

Lecture 9: Pension Funds

In this lecture, we will discuss

- The retirement income system
- Defined benefit plans
- Defined contribution plans
- Social Security

The U.S. Retirement Income System

- Three pillars:
 1. Government-provided Social Security (SS)
 2. Employer-sponsored pension plans
 - Defined benefit plans (DB)
 - Defined contribution plans (DC)
 3. Individual savings plans (IRA, Keogh, etc.)
- Lecture outline: 1. DB, 2. DC, 3. SS
- Trends:
 - Increasing reliance on private saving
 - Shift from DB to DC
- The *pension fund* of a pension plan is the cumulation of assets created from contributions and their investment earnings, less payments of benefits from the fund
- Basic pension fund tax rules (DB or DC):
 - Contributions to the fund are tax-deductible
 - Investment income of the fund is not taxed
 - Distributions from the fund are taxed as income

Defined Benefit (DB) Plans

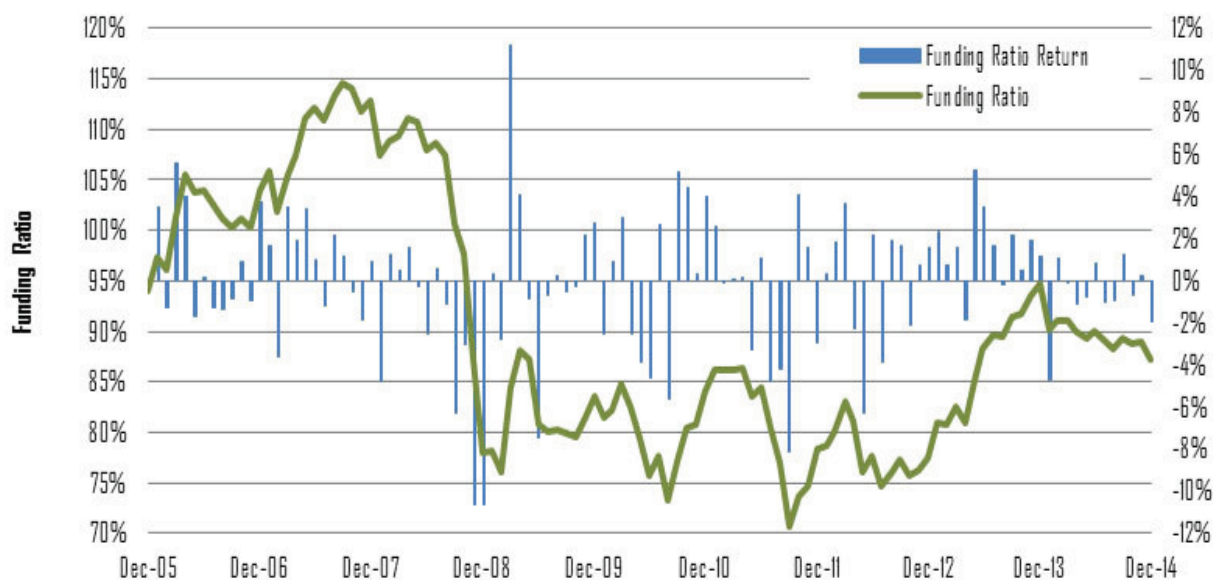
- DB plans dominate in many countries around the world, though their relative importance is declining
 - DB plans cover about 16% of private-sector workers in the U.S. today, down from 40% in the 1980s
- A formula specifies benefits but not contributions
- The pension amount is usually a function of the employee's salary history and years of employment
 - E.g., the employer pays employee for life, beginning at age 65, 2% of her final wage for each year worked
- The employer (the “plan sponsor”) guarantees the benefits and thus absorbs all investment risk
 - The pension benefit annuity promised to employees is a long-term *liability* of the employer
- In the U.S., the benefits are generally not indexed to inflation, but plans often provide voluntary increases
 - Without such increases, workers who change jobs receive lower pensions than workers who stay with one employer (the *portability* problem)
 - What about the U.K.?

- The pension plan vs. the pension fund
 - The pension *plan*: The contractual agreement setting out the rights and obligations of all parties
 - The pension *fund*: A pool of assets set aside to provide collateral for the promised benefits
- The plan sponsor makes contributions to the fund, which can be managed internally or externally or both
- The pension plan's

$$\text{Funding level} = \frac{\text{Market value of total assets}}{\text{Present value of total liabilities}}$$

- If $> 100\%$ \Rightarrow the plan is *overfunded*
- If $< 100\%$ \Rightarrow the plan is *underfunded*

- Aggregate pension plan funding (U.S., \$ billions):



- What is the appropriate discount rate for liabilities?
 - In the private sector? In the public sector?
- Is pension underfunding reflected in stock prices?
 - Franzoni and Marin (2006) argue that firms with severely underfunded pension plans are overpriced
 - * Such firms earn significantly lower stock returns than firms with healthier pension plans
 - * A strategy exploiting this mispricing earns 1.5% monthly alpha (in their follow-up paper)

Accounting

- FASB Statements 87, 88, 106, 132R, and 158 govern pension accounting & reporting
- For pension fund *liabilities*, there are two definitions:
 - The *accumulated benefit obligation* (ABO)
 - * To recognize unfunded pension liability on the balance sheet
 - * Present value of benefits owed to employees
 - The *projected benefit obligation* (PBO)
 - * To recognize pension expense on the income statement, and to compute the plan's Funded Status
 - * Unlike ABO, includes projected salary increases

- For pension fund *assets*, companies can smooth market values over time and specify expected asset returns
 - Expected returns, chosen by the fund’s trustees, directly impact the company’s bottom line (EPS)
 - Companies appear to manipulate their earnings by tinkering with the expected return on pension investments (Bergstresser, Desai, and Rauh, 2006)
 - **Example:** Nearly 5% of IBM’s pretax income in 2000 and 2001 resulted from an increase in the assumed rate of return on pension investments from 9.25% to 10%. IBM adjusted the rate (a “long-term” projection) four times between 1991-2002.
 - **Example:** In Q1-3 2004, Boeing pumped \$3.6 billion into its pension plan, far more than its \$100m requirement for 2004. Simple way of boosting earnings (8.75% assumed return, plus tax-deductibility).
- FAS 158 was issued by FASB in September 2006
 - Purpose of FAS 158: Create more transparency
 - FAS 158 moves pension plan’s *funded status* from the footnotes to the balance sheet
 - * Funded status is the excess of the PBO over the fair market value of the pension plan’s assets
- Are U.K.’s accounting rules different?

Regulation

- The Employee Retirement Income Security Act (ERISA)
 - Regulates the private pension system in the U.S.
 - Enacted in 1974 after several corporate pension plans collapsed (especially in auto industry)
 - Set minimum standards for DB and DC plans
- ERISA set the *minimum funding requirements*
 - Employers must make annual contributions based on the plan's Funded Status, which compares the fair market value of pension assets with PBO
 - For a plan that is sufficiently underfunded, sponsor must make extra contributions
 - Pension plan contributions are tax-deductible for the employer unless the plan is much overfunded
- ERISA also established PBGC
 - The Pension Benefit Guaranty Corporation
 - Agency that guarantees pension benefits, up to a maximum of \$60,136 per year (in 2016), if a company with an underfunded plan goes bankrupt
 - * PBGC insures almost 40 million participants in some 24,000 DB pension plans
 - * In 2016, PBGC paid \$5.8 billion in benefits to over 800k retirees of terminated pension plans

- * Over 4,800 underfunded pension plans have been terminated in PBGC's history
- Funded by premiums, which depend on the number of employees covered and the funding status
 - * Flat-rate premiums rose from \$35 per person/year in 2012 to \$49 in 2014, and have been indexed thereafter; variable-rate premiums have also risen and are to be indexed as well
 - * Premiums do not depend on the riskiness of the pension fund's portfolio, nor on the credit quality of the sponsor (this might change soon)
 - ⇒ distressed firms pay less than they should
 - ⇒ healthy firms pay more than they should
- The PBGC effectively provides a put option to a firm in financial distress ⇒ Such firms have an incentive to gamble (invest in risky assets)!
- PBGC deficit in September 2016: \$79 billion
 - * Up from \$11 billion in September 2008

- How does PBGC invest its assets?
 - * 2007: 28% stocks, 72% bonds
 - * 2008: 45% stocks, 10% alternative, 45% bonds
 - * Did this move make sense?
- Is there a U.K. equivalent of PBGC?
- The August 2006 Pension Protection Act
 - Biggest reform of U.S. pension laws since ERISA
 - New rules on funding, disclosure, PBGC premiums
 - Raised PBGC's flat rate premium from \$19 to \$30
 - Firms with underfunded DB plans face tighter rules
 - Firms are still allowed to smooth the value of their pension assets, but only over two years and within 90-110% of the assets' fair market value
 - * Used to be five years and 80-120%
 - ⇒ Larger contributions when market values fall
 - Encourages firms to automatically enroll their employees in DC plans, and to automatically increase worker contributions each year
 - Ensures that workers have more information and control over their accounts

Case study: The Boots Company, PLC

Should DB Plans Hold Stocks or Bonds?

- What do pension scheme members want?
 - To be fully funded at all times; no risk of a shortfall
 - This perspective seems to favor long-term bonds
- What do shareholders want?
 - Maximize the value of shareholder equity
 - In economic terms, a pension fund is an integral part of the balance sheet
 - We'll take the shareholder perspective
- For simplicity, assume that the pension benefit is a single lump-sum payment of K dollars in 5 years
- The current liability is the present value of K :

$$L = \text{PV}(K)$$

- Two ways of establishing a fully-funded pension fund:
 1. Buy $\$L$ worth of risk-free 5-year zero coupon *bonds*
 - No risk of a shortfall; liability is *immunized*
 - The employer's benefit guarantee has no value
 2. Buy $\$L$ worth of *stock*
 - Shortfall is possible
 - The employer's benefit guarantee has value

- Let S denote the value of the stock in 5 years
- Under policy 2, the employer must make an additional payment in 5 years, equal to

$$X = \max(0, K - S)$$

- This is the payoff of a *put* option on L (current) dollars worth of the stock, with a strike price of K
- Thus, the benefit guarantee issued by the employer can be valued as a put; denote its value by P
- We valued such a put option in Lecture 2!
- Does the employer who adopts policy 2 (buy stocks) get anything in return for giving up P ?
 - Yes. There is also a chance of a surplus.
- If the employer owns *all* of the surplus, the employer will receive the following payment in 5 years:

$$Y = \max(0, S - K)$$

- This is the payoff of a *call* option on L (current) dollars worth of the stock, with a strike price of K
- Thus, the surplus can be valued as a call: C
- Recall the put-call parity (with $S_0 = L = \text{PV}(K)$):

$$C + \text{PV}(K) = P + S_0$$

$$C = P$$

- Thus, the value of the benefit guarantee (P) is exactly offset by the ownership of the surplus (C)
 - The employer gives up P but gets back $C = P$
 - This assumes the employer owns the whole surplus
- Does the employer own the whole surplus?
 - Not really
 - Upon standard termination of the plan, excess assets are allocated to participants and beneficiaries
 - Recaptured surplus is subject to high taxes
 - Surpluses often lead to benefit adjustments
- If the employer owns only the fraction $f < 1$ of the surplus, then the value of that ownership is fC
 - By adopting policy 2, the employer loses $(1 - f)P$
 - So holding equity in a DB pension plan is costly!
- Moreover, when a DB fund holds stocks, required contributions are high when stock prices are low
 - When business conditions in general are bad
 - The firm must contribute to its pension fund just when it can least afford to do so!
- These arguments make a strong case for holding bonds
- Given all this, why might a DB fund hold stocks?

1. Employer may view the pension fund as a trust for employees and manage it effectively as a DC plan
 - This is at the expense of the shareholders
 2. Employer may want to exploit PBGC insurance, which gives an incentive to invest in risky assets
 - Relevant only if the pension plan is underfunded and the employer is in financial distress
 3. Employer may believe that money managers can identify underpriced equity
 - Valid reason, but good luck
 4. Employer may view stocks as an inflation hedge
 - Valid reason, but nominal stock returns have low correlation with inflation in short run
 5. Employer may view stocks as safe in the long run
 - But the cost of insuring against shortfall increases with the investment horizon (Lecture 2)
 6. Employer may want more leeway in choosing the assumed return on pension assets
 - Accounting shenanigan creating no economic value
- Do these reasons for holding equity outweigh the costs?
 - Tax considerations further strengthen the view that DB plans should hold mostly bonds

Tax “Arbitrage”

- Investment income of a pension fund is not taxed
 - ⇒ An incentive to hold assets with the biggest possible spread between pre-tax and after-tax return
 - Again, this favors taxable bonds over stocks
- A corporation whose pension fund holds \$E of equity can engage in a sort of “tax arbitrage”
 - Pension fund: Sell \$E stocks, buy \$E bonds
 - Corporation: Buy \$E stocks, issue \$E bonds
- Note: The overall risk of the corporate entity, including the pension fund, has not changed: The equity is still owned by the total entity, and the new corporate debt is offset by the pension fund’s bonds
- This trick exploits several tax features:
 - Bonds are taxed more heavily than stocks (whose capital gains can be deferred)
 - Interest paid on corporate bonds is tax-deductible
 - Pension fund’s investment income is not taxed
- The “arbitrage” profit reflects the corporate tax rate:
 - Firm borrows (directly) at the lower after-tax rate, lends (through the fund) at the higher pre-tax rate

- The firm pays $R(1 - T)$, the pension fund earns R (R is the pre-tax bond return; T is the tax rate)
- The present value of this tax shield can be huge!
- Also, the after-tax return on the equity held by the firm is close to the tax-free return on the same equity if held by the pension fund (since capital gains can be deferred and only 15% of dividends are taxed)

Case study: The Boots Company, PLC

- So... should Boots switch from stocks to bonds?
- What did Boots actually do?
- Did they do it right?
- How much shareholder value did they create?
- Boots: Example of **liability-driven investing**
- Another example: A swaption collar
 - Suppose duration of assets $<$ duration of liabilities
 - How can a pension fund manage interest rate risk?

Defined Contribution (DC) Plans

- A formula specifies contributions but not benefits
 - E.g., the employer contributes 5% of the employee's wages, or matches the employee's contributions
- Employees make regular contributions, make investment decisions, and bear all investment risk
- The pension fund consists of a set of individual investment accounts, one for each employee
- Most popular DC plans in the U.S.: 401(k) plans
 - Take their name from the section of the Internal Revenue Code of 1978 that created them
 - Other DC plans: 403(b), ESOP, profit sharing, etc.
- Main advantages of 401(k) plans for employees:
 - Control: You decide your own investments
 - Portability: Take it with you when you switch jobs
 - Match: Employers often match contributions
 - Taxes: Contribute from pre-tax income;
Investment grows tax-free until withdrawn
- Types of investment choices in 401(k) plans:
 - Mutual funds (stock, bond, money market)
 - Company stock

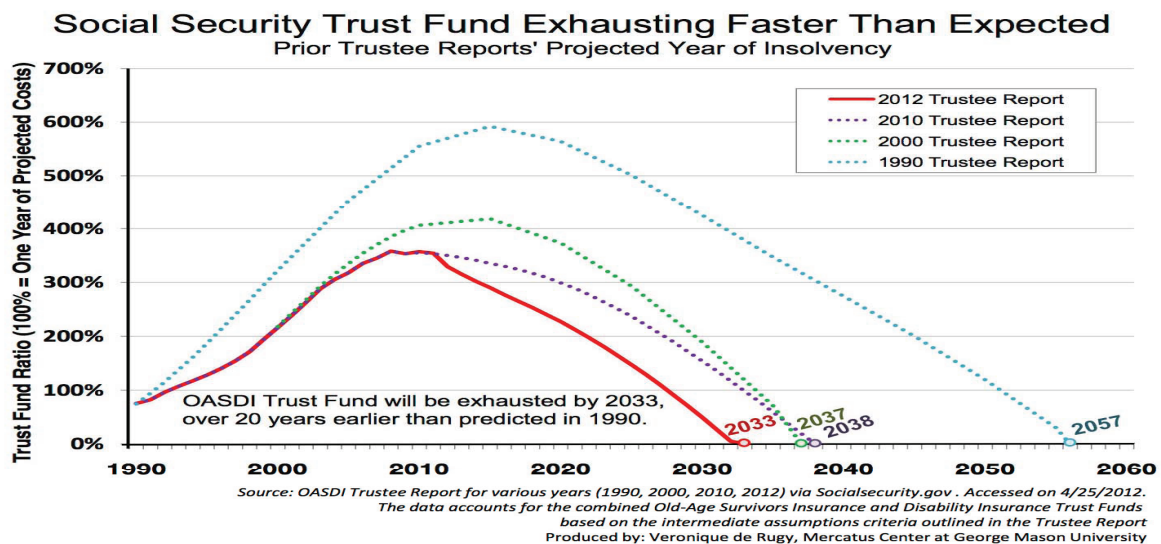
- Investing in the stock of the company you work for
 - About 9% of 401(k) balances is in company stock (in 2010), but the fraction has been higher for some companies (Enron: 58%, Pfizer: 90%, P&G: 96%)
 - Companies want employees to hold company stock
 - * Align incentives of employees and shareholders
 - * Contributing own shares to 401(k)'s saves cash
 - * Dividends paid on own stock held in certain DC plans are tax-deductible
 - This is costly – the value of company stock to employees is *lower* than the stock's market value
 - * How much lower? See Assignment 8
 - Why do people do it if it's costly?
 - * Restrictions; Incentives; Better info? Loyalty?
 - Consistent with loyalty, Cohen (2009) finds that workers invest a significantly bigger fraction of their 401(k)'s in the stock of their own company if
 - * they work for a stand-alone firm rather than a firm that is part of a bigger conglomerate
 - * they work for a company that advertizes more
 - * they are not members of a union
 - * they are salaried workers (as opposed to hourly)
 - * their company's CEO has been around longer
- Some individual DC choices appear irrational

- Benartzi and Thaler (2001) find employees often “diversify” by dividing their contributions equally across all employer-offered investment options
- Benartzi (2001) finds that discretionary 401(k) contributions to company stock are highly positively correlated with past stock returns, but uncorrelated with future stock returns
- Choi, Laibson, and Madrian (2011) analyze 401(k) accounts of employees who
 - * are older than 59.5 years (\Rightarrow can withdraw money from 401(k) any time with no tax penalty)
 - * have an employer match
 - * are allowed to make in-service withdrawals
 Find that 40% of these employees do not save up to the match threshold, thus leaving \$ on the table
- In Benartzi and Thaler (2004)’s “Save More Tomorrow” program, people commit to allocate a portion of their future salary increases toward retirement savings
 - The program has been successfully implemented
 - 78% of those offered the plan joined
 - 80% of those who joined remained in the program
 - The average saving rates for program participants increased from 3.5% to 13.6% over 40 months
- See Choi (2015) for a review of recent work

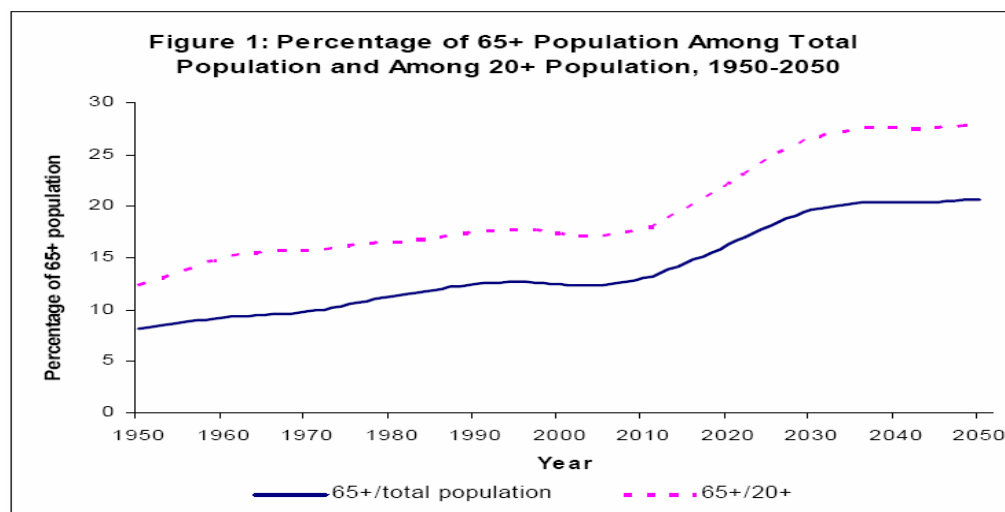
Social Security (SS)

- For a typical worker, SS provides retirement benefits equal to about 40% of the final-year earnings
- Financed by a payroll tax
 - Social Security taxes in 2017: 12.4% on earnings up to \$127,200, split equally between employers and employees
- Pay-as-you-go system
 - Current tax revenue pays for current benefits
 - Revenue is credited to the *SS Trust Fund*; any revenue that is not used to pay current benefits is loaned to the government (and earns interest)
 - The trust fund is just an accounting mechanism to keep track of past SS surpluses
- Since SS began in 1937, each generation of retirees has received SS benefits larger than the taxes that that generation paid while working
 - Windfalls from population growth and rising payroll tax (from 2% in 1937 to 10+% today)
- The SS Trust Fund balance has been increasing until recently, in that total receipts exceeded total benefits

- But this is changing:

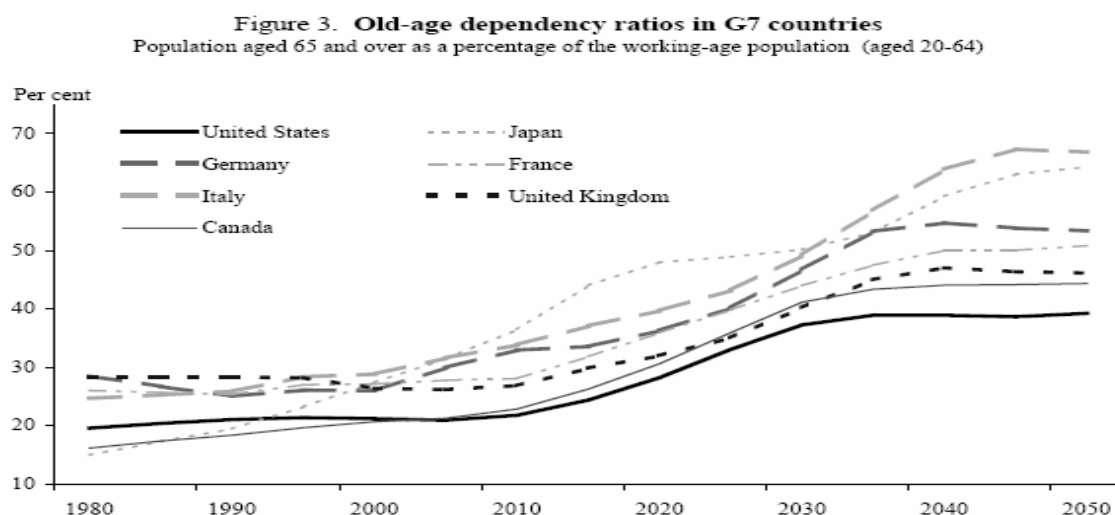


- What is happening?
 - Permanent rise in life expectancy + low birth rate
 - Declining number of workers per beneficiary:
5.1 in 1960, 3.3 in 2006, 2.1 projected in 2031



- What can we do about this?
 - Either increase income or cut benefits

- Income can be increased either by raising taxes or by earning a higher rate of return on the trust fund
- What about the rest of the world?



- The U.S. is actually doing great compared to much of the rest of the developed world!
 - * Better demographic projections
 - * More developed individual private savings schemes
- Many governments have shifted from pure pay-as-you-go toward investment-based systems (e.g., Australia, Britain, Chile, China, Mexico, Sweden)
- Any differences between the government-provided pension plans in the U.S. and U.K.?