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An examination of the Federal Employee Retirement System (FERS) survivor annuity benefit

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Abstract

The Federal Employees Retirement System (FERS) provides survivor annuity benefits for employees who forfeit a portion of their annuity as a premium. In this study, we construct a Monte Carlo simulation to describe the distributions and implied internal rates of return for FERS annuitants who elect a joint and survivor annuity. Our analysis suggests that the survivor benefit program is quite lucrative for most male retirees. In contrast, the program is less rewarding for female retirees, especially if younger than their spouse. For many female retirees, the program actually produces a negative return. Retirees and planners can use our results to make more informed annuity decisions.

JEL classification: G23; H55; J26; J38

Keywords: Survivor Benefit Plan; Insurance; Valuation; Pensions; Retirement; Simulation

1. Introduction

Unlike most defined-benefit plan studies, we focus on the value of the spousal insurance option. We explore the value of insuring the surviving spouse's benefit under different scenarios using a cost-benefit analysis. Considerable research exists on retirement annuities, as summarized in Davis and Fraser (2012) in their examination of the Survivor Benefit

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Program (SBP) for military annuitants. Here we extend that analysis to the Federal Employees Retirement System (FERS) survivor benefit.

Limited academic research exists on FERS, even though it has over 3 million active and retired participants (CBO, 2016). A comprehensive search for articles using databases such as ABI Inform and Business Source Premier found few studies. These efforts simply describe the program (e.g., Isaacs, 2010; Purcell, 2009). Books on the subject, like Matthew and Berman (2008), provide no information about the value of FERS annuity insurance. We add to the literature by examining the costs and benefits of the FERS survivor annuity for individuals.

In the remaining sections, we review the parameters of the FERS system, describe our simulation methods, and present our simulation results. After discussing the robustness and limitations of our approach, we conclude with implications for federal retirees.

1.1. Federal employee retirement and the joint and survivor annuity

While defined-benefit plans are becoming scarce for private sector workers, various government employees continue to earn defined-benefit retirements. Federal government employees, for example, are eligible for the FERS and can receive a lifetime annuity after as few as 5 years. For those under 62, FERS utilizes a Minimum Retirement Age (MRA, analogous to Social Security's Full Retirement Age, FRA) to determine eligibility. For most FERS retirees, the amount of their annuity is based on a formula that gives retirees 1% credit for each year of service. Their total percentage is then applied to their average salary during the 36-month period during which their pay was highest (high-3). For example, an employee who retired after exactly 20 years with a high-three average salary of $50,000 would be eligible for a $10,000 yearly annuity (20% of $50,000). After 5 years of service, government workers qualify for a retirement—however, if they have less than 10 years of service, they must wait until age 62 to initiate their benefits. Currently, the MRA is 56 if the worker has at least 10 years of service. A retirement based on MRA is typically accompanied by a 5% per year reduction in the retiree's annuity for each year short of age 62. However, with 20 years of service, a government worker can retire at age 60 without an accompanying annuity reduction; if the annuitant has 30 years of service, they can retire at age 55 without a reduction to their annuity. However, two incentives exist that encourage federal workers to continue working until age 62:

1. Retirees younger than 62 are initially ineligible for cost of living adjustments;
2. New retirees older than 62, with at least 20 years, earn 1.1% credit for each year of service instead of 1%.

The payments required to support FERS retirement are significant. The CBO reports the Federal government contributed about $26 billion to FERS in 2014 (CBO, 2016). Further, government contributions are expected to exceed $50 billion by 2027. Senators Richard Burr (R-NC), Tom Coburn (R-OK), and Saxby Chambliss (R-GA) introduced legislation in 2013 to end this defined benefit pension (Hicks, 2013). More recently, the Trump administration has called for severe cuts to the entire FERS program (Burr, 2018; Davidson, 2017).

Unless insured, retirement annuities are only paid until the retiree dies. The FERS annuity insurance program offers the opportunity to insure either 25% or 50% of the retiree's annuity. More accurately, the question is whether one should *opt out* of the benefit—50% joint and

survivor is the default option. (Spousal consent is required to elect a 25% or 0% survivor benefit.) This choice to insure the benefit is the focus of our analysis.

Jennings and Reichenstein (2001) examined retirement annuities for members of the military, outlining a valuation method while discussing the portfolio and asset allocation implications. They did not directly examine the costs and benefits of the insurance decision. Davis and Fraser (2012) analyzed the costs and benefits of the military survivor insurance program. This article builds on that research by examining a different federal program. We identify the relevant factors underlying the FERS insurance decision, modeling and comparing the costs and benefits of the program. Our research complements the work of Milevsky (2006) who notes that retirees tend to focus too much on the accumulation of wealth and too little on preparing how to spend or protect wealth.

2. The FERS survivor benefit annuity

2.1. General decision factors

The FERS insurance decision occurs at retirement. If the joint and survivor option is not selected within 30 days of retirement, a retired federal employee's retirement income ceases upon death. If FERS insurance is not declined, the retiree must choose to insure either 25% or 50% of their retirement annuity. For example, a retiree receiving $1,000 a month, who chooses to insure 50%, provides $500 each month to their surviving spouse. The premium to insure the 50% benefit is 10% of the retiree's full annuity. The premium for the 25% benefit is 5% of the retiree's annuity. Continuing our example, a retiree with a gross retirement benefit of $1,000/month, who elects to insure 50%, will pay an insurance amount of $100/month during the insured spouse's lifetime. This payment is pretax and reduces the retiree's net pretax retirement from $1,000/month to $900/month.

Each of the factors in Table 1 plays a role in the FERS insurance selection. Before making a final decision, retirees should consider the asset allocation implications discussed in Jennings and Reichenstein (2001) and the portfolio survivability implications of Americks, Veres, and Warshawsky (2001); however, these effects do not impact our analysis.

2.2. Individual factors

To evaluate the insurance program, we considered the life expectancy of both the retiree and the surviving spouse. We use the same Fig. 1 as in Davis and Fraser (2012) to illustrate our decision framework. For example, if a recently-retired couple lives together for 30 years and the spouse ultimately dies first, the couple will have paid premiums for 30 years and received no benefit. In contrast, if a retiree dies in the first month of retirement and the spouse lives for 30 years, the program would yield an extremely positive return on investment.

We measure the value of FERS insurance by examining the implied internal rate of return associated with the cash outflows over the life span of the retiree (the premiums or cost period—labeled "x") with the cash inflows received by the spouse (the benefits period—labeled "z"). If z is positive, there will be benefits for the surviving spouse from FERS

Table 1 U.S. Federal Employee Retirement System (FERS) annuity insurance details

Costs
10% to insure 50% of pension; 5% to insure 25% of pension
Payment must start within 18 months of retirement (if it does not start immediately the retiree must pay a lump sum penalty)
Payment ceases when either retiree or spouse dies
Payment is pre-tax
FERS retirement is increased by CPI-W each year; hence the FERS insurance payment increases by CPI-W each year (50% insurance always requires 10% of the retiree's pension; 25% insurance always requires 5% of the retiree's pension)
Benefits
Either 25% or 50% of the retiree's unreduced pension amount
Benefit is taxable (but avoids payroll taxes)
Benefit is increased by CPI-W each year (see specific rules below)
Benefit ceases upon death of survivor
Specific COLA rules
If CPI-W <=2.0%, retiree or survivor annuity is increased by CPI-W
If CPI-W >2% AND CPI-W <3%, retiree or survivor annuity is increased by 2%
If CPI-W >=3%, retiree or survivor pension is increased by CPI-W minus 1%

annuity insurance. The likelihood that survivor benefits outweigh the costs increases with the duration of the benefit period z and decreases with increases in the duration of the retiree life span x. We model the probabilities associated with x, y, and z using actuarial tables provided by the Social Security Administration (SSA).[1] Because SSA tables address averages for the total American population, it is important for planners and advisors to modify these distributions with subjective probabilities concerning heath and family circumstances. Limitations notwithstanding, our analysis serves as a foundation for an informed decision.

2.3. External considerations

In lieu of enrolling in the FERS annuity insurance program, a retiring couple might seek to purchase an insurance policy to protect their retirement income stream (see Jennings, Merrell, O'Malley, and Payne, 2018). However, such insurance depends on the insurability of the retiree and the payoff depends on the solvency of the insurer. The FERS program eliminates these concerns, reducing uncertainty for beneficiaries.

In addition to the life expectancy of the retiree-beneficiary pair, there are other factors that affect the FERS insurance decision, most notably inflation. Fortunately, we can somewhat

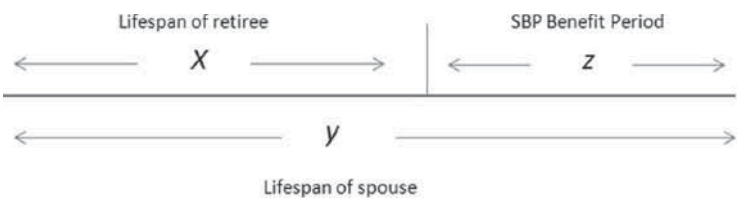

Fig. 1. Timeline of lifespans.

Table 2 Distribution of spousal ages

Husband	20+ years older	1.0%
	15–19 years older	1.6%
	10–14 years older	4.9%
	6–9 years older	12.2%
	4–5 years older	13.4%
	2–3 years older	21.7%
Husband and wife within 1 year		32.2%
Wife	2–3 years older	6.4%
	4–5 years older	2.9%
	6–9 years older	2.6%
	10–14 years older	0.9%
	15–19 years older	0.2%
	20+ years older	0.2%

Based on census table FG3 (Census website, 2002; per 100k marriages). The data is collected based on age as of last birthday; hence, spouses listed as 23 and 21 are considered "2–3 years" apart even though they could be less than 13 months apart.

deemphasize the role of inflation in our analysis because of the nature of the FERS insurance benefit. As shown in Table 1, a key attribute of FERS insurance is that benefits are partially indexed to inflation. However, the link is imperfect. When inflation (CPI-W) exceeds 2%, annuities receive less than the full CPI-W increase. To account for the probabilities of retirees and their survivors getting less than a full inflation adjustment, we adjust the expected retirement cash flows. We use forecasted data from the Philadelphia Fed Survey of Professional Forecasters (SPF) and historical data from Social Security CPI-W inflation adjustments from 1975 to the present to simulate prospective FERS cost of living adjustments (COLA). Using a historical resampling simulation that chose from past Social Security inflation adjustments, we found expected inflation to be 2.7%, resulting in a loss to FERS retirees of approximately 0.7% each year. However, the SPF forecasts 2.3% inflation for the next 10 years (as of 2017Q2). We assume a 2.5% inflation estimate, halfway between the SPF projection and the historical Social Security COLA. This results in a 0.5% real loss each year for FERS retirees. For our analysis of the effects of early retirement (at age 56), we use 2.3% inflation to compute the real loss in purchasing power for the first six years, until retirees reach age 62, then revert to the 2.5% and 0.5% numbers discussed above; this correctly accounts for the pre-62 absence of a COLA and the post-62 partial indexation.

3. Simulation model

We explore the cost-benefit tradeoff for the FERS survivor annuity by computing the internal rate of return associated with the annuity premium cash outflows and the benefit cash inflows received. We construct a Monte Carlo simulation accounting for the factors in Table 1. Our simulation illustrates the cost and benefit distributions—and helps describe the characteristics of those distributions. Specifically, in addition to finding the implied discount rate associated with the FERS, we find:

1. The distributions describing FERS insurance premiums payments;
2. The distributions describing FERS insurance benefit payments;
3. The descriptive statistics about durations of premium and benefit payments;
4. The percentage of participants who earn at least the implied discount rate.

3.1. Method description

As described in Davis and Fraser (2012), Jennings and Reichenstein (2003), and Stoller (1992), we compute the *expected future cash flow*s of beneficiaries. This approach does not use the projected direct cash flows paid to the beneficiary. Rather, we decrement the projected cash flows for the actuarial probability that the beneficiary is alive at any given age.[2] Our randomly generated sample size is 500,000 to achieve stable results from one simulation run to another. Because the distributions produced depend on retiree and spouse ages and genders, we focus on three scenarios:

1. A 62-year-old male retiree with a 62-year-old female spouse;
2. A 62-year-old female retiree with a 62-year-old male spouse; and
3. A 62-year-old female retiree with a 65-year-old male spouse.

The first two scenarios allow a direct comparison between male and female retirees; the third scenario maps well to current American marriage realities, where the average retirement-age spouse is three years older than his spouse as seen in Table 2. Table 3 depicts a summary of results and includes additional scenarios to provide context for age sensitivity within the simulation.

4. Results

4.1. Case 1: 62-year-old male retiree and 62-year-old female spouse

We first describe the number of years spouses outlive retirees; we show that distribution in Fig. 2.

Fig. 2 illustrates that for Case 1, the widow outlives the male retiree 58.9% of the time, which implies that 41.1% of those paying FERS survivor insurance premiums receive no benefit.[3] On average, for Case 1, a widow will live 2.89 years longer than the male retiree. To construct the expected benefits from the survivor annuity, we extract from Fig. 2 those instances where benefits are paid: the average spouse who outlives her spouse does so by an additional 12 years. When the 41.1% of spouses who collect no benefits are included, the average for all widows is still 6.89 years of survivor benefits.

Next, we use the age at which the retiree dies and the age at which the spouse dies to construct a distribution showing how many male retirees of the starting 500,000 are still paying premiums, by number of years since retirement. We also construct a distribution showing the timing of survivor annuities. Fig. 3 shows these two distributions.

The results of the simulation show that the average male retiree pays premiums for 15.2 years. Fig. 3 also shows that the benefits from the FERS survivor annuities occur much later than the costs.

Table 3 Summary of results

	Implied discount rate	Percent of annuitants at or above implied discount rate	Average number of years receiving survivor annuity	Percent chance spouse outlives retiree
Case 1 62 y/o male retiree 62 y/o female spouse	7.6%	30.0%	6.89	58.9%
Case 2 62 y/o female retiree 62 y/o male spouse	1.9%	27.3%	3.98	41.1%
Case 3 62 y/o female retiree 65 y/o male spouse	<0%	NA	3.00	34.1%
Additional cases				
Case 4 66 y/o male retiree 66 y/o female spouse	10.3%	29.8%	6.29	58.6%
Case 5 66 y/o female retiree 66 y/o male spouse	3.6%	27.0%	3.69	41.4%
Case 6 56 y/o male retiree 56 y/o female spouse	4.8%	30.8%	7.71	59.3%
Case 7 56 y/o female retiree 56 y/o male spouse	<0%	27.3%	4.37	40.7%
Case 8 62 y/o male retiree 59 y/o female spouse	8.65%	30.9%	8.60	65.9%
Case 9 62 y/o female retiree 59 y/o male spouse	3.5%	29.2%	5.21	48.4%
Case 10 62 y/o male retiree 65 y/o female spouse	6.25%	29.4%	5.39	51.4%

Fig. 3 compares the costs and benefits of FERS annuity insurance, but the areas under each curve represent retiree or survivor counts and not dollar amounts. Hence, they do not provide a sense of the relative costs and benefits. We generate the estimated costs by summing participants' premiums paid in our distribution and aggregate estimated benefits. Fig. 4 shows the simulated total real dollar value paid in by retirees each year and the total dollar amount paid out by the government. The starting point is 500,000 62-year-old male retirees who have 62-year-old female spouses.

Fig. 4 shows the area under the benefits curve is larger than the area described by the costs curve. Since both cash flows are inflation-adjusted, we conclude there is substantial aggregate real return here. To be more specific we calculate the internal rate of return.

For Case 1 the computed rate is 7.4%. As an after-inflation (real) return, this is remarkable for a government-guaranteed contract. According to Siegel (2014), real returns from the

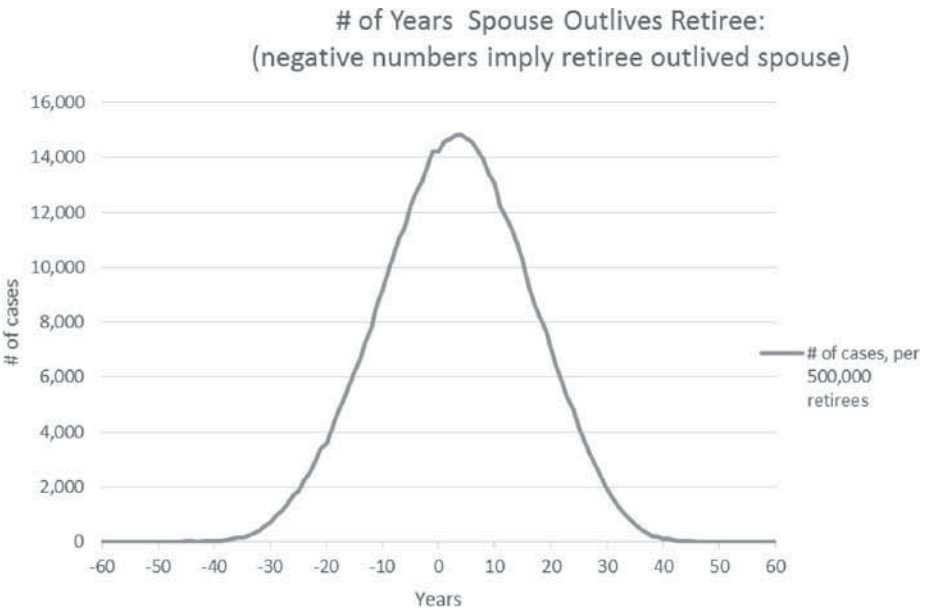

Fig. 2. Number of years spouse outlives retiree (500,000 simulations, each retiree was 62-year-old male with 62-year-old spouse).

stock market over the last 86 years have been approximately 6.4%. In this case, the real return of the low-risk FERS annuity benefit exceeds the (risky) historical real return from stocks.[4]

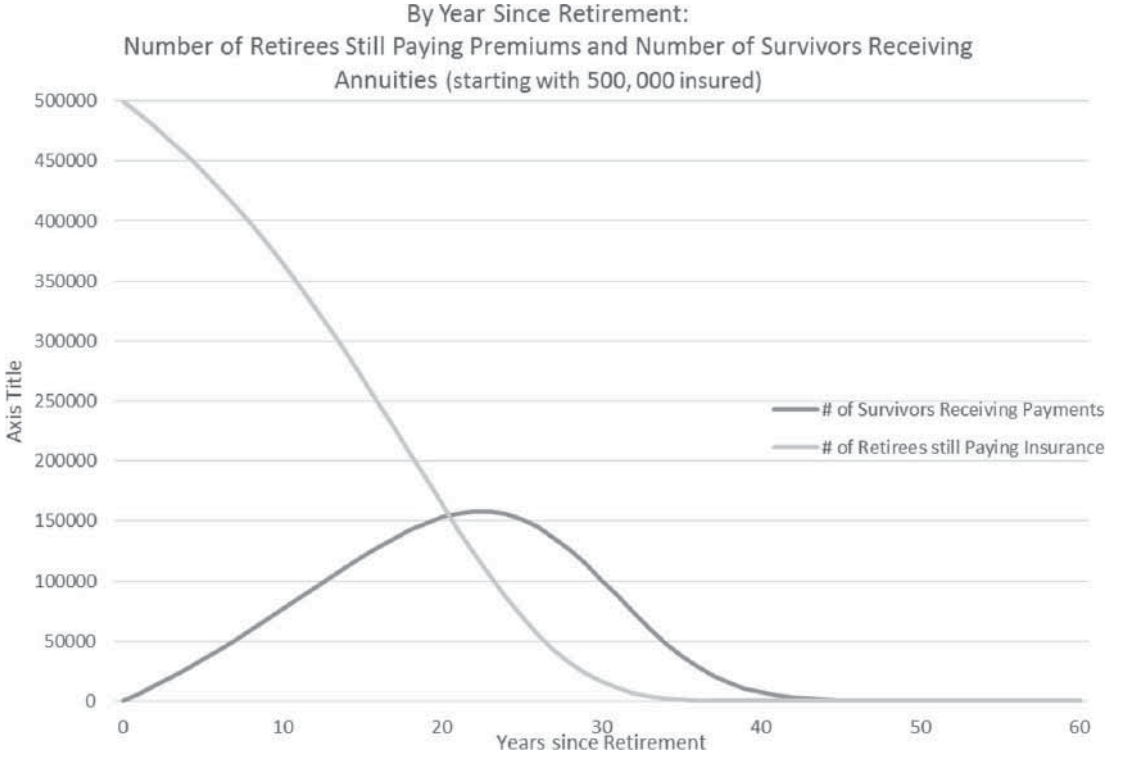

Fig. 3. Timing of benefits and premiums by number of retirees or survivors (based on a starting point of 100,000 Survivor Benefit Plan [SBP] insured retirees; each retiree is 62-year-old male with 62-year-old spouse).

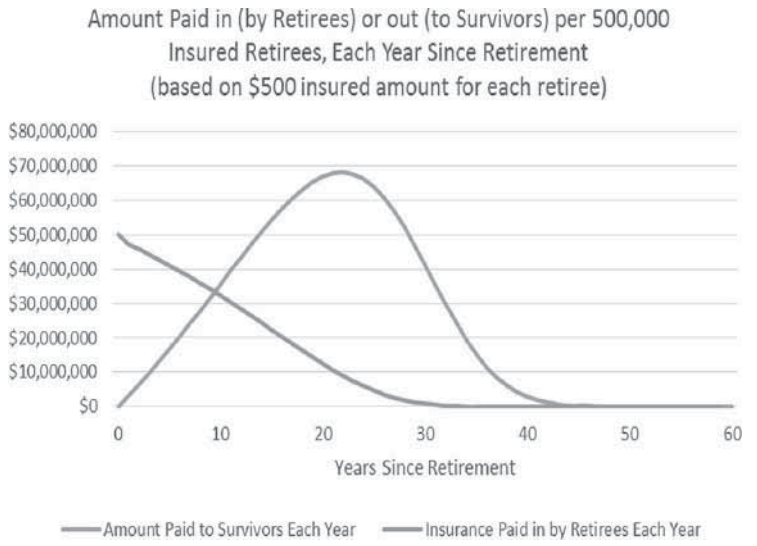

Fig. 4. Timing and amounts of Federal Employees Retirement System (FERS) insurance costs and benefits (62-year-old male retiree with 62-year-old female spouse).

4.2. Case 2: 62-year-old female retiree, 62-year-old male spouse

Fig. 5 replicates Fig. 4 with the genders of the retiree and spouse reversed.

In Fig. 5, the difference in the areas under the two curves is much less dramatic than in Fig. 4. With genders reversed, the female retiree is expected to outlive her spouse approximately 58.9% of the time, and the implied real rate of return falls to a relatively meager 1.7%.[5]

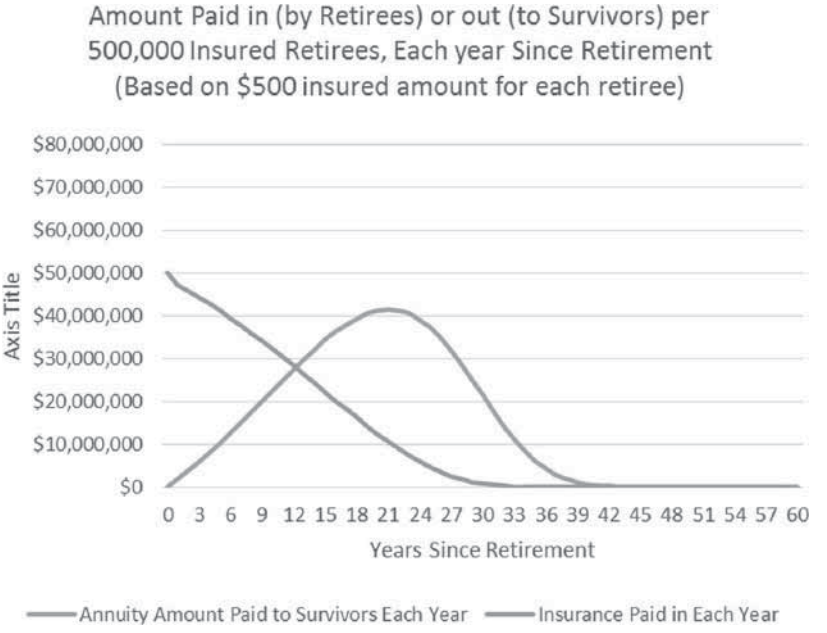

Fig. 5. Timing and amounts of Federal Employees Retirement System (FERS) insurance costs and benefits (62-year-old female retiree with 62-year-old male spouse).

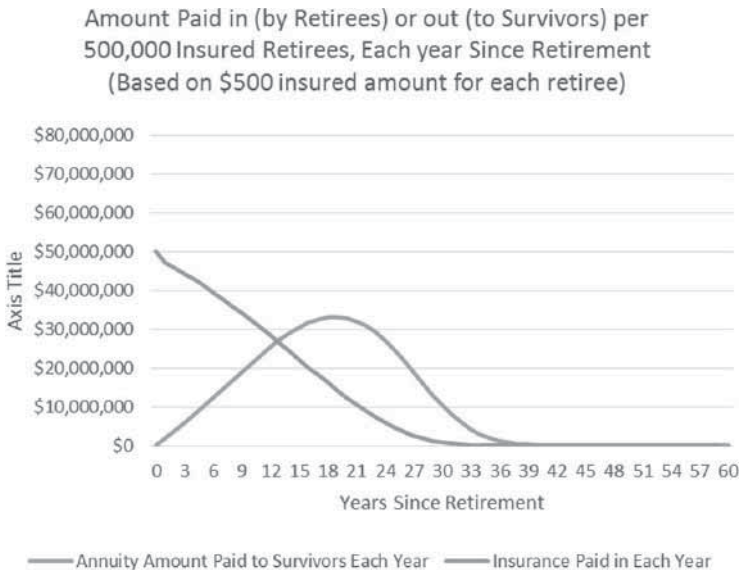

Fig. 6. Timing and amounts of Federal Employees Retirement System (FERS) insurance costs and benefits (62-year-old female retiree; 65 year-old-male spouse).

4.3 Case 3: 62-year-old female retiree and 65-year-old male spouse

For female retirees, the potential benefits from FERS annuity further diminish when one considers the typical age difference between spouses. Table 2 shows census figures for the age differences between spouses. This data, which applies to the U.S. population, implies a typical age difference just under three years. For an average couple, the male tends to be almost three years older. Unsurprisingly, this has important implications. Fig. 6 displays how the cash flow streams change from Fig. 5.

The age difference reduces the insurance premiums paid because these payments end upon the death of the older male spouse. However, the biggest change is in the decline in the expected benefit payout. As a result, the peak payouts in Fig. 6 are substantially lower than in the same-age Fig. 5. Here, the younger female retiree is now expected to outlive her spouse approximately 65.9% of the time.

For younger-spouse Case 3, the computed internal rate of return is negative (−0.3%). Absent personal health or trust considerations, for a 62-year-old female retiree, the typical three-year difference appears to define an important breakpoint in terms of whether female retirees should opt for FERS annuity insurance. Table 3 summarizes each of the three cases examined here in detail. Extra cases provide additional insight. To better illustrate the relationship of spousal ages and genders on the implied discount rate, we graph six cases in Fig. 7.

Fig. 7 shows, as expected, the younger the spouse, the higher the implied return for a 62-year-old FERS retiree. This is true for both male and female workers. Cases 4–7 of Table 3 show that the implied discount rate increases for same-age couples older than the 62 years used in Case 1. Again, this is as expected.

The results here contrast with the findings of Davis and Fraser (2012). In their analysis of the military survivor benefit, the computed returns were all positive. The primary driver for

Fig. 7. Sensitivity of Implied discount rate by gender and age of spouse (62-year-old retiree).

the difference in the results is the nature of the specific retirement programs, both in the timing and magnitude of cash flows. Military personnel can retire and start receiving an immediate benefit after 20 years of service, even if younger than 40. This contrasts with the base case here of a 62-year old FERS retiree. Additionally, military retirees pay a 6% premium to receive 55% of the retirement benefit, which is both cheaper and more generous.

5. Implications for retirees and planners

Our study has important implications for retirees and financial planners. Our numeric and graphical representations help frame the FERS annuity insurance decision. Our finding of gender differentials is striking; while the survivor benefit is lucrative for couples with a male FERS retiree, it is meaningfully less rewarding (perhaps even wealth destroying) for couples with a female retiree.

If couples elect or reject the survivor benefit based on some threshold return level, our analysis has financial planning implications. The FERS survivor annuity decision also has portfolio ramifications. For example, the decision to take survivor benefits directly impacts retiree insurance and asset allocation decisions.

Finally, our results have economic significance. The Congressional Budget Office estimates there will be more than 1 million FERS retirees by 2022, paying approximately $2 billion a year for FERS annuity insurance (CBO, 2012). The analysis presented here can aid planners who must consider the myriad of payout options associated with defined-benefit plans.

However, our results are a starting point. While *Homo Economicus* might rationally reject negative rates of return or rates below a market-based threshold, FERS retirees who are more risk averse might accept a lower internal rate of return to avoid worst case scenarios. Prospect Theory (Kahneman and Tversky, 1979) tells us this is not an unusual reaction. We also know that the elderly have high discount rates (see Huffman, Mauer, and Mitchell, 2016). Further, some FERS retirees have marital dynamics that prevent opting out (that might be viewed as a specific spousal form of risk aversion).

Personal considerations are critical in any retirement decision. Significant medical conditions can trump the general results demonstrated here. Furthermore, in rare cases where the retiree has very young or disabled children, a special program covering such insurable interests could change the general situation described here.

Additional research is needed to construct scenarios that address subsegments of the married population. For example, in using Social Security tables, there is an assumption that deaths are independent. However, research suggests that spouses influence each other's longevity. Drefahl (2010) and Neiman and Dortmann (2010) found that married men generally live longer than single men. Further, the death of the first spouse impacts the life expectancy of the surviving spouse (Elwert and Christakis, 2008). Building these interdependencies into the insurance decision analysis would substantially improve the discussion.[6] Another avenue for further research on subpopulations concerns the difference in life expectancies based on socio-economic status. Olshansky et al. (2012) showed that retiree life expectancy is strongly impacted by educational background and other factors.

Our research has important policy implications. The gender differences noted are striking. The current system defaults all retirees, male and female, into the survivor insurance program. A reasonable policy response might be to align the default-enrollment "nudge" (Thaler and Sunstein, 2009) with the on-average gender-specific economics. Alternatively, policy makers could adjust the pricing scheme (a 10% reduction for a 50% benefit) to produce better outcomes for female retirees.

Notes

1 Social Security Administration. Period Life Table (2009). Actuarial publications. See: http://www.ssa.gov/OACT/STATS/table4c6.html.
2 Jennings and Reichenstein (2003) note that the expected cash flow approach results in about 10% more value than evaluating cash flows over life expectancy.
3 The FERS survivor annuity program will cover a new spouse, but we take the more conservative valuation approach of ignoring re-marriages.
4 However, because of the skewness in the benefits distribution, slightly less than 30% of FERS annuity insurance participants will earn the 7.4% real return on their payments.
5 Though this 1.7% real return is still generous relative to the current real return on another government-guaranteed inflation-indexed investment, Treasury Inflation Protection Securities.
6 Note that health interdependencies are not amenable to universal simulation. For example, while the hazard ratio (likelihood of death) generally increases for widows and widowers (Elwert and Christakis, 2008; Martikainen and Valkonen, 1996), the size of the effect depends on the cause of death for the first spouse. Many cancers, for example, have little effect on the mortality probabilities for the surviving spouse. Lung cancer is an exception—however, causes like lung cancer introduce another problem—death of a spouse from lung cancer probably only "increases" the surviving spouse's hazard ratio because both spouses were smokers. These interactions are best

handled on a case-by-case basis. The importance of having an advisor address death interdependencies is discussed by Davis and Fraser (2012). By applying the likelihoods discussed by Elwert and Christakis (2008), Davis and Fraser found that an early death of the retiree (e.g. from 50 to 60 years of age) can result in the survivor living as much as a full year less than predicted by the Social Security tables.

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