The True Cost of Social Security

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Social Security

- In nearly all developed and in many underdeveloped countries the commitment to make payments to retirees and to collect taxes to pay for them is the largest single component of government obligations and resources
- This system of taxes and benefits is what I refer to as ‘Social Security’

Social Security

- Yet, remarkably, despite the commitment to do so – both explicit and implicit – we know surprisingly little about the true costs of social security
- We tinker with these commitments and with taxes – raising or lowering them – and content ourselves with primitive ad hoc assumptions to determine the effect
- To make matters worse, we ask economists to do the impossible; they must predict how much we will collect in taxes and have to pay to retirees in, say, 20 years
- Economists can hardly predict by how much wages will grow next year let alone in the next 20 years

Predicting the Cash Flows

- When confronted with the inaccuracy and the sheer impossibility of the task those who attempt it respond that: “Some number is better than no number”
- However inaccurate that number, how else can we even get a rough estimate of the cost of a policy decision?
- One also hears the argument that while we aren’t very good at forecasts for next year, we are more accurate over a longer period since the short term fluctuations cancel out from year to year
- This is just wishful thinking; there is no way to tell whether a change in the growth rate is a short run fluctuation or the start of a long run secular change

The Problem

- This is a very unfortunate and even crippling state of affairs
- If we cannot predict future payments and receipts it seems as though we must be at a loss in determining the implications of our current decisions

Another Approach

- Fortunately, there is an alternative way to determine the impact of decisions taken today on future consequences
- Astonishingly, it is both more accurate and requires that we make no explicit forecasts

The Financial Approach

- At the same time that macroeconomics and public policy struggle to deal with these issues the bread and butter of the flourishing financial industry is the accurate valuation of long term contracts
- What we are going to do is treat benefits and taxes like the financial securities that they are and borrow the technology and practice of the financial industry to help us to find the cost of the one and the value of the other
- Given the explosion over the past decades in both our understanding of finance and in the practice of finance, it is odd that it has taken so long to use it's tools and methods to address this problem

Modern Finance

- Since its birth with portfolio theory, Modigliani-Miller, and option pricing theory, modern finance has matured into one of the most successful disciplines in economics and in all of the social sciences
- It's valuation formulas fit so well with observed data that ‘financial engineers’ use them on a routine basis, just as other engineers use the formulas of physics
- There is no other field of economics that comes near to finance in the accuracy of its formulas

An Overview

- The key is to find two portfolios of marketed financial assets, the ‘benefits portfolio’ whose returns mimic or replicate the social security payments and the ‘tax portfolio’ whose returns mimics tax receipts
- The cost of the benefits portfolio is the cost of the social security commitment
- The cost of the tax portfolio is the value of the future tax receipts

An Example

- We know that real wages rise and fall with the economy
- Suppose that the average real wage next year will be a base of 50,000 € but will rise or fall by an amount equal to 20,000 € times ½ of the return on the CAC 40
- Interest rates are 5%/year
- What is the current value of that wage or, equivalently, how many euros would you need to invest in the financial markets today to get a payoff next year that would be the same as the real wage next year?

An Example

- The answer is 48,095 €
- Invest 10,000 euros in the CAC 40 and 38,095 € in bonds paying 5%/year
- The payoff on the bonds will be

  $$38{,}095 + 5\% \times 38{,}095 = 40{,}000 \text{ €}$$

- The payoff on the stocks will be

  $$10{,}000 + 10{,}000 \times \text{CAC 40 Return}$$

- For example, if the CAC 40 goes up 10% the combined payoff will be

  $$40{,}000 + 10{,}000 + 10{,}000 \times 10\% = 51{,}000 \text{ €}$$

- At the same time, the wage will be

  $$40{,}000 + (1/2) \times 20{,}000 \times 10\% = 51{,}000 \text{ €}$$

The US Social Security Contract

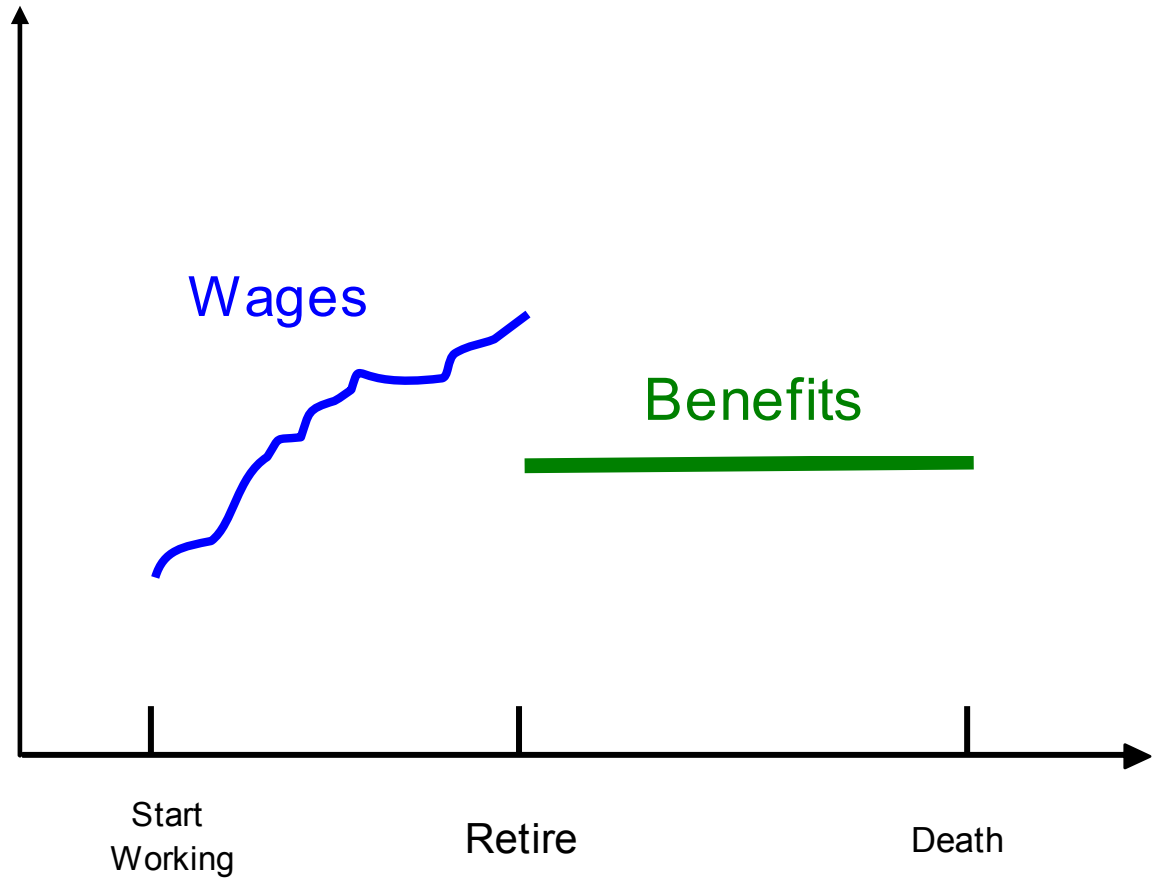
- The benefit payment to a worker depends on the worker's
  - Retirement age
  - Average lifetime wage
- The average lifetime wage that will be earned in the future averages all of the growth in wages over the working life

Bracketing

- The wage earned by an individual worker determines their benefits bracket, but
- Brackets are indexed to the overall average wage so that the benefits depend on the ratio of the worker's wage to the overall wage
- Total benefits paid are to all workers depend on the average wage for all workers

The Payment Time Line

Real Wages and Benefits



Valuing the Benefits

- Step 1: As of the date of retirement value the lifetime annuity benefit the worker will receive at retirement
- Step 2: Find the present value of that lifetime annuity
- Step 3: Add up all the present values of the benefits to be paid to all the workers

Step 1: Valuing the Annuity at Retirement

- Upon retirement the worker receives an annuity for the rest of his or her life
- The value of this annuity at retirement is just the benefit payment multiplied by an annuity factor which can be found from the mortality tables and discounted back to the present using current interest rates
- The current cost of a 1000 € annuity beginning in 2020 and lasting until the recipient dies is 7,474 €

Step 2: Today's Cost to Society of the Promised Benefits

- The annuity value at retirement is the average benefit (which is a function of the average wage) times the annuity factor
- To find the current value we have to value the average wage from now until retirement
- Consider one component, the wage in the year 2010

The Current Value of the 2010 Wage

- As in the example, we find a portfolio of assets whose payoff mimics the unknown (real) wage in 2010
- To find the mimicking portfolio, we estimate the historical relation between changes in the real wage and asset returns, e.g.,
  - Stock market and real asset returns
  - Bond returns (changes in interest rates)
  - Inflation indexed government bonds
- Initial results were surprisingly good (R-square > 50%)
- The part that isn't explained is noise that is unrelated to marketed assets and, like independent insurance risks, it's fair value is zero

The Change in the Wage as a Function of Market Returns

$$\frac{\Delta w}{w} = \alpha + \beta_{stocks} R_{stocks} + \beta_{bonds} R_{bonds} + \beta_{\inf} R_{\inf} + \varepsilon$$

The Mimicking Portfolio

- The coefficients in the above equation are the amounts of each asset in the mimicking portfolio
- In our example $\beta_{stocks} = ½$ and $R_{stocks} = 10\%$
- This allows us to find the exact starting portfolio of the assets that by 2010 will grow to be worth the same as the real wage the worker will receive in that year
- The retirement benefit value is the average of these yearly values

Step 3: Add up the Values of each Worker's Retirement Benefits

The Value of Taxes Collected

- The taxes paid by workers depend on their wages and their tax bracket
- As with benefits, since brackets are indexed to wages, a worker's taxes depend on the average wage and the ratio of a given worker's wage to the average
- A worker's taxes are now the average wage multiplied by a function of the ratio of their wage to the average

Valuing Taxes

- We can now do with taxes what we did with benefits with the simplification that taxes will stop when the worker retires
- We value the taxes collected from each worker in each year by forming a mimicking portfolio for taxes and then we add up the costs across the years
- The last step is to add up the values of the taxes for all workers

The Net Cost of Social Security

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Cost of Benefits

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Value of Taxes

The Results

Simple Mimicking Portfolio Model

	Portfolio Weights	t value
Constant	-0.004	-1.12
Real T Bond Return	0.284	2.35
Real Stock Return	0.054	2.77
Adjusted R-squared: 0.3679 F-statistic: 8.567 on 2 and 24 DF, p-value: 0.001557		

Representative Participant Costs

Education	Method	SSA Method	Mimicking Portfolio	% Difference	$ Difference
Less than HS education	Benefit Cost	$ 61,252	$ 62,606	2%	$ 1,353
(7,375 in sample;	Tax Value	$ 48,025	$ 43,702	-9%	$ (4,323)
23.2% of total)	Net Cost	$ (13,227)	$ (18,903)	43%	$ (5,676)
HS education	Benefit Cost	$ 61,337	$ 62,693	2%	$ 1,355
(11,966 in sample;	Tax Value	$ 47,309	$ 42,805	-10%	$ (4,503)
37.6% of total)	Net Cost	$ (14,029)	$ (19,887)	42%	$ (5,859)
College education	Benefit Cost	$ 111,799	$ 114,270	2%	$ 2,470
(12,489 in sample;	Tax Value	$ 121,797	$ 109,705	-10%	$ (12,091)
39.2% of total)	Net Cost	$ 9,998	$ (4,564)	-146%	$ (14,562)

Total Sample Results

Education	Method	SSA Method	Mimicking Portfolio	% Difference
Weighted Sample	Benefit Cost	$ 81,099	$ 82,891	2%
Average	Tax Value	$ 76,674	$ 69,238	-10%
	Net Cost	$ (4,424)	$ (13,653)	209%
Total Sample	Benefit Cost	$ 2,581,372,799	$ 2,638,413,442	2%
31,830	Tax Value	$ 2,440,541,398	$ 2,203,854,218	-10%
Results	Net Cost	$ (140,831,401)	$ (434,559,224)	209%

Three (Minor) Objections
Objection 1

- Social security would dwarf financial markets and are too large to be valued the way stocks and bonds are valued
- Valuation is ‘at the margin’ and the fact that these are infra marginal doesn’t effect the proper computation of their value
- In fact, the financial markets are now well over 100 trillion € and are certainly not dwarfed by social security

Objection 2

- The idiosyncratic component that we couldn't relate to marketed assets, ε, should really be priced
- Answer 1: If this was a risk investors were concerned with then there would be marketed assets that depended on it
- Answer 2: A deep philosophical debate; are markets sufficiently complete?

Objection 3

- Social security policy isn't stagnant – it changes over time
- That is precisely our point; policy may well change over time and this analysis shows that it will have to do so

Beyond Measurement

- The government can use the mimicking portfolio to track the cost of the benefits and the value of the taxes
- A further step would be to actually issue securities and acquire securities in the market that by design will hedge out the net cost

Conclusion

- Currently the costs of social security are estimated by building econometric forecasts of future incomes and wages
- This assumes the economist and the government can beat the market
- Why not rely on the forecasts embedded in financial market prices and employ the same analysis used by the financial markets?

Final Conclusion

- The simple and straightforward but tentative financial market net cost of US social security is over twice the standard cost estimate used by the government and policy makers