A Free Lunch: Gains from Diversification

A skilled investor is part artist and part mathematician. The artist in her allows her to paint a view of the market based on experience, opinion, and intuition, while the mathematician argues for a more defined quantitative view. The mathematical applications for investing would be nearly exact if it weren't for emotions, human behavior, and luck. This battle between reason and passion rages on today.

Las Vegas is full of games where the odds can be determined. A good example is roulette. In the game of roulette there are 38 numbered slots when 0 and 00 are included. Each gambler receives odds of 36 to 1 for bets on numbers. His expected return is 36 divided by 38 or a 5.3% expected loss for each bet. Betting in this game is clearly a bad investment. However, people do win at roulette. They are lucky. Sooner or later the odds generally play out and if you stay at the table long enough your pockets will be emptied.

Making a single bet is a highly risky venture. You can expect to lose 37 times for every 38 bets place if you bet on an individual number. If you bet on a color, red or black, you have nearly a 50% chance of winning or losing (actually it's a 47.4% chance of winning and a 52.6% of losing because of 2 green numbers). All of the strategies have the same expected return; a loss of 5.3%. If you want to remain at the table a little longer you need to reduce your risk. To do this you can split your bet and lay down half on another option. The less the options are related, the more likely you are to stay long enough to finish your free drinks. If you bet on black, the bet that will best reduce the risk of losing all of your funds is to place an equal size bet on red. Red and black are nearly completely negatively correlated. Generally, when black wins, red loses, and vice-versa. The problem is that the odds remain stacked against you. Sooner or later you will lose (green) otherwise they wouldn't be able to build the next billion dollar casino.

Stock market investing has some similarities. One major difference is that the odds are stacked in your favor. Most stock market indices have historically averaged between 10% and 12%. Sooner or later you will likely win or profit from investing in the stock market. There may be stocks that go down or years in which the value of your account declines, but over longer time horizons you are very likely to win. The key becomes to increase your chances of winning. And the key for this is risk reduction or proper diversification. Simply put "Don't put all of your eggs in one basket."

This may be intuitively obvious, however many behavioral traits or emotions detract from investors' ability to carry this process out. Guarding against these obstacles allows us to be better investors.

Most investors fail to diversify because of over confidence. They have emotional ties to a company or their portfolio and tend to underestimate the risk associated with their holdings. They are also affected by the Representativeness, which is a behavioral finance

term to describe how investors focus on recent events. This is playing out presently with the technology sector. Many investors refused to trim down or sell their tech stocks at the top of the bubble. This is because most investors had done well with tech and became over confident. Now, after the tech wreck, they want to avoid technology at all costs because they have had a recent experience of losing money in the sector. This effect is closely tied with herd risk which is the tendency of people to closely follow the herd. If their friends think tech is good or bad, they will tend to have the same opinions. Newspapers and the media tend to herd together as well. All of this is one of the reasons why contrarian investing has been so successful. Control your emotions, shed your over confidence and diversify.

But how is the best way to diversify? Diversification equates to risk control. The better diversified a portfolio, the less inherent risk. So we must define risk. Standard Deviation of Returns is the measurement that is used in finance theory. This term describes the magnitude of the fluctuation of the return of an asset or portfolio. The higher the standard deviation, the higher the variability of returns around the mean and the more uncertainty associated with achieving a desired return.

SP 500 has averaged a return of about 11% annually
Standard deviation has averaged about 17% annually

The SP 500 is likely to return between 11% +/- 17% for a range of a 6% loss to a 28% return. Assuming normal deviations, roughly 2/3rd s of the time the returns will be within the aforementioned range. Since half of 1/3rd of the returns will be larger than 28%, we know that 1/6th of the time the market should return less than a 6% loss. The goal is to reduce risk without reducing return.

The key to accomplishing proper diversification is to add assets the move differently than the rest of the portfolio yet have a high expected return over the long run. The measurement that quantitative analysts use to determine this is correlation. Correlations can range from -1.0 to +1.0. Lower correlations produce better diversification. Notice how risk is reduced in the following scenarios without any effect on expected return.

	Standard Deviation	Expected Return
Asset 1	17%	11%
Asset 2	17%	11%
Portfolio of Asset 1 & 2 (equal wt.)	**17%**	11%
Correlation is +1.0		

	Standard Deviation	Expected Return
Asset 1	17%	11%
Asset 2	17%	11%
Portfolio of Asset 1 & 2 (equal wt.)	**14.7%**	11%
Correlation is +0.5		

	Standard Deviation	Expected Return
Asset 1	17%	11%
Asset 2	17%	11%
Portfolio of Asset 1 & 2 (equal wt.)	**12.0%**	11%
Correlation is 0		

	Standard Deviation	Expected Return
Asset 1	17%	11%
Asset 2	17%	11%
Portfolio of Asset 1 & 2 (equal wt.)	**8.5%**	11%
Correlation is -0.5		

	Standard Deviation	Expected Return
Asset 1	17%	11%
Asset 2	17%	11%
Portfolio of Asset 1 & 2 (equal wt.)	**0%**	11%
Correlation is -1.0		

Risk decreases as correlations drop. A portfolio of two equal weighed securities with a perfectly negative correlation would eliminate risk. While this is impossible the charts above show that by adding investments with a low correlation, risk can be decreased without reducing expected return. In fact, adding assets with higher individual risk can still allow for better diversification and lower overall risk for an investment portfolio when these assets have a low correlation to the rest of the portfolio.

When reason overcomes passion and an investor diversifies her portfolio she reduces risk. When risk is minimized without affecting return you have earned a free lunch. Bon appetite!