“Investor behavior in a university student managed portfolio”

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Abstract

This paper analyzes whether behavioral issues can be partly responsible for the strong financial performance of a student managed investment portfolio (SMIP). The SMIP data include 144 monthly return observations from January, 2002 to December, 2013. The SMIP portfolio outperformed the S&P 500 by an average of 247 basis points per year over the lifetime of the fund. The SMIP portfolio also recently finished first in the "Undergraduate Growth" category at the Global Asset Management Education Forum in March, 2014. This data is quite unique because SMIP is managed by college juniors and seniors majoring in finance. The student managers in the SMIP portfolio are generally not tied to any preconceived notion of security prices since they are inheriting portfolios from previous classes, and were therefore not involved in selecting securities presently in the portfolio. This paper provides the specific trading data related to the fund. The authors attribute the strong performance of the SMIP fund to behavioral biases that were not present in the student investor selection process, particularly anchoring, overconfidence, and the disposition effect related to investor decisions.

Keywords: portfolio theory, behavioral finance, disposition effect, student managed investment portfolios.
JEL Classification: G02, G11.

Introduction

This paper analyzes the trading patterns and monthly returns of an AACSB accredited undergraduate college student managed investment portfolio (SMIP) from January, 2002 to December, 2013. The SMIP fund outperformed the S&P 500 Index by 247 basis points per year over this time period. The portfolio has also outperformed the S&P 500 during the recent financial recovery and experienced fewer losses during the financial crisis. The SMIP portfolio also recently finished first at the Global Asset Management Education Forum in March, 2014. This paper contributes to the academic literature by using a unique database that allows the authors to test whether certain behavioral biases such as anchoring, overconfidence and the disposition effect have an impact on the portfolio's performance. The authors contend that the relatively strong performance of the SMIP fund is partly attributed to certain behavioral factors that influence the security selection process by the students.

The SMIP was initially funded by three benefactors of the university with gifts of $35,000 and a loan of $165,000. Peng, Dukes and Bremer (2009) surveyed 35 student managed funds (SMFs) and found the median value of the funds were $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. As noted, the SMIP fund was started in 2002 and the authors have included data for 24 undergraduate classes that have participated in the portfolio selection process[1]. The financial performance of the fund 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 or invest in any fixed income securities. 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 securities either for hedging or speculation purposes.

The undergraduate students in the SMIP class are primarily juniors and seniors majoring in Finance. At the very least, they have completed one introductory finance course in a previous semester. Given the structure of the finance program, there is a high probability that they have taken other finance courses, subsequently or in conjunction with the SMIP course. The faculty member[2] lectures during the first five weeks of the semester, and there are usually no trades conducted during this time period. During these weeks, each student is assigned 2 or 3 securities from the inherited portfolio to analyze[3]. During the first weeks of each semester various valuation models are explained and students are encouraged to use those models when they recommend trades to the class.

[1] The lender receives money back when the fund's August 31st balance exceeds the prior fiscal year's balance. The SMIP has distributed approximately $110,000 to date.

[2] During the inception of the SMIP program, there were initially 2 professors involved in the lectures. This only lasted for 1 year and the same faculty member has been teaching the course since then. The university is relatively large with multiple campuses and the faculty member rotates teaching assignments between campuses for the SMIP course.

[3] The students prepare and distribute a short paper describing their assigned securities and "valuing" the stock using the CAPM via Money chimp and various models from Damodaran. Peng, Dukes and Bremer (2009) also found that the CAPM was commonly used to estimate the cost of equity. The SMIP students then compare this "value" with the stock's current price and propose a tentative buy/hold/sell opinion on the particular stock. The students also learn "stock screening" techniques by generating portfolios in various style boxes, using appropriate desired quantitative characteristics.

The faculty member then has the students develop a recommendation as to which stocks should be purchased during the remaining 10 weeks of each semester. The students vote on the recommendation and a simple majority determines if a particular stock should be added to the portfolio. The faculty member does not influence the voting process and simply records the vote and executes the trades through a broker if the recommendation is accepted. 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 usually 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.

Each student writes a paper based on a single recommendation she/he made during the semester. The paper includes both quantitative and qualitative reasoning supporting the recommendation to buy a particular stock. Additional credit is given to those students whose participation and questioning during the presentations lead to a clearer picture of the stock under discussion. Further credit is given to those students whose sell recommendations were lucid and logical. Grades are also assigned to the buy/hold/sell analysis and the stock screening assignment from weeks 1-4. Finally, some students are chosen to attend the RISE Symposium (2003-2010) at the University of Dayton, or the GAME Forum, (2011-2013), sponsored by Quinnipiac University. These students reported back their experience and were credited for those presentations to the class.

Kahneman and Tversky (1979) were one of the first and most widely known for the development of behavioral finance. They argued that there was a physiological influence related to investor behavior. Sohn and Park (2013) provide a review of the literature on behavioral theories. Havlicek (2013) discusses the difference between efficient markets theory as defined by Fama (1965) and the implications of various behavioral biases. Students were provided with a portfolio that they had not constructed; therefore, their behavior lacks some of the behavioral biases. Anchoring occurs when investors are reluctant to sell securities when they are focused on the initial price of their investment. Northcraft and Neale (1987) and Barberis and Huang (2001) demonstrate how anchoring has an effect on the decision making process of investors. The student managers in the SMIP portfolio are generally not tied to any preconceived notion of security prices. They are inheriting portfolios from previous classes, and were therefore not involved in selecting securities presently in the portfolio. Overconfidence is the investor mentality of being too confident in making investor decisions. Barber and O'Dean (2001), Hvide (2002), Allen and Evans (2005), and Wawaru et al. (2008) contribute to the academic literature on overconfidence. It is hard to imagine that the students in the SMIP class are over-confident in their selection of securities.

A survey performed recently in the class illustrated that the majority of the students had no prior experience in managing securities. In the survey, 72% of the students in the SMIP class did not have a brokerage account and 61% of the students had never owned any securities. The disposition effect was tested by Barber et al. (2007) and explains how investors are more likely to sell winners at a faster rate than they will sell losses. The paper will provide insights into the student behavior in the SMIP program by analyzing their selling of securities. The use of the Fama-French model for empirically testing portfolio returns are similar to those applied by Betker (2013), Becker and Sheehan (2013), and Hamid et al. (2012).

1. Data collection and empirical tests

The data for the SMIP returns cover the monthly returns from 1/31/2002 to 12/31/2013. The trades were executed through a regional brokerage firm located in Overland Park, Kansas[1]. This generates a total of 144 monthly observations. The S&P 500 monthly return data over the same time period were obtained from the CRSP database. The monthly data for the Fama-French factors were obtained through the Wharton database and there were 143 observations from 1/31/2002 to 11/28/2013. There is also annual information on the number of buys and sells in the portfolio, as well as the number of students participating yearly. Also included are the numbers of winners and losers that were sold by the students.

The portfolio returns are reported yearly and are also subdivided into those years of financial crisis and subsequent recovery. The annual mean, standard deviation, and Sharpe ratio are calculated for the SMIP portfolio as well as the market proxy. The Capital Asset Pricing Model (CAPM) was used to test the SMIP portfolio and assess the overall risk related to the market. The model can be written as:

$$R_{(Smip-rf)t} = \alpha + \beta_{(rm-rf)t} + \varepsilon_t, \quad (1)$$

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

where $R_{(Smip\ -\ rf)}$ is the excess return of the SMIP portfolio, alpha (α) is the intercept, β is the estimated coefficient, ($rm - rf$) is the excess return of the S&P 500 obtained from CRSP, and ε_t is the error term.

The authors also test the portfolio performance with the Fama-French model using conventional notation and can be written as:

$$R_{(Smip-rf)t} = \alpha + \beta_{(rm-rf)t} + s_{(SMB)t} + h_{(HML)} + \varepsilon_t, \qquad (2)$$

where $R_{(SMIP\ -\ rf)}$ is the excess return of the SMIP portfolio, alpha (α) is intercept, β is the coefficient corresponding to the excess return of the market from Fama-French, ($rm - rf$) is the excess return of the market, s is the coefficient corresponding to the small minus big average (SMB) factor. SMB is the three small portfolios minus the average return on the three big portfolios. h is the coefficient related to the high minus low (HML), estimated as the average return on the two value portfolios minus the average return on the two growth portfolios, and ε_t is the error term. Accordingly, using the Fama-French, the authors can test whether the SMIP portfolio mirrors more of a growth portfolio or a value portfolio. Thus a negative coefficient and statistical significance of the coefficient related to the HML factor is hypothesized.

2. Empirical analysis

The specific information obtained from the students' behavior of trading is very useful to analyze the trading patterns of the student investors. Table 1 provides information on the trading pattern of the students in the SMIP program. The number of securities in the SMIP portfolio ranged from 42 to 64, with the average number of securities held in the portfolio over the past 12 years is approximately 50 securities. Given the structure of the course, every student makes a presentation to be voted on to select a security. The portfolio change column refers to how many times a class sells a security that they have purchased. It ranges from a low of 2.17% in 2010 to a high of 16.33% in 2011. The average frequency that the same security is sold within the year is 8.46%. The student investors have a very high portfolio replacement ratio, but they are much less willing to alter the portfolio with securities that they had previously purchased. Rarely do the students vote to sell securities that were purchased during the same semester. So, on the one hand, the student investors benefitted from avoiding certain behavioral issues because of the high turnover of student investors. Yet, once the students purchase a security for the portfolio, they were reluctant to sell these securities for the duration of their involvement with the portfolio.

In the trades per student column, there is a wide discrepancy between the percentage of stock selections that were accepted and those that were rejected. With a low of .68 in 2007 to a high of 1.06 in 2011. The high of 1.06 was a function of individual students making multiple presentations. The column for portfolio replacement represents the total number of trades divided by the number of securities in the portfolio. Again, this ratio is consistent with the trades per student. This ratio will increase when the number of trades increases. The portfolio replacement percentage ranged from a low of 130.61% in 2005 to a high of 266.67% in 2008. A partial explanation for this high ratio is the process of having to sell securities to purchase new securities. This large trades per student and portfolio replacement also helps to explain the relatively high level of transaction costs related to the SMIP portfolio.

Table 1. Summary statistics of student trades

Year	Buy/sell same security	Portfolio changes	Total buys	Trades sells	Securities	Students	Trades per student	Portfolio replacement	SMIP return
2013	3	4.69%	49	43	64	51	0.96	143.75%	34.39%
2012	6	11.32%	44	46	53	49	0.90	169.81%	8.26%
2011	8	16.33%	56	63	49	53	1.06	242.86%	-2.10%
2010	1	2.17%	36	34	46	40	0.90	152.17%	27.44%
2009	3	7.14%	30	27	42	43	0.70	135.71%	24.43%
2008	5	11.90%	51	61	42	59	0.86	266.67%	-50.92%
2007	4	7.69%	38	38	52	56	0.68	146.15%	11.46%
2006	6	11.54%	48	51	52	56	0.86	190.38%	9.19%
2005	2	4.08%	28	36	49			130.61%	3.80%
2004	4	7.69%	41	37	52			150.00%	16.73%
Annual mean	4.20	8.46%	42.10	43.60	50.10	50.88	0.86	172.81%	8.27%

Notes: Portfolio changes is equal to the percentage of time during a year that a class would sell a security that was purchased in that year. Trades per student is equal to number of buy trades divided by the number of students. Portfolio replacement is equal to number of trades divided by number of securities in the portfolio.

During the 2 years that the SMIP portfolio lost money, the students drastically changed their trading patterns. In 2008 and 2011, the only years the SMIP portfolio experienced negative returns, the students drastically increased portfolio changes and portfolio replacement. The students in the SMIP portfolio actively sold securities when the market was declining. When faced with losses during these 2 years, the students aggressively reacted to liquidate more of the securities in the portfolios.

Table 2. Monthly descriptive statistics of the fund

	SMIP returns	S&P 500	SMIP* returns
Mean	0.00634	0.00428	0.00725
Standard error	0.00395	0.00364	0.00395
Median	0.01398	0.01106	0.01489
Standard deviation	0.04738	0.04374	0.04738
Sample variance	0.00224	0.00191	0.00224
Kurtosis	4.59594	4.51417	4.59594
Skewness	-0.71892	-0.74268	-0.71892

Notes: Number of observations = 144, 1/31/2002-12/31/2013. SMIP is monthly rate of return on the student managed investment portfolio. S&P 500 is monthly rate of return on S&P from CRSP. SMIP* is monthly rate of return on the student managed investment portfolio without transaction costs.

Table 2 provides the descriptive statistics for monthly observations of the entire sample from January 31, 2002 to December 31, 2013. The considerably higher median is consistent with negative skewness and equity market index returns. The descriptive statistics of the SMIP portfolio and the S&P 500 are relatively consistent. The annualized means, standard deviations, significance levels, and Sharpe Ratio are calculated for the SMIP portfolios and are reported in Table 3. The SMIP portfolio outperforms the S&P 500 from CRSP by 247 basis points annually over the 12 year existence of the portfolio. The Sharpe Ratio for the SMIP portfolio is .46 as compared to .34 for the S&P 500. We then estimate the transaction costs for the SMIP portfolio. On average, over a 12 year period, the transaction costs annually were 109 basis points. Estimating returns on the SMIP portfolio without transaction costs, and the SMIP returns outperform the S&P 500 by 356 basis points. This also generates a Sharpe Ratio of .52 for the SMIP portfolio as compared to the .34 for the S&P 500. With the transaction costs added back into the SMIP portfolio, one-tailed mean difference test is statistically significant with a *p*-value of .09. These results are also reported in Table 3. The authors attribute the strong performance of the student portfolio to three behavioral aspects. The student investors were not anchored to initial values because student managers were changing every 4 months. The students in each new class simply analyzed the portfolio to see what securities should remain, not being strongly committed to any securities in the portfolio. The students did not suffer from the over confidence aspect that was discussed earlier in the paper. As noted earlier, most of the students in the class were not engaged in the buying and selling of securities prior to taking the class.

Table 3. Annual returns and Sharpe ratios of the fund

	SMIP	S&P 500
Annual mean	7.61%	5.14%
Annual standard deviation	16.41%	15.15%
Sharpe ratio	0.46	0.34
Annual mean without transaction costs*	8.70%	
Sharpe ratio without transaction costs	0.52	0.34

Notes: SMIP is rate of return on student managed investment portfolio. S&P 500 = rate of return on S&P 500 from CRSP. * Mean difference with transaction costs for one-tailed test, *p*-value = .09. Number of observations = 143, 1/31/2002-11/29/2013.

Finally, we were able to test the disposition effect on the SMIP portfolio. As noted, to purchase securities for the portfolio, students have to sell securities to fund the purchase. They typically don't decide to sell a security until the class had voted to purchase another security. When this happens, the students vote which securities to sell again using a simple majority. The authors analyzed the trading pattern of the students related to which securities to sell. The authors analyzed the selling activities of the students from the period of 2011-2013. This involved 152 sell trades by the students. We tested how many of these sells were winners and how many were losers. The disposition effect argues that investors, particularly small investors, have a much greater propensity to sell winners as opposed to losers. To analyze this, we look at the price on the transaction date and the price of the security one week prior. The selection of one week was not random. The course met once a week and the students do not have a preconceived notion whether they will have to sell securities.

Out of the 152 sell trades from the period of 2011-2013, the students sold losers 93 times and sold winners 59. This means that the students sold losers 61% of the time. This represents a diversion from what would normally be expected related to the disposition effect. The reason for the selection of 2011-2013 was because the authors didn't want the results skewed by down markets. The S&P 500 over the 3 year trading period was positive. In addition, the data were subdivided into 6 separate trading periods representing the 6 separate classes that were involved in the trades. Every one of the 6 sub-periods had positive returns for the S&P 500. Therefore, the higher propensity to trade losers by the students had nothing to do with a down market as would have been experienced during the financial crisis of 2008.

Table 4. Annual returns during the financial crisis and economic expansion

Number of monthly observations = 21, 6/30/2007-2/28/2009			
	Financial crisis		
	SMIP returns	S&P 500	SMIP*
Annual mean	-34.80%	-39.38%	-33.71%
Annual standard deviation	20.65%	18.88%	20.65%
Number of observations = 57, 3/31/2009-11/31/2013			
	Expansion		
	SMIP returns	S&P 500	SMIP*
Annual mean	21.13%	20.09%	22.22%
Annual standard deviation	15.72%	14.47%	15.72%

Notes: SMIP = monthly rate of return on the student managed investment portfolio. S&P 500 = monthly rate of return on S&P from CRSP. SMIP* = monthly rate of return on the student managed investment portfolio without transaction costs.

The authors then subdivide the data to apply more empirical tests. Not only did the portfolio outperform the S&P over the entire 12 year period, it outperformed the S&P during the financial crisis and the economic recovery. In Table 4, during the financial crisis, the SMIP portfolio dropped 4.58% less than the S&P 500 and gained 1.04% more than the S&P 500 during the recent economic recovery. In addition, the SMIP program participated in a competition with 140 other SMIPs at the Global Asset Management Education Forum in March, 2014 and sponsored by Quinnipiac University and NASDAQ-OMX. The portfolios were classified by different styles and the SMIP portfolio was classified as a growth portfolio as determined by the selection committee. The Pace SMIP finished first in the growth category. The SMIP portfolio outperformed the S&P 500 by over 400 basis points for 2013. The SMIP portfolio has demonstrated strong financial performance in various business cycles and over long periods of time. The authors contend that some of the success of the portfolio is related to the behavioral aspect to how this fund is managed compared to other funds.

The authors want to test the portfolio risk of the SMIP fund by generating the beta coefficient using the CAPM, treating the SMIP portfolio excess return as the dependent variable and the S&P 500 excess return as the independent variable. The beta coefficient for the SMIP portfolio was .90 and statistically significant with a *p*-value of .01. Alpha was insignificant and the adjusted R^2 is equal .69. These results are presented in Table 5.

Table 5. Statistical results of the fund using the CAPM

	Coefficients	t-stat	P-value	Adjusted R^2	F-test
Alpha	0.002	1.03	0.31	0.69	323.19
S&P 500 − rf**	0.90	17.98	0.01		

Notes: ** *p* value statistically significant at .01. Dependent variable is SMIP − rf, the risk premium of the SMIP portfolio. Independent variable is S&P 500 − rf, the risk premium of the S&P 500 from CRSP. Number of observations = 143, January, 2002 to November, 2013.

The Fama-French model is then used to test a multiple factor approach to analyzing the SMIP portfolio returns. The results are provided in Table 6. As expected, β is equal to .92 and statistically significant with a *p*-value of .01 and is similar to the CAPM approach. Of interest, is the significance of the *h* coefficient related to the HML return. It has a negative coefficient of -.22 and is statistically significant with a *p*-value of .02. This implies that the SMIP portfolio is more closely categorized as a growth portfolio. This would be consistent with how the SMIP portfolio was classified as a growth portfolio by the Global Asset Management Education Forum when they finished first. Alpha was insignificant and the adjusted R^2 is .71. The s coefficient for SMB is also insignificant.

Table 6. Statistical results of the fund using the Fama-French model

	Coefficients	t-stat	P-value	Adjusted R^2	F-test
alpha	0.000	0.22	0.82	0.71	118.99
MKTRF**	0.92	17.56	0.01		
SMB	0.02	0.16	0.87		
HML*	-0.22	-2.40	0.02		

Notes: ** *p*-value statistically significant at .01. Dependent variable is SMIP − rf, the risk premium of the 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 the two growth portfolios. Number of observations = 143, January, 2002 to November, 2013.

Conclusion

The empirical results in the paper provide insights into the trading behavior of a student managed investment portfolio (SMIP). Over the 12 year period of the fund, there have been 24 different classes that have managed the portfolio. The SMIP fund outperformed the S&P 500 over the entire time period of the fund, as well as during the financial crisis and recent economic recovery. Since there were 24 different classes, the data and the empirical results suggest that much of the success of the fund is related to student turnover in the selection process. New classes are not committed to a particular portfolio that they inherited from a previous class. This helps to mitigate some of the issues related to behavioral finance, specifically anchoring, over confidence, and the disposition effect. The results show how a fund management is structured can have significant effects on the overall performance of the fund.

Future areas of research would be to study the behavior of every security transaction by the students, particularly the performance of the securities that were sold from the fund compared to

ones that remained in the student fund. This would provide interesting results on how SMIP students make decisions to purchase specific securities. It would also be interesting to compare the returns of the SMIP to a student equity club that does not change student investors every 4 months.

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