

Analysis of Structured Products in the Context of their Historical Performance

A White Paper from Aftcast.com

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Disclaimer: Throughout this paper, terms “successful”, “unsuccessful”, “failure”, “certainty” and any similar words refer only to statistical outcomes of the market history since 1900. Future outcomes will likely be different.

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Analysis of Structured Products in the Context of Historical Performance

Executive Summary:

In this paper, we analyze the historical performance of selected Structures Products (**SP**) in the historical context. SPs are known under different names such as index-linked CDs, principal protection funds, equity-linked notes, equity-linked certificates, market-index securities, each with a different twist. We only considered the plain-vanilla, classic SP which is linked to an equity index and ignored any other types with exotic or “innovative” links, swaps etc.

The common thread of the SP products is: the protection of the principal and an interest credit that is correlated to an equity performance. We compare their historical performance with two other asset classes: 1. Equity portfolio, 2. CD-type deposits.

Throughout this paper, we will avoid using any deterministic and Gaussian forecast methodology, such as assumed future growth rates, future inflation rates, or any type of Monte Carlo simulators. Instead we will use the aftcasting methodology that uses the actual market history. Aftcasting reflects the actual sequence of events, the actual sequence of returns (stocks, interest rates and inflation), actual correlation between stocks, interest rates and inflation; and finally, the actual volatility as they occurred since 1900. Aftcasting methodology and calculation tools for writing this article was developed by the author of this paper.

We did not include any tax consequences in our analysis. We only looked at actual portfolio performances, excluding any tax advantages of some specific products, strategies or account types.

All investment products have many different risk factors. We did not consider any risk factor other than historical market trends that affect the performance.

For each scenario we ran, we assumed that the SP was renewed at the end of its term for the same term, participation rate and minimum interest rate. In real life, these will change with economic and market forces over the investment time horizon. In all scenarios, we assumed that the minimum interest rate for the term is 0%, to account for the current low interest rate environment. At higher interest rates, the minimum interest rate might be larger than zero, which would make SPs more favorable than stated in this paper.

Summary of Findings:

The aftcast of all years since 1900 leads us to conclude the following:

Downside Protection: If the accumulation time horizon is shorter than 15 years, then downside protection should be the main concern. SPs can diminish that concern, because they have the built-in, phantom asset allocation that allows the SP manufacturer to provide that for the investor.

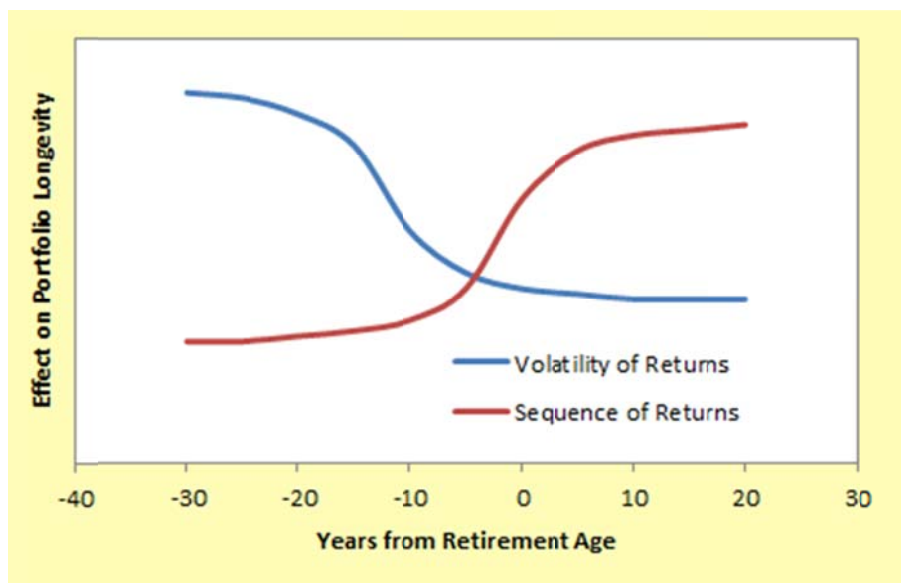
Asset Growth: Long term research by others shows that the average equity investor lags the equity index returns by as much as 6.5% on an annual basis. Many attribute this to behavioral risk. Our research indicates that over the long term, for the average investor, SPs will provide a larger median asset value compared with holding equity investments. Even a small underperformance of the equity portfolio, as little as 2.3%, is sufficient for this conclusion.

Generally, everything else being equal, the shorter the term of the SP, the larger is this added value.

Introduction:

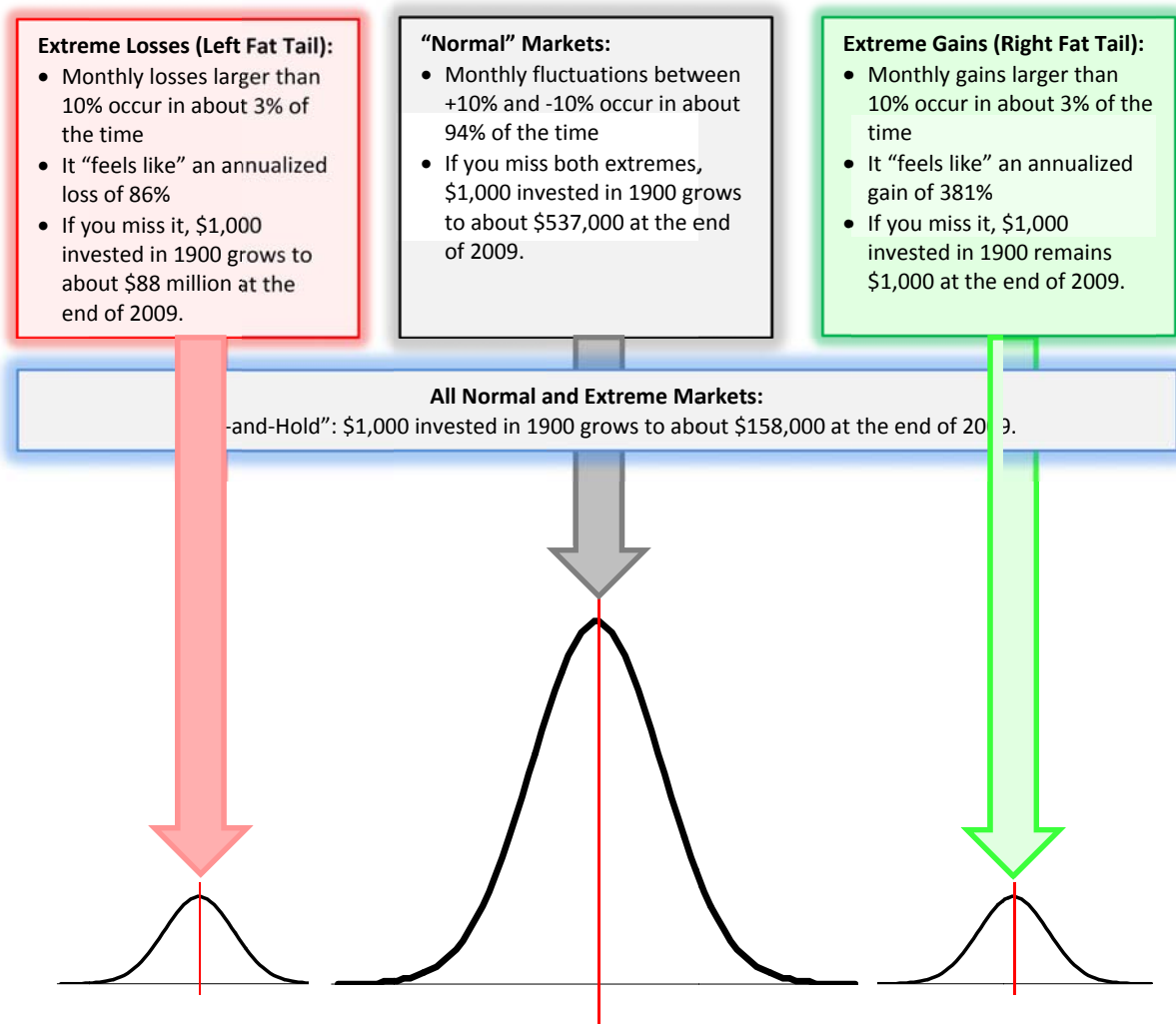
One of the challenges of holding an accumulation portfolio is to minimize its downside volatility. Asset allocation is an important tool to control the volatility of returns. However, as one gets closer to retirement, its well-publicized importance diminishes significantly and it is replaced by the importance of sequence of returnsⁱ. Figure 1 depicts the relative importance of these two factors on the portfolio longevity of a retirement portfolio for withdrawal rates over 3.5%.

Figure 1: The qualitative effect of volatility of returns and sequence of returns on portfolio longevity over retirement life cycle.



The market history since 1900 shows that in 94% of the time the annual index fluctuations remain within a $\pm 10\%$ range. We call these “normal” fluctuations. In about 3% of the time, the annual growth of the equity index is larger than 10%. In the Gaussian terminology, this is the right “fat-tail”. Conversely, in about 3% of the time, the index declines by more than 10% on an annual basis, in Gaussian language, the left “fat-tail”. This is depicted in Figure 2.

Figure 2: Depiction of Extremes and Normals from the Gaussian vantage point



History shows that given sufficient time, an accumulation portfolio eventually recovers from losses. However, the definition of “sufficient time” covers a very wide spectrum depending on in which regime the loss has occurred.

If the loss occurs in “normal” markets, then “sufficient time” for recovery can be from a couple of days to a couple of years.

On the other hand, the recovery time increases exponentially if the loss occurs in extreme markets. Most people start investing after markets start moving towards the right fat tail. By definition, these events are rare and short-lived (3% of the time). When they end, the market index does not just slide back to the normal region, but it usually follows Newton’s third law of

physics: “To every action there is always an equal and opposite reaction”. It moves all the way to the left fat-tail, causing great losses. It might even bounce a few times back-and-forth between the two fat-tails like a table-tennis ball, creating great volatility in its path. In that, the latest entrants to the right tail are punished the most with the largest losses. But eventually, the *volatility of returns* subsides and is replaced with the new, *adverse sequence of returns*.

History shows an investor does not recover from losses resulting from a bad sequence of returns as quickly as the losses from “normal” market volatility. In addition, the “math of loss” shows that it is significantly harder to recover in a distribution portfolio than in an accumulation portfolioⁱⁱ. A vast majority of accumulation portfolios switch to distribution phase at some point. There, the recovery period can be infinity.

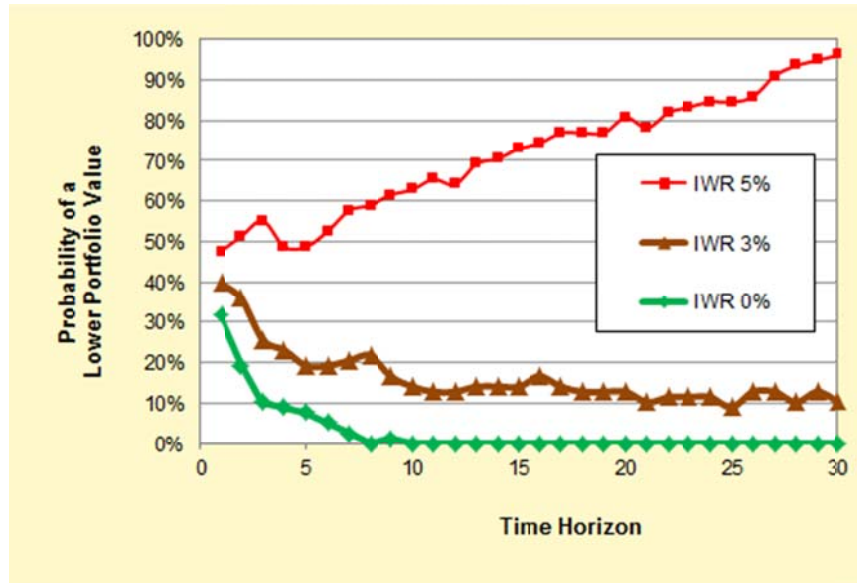
Let’s observe the history of loss recovery in a distribution portfolio. Figure 3 shows the “probability of never recovering from a loss” for various initial withdrawal rates. It indicates that in the presence of *any* amount of periodic withdrawals, there is *always* a chance of *never* recovering from a loss.

The green line on the chart indicates that, if you have no withdrawals (IWR=0%), there was about a 32% chance of a lower portfolio value in year 2. However, the portfolio inevitably recovered from the most catastrophic historical loss (keep in mind; the asset mix of these portfolios in this chart is 40/60). In year 8, the probability of a lower portfolio value comes down to 0%. In other words, when there were no withdrawals, after eight years, you always had a higher portfolio value than the starting amount in this balanced portfolio, even after the worst volatility/sequence of returns event during the last century.

What happens if this is a distribution portfolio? We observe that at an initial withdrawal rate of 3%, there is at least a 10% probability that a balanced portfolio never recovers from a loss, no matter how long the time horizon is. When there is even the smallest amount of periodic withdrawal, a full recovery might never happen during the investor’s lifetime.

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Figure 3: Probability of a lower portfolio value over time, asset mix 40% DJIA, 60% fixed income



Therefore, as one approaches retirement, it is of paramount importance not to lose even a small portion of retirement assets, however minor and temporary that loss might appear. Structured products can help the investor to achieve this objective.

Aftcast of an Investment Portfolio:

For withdrawal rates over 3.5%, the sequence of returns is the largest determinant of the success in a retirement portfolio. Yet its effect is missed by all man-made simulators that are based on Gaussian models. That is because of their inherent flaw: They can simulate the volatility of returns rather well. However, they cannot model the patterns of sequence of returns in any realistic way. These patterns happen as a result of specific correlations between various economic factors such as equities, bond yields, interest rates and inflation in typical market cycles.

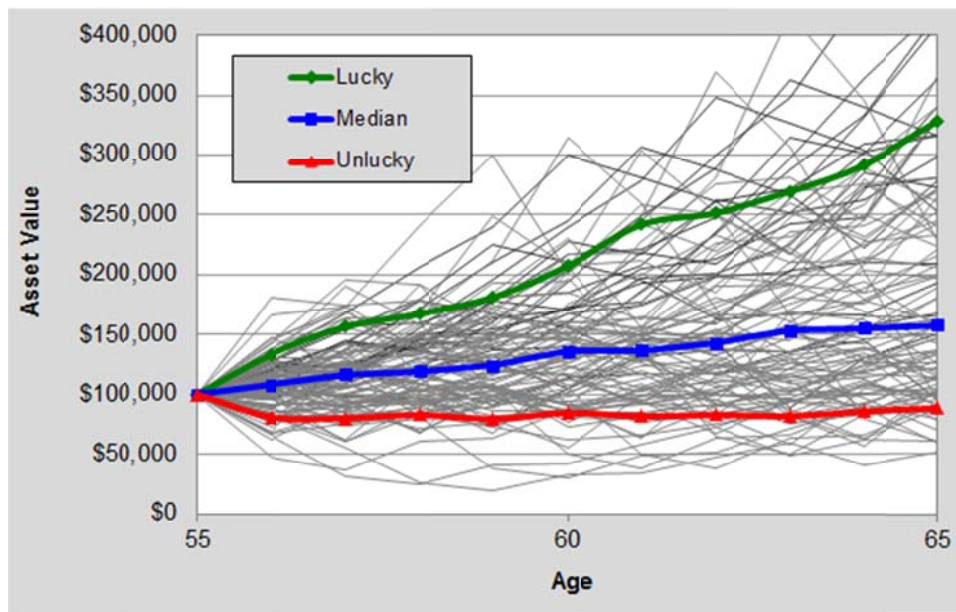
Aftcasting reflects the sequence of returns exactly – as well as the volatility of returns- as it happened in history. Aftcasting, as opposed to forecasting, is a method developed by the author for analyzing investment outcomes. It includes the actual historical equity performance, inflation and interest rates, as well as the actual historical sequencing of these data sets.

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Aftcasting displays the outcome of all historical asset values of all portfolios since 1900 on the same chart, as if a person starts his plan in each of the years between 1900 and 2000. It gives a bird's-eye view of all outcomes for his specific time horizon. It also provides the success and failure statistics with exact historical accuracy, as opposed to man-made simulation models.

Let's work through an example: Bob, 55, has just received \$100,000 inheritance. He wants this money to grow aggressively over the next ten years, invested 100% in equitiesⁱⁱⁱ, in time for his retirement. He wants to know how much money he will have at that time. The aftcast of this scenario is depicted in Figure 4.

Figure 4: The aftcast of an investment portfolio, starting capital of \$100,000



In addition to gray aftcast lines, each one representing one specific starting year since 1900, we see “lucky”, “median” and “unlucky” lines on the chart. Let's define what these mean:

- The bottom decile (the bottom 10%) of all aftcast lines is the “unlucky” outcome. That means 10% of observations are below this red line and 90% are above it.
- The top decile (the top 10%) of all aftcast lines is the “lucky” outcome (the green line).
- The blue line indicates the median outcome where half of the scenarios are better and half are worse.

We observe that by age 65, Bob's initial investment of \$100,000:

- would grow to \$328,254, if he were lucky,
- would shrink to \$88,434, if he were unlucky,
- would shrink to \$51,587 in the worst case,
- would grow to \$158,003 for the median,
- would be \$19,977 at the worst, year-end drawdown.

Structured Products:

SPs come under many different names, such as index-linked CDs, principal protection funds, equity-linked notes, equity-linked certificates, market index securities. For the purposes of this study, a structured product (SP) has the following attributes:

- **Guarantee of Principal:** At the end of a fixed holding term, the refund of principal is guaranteed
- **Interest:** The interest income on the SP is linked to a market index performance. The degree to which this credit is applied is called the Participation Rate^{IV}.

There are several dimensions of how SPs work and how the interest is credited:

Interest Credit: Two of the most popular methods of earning additional interest are:

- A participation rate of the underlying index (typically between 40% and 100% of the index growth)
- A yield spread of underlying index (for example: index growth less 3%)

We use the participation rate method (40%, 50%, 60%, 70% and 80%), calculated at the end of the term.

Interest Crediting Method: There are numerous methods of calculating the interest. We include term-end-point method in our analysis, where the index movements are measured for the entire term of the SP and accrued only at the end of the term.

Caps: A cap is a ceiling on the interest that can be credited. It can be of the type that limits the index cap (the ceiling for the index movement) or interest cap (the ceiling for the interest credit). Generally, but not always, the cap exists when the participation rate is 100%. In our analysis, we use no interest cap.

Minimum Interest: In our calculations, we used 0% minimum annual interest. This is a conservative figure relative to history because of historically low interest rates. In higher interest rate environments, the minimum interest rate offered will likely be higher.

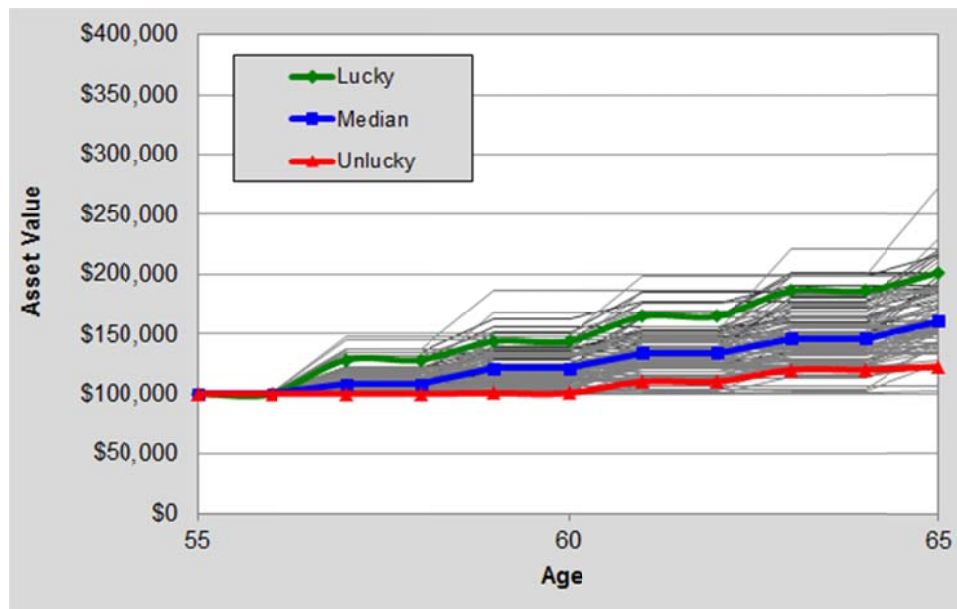
Underlying Index: We use DJIA as the underlying index.

Term: We use 1, 2, 3, 4, 5, 6 and 7 year terms, renewed at the end of each term with the same parameters for the term.

Time Horizon: We use an investment time horizon of 10, 20, 30 and 40 years, or a multiple of the term closest to these time horizons.

Going back to our earlier example, Bob decides to buy an SP with a 2-year term, 50% participation rate, no cap, and 0% minimum guaranteed interest. He renews it four times until age 65. Figure 5 depicts the aftcast.

Figure 5: The aftcast of Bob's FIA, starting capital of \$100,000



Notice how the asset value jumps every second year as the term ends and the interest –if any– is credited. Notice that the asset value never goes down to below the principal amount.

We observe that by age 65, Bob's initial investment of \$100,000:

- would grow to \$201,537, if he were lucky,
- would grow to \$122,643, if he were unlucky,
- would grow to \$102,720 in the worst case,

- would grow to \$160,366 for the median,
- would be \$100,000 at the worst, year-end drawdown.

Table 1 summarizes this outcome.

Table 1: The portfolio growth over ten years for various asset mix scenarios, starting capital of \$100,000

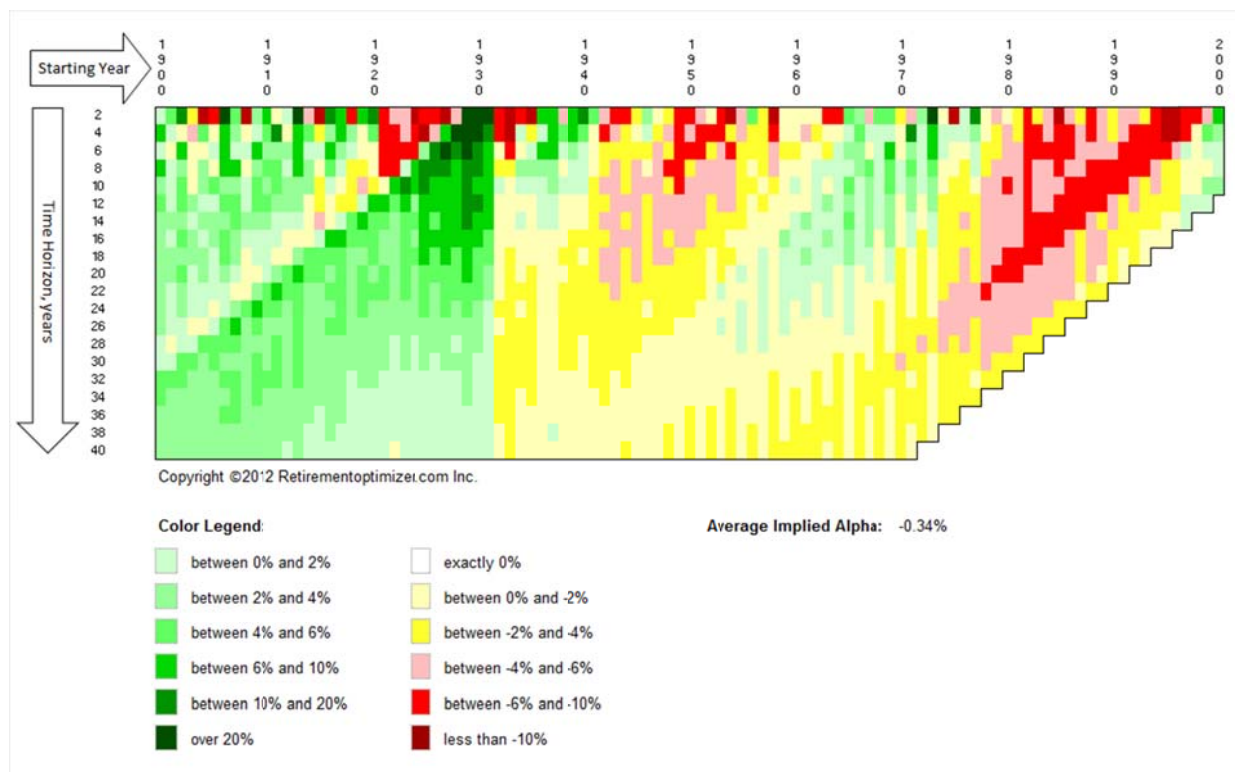
	Worst	Unlucky	Median	Lucky
Portfolio	\$51,587	\$88,434	\$158,003	\$328,254
SP	\$102,720	\$122,643	\$160,366	\$201,537

We observe that investing in the SP not only protected the principal, but it produced superior results for the median, unlucky and worst case scenarios for a ten-year time horizon.

The numerical difference between the two investment instruments can be displayed with a better clarity and resolution using a carpet chart (see Figure 6). We take the difference between the equity portfolio growth and SP growth for each starting year for all terms. We do that for a time horizon of up to 40 years.

The horizontal scale is starting years between 1900 and 2000. The vertical scale is the investment time horizon. Each “knot” of the carpet shows the difference in growth, which we call the “implied alpha”; generated by the SP for that term. Different colors indicate various brackets of this implied alpha, as indicated on the legend. The average implied alpha is also included on each chart. Colors in green shades mean that the SP was superior to portfolio, and red shades means the opposite.

Figure 6: The carpet chart of implied alpha for holding an SP (2-year term, 50% participation, no cap) compared with holding an equity portfolio with the index return



The Investor’s Return:

The market carpet in Figure 6 assumes that the investor can receive the full index return in his equity portfolio. However, this ideal return is rarely achieved by the average investor in real life. The investor’s behavior has a great impact on the outcome. There are numerous behavioral risks such as, failing to distinguish between the “normal” and “fat-tail” events, trading too often, too late, too early, in the wrong direction, and trading with emotions. All of these (and other) factors reduce the returns of the average investor significantly.

There are studies by others that compare the average market returns with the investor’s actual returns. DALBAR’s 2010 update of its Quantitative Analysis of Investor Behavior (QAIB) study^v found that while the S&P 500 has returned 8.35% over a 20 year period ending in 2008, the average equity investor earned just 1.87%. This means, the average investor had an implied alpha of *negative 6.48%*. Another source, John Bogle^{vi} estimates that over a 25-year period ending in 2005, the average mutual fund investor earned 7.3% compared to the 12.3% for the benchmark, an implied alpha of *negative 5%*.

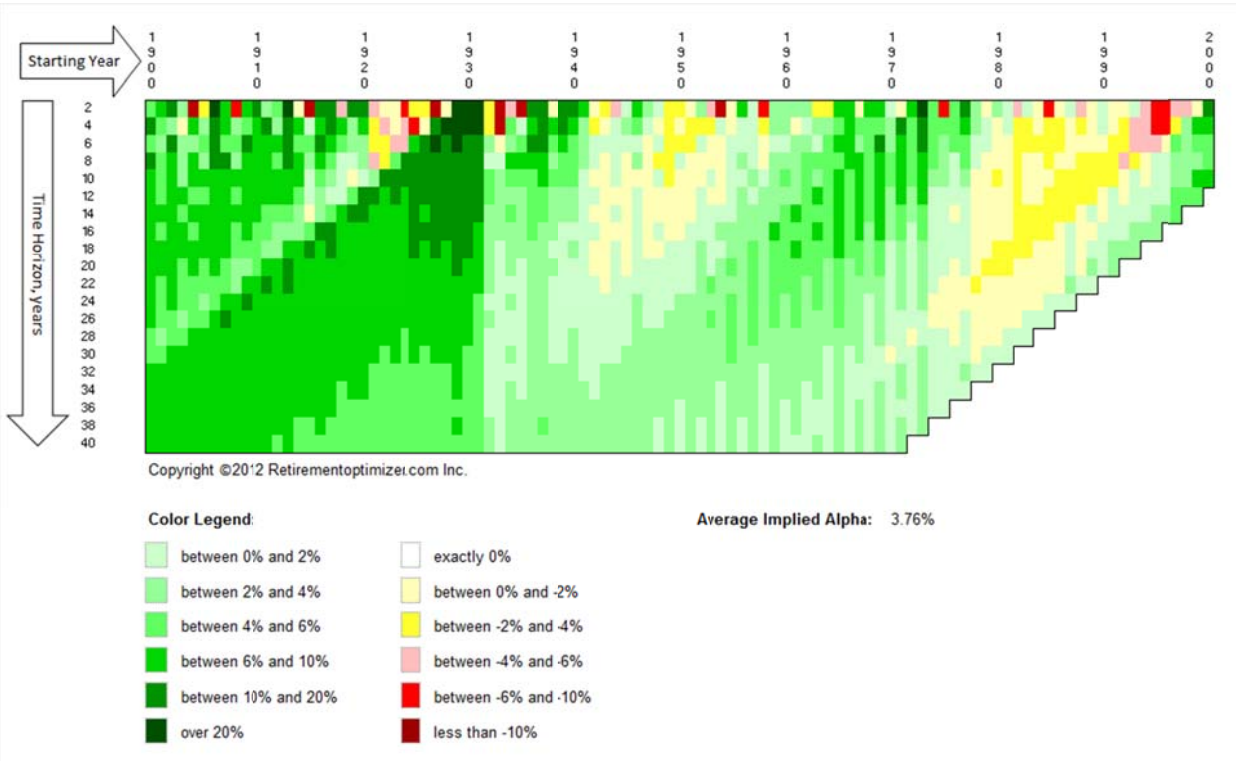
Equity Portfolio returns: to account for the behavioral risk, in our analysis, we include two sets of scenarios:

- The **index** return: historical index return for the equity portfolio such as we used in developing Figure 6.
- The **investor** return: We use a smaller degree of self-imposed wealth destruction in our scenarios. For the equity portfolio return, we use the historical index return less 4% as our **investor** return.

SP returns: Because the principal is guaranteed, it is less likely for the investor to make these behavioral mistakes when holding the SPs. Therefore in all scenarios, we use the index return, adjusted for the participation rate, for our SP returns.

Following this logic, we recalculate Figure 6. The results are depicted in Figure 7. Notice the abundance of “greener” areas on the carpet. Other than during parts of roaring, secular-bullish trends, SP added significant value. The average implied alpha was 3.8%.

Figure 7: The carpet chart of implied alpha for holding an SP (2-year term, 50% participation, no cap), compared with holding an equity portfolio with the investor return



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Using the same methodology, we calculate the average implied alpha for various terms and participation rates. Table 2 summarizes the results of holding SP versus equity portfolio with **index** return. For example, for an SP with a 2-year term and a 60% participation rate, the average implied alpha is 0.57% over and above holding the equity portfolio with index return.

We also calculated the effect of dividends for the 2-year term for comparative purposes. The second-last row shows the effect of including historical dividends in the portfolio's growth (i.e. the total return). The last row of numbers shows the effect of including a flat 2% dividend (prevailing average dividend yield at the time of writing), in the return of the portfolio's growth. In all calculations, the SP return is based on the index return only, no dividends at all.

We observe that the shorter is the term of the SP, the larger is the average implied alpha. Also, just as expected, larger participation rate increases the average implied alpha.

Table 2: Average implied alpha, holding SP compared with holding equity portfolio growing at **index** return:

Term of SP	Participation Rate of SP:				
	40%	50%	60%	70%	80%
	Average Implied Alpha:				
1 year	-0.30%	0.90%	2.09%	3.26%	4.42%
2 years	-1.26%	-0.34%	0.57%	1.45%	2.31%
3 years	-1.84%	-1.07%	-0.33%	0.39%	1.08%
4 years	-2.02%	-1.31%	-0.64%	0.01%	0.63%
5 years	-2.05%	-1.38%	-0.73%	-0.12%	0.47%
6 years	-2.19%	-1.56%	-0.96%	-0.38%	0.16%
7 years	-2.26%	-1.66%	-1.09%	-0.56%	-0.05%
	(portfolio return includes historical dividends)				
2 years	-5.91%	-4.99%	-4.08%	-3.20%	-2.34%
	(portfolio return includes a flat 2% dividend yield)				
2 years	-3.31%	-2.38%	-1.48%	-0.59%	0.27%

Table 3 shows the same for the SP against the equity portfolio with **investor** return.

Table 3: Average implied alpha, holding SP compared with holding equity portfolio growing at **investor** return:

Term of SP	Participation Rate of SP:				
	40%	50%	60%	70%	80%
Average Implied Alpha:					
1 year	3.79%	5.00%	6.18%	7.35%	8.51%
2 years	2.83%	3.76%	4.66%	5.54%	6.41%
3 years	2.25%	3.02%	3.76%	4.48%	5.18%
4 years	2.08%	2.78%	3.46%	4.10%	4.73%
5 years	2.05%	2.72%	3.36%	3.98%	4.57%
6 years	1.90%	2.54%	3.14%	3.71%	4.26%
7 years	1.84%	2.44%	3.01%	3.54%	4.05%
(portfolio return includes historical dividends)					
2 years	-1.83%	-0.90%	0.00%	0.88%	1.75%
(portfolio return includes a flat 2% dividend yield)					
2 years	0.78%	1.71%	2.61%	3.49%	4.36%

Optimum Asset Mix:

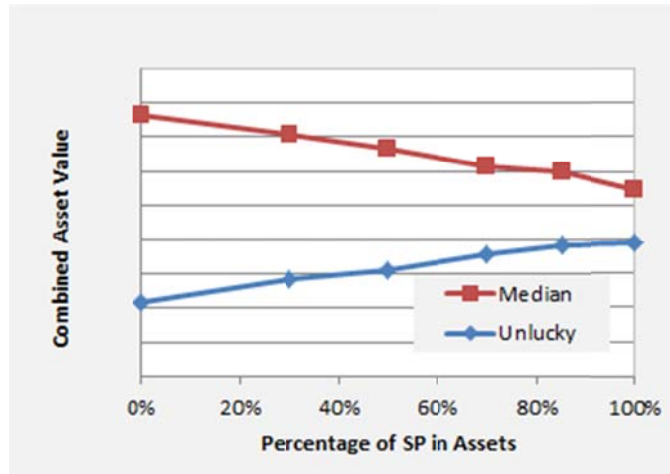
We can optimize a mix of SP and equity portfolio for two distinct objectives. The first one is maximizing the combined asset value for a given time horizon. The second is minimizing the risk of loss to an acceptable level.

Maximizing the Combined Asset Value:

We calculate the combined value of the unlucky and the median assets of the equity portfolio and the SP for various asset mixes. We repeat this calculation for 10, 15, 20, 30, and 40-year time horizons. Then we plot these on a chart, as depicted in Figure 8. The horizontal axis shows the percentage of the SP in the combined assets. The vertical scale indicates the combined asset value at the end of that particular time horizon.

In each of these calculations, we use the index return for the portfolio growth. As for the SP, we used 5-year term, 60% participation rate, no cap.

Figure 8: Combined asset value, time horizon 40 years using index return



To decide on the optimum mix, we ask two questions. The first one is: “As we add more SP to assets, does that decrease the median asset value?” If the answer is “yes” then we stop right there. This is our optimum.

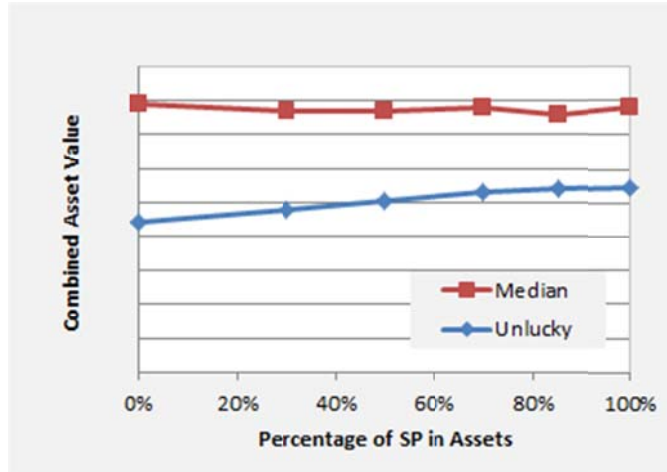
If the answer is “no”, then we ask our second question: “As we add more SP to assets, does that increase the unlucky asset value?” If the answer is “yes” then we choose the largest percentage of SP that increases the value of the unlucky asset value.

We look at the chart in Figure 8 which shows a 40-year time horizon. The answer to the first question is “yes”; i.e. adding SP decreases the median asset value. Therefore, our optimum is 0% SP and 100% equity portfolio.

Let’s look at the chart in Figure 9 which shows a 10-year time horizon. Here, we come to a different conclusion. Adding SP does not decrease the median asset value significantly; it is almost a flat line. However, adding SP improves the unlucky outcome. In this case, for a ten-year time horizon, the optimum mix is 100% SP and 0% equity portfolio.

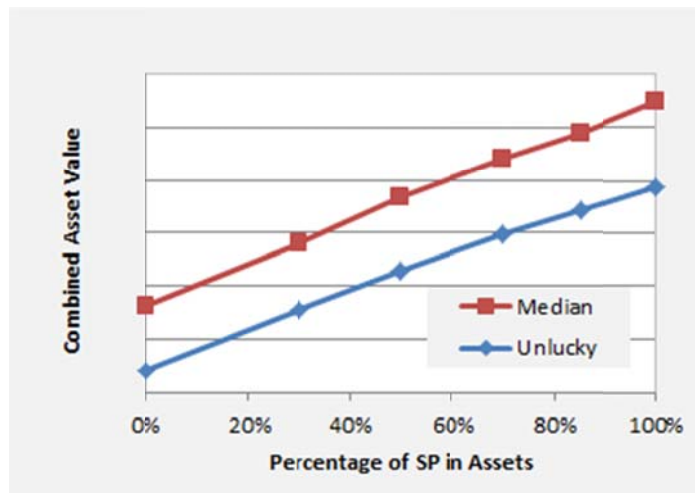
Following this methodology, our analysis indicates that SP gives better results when the time horizon is 15 years or shorter. When the time horizon is 20 years and longer then the equity portfolio is the better choice.

Figure 9: Combined asset value, time horizon 10 years using index return



However, these findings change significantly when we use the **investor** return instead of the **index** return. Figure 10 depicts the combined asset value for a time horizon of 40-years. It is based on using the investor return on the equity portfolio, i.e. applying index less 4%. We observe that the optimum allocation to SP is 100% for the average investor. This gives the largest median asset value, even after 40 years of holding time.

Figure 10: Combined asset, time horizon 40 years, using investor return



We expand our analysis further and calculate the breakeven levels for the investor return. Table 4 displays for each SP participation rate, the investor return below which it is better to hold the SP instead of the equity portfolio over long time horizons.

Table 4: Breakeven levels for holding SP versus holding equity portfolio for maximum median asset value

Participation Rate of SP	Breakeven Level:
40%	If the investor return lags index return by more than 2.3%, hold SP
50%	If the investor return lags index return by more than 1.6%, hold SP
60%	If the investor return lags index return by more than 1.0%, hold SP
70%	If the investor return lags index return by more than 0.4%, hold SP
77% and larger	Even if the investor return is same as the index return, hold SP

Minimizing the Risk of Loss:

Here, the investor has a specific tolerance for loss; he might say “I don’t want to lose more than 10% at the end of my 10-year time horizon”

Table 5 summarizes the maximum historical loss for various asset mixes between the equity portfolio and SP combinations for different time horizons. Here we assume that the return of the equity portfolio is the index return.

Keep in mind; these figures are based on historic extreme losses and future extremes will be different.

Table 5: Maximum loss for various asset mix and time horizons

Asset Allocation (Equity Portfolio / SP)	Time Horizon, years					
	1 year	2 years	3 years	5 years	10 years	20 years
Maximum Loss at the end of the Time Horizon						
100/0	52.7%	68.6%	75.9%	70.4%	48.9%	40.9%
70/30	36.9%	53.4%	61.2%	56.5%	40.7%	30.0%
50/50	26.3%	41.2%	49.6%	46.9%	33.5%	19.7%
30/70	16.3%	26.8%	34.5%	33.6%	23.3%	5.2%
20/80	11.9%	18.7%	25.0%	24.8%	16.5%	0%
10/90	6.5%	9.8%	13.7%	13.9%	8.0%	0%
0/100	0%	0%	0%	0%	0%	0%

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For example, if you want to keep your losses to less than 10% over a 10-year time horizon, then you can have 10% equity portfolio and 90% SP.

Structured Products versus Cash:

There are two different motivations for investing in a SP:

1. Those who want to invest in equities but don't like the downside volatility,
2. Those who invest in CD-type savings but don't like the low interest rates.

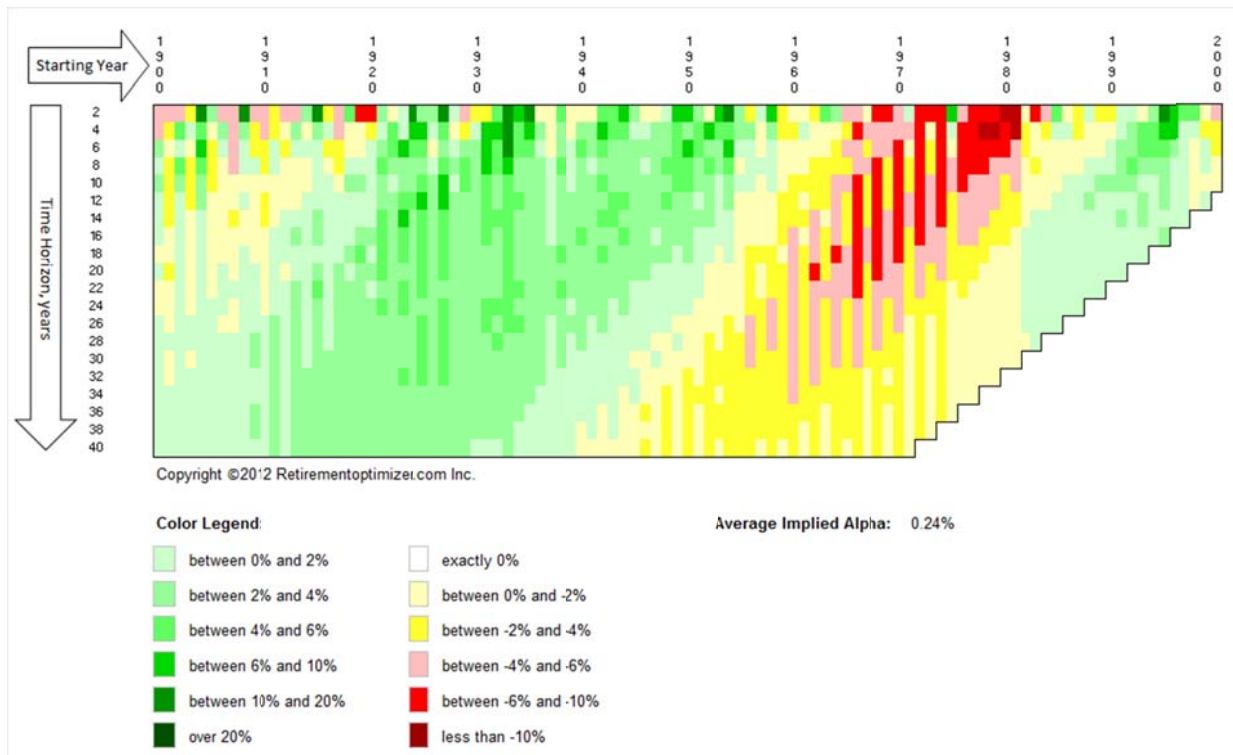
While both of these objectives converge into the same outcome, it is worthwhile to compare the historical performance of SP with the performance of CD-type savings to cover the second motivation type.

Table 6 summarizes the implied alpha for holding an SP versus a CD over the last century. Figure 11 depicts the carpet chart for the same.

Table 6: Average implied alpha, holding SP compared with holding CD:

Term of SP	Participation Rate of SP:				
	40%	50%	60%	70%	80%
	Average Implied Alpha:				
1 year	0.33%	1.53%	2.71%	3.89%	5.05%
2 years	-0.68%	0.24%	1.15%	2.03%	2.89%
3 years	-1.29%	-0.53%	0.21%	0.93%	1.63%
4 years	-1.47%	-0.77%	-0.10%	0.55%	1.17%
5 years	-1.52%	-0.84%	-0.20%	0.42%	1.00%
6 years	-1.66%	-1.03%	-0.43%	0.14%	0.69%
7 years	-1.74%	-1.14%	-0.57%	-0.04%	0.47%

Figure 11: The carpet chart of implied alpha for holding an SP (2-year term, 50% participation, no cap), compared with holding a CD



Conclusion:

The aftcast of all years since 1900 leads us to conclude the following:

Downside Protection: If the accumulation time horizon is shorter than 15 years, then downside protection should be the main concern. SPs can diminish that concern, because they have the built-in, phantom asset allocation that allows the SP manufacturer to provide that for the investor.

Asset Growth: Long term research by others shows that the average equity investor lags the equity index returns by as much as 6.5% on an annual basis. Many attribute this to behavioral risk. Our research indicates that over the long term, for the average investor, SPs will provide a larger median asset value compared with holding equity investments. Even a small underperformance of the equity portfolio, as little as 2.3%, is sufficient for this conclusion.

Generally, everything else being equal, an SP with a shorter term adds more value than an SP with a longer term.

About Aftcast.com

Aftcast.com provides research in the area of retirement income products to its clients. The research is based on non-Gaussian philosophy using actual market history. It helps its clients to better understand the behavior and impact of retirement income products under various, non-simulated, historical market environments. It provides the intelligence to its clients to make more informed decisions to manage and market their existing and planned retirement income products.

This report was researched and authored by Jim Otar, CFP, CMT, BAsC, MEng, who is the founder of aftcast.com.

For your comments and feedback, or to learn more about aftcasting, please visit www.aftcast.com or send an email to jim@retirementoptimizer.com

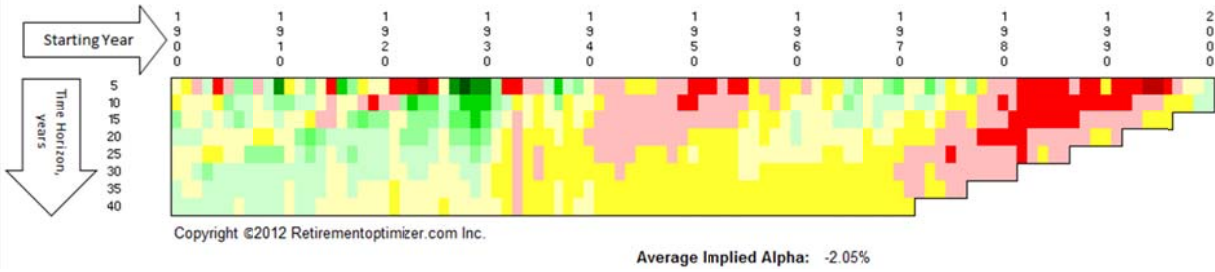
Footnotes:

- ⁱ Otar, Jim C., December 2011, whitepaper, “Determinants of Growth in Distribution Portfolios – A Non-Gaussian Analysis”
- ⁱⁱ Otar, Jim C., 2009, “Unveiling the Retirement Myth”, pages 90 -105, Chapter 8, “Mathematics of Loss”
- ⁱⁱⁱ Equity proxy: Dow Jones Industrial Average (DJIA) since 1900. DJIA is developed, maintained and licensed by Dow Jones Indexes, part of Dow Jones & Company, Inc.
- ^{iv} There are two popular ways of calculating the interest amount credited. The first one is the participation rate which is a fixed percentage of the index performance, such as 50%. The second method is the yield difference, which is index performance less an “asset fee”. In this study we only analyzed the first method.
- ^v Dalbar's 2010 Quantitative Analysis of Investor Behavior (QAIB), Dalbar.com
- ^{vi} Bogle John, “The Little Book of Commonsense Investing” ISBN: 978-0470102107

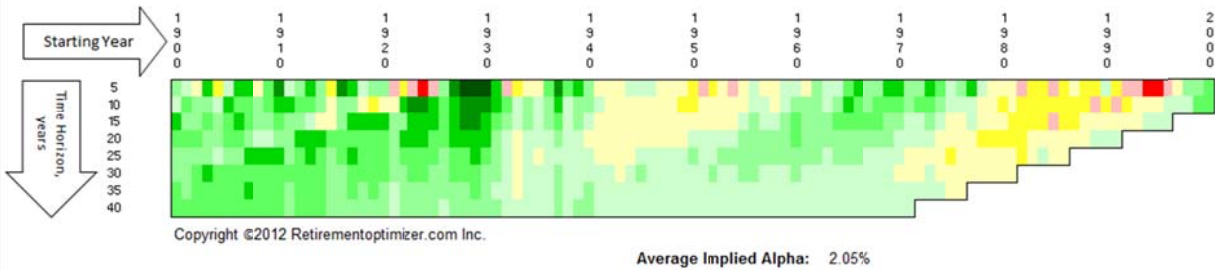
Appendix:

Sample Carpet Charts for Structured Products

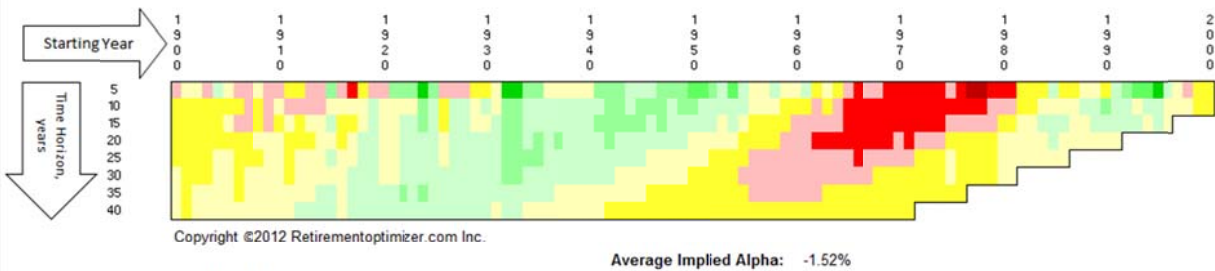
The carpet chart of implied alpha for holding an SP (5-year term, 40% participation, no cap), compared with holding an equity portfolio, index return:



The carpet chart of implied alpha for holding an SP (5-year term, 40% participation, no cap), compared with holding an equity portfolio, investor return:



The carpet chart of implied alpha for holding an SP (5-year term, 40% participation, no cap), compared with holding a CD:

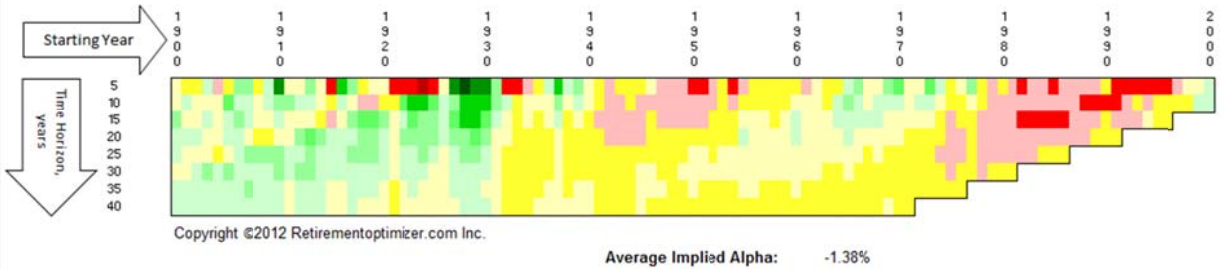


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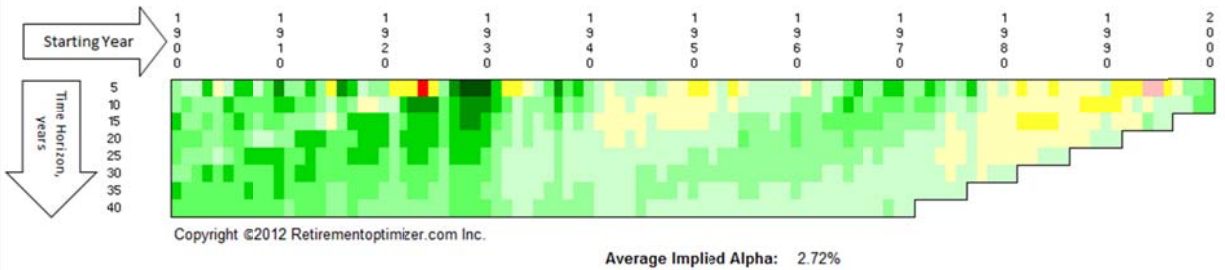
- | | |
|---------------------|----------------------|
| between 0% and 2% | exactly 0% |
| between 2% and 4% | between 0% and -2% |
| between 4% and 6% | between -2% and -4% |
| between 6% and 10% | between -4% and -6% |
| between 10% and 20% | between -6% and -10% |
| over 20% | less than -10% |

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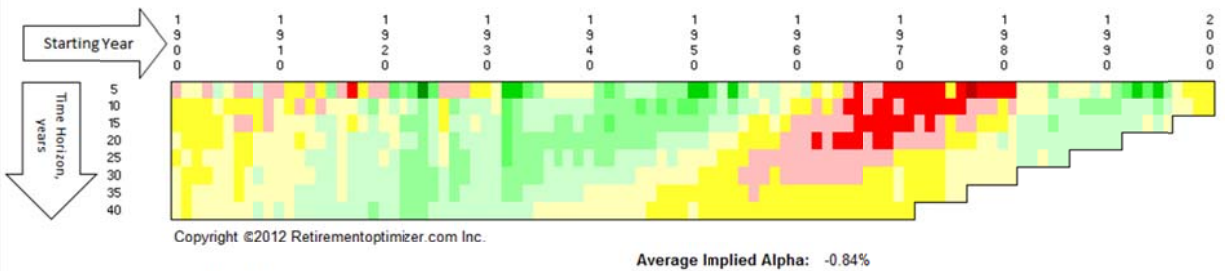
The carpet chart of implied alpha for holding an SP (5-year term, 50% participation, no cap), compared with holding an equity portfolio, index return:



The carpet chart of implied alpha for holding an SP (5-year term, 50% participation, no cap), compared with holding an equity portfolio, investor return:



The carpet chart of implied alpha for holding an SP (5-year term, 50% participation, no cap), compared with holding a CD:

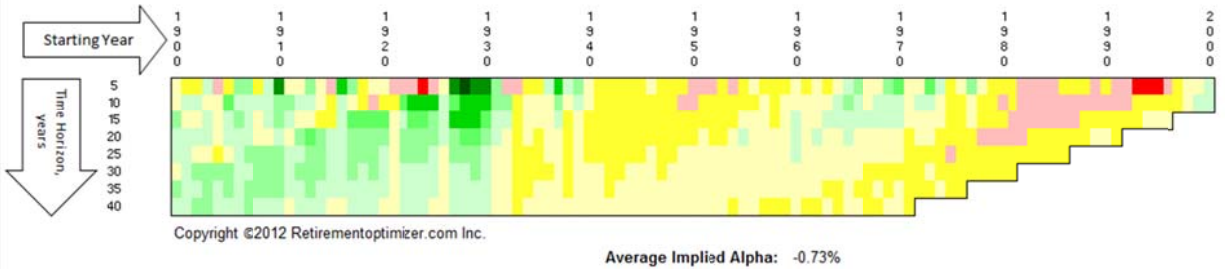


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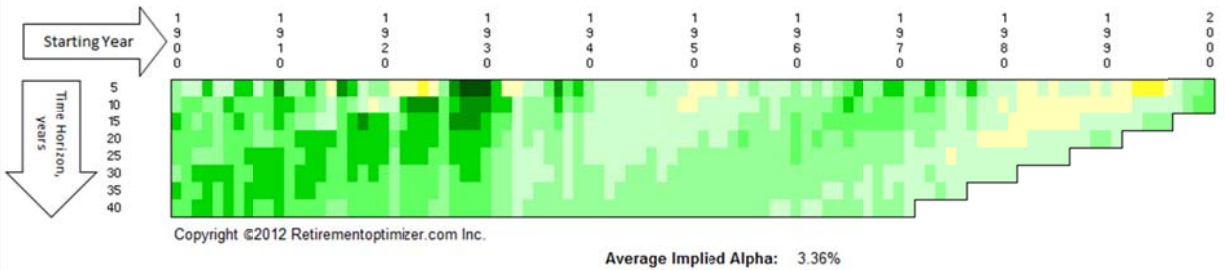
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| ■ between 0% and 2% | ■ exactly 0% |
| ■ between 2% and 4% | ■ between 0% and -2% |
| ■ between 4% and 6% | ■ between -2% and -4% |
| ■ between 6% and 10% | ■ between -4% and -6% |
| ■ between 10% and 20% | ■ between -6% and -10% |
| ■ over 20% | ■ less than -10% |

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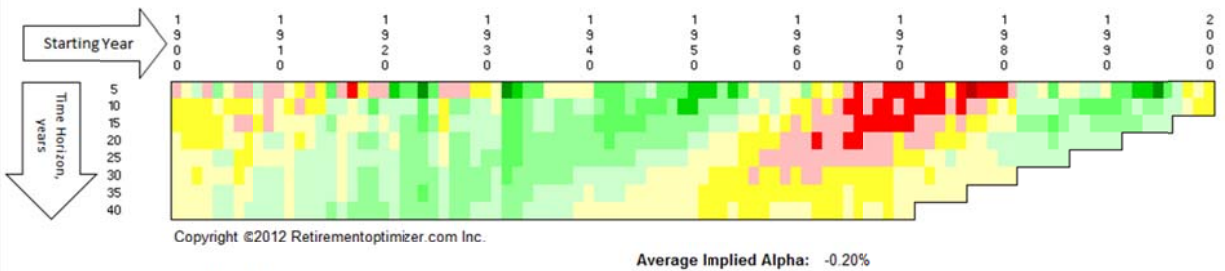
The carpet chart of implied alpha for holding an SP (5-year term, 60% participation, no cap), compared with holding an equity portfolio, index return:



The carpet chart of implied alpha for holding an SP (5-year term, 60% participation, no cap), compared with holding an equity portfolio, investor return:



The carpet chart of implied alpha for holding an SP (5-year term, 60% participation, no cap), compared with holding a CD:

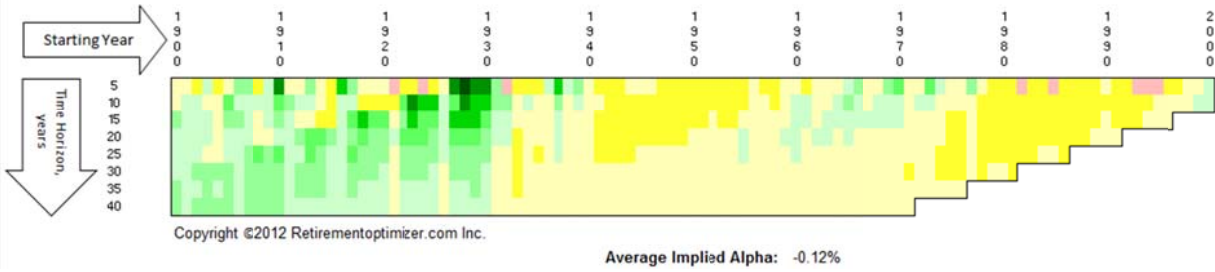


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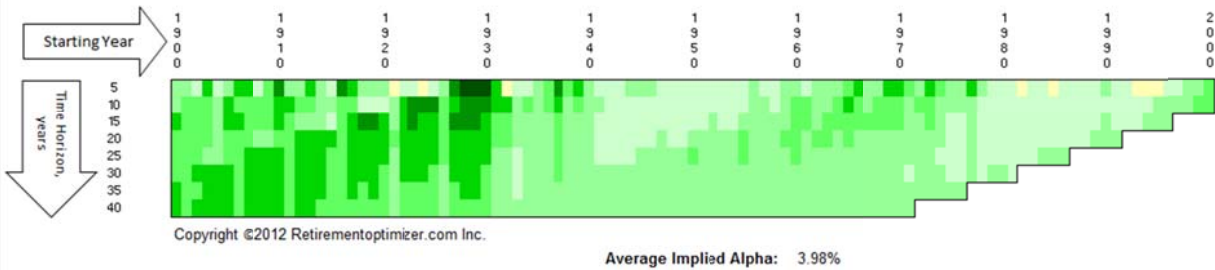
- | | |
|---------------------|----------------------|
| between 0% and 2% | exactly 0% |
| between 2% and 4% | between 0% and -2% |
| between 4% and 6% | between -2% and -4% |
| between 6% and 10% | between -4% and -6% |
| between 10% and 20% | between -6% and -10% |
| over 20% | less than -10% |

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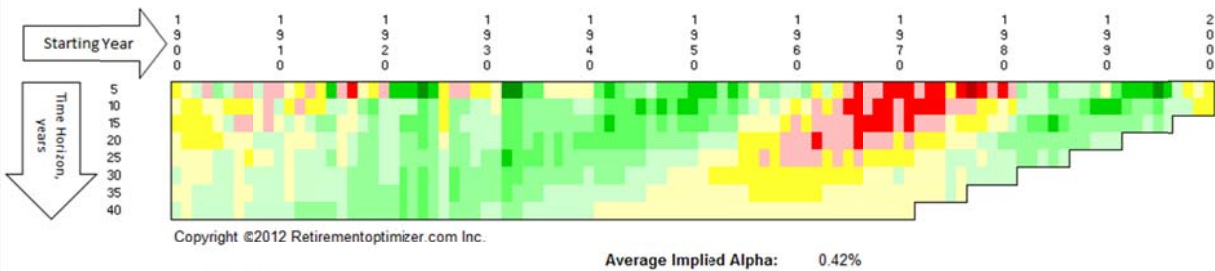
The carpet chart of implied alpha for holding an SP (5-year term, 70% participation, no cap), compared with holding an equity portfolio, index return:



The carpet chart of implied alpha for holding an SP (5-year term, 70% participation, no cap), compared with holding an equity portfolio, investor return:



The carpet chart of implied alpha for holding an SP (5-year term, 70% participation, no cap), compared with holding a CD:

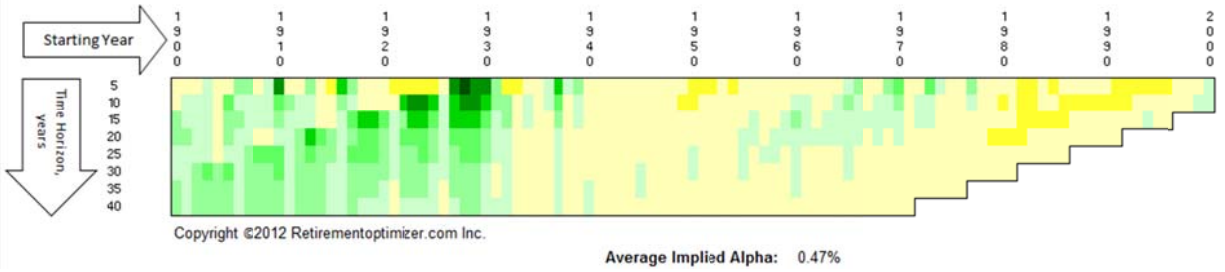


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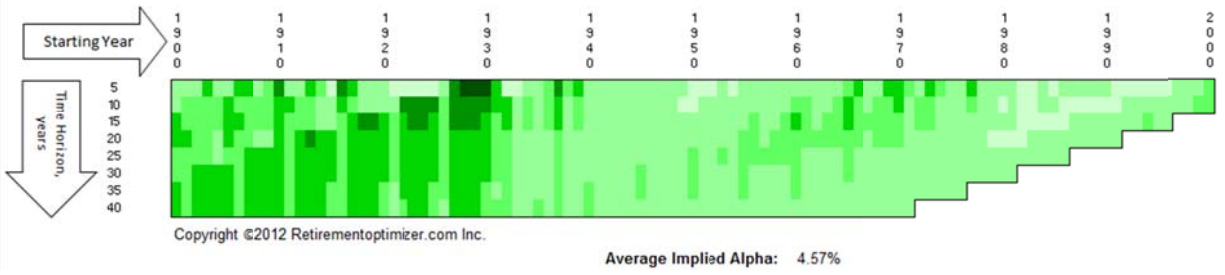
- | | |
|---------------------|----------------------|
| between 0% and 2% | exactly 0% |
| between 2% and 4% | between 0% and -2% |
| between 4% and 6% | between -2% and -4% |
| between 6% and 10% | between -4% and -6% |
| between 10% and 20% | between -6% and -10% |
| over 20% | less than -10% |

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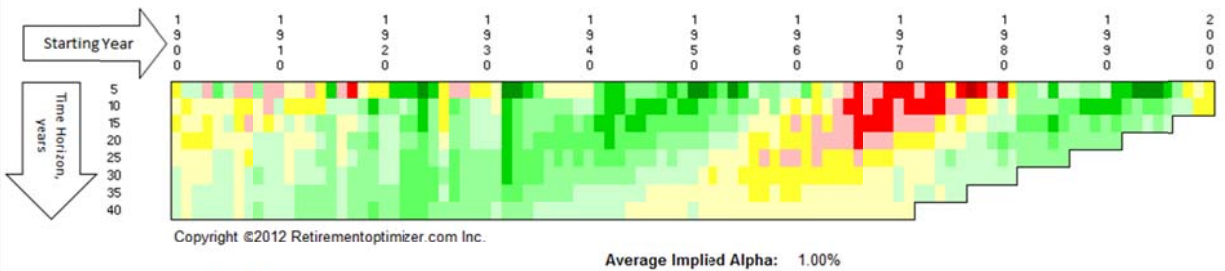
The carpet chart of implied alpha for holding an SP (5-year term, 80% participation, no cap), compared with holding an equity portfolio, index return:



The carpet chart of implied alpha for holding an SP (5-year term, 80% participation, no cap), compared with holding an equity portfolio, investor return:



The carpet chart of implied alpha for holding an SP (5-year term, 80% participation, no cap), compared with holding a CD:



Color Legend:

- between 0% and 2%
- between 2% and 4%
- between 4% and 6%
- between 6% and 10%
- between 10% and 20%
- over 20%
- exactly 0%
- between 0% and -2%
- between -2% and -4%
- between -4% and -6%
- between -6% and -10%
- less than -10%

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