Post-Retirement Discounting in Estate Loss Calculations and the Net Discount Rate

Fred Abraham and David R. Hakes*

ABSTRACT. We show that the accumulations to an estate from premature death should be discounted from the time of projected death rather than from retirement. We provide evidence that in most cases an estate does not grow, and is most likely stable, from the time of retirement to that of projected death. We then calculate the overstatement of the loss to the estate when a forensic economist mistakenly discounts the accumulations to the estate from the time of retirement instead of projected death. We also demonstrate that the use of a net discount rate to discount from retirement to projected death overstates the loss to the estate because a net discount rate implicitly assumes a positive growth rate in the nominal estate from retirement to projected death. (E43, K13, J26)

I. Introduction

Forensic economists are often called upon to evaluate the loss to an estate because of premature death. Depending on circumstances, the elements of the loss can be many or few. This paper will focus on instances where the loss is confined to the loss to the estate. The loss to the estate is the present discounted value of the accumulation that would have been generated had the deceased experienced a typical work life and death. The analysis we present in this paper applies to the case of death to a child who had not entered the labor force or started a family. It also applies to those cases of a single adult with no dependent survivors. The analysis may also apply to other more complex cases. We have, however, chosen to address these simple cases in order to better focus on the specific issue which we will develop below.

Conceptually, calculating the present value of the estate loss begins with a starting income imputed to the deceased which is then allowed to grow until retirement age. Each year, a certain portion of that income is set aside and considered accumulation to the estate. These annual amounts are grown at interest until some future date of retirement. This accumulation is then discounted to the present. That sum is considered

*Department of Economics, University of Northern Iowa, Cedar Falls, IA 50614-0129. Phone: (319) 273-2412. E-mail: f.abraham@uni.edu; hakes@uni.edu.

to be the present value of the loss to the estate because of the premature death. Note that this calculation requires the forensic economist to make assumptions regarding the treatment of the estate from retirement to projected death. First, should the estate be discounted to the present from the time of retirement or the time of projected death? Second, does the nominal value of the estate grow, stay constant, or decline from retirement to projected death?

With regard to the first question, because the estate is not realized until the time of projected death, forensic economists generally agree that the sum of the yearly accumulations should be discounted from the time of projected death rather than at retirement. Thus, while the mistake of discounting the estate from the time of retirement rather than death is rarely intentionally committed, we will show that this mistake is often accidentally committed due to the use of a common method of discounting. The second question regarding the nominal growth rate of the estate from retirement to projected death is not generally agreed upon. Therefore, we will address this issue below.

II. Post Retirement Accumulation Assumptions

There are several ways to treat the accumulation to the estate from the time of retirement to projected death. First, we can assume that the estate would continue to grow from retirement to projected death. Second, we can assume that the estate would remain constant. And third, we can assume that the estate declines. We will address these possibilities in nominal terms.

Assumption 1: Increased Estate Size after Retirement

Estates grow over time from two sources: Accumulations due to allocations from current income, and earnings on past accumulations. Since current income usually declines significantly in retirement it would be expected little additional contributions to the estate would accrue from this source but they could still occur. Earnings from past accumulation could be positive and contribute to the estate size so the estate at projected death could be higher than at retirement.

Assumption 2: Constant Estate Size after Retirement

Since current earned income usually declines after retirement and retirees still have living expenses, it is not unusual for retirees to live off any accrued pensions and Social Security benefits, frequently supplementing that with any income earned from past accumulations. In fact, it is not unusual for retirees to spend all income earned from an accumulation while making a point to not reduce the estate. Protecting the "nest egg" is a fairly common phenomenon. The nominal value of the estate at retirement is then equal to that at projected death.

Assumption 3: Decline in Estate Size after Retirement

In this case, in addition to living off any pensions, Social Security, and earnings from accumulation, some of the prior accumulation itself would be spent, resulting in an estate that is smaller at death than at retirement.

III. Evidence

Which assumption does the data support? The most cited study regarding wealth accumulation or decumulation after retirement is Hurd (1990). Utilizing data from the RHS (Retirement History Survey) he finds that singles have a reduction in their wealth in the first ten years after retirement of -36.4% for an annual rate of reduction of -4.5%. Couples have a reduction of -14.5% over the first ten years for an annual rate of reduction of -1.6%. Both groups together have a reduction of -27.3% over the first ten years after retirement. If we include housing in household wealth, the measure of the rate of decumulation is reduced, but both groups still have a reduction in their wealth, generating a combined reduction of -13.9% over the first ten years after retirement. Utilizing data from the HRS (Health and Retirement Survey) Poterba, et. al. (2011) find that there is a small decline in the financial assets for most households in the decades after retirement. Venti and Wise (2004) also find a small draw down of wealth during retirement. Smith, et. al. (2009) find that the middle three quintiles of the wealth distribution report relatively stable net worth in retirement, while the lowest quintile draws down its wealth and the highest quintile continues to accumulate.

In summary, there is strong evidence that the estate for most retirees is either stable or declining in the post-retirement period, except possibly

for the highest quintile of the wealth distribution. It would appear Assumption 1 would be the least reasonable, occurring in, at most, about 20% of the cases studied.

IV. Differences in Estate Value Calculations

The summation of the present values of each annual accumulation is easily done in a spreadsheet. The evidence suggests that most of the time the nominal value of the estate stays approximately the same from retirement to projected death. That is, 60% of the time (middle three quintiles of the wealth distribution) assumption 2 is most supported by the data. *Therefore, under assumption 2, the present discounted value of the estate at projected death will always be smaller than the present discounted value of the estate at retirement.* Thus, calculating the present discounted value of the estate from retirement instead of from projected death overstates the estate loss. The problem of the overstatement of the estate loss is even larger under assumption 3 (that the nominal value of the estate actually declines during retirement) but we will limit our analysis to assumption 2, the most likely case supported by the data.

V. Magnitude of the Difference when Discounting from Retirement vs. Projected Death

We have argued that estates should be discounted from the time of projected death rather than from the time of retirement. Employing assumption 2 (the nominal value of the estate is constant from retirement to projected death) we calculate the amount of overstatement of the loss to the estate when the forensic economist mistakenly discounts the estate from the date of retirement instead of projected death. Table 1 shows the amount of overstatement depending on various values of the time between retirement and projected death and discount rates assuming the nominal value of the estate remains constant from retirement to projected death. For example, if the nominal discount rate used is 3% and the time between retirement and death is 12 years, the present discounted value of the estate should be reduced to about 70% of the value that would have been calculated had the estate been incorrectly discounted from retirement.

TABLE 1–Necessary Adjustments to Estate Present Value Discounting from Projected Death versus Discounting from Projected Retirement*

		NOMINAL DISCOUNT RATE						
		0.01	0.02	0.03	0.04	0.05	0.06	0.07
YEARS FROM RETIREMENT TO PROJECTED DEATH	1	0.990	0.980	0.971	0.962	0.952	0.943	0.935
	2	0.980	0.961	0.943	0.925	0.907	0.890	0.873
	3	0.971	0.942	0.915	0.889	0.864	0.840	0.816
	4	0.961	0.924	0.888	0.855	0.823	0.792	0.763
	5	0.951	0.906	0.863	0.822	0.784	0.747	0.713
	6	0.942	0.888	0.837	0.790	0.746	0.705	0.666
	7	0.933	0.871	0.813	0.760	0.711	0.665	0.623
	8	0.923	0.853	0.789	0.731	0.677	0.627	0.582
	9	0.914	0.837	0.766	0.703	0.645	0.592	0.544
	10	0.905	0.820	0.744	0.676	0.614	0.558	0.508
	11	0.896	0.804	0.722	0.650	0.585	0.527	0.475
	12	0.887	0.788	0.701	0.625	0.557	0.497	0.444
	13	0.879	0.773	0.681	0.601	0.530	0.469	0.415
	14	0.870	0.758	0.661	0.577	0.505	0.442	0.388
	15	0.861	0.743	0.642	0.555	0.481	0.417	0.362
	16	0.853	0.728	0.623	0.534	0.458	0.394	0.339
	17	0.844	0.714	0.605	0.513	0.436	0.371	0.317
	18	0.836	0.700	0.587	0.494	0.416	0.350	0.296
	19	0.828	0.686	0.570	0.475	0.396	0.331	0.277
	20	0.820	0.673	0.554	0.456	0.377	0.312	0.258

*Table assumes no estate change after retirement

This correction is no trivial amount as the following examples in Table 2 show. For illustrative purposes, we provide simple examples for a death occurring at ages 20, 40 and 60. Our examples use a nominal rate of income growth of 2.5% and a discount rate of 4%, and an average accumulation rate of 10%. We assume a retirement age of 67. There are a variety of other variables that can be included but have been ignored for these examples. Including them as well as using different assumed values would alter the dollar values in the examples. It is not the point of this exercise to argue the merits of the assumptions. It is only to show how improper post retirement discounting can alter the amounts of a loss.

TABLE 2–Overstatement of Present Value of Estate Loss*

Actual Death	Annual Starting Income	Annual Accumulation	PV at Retirement	Age of Proj Death	PV at Proj Death	Loss Over Statement
20	$26,078	$2,608	$86,031	79.5	$52,691	$33,340
40	45,370	4,537	98,142	80.6	57,571	40,571
60	47,294	4,729	30,488	83.1	16,214	14,274

*Accumulation of 10% of gross income. Starting incomes from US Dept. Of Commerce, 2014.

For example, if a 40 year old deceased person is projected to earn $45,370 with an annual nominal increase of 2.5% and an accumulation rate of 10% until projected retirement at age 67, the present value of the estate discounted from time of retirement would be $98,142. Discounting from the life expectancy of 80.6 to present value yields $47,571 for an overstatement of the present value of the estate loss of $40,571.

VI. Implications of the Use of Net Discount Rates

Rather than do the calculations individually, that is, first do the growth and then the discounting, it has become common to use a net discount rate (NDR) to do the calculations simultaneously. Mathematically, the NDR is calculated by

$$\frac{(1+g)^t}{(1=i)^t}$$

where g is the nominal growth rate of the annual accumulation, i is the nominal discount rate, and t is the number of years of accumulation.[1]

The advantage of using a NDR is that it does two calculations simultaneously. It grows an amount and discounts the result in one step. However, using it to discount an estate from retirement to projected death makes implicit assumptions about post-retirement accumulation. That is, the use of a NDR *implicitly assumes the nominal value of the estate grows post-retirement*. But, recall that the evidence does not support a growing nominal value of the estate post-retirement for the average estate. Thus, the NDR overstates the value of the loss to the average estate.

The size of the overstatement of loss depends on the size of g and i. In the special case of assuming the nominal growth rate of the estate is exactly equal to the discount rate ($g = i$) the use of a NDR will generate the same present value at retirement as it would at projected death. Therefore, comparing this result to the baseline case of assuming no nominal growth in the estate from retirement to death (assumption 2 which is supported by the data) we find that the use of this special case NDR overstates the loss to the estate to be precisely equal to the values generated in Tables 1 and 2. If the assumed growth rate is less than the discount rate, the overstatement will be less than that demonstrated in Tables 1 and 2, but a NDR will still generate an overstatement because of the implicitly assumed positive nominal growth to the post-retirement estate. The only case when the use of a NDR fails to overstate the loss to the estate is when the NDR is set equal to the discount rate, which implies that the growth in the estate from retirement to projected death is zero. That is, this case reverts to the case of no nominal growth in the post retirement estate.

For all of these reasons, we argue the forensic economist should specify both the assumed nominal growth rate and the assumed discount rate when using a NDR. Then the post-retirement growth in the nominal value of the estate can explicitly be held to zero while the estate is discounted from retirement to projected death and the loss to the estate will not be overstated.

VII. Summary

We argued the accumulations to an estate from premature death should be discounted from the time of the projected death rather than from retirement. We cite evidence that in most cases an estate does not grow, and is most likely stable, from the time of retirement to that of projected death. We then calculate the overstatement of the loss to the estate when a forensic economist mistakenly discounts the accumulations to the estate from the time of retirement instead of projected death. We also demonstrate that the use of a NDR to discount from retirement to projected death overstates the loss to the estate because a net discount rate implicitly assumes a positive growth rate in the nominal estate from retirement to projected death. Indeed, in the special case of a NDR where the growth rate equals the discount rate, the overstatement is precisely equal to that of mistakenly discounting the estate from the time of retirement. If the average estate actually declines from retirement to death, then the use of a NDR overstates the loss to the estate even more than we have argued in this paper.

We argue that forensic economists should specify both the growth rate and the discount rate when using a NDR. This allows for correct calculation of the estate in the post retirement period by holding constant the nominal value of the estate. In some cases, the difference between the technically correct results and those obtained from the use of a NDR may be small. But opinions of forensic economists are carefully scrutinized and subjected to challenging debate. If a mistake is made in reasoning, it can call into question the credibility of all statements made, including an entire report. Thus, it is of critical importance that calculations be methodologically correct.

References

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Endnotes

1. It is sometimes convenient to calculate a NDR by simply subtracting *g* from *i*. While not strictly mathematically correct, the resulting differences in calculations are not large. The appropriate NDR has been the subject of considerable discussion and debate. As a result, the National Association of Forensic Economics regularly surveys its membership as to what values they are using, and responses vary. It is not the point of this paper to delve into the appropriate NDR but only to remind the reader it does ultimately and critically depend on the values assigned to *g* and *i*.