

## THIS MONTH'S HISTORY LESSON: (MAY 2006)

### **PICKING THE BEST MUTUAL FUND:**

**1.0 INTRODUCTION:** This month we explain how to pick the best mutual fund by balancing the potential gains against the risks that you are willing to take. High market returns usually requires you to take correspondingly high risks. This will give high gains during rising markets (yeah!), but also large losses when the market turns down (ouch!). On the other hand, safe, secure, low-risk assets have low gains, but also have smaller losses when the market is falling. Which type should you choose?

Since returns depend on risk, how do we go about quantifying risk, and decide how much is acceptable? To do this, we have to learn some definitions and understand how to apply these to the universe of mutual funds. Then we can move on to the process of picking the best mutual fund that matches your investing temperament. Those of you who only want the bottom line of best mutual fund picking, without all the details, can go directly to section 4.0.

### **2.0 TERMINOLOGY:**

**Return** is the gain or loss on an asset, such as a stock or bond or a fund of either stocks or bonds, over a specified period of time. Return is the sum of two components, the change in the fund price (up or down), plus dividends received.

**Mean** is used to denote the average value.

**Mean Return** is the gain or loss over a specified period of time.

**Annual Return** is the gain or loss over a 1 year period.

**Monthly Return** is the gain or loss over a 1 month period.

**Risk** is the volatility or fluctuation in the price of an asset, over a specified time period. An asset, whose price has large fluctuations, is called high-risk, while an asset with low price fluctuations is called low-risk.

**Standard Deviation** (abbreviated as “**Std. Dev**”) is used to quantify risk, and is also called “**sigma**”. Sigma measures the deviation of the price fluctuation from the mean return. It also provides the probability of how the price is distributed about the mean return.

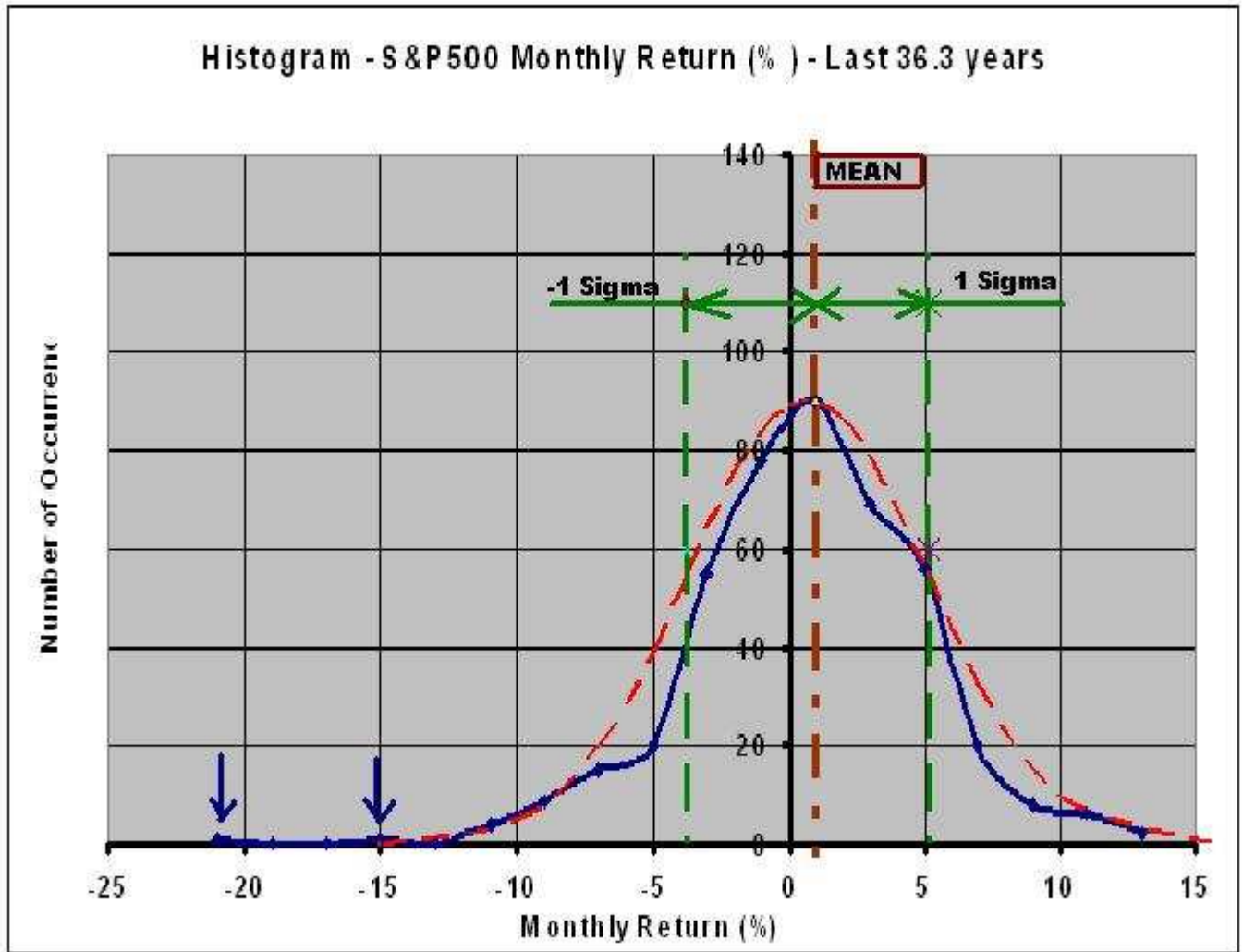
**Histogram** (also called distribution) is a graphical display of tabulated frequencies. That is, it is a graphical version of a table showing what proportion of cases fall into each category.

**Excess Yield:** The yield (interest rate) of a bond or annual return of a stock, minus the annual yield of the 3 month T-bill is called the “excess yield”. The 3 month T-bill, currently yielding 4.75%, has zero risk. You know therefore, that when you get a higher yield for a bond, or higher return on a stock, that you have taken on additional risk.

**Sharpe Ratio:** The Sharpe ratio is the Excess Yield divided by the Std. Deviation, which

gives a single number with which to compare the risk-reward ratio of different assets.

**3.0 CALCULATING RISK:** Figure 2 below (solid blue curve) is a histogram of the actual monthly return of the S&P500 over a 36.3 year period (436 months of data). This distribution is computed to have a mean monthly return of 0.71%, and a sigma of 4.42%.



The dash-dot brown line at  $X = 0.71$  is the mean value of  $X$ . The dashed green lines on both sides of the mean are spaced one sigma away from it, and are called the -1 sigma, and the +1 sigma lines.

Also shown for comparison (dashed red curve), is a “normal distribution” (bell curve), with the same mean return and sigma. A normal distribution has some well-known properties. These properties state that there is a 68% probability that  $X$  will fall between -1sigma and +1sigma. Also, there is a 95% probability that  $X$  will fall between the -2 sigma and +2sigma.

So for the monthly return of the S&P500 with a mean of 0.71%, and a sigma of 4.42%,

we can say that:

68% of the time, the monthly return will be between -3.71% and 5.13%.

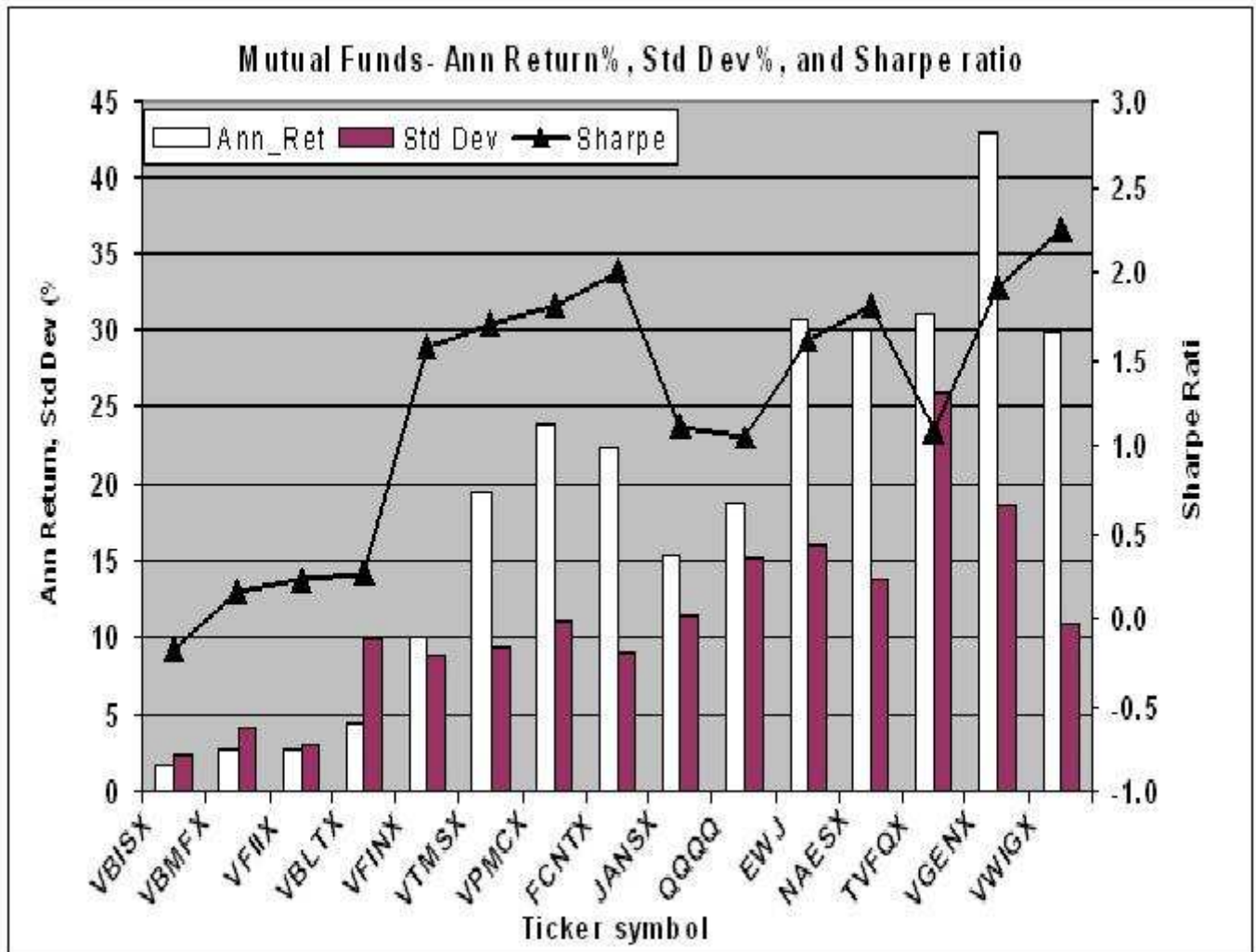
95% of the time, the monthly return will be between -8.13% and 9.55%.

However, the actual S&P500 monthly return (blue solid curve) is only an approximate match to the normal distribution (red dashed curve). The actual monthly return has a narrower width, and a very long left tail (statisticians call this a “log-normal distribution with high kurtosis”). This means that there are many months where the returns, both gains and losses, are smaller than that predicted by a normal distribution. Also, the long left tail (see the two blue arrows) shows that there are a few months with huge losses, that the normal distribution does not forecast. For instance, the normal distribution predicts that the monthly decline of 21.76% in October 1987 (a minus 5 sigma event), should occur only once in 139,000 years!!!! But of course it occurs much more frequently.

Nevertheless, the normal distribution assumption allows a simple and straightforward way of quantifying the performance of an asset using only two parameters (mean return and sigma), and is therefore widely used. *Please bear in mind that this predicts larger price fluctuations most of the time, and dramatically under-predicts infrequent but large declines.*

We should also know the probability and extent of possible worst case monthly declines. The distribution shows 2 occurrences (blue arrows) out of 436 months that have a loss greater than 15%. *Therefore, there is likely to be one month in about 18 years where we can experience a loss greater than 15% in the S&P500.*

**4.0 APPLICATION TO MUTUAL FUNDS:** Similar risk calculations can be performed for any stock or bond mutual funds and Exchange Traded Funds (ETF). The 3 year annual return, standard deviation and Sharpe ratio can be found at [www.morningstar.com](http://www.morningstar.com). Enter the fund symbol in the “quotes” box, and when the “Snapshot page” opens, click on “Risk Measures”. Figure 2 shows the annual and Std deviation for a variety of well known mutual funds and ETF’s. The cluster of 4 funds on the left are bond funds, the grouping of 5 in the middle are broadly based diversified domestic stock mutual funds, while the 6 on the right are “supercharged” sector funds (technology, energy, and foreign).



As expected, higher annual returns (white bars) are usually obtained with higher std dev i.e., higher risk assets (brown bars). But this is not always the case. There are 4 cases of about 30% annual returns (EWJ, NAESX, TVFQX, and VWIGX), where the corresponding std deviations are 16.09%, 13.98%, 25.9% and 10.96%. This means that we are taking a 2.4 times as much risk with TVFQX than with VWIGX, *to get the same annual return!*

The Sharpe ratio, shown as the black line in the figure, uses a slightly different formula, and is the best measure of return to risk ratio. The Sharpe ratio allows comparisons between different funds, and provides a concrete measure of the return to risk ratio. *The best mutual is the one with the highest Sharpe ratio, which indicates the fund with the highest return for a given amount of risk.*

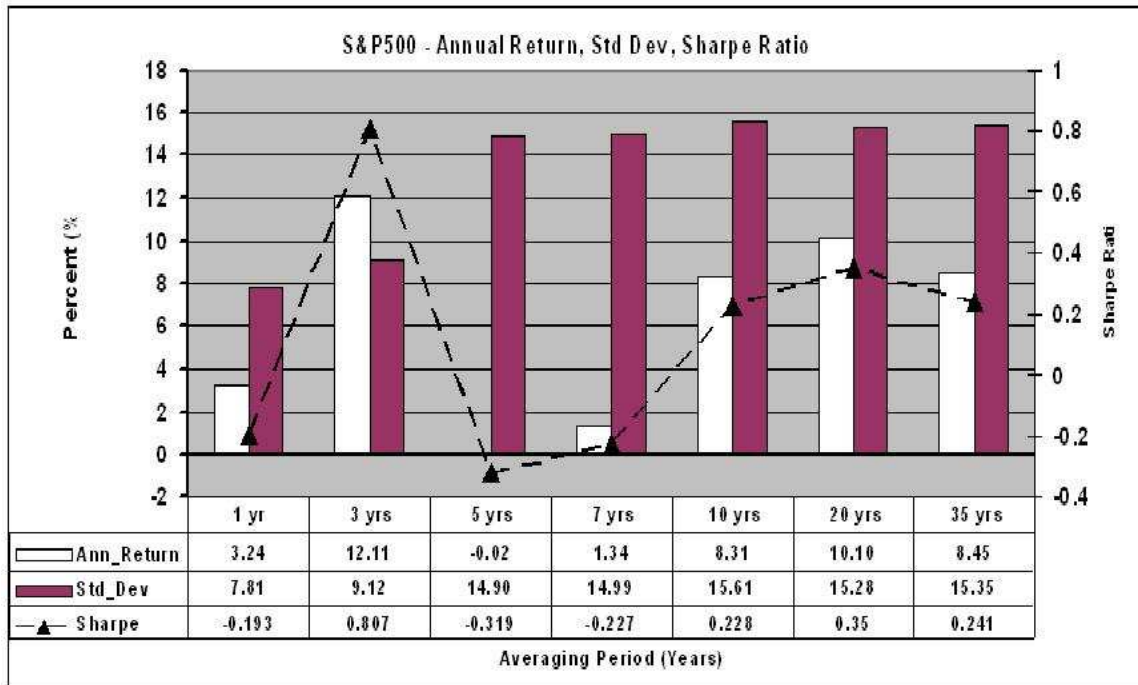
Comparing the 4 bond funds on the left of figure 3, we see that the Sharpe ratio of the bond fund VBLTX of 0.27 is almost the same as that for the bond fund VFIIX of 0.23. VBLTX is a long-term bond fund, and has a higher return than the medium term VFIIX. However, its std deviation is also much higher, so that the Sharpe ratio's for the two

funds are about the same. Therefore there is no need to take on the much higher price volatility of VBLTX, and VFIIX is a better choice.

Comparing the stock funds we see that Fidelity Contrafund (FCNTX) has the highest Sharpe ratio (2.01) of all the domestic funds shown. It handily beats even the narrowly focused “supercharged” sector funds. The Vanguard International Growth fund (VWIGX) has the highest Sharpe ratio of all, of 2.25, but it is not a domestic fund, has additional currency and other risks, and only a small amount should be included in a broad portfolio.

The Vanguard S&P500 Index fund VFINX, is also shown with a Sharpe ratio of 1.58. During the last 3 year bull-market, several managed funds have beaten VFINX. Over a longer-term period however, greater than 10 years, the VFINX has beaten over 80% of all the funds available. Data showing the return, risk, and Sharpe ratio of the S&P500, (which the VFINX is based on), is shown in the next section.

**5.0 CAUTION USING SHARPE RATIO:** Financial calculations are never straightforward, and this one has its own set of problems. The Sharpe ratio in the last section, were obtained using 3 year returns from [www.Morningstar.com](http://www.Morningstar.com) . However, the Annual return and Std Deviation can vary considerably, depending on the number of years over which the data is averaged, as shown for the S&P500 in the figure below.



The S&P500 Annual return goes from a high of 12.11% (last 3 year return, during a bull market) to a low return of -0.02% (last 5 year return, that includes the downturn of the early 2000's), and finally settles down to a long-term value of between 8.5%. The trend is similar for the Std dev which settles rapidly to a value of about 15%. The corresponding

Sharpe ratio fluctuates from a low of -0.319% to a high of 0.807%, and finally settles around 0.24%. The short-term averages are heavily influenced by recent data, while the long-term is only slightly influenced after about a 10 year averaging period. *Beware therefore of mutual funds that tout short-term performance only, which may be an aberration or due to random events, and never be repeated.*

## **6.0 CONCLUSIONS:**

- Never choose a mutual fund based simply on just short-term past performance, or promises of future returns.
- Quantify the excess yield, and understand the higher risk that comes with the asset. Be sure you can live with the price fluctuations at this risk level.
- The best mutual fund is the one with the highest Sharpe ratio.
- Understand that the Sharpe ratio using 3 year data will vary from year to year.
- It takes about 10 years for the return, std deviation and Sharpe ratio to approach a steady state value.
- Investment scams always claim guaranteed super-high gains with no risk.

**7.0 CLOSING THOUGHTS:** As an aside, you may be wondering why bonds should be included at all in any portfolio, as they all have very low Sharpe ratios..... Ah....there are many good reasons, but.... that is the subject of next month's history lesson.

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