

**Portfolio Stochastic Design Scans:
Annual Review of Model Assumptions**

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**“ In the end, how your investments behave is much less
important than how you behave. ”**

**Benjamin Graham
The Intelligent Investor**

2009 Year End Testing of Assumptions

After a year of scanning a few hundred 401k plans and managing investments, its time to conduct a year-end review of the assumptions used in the model for PSDS scans. How well did the forecasts describe actual portfolio performance? What issues were raised by 401k scan comments and what changes were made to PSDS. Some of the issues have been talked about in 2009 White Papers and Tech Notes but a few are new.

Monte Carlo Simulation Assumptions

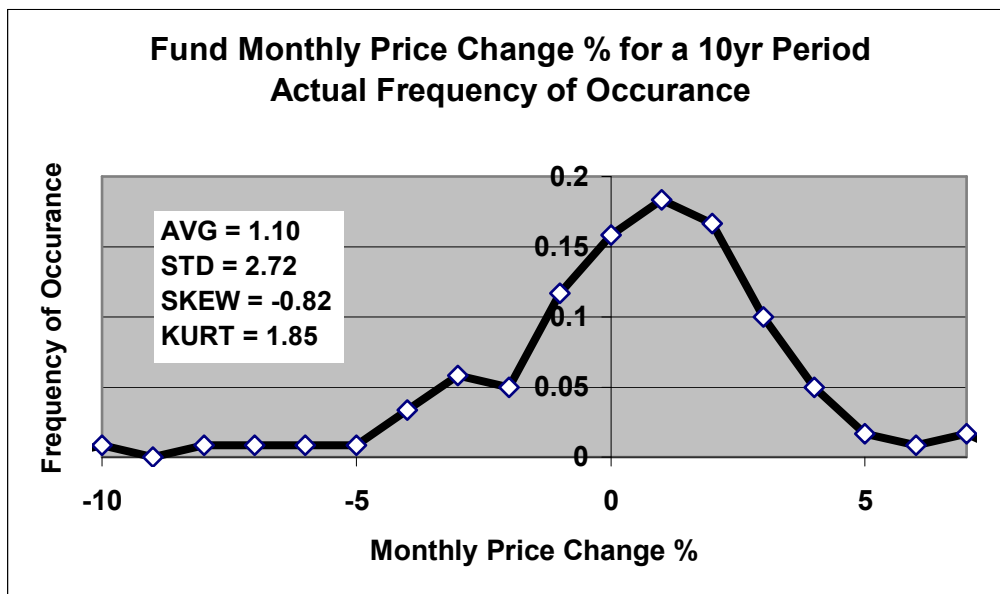
Lets start with the assumption that modern portfolio theory makes that markets are efficient and the assumption that PSDS Monte Carlo simulations find the highest Sharpe ratio portfolios. The Black Swan events of 2008 exposed the Mis-Behavior of markets for all to see. That issue was analyzed in ELS White Paper 2009-1 and the PSDS assumption I want to discuss here is that Funds in the Monte Carlo scan are not correlated. In math terms the variance-covariance matrix of the funds is assumed diagonal. It is a good approximation for design scans but a PSDS user who does not understand the implications can misuse PSDS like all software.

To illustrate the point, if you run a scan with just one Fund you get a Balanced portfolio APR, STD and PSR that is stochastically the same as the Funds input data. If you run a scan with two Funds that are the same Fund then the scan will get a Balanced portfolio with the same APR but with a lower STD. Why? Because the PSDS model assumes these are two independent Funds with the same input properties and they operate in parallel.

That means one can go down and one up at the same time. Clearly that is impossible if they are same Fund. PSDS input is now screened to exclude duplicate input Ticker Symbols. That change was made as a result of the year-end review.

Fund Probability Distributions

PSDS has three different probability distributions that can be used for a design scan. The 401k design scans posted on the Blog use the Gaussian (random) distribution function to model Fund data. The other two are Levy and Student T which are used for stress testing when “fat tails” are evident in the Fund data.



As the graphic for an actual Fund’s monthly price data shows that distribution is skewed and not symmetric. The same data sampled on an annual basis instead of monthly is closer to Gaussian.

The Hyperpatch Chronicles describes how to model actual fund data using Hermite polynomials based on fund AVG, STD, Skew and Kurtosis computed from price histogram data. This would increase the accuracy of the simulations in the same way finite element models increase the accuracy of simulation models for cars and planes. It would increase costs but might be appropriate if the portfolio being scanned was very large and complex. The computer cost to run the simulation would not be large but the modeling cost would be.

Fixed Income Fund Issues

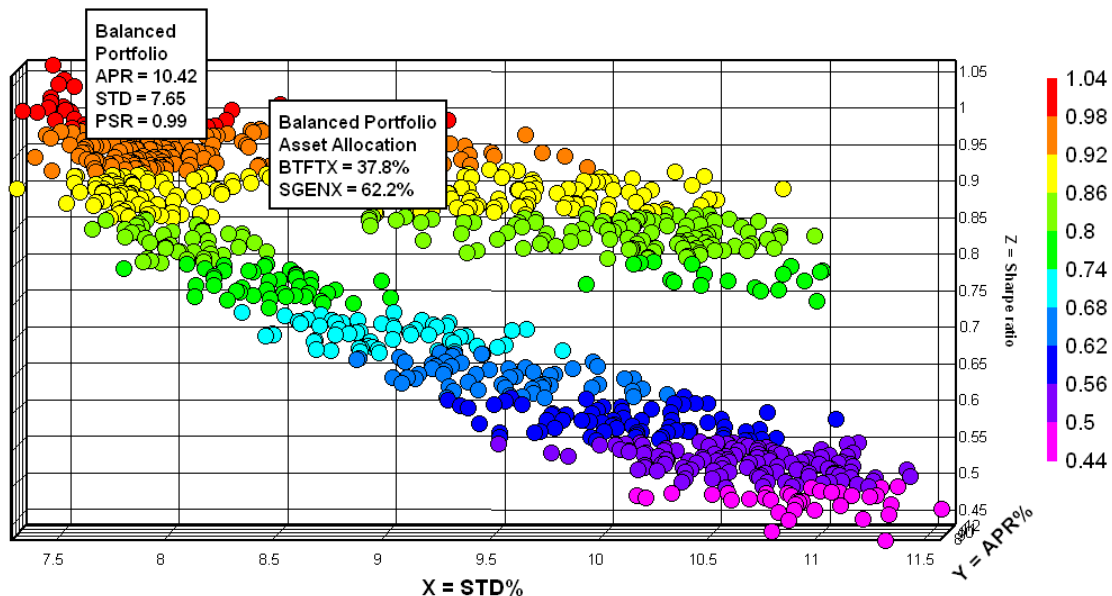
Early in 2009 as the market continued its steep decline I looked long and hard at my bond fund LSBDX whose price had declined 25% in Q4 2008 and had a negative 5yr Sharpe ratio. At the same time it continued to pay about the same monthly cash dividend making its yield go up more than 25%. In this case Sharpe ratio was saying sell but I decided to keep LSBDX in the portfolio. It is up 35% as 2009 draws to a close still paying about the same cash dividend each month. It is safe to say Mr. Market miss priced the Fund in the panic of Q4 2008. This same thing happened to other fixed income investments and while I still use Sharpe ratio as one metric for asset allocation it is not the only metric to consider especially for fixed income investments.

To deal with portfolio scans where no Fund had a positive 5yr Sharpe ratio, logic was add to PSDS that allocated money to Funds with positive 5yr APRs based on APR/STD and it has worked well. The message here is that Sharpe ratio is a design tool for all markets, but Black Swan markets require common sense changes

Actual 2009 Portfolio Performance

The PSDS portfolio asset allocations were checked every quarter and a few minor adjustments were made. I swapped VFITX out for VFIX to reduce volatility and rebalanced asset allocation each quarter to keep the actual portfolio close to the Balanced portfolio design. As we all know now the market bounced back strongly in 2009 in part because the US government bailed out the banks as the Treasury injected a lot of cash into the economy to rescue the sub-prime mortgage market from collapse. The portfolio scan in TechNote 2009-3 had a 10yr Balanced portfolio forecast return of APR = 10.2% with low volatility risk STD = 7.66%,

ELS TechNote 2009-3 Portfolio Scan
12/31/2008 10yr Market Data



The actual portfolio as of 12-19-2009 had a YTD return of over 22% and the Loomis and Sayles LSBDX fund was up over 35% in part because of government programs like TARP that rescued the financial markets. All I can say at this point is that the ELS portfolio design has done better in 2009 than forecast.