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Hedging Against Inflation Risk with Real Annuities

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ABSTRACT

The only retirement contract that both insures against longevity risk and hedges against inflation is a life annuity that is linked to the consumer price index (CPI). It is denominated in the same units of account as Social Security benefits and, unlike nominal annuities, its payments can be directly added to those benefits. The comparison of CPI-adjusted and nominal annuities often is incorrectly framed, using the nominal annuity as the baseline and interpreting the difference in initial payments as the "cost of insuring against inflation." We show that the correct framing of the analysis is to consider the CPI-adjusted annuity as the baseline and then to consider the additional income that might be generated by exposing the annuitant to inflation risk. We explain the flaws in comparing initial payments of the two types of annuities, note that CPI-adjusted annuities can hedge inflation rather than insure against it, and show that purchasing a nominal annuity is a speculative bet on future inflation rates.

NOMINAL ANNUITY PUZZLE

The only retirement contract that both insures against longevity risk and hedges against inflation is a life annuity that is linked to the CPI. It is denominated in the same units of account as Social Security benefits. We call it a "real annuity," although it is also referred to as an inflation-indexed single-premium immediate annuity (SPIA). In computing a person's replacement ratio of pre-retirement income, we can add Social Security benefits and the income produced by a real annuity to arrive at a meaningful number.

An annuity that is not linked to the CPI we call a "nominal annuity." It is measured in units that are different from Social Security, so it would be a mistake to add the two in computing a replacement ratio. Despite those obvious facts, real annuities are largely ignored in practice and they comprise a tiny portion of the annuities market. The vast majority of income annuities sold are fixed in nominal dollars. From the perspective of rational economic decision-making, this is a puzzle. Let's call it the "nominal annuity puzzle." The purpose of this paper is to explore the reasons behind this puzzle and to suggest ways to solve it.

Hedging eliminates the risk of loss by giving up potential for gain. In contrast, when we insure, we pay a premium to eliminate the risk of loss but we retain the potential for gain.

The lack of interest in real annuities can be explained by a lack of recognition that the purchase of a nominal annuity constitutes a speculative bet on future inflation rates and that the real annuity is the risk-free asset. Specifically, we disagree with advisors who suggest that:

- Nominal annuities should be the starting point for an analysis of the cost of real annuities;
- The cost of a real annuity is represented by its lower initial payment compared to that of a nominal annuity;
- Insurers don't offer real annuities because they don't want to accept inflation risk; and
- Graduated-payment annuities, which cost less than a real annuity, are an adequate inflation hedge.

There is only one U.S. insurer that offers income annuities with annual payments linked to the CPI—The Principal.[1] Two websites offer quotes for Principal SPIAs: ImmediateAnnuities.com and BlueprintIncome.com.

Some advisors suggest that insurers don't offer real annuities because they don't want to accept inflation risk. However, an institution can hedge the risk of inflation by purchasing Treasury Inflation-Protected Securities (TIPS),[2] or by means of inflation swaps or "CPI swaps."[3] The net result of combining a nominal annuity with an inflation hedge is a synthetic real annuity. Real annuities are not widely offered due to a lack of market demand and not because insurers can't hedge inflation risk.

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Hedging eliminates the risk of loss by giving up potential for gain. In contrast, when we insure, we pay a premium to eliminate the risk of loss but we retain the potential for gain. Real annuities hedge inflation risk; they do not insure it. This is an important distinction because hedging costs nothing (except for small transaction costs) while insurance can be quite expensive.

COST-EFFECTIVENESS OF REAL ANNUITIES

An analysis of the cost-effectiveness of real annuities will be influenced heavily by the manner in which the argument is framed. A common way of framing this annuity comparison is to assume that nominal annuities are the appropriate baseline and then to consider the "additional" cost of hedging inflation risk. This is opposite the way economists generally consider investment risk. We typically begin with the risk-free rate of return and then consider the wisdom of increasing the expected return from an investment by taking on additional risk.

Framing the analysis based on nominal annuities poses two problems. First, as previously mentioned, most Americans are entitled to Social Security retirement benefits and these are indexed to inflation. They are essentially a real life annuity. As such, nominal annuity payouts cannot be added directly to Social Security benefits to determine the household's expected income.

Second, framing the analysis with nominal annuities as the baseline implies that the difference between the initial payment of a nominal annuity and that of a similar real annuity can be interpreted as the cost of "inflation insurance." We will demonstrate the flaws in that interpretation and explain that inflation risk is hedged and not insured.

The correct framing of the comparison of real and nominal annuity payouts is to treat the real annuity as the risk-free asset and then consider the additional payout that is implied by exposing the annuitant to inflation risk.

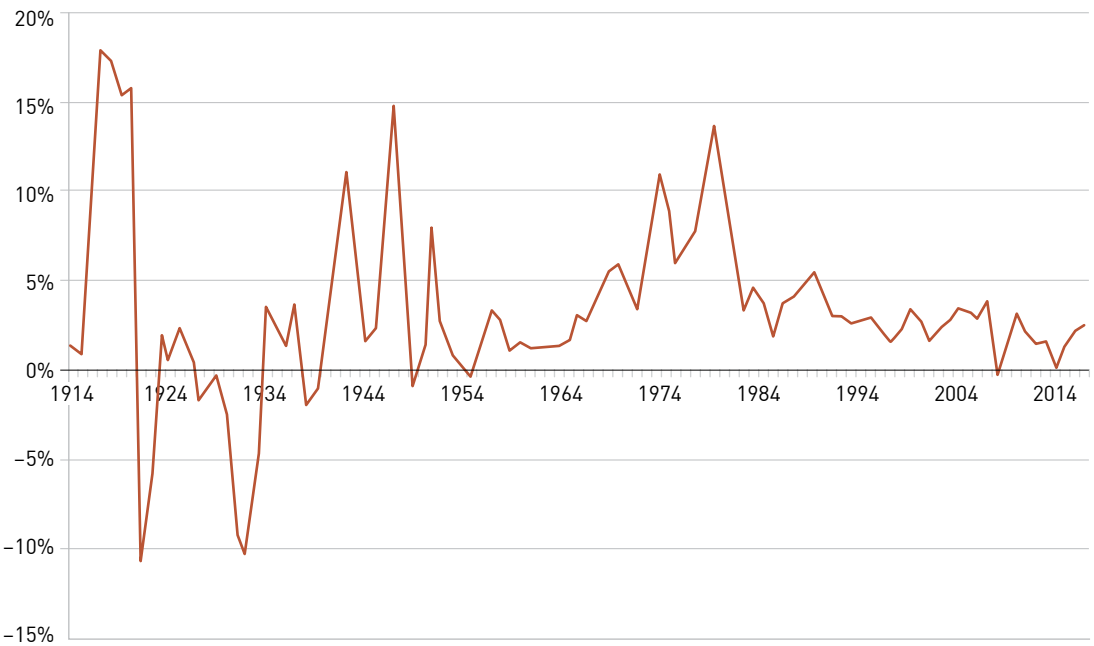
Economic theory implies that, faced with a choice between two annuities (SPIAs) costing the same amount, one of which is fixed in nominal dollars and the other in real dollars, a rational individual should consider the real annuity to be risk-free and the nominal annuity to be risky.[4] The reason is that individuals care about maintaining their levels of consumption, given that future inflation (CPI) is uncertain. A consumer can only purchase goods and services with real dollars.

The other consideration in choosing between the two annuities is the individual's beliefs about future inflation, its mean, variance, and tail risk (hyperinflation). Figure 1 shows U.S. annual inflation rates based on the Bureau of Labor Statistics CPI-U from 1914 to 2018.

For simplicity, let's assume a flat-term structure of real and nominal interest rates for which short-term bonds have approximately the same yield as long-term bonds so that we can talk unambiguously about the real and nominal rates of interest

Figure 1

U.S. AVERAGE ANNUAL INFLATION RATE, 1914–2018



Source: Calculated from Bureau of Labor Statistics CPI-U

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VOLUME 8
NUMBER 1
2019

Table 1

COMPARISON OF CANADIAN AND U.S. DOLLAR SPIAS, N=20 YEARS

Level payment in units of:	Interest rate	Annual payment
U.S. Dollar	3%	$6,721.57
Canadian Dollar	1%	$5,541.53
Difference		$1,180.04

Table 2

COMPARISON OF NOMINAL AND REAL SPIAS, N=20 YEARS

Level payment in units of:	Interest rate	Annual payment
Nominal dollars	3%	$6,721.57
Constant dollars	1%	$5,541.53
Difference		$1,180.04 or 21.3%

without specifying the maturity. When comparing two level-payment annuities of equal present value (i.e., cost), if the real rate of interest is lower than the nominal rate of interest, which is normally the case, the real annuity must have a lower starting value than the nominal annuity. The mathematics of compound interest and the time value of money guarantee this fact.

For example, let the present value of the annuities be $100,000, the risk-free real rate 1 percent per year, the nominal risk-free rate of interest 3 percent per year, and the number of years twenty. The difference between the nominal and real risk-free rates is the forward rate of inflation, or the "breakeven" inflation rate. In this example, we set the future rate of inflation equal to the current breakeven rate of 2 percent per year over the next twenty years.[5]

The term cost-of-living adjustment (COLA) is used by insurance companies to refer to one of two types of annual increases in the yearly payment:

COLA: A constant percent increase. Most insurers offer graduated payment increases from 1 percent to 5 percent per year. We refer to this type of annuity as a "graduated-payment nominal annuity," and it is fundamentally different from a real annuity. Payments are not linked to inflation, so this type of COLA is not an inflation hedge.

CPI-U index: As mentioned, The Principal offers a true Bureau of Labor Statistics derived CPI adjustment in addition to nominal and graduated-payment annuities. This percentage is recalculated January 1 of each year. Annuity income can either increase or decrease for that year based on the government's reported change in the CPI.

Let's consider how to compare these income streams. Nominal and real annuities are as different from each other as annuities denominated in different currencies. For example, think of an annuity denominated in U.S. versus Canadian dollars. If I live in the United States, I almost surely will not be interested in the Canadian annuity, unless I want to speculate on the U.S./Canadian dollar exchange rate. Now suppose that the interest rate in Canada is 1 percent per annum and in the United States it is 3 percent. A twenty-year nominal annuity would offer a level payment of C$5,541.53 per year but the U.S. annuity would offer payments of US$6,721.57 (see table 1).

Should we regard the difference of $1,180.04 as the cost of choosing Canadian rather than U.S. dollars? Clearly, it is not a cost. The two annuities are in different currencies. Canadian retirees will choose a Canadian annuity and U.S. retirees will choose the U.S. dollar annuity. For a Canadian to buy a U.S.-dollar annuity would be speculation on the future exchange rate between the two currencies. Retirees would avoid such speculation as imprudent if they understood its nature.

Similarly, real and nominal annuities are denominated in different "currencies." The real annuity is measured in constant dollars—we can call them "CPI bundles."

Similarly, real and nominal annuities are denominated in different "currencies." The real annuity is measured in constant dollars—we can call them "CPI bundles." In table 2 as in table 1, we can see that nominal and constant dollars are different "currencies" so that their difference does not represent a cost, either.

Choosing the nominal annuity amounts to speculating about the future value of the CPI, i.e., on the rate of inflation. It might be tempting to do so if one believes that the actual rate of inflation will be less than the 2-percent spread between the nominal and real interest rates. But then the annuitant would be exposed deliberately to inflation risk and betting that future inflation rates will be lower than the market consensus at the time the annuity is purchased. Like foreign exchange-rate bets, this sort of speculation is imprudent for retirees.

STANDARD OF LIVING THROUGHOUT RETIREMENT

To see this, let's consider the actual history of the CPI. In figure 2, we compare the twenty-year history of a real level-payment annuity versus a graduated payment nominal annuity from 1970 to 1990 in terms of their "real values."[6] The real

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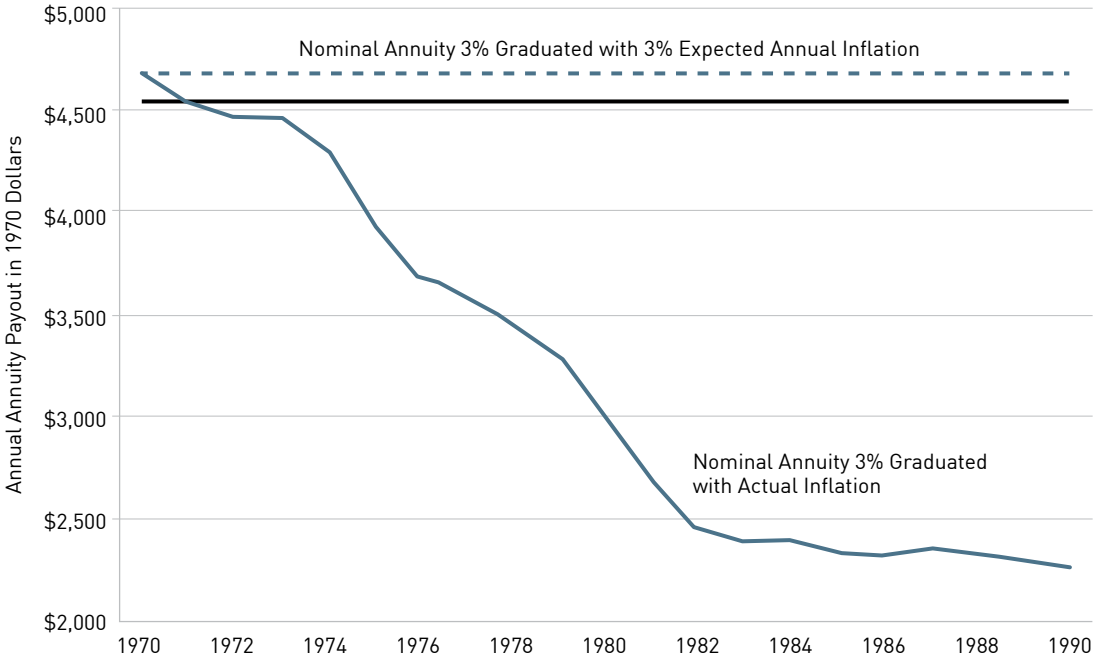
Figure 2

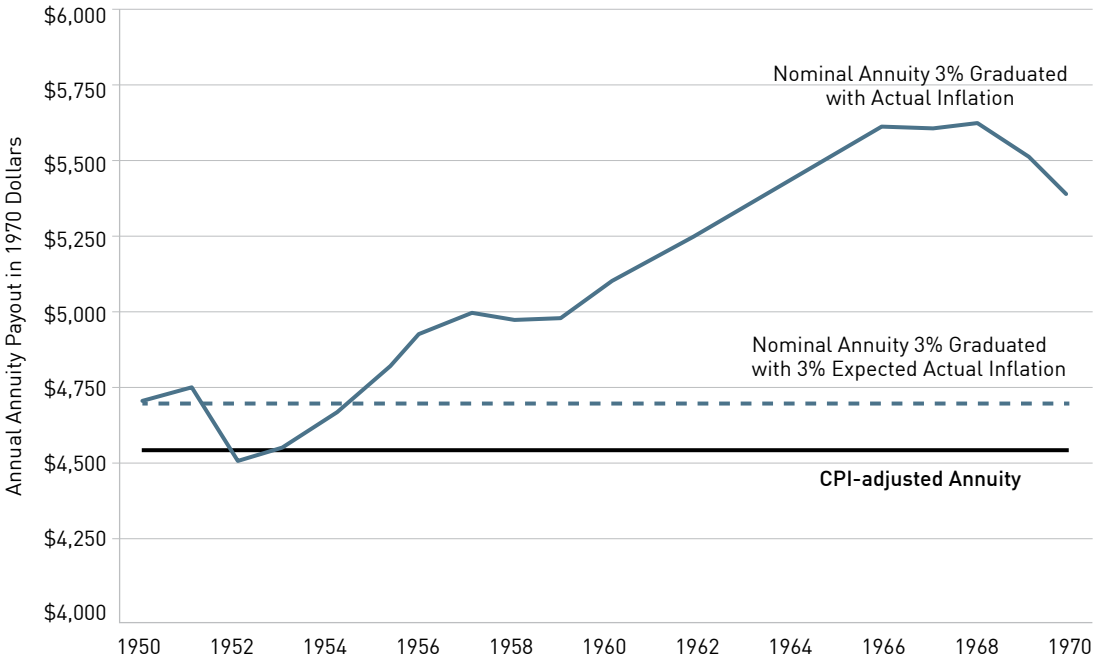
STANDARD OF LIVING THROUGHOUT RETIREMENT, $100,000 ANNUITY, 1970–1990



Note: CPI-adjusted annuity payments ex ante *equal CPI-adjusted annuity payments* ex post *and this is what we mean by "risk-free."*
Source: ImmediateAnnuities.com; sixty-five-year-old single male; CPI-adjusted: The Principal, all others: New York Life

Figure 3

STANDARD OF LIVING THROUGHOUT RETIREMENT, $100,000 ANNUITY, 1950–1970



Source: ImmediateAnnuities.com; sixty-five-year-old single male; CPI-adjusted: The Principal, all others: New York Life

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VOLUME 8
NUMBER 1
2019

value of the annuity is the inflation-adjusted purchasing power of the annuity's annual payments to the annuitant. Note that in the following examples, we chose to use a 3-percent inflation rate assumption rather than the 2-percent assumption used in the previous exchange-rate example.[7] Figure 2 shows the annual payments of a 3-percent graduated-payment nominal annuity (blue dashed line) assuming that future inflation (*ex ante*) indeed equals that 3-percent per year assumption along with the real value of these payments (solid blue line).[8]

In times of high inflation, such as the United States experienced in the 1970s and early 1980s, a real annuity will quickly provide for more real dollars of consumption than a nominal annuity.

We note that inflation during 1970–1990 averaged about 6.4 percent per year[9] and that the 3-percent graduated-payment nominal annuity payments fell far behind the payments of the CPI-adjusted annuity in real dollars.

In periods of lower inflation, such as during 1950–1970 shown in figure 3, the real value of the nominal annuity with graduated payments will exceed payments from the real annuity. Annualized inflation ran just above 2 percent per year during that period. Unlike the CPI-adjusted annuity whose *ex post* and *ex ante* payments are equal and risk-free, *ex post* payments from the nominal annuity in real dollars will vary with future inflation rates and are, therefore, risky.

Some advisors and retirees consider the difference between the initial payment of a nominal annuity ($6,440 from a recent quote) and the real annuity ($4,550 in the example), or $1,890, to be the cost of inflation protection with the real annuity. That is incorrect, in the same way that the direct comparison of U.S. and Canadian dollars was incorrect. The two annuity payments are in different "denominations" or units of measure. Figures 2 and 3 show that the constant-dollar difference in payments can vary substantially year-over-year depending on inflation.

CONCLUSION

We recognize the argument that real annuities are offered by a single U.S. insurer whose pricing is not subject to competitive pressures, but we don't address annuity pricing. Instead, we note that nominal annuities are a speculative bet on future inflation rates, a bet that is imprudent for retirees and, indeed, one that many would make unwittingly.

Purchasing a nominal rather than a real annuity is a decision to intentionally expose the annuitant to inflation risk. This inflation bet is similar to the example above in which a Canadian retiree buys a U.S. dollar-denominated annuity and inadvertently speculates on the future foreign exchange rate. Neither is the kind of speculation a retiree should consider.

Nonetheless, all financial products have pros and cons and, given their full appreciation in the context of the remainder of the retirement plan, a retiree can make a rational decision to purchase nominal or real annuities, or neither. Annuitants should understand before choosing that nominal annuities include a speculative bet on future inflation rates and the potential for substantial losses of purchasing power should high rates of inflation return, while real annuities include neither.

The safer choice for a retiree is the real annuity, which avoids speculating on inflation rates, while hedging inflation and its tail risk. Payments from a real annuity are therefore also the correct baseline for comparison with alternative riskier income streams for retirees.

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ENDNOTES

1. The Principal currently offers CPI-adjusted inflation protection on its immediate income annuities as an "optional consumer price index rider."
2. TIPS provide protection against inflation. The principal of a TIPS increases with inflation and decreases with deflation, as measured by the CPI. For more information see www.TreasuryDirect.gov.
3. For a description of CPI swaps, see for example, "How Liquid Is the Inflation Swap Market?" by the Federal Reserve Bank of New York, https://libertystreeteconomics.newyorkfed.org/2013/04/how-liquid-is-the-inflation-swap-market.html.
4. We note that Dimensional Fund Associates' retirement product, Target Date Retirement Income Funds, developed in collaboration with economist Robert Merton, gradually shifts to inflation-protected securities as the investor approaches retirement and hedges a real annuity.
5. The breakeven rate (forward rate) of inflation equals the expected rate plus an inflation risk premium of unknown size.
6. An annuity payout quote of $4,670 per year for a sixty-five-year-old single male was obtained online for New York Life at the end of May 2019 for a nominal annuity with a purchase price of $100,000 and a graduated 3-percent COLA. An annuity payout quote of $4,550 per year for a similar but CPI-adjusted "real" annuity was obtained online for The Principal at the same time.
7. We use an expected inflation rate of 3 percent for the following examples rather than the 2-percent current breakeven rate of inflation used in the previous example simply because annuity quotes were more readily available for 3-percent graduated payment annuities.
8. Nominal annuities front-load payments in real dollars given any positive rate of inflation. For this example, we assume the retiree desires constant real payments throughout retirement. However, a real annuity could be structured with the same present value that matches any spending slope desired by the retiree including declining real payments if the retiree expects spending to decline with age.
9. Inflation rates calculated using Bureau of Labor Statistics historical Consumer Price Index (CPI-U) data.

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