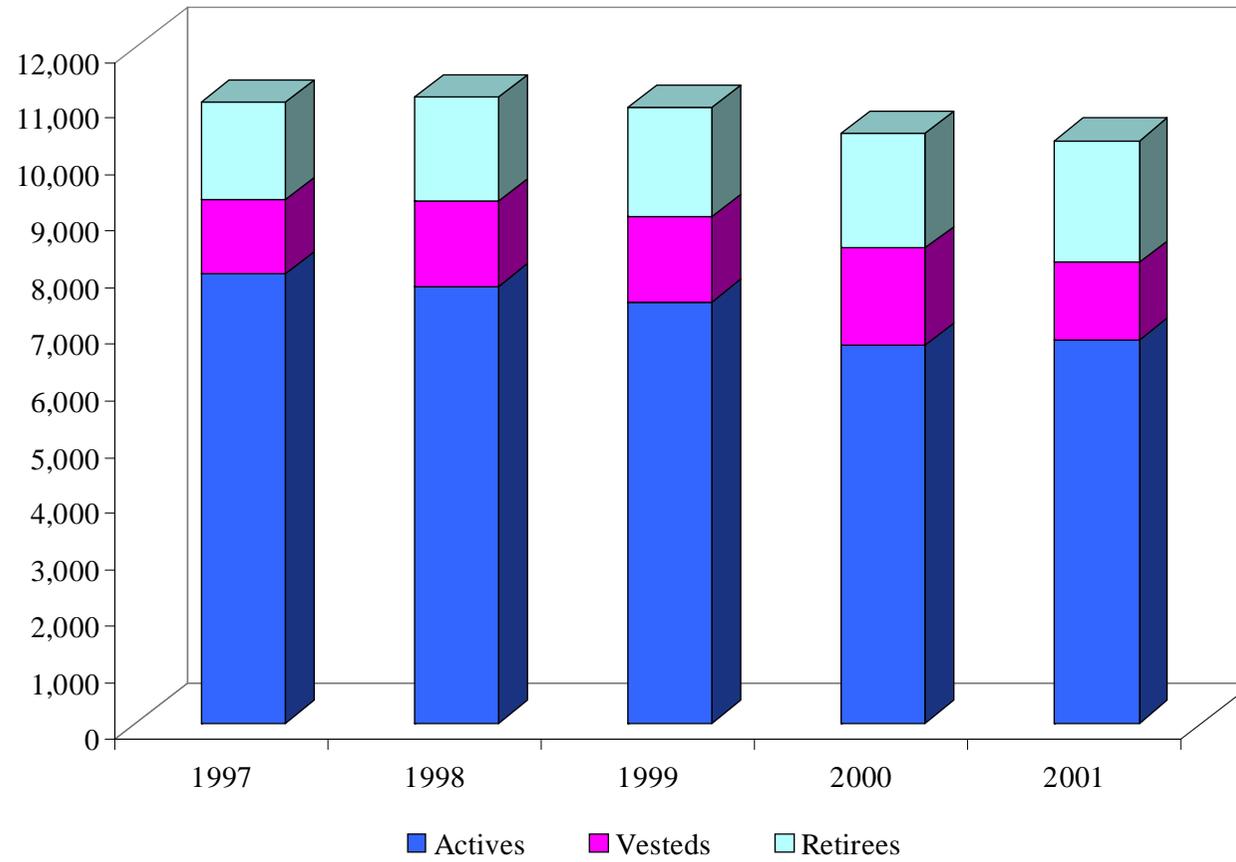
History of Asset Values and Rates of Return



Pension Expense and Contributions



Participants Counts



Determination of Unfunded Actuarial Liability

Effective December 1, 2001, the demographic assumptions used in the valuation were changed to reflect recent experience. The development of the liabilities of the plan is as follows:

	Before Assumption Changes	After Assumption Changes
Determination of Unfunded Actuarial Liability		
(1) Actuarial liability		
(a) Actives and disableds	\$ 30,077,916	\$ 33,318,283
(b) Terminated vesteds	32,134,031	32,134,031
(c) Retirees	101,818,177	101,818,177
(d) Total, (a) + (b) + (c)	\$ 164,030,124	\$ 167,270,491
(2) Actuarial value of assets	183,971,270	183,971,270
(3) Unfunded actuarial liability/(surplus), (1)(d) – (2)	\$ (19,941,146)	\$ (16,700,779)
Determination of Normal Cost		
(4) Normal cost, December 1, 2001	\$ 5,176,673	\$ 5,823,092
(5) Percent of valuation payroll	1.41%	1.59%
(6) Valuation payroll	\$ 366,743,000	\$ 366,743,000

Minimum & Maximum Contributions

- Minimum contribution = Normal cost + amortization of unfunded liabilities
 - Contributions are expected to be made monthly
 - Otherwise there should be interest adjustment
 - When there is a surplus, the normal cost may be offset by amount of surplus
- Maximum contribution = Normal cost + unfunded liabilities
 - Adjusted with interest to reflect timing of contributions
 - When there is a large surplus, excess surplus must offset normal cost

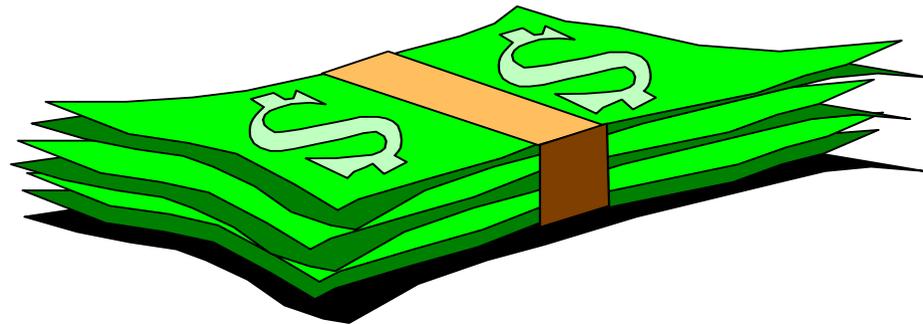
Gain / Loss Analysis

Actual valuation produces: Actual Asset Value
- Actual Liability Value
Actual Surplus (Unfunded Liability)

Gain/Loss Analysis shows: Difference between
Actual Experience & Expected Experience

Gain/Loss Analysis:

- Asset G/L
- Liability G/L



Discussed in greater detail in the next lecture

Using the Valuation Report

Use it as a planning tool

- Management planning tool to plan for future
 - Study both the current situation as well as past trend
 - Much information on population trend
 - Future of plan
 - Important issues for the plan

Using the Valuation Report (cont'd)

- Emphasis on security - look for changes
 - All changes between valuations have a reason
 - Look for drastic changes in costs
 - Understand the reasons for these changes
 - Make corrective actions, if necessary

How to use the information

- Understand the population
- Scrutinize the population trend
 - Examine the employee characteristics
 - Watch out for matured plan in decline stage
 - Plan wind-up or merger may be imminent
- Ensure adequate funding & security
 - Analyze the trends of the assets vs liability
 - on both funding and solvency basis
 - solvency deficiency needs immediate attention

How to use the information

- Take necessary remedial action
 - e.g. Assets not performing well?
 - review investment managers
 - e.g. Heavy retirement and terminations?
 - need substantial cashflow

How to use the information

- Examine the plan's liability trend
 - Has solvency liability changed drastically?
 - Will funding become an issue in the future?
 - Benefit increase - is it financially affordable?
 - Is there enough safety margin?

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Lecture 4 – Pension Plan Experience Analysis

By Michael Sze, PhD, FSA, CFA

Agenda

- Reasons for experience analysis
- Major components of experience analysis
 - Data reconciliation
 - Liability analysis
 - Asset analysis
 - Aggregate pension plan analysis
 - Detailed components

Reasons for Experience Analysis

- Pension plans are for the long-term
- There is relative stable patterns of development of liabilities and assets
- One of the best way to detect errors
 - Results out of line from previous years typically signify potential errors
- Good way to detect potential problems
 - Understanding the cause for undesirable developments help to avoid potential future problems

Data Reconciliation

- One of the most important steps
- Traces the ins and outs of the pension plan population
- Causes for changes of active population
 - Death, termination, retirement, new employees
- Causes for changes of retired population
 - Death, new retirement

Reconciliation of Actives

- Actives last year – deaths – terminations – retirements + new employees = actives this year
- Deaths: gains/losses – may be gains or losses
 - Decrease in active liabilities
 - Increase in survivor spouse liabilities
- Terminations: gains/losses – typically gains
 - Decrease in active liabilities
 - Increase in payments equal to termination benefits
- Retirements: gains/losses – typically small
 - Decrease in active liabilities
 - Increase in new retiree liabilities

Reconciliation of Retirees

- Retirees last year – death + new retirees = retirees this year
- Death: gains/losses – may be gains or losses
 - Decrease in retiree liabilities
 - Expected deaths according to mortality table
- New retirees: gains/losses – typically small
 - Decrease in active liabilities
 - Increase in retiree liabilities

Expected Assets and Liabilities

Glossary

BOY: Beginning of Last Year

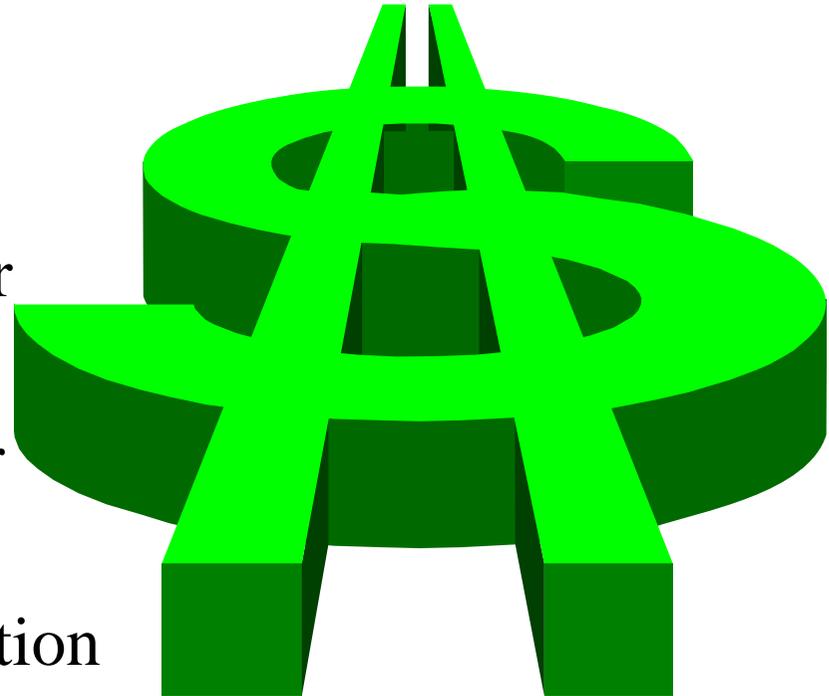
EOY: End of Last Year

NC: Normal Cost Last Year

Contributions Last Year

i : Interest Rate for Valuation

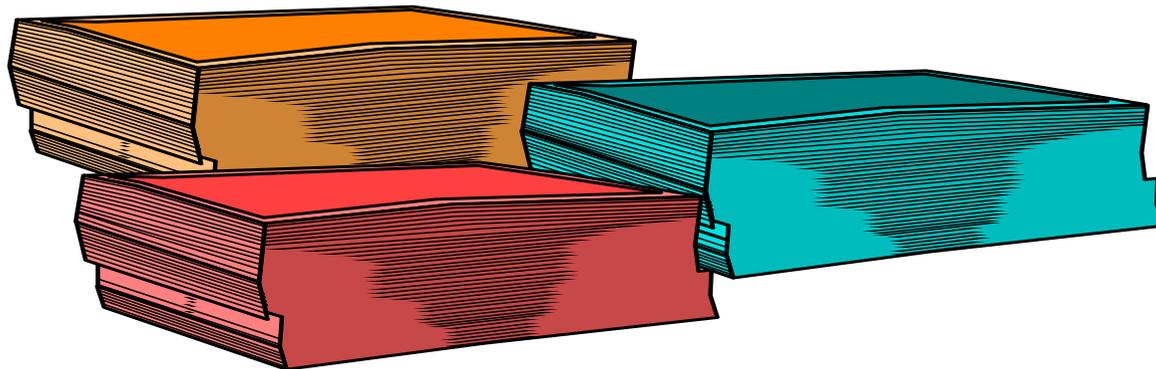
It is assumed that normal cost, payments, and contributions are all made in mid-year



Expected Liability

$$\text{EOY Expected Liability} = \text{BOY Liability} + \text{Normal Cost} \\ - \text{Payments} + \text{Interest}$$

$$\text{EOY Expected Liability} = \text{BOY Liability} * (1 + i) + \\ \text{NC} * (1 + i/2) - \text{Payments} * (1 + i/2)$$



Liability Gain/(Loss)

- Expected liability EOY
= Liability BOY x $(1 + i)$
+ Normal cost x $(1 + i/2)$
- Actuarial gain/(loss) from liability
= Expected liability EOY
- actual liability this year
- This gain/(loss) = sum of gains/(losses) from
actives and retirees

Liability Gain and Loss Analysis

1. Actual Liability at Beginning of Period _____
2. Normal cost (made mid-year) _____
3. Actual benefit payments (made mid-year) (_____)
4. Interest return on
 1. _____
 2. _____
 3. (_____)_____
5. Expected Liability at End of Period (1+2+3+4) _____
6. Actual Liability at End of Period _____
7. Liability Gain/Loss (5-6) _____

Total Gain and Loss ("G/L") = Asset G/L + Liability G/L

Retiree Liability Gain/(Loss)

- Expected retiree liability EOY
= Retiree liability BOY $\times (1 + i)$
- Benefit payment $\times (1 + i/2)$
+ New retiree liability
- Actuarial gain/(loss) for retirees
= Expected retiree liability EOY
- Actual retiree liability this year

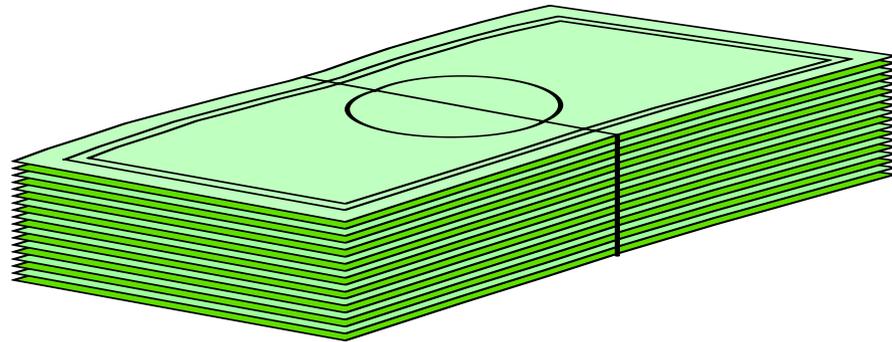
Active Liability Gain/(Loss)

- Expected active liability EOY
= Active liability BOY $\times (1 + i)$
+ Normal cost $\times (1 + i/2)$
- New retiree liability
- Actuarial gain/(loss) for actives
= Expected active liability EOY
- actual active liability this year

Expected Assets

$$\text{EOY Expected Assets} = \text{BOY Assets} + \text{Contributions} \\ - \text{Payments} + \text{Interest}$$

$$\text{EOY Expected Assets} = \text{BOY Assets} * (1 + i) + \\ \text{Contributions} * (1 + i/2) - \text{Payments} \\ * (1 + i/2)$$



Asset Gain/Loss

- Expected assets EOY
= Assets BOY x $(1 + i)$
+ Contributions x $(1 + i/2)$
- Benefit payments x $(1 + i/2)$
- Asset gain/(loss)
= Actual assets this year
- Expected assets EOY

Asset Gain and Loss Analysis

1. Actual Asset at Beginning of Period _____
2. Contributions (made mid-year) _____
3. Actual benefit payments (made mid-year) (_____)
4. Interest return on
 1. _____
 2. _____
 3. (_____)_____
5. Expected Asset at End of Period (1+2+3+4) _____
6. Actual Asset at End of Period _____
7. Asset Gain/Loss (6-5) _____

Expected Surplus (Unfunded Liability)

Expected Surplus



$$\begin{aligned} &= \text{Expected Assets} - \text{Expected Liability} \\ &= [\text{BOY Assets} * (1+i) + \text{Contributions} * (1+i/2) - \text{Payments} * \\ &\quad (1+i/2)] \\ &\quad - [\text{BOY Liability} * (1+i) + \text{NC} * (1+i/2) - \text{Payments} * (1+i/2)] \\ &= \text{BOY Assets} * (1+i) - \text{BOY Liability} * (1+i) + (\text{Contributions} \\ &\quad - \text{NC}) * (1+i/2) \\ &= \text{BOY Surplus} * (1+i) + (\text{Contributions} - \text{NC}) * (1+i/2) \end{aligned}$$

Pension Plan Gain/Loss

- Expected surplus (unfunded liabilities) EOY
= Surplus (Unfunded liabilities) BOY $\times (1 + i)$
- Normal cost $\times (1 + i/2)$
+ Contributions $\times (1 + i/2)$
- Pension plan gain/loss
= Actual surplus (unfunded liabilities) this year
- expected surplus (unfunded liabilities) EOY
- This gain/(loss) should equal sum of asset and liability gain/(loss)

Example

	<u>Actual at 1.1.95</u>
Asset	\$1,000,000
Liability	<u>\$800,000</u>
Surplus	\$200,000
NC	10% of payroll
Payroll	\$750,000
Benefit payment in 1995 was: \$50,000	
Interest rate assumption: 7.0%	
Contributions: \$90,000	

Q: Calculate expected surplus at 31.12.95.

Example -- 2 Methods

Method 1 (Short Version):

$$\begin{aligned}\text{Expected Surplus} &= \$200,000 * 1.07 + (90,000 - 75,000)*(1.035) \\ &= \$229,525\end{aligned}$$

Method 2 (Long Version):

$$\begin{aligned}\text{Expected Asset} &= \$1,000,000 * 1.07 + 90,000 * 1.035 - 50,000 * 1.035 \\ &= \$1,111,400\end{aligned}$$

$$\begin{aligned}\text{Expected Liability} &= \$800,000 * 1.07 + 75,000 * 1.035 - 50,000 * 1.035 \\ &= \$881,875\end{aligned}$$

$$\begin{aligned}\text{Expected Surplus} &= \$1,111,400 - \$881,875 \\ &= \$229,525\end{aligned}$$

Which Changes Affect the Valuation?

- Data
- Assumptions
- Methods



Which Changes Affect the Valuation

Any change that is not expected!

For example:



Date of Birth

Date of Employment

Credited Service

Plan Amendments

Change of Assumptions

and/or Methods

Quantifying the Changes

... through a series of examples

- Data
- Assumptions
- Methods



Quantifying the Changes



Example 1

Flat \$ plan (union negotiated)

Benefit at 1.1.2006 = \$20/month/year of service - non-contributory

Cost Method: Accrued Benefit

Improvement at 1.1.2006: Increase to \$22 retroactive/month/year
of service

Actuarial Liability at 1.1.2006 = \$400,000 before increase

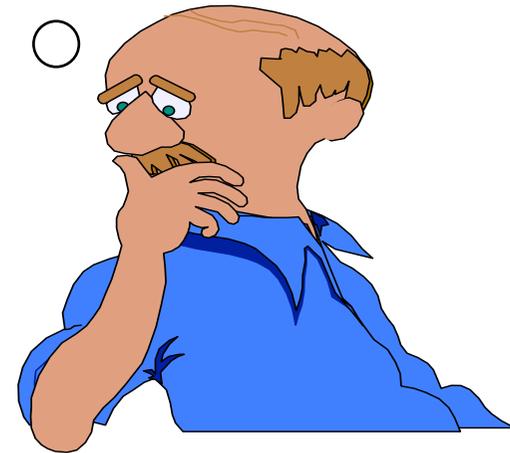
Normal Actuarial Cost at 1.1.2006 = \$20,000 before increase

Q: How will Actuarial Liability and Normal Cost change, due to the plan improvement?

Quantifying the Changes

Example 1

Q: How will Actuarial Liability and Normal Cost change, due to the plan improvement?



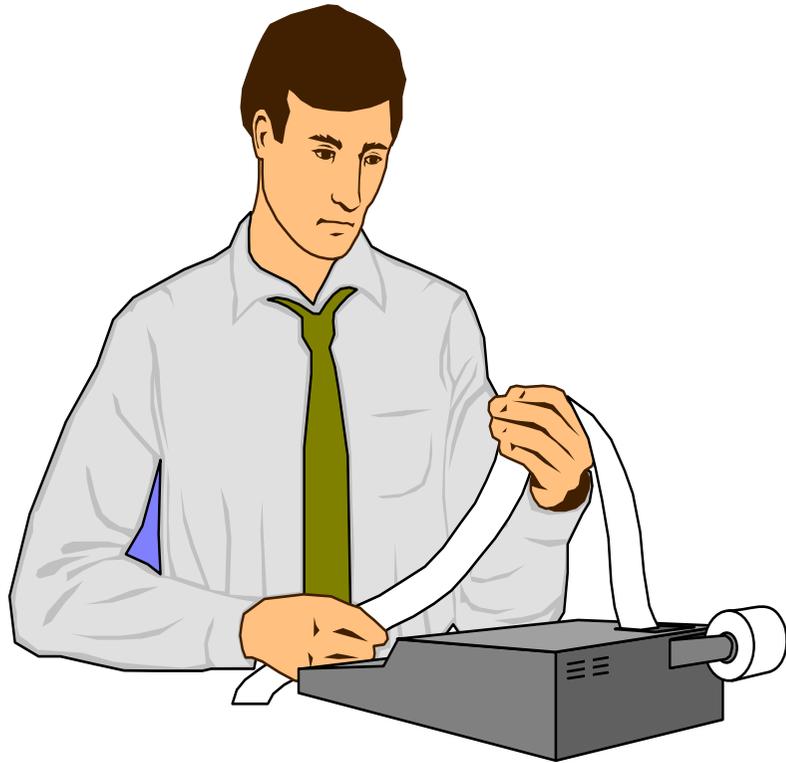
A: At 1.1.2006 after change: $AL = \frac{22}{20} * 400,000 = 440,000$

20

$NC = \frac{22}{20} * 20,000 = 22,000$

20

Quantifying the Changes



Example 2

Q: The date of birth of an employee was wrongly coded when the data was requested for the valuation at 1.1.2005. It was corrected for the 1.1.2006 valuation. Using the following information, calculate the plan gain or loss at 1.1.2006 due to the error.

Quantifying the Changes

Example 2

Plan formula:	1.2% Career Average Plan
Cost Method:	Accrued Benefit
Wrong Date of Birth:	January 1, 1976
Actual Date of Birth:	January 1, 1958
Accrued pension at 1.1.2005:	\$1,000 per month
Salary rate at 1.1.2005:	\$35,000
Interest rate assumption:	7%
Retirement date:	Age 65
Annuity factor at age 65:	10
Decrement before retirement:	None

Quantifying the Changes

Example 2

A: Expected Liability - Actual Liability = Gain (Loss)

Using Wrong Age:

at Age = 30
1.1.2006:

Accrued Benefit = $\$1,000 \times 12 (= \$12,000) + 1.2\% \times 35,000 = 12,420$

Expected Liability = $12,420 \times 1.07^{(-35)} * 10 = \$11,633$

Quantifying the Changes

Example 2

Using Actual Age

at Age = 48

1.1.2006:

Accrued Benefit = \$12,420

Actual Liability = $\$12,420 * 1.07^{(-17)} * 10 = \$39,319$

Therefore:

Gain (Loss) due to age = \$11,633 - 39,319

correction

= (\$27,686)

Intensive Pension Training for Egypt

February 2007

Lecture 5 – Investment of Pension Funds

By Michael Sze, PhD, FSA, CFA

Agenda

- Investment - Overview
- Statement of Investment Policy and Procedures
- Monitor Investment Performance

Investment - Overview

- Major types of investments
- Value of bonds
- Value of stocks
- Investment portfolio
- Efficient frontier

Major Types of Investments

- Money market investments
- Bonds (fixed income)
- Stocks (equities)
- Derivatives

Money Market Instruments

- Short term (< 1 year) debts issued by government or corporation
- Fixed repayment F at the end of period n days and annualized investment return r
- Price = $F / (1 + r \times n / 365)$
- Very low risk
- Examples: Treasury bill, commercial paper, bankers acceptances
- Typical use: to park assets in volatile market

Bonds (Fixed Income)

- Longer term (1-30 years) debts of government or corporation
- Fixed repayment F (face value) at the end of term n years (maturity date), fixed annual coupon interest rate r
- Semi-annual interest paid = $(F \times r) / 2$
- Market price of bond equals cumulative discounted values of the coupons and face value F
- Price sensitive to interest rate fluctuations
- Examples: federal, provincial, municipal, corporate, and foreign bonds, mortgages

Stocks (Equities)

- Owner of corporation, share in earnings/profit
- Price per share P reflects
 - Expected dividend payout D (= earnings E x payout ratio k)
 - Increased by expected rate of earnings growth g
 - Discounted by investor's expected rate of return r
- $P = D \times (1 + g) / (r - g)$
- $P / E = k \times (1 + g) / (r - g)$
- P sensitive to expected growth g and interest rate change Δr , especially sensitive to difference in r and g
- Very sensitive to g in the initial rapid growth period
- Examples: common stocks, preferred stocks, foreign stocks

Derivatives

- Examples: options, forwards, futures
- Risky by themselves
- Can be used to stabilize stock price fluctuation
- Sometimes used to synthesize a stock-index
 - Used to increase foreign content of RRSP
- Not extensively used in pension funds

Risk / Return Tradeoffs

- Historically, for a single investment: higher return is associated with higher risk
- Different investments behave differently
- To minimize risk: choose investments which rises and falls at different time
- Combined portfolio is more stable
- Optimal portfolio for a specific level of risk : the asset portfolio that has the highest rate of return
- Efficient frontier: trace of all optimal portfolios

Excel programs on bond and
stock values and efficient frontier

Statement of Investment Policy and Procedures

- Importance of Statement of Investment Policy and Procedures
 - In most developed countries, administrator must establish SIP&P that satisfies federal rules
 - Related investment rules
 - Prudent person rule
 - Special knowledge and skill
 - Financial reporting

Primary Purpose of SIP&P

- Purpose: to force plan sponsor to consider basic principles of pension fund investment
- Persons involved: plan sponsor, actuary, and fund manager
- Not filed, but submitted to
 - Advisory committee and actuary of DB plan
 - Available to members/former members, trade union, etc.
- Reviewed annually, confirmed or amended

Provisions of SIP&P

- Type of pension plan: DB, DC
- Funded status: going concern, solvency bases
- Risk tolerance of plan sponsor
- Investment objectives: related to plan
- Expected returns
 - Total portfolio: re inflation, benchmark
 - Fund component: re benchmark, peer group
- Asset mix policy: range allowed for each asset class
- Diversification of investment portfolio
- Other restrictions

Other Restrictions

- Allowable investments and loans
 - Investment quality, and restrictions
- Monitoring performance
 - Measurement method
 - Measurement time period
 - Acceptable practice
- Conflict of interest policies
- Delegation of voting rights

Factors Related to Pension Plan

- Characteristics of registered plan (DB/DC)
- Plan population: average age/service, # of retirees
- Liquidity needs: expected contribution vs benefit payments
- Funded status on going concern/solvency bases: actuarial method and assumptions used
- Plan sponsor's risk tolerance: company size, nature to industry, financial strength
- Impending drastic changes, if any

Prudent Person Rule

**“must exercise care diligence and skill
in investment of pension fund ...
using knowledge and skills that
he/she possesses or ought to possess”**

Investment Performance Measurement

- Types of performance measurement
 - Total return for entire portfolio and for each asset class
 - Relative to market indices
 - Relative to customized benchmarks
 - Relative to sample peer-group

Common Market Indices

- Canadian stocks:
 - TSE 300
 - S&P TSE 60
 - Nesbitt Burns Small Cap Index
- U.S. stocks:
 - S&P 500
 - Russell 2000 (small cap stocks)
 - Nasdaq Composite
- International stocks:
 - MSCI EAFE
 - MSCI World

Common Market Indices (continued)

- Canadian bonds:
 - SCM Universe
 - SCM Long Term Bonds
 - SCM Short Term Bonds
- Money market:
 - SCM 91-day T-bills
 - SCM 30-day T-bills

Customized Benchmark

- For entire portfolio: e.g. expected return over a 4-year period $>$ benchmark + 1%
- Sample benchmark:
 - 35% TSE 300 Index
 - 10% S&P 500 Index
 - 10% MSCI EAFE Index
 - 40% SCM Universe
 - 5% SCM 91-day T-bills
- Investment manager must either
 - Outperform each index
 - Shifting portfolio mix

Peer Group Comparison

- Peer group: universe of similar funds:
 - Equity, fixed income, balanced funds
 - Similar style: growth, valued, timing, etc.
- Comparison
 - Quartiles
 - Median

Some Important Notes

- Pension fund investment should aim for stability
- Requiring the manager to outperform the market = requiring higher risk
- Peer group comparison generates horse race scenario: must take higher risk
- Timing strategy rarely works
- Investment strategy must reflect plan situation
 - Time horizon shortens drastically if there are extraordinary events expected in near future
 - Investment strategy must change correspondingly

Intensive Pension Training for Egypt February 2007

Syllabus

The intensive pension training is intended for both general staff of EISA as well as for actuaries of EISA. While the actuaries of EISA may have learned some of the material before, it is still a useful review for them. There are topics which are new for every participant.

The course consists of five days of lectures and exercises. There are two 1-1/2 hours lectures separated by a 15 minutes break each morning , and a tutorial each afternoon, followed by an exercise session. There is a 3-hour multiple choice examination at the end of the course.

<u>Day</u>	<u>Lecture</u>	<u>Topic</u>
1	Lecture 1	Retirement Benefit Plans: Defined Benefits vs Defined Contributions Exercise 1 and Exercise 2
2	Lecture 2	Funding Methods for Defined Benefit Plans Exercise 3
3	Lecture 3	Actuarial Valuation Report Exercise 4
4	Lecture 4	Pension Plan Experience Analysis Exercise 5
5	Lecture 5	Investment of Pension Funds Exercise 6 and Exercise 7
6	Examination	

Textbooks for the course

Pension Mathematics for Actuaries by Anderson

The Theory and Practice of Pension Funding by C.L. Trowbridge and C.E.Farr.

Fundamentals of Private Pensions by McGill

Managing Investment Portfolios by Maginn



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TAPRII
TECHNICAL ASSISTANCE
FOR POLICY REFORM

Funding of Private Funds in Egypt

Michael Sze, PhD, FSA, CFA

May, 2008



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Agenda

- Introduction: importance of private pension
- International development vs Egyptian development
- Solvency situation in some developed countries
- Solvency study in Egypt
- Funding situation of private funds in Egypt
- Remedial actions recommended



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Introduction: Importance of Private Pension

- Principal sources for retirement income:
 - Government social security
 - Private pension
 - Individual savings
- With aging demographics, social security is under increasing funding pressure
- Individual savings are not reliable, especially for the lower income people
- Most countries are looking to pension plans provided by private companies to fill in the gap



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International Development of Private Pension Plans



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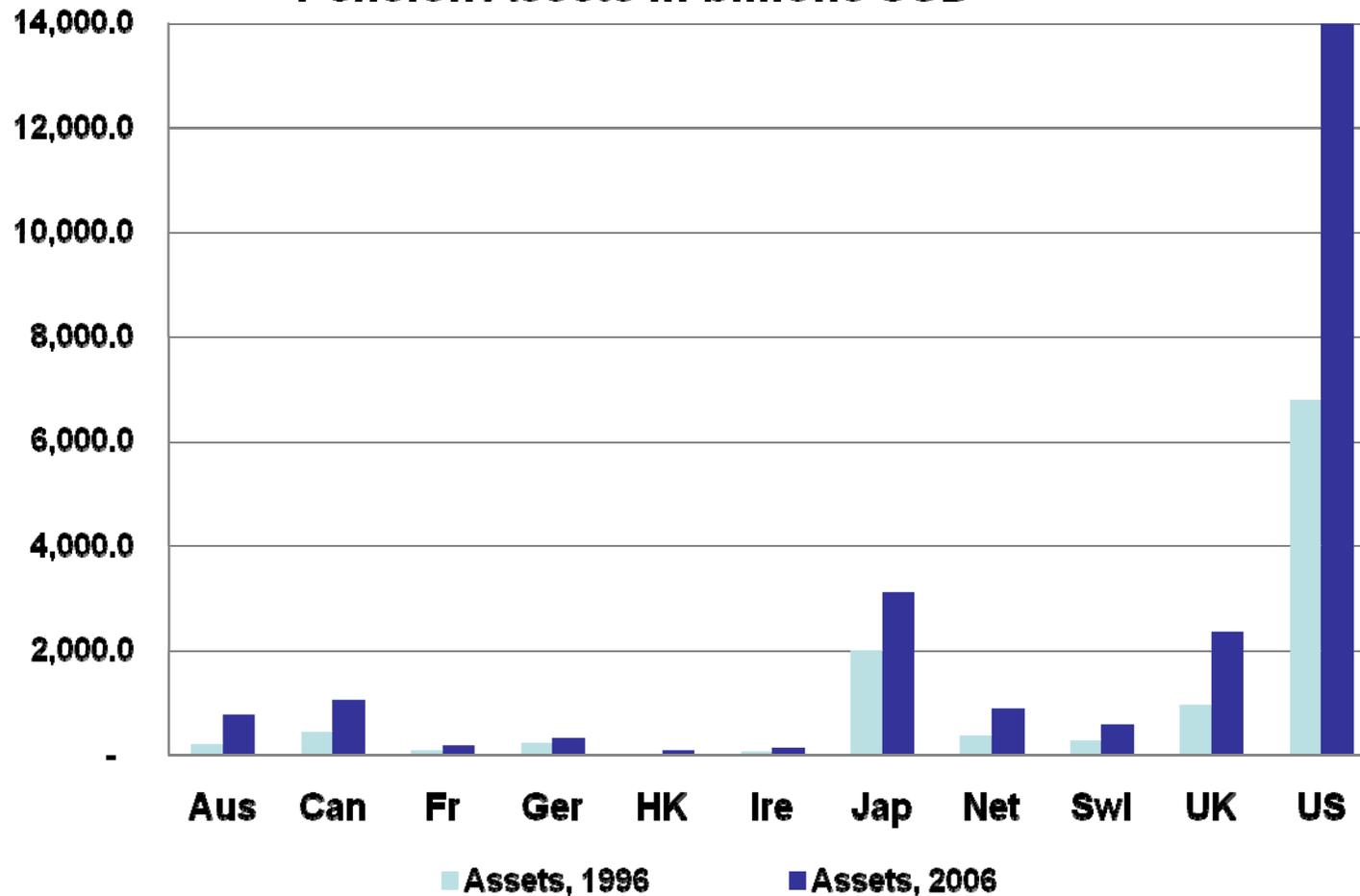


11 Countries included in the Pension Assets Study

- Australia (Aus)
- Canada (Can)
- France (Fr)
- Germany (Ger)
- Hong Kong (HK)
- Ireland (Ire)
- Japan (Jap)
- Netherlands (Net)
- Switzerland (Swi)
- United Kingdom (UK)
- United States (US)



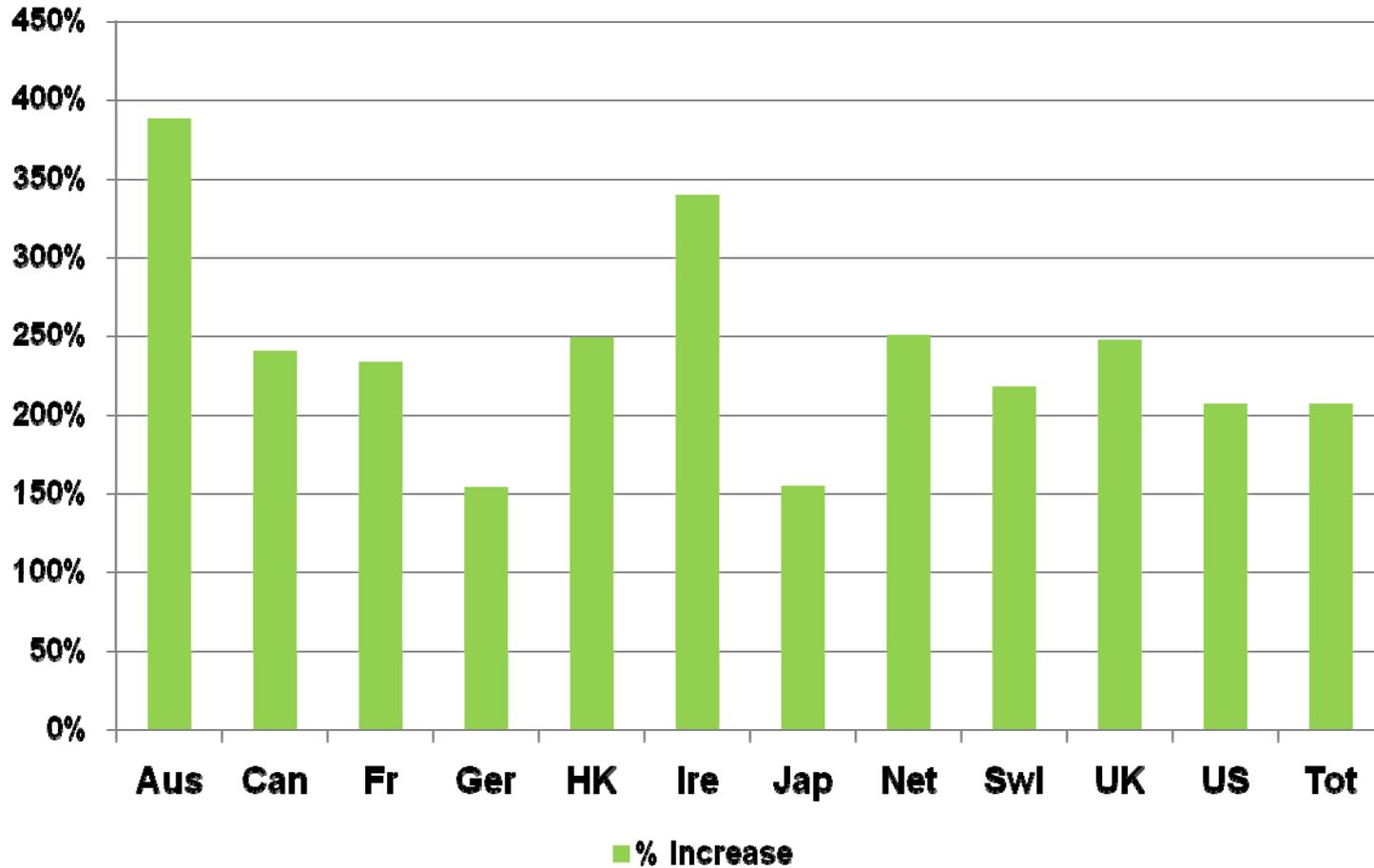
Pension Assets in billions USD



Data Source: With permission of Watson Wyatt, from their publication 2007 Global Pension Assets Study



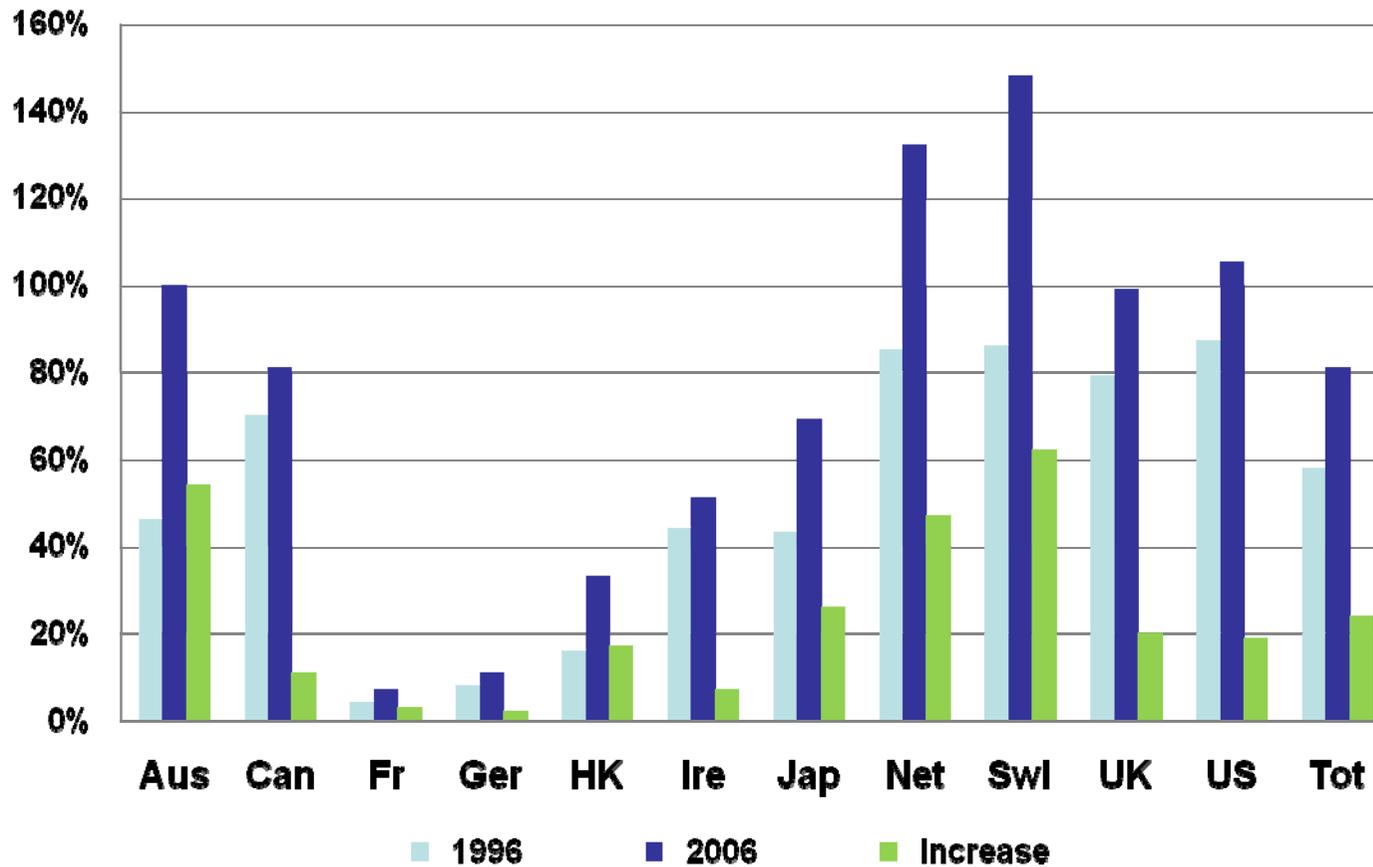
% Increase in Pension Assets



Data Source: With permission of Watson Wyatt, from their publication 2007 Global Pension Assets Study



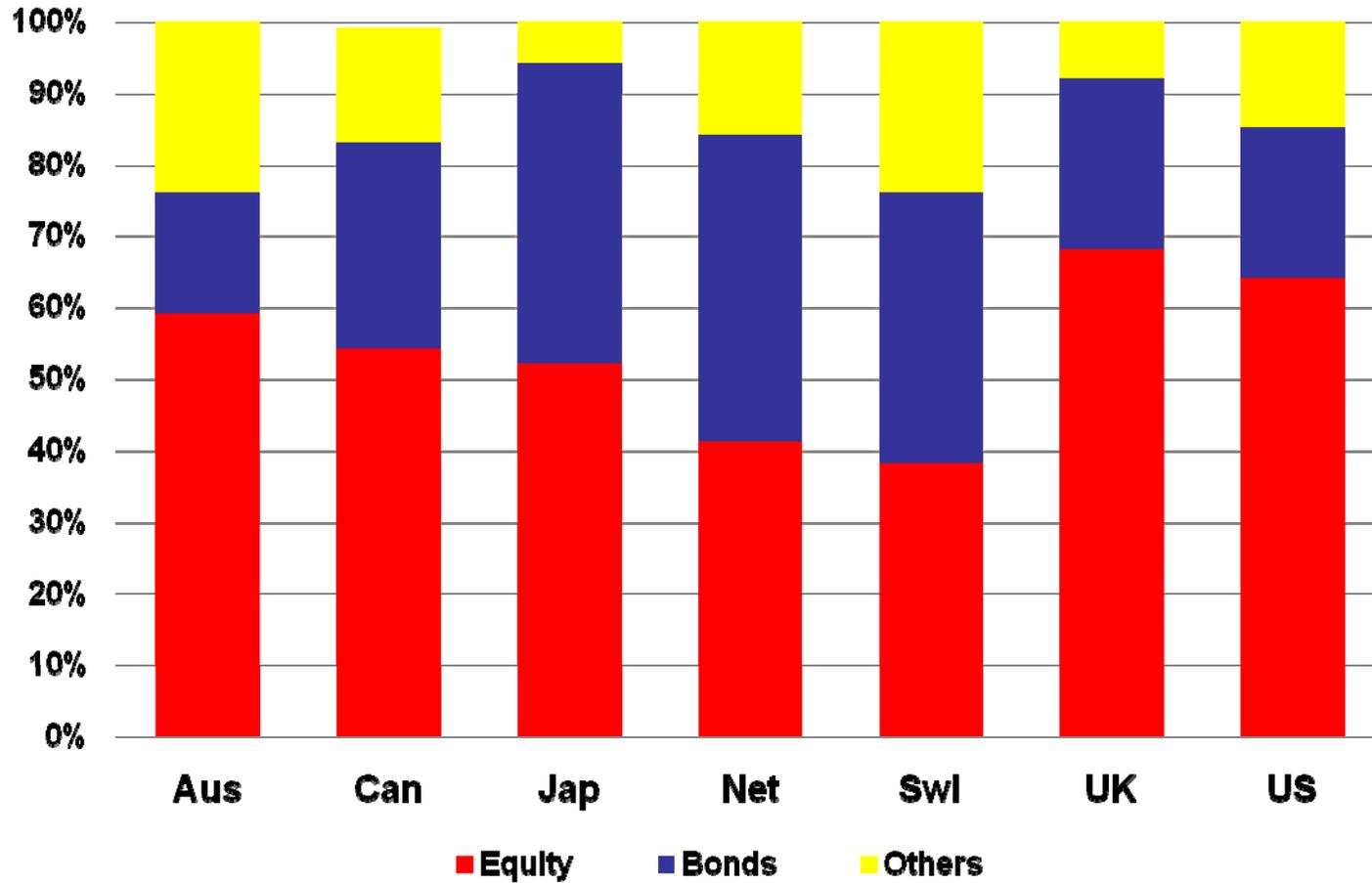
Pension Assets as % of GDP



Data Source: With permission of Watson Wyatt, from their publication 2007 Global Pension Assets Study



Asset Allocation



Data Source: With permission of Watson Wyatt, from their publication 2007 Global Pension Assets Study

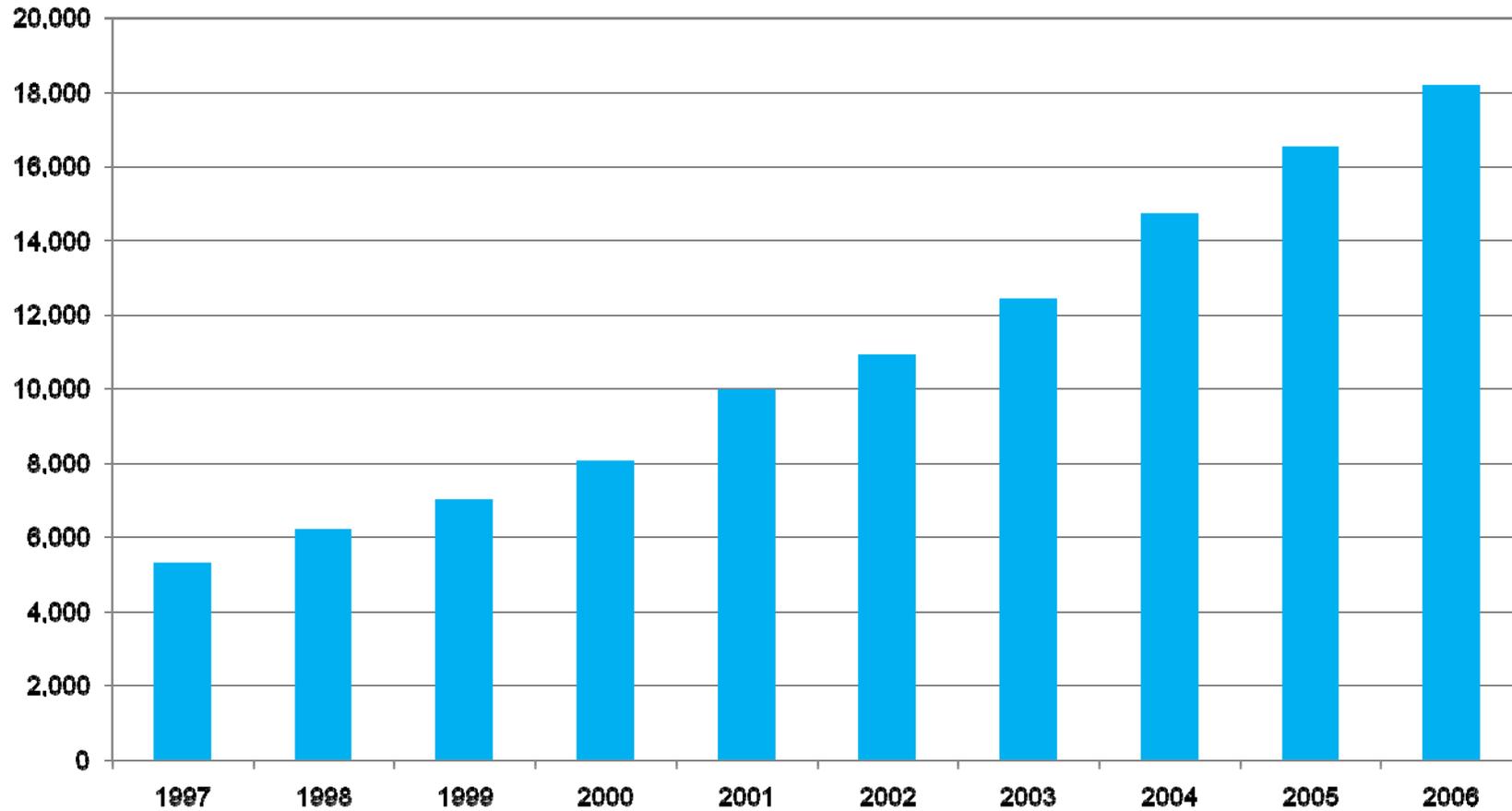


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Development of Private Funds in Egypt

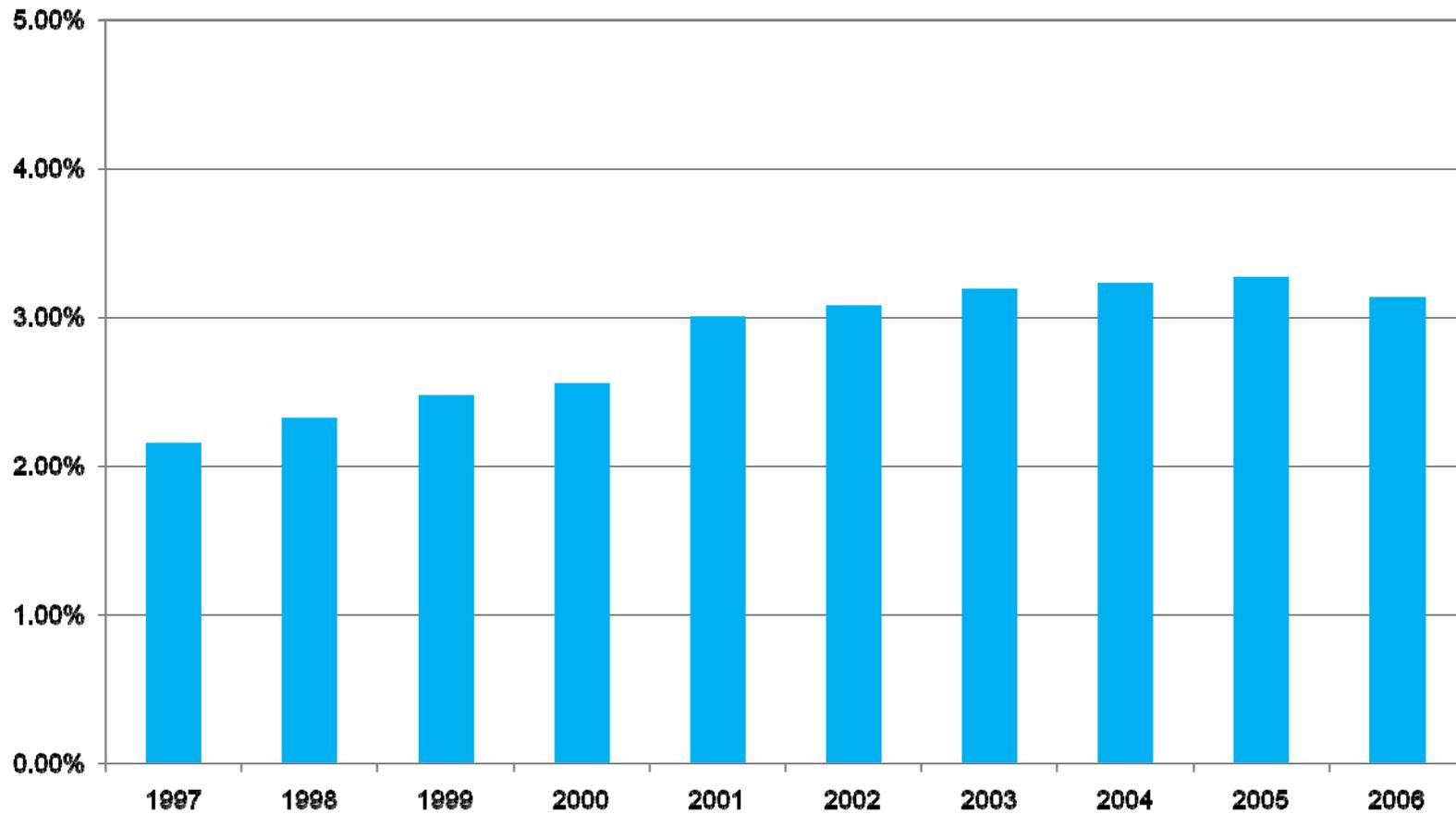


Pension Assets in Egypt in millions





Pension Asset as % of GDP





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Comments

- The amount of pension assets in Egypt more than tripled in the last 10 years from L.E.5.3 million to L.E. 18.2 million
- As a percentage of GDP, total pension assets increased from 2.15% in 1996 to 3.13% in 2006
- The volume of pension assets as a percentage of GDP is far less than other countries
- For a developing economy as Egypt, there is much room for expansion of pension business



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Funded Status of Pension Plans in Selected Countries



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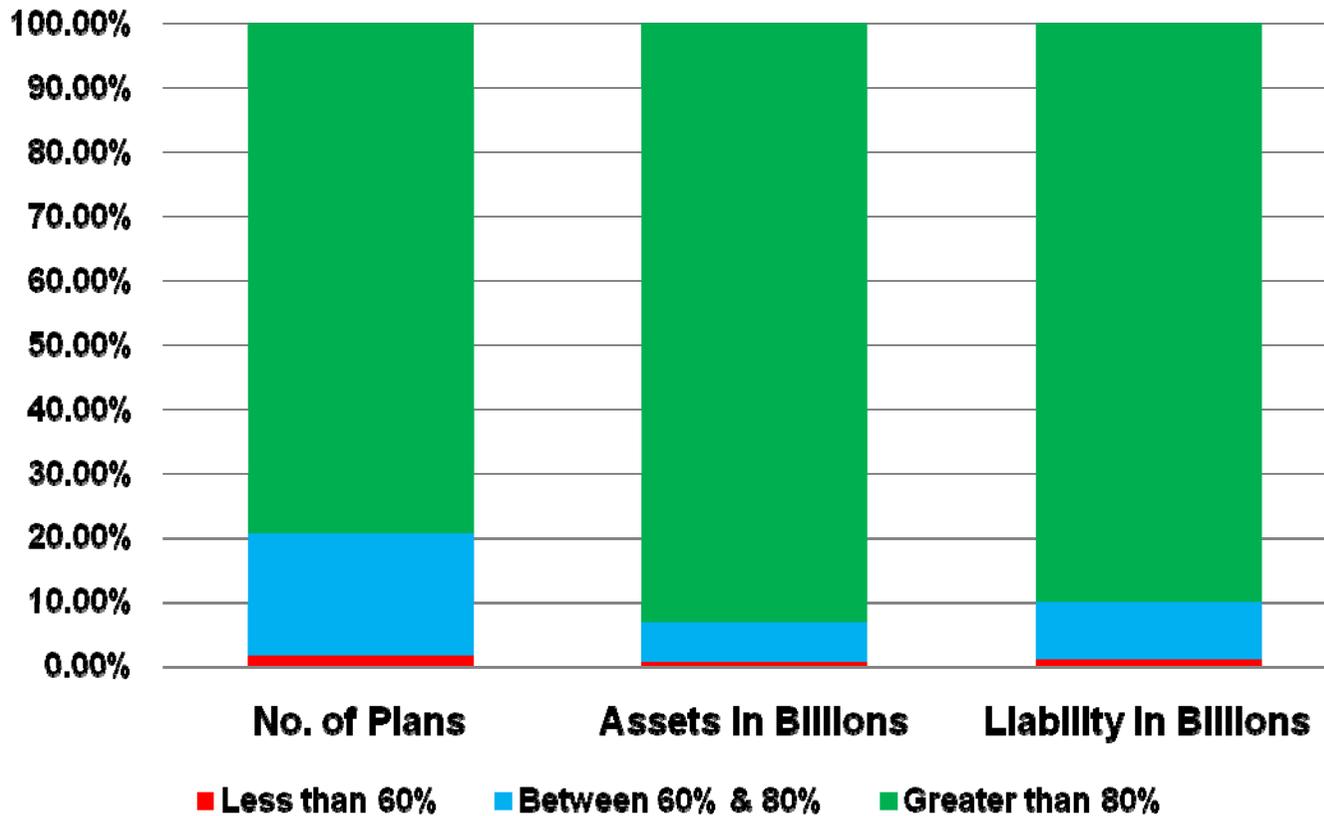


Generally Accepted International Standard

- Some form of solvency valuation is required in each country
- Details may vary
- Principal concept is quite similar in each country
- Protection of of employee benefit security is of paramount importance for each country
- In following pages we present solvency valuation results in three countries
 - The United States
 - Canada (Ontario)
 - The United Kingdom



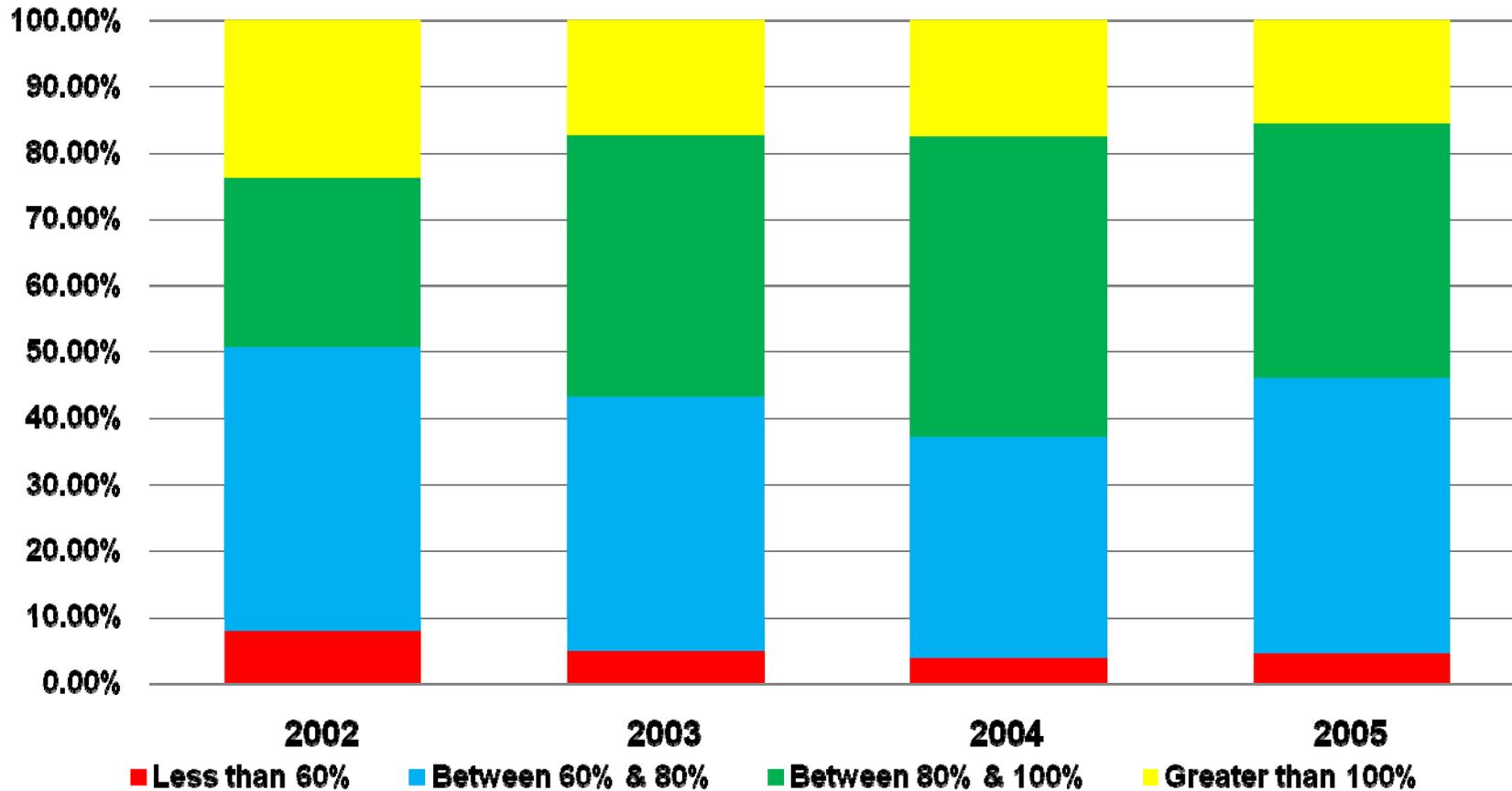
% Distribution of US Pension Plans by Funded Ratios



Data Source: Based on 2005 Form 5500 data for 10417 plans with over 100 employees. Funded ratios represent market assets divided current liabilities as defined in RPA 1994.



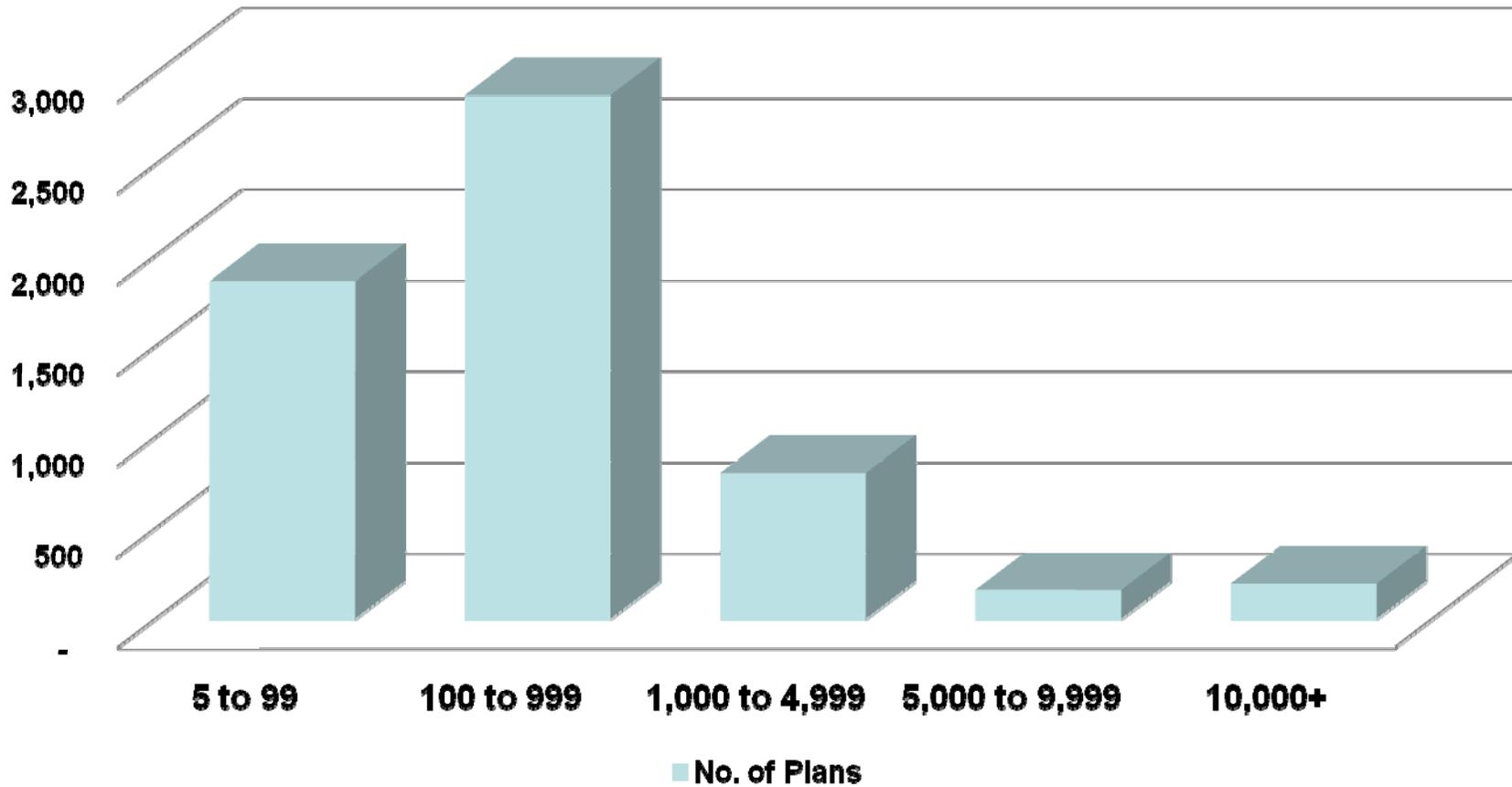
Distribution of Ontario Plans by Solvency Ratios



Data Source: Funding Defined Benefit Pension Plans: Risk-Based Supervision in Ontario - Overview and Selected Findings 2002-2006 by Financial Services Commission of Ontario



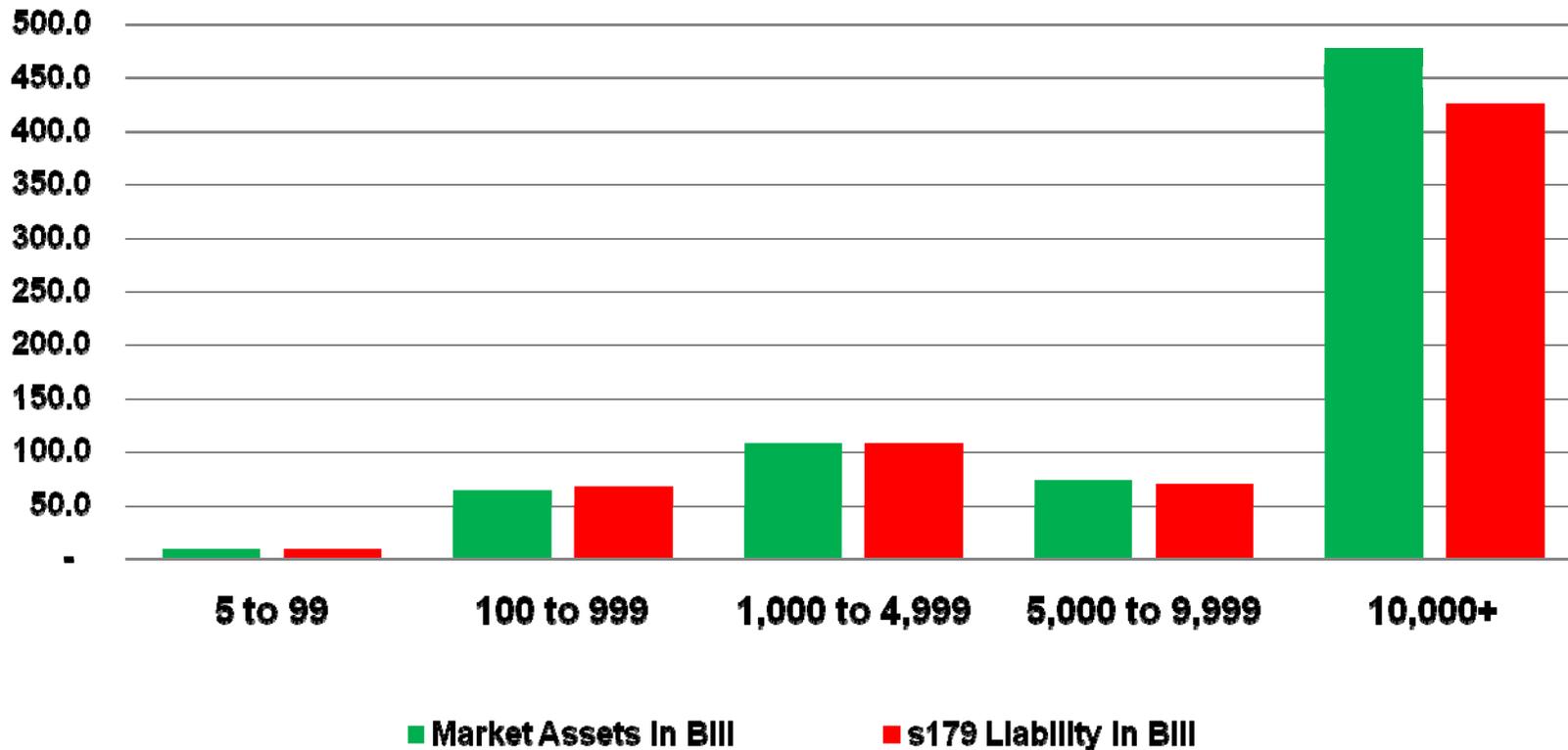
No. of Sample Plans in UK



Data Source: 2007 Purple Book published by the Pension Protection Fund of the United Kingdom



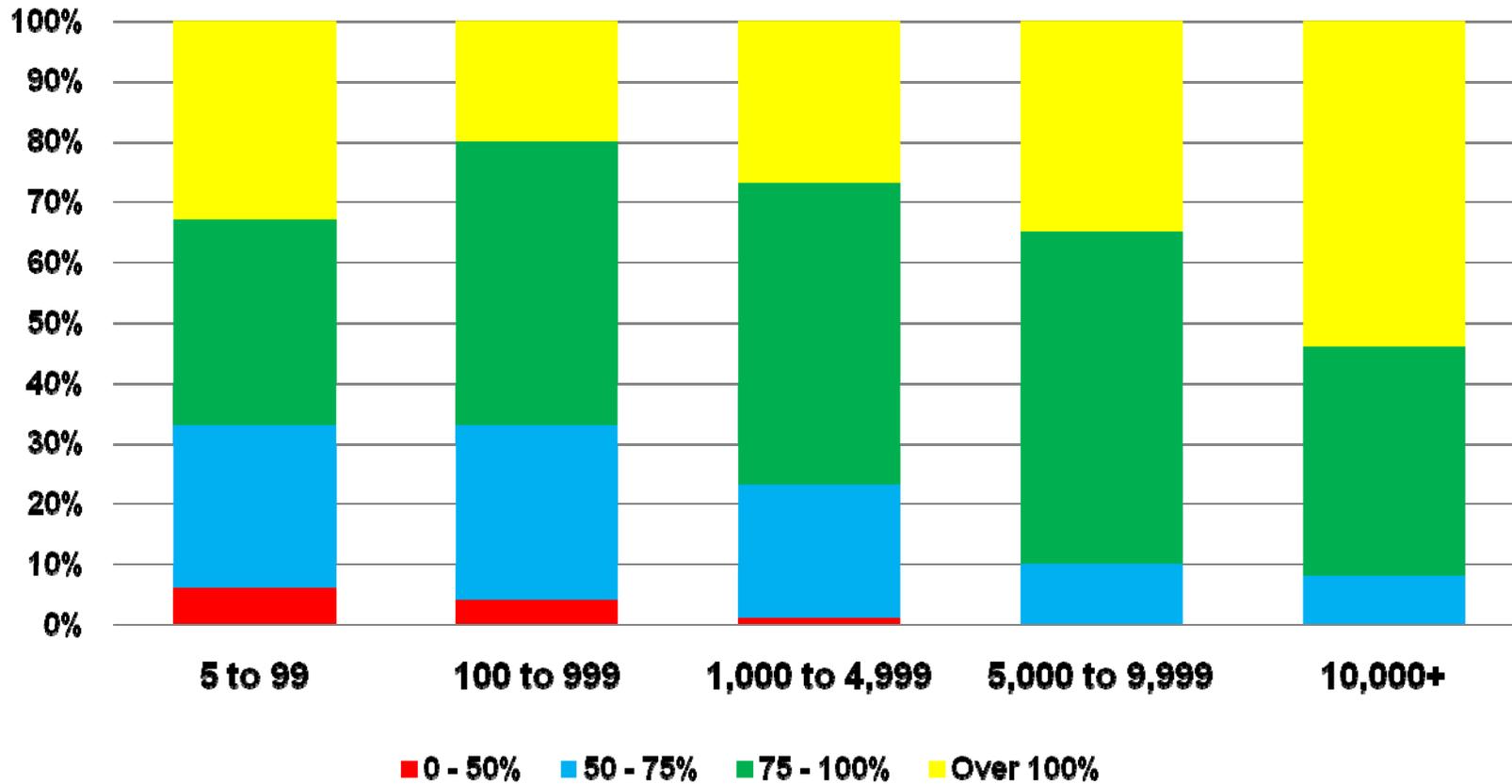
Assets vs Liabilities for Sample UK Pension Plans in Billion Pounds



Data Source: 2007 Purple Book published by the Pension Protection Fund of the United Kingdom



Funded Status of Sample UK Pension Plans



Data Source: 2007 Purple Book published by the Pension Protection Fund of the United Kingdom



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Some Pertinent Remarks

- Having a funded ratio below 50% or 60% is considered to be very critical in any country
- In each of the countries reviewed, there are very few plans with such critical status
- Normally, the regulator will step in when a plan gets into the critical stage
- Most sponsors will work hard to avoid falling into that situation



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Funding of Private Funds in Egypt



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Dr. Adel Mounir ordered Solvency Study in Egypt

- Supervisor – Dr. Ali Al-Ashry
- Team leader – Wael Abdel-Hady
- Actuaries
 - Ahmed Fouad Selim Mohamed
 - Essam A. Sabra
- Pension inspectors
 - Abdel Monsef
 - Moustafa Haussen
 - Sherif Hefny
 - Tarek Emam
 - Hussien Amin



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Procedure of Solvency Survey in Egypt

- Delegation of responsibilities
- Detailed time-table
- Survey closely monitored by Dr. Adel, Wael Abdel-Hady and Gail Burns of BearingPoint
- EISA actuaries and pension inspectors were enthusiastic and worked hard
- Progress went according to plan
- Results of the study are summarized in the following pages



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Data

- 46 private funds were included in the study
- Total fund assets exceed L.E. 10 billion – more than 50% of total private fund assets in Egypt
- Total members exceed 2.3 million, over 80% of total private fund membership in Egypt
- Average age ranges from 30.3 to 50.6
- Average service ranges from 26.9 to 5.3
- Study expected to represent potential risk of private fund industry in Egypt



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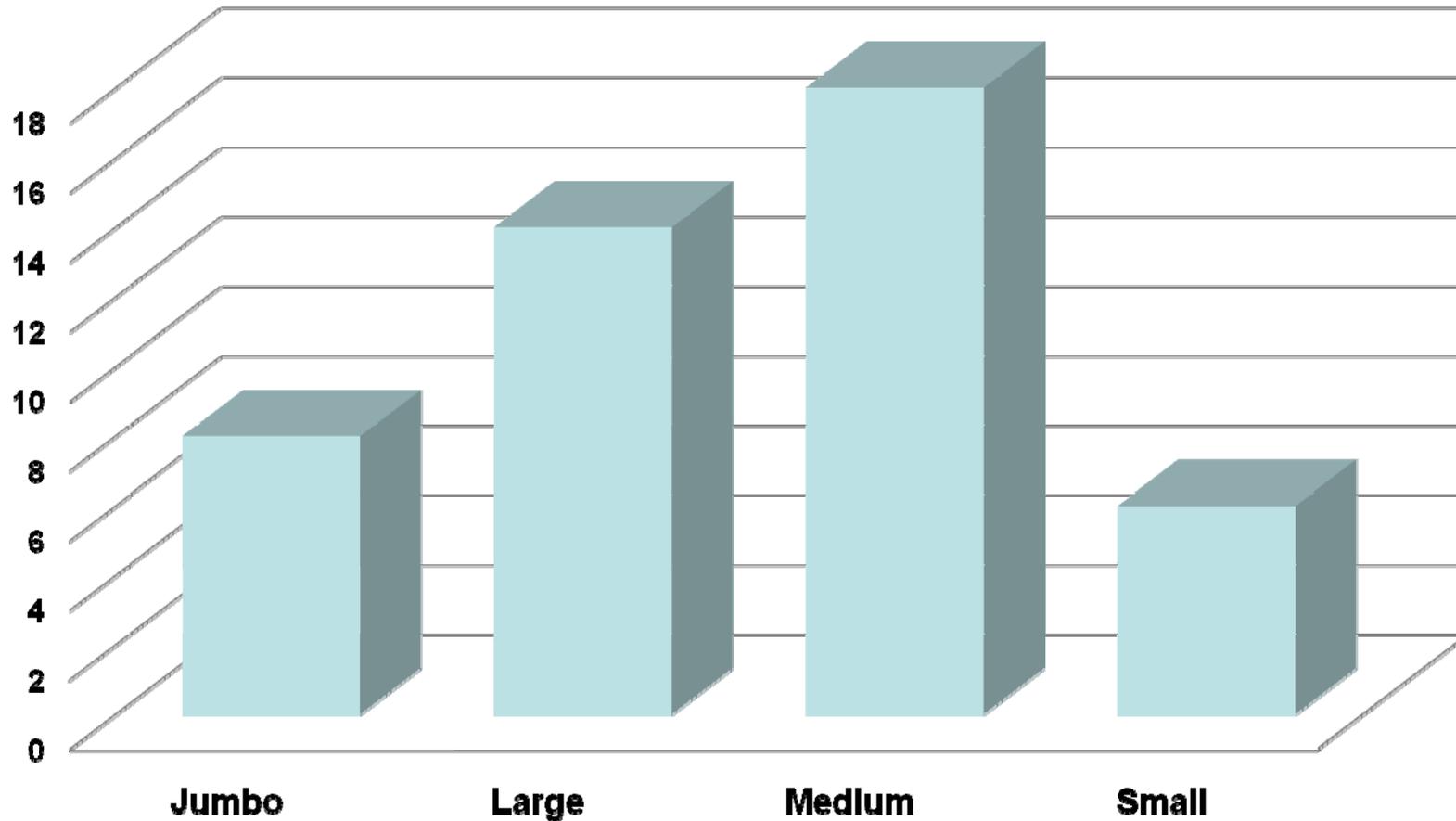


Data Groups

- The 46 private funds are classified into four categories
- Category 1 – 8 jumbo funds, with over 50,000 members each
- Category 2 – 14 large funds, with over 10,000 members each
- Category 3 – 18 medium funds, with over 1,000 members each
- Category 4 – 6 smaller funds, with less than 1,000 members each



Number of Private Funds in the Study



Data Source: 2008 Solvency Study of the EISA

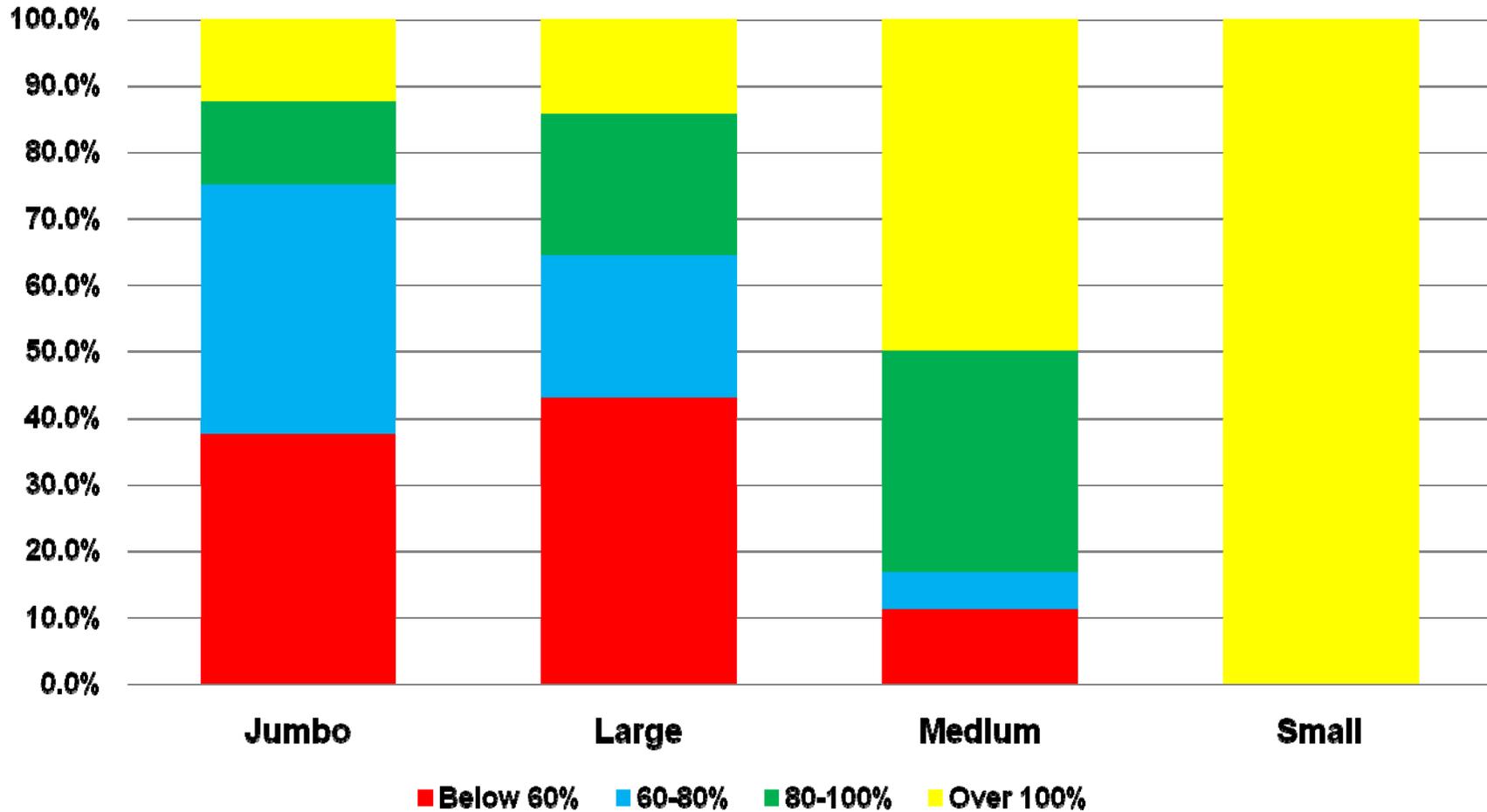


Solvency Valuation Results

- A solvency valuation was performed for each fund
- Solvency liability is the present value of accrued benefits based on
 - Current service, current pay and conservative interest rates
- Solvency ratio = market assets / solvency liability
- Funds are further classified into four groups according to their respective solvency ratios
 - Below 60%
 - Between 60% and 80%
 - Between 80% and 100%
 - Over 100%



Distribution of Private Funds by Solvency Ratios



Data Source: 2008 Solvency Study of the EISA



Some Comments on Solvency Results

- The study shows that the problem with the private fund system in Egypt is very serious
- The results for the jumbo and the large categories are especially disturbing because
 - each fund covers a large number of members
 - each fund has a large amount of assets, but an even larger amount of liabilities
 - a collapse of the private fund system will have devastating effects on the economy of Egypt
- Many plans in these categories are in a critical situation



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Update of 2003 Solvency Study



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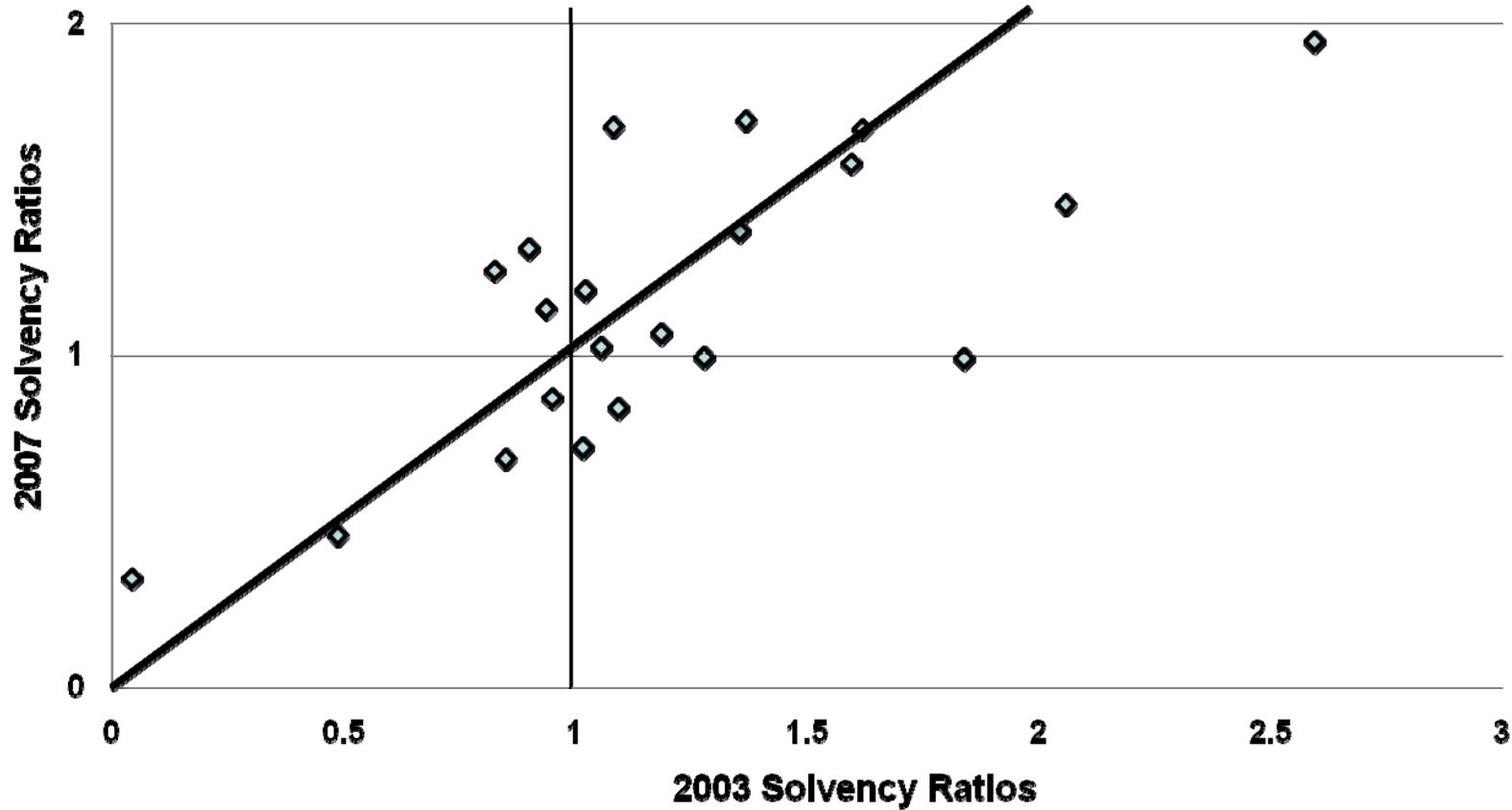


2007 Update of 2003 Solvency Study Results

- Of the 30 private funds included in the 2003 solvency study, the 2007 update shows
 - Four funds have terminated during the last five years
 - Two of the four were deficient in 2003, one had SR <50%
 - Four other funds have not completed any actuarial report during the last five years
 - Three of the four were deficient in 2003, one had SR < 25%
 - The proportion of funds terminating and funds with potential reporting problems should prompt further investigation
 - A comparison of the results of the other funds in 2003 and 2007 is shown in the following scatter plot



Comparison of Solvency Ratios



Data Source: 2008 Solvency Study of the EISA



Summary Results

- Each point on the graph represents the SR of a fund
 - Horizontal co-ordinate represents the SR in 2003
 - Vertical co-ordinate represents the SR in 2007
- Many points are close to the diagonal line, showing that they have approximately the same SR in both studies
- The 4 points in the lower left quadrant represent funds with solvency deficiency in both studies
- The three points in the upper left quadrant represent funds changing from deficit position to surplus
- The four points in the lower right quadrant represent funds depreciating into deficit position
- Graph shows that, even after eliminating the eight problematic funds, there is still slight deterioration in solvency situation



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Additional Investigation



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Areas of Further Investigation

- Benefit payments vs contributions
 - Global annual income vs outgo for each plan
 - Payments to individual vs his/her accumulated contributions
- Investment returns
- Actuarial assumptions
 - Mortality
 - Interest rate
 - Salary scale
- Actual contributions vs expected normal cost

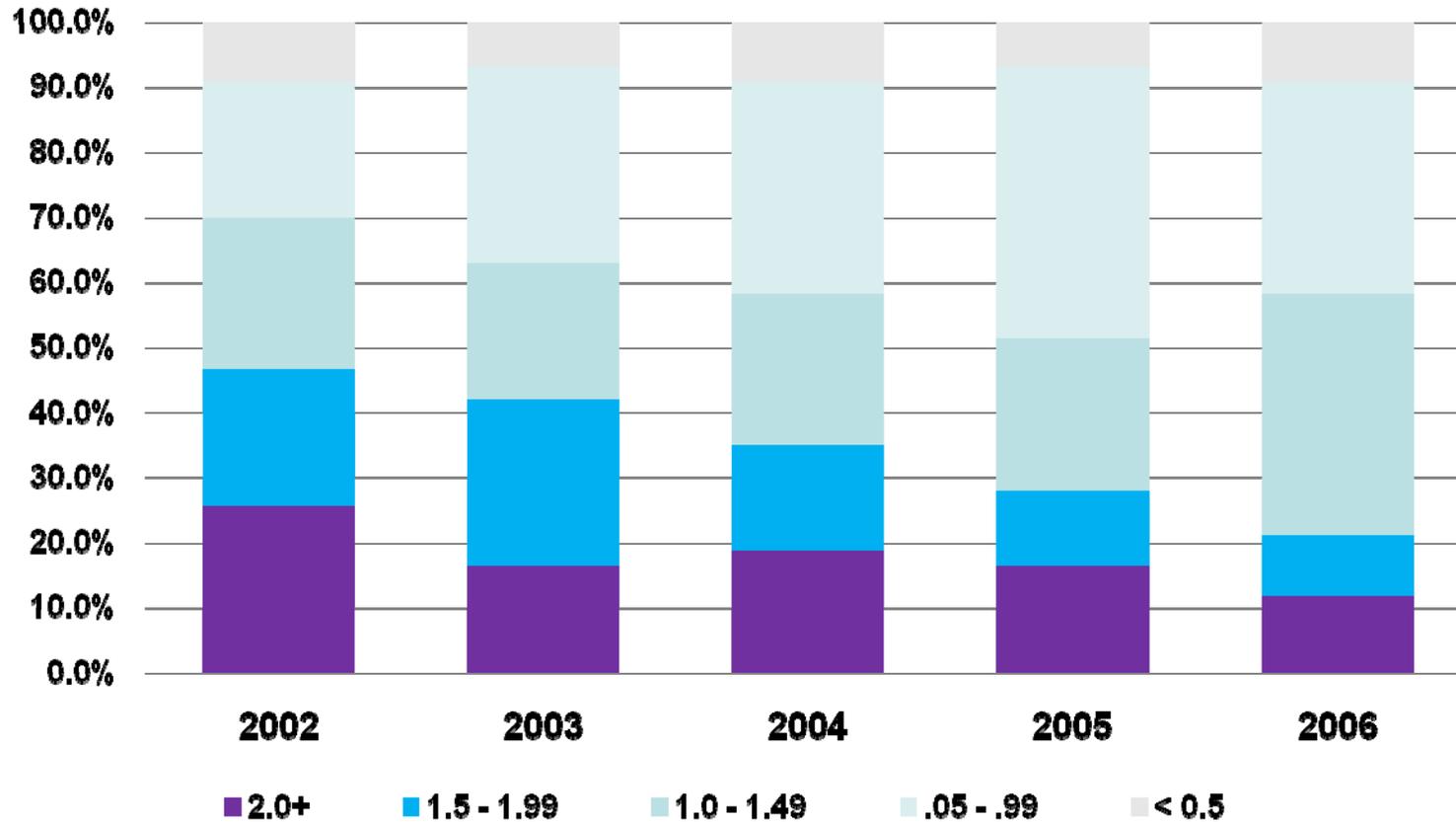


Annual Total Cash Income of Fund vs Outgo

- The pension fund needs to build up assets for future payments
- Cash income must outpace outgo by 50% or 100%
- The financial statements of each fund in the period 2002 – 2006 were examined
- The cash income for each year was compared to the outgo for that year
- Income equals contributions from all sources
- Outgo equals benefit payments and expenses
- Ratio of income / outgo was calculated



Cashflow - Income / Outgo Ratio



Data Source: 2008 Solvency Study of the EISA



Observations

- In 2002, only about 40% of the funds had Income/outgo ratios over 1.5
- The rest of the funds had ratios of less than 1.5
 - After covering the outgo, there was not enough asset buildup for future benefit payments
- The situation got progressively worse over the next four years
- In 2006, only about 20% of the funds had income/outgo ratios over 1.5
- 80% of the funds were not building up enough assets for future payments

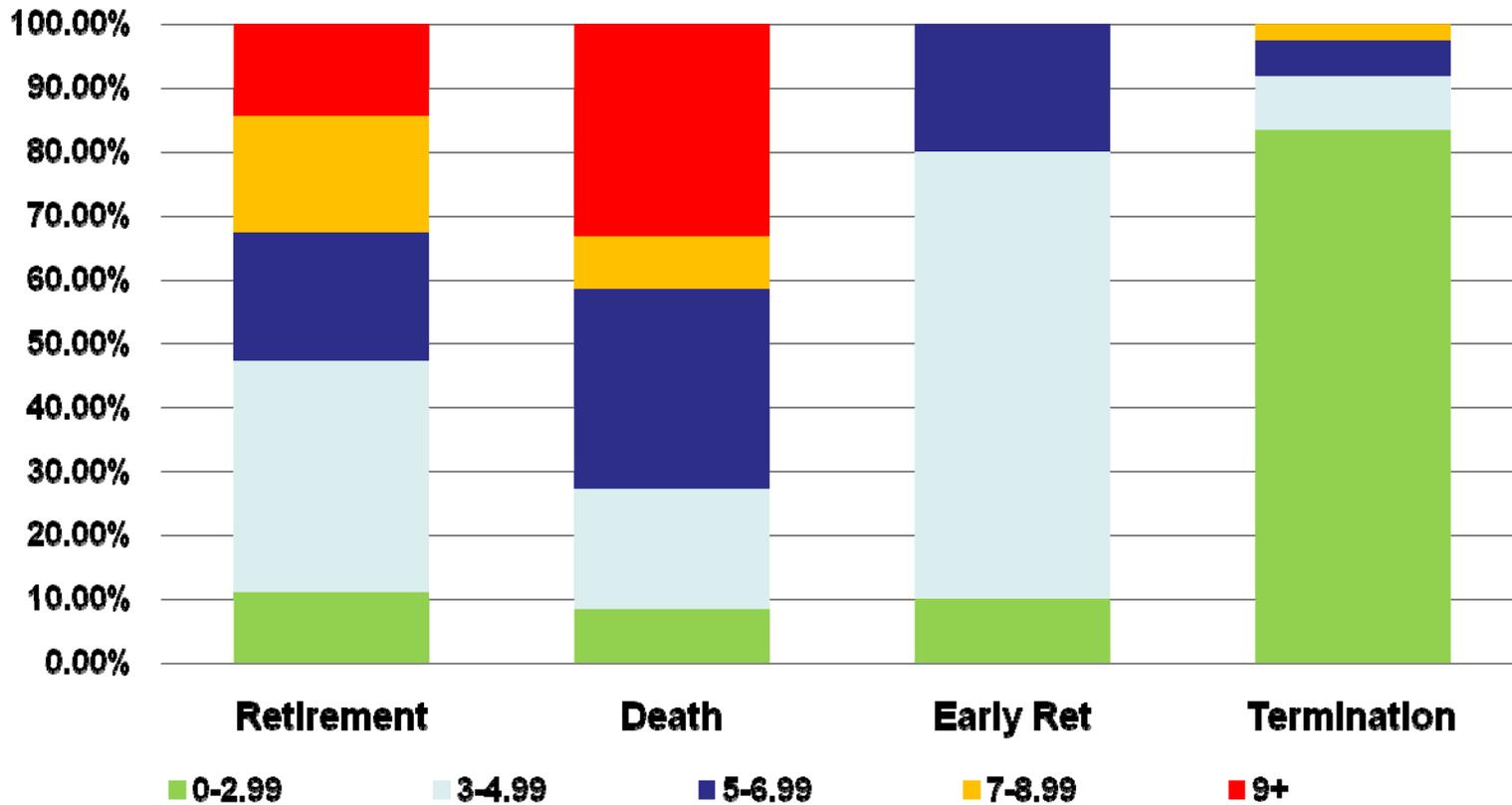


Individual Payment vs Accumulated Contribution

- For each employee to pay his/her own retirement cost
 - the value of benefit received must not exceed his/her accumulated contribution plus interest
- Unless the investment return far exceeds salary increase,
 - accumulated contribution plus interest is not expected to exceed three times accumulated contributions
- For each retirement, death or termination in 2002-2006 we examine
 - ratio of the **benefit paid to the individual/ his accumulated contributions**



Distribution of Payments by Ratios of Payment to Accumulated Contributions for 2002-2006



Data Source: 2008 Solvency Study of the EISA



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Observations

- The early retirement column included results for disability and partial disability
- The payments for retirement and death were much higher than for the other decrements
- For retirement and death, only 10% of funds were paying out less than 3 times the accumulated contributions
- More than 35% of funds were paying out much higher retirement and death benefits than they could afford



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Investment Returns

- The solvency study shows most of funds invested most assets in government guaranteed securities
- Although not conforming to international practice, the investments generated over 9% investment return every year
- The returns were higher than the interest rate assumption
- There was no negative impact on the funded status of the funds



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Actuarial Assumptions

- Three principal actuarial assumptions were examined
 - Mortality rates
 - Interest rate
 - Salary scale
- The assumptions in Egypt were compared to international practice



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Mortality Rates

- The mortality assumptions in other countries are continually updated
- The UK is using PA92 Tables
- The US and Canada are using a version of the UP94 Table
- Egypt is still using the old British a49-52 Table
- With mortality improvement, using outdated mortality rates tends to understate the pension cost



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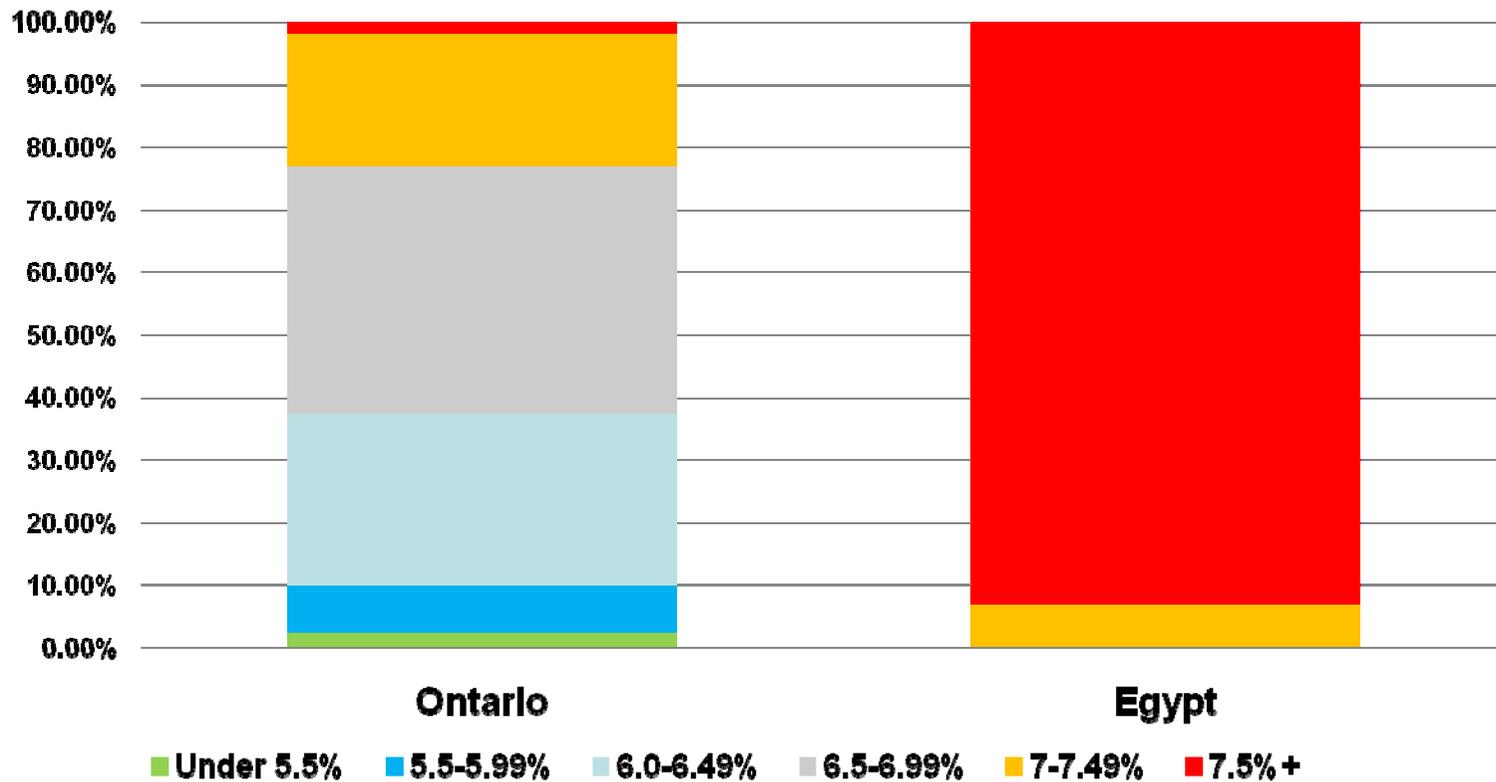


Interest Rate and Salary Scale

- Pension cost is highly sensitive to the choice of interest rate and salary scale
- For pay related plans, the interest - salary differential has pivotal effect on the pension cost
- We compare the Egyptian assumptions to the Ontario assumptions in Canada
- The results are shown in the following diagrams



Distribution of Pension Plans by Interest Assumptions



Data Source: Ontario Data – Overview and Selected Findings 2002-2006 by FSCO
Egyptian Data - 2008 Solvency Study of the EISA



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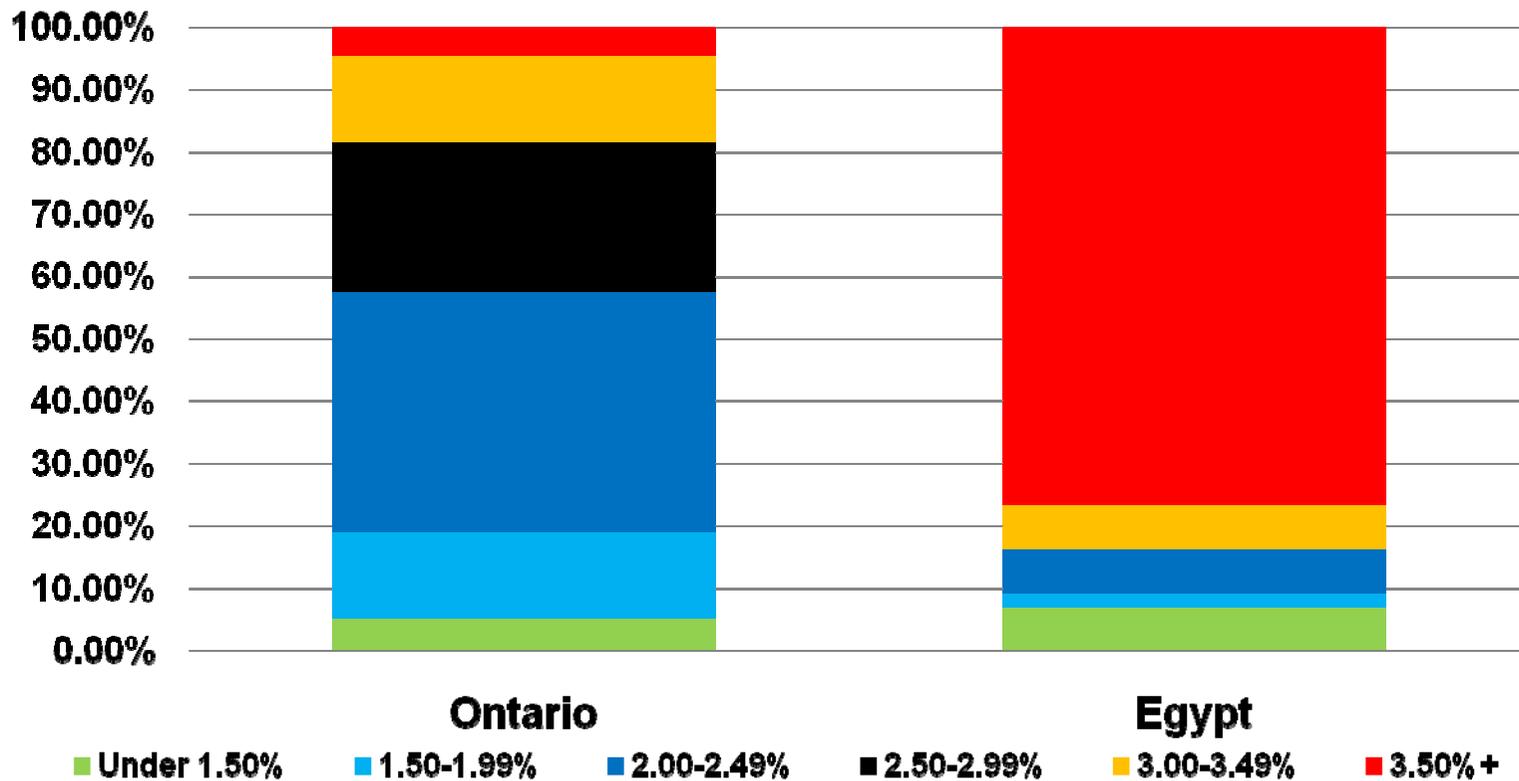


Comments on Interest Rate Assumption

- Interest rate of 5% is considered to be conservative
- Most Ontario plans have interest rates between 5% – 7%
- Few Ontario plans would venture above 7% interest
- In Egypt, all funds are using higher than 7% interest
- Quite a number of funds are using 9% interest
- Egyptian interest rate assumptions are very aggressive, and cannot be sustainable long term



Distribution of Pension Plans by Interest - Salary Differential



Data Source: Ontario Data – Overview and Selected Findings 2002-2006 by FSCO
Egyptian Data - 2008 Solvency Study of the EISA

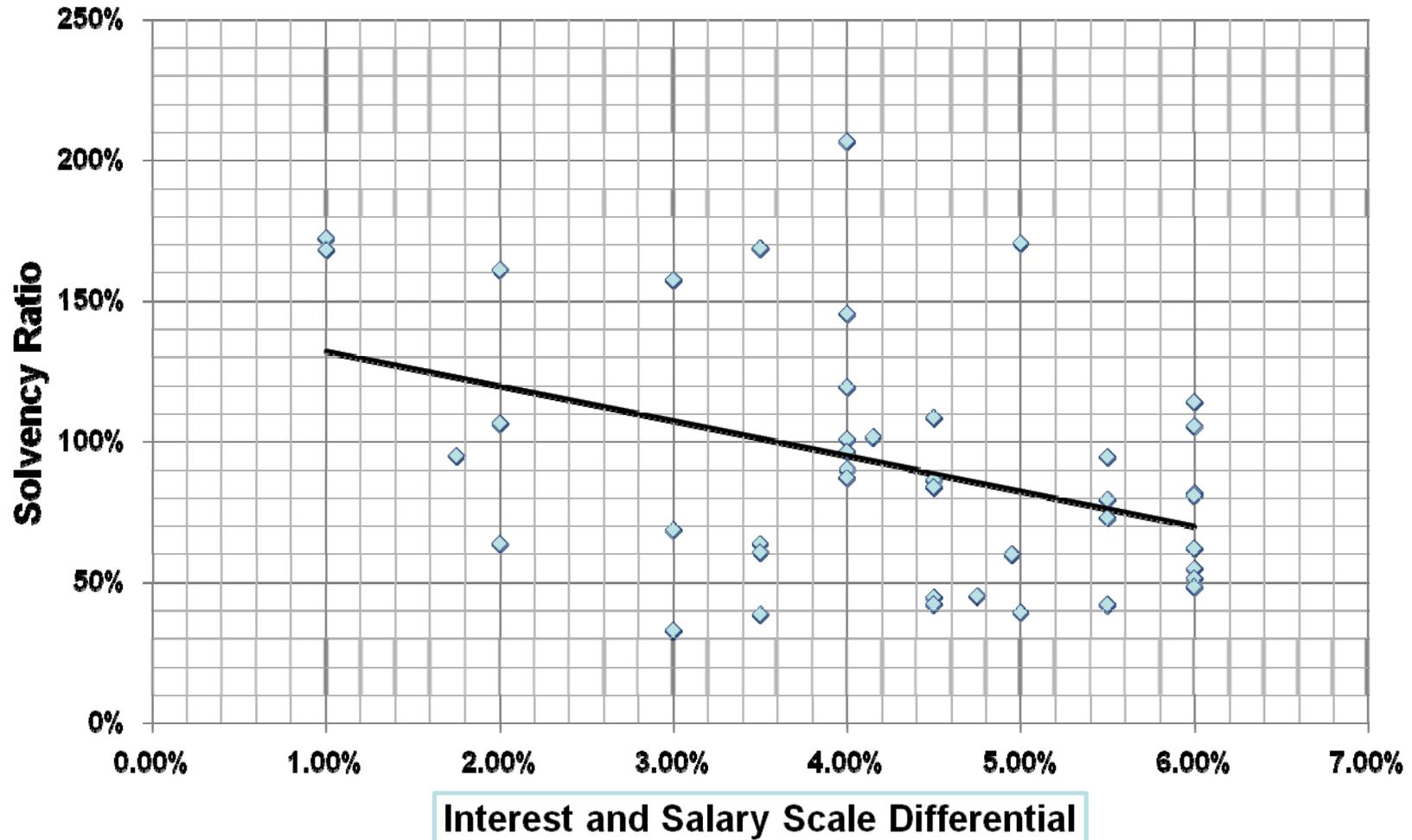


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Comments

- In Ontario, an interest - salary differential of 2% or less is considered to be conservative
- Most plans use a 2% - 3% differential
- Few plans would use a differential higher than 3%
- In Egypt majority of funds have higher than 3% differential
- Many funds have differential as high as 5%
- The impact of differential on solvency ratio is examined in the following scatter plot



Data Source: 2008 Solvency Study of the EISA



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Comments

- Every point on the plot represents the comparison of the interest - salary differential of a private fund vs its solvency ratio
- The horizontal co-ordinate represents the interest - salary differential
- The vertical co-ordinate represents the solvency ratio
- The regression line shows the general relation between a funds differential vs its solvency ratio
- Observation: the higher the differential, the lower the solvency ratio

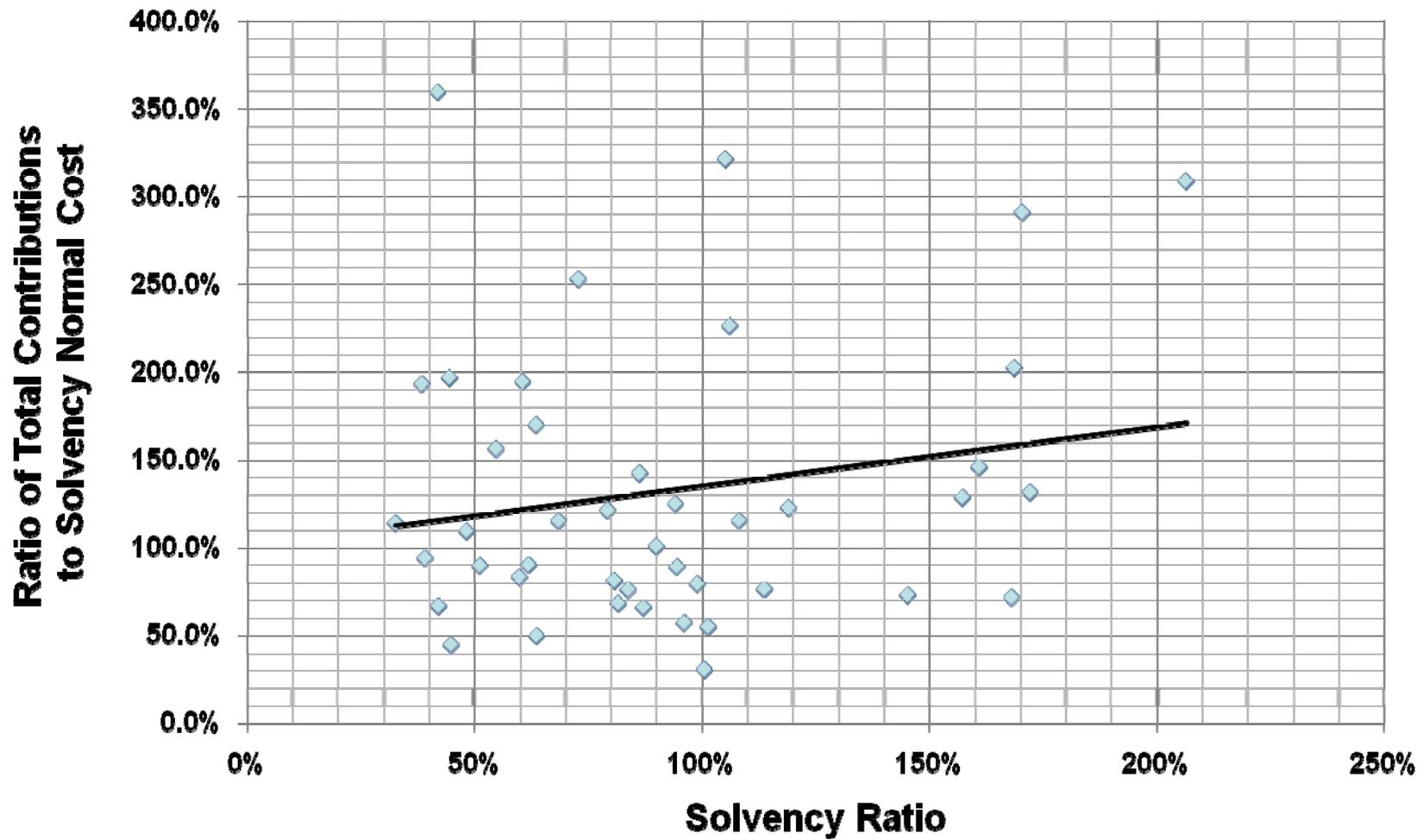


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Solvency Normal Cost

- Solvency normal cost is the present value of the expected benefit accrual for the present year
- If actual contributions of the fund exceed the solvency normal cost, solvency ratio will improve
- We examine this by a scatter plot of the solvency normal cost vs actual contributions



Data Source: 2008 Solvency Study of the EISA



Impact of Actual Contribution/ Solvency Normal Cost

- Each point on the graph represents the characteristics of a private fund
- The horizontal co-ordinate represents the solvency ratio of the fund
- The vertical co-ordinate represents the ratio of actual contributions/solvency normal cost of the fund
- The regression line shows the relationship between the two variables
- Observation: There is positive correlation between the two variables



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Recommendations



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Three-Prong Recommendations

- Reporting and disclosure
- Contributions
- Benefit payments



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Reporting and Disclosure

- Solvency valuation is required in each actuarial valuation report
- The date of solvency valuation must be January 1 of each year
- The first solvency valuation must be done for 2009
- If there is no solvency deficiency, the next valuation may be done after three years
- If there is a solvency deficiency, solvency valuation must be done each year
- Solvency ratio must be disclosed to all stake holders



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Contributions

- Plans with solvency deficiency must make solvency payment
- Solvency deficiency = solvency liability – market assets
- Solvency payment = solvency deficiency /5
- Minimum contribution = solvency normal cost + solvency payment
- Plan sponsor is required to ensure that the minimum contribution is made



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Benefit Restrictions

- Solvency ratio = Market assets / solvency liabilities
- If solvency ratio < 100%, lump sum distribution is limited to the portion of funded ratio
 - In order to distribute full lump sum, additional contribution is required from the sponsor
- If solvency ratio < 80%, amendments to improve benefits are not allowed
- If funded ratio < 60%, future benefit accruals are not allowed
- Limitations may be removed when the solvency ratio improves



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Implementation Process

- Consultative approach
 - Numerous meetings
 - Comments welcome
- Effective date
 - January 1, 2009
 - Early compliance encouraged
- Training sessions
 - Actuarial methodology and administrative issues
 - June 1 – June 14, 2008
 - Principles and Methodology of Solvency Valuation of Pension Funds by Michael Sze, January 2008



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Acknowledgement

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- *2007 Global Pension Assets Study by Watson Wyatt Worldwide, January, 2007*
- *Funding Defined Benefit Pension Plans: Risk-Based Supervision in Ontario, Overview and Selected Findings, 2002-2006 by Financial Services Commission of Ontario, March, 2007*
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- *Principles and Methodology of Solvency Valuation of Pension Funds by Michael Sze, January, 2008*



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Solvency Valuation and Implications

Michael Sze, PhD, FSA, CFA

January, 2008



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Overview

- Background
- What is solvency valuation?
- Solvency valuation is different from past practice
- What is pension cost?
- How does solvency process improve security?
- What legal implications?
- Update of 2003 solvency analysis
- Standardized actuarial valuation report



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Background

- Pension has to compete with saving accounts, and insurance for retirement funds
 - Must enjoy comparable tax advantages
 - Must provide similar fund protection
- Current pension benefit provisions in Egypt
 - Benefits are not directly linked to contributions
 - No interest credit on contributions made
- International pension benefit provisions
 - Value of benefits must exceed contribution plus interest
 - Benefit security through solvency valuations: looking back



Different Types of Pension Plans

- Defined benefit plans
 - Promise to provide a definite benefit upon retirement
 - **Cost may fluctuate** depending on investment return and plan experience
- Defined contribution plans
 - Provide a definite contribution each year
 - **Benefit uncertain**, depending on investment return and how long the person lives
- Egyptian pension funds are hybrid plans
 - Fix contribution each year
 - Provide definite benefit on retirement
 - Difficult to achieve both objectives: **careful monitoring**



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What is solvency valuation?

- A concrete evaluation of assets and liabilities of a pension fund
- Assets: market value of assets
- Liabilities: based on past service and pay on termination basis
- Funded status: comparison of assets vs liabilities
- Rigid rules: not subject to manipulation
- Provides an acid test of whether a pension fund has enough assets to cover all pension obligations



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Solvency Valuation is different from Past Practice

- In past valuations, pension cost and liabilities are valued on a prospective basis
 - Past service liabilities = total benefit value – value of future contributions
 - Subject to manipulation: assuming unrealistic future contributions
 - Plans with solvency deficiency are shown to have surpluses
 - Directors receive bonuses
 - Senior executives receive excessive distributions
 - Solvency deficiency increases
- Such situation must not continue



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What is Pension Cost?

- Two components
 - Normal cost: value of benefits earned in current year
 - Makeup for past deficits: amortization of solvency deficiency
- Solvency deficiency = solvency liability minus solvency assets
- Solvency payment = solvency deficiency / 5
- Both of these components are calculated on a solvency basis



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How Does Solvency Process Improve Security?

- Push funds towards 100% funded on solvency basis
- Plans with solvency deficiency are required to
 - **Increase funding**
 - **Decrease distribution**
- **Increase funding**
 - **Solvency payment = solvency deficiency / 5**
 - **Minimum contribution = normal cost + solvency payment**
- **Decrease distribution**
 - **Discussed on the next page**



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Decrease Distribution for Deficit Plans

- Funded ratio = solvency assets / solvency liabilities
- If funded ratio < 100%, lump sum distribution is limited to the portion of funded ratio
 - In order to distribute full lump sum, addition contribution is required from the sponsor
- If funded ratio < 80%, not allowed to amend plan to improve benefits
- If funded ratio < 60%, not allowed to accrue future benefits
- Limitations removed when funded ratio improves



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Legal Implications

- New solvency regulations
 - Drafted and proposed
 - Public comments are solicited
 - Final regulations published
- EISA staff must be trained:
 - Actuaries on solvency valuation: contributions
 - Staff on administration supervision: distributions
- New risk based supervision procedure formulated along the line of solvency rules
- Training of pension professionals



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Update of the 2003 Solvency Analysis

- There is probability that the 2003 analysis may have painted a better solvency picture than reality
 - No reflection of contributions and interest
- Update to trace the updated funded status of plans covered by 2003 analysis
- More accurate data, updated assumptions
- Analyze contribution, distribution, director bonus trends
- Asset study



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Standardized Actuarial Valuation Report

- More transparency
- Easier reporting
- Easier supervision
- Electronic communication
- Regular and timely filing
- Standardized analysis by EISA
- Easy to spot outlier



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Major Sections of Standardized Report

- Signature page
- Executive summary
- Actuarial balance sheets
- Contribution pages
- Experience analysis
- Data reconciliation
- Summary of actuarial method and assumptions
- Details in a separate document