

The Market Value of Accrued Social Security Benefits

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Conference on Measuring and Managing Federal Financial Risk
Kellogg School of Management, Northwestern University
February 8-9, 2007

Outline

- ➔ ● Introduction
- The importance of market valuation
- Converting accrued benefits into tradeable securities (PAAWs)
- The price of a PAAW
- The quantity of PAAWs outstanding
- The market value of outstanding PAAWs
- Conclusions and policy implications

SSA present value estimates

- Maximum transition cost
 - = PV accrued benefits – value of trust fund (TF)
 - = \$ 15.8 trillion (2006)
- Closed group transition cost (100 years)
 - = [PV outflows – PV inflows] (current participants) - TF
 - = \$ 13.3 trillion (2006)
- Open group unfunded obligation (~ actuarial imbalance)
 - = [PV outflows – PV inflows] (current and future participants) - TF
 - = \$ 4.6 trillion (75 year projection, 2006)

Results so far only for maximum transition cost, but others could be done as well

FASAB: Federal Accounting Standards Advisory Board

- Financial Statements of the U.S. Government
- FASAB currently debating whether to include Social Security accrued benefit obligations as a liability on U.S. Government balance sheet
- If included, should it be based on actuarial valuation or market valuation ?

How should present values be computed?

- SSA valuation
 - Discount intermediate cost estimates “single focal scenario” at expected return on trust fund assets
 - Approximately: discount expected cash flows at riskless rate
- Market-based valuation
 - Estimate what market value would be if claims to benefits and taxes traded in financial markets
 - Approximately: discount expected cash flows at risk-adjusted rate of return

A simple example

- Suppose Social Security benefits directly indexed to a stock price index at age 65
- Seems clear that (ignoring dividends between now and age 65) the best estimate of the present value of the future liability = today's stock price

Our approach

- Social Security benefits are linked to average economy-wide wages
- Wages are correlated in the long run with stock prices
- Market valuation of Social Security benefits therefore requires a correction for market risk

Why is market valuation of liabilities useful?

- Provides a better measure of the long-run health of Social Security system
- Provides estimate of current cost to government to
 - balance system or
 - pay private sector to cover promised obligations
- Treats liabilities and assets in comparable ways
- Computed hedge portfolio might help determine optimal trust fund portfolio
- Market value of SSec benefits helps workers complete market value balance sheet (for saving and asset allocation decisions)
- Provides methodology to value wage and life indexed securities (PAAWs) if / when trade in financial markets

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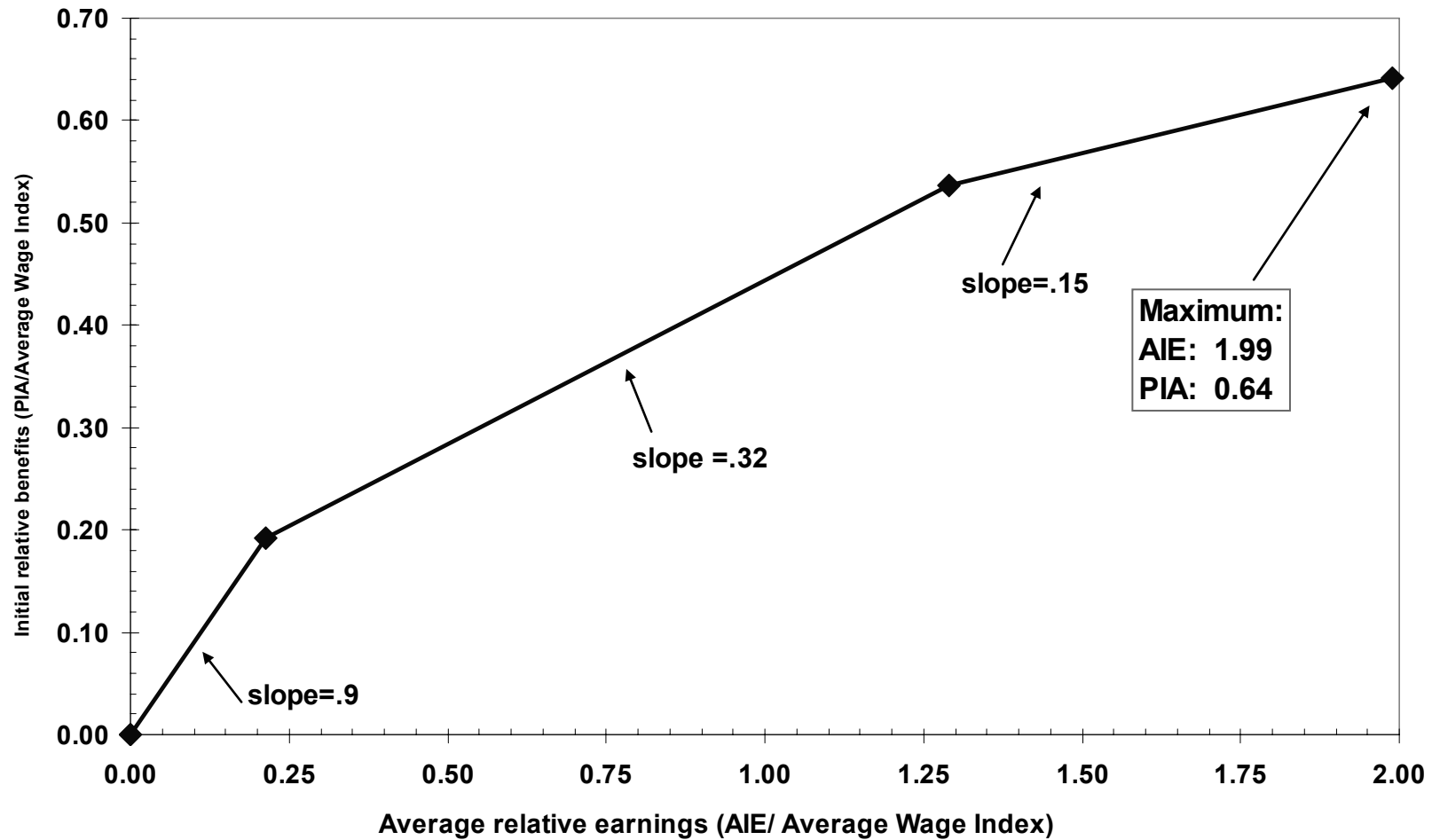
Mechanics of Current OASDI System

Calculation of Benefits

- 1) Calculate relative earnings (ratio of individual covered earnings to average economy-wide earnings)
- 2) Average worker's relative earnings across highest 35 years
- 3) Compute PIA (in average wage units) as concave function of average relative earnings
- 4) Benefit in retirement year = PIA (in average wage units) x **average wage index**
Benefit in future years (each remaining year of life) indexed to CPI

Mechanics of Current OASDI System

Calculation of Primary Insurance Amount (PIA)



A language for describing benefits

- PAAW (Personal Annuitized Average Wage security)
- Each PAAW pays average wage index in individual's retirement year, then same amount indexed for inflation each year for rest of individual's life
- An individual's Social Security benefits can be simply described a number of PAAWS = PIA

Defining accrued benefits

- Define accrued benefits = PIA (PAAWS) assuming 0 earnings for rest of life
- This equals maximal accrual that can never be reduced (Geanakoplos-Zeldes 2006)
- Other (slower) accrual rules exist. See Goss (2004) and Jackson (2004)

Reforming Social Security with Progressive Personal Accounts (Geanakoplos / Zeldes, 2006)

- Individuals given property rights over accrued PAAWS
- Fixed small percentage of PAAWS of a cohort pooled (like mortgages) and traded in financial markets, giving a market price of PAAWS
- Achieves many advantages of private accounts while reproducing cash flows of current system

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Pricing PAAWs

- If PAAWs spanned by currently traded securities, would be relatively easy to price
- Since not spanned, need to make assumption about the part not spanned
- Our approach
 - Price a PAAW as a derivative of the stock market
 - Assume that risk unrelated to the stock market has price = 0
 - Ignore (for now) aggregate longevity risk and interest rate risk
 - See Lucas / Zeldes (2006) (valuing private defined-benefit pension obligations (PBO))
- Alternative approaches
 - Assume model such as consumption CAPM
 - Assume maximum Sharpe ratio on unspanned part (e.g. Cochrane/Saa-Requejo “Good Deal Asset Price Bounds in Incomplete Markets”)

Key issue: correlation of return on average wage bond and return on stock market

- Theoretically, expect average labor earnings and value of stock market to be positively correlated over the long run
- Empirically, correlation of wage growth and stock returns
 - Close to zero over short horizons (qtrly/annual)
(See Goetzmann, 2005)
 - Positive over long horizons (cointegration)
(See Benzoni et al, 2006, Cardinale, 2004)
- Note: return on wage security \neq growth in labor earnings

Model for labor earnings and stock returns (Benzoni et al JF, forthcoming)

- Stock prices:

$$S_{t+h} = S_t \exp\left((r_s - \text{div} - .5\sigma_s^2)h + \sigma_s \sqrt{h}(dz_s)\right)$$

Stock		
	mean stock return (rs)	7%
	stock std dev	16%
	div yield (div)	5.5%

- Labor earnings

$$\ln(W_{t+h}) = \ln(W_t) + h * \text{kappa}(\ln \text{tau} - \ln(W_t / S_t)) + \left(\sigma_w \sqrt{h}(dz_w)\right)$$

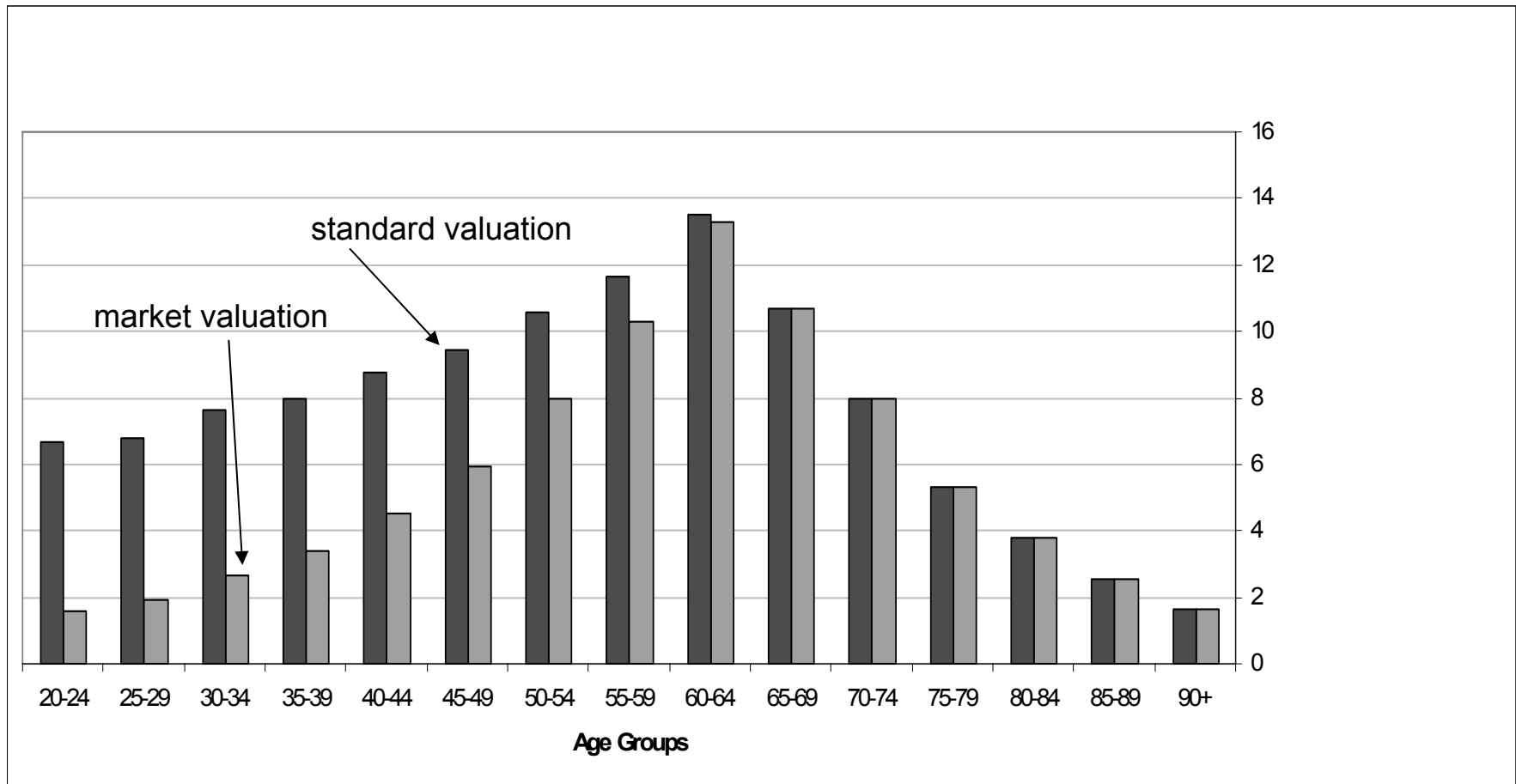
kappa	0.15
stddev(wage innovation)	5%

- We also try alternative model from Lucas/Zeldes (2006). Similar results.

Solving and applying the model

- Use empirical evidence to choose model parameters
 - Stock returns, labor earnings, risk-free rate, SSA cohort life tables
- Use derivatives pricing (risk-neutral, Monte Carlo) techniques to numerically solve for PAAW prices
- For each birth year, PAAW price will be a function of
 - Current average earnings
 - Current value of the stock market
- Also yields dynamic hedge portfolio

Price of one PAAW by cohort (measured in average wage units)



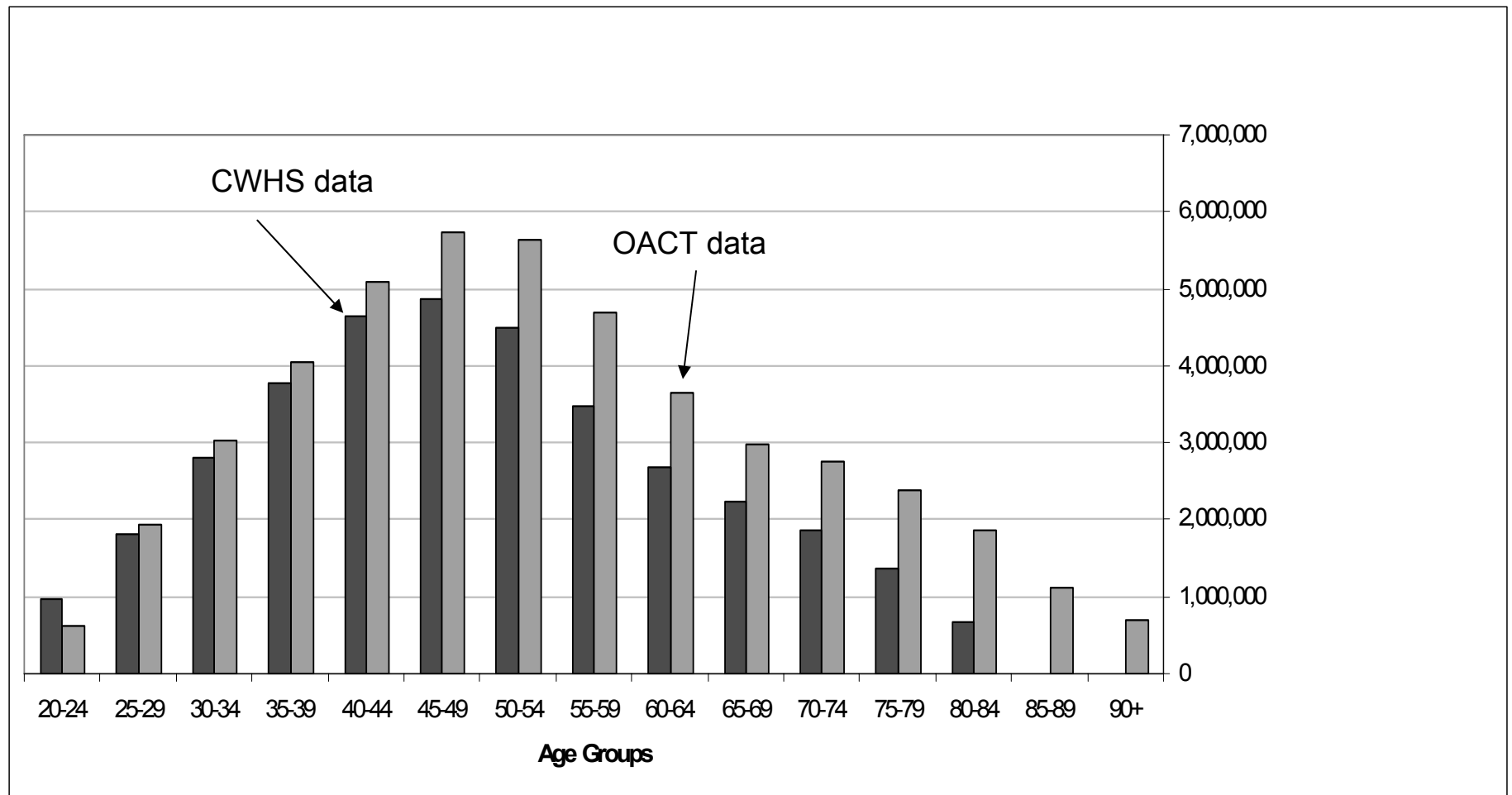
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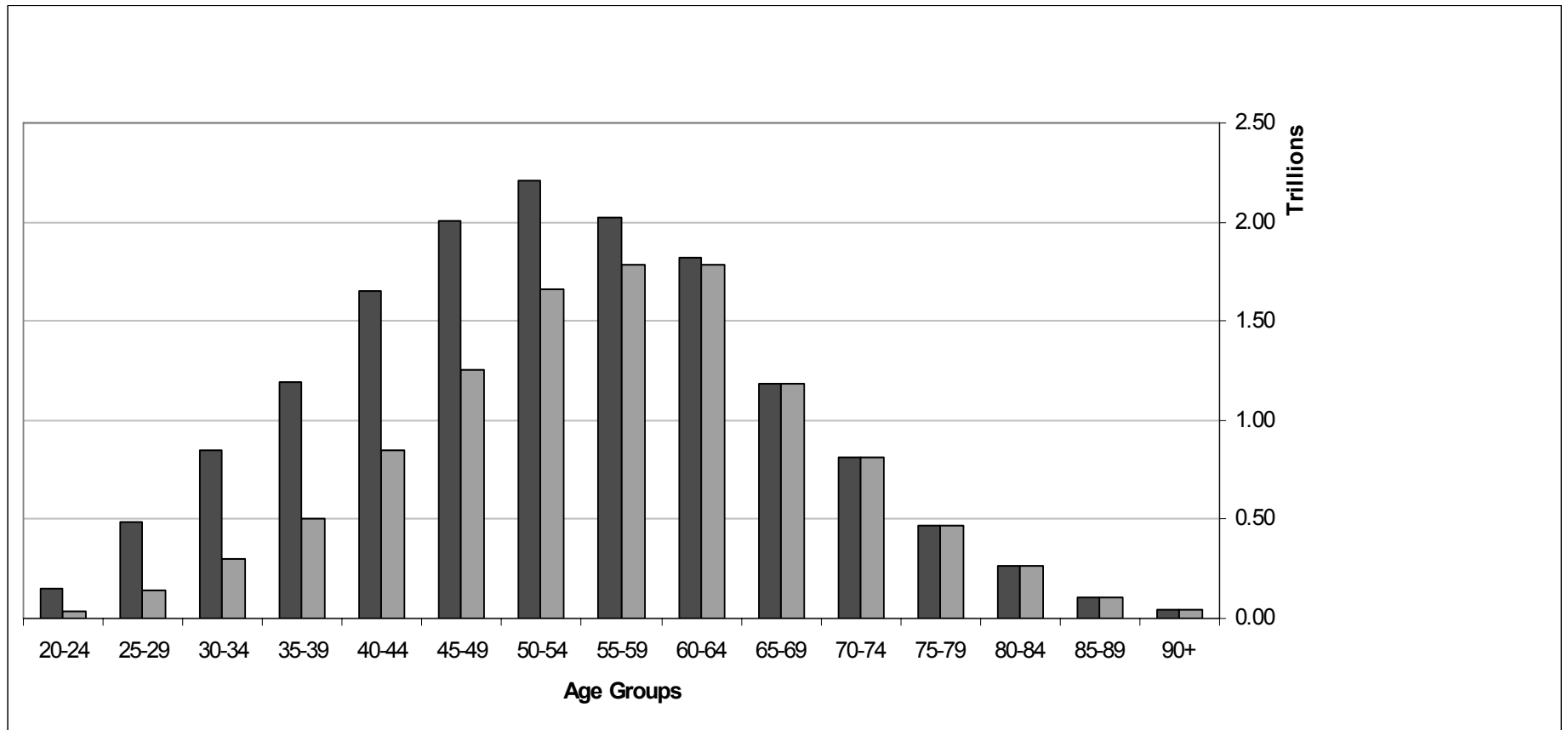
Aggregating across all individuals

- Next step: from individual to economy-wide liabilities
- Require data on accrued PAAWs for each cohort
 - OACT: Cohort data on open-group benefits (we estimate % already accrued)
 - CWHS: Cohort data on accrued benefits based on 1% SSA sample
- Sum market value of liabilities across all cohorts, to get estimate of aggregate liabilities

Quantity of PAAWs accrued to date by cohort



Value of total PAAWs accrued to date by cohort



Estimates of PV of accrued benefits (Trillions of dollars)

	Standard practice valuation	Market valuation (risk-corrected)	Ratio Market/standard
Total benefits	15.2	11.2	.73
Pre-retirement benefits	12.4	8.3	.67

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Conclusions

- Market valuation is important and appropriate
- Market (risk-corrected) valuation differs from standard practice due to
 - Wage indexing in benefit formula
 - Long-run positive correlation between earnings and stock prices
- In absence of spanning, market valuation somewhat complicated
- Market value of maximum transition cost ~ 25% less than standard actuarial value

Improvements / Extensions

- Calibration refinements
- Separate male vs female (different life tables)
- Pricing other obligation measures
 - Open group unfunded obligation / actuarial imbalance
 - Closed group transition cost
- Pricing personal account guarantees linked to current promised benefits

Research References

- Geanakoplos, John, and Stephen P. Zeldes (2006), “Reforming Social Security with Progressive Personal Accounts,” working paper.
- Geanakoplos, John, and Stephen P. Zeldes (in progress), “Creating a Market for Trading Defined Benefit Pension Liabilities.”
- Lucas, Deborah, and Stephen P. Zeldes (2006), “Valuing and Hedging Defined Benefit Pension Obligations – The Role of Stocks Revisited,” working paper.

See www.gsb.columbia.edu/faculty/szeldes/research