



## Ruminations on High Yield Bonds

High Yield bonds, aka Junk or Non-Investment Grade bonds, may have a place in a diversified portfolio. Here are some general thoughts on HY as an asset class:

- HY is somewhat like covered call writing on an equity portfolio. It gives higher returns in moderate periods, but with little upside potential in good times and all the downside in bad times. In other words, the distribution has negative skew about which more below.
- It is very good for “muddle through” markets. If the economy booms, stocks win. If the economy tanks, investment grade bonds (Treasuries in particular) win. But in a slow growth or stagnant environment HY can outperform both.
- The “normal” default rate on HY is about 4% though obviously it is significantly different depending on the state of the economy.
- The “normal” recovery rate is about 40% though obviously that depends on the underwriting criteria when the bonds were issued – the covenants were very loose a few years ago in the euphoric days of the credit bubble.
- To combine the last two points, if the default rate is 4% and the recovery rate is 40%, the actual losses would be 2.4% net. This means the “normal” yield over Treasuries should be at least 2.4% to make them similarly attractive.

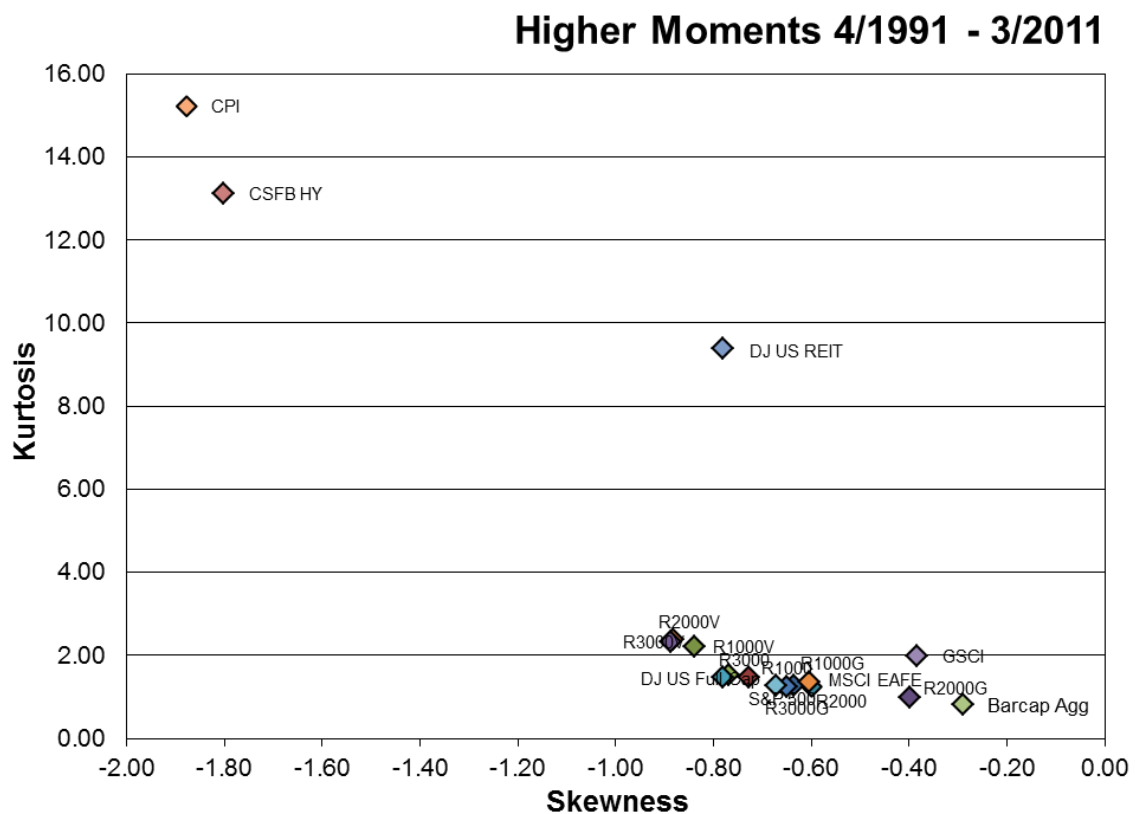
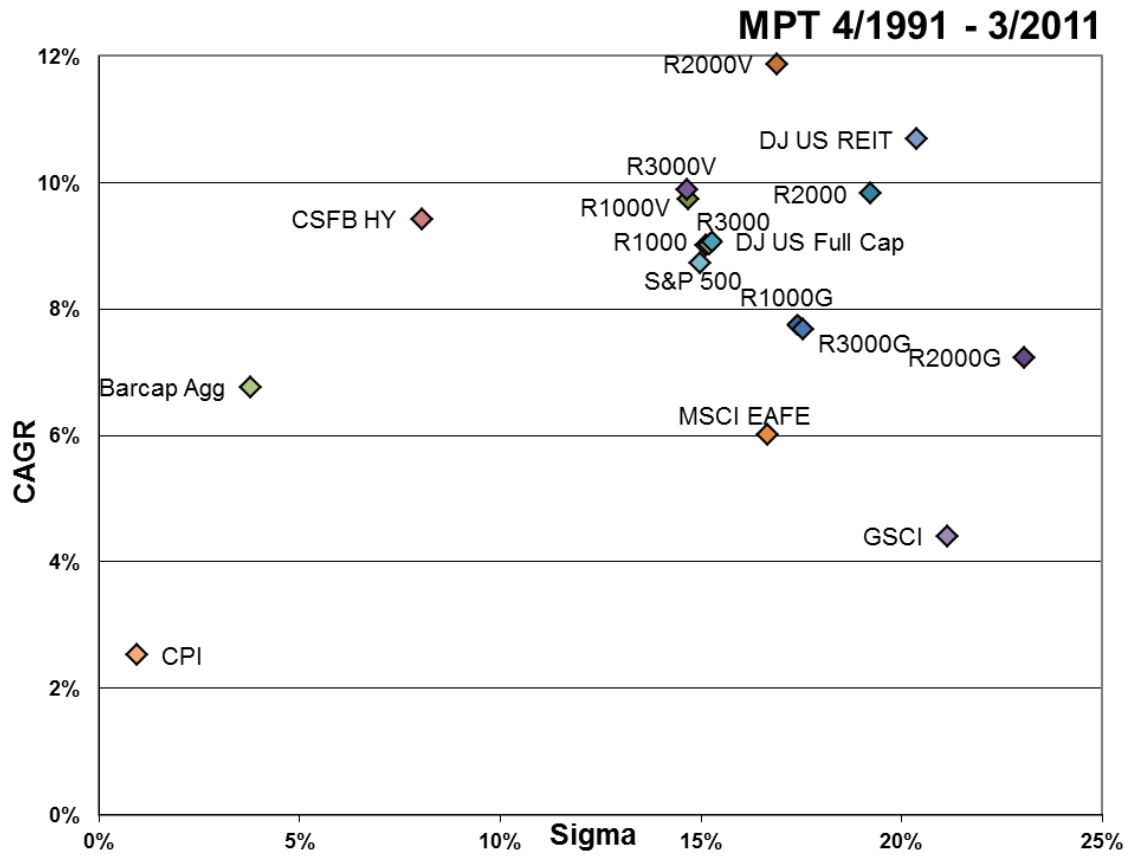
In statistics the first four “moments” of a distribution are the average, standard deviation, skewness, and kurtosis. The first two are familiar as they equate to return and risk. The second two are important also though if a distribution is not “normal” – in other words if the expected returns don’t fit to a normal curve that is a very good thing to be aware of ahead of time.

Skew means the distribution is pulled way or the other. With positive skew the right tail is long (for example a graph of wealth levels with a group that included Bill Gates gives an extreme right outlier), with negative skew the left tail is long (for example life expectancies have negative skew because it is far easier to die 50 years before the average life expectancy than it is 50 years after).

High Yield bonds have negative skew because while the entire principle can be lost (i.e. the company goes bankrupt), in even the best case scenarios they only pay the stated interest. There can be huge positive (and negative) swings as the valuation of those flows is reassessed in the market, but the underlying flows have negative skew so the overall returns do as well.

Kurtosis is the technical name for what are now being popularly called Black Swan events (that is actually a misunderstanding of Nassim Taleb’s thesis, but that is a subject for another day). Another way to say excess positive kurtosis is to say a distribution has “fat tails” – in other words extreme events happen more frequently than expected given the mean and standard deviation of the distribution.

High Yield bonds (and REITs) have both negative skew and positive excess kurtosis and both in combination are obviously very dangerous – the left tail (poorer return) is both longer and fatter than would be expected. On the following page are graphs for a variety of asset classes of risk and return (the common Modern Portfolio Theory statistics) as well as the higher moments of their distributions.



A “normal” curve has skewness and excess kurtosis of zero, so while HY bonds can be appropriate for a small portion of the allocation, it would be imprudent to invest a great deal of a portfolio in them.

Some analysts believe HY is an unnecessary addition to a portfolio as it should be considered merely a hybrid of stocks and bonds. It appears to be more than that though. Using 20 years of data from April 1991 through March of 2011, if the CSFB HY index is regressed on 15 other indexes (which significantly overfits the data and has a collinearity problem), the adjusted  $R^2$  is still only 0.49, so only half of the movement in HY has been explained by other asset classes. Here is the ANOVA table:

## SUMMARY OUTPUT

<i>Regression Statistics</i>						
Multiple R		0.72				
R Square		0.52				
Adjusted R Square		0.49				
Standard Error		0.02				
Observations		240				

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sig. F</i>
Regression	15	0.07	0.00	16.48	0.00
Residual	224	0.06	0.00		
Total	239	0.13			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.00	0.00	2.03	0.04	0.00	0.00
R1000G	0.31	7.84	0.04	0.97	-15.14	15.76
R1000	6.81	13.53	0.50	0.62	-19.86	33.48
R1000V	-0.64	6.19	-0.10	0.92	-12.84	11.55
R2000G	0.95	0.68	1.40	0.16	-0.38	2.28
R2000	-1.52	1.23	-1.23	0.22	-3.95	0.91
R2000V	0.99	0.68	1.46	0.15	-0.35	2.33
R3000G	-0.65	8.37	-0.08	0.94	-17.15	15.85
R3000	-7.48	14.44	-0.52	0.60	-35.95	20.98
R3000V	0.34	6.60	0.05	0.96	-12.66	13.34
DJ US Full Cap	2.10	0.69	3.03	0.00	0.73	3.47
MSCI EAFE	0.10	0.04	2.51	0.01	0.02	0.17
DJ US REIT	0.12	0.03	3.81	0.00	0.06	0.18
Barcap Agg	0.28	0.10	2.67	0.01	0.07	0.49
GSCI	0.02	0.02	1.15	0.25	-0.02	0.06
S&P 500	-1.08	0.47	-2.32	0.02	-1.99	-0.16

So as to not overfit the data, HY is similar to a portfolio with 10% EAFE, 10% REITs, 30% AGG, and the other 50% US Stocks (using the DJ US Full Cap). Here is a comparison of a portfolio of those weights (no data mining, this is the very first weighting considered), rebalanced monthly, over the same time period:

	<u>CSFB HY</u>	<u>HY Replica</u>
<b>CAGR</b>	9.42%	8.67%
<b>Annualized Sigma</b>	8.05%	10.44%
<b>Monthly Arithmetic Return</b>	0.78%	0.74%
<b>Monthly Sigma</b>	2.32%	3.01%
<b>Skewness</b>	-1.802	-0.989
<b>Significant?</b>	Yes	Yes
<b>Excess Kurtosis</b>	13.108	3.147
<b>Significant?</b>	Yes	Yes
<b>Correlation</b>		66%

Higher return, lower risk, and imperfect correlation means there appears to be diversification value.

Running the regression using just the EAFE, REITs, AGG, and DJ US Full Cap to get a more precise model gives the following results:

#### SUMMARY OUTPUT

<u>Regression Statistics</u>	
Multiple R	0.69
R Square	0.47
Adjusted R Square	0.46
Standard Error	0.02
Observations	240

#### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sig. F</i>
Regression	4	0.06	0.02	52.63	0.00
Residual	235	0.07	0.00		
Total	239	0.13			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.00	0.00	2.75	0.01	0.00	0.01
MSCI EAFE	0.09	0.04	2.50	0.01	0.02	0.17
DJ US REIT	0.13	0.02	5.55	0.00	0.08	0.17
Barcap Agg	0.25	0.10	2.45	0.02	0.05	0.45
DJ US Full Cap	0.14	0.04	3.32	0.00	0.06	0.22

Adjusting the coefficients so they sum to 100%, the portfolio weights would be:

MSCI EAFE	15.3%
DJ US REIT	20.7%
Barcap Agg	41.0%
DJ US Full Cap	23.0%

That mix historically would have produced:

	<u>CSFB HY</u>	<u>HY Replica</u>
<b>CAGR</b>	9.42%	8.56%
<b>Annualized Sigma</b>	8.05%	9.12%
<b>Monthly Arithmetic Return</b>	0.78%	0.72%
<b>Monthly Sigma</b>	2.32%	2.63%
<b>Skewness</b>	-1.802	-1.141
<b>Significant?</b>	Yes	Yes
<b>Excess Kurtosis</b>	13.108	6.220
<b>Significant?</b>	Yes	Yes
<b>Correlation</b>		69%

Thus the results hold – higher return, lower risk, and imperfect correlation by adding HY to a portfolio.

**Notes:**

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