Risk in Fixed-Income Hedge Fund Styles

Review of «Risk in Fixed-Income Hedge Fund Styles» (Journal of Fixed Income, September 2002, pages 6-27) By William Fung, visiting research professor of finance at the Centre for Hedge Fund Research and Education of the London Business School, and David Hsieh, professor of finance, Fuqua School, Duke University

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Introduction

Once again the research of Fund and Hsieh (hereafter FH) has happily anticipated the focus of swissHEDGE. In characterizing the risk in fixed-income hedge fund styles FH closely follow their approach in a paper reviewed in the 2001Q3 swissHEDGE, «The risk in HF strategies – theory and evidence from trend followers». In brief, they argue that the risk of a given hedge fund is best characterized by identifying its asset based style factors (hereafter ABS factors).

(The plethora of ambiguous or redundant words and phrases is a significant problem in the hedge fund industry. The next paragraph attempts to clarify some new terms introduced by FH. Without a clear understanding of these terms the rest of the paper is egregiously turbid.)

To understand ABS factors, it is useful to recall the meaning of the return based style factors (hereafter RBS factors) found on the right hand side of a Sharpe style regression. Sharpe argued that a small number of carefully chosen RBS factors can act as proxies for the many buy and hold styles that a mutual fund manager might employ. Each slope coefficients from a style regression is an estimate of the portfolio weight of an RBS factor. (The coefficients are constrained to be positive and to sum to 1.0 in keeping with the typical regulatory constraints on mutual funds). «Return based» style factors get their name because the only information used to estimate the portfolio weight is past returns (for both the mutual fund and the RBS factors). A good set of RBS factors includes buy-and-hold indices that proxy for the whole range of mutual fund styles: the S&P 500 index, a small cap equity index, a value index, a growth index, a T-bond index, a high yield bond index, a Japan equity index, etc.

RBS factors (and their portfolio weights) can help us understand the added value of a mutual fund manager. Imagine running a Sharpe regression on the Just Watching Mutual Fund (which charges an annual management fee of 1%) and finding the following estimates: alpha = 0.0, beta = 1.0 on the S&P 500 RBS factor and R-squared = 1.0. If the Sharpe regression was well-specified (all RBS factors included, sufficiently low correlation across factors, sufficiently higher factor variance, large number of observations, etc.), then these estimates would be fairly precise and the investor would be very likely to earn a slightly higher return every month by investing in an S&P 500 index fund (and paying a much lower management fee.) Contrarily, imagine running a well-specified Sharpe regression on the Just Wonderful Mutual Fund and finding the following estimates: alpha = 1.0, all betas = 0.0 and R-squared = 1.0. This investor might be pleased to be likely earning 1% per month with no risk. (Parenthetically, RBS factors are conceptually distant from APT factors or the factors estimated from a factor analysis. For example a «good» RBS factor model explains a high percentage of the time series variation of the mutual fund. A «good» factor analysis explains a high percentage of the cross sectional variation of the securities in the sample.)

FH want to extend the Sharpe style regression to hedge funds. But they are well aware of difficulties encountered in their previous research. While the returns of some hedge funds might be explained by standard mutual fund indices, certainly many are not. Another possible source of hedge fund style proxies is factor analysis of hedge fund returns. In their 1997 paper, «Empirical characteristics of dynamic trading strategies, the case of Hedge Funds» FH run a factor analysis on 409 hedge funds and extract five potential Factor Analysis Based Style factors (hereafter FABS factors). FH conjectured that three FABS combined with the standard mutual fund RBS factors might be an adequate set of style factors for 40% of all hedge funds at the time (1996). On the other hand they acknowledge that the universe of hedge funds have too wide a range of styles to be explained by just five factors. (The five factors only explained 43% of the cross sectional variance of the 409 hedge funds in the sample. Sharpe has stressed the importance of

including a proxy for every style in the regression.) For these reasons, FABS factors are unlikely to provide a good set of proxies for a hedge fund style regression.

We still need to define two additional terms introduced by FH before defining ABS factors. FH define a hedge fund's style as a combination of its location and strategy. Location refers to the asset class (or subclass) in which the hedge fund trades (e.g. stocks, bonds, commodities or currencies) and strategy refers to the trading rule that the hedge fund executes (e.g. buy and hold, trend following or convergence trading). Using these terms, a mutual fund style might be defined as follows: the location is U.S. exchange-traded small cap stocks and the strategy is buy and hold. A merger arb hedge fund style might be defined as follows: the location is G-7 exchange-traded stocks and the strategy is long the target firm and short the bidder firm (in the ratio of the exchange offer).

Having finally completed the background, we can now state that FH define an ABS factor as a location and a strategy that can be executed with traded assets, which have observable prices. For example, in their trend following paper, FH argue that the risk of a trend follower strategy is similar to the risk of a long position in a look-back straddle as follows. Since a look-back straddle pays out the difference between the maximum and minimum price during a specified time period, it can be regarded as the payout for a perfect trend follower who is constrained to the same time period. FH then provide empirical support for their argument by showing that a large fraction of the times series variation of actual trend-follower hedge fund returns is explained by the returns of look-back straddles on similar securities.

It is important to note that FH do not suggest that the look-back straddle is a benchmark for trend followers, but rather that look-back straddle returns characterize the risk of trend follower returns. Their caution may be due to the early stage of research in this area. Or it may be due to the difficulty in finding an ABS factor with a high correlation with actual hedge funds. This is a core issue in considering the potential success of the FH ABS factor approach to hedge fund style regressions. We return to this issue below.

Despite this concern, FH argue persuasively for the advantages to ABS factor approach. «First, ABS factors can be applied to create performance benchmarks that depend solely on observable prices.» Assuming that there is a consensus on the appropriateness of the ABS factor, it would be far superior to guessing which other hedge funds have similar styles during the relevant time period. «Second, ABS factors based on observable prices typically provide longer histories than hedge funds themselves.» From time to time, most hedge fund analysts have wondered whether they could generate returns similar to many of the funds in one style using a fixed trading rule implemented with a computer and a brokerage account. If this were possible, then the same rule could simulate returns to the style in earlier time periods, providing better insights into risk and return. «Third, from these explicit links, expected returns of hedge fund strategies can be directly linked to expected returns of underlying assets.» So the analyst with the confidence to predict future asset returns might have the greater confidence required to predict future hedge fund returns.

Implementation of ABS factors for five fixed income hedge fund styles

The implementation of ABS factors for fixed income hedge fund styles follows the trend following paper closely. The first step is to perform a principal components analysis (very similar to a factor analysis) on a group of hedge funds with a similar style as defined by the HFR peer groupings. Each significant principal component is called a style factor. This may sound a bit circular, using HFR's style groupings to create a sample that is analyzed to identify a style grouping. However, FH test their ABS factors with out of sample data. The second step is to use public knowledge about the hedge funds and some trial and error to find an index with observable prices, i.e. a location, and a trading

rule, i.e. a strategy, which in combination form an asset based style factor which is highly correlated with the principal component style factor.

Clearly there is potential for estimation error in this process. HFR's peer groupings may contain dissimilar hedge funds and omit many similar hedge funds. The principal components estimation necessarily contains sample error and requires a sufficient number of observations to represent the full range of the underlying distribution. (We have noted many researcher's concerns that some hedge fund strategies are similar to selling an out of the money put, which only rarely generates losses.) Also, principal components with low marginal cross sectional variance explanatory power are excluded, which emphasizes FH's point that ABS factors are useful in explaining typical, rather than niche, hedge fund returns. Finally the identification of the ABS factor that has a high correlation with the principal component style factor is highly dependent on research judgment and integrity. These points do not weaken the case for ABS factors in hedge fund style regressions, but rather highlight the role of judgment and integrity in any style regression.

FH use this procedure to identify ABS factors for the five HFR fixed income hedge fund styles in table 1. The hedge funds included had 36 months of returns between 1998 and 2000. A complete set of returns is required for the principal components analysis, but this requirement does raise the issue of selection bias (not explored here.)

Table 1 | Description of hedge funds in the FH sample

Style	Number of HFs	Assets	Correlation with Bonds
Convertible Bonds	12	$15 billion	0.03
High-Yield Bonds	20	$8.9 billion	0.09
Mortgage-Backed	17	$3.0 billion	0.11
Arbitrage	19	$4.4 billion	0.20
Diversified	39	$1.9 billion	0.51

The results for the HFR fixed income arbitrage style

For brevity we illustrate the procedure for one of the five style groups, fixed income arbitrage. This style is interesting since it is a classic convergence style and FH make a conceptual argument for their convergence trading ABS factor. HFR describes this style as «a market neutral hedging strategy that seeks to profit by exploiting pricing inefficiencies between related fixed-income securities while neutralizing exposure to interest rate risk».

As noted above, FH argue that trend following returns are «similar» to the returns of a long position in a lookback straddle. The investor profits from large price movements away from the beginning of period price, since she receives a payoff equal to the maximum price minus the minimum price during the time period. This mimics the perfect trend follower buying at the lowest price of the month and selling at the highest price or vice versa. Following this reasoning, FH argue that convergence-trading returns are also «simi-

lar» to the returns of a lookback straddle on the spread between the prices of the long and short asset. The investor profits from large spread movements away from the beginning of period spread, since she receives a payoff equal to the maximum spread minus the minimum spread during the time period. This mimics the perfect convergence trader shorting at the highest spread of the month and closing the short at the lowest spread of the month or vice versa. In this case, vice versa means that the convergence trader has bet in favor of a low spread diverging. Ideally the lookback straddles should have the same time period (and the same start and end dates) as the hedge funds. Recognizing that any choice would be arbitrary, FH simulate the returns for 1 month and 10-year lookback straddles. They note that during a period of consistently rising or falling spreads, a 10-year lookback straddle and a static (i.e. buy-and-hold) position in the underlying spread would have similar returns. In this case FH point out it would not be possible to distinguish between a hedge fund executing a linear buy-and-hold strategy and a hedge fund executing a non-linear convergence strategy.

The principal components analysis of the HFR fixed income arbitrage hedge funds using 36 months of returns from 1998 to 2000 is summarized in table 2.

Table 2 | Results of principal components

Index	% of Cross-Sectional Variance Explained		
	PC1	PC2	PC3
HFR Fixed Income Arbitrage	33%	24%	16%

FH appear to exclude principal components that explain less than 20% of the cross sectional variance from the analysis, leaving 2 principal components (hereafter PC1 & PC2) as proxies for RBS factors for the arbitrage style. (For other styles with a single principal component above 20%, FH used an equal-weighted average of the hedge funds in the style group as the RBS factor. I am not sure why.) A separate Sharpe style regression is run for PC1 and PC2, with the following regressors: the Baa/Treasury spread, the high-yield/Treasury spread, the mortgage/Treasury spread and the interest rate swap/Treasury spread.

FH find that PC1 is correlated with the high-yield-minus-Treasury returns (R-squared = 0.50) and a graph of the two shows a reasonably linear relationship with two Fall 1998 outliers. They add the 10-year lookback straddle on the high-yield/Treasury spread to the style regression and find that it adds no explanatory power (since for reasons

discussed above both regressors are highly correlated), FH do not mention the result from adding the 1-month look back straddle. These results offer some support for the conjecture that PC1 is a reasonable RBS factor for default spread convergence trading.

FH find that PC2 is most strongly correlated with the convertible-bond-minus Treasury returns (R-squared = 0.35) and a graph of the two again shows a reasonable linear relationship. When either the 1-month or the 10-year look-back straddle on the convertible bond/Treasury spread are added to the regression neither is statistically significant. These results offer some (though less) support for the conjecture that PC2 is a reasonable RBS factor for convertible bond-Treasury spread convergence trading.

The ABS factor is calculated by regressing the equally weighted portfolio of HFR fixed income arbitrage hedge funds on PC1 and PC2. The regression has an R-squared of 0.66. Finally, the ABS factor is the inner product of weighted average of PC1 and PC2, using the estimated coefficients as weights.

It is interesting to see that after some effort to develop the convergence trading ABS factor, FH do not find it to be significant in the HFR fixed income arbitrage style hedge funds. This may be due to the noise introduced at each step of the estimation/judgment process. It may also be due to the short time period (1998-2000) over which the estimation takes place, so that a sufficient number of divergence-convergence cycles were not available.

Using the hold out sample of the 12 months of 2001, FH can offer some out-of-sample evidence on the ability of the ABS factor to track fixed income arbitrage hedge fund returns. A graph of the ABS factor versus the equal-weighted average of the HFR fixed income arbitrage hedge funds in 2001 is reasonable linear. With such limited evidence, any conclusions about the usefulness of the ABS factor approach must await more data.

Conclusion

FH offer additional support for their ABS factor approach by considering how well RBS factors could explain the Fall 1998 fixed income hedge fund losses. Since RBS factors can only extend back in time to about 1990, they do a poor job of explaining the Fall 1998 losses, primarily because a similar event did not occur during that time period. The arbitrage ABS factor is able to explain most of the losses since a similar event (a large drop in the S&P 500 coinciding with a widening of fixed income spreads) occurred in April 1932. Likewise the arbitrage ABS factor is able to explain about 1/3 of the LTCM losses.

FH also find support for their ABS factor approach by showing that the ABS factors derived from HFR fixed income hedge funds have a high correlation with the three principal components extracted from a sample of hedge funds found on the Tass dataset (after eliminating duplicates with HFR).

With such a wealth of suggestive support, one might next wonder about the practicality of the ABS factor approach for performance attribution, performance evaluation, asset allocation and risk management in hedge fund portfolios. The concern for accumulation of estimation error in the each step was mentioned above. Perhaps more important is the care with which each ABS factor is chosen. The principal components estimation provides a set of RBS factors. A set of potential ABS factors is assembled and includes both appropriate buy-and-hold indices (on spreads for example) as well as non-linear of dynamic variations on the indices (by translating knowledge of the trading strategy into either a trading strategy or a security that mimics the trading strategy returns). A Sharpe style regression is used to select statistically significant ABS factors and the fitted values of the ABS factors are combined to form a single composite ABS factor. This approach has limits. Considering the range of hedge fund strategies that it can capture, it is not useful for niche strategies and may only be useful for vanilla strategies. (Indeed, vanilla strategies may be the easiest to benchmark with other hedge funds.) Considering the care needed to carry out this approach, judgment and integrity are necessary. (Without a standardized approach, this technique can easily be manipulated to appear to fit past data well, leaving investors to wait to realize the lack of integrity.) Considering whether the industry will accept this approach, only time and data for additional out-of-sample testing will tell.