Safety First: Protected Investment Products

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ABSTRACT

After outlining various types of Equity Indexed Annuity [EIA] contracts, the article discusses reasons why both direct contract comparisons and ex ante performance estimates are difficult. It then explores three types of performance evaluation metrics: (1) option payoffs; (2) historical payoffs; and (3) simulation-based payoffs. Using the lower and upper bound dollar payoffs set by the EIA's contract provisions, the article quantifies the likelihood that a contract owner either benefits from the downside protection or regrets the cap on the upside payoff. The probability of regret is explored over a spectrum of investment portfolio alternatives that might appeal to both conservative and aggressive investors. This discussion suggests that EIAs should be evaluated in both 'dollar-wealth' space and 'utility-of-wealth' space. It concludes by noting that the utility theory underlying classical economics cannot explain the popularity of EIAs among retail investors.

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A basic rule of investing is "buy low, sell high." Yet, despite the obvious merits of this approach, declining stock prices cause many investors to question their commitment to equity markets—falling prices spark a desire to "sell low." Given human nature, this sentiment is completely understandable—investors may be academically comfortable with the risk they have assumed, but market losses make risk real, triggering an urge to sell before portfolio losses become extreme. The desire to sell into market weakness is akin to the genetically programmed "fight or flight" response to physical threats. Although intellectually we may understand that a contrarian response to market turmoil holds the greatest probability of long-term success; nevertheless, when faced with falling prices, we prefer to seek "safer" options.

Ideally, investors would like to participate in the price appreciation of stocks, while protecting themselves against downside price movements during bear markets. Even balanced and diversified allocations are subject to bear market forces; and, although many investors allocate wealth across both growth investments (stocks) and lower-risk investments (bonds), nevertheless, sudden decreases in portfolio value are disconcerting.

The prudent investor, knowing that uncertain future returns are a function of portfolio risk, seeks a return distribution that matches his or her personal (sleep tight) risk tolerance. For each investor the optimal distribution of expected investment returns is different. The prudent investor avoids distributions offering more than a trivial probability of catastrophic financial results. For one investor, a catastrophe may be a loss of wealth sufficient to cause a permanent decrease in his or her current standard of living; for another, a catastrophe might be a loss of wealth that impairs the ability to sustain bequest or gifting objectives; and, for a third, a catastrophe might jeopardize a threshold subsistence level.

In uncertain investment environments, investors always endure tradeoffs between the return required to achieve financial objectives and the risk that is concomitant with the return target. The theoretical underpinning of an asset management strategy based on prudent asset allocation is that the selected distribution of expected returns (the "shape of risk"), although having both positive and negative returns, creates an expectation of a favorable long-term financial outcome and mitigates the probability of unacceptable results defined in terms of "dollar shortfall" or "portfolio insufficiency." However, risk tolerance is in short supply in that investors only have limited patience. Bob Litterman [2003] of Goldman Sachs observes that the real constraint on long-term wealth accumulation is not the investor's savings budget but the investor's risk budget.

This said, it is also an unavoidable truism that, for risk averse investors, the pain of a loss will always be greater than the satisfaction from a gain where the amount gained or lost is equal. Few investors have "linear" risk tolerance functions; and, consequently, most investors are interested in strategies for protecting wealth during bear market periods.

One solution currently capturing much attention has the generic name of Protected Investment Product [PIP], or Principal Protected Security [PPS]. These products have been discussed by Sharpe [2007], Edwards and Swidler [2005], Baubonis, Gastineau, and Purcell [1993], among many others. A common form of PIP is an "Equity Indexed Annuity" [EIA] contract offered primarily through banks, insurance agents, and financial planners. Generally, the investor purchases the EIA contract with a single premium in exchange for the promise from the insurer the promise of a payoff based on the greater of a minimum guaranteed floor value or on the performance of a reference equity index. Most contracts are written for periods between seven and fifteen years, and the majority use the S&P 500 stock index as the reference index. If the index gains during the period, the contract owner participates in the price increase; if the index does poorly, the floor protects against equity losses.

As pointed out by Palmer [2006], when acquiring an EIA contract, neither the investor nor the insurer purchases stocks. The investor buys an insurance contract that is guaranteed by the general assets of the underwriting company. The insurance company, in turn, uses the investor's premium for a threefold purpose: (1) to pay commissions, administrative costs, taxes, and other fees associated with implementation and ongoing administration (including, possibly, the costs of a dynamic hedging strategy); (2) to purchase a fixed income instrument (usually a zero-coupon bond) sufficient to fund the minimum guaranteed return; and, (3) to purchase derivative financial contracts (usually call options) sufficient to fund the promised upside participation in the growth of the index. Thus, as demonstrated by Edleson and Cohn [1993], VanderPal [2004] and others, in many respects, an EIA contract shares both payoff and structural characteristics of derivative financial products.

The technical description of a typical EIA is important because it forms a rationale for both praise and criticism of the financial engineering approach to asset management. The reader should recognize that a financial engineering approach to risk control differs significantly from more traditional investment strategies based on asset allocation and diversification. However, the first thing that can be said about EIA contracts is that they are fiendishly difficult to understand. Indeed, Moody's analysts Fliegelman, Robinson and Riegel [2001] devoted an entire research paper to the topic of ascertaining likely risk exposures given the opaque nature of the EIA contract.

A second point is that, unlike a life insurance contract which makes money for an insurer if actual investment and mortality experience are better than the assumptions embedded in the product's actuarial reserve account, an EIA provides the insurance company with limited opportunity for either actuarial or investment gains. The insurer must commit sufficient funds to the contract to assure that the minimum guaranteed payout can be met in case of poor market performance; or, that the company can pay the promised growth to the investor under favorable market conditions. The astute reader may point out that an insurer can "play games" with the guarantee by deliberately mismatching asset and liability duration (i.e., interest rate sensitivities); or, that equity hedge exposure may be imperfect because of a desire to decrease trading costs. However, an insurer executes such strategies at its peril; and, should the company go bankrupt, at the contract owner's

peril, as well. When considering EIA contracts, it is wise to remember the advice of Ziemba [2003]: "Selling guarantees is like smoking Cuban cigars while driving a dynamite truck; you better do it carefully."

This leaves the fee portion of the premium as the primary source for insurer profit and commission payments. A critical issue, as pointed out in Boyle and Tian [2007], is the amount of premium in excess of the fair value (the "no arbitrage" value in investment jargon) that an investor is willing to pay to secure the upside participation/downside guarantee benefits. All else equal, the more risk averse the investor, the greater the financial "haircut" the investor should be willing to endure. This is simply a variation on a theme that economists have preached for many years: the best investment is neither the cheapest nor the one that maximizes expected future wealth; but the one that maximizes the investor's satisfaction ("utility") of wealth. It seems as if investors like to both eat well and sleep well.

EIA contracts first appeared in the 1990s. According to Asl [2008], they have grown increasingly popular, and current annual sales exceed $27 billion. This suggests that many retail customers (defined as small investors unable to access the customized derivatives markets required to hedge longer-term equity exposures) are paying a lot of money to acquire these products. How do EIAs work?

Unfortunately, this is a simple question that has a complicated answer. In fact, to skip to the end, there is no way to judge *ex ante* how an EIA contract will perform either on an absolute or a relative basis. This is not merely a statement about the uncertainty of investment outcomes; but, rather, an acknowledgement that each EIA contract has so many moving parts that are under the discretion of the issuing insurer, that it is difficult to determine that company A's EIA structure is better or worse that company B's. Lewis [2005] employs the term "management discretion risk." to characterize the lack of predictability for EIA contract values; while Warner [2005] contends that "it's almost impossible to compare one product with another."

The following descriptions cover some of the critical elements common to most EIAs.

Minimum Guarantee or "Floor" Value of the Contract. Each EIA has a minimum guaranteed value to which the investor is entitled. In New York State, the minimum floor value must, by statute, equal 100% of the contract's initial premium. This 100%-of-premium floor is one reason why most contracts are sold by insurers without sales operations in New York [New York insists that its standards govern the national practices of any insurer admitted to do business in the state]. Despite the fact that an EIA's contract term can last many years, New York does not require the insurer to credit any interest. The minimum floor level required by new nonforfeiture reserving regulations promulgated by the National Association of Insurance Commissioners is 87.5% of the initial contract premium. Most commonly, EIAs provide a minimum floor equal to 90% of the initial premium with a modest 2% to 3% annual interest credit. Given a reasonable factor for the time value of money, this provision suggests that the investor's downside risk is limited to approximately a 10% loss of principal.

Index Participation Rate. Each EIA declares a rate at which the investor shares in the growth of the reference index (generally, the S&P 500). This participation rate varies from 50% to 100% of the index's price appreciation. No EIA contract currently credits the investor with dividend returns paid by the index. If, during the applicable measuring period, the S&P 500 index price increases by 10% and the dividend yield is an additional 2%, the index's total return is approximately 12%. An EIA contract with a participation rate of 80%, however, would calculate the investor's share as 80% of 10%, or 8% vs. the actual index total return of 12%. Many EIAs permit the insurer to reset the participation rate periodically during the term of the contract.

The Yield Spread Cost Factor. After calculating the investor's share of index growth, many EIA contracts apply an additional adjustment known as a Yield Spread Cost Factor. To the extent that the participation rate in index growth approaches 100%, the annuity purchaser can expect a high yield spread cost; to the extent that the participation rate approaches 50%, spread costs tend to decrease. Yield spread costs are fees paid to the insurer; and are direct decrements to the investor's participation rate return. The annual costs range from approximately 1% to 4.5%. Typically, the insurer can reset yield spread cost factors periodically.

The Growth Rate Cap. After applying the participation rate and yield spread factor adjustments, a typical EIA will apply a growth rate cap. The cap sets a maximum crediting rate for the applicable period. Caps may be applied to periodic returns (e.g., monthly increases in the reference index), to annual returns, or, on a one-time basis, to the aggregate net gain over the entire measurement period. If, for example, the investor's annual share of index growth is calculated at 7.5%, an EIA with an annual cap of 6.5% puts a ceiling on the amount of growth credited to the contract owner. Typically, the insurer can reset the growth rate cap periodically.

Surrender Charges. The existence of surrender charges means that the EIA is not a liquid investment. Shorter term EIAs typically have surrender charges starting at 7% to 10% grading down over the life of the contract. Longer term EIAs may have graded surrender charges with the initial penalty as high as 20%. Application of a surrender charge, however, cannot reduce an investor's return to less than the minimum guaranteed value. Generally, a surrender charge is in force for the life of the contract, and can be avoided only if the investor keeps the EIA in force until maturity. Contracts with high surrender charges often offer high participation rates, more favorable growth rate caps, and lower yield spread costs. However, to protect the solvency / profitability of the insurer, most EIAs permit the insurer to reset these critical moving parts.

Market Value Adjustment. Additionally, many EIAs impose a Market Value Adjustment [MVA] if the investor surrenders the contract prior to the end of its term. An MVA can work in an investor's favor if the contract is surrendered in a low interest rate environment; or, to an investor's detriment if the contract is surrendered in a high interest rate environment. A cynical reader may point out that market value adjustments are the

very thing that the EIA contract holder seeks to avoid; but, nevertheless, there they are--*Caveat Emptor*.

Most EIAs are not registered with the Securities and Exchange Commission by virtue of the fact that they are deemed to be insurance contracts and not securities. As a consequence, many EIA salesmen do not have a "security license" nor, in some cases, do they have extensive training or background in security analysis. The sales agents face considerable challenges, however, because they must present a complex product to the public; and, furthermore, must avoid comparing the insurance product to investment alternatives such as mutual funds. Most presentations compare an EIA to a bank CD or money market fund. Regulators have raised a host of "suitability" related issues especially for retirees who are considering moving funds from bank CDs to EIAs; and, as discussed in Kuhlemeyer [2000], EIA contracts force "many insurance agents into areas that they are not legally equipped to handle." In general, according to Marmorstein, Robinson, Schulte and Trent [2006], PIP contracts are difficult for the average investor to understand and evaluate.

Having outlined typical EIA provisions, we now turn to a description of the current EIA product menu. What kinds of products can you buy and what kind of payoffs can you expect to receive? Although the moving parts allow for significant variation in contract offerings, most EIA contracts can be slotted into six general categories:

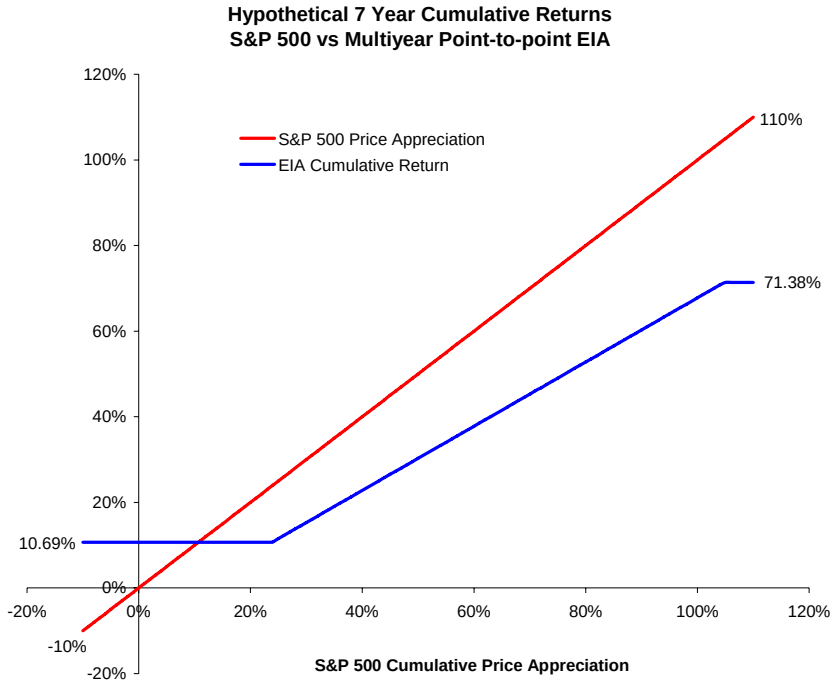
1. Multiyear Point-to-Point Contracts calculate the payoff based on the difference between the reference index's value at the date of contract purchase and on the date of contract maturity. If the index share price has increased, the EIA owner receives interest credits according to the terms of the contract; if the share price has decreased, the EIA owner receives the guaranteed minimum value. No interest is credited until the end of the contract's term.
2. Multiyear Point-to-Point Averaged Contracts calculate the payoff based of the difference between the reference index's value at the date of contract purchase and the average of the sum of the final twelve month's index prices. By averaging the last 12 month's price level, the contract cushions investors against a calamitous decline in value towards the end of the contract's term. No interest is credited until the end of the contract's term.
3. High Water Mark Contracts utilize more than two reference points (ending value – beginning value) to determine the amount of gain upon which the EIA owner's interest credit is calculated. Typically, over a seven to ten year period, a High Water Mark EIA samples the index value at the purchase date annual anniversary. A seven-year contract would, therefore, have seven index value reference points; and, as the name implies, the highest reference point value is designated as the contract's "ending" value for interest calculation purposes. No interest is credited until the end of the contract's term.
4. Annual Reset Contracts are single year Point-to-Point contracts that reset the interest crediting rate formula each year. If the index experiences negative price appreciation for any contract year, the credited interest rate is zero. Annual Reset Contracts calculate and credit interest each year; and, once the interest is credited to the accumulation value, it is locked in irrespective of the index's future

performance. Of course, any nonguaranteed elements such as the participation rate, yield spread cost, and interest rate cap are also subject to periodic reset by the insurer throughout the contract's term.

5. Annual Reset Averaged Contracts use an averaging method, as opposed to an annual beginning and ending price difference, to calculate interest credits. The average becomes the "ending" value upon which index gain is determined. Averaging smoothes price volatility; and, therefore, further dampens index gains and losses. Interest is calculated and credited each year.
6. Annual Reset Monthly Cap on Gain Contracts are monthly Point-to-Point contracts that calculate interest crediting using adjusted monthly changes in the index's share price; but, credit interest at the end of each contract year. Typically, monthly index gains are capped at 2% to 3% with no cap on monthly index price declines. The sum of the capped monthly gains and the uncapped monthly losses equals the index's annual gain for the year. If the annual "gain" is negative, the EIA, as expected, credits the index with zero gain. Interest is calculated and credited each year. There is anecdotal evidence that the Annual Reset Monthly Cap on Gains contract pays, in general, the highest sales commission; and, currently is the most widely sold product.

Although there are several metrics by which an EIA contract may be valued, there is no perfect method for determining the "best" contract. This said, we evaluate the merits of the various contract types by comparing EIA payoffs with the S&P 500 stock index decremented by a reasonable factor for investment fees and trading expenses. The initial graphs focus on a $100,000 investment in a seven-year Point-to-Point contract with a 90% of initial premium/3% interest credit minimum guarantee; a $5,000 bonus credit; a 75% index price appreciation participation rate / 1% yield spread fee; and, an 8% cap on yearly gain. The analysis assumes that the investor holds the contract for the full seven-year term. If this were not the case, additional surrender charges may reduce realized returns.

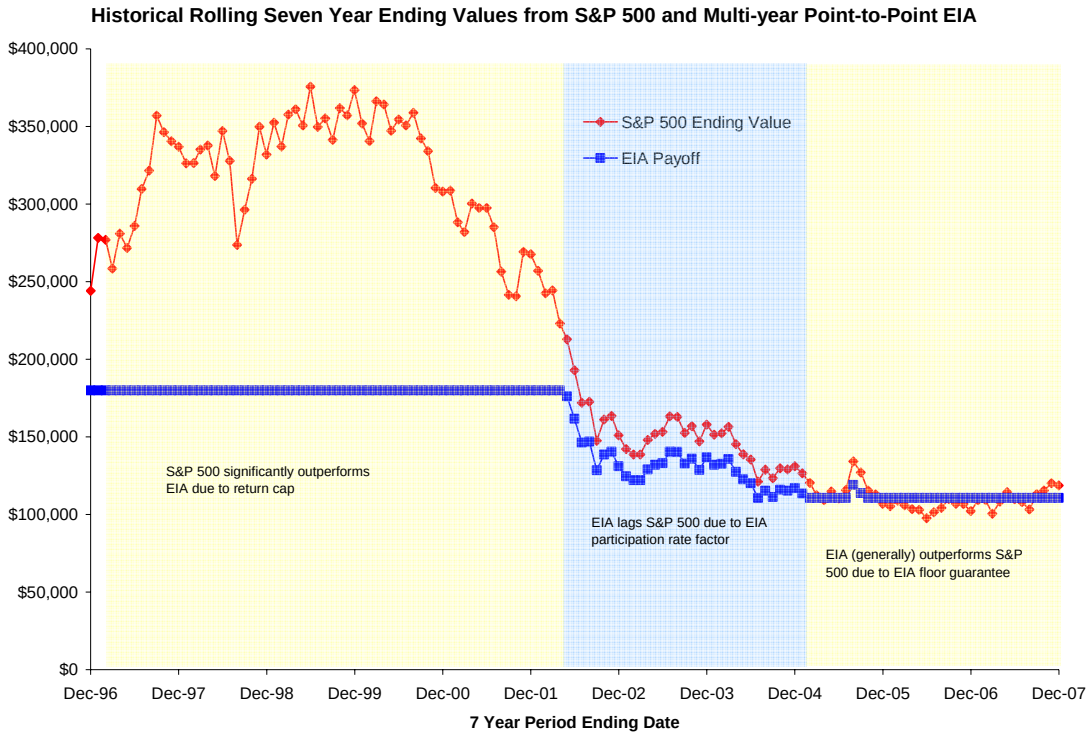
Graph One: The Theoretical Payoff Structure



This chart considers a range of possible ending values for the S&P 500 index's total return over the interval –10% through +110%. The red-colored line represents the stock index; and, not surprisingly, shows that the investor participates dollar-for-dollar in the gains and losses. By contrast, the EIA contract (blue-colored line) puts both a cap and a floor on gains. The EIA is attractive for the investor wishing to cede a portion of potential upside gain in return for minimum guaranteed returns. The astute reader may recognize that the EIA's payoff mirrors that achievable through the sale of a covered call option on the stock index and the purchase of a put option each having the same strike date. Thus, by one metric, a short call / long put position is a no-arbitrage replicating portfolio, although the slope of the EIA payoff line is less steep because of the absence of dividend income, as well as other constraints on returns.

The next chart shows how an investor fared historically with a representative Point-to-Point contract payoff structure. It depicts, over a monthly series of rolling 7-year (84 month) periods beginning in December 1996 through December 2007 the payoffs on an initial investment of $100,000 received by an EIA contract owner; and compares the EIA payoffs to those received by investors holding the S&P 500 index (decremented by a reasonable factor for expenses) in comparable 7-year investment periods (total of 216 months of S&P 500 return data).

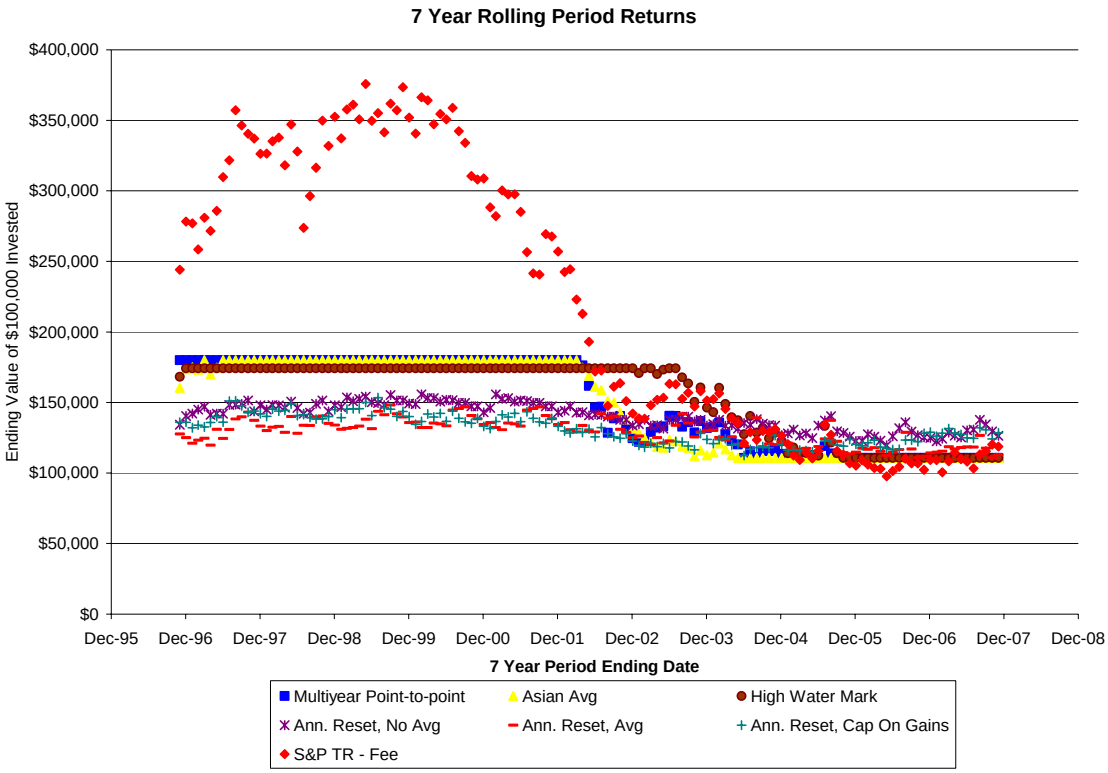
Graph Two: Historical Payoffs



This chart nicely illustrates the floor/cap payoff structure offered by the 7-Year Point-to-Point EIA. An investor whose contract matured in the mid 1990s might conclude that the EIA was a poor investment; the reverse is true for investors having their contracts mature after January of 2006. If nothing else, graph two demonstrates that evaluations based on historical results are highly sensitive to the beginning and ending dates; and, therefore, although interesting, should be viewed with some suspicion. Although graph two suggests that the EIA contract holder incurred, on average, a significant opportunity cost during the period under evaluation, there is nothing to suggest that this will be the case for the forthcoming period. For the EIA contract types that employ averaging methods, results are path dependent; and, any evaluation metric based on historical results approaches mere conjecture.

For the sake of completeness, the following chart depicts the payouts of the six types of representative EIA contracts.

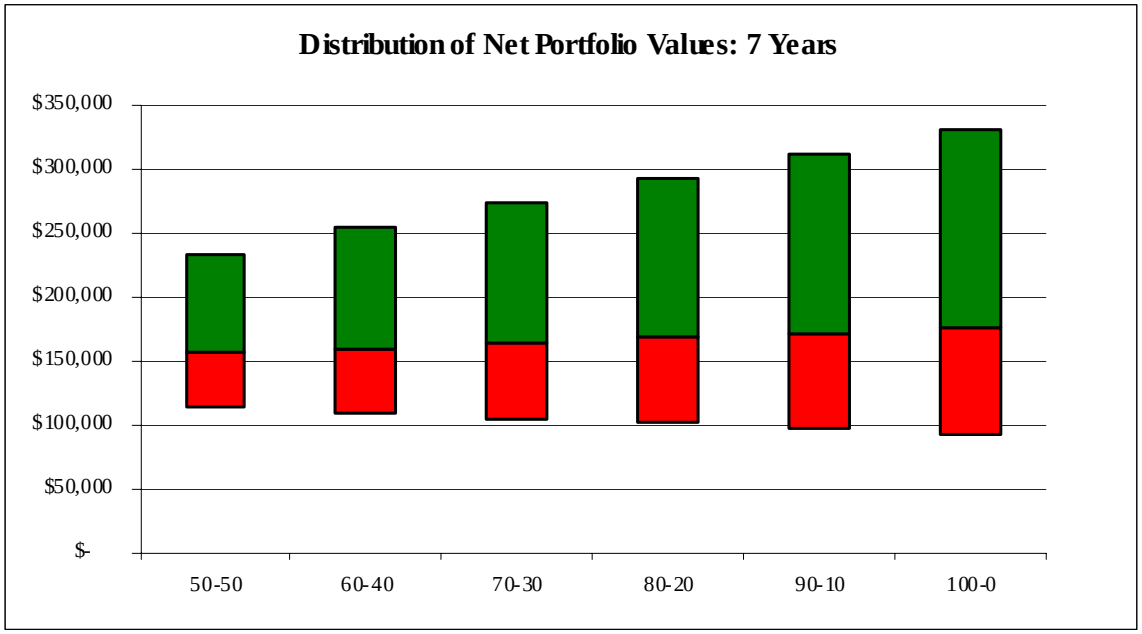
Graph Three: Historical Payouts



Contract Type	Minimum Guarantee	Participation Rate	Annual Cap on Gain
Annual Reset	3% compounded on 90% of premium	55%	7.0%
Annual Reset Averaged	3% compounded on 90% of premium	60%	7.5%
Annual Reset Cap on Monthly Gains	3% compounded on 90% of premium	70%	8.5%
Multiyear Point-to-Point	3% compounded on 90% of premium	75%	8.0%
Multiyear Point-to-Point Averaged	3% compounded on 90% of premium	70%	8.0%
Multiyear High Water Mark	3% compounded on 90% of premium	65%	7.5%

Fortunately, we are not totally without means to evaluate the EIA payoff structure. Given the time series of returns on the reference index, a model of future return evolutions is available through simulation analysis. No one knows what the actual future vector of seven-year returns will look like. However, by simulating thousands of such vectors based on historical data, a rich set of probable future results is available for inspection. The investor can estimate how likely it is that the EIA's guaranteed minimum return will generate a positive payoff; and, conversely, the likelihood that the EIA will impose an opportunity cost because it lags the reference index's total return.

Graph Four: Simulation Analysis

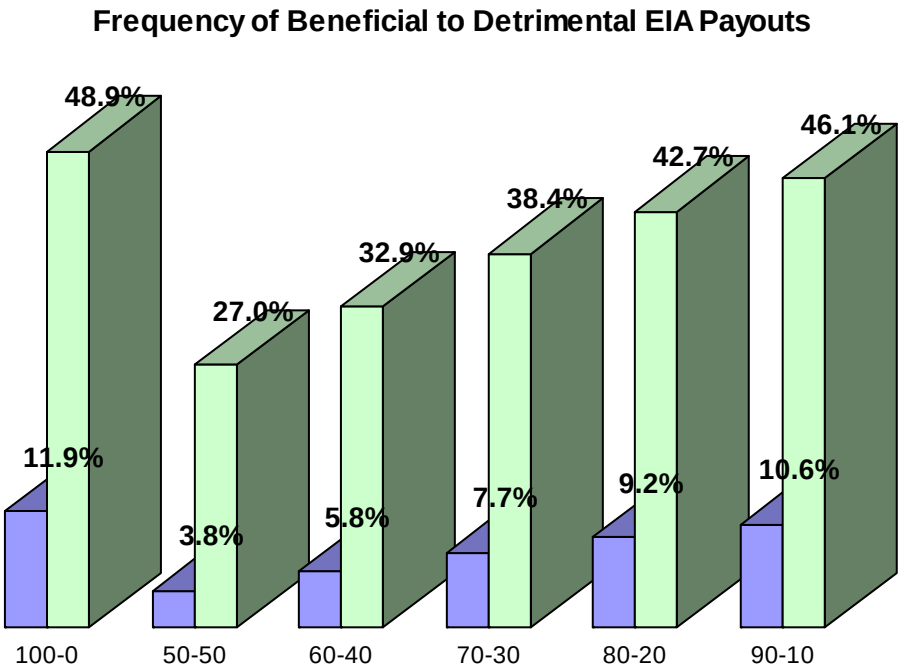


Portfolio	50-50	60-40	70-30	80-20	90-10	100-0
95th Percentile	$233,730	$253,153	$272,733	$292,234	$311,735	$331,236
50th Percentile	$155,832	$160,051	$164,234	$168,479	$172,650	$176,883
5th Percentile	$113,368	$109,511	$105,488	$101,049	$97,161	$92,960

The above graph depicts 5,000 simulated trials each of which invests an initial amount of $100,000 into a portfolio consisting of various allocations to the S&P 500 stock index and a U.S. One-Year, constant maturity T-Bill return series. Each portfolio is decremented by a 50 basis points yearly fee. Return distributions record the portfolio's 7^{th}-year value at a 90% confidence interval. The portfolio allocations are buy-and-hold positions (no rebalancing) ranging from 100% S&P 500 / 0% T-Bill to 50% S&P 500 / 50% T-Bill. The more risk averse the investor, the greater the propensity to "anchor" the portfolio with a large allocation to T-Bills. The simulation utilizes monthly historical returns over the period 1973 through 2007.

Critical values are the lower-bound EIA guaranteed payout of $110,689, and the upper-bound payout of $179,952. The statistics of interest focus on the likelihood that the EIA contract's lower-bound floor payout is greater than the payout of the T-Bill/S&P 500 portfolio; and the likelihood that the EIA contract's upper-bound cap is less than the payout of the T-Bill/S&P 500 portfolio. The percentage of portfolio values less than the EIA contract's lower-bound floor represents the frequency at which the EIA owner benefits from the minimum payout guarantee. The percentage of portfolio values greater than the EIA contract's upper-bound cap represents the frequency at which the EIA owner suffers opportunity costs. Of course, the frequency at which the contract's payout is truncated by the upper bound limit is not the sole measure of opportunity cost because payout values between the lower and upper bound limits are also decremented by a variety of contract provisions.

Graph Five: Asset Allocation, Risk, and EIA Payouts



The above chart demonstrates some interesting points. When the representative 7-year Point-to-Point EIA contract is compared to the 100% S&P 500 index portfolio payout, the contract holder can expect to benefit approximately 11.9% of the time. However, an investor pursuing a safety-first objective, which allocates only 50% of the portfolio to the S&P 500 index, can expect to benefit only 3.8% of the time. With respect to the EIA contract's upper bound limitations, a less risk averse investor allocating 100% of funds to the stock index can expect to regret the EIA purchase decision 48.9% of the time; while the more risk averse investor can expect to regret the purchase decision 27% of the time.

So who should purchase an EIA? Many investors might conclude that the opportunity costs of the annuity outweigh its downside benefits. The above graphs illustrate results in "dollar wealth space" rather than in "utility of wealth space;" and they suggest that only highly risk averse investors are likely to purchase an EIA contract. Indeed, at a 90% confidence interval, a conservative 50-50 asset allocation appears to dominate the EIA payout distribution. With greater portfolio diversification, it may well be the case that the investment solution dominates the annuity solution throughout all but a small portion of the return distribution's left tail.

Viewing the decision from the more classical economic framework of utility theory, however, provides additional insight. Clearly, an EIA is not a liquid investment; and, formidable surrender penalties preclude it from consideration as a precautionary savings vehicle for potential future expenses during times of economic distress. This implies that a prospective EIA purchaser will fund the contract from longer-term investable funds.

Investors with a relatively low wealth-to-income-need ratio may consider even a small loss of discretionary funds to be financially catastrophic. These investors will move from dollar wealth space to a utility space that applies an increasingly convex utility penalty function to changes in contract values as they approach a threshold payout amount. Investors with a relatively high wealth-to-income-need ratio, however, should, all else equal, move from dollar wealth space to a utility space that employs a more linear utility penalty function as the contract's payout value approaches its minimum guarantees. Indeed, the later group of investors may find the EIA contract to be an inferior alternative.

The upshot of these observations is that the potential customer base for EIA contracts appears limited. The illiquidity of the contracts makes them generally unsuitable for individuals with low levels of wealth. The potential buyer of an EIA contract has discretionary long-term wealth; but, nevertheless, exhibits a great sensitivity to downside risk. However, the greater the discretionary wealth, or the greater the ability to tolerate long-term illiquidity, the greater the likelihood that the investor exhibits constant relative risk aversion. In this case, the investor enhances utility by selecting the investment portfolio alternative.

How well does investment theory match reality? The answer to date is 'not well.' The boom in EIA sales indicates a steep demand curve for this product. The source of demand may reflect consumer willingness to pay a premium for a 'pre-fabricated' product that provides downside protection without the inconvenience of investment portfolio management; lack of awareness of the potential costs of acquiring downside protection through an annuity-based solution; the tax-deferral benefits of the annuity contract structure; or, the efficacy of a well-designed product marketing campaign. Whatever the factor or factors determining EIA sales growth, the discrepancy between theory and reality remains puzzling.

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