

# RECORD OF SOCIETY OF ACTUARIES 1994 VOL. 20 NO. 3B

## RETIREMENT IN THE 21ST CENTURY

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Can our pension system provide people with their preretirement standard of living over the next century? How robust is the retirement system? What happens if there are Social Security cuts, early retirements, increased expectancy, negative population growth, high inflation, and unfavorable investment experiences?

This session will examine the entire U.S. retirement system, including private and public pension plans, Social Security and personal savings. It will show how much retirement income can be provided by each component over the next century.

MR. MICHAEL KANTOR: One of my major functions is matching assets against liabilities on pension plans. To do this job, I project and simulate assets and liabilities many years, even decades into the future. I can tell you whether a plan is likely to be fully funded in the year 2010 or what the contribution will be in 2050. I think I'm very smart, but I have a confession. We're among friends so I can let you in on a secret. Ask me how many of our retirees in the 21st century will be living below the poverty line. That draws a blank.

Most of our activities deal with the plan, making sure that the plan is healthy, that the plan complies with accounting, Department of Labor (DOL), and IRS standards. But what about the individual? Do healthy plans mean that retirees live well? This presentation addresses just that issue.

I want to examine the U.S. pension system from the participant's point of view. Most employees retiring now cannot maintain their preretirement standard of living. In the next century, it may get worse. Many retirees could actually live below the poverty line. I'm going to analyze each leg of the three-legged retirement stool: Social Security and the defined-benefit (DB) and defined-contribution (DC) plans. Finally, I will present a proposal to correct the problem.

### INTRODUCTION

#### Now What is the Problem?

Retirees need to replace 70% of their preretirement income to maintain their standard of living. Also, retirement benefits have to be adjusted for inflation. Why are most retirees falling short of this 70% target? According to the Employee Benefit Retirement Institute, only 43% of full-time workers are covered by any pension plan, and many of these covered people are getting insignificant benefits. Most retirees depend on Social Security, and we all know it is experiencing financial difficulties. Finally, most people save too little.

Viewing this problem from an actuarial point of view allows us to measure the actuarial liability associated with this 70% benefit target. Suppose we consolidate all retirement plans into a gigantic megaplan that will provide every American retiree this 70% targeted benefit, fully indexed for inflation. Because it is a DB plan, we can perform an actuarial valuation. Liabilities range between \$12 trillion and \$15 trillion, and pension assets are a mere \$4.4 trillion. By any actuarial standard, this is a grossly underfunded retirement plan.

There are three types of plans that can provide retirement benefits. The first is the Ponzi scheme, better known as Social Security. Second is the mandatory DB plan, and third is the mandatory DC plan.

My proposal is that each of the plans replace a small piece of preretirement income, but aggregating to 70%. Social Security would replace 20% of salary, the mandatory DB plan would replace another 20%, the mandatory DC plan would be targeted to replace 20% of salary, and the voluntary savings plan would be targeted at 10%.

I'll also discuss some transitional issues, how to get from where we are to where I would like to be. I will then talk about developing a portable DB plan.

### **NEEDS OF RETIREES**

Retirees need 70% of their preretirement income to maintain their standard of living. A person who receives 70% of his or her preretirement salary during the first year of retirement will maintain his or her standard of living for the first year only. Cost-of-living adjustments (COLAs) are necessary to preserve the standard of living after the first year. Otherwise, the retiree's standard of living will drop several percent every year due to inflation.

Why are most retirees receiving less than this amount? Lower savings is one of the first reasons. We have one of the lowest savings rates of any industrialized nation. *People spend more and save less than they should. As a result, retirees have little personal savings to draw upon.*

The government is partially to blame by adopting a tax policy that discourages savings. It also discourages setting up prefunded pension plans, which is a form of savings. We know how they have made the DB plan administratively complex. Many small companies disperse more money to actuaries, lawyers, and accountants than to retirees. The administrative burden is simply a nightmare. This is why many companies, especially smaller companies, have abandoned their DB plans. Even a DC plan still has some administrative hurdles.

*The nondiscrimination rules are one of the major administrative impediments. Plan sponsors must perform elaborate tests to prove that no highly compensated employee earns a pension benefit that is somehow superior to that of a lower-paid employee. Thus, if one top honcho's pension is \$3 a month too much, the IRS may swoop down and say this plan violates the nondiscrimination rule, and it no longer gets the tax qualification.*

### **FINANCIAL DIFFICULTIES WITH SOCIAL SECURITY**

The health of Social Security is based on a dependency ratio: the ratio of active people who contribute to retired people who receive. There are 3.8 active people for every retiree right now. Most of the projections say that this ratio will drop to around two, especially when the baby boomers retire next century. Now you can argue that maybe it will be 1.8 or 2.1, but the fact of the matter is that this ratio is going to be approximately half of what it is today.

The retiree population will double during the next 30–40 years, and the active population will remain constant. To maintain the same level of benefits, contributions must

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double, or benefits will be cut in half. There are going to be some very painful changes. The government is doing it slowly in small increments, but either Social Security will have to be half as generous as it is today or twice as expensive. Neither one of those outcomes is going to be very palatable.

### **Low Fertility**

Low fertility adversely affects Social Security because there will be too few active people entering the workforce to support the retirees. I'm introducing a little religion by quoting the commandment: be fruitful and multiply. If we disobey this commandment, Social Security will have a very unfavorable dependency ratio.

To maintain the same population size, we need approximately 2,100 births for every 1,000 women. Fertility dropped to below 1,800 in the 1970s and 1980s. If that trend persists, our population will get smaller and smaller. It would first shrink the active population as well as the dependency ratio. Fortunately, the fertility rate has rebounded in recent years.

### **Low Mortality**

People live longer after retirement. Life expectancy has increased dramatically during the last century. For example, in 1940, a retiree aged 65 had a life expectancy of 12.6 years. Today, the 65-year-old should live approximately 17 years, a very significant difference. Social Security must pay 4.4 additional years' benefits for every retiree. This adds more of a strain on the retirement system.

### **Inflation**

Up through the mid-1960s, inflation ran 1–2% a year. I remember a time when 2% inflation was a cause for alarm. Today 2% inflation is a cause for jubilation. We are in an era of high inflation, and I'm not very optimistic that we're going to keep it under control. This is a recession; we're still running 2% inflation. What's going to happen when we have a full economic recovery?

Let me give you a personal experience. My parents are retired and they always ask me questions dealing with finance. I remarked that they have to worry about inflation. Their first reaction was, why should a retiree worry about inflation? When inflation averaged 1% per year and life expectancy averaged 12.6 years, inflation was not a serious problem. It is not so today when life expectancy is 17 years and inflation is likely to average 4%.

The average retiree will see prices double in his or her lifetime. However, many will live longer than average, perhaps past age 90. This is very common today and will become more prevalent during the next century. These people could see prices triple during their lifetime. I believe we must face the cost-of-living-adjustment issue. The ad hoc 50% COLA is not going to be adequate. We're going to have many 90-year-old retirees living below the poverty line unless we provide better COLAs.

**The Gap Between the Haves and the Have-Nots**

Only 43% of workers are covered by any type of retirement plan. This leaves a majority of workers with little more than Social Security, so the haves are among the 43%, and the have-nots are among the other 57%. Even among the 43%, things are not that rosy.

The other gap between the haves and the have-nots is caused by the DB plans. These plans typically provide very adequate benefits to a small segment of the workforce, specifically those who have been working for the same employer during an entire career. We are in a day and age where fewer people work for a single company during their entire career.

Employees frequently change jobs, and the way the DB plan is structured now just isn't up to the task. One significant statistic is that among those covered by DB plans, only 15% have accrued enough to earn 60% of the final pay after combining with Social Security. Many employees are technically covered by a DB plan but will receive little or no benefits.

We now look at the United States pension system from an actuarial point of view. I alluded to it in the introduction, but now let's talk about it in a little bit more detail. I introduced this fictional term, megaplan. What is a megaplan? It is a consolidation of all pension plans, together with the assets and contributions. Megaplan provides retirement benefits for all Americans equal to 70% of the final salary, with a 100% COLA. Because it is a DB plan we can perform an actuarial valuation.

I have listed the major assumptions. I selected age 64 as the retirement age, because that seems to be the average retirement age today. The covered payroll is just under \$3 trillion.

**United States Pension System From An Actuarial Viewpoint  
Consolidate all the Pension Plans into this Single Mega Plan**

<b>Base Case Assumptions</b>	
Interest and asset returns	7.5%
Inflation	4.0%
Turnover (nonmortality)	0.0%
Retirement age	64
1992 covered payroll	\$2.85 trillion
Fertility	2,107
Inflation protection	100%
Assets	\$4.42 trillion
Pay-out/payroll	16.3%

How much are pension assets? Now that's a tricky number to calculate. Pension plans have aggregate assets worth \$3.4 trillion, and then we made the assumption that individual savings should kick in another trillion dollars to the pool, giving us a total of \$4.4 trillion. Like I said, this is a very tricky number to get at, but I think it's a reasonable estimate of where we stand.

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Pay-outs are about 16.3% of covered payroll, equivalent to \$465 billion a year to retirees. Contributions and pay-outs include Social Security.

Now we talk about some of the actuarial results. I used three different scenarios dealing with life expectancy. The different life expectancies correspond to three projections made by Social Security. There is an optimistic projection, a pessimistic projection, and then a most likely projection. The first of the projections, Social Security I, has a life expectancy at age 65 of 17.8 years. The second and most likely projection, Social Security II, has a life expectancy of 20.3 years, and the pessimistic projection, Social Security III, has a life expectancy of 23.5 years.

Our definition of optimistic and pessimistic seems awkward. We used to think of being optimistic as living a long life and pessimistic passing away at an early age. But for financing purposes, everything is upside down.

For each of these sets of assumptions, I calculated a normal cost and accrued liability. The results are in Table 1. We will key in on Social Security II, which is the most likely. It assumes that during the next 60 or 70 years, life expectancies will increase by approximately two to three years. The normal cost (using entry age normal) is almost \$329 billion or 11.6% of payroll.

TABLE 1  
BENEFIT PROVISION  
70% INCOME REPLACEMENT AND FULL COLA

	Life Expectancy at 65	Normal Cost (Entry Age Normal)	Accrued Liability (Trillions)	Year Mega Busts
Social Security I	17.8 years	\$290 (10.2%)	\$12.0	2047
Social Security II	20.3 years	\$329 (11.6%)	\$14.0	2033
Social Security III	23.5 years	\$381 (13.6%)	\$15.4	2025
Pension Assets			\$4.4	

Our aggregate contributions to the pension plans are more than normal cost because of the tremendous amount of unfunded liability. In other words, if we had faithfully prefunded all of these benefit promises from the very beginning, we would only need to contribute \$329 billion and be up to date and fully funded. So a significant part of the contributions is compensating for past underfunding. I also calculated the accrued liability. Under the Social Security II, the accrued liability is \$14 trillion versus assets of \$4.4 trillion, for a funded ratio of 31.3%, which is not a very healthy funding ratio.

Finally, I looked at megaplan from a cash-flow point of view. How long would it take megaplan to bust; that is, to run out of assets? Under Social Security II, it occurs in the year 2033. If megaplan were the exclusive retirement plan, we'd have tell all retirees that pension assets are not adequate to pay what we have promised. The reason is that baby boomers begin to retiree in the year 2010, which begins to drain the pension fund. By 2033, when the last of the baby boomers have retired, the assets have been fully depleted.

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I have described in detail the major Social Security projections, covering fertility and life expectancy at age 65. The projections include some of the short-term economic changes. I'm looking out the entire century, so the scenarios over the next two or three years are not important. For the time being, I am ignoring immigration.

Projected Life Expectancy And Fertility

- Current
  - Fertility 2,060 per 2,000 women
  - Life expectancy at age 65 17.1 years
  
- Three Projections made by Social Security
  1. Optimistic
    - Fertility 2,200 per 2,000 women
    - Life expectancy at age 65 17.8 years
  
  2. Most likely
    - Fertility 1,900 per 2,000 women
    - Life expectancy at age 65 20.3 years
  
  3. Pessimistic
    - Fertility 1,600 per 2,000 women
    - Life expectancy at age 65 23.5 years

Table 2 shows the impact of certain assumption changes in conjunction with Social Security II. I want to examine the type of changes we can make to keep Megaplan above water. We can make some value judgments to determine the least painful benefit reductions.

TABLE 2  
SENSITIVITY OF SOCIAL SECURITY PROJECTION II

	Normal Cost (Entry Age Normal)	Accrued Liability (Trillions)	Year Mega Busts
Social Security II base case	\$329 (11.6%)	\$14.0	2033
Raise retirement to age 66	\$277 (9.7%)	\$12.1	2055
Raise mortality	\$290 (10.2%)	\$12.0	2045
Reduce wage growth by .5%	\$292 (10.3%)	\$13.1	2032
50% COLA	\$269 (9.4%)	\$13.2	2067
8.5% investment return	\$238 (8.4%)	\$11.7	2041

The first possibility is raising the retirement age to 66. I'm a staunch advocate of this proposal to reduce the financial burden. By raising the retirement age from 64 to 66, the normal cost will drop considerably from 11.6% to 9.7% of payroll, and the

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accrued liability will drop to only \$12 billion. So we now could bring up the funding ratio from 31.40% to 36.7%.

Raising the mortality or investment assumption does reduce costs and liabilities as well as delay the bankruptcy date of Megaplan. Unfortunately, there is no easy way to implement these changes.

Reducing the COLA from 100% to 50% significantly cuts the cost of the program. I personally believe a 50% COLA is unacceptable because when prices double and triple and only half of that cost-of-living increase is being replaced, retirees will experience a progressively lower standard of living.

Finally, there's an 8.5% investment return assumption. How do we raise investment returns? One way of doing it is by investing more aggressively, and we'll talk about that a little bit later.

### **Megaplan from a Cash-Flow Viewpoint**

I estimate that we're contributing about 15% of our payroll to megaplan, and we're paying out 16.5% of payroll. If we continue contributing this rate, megaplan will go bust in the 21st century. Increasing the contribution rate to 20% of payroll may keep megaplan afloat.

The purpose of the megaplan exercise is to quantify the value of this 70% benefit target and how much assets are available to cover this liability. It shows that in aggregate, this benefit target is not reachable today and that our pension contributions must increase.

However, there are great disparities among individuals, and obviously it is inequitable to assess everybody an additional 5% or 6% of salary. For example, somebody who has been very meticulous about saving for retirement is in good shape. Why should he be asked to subsidize somebody who hasn't been so meticulous?

### **Solution**

There's very little we can do for those who are in or near retirement. Unless we find a couple trillion dollars, it is too late to help these people. They'll live on Social Security and enjoy a minimal standard of living but well below the 70% needed to maintain their preretirement standard of living. Fortunately, baby boomers have not yet retired so Social Security won't have to implement major benefit reductions immediately.

I want to set up a permanent structure that will provide adequate benefits to everybody. There are three types of pension programs that are in existence: a DB plan, a DC plan, and Social Security.

I'm also going to set up a straw man to demonstrate the difficulties of providing pensions exclusively by one vehicle. We will show that placing the entire burden on just one of these plans will put all the financial pressure on a small segment of the population. Instead, I will recommend taking a combination of all three.

I want to describe the characteristics of each of these plans plus their advantages and disadvantages. This allows us to judge what role each type of plan should have in the solution.

### **Mandatory Employer-Sponsored DB Plan**

DB plans are prefunded rather than pay as you go. Money is put aside long before the employee retires. The employer assumes the investment and other risks. If there is an investment shortfall, the employer has to make up the difference. If investments do well, the employer can reduce contributions. Also, major employers have a long-term time horizon, because they outlive employees.

### **Advantages**

DB plans have a long time horizon. An employer that will be around long term could invest more aggressively than somebody with a shorter time horizon. In general, the more aggressively you invest, the more risk you have to bear. However, the more likely you are to receive a higher rate of return. So the DB plan is probably the cheapest, available way to provide a benefit.

Also, employers are better able to incur some of these risks than are employees. If investment returns fall short of expectations, the employer can raise the price of its products to defray the higher contributions. Finally, the prefunding allows the DB plan to absorb adverse shocks such as a large number of people going into retirement; there's a major cash drain. Social security would go bankrupt immediately if that happened because it's not prefunded, but prefunded plans have the cash reserve to tide you over.

### **Disadvantages**

The major disadvantage of the DB plan is it's not portable. I'm going to discuss later how to structure a portable DB plan, but it's going to be difficult to implement.

Another disadvantage is that there's no cap on the employer's cost, should adverse experience occur. Employers like to know what things will cost. If it is stated at 5% payroll, they don't want to see the cost jump to 10% or more. Bad investment experience could easily double the contribution requirements.

Table 3 shows the cost of the DB plan. Mortality is assumed to be the only reason for employee turnover. Nominal returns range from 5.5% to 8.5%, which translates into real returns ranging from 1.5% to 5.5%. The bottom of Table 3 has the cost as a percentage of payroll for the three Social Security mortality assumptions.

In the best of all worlds where nominal returns are 8.5%, or 4.5% real, the costs don't seem to be overly burdensome. They range from 7.4% to 9.6% of payroll, which is in line with the cost of pension plans that we've seen in our practice. However, if we start looking into some of the more unfavorable investment assumptions, the contribution rate could exceed 20%.



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TABLE 3  
COST OF A DEFINED-BENEFIT PLAN  
SERVICE COST AS A PERCENTAGE OF PAYROLL

Nominal Return	5.5%	6.5%	7.5%	8.5%	
Real Return	1.5	2.5	3.5	4.5	
Life expectancy age 65					
I	(17.8)	19.0%	13.9%	10.2%	7.4%
II	(20.3)	21.9	15.9	11.6	8.4
III	(23.5)	25.9	18.6	13.4	9.6

So DB plans have certain good qualities and should be part of the solution. However, I'm not going to mandate a retirement program to any employer that could cost 20% of payroll. Many of these companies would go out of business or stop hiring new employees.

### **Mandatory DC Plan**

This plan is the fastest growing type of plan in our pension system. I sense a certain amount of infatuation with it, but it, too, has its good and bad points.

It is prefunded because people put money away long before they retire. Typically, employees determine how much they put in and what type of an asset mix they should adopt. The employee assumes investments and other risks by retiring with less than the targeted benefit.

Finally, DC plans tend to have a shorter investment time horizon than DB plans, because working careers last typically 40 years, which is shorter than the life expectancy for major employers.

### **Advantages**

As with the DB plan, the prefunding aspect better absorbs adverse shocks such as an early retirement. DC plans are very portable because the individual has his or her own account balance, and that account balance stays with him through his working career. If he changes jobs, he continues contributing money to his account. So this is a very important advantage. Another advantage is that the contribution is capped. If the DC plan calls for a contribution of 4% of pay, that is your obligation. It will not go up to 6% or 8% or 10%.

### **Disadvantages**

Because of the shorter time horizons, investments must be more conservative. Specifically, equity holdings in DC plans have to be less than for DB plans. The time horizon ranges from less than five years for participants past age 60 to approximately 40 years for a participant in his or her early 20s.

Obviously, the participant past age 60 does not have the luxury to have a significant amount of equity in his or her retirement fund. This is because equities can quickly

drop in value, and the participant near or in retirement doesn't have the time to make up the loss. Because of the shorter time horizon on DC plans, there is a question of what asset mixes individual participants should select. Some financial planners suggest the rule of 100 less your age. What does that mean? If you're aged 22, 100 less 22 turns out to be 78. Thus, the 22-year-old should be 78% invested in equities. The 65-year-old under that rule should be 35% invested in equities—100 less 65. The 90-year-old should be 10% invested in equities.

Even though the younger person could invest very aggressively, most of the account values belong to those past age 50 who must invest conservatively. Looking at the demographics, I find that if everybody followed this 100-minus-your-age rule, the equity mix of a DC plan would be approximately 40%. In contrast, DB plans are usually over 50% equities and in some cases, over 60% equity. So the difference between the 40% and the 60% equity mix could add a significant amount of investment return, especially taken over a long period of time.

Another disadvantage is that the employee is less able to absorb the investment risk. I simulated the growth of the account balances for participants who contribute over their working careers. In some simulations, poor investment return reduced the retirement benefit from an expected 70% to less than 35%. It did not happen very often, but there was maybe a 5% probability that the actual benefit was less than half of what was expected. Obviously, this is a major problem of the DC plans.

Employees may select inappropriate asset mixes. That's a very serious problem. For example, young employees do not save for retirement because it is too far away. If they do put money away, they pick conservative investments, or they go to the other extreme by buying company stock that is very undiversified, because much of their financial well-being is already being dictated by the fortunes of their employer.

We must educate participants on how to make better investment decisions. Many have the impression that the stock market is the gambling casino rather than a place to invest for retirement.

Finally, the preretirement death benefit, which preserves the account value in case of preretirement death, cannot be unbundled from the DC plan. Thus, it raises the cost of a DC plan.

### **EXPANDED SOCIAL SECURITY**

Let's look at the third type of retirement system, the Ponzi scheme or Social Security. It's pay as you go with little or no prefunding. It's Ponzi because it transfers money from actives via a payroll tax to retirees. The government determines contributions and benefits; thus, whenever there's a shortfall, it decides how much of the shortfall is paid by the actives in the form of higher payroll taxes and how much is absorbed by the retirees in the form of lower benefits.

#### **Advantages**

Even though I have called Social Security a Ponzi scheme, there are some positive aspects to it. It's portable and that's very important in a country where people frequently change jobs. It has minimal investment risk because it's not prefunded. There are very few dollars in the Social Security System to get lost by bad

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investment experience. Finally, it better absorbs inflation risk because payroll automatically adjusts for inflation.

### Disadvantages

It's more expensive because there's no investment return to offset some of the costs. Prefunding is always cheaper than pay as you go because money is set aside before it is needed. In the interim, the contributions earn investment income and that reduces the ultimate cost.

Social Security has a demographic risk as expressed by the dependency ratio. Today there are 3.8 actives per retiree, and this number will drop down to approximately 2.0, which means it will drop to half its current level. The contributions rates would have to double just to maintain the current level of benefits.

If the cost of maintaining current levels of Social Security benefits is unacceptable, imagine the cost of expanding Social Security to replace the entire 70% pre retirement income. The payroll tax for such a plan would be in the 35-40% range. And this amount doesn't include Medicare, death and disability benefits or personal income tax. The tax burden of this proposal would be so high that employees would not find it economical to work.

In summary, we've talked about three different types of pension plans, each enjoying certain advantages and disadvantages. I would certainly not choose to go exclusively with one of these plans and one of these plans only. This is why I suggest combining all three plans as shown in Table 4. Social Security takes a piece, the DB plan takes a piece, the DC plan takes a piece, a voluntary savings plan takes another piece, and it adds up to 70%.

TABLE 4  
PROPOSAL  
COMBINE THE THREE APPROACHES AS FOLLOWS\*

Social Security	Replaces	20% Final Salary
Mandatory DB Plan	Replaces	20% Final Salary
Mandatory DC Plan	Targets	20% Final Salary
Voluntary Savings	Targets	10% Final Salary
<b>Total</b>	<b>Targets</b>	<b>70% Final Salary</b>

\*Selecting a single approach would concentrate the financial burden and risk on a single segment of the population while mixing these approaches spreads the risks

Table 5 shows the distribution of risk by type and bearer. The various plans are listed on the left, followed by the size, the major risk, and who bears the risk.

TABLE 5  
DISTRIBUTION OF RISK BY TYPE AND BEARER

Type of Program	Size	Major Risk	Who Bears Risk
Social Security	20% salary	Demographic	Employer/ Employee
Mandatory DB Plan	20% salary	Investment	Employer
Mandatory DC Plan	20% salary	Investment	Retiree
Voluntary Savings	10% salary	Investment	Retiree

### SOME COMMENTS ABOUT THESE RETIREMENT PROGRAMS

#### Social Security

An important advantage of Social Security is that it's exposed to demographic risk not to investment risk, and DB and DC plans are exposed to investment risk, so we have a diversification.

Who bears the risk? Social Security risk is borne by employer and employee. The mandatory DB plan risk is borne by the employer, and the DC plan risk is borne by the retiree. This splits the risks so if unfavorable developments occur, we do not push the entire financial pressure on just one segment of the population.

Why retain Social Security? Unlike DB and DC plans, it is not exposed to investment risk, and it's funded from payroll, which adjusts for inflation. Social Security would replace 20% of final salary under this plan compared with the 43% replacement rate for an average retiree at age 65. This cuts Social Security from 43% final pay to only 20%. In doing so, we can keep contribution rates at or near current levels.

#### MANDATORY DB PLAN

It will replace 20% of final salary over a working career of approximately 43 years. This is equivalent to less than half of a percent benefit for a year of service. It is much less generous than the typical DB plan, which gives 1-1.75% per year of service.

The benefit level is much smaller than for the typical DB plans. This allows the employer the luxury of being able to afford full COLAs after retirements and provide more equitable benefits to employees leaving before retirement by determining benefits on the expected preretirement salary.

Suppose someone is now earning \$30,000 and leaves but ultimately will retire at \$80,000 after salary increases. The current DB plan will base this benefit on the \$30,000 he or she is earning now when he leaves the company, not on the \$80,000 that is earned later.

By revaluing earnings, we adjust earnings for inflation, future productivity increases, and merit. By keeping the employer's obligation so small, it can afford to add COLAs

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and take care of people who leave early. This alleviates the portability problem inherent in DB plans.

### Proposed Benefit Reduction

My feeling is that the least painful benefit reduction is raising the retirement age. Let's look at Social Security III, having the longest life expectancy, an increase of six years. I argue that if medical science can increase life expectancy by six years, it should be able to add at least three years to the productivity of that person, allowing him or her to delay retirement. This is why I think that this is the least painful type of benefit cut that we can make.

Now we go to costing the mandatory DB plan. It is 20% final pay, fully indexed. Table 6 covers the range of nominal returns from 5.5% to 8.5%, which translates into real returns from 1.5% to 4.5%. On the bottom, there is the life expectancy and the associated retirement age.

TABLE 6  
COST OF MANDATORY DEFINED-BENEFIT PLAN  
20% FINAL PAY, FULLY INDEXED BENEFIT

Nominal Return			5.5%	6.5%	7.5%	8.5%
Real Return			1.5	2.5	3.5	4.5
Social Security Assumption	Life Expectancy Age 65	Retirement Age				
I	17.8	65	5.01%	3.67%	2.67%	1.94%
II	20.3	66	5.33	3.86	2.78	1.99
III	23.5	67	5.98	4.27	3.03	2.14

Assumption I has the shortest life expectancy, so I'm delaying retirement by only one year, from age 64 to 65. On the other hand, projection III increases life expectancy by six years, which justifies raising the retirement age to 67. This also offsets the higher cost associated with the longer life expectancy.

On the lower right are the various cost figures. Let's take the most optimistic investment scenario, 8.5% nominal, 4.5% real. On average, the cost is approximately 2% of payroll. Even if investment returns are below expectation, the cost could go up to 3% or 4% of payroll, but we're starting from such a low base that even very unfavorable experience keeps the cost acceptable.

### The Cost of the Mandatory DC Plan

Table 7 is structured the same way as Table 6. These costs are a little bit higher than for the DB. The major reason is that the DB plan gives nothing to a participant who passes away before retirement, while the DC plan pays the account balance for the people who do pass away before they retire.

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TABLE 7  
 COST OF MANDATORY DEFINED CONTRIBUTION PROGRAM  
 TARGET BENEFIT 20% FINAL PAY FULLY INDEXED

Nominal Return			5.5%	6.5%	7.5%	8.5%
Real Return			1.5	2.5	3.5	4.5
Social Security Assumption	Life Expectancy Age 65	Retirement Age				
I	17.8	65	5.85%	4.30%	3.15%	2.29%
II	20.3	66	6.08	4.42	3.19	2.29
III	23.5	67	6.61	4.73	3.37	2.39

Let's assume that only a 2.5% real return is earned. Contributions are less than 5% of payroll, which I think is very palatable.

One reason contributions are so low is that contributions to the DC plan begin at age 22, not at age 40. This exercise shows clearly that to keep the expenses reasonable and avoid a big hit, saving for retirement should begin when an employee enters the workforce. Age 22 is none too early to begin. By the magic of compound interest, a \$1,000 contribution at age 22 buys a much, much larger benefit than a \$10,000 contribution made at age 65. So those early-year contributions are critical for keeping the costs under control.

**Minimum Income Replacement Rates**

How well do retirees fare when investment returns are well below expectation? Social Security will still provide a 20% preretirement income because it is not pegged to investment returns. The mandatory DB plan makes the employer responsible for replacing losses so the DB provides the full 20%. The mandatory DC plan is targeted at 20%, but suppose investment returns are poor and it only gives you 10% of final pay. Similarly, the voluntary DC targeted at 10% will only give you a 5% replacement because of poor investment returns. So under this very pessimistic assumption, the total income replacement is 55%. The 70% is not needed to preserve a preretirement standard of living, but will keep these people well above the poverty line.

**Transitional Issues**

To implement this proposal, we have to equitably deal with those who are in midcareer when the change occurs. Social Security benefits and contributions will be based on all of income, not capped at approximately \$53,000. This is a bonanza to the upper-income people, because under the current Social Security system, a person who goes out earning \$50,000 a year has been contributing twice the amount as a person who goes out at \$25,000. However, his or her benefit is probably only 10% or 20% greater. So the current Social Security requires higher-income people to significantly subsidize lower-income people.

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The benefit formula will be a mixture of the current benefit formula and this new 20% replacement, weighted by the years of service before and after the change. To illustrate, those entering retirement one year after the change is adopted will get 1/43 of his or her benefit based on the new plan, and 42/43 of the benefit based on the traditional Social Security formulas. Each successive group going from active to retirement will get more of their benefit based on the new formula and less on the old formula. In 40 years it will be completely phased in.

### **DB Plans?**

The benefit is prorated by the number of years of service after the changes go into effect, much like Social Security. A DB plan is promising 20% of final salary for a 43-year working career. The person who has worked one year under the new system gets only 1/43 of the 20% or about half a percent of final salary from the new plan. But someone coming out a year later gets a little larger benefit from the new plan, and in 40 years people going out into retirement will be getting the full 20% benefit.

*If there is an existing DB plan, it would be amended to provide the mandated benefit as the minimum benefit. Otherwise, the DB plan can continue using its existing benefit formulas. For most DB plans, the amendment would affect short-service employees only.*

There is a transition problem for someone who is past age 22 at the time of change. Because of the effects of compound interest over longer time periods, contributions made early in the working career purchase bigger benefits than contributions made toward the end of the working career.

Someone at midcareer at the time of transition doesn't have the advantage of these early contributions. To illustrate, suppose age 22 is the starting date, and the retirement age is 66. An employee working for the full 44 years under the new plan gets the full 20%, and the cost is just under 2% of payroll in the investment return averages of 8.5%. (See Table 6.)

But let's say somebody is age 44 at the time of transition. Half the career is under the new plan. Thus he or she should get half the 20% final pay or 10%. Because of the late funding, the cost goes from 2% to just above 3% of pay. It is a temporary problem that diminishes over time. Maybe some larger contributions would be needed during the transition period.

One possible solution is to use a temporary windfall from Social Security to cover the temporary shortfall. Under the proposal, Social Security is now giving smaller benefits for service past the transition date. However, initially it's taking in more money than it took in before, because employees will be taxed on all of their income, not just part of their income, so Social Security will have a temporary windfall.

### **STRUCTURING A PORTABLE DB PLAN**

Another topic that I alluded to before is the structuring of a portable DB plan. Portability is one of the major drawbacks of DB plans. I suggest that Social Security sell and administer indexed annuities. An employer could satisfy its mandatory DB obligation by purchasing indexed annuities from Social Security or by sponsoring a DB plan that is at least as generous as the mandatory benefit.

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Social Security will hedge this inflation and investment risk by purchasing real return bonds from the U.S. treasury. In March 1994, I wrote an article titled "Fixed Real Bonds" in *Risks and Rewards*, published by the Investment Section of the Society of Actuaries.

Federal Reserve Chairman Greenspan has talked about the U.S. government issuing real return bonds because he thinks he would get a better barometer of inflation expectations. So there may be reasons to have these real return bonds, and I think real return bonds could be used to protect those who are most vulnerable to the ravages of inflation. Also, private vendors should be allowed to compete with Social Security.

### **Advantages of Offering these Indexed Annuities**

An employer can lay off the investment, inflation, and mortality risk. It also relieves the employer of the administrative burden of operating its own DB plan.

There are other uses of indexed annuities. An employer can maintain its DB plan but purchase annuities for young, short-service employees where administrative costs are high relative to the benefit. For example, an employee who works for a company two years and then leaves has earned almost a 1% final-pay benefit.

This will also consolidate benefits for a job hopper whose career might span 20 different companies. When he or she retires, he would receive 20 different retirement checks each month. If these benefits are administered by Social Security, he would receive only one check from Social Security each month.

### **Additional Comments**

One major issue is what real return expectation we should use. Most of us are familiar with the Ibbotson and Sinquefeld studies that go back approximately 67 years. Real returns on stocks have averaged 6.5% over this period of time. Is that a statistical fluke, or is this something that one can realistically expect in the future?

There's a book that was recently published by Jeremy J. Siegel, a professor at Wharton. The title is *Stocks for the Long Run: A Guide to Selecting Markets for Long-Term Growth* (Burr Ridge, IL: Richard D. Irwin, Inc., 1994). His study covers 190 years, which he divides into three major periods of approximately 60 years each. Amazingly, real returns on stocks range between 6.6% and 7% over the major periods. Thus, the 6.5% real return on stocks may be a reasonable expectation.

The study goes a little bit further than that. He also tracks British stocks during the last 120 years. The British experience was that equities provided approximately the same real return as U.S. equities, so it's not as if it's just a U.S. phenomena.

He also looks at Germany, which is a very special case. During the last 120 years, the country was invaded twice by world wars, destroying much of the countryside and economic base. It experienced a hyperinflation in the 1920s and then after World War II, the communist government seized privately held assets. German companies experienced the worst calamities imaginable during this time period. Yet the real return on German stocks averaged 3.5-4% a year. So if under the most horrendous



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circumstances, a 3.5–4% real return was achieved, I feel more comfortable expecting a 6.5% real return on equities under typical conditions.

Jeremy Siegel also discusses intermediate and long-term government bonds. During the last 67 years, long-term bonds provided a much lower real return of 1.7%, compared with 3.7% between 1871 and 1925 and 4.8% between 1802 and 1871. Unlike stocks, real returns on bonds varied significantly during the three major periods. Perhaps some of this early experience is not relevant for the 21st century.

For example, the United States was a 26-year-old, fledgling republic in 1802, not the major world power it is today. Back in 1802, there was no certainty that the country would survive or achieve political stability. Obviously, U.S. Treasury obligations were not considered default free.

Similarly, the last 67 years may not be any more relevant. During this period, the United States abandoned the gold standard and for the first time, inflation was no longer strictly a wartime occurrence. Interest rates were late anticipating this uptrend in inflation, and bondholders found their real returns much lower than anticipated. Because inflation continuously exceeded expectation, bond prices tended to fall.

So there's certainly a good argument that looking into the future, real returns on long-term bonds will significantly fall below the 4.8% experienced during the first major period. Similarly, they should be well above the 1.7% that we've experienced during the last 67 years.

In summary, let me return to my opening remark. As actuaries, we have been concerned about the pension plan and keeping the plan healthy. We've done a good job in keeping pension plans healthy, but I think we have to focus on the individual. To say that 99% of our pension plans are healthy is a meaningless statement if we find that 50% of our retirees are living in poverty. We have to think more in terms of individuals than of plans.

This proposal will not only provide retirees with adequate pensions but will also increase our savings rate and alleviate the capital shortage problem. We are typically a nation that spends more than other countries and saves less. We find more and more of our capital assets being held by foreign companies, and we have reached a point where foreigners hold more assets in the United States than Americans hold abroad. When that happens, our standard of living will go down.

**FROM THE FLOOR:** First of all, that was a magnificent presentation, and thank you very much for the comprehensive nature of what you did. Replacement ratios are correctly what we should focus on. They are a bit more subtle of a concept than they seem. If you look at the career paths of the ordinary person, you'll see a very rapid increase in real wages early in life. This is probably more due to increased working time than simply to the wage rate as people gain seniority. You'll see a peak, probably in the order of age 55, a slight downturn then, and then some funny business toward the end. The funny business probably is due to disabilities and retirements. As Social Security does long-term indexed measures rather than keying on an immediate point, we may want to consider an immediate postretirement one when we talk about Mr. and Mrs. Blue Collar Worker.

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The other and more basic point has to do with thanking you for your emphasis on real rates of return. I agree with your numbers and with Siegel's numbers, that over the long term, equities have been in the order of 6% and bonds more in the order of 1.5–3%. These are not automatic. Ultimately, each year we create a bunch of goods and services and we largely consume them in that year. Some of them we don't consume, but we invest to create goods that we can consume later. Simply funding or laying aside financial assets without those real returns simply won't work, unless we can create greater productivity in the year 2030 and create those real returns. If in fact we cannot increase productivity in 2030 or 2040 so that basically all of our workers are roughly twice as productive as they are now, the standard of living will go down. The mechanism will probably be increased inflation. We will have the financial assets but not the physical assets.

It seems to me from a global viewpoint, the key point is that we must identify—and that's what markets are for— those investments, whether they be in human capital or physical capital or overseas human capital or overseas physical capital, to in fact increase our productivity of the order of at least two times to achieve the laudable goals that you mentioned.

MR. KANTOR: OK, one comment. In some of my actuarial valuations, I did use a merit scale taken from the Department of Census, which was probably structured the way you were suggesting it should be. So my actuarial valuation does have that. The only piece of cheating was keeping average salaries stable past age 55 rather than letting them fall.

Certainly just because you have an expected real return of 6.5% doesn't mean you get it year after year. My concern about DC plans is that real returns on equities are well below 6.5% over a 40-year period, and you will be very disappointed.

MR. MICHAEL SCOTT BOST: Regarding the mandatory DB plan and the job-hopping employee, your suggestion was that the original employer provide an indexed annuity for whatever his or her final pay would be wherever he ends up 40 or 50 years or whenever down the road.

MR. KANTOR: Suppose a person leaves at \$30,000 salary midway in a career. The typical DB plan would base retirement benefits for service at the beginning of the working career on \$30,000 rather than on the salary earned just before retirement.

Instead of pegging benefits to \$30,000, we adjust it for inflation, or if you're more generous, adjust for inflation plus average productivity increase. Perhaps we also include expected merit increases. That detail I haven't worked out, and you have to look at it more closely as to which way, but at least we will give some basic protection for the short-term employee.

MR. BOST: I understand the concept of making it portable and protecting the target replacement ratio aspect, but I think that employers would be very reluctant to have an open-ended commitment if there weren't some cap based on the national average wage or something.

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MR. KANTOR: I proposed that the employer be responsible for only 20% of final salary for a career employer. It is a much smaller piece than the typical DB plans. So even if costs do run higher than expected, it's not going to break the employer.

MR. CHRISTIAN A. ULMER: I have many questions, most of which you probably can't answer just off the top of your head. But I think they probably need to be asked because like you said, what we want to zero in on here are the participants rather than the plan, and so the questions relate more to percentages and ratios related to the participants than say the funding ratio.

One question would be, what is our present situation for the current retirees or the current cohort of 1993 retirees? What is our average replacement ratio right now? And the other question would be what percentage of our retirees have a 70% replacement ratio? Because you may have an average replacement ratio of 60% but that's because of very high replacers.

MR. KANTOR: I don't have that number. I would assume an aggregate is probably below 70%.

FROM THE FLOOR: You said that Social Security right now is at 43%?

MR. KANTOR: Yes, if you come out with an average salary and you're aged 65, Social Security claims it will replace 43% of your income. Obviously, if you're much higher paid, the ratio goes down a lot. If you retire before age 65, your replacement ratio would be less than that.

Right now, Social Security will cover 43% for the average person. Unless he or she earns a significant benefit from a retirement plan, his replacement will be below 70%. If he has any small auxiliary plan such as IRAs, private savings, or was a vested, short-term participant in a DB plan, the replacement may increase to 55–60%. He is not below the poverty line, but I'm concerned that Social Security is not going to continue that 43% replacement ratio for very long unless we double the payroll taxes.

MR. ULMER: Or maybe we just double or triple our immigration. That's something unrealistic, I'm sure. Then the other question was whether there are any data on showing what happens if we continue the way we are now. For example, your data say that Social Security can't continue the way it is right now. How would those kind of ratios change?

MR. KANTOR: Social Security is driven by the dependency ratio changes. I think by the year 2030 or 2040, you would find the benefits going down almost by 50%. Obviously the fertility rate could increase, and we suddenly get many newborns during the next few years who will become active employees by the year 2030. This will make things a little bit better.

FROM THE FLOOR: Could you give us your thoughts if partial retirement might fit into your thinking?

MR. KANTOR: If I worked 20 hours rather than 40 hours?

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FROM THE FLOOR: Whatever.

MR. KANTOR: There's probably a lot to say about partial retirement, from both the individual's and the employer's point of view. The individual can launch a second career. An actuary mentioned that mortality rates three years after retirement increase, and that may be due to psychological factors.

Before retirement, the employee has his or her day all laid out. He goes to work, comes home, and now has ten times as many things as he has time for. Suddenly, the situation is reversed, he has more time on his hands than things to do, and he probably tells his body to shut down. So I think it makes sense to institute some type of a semiretirement type of plan. Maybe I'll give a presentation on that next year.