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Invisible handcuffs: identifying investment constraints through fund performance

Abstract

This paper analyzes whether constraints placed on a student managed investment portfolio (SMIP) can be identified by comparing fund returns with three clearly defined hedge fund strategies. There are 118 monthly total return observations for the fund from October, 2004 to July, 2014. The paper uses a unique database to determine if the constraints placed on the SMIP fund by the oversight committee are clearly identified in the performance of the fund. Specifically, we test a long/short strategy, a short bias strategy, and a managed futures strategy. The empirical results are indeed what are hypothesized in the paper, and it demonstrates that the financial performance of the fund was responsive to these constraints. The paper also demonstrates that in using an emerging market hedge fund strategy, the fund was correctly categorized as a growth portfolio in a recent competition. The paper makes the hedging strategies orthogonal to the Fama-French factors to test the four hypotheses outlined in the paper.

Keywords: portfolio theory, student managed investment portfolio, Rachev Ratio, hedge funds.
JEL Classification: G10, G11, G12.

Introduction

This paper analyzes whether the total monthly returns of an AACSB accredited undergraduate student managed investment portfolio (SMIP) fund was reflective of the administrative constraints placed upon the fund. The data for the fund covers the time period from October, 2004 to July, 2014. The SMIP fund performed very well over this time period and outperformed the S&P 500 Index by 132 basis points. This paper contributes to the academic literature in a few ways. First, the paper allows the authors to test whether the constraints of the portfolio as imposed by the oversight board can be tested by using specific hedge fund strategies. The paper makes the hedging strategies orthogonal to the Fama-French factors to test the four hypotheses outlined in the paper. The hedge fund strategies that were selected for this were a long/short proxy, a short bias proxy, and a derivatives proxy. These constraints are outlined in hypotheses 1-3. Secondly, it allows the authors to test whether the SMIP fund was correctly identified as a growth portfolio by the Global Asset Management Education (GAME) forum in 2014. The SMIP fund was designated a growth portfolio and won first prize in this category. This will be outlined in Hypothesis 4 using the emerging markets hedge fund strategy as a proxy for growth. According to Morningstar, many firms have some of their emerging markets mutual funds investment style characterized as large growth. These funds include Goldman Sachs, Prudential, Fidelity, TIAA – CREF, and T. Rowe Price. All four of the hypotheses in the paper were proven to be reflective of the SMIP fund performance.

The SMIP fund was initially funded by three benefactors of the university with gifts of $35,000 and a loan of $165,000. The financial performance is impressive, particularly given the many restrictions that were placed on the SMIP fund by the university's Board of Trustees when it was first established. The SMIP fund is not allowed to use margin, and the fund must be invested in equities or money market equivalents. The fund is also restricted from investing in any foreign securities, and short positions are not permitted. Finally, the SMIP fund is not allowed to use any derivative products for either hedging or speculation purposes. These constraints will be tested in the paper.

Hedge fund strategies are unique in that they allow the authors to test constraints in a very structured fashion, since the strategies are very specific in how they are managed. The approach in this paper for Hypothesis 1-3 is similar to Kim et al. (2009) that found that the markets did price the difference between non-derivatives and derivatives using gold mining firms. Using an event study methodology, the authors found that with positive and negative gold shocks, the non-hedged firms had greater variability of equity returns. Jin and Jorion (2006) also found that hedging did reduce stock price volatility for oil and gas producing firms. Our paper is similar in that we want to test whether the constraints placed on the portfolio are reflected in the total return performance of the SMIP fund.

This paper is an extension of work by Wynne and Filante (2014) that used a similar SMIP database related to behavioral aspects of the students' trading approach. First, the authors found that the students were not anchored, (Northcraft and Neale, 1987; Barberis and Huang, 2001), to initial values of the

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stocks because the student composition of the class was changing every 4 months. Secondly, the students were much more likely to sell losers as opposed to winners. This is in contrast to the disposition effect, Barber et al. (2007), where small investors are much more likely to sell winners over losers. These behavioral aspects helped to explain how the SMIP fund outperformed the S&P composite.

Much has been written on the use of student managed investment funds to help develop an applied learning experience in the classroom. Cooley and Hubbard (2012) discuss the academic content of the funds as well as the administrative oversight of the funds. Macy (2010) outlines establishing student funds at regional schools as well as connecting it to CFA and CFP certifications. Mallet, Belcher, and Boyd (2010) discuss the history of the student fund at Stetson University and curriculum issues and technology related to the fund. Peng, Dukes, and Bremer (2009) surveyed 35 student managed funds (SMFs) and found the median value of the funds was $460,000 with almost 70% of the funds investing at least 90% of their capital in equities. The SMIP fund in this paper is slightly lower as far as capitalization, but over 90% of the funds are invested in equities. Saunders (2014) illustrates how covered call options and protective puts can be used in a student managed investment portfolio, although the majority of student managed investment funds do not utilize derivatives.

The faculty member responsible for overseeing the fund has the students develop a recommendation on which stocks should be purchased for the fund. The students vote on the recommendation, and a simple majority determines if a particular stock should be added to the portfolio. In order to purchase a new security, in most instances, the students must decide which security to sell. The students also need to decide which securities to sell when payments must be made to the original benefactor of the fund. The selling of existing securities is also conducted by a simple majority vote of the students. The amount of the buying transaction is limited to $5,000. The students are allowed to set stop loss or target sale prices; (GTC and Limit Orders). If the student's recommendation is accepted, the stocks are purchased within weeks 6-15 of the course.

1. Hypotheses development and data collection

Hypotheses 1-3 in the paper determine whether the three constraints placed on the fund by administrators can be identified in the fund's performance. Hypothesis 4 tests whether the designation as a growth fund was correct for the SMIP fund. The hedging strategies are used because they are well defined and serve as excellent proxies for the constraints and designations of the SMIP fund. The four hypotheses are outlined below with the expected sign and significance levels of the various strategies.

Hypothesis 1: The first hedge fund strategy tested is the long/short. Given the structure of the SMIP fund, we would hypothesize that the coefficient would be positive and statistically significant. The rationale is that although the students are not allowed to short securities, the process of how the portfolio is structured lends itself to mimicking this strategy. In order to purchase new securities, the students must sell existing securities from the fund.

Hypothesis 2: The second hedge fund strategy tested is the short bias. Given the structure of the SMIP fund, we would hypothesize that the coefficient would be statistically insignificant. The rationale is that the portfolio is not allowed to short securities and therefore should not be reflected in the performance of the fund.

Hypothesis 3: The third hedge fund strategy tested is the managed futures. Given the structure of the SMIP fund, we would hypothesize that the coefficient would be insignificant. The rationale is that the portfolio is not allowed to use any derivatives to hedge or speculate, and therefore should not be reflected in the performance of the fund.

Hypothesis 4: The fourth hedge fund strategy tested is the emerging markets. Recently, the SMIP fund was classified as a growth portfolio at the GAME competition where it finished first. We hypothesize that the coefficient would be positive and statistically significant. The rationale is that the SMIP fund exhibits many of the characteristics of a growth portfolio as outlined at the GAME competition. This hypothesis tests whether the designation of a growth portfolio was accurate.

The data for the SMIP fund covers the monthly total returns from October, 2004 to July, 2014. The trades were executed through a regional brokerage firm located in Overland Park, Kansas[1]. This accounts for 118 observations. The time period selected was to coincide with the monthly returns on the hedge fund database that were available. The S&P 500 Composite monthly return data was obtained from the CRSP database. The monthly data for the Fama-French factors and the risk-free rate was obtained through the Wharton database. The hedge fund strategy data was obtained from the Dow Jones – Credit Suisse Hedge Fund Index. The four hedge fund strategies that are used in the paper are long/short, short bias, managed futures, and emerging markets.

[1] This brokerage firm was selected because the faculty member directing the SMIP program is a registered representative of this firm.

2. Methodology

The annual mean, standard deviation, and Sharpe ratio are calculated for the SMIP portfolio as well as the market proxy over the October, 2004 to July, 2014 time period. The market proxy used was the S&P Composite from CRSP. The authors test the portfolio performance using the Fama-French (1993) model and this is written as:

$$R_{SMIPt} - R_{ft} = \alpha + \beta_p (R_{mt} - R_{ft}) + s_p(SMB)_t + \\ + h_p(HML)_t + \varepsilon_t, \quad (1)$$

where $R_{SMIPt} - R_{ft}$ is the risk premium of the SMIP portfolio, $(R_{mt} - R_{ft})$ is the risk premium of the market from Fama-French, SMB is the small minus big average return on the three small portfolios minus the average return on the three big portfolios. *HML* is the high minus low average return on the two value portfolios minus the average return on the two growth portfolios. The corresponding regression coefficients are β_p, s_p and h_p. ε_t is the error term. The Fama-French model for empirically testing portfolio returns are similar to approaches used by Betker and Sheehan (2013) and Hamid et al. (2012).

To determine whether the constraints and designations were reflected in the SMIP fund performance we use four different hedge fund strategies to test significance levels. The hedge fund strategies are long/short; short bias, managed futures, and emerging markets. The model can be written as:

$$R_{HFt} - R_{ft} = \alpha + \beta p(R_{mt} - R_{ft}) + s_p(SMB)_t + \\ + h_p(HML)_t + \varepsilon_t, \quad (2)$$

where $R_{HFt} - R_{ft}$ is the risk premium of the four different hedge fund strategies. This is in general notation because all four strategies will be tested separately. There will be four separate regressions to estimate the residuals.

We then use the residual term of the four different strategies to test the effects of the hedging strategies on the SMIP fund. This approach is similar to Burmeister and McElroy (1988) who used it to capture omitted market information in the Arbitrage Pricing Theory (APT) of Roll and Ross (1980). This can be written as:

$$HF_{residualt} = (R_{HFt} - R_{ft}) - (\alpha + \beta_p(R_{mt} - R_{ft}) + \\ + s_p(SMB)_t + h_p(HML_t)), \quad (3)$$

where $HF_{residualt}$ relates to the four different hedge fund strategies. By definition, the four $HF_{residual}$ will be orthogonal to the Fama-French factors. The correlation coefficient between the hedge funds strategies and the Fama-French factor will therefore be equal to 0. This transformation allows us to evaluate the four hypotheses of the paper without concerns that they are correlated to the Fama-French factors. We then regress the SMIP risk premium, $R_{Smip\ t} - R_{ft}$ on the Fama-French factors and the hedge fund residual. The equation can be written as:

$$R_{Smip\ t} - R_{ft} = \alpha + \beta_p(R_{mt} - R_{ft}) + s_p(SMB)_t + \\ + h_p(HML)_t + r_p(HF_{residualt}) + \varepsilon_t, \quad (4)$$

where r_p is the coefficient related to the four separate hedge fund strategies run in separate regressions. We would expect that the r_p coefficient for the long/short hedge fund strategy should be positive and statistically significant. Although the students do not short securities, they are forced to sell securities in order to be able to purchase new securities. This in essence replicates the long/short hedge fund strategy. The authors hypothesize that the short bias and managed futures should be insignificant because of the constraints on the SMIP fund not allowing derivatives or the shorting of securities. The r_p coefficient for the emerging markets should be positive and statistically significant, if it was correctly characterized as a growth portfolio.

3. Empirical results

The annualized means, standard deviations, and Sharpe ratio are calculated for the SMIP fund and a market proxy as well as other descriptive statistics. The SMIP fund over the time period of this study has an annual arithmetic mean of 8.04% and an annual standard deviation of 16.07%. This compares in contrast to the S&P Composite from CRSP with an annual arithmetic mean of 6.72% and an annual standard deviation of 14.79%. The SMIP fund outperforms the S&P 500 Composite from CRSP by 132 basis points. The Sharpe ratio for the SMIP fund is .43 as compared to .38 for the S&P 500 Composite. The Rachev ratio[1] is also reported in Table 1. The Rachev ratio is the expected right tail return divided the expected left tail loss. The ratio is explained by Rachev et al. (2008) as a more thorough estimate of the risk return relationship of a portfolio. The Rachev ratio for the SMIP fund was 0.7768 as compared to the 0.8296 for the S&P Composite. As expected, the events of 2008 drastically affected the ratio for the SMIP fund. Removing 2008 from the sample, the Rachev ratio increases to 1.1064 based on 106 observations for the SMIP fund.

Table 1. Descriptive statistics and risk measures of the student managed investment fund (SMIP) and the S&P returns

	SMIP returns	S&P returns
Monthly mean	0.67%	0.56%
Standard deviation	4.64%	4.27%
Kurtosis	2.27	2.17
Skewness	-0.92	-0.88
Annual mean	8.04%	6.72%
Annual standard deviation	16.07%	14.79%
Sharpe ratio	0.43	0.38

[1] The Rachev ratio was calculated using ApaLibNET – Advanced Portfolio Analytics. The software was back-tested to insure that it generated the same mean, standard deviation, and Sharpe ratio that was reported in the paper.

Table 1 (cont.). Descriptive statistics and risk measures of the student managed investment fund (SMIP) and the S&P returns

	SMIP returns	S&P returns
Rachev ratio	0.7768	0.8296
Observations	118	118

Notes: SMIP = rate of return on student managed investment portfolio. S&P 500 = rate of return on S&P 500 from CRSP. Observations: October, 2004 to July, 2014.

The Fama-French results related to the SMIP returns prior to the introduction of the hedge fund residuals are presented in Table 2. The market risk premium coefficient β_p is .92 and statistically significant with a *p*-value of .01. The HML coefficient h_p, is -.29 and statistically significant with a *p*-value of .01. The SMB coefficient s_p is not statistically significant. The adjusted R^2 is .66.The F-test is statistically significant for the model with a *p*-value of .01

Table 2. Multiple regression model with the student managed investment portfolio (SMIP) risk premium as the dependent variable and the Fama – French factors as the independent variables

	Coeffi-cients	SE	t-stat	Adjusted R^2	F-test	Significance
Alpha	0.000	0.003	-0.089	0.66	78.02	0.01
MKTRF	0.916	0.067	13.715***			
SMB	-0.030	0.125	-0.243			
HML	-0.291	0.112	-2.585***			

Notes: Dependent variable = risk premium of Student Managed Investment Portfolio (SMIP). Independent variables − MKTRF = risk premium of the market. SMB (Small Minus Big) = the average return on the three small portfolios minus the average return on the three big portfolios. HML (High Minus Low) = the average return on the two value portfolios minus the average return on two growth portfolios. Number of observations = 118. *** $p < 0.01$.

Using equation 2, we treat the hedging strategies as the dependent variable and the Fama-French factors as the independent variables to generate the hedge fund residuals. The results for all 4 hedging strategies are presented in Table 3. For the emerging markets strategy, the market risk premium coefficient, β_p is .70 and statistically significant with a *p*-value of .01. The SMB coefficient, s_p is -.22 and statistically significant with a *p*-value of .10. The HML coefficient, h_p is not statistically significant. The adjusted R^2 is .51. The F-test is statistically significant with a *p*-value of .01. For the long/short strategy, the market risk premium coefficient, β_p is .53 and statistically significant with a *p*-value of .01. The SMB coefficient, s_p is statistically insignificant. The HML coefficient, h_p is -.23 and statistically significant with a *p*-value of .01. The adjusted R^2 is .75. The F-test is statistically significant with a *p*-value of .01.

Table 3. Multiple regression model with the hedge fund strategies riskpremium as the dependent variable and the Fama – French factors as the independent variables

	Emerging markets coefficients	Long/short coefficients	Short bias coefficients	Managed futures coefficients
Alpha	0.000 (0.292)	0.000 (-0.29)	-0.002 (-0.778)	0.004 (-1.333)
MKTRF	0.698 (10.419)***	0.527 (16.996)***	-0.489 (-6.243)***	0.025 (0.346)
SMB	-0.223 (-1.782)*	-0.010 (-0.176)	-0.681 (-4.662)***	-0.129 (-0.958)
HML	-0.170 (1.505)	-0.225 (-4.314)***	0.088 (0.668)	-0.091 (-0.755)
Adjusted R^2	0.51	0.75	0.48	-0.01
F-test	40.83	118.33	37.16	0.54

Notes: Dependent variable = risk premium of the four different hedge fund strategies. Independent variables − MKTRF = risk premium of the market. SMB (Small Minus Big) = the average return on the three small portfolios minus the average return on the three big portfolios. HML (High Minus Low) = the average return on the two value portfolios minus the average return on two growth portfolios. Number of observations = 118. *t*-statistics in parenthesis. *** $p < 0.01$, * $p < 0.10$.

For the short bias strategy, the market risk premium coefficient, β_p is negative with a value of -.49 and statically significant with a *p*-value .01. The SMB coefficient, s_p is -.68 and statically significant with a p-value of .01. The HML coefficient, h_p is not statistically significant. The adjusted R^2 is .48. The F-test is statistically significant with a *p*-value of .01. For the managed futures strategy, all of the coefficients are statistically insignificant. These results allow the authors to test whether the constraints and designation of the SMIP fund were reflected in the performance using the hedge fund residuals. All of the hedging strategies are now orthogonal to the Fama-French factors. We are now able to test the four hypotheses that were outlined in the modelling section of the paper.

Theoretically, all of the coefficients for the Fama-French results reported in Table 2 should be identical, since the added hedging strategies variables are orthogonal to the other factors. Indeed, all of the Fama-French coefficients from Table 2 are the same as the ones in Tables 4-7. In Hypothesis 1, the authors argued that the long/short strategy coefficient should be positive and statistically significant. The results are also reported in Table 4. This is because the SMIP fund has not received any new inflows of capital. For the SMIP fund to elect to purchase new securities they must liquidate existing securities in the portfolio. The long/short residual coefficient, r_p is positive and statistically significant with a value .70 and a p-value of .01. The adjusted R^2 also increases from Table 3 of .66 to .70 with the long/short strategy residual. These results confirm Hypothesis 1.

Table 4. Multiple regression model with the student managed investment portfolio (SMIP) risk premium as the dependent variable and the Fama – French factors and the long/short residual as the independent variables

	Coefficients	SE	t-stat	Adjusted R^2	F-test	Significance
Alpha	0.000	0.002	-0.093	0.70	67.817	0.010
MKTRF	0.916	0.064	14.410***			
SMB	-0.030	0.119	-0.255			
HML	-0.291	0.107	-2.717***			
Long/short	0.689	0.192	3.587***			

Notes: Dependent variable = risk premium of SMIP portfolio. Independent variables − MKTRF = risk premium of the market. SMB (Small Minus Big) = the average return on the three small portfolios minus the average return on the three big portfolios. HML (High Minus Low) = the average return on the two value portfolios minus the average return on two growth portfolios. Long/short = residual of Long/short from the Fama-French model. Number of observations = 118. *** $p < 0.01$.

In Hypothesis 2, we argued that the short bias strategy coefficient should be insignificant. The results are also reported in Table 5. The reason is that there is a constraint on the portfolio that it is not allowed to short any securities in the portfolio. The short bias residual coefficient, r_p is insignificant and there is no change in the adjusted R^2. These results support Hypothesis 2. In Hypothesis 3, we argued that the managed futures coefficient should be insignificant. The results are reported in Table 6. The reason is that there is a constraint on the fund that it is not allowed to use any derivative products. The managed futures residual coefficient, r_p is insignificant, and there is no change in the adjusted R^2. These results support Hypothesis 3.

Table 5. Multiple regression model with the student managed investment portfolio (SMIP) risk premium as the dependent variable and the Fama – French factors and the short bias residual as the independent variables

	Coefficients	SE	t Stat	Adjusted R^2	F-Test	Significance
Alpha	0.000	0.003	-0.088	0.66	58.001	0.010
MKTRF	0.916	0.067	13.655***			
SMB	-0.030	0.125	-0.242			
HML	-0.291	0.113	-2.574***			
Short bias	0.004	0.080	0.055			

Notes: Dependent variable = risk premium of SMIP portfolio. Independent variables − MKTRF = risk premium of the market. SMB (Small Minus Big) = the average return on the three small portfolios minus the average return on the three big portfolios. HML (High Minus Low) = the average return on the two value portfolios minus the average return on two growth portfolios. Short bias = residual of the Short bias from the Fama-French model. Number of observations = 118. *** $p < 0.01$.

Table 6. Multiple regression model with the student managed investment portfolio (SMIP) risk premium as the dependent variable and the Fama – French factors and the managed futures residual as the independent variables

	Coefficients	SE	t-stat	Adjusted R^2	F-test	Significance
Alpha	0.000	0.003	-0.089	0.66	58.568	0.010
MKTRF	0.916	0.067	13.699***			
SMB	-0.030	0.125	-0.242			
HML	-0.291	0.113	-2.583***			
Managed futures	-0.075	0.087	-0.864			

Notes: Dependent variable = risk premium of SMIP portfolio. Independent variables − MKTRF = risk premium of the market. SMB (Small Minus Big) = the average return on the three small portfolios minus the average return on the three big portfolios. HML (High Minus Low) = the average return on the two value portfolios minus the average return on two growth portfolios. Managed Futures = residual of Managed Futures from the Fama-French model. Number of observations = 118. *** $p < 0.01$.

In Hypothesis 4, we argued that the emerging market hedge fund strategy coefficient should be positive and statically significant. The results are reported in Table 7. The emerging market residual coefficient, r_p is positive and statistical significant with a value of .35 and a *p*-value of .01. As expected, the adjusted R^2 increases from .66 to .70. Hypothesis 4 confirms that the SMIP fund was characterized correctly as a growth fund. This is consistent with the Global Asset Management Education (GAME) forum classifying the SMIP fund as a growth fund.

Table 7. Multiple regression model with the student managed investment portfolio (SMIP) risk premium as the dependent variable and the Fama – French factors and the emerging markets residual as the independent variables

	Coefficients	SE	t-stat	Adjusted R^2	F-test	Significance
Alpha	0.000	0.002	-0.09	0.70	0.70	0.010
MKTRF	0.916	0.063	14.600***			
SMB	-0.030	0.117	-0.258			
HML	-0.291	0.106	-2.752***			
Emerging markets	0.353	0.088	4.025***			

Notes: Dependent variable = risk premium of SMIP Portfolio. Independent variables – MKTRF = risk premium of the market. SMB (Small Minus Big) = the average return on the three small portfolios minus the average return on the three big portfolios. HML (High Minus Low) = the average return on the two value portfolios minus the average return on two growth portfolios. Emerging markets = residual of the Emerging markets from the Fama-French model. Number of observations = 118. *** $p < 0.01$.

Conclusion

The empirical results in this paper provide insights into the trading behavior of a student managed investment portfolio (SMIP) when constraints are placed on the fund. Using well defined hedging strategies, the authors were able to determine that constraints placed on the SMIP fund by the administration are reflected in the return performance of the portfolio. The rationale for the choosing of hedge funds strategies is that they are well defined and allow the authors to test the four hypotheses outlined in the paper. The authors create residuals of the three strategies; long/short, short bias, and managed futures using the Fama-French model. This allows the hedging strategies to be orthogonal to the Fama-French model. The empirical results support the three hypotheses as outlined by the authors. The coefficient for the long/short was positive and statistically significant, supporting Hypothesis 1. The structure of the portfolio had the students having to sell securities in order to purchase new securities. This occurred because there was no influx of new funds. The coefficients for the short bias and managed futures were statistically insignificant. This supports Hypotheses 2 and 3. The students are not allowed to short securities nor are they allowed to use any derivative products. They were only allowed to invest in equities and money market equivalents. Hypothesis 4 was also shown to be correct. The SMIP fund was identified as a growth portfolio at the GAME competition when it won the first place award in the growth category. We were able to demonstrate that the emerging market coefficient was positive and greatly significant.

The paper demonstrates that constraints and designations placed on a student managed fund are reflected in the performance of the portfolio and hedging strategies are useful proxies to test these assertions. The unique database of the SMIP fund allows the authors to conduct this analysis. Further research with the SMIP database will be to test if the students have engaged in a process selling low beta stocks and purchasing high beta stocks or whether they have been betting against beta (BAB). This is where low beta stocks are longed and high beta stocks are shorted.

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