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Insuring defined-benefit plan value: An examination of the survivor benefit plan (SBP) decision

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Abstract

The U.S. Military Survivor Benefit Plan (SBP) allows military retirees to protect a portion of their retirement income stream. Specifically, retirees can pay a pre-tax premium from their retirement income to insure up to 55% of the retirement income stream. Two recent changes have dramatically improved the value of the plan. In this study, we construct a Monte Carlo simulation model to describe the distributions and implied discount rate for SBP participants. Our model demonstrates that the program is quite lucrative for most male retirees. In contrast, the program is less rewarding for female retirees, especially when they are somewhat younger than their spouse. Retirees and their financial planners can use our results to make more informed retirement planning decisions. © 2012 Academy of Financial Services. All rights reserved.

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1. Introduction

The focus of this article is on valuing the spousal insurance option of the U.S. military's defined-benefit retirement plan. The Survivor Benefit Plan (SBP) allows retirees to insure up to 55% of their retirement cash flow benefit to a spouse. More specifically, in valuing the benefit for the surviving spouse, we seek to inform the selection decision. We want to identify when insuring the retirement cash flow is worth the cost and under what circum-

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stances. Recently, the program has experienced two important changes, generating a need for new research to reassess the retiree SBP decision. The first change allows retirees to stop paying insurance after 360 months; at that point the insurance remains in force without further payment. The second change was even more significant: the Social Security offset, which in some cases could reduce the insured spouse's SBP payout by more than 35% after age of 62, was removed.[1]

Johnson, Uccello, and Goldwyn (2003) suggest that retiree survivor benefit decisions are generally rational. However, other studies suggest that retirees and their spouses would benefit from additional information concerning this important decision. For example, Aura (2001) finds that education level matters greatly; relative to annuitants with only a high school education, those with a college education are 13% to 20% more likely to opt for survivor benefits. In addition, Holden and Nicholson (1998) find that the survivor benefit decision is strongly affected by race. Holden and Zick (2000), using data from the early 1990s, find widow poverty rates can be reduced from 21% to 15.5% simply by increasing the election of survivor annuities.

Limited research particular to the SBP program exists, and none that examines the SPB decision in light of the most recent changes. Higdon (2009) provides a detailed account of the program from a legal perspective, while Burrelli (2011) provides an overview of the program. Neither conducts an analysis of the costs and benefits at an individual level. Burrelli (2011) does highlight that in fiscal year 1973, costs to retirees totaled $36,145,000 while payment to families totaled only $5,700,000. In fiscal year 2005, payments into SBP were $1,099,363,000 with payouts increasing to $ 2,253,728,000.

1.1. Military retirement and the SBP

The spectrum of retirement options continues to change. For example, the number of workers who are covered under defined-benefit plans falls every year. The Center for Retirement Research at Boston College reported that the percentage of workers covered by only defined-benefit plans fell to 8% in 2006 from 23% in 1993 (Munnell, Aubry, and Muldoon, 2008). However, various government employees, both state and federal, continue to earn excellent defined-benefit retirements. One standout in the defined-benefit arena is the U.S. military. Those serving in the U.S. military have the opportunity to retire, in most cases, after 20 years of service. Retirees then receive an immediate lifetime annuity. The size and scope of military retirements is economically significant for the government as well as for the planning community that provides financial planning services to the group. The Department of Defense (DoD) reports nearly 1.9 million military retirees were drawing benefits in 2008; approximately $50 billion in benefits was paid to military retirees and surviving annuitants in fiscal year 2009.[2]

The military retirement system is rather unique. First, military retirement is not subject to the Employee Retirement Income Security Act (ERISA). As such, the military program does not have the same vesting requirements as comparable civilian programs. One disadvantage of military retirement results from what is often called "cliff vesting," where members accrue no benefits until the 20-year point. This characteristic creates various incentive structures for both managers and employees. However, the retirement benefits are perceived as quite

generous. New retirees can generally depend on earning 50% of the average of their highest three years of base salary—bonuses and allowances such as housing and subsistence stipends are not included in the calculation. Unless insured, this benefit is paid until the retiree dies; benefits do not pass on to a spouse or children.

The SBP offers the opportunity to immediately insure up to 55% of the retirement benefit. Specifically, military retirees face the question of whether or not to insure a portion of the retiree's retirement income by electing to take SBP. More accurately, the question is whether one should *opt out* of the benefit—SBP enrollment is the default for those retiring. Jennings and Reichenstein (2001) outline a method to value the retirement income stream from military retirement and discuss the portfolio and asset allocation implications. They include the impact of the reduced income stream produced by the cost of SBP, but do not specifically examine the SBP decision. In part, we build on their research. In this article, we identify and examine the factors to consider when making the SBP decision, and model and compare the costs and benefits of the program. This research also compliments the work of Milevsky (2006) who notes that those facing retirement have focused too much on the accumulation of wealth, and too little preparing how to spend (or protect) that wealth.

2. The SBP

2.1. General decision factors

The SBP decision occurs when the military member retires. If the SBP option is not selected and paid for, a retired military member's retirement income ceases upon their death. If SBP is chosen, the retiree can ensure any *base* amount of their retirement pay (up to 100%). For every *base* dollar insured, a surviving spouse receives 55 cents. For example assume a retiree is receiving $1,000 a month and chooses to ensure 100% of that amount. Once that retiree dies, their spouse will receive $550 each month. The premium for this insurance is set at 6.5% of the *base* amount insured. For example, if a retiree has a gross retirement benefit of $1,000/month, and elects to insure the entire amount, the retiree would pay an insurance amount of $65/month. This payment is completely pre-tax, but reduces the retiree's net pre-tax retirement from $1,000/month to $935/month. In sum, for each $1,000/month a retiree insures, the cost of insurance is $65 (6.5%); for each $1,000/month that is insured, a survivor receives $550 (55%). Table 1 lists factors that must be considered in valuing the SBP.

Each of the factors in Table 1 plays a role in the SBP election decision. Before retirees make a final decision, they should certainly consider the asset allocation implications discussed in Jennings and Reichenstein (2001); however, the asset allocation decision does not impact our analysis.

2.2. Individual factors

Any insurance program decision must consider the health of those insured. In the case of SBP, it is the health and life expectancy of *both* the retiree and the surviving spouse. Using

Table 1 U.S. military SBP details

Costs
6.5% per dollar insured
Payment must start on retirement day
Payment ceases when either retiree or spouse dies
Payment ceases at 30 years if both retiree and spouse are still alive
Payment is pre-tax
Military retirement is increased by CPI-W each year; hence SBP payment increases by CPI-W each year (but stays at 6.5% of the dollar amount insured)
Benefits
55% per dollar insured
Benefit is taxable (but avoids payroll taxes)
Benefit is increased by CPI-W each year
Benefit ceases upon death of survivor

extreme examples to illustrate, if a recently retired couple lives together for 30 years and the spouse ultimately dies first, they 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 provide an incredible financial return on investment. While both of these extremes are unlikely, they serve to provide a boundary or framework through which we quantify the SBP decision. Fig. 1 provides a basic view of the situation.

The benefit of the SBP program is a function of the "gap" (labeled "z"), representing the difference in the life span of the spouse (y), and that of the retiree (x). As long as the time period z is positive (i.e., $y > x$), benefits will be received from SBP. The probability that SBP benefits outweigh costs increases with the duration of z, and decreases with increases in the duration of x. To explore the probabilities behind x, y, and z, we use the actuary tables provided by the Social Security Administration (SSA).[3] Because SSA tables address the total American population, it is critical for each retiree/beneficiary pair to modify these distributions with subjective probabilities concerning their own heath and family circumstances. We discuss this limitation further below. Limitations notwithstanding, our analysis serves as a starting point for a more informed SBP decision.

2.3. External considerations

The analysis in this article focuses on the implied interest rate earned on the SBP premiums measured by the expected cash flows paid to a beneficiary. In lieu of enrolling in

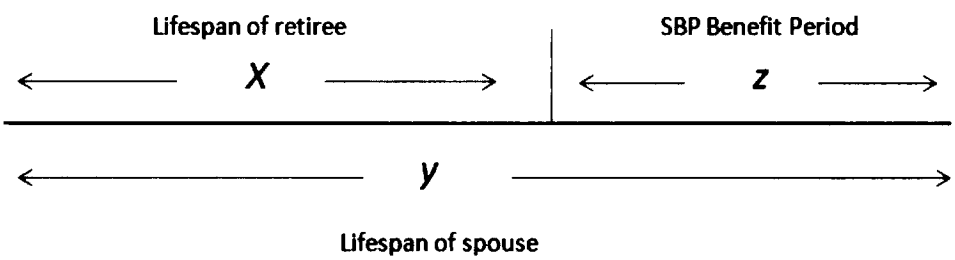

Fig. 1. SBP Analysis Timeline.

the SBP plan, a retiring couple might instead seek to purchase an insurance policy to protect the retirement income stream. Acquiring such a contract, however, inevitably involves the question of the insurability of the retiree. The ability to protect the retirement income stream with SBP eliminates the insurability concern and can reduce the uncertainty for beneficiaries. Hence, our results *understate* the benefit when considering the reduced uncertainty associated with this insurability aspect.

Shankar (2009) proposes an approach to protecting retirement involving the use of a combination of Treasury-Inflation Protected Securities (TIPS) and what he describes as longevity insurance—or a deferred annuity. Retirees can essentially divide retirement into two phases, one funded by the TIPS portfolio and one funded with the deferred annuity. He suggests such an approach can reduce or eliminate the probability of financial ruin. For service members, the SBP program provides for a similar outcome without the need to make the choices required in Shankar's (2009) approach.

In addition to the life expectancy of the retiree/beneficiary pair, there are other factors that affect the SBP decision. For example, no financial analysis should be conducted without considering inflation. While most long-term inflation estimates are relatively low, the impacts can be considerable. Fortunately, we are able to deemphasize the role of inflation in our analysis because of the nature of the SBP benefit. As noted in Table 1, a key attribute of the SBP program is that benefits paid to a beneficiary are indexed to inflation. That is, as the gross retirement pay increases with inflation, so too does the SBP benefit.

3. Simulation model

To explore the cost/benefit tradeoff for the SBP, we construct a Monte Carlo simulation constrained by the factors in Table 1. The primary goal of the simulation is to describe the distribution(s) for an outcome variable that is dependent on a number of random input variables. It is also important to describe the characteristics of those distributions. Specifically, we seek to find: (1) the implied discount rate associated with SBP premium payments and cash flows to beneficiaries; (2) the distributions describing the payment of SBP premiums; (3) the distributions describing SBP benefit payments; (4) the descriptive statistics generated from these distributions such as: the average number of years of SBP benefits per participant and the average number of years participants pay SBP premiums; and (5) the percentage of participants who earn at least the implied discount rate.

3.1. Method description

Our simulation model uses Social Security 2006 actuary tables. In agreement with Jennings and Reichenstein (2003), as informed by Stoller (1992), we use the *expected future cash flows* method to estimate the value of SBP with our simulation. This approach does not use the projected direct cash flows paid to the beneficiary. Rather our simulation adjusts the projected cash flows received by the beneficiary to account for the probability the beneficiary is alive at any given age according to actuarial data. For example, we reduce the aforementioned $550 monthly cash inflow. We multiply this amount by the actuarial probability of

Table 2 Summary of results

	Implied discount rate	Average number of years paying into SBP	Average number of years receiving SBP benefits	Percent of chance spouse outlives retiree
Case 1				
45 y/o male retiree 45 y/o female spouse	6.55%	24.4	8.81	59.9%
Case 2				
45 y/o female retiree 45 y/o male spouse	2.95%	24.4	4.84	40.1%
Case 3				
45 y/o female retiree 48 y/o male spouse	1.90%	23.6	3.81	33.5%
Additional cases				
Case 4				
45 y/o male retiree 48 y/o female spouse	5.91%	23.9	7.18	52.8%
Case 5				
50 y/o male retiree 50 y/o female spouse	8.32%	22.2	8.37	59.9%
Case 6				
50 y/o female retiree 50 y/o male spouse	3.87%	22.2	4.61	40.1%
Case 7				
48 y/o male retiree 45 y/o female spouse	8.12%	23.6	10.4	66.6%
Case 8				
48 y/o female retiree 45 y/o male spouse	4.37%	23.9	5.96	47.2%
Case 9				
45 y/o male retiree 42 y/o female spouse	7.08%	24.8	10.7	66.7%
Case 10				
45 y/o female retiree 42 y/o male spouse	3.78%	25.0	6.11	47.1%

being alive, resulting in a smaller cash flow each year.[4] Our randomly generated sample size is 100,000, and we collect data from 10 iterations. Because the distributions produced depend on retiree and spouse ages and genders, we analyze and discuss three distinct scenarios: (1) a 45 year-old male retiree with a 45 year-old female spouse; (2) a 45 year-old female retiree with a 45 year-old male spouse; (3) a 45 year-old female retiree with a 48 year-old male spouse. The first two allow a direct comparison between male and female retirees; the third scenario maps well to current American marriage realities, because the average spouse is three years older than their spouse (more discussion later). Our final summary of results (Table 2) includes additional scenarios to provide context for age sensitivity within the simulation.

Starting with the ages of the retiree and spouse, random numbers are connected to the Social Security actuarial tables to simulate mortality. As noted above, each of the restrictions in Table 1 is built into the model. For each couple in a sample, the life expectancy numbers

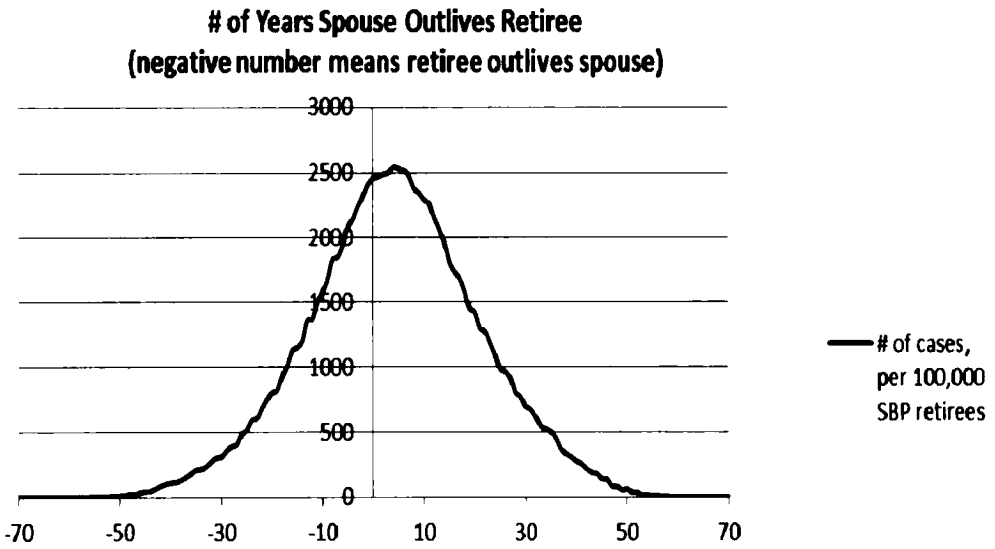

Fig. 2. Number of years spouse outlives retiree (100,000 simulations, each retiree was 45 y/o male with 45 y/o spouse).

generated determine the cost and benefit of SBP for that couple. The results of the simulations are used to create the relevant distributions and descriptive statistics.

4. Results

4.1. Case 1: 45 year-old male retiree, 45 year-old female spouse; 100,000 cases are simulated

We begin by describing the results for a 45 year-old male retiree with a 45 year-old spouse. Our first distribution describes the number of years spouses outlive retirees; we show that distribution in Fig. 2.

Fig. 2 describes a situation where the spouse outlives the retiree 59.9% of the time; which implies that 40.1% of those paying into SBP under the Case 1 scenario (45 y/o male; 45 y/o spouse) will never benefit from their premiums.[5] On average, across our entire sample, a female spouse will live 3.96 years longer than the male retiree. Note that this average includes the 40.1% of retirees who outlive their female spouse. To construct the expected benefits from SBP we need to extract from Fig. 2 those instances where benefits are paid; this is done in Fig. 3.

Fig. 3 extracts those instances where the spouse outlives the retiree. While only 59.9% of spouses do so, the average spouse who outlives her spouse does so by an additional 15 years, and could therefore collect 15 years of SBP benefits. When the 40.1% of spouses who collect no benefits (as noted earlier) are included, the average for all spouses is still 8.8 years of survivor benefits.

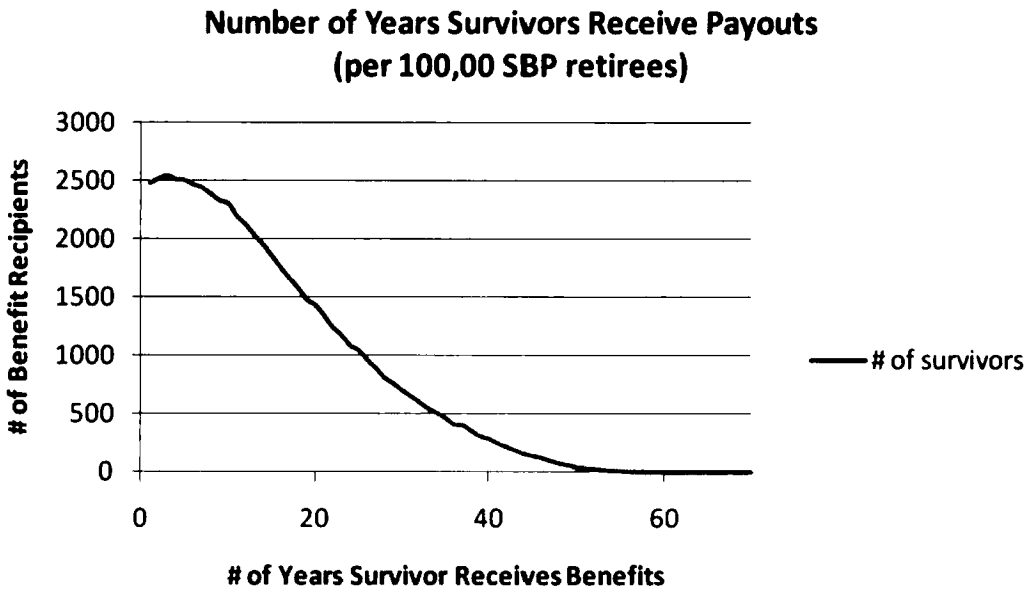

Fig. 3. Number of survivors receiving benefits, by number of years since spouses' military retirement (assumes starting point of 100,000 45 y/o male retirees with 45 y/o spouses; recasting the data in the chart, the average surviving spouse receives SBP for approximately 15 years).

Next, using the age at which the retiree dies, the age at which the spouse dies, and the 30 year maximum for SBP premium payment, we construct a distribution showing how many retirees (of the starting 100,000) are still paying premiums, by number of years since retirement. The result is shown in Fig. 4.

Relying on the data used to construct Fig. 4, our simulation shows that the average retiree pays premiums for 24.4 years. (Since the 30 year maximum, discussed earlier, is a relatively recent change we also simulated this distribution without the 30 year "paid-in-full" insurance truncation. Previously Case 1 retirees could expect to pay premiums for 28.0 years, on average.) Fig. 4 represents an early step in the estimation of the cost side of SBP.

To estimate the benefits side of SBP we create a distribution showing the timing of benefits. The results are depicted in Fig. 5. Not surprisingly, the distribution in Fig. 5 shows the benefits from SBP generally occur much later than the costs (shown in Fig. 4). This is more easily seen when we combine the two distributions (from Figs. 4 and 5) in Fig. 6.

Fig. 6 moves us forward in terms of comparing the costs and benefits of SBP, but the areas under each curve do not represent dollar amounts, hence they do not provide a sense of the relative dollar costs and benefits of SBP. We next utilize the results of the simulation to translate the probability distributions from Fig. 6 into dollar values. Specifically, we generate the estimated costs by summing the premiums paid for the participants in our distribution and aggregate estimated benefits in a similar manner. We show the result in Fig. 7; this figure shows the simulated total dollar value paid in by retirees each year and the total dollar amount paid by the government to insured survivors. The starting point is 100,000 45 y/o male retirees who have 45 y/o spouses; each retiree has elected to insure $1,000 of their annual retired pay.

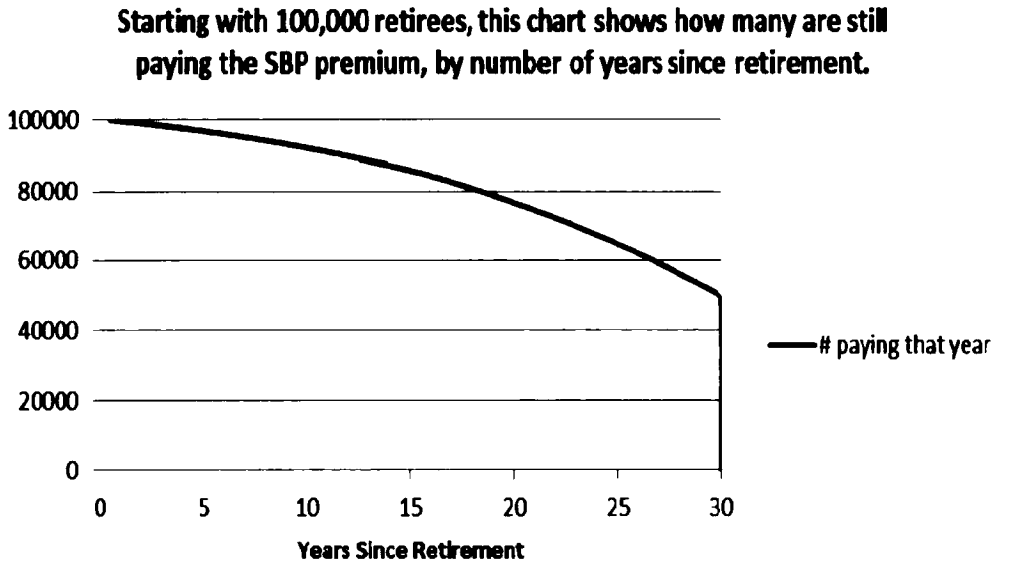

Fig. 4. Number of years of SBP premiums (assumes starting point of 100,000 45 y/o male retirees with 45 y/o spouses).

A cursory examination of Fig. 7 shows the area under the benefits curve is substantially larger than the area described by the costs curve. Because both cash flows are adjusted for inflation, we conclude there is substantial real return here. To compute the implied rate of return, we solve for the interest rate that makes the present value of the premiums equal to

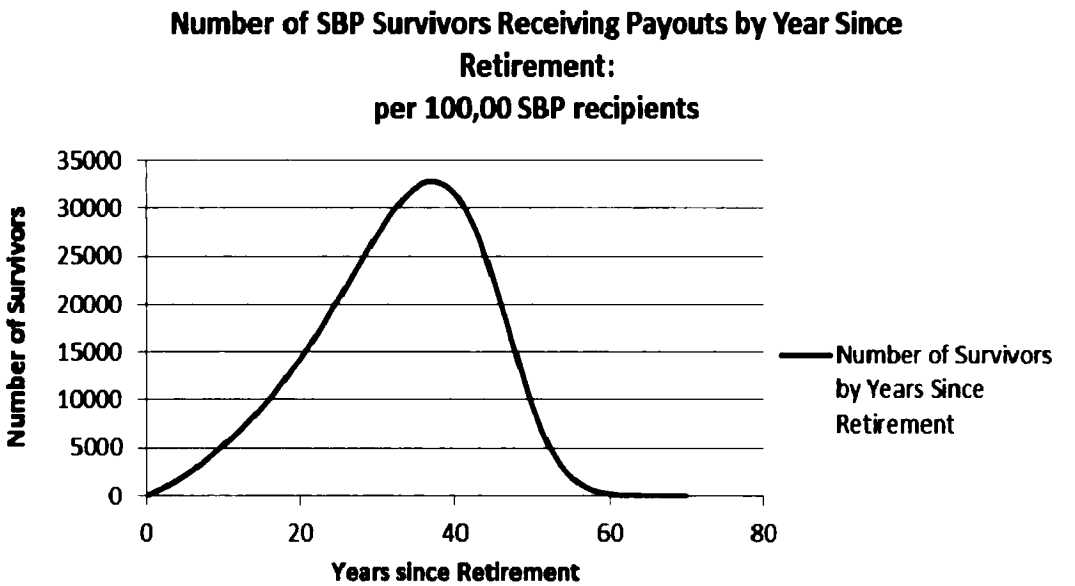

Fig. 5. Number of survivors receiving payouts (based on starting point of 100,000 45 y/o male retirees with 45 y/o spouses).

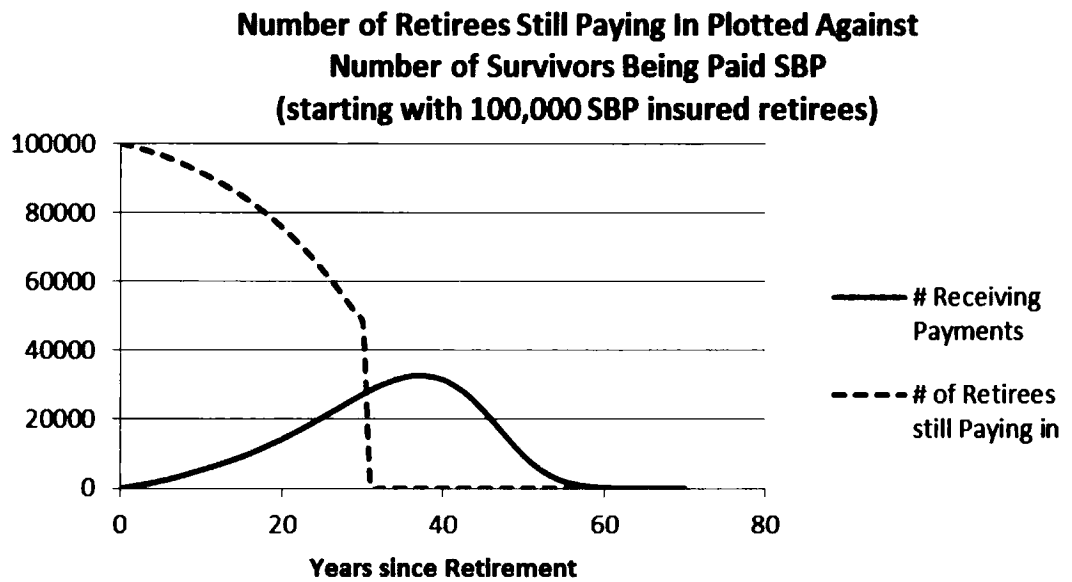

Fig. 6. Timing of benefits and premiums by number of retirees or survivors (based on a starting point of 100,000 SBP insured retirees; each retiree is 45 y/o male with 45 y/o spouse).

the present value of the benefits received by the surviving spouse. This comparison is examined at the time of the SBP decision.[6]

For Case 1, that of a 45 year-old male retiree and a 45 year-old female spouse, the relevant discount factor is 6.55%. As an after-inflation (real) return, this is an impressive return for a government guaranteed contract. According to Siegel (2008), returns from the stock market over the last 80 years have been less than 6.8%. Hence, the real return in this case is almost

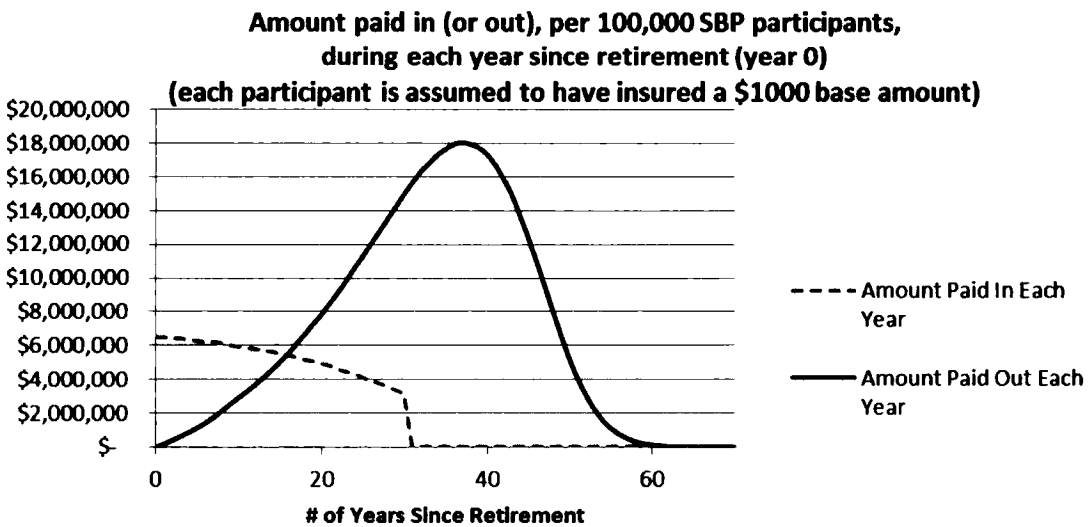

Fig. 7. Timing and amounts of SBP costs and benefits (45 y/o male retiree; 45 y/o female spouse).

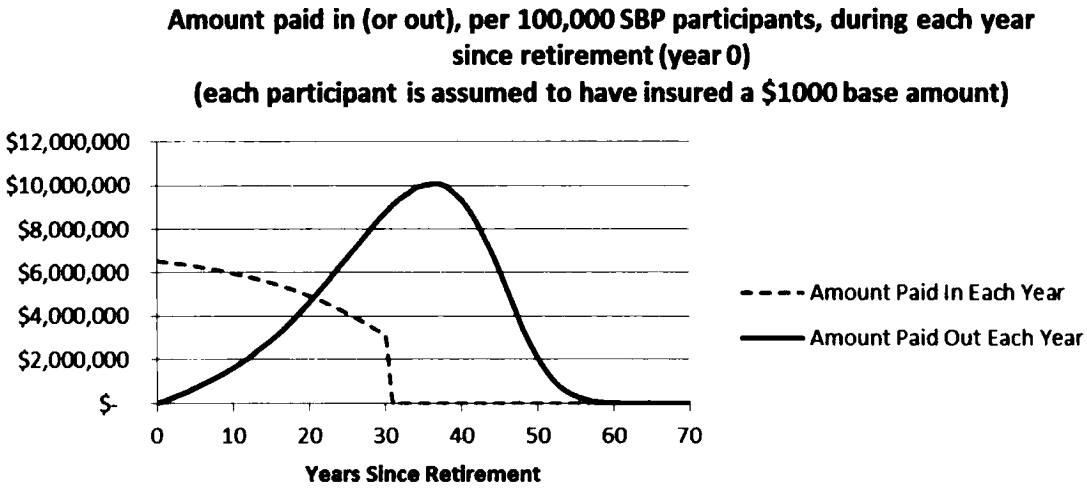

Fig. 8. Timing and amounts of SBP costs and benefits (45 y/o female retiree, 45 y/o male beneficiary).

equal to the historical real return from stocks. Note that because of a significant skew in the benefits distribution, only a little more than 26.5% of SBP participants will actually earn the 6.55% real return on their SBP payments. However, many of those earn substantially more than 6.55%.

4.2. Case 2: 45 year-old female retiree, 45 year-old male spouse; 100,000 cases are simulated

Fig. 8 replicates Fig. 7 but reverses the genders of the retiree and spouse. In Fig. 8, the difference in the areas under the two curves is less dramatic than what we observed in Fig. 7. While the amount paid into SBP is about the same, 45 year-old female retirees are more likely than 45 year-old male retirees to hit the 30-year maximum payoff. This fact is offset by the increased likelihood that their spouse will die before the 30-year maximum is reached. The expected SBP payout (benefit), however, is significantly reduced. With genders reversed, the *retiree* is expected to outlive their spouse approximately 59.9% of the time. As a result, the discount rate falls to approximately 2.95%.

4.3. Case 3: 45 year-old female retiree and 48 year-old male spouse; 100,000 cases are simulated

For female retirees, the potential benefits from SBP further diminish when one considers the typical age difference between spouses. Table 3 shows census figures for the age differences between spouses. This data, which applies to the U.S. population, implies a typical age difference just short of three years; more specifically, for an average couple, the male tends to be almost three years older than the female. Naturally, this has important implications for our analysis. Fig. 9 displays how the two cash flow streams change from Fig. 8.

Table 3 Distribution of spousal ages

Based on Census table FG3 (2002) (per 100 k marriages)		
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%

Notes: 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.

The age difference reduces the premiums paid in somewhat, with the average number of years paid-in declining to 23.6 years. While this is significant, the biggest change is in the decline in the expected payout of SBP benefits. The retiree can now be expected to outlive their spouse approximately 66.5% of the time. Note that the percentages from Case 3 are close to those cited by SSA researchers. For example, Bridges and Choudary (2005) suggest that spouses outlive their spouses about 75% of the time.

For Case 3, the implied discount rate explaining the two cash flows in Fig. 9 now declines to approximately 1.90%, a rate that might be achieved using TIPS. Absent personal health or trust considerations, the typical three-year difference appears to define an important break point in terms of whether female retirees should opt for the SBP plan. Table 2 summarizes each of the three cases examined here in detail. We include a number of extra cases to

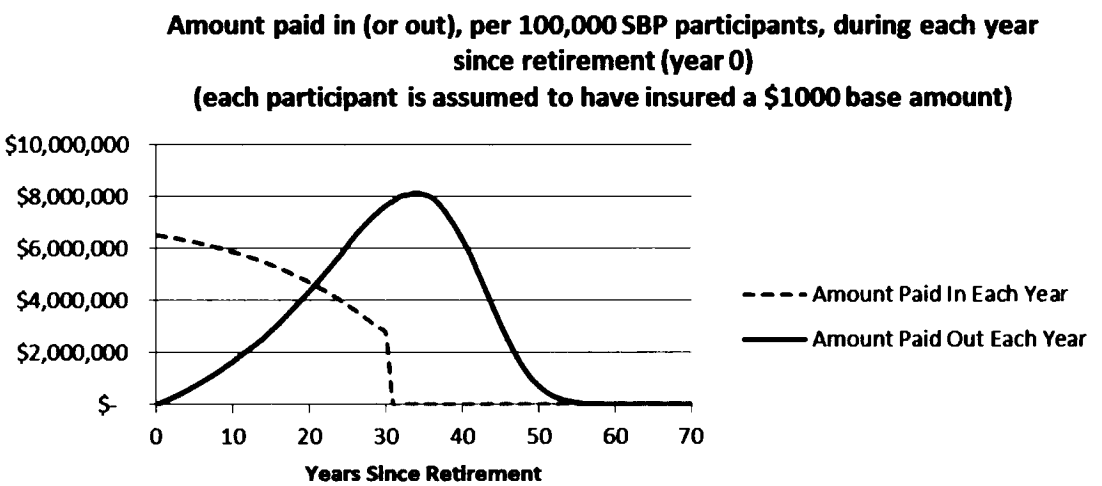

Fig. 9. Timing and amounts of SBP costs and benefits (45 y/old female retiree, 48 y/o male beneficiary).

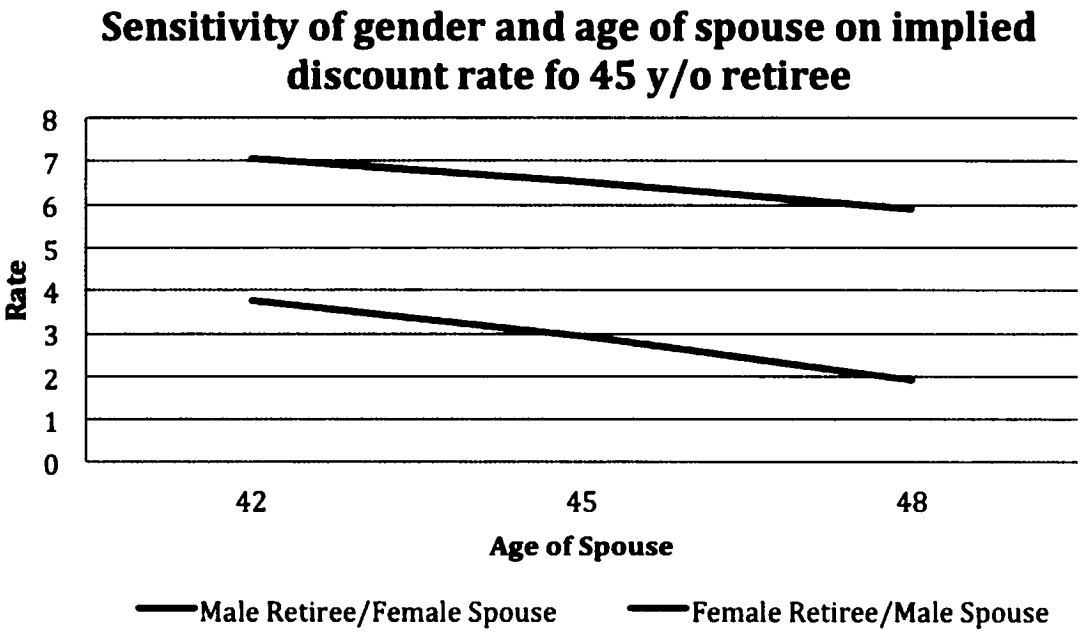

Fig. 10. Sensitivity of Implied discount rate by gender and age of spouse (45 y/o retiree).

provide additional insight. In an effort to better illustrate the relationship of spousal ages and genders on the implied discount rate, we graph six of the cases in Fig. 10.

5. Implications for retirees and planners

The results of our study have implications for retirees and planners alike. We create useful numeric and graphical representations framing the SBP decision. These results will greatly help retirees to understand the program and aid planners in explaining the program. The results have economic significance as well. Burrelli (2011) notes that in FY09 more than 850,000 participants were paying into the program; cumulative payout from the program exceeds $43 billion. Further, the analysis presented here can aid planners who must consider the myriad of payout options associated with many defined-benefit plans found today. The simulation framework utilized here can be altered to conduct many types of scenario analysis.

However, our results are a starting point. As noted above, 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 a child after the age of 38, or has a child with significant disabilities, a special program covering children could again change the general situation described here. Further research is also needed to construct tables that address sub-segments of the married population. For example, in using Social Security tables, there is an assumption that deaths are independent. However, research on couples suggests that spouses influence one another in terms of longevity. Drefahl (2010)

found that married men generally live longer than single men. Neimann and Dortmann (2010) produced similar findings; specifically, married men seemed to be more attentive to medical issues, exercise, and diet. In addition, the death of the first spouse often impacts the life expectancy of the surviving spouse, for reasons that aren't always clear (Elwert and Christakis, 2008). Building these interdependencies into the SBP decision analysis would substantially improve the discussion.

The need for addition research is driven in part by the fact that health interdependencies are not amenable to a 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, because it seems to increase the hazard rate of the surviving spouse substantially. Note, however, that 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 shared the habit of smoking. These interactions are best handled on a case-by-case basis. The importance of having an advisor address death interdependencies can be demonstrated by applying the increased odds discussed by Elwert and Christakis (2008) to our case of a 45 year-old male retiree with a 45 year-old female spouse. Averaging across all cases and types of death interdependency we found the following numbers: If the retiree dies at age 50, the spouse's life expectancy is 1.3 years less than what is predicted using the Social Security tables; if the retiree dies at age 60 the spouse's life expectancy is reduced by 1.1 years; if the retiree dies at age 70 the spouse's life expectancy is reduced by 0.8 years. These general numbers, averaging the interdependency numbers from all causes of death on the part of the retiree, illustrate that these interdependencies can change the survivor benefit decision—and for certain causes of death the reduction in life expectancy is much higher.

However, another consideration for further research on subpopulations concerns the difference in life expectancies based on rank at the time of retirement. For example, as noted by Edwards (2008), officer retirees live on average almost four years longer than enlisted retirees. Pending further work on subpopulations, our current research serves as a robust starting point for the survivor benefit decision.

Notes

1 Defense Finance and Accounting Service (DFAS). The change to a 30 year maximum payment is explained at: http://www.dfas.mil/rna-news/october2008/paid-uprsfppandsbpupdate.html. The change to SBP social security offset is explained at: http://www.dfas.mil/rna-news/may2007/sbpannuity.html.

2 Fiscal year 2009 military retirement fund audited financial statements. See: http://actuary.defense.gov/cfo2009.pdf.

3 Social Security Administration. Period Life Table, 2006. Actuarial publications. See: http://www.ssa.gov/OACT/STATS/table4c6.html.

4 See Jennings and Reichenstein (2003) for a detailed explanation of the approach as well as example discount factors for various ages and discount rates.
5 The SBP program will cover a new spouse, but for the purposes of this article we will take the more conservative approach of ignoring additional marriages.
6 The present value of premiums paid is simply the present value of an annuity. We find the present value of the benefit stream as the present value of an annuity over the period when benefits are paid; further discounted as a lump sum over a period equal to the timeframe over which the premiums were paid.

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