

# WHAT DRIVES HEDGE FUND Returns?

Economic factors can have an impact on equity market neutral returns.

BY STEPHEN FOERSTER

**RECENTLY**, a number of studies have examined the behaviour of hedge fund returns to better understand what drives performance, a key issue related to hedge funds given their lack of transparency. In this study, we focus our research primarily on the “classic” hedge fund style: equity market neutral strategies. According to the Web site of the well-known Credit Suisse First Boston (CSFB)/Tremont Hedge Fund Indices (see [www.hedgeindex.com](http://www.hedgeindex.com)), equity market neutral strategies are described as follows: “This investment strategy is designed to exploit equity market inefficiencies and usually involves being simultaneously long and short matched equity portfolios of the same size within a country. Market neutral portfolios are designed to be either beta or currency neutral, or both. Well-designed portfolios typically control for industry, sector, market capitalization, and other exposures. Leverage is often applied to enhance returns.”

If such strategies are able to exploit market inefficiencies, then these strategies should provide significant out-performance after adjusting for risk. Measures of market beta should not be significantly different from zero. Similarly, any other betas relative to various exposures or factors should not be significantly different from zero. In order to test these propositions, one needs to identify various risk factors beyond the traditional market that might explain returns. The finance literature has identified various factors that relate to portfolio strategies such as going long in small stocks and short in large stocks, going long

in value stocks and short in growth stocks, and going long in stocks that have experienced large price increases and short in those that have not. As such, investors may be better off simply replicating such long/short strategies directly rather than through hedge fund investments. While much attention has been placed on these portfolio strategies as risk factors, less attention has been placed on economic factors that may have an impact on performance. Examination of economic factors as explanatory variables for equity market neutral hedge funds may shed light on the ability of such funds to act as a counter-balance during depressed economic times.

Our study makes three contributions to the literature. First, we create and examine the properties of four asset-based style factors based on equity market neutral market strategies. The strategies are based on rankings and monthly updates of equal-weighted portfolios of S&P 500 stocks and involve going long (short) on the highest (lowest) ranked quintile sorted on earning/price (EP), price/book (PB), price momentum (PRM) and market capitalization (MKT). Second, we examine the CSFB/Tremont equity market neutral index return series to explain what drives average equity market neutral hedge fund return performance (i.e., based on aggregation of firms in the CSFB/Tremont universe of hedge funds), measured in excess of treasury bill (T-bill) returns (EMNE). Third, we extend our analysis to other hedge fund styles, as a robustness check and to

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examine whether style factors and economic variables that are significant in explaining equity neutral returns also explain returns from other styles.

### Data and methodology

Prices and market capitalizations are from Interactive Data Corp. while book values are from Compustat and earnings estimates are from IBES. Market indices and U.S. T-bill returns (Rf) are available from Kenneth French's Web site and index returns, including the S&P 500 return series (SP) and the MSCI World index (MSCI), are available from Datastream. The CSFB/Tremont hedge fund indices are available from [www.hedgeindex.com](http://www.hedgeindex.com). Our primary focus is on the equity market neutral index and corresponding index returns measured in excess of U.S. T-bill returns (EMNE). The Fama-French factors, including the market risk premium (RmRf), small-minus-big market capitalization portfolios (SMB), value (high book/price) - minus-growth (low book/price) portfolios (HML), as well as the (up-minus-down) momentum variable (UMD) are available from <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/>.

Interest rate data for the YLD and PREM data series are from the Federal Reserve Statistical Release series. YLD is the difference between the 10-year Treasury note yield and the three-month T-bill yield, while PREM is the difference between the Moody's seasoned Aaa and Baa bond yields. The inflation change variable (INFCHG) is derived from the U.S. Department of Labor Bureau of Labor Statistics series found at <http://www.bls.gov/data/home.htm> and represents changes in the all-item urban consumer price index year-over-year series. For the volatility measure (VIX), 1980-1985 data represent trailing 250-day annualized standard deviations of S&P 500 returns and the 1986-2005 data are annualized implied volatility measures from the (old) VIX S&P 100 volatility index (see [www.cboe.com](http://www.cboe.com)).

Returns are regressed on a number of style-based and economic variable factors as indicated in the following equation:

$$R_{i,t} = a_i + \sum_{j=1}^n \beta_{i,j} F_{j,t} + \epsilon_{i,t} \quad t=1, \dots, T \quad (1)$$

where  $a_i$  is an intercept term,  $F_{j,t}$  represent the  $j = 1, \dots, n$  factor returns in period  $t$ ,  $\beta_{i,j}$  are the coefficients or betas for each factor and  $\epsilon_{i,t}$  is an error term for time  $t$ .

### Regression analysis and results

To begin, we examined the long/short "style" strategies. In our results, all strategies except PRM show positive and significant returns.<sup>1</sup> The PRM strategy (while still positive returns) is most volatile while the MKT strategy is the least volatile. EP shows the largest Sharpe ratio, as measured by the average return in excess of the T-bill return divided by the standard deviation. The EP and PRM strategies have higher returns than the excess market return, with a smaller standard deviation. The MKT return is almost three times that of the somewhat similar Fama-French SMB, albeit with a slightly higher standard deviation. The PB return is slightly higher than the HML return, again with a higher standard deviation. The UMD return is higher than the PRM return but with a lower standard deviation. RmRf provides a benchmark Sharpe ratio of 0.032. The yield curve is, on average, upward-sloping as expected, although there are periods of inverted yield curves (as indicated by a negative minimum value for YLD). The default premium is around 1% but ranges from 0.55% to 2.69%, indicating variability in economic conditions. Inflation has trended downward slightly over the period. We also looked at correlations with variables. Among the style strategies, PB and MKT are most highly correlated (0.69), followed by EP and PB (0.45). Many of the style strategies are significantly negatively related to inflation changes. Interestingly, the Fama-French market risk premium is significantly negatively related to the volatility measure.

Table 1 presents results of regressions of the monthly style factor excess returns (i.e., above T-bill returns) on the various Fama-French factors as well as the economic variables. over the 1980-2005 period (coefficient significance is indicated by p-values in parentheses) Much of the EP strategy returns can be explained by the Fama-French factors. The return is significantly positively related to HML and significantly negatively related to UMD. These results suggest the EP strategy is driven by the performance of value

STYLE FACTOR REGRESSION ANALYSIS										TABLE 1
	Int	RmRf	SMB	HML	UMD	YLD	PREM	INFCH	VIX	Adj R <sup>2</sup>
EPE	0.51 (0.032)	-0.35 (0.000)								0.121
EPE	-0.02 (0.915)	-0.02 (0.639)	-0.12 (0.051)	0.83 (0.000)						0.428
EPE	0.08 (0.712)	-0.04 (0.48)	-0.12 (0.071)	0.81 (0.000)	-0.10 (0.030)					0.435
EPE	-0.35 (0.686)	-0.03 (0.571)	-0.11 (0.080)	0.81 (0.000)	-0.09 (0.037)	0.05 (0.741)	0.19 (0.683)	0.09 (0.478)	0.01 (0.809)	0.429
PBE	0.06 (0.773)	-0.02 (0.73)								-0.003
PBE	-0.62 (0.003)	0.33 (0.000)	0.26 (0.000)	1.04 (0.000)						0.467
PBE	-0.17 (0.176)	0.27 (0.000)	0.31 (0.000)	0.94 (0.000)	-0.44 (0.000)					0.713
PBE	-1.31 (0.015)	0.3 (0.000)	0.31 (0.000)	0.96 (0.000)	-0.44 (0.000)	0.07 (0.487)	-0.02 (0.932)	0.01 (0.913)	0.05 (0.007)	0.717
PRME	0.000 (0.997)	0.18 (0.014)								0.016
PRME	0.23 (0.509)	-0.31 (0.003)	0.03 (0.801)	0.35 (0.007)						0.039
PRME	-0.99 (0.000)	-0.17 (0.000)	-0.10 (0.04)	-0.08 (0.135)	1.21 (0.000)					0.839
PRME	-0.16 (0.791)	-0.19 (0.000)	-0.10 (0.022)	-0.10 (0.054)	1.20 (0.000)	0.24 (0.023)	-0.65 (0.041)	-0.09 (0.316)	-0.03 (0.174)	0.844
MKTE	0.24 (0.273)	0.21 (0.000)								0.058
MKTE	-0.71 (0.000)	0.36 (0.000)	0.87 (0.000)	0.68 (0.000)						0.423
MKTE	0.35 (0.020)	0.32 (0.000)	0.72 (0.000)	0.61 (0.000)	-0.35 (0.000)					0.582
MKTE	-2.47 (0.000)	0.36 (0.000)	0.72 (0.000)	0.63 (0.000)	-0.34 (0.000)	0.08 (0.469)	0.44 (0.194)	0.04 (0.637)	0.07 (0.001)	0.595

stocks versus growth stocks. Performance over this period is also driven to some extent by larger stocks. These factors combine to subsume any market effects. EP excess returns are negatively related to the momentum factor. The addition of economic variables as explanatory factors does not impact on the results, suggesting the other factors are not dependent on economic conditions. While the intercept term was significant in the initial CAPM regression with one market factor, once additional factors are included the intercept is no longer significant, suggesting no positive alpha.

The PB strategy shows a somewhat similar pattern compared with EP. The intercept or alpha relative to the market factor is positive although not significant. The PB excess returns are significantly positively related to the HML factor and significantly positively related to the SMB factor, suggesting a small cap effect. Unlike the EP strategy, the

market effect is also significant. PB excess returns are negatively related to the momentum factor. The strategy performs well when markets are more volatile.

For the PRM strategy, the initial alpha based on the CAPM regression is virtually zero. With the inclusion of the Fama-French factors, the price momentum strategy is significantly negatively related to the market factor and the SMB factor. The addition of the UMD factor is significantly positive as expected. The price momentum strategy tends to perform better in economic expansions which are associated with an upward sloping yield curve and a lower default premium.

Finally, the MKT strategy shows a positive alpha in the CAPM regression but one that is not significant. The strategy is significantly positively related to all of the three Fama-French factors. The strategy is significantly positively related to SMB. With the addition of

EQUITY MARKET NEUTRAL INDEX VERSUS OTHER STYLE REGRESSION ANALYSIS											TABLE 2
	Int	RmRf	EP	PB	PRM	MKT	YLD	PREM	INFCH	VIX	Adj R <sup>2</sup>
EMNE	0.44 (0.000)	0.07 (0.000)									0.131
EMNE	0.43 (0.000)	0.10 (0.000)	0.07 (0.000)	-0.09 (0.010)	-0.02 (0.082)	0.02 (0.424)					0.218
EMNE	0.02 (0.938)	0.11 (0.000)	0.06 (0.000)	-0.09 (0.006)	-0.02 (0.107)	0.02 (0.429)	-0.09 (0.129)			0.02 (0.008)	0.279
EMNE	-0.18 (0.532)	0.11 (0.000)	0.08 (0.000)	-0.09 (0.006)	-0.02 (0.105)	0.02 (0.548)	-0.13 (0.095)	0.53 (0.190)	0.09 (0.192)	0.02 (0.124)	0.287
HFIE	0.55 (0.441)	0.32 (0.000)	0.01 (0.740)	-0.09 (0.278)	0.13 (0.000)	0.13 (0.040)	-0.16 (0.434)	0.63 (0.533)	0.2 (0.246)	-0.02 (0.454)	0.408
CAE	-0.09 (0.871)	0.05 (0.169)	0.02 (0.524)	-0.04 (0.516)	0.01 (0.806)	0.06 (0.185)	-0.28 (0.063)	1.05 (0.166)	0.282 (0.028)	0 (0.920)	0.068
DSBE	2.02 (0.050)	-0.96 (0.000)	-0.07 (0.260)	0.39 (0.001)	-0.06 (0.191)	-0.45 (0.000)	0.05 (0.860)	-1.94 (0.182)	-0.20 (0.410)	-0.02 (0.678)	0.751
EME	-1.73 (0.270)	0.61 (0.000)	0.12 (0.166)	-0.28 (0.111)	0.12 (0.099)	0.37 (0.009)	0.41 (0.348)	3.11 (0.162)	0.74 (0.049)	-0.07 (0.285)	0.357
EDE	0.83 (0.096)	0.22 (0.000)	0.05 (0.094)	-0.06 (0.027)	0.04 (0.103)	0.13 (0.005)	-0.15 (0.292)	1.38 (0.052)	0.25 (0.036)	-0.06 (0.005)	0.449
EDDE	0.97 (0.108)	0.24 (0.000)	0.05 (0.180)	-0.03 (0.611)	0.04 (0.205)	0.12 (0.025)	-0.12 (0.462)	1.31 (0.126)	0.23 (0.109)	-0.06 (0.019)	0.390
EDMSE	0.68 (0.230)	0.21 (0.000)	0.05 (0.142)	-0.08 (0.210)	0.04 (0.094)	0.13 (0.010)	-0.13 (0.425)	1.35 (0.094)	0.3 (0.030)	-0.05 (0.019)	0.362
EDRAE	1.18 (0.003)	0.12 (0.000)	0.05 (0.044)	-0.1 (0.016)	0.01 (0.731)	0.15 (0.000)	-0.25 (0.024)	0.46 (0.405)	0.1 (0.291)	-0.04 (0.010)	0.368
FIAE	0.06 (0.888)	0.01 (0.614)	0.02 (0.445)	0.00 (0.940)	0.02 (0.217)	0.010 (0.816)	-0.01 (0.918)	1.2 (0.052)	0.18 (0.088)	-0.04 (0.035)	0.045
GME	0.75 (0.557)	0.27 (0.002)	0.09 (0.221)	-0.08 (0.578)	0.12 (0.046)	0.10 (0.370)	-0.25 (0.470)	1.02 (0.570)	0.04 (0.887)	-0.03 (0.620)	0.071
LSEE	0.11 (0.068)	0.52 (0.000)	-0.03 (0.395)	-0.13 (0.067)	0.2 (0.000)	0.21 (0.000)	-0.3 (0.102)	0.61 (0.510)	0.23 (0.136)	0.01 (0.738)	0.713
MFE	-2.22 (0.111)	0.000 (0.961)	0.05 (0.500)	0.000 (0.983)	0.11 (0.088)	0.12 (0.325)	0.37 (0.335)	-1.17 (0.552)	-0.12 (0.707)	0.12 (0.034)	0.042
MSE	-0.16 (0.753)	0.03 (0.352)	-0.05 (0.084)	0.07 (0.180)	0.03 (0.252)	-0.01 (0.865)	0.12 (0.405)	-0.54 (0.449)	0.11 (0.361)	0.03 (0.102)	0.003

the momentum variable, the size-based strategy is significantly negatively related to UMD, suggesting small stocks do better when momentum is not as strong. The strategy also tends to do better in volatile markets.

We also considered results related to the equity market neutral index.<sup>2</sup> According to our summary statistics, average monthly returns of 0.80% are significantly positive. The standard deviation is much lower than that of the U.S. market risk premium (RmRf) or the world index excess return (MSCIE). In contrast, no other strategy has significant positive returns over this sample period. The EMN index can be thought of as a proxy for a fund-of-hedge funds and clearly demonstrates the diversification benefits versus some pure style portfolios. The economic variables in this sub-period are of similar order of magnitude compared with the overall

period. As for correlations, EMN is positively and significantly related to the U.S. market risk premium and the world market risk premium. EMN is negatively and significantly related to the yield curve. MKT is significantly related to all other non-economic factors—positively in all cases except PRM.

Table 2 examines the drivers of equity market neutral hedge fund excess returns (EMNE) over the 1994-2005 period. We begin with a simple CAPM regression using U.S. market risk premium excess return, RmRf, although results are similar using a world market excess return (MSCIE). The intercept term can be interpreted as alpha. In this first regression, the beta is significantly positive but very low (0.07) as expected in such a market neutral strategy. Thus equity market neutral strategies are not truly neutral, but do exhibit very little pure market exposure.

The alpha is positive and significant (0.44) and represents an annualized return of 5.4%. Thus in a CAPM world, it appears that such strategies offer superior performance.

The second regression examines the impact of the addition of the four style factors. The market beta now increases slightly to 0.10. The EP coefficient is significant (positive) at the 1% level as is the PB variable (but negative), while the PRM variable is significant (negative) at the 10% level. The alpha decreases slightly to 0.43 or 5.3% on an annualized basis. The adjusted R-square increases substantially. Thus equity market neutral fund performance captures a value effect as measured by the price-earnings ratio, but a growth effect as captured by the price-to-book ratio. This suggests that the Fama-French HML factor may not be capturing all of the value-growth effect. With the negative price momentum coefficient, this suggests that equity market neutral captures some price reversal effects rather than continuation of strong 12-month performance. The MKT variable is not significant suggesting size is not a relevant factor driving equity market neutral performance.

The third and fourth equations add the economic variables (YLD, PREM, INFCH, and VIX). In both regressions the adjusted R-square increases to over 27%—a fairly substantial increase—and the alpha becomes small (0.02 or less) or negative and insignificant. If we are willing to consider these economic factors as reflective of risks for which one expects to be compensated, then the equity market neutral strategies, on average, are not providing superior performance. The RmRF, EP, PB, PRM and MKT coefficients are a similar order of magnitude and significance as in the previous regressions, suggesting an orthogonal impact of the economic variables. The dominant style factors continue to be RmRf, EP, PB, and to a lesser extent PRM. The yield variable is significant and negative, and the volatility variable is significant and positive. Thus it appears that in addition to the factors described above, the equity market neutral excess return alpha can be explained by the shape of the yield curve and market volatility.

The remaining regressions examine the other hedge fund style excess returns. There is a clear dichotomy: with five of the styles, less than 8% of the variability is explained—convertible arbitrage (CAE), fixed-income arbitrage (FIAE), global macro (GME), managed futures (MFE), and multi-strategy (MSE)—while for the remaining seven styles—dedicated short bias

(DSBE), emerging markets (EME), event-driven (EDE), event-driven distressed (EDDE), event-driven multi-strategy (EDMS), event-driven risk arbitrage (EDRA), long-short equity (LSE)—more than 35% of the variability is explained, and for the overall index (which is value-weighted) 41% is explained.

Among these seven “equity-related” styles, all have significant world market premium betas (ranging from 0.12 to 0.52) and, as expected, DSBE has a significant negative beta (-0.96). There is prevalence among the remaining six strategies to have a growth tilt as evidenced by significant and negative PB coefficients, while the EP coefficients don't appear to show any consistent trend. There does not appear to be a consistent price momentum effect. There is also a small-cap tilt as evidenced by significant and positive MKT coefficients (negative for the DSBE strategy) for most of the equity-related strategies.

In terms of the economic variables, CAE, EDRAE and LSEE have significant and negative YLD coefficients while many others have negative but not significant coefficients. Thus, these other hedge fund strategies tend to be counter-cyclical as measured by the shape of the yield curve. EDE, EDMSE and FIAE show a positive relationship with a wider default premium spread. CAE, EME, EDE, EDDE, EDMSE, and FIAE performance is positively related to higher inflation. Unlike the equity market neutral strategy, most of the event-driven strategies have significant and negative VIX coefficients, suggesting lower volatility is better for these types of strategies. Managed futures tend to do better in more volatile times.

## Conclusions

Our research sheds light on some key drivers behind equity market neutral returns and highlights the importance of economic conditions in explaining hedge fund returns. For the most part, equity market neutral funds show very little market exposure. Performance appears to be superior when measured against a variety of long/short style factors, but not with the addition of economic factors. The “good news” is that equity market neutral returns are negatively related to the shape of the yield curve and positively related to market volatility, suggesting an important counter-cyclical role for such a strategy. ■

## Endnotes:

1. Table not shown here but is available upon request from the author.
2. Table not shown here but is available upon request from the author.