



A new quantitative approach for the management of a student-managed investment fund

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Abstract

Purpose – The purpose of this study is to develop an investment strategy designed both to enable student-managed investment fund (SMIF) students to more quickly build out their portfolio at the beginning of the academic year and to give them some exposure to quantitative approaches to investment management.

Design/methodology/approach – This study uses data and software that would be readily available to typical SMIF students to develop both an asset-allocation model and a security-selection model that can be described as a long-flat (or synthetic protective put) equity strategy with a momentum-based style-rotation overlay.

Findings – Over the time period since the requisite style-based ETFs began trading, the composite strategy would have outperformed the S&P 500 index during both market downturns and market upturns, providing better than market returns at lower than market levels of risk.

Originality/value – The key innovation of this paper is the development of a quantitative investment strategy tailored specifically to meet both the educational and the portfolio management needs of SMIF students; a secondary innovation is the demonstration of the efficacy of a style-rotation strategy, in contrast to the more typical sector/industry-rotation type of strategy.

Keywords Student-managed investment fund, Quantitative investment management, Long-flat strategy, Style-rotation strategy, Students, Investment funds, Quantitative methods

Paper type Research paper

1. Introduction

The Student-Managed Investment Fund (SMIF) Program at the California State University, Long Beach (CSULB, also known as Long Beach State) is an academic-year-long honors-type program that was established in 1995 with an initial funding of \$50,000 and with subsequent additional funding that has brought the portfolio to a current size of over \$100,000. Based on a combination of grades, work and internship experience, career goals, and demonstrated ability and work ethic through a series of summer “boot-camp” sessions, 12-16 students are selected at the end of each summer to participate in the program for the full upcoming academic year. The SMIF program was the first program of its kind within the CSU system, and this fact, together with Long Beach State’s location (at the southern corner of L.A. County, adjacent to the border with Orange County, and established to meet the needs of students from both counties) led to some unique characteristics for the program.

Among the major investment-related employers in our region are a number of firms that focus primarily on fixed-income portfolio management, including PIMCO, in Orange County, and Payden & Rygel and Bradford & Marzec, in L.A. County. Thus, in order to give our students some exposure to the fixed-income markets and help them



become more marketable to these potential employers, our SMIF portfolio was required to have a target allocation to fixed income of between 25 and 50 percent of the portfolio. This is major difference between our program and most other student-managed portfolios, which tend to be focused exclusively on equities. This requires our students to spend additional time and effort on their economic analysis and the determination of their target asset allocation.

(Another local employer is Capital Group, which manages the American funds and is well known for its team-based approach to the management of its funds. The SMIF classes have also always been organized into a team structure, and all of the work the students do in the SMIF program is done as part of these teams.)

In addition to a somewhat conservative asset-allocation requirement compared to most student-managed funds, the fact that the CSULB SMIF program was the first such program in the CSU system led to an investment policy that was fairly conservative and risk averse in other areas, as well. For example, each purchase of a security for the portfolio was required to be accompanied by a 10 percent stop-loss order for that security. (Note: at the beginning of the current academic year, the allowable stop loss was widened to 15 percent.) This not only places a direct limit on the risk exposure of the portfolio, but it also encourages greater conservatism among the students during the initial stock-selection process, as they focus on stocks with lower levels of daily volatility that are thus less likely to be stopped out in the first place.

A more direct, fundamental means to control risk in the portfolio has been a requirement that the portfolio be liquidated at the end of the academic year and remain in cash rather than being invested and at risk during the summer months. In addition to controlling the risk exposure faced by the university on this portfolio, this also helps to ensure that the portfolio always remains a student-managed rather than becoming a faculty-managed portfolio during the summer. This also allowed each new incoming class to develop its own unique portfolio strategy. Unfortunately, however, knowing that whatever investments they make will have to show a gain within the span of a few short months can encourage a short term, speculative attitude that is at odds with the long-term perspective encouraged in the other investments-related classes the students are required to complete.

To counterbalance the possibility of such a speculative tendency and instead instill some analytical discipline and a bit more long-range thinking into the students' security-selection process, they have always been required to follow the three-stage top-down approach to security analysis and selection (see, e.g. Reilly and Brown, 2009, for a description of this process and a brief review of some of the empirical studies that support the use of such an approach). However, as simple and basic as this approach can seem in concept, for students who have never actually created any economic forecasts of their own or even spent much time conducting more than a cursory overview of any professional forecasts, it can be an incredibly time-consuming process, especially when compounded by the need to reach a consensus about the forecast among the 12 + honors students who are admitted into the program each year!

A consequence of this approach, therefore, are additional stretches of time at the beginning of the academic year (following a summer during which the portfolio has been liquidated and is sitting in cash) during which the portfolio continues to remain in cash rather than being immediately reinvested. Moreover, this problem was compounded by the fact that, until this year, the investment guidelines did not allow the students to invest

in ETFs or mutual funds, so, even after they had determined their asset allocation, it was not feasible to act upon this decision until, for the fixed-income allocation, they had completed their analysis of specific individual bonds they were considering and, subsequently, for the equity portion, they had completed both their sector and industry analysis and their more in-depth analysis of the specific candidate equities toward which this process had directed them. As a result, even after the new class of SMIF honors students had been selected to carry the baton of managing the portfolio and the new academic year had started, the portfolio frequently remained in cash for an additional month or two (and sometimes even longer) beyond the start of the fall semester before the first securities, typically bonds for the fixed-income allocation, were selected for inclusion and actually purchased for the portfolio. This would then be followed by additional sector and industry analysis within the equity markets before the first equities could subsequently be selected for inclusion in the portfolio.

Such a delay in getting the portfolio invested could obviously have a serious impact on portfolio performance during periods of rising markets, and the magnitude of this impact would be compounded with the two other portfolios that the SMIF students are now also responsible for managing, the CFA Society of Orange County Foundation (CFAOCF) portfolio and the Forty-Niners Shops portfolio, both of which will be described below. To help alleviate this problem, the investment guidelines for the SMIF portfolio were revised during Spring 2010 to allow for investment in ETFs (at a level beyond the 5 percent limit established for individual bonds or equities), the requirement to liquidate the portfolio at the end of the academic year has been eliminated, and, partially in response to above-average levels of day-to-day market volatility in recent years, the stop-loss requirement has been widened to 15 percent from the previously required 10 percent. And, approaching this problem from another direction, we have also worked on developing a new quantitative approach, the heart of this paper, to be described in more detail below, to assist the students in getting up to speed and operational very quickly in conducting their analysis and starting to make their investment decisions.

2. The CFAOCF portfolio

In 2005, the students of the SMIF program started to manage a second portfolio, funded through (what is now known as) the CFAOCF (www.cfaocf.org/ for additional information). This foundation was established, using seed money from the Association for Investment Management Research (since renamed the CFA Institute), with the goal of providing a real-world investment-management experience to student teams from local universities by making real-dollar portfolios available for them to manage but requiring them to go through a request-for-proposal (RFP) process in order to obtain the right to manage those funds. Thus, for the past few years, the CSULB SMIF students have competed with student teams from CSU, Fullerton, and University of California, Irvine, in an annual RFP competition sponsored each fall by the CFAOCF. Each team must submit a written response to the RFP (see www.cfaocf.org/Documents/CFAOCF%20RFP%20-%202010.doc for the most recent version of the RFP form) and make an oral presentation to the foundation's Investment Policy Committee (IPC).

The winner of this competition, which, to date, has always been CSULB, is awarded the right to manage the first-place portfolio of approximately \$100,000 for the subsequent calendar year, while the second-place team is awarded a portfolio of approximately \$40,000 and the third-place team a portfolio of approximately \$25,000.

The following fall, the competition is held again, and the portfolio management rights are reassigned for the next calendar year based on the results of that competition. During the year, the student teams must provide quarterly reports on their portfolio activities to the IPC and, in addition, subsequent to the first and third quarters (during the spring and fall semesters, respectively), they must make formal presentations to the IPC (and in front of the student management teams from the other universities), as well. This provides the students with real-world experience in making client presentations while also allowing them to get to know investment students from other area universities. A number of the alumni from this program have been able to use this experience to obtain positions working in the RFP departments of various local employers, including PIMCO and Western Asset Management.

Similar to the SMIF portfolio's investment guidelines, the investment policy statement (IPS) that governs the management of the CFAOCF portfolios allows for investments in both equity and fixed-income securities, and the performance benchmark for the portfolios is a composite one comprising 30 percent of the Barclay's Aggregate index and 70 percent of the S&P 500 index. However, the IPS provides a bit more flexibility to the student teams in choosing investments to allow for differences in team economic perspectives, investment philosophies, and areas of expertise. For example, teams are free to choose an asset allocation of 100 percent equity, or 100 percent fixed income, or any combination in between.

3. The Forty-Niner Shops portfolio

The third and newest portfolio that the CSULB SMIF students manage is an approximately \$100,000 portfolio that was provided by and is managed on behalf of Forty-Niner Shops, Inc. (www.csulb.edu/aux/49ershops/corporate/), which is the non-profit corporation that manages CSULB's bookstores and food concessions. Traditionally, the Forty-Niner Shops had maintained a very conservative investment policy focused only on fixed-income investments. In 2008, however, after a long period of deliberation, the board of directors decided to switch to a higher risk but potentially higher return strategy and shifted the asset allocation to approximately 70 percent equity and only 30 percent fixed income. Unfortunately, soon after this shift was made, the "market meltdown" of 2008 struck and a significant portion of the portfolio's value quickly vanished.

As a result of this experience, the members of the board, most of whom are university-related appointees and one of whom is a CSULB Finance alumnus who had some familiarity with our SMIF program, its accomplishments, and its degree of conservatism, invited a group of the SMIF students to give a presentation to the board covering an analysis of the Forty-Niner Shops' existing portfolio, the students' current outlook for the markets at the time, and a brief overview of how they would invest the Forty-Niner Shops portfolio if it were up to them. As a result of this meeting, the board decided to carve out a small portion of their portfolio for the students of the SMIF program to manage, while the bulk of their portfolio would remain under professional management at Morgan Stanley Smith Barney. With this move, the board was able to fulfill its mission of furthering the educational opportunities of CSULB's students while also allowing the SMIF students to serve as an educational resource for the board about investments and the financial markets, with a key question being, is there any approach the board could take that would facilitate a bit more aggressive an investment policy

than it had followed prior to 2008 while avoiding a repetition of the portfolio losses similar to those witnessed during 2008?

4. Current challenges

In trying to develop a management approach for this new, third portfolio to be managed on behalf of the Forty-Niner Shops that could meet the challenge posed by their board of directors, there were a number of broader goals that we also wanted to keep in mind. First, for each year's incoming students, we wanted them to:

- (1) gain some exposure to quantitative approaches to portfolio management instead of just the more traditional and more qualitative top-down approach the SMIF student participants have employed almost exclusively in the past;
- (2) be able to get up to speed fairly quickly (i.e. in a few weeks at most, rather than a few months) in terms of both understanding this quantitative approach and being able to actually apply it to the management of (at least a portion of) their Forty-Niner Shops portfolio; and also
- (3) be able to use the information generated from this approach to make better-informed decisions for the two other portfolios for which the SMIF students are responsible and, along the way, to provide a more thorough, better informed, and more strongly supported response for the CFAOCF's annual RFP competition.

Second, since the students will be managing only part of the Forty-Niner Shops' overall investment portfolio alongside of professional portfolio managers, the approach must also offer the possibility of superior returns compared to these professional managers. Ultimately, these goals, together with some of the constraints imposed by the investment policy guidelines to which the SMIF students are subject, led us to develop an approach that can best be described as a long-flat equity strategy with a momentum-based style-rotation overlay.

5. Search for a quantitative strategy

In developing a quantitative approach for managing the portfolio, there were a number of requirements that the approach needed to satisfy. First, the data required for conducting the analysis had to be readily obtainable from a source available to the students, such as Yahoo!Finance (www.finance.yahoo.com). It also had to be possible to conduct the analysis on a readily available software package, such as Microsoft Excel. Next, it had to be possible to implement the strategy using ETFs, and the analysis had to be relevant at the ETF level (rather than being company specific or generic to the entire market). Finally, of course, the strategy had to be simple enough for the students to be able to learn it and start conducting the analysis for it fairly quickly, but it had to entail sufficient complexity to provide both a good continuing learning experience for the students and to generate relevant information that could be used to make better investment decisions for the other two portfolios.

The most basic approach for such a strategy would involve two levels of analysis. The first level would determine the asset allocation decision, or, more specifically, the decision of whether to invest in equities or not. Assuming the answer to this first level is in the affirmative, the second level of analysis would determine where in the equity market to invest.

5.1 *The asset allocation decision and the long-flat strategy*

The most basic and most important component of the quantitative strategy is the first level, which determines the asset allocation. This is the level that provides the answer to the question posed by the Forty-Niner Shops' board of directors: how can we attempt to avoid this type of situation in the future?

The easiest way (though not an entirely costless way) to avoid losses such as those seen in 2008 is by following a "long-flat" strategy rather than a "buy-and-hold" strategy. The term "long flat" comes from the world of foreign-exchange trading, for which a "flat" position is one that is neither "long" nor "short" a given currency but is instead neutral with respect to that currency. Similarly, a "flat" equity position would be one in which the investor is neither long nor short equities but would instead be neutral with respect to the equity markets (as would be the case, for example, with a zero-beta portfolio). A "long-flat" strategy, in turn, is one in which the investor can be either long (with positive exposure to) or flat (neutral with respect to) the equity markets.

Thus, a "long-flat" strategy can be viewed as an "in-or-out" strategy for which one trigger would lead to getting into the market and going long on equities, and another trigger would lead to exiting the market, liquidating the equity holdings, and going flat, by shifting the funds into either fixed-income securities or money-market funds. The goal of a long-flat strategy is to be able to ride with and make profits from the up-trends in the market and to avoid the draw downs during the downtrends. Consequently, the trigger for such a strategy would generally be based on a trend-following system, such as a moving-average system. As Reilly and Brown (2009) note, a 200-day moving average is a commonly used metric for developing longer term trading systems. Moreover, an article that appeared in Barron's near the time we started working on developing this system also suggested using the 200-day moving average as part of a strategy that could have avoided the market meltdown.

Unfortunately, a moving-average system, as with most trend-following systems, entails the possibility of getting "whipsawed" with a series of back-to-back buy and sell trades. This possibility can be reduced through the use of, for example, a dual moving-average crossover system (for which a "buy" is signaled when the shorter moving average crosses up through the longer moving average, and a "sell" is signaled when the shorter moving average crosses back down through the longer moving average); this is an improvement over the single moving-average strategy, but it can still allow for relatively short-term signal reversals. A better alternative is the use of a system employing a single moving average employing upper and lower bands around that average, for which a "buy" is signaled when the price crosses up through the upper band that is above the moving average, and a "sell" is signaled when the price crosses down through the lower band that is below the moving average. Based partially on the example in the Barron's article, we chose to use the latter type of system, with ± 5 percent bands, since an unprofitable whipsaw trade in this case, if one did occur, would result in approximately the same magnitude of loss as our required 10 percent (at that time) stop-loss requirement. Thus, if the moving-average system gave us a buy signal and we purchased the security, if the security we purchased then immediately fell back by 10 percent, that would push us down to the lower band 5 percent below the moving average, and the moving-average system would thus trigger a sell order. But, at that point, the stop-loss order that was required upon first entering into the position would be triggered, and so the position would be stopped out, anyway.

One reasonable question to ask is, what is the justification for using 200 days (or approximately 9.6 months' worth of trading days) for the moving average? The very fact that 200-day moving-average strategies are widely followed and deployed would, by itself, enhance the effectiveness of following such an approach, but this observation still begs the question of what would have led the 200-day moving average to become widely used in the first place. So, the key question becomes, what is the information contained in a 200-day moving average that would enable it to serve as an effective signal, compared to the current price, for entering or exiting the market? There is no definitive answer to this question, but there are a number of possibilities.

One possibility is suggested by some comments that Nobel-Prize-winning economist Harry Markowitz made at a presentation to the CFA Society of Orange County on September 17, 2009. During the question-and-answer session following his speech, he noted the fact that security analysts have a poor record of being able to predict corporate earnings for the firms within the S&P 500 with any degree of accuracy, yet the S&P 500 is still able to serve as a leading indicator for GDP. His explanation for this was not that this is a reflection of the information processing efficiency of the market in aggregate but rather due to the mechanics of the financial markets *vis-à-vis* the rest of the economy. The main influence on the economy over the short to intermediate term is the Federal Reserve, but the Federal Reserve's actions always affect the financial markets first on their way to impacting the rest of the economy, so, as a result, their movements serve as a leading indicator for the rest of the economy. But, changes in the direction of Federal Reserve policy have an impact only after a long and variable period of time, ranging from approximately six months to two years or longer (with the impact of expansionary policies tending to be at the longer end), or, on average, about one-and-a-quarter years. Subtracting out the six months on average by which the equity markets tend to precede the rest of the economy leaves a remaining lag of approximately three quarters of a year, or nine months, that would typically be required before one could obtain the weakest confirmation that a new trend is starting, and adding two or three more weeks for a stronger confirmation would yield the 200 trading days to whose moving average the current price is compared. Another, related, explanation is that the strongest momentum effects (which have also been linked to the effects of Federal Reserve actions) tend to manifest themselves after a period of six months to one year, so a 200-day period would fall right in the middle of this time frame for establishing momentum within the market.

5.2 The sector/style allocation decision and the sector/style-rotation overlay

The next component of the quantitative strategy is the second level, which determines, depending on how it is applied, either the sector or the style allocation. This is especially important when used in conjunction with the 200-day moving average ± 5 percent trading rule described above, because any trend-following strategy, such as a moving-average strategy, will always miss the market tops and bottoms and will, as a consequence, always underperform a buy-and-hold strategy from the most recent market bottom. Thus, for an ideal strategy, some way would need to be developed to allow the system, once it has finally gotten back into the market, to gain back in some other way what it missed out on by getting back into the market only after the bottom had already been passed and the market had moved on to higher levels. In addition, another important consideration, always keeping the educational purpose of the SMIF program explicitly in mind, is that, given the simplicity of the moving-average strategy, how basic

of an approach it is, and how infrequently it provides a trading signal (approximately once every two years over the time period of our study, from December 31, 2002 to June 2, 2010, and, approximately, only once every four years over the 20-year period from 1990 through 2009), if used only by itself it will provide relatively limited ongoing educational value to the students once the basics (in terms of both techniques and possible justifications for and limitations to its effectiveness) of the approach have been taught. Thus, for both of these reasons, an additional overlay strategy is needed.

A natural type of overlay strategy to use in conjunction with a moving-average strategy is a momentum-based strategy (see Chan *et al.*, 1999; Rouwenhorst, 1998, for additional background research on momentum strategies). Momentum-based approaches do not work consistently – as one investment consultant noted, momentum-based strategies work, very well, for a while, and then they stop working for a while; thus, the key question for the managers following momentum-based strategies, then, is what they do during the time periods when momentum is not working. But, the dynamics behind momentum effects have been linked to expansionary Federal Reserve policy, which is also one of the justifications for the effectiveness of the primary moving-average strategy. Thus, the time periods during which momentum-based approaches are more effective would likely coincide with the time-periods during which the moving-average strategy suggests being in the market. And, conversely, during the time periods for which momentum-based strategies are least likely to be effective, the underlying moving-average strategy would signal to exit the (equities) markets altogether (and to invest instead in money-market funds or other fixed-income investments). Thus, conceptually, a momentum-based rotation strategy is a natural type of strategy to overlay on the moving-average strategy. In addition, from an educational perspective, doing the analysis for and implementing such an overlay strategy would provide an additional, deeper learning experience for the SMIF students, and the specific trades that are suggested by the momentum-based rotation overlay strategy would provide useful information to the students for, e.g. developing their responses and providing their justifications for a number of the questions asked in the CFAOCF RFP.

There are two key decisions that must be made in developing a momentum-based strategy. First, how is “momentum” measured? And second, for what categories of equities will this measure of momentum be assessed? The answers to both of these questions went through a number of iterations before the final version of the strategy was developed. First, in terms of measuring momentum, various possibilities were examined, including a variety of composite return rankings that combined assessments of the levels of returns over a number of overlapping time frames ranging from the most recent full year (to determine whether a persistent strength of returns has been achieved) down to the most recent week (to assess whether that momentum continues to persist into the present), as well as single measures of momentum, such as the cumulative returns over the most recent six months. Ultimately, the simplest measure also proved to be the most effective, and the measure of momentum chosen was, simply, the level of cumulative returns over the most recent six months.

With regard to the category of equities to which these measures of momentum were applied, the initial choice, mimicking the second stage in the traditional three-stage top-down approach to security analysis and selection, was the family of SPDR sector ETFs. The momentum effects did not appear to be especially strong for these ETFs, however, and the specific momentum rankings of the various sector ETFs could often

change dramatically from one month to the next. So, as an alternative, because it was hypothesized that style portfolios would exhibit more persistence in returns than would sector portfolios, and, given the greater liquidity and wider ultimate coverage of the security universe that they provided, the iShares family of Russell style index ETFs (Figure 1) was chosen for analysis.

The strong degree of persistence of the momentum-based rankings for these ETFs is clearly demonstrated by their rankings for the first half of the 2010 calendar year, during which, for example, IYR, the iShares Russell Mid-Cap (Blend) ETF, maintained its top ranking throughout, can clearly be seen in Table I.

	Value	Blend	Growth
Large	IWD	IWB	IWF
Mid	IWS	IWR	IWP
Small	IWN	IWM	IWO

Figure 1.
iShares Russell style index
ETFs used for analysis

	January 4, 2010	February 1, 2010	March 1, 2010	April 1, 2010	May 3, 2010	June 1, 2010
IYR	IYR	IYR	IYR	IYR	IYR	IYR
IWS	IWS	IWP	IWP	IWS	IWN	IWN
IWR	IWR	IWR	IWR	IWP	IWM	IWM
IWN	IWP	IWS	IWR	IWR	IWO	IWO
IWP	IWD	IWO	IWN	IWN	IWS	IWS
IWM	IWB	IWM	IWM	IWM	IWR	IWR
IWD	IWF	IWN	IWO	IWO	IWP	IWP
IWB	SPY	IWF	IWF	IWF	IWD	CASH
SPY	IWN	IWB	IWB	IWB	IWB	IWD
IWF	IWM	SPY	SPY	IWF	IWF	IWB
EFA	IWO	IWD	IWD	IWD	SPY	IWF
IWO	EFA	EFA	EFA	EFA	EFA	SPY
CASH	CASH	CASH	CASH	CASH	CASH	EFA

Table I.
iShares Russell style
index ETF
momentum-based
rankings, 2010

Notes: ETFs appearing at the top of the column have the highest momentum-based rankings; ETFs at the bottom had the lowest momentum-based rankings; CASH is an index value based on the performance of the VMMXX money-market fund

6. The long-flat strategy with momentum-based style-rotation overlay

The end result of our development and analysis is a quantitative strategy that can best be described as a long-flat strategy with a momentum-based style-rotation overlay. Thus, the strategy is composed of two components – the underlying moving-average-based long-flat strategy that determines whether or not to be invested in equities in the first place, and the momentum-based style-rotation overlay strategy, which determines which equities, or, more specifically, which style ETFs, to purchase once the underlying long-flat strategy gives its buy signal. The specific rules and guidelines for the strategy are as follows:

- (1) If the S&P 500 crosses below the 5 percent band below its 200-day moving average, all positions are liquidated the following day (at the closing price for that day), and the proceeds are invested in either a money-market fund (the alternative assumed for the empirical results given below) or a fixed-income ETF.
- (2) If the S&P 500 crosses above the 5 percent band above its 200-day moving average, this generates a buy signal, and the five style ETFs with the strongest measured momentum, in terms of either:
 - cumulative returns since the most recent market bottom or;
 - cumulative returns over the previous six months, whichever period is shorter, are purchased in equal amounts for the portfolio (20 percent of the portfolio in each)) at the following trading day's closing prices:

If SPY is in the rankings among the top five, then only the style ETFs that are ranked above SPY will be put into the portfolio (at 20 percent for each), and the rest of the portfolio will be allocated to SPY.
- (3) At the beginning of each month (so long as the S&P 500 remains above the 5 percent band below its 200-day moving average), the momentum rankings will be recalculated, the new top five style ETFs will be determined, and the style ETF holdings will be rebalanced.
- (4) This process continues until the moving average system gives a sell signal to liquidate the holdings and move back into money-market funds.

Figure 2 shows the cumulative portfolio returns from December 31, 2002 through June 2, 2010 (note that 2003 was the first full calendar year during which all of the style ETFs were available for investment and could thus be used for this type of strategy) for the simple SPY buy-and-hold strategy versus the moving-average-based long-flat strategy by itself, implemented using the SPY ETF, versus the full long-flat strategy with momentum-based style-rotation overlay. As can readily be seen in this figure, the long-flat strategy eventually outperformed the buy-and-hold strategy, and the full long-flat strategy with momentum-based style-rotation strategy outperformed both of the other approaches.

Table II provides the performance data and additional details for comparing the three alternatives. Over the sample period, a simple buy-and-hold approach using the SPY would have yielded a return of 41.7 percent over the period from December 31, 2002 through June 2, 2010. Following just the moving-average-based long-flat strategy implemented via SPY would have resulted in being out of the market and in money-market funds from December 31, 2002 through May 3, 2003, and again from November 27, 2007 through July 16, 2009, which covers most of the market meltdown of 2008. Primarily, as a result of missing the substantial losses during that year, the long-flat

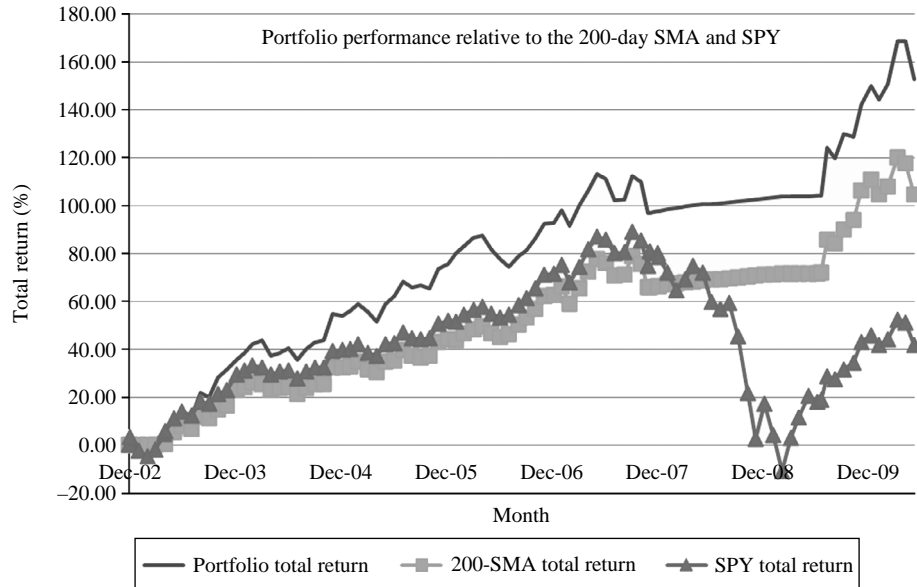


Figure 2.
Cumulative
portfolio returns

Note: Buy-and-hold vs long-flat vs long-flat with style-rotation overlay, December 31, 2002-June 2, 2010

Long-flat strategy	Bottom	Pure 9 styles	
Summary	Style rotation (%)	200-day SMA (%)	SPY (%)
Cash period 1 (January 1, 2003-May 3, 2003)	0.36	0.36	5.87
Investment period 1 (May 3, 2003-November 27, 2007)	96.09	65.09	65.09
Cash period 2 (November 27, 2007-July 16, 2009)	3.66	3.66	-31.90
Investment period 2 (July 16, 2009-June 2, 2010)	23.93	19.06	19.06
	152.83	104.48	41.70

Table II.
Summary of
performance results

Note: Buy-and-hold vs long-flat vs long-flat with style-rotation overlay, January 1, 2003-June 2, 2010

strategy is able to generate a return of 104.48 percent, well over twice the return from the buy-and-hold strategy. Finally, the long-flat strategy with the style-rotation overlay not only misses the substantial losses by being out of the market during the market meltdown, but it also outperforms the SPY during both of the periods in which it is in the markets, generating a total return of 152.83 percent (well over three times the cumulative return of the buy-and-hold approach). Thus, in addition to providing a good educational tool for the SMIF students, this strategy also appears to be able to meet the goal of providing the possibility of outperforming the professional portfolio managers against whom the SMIF students compete in managing the Forty-Niner Shops portfolio.

7. Conclusions and future directions

As the results described above demonstrate, the moving-average-based long-flat strategy with a momentum-based style-rotation overlay shows clear promise for both

enhancing the educational experience of the SMIF students and enhancing the performance of the portfolios that they manage. In terms of performance, the long-flat component of this quantitative approach takes the portfolio out of the equity markets during steep declines and helps prevent them from suffering some of the worst of the losses that the markets can bring, while the momentum-based style-rotation overlay strategy enables the portfolio, once it returns to the equity markets, to outperform a simple buy-and-hold and make up for the ground the portfolio loses by always missing the market bottom.

But, just as education is a never-ending process, so the work on this quantitative approach to portfolio management promises to undergo continual development and evolution as well, especially as more ETFs are created and longer trading histories are generated for them. A key direction for additional research is in the area of international investments, an area that will be increasingly important as the students progress through their careers, but also the area in which the students' background and exposure is probably the weakest. Initial analysis in this direction incorporating both EFA (the iShares MSCI EAFE Index Fund) and IYR (the iShares Dow-Jones US Real Estate Index Fund) into the analysis shows promise for further enhancement of returns, yielding a composite return of 170.64 percent, compared to the 152.83 percent return when only the nine style ETFs are used in the momentum-based style-rotation overlay, and more than four times the cumulative return of the SPY buy-and-hold approach. Presumably, international (non-US) style-based index ETFs would provide for even stronger momentum-based results.

In the meantime, the key goal for this project is to continue updating the results and present the current model to each year's incoming class of SMIF students, and hopefully spur them on to carry the project forward and make it their own!

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