Defined Contribution Pension Plans for All: What if?

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Outline

Four Results:

1. retirement age uncertainty

2. erratic retiree/worker ratio

3. significant market return influence

4. retirement age inequity

Motivation: DC plans becoming more important

- Three Pillars
  - personal savings — DC $\Uparrow\Uparrow$
  - employer pension plan — DC $\Uparrow\Uparrow$ DB $\Downarrow$
  - state pension system — DC $\Uparrow$ DB $\Downarrow$
- DC $\Rightarrow$ financial risk borne by individual members
  - fixed vs flexible retirement age
  - impact on population dynamics
  - impact on individual members

Basic Model

- Population
  - members enter at age 25
  - fixed salary growth rate
  - stable population
- Decision variable
  - contribution rate: 10% of salary
  - 3 investment strategies: Low, Medium or a High risk
    - interest rates: Vasicek, risk-free rate $r(t)$
    - accumulated fund used to buy level annuity

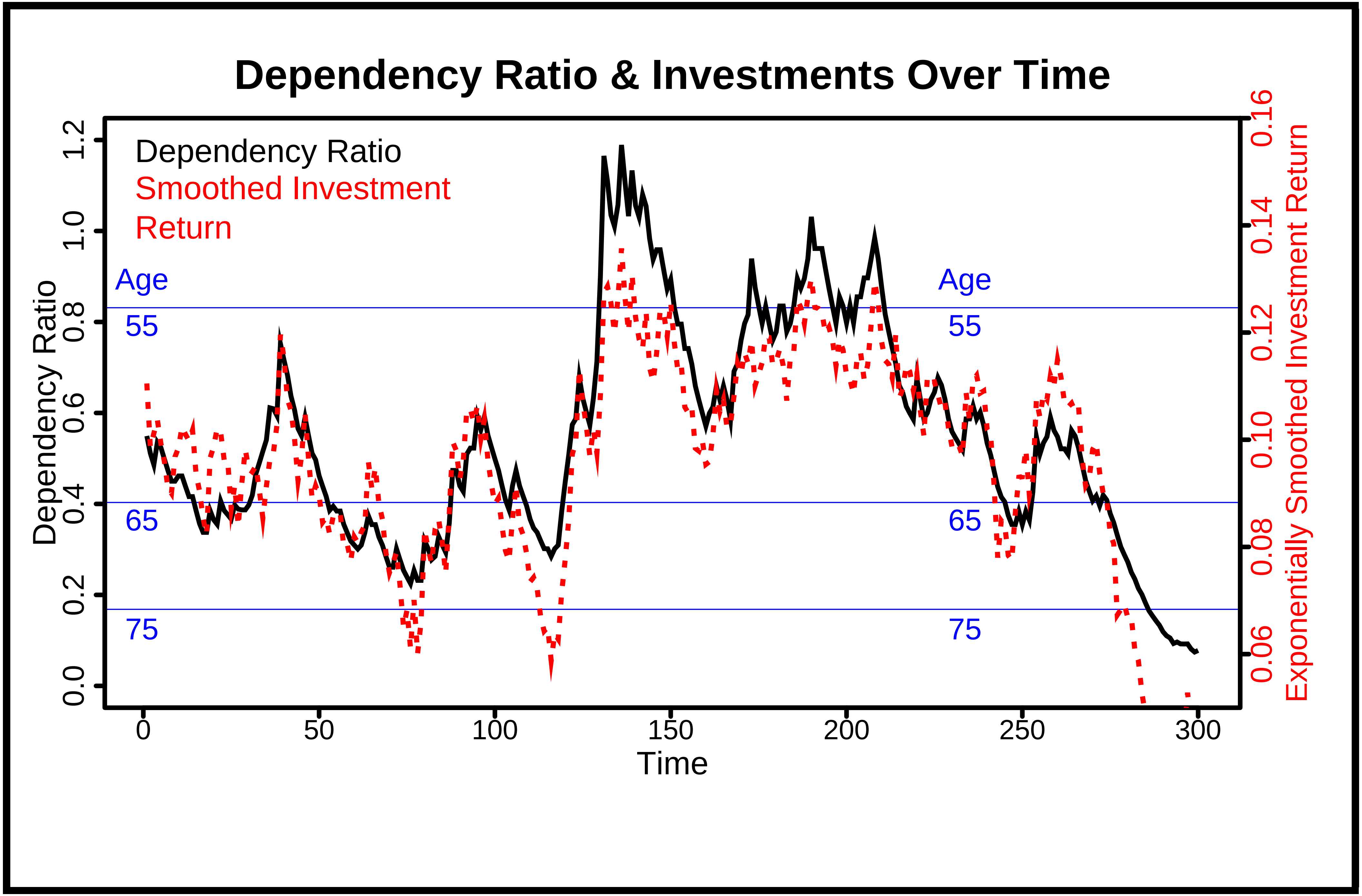
When to retire?

$$\text{Replacement Ratio}_t = \frac{\text{Pension}(t)}{\text{Salary}(t)}$$

$\Rightarrow$ retire when Replacement Ratio$_t \geq 2/3$

Impact on the population

$$\text{Dependency Ratio} = \frac{\#\ \text{retired population}}{\#\ \text{working population}}$$


Dependency Ratio & Investments Over Time
Dependency Ratio
Smoothed Investment Return
Age
55
65
75
Age
55
65
75
Dependency Ratio
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Exponentially Smoothed Investment Return
0.06
0.08
0.10
0.12
0.14
0.16
Time
0
50
100
150
200
250
300

Why are these fluctuations undesirable?

- late-retirement risk for plan members
- swings in labour force

$\Rightarrow$ Impact on economy:

- market equilibrium upset
- labour shortage vs unemployment
- tax revenue
- social programs
- consumption vs production

“products cannot be stockpiled.

They have to be provided at

the time of consumption.”

(Francisco Bayo, Deputy Chief Actuary of the

U.S. social security system (OASDI),

commenting on pre-funded social security)

Problems at the individual level

- example: Employee A & Employee B
  - identical work history
  - identical DC investment strategy

A	B
Born 1959	Born 1960
Join 1984	Join 1985
Retire 2013	**Retire 2027**

Is the instability in the dependency ratio due to the simple model + the strict retirement decision rule?

$\Uparrow$ Realism $=$ $\Uparrow$ Stability???

- stochastic price inflation and salaries
- larger variety of investment options
- heterogeneity in:
  - retirement decisions
  - contribution rate
  - entry age to plan
  - career flight path (high flyers/low flyers)
  - annuity type

Conclusions

- DC plans have known drawbacks
- further potential drawbacks
  - demographic timebomb
  - market equilibrium timebomb
  - public opinion timebomb

MacDonald, B.-J. and Cairns, A.J.G., (2005)

DC Pension Plans For All: What If?

http://www.ma.hw.ac.uk/∼andrewc/papers