

## Research Spotlight

### Defined Benefit Pensions and Household Income and Wealth

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RETIREMENT programs are becoming increasingly important sources of household income and wealth as the U.S. population and workforce age. A good understanding of the economic effects of such retirement programs requires a complete set of measures of the wealth and income generated by such plans. To that end, the Bureau of Economic Analysis (BEA) has embarked on some initial research on alternative measurements of defined benefit pensions plans. That research is detailed in this article.

The first section of this article discusses accrual approaches to accounting for defined benefit pension plans. The second section provides some preliminary estimates of household income from various defined benefit programs. The third section provides looks at the effect of these new measures on aggregate household income, saving, and wealth.

U.S. households usually participate in two kinds of retirement income programs: social security, and a plan sponsored by their employer. The employer plan may be organized as either a defined contribution plan, such as a 401(k) plan, or a defined benefit plan. Defined contribution plans provide resources during retirement based on the amount of money that has been accumulated in an account, while defined benefit plans determine the level of benefits by a formula that typically depends on length of service and average or final pay. For any program that set benefit levels according to a formula, the movement of large numbers of participants into retirement raises questions not only about how households will fare in retirement but also about how the finances of the program and its sponsor will be affected.

In the national income and product accounts (NIPAs), households participating in a pension plan are viewed as the owners of the plan's assets. Employers' contributions to pension plans are therefore included in the employee compensation component of personal income, and interest and dividends earned on pension plan assets are included in personal interest and dividend income. Furthermore, pension benefit payments to retirees are excluded from personal in-

come because they are financial transactions that merely change the form in which persons hold their wealth, just like employees' contributions to pension plans.<sup>1</sup>

This treatment provides a full accounting picture of the operations of defined contribution plans because in these plans only the balance in the participant's account matters. However, the accounting picture for defined benefit pension plans is more complex. A defined benefit plan has an actuarial liability for future benefits equal to the expected present value of the benefits to which the plan participants are entitled under the benefit formula. The value of participants' benefit entitlement often does not coincide with the value of the assets that the plan has on hand; indeed, a plan that has a pay-as-you-go funding scheme might have only enough assets to ensure that it can make the current period's benefit payments.<sup>2</sup>

To provide a more complete picture of the operations and net position of defined benefit plans, the 2008 revision of the *System of National Accounts*, which provides international guidelines for national economic accounts, has recommended that information be provided on defined benefit plans' actuarial liability for future benefits. The Bureau of Economic Analysis (BEA) has therefore begun research on actuarial measures of accruals of pension benefits.

Actuarial estimates of pension income and pension wealth of households from the early stages of this research are higher than those under the approach now used in the NIPAs. These estimates do not imply any change in estimates of national wealth or national saving, however, because the additional wealth of the participants in defined benefit plans that would be recognized under an actuarial approach would represent an additional liability for the employers that sponsor these plans.

1. Information on pension benefits and employee contributions to pension plans is shown in the addenda of NIPA table 6.11D, not as part of the underlying detail of the calculation of the pension component of personal income.

2. Federal law requires that private pension plans operate as funded plans, not as pay-as-you-go plans.

## Accrual Accounting Measures

### Accounting basics

A complete measure of the wealth of defined benefit plan participants is the expected present value of the benefits to which they are entitled, not the assets of the plan. This follows from the fact that if the assets of a defined benefit plan are insufficient to pay promised benefits, the plan sponsor must cover the shortfall. This obligation represents an additional source of pension wealth for participants in an underfunded plan.

Accounting for the wealth of plan participants as the value of their benefit entitlements rather than the value of the plan's assets changes the measure of their income. Instead of the actual interest and dividends earned on the plan assets, the participants earn imputed interest on their actuarial wealth. This imputed interest equals the increase in the present value of their future benefits caused by the shortening of the wait before the benefits are received. It would also equal the actual income earned on the plan assets if the value of the assets matched the actuarial value of the future benefits and if the rate of return on the assets matched the discount rate used to calculate the actuarial value of the future benefits. In addition, under the accrual approach, the measure of compensation income for the participants in the plan is no longer the employer's actual contributions to the plan. Instead, it is the present value of the benefits to which employees become entitled as a result of their service to the employer.

Measuring household income from defined benefit plans by actual contributions from employers plus actual investment income on plan assets can be considered a cash accounting approach to measuring these plans' transactions.<sup>3</sup> The alternative approach that measures this income by the increase in the value of the participants' benefit entitlements caused by the shortening of the discount period and by the crediting of additional service to the employer is an accrual accounting approach. We use the term "accrual accounting" to mean any approach that adopts the principle that a plan's benefit obligations ought to be recorded as they are incurred. Widely used actuarial methods for calculating a pension plan's benefit liabilities are designed to show smooth growth over an employee's career, not to track the value of the benefits that have actually been accrued in each year of the career.

3. The contributions, interest, and plan expenses used to measure income under the cash accounting approach may be recognized before they are settled in cash, so we do not mean to imply that all transactions are measured on a cash basis.

### Pros and cons, cash and accrual approaches

The accrual approach to pensions has important advantages for economic statisticians. Taking the accrued liability for future benefits into account provides a useful picture of the net position of the plan sponsor, because a gap between this liability and the plan assets indicates that increased contributions may be needed in the future.<sup>4</sup> It also provides a better picture of the pension wealth of plan participants.

Moreover, the accrual approach avoids the arbitrariness in the timing of the recording of compensation income that can occur under a cash accounting approach. In principle, if employers always made contributions equal to benefit accruals and if the plan assets always earned a rate of return equal to the constant interest rate used to calculate the benefit accruals, cash accounting and accrual accounting measures of pension income would coincide.<sup>5</sup> In practice, however, the timing of employer contributions can cause large shifts in the cash accounting measure that do not reflect genuine changes in the growth of pension entitlements. Employers sometimes skip contributions when the plans have enjoyed unusually good investment returns or when they lack the needed funds. If a business defers contributions in unprofitable years and catches up when profits are good, the cash accounting measure of households' compensation income may be too volatile, and the cash accounting measure of the business' gross operating surplus may be too smooth.

Nonetheless, the cash accounting approach has one major advantage for economic measurement purposes. No assumptions are necessary to measure events that have actually transpired, such as a plan's receipt of contributions from the employer. In contrast, estimates of the present value of future benefits are inherently dependent on assumptions about the discount rate, participant separation rates, retirement ages, mortality, and even future pay increases and future inflation if the method used attempts to take these into account.

The sensitivity of actuarial methods to assumptions means that estimates of pension benefit accruals are subject to a source of imprecision that is not normally present in national economic accounting. Furthermore, variation in assumptions can make it impossible to identify a single set of assumptions used for the estimates when actuarial estimates made by different plans

4. An increased contribution rate may be needed to prevent an unfunded plan from running out of money after a rise in the proportion of participants who are retired.

5. In addition, assumptions about mortality, participant retirement, separation patterns, and a lack of changes in plan features would have to hold precisely. The assumptions used to estimate accrued values of pension entitlements are unlikely to be realized in practice, so contributions will need to be adjusted to correct past mistakes. It is thus unrealistic to expect complete agreement between a cash accounting and an accrual accounting measure of personal pension income even under the best of circumstances.

are combined. Changes in assumptions can also complicate comparisons of benefit accruals over time.

### Two accrual accounting approaches

On an employee's retirement date, the value of the employee's pension benefit entitlement is simply the present value of the expected future benefits. How to value the benefit entitlement at earlier dates is less clear. In this section, we discuss two possible approaches.

**Accrued benefit obligation (ABO).** This approach relies on the plan's calculated ABO as of the valuation date. The ABO is the present value of the future benefits to which the employee has actually become entitled, meaning the benefits that would be due if the employee were to separate from the employer or otherwise lose the opportunity to accrue further benefits under the plan. Some sponsors of private defined benefit plans have, for example, frozen the plans and replaced them with a defined contribution plan or converted them from a traditional defined benefit plan

into a cash balance plan. For a typical benefits formula based on years of service multiplied by a measure of average or final pay, the ABO measure of benefits accrued during the year would include both the effects of an extra year of employment and the effects of any salary increase received during the plan year.

**Projected benefit obligation (PBO).** This approach attributes some fraction of the plan's PBO on the retirement date to the portion of the career completed by the valuation date. Pension actuaries have several methods of doing this. One that is commonly used measures the growth of the benefit entitlement over the participant's career by calculating a level percent of pay that would have to be contributed throughout the career to end up with assets at retirement that match the PBO. The level percent-of-pay method has the effect of making the part of the final pension attributed to service in any year (or "employer's normal cost") proportional to earnings in that year.

One distinction between the PBO and ABO approaches is that the projected future salary increases

### An Example of ABO and PBO Approaches

A simple hypothetical pension plan can illustrate some of the differences between the accrued benefit obligation (ABO) and projected benefit obligation (PBO) actuarial measures. Participants in this pension plan work for 3 years, retire in the 4<sup>th</sup> year, and die in the 5<sup>th</sup> year. Their salary grows 5 percent per period from a starting level of \$25,000. Vesting is immediate, there are no breaks in service, and there is no early retirement. The accrued retire-

ment benefit equals 10 percent of salary times the number of periods worked times final salary. The interest rate is 15 percent. The constant-percent version of the entry age method is used to fund the PBO liability. This method sets the normal cost in each period equal to a constant percentage of salary (approximately 7.9 percent in this case). It is standard actuarial practice to require the normal cost to be paid at the beginning of the period.

Table A shows that the PBO liability is initially higher than the ABO liability and that they become equal at retirement. The PBO normal cost is higher than the ABO normal cost in the first period and lower in the third.

In table B, the employer who sponsors the plan builds or maintains a workforce of 30 employees by hiring 10 employees (each at age 1) each year from year 1 to year 6. Hiring ceases in year 7, and the plan terminates in year 9. Employees work 3 years, and spend 1 year in retirement. The average normal cost as a percent of payroll rises from 6.6 to 9.5 percent under the ABO approach but remains constant under the PBO approach.

**Table A. Accrual Measures for a Hypothetical Employee's Lifespan**  
[Dollars]

| Age | Salary paid | Pension benefit paid | Accrued retirement benefit | Liability |       |         | Normal cost |       |         | Imputed interest income |       |         |
|-----|-------------|----------------------|----------------------------|-----------|-------|---------|-------------|-------|---------|-------------------------|-------|---------|
|     |             |                      |                            | ABO       | PBO   | PBO/ABO | ABO         | PBO   | PBO/ABO | ABO                     | PBO   | PBO/ABO |
| 1   | 25,000      | 0                    | 0                          | 0         | 0     | .....   | 1,644       | 1,979 | 1.2     | 247                     | 297   | 1.2     |
| 2   | 26,250      | 0                    | 2,500                      | 1,890     | 2,276 | 1.2     | 2,079       | 2,078 | 1.0     | 595                     | 653   | 1.1     |
| 3   | 27,563      | 0                    | 5,250                      | 4,565     | 5,008 | 1.1     | 2,625       | 2,182 | 0.8     | 1,079                   | 1,079 | 1.0     |
| 4   | 0           | 8,269                | 8,269                      | 8,269     | 8,269 | 1.0     | 0           | 0     | .....   | 0                       | 0     | .....   |
| 5   | 0           | 0                    | 0                          | 0         | 0     | .....   | 0           | 0     | .....   | 0                       | 0     | .....   |

**Table B. Accrual Measures for a Hypothetical Plan from Initiation to Termination**  
[Thousands of dollars except numbers of participants and ratios]

| Year | Salaries paid | Pension benefits paid | Accrued retirement benefits | Liability |     |         | Normal cost |     |         | Normal cost as a percent of payroll |     | Participants |         |
|------|---------------|-----------------------|-----------------------------|-----------|-----|---------|-------------|-----|---------|-------------------------------------|-----|--------------|---------|
|      |               |                       |                             | ABO       | PBO | PBO/ABO | ABO         | PBO | PBO/ABO | ABO                                 | PBO | Active       | Retired |
| 1    | 250           | 0                     | 0                           | 0         | 0   | .....   | 16          | 20  | 1.2     | 6.6                                 | 7.9 | 10           | 0       |
| 2    | 513           | 0                     | 25                          | 19        | 23  | 1.2     | 37          | 41  | 1.1     | 7.3                                 | 7.9 | 20           | 0       |
| 3    | 788           | 0                     | 78                          | 65        | 73  | 1.1     | 63          | 62  | 1.0     | 8.1                                 | 7.9 | 30           | 0       |
| 4    | 788           | 83                    | 160                         | 147       | 156 | 1.1     | 63          | 62  | 1.0     | 8.1                                 | 7.9 | 30           | 10      |
| 5    | 788           | 83                    | 160                         | 147       | 156 | 1.1     | 63          | 62  | 1.0     | 8.1                                 | 7.9 | 30           | 10      |
| 6    | 538           | 83                    | 160                         | 147       | 156 | 1.1     | 47          | 43  | 0.9     | 8.7                                 | 7.9 | 20           | 10      |
| 7    | 276           | 83                    | 135                         | 128       | 133 | 1.1     | 26          | 22  | 0.8     | 9.5                                 | 7.9 | 10           | 10      |
| 8    | 0             | 83                    | 83                          | 83        | 83  | 1.0     | 0           | 0   | .....   | 0.0                                 | 0.0 | 0            | 10      |
| 9    | 0             | 0                     | 0                           | 0         | 0   | .....   | 0           | 0   | .....   | 0.0                                 | 0.0 | 0            | 0       |

are reflected in PBO measures of normal cost (the value of the benefits earned through service to the employer), while the effects of current-period salary increases are reflected in the ABO measure of benefits accrued in the current period. This is one reason why the PBO methods often yield a substantially higher estimate of the value of benefit entitlements of employees in the early and middle stages of their careers than the ABO approach.

**ABO versus PBO.** The choice between the ABO and PBO approaches turns in part on circumstances and measurement objectives. For example, employers who want the percent of pay that they must contribute to the pension plan to remain stable need a method that yields a smooth profile of pension expenses over employees' careers. The PBO approach is well suited for this purpose; using the level percent-of-pay method, the growth rate of the measure of benefits earned during a year is just the salary growth rate. In contrast, the growth rate over the career of the annual change in the ABO includes, in addition to current-period salary growth, (1) the effects of discounting and of allowing for separations from the employer and preretirement mortality and (2) the effects of any jump in benefits upon reaching normal retirement age that may be part of the benefits formula. As a result, the pension expense recognized in the early or middle years of the career under the ABO approach is generally low, compared with the pension expense recognized near the end of the career. Using the ABO approach, the rapid rise in pension expenses near the end of an individual's career means that for an aging workforce as a whole, total pension expense will rise as a percent of payroll.

For national accounts purposes, the ABO approach has advantages; it is more straightforward to interpret and offers better consistency with the way that accrued income and expenses are measured elsewhere in the accounts.<sup>6</sup> Benefits to which the employee has legally become entitled fit the usual definition of a liability well, while the recognition of liabilities arising from projected future events is inconsistent with the principles of accrual accounting. This is particularly so when the future events are determined at the discretion of the employer, as is the case for defined benefit plans that employers are able to discontinue. (Indeed, in 2006, about 900,000 employees were participants in private defined benefit plans that had been frozen.) Benefits that participants in private defined benefit plans have already earned share none of the riskiness of the benefits that are contingent on continued partici-

pation in the current plan because they are insured by the Pension Benefit Guaranty Corporation (PBGC).

The ABO approach also has a practical advantage for national accounts purposes if a goal is to eliminate the volatility of the cash accounting measure of compensation income without changing the average level of the measure of compensation. ABO approach estimates of compensation income are likely to be closer on average to the level of employer contributions. Plans' total returns on assets, including holding gains, are often short of the imputed interest on the PBO actuarial liabilities, so employer contributions must be higher than the PBO measure of normal cost. In effect, the higher estimates of the actuarial liability under the PBO approach seem to be more a description of aspirational funding targets than a description of what plan sponsors actually do.

Nevertheless, the ABO approach is not without disadvantages, particularly if it is applied to government plans. One drawback of the ABO approach is that it is not a full measure of an employee's pension wealth if the option to accrue further benefits under the plan is viewed as an asset of the employee.<sup>7</sup> To induce an employee covered by a defined benefit pension plan to take early retirement, an employer will have to offer a buy-out that compensates both for the loss of projected future wages net of the opportunity cost of the employee's time and for the loss of the opportunity to increase the value of the pension above the ABO. If the employee has reached the point in the life cycle where the value of leisure starts to be greater than the wage, compensation for lost future wages will be unnecessary and the minimum buy-out necessary to induce the employee to retire will be the value of the employee's option to increase the value of the pension from the ABO to the PBO by staying on the job.

The lower the probability that an employee will lose the opportunity to accrue benefits after the valuation date, the greater the value of the option to accrue the PBO. Most government pension plans cannot be frozen (or even closed to new participants) without a change in the law. And these plans are not at risk of a termination due to bankruptcy of their sponsor. Risks of involuntary separation also tend to be low for government plan participants. Thus, employees in government pension plans can generally count on having the opportunity to earn additional benefits under the plan. Estimating accrued pension entitlements in a way that grows smoothly over the course of the career is a reasonable convention when the ABO significantly understates employees' pension wealth because of the neglect

6. For example, the amount of the fixed monthly payment attributed to principle repayment is not held constant over the life of a fixed-rate mortgage as it would be if PBO-like smoothing were applied.

7. Models of the option value of pension earnings were developed and estimated by Lazear and Moore (1988) and Stock and Wise (1990).

of the value of the employees' option to earn additional pension benefits. For government plans, therefore, the PBO approach may give a more realistic picture of the position of the plan participants and the plan sponsor.

The use of the PBO approach for government pension plans is also convenient. Most government plans make actuarial estimates of their benefit liabilities with a level percent-of-pay formula, where the percent is chosen so that contributions equal to the percent of pay over the course of the career will fully fund the liability for pension benefits at the time of retirement. On the other hand, for private plans, ABO estimates prepared using comparable methods are available from tax data.

## Cash and Accrual Approach Estimates

### Private pension plans

Households' income and wealth from private defined benefit pension plans can be estimated from tax data because these plans report their assets, income, and expenses together with actuarial information on their liabilities for future benefits on Internal Revenue Service

(IRS) Form 5500.<sup>8</sup> Estimates of totals for the nation of the cash-accounting measures of plan assets, income and benefit expenses based on Form 5500 are published by the Department of Labor.<sup>9</sup> Based on the actuarial information schedule of Form 5500, the Pension Benefit Guaranty Corporation (PBGC) estimates the current liabilities for vested benefits of the plans that it insures.<sup>10</sup> This schedule includes ABO estimates of the plan's current liability for benefits and benefits accrued during the year that are well-suited for economic statistics purposes as well because the plans all calculate them using approximately the same assumptions. In the years analyzed for this article, the interest-rate assumptions used by the plans are mostly clustered in a narrow range around 6 percent.

The private plan estimates in this article are based

8. Private defined benefit pension plans whose benefits are fully provided by contracts with life insurers provide insufficient information on Form 5500 to be included in the estimates in this article, but the amounts in question are small.

9. *Private Pension Plan Bulletin: Historical Tables and Graphs*, U.S. Department of Labor.

10. PBGC *Pension Insurance Data Book 2007*.

## Organization of the U.S. Pension System

Both defined benefit and defined contribution plans play key roles in financing retirement for U.S. households. Here's a big picture look at the system.

**Private sector.** Newer plans in the private sector are almost invariably defined contribution plans, and some of the defined benefit plans that are still in existence are closed to new hires or even frozen (meaning that benefit entitlements are no longer being accrued under the plan). Furthermore, from 1986 to 2004, about 99,000 plans were terminated by their sponsors, about 2000 plans entered into PBGC trusteeship, and a significant fraction of defined benefit plans matured, in the sense of having reached the point where contributions no longer exceed benefit payouts to retirees. As a result, the number of employees accruing benefit entitlements in private defined benefit plans fell from over 22 million in 2002 to under 20 million in 2006. Nonetheless, the number of private sector defined benefit plans in existence is declining very slowly: in 2006, it was still above 40,000, of which nearly 12,000 were plans with 100 or more participants.

**Government plans.** There are more than 2,500 defined benefit plans for employees of state and local governments. Defined benefit plans still predominate in the state and local government sector. Federal government agencies and federal government enterprises (such as the Post Office and the Tennessee Valley Authority) sponsor about 40 defined benefit plans for their employees. The federal government also makes defined contribution plans available to its employees; these plans are a key

component of the retirement plan for civilian federal employees hired in 1984 or later. For these employees, employer contributions to the defined contribution plan are an important component of compensation, and accruals of benefit entitlements under the defined benefit plan are lower than they would have been under the older defined benefit plans.

**Other plans and accounts.** Besides pension plans, many households have self-funded retirement accounts, such as individual retirement accounts (IRAs). These are not considered pension plans in the NIPAs, as they are not sponsored by an employer. (Some small businesses have defined contribution plans organized as SEP or SIMPLE IRAs, however.) In addition, except for some government employees, almost everyone is covered by social security. Social security is a government social insurance program rather than a pension plan because entitlements to benefits do not arise from an explicit or implicit contract with an employer. The classification of social security as a social insurance program in the NIPAs means that household income from social security is measured by benefit payments. Neither social security nor the self-funded retirement accounts are discussed in this paper, but the expectation that employees will receive social security benefits when they retire influences the design of the pension plans that are the topic of this paper. For example, the defined benefit plan for federal government employees who are covered by social security provides lower benefits than the plan for federal employees who are not covered by social security.

on the data sets maintained by the PBGC because these data sets have detailed information on the actuarial schedule of Form 5500. The PBGC classifies returns by calendar years based on the starting date of the period that they cover; this article follows this approach.<sup>11</sup>

Comparisons across years reveal that significant numbers of plans are missing from the PBGC data sets for 2000–2002. Overlapping estimates of ending and beginning assets adjusted for revisions to previously reported values imply that about 15 percent of plans (weighted by assets) are missing for 2000, falling to 8.7 percent in 2001 and 5.6 percent in 2002. The variable totals for these years were increased by the appropriate percent to take account of missing plans. Furthermore, values for variables that are missing or that have unusable information are imputed using regression models.

Estimates using the cash accounting approach provide a baseline for comparison with the actuarial measures of pension income. The income to households from employer contributions recorded under this approach is quite variable, rising from about \$33 billion for 2000 to near \$100 billion for both 2002 and 2003 (table 1). Large holding gains during the bull market that lasted from 1995 to early 2000 left many plans overfunded, allowing their sponsors to take contribution holidays in 2000 and 2001. Holding losses followed in 2000–2002 with the bursting of the dot-com bubble. Employers were therefore obliged to increase contributions to restore funding levels. Yet despite the

increase in contributions, the holding losses left the plans with \$400 billion less in assets at the end of 2002 than the \$2 trillion they had at the beginning of 2000. These losses were then reversed by a 4-year string of holding gains, leaving the plans with \$2.5 trillion in assets at the end of 2006.

Saving by the plans plays almost no role in the growth of their assets because it was near zero in 2002–2006. This lack of saving reflects the aging of plan participants, who are more likely to be retired than active. The retirement of many participants is also reflected in the rising totals for benefit payments net of employee contributions, which reached \$150 billion in 2006.<sup>12</sup>

As expected, accruals of entitlements to benefits measured under the ABO approach are more stable than employer contributions to the plans. The ABO value of benefits earned rises from \$66.6 billion for 2000 to \$79.4 billion for 2006 (table 2), with an average level over those 7 years of \$73.5 billion, close to the \$79.6 billion average of the employer contributions. On the other hand, the imputed interest cost of the actuarial current liability of the plans is, on average, more than twice as high as the actual investment income shown in table 1. The actuarial liability of the plans is lower than their assets in 2000 and 2001, and only 10 to 25 percent higher in later years, so the main reason why the imputed interest on this liability is higher than the actual investment income from the plan assets is that the assumed interest rate is higher than the realized rate of return on assets excluding

11. This causes some differences between the estimates in this article of contributions to private defined benefit plans and those published in NIPA table 6.11D. The estimates in this table are based on data from the Department of Labor, which classifies returns by calendar years based on the ending date of a plan's fiscal year. A few large plans have fiscal years that span the turn of the new year, so their returns are classified in an earlier year when the starting date is used.

12. The benefits in table 1 include lump-sum distributions at the time of retirement that go directly to the retiree or used to purchase an annuity from a life insurer. Investment income on life insurance reserves for group annuity contracts purchased by employers or defined benefit plans are excluded from the investment income shown in table 1.

**Table 1. Household Wealth and Income from Private Defined Benefit Plans: Cash Accounting Approach**

[Billions of dollars except as noted]

| Line            |                                                                                                                            | 2000    | 2001    | 2002    | 2003    | 2004     | 2005     | 2006     |
|-----------------|----------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|---------|----------|----------|----------|
| 1               | Opening balance.....                                                                                                       | 2,011.7 | 1,918.4 | 1,755.0 | 1,657.6 | 1,944.7  | 2,105.8  | 2,227.4  |
| 2               | Household income.....                                                                                                      | 96.1    | 110.2   | 149.3   | 149.7   | 149.2    | 149.8    | 155.7    |
| 3               | Employer contributions.....                                                                                                | 32.8    | 52.2    | 100.2   | 100.8   | 95.4     | 92.7     | 89.0     |
| 4               | Investment income from plan assets.....                                                                                    | 63.3    | 58.0    | 49.1    | 48.9    | 53.8     | 57.1     | 66.7     |
| 5               | Plan administrative expenses.....                                                                                          | 7.3     | 7.2     | 6.9     | 7.4     | 8.3      | 8.6      | 9.4      |
| 6               | Net benefits.....                                                                                                          | 117.4   | 123.8   | 133.7   | 134.8   | 141.1    | 138.8    | 149.7    |
| 7               | Household saving (2 – 5 – 6).....                                                                                          | –28.6   | –20.8   | 8.7     | 7.5     | –0.2     | 2.5      | –3.5     |
| 8               | Holding gains/losses on plan assets.....                                                                                   | –74.1   | –139.4  | –130.9  | 277.2   | 167.3    | 126.5    | 230.9    |
| 9               | Net transfers and other sources of difference between reported beginning-of-year and end-of-year assets <sup>1</sup> ..... | –0.5    | –4.4    | –7.0    | –2.5    | 10.0     | –7.3     | 31.2     |
| 10              | Reported end-of-year assets (1 + 7 + 8 + 9).....                                                                           | 1,908.5 | 1,753.8 | 1,625.9 | 1,939.7 | 2,121.8  | 2,227.4  | 2,485.9  |
| 11              | Other changes in value of assets <sup>2</sup> .....                                                                        | 9.9     | 1.3     | 31.7    | 5.0     | –16.0    | –2.5     | n.a.     |
| 12              | Change in wealth (7 + 8 + 9 + 11).....                                                                                     | –93.3   | –163.4  | –97.4   | 287.1   | 161.1    | 119.1    | 258.6    |
| <b>Addenda:</b> |                                                                                                                            |         |         |         |         |          |          |          |
| 13              | Number of active participants (millions) <sup>3</sup> .....                                                                | 22.4    | 22.4    | 22.2    | 21.6    | 21.0     | 20.4     | 19.9     |
| 14              | Total number of participants (millions).....                                                                               | 41.7    | 42.1    | 42.9    | 42.8    | 42.7     | 42.5     | 42.2     |
| 16              | Personal income, NIPAs.....                                                                                                | 8,559.4 | 8,883.3 | 9,060.1 | 9,378.1 | 10,485.9 | 11,268.1 | 11,894.1 |

n.a. Not available

1. Consists of data discrepancies as measured by comparing opening and closing balance sheets reported by the plans to the income and holding gains reported by the plans.

2. Difference between reported assets at year end and the assets that the tax returns for the following year show as present at the beginning of that year after adjustments for missing tax returns.

3. Includes 0.7 million participants in frozen plans in 2005 and 0.9 million participants in frozen plans in 2006. (Frozen plans cannot be identified before 2005.)

NOTE: Totals for 2000, 2001, and 2002 include imputations for missing observations. The reported totals have been adjusted up by 15.7 percent, 9.2 percent, and 5.3 percent in 2000, 2001, and 2002, respectively.

holding gains. The low level of actual investment income reflects the reliance of the plans on holding gains as a source of funding for benefits, so including the imputed interest in household income in effect includes expecting holding gains in income. This makes the actuarial measures of household income and saving in table 2 higher than the cash accounting measures in table 1. Table 2 also shows that estimates of plan actuarial liabilities are sensitive to assumptions about interest rates and other factors.

### Federal programs for private sector retirees

The federal government has two programs—the Pension Benefit Guaranty Corporation (PBGC) and the Railroad Retirement Board—that provide pension benefits to private sector retirees. Like social security, these programs are classified as government social insurance in the NIPAs, which means that household income from these programs is measured by benefit payments. They are small in comparison with national totals for private defined benefit plans. Nevertheless, they are close substitutes for defined benefit plans and are part of the complete picture of households' accrued pension benefit wealth.

**The PBGC.** As trustee for underfunded defined benefit plans that are terminated, the PBGC receives the assets of these plans and assumes responsibility for paying the benefits due to their participants up to the insured maximum (currently \$4,500 per month for a 65 year old retiree without survivor's benefits or \$4,050 with a survivor annuity). Between 1986 and 2004, about 2000 plans entered into PBGC trusteeship.<sup>13</sup>

13. PBGC *An Analysis of Frozen Defined Benefit Plans*, 1.

Participants in plans under PBGC trusteeship effectively receive annuities purchased with a combination of PBGC insurance and the value of the surrendered plan assets. The interest on the principle used to purchase the annuity and the government social insurance provided by the PBGC would represent household sector income in a cash accounting framework. Benefits paid by the PBGC also include a component that represents a return of the principle used to purchase the annuity. For purposes of measuring household sector wealth in a cash accounting framework, the assets held by the PBGC can be viewed as a measure of the value of the portion of the annuity that does not come from government social insurance.<sup>14</sup>

The assets of plans entering PBGC trusteeship are generally sufficient to pay much of the promised benefits—plans that were taken over by the PBGC in 2008 had, for example, an average funding ratio of 59 percent.<sup>15</sup> The remainder of the benefit funding comes from the insurance provided by the PBGC. In 2007, the PBGC disbursed \$4.3 billion in benefits to retirees and assistance to multiemployer plans (table 3). Of this amount, \$2.6 billion was funded by insurance and hence included in government social benefits in the NIPAs, and \$1.7 billion was funded from the assets of terminated plans.

Under accrual accounting approaches, the present

14. A comprehensive measure of retirement wealth would also include annuities purchased in standard terminations of defined benefit plans and by existing defined benefit plans, defined contribution plans, and individuals. The Labor Department's *Private Pension Plan Bulletin: Abstract of 2005 Form 5500 Annual Reports* estimates the value of the group annuity contracts for payment of retirement benefits at 10 to 15 percent of the total for defined benefit and defined contribution plan assets.

15. PBGC *2008 Annual Report*, 13.

**Table 2. Household Income and Wealth From Private Defined Benefit Plans: ABO Accrual Accounting Approach**

[Billions of dollars]

| Line            |                                                                                                           | 2000    | 2001    | 2002    | 2003    | 2004    | 2005    | 2006    |
|-----------------|-----------------------------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| 1               | Opening ABO current liability at interest rates used by plans .....                                       | 1,761.1 | 1,852.2 | 1,932.8 | 2,080.7 | 2,066.2 | 2,278.7 | 2,346.1 |
| 2               | Effect of changing to 6 percent interest rate .....                                                       | 12.9    | -7.6    | 21.6    | -9.3    | 64.7    | 3.3     | -58.9   |
| 3               | Opening ABO current liability at 6 percent interest rate .....                                            | 1,773.9 | 1,844.6 | 1,954.4 | 2,071.3 | 2,130.9 | 2,282.0 | 2,287.2 |
| 4               | Benefits accrued .....                                                                                    | 66.6    | 70.5    | 76.1    | 75.3    | 71.3    | 75.3    | 79.4    |
| 5               | Employee contributions .....                                                                              | 0.8     | 0.7     | 1.1     | 0.9     | 0.8     | 1.0     | 0.9     |
| 6               | Benefits accrued net of employee contributions .....                                                      | 65.8    | 69.8    | 75.0    | 75.4    | 70.5    | 74.3    | 78.5    |
| 7               | Interest cost of current liability at 6 percent interest rate .....                                       | 106.4   | 110.7   | 117.3   | 124.3   | 127.9   | 136.9   | 137.3   |
| 8               | Household income, ABO approach (6 + 7) .....                                                              | 172.3   | 180.5   | 192.3   | 198.7   | 198.4   | 211.3   | 215.6   |
| 9               | Net benefits paid .....                                                                                   | 117.4   | 123.8   | 133.7   | 134.8   | 141.1   | 138.8   | 149.8   |
| 10              | Household saving, at 6 percent rate (8 - 9) .....                                                         | 54.8    | 56.7    | 58.6    | 63.9    | 57.3    | 72.5    | 66.0    |
| 11              | Other factors <sup>1</sup> .....                                                                          | 15.8    | 53.1    | 58.3    | -4.3    | 93.9    | -69.9   | n.a.    |
| 12              | Change in current liability at 6 percent interest rate .....                                              | 70.7    | 109.8   | 116.9   | 59.5    | 151.1   | 2.6     | n.a.    |
| 13              | Effect of change in interest rate assumption to 6 percent .....                                           | 20.5    | -29.2   | 30.9    | -74.0   | 61.4    | 62.2    | n.a.    |
| 14              | Change in current liability, at rates used by plans (12 + 13) .....                                       | 91.2    | 80.6    | 147.8   | -14.5   | 212.6   | 64.8    | n.a.    |
| <b>Addenda:</b> |                                                                                                           |         |         |         |         |         |         |         |
| 19              | Assets as percent of current liability at rates used by plans .....                                       | 114.2   | 103.6   | 90.8    | 79.7    | 94.1    | 92.4    | 94.9    |
| 20              | Assets as percent of current liability at 6 percent interest rate .....                                   | 113.4   | 104.0   | 89.8    | 80.0    | 91.3    | 92.3    | 97.4    |
| 21              | Assets as percent of current liability, excluding plans with missing values, at rates used by plans ..... | 116.3   | 103.9   | 92.8    | 81.4    | 96.3    | 96.4    | 93.8    |

n.a. Not available

ABO Accrued benefit obligation

1. Includes effects of experience, changes in assumptions other than the interest rate, and plan amendments.

NOTE. Totals for 2000, 2001, and 2002 include imputations for missing observations. The reported totals have been adjusted up by 15.7 percent, 9.2 percent, and 5.3 percent in 2000, 2001, and 2002, respectively.

value of future benefits payable by the PBGC is included in the benefit entitlement wealth of the household sector. Thus, when a plan is taken over by the PBGC, only the loss of benefits that exceed the insured maximum is recorded as a decline in household sector wealth. Under this approach, households would also receive imputed interest income on the actuarial value of their benefit entitlements, which would normally exceed the interest on plan assets that would be recorded under the cash accounting approach.

The present value of future benefits from PBGC trustee plans rose from under \$10 billion in 2000 to \$65.1 billion in 2007 (table 3). In estimating these values, the PBGC adjusts its interest-rate assumption to reflect currently available rates on annuities, so part of this rapid rise stems from a decline in the assumed interest rate from 7 percent to 5.31 percent. For 2008, about \$7.6 billion of the \$8.5 billion decline to \$56.6 billion is due to a change in the interest rate assumption to 6.66 percent (PBGC 2008 *Actuarial Report*, 27).

The estimate of the interest cost of the PBGC's benefit liability is less sensitive to the interest-rate assumption; it rose to \$3.4 billion in 2008 from \$3.3 billion in 2007. These amounts should be treated as imputed interest income to households under the accrual accounting approach. They are about \$1.1 billion higher

than actual investment income earned on PBGC assets because these assets are not as large as the benefit liability and because the rate of return on assets (excluding holding gains and losses) is lower than the assumed interest rate.

**The Railroad Retirement Board.** This program takes the place of both social security and defined benefit pension plans for employees of the railroad industry. Payroll taxes levied on employers and on employees are its main source of funding.

In the NIPAs, the railroad retirement program is treated like social security. This is the only possible treatment for Tier I of railroad retirement, which is integrated with social security and has equivalent taxes and benefits. Tier II, on the other hand, is similar enough to a defined benefit plan to justify a treatment that includes it in the defined benefit pension assets of households. Indeed, this is the approach taken by the Federal Reserve Board in its flow-of-funds accounts.

Although the long downward trend in railroad employment ended in 2002, Tier II benefit payments continue to grow faster than payroll tax receipts. The level of the benefits is also higher; for example, in 2007 the benefit payments amounted to about \$4 billion, and the payroll taxes were \$2.6 billion, of which \$2 billion came from employers (table 4). Normally,

**Table 3. Benefit Payments and Benefit Obligations of the Pension Benefit Guaranty Corporation (PBGC)**

[Billions of dollars except as noted]

| Line                                                                                      | 2000 | 2001 | 2002 | 2003  | 2004  | 2005  | 2006  | 2007  | 2008  |
|-------------------------------------------------------------------------------------------|------|------|------|-------|-------|-------|-------|-------|-------|
| <b>Income or expense:</b>                                                                 |      |      |      |       |       |       |       |       |       |
| 1 Benefits and assistance to plans .....                                                  | 1.0  | 1.2  | 1.9  | 2.5   | 3.0   | 3.7   | 4.2   | 4.3   | 4.4   |
| 2 Government social benefits, NIPAs .....                                                 | 0.9  | 1.1  | 1.7  | 2.3   | 2.4   | 2.6   | 2.5   | 2.6   | n.a.  |
| 3 Investment income from assets .....                                                     | 0.9  | 0.9  | 1.0  | 1.0   | 1.0   | 1.4   | 1.9   | 2.2   | 2.3   |
| 4 Interest cost of liability for future benefits, single employer plans .....             | 0.7  | 0.8  | 1.1  | 1.8   | 1.9   | 2.6   | 3.2   | 3.3   | 3.4   |
| 5 Administrative expenses .....                                                           | 0.2  | 0.2  | 0.2  | 0.2   | 0.3   | 0.3   | 0.3   | 0.4   | 0.4   |
| 6 Premium income .....                                                                    | 0.8  | 0.8  | 0.8  | 1.0   | 1.5   | 1.5   | 1.5   | 1.6   | 1.5   |
| <b>Assets and benefit liability:</b>                                                      |      |      |      |       |       |       |       |       |       |
| 7 Net assets, before benefit liability .....                                              | 20.3 | 21.2 | 25.0 | 33.4  | 37.5  | 47.0  | 51.0  | 56.1  | 49.3  |
| 8 Present value of future benefits, trustee plans .....                                   | 9.4  | 12.7 | 21.7 | 38.9  | 43.3  | 57.3  | 63.9  | 65.1  | 56.6  |
| 9 Future benefits of trustee plans plus projected net cost of probable terminations ..... | 10.6 | 13.5 | 28.6 | 44.6  | 60.8  | 69.7  | 69.1  | 69.2  | 60.0  |
| 10 PBGC net position (7-9) .....                                                          | 9.7  | 7.7  | -3.6 | -11.2 | -23.3 | -22.8 | -18.1 | -13.1 | -10.7 |
| <b>Addenda:</b>                                                                           |      |      |      |       |       |       |       |       |       |
| 11 Number of participants receiving benefits (millions) .....                             | 0.2  | 0.3  | 0.3  | 0.5   | 0.5   | 0.7   | 0.6   | 0.6   | 0.6   |
| 12 Interest rate assumption (for first 20 years) .....                                    | 7.0  | 6.7  | 5.7  | 4.4   | 4.8   | 5.2   | 4.9   | 5.3   | 6.7   |

n.a. Not available

**Table 4. Railroad Retirement Board Tier II Taxes and Benefits**

[Billions of dollars except as noted]

|                                                                                                                    | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|--------------------------------------------------------------------------------------------------------------------|------|------|------|------|------|------|------|------|------|
| Receipts from payroll taxes .....                                                                                  | 2.9  | 2.8  | 2.7  | 2.7  | 2.6  | 2.6  | 2.7  | 2.6  | 2.6  |
| Employer portion of payroll taxes .....                                                                            | 2.3  | 2.2  | 2.1  | 2.0  | 1.9  | 1.9  | 2.0  | 2.0  | 2.0  |
| Investment income on assets of Railroad Retirement Account and National Railroad Retirement Investment Trust ..... | 1.3  | 2.0  | 1.9  | 0.6  | 0.4  | 0.4  | 0.6  | 0.5  | 0.6  |
| Benefit payments .....                                                                                             | 3.0  | 3.0  | 3.2  | 3.5  | 3.6  | 3.7  | 3.8  | 4.1  | 4.1  |
| Net of employee portion of payroll tax .....                                                                       | 2.3  | 2.3  | 2.6  | 2.8  | 2.9  | 3.0  | 3.1  | 3.4  | 3.5  |
| Railroad Retirement Account balance .....                                                                          | 17.0 | 18.9 | 18.6 | 0.5  | 0.6  | 0.6  | 0.5  | 0.6  | 0.6  |
| National Railroad Retirement Investment Trust balance .....                                                        | 0.0  | 0.0  | 1.4  | 23.0 | 25.0 | 27.6 | 29.3 | 32.6 | 25.3 |
| Holding gains on assets of National Railroad Retirement Investment Trust .....                                     | n.a. | n.a. | -0.1 | 2.7  | 3.0  | 3.1  | 2.2  | 4.2  | -6.5 |
| Number of beneficiaries (millions) .....                                                                           | 0.8  | 0.7  | 0.7  | 0.7  | 0.7  | 0.7  | 0.6  | 0.6  | 0.6  |

n.a. Not available

Notes. In 2007, employer's tax rate for nonsocial security portion of railroad pension was about 12 percent, and the employee's tax rate was about 4 percent. At an interest rate of 7.5 percent, a projected benefit obligation estimate of the normal cost rate was 6.26 percent of payroll.

At an interest rate of 7.5 percent, a projected benefit obligation estimate of the present value of accrued future benefits as of the end of 2007 is \$66.4 billion, which implies a funded ratio of about 50 percent based on 2007 assets.

however, investment income and holding gains on assets are sufficient to cover the gap between the program's benefit expenses and its receipts from payroll taxes. In 2007, which was a good year for holding gains, investment income was about \$0.5 billion, and holding gains were about \$4.2 billion.

A railroad retirement actuarial report for a valuation date of December 31, 2007, estimates a PBO normal cost rate of 6.26 percent of payroll, assuming an interest rate of 7.5 percent. After subtracting the payroll taxes paid by employees of \$0.6 billion from the dollar value of the plan's normal costs (employee's service in 2007), earnings of benefit entitlements are only about \$0.4 billion in 2007. The implied value of participants' imputed interest income from interest on the actuarial value of their benefit entitlement is, however, much higher, about \$5 billion. The imputed interest income is also large in relation to the actual investment income earned on plan assets, because assets are about half as large as the actuarial value of the benefit entitlement, and much of the return on the assets in the portfolio is expected to come from holding gains, not interest and dividends.

### State and local government plans

Although pension plans in the private sector are increasingly structured as defined contribution plans, in the state and local government sector, defined benefit plans continue to predominate. The importance of the pension plan tends to be greater for state and local government employees than for private sector employees, in part because many state or local government employees are not covered by social security. State and local government plans differ from private defined benefit plans in several ways. For example, many state and local government plans escalate benefit payments based on a measure of inflation. Although this adds to

the cost of the plans, the burden of making the contributions needed to fund the promised benefits is likely to be shared by the employees of the state or local government. In contrast, private sector defined benefit plans rarely require significant employee contributions.

State and local government plans had roughly 14.4 million active participants in 2006 (table 5). Their employer contributions were \$67.8 billion in 2006, compared with \$89.0 billion for private plans. Yet even though they have fewer active participants and lower employer contributions than the private plans, their total income is about the same as that of the private defined benefit plans because of their high investment income from their assets. The total income of the state and local government plans rose from \$141 billion to \$161 billion in 2004–2006, compared with a rise from \$149 billion to \$156 billion.

State and local plans have higher investment income than private plans because they have more assets, \$3.1 trillion at the end of 2006, compared with \$2.5 trillion for private plans. The plans are able to acquire high levels of assets despite having comparatively low levels of employer contributions because they receive significant funds from employee contributions. Moreover, the state and local government plans suffered smaller holding losses in the bear market of 2000–2002, giving them a slightly better average investment performance than the private plans over 2000–2006. The investment income and employee contributions help the state and local government plans to achieve a higher average saving level (around \$22 billion per year over 2000–2006, compared with a negative average for the private plans). The higher saving is a reflection of the younger age profile of the participants in the state and local government plans: around 55 percent of the participants in these plans are still in their working years,

**Table 5. Household Income and Wealth From State and Local Government Defined Benefit Plans: Cash Accounting Approach**

[Billions of dollars except as noted]

| Line            |                                                         | 2000    | 2001    | 2002    | 2003    | 2004    | 2005    | 2006    |
|-----------------|---------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| 1               | Household income.....                                   | 122.6   | 109.5   | 110.6   | 128.6   | 141.0   | 147.8   | 161.2   |
| 2               | Employer contributions .....                            | 39.5    | 38.8    | 42.1    | 53.1    | 59.8    | 60.9    | 67.8    |
| 3               | Investment income from plan assets .....                | 83.1    | 70.6    | 68.5    | 75.5    | 81.3    | 86.9    | 93.4    |
| 4               | Plan administrative expenses .....                      | 6.0     | 7.5     | 7.6     | 7.6     | 9.0     | 10.0    | 12.5    |
| 5               | Benefits, net of employee contributions.....            | 74.7    | 82.6    | 91.7    | 101.1   | 109.3   | 117.4   | 127.5   |
| 6               | Benefits and withdrawals .....                          | 100.4   | 109.6   | 119.6   | 130.5   | 140.1   | 149.0   | 160.5   |
| 7               | Employee contributions.....                             | 25.7    | 27.0    | 27.9    | 29.4    | 30.8    | 31.6    | 33.0    |
| 8               | Household saving (1 + 4 + 5) .....                      | 42.0    | 19.3    | 11.3    | 19.8    | 22.7    | 20.4    | 21.2    |
| 9               | Holding gains on plan assets.....                       | 61.8    | -77.9   | -69.6   | 113.6   | 201.8   | 187.7   | 288.0   |
| 10              | Net transfers and other changes in value of assets..... | 22.0    | 53.2    | 47.4    | 24.7    | 29.2    | -9.9    | 50.7    |
| 11              | Change in assets (8 + 9 + 10) .....                     | 125.8   | -5.3    | -10.9   | 158.1   | 253.8   | 198.2   | 359.9   |
| 12              | Closing assets .....                                    | 2,163.1 | 2,157.8 | 2,146.9 | 2,305.0 | 2,558.8 | 2,757.0 | 3,116.9 |
| <b>Addenda:</b> |                                                         |         |         |         |         |         |         |         |
| 13              | Active participants (millions) .....                    | 13.5    | 13.8    | 14.1    | 14.1    | 14.1    | 14.2    | 14.4    |
| 14              | Total participants (millions) .....                     | 22.4    | 23.2    | 23.9    | 24.3    | 24.8    | 25.4    | 26.1    |

compared with around 45 percent for private plans. The state and local government plans also have smaller net benefit disbursements; they average \$100.6 billion per year, compared with \$134.2 billion for private plans.

The Census Bureau has long collected cash accounting data on state and local government pension plans, but until recently, it did not collect actuarial data on these plans. To obtain actuarial data on state and local government plans, BEA compiled a data set of the actuarial information found in the financial reports of the larger state and local government plans and of a sample of smaller plans. This data set has observations on 124 large plans or plan families, which collectively account for most of the plan contributions, assets, and benefits.

Actuarial estimates of household income and wealth from state and local government pension plans based on the BEA data set are higher than the corresponding cash accounting estimates, but how the actuarial estimate of benefits accrued during the plan year compares with employer contributions depends on whether the ABO or the PBO approach is used.<sup>16</sup> The PBO measures of benefits earned net of employee contributions, labeled “employer’s normal cost” in table 6, are lower than the cash-accounting measure of household income from employer contributions in 2003–2006. In 2006, for example, employer’s normal cost is about \$51.7 billion, compared with employer contributions of \$67.8 billion.

On the other hand, the PBO measure of overall income from the plans is higher than the cash accounting measure, because the imputed interest income of the plan participants on the actuarial value of their benefit entitlements is \$261.9 billion, which far exceeds the actual investment income on the plan assets in 2006 of \$93.4 billion. Table 6 is based on measures reported by the plans, which are mostly calculated using

a level percent-of-pay approach and interest rates around 8 percent. The tendency of the PBO approach to attribute a large share of the total income accruing to plan participants to interest on the actuarial value of their benefit entitlements becomes more noticeable at such high rates of interest.

Defined benefit plans’ financial strategies generally rely on expected holding gains as one of the sources of funds for benefit payments. Yet even after adding holding gains to investment income, total returns from the plans’ assets fall short of the interest cost of their actuarial liability at the rates assumed by the plans. The total returns average \$181 billion over 2000–2006, compared with an average interest cost of the PBO liability of \$219 billion. The plans’ total rates of return on their assets are not as high as the rates of interest that they assume, and their assets are not as large as their PBO actuarial liabilities. The funded ratios in table 6 range from 97.5 percent in 2000, when a bull market ended, to 83.8 percent at the end of the bear market 2 years later.

Switching to an ABO approach and adjusting the interest-rate assumptions to the 6 percent level that many private plans use for the ABO information on Form 5500 raises the estimate of benefits accrued in 2006 to \$76.4 billion (table 7).<sup>17</sup> The increase from the PBO estimate of \$51.7 billion reflects both the effect of scaling back the interest-rate assumption and the tendency of the ABO approach to attribute more of employee’s total income from the plan to service to the employer than does the PBO approach. The imputed interest income on plan participants’ benefit entitlements under the ABO approach falls to \$189.6 billion, so the total participant income falls from \$313.6 billion under the PBO approach to \$266.0 billion under the ABO approach. The ABO approach also yields lower

16. For a discussion of these estimates, see Lenze (2009).

17. To change the interest-rate assumption, Lenze (2009) uses the formula that the PBGC uses to find the effects of changing the interest rate on plans’ termination liability.

**Table 6. Household Income and Wealth From State and Local Government Defined Benefit Plans: PBO Approach**

[Billions of dollars except as noted]

| Line            |                                                                | 2000    | 2001    | 2002    | 2003    | 2004    | 2005    | 2006    |
|-----------------|----------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| 1               | Household income .....                                         | 219.3   | 236.2   | 251.7   | 265.2   | 278.6   | 294.7   | 313.6   |
| 2               | Employer's normal cost excluding administrative expenses ..... | 41.0    | 43.9    | 46.1    | 46.9    | 47.4    | 49.0    | 51.7    |
| 3               | Imputed interest on plans' benefit liability .....             | 178.3   | 192.3   | 205.7   | 218.3   | 231.2   | 245.7   | 261.9   |
| 4               | Benefits, net of employee contributions .....                  | 74.7    | 82.7    | 91.6    | 101.1   | 109.3   | 117.4   | 127.5   |
| 5               | Household saving (1 + 4) .....                                 | 144.6   | 153.6   | 160.1   | 164.1   | 169.2   | 177.3   | 186.2   |
| 6               | Actuarial liability of plans .....                             | 2,218.1 | 2,393.3 | 2,560.7 | 2,730.6 | 2,902.4 | 3,088.3 | 3,296.3 |
| 7               | Assets of plans (market value) .....                           | 2,163.1 | 2,157.8 | 2,146.9 | 2,305.0 | 2,558.8 | 2,757.0 | 3,116.9 |
| 8               | Unfunded actuarial liability .....                             | 55.0    | 235.5   | 413.8   | 425.6   | 343.6   | 331.2   | 179.3   |
| 9               | Funded ratio (percent) .....                                   | 97.5    | 90.2    | 83.8    | 84.4    | 88.2    | 89.3    | 94.6    |
| <b>Addenda:</b> |                                                                |         |         |         |         |         |         |         |
| 10              | Unfunded actuarial liability as a percent of payroll .....     | 11.1    | 45.2    | 76.3    | 76.4    | 59.9    | 55.6    | 28.7    |
| 11              | Employer's normal cost per active participant (dollars) .....  | 3,034.0 | 3,171.0 | 3,276.0 | 3,334.0 | 3,362.0 | 3,440.0 | 3,582.0 |
| 12              | Employer's normal cost as a percent of payroll .....           | 8.3     | 8.4     | 8.5     | 8.4     | 8.3     | 8.2     | 8.3     |
| 13              | Investment rate of return assumption (percent) .....           | 8.0     | 8.0     | 8.0     | 8.0     | 8.0     | 8.0     | 8.0     |

estimates of the value of participants' benefit entitlements than the PBO approach. These lower estimates are closer to the plans' asset levels than the PBO estimates, so the plans' assets remain above 90 percent of their accrued benefit liability for the entire period covered by table 7 and end at 98.7 percent in 2006.<sup>18</sup>

### Federal employee plans

Defined benefit pension plans for federal government employees have less than one-third of the number of active participants of state and local government plans and about a fifth as many as private defined benefit plans. Nonetheless, their employer contributions are higher than those of the state and local government plans in every year, and by 2006, they had reached parity with those of the private plans at \$91.2 billion (table 8). In other words, under the cash accounting approach, in 2006, defined benefit pension-related compensation for 4 million federal employees is as large as it was for a group of almost 20 million private sector employees.

This striking difference in the average contribution rate per employee arises because plan freezes and hold-

ing gains from investments reduce required contribution levels for the private plans, while young retirement ages in military plans and relatively generous benefit levels (caused in part by the substitution of pension benefits for social security benefits for participants in military plans and the older civilian plans) raise required contribution levels in the federal plans. Moreover, about half of the federal plan contributions are designated as "catch-up contributions" that are intended to compensate for past underfunding.<sup>19</sup> Because the federal employee plans historically operated on a pay-as-you-go basis, their asset levels are only around 40 percent of the value of their actuarial liabilities; despite the rapid growth of assets since the catch-up contributions began, their value in 2007 of under \$1 trillion was far less than their benefit liability of \$2.4 trillion (table 9).<sup>20</sup> These relatively low asset levels mean that relatively little investment income is available to help fund benefit payments by federal plans, which places an additional burden on contributions. Note, however, that the PBO approach and

18. Lenz (2009) also considers the effect on the ABO of reducing the interest-rate assumption to the risk-free rate on a 20-year Treasury bond. Using a rate of 4.9 percent for 2006 reduces the estimate of the ratio of assets to the ABO to 91.5 percent.

19. To prevent distortion in the measure of current compensation of federal government employees, most federal catch-up contributions are treated as capital transfers in the NIPAs.

20. These plans invest almost entirely in special Treasury securities. As these are a liability of the employer, in a strict sense, the federal plans are unfunded.

**Table 7. Household Income and Wealth From State and Local Government Defined Benefit Plans: ABO Approach**

[Billions of dollars except as noted]

| Line            |                                                                                    | 2000    | 2001    | 2002    | 2003    | 2004    | 2005    | 2006    |
|-----------------|------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| 1               | Household income .....                                                             | 175.3   | 193.3   | 207.1   | 219.4   | 232.4   | 246.2   | 266.0   |
| 2               | Benefits accrued (net of employee contributions and administrative expenses) ..... | 55.0    | 60.8    | 64.2    | 65.9    | 67.6    | 69.8    | 76.4    |
| 3               | Imputed interest on plans' accrued liability .....                                 | 120.3   | 132.5   | 142.8   | 153.5   | 164.8   | 176.4   | 189.6   |
| 4               | Benefits net of employee contributions .....                                       | 74.7    | 82.7    | 91.6    | 101.1   | 109.3   | 117.4   | 127.5   |
| 5               | Equals: accrued saving in pension plans .....                                      | 100.6   | 110.6   | 115.4   | 118.3   | 123.1   | 128.8   | 138.5   |
| 6               | Accrued liability .....                                                            | 2,005.1 | 2,207.7 | 2,380.8 | 2,558.1 | 2,747.2 | 2,939.3 | 3,159.7 |
| 7               | Assets (market value) .....                                                        | 2,163.1 | 2,157.8 | 2,146.9 | 2,305.0 | 2,558.8 | 2,757.0 | 3,116.9 |
| <b>Addenda:</b> |                                                                                    |         |         |         |         |         |         |         |
| 8               | Unfunded actuarial liability .....                                                 | -158.0  | 49.9    | 233.9   | 253.0   | 188.4   | 182.3   | 42.7    |
| 9               | Funded ratio (percent) .....                                                       | 107.9   | 97.7    | 90.2    | 90.1    | 93.1    | 93.8    | 98.7    |
| 10              | Unfunded actuarial liability as a percentage of payroll .....                      | -32.0   | 9.6     | 43.1    | 45.4    | 32.9    | 30.6    | 6.8     |
| 11              | Benefit accruals per active participant (dollars) .....                            | 4,068.0 | 4,395.0 | 4,569.0 | 4,683.0 | 4,792.0 | 4,902.0 | 5,295.0 |
| 12              | Benefit accruals as a percent of payroll .....                                     | 11.1    | 11.7    | 11.8    | 11.8    | 11.8    | 11.7    | 12.2    |

ABO: Accrued benefit obligation.

NOTE: Estimates assume an interest rate of 6 percent.

**Table 8. Household Income and Wealth From Federal Government Defined Benefit Plans: Cash Accounting Approach**

[Billions of dollars except as noted]

| Line            |                                               | 2000  | 2001  | 2002  | 2003  | 2004  | 2005  | 2006  | 2007  |
|-----------------|-----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1               | Household income .....                        | 114.6 | 117.8 | 121.4 | 118.6 | 128.3 | 134.7 | 139.1 | 147.4 |
| 2               | Employer contributions .....                  | 66.6  | 68.6  | 72.2  | 70.4  | 81.3  | 85.1  | 91.2  | 98.0  |
| 4               | Investment income from plan assets .....      | 48.1  | 49.2  | 49.1  | 48.2  | 47.0  | 49.6  | 47.9  | 49.4  |
| 5               | Plan administrative expenses .....            | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   | 0.1   |
| 6               | Benefits, net of employee contributions ..... | 75.2  | 78.9  | 81.3  | 83.1  | 87.2  | 92.4  | 98.3  | 104.1 |
| 7               | Benefits and withdrawals .....                | 79.9  | 83.6  | 85.9  | 87.8  | 91.8  | 96.8  | 102.7 | 108.3 |
| 8               | Employee contributions .....                  | 4.8   | 4.7   | 4.6   | 4.6   | 4.6   | 4.5   | 4.4   | 4.2   |
| 9               | Household saving (1 - 5 - 6) .....            | 39.3  | 38.8  | 40.0  | 35.3  | 41.0  | 42.2  | 40.9  | 43.2  |
| <b>Addenda:</b> |                                               |       |       |       |       |       |       |       |       |
| 10              | Assets, end of calendar year .....            | 691.4 | 751.0 | 789.0 | 826.2 | 868.2 | 895.4 | 931.9 | 965.6 |
| 11              | Active participants (millions) .....          | 4.1   | 4.1   | 4.1   | 4.1   | 4.2   | 4.1   | 4.1   | 4.1   |
| 12              | Total participants (millions) .....           | 8.6   | 8.6   | 8.7   | 8.7   | 8.7   | 8.7   | 8.7   | 8.7   |

conservative assumptions used to calculate the actuarial liability of the federal plans result in lower estimates of the funded ratio than the ABO approach used for the private plans. (BEA has not developed ABO estimates for the federal plans, but it plans to do so in the future.)

The cash accounting and accrual accounting approaches give different pictures of the relative amounts of pension-related compensation that federal government employees receive. The employer's normal cost for the federal plans of about \$41 billion in 2007 is less than half of the \$98 billion in employer contributions. As the contributions partly relate to past service, the federal plans are an example of the potential for distortions in the timing of measured pension-related compensation under the cash accounting approach. On the other hand, the actuarial measure of total participant income is higher than the cash accounting measure (\$180.5 billion, compared with \$147.4 billion in 2007) because the participants' imputed interest income based on the actuarial value of their benefit entitlement is much higher than the actual interest received

on plan assets. As a result, defined benefit plan saving is higher when measured on an accrual accounting basis than when measured on a cash accounting basis.

### Effect on Household Income, Saving, and Wealth

#### Income

Combining all defined benefit plans shows that the income households received from these plans in 2006 is, on average, about 4.6 percent of disposable personal income (DPI) if measured on a cash accounting basis and about 6.6 percent of DPI if measured on an accrual basis (table 10). (The accrual estimate uses the ABO approach with a 6 percent interest-rate assumption for private and state and local government plans and a PBO approach for federal government plans.)

The actuarial value of benefits earned is actually lower than the employer contributions, so the gap between the actuarial and cash accounting measures of pension-related income is entirely due to the shortfall of the investment income that the plans receive from

**Table 9. Household Income and Wealth From Federal Government Defined Benefit Plans: PBO Approach**

[Billions of dollars except as noted]

| Line                                                            | 2000    | 2001    | 2002     | 2003    | 2004    | 2005     | 2006     | 2007     | 2008     |
|-----------------------------------------------------------------|---------|---------|----------|---------|---------|----------|----------|----------|----------|
| 1 Normal cost for benefits, net of employee contributions ..... | 29.3    | 33.0    | 37.1     | 33.9    | 33.7    | 37.1     | 38.0     | 40.9     | 42.0     |
| 2 Imputed interest on actuarial liability .....                 | 113.3   | 116.7   | 116.9    | 114.8   | 118.4   | 126.9    | 133.0    | 139.6    | 145.6    |
| 3 Actuarial income of households (1 + 2) .....                  | 142.6   | 149.7   | 154.0    | 148.7   | 152.1   | 164.0    | 171.0    | 180.5    | 187.6    |
| 4 Benefits, net of employee contributions .....                 | 75.2    | 78.9    | 81.3     | 83.1    | 87.2    | 92.4     | 98.3     | 104.1    | 109.0    |
| 5 Actuarial saving of households (3 - 4) .....                  | 67.5    | 70.8    | 72.7     | 65.5    | 64.9    | 71.7     | 72.7     | 76.4     | 78.6     |
| 6 Actuarial liability of plans .....                            | 1,762.3 | 1,821.2 | 1,859.8  | 1,929.4 | 2,067.9 | 2,169.2  | 2,316.1  | 2,415.1  | 2,608.9  |
| 7 Assets of plans (end of calendar year) .....                  | 691.4   | 751.0   | 789.0    | 826.2   | 868.2   | 895.4    | 931.9    | 965.6    | 1,029.7  |
| <b>Addenda:</b>                                                 |         |         |          |         |         |          |          |          |          |
| 8 Unfunded actuarial liability .....                            | 1,070.9 | 1,070.2 | 1,070.8  | 1,103.2 | 1,199.7 | 1,273.8  | 1,384.2  | 1,449.5  | 1,579.2  |
| 9 Funded ratio (percent) .....                                  | 39.2    | 41.2    | 42.4     | 42.8    | 42.0    | 41.3     | 40.2     | 40.0     | 39.5     |
| 10 Average normal cost per active employee .....                | 8,352.0 | 9,231.0 | 10,201.0 | 9,322.0 | 9,229.0 | 10,100.0 | 10,324.0 | 11,043.0 | 11,074.0 |
| 11 Actuarial saving less cash accounting saving .....           | 28.1    | 32.0    | 32.7     | 30.2    | 23.9    | 29.4     | 32.1     | 33.2     | n.a.     |
| Assumptions for actuarial estimates: civilian plans             |         |         |          |         |         |          |          |          |          |
| 12 Interest rate .....                                          | 7.0     | 6.8     | 6.8      | 6.3     | 6.3     | 6.3      | 6.3      | 6.3      | 6.3      |
| 13 Inflation rate .....                                         | 4.0     | 3.8     | 3.8      | 3.3     | 3.3     | 3.3      | 3.5      | 3.5      | 3.5      |
| 14 Projected salary increase rate .....                         | 4.3     | 4.3     | 4.3      | 4.0     | 4.0     | 4.0      | 4.3      | 4.3      | 4.3      |
| Assumptions for actuarial estimates: military plans             |         |         |          |         |         |          |          |          |          |
| 15 Interest rate .....                                          | 6.3     | 6.3     | 6.3      | 6.3     | 6.3     | 6.3      | 6.0      | 6.0      | 5.8      |
| 16 Inflation rate .....                                         | 3.0     | 3.5     | 3.0      | 3.0     | 3.0     | 3.0      | 3.0      | 3.0      | 3.0      |
| 17 Projected salary increase rate .....                         | 3.5     | 3.5     | 3.5      | 3.8     | 3.8     | 3.8      | 3.8      | 3.8      | 3.8      |

n.a. Not available  
PBO Projected benefit obligation

**Table 10. Comparison of Cash Accounting and Actuarial Measures of Defined Benefit Pension Income and Wealth of U.S. Households**

[Percent of disposable personal income except as noted]

| Line                                                             | 2000    | 2001    | 2002    | 2003    | 2004    | 2005    | 2006    |
|------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| 1 Household income, cash accounting approach .....               | 4.6     | 4.4     | 4.8     | 4.7     | 4.7     | 4.7     | 4.6     |
| 2 Household income, actuarial approach .....                     | 6.7     | 6.9     | 6.9     | 6.8     | 6.6     | 6.7     | 6.6     |
| 3 Compensation, cash accounting approach .....                   | 1.9     | 2.0     | 2.7     | 2.7     | 2.7     | 2.6     | 2.5     |
| 4 Compensation, actuarial approach .....                         | 2.0     | 2.1     | 2.2     | 2.1     | 1.9     | 2.0     | 1.9     |
| 5 Interest and dividend income, cash accounting .....            | 2.7     | 2.3     | 2.1     | 2.1     | 2.1     | 2.1     | 2.1     |
| 6 Interest income, actuarial approach .....                      | 4.6     | 4.7     | 4.7     | 4.7     | 4.6     | 4.8     | 4.7     |
| 7 Household saving, cash accounting approach .....               | 0.7     | 0.4     | 0.7     | 0.7     | 0.7     | 0.7     | 0.6     |
| 8 Household saving, actuarial approach .....                     | 3.0     | 3.1     | 3.1     | 3.0     | 2.8     | 2.9     | 2.8     |
| 9 Household pension wealth, cash accounting .....                | 65.3    | 61.2    | 57.3    | 60.9    | 62.8    | 63.9    | 66.4    |
| 10 Household pension wealth, actuarial approach .....            | 79.4    | 80.1    | 80.6    | 81.6    | 81.0    | 82.7    | 81.0    |
| 11 Disposable personal income, NIPAs (billions of dollars) ..... | 7,327.2 | 7,648.5 | 8,009.7 | 8,377.8 | 8,889.4 | 9,277.3 | 9,915.7 |

their assets from the interest accruing on their actuarial liabilities for future benefits. About a third of this shortfall can be attributed to the gap between the value of the plans' assets and value of their actuarial liability, and about two-thirds of it can be attributed to the role of expected holding gains in the funding strategy of the private and state and local government plans. The interest and dividend income from these plans' assets are low because many of these assets are securities that are expected to rise in value. If we assume that the expected holding gains are sufficient to bring the rate of return on plan assets up to 6 percent, the gap between household cash accounting income from defined benefit plans and their accrual accounting income shrinks from about 30 percent of the accrual accounting income to about 10 percent.

Besides a shift in the level of income, the accrual approach also implies a reduction in income volatility. In particular, the accrual approach eliminates the volatility seen in the cash accounting measure of household income from defined benefit plans in 2002. In that year, a jump in employer contributions added an amount equal to 0.4 percent of DPI to the cash accounting measure.

### Saving

Households accruing entitlements in a defined benefit plan may take the growth of those entitlements into account in deciding how much of their overall income to save. The higher measure of household income from defined benefit plans when these plans are accounted for on an accrual basis implies a correspondingly higher measure of the personal saving rate. On a cash accounting basis, defined benefit plans account for about 0.7 percentage point of the average personal saving rate of 2.8 percent in 2000–2006, but on an accrual accounting basis, household saving in these plans would average around 3 percent of DPI, implying an average personal saving rate of 5.1 percent.

### Wealth

Household wealth is also higher when measured by the actuarial value of their pension benefit entitlement, averaging about 81 percent of DPI, compared with 63 percent of DPI if defined benefit pension wealth is measured by plan assets. Thus, U.S. households appear thriftier and wealthier when the saving and wealth of participants in defined benefit pension plans are measured on an accrual basis.

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