

*Development of Alpha in Long/Short Equity Hedge
Funds: Why Selecting the Right Managers Have
Become More Important*

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Current version: January 2008

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1. Introduction

The identification of “pure alpha”, and later the separation of alpha and beta, has been one of the hottest topics among investors and academics for a number of years. The alpha is by definition the part of the return that is not explained by the model in use, and the beta has traditionally been defined as the sensitivity to the broad equity market. Introduced by Sharpe (1964), the CAPM has since then been the most common model for the quantification of alpha and beta. Sharpe’s model has during the past 10 years been extended into accounting for more than one beta, and these additional betas are often referred to as alternative betas. With the extended models larger parts of the return of hedge funds have been explained. This has resulted in a better understanding of how the returns are generated, and thereby also which risk factors that are dominant for different hedge fund strategies.

In this paper we study how the alpha generated by Long/Short hedge funds has developed over time and in different market environments. Furthermore, we compare a 2-factor model, more suitable for the creation of portable alpha series, with a 3-factor model. The results show that market beta and alternative betas are the main drivers of the return of Long/Short Equity hedge funds. Furthermore, the alpha generated by the funds has decreased over time and is depending on the general equity market climate, where the main part of the alpha is generated during periods with a strong equity market.

The rest of this paper is structured as follows; in section 2 we describe asset based factor models, in section 3 we present the result from the study of alpha and section 4 contains some concluding remarks.

2. Asset Based Factor Models

One way of analyse and quantify the return drivers, and risks, of different hedge fund strategies is to apply a multi-factor regression analysis. In order to be able to replicate the strategy in an accessible manner the aim is to use factors where historic return series are easily obtained, for example various market indices. The relevant factors for a specific strategy are named asset-based factors or asset-based style factors.

A general version of a multi-factor model takes the following form:

$$R_i = \alpha_i + \sum_{j=1}^K \beta_{i,j} \cdot F_j + \varepsilon_i \quad (1)$$

where R_i is the return on fund i , K is the number of factors, F_1, \dots, F_K are the values of the factors, $\beta_{i,1}, \dots, \beta_{i,K}$ are the corresponding sensitivities and ε_i is a zero mean random variable.

Specification of factors in the model

Based on the academic research during the last 10 years a number of factors have been identified as the significant risk- and return drivers for Long/Short Equity hedge funds.² The two most significant factors in most studies are a market index and the spread between stocks with small and large market capitalization. We here test two models, one with two factors and one with three factors. Specification of the factors follows below:

- *Market factor.* The return on a broad stock market index, here S&P500.
- *Small cap- Large cap spread.* The difference in return between stocks with a low market capitalization and stocks with a large market capitalization. We here use the spread between Russell 2000 and S&P500.
- *Lagged return of the index itself.* Some researchers have shown that there is an effect of stale or smoothed prices in the return series of Long/Short Equity funds and we therefore include a 1-month lagged factor on the index itself.

The identification of the first two factors is natural since they reflect the investment strategy of most Long/Short Equity hedge funds, where a net long bias often is maintained and a fundamental stock picking approach is used. The long side of the portfolio often consists of stocks with a smaller market capitalization than the short side, explaining the significance of the small – large cap spread.

Since there is yet no conclusive model for modelling the return on Long/Short Equity hedge funds we here study a two factor model with a market factor and a small – large cap spread factor, and a three factor model with the one months lagged return of HFR Equity Index itself as an additional factor. The models we apply are therefore structured as follows:

$$R_i = \alpha_i + \beta_M X_{M,t} + \beta_{SL} X_{SL,t} + \varepsilon_i \quad (2)$$

$$R_i = \alpha_i + \beta_M X_{M,t} + \beta_{SL} X_{SL,t} + \beta_{HFR,t-1} X_{HFR,t-1} + \varepsilon_i \quad (3)$$

where R_i is the return on fund i , $X_{M,t}$, $X_{SL,t}$ and $X_{HFR,t-1}$ are the values of the factors, β_M , β_{SL} and $\beta_{HFR,t-1}$ are the corresponding sensitivities and ε_i is a zero mean random variable.

² For more information regarding asset based factor models for hedge funds we recommend the papers by Agarwal and Naik (2002), Fung and Hsieh (2004) and Jaeger and Wagner (2005).

3. Analysis of HFR Equity Hedge Index

We first run a single regression analysis of each factor in order to determine the significance of each factor to the return on HFR Equity Hedge Index (“Equity Hedge Index”). The analysis is conducted with data from the period January 1997 to August 2006. The results from the regressions are shown in Exhibit 1-3, and all factors demonstrate a positive beta against the Equity Hedge Index. The market factor and the Small-Large spread factor are statistically significant at the 95% level. The lagged HFR Equity Index factors shows less significance. To test the models for serial correlation of the error terms we apply the Durbin-Watson test and, as a rule of thumb, a Durbin-Watson statistic between 1.5 and 2.5 indicates independently distributed error terms.

Exhibit 1 Single regression Equity Hedge Index against S&P500

<i>Regression Statistics</i>		<i>Durbin-Watson test</i>			
Multiple R	0.6988	1.75			
R ²	0.4884				
Adjusted R ²	0.4839				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t -stat</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.0081	0.0018	4.4156	0.0045	0.0117
S&P500	0.4258	0.0408	10.4315	0.3457	0.5057

Footnote

The lower critical value of the t-statistic is 1.9809.

Exhibit 2 Single regression Equity Hedge Index against Small – Large factor

<i>Regression Statistics</i>		<i>Durbin-Watson test</i>			
Multiple R	0.4838	1.79			
R ²	0.2341				
Adjusted R ²	0.2273				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t -stat</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.0097	0.0022	4.3433	0.0053	0.0141
Small - Large	0.3245	0.0550	5.9022	0.2168	0.4323

Footnote

The lower critical value of the t-statistic is 1.9809.

Exhibit 3 Single regression Equity Hedge Index against HFR Lag1

<i>Regression Statistics</i>		<i>Durbin-Watson test</i>	
Multiple R	0.1643	2.02	
R ²	0.0270		
Adjusted R ²	0.0184		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t -stat</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.0089	0.0027	3.2921	0.0036	0.0142
HFR AR(1)	0.1643	0.0924	1.7790	-0.0167	0.3454

Footnote

The lower critical value of the t-statistic is 1.9809.

We now perform a multiple regression on the models specified in equation 1 and 2 above.

Exhibit 4 Multiple regression Equity Hedge Index against S&P500 and Small – Large factor

<i>Regression Statistics</i>		<i>Durbin-Watson test</i>	
Multiple R	0.8750	1.37	
R ²	0.7656		
Adjusted R ²	0.7619		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t -stat</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.0073	0.0012	6.2414	0.0050	0.0096
S&P500	0.4452	0.0266	16.7629	0.3931	0.4972
Small - Large	0.3594	0.0289	12.4313	0.3027	0.4161

Footnote

The lower critical value of the t-statistic is 1.9779.

Exhibit 5 Multiple regression Equity Hedge Index against S&P500, Small – Large factor and 1 month lagged HFR Equity Hedge

<i>Regression Statistics</i>		<i>Durbin-Watson test</i>	
Multiple R	0.8926	1.72	
R ²	0.7967		
Adjusted R ²	0.7913		

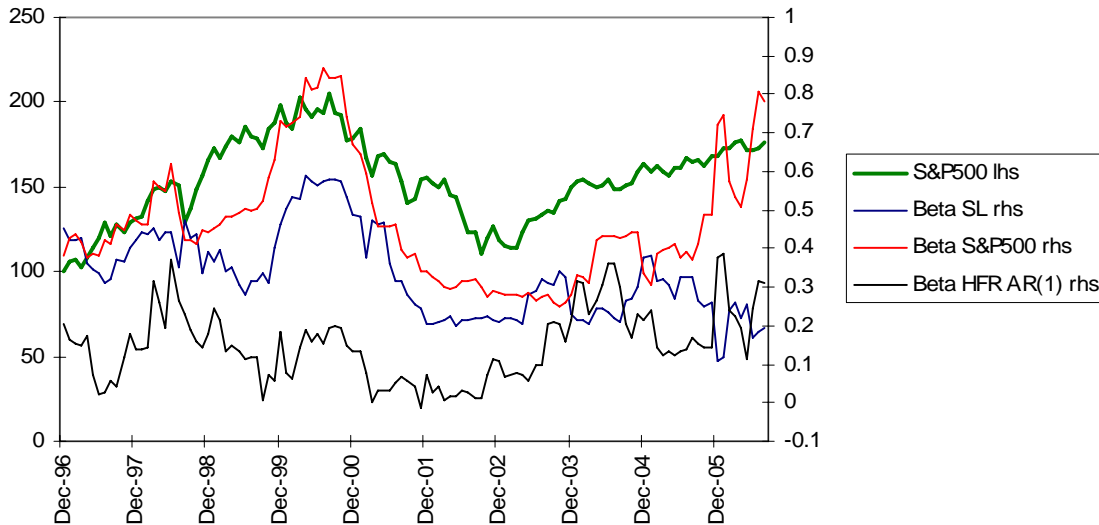
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t -stat</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.0052	0.0013	4.1015	0.0027	0.0076
S&P500	0.4448	0.0260	17.1054	0.3938	0.4957
Small - Large	0.3579	0.0286	12.4948	0.3017	0.4140
HFR AR(1)	0.1734	0.0426	4.0688	0.0899	0.2569

Footnote

The lower critical value of the t-statistic is 1.9813.

The 2-factor model in Exhibit 4 shows an adjusted R^2 of 0.76, a high figure for a two factor model. The Durbin-Watson test is somewhat low and indicates some degree of positive correlation among the error terms. Exhibit 5 displays the result from the 3-factor model regression. The R^2 is slightly higher compared to the 2-factor model, and the Durbin-Watson statistic is now 1.72, indicating that there is no longer any significant serial correlation among the error terms.

Exhibit 6 Rebased S&P500 and 12- months rolling alternative betas



Models with dynamic betas

To study the effect of time-varying behaviour of the hedge funds in the Equity Hedge Index we conduct a 12-months rolling regression analysis. The result with the corresponding betas is displayed in Exhibit 6. The market factor beta change quite drastically over time and indicate a dependency on the overall market environment, where a high market factor beta is seen during equity bull markets and a very low market factor beta during bear markets. The beta to the market factor fluctuates more than the beta of the small- large cap factor, indicating that the funds mainly use the exposure to the broad market rather than the small- large cap spread as a tool to adjust their exposure.

Alpha in the dynamic 2- and 3-factor models

The alpha generated by the funds in the Equity Hedge Index is extracted by establishing a long position in the index itself and a short position in the alternative beta factors discussed above. Put it another way, the alpha is the part of the return that is not explained by the multi-factor models in Equation 2 and 3.

In Exhibit 7-10 we have analysed the return characteristics of the extracted alpha from the two models. Both the alpha series from the 2-factor model and the 3-factor model demonstrates a positive skewness and kurtosis, indicating a small risk of extreme negative observations. This can also be seen in low 95% Modified VaR figures for both series. As a result of the right side tail in the distributions none of the series fulfil the criteria of being normally distributed according to the Bera-Jarque test. Utilizing an asset allocation framework that assumes normally distributed returns, for example a mean-variance approach, can therefore over-estimate the risks of the alpha series. Noteworthy is also the increase in the right side tail in the 3-factor model compared to the 2-factor. None of the series demonstrate a correlation with the S&P500 that is statistically significant at the 95% level. The monthly alpha in the 2-factor model is on average 0.18% higher compared to the 3-factor model. The return distributions compared to a normal distribution are displayed in Exhibit 9 and 10.

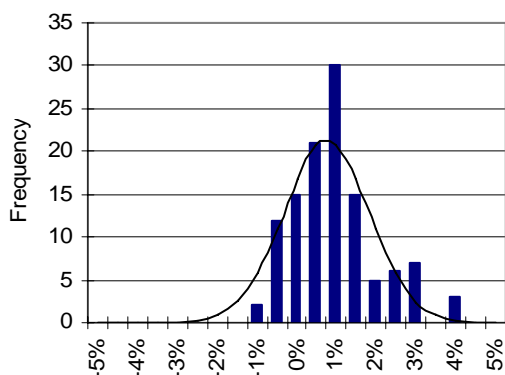
Exhibit 7 Return statistics

	<i>Alpha 2-factor</i>	<i>Alpha 3-factor</i>
Total return	134.27%	91.39%
Annualized return	9.21%	6.95%
Monthly mean	0.74%	0.57%
Lower quartile 25%	0.00%	-0.09%
Upper quartile 75%	1.31%	0.97%
Best month	3.91%	3.80%
Worst month	-1.32%	-1.35%
Positive month	75%	70%
Volatility	3.75%	3.34%
Skewness	0.747	0.856
Kurtosis	0.556	1.072
Bera-Jarque test	12.29	19.73
Sharpe	1.45	0.95
95% VaR	-1.38%	-1.33%
95% Modified VaR	-0.95%	-0.90%
Modified Sharpe	0.45	0.28

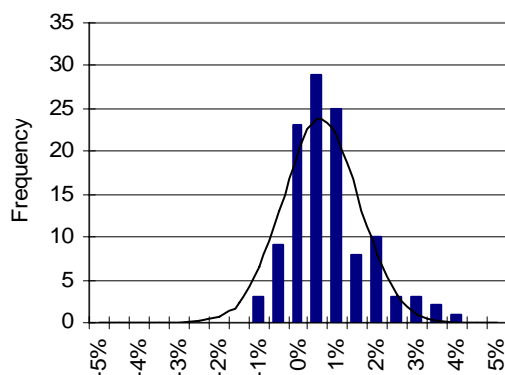
Exhibit 8 Correlation and 95% confidence interval for the correlation coefficient

	<i>Alpha 2-factor</i>	<i>Alpha 3-factor</i>
Correlation with S&P500	0.01	0.00
95% lower correlation confidence	-0.17	-0.18
95% upper correlation confidence	0.19	0.19

*Exhibit 9
Distribution of alpha in 2-factor model*



*Exhibit10
Distribution of alpha in 3-factor model*



Next we turn to an analysis of the development of alpha over time and in various market environments. In Exhibit 11 and 12 we show the monthly alpha of the two models and as displayed, there is a trend towards a lower alpha generated by the funds in the Equity Hedge Index. The reason for this is likely to be twofold; lower entry barriers to setting up a hedge fund have resulted in a decrease in the quality of the average manager, and secondly, a crowding out effect since more and more funds are trying to exploit the same opportunities. The results here are in line with the results in Jaeger and Wagner (2005), where they identify a declining alpha for Long/Short Equity funds during the period January 2000 to September 2005.

Since we have concluded that the alpha of the funds in the Equity Hedge Index have been decreasing over time a study of the average alpha created in different equity markets is conducted. As displayed in Exhibit 13, the alpha created in the bull markets during April 2003 – February 2004 and November 2004 – April 2006 has almost halved compared to the January 1997 – June 1998 period. Little or no alpha is created during periods with weak or flat stock markets. A likely explanation is that many Long/Short managers have a fundamental stock-picking background, where the aim is to find stocks that outperform the market.

Our study of the behaviour of the alpha series indicates a different result compared to Fung and Hsieh (2004). They divide the S&P500 return into quintiles and show that the alphas are stable and not depend on the returns of S&P500. Our study suggests that the behaviour of the alpha is more dependent on the general market environment rather than on single market observations and secondly, that the alpha generated by the Long/Short managers has decreased over time.

Exhibit 14 and 15 displays the return contribution of the alternative betas and the alpha over the studied period.

Exhibit 11 Alpha in 2-factor model (blue) with trend line (red)

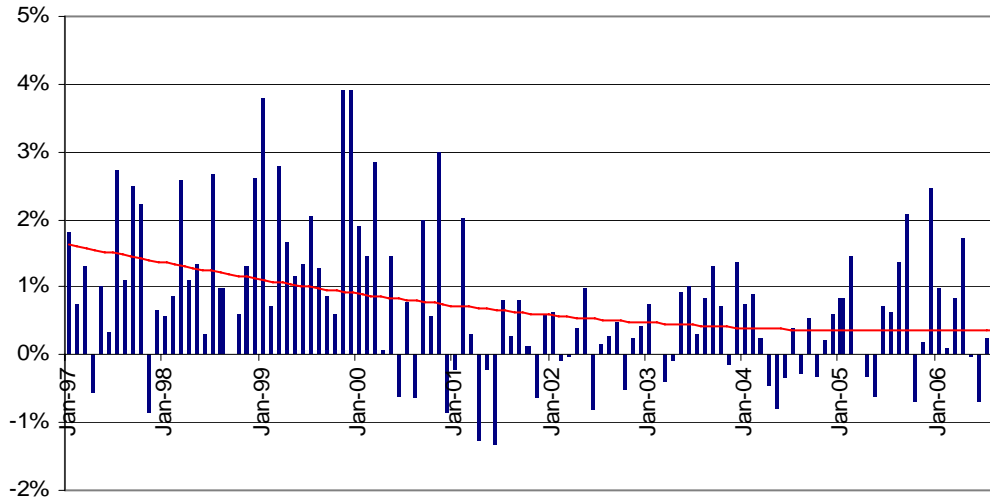


Exhibit 12 Alpha in 3-factor model (blue) with trend line (red)

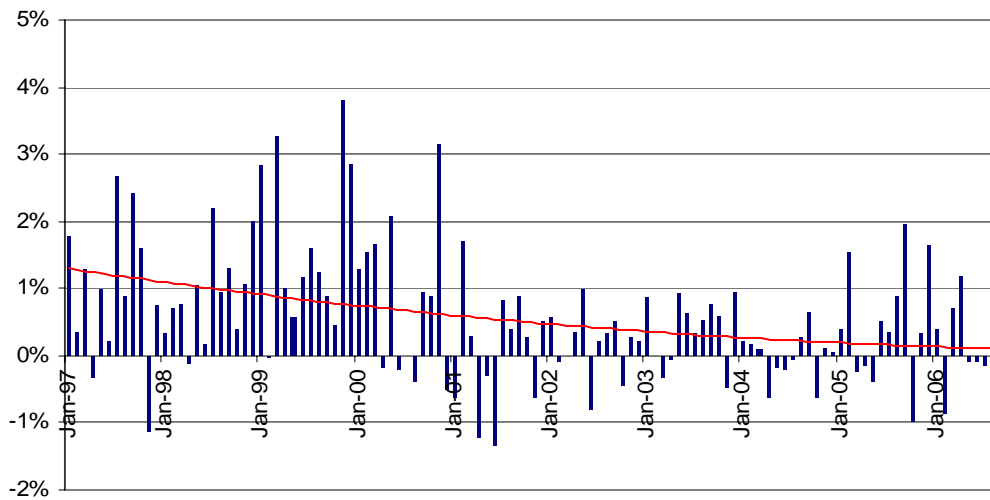


Exhibit 13 Alpha in different market conditions

	Average monthly alpha 2- factor	Average monthly alpha 3- factor
Strong equity market		
Jan 97 – Jun 98	1.10%	0.80%
Sept 98 – Aug 00	1.49%	1.26%
Apr 03 – Feb 04	0.72%	0.41%
Nov 04 – Apr 06	0.70%	0.41%
Flat equity market		
Mar 04 – Oct 04	-0.13%	-0.09%
Weak equity market		
Sept 00 – Sept 02	0.32%	0.29%

Exhibit 14 Return contribution 2-factor model

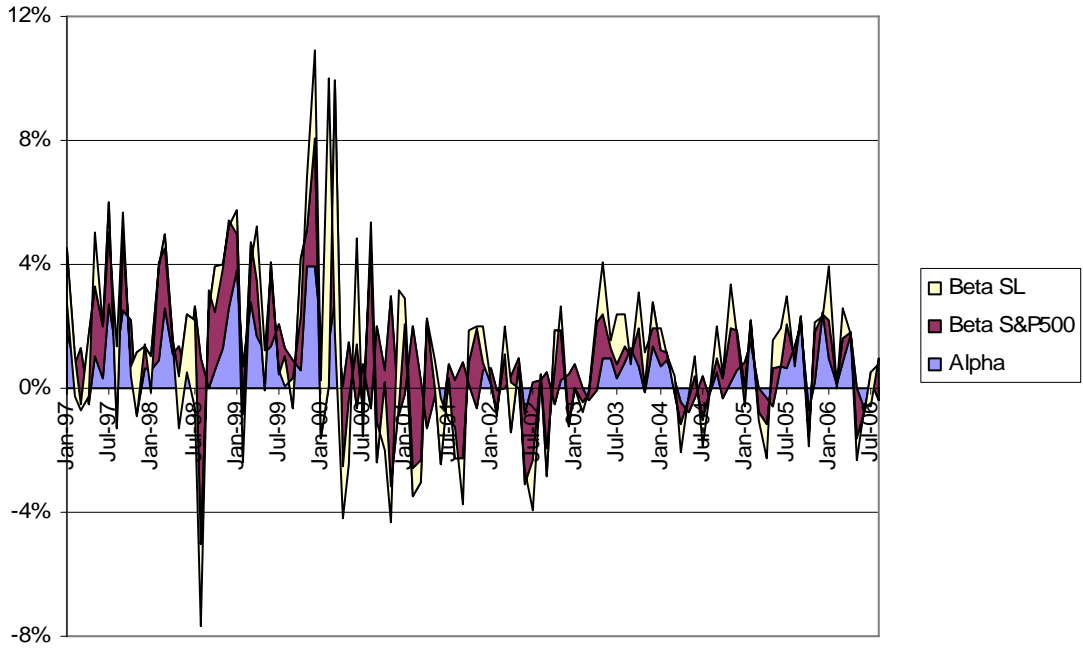
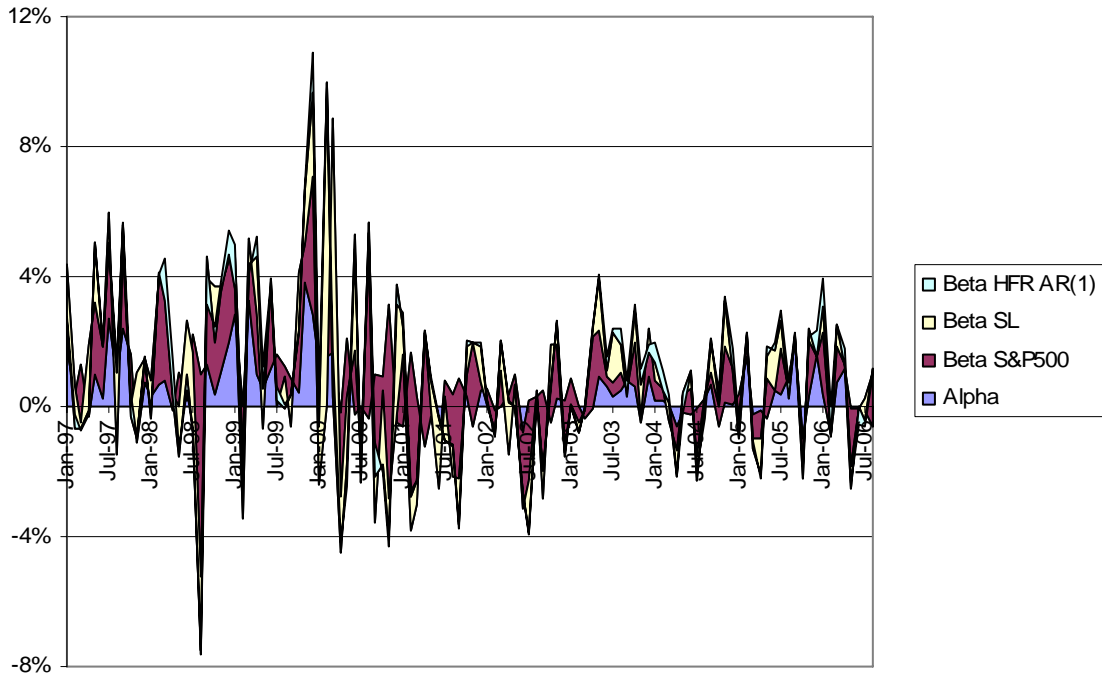


Exhibit 15 Return contribution 3-factor model



5. Concluding remarks

Since the alpha generated by Long/Short hedge funds on average has decreased over time it has become more important to be selective and identify managers that add value. But, as demonstrated in this paper, most of the return comes from alternative beta factors and when funds are included in a portfolio the primary focus should therefore be on evaluating the effects of these betas.

The choice of alternative beta factors in the factor model depends on the purpose of creating an alpha series, when the aim is to construct a portable alpha series it must be possible, and practical, to short the alternative beta factors. This fact excludes factors used by some researchers, for example a convertible bond index or a momentum factor. Too many factors in the model will also result in higher trading costs, which will have a negative effect on the return, and add unwanted complexity to the extraction process. When using a 2-factor model as the one in this paper to generate a portable alpha series an adjustment of the expected alpha is appropriate in order to reflect the missing alternative beta factors. If not, alternative beta will appear as alpha and will lead to an over-estimation of alpha. According to this study the adjustment of alpha should be at least 0.18% per month.

References

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