

**ALPHA FACTOR  
PORTFOLIO INSIGHT  
II. LIQUIDITY- CONSTRAINED  
INVESTING**

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Moody's Capital Markets  
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## Generating bond portfolio outperformance in a limited liquidity world

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Welcome to our second Alpha Factor Portfolio Insight report in which we address the question of liquidity constrained investing. We are publishing a series of these reports, covering topics of interest to users of the Alpha Factor portfolio investment framework.

As many readers will be aware, we use our Alpha Factor metrics<sup>1</sup> as the basis for the construction of a number of model portfolios. We have benchmarked the portfolios vs. a range of indices, and have consistently achieved good levels of outperformance. Our philosophy has been to make the exercise as realistic as possible, so we incorporate transaction costs and other factors that fund managers have to deal with (see p.2 for the complete set of portfolio construction and maintenance rules). At the same time we have striven for simplicity, so as to isolate the value added by selecting bonds and CDS for the model portfolios solely based on their Alpha Factors.

In this report we impose a significant constraint on the US dollar and euro investment grade and dollar high yield model portfolios in the form of only "buying" liquid issues. As shown below, even with this limitation the Alpha Factor framework still produces healthy portfolio excess returns with high Sharpe Ratios. We believe that this reinforces that conclusion that Alpha Factors can play a valuable role in fund managers' investment and portfolio surveillance processes.

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<sup>1</sup> Please see the sidebar on pg.2 for a description of the Alpha Factor asset selection framework and the portfolio construction and performance measurement rules. Our model portfolios are based on research carried out by our colleagues Jing Zhang and Zan Li. For details, please see Zhang and Li, *A Model-Based Approach to Constructing Corporate Bond Portfolios* April 2012, available on moodys.com.

## Alpha Factor Portfolio Methodology

$$\text{A bond's Alpha Factor} = (\text{OAS} - \text{FVS}) / (\text{CEDF} * \text{LGD})$$

The Alpha Factor measures how much "excess" spread the market is offering on an issue above a modeled spread, per unit of expected loss. The inputs into the equation are as follows:

- ✓ OAS is the bond's spread obtained from EJV Reuters
- ✓ FVS (Fair Value Spread) is a modeled bond spread as calculated by Moody's Analytics. The inputs into a bond's FVS are:
  - The issuer's EDF (Expected Default Frequency) metric. EDFs are probabilities of default calculated based on information from a firm's capital structure and its equity price. They range from 1 bp to 35%, and are updated daily. Please see the Appendix for a brief description of the EDF model.
  - The expected recovery rate on the issue, which is a function of its sector and seniority. This calculated by Moody's Analytics.
  - The size of the issue
  - The term of the issue
  - The market price of risk associated with the issue. This encompasses factors such as liquidity and the degree of investor risk aversion generally.
- ✓ The cumulative EDF matching the maturity of the bond
- ✓ The loss-given default, as calculated by Moody's Analytics

The bond selection and portfolio measurement rules are as follows:

- ✓ Both portfolios were formed in January 2007
- ✓ All bonds are members of the Merrill Lynch US (Euro) Investment Grade (IG) or High Yield (HY) Indices
- ✓ All bonds are sold by publicly traded companies and have EDF credit measures
- ✓ All bonds are rated by Moody's
- ✓ The portfolios are rebalanced monthly by buying the bonds with the highest Alpha Factors in each duration bucket (~ the top 10%), and selling the issues that are no longer top-ranked or that fall out of the index. Excludes the top 2% of issues by Alpha Factor.
- ✓ The average portfolio size is 180 bonds and the monthly turnover is 5%
- ✓ Transaction costs:
  - For IG, 60 bp for a roundtrip transaction during the period August 2007 through December 2009, and 15 bp otherwise;
  - For HY, 100 bp for a round trip transaction during the period August 2007 through December 2009, and 30 bp otherwise
- ✓ The portfolios are duration-matched to the index
- ✓ All bonds are equally-weighted
- ✓ Portfolio excess return = portfolio total return – index total return

**Returns are calculated monthly, and are compounded to get annualized figures.**

### Adding constraints

The straightforward approach to portfolio construction shown on p.2 means that our model portfolios enjoy a couple of key advantages not available to fund managers. The previous Portfolio Insight report addressed one of them – our ability to significantly overweight and underweight sectors vs. the relevant benchmarks.<sup>2</sup>

In this analysis we cover a second such consideration, namely that in building and maintaining our cash model portfolios we can “buy” any bond in the relevant indices. The resulting unconstrained choice sets give us a big leg-up compared to bond fund managers, who can only purchase issues that are readily available in the market. This generally means larger, more recently sold deals, with several years to their final maturities. Thus, to more closely mimic this crucial limitation faced by practitioners we have constrained our bond choice sets as shown in Figure 1.<sup>3</sup>

FIGURE 1

#### Index and portfolio sizes for different constraining rules (by bond count)

	US IG	US HY	EU IG
ML Indices	5,228	2,065	1,731
Constraints			
× Amount Outstanding	\$750	\$400	€750
× Years to Maturity	3	1.5	3
√ Liquid	1,379	994	788
Alpha Factor Portfolio	180	160	160

Later in the report we extend the exercise by combining the liquidity constraint with the sector constraint described in the first Portfolio Insight report. Taking these two constraints together means that we have three strategies for the dollar and euro investment grade portfolio – regular (i.e., with no constraints), liquidity constrained, and liquidity and sector constrained. High yield is different. Financial institutions have scant representation in the speculative grade world, so sector weights (at least for financials vs. non-financials) is not an issue. We therefore have only two variations of our high yield portfolio, regular and liquidity constrained.

Many readers are aware that we also maintain cash model portfolios in sterling and Canadian dollars. They are smaller, reflecting the significantly smaller number of bonds in their benchmarks, and are therefore not suitable for the imposition of liquidity and sector constraints. However, we believe that we would achieve the same results in these portfolios: that is, imposing sector and liquidity constraints would lower excess returns, but that in most cases the contribution of the Alpha Factor framework would remain considerable.

#### Liquidity-constrained portfolios show somewhat lower results, but still outperform strongly

Aside from these additional rules relating to issue size and sector, in the constrained portfolios we follow the same construction and turnover guidelines as for the regular portfolios. The successive constraints mean, obviously, that we have fewer bonds from which to choose in constructing the portfolios. A corollary is that we are forced to buy bonds with lower Alpha Factors than for the unconstrained exercise. And given the positive relationship between Alpha Factors and bond returns, it means, predictably, a loss of performance at the margin. The key question is whether the remaining returns are sufficient to show that the Alpha Factor framework would still add value to fund managers.

The answer, we believe, is yes. Figure 2 shows the annualized average excess returns and Sharpe Ratios for the liquidity constrained portfolios and their unconstrained counterparts. The portfolios' average annual excess returns all decline, as expected. But they remain at very strong levels. The same goes for the Sharpe Ratios. The performance of the constrained performances is especially noteworthy, given that the Alpha

<sup>2</sup> The report, The Impact of Sector Constraints on Alpha Factor-based Model Portfolios, is available from your Moody's Analytics representative. It contains model portfolios that have been sector-matched (i.e., financial and industrial/utility entities) compared to the relevant indices, thus correcting for the considerable financial sector underweights driven by the Alpha Factor process. The exercise is designed to reflect the limits on sector bets limits faced by many fund managers.

<sup>3</sup> What's “liquid” in the corporate bond market is a subject of considerable debate, and in any event varies depending on the prevailing market conditions. Our definition of liquid issues broadly reflects the rules used to determine bond eligibility for the iBoxx Liquid Bond Indices. Details can be found at [Markit iBoxx Rules](#).

Factor framework is a naive strategy. That is, in constructing and maintaining our portfolios we are just blindly following a rule. Fund managers, using bond issues' Alpha Factors as additional inputs into what are already successful processes, could presumably do even better.

FIGURE 2

**Avg. annual excess returns and Sharpe Ratios for the regular and liquid portfolios (2007-2012)**

	Annual Excess Returns vs. ML Index			Sharpe Ratio		
	US IG	US HY	EU IG	US IG	US HY	EU IG
Alpha Factor Portfolio	5.2	8.3	4.1	1.9	1.4	1.8
√ Liquid	3.6	6.7	2.4	1.4	1.1	1.3

Figures 3, 4, and 5 extend the analysis by breaking the data in Figure 2 down into individual years. The liquid portfolios' outperformances are strongest in high volatility years, but they have outperformed in almost every period, with the exception of 2012 year-to-date for high yield. This reflects the Alpha Factor framework's tendency to add more value in bear markets.

FIGURE 3

**US Investment Grade: Performance of the liquid portfolio vs. the ML US IG index**

	Index TR (%)	Port. TR (%)	Excess Return (bp)	Sharpe Ratio
<b>Avg. 2007-2012 (annualized)</b>	6.7	10.3	360	1.4
<b>2007</b>	4.6	6.5	184	
<b>2008</b>	-6.8	2.8	961	
<b>2009</b>	19.8	21.2	148	
<b>2010</b>	9.5	10.8	128	
<b>2011</b>	7.5	10.0	249	
<b>2012 (YTD)</b>	8.2	9.1	90	

FIGURE 4

**US High Yield: Performance of the liquid portfolio vs. the ML US HY index**

	Index TR (%)	Port. TR (%)	Excess Return (bp)	Sharpe Ratio
<b>Avg. 2007-2012 (annualized)</b>	7.8	14.5	670	1.1
<b>2007</b>	2.2	4.2	204	
<b>2008</b>	-26.4	-13.1	1,326	
<b>2009</b>	57.5	75.5	1,798	
<b>2010</b>	15.2	14.2	-100	
<b>2011</b>	4.4	8.8	442	
<b>2012 (YTD)</b>	10.4	10.0	-40	

FIGURE 5

**Euro Investment Grade: Performance of the liquid portfolio vs. the ML EU IG index**

	Index TR (%)	Port. TR (%)	Excess Return (bp)	Sharpe Ratio
<b>Avg. 2007-2012 (annualized)</b>	4.8	7.2	240	1.3
<b>2007</b>	0.2	0.3	12	
<b>2008</b>	-3.3	1.4	465	
<b>2009</b>	14.9	19.6	473	
<b>2010</b>	4.8	5.9	105	
<b>2011</b>	2.0	3.5	148	
<b>2012 (YTD)</b>	9.8	11.2	139	

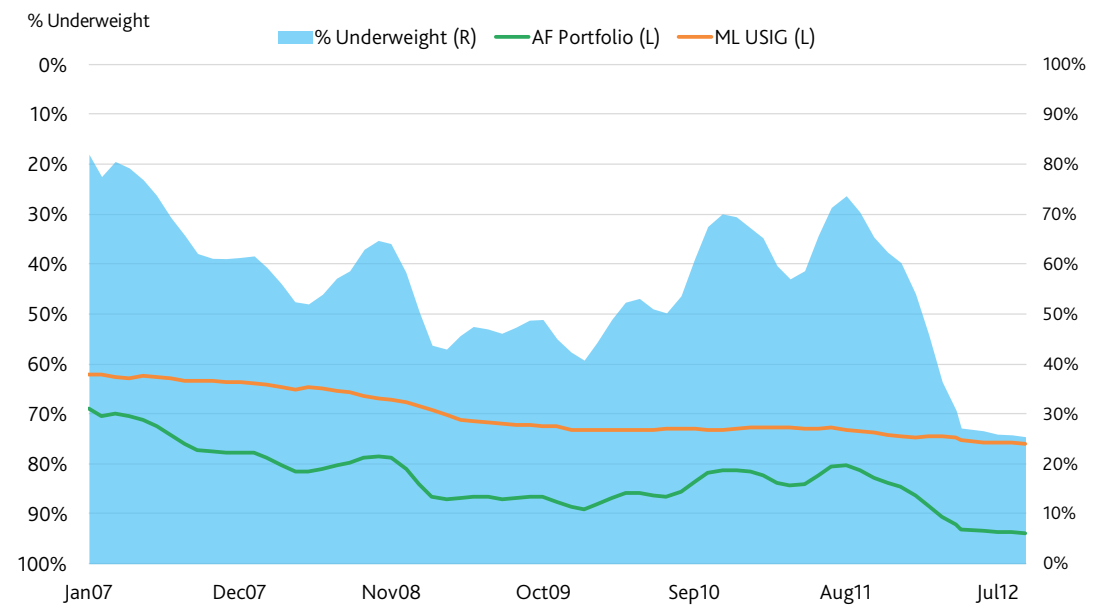
### Adding Sector Constraints to the Portfolios

We now combine the two portfolio constraints, i.e., we 1) limit the choice sets liquid securities, as defined; and 2) force the investment grade portfolios to be sector-matched (financials and non-financials) vs. the benchmarks on market-weighted basis. As part of our regular monthly portfolio rebalancing exercise we check to ensure that the sector market weights in the portfolio match that of the relevant benchmark, and adjust as needed.

As we noted in the Portfolio Insight report on sector-matched investing, the Alpha Factor framework has caused our investment grade euro, sterling, and dollar model portfolios to underweight the financial institution sector vs. the relevant benchmarks. Moreover, it has done so since our research began in January 2007, and with increasing intensity. We see this in Figure 6 for the dollar portfolio – the picture is largely the same for euros and sterling. This has been the right call – over the period the total return on financial institutions bonds has been significantly lower than that for industrials and utilities. However, although we are underweight financials, the financial institution bonds that are selected for the portfolio on an unconstrained basis tend to do very well (Figure 7).

FIGURE 6

#### Share of FIs in the ML IG index and the Alpha Factor portfolios, and the percent underweight



In other words, the Alpha Factor framework has led us to underweight financials vs. the relevant benchmarks, but the relatively few bonds that it selected were the right ones. Thus, forcing the portfolio to be sector-constrained significantly reduces the value added by the bonds' Alpha Factors. As noted on p.2, one of the model portfolio rules is that the bonds are equally weighted. So an alternative approach for fund managers would be to buy a lot of financial institution bonds with high Alpha Factors. This would allow a portfolio to achieve a more or less neutral sector weighting against its benchmark, while still taking advantage of the Alpha Factor framework. We acknowledge this by modifying our portfolio construction rules to allow the portfolios to own bonds in any one issuer in an amount equal to a maximum of 3% of the portfolio values. The 3% limit allows the portfolio to more closely resemble the behavior of a fund manager who can buy greater amounts of issues he or she likes, while still maintaining a reasonable level of diversification. The performance reported in Figures 8, 9, and 10 reflect the 3% issuer limit. As can be seen, the addition of sector matching reduces the portfolios' outperformance in some of the low volatility years, but the amount of return added by our naïve strategy remains significant, and the Sharpe Ratios over the five-year period are all well above 1.

FIGURE 7

## Cumulative outperformance of financial institutions bonds in US IG model portfolio

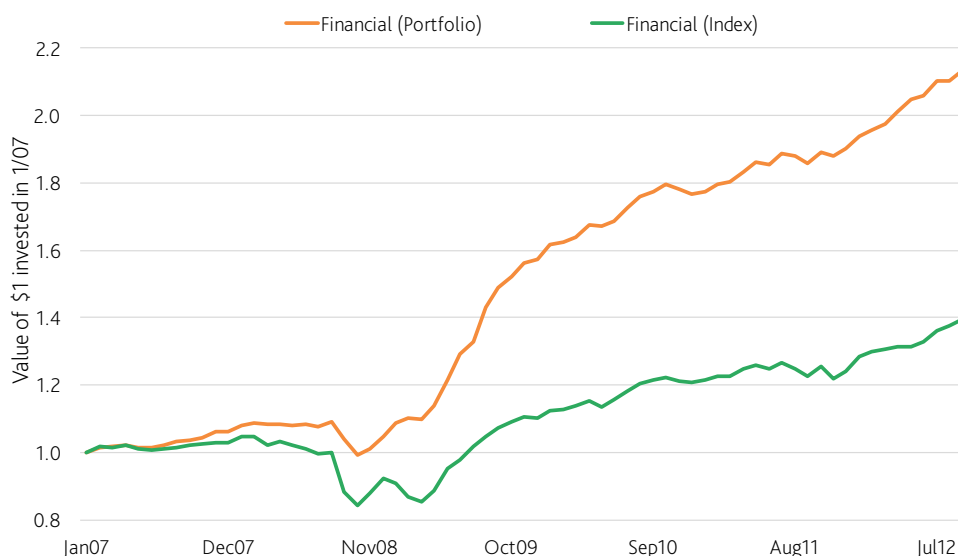


FIGURE 8

## Avg. annual excess returns for the regular and constrained portfolios (2007-2012)

	Annual Excess Returns vs. ML Index			Sharp Ratio		
	US IG	US HY	EU IG	US IG	US HY	EU IG
Alpha Factor Portfolio	5.2	8.3	4.1	1.9	1.4	1.8
√ Liquid	3.6	6.7	2.4	1.4	1.1	1.3
√√ Sector Constrained + Liquid	3.5	-	2.4	1.4	-	1.3

FIGURE 9

## US Investment Grade liquidity and sector-constrained portfolio vs. the ML US IG index

	Index TR (%)	Port. TR (%)	Excess Return (bp)	Sharpe Ratio
Avg. 2007-2012 (annualized)	6.7	10.2	350	1.4
2007	4.6	6.5	182	
2008	-6.8	3.8	1,065	
2009	19.8	21.3	155	
2010	9.5	10.3	77	
2011	7.5	8.0	52	
2012 (YTD)	8.2	8.5	27	

FIGURE 10

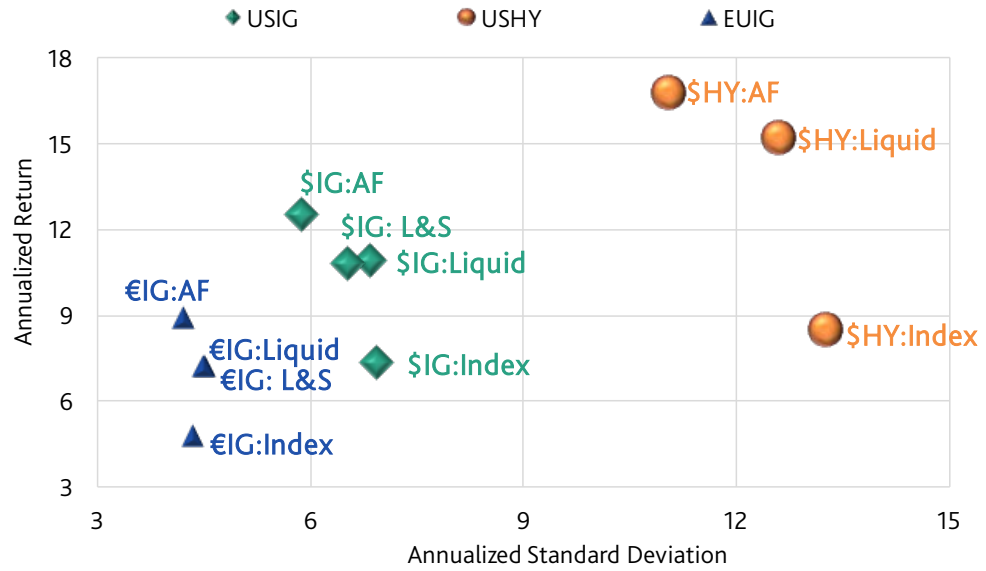
## Euro Investment Grade liquidity and sector-constrained portfolio vs. the ML EU IG index

	Index TR (%)	Port. TR (%)	Excess Return (bp)	Sharpe Ratio
Avg. 2007-2012 (annualized)	4.8	7.2	240	1.3
2007	0.2	0.6	34	
2008	-3.3	1.5	474	
2009	14.9	18.3	343	
2010	4.8	5.5	69	
2011	2.0	2.8	79	
2012 (YTD)	9.8	13.8	407	

Lastly, Figure 11 shows the risk/return profiles of various Alpha Factor Portfolios and their corresponding benchmarks. In all cases the Alpha Factor Framework improves significantly the tradeoff between return and volatility, even under stringent portfolio limitations.

FIGURE 11

Risk/Return profiles of the Alpha Factor Portfolio and the index (2007-2012)



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