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Managing a Student-Managed Fund: *The University of San Francisco Experience*

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A student-managed fund (SMF) is a unique opportunity for students to learn the intricacies of managing and working with a fund. The opportunity for students to manage real money dates back to 1952 when Gannon University received a donation from a local businessman to do just that (Lawrence [1994]). Over the past 65 years, many different student-managed funds have been developed and managed in a variety of ways; Lawrence [1990, 1994, 2008] performed surveys and studies tracking the growth of these funds. In Appendix A (U.S SMFs) and Appendix B (international SMFs), we present lists of student-managed funds across the United States and abroad.[1] The largest SMF in the United States is at the University of Wisconsin (Madison) with around $50 million under management. Among the SMFs found, the State University of New York College was the smallest with $10,000. The University of San Francisco's SMF ranks about 85th with $1.18 million. One of the fastest growing funds, in terms of new inflows, is the University of Louisville's, which managed $50,000 in 2007 and now manages around $9.471 million. We weren't able to obtain as much data from international schools. One of the largest funds is managed at Simon Fraser University with 16.9 million Canadian dollars.

Block and French [1991] discussed the benefits of having a SMF complementing classroom curriculum and laid out a thorough outline of the organizational structure of a typical fund. Bhattacharya and McClung [1994] wrote about an alternative way to raise capital for an SMF using advantageous borrowing rates. Neely and Cooley [2004] wrote about the benefits managing real money has over computer simulations. The benefits to students at the University of San Francisco (USF) are immeasurable. First, students gain the opportunity to apply basic investment concepts by actually investing real money. Second, students must develop much more thoroughly and accurately their financial skills, data retrieval skills, and data analysis skills to make stock recommendations. Third, students learn the importance of teamwork—groups of teams analyze stocks and other teams perform routine tasks in the fund. Fourth, students enhance their presentation and negotiation skills by having to present and being judged by their peers regularly. Overall, these skills go above and beyond what students find in a typical classroom.

This article will go through the details of how the USF's student-managed fund was founded and a background on the history of the fund, how the fund is organized, how it adds to the education of business students, the trading strategies that the fund has undertaken, and some past and persisting obstacles.

BACKGROUND OF USF'S SMF

In 2012, Professor Chincarini came to USF as an associate professor in finance. He had previously helped start a student-managed fund at another school and found it to be a very important experience for students. With the help of the finance department of USF and a forward-looking dean, Professor Chincarini wrote a proposal for a student-managed fund for graduate students at USF.[2] The proposal for a new course entitled "Student-Managed Fund" also needed seed money. He approached the Business and Finance department of USF, and they agreed to give the SMF $1 million of the University's operating and cash investments.[3] In order to create the ideal SMF, Professor Chincarini relied on his past experience and also reviewed different SMF programs around the country.[4] As with most bureaucracies, the initial proposal for the "ideal" student-managed fund was not accepted, and Professor Chincarini had to compromise on various elements to get the course approved.[5] The course was launched in the Fall of 2014 for MBA students. The SMF was divided into two separate courses, SMF I and SMF II. Each course would be a half-semester course worth 2 units. The initial thought was that MBA students would have to take an investments course as a prerequisite and would have to apply to be accepted with the notion that only the best students could take the SMF course. Soon, we realized that we did not have enough MBA students ready and willing to pursue the extra costs to apply to and participate in the course. Thus, we dropped the strict application standards and allowed Master in Financial Analysis (MSFA) students and undergraduate business students to take the course.[6]

STRUCTURE AND MANAGEMENT

Investment Goals and Strategies

The investment goal for the fund is twofold. First, to enrich the education of business students through a "hands-on" approach to investing. The benefits of student-managed funds have been outlined by Block and French [1991], Kahl [1997], and Phillips and Volker [2014]. The second goal is to achieve a greater return than the benchmark. For the first three years of the fund, our benchmark was 25% weighted in cash and 75% weighted in the S&P 500 Index.[7] Starting in November of 2017, the SMF switched to an all-equity benchmark and became fully invested in the equity markets.

The active stock selections of the SMF consist of student selections and a quantitative investing model.

Investment Constraints

As stated previously, the initial seed money came from USF's working capital. This funding came with the constraint that it must abide by the bylaws set out by the University's Board of Trustees. One of these bylaws restricts the ability to borrow money, resulting in the fund not being able to operate with a margin account. This limits the fund to only being able to take long positions in equities and exchange-traded funds (ETFs).[8]

Fund Management

The SMF portfolio is selected through student picks, as well as an underlying quantitative model. The reason for using both a quantitative model and student picks is twofold. First, during the short period in which classes are held, typically only a few stocks are selected by the students. This is in part due to the time it takes students to find a prospective company and research it thoroughly enough to present it. Additionally, many stock picks are rejected by the class during voting, further reducing the number of successful student stock picks. Thus, having another source of selecting many stocks provides diversification to the fund. Second, the quantitative model takes advantage of the benefits of quantitative investing (Chincarini and Kim [2006]). It also allows students to learn the benefits of analyzing stocks using objective measures, as well as learning about stock screening, and relative valuation.

Thus, the quantitative model generates the core portfolio that is neutral with respect to the beta and the sectors of the S&P 500. The students then add their selections on top of that core portfolio. In the following sections, we discuss the core quant portfolio and student selection process in more detail.

The Quant Model

The quant model is built upon principles in *Quantitative Equity Portfolio Management* (Chincarini and Kim [2006]). A series of factors have been determined to influence future stock returns. These factors are a combination of fundamental factors (e.g., the value factor as represented by the book-to-price ratio of each stock)

and other factors. First, we construct our factors so that a higher value of the variable represents a better attribute for the particular company. Thus, if we think that value stocks (low price-to-book ratio, or P/B) will outperform growth stocks (high P/B), then we use B/P as our factor, because a higher value is better. We then take all of our raw factors and compute a Z-score using the standard formula:[9]

$$z_{it} = \left(\frac{f_i - \overline{f}_t}{\sigma_{f_t}} \right) \qquad (1)$$

where f_i is the factor value for stock i, $\overline{f}_t$ is cross-sectional mean across stocks at time t, and σ_{ft} is the cross-sectional standard deviation at time t.

All of the Z-scores for each factor are then combined into an equally weighted aggregate Z-score as follows:

$$\overline{z}_{it} = \frac{1}{K}(z_{f_1} + z_{f_2} + z_{f_3} + \cdots + z_{f_k}) \qquad (2)$$

where f_1 represents factor 1, f_2 represents factor 2, and so on, for all k factors used in the model.

Unfortunately, real financial data are subject to both data error and extreme data points. Given the limited time of our students, we cannot examine every outlier to determine whether it is legitimate extreme data or faulty data. Thus, we remove outliers from each individual factor Z-score using the interquartile range procedure. That is, we compute the third quartile entry of every factor (Q3) and the first quartile entry of every factor (Q1). Then we compute the interquartile range (IQR) as Q3 − Q1. We then compute an upper and lower bound for the factor as

$$UB = Q3 + 3IQR \qquad (3)$$

$$LB = Q1 - 3IQR \qquad (4)$$

We define all stocks with factor values above the upper bound and below the lower bound to be outliers.[10] For these, we set their values to missing and compute the Z-scores for the remaining stocks. For the outlier stocks, we fix the Z-scores at the maximum and minimum of the non-outlier stocks' Z-scores.[11]

Every month, we update our raw data sheet for all stocks traded in the United States. The screening round is initially conducted to narrow down the massive investment universe. The initial investment universe is selected by choosing the top 5,000 stocks by market capitalization that are U.S. domiciled and represent the primary common equity. The stocks' fundamental information is downloaded from Bloomberg. The data are then cleaned for missing entries and other minor issues. This data sheet is loaded into MATLAB, and a proprietary program is used to construct the quant model and stock rankings.

Ideally, we would like to use a risk model to select our final quantitative portfolio. Unfortunately, ren due to limited resources at the University of San Francisco, we do not have this luxury.[12] Thus, we perform a very simple optimization to choose 100 stocks for our quantitative allocation. The optimization chooses the best 100 stocks according to our quantitative model while achieving an average beta close to 1, sector neutrality with respect to the S&P 500, weights as close to equal weighting as possible, and the elimination of any stocks with low trading volume.

Student Selections

Students in the course make presentations on stocks that they would like to buy or remove from the existing portfolio. After a stock is presented, the entire class votes to accept or reject the recommendation. A successful vote requires a two-thirds majority. A student's presentation can be a single stock, a view on a sector, or an idea regarding the market as a whole. With the advancement of ETFs, students can pitch an innumerable amount of ideas. Most ideas begin through utilization of stock-screening tools, news stories, or their own experience with using the company's products and services in everyday life. Once a student has done the appropriate research and deduced a logical buy or sell opinion, the student must present their findings. An effective presentation begins with a short pitch on what their view is, the main reason to buy or sell, and why a stock is mispriced in the marketplace. Successful pitches include the basics of the business, how the student came across their idea, and a visual representation of their company. Typically, convincing valuations do not get caught up in every number and detail, but rather some of the best analyses are based on a good idea with simple computations. The strongest pitches are when students read quarterly and annual reports, use and compare the company's products, and attempt to chat with the company directly.

Elements of a Stock Presentation

Element	Description
1. Executive Summary	This page or discussion should include the company name and ticker, what the student's recommendation is (Buy or Sell), very briefly why the student believes the recommendation (what's the core reason), and finally why is the market missing this (i.e., why does the price not reflect it).
2. Origin of Idea	Describes how the student came about this idea.
3. Story of Company	Describes the company and what they do. Describes to the class a bit of the history of the company. The student should focus on items in their history and the current status of the company that will intrigue the audience and eventually support the recommendation of the student. Should also include actual products of the company, pictures of the company, and/or videos that allow students to get a feel for the company. This part should be relevant and not filler to bore the audience.
4. Valuation of the Company	This is a very important piece. Students should not get caught up in silly mathematics and accounting. They should only do what is necessary to value the company in specific relation to their ideas. Some of the best analysis is a good idea with simple computations. Both discounted cash flow (DCF) techniques and relative valuation techniques are typically used. They might also use analyst expectations in their DCF to derive the current stock price, so as to then show the impact of their modifications/insights to the DCF. For quantitative strategies, backtesting of their strategies can also be presented.
5. Qualitative	Students are encouraged to read the company's actual annual and quarterly reports. They are encouraged to use or try the products of the company. They are encouraged to speak to the company's suppliers, buyers, and competitors. Students are also encouraged to contact the company both at the management level and the store level.
6. Risk	Students are asked to examine downside risks to the trade. To analyze the events that could lead to a bad trade and to attempt to quantify how bad the trade could be. Students are also encouraged to describe the upside versus the downside risk on every trade.
7. Catalysts	The student should describe any upcoming events or potential events that could accelerate the price either in favor of the position or against the position.

Note: These are elements suggested by Professor Chincarini to be part of every stock presentation.

Exhibit 1 describes the core elements that students are encouraged to include in their stock presentations.

Unsuccessful presentations focus solely on the valuation, painstakingly explaining every number and detail of the valuation approach without offering any deep insight that makes their analysis unique or different from that of the market. Other pitches that frequently do not pass are those when the student does not have much conviction in their idea. Oftentimes, someone will ask whether they would invest their grandmother's life savings into the company. The response to this question can clarify to the class whether the student has faith in their analysis or not. In the following discussion, we give some examples of successful and unsuccessful student stock selections.

Example 1: Nvidia Corporation (NVDA). On October 29, 2016, one of the students presented on Nvidia Corporation, an American technology company based in Santa Clara, California. Nvidia designs graphic processing units for the gaming market, as well as chip units for the mobile computing, cloud computing and automotive markets. Nvidia provides computer chips that are extremely important for future technologies (e.g., VR and AR, cloud computing, deep learning and AI, and self-drive cars). The student that presented Nvidia did a very good job at explaining the market in which Nvidia thrived and at explaining why other chip companies would not be as well suited at providing these chips. The student did not do a very good job at the valuation part of Nvidia, nor did he do a good job at explaining why the market price for Nvidia had not incorporated his beliefs. Nevertheless, the class voted in favor of buying Nvidia. Nvidia was expected to release their earnings on November 11, 2016. The student said that because this posed some risks, the SMF should wait until that earnings release before buying the stock.

The SMF bought the stock on November 11, 2016, and still holds the stock as of September 18, 2017. The return has been 104.74%. Had we purchased the stock on the next day of the recommendation, rather than waiting for the earnings report, the SMF would have made even more at 154.28%.

On April 4, 2017, another student presented again on Nvidia Corporation suggesting that we should add to our exposure. The class voted 13 against 4 to double our exposure to Nvidia Corporation. We purchased the additional shares on April 7, 2017. The return of that additional purchase has been 79.86% through September 18, 2017.

Example 2: Lending Tree (TREE). On May 3, 2016, one of the students presented on Lending Tree Corporation. Lending Tree operates an online loan marketplace for consumers seeking loans and other credit-based offerings in the United States. The company offers tools and resources for mortgage and non-mortgage products, including auto loans, credit cards, home equity loans, personal loans, reverse mortgages, small business loans, and student loans. The student believed that Lending Tree was a buy for several reasons. One of the reasons was that despite having a 52% revenue growth from the prior year, Lending Tree did not look expensive versus peers in its industry group, as reflected by its price-to-earnings ratio (P/E) and price-to-book ratio (P/B). Analyst recommendations on the company were very positive with target prices between $110 and $160, even though the stock was trading at $73.34. Lending Tree was already in the SMF portfolio because the quantitative model had picked it up in prior months. Thus, the student recommended that we double our position in Lending Tree. Once again, the student did not do a thorough job on valuation and in explaining why the market price was not reflective of the future. Nevertheless, the proposal passed by unanimous decision.

The performance of TREE from May 9, 2016, to June 6, 2016 was 20.03%. Unfortunately, we sold this stock in June of 2016. Had we held on to this student pick, the performance through September 18, 2017, would have been an additional 166%!

Example 3: Alibaba (BABA). On April 28, 2017, a student proposed that the SMF purchase Alibaba Group Holding. Alibaba is a Chinese e-commerce company with services in consumer-to-consumer, business-to-consumer, and business-to-business sales. They have cloud computing services, electronic payment services, and a shopping search engine. It is considered to be the largest retailer in the world. The major sources of revenue are commissions from online stores and advertisements on online shopping platforms. The student did not do a very good job in the valuation model for Alibaba or explain why the market price was incorrect. Part of the reason for this was the difficulty in valuing all of Alibaba's current businesses and future businesses. This resulted in a vote to not buy Alibaba. Eight students voted for buying it, and nine students voted against it. Since April 28, 2017, Alibaba shares have risen from $115.50 to $176.7. This represents a percentage increase of 53% and hence was a forgone loss to the SMF.

Although the students sometimes make good pitches and sometimes less interesting pitches, the learning is continuously taking place. In order to give the reader a flavor of a more complete presentation, we refer to one of the example presentations used by Professor Chincarini to inspire students.

Example 4: Potbelly (PBPB). On October 4, 2013, Potbelly went public at an offering price of $14 per share. However, the price quickly rose to $30.77 by the day's close for investors wishing to buy the stock in the secondary markets. Before the IPO, an analysis was done to determine whether or not PBPB should be purchased as a stock in a portfolio.

The executive summary of the pitch was to not buy and/or short sell Potbelly. The reason was that using fair growth rate assumptions, the stock was trading below fair value using a discounted earnings model. Using a relative valuation approach, the company also looked very expensive. The "market" may have missed this on the first day of trading, because markets tend to hype up IPO stocks in the first few days of trading.

The student might then explain that they had eaten at this sandwich shop and loved the food and the business model. For example, the student might say that they enjoyed the simple menu of the store, they enjoyed the low cost, enjoyed the simple choice set, which probably made it easier to run a restaurant-like business. The student could then show pictures of an actual store, of the menu, and of the sandwiches. A great student might have taken these pictures himself or simply copied them from a company brochure or prospectus.

The student could also describe a brief history of the company. Potbelly started in 1996 when Bryant Keil purchased the family shop from a couple in Chicago. By the time of the IPO, the company had 286 stores

in 18 states and the District of Columbia (including 6 franchises) and 12 stores in the Middle East. From 2008 to 2012, Potbelly increased per-store profit margin to 20.7%. Leading up to the IPO, comparable store sales increased in 12 of the preceding 13 quarters.

There were two valuations that the student might have produced. The discounted future earnings model valued Potbelly between $14.38 and $15.42. This was much lower than the closing price of Potbelly on the first day of trading, $30.77. The key criteria in this assessment was that Potbelly per-store profits would stay the same and that stores would grow at 10% annually (this is what management of Potbelly said would likely occur).[13] In order to do this, the student might look at the 2012 net profit and divide it by the total existing stores to get a per-store profit in 2012. The student might have found a number like $32,397 per store.[14] The student could then prepare a pro-forma income statement going from 2013 to 2085 (72 years) with 10% growth in stores for the first 16 years from 290 stores to 1,211 stores.[15] The student then might have assumed that Potbelly had saturated the available market and growth would subside to zero. The discount rate used for the future profits might have been 6.225%. This was computed with the following equation: $r_{PBPB} = r_f + \beta(r_m - r_f)$, where r_f was 1.35% (the latest value of interest on the company's credit facility); β was 0.65, which was estimated from a basket of restaurant securities and a historical risk premium of 7.5% (estimated from Fama–French from 1926 to present and annualized).[16]

Based on these simple calculations, the student may have found the discounted value of Potbelly to be $431,822,591. Dividing this by the total shares outstanding (28,006,535) resulted in a per share value of $15.42. In another calculation, the student may have increased general and administrative costs by 10% annually to mimic the growth in store sales. This would have resulted in a present discounted value of $14.38 per share for Potbelly.[17] Although every analysis has its assumptions and its shortcomings, this simple analysis of Potbelly would have led the student to propose to short sell the stock or at the very least not buy it after IPO.

The relative valuation model might have consisted of computing various financial ratios, like enterprise value (EV)[18] to EBITDA (earnings before interest, taxes, depreciation, and amortization) and enterprise value to operating cash flow (OCF). Next, the student might have chosen companies that he thought would represent similar companies to Potbelly. Of course,

EXHIBIT 2
Valuation Ratios of Potbelly vs. Peer Group

Ticker	EV/EBITDA	EV/OCF
PBPB	25.78	32.32
AFCE	11.98	16.65
BAGL	7.46	6.76
CMG	16.25	20.90
DNKN	17.36	33.22
JACK	7.53	12.05
KKD	16.96	13.62
NATH	12.12	16.78
PNRA	11.74	15.16
SBUX	14.16	20.86
THI	10.81	14.05
Comparables Average	12.64	17.00
Maximum	17.36	33.22
Minimum	7.46	6.76

Notes: For all companies, we used their end-of-year 2012 values to compute these numbers. Enterprise value, EBITDA, and OCF were taken directly from Bloomberg. For Potbelly (PBPB), the enterprise value was computed using their SEC filing, which consisted of market value of equity at the close of the first day of trading plus debt minus cash plus minority interest. Their EBITDA was taken as the adjusted EBITDA, and the operating cash flow was taken from end-of-year 2012.

this is a difficult task, because there really is no restaurant exactly like Potbelly. Suppose the student chose the following companies: Nathan's Famous (NATH), AFC Enterprises (AFCE), Einstein Noah Restaurant Group (BAGL), Jack in the Box Inc. (JACK), Krispy Kreme Doughnuts Inc. (KKD), Panera Bread Company (PNRA), Starbucks (SBUX), Chipotle Mexican Grill, Inc. (CMG), Dunkin' Brands Group (DNKN), and Tim Hortons Inc. (THI).[19]

Exhibit 2 shows these two ratios for Potbelly and a peer group of companies. For this exercise, the student used 2012 end-of-year values for each company.[20] It is quite obvious from this table that based on the Potbelly stock price after the IPO, it was trading very expensively with respect to the other companies. For example, Potbelly had a much higher ratio on these two metrics than almost every other company that was chosen for the peer group. With an EV/EBITDA of 25.78, Potbelly had the largest ratio and was well above the average ratio of 12.64. The EV/OCF ratio was 32.32, which was higher than all other companies except Dunkin Group at 33.22, but still above the average of all companies of 17. One way to look at this is that Potbelly was trading very expensively

compared to other restaurants. Thus, the recommendation would be to not buy or short sell Potbelly.

In fact, Potbelly's shares dropped by 61.5% over the first year of being public and to this day (September 18, 2017) trades at $11.55 per share, representing a decline since the IPO of 62.5%. Good analysis doesn't always mean good results, but it is a useful guide for making stock recommendations.[21]

Student Roles

Every student in the SMF has a duty to make stock presentations to the class and to be actively engaged in listening to other students' pitches with skepticism and curiosity. Students are graded on participation, which includes asking questions of the other students, making stock presentations, challenging other students, and providing their own insight. In addition to making stock presentations, each student in the class is assigned an active role in the class. We typically give MSFA and MBA students more senior roles and undergraduates more junior roles. All students work together on teams, which makes learning easier for everyone. We discuss each of the roles below.

The *Chief Investment Officer (CIO)* oversees the class. The CIO organizes presentations and ensures the class stays on schedule and individuals maintain consistent progress on their duties. The CIO assists with stock research, leads discussions, and works with each group on their responsibilities and duties.

The *Chief Operating Officer (COO)* is responsible for community, donor, and alumni outreach. They aim to raise awareness of the fund with potential donors. The COO also is tasked with bringing in professionals to speak with the class about real experiences in managing a fund. They research potential guest speakers, initiate the interest to have them speak to the class, and coordinate schedules. Ideally, the COO seeks successful alumni of the school to come and speak with the hope that one day they may donate money to the SMF.

The *Quantitative Analysis Group* runs and maintains the quantitative model used in the fund. The group uses such services as Bloomberg to update and maintain the data necessary to run the model. The group members work with computer programs to run the models and ensure that there are no errors in the data, the coding, and the final results.

The *Economists* monitor and report on the economic situation in both the domestic and international economies. They keep the class informed of upcoming economic events and later report on the results of those events.

The *Newsletter Group* is in charge of compiling and writing the SMF newsletter. This group coordinates with all the other groups to ensure to relay a clear and cohesive message.

The *Past Stock Selection Review Committee* reviews former class stock selections. They take into consideration the reason the stock was originally selected, review the current stock performance, and judge if the stock should continue to be held, sold off, or if its exposure should be increased. This committee ensures the longevity of the stock selections from previous classes and is important to achieving long-term performance goals.

The *Performance Analysis Team* monitors the performance of the fund, producing weekly performance reports. The team is also responsible for tracking the benchmark and the fund's relative performance. There is much analysis that can be derived from past performance regarding which strategies are working and why they are working. This can lead to valuable insights as the fund progresses.

The *Trader* coordinates with the Quantitative Analysis Group to monitor and execute trades.[22]

Each of these roles may be performed by one individual or several individuals. The class is also dynamic, and as conditions change, some roles are added to this list and some are removed.

TRADING AND REBALANCING

The SMF has a dedicated trading team of one to three people. The traders learn many skills which include the discipline of preparing and executing real trades, the process of diligent checking to avoid trade mistakes, and the use of real trading systems. In this section, we describe some of the details of actual trades done by the SMF during the period from 2014 to 2017.

The fund engages in trading when a student pitch is approved and once a month when the quant model is rebalanced. Exhibit 3 examines the statistics on trades since the inception of the fund. Of the 1,024 observed days covered, there were 40 instances of basket trades. Because the aim is to rebalance monthly, this averages out to about twice per month, one basket trade to sell the necessary stocks and another basket trade to purchase the new selections. Some months the fund was

EXHIBIT 3
Trading Rebalance and Commission Statistics

Category	
No. Days Examined	1,024
No. Rebalancing Days	40
No. Rebalance	20
No. Stock Exchange	21
Avg. No. Stock per Basket Trade	76.33
Avg. Commission (per trade)	$1.52
Std. Dev.	$1.32
Avg. Commission (% per trade)	0.08%
Std. Dev.	0.23%
Cost per Share	$0.0067

Notes: This exhibit reports summary statistics of trading and commission fees for the period October 2014 through August 2017. The statistics for rebalancing and basket trades ignore individual trades. Each rebalance of the fund needs to be conducted on two separate days. Thus, No. Rebalance (i.e., the number of rebalances) equals half of No. Rebalance days (i.e., the number of rebalancing days). No. Stock Exchange indicates the number of exchanges on which the SMF's stocks are traded. Per trade indicates any trade that the fund made whether basket or individual trades. Meanwhile, each basket trade indicates when a portfolio of stocks (usually less than 100) is bought or sold simultaneously. Avg. Commission (per trade) is simply computed by dividing total commissions of all trades by the total number of trades. Avg. Commission (% per trade) is the average commission divided by the average trade size. Std. Dev stands for the standard deviation of the previous category. Cost per Share is derived by dividing the total commission fees by the aggregate number of shares traded over the entire period.

not rebalanced, and during class sessions, the fund trades more often because of student picks.

All of the trades were implemented on 21 stock exchanges, such as the Interactive Brokers (IB) platform (i.e., IBKRATS) and well-known and high-profile ones like NYSE and ARCA. The diversity of exchanges is due to the smart-routing mechanism, which handles orders automatically and uses the best available opportunity across multiple venues. On average, the fund bought or sold 76 stocks in each basket trade.

The average commission per stock traded was $1.52. That means when a stock is bought or sold, we paid $1.52 on average.[23] The average commission in percentage terms was 0.08%, which implies that for each $10,000 trade, we were charged $8 in commissions,[24] and on a per-share basis, around $0.0067. In other words, our effective cost per share is higher than the advertised price of Interactive Brokers of $0.005 per share. The deviation can be, in part, attributed to a minimum commission fee of $1, as well as FINRA regulatory fees and exchange fees.[25] The regulatory fees of FINRA

EXHIBIT 4
SMF Trading Statistics

	Avg.	Std. Dev.	Minimum Size	Maximum Size
Trade Size ($)	$5,719	$3,200	$20	$37,697
Trade Size (shares)	215	280	1	4,715

Notes: This exhibit presents summary statistics of each trade SMF placed for the period from October 2014 through August 2017. Trade Size ($) represents the total dollar value of each trade. Trade Size (shares) represents the number of shares of each trade. Avg. and Std. Dev. are average and standard deviation, respectively. Minimum Size and Maximum Size represent the minimum and maximum values.

are both transaction fees and trading activity fees. FINRA transaction fees increase with the size of a trade as 0.0000231 multiplied by the dollar trade size, and FINRA trading activity fees are charged on sell orders of the amount $0.000119 multiplied by the number of shares traded.

Exhibit 4 summarizes the average value of standard orders that were placed. Our typical trade size was $5,719, which represented roughly 1% of our total equity value.[26] The largest dollar trade over the entire period was $37,697, which corresponded to the purchase of 185 SPY shares. The minimum size trade was a company with ticker symbol EFSC.

In Exhibit 5, we show all the trades completed by the SMF along with the "theoretical trading" costs as a line and the actual trading costs with dots. It seems as though sometimes we paid more than the stated costs and sometimes we paid less.

Single Trades

A single trade is enacted when a student's pitch is approved by the class. The trader will execute the trade on the following business day. An approved pitch receives a 1% allocation of the equity portion of the fund. Thus, the number of shares traded of that stock is given by $\frac{V_E \cdot 0.01}{P_i}$, where V_E is the total dollar value of the equity position of the fund and P_i is the current price of the stock. For example, if the equity portion of our fund was $750,000 and we wanted to buy Microsoft (MSFT) at $75 per share, then we would place an order for 100 shares.

The buying of student selections shifts the weights of equity and cash in the portfolio because no positions

Actual SMF Commission Fees and Number of Shares Traded
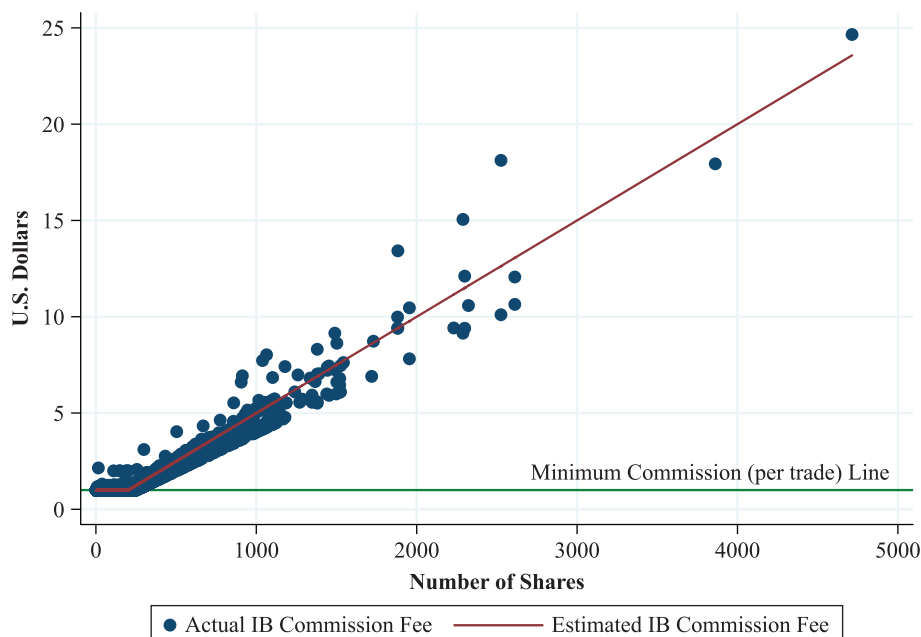
Notes: The Minimum Commission (per trade) line is the lower bound that IB charges for each trade regardless of the number of shares (i.e. $1 per trade). The estimated IB commission fee is modelled by the formula $c = max\{1, 0.005N\}$ where N represents the number of shares bought or sold. The deviation of actual trade costs from the theoretical costs stems from other charges including transaction cost fees, FINRA trading activity fees and exchange-specific fees. Transaction fees increase with the size of a trade (i.e., 0.0000231*dollar trade size) and FINRA trading activity fees equal 0.000119*number of shares only charged from sell orders. Liquidity-adding smart-routed orders placed on IBKRATS and IBDARK can lead to an overestimation of fees. The discount is a 0.001 multiple of the number of shares traded and is refunded to investors who increase liquidity for the exchange. Fees may also be added in if the order removes liquidity. Liquidity is based on where limit orders are priced compared with the current price. Stock exchange fees and regulatory fees are included in the fixed charge of $0.005 per share.

are sold off when a student pick is traded. Upon the next monthly rebalance, the fund reweights all stocks so that the size of the quantitative portion of the portfolio is the total equity position less the total value of student picks.

Monthly Rebalancing

The portfolio is traded every month when all of the raw stock data and the quant model are updated. This usually entails a larger turnover as many stocks might be bought and sold.[27]

During the rebalancing process, our program creates a target portfolio of quantitative and student picks. The program also produces two trade basket files. One file is for the sell orders on the rebalance day when we sell all stocks no longer wanted by the model. The other file is for the buy orders on the rebalance day and

contains the stocks we wish to buy as well as stocks which need weight adjustments. These files are constructed in a format that can be quickly loaded into IB's basket trading platform.[28] This sequential trading is necessary, because we have a cash account and cannot simultaneously buy and sell. The SMF trading team then submits the basket orders as limit orders so as to protect the fund against sudden market movements in any one stock name and/or thin trading in one of the stocks. Some stock trades do not get executed. This could be due to a stock price moving past its limit order, a corporate action on a stock that occurred that day, or thin trading on that stock. In these cases, the trading team is left to use their best judgment on how to proceed, which includes manually trading the stock at a new price or not trading the stock at all.

All of our procedures attempt to measure and consider liquidity when trading. Exhibit 6 examines various

Exhibit 6
Size-Bias Commission Fee and Liquidity Measures

	Large Cap (>$6 billion)	Small Cap (<$2 billion)	Total Portfolio
Avg. Commission	$1.16	$1.86	$1.52
Std. Dev.	$0.49	$1.65	$1.32
Avg. Market Cap ($ millions)	55,089.58	788.43	17,030.40
Avg. Bid–Ask Spread (%)	0.06	0.72	0.41
Med. Bid–Ask Spread (%)	0.04	0.31	0.15
Avg. Free-Float Percentage (%)	93.16	83.83	87.19
Avg. Quantity-to-ADTV Ratio (%)	4.41	10.21	7.62
Avg. Quantity (shares)	111.47	331.65	228.40

Notes: This exhibit presents the commission and liquidity analysis of the SMF by market capitalization for the period October 2014 through August 2017. The small-cap companies are defined as the ones with a market capitalization of less than $2 billion. The large-cap companies are defined as those having a market capitalization of $6 billion or more. Avg., Med., and Std. Dev. stand for average, median, and standard deviation across all trades. Market Cap is the market value of a company, which is defined as the total number of shares multiplied by the current share price. Bid–Ask Spread (%) is the difference between the bid price and the ask price taken as a percentage of the mid-price. Free-Float Percentage (%) represents the portion of shares of a corporation that are in the hands of public investors as opposed to locked-in stock held by promoters, company officers, controlling-interest investors, or government. Quantity-to-ADTV Ratio (%) is the measure of the number of shares traded relative to the 30-day average daily trading volume. Avg. Quantity (shares) is the average of share numbers traded in each trade.

liquidity statistics in relation to market capitalization. All stocks that were bought or sold by the SMF were stratified into two groups based on their market capitalization. Stocks with a market capitalization of $2 billion or less were considered small-cap shares, while stocks with a market capitalization of $6 billion or more were considered large-cap companies. As shown in Exhibit 6, relative to large-cap stocks, small-cap counterparts trade with a greater commission rate ($1.86 compared with $1.16 per stock traded) and a larger bid–ask spread (0.72% compared with 0.06%).[29] From our historical trading experience, small-cap companies also have a lower percentage of free-float shares than large-cap stocks. Also, the average trade size of smaller companies represents a much larger percentage of the average daily trading volume (around 10% compared with 4%), which could lead to higher market impact costs during trading.

Broker Discussion

When the entire portfolio is rebalanced, sometimes as many as 100 stocks are sold and 100 new stocks are bought. Thus, it was important for us to choose a brokerage that allowed basket trading. Interactive Brokers advertises a fixed $0.005 per-share cost. IB also offers a tier pricing that we can flexibly switch between. The tier pricing has a reduced rate per share as the range of shares traded per month increases, this could be an advantage for a high-frequency trading strategy that transacts high volumes of shares within short time frames.[30] All of the other brokers that were examined charged on a per-trade basis. The lowest being Vanguard at $2.00 and the highest being TD Ameritrade at $6.95. In order to fully utilize the quant model, it is essential to have the ability to trade as a basket. Thus the only true alternatives for our fund were IB and Fidelity. Fidelity charges a fee of $4.95 per stock trade. For IB and Fidelity to have the same cost per stock trade, it would be necessary to trade 990 shares per stock. In Exhibit 4, we show that the average number of shares traded is 215 shares with a standard deviation of 280. This is significantly lower than the 990 mark that would equalize the cost of the two brokers. This is one of the reasons that we chose IB.

Exhibit 7 compares other brokers' stated costs and how that translates into annualized costs based on large basket trades. In addition to basket trades and commissions, we also considered trading features and products. Given our large cash position, we considered the interest that brokers pay on cash. IB's cash rate was the highest among those that we chose. For example, a 25% cash position of a $1 million fund can earn $1,584 at Interactive Brokers' rate or $0 with Vanguard.

REPORTING, PERFORMANCE, AND ACCOUNTABILITY

It is important that students learn accountability and take responsibility for the actions in the portfolio. Thus, the SMF has a dedicated team to monitor and report on the performance of the fund on a weekly basis. At the end of every class session, instead of a final exam, students prepare an entire newsletter to be shared with members of the USF community, which include the president of the university, the dean of the School of Business, and the Board of Trustees. In this section, we highlight some of the performance analysis of the SMF.

Comparison of Brokers for Institutional Investing

	TD Ameritrade	e*Trade	Fidelity	Vanguard	Charles Schwab	IB
Cost per Trade (standard)	$6.95	$4.95	$4.95	$2.00	$4.95	–
Cost per Share	–	–	–	–	–	$0.005
Cash Interest	0.10%	0.05%	0.07%	–	0.35%	0.66%
Basket Trading Support	No	No	Yes	No	No	Yes
Ann. Cost (AUM = $1M, 100 trade size)	$8,340	$5,940	$5,940	$2,350	$5,940	$1,290
Ann. Cost (AUM = $5M, 100 trade size)	$8,340	$5,940	$5,940	$2,200	$5,940	$6,450
Account Minimum	No	$500	$2,500	No	$1,000	$10,000

Notes: Advertised cost per trade (standard) and cost per share are shown for the SMF typical trades. The numbers could be different for different investors. Vanguard charges $7 per trade if the investor's asset under management (AUM) is between $50,000 and $500,000. With the exception of IB, which charges investors based on the number of shares traded, other brokers charge on a per-trade basis. For example, Charles Schwab charges $4.95 per trade regardless of the account balance or how many shares an investor trades. The hypothetical cost computation is conducted via multiple scenarios of number of shares per trade, the number of trades and total AUM. The assumptions are made for our fund-specific information with $1 million AUM, 100 trades for each rebalance, and share numbers traded obtained from the fund's historical average quantity per trade (specific numbers shown in Exhibit 4). Cash Interest is the prevalent interest rate at which brokers pay on cash balances. Account Minimum indicates the minimum amount of money required to open a brokerage account.

The measure we used to track the performance of varying portfolios is a time-weighted return, which comprehensively takes into account cash inflows and outflows. The commonly used approach of calculating the percentage change in portfolio value would work for the total fund performance but could be misleading for the equity portion of the portfolio. In order to calculate the historical returns of the equity portion of the SMF portfolio, we use the Dietz method on daily returns.[31] The Dietz calculation we use is

$$r_{t,t+1}^{Dietz} = \frac{V_{t+1} - V_t - C_{t+1}}{V_t + 0.5C_{t+1}} \qquad (5)$$

where V_t measures the portfolio value at the close of day t and day $t + 1$, C_{t+1} represents the net cash flows in the portfolio on day $t + 1$.

From inception through October 2017, the SMF's aim was to beat a benchmark made up of 75% of the S&P 500 and 25% cash. Starting in November of 2017, the SMF switched to an all–equity benchmark and became fully invested in the equity markets. Exhibit 8 and Exhibit 9 show the fund's performance against the benchmark and the equity holding against the S&P 500 since inception. The fund is fairly close to the benchmark during the early stages as the fund was being implemented. The class was still taking shape and the quant model used now was still being developed.

During the first break from classes, the fund diverges from the benchmark quite dramatically. The portfolio was not rebalanced, which could have been a significant factor. Since that initial lapse in rebalancing, the fund relies on volunteers to continue the rebalancing between classes. Although this has helped, there are still time periods in which the fund does not undergo a monthly rebalance, which adversely affects performance.

Exhibit 10 summarizes the performance analysis on the portfolio and its benchmark as well as the equity-only performance of the fund against the S&P 500. Over the entire period, the fund has underperformed its benchmark (4.23% vs. 5.88% annualized). The Sharpe ratio of the fund, a measure of risk-adjusted return, lags behind that of the custom benchmark as well, which is predominantly driven by the better return of the benchmark over this period. The best and worst monthly return over the three-year period are also given, with the best return of our equity holding of 9.43% coinciding with the U.S. presidential election (November 2016). Monthly tracking error, which indicates the deviation from the target benchmarks, is shown to be 1.28% for the overall fund and 2.14% for the equity-holding part.

The alpha and beta rows indicate the estimated α and β of the tracking portfolios with respect to the benchmarks. Alphas are marginal and not statistically different from zero. Both portfolios have a beta close to 1, so the negative excess returns are largely attributed to

Exhibit 8
Total SMF Fund Performance since Inception
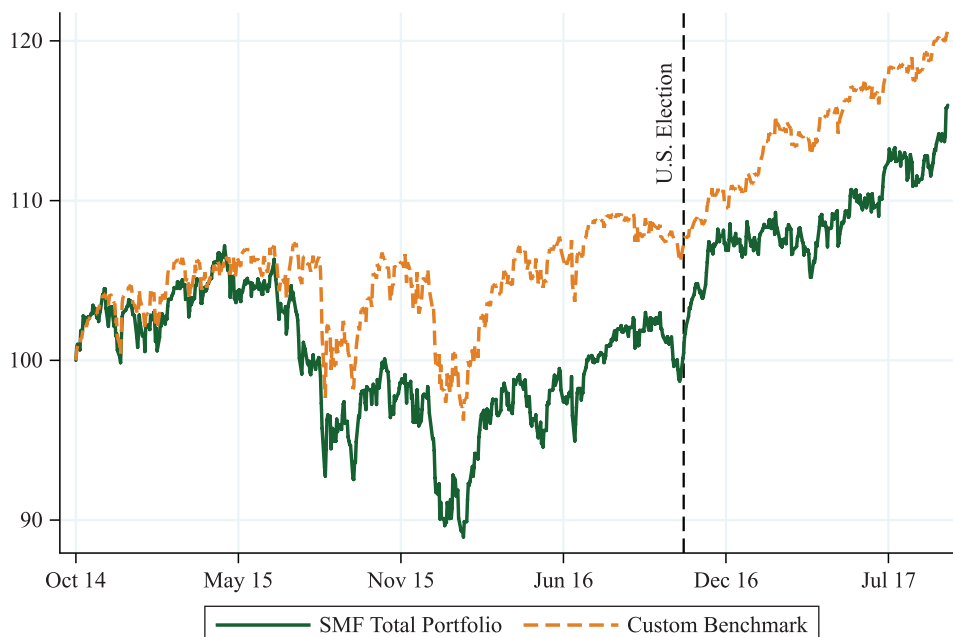
Notes: This exhibit illustrates the overall SMF performance relative to the custom benchmark for the period October 2014 through September 2017. The custom benchmark is a portfolio consisting of 25% cash and 75% the S&P 500.

the stock-picking process. The information ratio (IR) of the portfolio is negative, reflecting its underperformance with respect to the benchmark.

The subperiods of the fund and the benchmark tell a story as well. In the first year of the fund, the SMF underperformed the benchmark with a return of 2.88% versus 3.53%. In 2015, the SMF also underperformed the benchmark by 6.84% (−6% minus 0.84%). The 2016 year was a strong year for the SMF as it outperformed the benchmark by 5.6%. So far, in 2017, through September, the SMF is lagging the benchmark. Much of this performance is mimicked by the behavior of small-cap stocks versus large-cap stocks given the small-cap bias of the SMF.

Having the ability to monitor and evaluate the fund performance is essential to managing our fund. Part of the responsibilities of the Performance Analyst Team is to figure out biases to which the portfolio is exposed. Exhibit 11 shows the exposure of the fund to the Fama–French factors. This exhibit shows that the fund's exposure to the market beta is about 0.61, due mainly to its large cash component. The fund has a significant exposure to smaller companies as evidenced

by the 0.192 coefficient on the size factor. The fund has a positive but insignificant exposure to value and a negative but insignificant exposure to momentum. One of the key bets that the SMF is taking on versus the benchmark is its exposure to smaller-cap companies. In fact, in the years 2014, 2015, and 2017, larger companies outperformed smaller companies, which probably hurts the performance of the SMF.[32]

Once the class is aware of the biases inherent in the fund, we typically discuss whether or not we appreciate those biases or whether we should make overlay adjustments to alter them. At the current time, we are debating whether or not to reduce our small-cap bias.

These performance metrics, as well as others, are published in the SMF newsletter. The newsletter contains the performance statistics of the fund, a description of the economy and other key events during the period covered by the class, details of student stock presentations and voting results, and the biographies and roles of students in the fund. The newsletter is a key source of communication to people in the USF community. The newsletter is also a document that can be used by recruiters to advertise the school to prospective

SMF Equity Performance since Inception

Notes: This exhibit illustrates the SMF equity performance relative to the S&P 500 for the period October 2014 through September 2017. In order to calculate the historical returns of the all equity portion of the SMF portfolio, we use the Dietz method on daily returns.

students. Finally, the newsletter teaches students the importance of clear and concise communication, the concept of accountability, and the importance of honest reporting. Both in the newsletter and in the class, students are encouraged to communicate their mistakes, report them, and learn from them. Exhibit 12 shows a snapshot from the cover of the Spring 2017 newsletter, and Exhibit 13 shows an excerpt from the student stock presentation section.

CHALLENGES

There are a number of challenges that the SMF has had to endure since its inception. Some of these are logistical and have been managed to the best available solution. Other difficulties are persistent, but we hope to solve them in the future.

Frequency and Duration of the SMF

The USF's SMF course is only offered twice per year in seven-week increments. This leaves a large time frame for the fund to be unmanaged with large gaps

between classes. This has been remedied somewhat by having volunteer students continue to operate the quant model and manage the rebalancing of the portfolio when class is not in session, but this is not ideal. There is also a high turnover rate because certain students are not given university credit for taking both courses. In addition, there is some student attrition due to wanting other experiences. This results in higher startup costs as new students must transition into their roles and learn the responsibilities. To assist with this discontinuity, we have relied on prior students leaving detailed procedures and instructions for new students. We also frequently ask alumni of the SMF to come and sit in on the class and make themselves available to current students.

Ultimately, we would like to make the SMF a year-long course with a large percentage of students that stay in the course all year.

Assets and Resources

Currently, the returns made by the fund belong to the University. In another SMF that Professor Chincarini took part in, alumni donations to the fund were solicited.

Exhibit 10
SMF Risk and Return Characteristics Summary

Metrics	SMF Portfolio	Custom Benchmark	SMF Equity	S&P 500
Panel A: Historical Fund Performance over Whole Period				
Avg. Return	4.23	5.88	5.16	7.90
Std. Dev.	7.86	7.12	13.04	10.14
Sharpe Ratio	0.51	0.80	0.38	0.76
Max. Return	4.91	6.00	9.43	8.30
Min. Return	−4.20	−4.43	−8.23	−6.26
Ex-Post TE	1.28		2.14	
Alpha	−0.08		−0.23	
Beta	0.92		1.06	
IR	−0.07		−0.11	
Panel B: Historical Fund Performance by Subperiods				
2014 Return	2.88	3.53	6.00	6.84
2015 Return	−6.00	0.84	−12.20	−0.73
2016 Return	10.53	4.93	20.89	9.54
2017 Return	8.50	10.23	8.97	12.53

Notes: This exhibit provides summary statistics of the SMF fund and the equity portion of the fund along with their respective benchmarks for the period October 2014 through September 2017. Avg. Return is the annualized geometric return. Std. Dev. is the annualized standard deviation of monthly returns over the entire period. The Sharpe Ratio is computed as the average portfolio return minus the risk-free rate (one-month Treasury bill return) divided by the standard deviation of the portfolio. All other items are not annualized (i.e., monthly). Max. Return and Min. Return represent the maximum and minimum monthly returns. Ex-post TE is the monthly tracking error, which is computed as the standard deviation of monthly excess returns (portfolio return minus benchmark return) over the period. Alpha and beta are estimated as $R_{P,t} = \alpha + \beta R_{B,t} + \epsilon_t$, where R_P and R_B are the examined portfolio return and corresponding benchmark return, respectively. IR indicates the information ratio of monthly returns of the portfolio measured by alpha divided by the standard deviation of the error terms from the above regression. Panel B reports the actual compounded returns over the course of those years. With the exception of the Sharpe ratio, beta, and IR, all items are expressed in percentages (%).

Exhibit 11
SMF Historical Factor Exposures

	SMF Fund		SMF Equity		Ann. Premium
	Coeff.	*p-Value*	Coeff.	*p-Value*	
Market Factor	0.611***	*0.000*	0.995***	*0.000*	9.582
(MKTRF)	(0.058)	–	(0.094)	–	–
Size Factor	0.192***	*0.010*	0.339***	*0.006*	0.247
(SMB)	(0.069)	–	(0.113)	–	–
Value Factor	0.021	*0.763*	0.260**	*0.029*	−1.353
(HML)	(0.069)	–	(0.113)	–	–
Momentum	−0.054	*0.317*	−0.004	*0.963*	1.440
Factor (MOM)	(0.053)	–	(0.087)	–	–
Multi-Factor	−0.002	*0.274*	−0.003	*0.295*	–
Alpha	(0.002)	–	(0.003)	–	–
Adj. R^2	0.868	–	0.866	–	–
	–	–	–	–	–

Notes: This exhibit presents the exposures of the SMF to the Fama–French factors (MKTRF, SMB, HML, MOM) for the period October 2014 through July 2017. This model regresses monthly portfolio and equity returns on four main factors (market, size, value, and momentum). Market Factor is the equity market return minus the risk-free rate. Size Factor, Value Factor, and Momentum Factor are the returns on a value-weighted, zero-dollar investment, and factor-mimicking portfolio for size, book-to-equity ratio, and 11-month momentum in stock returns, obtained from the Kenneth French database. Ann. Premium is the annualized factor premium, computed as the average monthly factor premium multiplied by 12 and expressed in percentage (%). *** denotes significance at the 1% level, ** denotes significance at the 5% level.

to host guest speakers or for travel projects for students to go to company meetings or other events.

Ultimately, we would like to have the alumni of USF or other people donate funds explicitly to be managed by the SMF and whose profits could ultimately benefit students in the SMF.

Educational

The USF's SMF course is open to both undergraduate and graduate students across multiple areas of study. This results in a wide range of skill sets and knowledge before coming into the class.[33] Although the class is structured to be highly collaborative, the differing levels of skill can pose burdens to some students, while creating confusion for less advanced students. To address some of these issues, we have added finance case studies to be done by students prior to each meeting of the SMF. These case studies contain information related to evaluating companies and investments. By doing these

This had several important benefits. First, it brought alumni closer to the education and prosperity of the school. Second, the alumni could determine the uses of the profits of their donation. Ideally, we would like some of the profits from alumni donations to be used to fund the resources used by students in the SMF and for other activities. For example, with a donation to the fund of $3 million, even a 3% return would imply $90,000 of income that could be used to pay for other datasets and products, like FactSet. The income could also be used to pay for a class dinner at a fancy restaurant. The income might also be used for scholarships for the best stock presentation. The income could also be used

Exhibit 12
SMF Newsletter Summary Page

Student Managed Fund Newsletter

University of San Francisco

May 8nd, 2017

Dear Investor,

United States equities continue to test new highs through the first quarter of 2017. Positive corporate earnings surprises, global reflation, and optimism surrounding a new White House administration have all contributed to rising markets. Lofty expectations on fiscal stimulus, tax reform & healthcare reform contributed to positive market returns.

Emmanuel Macron won the French general election last Sunday and the populist rhetoric was calmed for the time being. The Euro rose slightly and the VIX hit an all-time low. Yet uncertainties about the upcoming U.K., German, and Chinese elections weigh on global markets. The Trump administration's ability to pass policies as promised is suspect after the failure to pass a healthcare bill in a timely, organized fashion. North Korea's nuclear capabilities and the Syrian Civil War create a tense political landscape.

All the while an aging bull market continues, despite many historical valuation metrics signaling limited upside potential in the near term.

The SMF Quantitative model seeks to replicate and outperform the S&P 500, while student picks are purely additive to overall fund returns. From April 28th, 2016 to April 28th, 2017, the top performing sectors in the S&P 500 were Financials and Technology, returning 36.76% and 34.57% respectively, leading all sectors. A vast majority of student selections this semester have been in the Information Technology sector. Over the same time period, the most adverse performer in the S&P 500 was Energy, returning –5.22%.

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Notable Events

Jan 20	Trump Inauguration
Jan 27	Immigration Ban Signed
Feb 1	FOMC Meeting
Mar 15*	FOMC Meeting
Feb 11	North Korea successfully fires long-range ballistic missile
Mar 25	Congress Abandons Healthcare Bill
Mar 29	U.K. Formally Triggers 'Brexit'
Apr 6	U.S. Retaliation against chemical weapon use in Syria
May 7	Macron wins French Election

*Denotes a rise of 25 bps in the FFR

Over the course of the semester, students compiled and discussed these macroeconomic developments in order to experience a career in portfolio management.

Sincerely,

The SMF Team

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case studies, students that are less prepared gain more knowledge for success in the class.

Another challenge is the implicit motivation of students. Some students in the SMF are extremely motivated and do lots of work to make the SMF better, while other students attempt to "coast" in the class. One way to reduce the "coaster" types would be to make entry much more difficult. However, as mentioned earlier, given the elective nature of the course, higher restrictions results in lower enrollment, which causes other problems for the SMF.[34]

Another educational challenge is to convince students that the stock pitch they are presenting is not just for a grade but should be for their sincere belief in the company. We try to engage the students by asking them if they would sincerely recommend the stock to their grandmother. The purpose of this question is to get students to immerse themselves in the decision rather than just state a decision. We also want students to look at the whole portfolio picture and understand that the choice of one company or sector is implicitly not the choice of another sector. Every decision they make has an implicit bet somewhere else.[35]

EXHIBIT 13
Investment Recommendations from SMF Students

Recommendations Approved

Pure Storage Inc. (NYSE: PSTG) Recommendation: Buy Price (4/4/2017): $10.52 Target Price: $14.68 Unrealized Return: 1.9% Vote Results: 13 for, 3 against	Pure Storage is an American technology company based in Mountain View, CA. Pure Storage operates in the Solid State Storage (SSS) space, selling hardware and service. Their product allows for 20 refrigerator sized, outdated mechanical storage units to be replaced with a SSS unit the size of a microwave, saving space and money. PSTG ranks in the top 1% of tech firms in terms of customer satisfaction.
SolarEdge Tech. Inc. (NASDAQ: SEDG) Recommendation: Buy Price (4/4/2017): $15.50 Target Price: $23.89 Unrealized Return: 3.0% Vote Results: 12 for, 4 against	SolarEdge is a solar company that designs, manufactures and sells solar accessories including optimizers, converters, and monitors. We believe the solar industry will focus on more efficient installations moving forward and SolarEdge holds 60+ patents with 60+ more pending; they are positioned to capitalize on this industry shift. SolarEdge sells to solar panel manufacturers. In this niche market they have few competitors and only sell B2B. We also believe that after President Trump was elected there was a large shift out of the solar industry, causing it to be oversold.
NVIDIA Corporation (NASDAQ: NVDA) Recommendation: Buy Price (4/7/2017): $100.19 Target Price: $150 – $200 Unrealized Return: 2.6% Vote Results: 13 for, 4 against	Nvidia Corporation is an American technology company based in Santa Clara, CA. Nvidia designs graphic processing units (GPU's) for the gaming, mobile computing, cloud computing, and automotive markets. Nvidia provides something that is necessary for most future technologies (VR and AR, cloud computing, deep learning and AI, self-drive cars).
MOMO Inc. (NASDAQ: MOMO) Recommendation: Buy Price (4/13/2017): $38.18 Target Price: $54.19 Unrealized Return: 3.4% Vote Results: 11 for, 5 against	Momo Inc. is a Chinese technology company based in Beijing, China launched in 2011. It is a location-based mobile social networking and entertainment platform with millions of monthly active users. Users can connect with each other in a personal and lively way through short-term videos and live streaming. They are also able to discover and connect with groups nearby with whom communicate.
Vishop Holdings Ltd (NYSE: VIPS) Recommendation: Buy Price (4/26/2017): $13.81 Target Price: $36.45 Unrealized Return: 4.9% Vote Results: 12 for, 5 against	Vipshop Holdings Ltd is a leading online discount retailer for brands in China. The Company offers high quality and popular branded products to consumers throughout China at a significant discount from retail prices through flash sales. Since its founding in August 2008, the Company has rapidly built a sizeable and growing base of customers and brand partners. Currently, it has 3.8% market share which ranked third in Chinese E-Commerce industry just after Alibaba and JD.COM.

Of course, we are constantly working on improving these motivational issues.

CONCLUSION

A student-managed fund can provide immense value to both undergraduate and graduate students. The SMF at the University of San Francisco attempts to give students access to a real-time, realistic investment management experience. This course supplements the theoretical learning students get from other classes.

Students sharpen and improve on their analytical and computer capabilities. They learn to use databases, such as Bloomberg, to solve the problem of figuring out whether to buy or sell a stock. The students learn

the implications of taking responsibility for the actions they take and how those actions impact others in the classroom. Students hone their presentation skills and the skills of making a persuasive argument about their analysis. Students also learn, that just as in the real-world, sometimes the best presentations are not the ones with the best analysis, but rather the ones that have the greatest flare (i.e., have good marketing). Differentiating between these subtleties is another student learning moment. Students also learn the benefits and challenges of working together in groups. The combination of these added skills and experiences along with the credentials of their role within the class can also shine on a student resume and help individuals stand out from their competition. As one previous student noted, "When

applying for my current position, I went through five rounds of interviews and every interviewer noticed the student-managed fund experience listed on my resume and asked about it. I used the opportunity to further prove my finance acumen and demonstrate examples of leadership and collaboration."

Since the launch of USF's SMF in the Fall of 2014, the students have slowly improved the techniques for managing the funds. This has led to an improved performance in the equity portfolio. The portfolio consists of a blend of quantitative equity models and fundamental analysis on individual stocks. The students focus primarily on finding stocks that they believe will outperform, but they must also be aware of economic trends that may affect the entire portfolio. In summary, the SMF at the University of San Francisco completes the education circle by tapping all elements of the portfolio management experience, including interpersonal skills, analytical skills, assessment skills, knowledge skills, responsibility skills, ethical and honesty skills, and writing and presentation skills.

APPENDIX A
List of U.S. Student-Managed Funds for 2017

No.	University Name	State	Year	AUM (2017)	AUM (2007)
1	University of Wisconsin–Madison	WI	1970	50,000	62,000
2	University of Minnesota–Minneapolis	MN	1998	38,000	25,000
3	University of Texas	TX	1994	28,000	1,700
4	University of Dayton	OH	1994	24,315	6,300
5	University of North Carolina–Chapel Hill	NC	1952	13,000	1,424
6	University of Arkansas–Fayetteville	AR	1971	11,300	12,000
7	Ohio State University	OH	1990	10,584	25,810
8	University of Houston	TX	2002	10,000	9,177
9	University of Notre Dame	IN	1998	10,000	5,000
10	Menlo College	CA	2016	10,000	–
11	University of Virginia (for MBA)	VA	1990	10,000	–
12	University of Louisville	KY	2004	9,471	50
13	Southern Methodist University	TX	1980	9,000	6,500
14	University of Michigan	MI	2000	7,320	3,700
15	Pennsylvania State University	PA	2005	7,175	5,000
16	Baylor University	TX	2001	7,000	6,500
17	University of Southern California	CA	1986	6,400	2,600
18	Miami University	OH	1996	6,000	375
19	University of Ohio	OH	1994	5,822	1,572
20	The University of Iowa	IA	1994	5,820	505
21	Virginia Tech & State University	VA	2006	5,650	4,600
22	Creighton University	NE	1993	5,600	2,500
23	Washington and Lee University	VA	1998	5,600	1,840
24	Michigan State University	MI	2003	5,000	4,200
25	University of Tulsa	OK	1998	5,000	1,577
26	Trinity University	TX	1998	5,000	1,340
27	Western Kentucky University	KY	1998	5,000	340
28	University of St. Thomas	MN	1999	4,700	3,000
29	Tulane University	LA	1999	4,500	2,419
30	College of Wooster	OH	1955	4,100	1,300
31	Syracuse University	TN	2006	4,000	1,100
32	Stetson University	FL	1980	3,500	3,100
33	Saint John's University (Undergrad.)	NY	2001	3,470	2,700
34	University of Maryland	MD	1993	3,000	1,350

List of U.S. Student-Managed Funds for 2017

No.	University Name	State	Year	AUM (2017)	AUM (2007)
35	University of the Pacific	CA	2007	3,000	1,100
36	Butler University	IN	2007	3,000	1,000
37	California State University	CA	1999	3,000	90
38	Florida State University	FL	2008	3,000	–
39	Yale University	CT	2000	2,900	2,900
40	Texas Tech University	TX	1997	2,800	2,200
41	Washington State University	WA	2001	2,800	1,500
42	Louisiana State University	LA	2005	2,800	1,000
43	University of New Mexico	NM	2006	2,596	–
44	University of Northern Colorado	CO	1992	2,500	1,100
45	Xavier University	OH	2004	2,500	1,000
46	University of Maine	ME	1993	2,300	1,253
47	University of Connecticut	CT	2000	2,000	2,300
48	University of California–Los Angeles	CA	1987	2,000	2,000
49	George Washington University	DC	2005	2,000	1,500
50	Moravian College	PA	1962	2,000	1,442
51	Babson College	MA	1997	2,000	1,300
52	Samford University	AL	2008	2,000	500
53	Trevecca Nazarene University	TN	2003	2,000	405
54	Oakland University	MI	2015	2,000	–
55	University of Pennsylvania	PA	1996	1,996	700
56	Southern Illinois University	IL	2000	1,992	353
57	Saint John's University (Graduate.)	NY	2002	1,980	–
58	Northern Arizona University	AZ	2000	1,880	997
59	Wright State University	OH	1996	1,807	600
60	New York University	NY	2000	1,800	2,001
61	University of Delaware	DE	1996	1,800	800
62	Drexel University	PA	2007	1,800	250
63	University of Toledo	OH	2005	1,700	1,000
64	Bucknell University	PA	2000	1,700	750
65	University of Chicago	IL	2005	1,599	1,000
66	University of Denver	CO	1999	1,559	550
67	University of North Carolina–Wilmington	NC	2011	1,528	1,000
68	Michigan Technological University	MI	1998	1,500	1,300
69	University of Tennessee–Knoxville	TN	1998	1,500	1,000
70	Rice University	TX	1996	1,500	900
71	Fordham University	NY	NA	1,470	–
72	St. John's University	NY	2001	1,460	–
73	Saint Louis University	MO	2002	1,443	916
74	University of Missouri–Columbia	MO	1967	1,399	1,354
75	Texas Christian University	TX	1973	1,300	1,500
76	University of North Dakota	ND	2005	1,300	676
77	Ashland University	OH	2000	1,300	375
78	Anderson University	IN	2007	1,300	10
79	Austin College	TX	2007	1,253	1,000
80	Columbia University	NY	2016	1,250	–

(continued)

List of U.S. Student-Managed Funds for 2017

No.	University Name	State	Year	AUM (2017)	AUM (2007)
81	Georgia Institute of Technology	GA	1986	1,200	810
82	Radford University	VA	2002	1,200	495
83	West Texas A&M University	TX	1996	1,187	600
84	Texas A&M University	TX	2000	1,187	250
85	University of San Francisco	CA	2014	1,180	–
86	University of Oregon	OR	1999	1,165	900
87	University of Alaska	AK	1995	1,148	550
88	University of North Florida	FL	1999	1,100	772
89	Ouachita Baptist University	AR	2000	1,100	20
90	Cornell University	NY	1998	1,000	13,500
91	University of Wyoming	WY	2005	1,000	1,700
92	University of Arizona	AZ	2000	1,000	930
93	College of William & Mary	VA	1999	1,000	590
94	Villanova University	PA	2004	1,000	475
95	Bryant University	RI	2005	1,000	425
96	Indiana University of Pennsylvania	PA	2005	1,000	223
97	University of Georgia	GA	2007	1,000	101
98	McMurry University	TX	2017	1,000	–
99	Western Michigan University	MI	2009	1,000	–
100	Youngstown State Universitys	OH	2008	1,000	–
101	Pomona College Sagehen Capital	CA	2007	1,000	–
102	University of Virginia	VA	1994	960	6,200
103	Abilene Christian University	TX	2000	950	319
104	California State University–Northridge	CA	1994	913	2,000
105	Ball State University	IN	2005	800	577
106	Loyola College	MD	2006	800	500
107	Cleveland State University	OH	2007	700	100
108	Roanoke College	VA	2004	685	500
109	University of Wisconsin–Oshkosh	WI	2000	684	135
110	Widener University	PA	2017	682	–
111	Ithaca College	NY	2005	675	24
112	Northeastern University	MA	2008	668	–
113	Salisbury University	MD	2000	640	388
114	California Institute of Technology	CA	1978	600	490
115	Longwood University	VA	2002	600	470
116	University of Tennessee–Martin	TN	1998	600	460
117	Mississippi University for Women	MS	1999	600	385
118	Georgetown University	DC	1999	600	200
119	Lafayette College	PA	1950	591	–
120	The University of Alabama	AL	2007	575	385
121	Lipscomb University	TN	2003	550	450
122	Illinois State University	IL	1982	542	383
123	University of Memphis	TN	1999	540	475
124	University of Idaho	ID	1989	540	400
125	Bentley College	MA	1997	520	555
126	American University	DC	2002	520	100

List of U.S. Student-Managed Funds for 2017

No.	University Name	State	Year	AUM (2017)	AUM (2007)
127	University of Utah	UT	1998	507	18,173
128	Rollins College	FL	1999	500	750
129	Washington College	MA	2007	500	504
130	Mississippi State University	MS	1998	500	400
131	East Tennessee State University	TN	2000	500	370
132	Auburn University	AL	2015	500	50
133	Barry University	FL	2011	500	—
134	Universityof Central Missouri	MO	2013	500	—
135	University of Miami	FL	2011	500	—
136	Boston College	MA	1983	485	360
137	Boston University	MA	2001	475	25
138	Saint Bonaventure University	NY	2003	472	45
139	University of Northern Illinois	IL	1999	471	200
140	University of North Texas	TX	2003	460	277
141	Northern Illinois University	IL	2000	459	230
142	California Polytechnic State University	CA	1992	456	453
143	University of South Florida	FL	NA	451	—
144	California State University–Sacramento	CA	2010	440	—
145	Dartmouth College	NH	1996	420	400
146	University of North Carolina–Charlotte	NC	2017	416	235
147	University of Iowa	IA	1994	402	536
148	Tennessee Tech University	TN	2000	400	500
149	Illinois College	IL	1995	400	458
150	Indiana State University	IN	2000	400	437
151	Canisius College	NY	2003	400	300
152	Stevens Institute of Technology	NJ	2014	379	NA
153	Bowling Green State University	OH	2006	365	265
154	Elizabethtown College	PA	2007	359	130
155	University of Cincinnati	OH	2000	350	350
156	Oberlin College	OH	2004	335	281
157	University of Rhode Island	RI	2001	325	151
158	Pace University	NY	2002	300	280
159	University of Washington	WA	2011	300	50
160	Colby–Sawyer College	NH	2012	300	—
161	Binghamton University–SUNY	NY	2003	290	130
162	University of Kansas	KS	1994	282	1,523
163	Vanderbilt University (MBA)	TN	1983	270	—
164	University of Nebraska–Lincoln	NE	1981	250	1,300
165	University of Tennessee–Chattanooga	TN	1998	250	510
166	Belmont University	TN	2003	250	400
167	Colorado State University	CO	1998	250	190
168	Seattle University	WA	2009	250	510
169	University of South Alabama	AL	2015	250	—
170	West Virginia University	WV	2017	250	NA
171	University of Chattanooga	TN	NA	250	—
172	Baruch College	NY	2010	250	—

(continued)

List of U.S. Student-Managed Funds for 2017

No.	University Name	State	Year	AUM (2017)	AUM (2007)
173	University of Richmond	VA	1993	248	325
174	Ohio Northern University	OH	1989	240	128
175	Emory University	GA	2006	237	1,200
176	Kent State University	OH	2017	225	–
177	Florida International University	FL	2008	220	–
178	Virginia Military Institute	VA	1984	213	230
179	Georgia State University	GA	2005	200	368
180	Alabama A&M University	AL	1998	200	330
181	Bluffton University	OH	1956	190	174
182	College of William & Mary	VA	2010	186	–
183	Wofford College	SC	2008	177	–
184	University of Massachusetts Amherst	MA	2007	175	25
185	Kennesaw State University	GA	2009	170	100
186	Centenary College of Louisiana	LA	2003	163	120
187	Gustavus Adolphus College	MN	1998	160	123
188	College of New Jersey	NJ	2000	155	170
189	Texas State University	TX	NA	150	–
190	Appalachian State University	NC	2000	139	116
191	University of Redlands	CA	2012	135	NA
192	New Mexico State University	NM	2007	133	5,013
193	Tufts University	MA	NA	130	1,059
194	Saint Mary's University	TX	2007	125	1,000
195	University of Incarnate Word	TX	2016	125	–
196	Seton Hall University	NJ	NA	136	–
197	Connecticut College	CT	2002	121	77
198	North Dakota State University	ND	2007	120	110
199	Yale (Socially Responsible Investment Fund)	CT	2007	110	–
200	Rensselaer PolyTechnic Institute	NY	2017	104	–
201	Washington University	MO	1997	100	1,540
202	University of Tampa	FL	2003	100	155
203	California State University–Long Beach	CA	1995	100	100
204	Princeton University	NJ	2006	100	10
205	Dixie State University	UT	NA	100	–
206	East Carolina University	NC	2015	100	–
207	San Jose State University	CA	2015	100	–
208	University of Dallas	TX	2013	100	–
209	University of Nebraska–Kearny	NE	2017	100	–
210	Valparaiso University	IN	2017	100	–
211	Wayne State University	MI	2017	100	–
212	Louisiana Tech University	LA	2016	100	–
213	Colorado College	CO	2004	93	24
214	Brandeis University	MA	1998	85	13
215	Oregon State University	OR	2005	67	60
216	Duke University	NC	1952	50	162
217	Indiana University Northwest	IN	2015	50	–
218	North Carolina A&T University	NC	2015	50	–

(continued)

List of U.S. Student-Managed Funds for 2017

No.	University Name	State	Year	AUM (2017)	AUM (2007)
219	Gallaudet University	DC	NA	50	–
220	University of California–Irvine	CA	2011	50	–
221	University of Colorado–Boulder	CO	2002	49	300
222	Kansas State University	KS	2002	46	1,100
223	Cedar Crest College	PA	1997	40	52
224	Harvard University	MA	NA	40	–
225	California State University Fullerton	CA	NA	31	–
226	University of Maryland (Baltimore County)	MD	2010	25	–
227	University of Northern Iowa	IA	1999	20	115
228	University of South Dakota	SD	2001	10	520
229	State University of New York College	NY	2007	10	–
230	Northwestern University	IL	1964	NA	2,375
231	Brigham Young University	UT	1984	NA	1,866
232	Rutgers University	NJ	2012	NA	1,605
233	University of Nebraska–Omaha	NE	2001	NA	1,400
234	Marquette University	WI	2005	NA	1,200
235	Wartburg College	IA	1969	NA	1,071
236	Southeast Missouri State University	MO	1990	NA	835
237	Cameron University	OK	1998	NA	800
238	Texas Wesleyan University	TX	1998	NA	776
239	Illinois Wesleyan University	IL	1993	NA	740
240	Wake Forest University	NC	1997	NA	614
241	Arizona State University	AZ	1996	NA	515
242	University of Oklahoma	OK	1996	NA	505
243	Indiana University	IN	1986	NA	500
244	Central Michigan University	MI	1997	NA	469
245	Jacksonville University	FL	1987	NA	454
246	Murray State University	KY	1998	NA	440
247	University of Minnesota–Duluth	MN	2003	NA	440
248	Vanderbilt University	TN	1988	NA	435
249	University of Alabama–Huntsville	AL	1998	NA	428
250	Austin Peay State University	TN	1998	NA	400
251	Christian Brothers College	TN	2003	NA	400
252	Christian Brothers University	TN	2003	NA	400
253	Purdue University	IN	2000	NA	400
254	Tennessee State University	TN	1998	NA	400
255	Union University	TN	2003	NA	400
256	University of Kentucky	KY	1999	NA	400
257	University of North Alabama	AL	2003	NA	400
258	Western Carolina University	NC	1998	NA	400
259	University of Illinois	IL	1999	NA	390
260	Claremont Graduate School	CA	2001	NA	381
261	Lehigh University	PA	1962	NA	360
262	University of Pittsburgh	PA	1999	NA	351
263	Santa Clara University	CA	2000	NA	350
264	Southwestern University	TX	1999	NA	349

List of U.S. Student-Managed Funds for 2017

No.	University Name	State	Year	AUM (2017)	AUM (2007)
265	Henderson State University	AR	2001	NA	343
266	DePaul University	IL	1982	NA	341
267	University of Mississippi	MS	2001	NA	335
268	Middle Tennessee State University	TN	1998	NA	325
269	University of Southern Mississippi	MS	2002	NA	308
270	Clemson University	SC	2004	NA	300
271	Fairfield University	CT	2006	NA	300
272	Middlebury College	VT	1987	NA	275
273	Portland State University	OR	1997	NA	251
274	Nebraska Wesleyan University	NE	2005	NA	250
275	University of Wisconsin–Eau Claire	WI	2003	NA	250
276	Drake University	IA	1999	NA	239
277	Florida Gulf Coast University	FL	2006	NA	220
278	Northern Michigan University	MI	2006	NA	210
279	Franklin and Marshall College	PA	1999	NA	204
280	Alfred University	NY	1995	NA	200
281	Gonzaga University	WA	2000	NA	200
282	Millsaps College	MS	1989	NA	200
283	Scripps College	CA	200	NA	200
284	University of Rochester	NY	1995	NA	200
285	Iowa State University	IA	1999	NA	195
286	Kutztown University of Pennsylvania	PA	2005	NA	190
287	University of Wisconsin–Platteville	WI	2001	NA	190
288	Alaska Pacific University	AK	2000	NA	185
289	Stanford University	CA	1978	NA	180
290	Baldwin–Wallace College	OH	2006	NA	175
291	Loras College	IA	1998	NA	172
292	John Carroll University	OH	1996	NA	170
293	Willamette University	OR	2004	NA	160
294	Boise State University	ID	1995	NA	149
295	James Madison University	VA	1999	NA	146
296	Eastern Illinois University	IL	1994	NA	136
297	North Carolina State University	NC	2004	NA	135
298	Gannon University	PA	1952	NA	126
299	University of Missouri–St. Louis	MO	1988	NA	125
300	Grinnell College	IA	2000	NA	122
301	Roger Williams University	RI	2004	NA	122
302	University of California	CA	1997	NA	120
303	Saint Joseph's University	PA	2004	NA	117
304	Saint Cloud State University	MN	1999	NA	115
305	University of Nevada	NV	2004	NA	107
306	Adelphi University	NY	2008	NA	100
307	Bates College	ME	2004	NA	100
308	Bryn Mawr College	PA	1975	NA	100
309	California State University–Los Angeles	CA	2001	NA	100
310	Indiana University Bloomington	IN	2010	NA	100

List of U.S. Student-Managed Funds for 2017

No.	University Name	State	Year	AUM (2017)	AUM (2007)
311	San Diego State University	CA	1992	NA	100
312	University of Akron	OH	1996	NA	100
313	Washburn University	KS	2007	NA	100
314	Pacific Lutheran University	WA	1982	NA	92
315	University of Wisconsin–Whitewater	WI	1999	NA	85
316	Shippensburg University	PA	1994	NA	81
317	Cedarville University	OH	2008	NA	75
318	Marywood University	PA	2006	NA	75
319	Northwest Nazarene University	ID	2003	NA	70
320	University of Portland	OR	2003	NA	65
321	Carnegie Mellon University	PA	2006	NA	64
322	Idaho State University	ID	2005	NA	59
323	Southern New Hampshire University	NH	2004	NA	59
324	University of Colorado–Colorado Springs	CO	2004	NA	58
325	Culver Stockton College	MO	1996	NA	55
326	Carroll College	MT	2004	NA	50
327	Eastern Washington University	WA	2004	NA	50
328	Montana State University–Billings	MT	1985	NA	50
329	Montana State University–Bozeman	MT	1985	NA	50
330	University of Alabama–Tuscaloosa	AL	1998	NA	50
331	University of Montana	MT	1985	NA	50
332	University of New Hampshire (Angel Fund)	NH	1995	NA	50
333	Utah State University	UT	1985	NA	50
334	Westminster College	UT	NA	NA	50
335	Wittenberg University	OH	2000	NA	50
336	Massachusetts Institute of Technology	MA	1964	NA	27
337	Gardner Webb University	NC	2000	NA	25
338	McNeese State University	LA	2007	NA	21
339	State University of New York–Geneseo	NY	2007	NA	18
340	Wagner College	NY	NA	NA	15
341	Spring Arbor University	MI	2005	NA	12
342	Humboldt State University	CA	2006	NA	7
343	Bentley University (Venture Capital Fund)	MA	2017	NA	–
344	Coaster Carolina University	SC	NA	NA	–
345	DePauw University	IN	NA	NA	–
346	Hofstra University	NY	2016	NA	–
347	Jacksonville University (Dolphin SMIF)	FL	2009	NA	–
348	Midwestern State University	TX	NA	NA	–
349	Minnesota State University	MN	NA	NA	–
350	Piedmont Virginia Community College	VA	2016	NA	–
351	Seattle Pacific University	WA	2012	NA	–
352	University of Arkansas–Forth Smith	AR	NA	NA	–
353	University of Florida	FL	NA	NA	–

Notes: This exhibit provides basic information of SMF funds in the United States. Year shows the year of fund inception. AUM (2017) indicates the most recent fund's assets under management that we were able to find in 2017. This does not mean that the number is current to 2017 but is the number we found in 2017. AUM (2007) represents the assets under management of the fund in 2007, which we obtained from the paper of Professor Edward C. Lawrence in 2008. Schools are ranked by AUM in 2017 and when unavailable, they are ranked by AUM in 2007. If neither exists, they are alphabetically ranked. NA means we were unable to obtain information for a particular fund. A dash (−) for the 2007 AUM level indicates new SMFs that were not part of the original Lawrence list. AUM is measured in thousands of U.S. dollars.

APPENDIX B
List of International Student-Managed Funds for 2017

No.	University Name	Country	Year	AUM (2017)	AUM (2007)
1	Australian National University	Australia	NA	NA	–
2	Birla Institute of Tech. & Sciences	India	2007	NA	3
3	Bishop's University	Canada	1996	NA	485
4	Bond University	Australia	NA	NA	28
5	Brock University	Canada	1995	NA	17
6	Concordia University	Canada	1999	NA	1,378
7	Goa Institute of Management	India	2013	NA	–
8	Griffith University	Australia	NA	NA	–
9	Hebrew University of Jerusalem	Israel	1999	NA	580
10	HEC Montreal	Canada	1999	NA	3,810
11	London Business School	United Kingdom	2003	NA	300
12	Maastricht University	Netherlands	1994	NA	70
13	Massey University	New Zealand	1995	NA	15
14	McGill University	Canada	NA	4,000	10
15	National University of Singapore	Singapore	2012	NA	–
16	Punjab College of Technical	India	NA	NA	3
17	Queens University	Canada	2001	NA	3,000
18	Simon Fraser University	Canada	2003	16,900	9,983
19	St. Francis Xavier University	Canada	2000	NA	2
20	St. Mary's University	Canada	2005	NA	184
21	Trinity College Dublin	Ireland	2010	100	–
22	University of Alberta	Canada	1998	NA	1,292
23	University of British Columbia	Canada	1987	NA	3,514
24	University of Calgary	Canada	1996	NA	361
25	University of Edinburgh	United Kingdom	1997	43	–
26	University of Guam	U.S. Territory	2006	NA	53
27	University of Lethbridge	Canada	NA	100	–
28	University of Manitoba	Canada	1997	NA	11
29	University of New Brunswick	Canada	1998	8,000	2,200
30	University of Sydney	Australia	2017	NA	–
31	University of Toronto	Canada	2017	250	17
32	University of Twente	Netherlands	2017	50	–
33	University of Waterloo	Canada	2001	205	–
34	University of Western Australia	Australia	2014	20	–
35	University of York	United Kingdom	2013	11	–
36	Wilfrid Laurier University	Canada	2001	NA	340

Notes: This exhibit provides basic information of SMF funds outside the United States. Year shows the year of fund inception. AUM (2017) indicates the most recent fund's assets under management that we were able to find in 2017. This does not mean that the number is current to 2017 but is the number we found in 2017. AUM (2007) represents asset under management of a fund in 2007, which we obtained from the paper of Professor Edward C. Lawrence in 2008. Schools are alphabetically ranked. NA means we were unable to obtain information for a particular fund. A dash (–) for the 2007 AUM level indicates new SMFs that were not part of the original Lawrence list. AUM is measured in thousands of local currencies.

ENDNOTES

We would like to thank Carl Fixsen for research assistance and useful discussions, and Mark Fredenburg, Tim Rasmussen, and Andrew Schonlau for helpful comments. We also wish to thank a team of USF students that helped us update the list of SMFs across the United States and internationally, including Brandon Penn, Jordan Harrison, Kyle Juedes, Ophelia Zhu, Ashley Burneka, Dane Schmid, Xiaoyu Zhou, Qianhui Qu, Shuming Liang, Yilun Wang, Sherry Guan, Taolan Zhu, Ying Xu, and Jieli Ma.

[1]The list of SMFs may have missing data and some errors. We compiled the list as follows. We started with a list of SMFs compiled by Professor Edward C. Lawrence in 2007. We updated and expanded the list in two ways. First, students of USF surfed the web for public information on SMFs on university websites, fund webpages, and financial reports that funds made available to the public. USF students also actively reached out to each SMF either by emailing or calling people associated with a particular SMF. Most of the people that students contacted were professors in charge of the SMF at a particular university.

[2]The creation of the SMF would not have been possible without the support of Dean Michael Webber, Associate Dean John Veitch, Professor Frank Ohara, and Professor Barry Doyle.

[3]We must thank Charlie Cross and Stacy Lewis for their forward-looking thinking.

[4]Professor Chincarini would like to thank former Professor Phillip Cooley for taking time to discuss his experiences with the SMF at Trinity College and for sharing information.

[5]More of this will be discussed later, in the Challenges section.

[6]For more information about the MSFA program, see www.usfca.edu/management/graduateprograms/financial-analysis. Originally the course was designed to consist of 10 to 12 of the best students, but due to strict budget considerations by the University administration, we had to force a minimum enrollment of 15 students.

[7]This decision was influenced by misinformation that we received from institutional sales representatives at Interactive Brokers.

[8]This also has subtle implications for trading in-between trade date and settlement date, which used to be three days. On March 22, 2017, the U.S. SEC announced that the standard settlement cycle would be shortened by one day (settlements will be complete two days after execution) effective September 5, 2017. The SEC acting chairman cited an increase in technology, trading growth, and the emergence of new products as reasons for the amendment.

[9]For more info, see Chincarini and Kim [2006].

[10]Other values for the upper and lower bound could be chosen by using 1.5 instead of 3. It is common to use both.

[11]This procedure works quite well at dealing with outlier data. For example, in December 2013, the raw data for the five-year beta of company stock returns, ranged from $-9{,}022$ to 943. The values for the IQR procedure were $Q3 = -0.65$, $Q1 = -1.58$, $IQR = 0.93$, $UB = 2.14$, and $LB = -4.37$. This procedure removed 2.43% of all of our cross-sectional data but left us with very stable Z-score values for 97.57% of our stock data. Another way to avoid outlier issues is to use a ranking method of stocks, instead of the actual Z-scores. However, this removes important relative information (Chincarini and Kim [2006] and Bruno, Chincarini, and Davis [2015]).

[12]More of this topic will be discussed in the Challenges section of the article.

[13]It is clear that there are many other assumptions an analyst could have made. In fact, later, analysts on Wall Street used a target price on the stock of $32 with assumptions like higher growth in the number of stores per year (12%–14%), growth in same-store sales (1%–3%) and growth in overall EBITDA (50–100 bps per year). Our student's analysis was simple and less ambitious.

[14]These numbers were calculated based on the Potbelly filing, which was available prior to IPO (see pages 8 and 10). This document had the shop-level profit of $56,609,000 (which was calculated as total revenue [$274,914,000] minus COGS [$79,847,000], labor costs [$77,479,000], occupancy expenses [$32,016,000], other expenses [$28,119,000], and franchise royalties [$844,000]), from which depreciation ($16,219,000) was subtracted, from which store opening costs were subtracted ($2,051,000), from which general and administrative costs ($29,624,000) were subtracted to give $32,397.77 per store. We did not subtract impairment and loss on disposal of property and equipment, which was a small amount at $994,000, but we could have. Potbelly's filing mentions 286 domestic shops as of June 2013 and 17 newly created shops in 2013. Thus, we subtracted 17 from 286 to obtain our 2012 number of 269 stores in operation at the time. One could argue that there would be a better way to deal with franchise fees, store opening costs, and impairments, but we ignored this in our quick and dirty calculations.

[15]The 72 years is arbitrary and a two-staged growth model could have been used. The number of years was chosen so as to make the discount factor essentially close to 0. With a two-stage growth model of the following form $P = \dfrac{D_0(1+g_h)}{(r-g_h)}\left[1-\left(\dfrac{1+g_h}{1+r}\right)^{n_h}\right] + \dfrac{D_0(1+g_h)^{n_h}(1+g_l)}{(1+r)^{n_h}(r-g_l)}$, the price-per-share would have been very similar, where g_h and g_l represent the high and low rates of growth in the first and second stages (10% and 0%, respectively), and n_h represents the periods of high growth (16 years).

[16]The student could have also tried other combinations, including a simple beta equal to 1, a lower interest rate, because the "risk-free" Treasury rate was trading at practically zero percent, a lower risk premium, and it still pointed in the same qualitative direction. Our calculations ignored debt in the computation, because Potbelly was going to use IPO proceeds to pay down the debt to a value of just $1.13 million.

[17]General and administrative expenses typically have a significant portion that are fixed expenses, so growing at 10% may not have been realistic, but nevertheless, this is another quick and dirty way to examine the potential value of Potbelly.

[18]Enterprise value is defined as the market value of common stock plus market value of preferred equity plus market value of debt and minority interest minus cash and investments. It is a measure of the total value of a firm that includes debt. It is an alternative to the equity market capitalization of a company.

[19]AFC Enterprises owns or franchises Popeyes Chicken. They used to own Seattle's Best Coffee and Cinnabon, but those were sold off. Their ticker changed to PLKI in 2014 and the company was later acquired. In 2014, BAGL was acquired by JAB Holding Company and BDT Capital Partners and is no longer trading on the U.S. stock exchanges. Tim Hortons (THI) was purchased by Burger King in December 15, 2014 and the company name changed to Restaurant Brands International (QSR).

[20]The reader should note that although this is presented as a hypothetical illustration, it was actually done. When this analysis was done, the most recent values for each company were used. It did not change the basic qualitative implication of the analysis. The end–of–year 2012 values were chosen for this article to make it easier for the reader to replicate.

[21]Most Wall Street analyst reports had a target price of Potbelly between $30 and $32 per share.

[22]In the section Trading and Rebalancing, we discuss the Trader role in more detail.

[23]This calculation ignores individual student stock pick trades and only calculates the averages from basket trades. It is based on the average number of shares purchased for each stock trade in the basket. Interactive Brokers charges investors based on the number of shares traded instead of following the common practice of brokers of charging a fixed fee per stock trade.

[24]This statistic is somewhat misleading, since the average cost per share also includes many small trades that the fund completed, including 1 or 2 share trades that activate the minimum trading fee. If one excluded trades of less than 5 shares, the average commission per $10,000 trade is $5.00.

[25]We were told by IB that they do not charge us exchange fees for the fixed trading platform, which the sales representative referred to as "bundled" trading platform.

[26]This was the typical trade size since the inception of the SMF, however, this will vary depending on the total portfolio size, because we traded about 100 stocks on 75% of the total asset value of the fund. Starting in November of 2017, the SMF switched to an all–equity benchmark and became fully invested in the equity markets.

[27]See the Quant Model section for more information on the quantitative modeling process.

[28]In recent times, we have had trouble loading the files into IB. Unfortunately, the client support at IB has not been very helpful in assisting us with our problem. The issue is that many of the limit orders in the file disappear once loaded into IB and we have to manually adjust them.

[29]This might also be due to the fact that small-cap companies might have lower stock prices on average, leading to more shares being traded and slightly higher commissions.

[30]To give the reader a better understanding of IBs tier structure, we provide an example as we understand it. Suppose an investor trades 100,000 shares at a price of $8 per share on NYSE stock exchange within one month. The standard IB commission fee is $350 ($0.0035 per share). Distinct from the fixed or bundled structure, several fees are charged separately in the tiered structure, which comprise exchange fees of $300, clearing fees of $20 ($0.0002 per share), FINRA pass-through fees of $2.35 (0.056% of the standard fee), and NYSE pass-through fees of $0.74 (0.0175% of standard fee). The exchange fee can vary whether one is providing or removing liquidity to the exchange. In our calculations, we assumed that this trade removed liquidity from the exchange. In addition to this, there would be transaction fees and FINRA trading activity fees totaling $30.38. Thus, the total trading cost in this example could be as high as $703.47. These latter fees would only be calculated on sell orders. Thus, on the buy order, the total would be around $673.09

[31]For more information, see Chapter 15 of Chincarini and Kim [2006].

[32]We measured this as the cumulative return of the SMB Fama–French factor in those years.

[33]The most well-prepared students are typically MSFA students.

[34]Unfortunately, this is very similar to the grade inflation problem, where professors that make courses easy sometimes steal enrollment from better courses that are more difficult.

[35]Readers familiar with the Black–Litterman asset allocation model will appreciate this as the fact that every bet taken might have an implicit bet somewhere else. We also thank Jeff Silk for pointing this issue out in a guest lecture he gave to the SMF.

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