

## PERSPECTIVES

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# Most People Need Longevity Insurance rather than an Immediate Annuity

Don Ezra

*An immediate annuity is precisely the sum of two parts. One is a deferred annuity commencing at a specified date, with no death benefit before that date. The remainder, before the deferred annuity commences, is a reverse whole life insurance policy with limited premiums. That reverse policy is effectively one underwritten by the annuitant, with the insurance company as beneficiary—a policy that benefits few retirees. However, the deferred annuity (called “longevity insurance” in the literature) is a valuable component of a retirement portfolio that supplements components that focus on safety and growth.*

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**W**e are now aware that a large number of people will want to retire in the next decade or so and that they are worried about whether they will outlive their savings. Increasingly, investment literature focuses on this issue.

The seminal paper on generating income after retirement is by Yaari (1965), who found that an immediate annuity is invariably the best solution, maximizing utility in the face of uncertain longevity.

Ameriks, Veres, and Warshawsky (2001) showed, using history and Monte Carlo simulations, that by including immediate annuities in their retirement portfolios, retirees trade the possibility of extremely large accumulated wealth levels for a greater degree of certainty that their portfolios can generate income throughout their lifetime. In effect, the annuity dampens future uncertainty.

Dus, Maurer, and Mitchell (2005) looked not only at the probability that a specified withdrawal rate or formula will result in a shortfall of assets after retirement but also at the size of the shortfall. One of their (many) conclusions is that there is an advantage to allowing withdrawal flexibility until an advanced age (such as 75 or 85)—if the portfolio includes a deferred annuity that kicks in at that age if the retiree is still alive.

Moshe Milevsky has written extensively on many aspects of post-retirement finance. Milevsky and Robinson (2005) introduced the concept of the

“stochastic present value of spending.” Just as an insurance company’s reserving process combines future payments with mortality tables, investment returns that reflect asset allocation, and a high probability of reserve adequacy, so too can sustainable post-retirement spending be backed out of a personal reserving process in which the assets constitute the reserve.

Scott (2008) introduced the “spending improvement quotient (Q)” as a natural explanation of the superior characteristics of an immediate annuity. To the extent that there is any possibility—no matter how small (and there always is this possibility)—that an individual will not survive to require a withdrawal from her savings at some future date, an annuity will improve her spending power relative to self-insurance (meaning *saving all her money for a drawdown*) because she may only need the withdrawal with, say, 99% probability, rather than the 100% that underlies self-insurance. Why pay unnecessarily for that 1% difference? Scott’s Q is essentially determined by the cumulative probability of death. Of course, until relatively late in life, this cumulative probability may be less than the margin or loading added by an insurance company to cover its expenses, contingency reserves, and profits, but eventually, the annuity will show its economy.

Ezra (2011) showed that after age 75, the financial impact of uncertain longevity exceeds, for most people, the financial uncertainty of being 100% invested in equities. Again, this argument is for annuities, eventually.

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These are just a few of the many notions found in the literature. They all involve the positive effects of some form of annuity in a retirement portfolio. Yet immediate annuities are voluntarily purchased by only a tiny proportion of retirees (except, apparently, in Chile), which is “the annuity puzzle.”

Scott (2008) mentioned the “longevity annuity” as a more palatable solution. It is essentially a deferred annuity purchased today but with payments commencing at some future date if the purchaser is then alive—but with no payments if the purchaser does not survive to that pre-specified future date.

In this article, I examine the financial composition of an immediate annuity and show that it is exactly the sum of two separate products: a longevity (deferred) annuity and a reverse whole life policy, under which the immediate annuitant actually underwrites a whole life policy on his own life. The incongruity of activating this second component surely plays some part in explaining the annuity puzzle.

I also show that an immediate annuity is nevertheless optimal for a particular set of financial circumstances.

I hope that these two contributions will help prospective retirees make sensible decisions for themselves and will encourage insurance companies to offer longevity annuities. At present, I believe they are available in the United States but not, for example, in the United Kingdom, Canada, or Australia, where the need is just as great.

## Conceptually, an Immediate Annuity Is the Sum of Two Products

First, it is important to note that the numbers I use in this article are not important in themselves; they simply serve to make the explanation easier to follow.

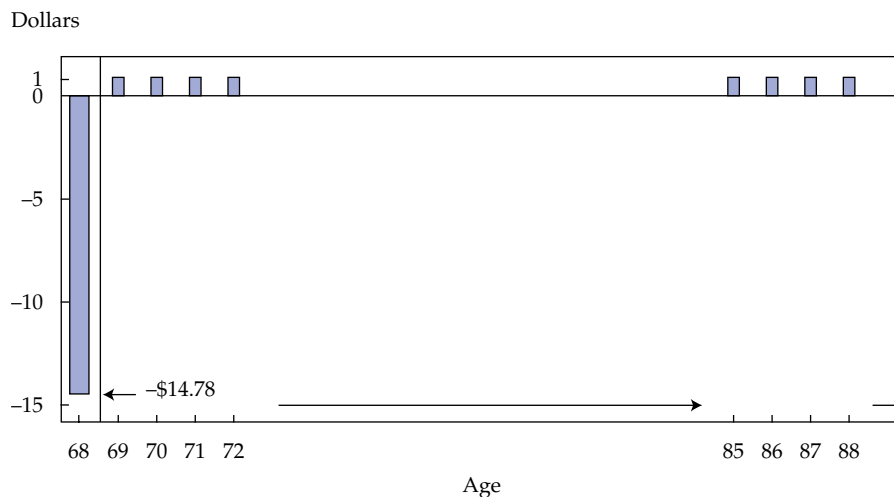
Let’s price an immediate annuity for a 68-year-old male. I use longevity according to a Canadian annuitants’ table and an interest rate of 2.5% a year as the fixed rate of return built into the contract. For convenience, I assume that the insurance company makes payments once a year, starting today. I ignore the fact that the insurance company will have to make further allowances (“loadings”) for setting up its reserves, for its costs, for profits, and for overestimating longevity so that its guarantee is highly likely to be met. And to make my calculations easier, I ignore the traditional spouse-linked “joint and last survivor” feature; it does not add any new principles.

For our 68-year-old male, the cost of providing \$1 a year is a lump sum of \$14.78. The payments are illustrated in **Figure 1**. Here, the purchaser pays \$14.78 (shown as a negative payment) and receives \$1 a year (shown as positive receipts) until death.

With that mortality table, roughly half of 68-year-old males like our purchaser will die before age 86 and roughly half after age 86. For convenience (I will explain later why this may be a sensible choice), let’s suppose the purchaser wants to self-insure until age 85 and to buy a longevity annuity that kicks in after age 85. How much does this cost?

Using the same 68-year-old male, the same 2.5% interest rate, and no additional insurance company loadings, insurance that pays \$1 a year starting at age 85 and continuing thereafter for life costs \$2.53 today.

**Figure 1. Cash Flows with an Immediate Annuity**



Remember that the immediate annuity costs \$14.78. So, the longevity annuity costs 17% of what an immediate annuity costs.

The payments are illustrated in **Figure 2**; I call these payments the “back half” of the immediate annuity.

A natural question arises: What is the remainder (the “front half”) of the immediate annuity, the payments shown in **Figure 3**? It is a product under which the insurance company pays \$1 a year, continuing while the purchaser is alive up to a maximum of age 84, and the purchaser pays \$12.26 up front.

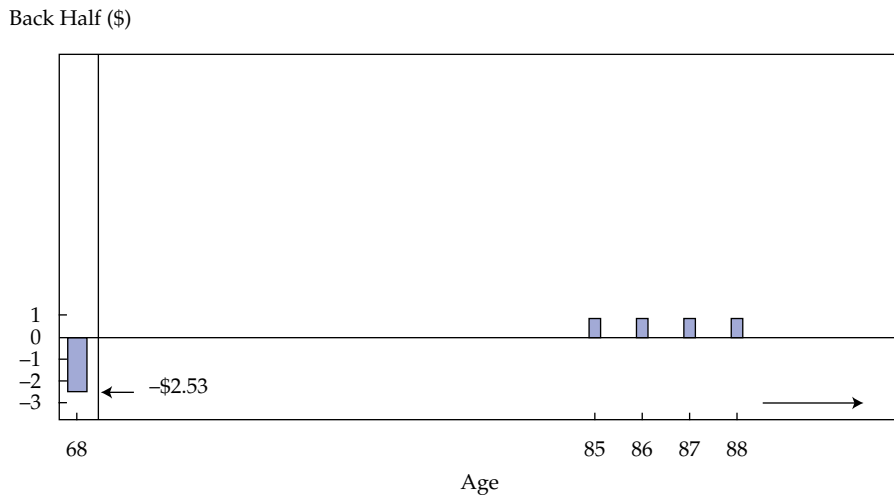
In fact, this is a reverse whole life policy, with a couple of twists. To see why, look at **Figure 4**. Here, we see annual premiums paid by the purchaser of a whole life policy, along with the lump sum assured paid at death by the insurance company. Simply for illustration, I have shown death occurring at age 90. The relevant numbers are \$100 paid at death and a required annual premium of \$4.43.

Compare Figure 4 with the front half. It differs in three ways.

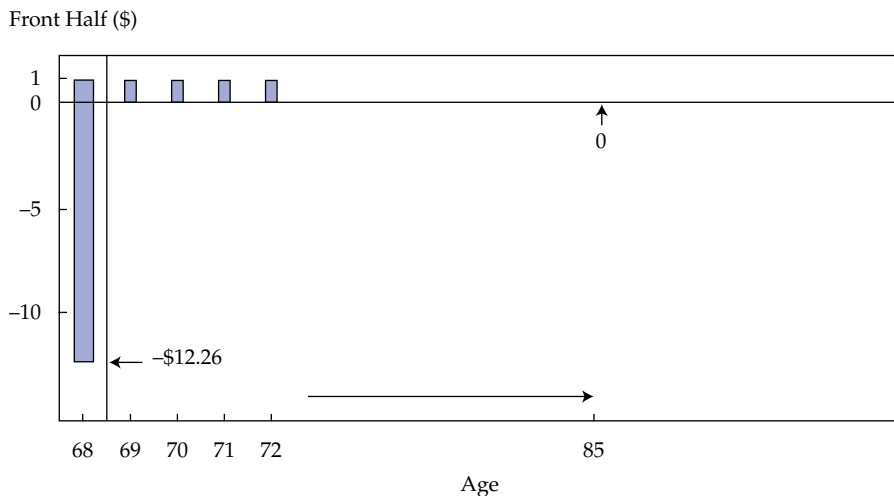
The first, and most obvious, difference is that the front half involves a lump sum paid by the purchaser and annual amounts paid by the insurance company—exactly the reverse pattern relative to traditional insurance. That is why it is the equivalent of the purchaser underwriting a policy on his own life.

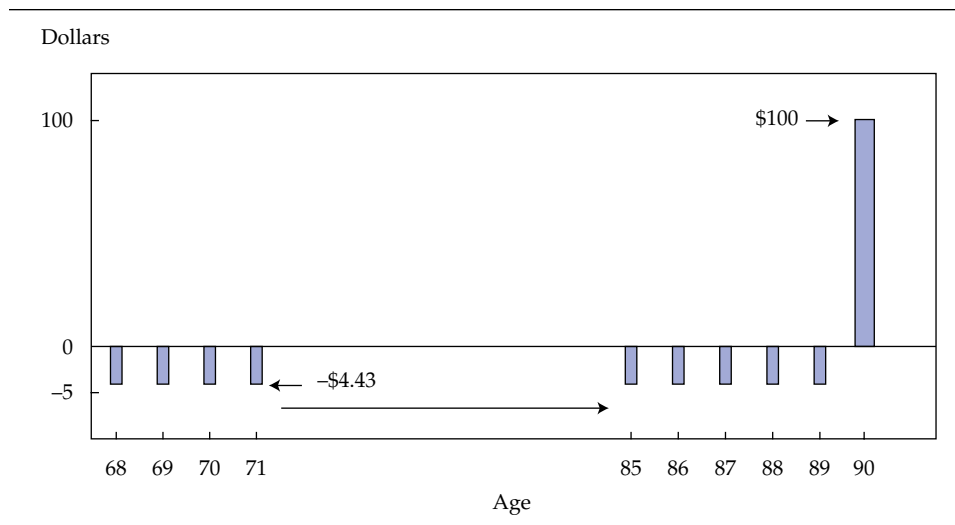
A second difference is that in the front half, the annual payments do not go beyond age 84, whereas in Figure 4, they continue until death. This feature is called “limited premiums.” The purchaser could arrange for the amount of whole life premiums to be slightly increased so that if he survives to age 85, the premiums cease. That’s a “whole life with limited premiums.” Actuaries do the calculation easily. They know that the present value of a lifetime’s worth of \$1 a year is \$14.78, whereas the present value of \$1 a year to an age no greater than 85 is \$12.26 (the

**Figure 2. Cash Flows with a Longevity Annuity**



**Figure 3. Cash Flows from the Front Half of an Immediate Annuity**



**Figure 4. Traditional Whole Life Insurance**

lump sum for the front half). So, they increase the premiums in the ratio  $14.78/12.26$  and charge \$1.21 instead of \$1 for premiums ceasing before age 85.

The third difference between Figure 4 and the front half is that in Figure 4, the lump sum is paid at death, whereas in the front half, it is paid at the start. Surely that is not a whole life policy—right? Actually, it is. The lump sum assured could be paid at the start or at the end as long as the two amounts are actuarially equivalent. It turns out that with a 2.5% interest rate and the longevity table I used, the equivalence factor is 0.6554; in other words, \$0.6554 at the start is actuarially equivalent to \$1 at death. So, if \$12.26 is payable at the start as a lump sum, it is equivalent to  $\$12.26/0.6554 = \$18.71$  payable at death.

So, with those two equivalencies, we can convert the front half to a (reverse) traditional whole life policy. Instead of \$12.26 at the start, we can use \$18.71 paid at death. And instead of \$1 a year to age 85, we can use \$0.83 a year until death (at any age). Scale these numbers up for a lump sum assured of \$100, and we get an annual premium of \$4.44. Except for the rounding of the decimal places, that is exactly the same as in Figure 4.

Yes, the front half is indeed a whole life policy on our 68-year-old life, taken out by the insurance company (because it is the party making the annual payments, in Figure 3) and underwritten by the purchaser (the party paying the lump sum assured). The two twists are (1) the premiums are slightly increased to ensure that they can stop by age 85 and (2) the purchaser pays the lump sum assured up front because, frankly, it is more convenient for the insurance company to take the money now than to settle with the estate after the purchaser's death. (In effect, the policy is doubly reversed, in both the direction and the sequence of the cash flows.)

And that is the arithmetical demonstration of what the front half of an immediate annuity really is.

## What Most People Desire Financially, after Retirement

Why would any purchaser of an immediate annuity want to be involved with a product like the front half? Actually, it could make sense. Let's start by seeing what kinds of financial arrangements are desirable after retirement.

At one extreme of the retiree spectrum are those with assets (meaning total assets, not just retirement assets) so large that there is no chance of their ever outliving their wealth. They have the freedom to make numerous choices and have no longevity risk. Longevity insurance is unnecessary for them.

At the other extreme are those with assets so small that, together with their national retirement plan (such as US Social Security or the Canada Pension Plan), they have barely enough for their essential needs. They have virtually no choices available to them.

Most retirees—the middle-of-the-road retirees, being at neither of these extremes—by definition have enough money to make choices but not so much that longevity risk does not matter to them. So, they have three broadly defined goals.

One is safety. It is well known that the average retiree is much more risk averse than the average worker because there is no further opportunity to add to wealth by working longer.

The second is growth. By definition, these retirees do not have enough money to be sure that it will last the rest of their life. So, they would love to have their portfolio grow in the hope that they can sustain their desired lifestyle longer or even end up in the top extreme category.

And of course, the third is longevity insurance because (again by definition) they cannot be sure they will not outlive their money.

How to balance these three goals is a fundamental question.

## The Characteristics of an Immediate Annuity

Those with assets large enough to never outlive them do not need longevity insurance, yet they may well find an immediate annuity attractive because it has two fundamentally important characteristics.

One is that it is essentially a fixed-income contract. The insurance company's reserves are based on matching the projected guaranteed payment stream with fixed-income investments, and annuities, therefore, are priced off available fixed-income contracts. To the extent that the asset owner wants to hold some portion of her assets as fixed income, an immediate annuity might make an attractive choice. The main reason for this is based on the second important characteristic of immediate annuities: that (if we ignore the insurance company's loadings) they offer the cheapest form of guaranteed lifetime income, the form that maximizes Scott's spending improvement quotient,  $Q$ .

Immediate annuities for any group of people are based on risk pooling. Using a mortality table (I confess that, at my age, I prefer to think of it as a longevity table!), the insurance company projects the gradual decline in the payments guaranteed as deaths are projected to occur. Each purchaser is charged the appropriate share of the aggregate initial amount required to match the payment stream with fixed-income contracts. An exact match means that everybody pays exactly as much as her mortality prospects require—99% of the guaranteed payment if the probability of receiving the payment is 99%, 10% if the probability is 10%. This necessarily maximizes Scott's  $Q$ .

Self-insurance (for example, retaining enough assets to ensure sufficiency until some advanced age, such as 100) implies reserving 100% of the guaranteed payment until the advanced age, which is necessarily greater than the corresponding assets required for the insurance company's reserves. And it also implies failure if the person outlives the advanced age.

Therefore, unless the insurance company's loadings are so high as to make  $Q$  negative, the immediate annuity is cheaper than self-insurance.

Of course, I have oversimplified the comparison. In practice, one also has to take into account the possibility that the insurance company will fail and has to make an estimate of the proportion of the remaining guaranteed payments that are likely to be

paid after failure. (Failure does not mean that 0% will be received, just that the reserves are inadequate to meet 100% of the payments. Reinsurance and other arrangements will also become relevant.)

My point is not to get into these complexities but simply to explain why immediate annuities may be desirable. And there are numerous other uses to which annuities can be put, involving, for example, tax and bequest motives.

## Balancing the Three Goals

Let's return to the middle category of retirees mentioned earlier, those with sufficient assets to have choices but not enough to finance their desired lifestyle to the final age of the mortality table. If we consider such people as one-person or one-couple pension plans, comparing their assets with the amount required to buy an annuity that guarantees their future desired lifestyle, my definition of their category implies that their personal funded ratio is below 100%.

They already have pre-annuitized assets in the form of Social Security and its counterparts in other countries. Some literature deals with how to maximize the after-tax utility of these arrangements to an individual or couple—for example, by varying the age of commencement—but I will not go further into this issue because the conditions vary substantially from country to country. I mention them only to make the point that, implicitly, most retirees in developed countries already have immediate annuities.

Those who are most risk averse with regard to investment fluctuations may buy immediate annuities with all their remaining assets—if they are prepared to ignore inflation (since most available annuities have nominal rather than inflation-linked guarantees) and also if they prefer to downsize their desired lifestyle permanently to what is affordable. In essence, downsizing their lifestyle enables them to increase their personal funded ratio to 100%.

It appears that most retirees do not fall into this category. They appear to hold some proportion in growth-type assets, such as equities, in the hope that the risk premium materializes and raises their personal funded ratio to 100%—exactly as most defined benefit pension plans do.

Some of these retirees may still want to secure the essential elements of their lifestyle with an immediate annuity and leave the desired elements underfunded but partly backed by growth assets. Again, from the paucity of voluntarily purchased immediate annuities, it appears that most retirees do not do this.

Although it may make good sense for retirees to hope for some growth in their future personal funded ratio, one important difference between them

and the typical pension plan is that if the typical plan has a sufficiently large retiree population, it can undertake longevity risk pooling across its retirees. But an individual or a couple cannot.

And that is where deferred annuities come into play. They pool the greatest part of the longevity risk exposure, the part at the oldest ages, when longevity uncertainty is greatest (relative to expected, or average, future longevity). In fact, for the average retiree (in the middle category), only a longevity (deferred) annuity makes sense, not an immediate annuity.

## Why Buy Longevity Insurance rather than an Immediate Annuity?

In addition to the limited purposes described earlier, a common-sense perspective provides another reason why longevity insurance is the most sensible way to proceed.

Go back to first principles. What are insurance risks that we do not mind paying for? (For those who object to this way of expressing our attitude, let's say that these are the risks we least mind paying for.) I think of risks in terms of the matrix in **Exhibit 1**.

Risks can be classified into two broadly defined types. One type is risks that are likely to occur (high probability); the other is risks that are unlikely to occur (low probability). And think of their impacts, if they do occur, as being either high or low.

For risks that are likely to occur, the sensible course is to budget for them, whether their impact is high or low. For risks that are unlikely to occur and have a low impact if they do occur, we tend to ignore them in budgeting and cope with the minor adjustment in spending if they do occur.

It is the fourth quadrant that calls for risk pooling. It is for risks that are unlikely to occur but that will have a high impact if they do occur. We are used to this sort of risk in our daily lives—for example, fire insurance for our homes. According to statistics available via the internet,<sup>1</sup> the chance that a person's home will catch fire in any given year is far less than 1%. But if there is a fire, it can do enormous damage. So, we pool our risk exposure with others by buying a fire insurance policy. The premium (apart from the insurance company's loadings) is essentially the product of the probability of occurrence and the likely financial impact. And typically, the product is a small number. So, the premium tends to be small and acceptable, and if we do not have a claim, that

is just fine. Car insurance works in the same way, with the chance of our car being in an accident in a given year only around 6%,<sup>2</sup> but again with a high financial impact.

Now apply the same principles to long life. If we are likely to survive to a given year, we will budget for it, whether the necessary expenditure is high or low. (Yes, even if that does go against maximizing Q.) If we are unlikely to survive and the expense associated with survival is low, we will ignore it in budgeting and accept whatever the low cost is if it occurs. But what about that fourth quadrant, the one with a year we are unlikely to survive to but the financial impact is high if we do?

What sort of a year is that? Well, that depends on what we mean by a high probability or a low probability of survival. There is no definitive way to classify these probabilities. But there is a fairly obvious and easy way to draw the line between high and low probability, between likely and unlikely. And the dividing line is our life expectancy. Up to our life expectancy, we are likely to survive. Beyond our life expectancy, we are unlikely to survive. (For the technical reader, it is true that I am ignoring the difference between the mean age of survival, which is the life expectancy, and the median age, which is where the 50/50 probabilities split; in practice, it does not matter because, to the extent that deferred annuities are available at all, they tend to use a starting age that ends in 0 or 5.)

In other words, that risk-pooling quadrant is essentially the situation in which we outlive our life expectancy and the potential financial impact is high. That is where we want to pool our risk exposure; that is the risk we want to insure against. We want something that pays only if that risk occurs. If we outlive our life expectancy, we want to receive an income for the rest of our life. In other words, we want longevity insurance, a deferred lifetime income annuity. And to keep the cost as low as possible, we add that if the risk does not materialize (that is, if we do not outlive our life expectancy), we collect nothing (just like fire and car insurance).

Canadian deferred annuities, to the extent they are available at all, typically return the single premium, or the single premium plus interest, on death before the commencement date, which makes no financial sense. With a no-benefit-on-early-death deferred annuity, the entire single premium is pooled. With a benefit of return of premium plus interest, effectively there is no risk pooling in the deferred portion of the contract; it is a pure fixed-income investment followed by the purchase of an immediate annuity. With a benefit of return of premium, it is effectively only the interest that is placed in the risk pool. Any form of risk pooling that

### Exhibit 1. Risks and Financial Impact

	High Probability	Low Probability
High impact	Budget for the expense	Pool risk; buy insurance
Low impact	Budget for the expense	Accept disruption

places nothing or very little in the pool is wasteful and unnecessarily enhances the cost of the insurance. Therefore, zero death benefit in the deferral period makes the most sense.

The reason for having some death benefit in the deferral period is probably psychological—the desire to feel as though the premium has not been gambled away. As Hu and Scott (2007, p. 79) put it, “If annuity outcomes are separated from their impact on total retirement spending, then purchasing an [immediate] annuity appears to be a gamble that increases overall risk, rather than a form of insurance that can reduce risk.” But there really has been no gamble, no more than house or car insurance is a gamble. The real gamble exists only with an immediate annuity because of its first half—the reverse whole life insurance that the purchaser is underwriting.

As I mentioned earlier, most people do not buy immediate annuities. The so-called annuity puzzle is not a puzzle to me. If longevity insurance were widely available but still shunned, then that would indeed be a puzzle for social scientists to investigate.

## Please!

I end this piece with two pleas.

One is to financial advisers, who typically do not like annuities (for a variety of reasons): Please

recognize the huge risk-mitigating effect of longevity insurance. For many clients (and virtually every client in the middle category), it is much more effective than self-insurance because it enables the client to come closer to the desired lifestyle than self-insurance does, which surely is the goal. It is also far less expensive than the immediate annuities that are the real focus of your negative attitude and permits you to manage a client’s portfolio with a higher proportion of growth assets than is typically used.

The other is to life insurance companies: Please consider writing longevity insurance, the kind with no death benefit before the proposed annuity commencement date. It is a very valuable product for most retirees. And although it doesn’t balance the mortality risk of your traditional insurance (term and whole life) portfolio to the same extent that immediate annuities do, it still provides some balance. And if it sells, the balance is real, not just theoretical.

I am personally in the middle category of retirees. I am fortunate enough to be able to purchase a US deferred annuity. And that is exactly what I have done for my wife and myself.

CE Qualified Activity  CFA Institute 0.5 CE credit

## Notes

1. See [www.insure.com/home-insurance-faq/homeowners-insurance-odds-of-a-fire-claim.html](http://www.insure.com/home-insurance-faq/homeowners-insurance-odds-of-a-fire-claim.html).
2. See [www.forbes.com/sites/moneybuilder/2011/07/27/how-many-times-will-you-crash-your-car](http://www.forbes.com/sites/moneybuilder/2011/07/27/how-many-times-will-you-crash-your-car).

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