

## Validating Historical Analysis for EIA Analysis

By Mitchell Maynard

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I have been hearing for some time a number of individuals denouncing the use of historical analysis for EIAs. I feel that now is a good time to provide some in-depth analysis on what historically may have happened to the participation rates of EIAs had they existed back in 1955.

I broke the analysis down into 4 key components:

1. Historical Interest Rates on the 10 Year Treasury Bond
2. Historical Annualized 1 Year Volatility on the S&P 500
3. Assumed Annual Administration Fee by the Insurance Company of 2%
4. Calculated Participation Rate using 1/1/2005 Rates as the Baseline Proxy

Please let me provide some details on how and why I am using the components above for this analysis.

### Historical Interest Rates

Insurance companies that provide EIAs take a portion of the premium and allocate it to bond investments. This allocation will provide the certain growth required to support the guarantee promises and also to create income to purchase the call options required for the Index Credit Method interest. I used the 10 Year US Treasury Bond since it is a good proxy for intermediate interest rates. This information was obtained from the Federal Reserve Bank.

### Historical Annualized 1 Year Volatility on the S&P 500

This aspect of the analysis was quite a challenge. The challenge is in which volatility the best used for this study: Historical Volatility or Implied Volatility. A primary constituent of option pricing is based on implied volatility. In short, implied volatility is the market's prediction subject to change daily (if not by the second) based on the events that effect stock market volatility. This value is calculated based on the pricing of options (and other factors i.e. stock index price, strike price, expiration, and risk-free rate). In order for me to calculate the historical implied volatility, I need the actual option pricing history but this is unavailable because they didn't exist in 1955 (liquid markets for the S&P 500 options didn't exist until the early 1980's).

So instead, I chose to use an annualized historical standard deviation of the S&P 500. Although some studies have proven that actual historical volatility is not perfectly correlated to implied volatility, using an annualized historical standard deviation allows us to closely track the recent volatility with a predictive value consistent with the term of the option contracts used in the annual reset point-to-point credit method (1Year). Annualized standard deviation is calculated by using monthly performance data and annualizing it so that the terms are in an interval; in essence it allows us to use the last 12 months to determine the latest 'annual' volatility.

### Assumed Annual Administration Fee by the Insurance Company of 2%

It is my understandings that many insurance companies price their annual administrative costs are 2% per annum. I further understand that there are companies that charge higher but I have not heard of anyone charging less. For the purpose of this analysis I assume an annual administrative fee of 2%.

### Calculated Participation Rate using 1/1/2005 Rates as the Baseline Proxy

Since I do not have all the information from the insurance companies regarding the internal spread calculations and profit target margins, I used a synthetic analysis technique to approximate the annual participation rates offered to an annual reset point to point credit method with no cap and a fluctuating participation rate.

My assumptions were that using the American Equity participation rate offered last year of 50% when the 10 Year Treasury Bond had an interest rate of 4.22% when the annualized standard deviation was 7.48% subtracting the 2% annual administrative fee.

The formula below was used:

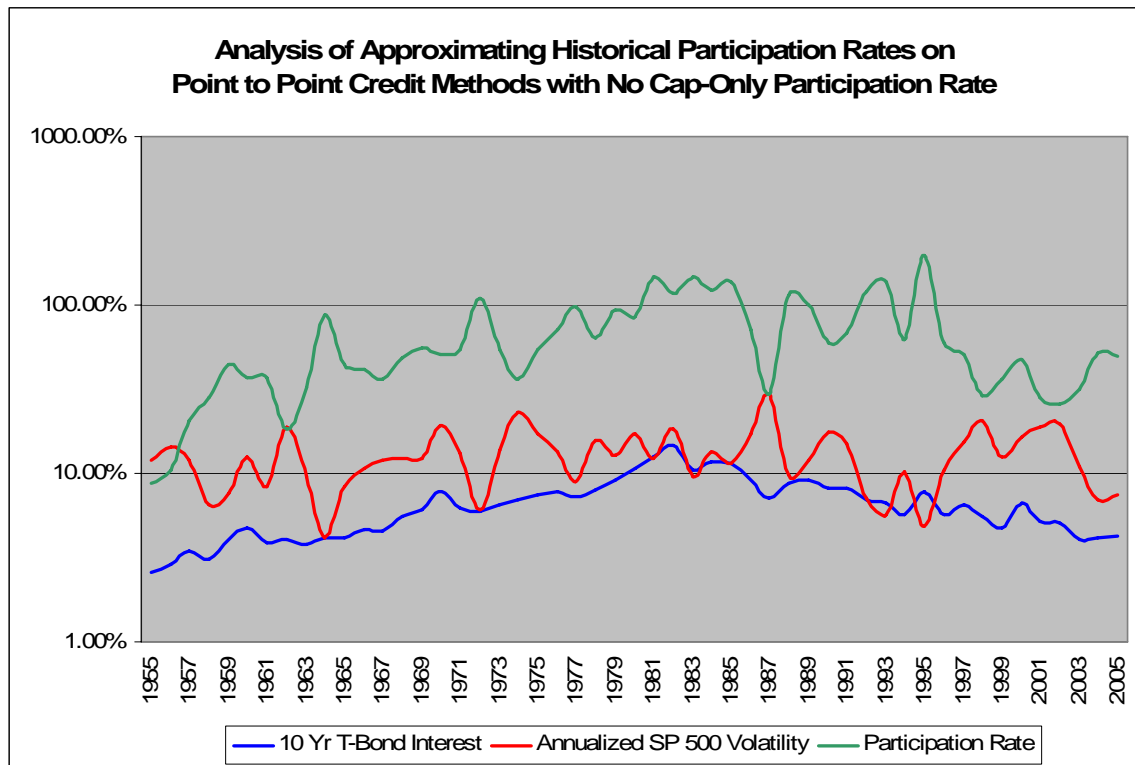
$$=(((7.48\%/Recent\ 1\ Year\ Annualized\ Standard\ Deviation)*50\%) * ((10\ Year\ Treasury\ Bond\ Yield-2\%)/2.22\%))/100$$

Please understand that I have tried to create an analysis technique that would allow us to fairly approximate the participation rate fluctuations based on the macro factors that have a determining factor. You can use this information as a basis for your own historical back-testing. In the next release of EIAAnalyst2, the user will be able to control the annual caps, etc. and this study can be the basis for making historical approximations.

Below is the evidence of my analysis.

Chart 1  
Table 1

**Chart 1: Fluctuation of Estimated EIA Participation Rates**



**Table 1: Estimated Historical EIA Participation Rates**

10 Year T-Bond Interest	SP 500 Annualized Year StDev	Ins. Co. Ann Fee	Base 50% Par @ 7.48% STD 2005
1955 2.61%	1955 11.86%	2%	8.67%
1956 2.90%	1956 14.37%	2%	10.55%
1957 3.46%	1957 11.95%	2%	20.59%
1958 3.09%	1958 6.55%	2%	28.03%
1959 4.02%	1959 7.67%	2%	44.36%

1960	4.72%	1960	12.44%	2%	36.85%
1961	3.84%	1961	8.35%	2%	37.12%
1962	4.08%	1962	18.93%	2%	18.51%
1963	3.83%	1963	9.52%	2%	32.38%
1964	4.17%	1964	4.18%	2%	87.42%
1965	4.19%	1965	8.27%	2%	44.60%
1966	4.61%	1966	10.72%	2%	41.02%
1967	4.58%	1967	11.94%	2%	36.40%
1968	5.53%	1968	12.15%	2%	48.94%
1969	6.04%	1969	12.33%	2%	55.19%
1970	7.79%	1970	19.27%	2%	50.61%
1971	6.24%	1971	13.16%	2%	54.27%
1972	5.95%	1972	6.12%	2%	108.77%
1973	6.46%	1973	13.68%	2%	54.92%
1974	6.99%	1974	23.05%	2%	36.47%
1975	7.50%	1975	17.02%	2%	54.44%
1976	7.74%	1976	13.46%	2%	71.82%
1977	7.21%	1977	8.95%	2%	98.06%
1978	7.96%	1978	15.85%	2%	63.36%
1979	9.10%	1979	12.86%	2%	93.00%
1980	10.80%	1980	17.32%	2%	85.59%
1981	12.57%	1981	12.21%	2%	145.87%
1982	14.59%	1982	18.27%	2%	116.08%
1983	10.46%	1983	9.61%	2%	148.37%
1984	11.67%	1984	13.38%	2%	121.73%
1985	11.38%	1985	11.49%	2%	137.52%
1986	9.19%	1986	17.02%	2%	71.16%
1987	7.08%	1987	29.26%	2%	29.25%
1988	8.67%	1988	9.78%	2%	114.90%
1989	9.09%	1989	11.99%	2%	99.65%
1990	8.21%	1990	17.39%	2%	60.17%
1991	8.09%	1991	15.08%	2%	68.05%
1992	7.03%	1992	7.14%	2%	118.67%
1993	6.60%	1993	5.68%	2%	136.52%
1994	5.75%	1994	10.16%	2%	62.17%
1995	7.78%	1995	4.91%	2%	198.46%
1996	5.65%	1996	10.37%	2%	59.32%
1997	6.58%	1997	15.24%	2%	50.62%
1998	5.54%	1998	20.56%	2%	29.00%
1999	4.72%	1999	12.58%	2%	36.42%
2000	6.66%	2000	16.40%	2%	47.87%
2001	5.16%	2001	19.00%	2%	28.01%
2002	5.04%	2002	19.73%	2%	25.96%
2003	4.05%	2003	10.90%	2%	31.68%
2004	4.15%	2004	6.94%	2%	52.19%
2005	4.22%	2005	7.48%	2%	49.99%
					<hr/>
					<b>AVG</b>
					<b>65.91%</b>
					<hr/>
					<b>StDev</b>
					<b>40.92%</b>