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The journal is the official publication of the Student Managed Investment Fund Consortium. The Consortium was created by a grant from the Lilly Endowment. The consortium focuses on student-managed investment fund leadership and research. SMIFC currently has over 150 member universities. The consortium holds an annual SMIFC conference every fall in Chicago. Since inception in 2013 the consortium has held nine annual conferences. Beginning in 2024, this expanded to include SMIFC-South. The Consortium is led by the journal's Executive Editor, Tarek Zaher, a professor at Indiana State University.

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The journal is sponsored by the Center for Investment Research. The Center was founded in 1993 by a prominent group of academics including Nobel Laureates Harry Markowitz and Larry Klein. The Center has funded research projects at a number of academic institutions since its inception. As part of its program to support student-managed investment funds, the Center currently sponsors the only textbook for student-managed funds: Student-Managed Investment Funds: Organization, Policy, and Portfolio Management, 2nd Edition. Information on the book can be found at www.investmentresearch.org/initiatives/student-managed-investment-fund-textbook/. The Center also sponsors a student-managed fund ranking. This ranking is the result of a survey of over 400 student-managed investment funds. The Top 25 Rankings can be found at www.investmentresearch.org/studentmanaged-investment-funds-rankings/.

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The Editor of the journal is Brian Bruce. Brian has over 30 years of experience editing journals and teaching student-managed investment fund classes. Brian has previously launched 6 investment journals and is currently the editor of the Journal of Investing, the Journal of Beta Investment Strategies, the Journal of Impact & ESG Investing, and the Journal of Behavioral Finance. Brian was a Visiting Professor of Investments and taught the student-managed investment class in the Hankamer School of Business at Baylor University for 18 years and currently serves on the fund's board. He also taught the student-managed portfolio classes for 11 years and served as the Director of the Finance Institute and Founding Director of the Alternative Asset Management Center at the Cox School of Business at Southern Methodist University.

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Submissions to the Journal can be sent to **submissions@smifjournal.com**.

EDITOR'S LETTER

Welcome to the inaugural issue of the **Journal of Student Managed Investment Funds**. We have an excellent Editorial Board and great articles for you.

We hope you enjoy this issue and want to invite professors and students to contribute articles on the various aspects of investing, portfolio management, trading, and administration in student-managed portfolios. As part of the journal launch, the normal $350 submission fee will be waived until further notice.

The **Journal of Student Managed Investment Funds** is currently an open access journal with articles freely available to everyone, including non-subscribers. The journal allows authors to self-archive pre-publication versions of their accepted papers in online repositories such as SSRN or authors' own websites.

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SMIF and Endowment Performance: A Comparative Study

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ABSTRACT

This study highlights key differences in fund characteristics, asset allocations, and returns between Student Managed Investment Funds (SMIFs) and postsecondary endowments. It contributes to the burgeoning body of research surrounding SMIFs by performing a unique macro-level summary of these funds. SMIFs are predominantly established as part of a university's endowment. Despite this peculiar and persistent inherent characteristic, the literature comparing these two funds is scarce. Yet, the available research data, as summarized in this paper, leads to conclusions that have numerous practical implications for SMIF and endowment managers. This study demonstrates that portfolio management strategies employed by endowments vary significantly from those observed in SMIFs. While endowments tend to follow and reflect defensive investment strategies, SMIFs invest significantly more myopically and exhibit higher risk tolerances. Our study also shows that SMIFs outperform endowments on average, which we attribute to their large apportionment to equities. Those findings should be considered in investment and funding decisions across US universities and colleges.

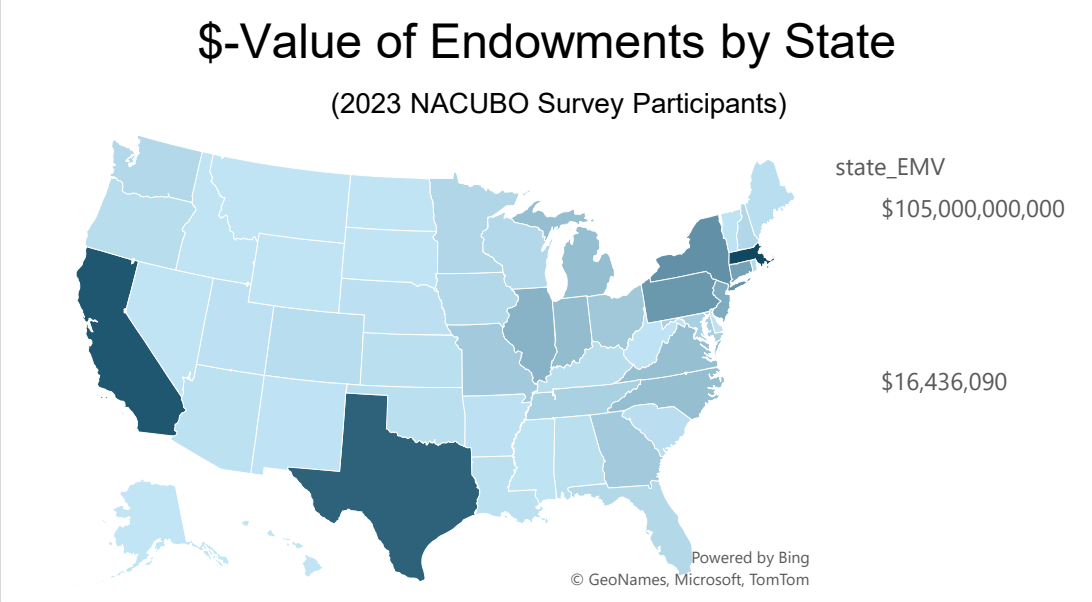
Introduction

The Link Between SMIFs and Endowments

The intriguing overlaps and disparities between SMIFs and endowments are perhaps most poignantly illustrated via a geographical map of the US. In Exhibits 1 and 2, we visually contrast

the market values of postsecondary endowments and SMIFs. Since SMIFs report to and are traditionally financed from an institution's endowment, one could make the erroneous assumption that the largest SMIFs should all exist at the wealthiest universities. This, however, is not the case. The maps demonstrate that the relationship between SMIFs' assets under management[1] (AUM) and university endowments' market values (Endowment_Market_Value*)* is more nuanced. Asymmetry in portfolio values is most visible in states located in the Northeast US, which host some of the largest endowments in the nation. Exhibit 2 illustrates that these endowments do not translate to particularly large SMIFs among those very same states. In fact, the biggest SMIFs happen to be found in the Midwest US, with the single largest SMIF by AUM found at the University of Dayton in Ohio. It boasts $67.8 million AUM (2021). The University of Minnesota comes in second place, with an AUM worth approximately $50 million (2022). Hence, a SMIF's size and prominence cannot be exclusively tied to endowment wealth. The next section will further elaborate on these disparities by summarizing relevant contributions found in academic literature.

Exhibit 1: Market Values of Endowments by State (USD, 2023)

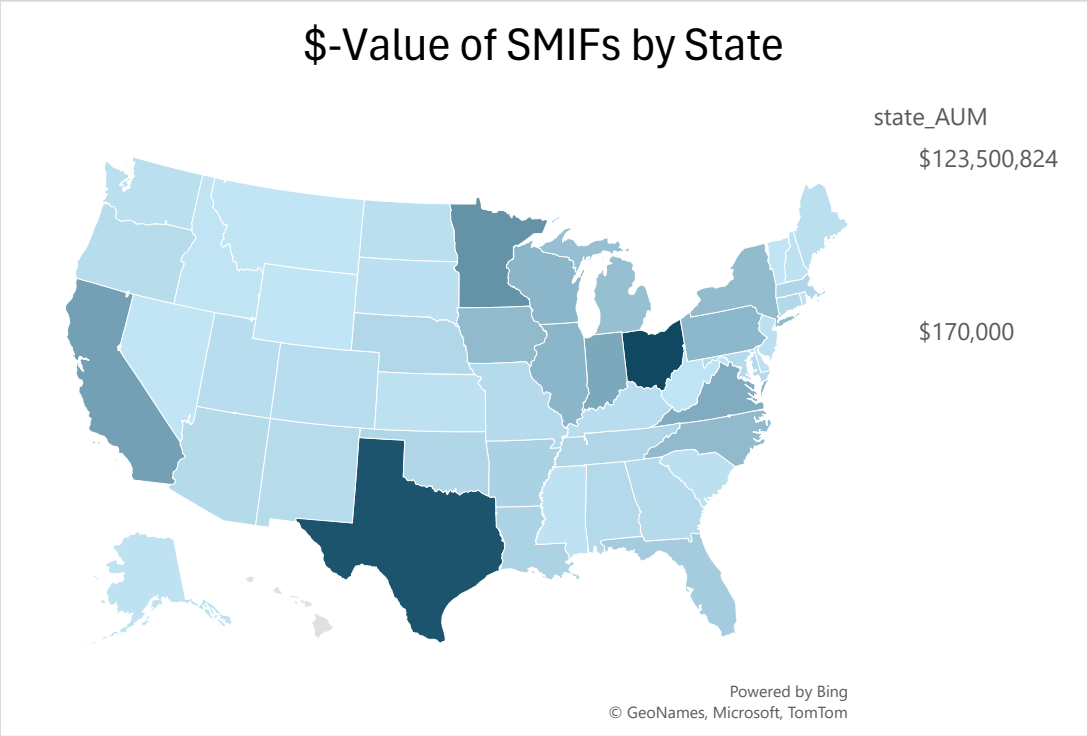


This map displays the gross market values (USD) of postsecondary endowments in each US state as of 2023. The darker shades of blue illustrate higher concentrations of well-endowed institutions. The lighter shades of blue signify lower concentrations of high-value endowments. The exhibit

[1] Assets under management in USD (AUM). There is a year associated with each AUM figure (*AUM_as_of_year*).

demonstrates that the wealthiest endowments are found in the US Northeast, California, and Texas. The map is constructed with Microsoft Excel and Bing Maps.

Exhibit 2: SMIFs AUM by State Map (USD)



This map displays the cumulative assets under management (USD) of US SMIFs for each US state. From the SMIFC dataset, we locate SMIFs in 49 states (None in Hawaii). The average year of AUM is 2019, and the median is 2021. The darker shades of blue indicate higher concentrations of high-value SMIFs. Lighter shades of blue show states with relatively low concentrations of high-value SMIFs. The largest SMIFs are found in the Midwestern states, Texas, and California. The map was constructed with Microsoft Excel and Bing Maps.

Summary of Leading Studies

Research on Endowments

Endowment literature is vast in terms of scope and application. Yet, despite having a natural connection to portfolio theory and asset management, many papers on this topic are not principally associated with any financial theory. In relation to the summary statistics we provide in later sections, we highlight significant empirical themes and characteristics of endowments as funds.

A well-known characteristic of university endowments is the notorious inequality in wealth observed across institutions. Day and Norton (2022) look at current and perceived endowment inequalities in the US and uncover something that approximates a Pareto distribution among the fund values. They observe that "the distribution of university wealth is extremely unequal," with the top 20% of universities having approximately 80% of the total endowment wealth, while the bottom 20% accumulate only 0.6% of it. Such a large imbalance should logically influence portfolio allocations and strategies, as well as the capital allotted to SMIFs.

Another reoccurring theme in relation to endowment characteristics is the measured diversification to alternative assets. Lerner, Schoar, and Wang (2008) discovered that eminent university endowments doubled their average holdings in alternative assets from roughly "11% in 1993 to 21% by 2005". This increase led to a fall in the "combined share of equities and fixed income [...] from 83% in 1993 to 73% in 2005". This characteristic suggests a concerted effort on the part of universities to achieve substantive asset diversification[2].

Some scholars attempt to find a plausible explanation for this growth in alternative asset investment. Goetzmann and Oster (2012) attribute the growth in alternative asset investments to a form of competitive trend following. They formulate "a metric capturing competition for undergraduate applications" to "test whether endowment performance relative to a school's nearest competitor is associated with the likelihood of changing investment policy, and conditionally, whether the nature of that change is consistent with the goal of catching up to its closest rival". As a result, Goetzmann and Oster "find evidence that endowments with below median holdings of alternative investments tend to shift policies in that direction". The authors dub this phenomenon "trend-chasing" and observe that endowments with recent positive experience with alternative asset classes tend to amplify exposure to those assets. Their research also leads to the conclusion that it is the competitive pressures amongst top university endowments that would best explain significant and rapid shifts in portfolio compositions.

In summary, an overview of research on university endowments suggests that those funds exhibit many idiosyncrasies as they vary greatly in wealth and composition. In recent years, endowments have worked to achieve higher levels of diversification, which correlates to a lower time preference than many standard mutual funds or retail investor portfolios. In the following sections, we endeavor to contribute to these core hypotheses by providing comprehensive summaries and comparisons of endowments as funds.

[2] Although we analyze a more recent time period, we note a continuation of this phenomenon in our study (see Exhibit 8).

Research on SMIFs

In stark contrast to research on endowments, the literature relating to SMIFs is noticeably limited. SMIF-related research largely centers on individual funds' performances. These studies are often conducted by fund managers or professors and are limited to their specific portfolio's performances, operations, and strategies. The findings are nevertheless helpful in explaining trends observed on a macro level. Mullen and Salvucci (2019) conducted a retrospective analysis of Stonehill College's undergraduate SMIF. They note that resources devoted to running SMIFs are often very restricted. This is mostly because of time constraints faced by the faculty's fund managers, who are distracted with "teaching, administrative and publishing requirements". These restrictions are unique to SMIFs because privately managed funds have designated professionals whose primary role is to focus on successfully managing clients' portfolios. Such constraints are likely to have measurable effects on the management of SMIFs and the application of prudent investment practices. Another important characteristic of SMIFs is their integral relationship with endowments. Lawrence (2008) conducts a comprehensive review of SMIFs worldwide and establishes that the majority of them are set up as part of the university endowment itself. To be exact, from written surveys, the author finds that "62% of all funds" were established in this manner while only "14% are set up as a separate entity, like a nonprofit foundation or trust to provide more autonomy from the university". This close association means that successful returns from SMIFs positively impact university endowments. SMIF returns are, therefore, of primary interest to endowments, and reliable SMIF performance should be met with greater allotments of capital for the student funds.

For more generalized summaries of SMIFs' characteristics, it is helpful to turn to private research organizations. One such reputable source is NACUBO-TIAA, which conducts an annual study of endowments[3] (NTSE). According to the NTSE (2021) report, student-run endowments are present at 225 of the 720 participant institutions.[4] Collectively, these SMIFs report nearly $520 million in assets, and the median fund value equals $800 thousand (Redd 2022). Remarkably, the same report notes that these funds outperformed the endowments. Their success is specifically attributed to SMIFs' higher exposure to equities. Another interesting statistic highlighted by the NTSE is that about 43% of the campuses with over $1 billion in total endowments have student-run funds, compared to only 10% of campuses with endowments worth less than $25 million (Redd 2022).

[3] The annual Study of Endowments conducted by NACUBO-TIAA (National Association of College and University Business Officers and the Teachers Insurance and Annuity Association of America) is a survey of the largest postsecondary institutions in the US and Canada (Redd 2023).

[4] For context, in the SMIFC sample, we are working with 618 and, later, 633 SMIF funds. Hence, this paper conducts a relatively larger analysis.

To summarize, leading studies from across the US demonstrate that SMIFs are active across US campuses and vary in size in similar patterns to endowments. Moreover, these low management cost funds can serve as profitable portfolios for the institutions themselves. The literature surrounding SMIFs implies that student-run portfolios have the potential to provide greater value than merely serving experimental and pedagogical purposes.

Data

The data in this analysis are primarily sourced from the NACUBO-TIAA Study of Endowments (NTSE), the Integrated Postsecondary Education Data System[5] (IPEDS) as well as Indiana State University's SMIF Consortium (SMIFC)[6].

Endowments Data

Data on university endowments are primarily taken from the above-mentioned annual NTSE reports. There are publicly available tables from the reports for every year from 2002 to 2023[7]. The total timeframe evaluated encompasses a period of 22 years. The annual reports are based on voluntary surveys. They provide detailed information on investment returns, asset allocations, and operational practices for endowments and affiliated foundations operated by US colleges and universities. The NTSE notes that participating institutions collectively hold over $630 billion in assets (2019). In this study, we isolate and examine tables containing data on endowment institutions, asset allocations, and annualized rates of return. In total, from the NTSE tables, we gather 17,212 institution-year observations with an average of 782 endowments represented per year.

The NTSE tables identify post-secondary institutions by name and by IPEDS_UNITID. IPEDS is an expansive public database of educational institutions in the US managed by the National Center for Education Statistics (NCES). We utilize the uniquely assigned IPEDS_UNITID codes to match institutions from the NTSE with SMIFs included in Indiana State's database. The process is accomplished via fuzzy match in Stata. Universities are matched based on their names and locations[8]. In addition, IPEDS_UNITIDs are matched to the IPEDS database directly for confirmation and to fill in any missing IDs. We gather all relevant tables concerning endowment institution information, asset allocations, and annualized rates of return to create three respective datasets, which are further described in the methodology sections of this study.

[5] IPEDS data on US colleges and universities can be accessed online from https://nces.ed.gov/ipeds

[6] The Student Managed Investment Fund Consortium (SMIFC) is a community of colleges and universities with a shared vision for student success and leadership in investment management. Research tables can be accessed at https://www.indstate.edu/business/SMIFC/research/stats

[7] Public tables can be accessed online from https://www.nacubo.org/Research/2023/Public-NCSE-Tables

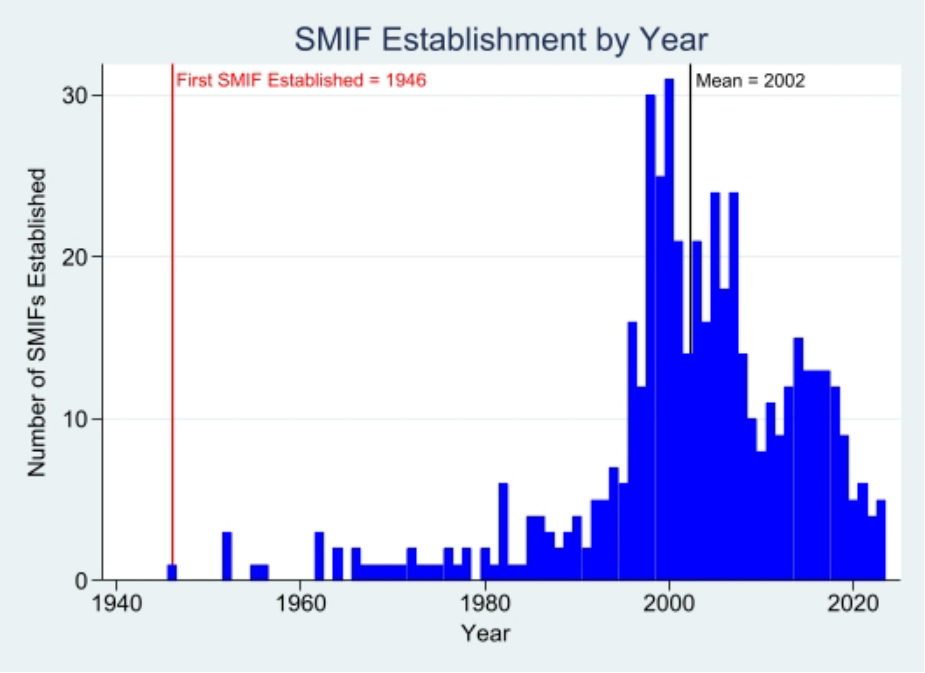
[8] The matched location parameters are State and City.

SMIFs Data

Data on SMIFs are predominantly sourced from the SMIFC statistics tables managed by Indiana State University. This database contains information on funds' characteristics such as university names, AUM, year of founding (Year Formed), associated websites, as well as other important dates and notes. Notably, the initial statistics do not contain much data on SMIFs' returns and portfolios. We gather this data independently and web-scrape public reports on SMIFs' returns and portfolios using websites provided by the SMIFC database. This contributes 130 observations for SMIFS' portfolio allocations and 73 observations relating to portfolio returns. Exhibit 4 presents summary information on all SMIF dataset variables. A particular university may have multiple SMIFs in operation. In the expanded dataset, the SMIFs span 49 of the 50 states (none in Hawaii). These funds operate in public and private postsecondary institutions. The average year of founding for SMIFs is 2002. The oldest SMIF was founded in 1946 at Lafayette College in Pennsylvania. New SMIFs continue to be established every year. We provide a histogram (Exhibit 3) to illustrate SMIF creation over the years and observe an acceleration in new funds at the turn of this century.

To summarize, after our independent contributions, the working dataset contains 534 AUM values for the 633 listed SMIFs. Additionally, there are 413 values for matched endowments and 383 values for SMIFs as a percentage of endowments. In terms of portfolio data, we contribute 130 values for portfolio compositions and 278 SMIF-year return values.

Exhibit 3: Histogram of SMIF Establishment by Year



This histogram graphs the number of US SMIFs established over time. The y-axis displays the total number of funds established each year. The x-axis contains the year of establishment for a given SMIF. A total of 495 SMIFs are graphed below. The oldest SMIF was founded in 1946. The newest SMIF was founded in 2024. The average year of formation is 2002, while the median year of formation is 2003. The graph was produced with the histogram function in Stata.

Methodology

This section contains information on how the tables provided below have been constructed. There are four main tables encompassing all the data obtained on SMIFs and postsecondary endowments. We start by describing the construction of these four main tables and later delve into the additional tables used to highlight key differences and similarities between SMIFs and endowments.

SMIFs

Exhibit 4 provides an unprecedented overview of SMIF performance and size across the US. To construct this table, we retrieve statistics from Indiana State University's proprietary SMIFC database. As of the date of publication of this paper, a public and simplified version of this database exists on the university website, but the specific version we construct requires considerable independent data retrieval. We use fund websites provided in the initial statistics to individually web-scrape and update any existing data on portfolio returns and compositions. Some funds are very transparent and openly report their historical performances and portfolios regularly. From the funds' websites, we generate new variables that detail annual returns and the most recent portfolio allocations. Funds that are exclusive to a particular asset class (i.e., all equity, fixed-income, venture capital), retain a score of 100 (%) for the applicable variable (SMIF_%_Equity, SMIF_%_FI, SMIF_%_Other). Annual portfolio returns can be reported on a calendar year or fiscal year basis. When possible, we opt for the calendar year annual returns of SMIFs which match the reporting format of endowments and index benchmarks. Using these returns, we generate portfolio return variables for each year evaluated (PR_year). The Mean_PR variable measures the mean portfolio returns for a given fund throughout the period of interest. Notably, a particular SMIF may only have a few PR_year observations represented by the Mean_PR variable. This problem is especially pronounced in the early years of the dataset, where only 7 funds report returns for the year 2002. By 2023, there are 73 funds with annual return data.

After finalizing the data retrieval process, we then match SMIFs to the endowments listed in the NTSE reports. The matching process is accomplished by retrieving IPEDS_UNITID codes for each institution. We also use the IPEDS database to perform a fuzzy match to retrieve each university's ID. This match allows us to generate variables detailing corresponding endowments' market values (Matched_endowment) and the SMIFs' proportions to those figures (SMIF/endowment). SMIFs and

endowments are matched by year so that the variable computes applicable percentages. SMIFs' proportions to endowments are calculated by dividing AUM by the matched endowment's market value (Matched_endowment). The simplified SMIFC dataset comprises 618 funds and 11 variables. Through our independent contributions, this expands to 633 funds and 40 variables.

Exhibit 4: SMIFs

Summary Statistics

Panel A: SMIFs Data						
	N	Mean	Median	SD	Min	Max
IPEDS UNITID	633	182776.3	184603	48188.71	100654	495767
Control number	633	1.52	2	0.5	1	3
Year Formed	495	2002.31	2003	12.68	1946	2023
AUM	534	1752739	450000	4921469	2000	67800000
AUM start value	70	397815.4	100000	977929.6	800	7750000
AUM as of year	588	2019.48	2021	4.58	2002	2024
State AUM	633	33693654	33086068	32714031	170000	124000000
Matched endowment	413	1370000000	273000000	4060000000	14834000	51900000000
SMIF/endowment	383	0.45 (%)	0.17 (%)	0.76 (%)	0 (%)	8.42 (%)
SMIFC Membership Year	130	2017.75	2018	3	2013	2023
Portfolio Allocation as of year	120	2022.05	2023	2.75	2009	2024
Panel B: Portfolio Allocations (%)						
SMIF % Equity	130	86.19	95.03	21.39	0	100
SMIF % FI	96	10.3	0	19.51	0	99.5
SMIF % Cash	98	6.2	2.03	11.32	0	77.38
SMIF % Other	92	4.8	0	15.92	0	100

Panel C: Portfolio Returns (%)						
PR 2002	7	-13.34	-15.37	9	-22.18	4.22
PR 2003	7	21.33	26.33	14.36	1.49	36.17
PR 2004	7	8.47	11.63	6.87	-1.74	14.67
PR 2005	7	9.57	11.23	4.46	2.51	13.97
PR 2006	8	8.4	7.9	4.91	-0.16	13.64
PR 2007	8	11.16	10.85	8.91	-1.08	28.89
PR 2008	9	-26.5	-26.58	10.92	-38.1	-11.99
PR 2009	11	15.04	21.44	20.35	-30.86	33.6
PR 2010	12	14.63	12.17	9.1	3.67	32.59
PR 2011	13	4.21	2.15	8.05	-2.12	26.22
PR 2012	13	9.07	13.3	7.99	-9.25	16.87
PR 2013	14	24.67	23.46	9.14	9.6	43
PR 2014	15	11.19	9.77	8.03	-4.18	28.07
PR 2015	17	-1.58	-0.33	6.03	-15.32	8.36
PR 2016	19	6.97	5.15	8.76	-7.42	26.79
PR 2017	23	14.01	15.4	7.38	2.33	26.82
PR 2018	21	-0.13	-2.16	9.1	-13.74	22.8
PR 2019	24	21.96	17.7	12.21	5.7	42.8
PR 2020	30	17.8	18.49	15.56	-21.08	52.59
PR 2021	30	22.89	22.7	13.25	-1.3	50.41
PR 2022	33	-12.85	-15.2	6.92	-24.61	6.02
PR 2023	31	16.55	16.24	14.42	-8.53	70.8
Mean PR	73	9.95	9.83	10.27	-24.61	42.8
SMIFs PRM	22	8.34	10.37	12.81	-26.5	24.67

The table presents summary statistics for SMIFs in the US. The original data is sourced from Indiana State's SMIFC statistics. Initially comprised of 10 variables and 618 funds, we contribute an additional 30 variables found via web-scraping that pertain to SMIF portfolio allocations and returns along with relevant dates and links. The summary statistics below provide insight into the fund characteristics of 633 US SMIFs.

Endowments and Institutions

Exhibit 5 provides an overview of US endowments and their institutions. Key variables include year (Year), institution names (INSTNM), IPEDS IDs (IPEDS_UNITID), current and lagged endowment market values (Endowment_Market_Value, Lagged_Endowment_Market_Value), full-time enrollments (FTE) and annual changes in endowment market values (Endowment_Growth). The Endowment_Growth variable is simply the current endowment market value divided by the previous year's, subtracted by

one. This variable is used as a proxy for endowment performance, but it does include account transfers unrelated to asset yields. Exhibit 5 is the product of merging annual tables from the NTSE (2002 to 2023) that are titled "Endowment Market Values". Since the original raw tables require some nominal data cleaning, we destring and unscale all variables into one merged file and match corresponding IPEDS_UNITIDs to each postsecondary institution. This enables a direct comparison of endowments and SMIFs. Numerous endowments are not university-specific but rather system-specific.[9] This means that there can be several universities included in each endowment figure.[10]

The table presents summary statistics for endowments and institutions. The data are sourced from public NTSE annual reports. Each annual report table on "Endowments and Institutions" is merged and destringed to create a single file. There are 17,212 fund-year observations and an average of 782 fund survey participants per year. The table ranks endowments and institutions by market values and includes values corresponding to IPEDS_UNITID, City, State, Control status, and full-time enrollment (FTE). The observations span from 2002 to 2023.

Exhibit 5: Endowments Market Values

Summary Statistics

	N	Mean	Median	SD	Min	Max
Total Institutions	22	782.27	788.5	62.29	654	865
Year	17212	2012.5	2012	6.13	2002	2023
Rank	17210	394	392	229.8	1	865
IPEDS UNITID	13757	182303.64	183239	45347.83	100654	495767
Control number	11571	1.77	2	0.42	1	2
FTE	4808	10883.71	3975	19514.72	0	300856
Endowment Market Value	17212	624000000	109387500	2451000000	159000	51900000000
Lagged Endowment Market Value	17075	592100000	104746000	2321000000	159000	51900000000
Endowment Growth (%)	17075	6.63	6.37	15.13	-59.67	565.68
Annual Mean Endowment Growth (%)	22	6.63	6.91	10.67	-18.69	29.98
Endowment/FTE	4791	162661.51	42058.19	719749.19	8.23	35728988

[9] Such as in the case of The Texas A&M University System & Related Foundations* observations.

[10] E.g. Texas A&M College Station, Texas A&M Galveston, etc. counted as one endowment observation.

Endowments Asset Allocations

Exhibit 6 summarizes endowments' portfolio allocations by asset class for the 22-year time horizon. Figures are derived from the referenced NTSE tables which divide the institutions by market values[11], institution types[12] and computed averages[13]. The sample represented skews towards larger institutions valued at over $5 billion. These mega endowments comprise 58% of the total market value. An equally weighted average of these allocations is therefore more indicative of endowment trends.

The dataset construction process largely mimics the procedures described in previous sections. First, we download all relevant tables from the NTSE called "Summary Asset Allocations". Next, we merge all tables into one master file. We then destring observation values where applicable and assign group codes to the various asset classes available. To increase readability, we remove superfluous observations that describe the institutions too granularly. These observations separate endowments by market values and institution types. Such data cannot be matched to what is currently available from the SMIFs table. As a result, in Exhibit 6 we summarize the equally- and dollar-weighted averages of endowments' asset allocations.

Cumulatively, the working dataset includes 22 observations using the following classifications: portfolio allocations to equities (Equity), fixed income (FixedIncome), and alternative assets (Alternative OtherAssets). There are also 18 observations for allocations to cash (Cash). These four classifications represent the complete composition of endowments' portfolios. Other variables simply break down the initial four classifications to include the following: exposures to US equities, global equities, short-term securities, and others[14]. Over the 22-year period, asset classes are sometimes changed, removed, or added. This reclassification occurs five times in our dataset (2009, 2019, 2020, 2022 and 2023). New classifications always fit under the initial four (Equity, FixedIncome, AlternativeOtherAssets, Cash). Thus, to avoid double counting and loss of generality, we center the bulk of our comparisons on these four percentages.

[11] The market value ($USD) tranches are divided as follows: Over $1 Billion, $501 Million to $1 Billion, $101 Million to $500 Million, $51 Million to $100 Million, $25 Million to $50 Million and Under $25 Million.

[12] The institution types are as follows: All Public Institutions, Public College, University, or System Institution-Related Foundations Combined Endowment/Foundation and All Private Colleges and Universities.

[13] The computed averages either follow a dollar-weighted or equal-weighted average for all participating institutions.

[14] After 2009, the following categories of assets are included: ST_Securities, USequities, NonUSequities, GlobalEquities, RealAssets, Otherequties, AlternativeStregies, RealEstate, HedgeFunds, PrivateEquity, entureCapital, NaturalRessources, MarketableSecurities, Cash, Other.

Exhibit 6: Endowments Asset Allocations

Summary Statistics

Panel A Dollar-Weighted Average (%) 2002-2023						
	N	Mean	Median	SD	Min	Max
Year	22	2012.5	2012.5	6.49	2002	2023
Equity	22	37.79	35.1	7.45	27.93	50.8
FixedIncome	22	12.33	11.4	4.25	7.56	23.4
Cash	18	2.92	3.21	1.34	0.5	5
AlternativeOtherAs~s	22	47.46	52	10.62	25.2	61.37
RealEstate	7	4.96	4.5	0.84	4	6.5
HedgeFunds	8	19.04	17.3	8.61	11.3	39
PrivateEquity	9	6.88	4.3	4.71	3.2	15.4
VentureCapital	9	4.82	3.3	3.25	2.7	11.8
NaturalResources	7	3.77	3.6	1.54	2	6.5
Other	11	1.47	1	0.76	0.8	2.73
USEquities	14	15.15	16	1.81	11.2	18
NonUSEquities	14	16.25	16.5	3.17	9.85	20
AlternativeStrateg~s	12	52.31	52.5	3.02	45.09	58.64
ShorttermSecuritie~r	10	3.9	4	0.57	3	5
GlobalEquities	4	7	6.94	0.38	6.6	7.5
RealAssets	4	11.1	11.11	0.98	9.9	12.3
MarketableAlternat~s	2	18.5	18.5	2.12	17	20
Panel B Equal-Weighted Average (%) 2002-2023						
Year	22	2012.5	2012.5	6.49	2002	2023
Equity	22	51.41	50.45	4.58	46	59.9
FixedIncome	22	19.43	19.15	3.13	15	26.9
Cash	18	4.96	4.5	1.47	3.31	8
AlternativeOtherAs~s	22	25.11	28	6.43	11.8	34.69
RealEstate	7	3.21	3.1	0.51	2.7	4.1
HedgeFunds	8	10.05	9.15	4.77	5.1	20.1
PrivateEquity	9	3.02	1.9	2.53	0.9	7.6
VentureCapital	9	1.49	0.9	1.2	0.8	4.1
NaturalResources	7	1.09	0.9	0.69	0.4	2.2
Other	11	1.52	1.5	0.17	1.27	1.94
USEquities	14	29.68	30	1.53	26.29	31
NonUSEquities	14	16.87	16.5	2.59	12.4	21
AlternativeStrateg~s	12	27.78	28	2.36	23.93	33.42
ShorttermSecuritie~r	10	6	6	1.15	4	8
GlobalEquities	4	7.81	7.77	0.35	7.5	8.2
RealAssets	4	7.04	7.12	0.32	6.6	7.3
MarketableAlternat~s	2	11.55	11.55	2.05	10.1	13

Exhibit 6 presents summary statistics for endowments' asset allocations. Data are sourced from public NTSE annual reports from 2002 to 2023. The table reports equity, fixed-income and alternative asset proportions for each of the 22 years observed. From 2019 to 2022, the NTSE classified cash as fixed-income. Asset classifications changed five times throughout the period observed and became

more granular. Any additional variables collectively fit under the initial equity, fixed-income, alternative asset, and cash percentages. Panel A displays the dollar-weighted averages for endowments. Panel B uses an equal-weighted average for the percentages displayed.

Endowments Rates of Return

Exhibit 7 summarizes the portfolio and benchmark rates of return of all participating institutions from 2002 to 2023. The initial NTSE return rate tables classify data by market values, institutional-types, and weighting methods. The primary variables of interest are the 1-year, 3-year, 5-year and 10-year annualized returns of endowments or benchmarks. The annualized returns are net of external management fees and expenses and apply equal weights for all endowments. As such, the table does not isolate individual university returns but instead compiles them all into a grand average for the survey participants. The benchmarks of choice published by the NTSE are the LB Bond Aggregate Index (Bloomberg), the S&P500 and the Rusell 3000. We omit the Rusell 3000 from the table since equity performance is sufficiently represented by the S&P500.

To construct the table in full, we download all NTSE tables that capture "Annual Rates of Return". We merge a total of 22 tables into Stata and destring any numeric variables. Lastly, we assign group codes to each of these rates and use Stata to summarize the return statistics (Exhibit 7). In this study, the crux of our analysis centers on the 1-year equally-weighted average of these returns (1-year_return). SMIF returns and endowment market value changes likewise follow a 1-year equally-weighted basis.

Exhibit 7: Endowments and Benchmarks Return Rates

Summary Statistics

	N	Mean	Median	SD	Min	Max
Year	22	2012.50	2012.50	6.49	2002.00	2023.00
1-year return	22	6.54	7.95	10.67	-18.70	30.60
3-year return	22	6.25	7.75	4.87	-4.20	12.40
5-year return	22	6.21	5.6	3.05	1.1	11.7
10-year return	22	7.1	7.15	1.85	3.4	9.9

Panel B: S&P500 Return (%)						
1-year return	22	9.31	9.5	15.91	-26.2	40.8
3-year return	22	7.75	10.95	9.67	-11.3	18.6
5-year return	22	7.46	9.15	7.09	-2.4	18.8
10-year return	22	8.31	8.1	4.74	-2.2	14.8
Panel C: Bloomberg Aggregate Bond Index Return (%)						
1-year return	22	3.99	6	4.91	-10.3	10.4
3-year return	22	4.31	4.1	3.11	-4	10.1
5-year return	22	4.64	4.7	1.99	0.8	7.6
10-year return	22	5.04	5.35	1.82	0.15	7.4

Exhibit 7 presents summary statistics for the return rates of endowments and associated benchmarks. It presents fund return percentages on a 1-year, 3-year, 5-year and 10-year basis. The statistics below are the result of merging and destringing NTSE tables entitled "Annual Rates of Return" from 2002 to 2023. Panel A reports endowment portfolio returns. Panel B reports S&P500 returns. Panel C reports Bloomberg Aggregate Bond Index returns. There are 22 observations for each variable.

Results and Comparisons

SMIFs Characteristics

From Exhibit 4, we conclude that SMIFs exhibit a great degree of in-group heterogeneity. The variation in SMIF sizes is one of the most remarkable findings from the table. We observe that the mean SMIF *AUM* is $1,752,739 while the median SMIF *AUM* is just $450,000. The standard deviation for *AUM* computes to $4,921,469. Much like endowments, large inequalities can be found by comparing the SMIFs. Based on the Exhibit 4 data, we also note that SMIFs seldom comprise more than half a percent of their corresponding endowments' market values. On average, a SMIF is just 0.45% of its matched endowment's value. The median proportion is a meager 0.17%. Incidentally, the largest SMIF by *AUM* (University of Dayton) produces the maximum percentage of a SMIF to its endowment's value at 8.42%.

The bulk of the data on SMIFs' allocations is quite recent with the median year reported for *AUM* being 2021. Most of these SMIFs are long equities which explains the mean equity exposure of 86.19%.

Fixed-income allocation comes second highest in percentages with a mean allocation of 10.30%. Allotment to cash amounts to a mean of 6.20%. Unlike endowments, exposure to alternative or other assets only averages 4.8%.

The consequences of high equity exposure are very apparent. In line with the previously referenced NTSE report (2021), we observe that SMIF returns outperform endowment returns, on average. SMIFs yield a mean rate of return equal to 8.34% year-over-year (SMIFs_PRM). This comes at a high cost in terms of variability (standard deviation) which equals 12.81%. Furthermore, consistent with the notion that SMIFs' are overexposed to equities, the evaluated SMIFs yield particularly high returns in bull market years (16.55% in 2023, 22.89% in 2021 and 21.96% 2019) and disappointing results in bear market years (-12.85% in 2022, -26.50% in 2008 and -13.34% in 2002). In later sections, we contextualize these findings further by benchmarking them to relevant indexes and the two proxies for endowment yields.

Endowments and Institutions

Exhibit 5 provides a macro-level summary of endowment market values and their annual percentage changes from 2002 to 2023. These figures demonstrate a remarkable and steadfast growth in postsecondary endowments throughout many market downturns and crises. On average, endowments grow at a rate of 6.63%. This statistic is the mean change in endowment value and is a proxy for fund performance, later in this analysis. It is important to note that the rate is not equal to pure portfolio returns. It can also reflect increases due to donations, balance transfers and any other account altering transactions not related to portfolio yields. Intriguingly, mean endowment growth only declined during the 2008-2009 GFC (Exhibit 11). Postsecondary endowments maintained stable growth during the coronavirus pandemic from 2019 to 2021, which undoubtedly affected enrollments and donations. Other variables demonstrate that NTSE participants are significantly biased towards larger universities. For all years, the mean endowment value is $624 million. The median endowment value is much lower at $109 million. By 2023, the mean endowment value is $1.21 billion, and the median is just $216 million. Consequently, these results display a great degree of variability amongst endowment market values which generates a standard deviation of $2.45 billion for the full period analyzed. Cumulatively, these statistics are consistent with research results provided by academics, such as Day and Norton (2022) who observe that "the top 20% of universities have 80% of the total university endowment wealth while the bottom 20% have around 1%."

Endowments Asset Allocations

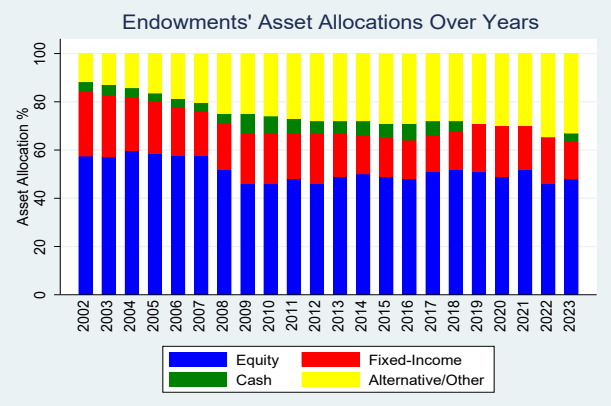
Exhibit 6 contrasts endowments' dollar- and equally-weighted portfolio allocations for the 22-

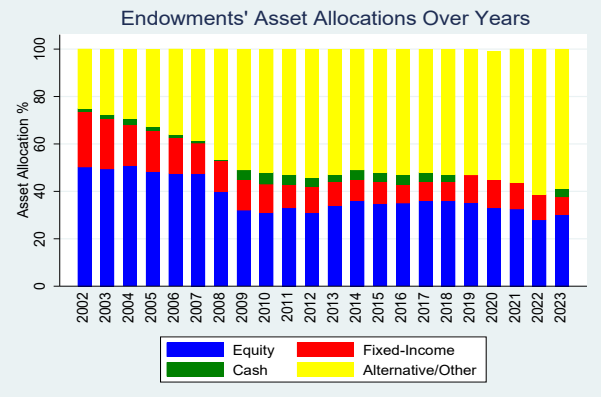
year period evaluated. The primary asset classifications of interest are equities (Equity), fixed-income (FixedIncome), alternative assets (AlternativeOtherAssets), and cash (Cash). As before, we note that the other classifications are already captured by these initial four. The table demonstrates that larger endowments (as emphasized in the dollar-weighted table) are much more diversified and less allocated to traditional equity and fixed-income investments.

The dollar-weighted average allocation to equities is 37.79%. On an equally weighted basis, this becomes 51.41%. The dollar-weighted average allocation to fixed-income is 12.33% versus 19.43% when funds are averaged with equal weighting. Next, the dollar-weighted exposure to alternative assets (non-traditional equity or fixed-income) is 47.46% compared to just 25.11% on an equally weighted basis. There are fewer observations for allocations to cash due to a change in classifications that occurred in 2019 which allocated cash and near-cash to fixed-income. For the period observed, endowment allocation to cash averages 2.92% on a dollar-weighted basis versus 4.96% on an equal-weighted basis.

Using the above-described methodology and statistics reflected in Exhibit 6, we produce Exhibit 8. The stacked bar graph illustrates measured growth in diversification as time increases. A visible growth in endowment exposure to alternative assets occurs from 2002 to 2005 as detected by Lerner, Schoar and Wang (2008). Remarkably, this trend continues throughout the entire period observed until 2023. These results corroborate the trend following the phenomenon observed by Goetzmann and Oster (2012). Post-GFC, endowment allocations to equities decline significantly. On average, endowments hedge equity and fixed-income exposure through investments in alternative, sometimes non-securitized assets. Based on these results, we conclude that typical endowment investment philosophy amounts to a traditionally more defensive approach.

Exhibit 8: Endowments Asset Allocations Over Years





The stacked bar graphs above illustrate changes in endowments' asset allocations from 2002 to 2023. In the first graph, allocation percentages follow a dollar-weighted average for all years of interest. This weighting biases towards the top 20% of universities which hold approximately 80% of the total endowment wealth. Larger universities appear to be setting trends in asset diversification. The second stacked bar graph employs an equal-weighted average over the sample period, offering an unbiased perspective that is not skewed by larger funds. It provides insight into portfolio trends on a macro level. Diversification is less pronounced for smaller endowments which align them more closely to SMIFs. Investments in alternative assets rise as time increases. From 2019 to 2022, the NTSE classified cash as a form of fixed income.

Endowments Rates of Return

This section offers a general summary of the performance of endowment portfolios. The endowment returns classified in Exhibit 7 are collective for all participating institutions in the NTSE. On average, 782 institutions participated in the annual survey. The *1-year_return* variable is the annual NTSE-provided value for endowment or benchmark returns. We also include the 3-year, 5-year and 10-year returns for endowments and benchmarks.

From 2002 to 2023, the mean endowment portfolio return is 6.54% (*1-year_return*). The median annual return equals 7.95%. These yields produce a standard deviation of 10.67%. The mean 3-, 5- and 10-year returns for endowments are 6.25%, 6.21% and 7.10%, respectively. The statistic for standard deviation decreases as the yield time horizon lengthens and reaches a low of 1.85% for the *10-year_return* variable. The benchmark for equities is the S&P500 which outperforms endowments and produces a 1-year return of 9.31%. The S&P500 also outperforms mean endowment returns on the 3-, 5- and 10-year basis. The benchmark for fixed-income is the Bloomberg Aggregate Bond Index, which produces a mean annual return of 3.99%. Endowments succeed in outperforming this benchmark on the 1-, 3-, 5- and 10-year time horizons. The results of this table add credence to the notion that endowments operate with much less risk exposure than SMIFs and invest more defensively. In the next section, we illustrate this point further by highlighting divergencies in portfolio management styles between SMIFs and postsecondary endowments.

SMIFs and Endowments Portfolio Allocations

Exhibit 9 compares average portfolio allocations for SMIFs and endowments. We construct this table with the summary statistics summarized in Exhibits 4 and 6. The data shown suggest that endowments on average follow a comparatively more defensive investment philosophy than SMIFs. Conversely, the latter employ more risk-tolerant and myopic strategies. The predominant asset class for both funds is equity. For SMIFs, this computes to an average exposure of 86.19%. For endowments,

there is an average equity exposure of 51.41%. Fixed-income can be the sole asset class of some SMIFs; however, it only comprises 10.30% of the average portfolio. Bond exposure averages approximately 19.43% for endowments. Another large discrepancy occurs regarding the other/alternative assets category. This classification only makes up 4.80% of the average SMIF, however it comprises 25.11% of the average endowment. Also, SMIF allocation to cash averages 6.20% versus 4.96% for endowments.

There are multiple intuitive explanations for those disparities in allocations. First, many SMIFs are explicitly long equity only. This is their stated mandate from inception, which differentiates them from a typical endowment, and forbids making investments in a variety of asset classes. Second, endowments and SMIFs differ significantly in management. The latter funds face considerably higher degrees of management turnover, including the fund analysts. Students usually graduate within four years hence funds must recruit new analysts much more frequently. There are also inherent and stringent time constraints for university courses (as Mullen and Salvucci (2019) observe) which contribute to the emphasis on security analysis over fixed-income and alternative asset research. Finally, the disparity reliably correlates to the sizeable differences in values-at-risk. As observed earlier, the average SMIF is just 0.45% of its matched endowment market value. Endowments dwarf SMIFs in size and obligations. Endowments cannot dependably subject such large portfolios to unpredictable and undiversifiable volatilities.

Exhibit 9: Comparison of SMIFs and Endowments Portfolio Allocations

Panel A: SMIFs Asset Allocations (%)						
	N	Mean	Median	SD	Min	Max
SMIF % Equity	130	86.19	95.03	21.39	0	100
SMIF % FI	96	10.3	0	19.51	0	99.5
SMIF % Cash	98	6.2	2.03	11.32	0	77.38
SMIF % Other	92	4.8	0	15.92	0	100
Panel B: Endowments Asset Allocations (%)						
Equity	22	51.41	50.45	4.58	46	59.9
FixedIncome	22	19.43	19.15	3.13	15	26.9
Cash	18	4.96	4.5	1.47	3.31	8
AlternativeOtherAs~s	22	25.11	28	6.43	11.8	34.69
RealEstate	7	3.21	3.1	0.51	2.7	4.1
HedgeFunds	8	10.05	9.15	4.77	5.1	20.1
PrivateEquity	9	3.02	1.9	2.53	0.9	7.6
VentureCapital	9	1.49	0.9	1.2	0.8	4.1
NaturalResources	7	1.09	0.9	0.69	0.4	2.2
Other	11	1.52	1.5	0.17	1.27	1.94

USEquities	14	29.68	30	1.53	26.29	31
NonUSEquities	14	16.87	16.5	2.59	12.4	21
AlternativeStrateg~s	12	27.78	28	2.36	23.93	33.42
ShorttermSecuritie~r	10	6	6	1.15	4	8
GlobalEquities	4	7.81	7.77	0.35	7.5	8.2
RealAssets	4	7.04	7.12	0.32	6.6	7.3
MarketableAlternat~s	2	11.55	11.55	2.05	10.1	13

The table presents summary statistics on annual portfolio allocations for SMIFs (Panel A) and endowments (Panel B). The averages are computed on an equally-weighted basis so that each fund's allocations have an equal effect on the summary statistics. SMIFs exhibit more risk tolerance through higher exposures to equities while endowments diversify investments more defensively.

Comparison of SMIFs, Endowments and Benchmarks Returns

In Exhibit 10, we provide an overview of funds' yields from 2002 to 2023. There are five funds included in the table with each containing 22 observations. The first fund (SMIFs_PRM) represents collective SMIFs' annual portfolio returns per year. This figure is imported from Exhibit 4. There are two measures for endowment returns. The first (Endowments_%_Growth), is the mean change in endowment market values per year. This is pulled from Exhibit 5. The second endowment figure is the mean rate of return from endowment portfolios per year (Endowments_PRM). This figure comes from Exhibit 7. The last two funds are the index benchmarks: one representing equity returns (S&P500) and the other representing bond performance (LB_Bond_Index). These two variables are also imported from Exhibit 7. The return_(%) variable is the annual return of each fund while the Year variable contains the particular year associated with the yield. On average, S&P500 returns produced the highest average returns over the 22-year period. The index produces an average yield of 9.31%. SMIFs produce a competitive yield of 8.34% on average. This statistic is 1.71% higher than the highest proxy for endowments' performance (Endowments_%_Growth). Endowments' market values change at an average of 6.63% and the portfolio returns produce a mean of 6.54%. Taking last place in terms of performance, the LB Aggregate Bond Index produces an annual mean return of 3.99%.

Since 2002, capital markets have experienced many notable "bull" and "bear" cycles. The results published in Exhibit 10 demonstrate that on average, SMIFs outperform endowments and fixed-income benchmarks if seen from a longitudinal study perspective.

One cautionary note on this remarkable performance is the pronounced volatility of SMIFs' returns relative to endowments. The *SMIFs_PRM* variable produces a standard-deviation of 12.81%. For *Endowments_%_Growth* and *Endowments_PRM* we observe standard-deviations equal to 10.67%. The standard-deviation of S&P500 returns stands at 15.90%. This is the highest figure for standard-

deviations in the table. The fixed-income benchmark produces the lowest standard-deviation of returns, equal to only 4.91%.

SMIFs are likely highly sensitive to market conditions and management policies. The next section will analyze these fund returns on a yearly basis and allow us to see if SMIF dominance is challenged during market downturns.

Exhibit 10: Comparison of SMIFs, Endowments and Benchmarks Returns

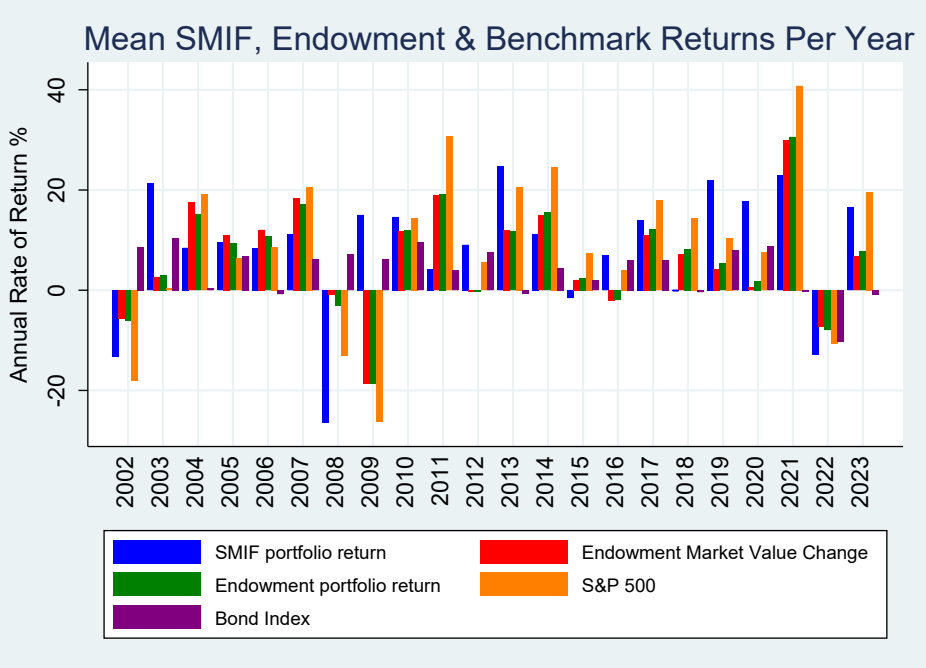
	N	Mean	Median	SD	Min	Max
Year	22	2012.5	2012.5	6.49	2002	2023
SMIFs_PRM						
return (%)	22	8.34	10.37	12.81	-26.50	24.67
Endowments % Growth						
return (%)	22	6.63	6.91	10.67	-18.69	29.98
Endowments_PRM						
return (%)	22	6.54	7.95	10.67	-18.70	30.60
S&P500						
return (%)	22	9.31	9.50	15.90	-26.20	40.80
LB_Bond_Index						
return (%)	22	3.99	6.00	4.91	-10.30	10.40

Exhibit 10 compares summary statistics of SMIF, endowment and benchmark returns. Returns are calculated on a 1-year basis and the period of analysis is 2002 to 2023. *SMIFs_PRM* is the annual return of all SMIFs for a given year. The *Endowments_%_Growth* variable is the mean change in endowments' market values per year. The *Endowments_PRM* variable presents endowment portfolio returns per year. We include 2 variables for benchmarks. The S&P500 variable produces the mean 1-year return of the S&P 500 benchmark index. The bond-index variable is the Bloomberg LB Aggregate for fixed-income *(LB_Bond_Index*). SMIF returns outperform all funds except the S&P500. The standard deviation of SMIF returns is also second highest behind the S&P500.

Exhibit 11 graphs mean SMIF, endowment and benchmark performances over the period of 22 years. The dataset's period ranges from 2002 to 2023, which includes some market downturns but is overall a net favorable timeframe for equity investment. As such, a critic could justifiably question whether these student funds' results can be replicated during a prolonged bear market. On the whole, we note that the often-superior returns of SMIFs are recurrently contested during equity bear market cycles. In 2002, 2008 and 2022, S&P 500 returns are negative or near zero. During these periods, yields from endowments and the LB Aggregate Bond index surpass SMIFs' performances. For all other years, the graph shows that SMIFs produce competitive if not superior returns than the endowments and other comparative funds.

These results suggest that endowments could benefit from adopting an allocation strategy similar to that of student-managed portfolios. If endowments increased their equity exposure to 86.19%, up from the current 51.41%, they would need to perform sizeable reductions in several investment classes such as alternative assets, fixed income, and cash. By following a passive investment approach, endowments could achieve performances comparable to SMIFs albeit with higher volatilities as indicated by the S&P 500's mean return of 9.31% and annual standard deviation of 15.90%. Endowments could also choose to simply allocate more capital to SMIFs. Exhibit 11 illustrates that SMIFs demonstrate effective and competitive portfolio management practices in real-world settings. Universities may be able leverage their student funds to produce superior returns at lower management fees than their endowments.

Exhibit 11: Fund Performance Over Years



This graph reports the mean SMIF, endowment and benchmark annualized returns from 2002 to 2023. There are 5 bars for each year in the period evaluated. SMIF portfolio return represents the average portfolio return for all SMIFs per year. Endowment returns are graphed with two variables: the annual percentage changes in market values and the aggregated NTSE portfolio returns. The benchmarks utilized are the S&P500 and the Bloomberg LB Aggregate index. The graph illustrates how

SMIF returns often simulate S&P500 performance. SMIFs generally outperform endowments over the 22-year period. This figure was produced with Stata's graph bar command.

Conclusion

This comparative study analyzes key differences in fund characteristics, asset allocations and returns between SMIFs and endowments. It contributes to the burgeoning literature on SMIFs by offering a unique macro-level comparison of these funds' performances for the time period between 2002 and 2023.

The data for this analysis are predominantly drawn from sources such as annual NTSE reports, datasets from IPEDS as well as Indiana State University's SMIFC statistics. The initial SMIFC statistics contain 618 unique SMIFs. Independently, we adjusted the dataset to include 633 unique funds as well as information on fund returns and allocations. The comprehensive dataset pertaining to endowments and institutions contains 17,210 unique institution-year observations. Datasets regarding funds' returns and asset allocations contain 22 observations for each of the years evaluated.

SMIFs are inextricably linked to their universities' endowments. Yet on average, they comprise only 0.45% of their respective endowment's market value and operate very distinctively from the overarching funds by displaying higher levels of risk tolerance.

In terms of funds' characteristics, we observe an average *AUM* of $1.75 million for SMIFs. The mean endowment value for the entire period under review is $624 million. Endowments dwarf SMIFs in values-at-risk. In terms of asset allocations, endowments collectively adhere to more sophisticated asset diversification strategies than SMIFs. On an equally weighted average, endowments allocate 51.41%. to equities, 19.43% to fixed-income, 25.11% to alternative assets and 4.96% to cash. SMIFs chose to allocate overwhelmingly to equities at an average of 86.19% versus 10.30% to fixed income, 4.80% to alternative/other assets and 6.20% to cash. The disparity in portfolio strategies between these funds can be attributed to many inherent constraints such as mandates, turnovers, and values-at-risk.

Significantly, SMIFs prove to be capable of outperforming endowments throughout a prolonged period of time. From 2002 to 2023, capital markets favored equities but faced several substantial downturns and crises. On average, SMIF returns outperform endowment yields by approximately 1.71%. The mean return of all SMIFs in the sample is 8.34% per year. The mean change in endowment market value is 6.63% with a mean endowment portfolio return of 6.54% per year.

SMIFs and endowments outperform the fixed-income benchmark, which yields a mean annual return of 3.99%. The equity index produces the highest average return at an annual rate of 9.31%. SMIF returns come at a higher cost of volatility relative to endowments. SMIFs' returns produce a standard-deviation of 12.81%, while endowments' returns have a standard-deviation of 10.67%. In addition to

generating higher yields to endowments, Exhibit 11 demonstrates that SMIFs manage to outperform the S&P500 numerous times in the sample period. Together, these results bolster the findings of other research studies that report SMIFs' outperformance of endowments. Hence, an important lesson for fund managers would be to take careful note of market cycles and appropriate SMIF investments accordingly.

The results of this comparative study are highly encouraging for SMIFs and participating universities across the US. At the very least, they call into question prevailing assumptions regarding the management of SMIFs. SMIFs, frequently seen as purely educational in mandate, have demonstrated that they can apply successful and competitive portfolio management practices in the real world. Consistent outperformance to the margins described in this paper should inspire greater allocation of capital to SMIFs. This, in turn, could translate into a better "hands-on" learning experience for the students involved in the management of the university funds. Additionally, a greater apportionment of capital from endowments could prove to be more profitable in terms of return dollars gained from the investment in SMIFs and saved by avoiding paying exuberant amounts for professional management of the funds. The implications of the results presented in this paper are worthy of further investigation, which we hope to conduct and present to the public in the near future.

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Integrating Stakeholder Objectives into the Philosophy and Process of a Student-Managed Investment Fund

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ABSTRACT

We present an approach to a student-managed fund (SMIF) that successfully integrates return maximization, experiential learning, and stakeholder values. We demonstrate how the SMIF at our military college uses the LEADERS model to make investment decisions that align with the school's core mission of Principled Leadership. Students learn how to incorporate non-financial investment objectives into their investment philosophy and enhance their leadership training and experience. At the same time, the school's leadership principles are reinforced in their minds. Other schools can use similar approaches to connect their missions to the management of their SMIFs.

Introduction

The use of student-managed investment funds (SMIF) as an experiential learning technique was first reported around the late 1940s or early 1950s.[1] Since then, and despite inherent challenges in their creation and operation, SMIFs have become increasingly common. A comprehensive survey of the undergraduate finance curriculum of 655 academic institutions (Root, Rozycki, Senteza and Suh 2007) found that 14.5% of AACSB schools and 2% of non-AACSB schools had SMIFs by 2007. Around the same time, Lawrence (2008) reported that there were 78 student-managed investment funds worldwide with

[1] A recent WSJ article (Miao 2023) claims that the oldest student-managed investment fund was the one established by Lafayette College in 1946. However, Lawrence (1994) reports that the first fund was created in 1952 when a local businessman donated $2,500 to Gannon University.

more than $1 million under management, with some of the most significant funds reporting total assets in excess of $25 million.[2] More recently, Boughton and Jackson (2018) reported that as of 2018 more than 400 such funds exist in the U.S. and Canada.[3]

The growth in the number and size of SMIFs is not surprising, considering the benefits. Like investment professionals, students get to work with real money and tie theory to practice. Hirt (1977) discusses the psychological benefits to students who feel a sense of pride when managing real money and are willing to devote significant amounts of time to this unique learning experience. Students get to interact with real professionals and make presentations to trustees and investment committees. This introduces them to professional accountability as a key dimension of investment management within the "real world" and which can significantly influence investment decisions. Importantly, Daugherty and Vang (2015) provide evidence that SMIF classes lead to a better understanding of valuation and portfolio management, and Hysmith (2020) finds a positive impact of SMIF participation on financial knowledge. The ramifications of SMIF exposure for students' appreciation and comprehension of traditional "classroom" based knowledge of these topics is difficult to overstate. Arguably, one of the most significant challenges an investment professional encounters is managing the interaction between their emotions (e.g. fear, greed, FOMO) and economically rational, fundamental-based decision making (e.g. valuation and risk). This challenge is difficult to appreciate absent firsthand experience. As John Keats said: "Nothing ever becomes real until it is experienced."[4] It seems that employers understand and appreciate these connections as several survey studies find that students involved with SMIFs appear more valuable to prospective employers (Boughton and Jackson 2018, Lawrence 2008).

Student-managed funds can vary in many ways; these include size, funding sources and structure, curriculum, faculty involvement, method of operation, financial data sources and tools used (Lei and Li 2012, Bruce 2020) and asset classes targeted (Barnes and Buller 2021, Lawrence, 2008). The nature of such funds, however, means they will not vary in at least one way – the intention to provide students with experiential learning. Core to this intention is an implied understanding of the "experience" students are intended to have. A traditional approach might assume a learning experience limited to basic investing principles applied in a portfolio setting. To achieve such learning a fund might employ widely held long-term equity investment principles to identify mispriced securities of large established companies listed in well-known indices such as the S&P 500.

As SMIFs have become more widespread, many have begun to move beyond basic experiential learning approaches by expanding their investment universe to fixed income securities, real estate and

[2] In the same study they report that 24.5% (0.4%) of AACSB (non-AACSB) schools have Bloomberg terminals and 7% (0.7%) have a dedicated trading room.

[3] They report that, as of 2008, the size of the University of Wisconsin's student-managed fund was $62 million. Ohio State University was second on the list with $25.8 million assets under management.

[4] John Keats in a letter to George and Georgiana Keats (February 14-May 3, 1819) said: "Nothing ever becomes real till it is experienced – Even a proverb is no proverb to you till your Life has illustrated it."

venture capital.[5] Some have also expanded their mandate by implicitly or explicitly adding fund objectives addressing non-pecuniary topics. Specifically, the popularity of movements such as Socially Responsible Investing (SRI) and Environmental, Social and Governance (ESG) investing have increased dramatically across the investment industry over the last two decades as various stakeholder groups have highlighted the potential inadequacy of a "return maximization" objective. Some SMIFs have sought to introduce such goals into fund objectives. Adding ESG/SRI objectives to the traditional fund return-maximization objective, in addition to the experiential learning objective inherent to the nature of such funds, creates several challenges (Clinebell 2013) not the least of which being that student investment funds can be confronted (or even overwhelmed) with a multiplicity of competing constituencies (students, faculty, foundations). Such diffuse constituencies may not be able to reach consensus on fund objectives, or the relative priority of those various objectives.

Student-managed funds have at least two inherent, and potentially competing objectives. Experiential learning is arguably the purpose for creating most, if not all, SMIF funds. Consequently, the students and educators involved in this learning together form an inherently important stakeholder group in such a fund. Due to their underlying importance in fund formation, this group may be assumed to be the most, or only, important stakeholder group. However, for student-managed funds to provide a realistic experience that reflects the pressures and stresses experienced by professional investors, such funds must also take into consideration the objectives of their other most direct stakeholder group; specifically, those who provide the investment funds. The traditional preeminent objective of investor groups is risk-adjusted return maximization. This may at times conflict with experiential learning when, for example, inexperienced students are "practicing" their investment skills within the fund framework. Potential conflict becomes even more significant when non-pecuniary objectives emanating from more indirect stakeholder groups push to the top of fund priorities. The university under which a fund operates represents such a constituency. As just one example, consider the challenge involved for a SMIF at a Catholic funded university when considering investment candidates involved in stem-cell research. Determining whether the return maximization goals of investors, or the university's strongly held beliefs, or student's basic experiential learning needs take priority can understandably lead to challenging decisions.

The purpose of this paper is to present a framework that illustrates that experiential learning within a SMIF environment can proactively integrate the goals of various stakeholder groups into an integrated and cogent investment philosophy that incorporates those disparate objectives into a unified whole. Our institution is a military college whose mission is to educate and develop principled leaders. We present a model that maps our LEADERS principles to an investment context that the students can

[5] The University of Michigan Ross School of Business' webpage lists seven different student-managed investment funds with over $10 million dollars combined assets under management. Most of them invest in start-up companies. (Webpage https://michiganross.umich.edu /graduate/full-time-mba/curriculum/student-investment-funds accessed on 5/22-2023).

use to select securities. It is vital that students are aware and able to balance various constituencies' priorities, including non-financial investment criteria. We present an example approach to a student-managed fund that realistically integrates potentially competing objectives of return maximization, experiential learning, and an ESG/SRI related value referred to as Principled Leadership that is a critical part of our university's mission statement. Due to space concerns and since this is not the focus of the paper, we do not present the traditional valuation methods (e.g. FCFF, Market Multiples) and deliberations which we perform and require for all holdings, similar to other SMIFs, and that play a significant role in security selection. Our focus on the current work is to present how we incorporate the requirement of above average Principled Leadership in our screening process. It is by no means, and one and only criterion for security selection.

As with many ESG/SRI objectives, the seemingly non-pecuniary nature of Principled Leadership may invite an argument that including it may harm returns (i.e. conflict with risk-adjusted return objective). However, integrating Principled Leadership into our investment philosophy has many advantages. Principled Leadership enjoys wide acceptance as a driver of enterprise success across all disciplines, thus inviting its use as a potential indicator of future corporate success. Our students know the markers of leadership as they are routinely exposed to them in their core curriculum throughout their time at the university. By mapping these markers into investment attractiveness, students gain practical understanding as to how seemingly non-pecuniary core values learned in a sanitized classroom can "play out" in the real world in a decidedly pecuniary way. At the same time, this allows students to truly add value to the investing decision by applying their acquired knowledge in the field of leadership to identifying cases in which it might lead to company success. This focus on the university's mission statement expressly aligns the fund with the expressed ideals of the institution to which students, faculty, and foundation all belong and reinforces students' internalization of the school leadership mission. This allows students to learn to positively navigate the complicated process of balancing and integrating seemingly competing objectives into a holistic approach to investing (and other professional challenges). Our approach may be valuable to other institutions as a timely example of how to navigate an increasingly complex environment in which various constituency groups prioritize potentially conflicting objectives. Our hope is that other institutions will be inspired to map their mission and values into investment criteria turning the SMIF into another vehicle that reinforces and instills the university's values to participating students.

The rest of the paper is structured as follows. The second section provides a review of the literature around non-financial investment objectives of student-managed investment funds. The next section discusses the Principled Leadership model of our institution and how this translates to the LEADERS investment model. The fourth section provides an application of the LEADERS model on two real S&P 500 companies. The final section concludes the paper.

Investment Philosophy and Student-Managed Investment Funds

The objective of an investment fund describes its goal – its purpose or reason for being. While traditionally most funds have had a single, return-based objective, this is not always the case and there are increasingly funds with dual objectives. Specifically, the priority of most funds is to earn a risk-adjusted return for fund investors over and above a particular benchmark. However, an increasing number of funds have recognized that fund investors often have objectives beyond return – and even that there are potentially relevant stakeholder groups beyond such investors. As an example, fund managers have long recognized that corporate ethics are important, yet only in recent decades have an increasing number of funds introduced a formal assessment of such ethics into their decision-making process, referring to this approach as "ethical" or "socially responsible" investing. Along these lines, Saunders 2008 reports that about one third of the religious institutions he looked at engage in socially responsible investing and about a third of the private universities conduct advocacy and community investing strategies. In some cases, this ESG-related objective may be the fund's primary objective. Consequently, traditional return-related fund objectives can at times conflict with ESG-related objectives, creating challenges for fund managers in prioritizing and/or balancing between them.

SMIFs are in an even more difficult situation in that they have one or more unique objectives in addition to those mentioned above – these include student learning and a related implied requirement to align with the educational institution's stated mission. So, even though the foundational idea behind the creation of SMIFs was to teach students investment fundamentals, SMIFs find themselves expanding this mandate by incorporating social responsibility and other non-financial investment objectives into their student managed funds (Saunders 2008), with the goal of investing in companies that exhibit values and characteristics specific to their own university, or at least generally accepted within the broader community. These objectives are in addition to the core fiduciary based goal of maximizing risk adjusted return – and can come into conflict with that goal.

The existence of multiple SMIF-related stakeholder groups can result in conflicts between the objectives of those various groups. This type of conflict, however, is not limited to student-managed funds. Over the last 20 years a wide array of investment fund stakeholders with diverse priorities have been identified and increasingly prioritized, giving rise to questions about the appropriateness of risk-adjusted return as a primary fund objective. Investors have given increased attention to environmental, social, and governance (ESG) related concerns – concerns that arguably emphasize a broad-based (and at times undefinable) stakeholder constituency at the potential expense of shareholders. For some time, ESG concerns seemed to be headed towards a preeminent position among competing fund objectives, with return maximization correspondingly declining in importance. More recently, however, the pendulum has begun to swing back towards an emphasis on return maximization. Several large plan sponsors, particularly in the United States, have pushed back against interest groups with the claim

that such non-pecuniary objectives do not align with fund managers' fiduciary duties to plan participants in that such objectives are inherently ill-defined and lead to decision-making that can compromise long-term fund performance. The debate is far from settled – and as such can be incorporated within students' experiential learning process as they seek to navigate complex investment decisions such as investments in "sin" stocks, weapons manufacturers, and firms with operations that exhibit less than stellar labor practices.

The student-managed investment fund outlined herein describes a framework under which the objectives of at least several fund stakeholders are integrated into a single balanced investment philosophy and process. Our university SMIF has as stakeholders 1) educators and students, 2) the university foundation (as the primary investor), and 3) the university itself as the umbrella under which the fund exists. Educators and students form a critical stakeholder group since the fund was created by educators explicitly for the experiential learning benefit of their students – so experiential learning is at the heart of the fund's existence. That being said, the fund cannot exist without investors willing to put real money at risk. Therefore, in this case the SMIF owes its primary investor, the university foundation (and its donors), a fiduciary duty to maximize risk-adjusted return.

Principled Leadership and the LEADERS Model

Institutional Background and Principled Leadership

Our institution is a military college with a distinguished history and a commitment to the education and development of principled leaders. The university's mission statement states as a primary goal to "Achieve excellence in the education and development of principled leaders". This leadership development emphasis is a heritage passed down through succeeding generations of graduates – and owes its beginnings to the understanding that strong leadership is needed for military victory and that, most importantly, Principled Leadership is critical for achieving such victory with honor. But leadership is not only relevant to military success. It is critical to the success of any venture, regardless of the contextual setting. It goes without saying that business enterprises cannot survive for long, much less prosper without strong leadership. Consequently, the university's school of business mission statement echoes that of the university, acknowledging the centrality of Principled Leadership in its mission statement "…to educate and develop innovative leaders of principle to serve a global community". To put this mission into practice our institution defines seven characteristics of principled leaders:

1- Lead with humility
2- Embrace a true, authentic self
3- Act and speak with courage
4- Develop and value people and resources

5- Empower and hold others accountable
6- Respect others by building trust and learning from mistakes
7- Serve others before self

This LEADERS acronym operationalizes the school's leadership culture. Importantly, this emphasis is not simply a mission statement created to foster a capital campaign. It is taken very seriously at all levels of the institution and is operationalized through an intensive four-year program students are required to complete in addition to their normal academic programs. This process serves to internalize the core concepts of Principled Leadership such that upperclassmen can readily recognize related attributes when they encounter them. This internalization is an important aspect in allowing Principled Leadership to be incorporated into the investment philosophy of the student managed investment fund.

The Student Managed Investment Fund

Our university's SMIF was instituted in 1993 and for much of its history focused its investment efforts on identifying and investing in mis-valued mega-cap companies with a stated goal of outperforming the S&P 500 index. The fund was small and relatively nascent for many years, primarily being used from time to time as an opportunity for students to sporadically experience the feel of making a live investment. As with many professional investment funds, a lack of clarity around fund objectives as reflected in an unclear and inconsistent philosophy/process structure resulted in a fund that performed inconsistently and failed to grow assets. In late 2019 the fund was given a new life – faculty brought industry experience to bear and institutionalized the fund by reorganizing both its strategy and operational structure. As part of this reorganization, students were asked to build a new investment policy statement; a statement that would set the fund philosophy apart from generic "motherhood" investment approaches such as identifying "cheap value" and/or "enduring growth". Such generic spaces are by nature crowded and therefore offer little excess return opportunity on their own. They are also easily and cheaply replicated through ETF products. Students were instructed to develop a philosophy that would take advantage of the natural intersection between the Principled Leadership concept emphasized by the university and the impact such leadership has on long-term enterprise success. Because they are taught to internalize, or "own" the values of Principled Leadership, students can naturally buy-in to these linkages and are able to identify them among companies and associated executives. This then results in a competitive advantage with regards to the fund's investment philosophy versus other fund managers or generic style-based investment products.

The investment philosophy stems from our university's fundamental values of creating principled leaders through the values of honor, duty, and respect. The aim is to invest in companies that understand the importance of Principled Leadership and exhibit the characteristics of Principled

Leadership as defined in section 3.a. The underlying belief is that across economic cycles the fruits of Principled Leadership will manifest themselves in superior long-term profits – and coincident investment performance. This emphasis is incorporated as one leg of a three-legged stool that represents a sound fund investment candidate. The three legs of the philosophy are 1) Principled Leadership, 2) fair valuation, and 3) above average growth prospects. While all three legs are critical aspects of our overall investment portfolio, our focus in this paper is to describe how we evaluate principles leadership. Above average Principled Leadership is viewed as required of every individual holding. For the valuation and growth dimensions, we allow for a stronger emphasis on one or the other in individual holdings – since these attributes are often in direct conflict with one another (e.g. cheap companies rarely have above average growth prospects and vice versa).

The new fund investment policy statement reads "While the SMIF does not adhere to a specific ESG (Environmental, Social, and Corporate Governance) standard, all target company's leaders are evaluated, based on the school's Principled Leadership model." This means that an analyst's assessment of the management team is an integral part of his/her stock "pitch" and particular attention is paid to the firm's senior managers' credentials, ethical record, insider ownerships, compensations and compliance with regulatory environment and constraints.

Principled Leadership and the LEADERS Model

As described previously, the LEADERS acronym at our institution is an operationalization of the school's leadership culture. To map this to an investment context, we focus on how leadership characteristics manifest in the business world. Students use the LEADERS rubric to rate each leadership principle listed in section 3a on a four-tier scale: Top quartile (top 25% of leaders) = 4; second quartile (above average) = 3; third quartile (below average) = 2; bottom quartile (worst 25% of leaders) = 1. It is important to understand that determining a quantitative measure for each firm can be subjective sometimes.

Next, we estimate the average rating among all seven principles. We also continuously reevaluate leadership, particularly when there has been a change in top management because people, attitudes, and culture can and do change often due to pressure from shareholders. Companies must score in the top two quartiles to be considered – above median leadership quality. Exhibit 1 presents a sample rating sheet and scores for Advanced Micro Systems (AMD), one of the SMIF holdings in early 2020.

Exhibit 1: Sample Principled Leadership Rating Rubric				
Advanced Micro Devices (AMD)	Lowest			Highest
	1	2	3	4
a. Lead with Humility				x
b. Embrace a True, Authentic Self			x	
c. Act and Speak with Courage				X
d. Develop and Value People and Resources				X
e. Empower and Hold Others Accountable			x	
f. Respect Others by R Building Trust and Learning from Mistakes				X
g. Serve Others Before Self		x		
Average Score	3.43		Rating	86%

To arrive at their ratings, students mainly focus on public filings and financial press sources like the Wall Street Journal, Barron's, and Bloomberg among others and they engage in deliberations discussing each of the Principled Leadership principles. There is no exact formula to arrive at a rating, as it is critical that students understand such judgments are inherently subjective. Discussions help students further develop and understand leadership principles and get many examples on how they manifest in real life. Sometimes there is not enough evidence to arrive at a rating for one or more of the leadership principles. We only score metrics that we can confidently assess. While a theoretically perfect leadership score of 100% might be out of 28 total possible leadership points (i.e., top quartile 4s on each of 7 leadership attributes), we are often only able to confidently score companies on a subset of attributes. For example, in a case where we could score 5 of 7 attributes our percentage would be computed out of 20 possible leadership points. In the remainder of this section, we describe each leadership principle and list relevant examples to demonstrate the nature of the questions and issues students try to look at when evaluating company leaders and assign ratings. We also describe how we use proxy statements in our analysis.

Lead with Humility: "Hubris, the sin of overweening pride or arrogance, may be the most misunderstood disorder an executive will ever be confronted with. It's not just narcissism; it's much more dangerous than that"[6] This leadership principle seeks to subjectively measure hubris related danger surrounding a company's C-suite. Do leaders understate or overstate the cult of personality? Microsoft (MSFT) is a good example of a company in which a change of leadership boosted this LEADERS metric. In 2014, Satya Nadella replaced Steve Ballmer as CEO. Ballmer had been the firm's boss for 14 dismal years over which the stock had dropped a cumulative -22% while the S&P 500 Index had risen +40%. He was viewed as loud and boastful of the firm's past successes.

[6] "Rooting out Hubris, Before a Fall", Harvard Business Review, April 14, 2014, Steven Berglas.

Ballmer's brashness may have helped him become Microsoft's uber-salesman before he became CEO, but it hurt him as the firm's leader as he was unwilling to pivot from the company's past. Specifically, he was locked in an "only here" mindset in which he doubled down on the company's existing technologies as the market moved from Microsoft's personal computer-centric products to the Internet and then to mobile applications. A change in leadership was critical but it did not appear that Nadella, although he was a company insider, was a strong candidate. He was a quiet, self-effacing engineer and no one's frontman. Nadella oversaw Azure, Microsoft's public cloud infrastructure platform that had been launched in 2010 with no fanfare. The Board of Directors seemed to be leaning toward available celebrity CEOs, but they surprised investors by selecting Nadella.

As CEO, Nadella immediately emphasized Azure and cloud computing and he pushed Microsoft to embrace outside technologies, including through acquisitions, even partnering with some former enemies. Interestingly, as an example of Nadella's humility, nine years later he still credits his predecessor with introducing Azure. While true, Azure was a grossly underutilized asset under those predecessors, and overall Microsoft was so poorly positioned then that it indeed was in crisis. As of July 2023, Microsoft's market capitalization is $2.5 trillion. When Nadella took the reins at Microsoft in 2014 it was less than $400 billion. The stock has significantly outperformed the S&P 500 and any technology index since then. Using our "Lead with Humility" metric in our LEADERS scheme, Nadella would score high and Ballmer low even if they were measured as leaders in isolation in real-time and not compared to one another in retrospect. Microsoft is a top SMIF holding, and its inspired leadership is a key reason why.

Embrace a True, Authentic Self: "A double-minded man is unstable in all his ways" (*James 1:8*). From ancient times, it has been clear that a lack of clarity of purpose leads to instability. Multi-billion-dollar modern day public corporations are no different. This attribute seeks to measure a company's apparent willingness or ability to understand and remain focused on its core mission. In this case, LVMH might score very highly as it has a consistent luxury focus across a wide variety of products. It knows who it is and embraces that. Some retailers have, from time to time, drifted from their core competency in attempts to restart or increase growth – and almost always suffered from that in the end. A simple question to ask here is "Does the company consistently focus on what it is best at doing?" Does it maintain focus, or seem to drift off its mission? One way we incorporate this view in our evaluation of companies is to search for firms that clearly identify their customers and serve them with intentionality, while never straying from a well-defined business strategy. As an example, we can look to another multi-year SMIF holding, Costco (COST). While the company has mega-warehouses stocked with scores of products, it has a target demographic to which it sells. This demographic is not gender or ethnicity-specific but caters to those in relatively wealthy areas who are over 30 years old and have families. Costco has demonstrated that even the well-to-do like to buy in bulk. As to its laser-focused business strategy, Costco stocks high-quality items that are sold in bulk size at low profit margins. In fact, the

company prices merchandise at prices that are gross profit breakeven. They entice shoppers to become "members" and earn high margins on their recurring subscription fees. Every few years, Costco raises its membership fees without much pushback from customers or prospective members. Amazon (AMZN) has a similar successful strategy with its Prime members. Both companies know that members shop more than other customers. Jim Sinegal and Jeff Brotman founded Costco in 1983. Sinegal was the company's CEO through 2011. His successor Craig Jelinek still leads the company, so in 40 years there have only been two CEOs. They have led the same way and, no doubt, their successors will follow their path. As this LEADERS metric states, they have "embraced a true, authentic self" for their company. Of course, Costco and its leadership score the highest on this LEADERS indicator. There are scores of "double-minded" companies that never properly define who they really serve and what and how they are to consistently deliver – and pay the price for this with underperformance. Think of conglomerates that try to be all things to all people. Instead of perhaps diversifying their businesses to lower overall risk they inevitably go too far as they seek continued growth that is unavailable in their traditional market – and the company loses focus, sales slow, and profits deteriorate.

Act and Speak with Courage: "Courage is the main quality of leadership, in my opinion, no matter where it is exercised.", Walt Disney. Does a company (or its executives) have the courage to speak up with strength – does it make unpopular decisions? Examples here include Nike and Colin Kaepernick's refusal to stand during the national anthem – whether one agrees or not with the stand – the company had the courage to step up. On the other hand, Mary Barra at General Motors has also demonstrated courage by not ceaselessly pursuing market share, by prioritizing profits over market share – and her rise in that GM culture itself speaks to a culture of courage to some extent and may be a change from the historical culture of that firm. The SMIF has owned Meta Platforms (META), formerly Facebook, for several years. Although Meta has contributed to the portfolio's performance over time, 2022 was a "grin and bear it" year as the stock plunged -64%. Fortunately, it has rebounded +148% (through July 12) in 2023. What follows is interesting. When we evaluated the company, CEO Mark Zuckerberg leadership style was seen to be a drawback particularly when viewed by this LEADERS metric. Despite scoring high as an innovator/visionary, after all, Zuckerberg coined the term "move fast and break things," we criticized him for his seemingly tone-deaf external communications, particularly as the head of the world's largest social media platform with 3.8 billion (March 2023) "monthly active product family users," and even more so for his inability to change his views and strategies despite such evidence to the contrary. We see the courage to speak the truth and to admit mistakes and rectify them as leadership attributes. Some investors had plotted to remove Zuckerberg during the dismal 2022. However, this year, he has "gotten religion" and has declared 2023 Meta's "Year of Efficiency" in which has cut bloated costs, which is always difficult, and has refocused the company on more promising technologies while deemphasizing or even cutting his own pet projects. He has been humbled but he has embraced it through his actions and even with his public comments. This is courage

in someone from whom you, or at least we, would never expect it. This has in part driven the value of the SMIF's holding back up. Interestingly, we initially had given Meta a mixed overall LEADERS score, but a particularly poor one for this indicator. Now we are rooting for Zuckerberg et al. so, yes, a tiger can change its stripes.

Develop and Value People and Resources: Does the company promote from within? Does the culture demonstrate caring for employees? A low scoring example on this dimension might be Activision (ATVI) with its sexual harassment culture a few years ago. These issues greatly hurt the company. More recently, they seem to have turned that around through intentional actions to diversify their workforce and strengthen internal HR controls and this is a case where the company's ranking may have moved from 1 to 3, for example. Danaher (DHR) is a core SMIF holding. One of the reasons why we like the company, and why we often continue to hold the shares of its spin-off firms, is that its leadership is so strong and focused (another LEADERS trait from above) on executing a simple -- but it really cannot be that simple because, so few do it or at least succeed in doing it -- growth and profitability formula. The company seems to consistently develop leaders from within that succeed at the firm, at its spin-off companies, or at other organizations because they are actively recruited to turn around other industrial companies because there is so much confidence in their training, experience, and, of course, their leadership. Case in point: Larry Culp, a Danaher alumnus, became the CEO of General Electric (GE) in 2018. Although GE, founded in 1892, had been an American icon, it had floundered for years. One of the reasons why is that it was an Old School conglomerate with a jumble of businesses in which the pieces did not fit in any puzzle. Culp boldly set a different course for the firm that included a Danaher-style spin-off of three GE companies each of which were left to focus only on what it did best. No surprise, GE's shareholders have been nicely rewarded by Culp five years into his reign. It seems that Danaher can put one All-Pro quarterback on the field and follow him with another and another whether they stay in the lineup long or not. Few companies here or abroad have a record of consistently developing such leaders often right out of school.

Empower and Hold Others Accountable: "Accountability breeds response-ability" Stephen Covey as quoted in "How True Accountability is About Choice, Not Blame." By Roger Dean Duncan, Forbes, May 3, 2022. Does the company foster accountability? Does it seem to allow bad behavior from powerful performers? Does the rule of law seem to be part of the firm culture? Or is it "you can do what you want as long as you contribute to profits?" Examples are bribery in foreign countries, allowing bad actors into top positions (e.g. Barclays CEO and his relations with Jeffrey Epstein) etc. We always have been fans of Home Depot (HD), so the SMIF has long held its shares. How do you empower, or at least create a culture of empowerment, across an organization with 475,000 employees and 2,300 stores? It is quite a feat. One compelling example is that any associate/salesperson can give a customer a $50 discount without checking with his or her manager. To put this in perspective, in 2022, the average amount spent per customer visit was $104. The company also aggressively discounts purchases for

employees, encourages them to volunteer in their communities for organizations of their own choosing, reimburses employees for outside training and education, and honors its veterans in special ways, which we particularly appreciate at our institution. On the other side of the ledger, too many companies are top-heavy, micro-managed, and solely short-term profit-focused. Wells Fargo (WFC), still one of America's largest banks by assets ($1.7 trillion, March 2023), is still suffering from a 2016 scandal in which its branch agents were pushed by their managers, who were undoubtedly encouraged by the top brass, to aggressively and unnecessarily cross-sell products to boost Wells Fargo fees. Seven years later, the bank's reputation is still damaged, and regulators continue to restrict its business. Of course, there has been a cleansing of management since then although related litigation continues and probably will for years. All in, Wells Fargo will pay several billion dollars in fines and restitution and still may never regain its glory.

Respect Others by Building Trust and Learning from Mistakes: Is the company direct and upfront about any issues? Do they acknowledge them and deal with them forthrightly? Above, we discussed how Microsoft's Satya Nadella learned as an insider what mistakes his company was making and somehow turned a battleship like a speedboat as its CEO to embrace critical change and by selling that vision to over 200,000 employees while not snubbing his predecessor or his team that Nadella would still depend on. In 2023, Meta's CEO Zuckerberg regained respect and became a rockstar again after reversing the course that he had set after humbly capitulating to do the right thing by cutting bloated costs and by focusing on other technologies even at the expense of his own projects. We also applaud General Motors (GM) CEO Mary Barra for turning a lemon into lemonade. Barra started at GM when she was 18 years old. She became its CEO at 52. As soon as she took the helm, and she was already probably facing a "glass cliff" as a woman in the hardscrabble automobile industry, the company faced major product recalls. As the firm's front "man" she seemingly had to give one "mea culpa" after another over the ensuing years. Barra also had to steer GM through COVID and that was after the company had never fully recovered from the Financial Crisis. Of course, she is now shepherding the transition at GM and in the entire industry worldwide from internal combustion engines to electric vehicles. It would be difficult to find a leader under such stress who handles it with such grace. Again and again, Barra has been forthright about GM's mistakes, which there have been a lot when trying to reshape a 115-year-old company, as well as about her own blunders. We think that GM is in good hands with Barra for what will be a gut-wrenching transition to electric vehicles over the next decade or so. She is a top-ranked LEADER by this metric and others.

Serve Others Before Self – "He who is not a good servant, will not be a good master." Plato. How are employees treated? How is compensation meted out? Is it extremely top heavy or more spread out? We also look at how the company serves its customers and the community. Greenleaf (1970) discusses servant leadership and its characteristics. It is interesting to note that in his book's title and throughout its text Greenleaf emphasizes that the leader places himself or herself at the service of the employees

and not the other way around. Although the company's credibility in this regard may have been tarnished a bit in the past year or so as it has been accused of union-busting (it is facing its first ever union drive), we still feel that the weight of the evidence is in favor of Starbucks (SBUX) as a selfless leadership company over the 52 years since its 1971 founding. Starbucks continually surveys its employees to identify potential improvements not just for productivity but for their wellbeing. Career growth is also emphasized and that includes 100% tuition coverage for an online bachelor's degree for all employees including part-timers. CEO only since April 2023, Laxman Narasimhan has replaced long-term leader Howard Schultz who had come of retirement to help steer the company through its union battle. Starbucks leadership is clearly working to regain its mojo. Although Starbucks LEADERS score by this metric has dropped from the first to the second quartile given the protests over the company's so-called union-busting, we still think that it deserves a superior rating relative to most other companies in or out of its Consumer Discretionary sector. Therefore, the SMIF continues to hold its shares.

Although a totally objective analysis and a precise mapping to our LEADERS schematic is extremely difficult, we still find it a worthy exercise and believe that it adds value to our investment process and reiterates the leadership training and experiences at our school. In our SMIF class offered in the fall, and throughout the academic year in our separate SMIF "club" we use a company's proxy statement to help us delve into its management and more.

The Proxy Statement as a Tool to Evaluate Leadership

Besides Bloomberg and some other financial news sources, our students can get most of the information needed to evaluate company leadership from the company's proxy statements. One benefit to all SEC filings is that they are templates that rarely change so they are relatively easy for students to become familiar with. That is, regardless of which document a student examines, even for different companies in different economic sectors, they will always read the answers to the same questions in the same order. Therefore, students are able to go directly to the key areas of the proxy statement with minimal experience reviewing this filing. It is also helpful that the hyperlinks in the online Tables of Contents instantly provide direct links to relevant materials.

In the proxy statements, we highlight the following:

- The board of directors. Who are they? Are they qualified? Are they diverse? Are they conflicted in any way? Are they truly independent? Do they have "skin in the game (i.e., do they own a reasonable amount of the company's shares)?" Who are on key committees like the Audit and Finance Committee and the Compensation Committee? Risk oversight is also typically discussed in this section of the proxy.
- Principal stockholders. Who are the major shareholders? What are their investment objectives? Are they long-term shareholders or traders?

- Executive officers. These leaders are critical and our focus, particularly the Chairman, CEO, CFO, and a few others depending on the business. For example, the CTO, or the Chief Technology Officer, is obviously essential at a technology company. A key item we look for here is whether the Chairman of the Board is the also CEO on not. We favor companies that have these roles separated.
- Compensation discussion and analysis. We look for significant "at risk" compensation, which means that pay is variable and related to the company's success which should directly lead to greater shareholder wealth. There are several ways to compensate executives, ranging from cash-based compensation, stock options, stock grants, and/or through other payments based on achieving certain financial and other metrics. It is crucial that the Board's Compensation Committee sets these benchmarks properly so that they reflect what best drives the business and ultimately the stock price, and that managers do not earn the highest compensation unless they really stretch and clearly significantly outperform.
- Severance and change in control arrangements. In this section we look for ways that bad directors, managers, and even founders can protect themselves from shareholder threats. We prefer that only shareholders control their fate as business leaders. If they are working hard, doing the right thing for the right constituents, and the company is performing well, so the stock probably is too, stockholders should remain supportive. Also, if a potential acquirer, even a hostile one, approaches the company and offers to buy it at a full price then we want the company to objectively consider it and not just immediately spurn any bid.
- Certain relationships and transactions. We are looking for any strange and conflicting relationships here that could be detrimental to the company down the road and raise red flags.
- Audit and finance committee report. The hallmark of a good management team is transparent financial reporting that accurately reflects the business. Specifically, we prefer no to little disparity between GAAP and non-GAAP financial results, the latter of which more companies are using to obscure what is happening in their businesses and to boost their stock prices.
- What do the auditors have to say? Financial reports are audited but the firms being evaluated pay for the assessments of their company so the auditors may be hesitant to publish reports that are not "clean" because they do not want to anger valuable customers and lose their audit fees and potentially even greater consulting fees. However, unbelievably, from time to time, some auditors still raise red flags in this section and too many shareholders ignore them.

Application of the LEADERS Model - A LEADERS Winner Knocks Out a Loser: Advanced Micro Devices Versus Intel

When Dr. Lisa Su became CEO of Advanced Micro Devices (AMD) in October 2014 the company's market capitalization was $2.5 billion. That year AMD would post just $5.5 billion in sales and would continue to bleed by losing another $398 million before taxes. Intel, its archrival, although no one really thought AMD was anyone's rival at that time because its survival was in doubt, had a market capitalization of $162.6 billion and would earn $1.7 billion pre-tax on $55.9 billion in revenue in 2014. But then the fortunes of the companies began to turn under the inspired leadership of Dr. Su at AMD and under the disastrous stewardship of four Intel CEOs since her arrival. Today (July 10, 2023), AMD's $182.5 billion market capitalization significantly exceeds Intel's $136.6 billion, and the former should deliver $21.8 billion in sales in 2023 versus $51.3 billion for Intel according to consensus forecasts. Consider this: AMD is now 42% of Intel's size. When Dr Su took the helm at AMD it had posted just 10% of Intel's revenue. Furthermore, the reason AMD is valued higher than Intel even though it is still a much smaller company is because investors believe that AMD will continue to outperform Intel, other technology companies, and the broader market. We in The Citadel's SMIF concur. We are shareholders.

Exhibit 2 uses our LEADERS model to discuss the SMIF's assessment of the stewardship of two of America's top technology companies who also compete in the semiconductor industry. Since Dr. Lisa Su became AMD's CEO, Intel has had four bosses with the current (since 2021) CEO Pat Gelsinger working on a total overhaul of the company. In 2014, Intel was "King of the Hill". AMD was potentially bankrupt. Were there signs when evaluating the companies' bosses using our LEADERS schematic that there was going to be such a dramatic change in the firms' fortunes? Of course, in our analysis we also consider other publicly available data to bolster our case for covered companies. We only lead our students to the proxy statement as the best document to delve into corporate governance among the SEC filings. Of course, there are other sources for such information.

As shown in Exhibit 2, AMD has, or at least had, superior leadership to Intel according to our LEADERS scheme. This has been evident in the massive outperformance of the shares of AMD over those of Intel for many years. Indeed, we believe that the terrific leadership of AMD under Dr. Lisa Su and the blunders committed by at least Intel's three prior leaders have helped account for the former's gains and the latter's losses. However, we think that the emergence of CEO Pat Gelsinger in 2021 may be a catalyst for Intel and ultimately for its shares. The company's prodigal son has returned. Unlike some of his predecessors at CEO who were not engineers, Gelsinger is a technologist who was critical of some of the firm's innovations in the 1980s. He has gone on attack since returning to Intel by building fabs (fabrication facilities where semiconductors are produced) including a $20 billion project in Ohio, with a vow to catch up to the world's manufacturing leaders, the foundries Taiwan Semiconductor and Samsung, by the end of 2024, and, most dramatic of all, a change in a 55-year strategy from captive

manufacturing to also building others' chip designs (aka a foundry or outsourcing model). Gelsinger scores particularly high in our evaluation by "acting and speaking with courage."

Exhibit 2: LEADERS scores for AMD and Intel				
LEADERS	**AMD Comment**	**AMD Score**	**Intel Comment**	**Intel Score**
Lead with humility	Engineer Dr Su becomes CEO in 2014; AMD introduces Zen CPU architecture in 2017; makes fastest data center chips by 2020	3	Clings to fabs when others like AMD outsource manufacturing; lost manufacturing edge to TSM and Samsung; arrogance	2
Embrace a true, authentic self	AMD sells fabs to focus on design; innovation laggard to leader; data center focus with fastest CPUs with AI chips next	4	True to themselves, their customers, and their technology roadmap, but poorly execute and miss other market opportunities; too dependent on PCs and miss the shift to mobile	2
Act and speak with courage	Possible bankruptcy when Dr. Su became CEO; had to rebuild credibility internally and with customers and investors	4	New (since 2021) CEO Gelsinger gets high marks for boldly trying to change Intel's course; to catch up on manufacturing; building US fabs; entering foundry market	4
Develop and value people and resources	Engineers are paramount at AMD; grooved innovation; could better develop C suite beyond Dr Su	3	High management turnover; 4 CEOs since Dr Su became AMD's leader; lost engineering talent; innovator to tech laggard; will CEO Gelsinger save the company?	2
Empower and hold others accountable	Marquee engineers have flocked to AMD; next test: can AMD compete with NVDA in AI?	3	Had not been the case; critically, poorly executed tech roadmap so lost lead to AMD and foundries	2
Respect others by building trust and learning from mistakes	AMD's turnaround under Dr Su is the greatest evidence; AMD and NVDA are now America's top semiconductor companies	4	Gelsinger's aggressive plan to catch up in manufacturing within 2 years; the ultimate mea culpa: becoming a foundry	3
Serve others before self	Dr Su et al. seem to have instilled a strong, selfless culture particularly among critical engineers, but we need more evidence	3	CEO hubris: Had ignored too many constituents; slow to change strategy; a CEO fired for inappropriate relationship at work	2
Total Score		**3.43 (86%)**		**2.43 (61%)**

Conclusion

Student-managed funds have several inherent, and potentially competing objectives. Both students and educators are important stakeholders in a SMIF. Experiential learning is arguably the purpose for creating most, if not all such funds. However, for student-managed funds to provide a realistic experience that reflects the pressures and stresses experienced by professional investors, such funds must also take into consideration the objectives of the fund's other stakeholders; Specifically, those who provide the investment funds. The traditional preeminent objective of this stakeholder group is risk-adjusted return maximization. More recently, non-pecuniary, ESG/SRI related objectives have also come to the forefront of the investment world.

In this paper we demonstrate an approach to a student managed fund that successfully integrates the potentially competing objectives of return maximization, experiential learning, and stakeholder values. We present examples showing how the SMIF at our military college uses the LEADERS model to guide its investment decisions and align with the school's mission. Principled Leadership is central to the school's values and mission and the LEADERS model operationalizes this leadership culture. We present a blueprint on how to translate and successfully integrate the school's leadership principles into an investment process. The benefits of this approach include not only teaching the students how to incorporate non-pecuniary investment objectives into their investment philosophy but also enhances their leadership training and experience. As a result, the SMIF helps as an additional experiential learning tool that reinforces the school's leadership principles in the minds of the students. Other SMIFs could use this approach as an example to connect their own schools' mission to the management of their SMIF. An interesting future research question is to investigate whether this Principled Leadership investment framework would also lead to consistent higher risk-adjusted returns.

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Bloomberg and Experiential Finance Learning

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ABSTRACT

The purpose of this paper is to provide 1) key student highlights regarding the impact of Bloomberg and its tools on their learning in the context of a student run investment fund (SMIF) course as well as other finance courses and 2) suggestions regarding integration of Bloomberg and its tools in finance learning based on my experience as a practitioner and teacher leading over the past two years a unique group of courses that integrate Bloomberg and its tools in student learning.

Summary

The purpose of this paper is to provide 1) key student highlights regarding the impact of Bloomberg and its tools on their learning in the context of a student run investment fund (SMIF) course as well as other finance courses and 2) suggestions regarding integration of Bloomberg and its tools in finance learning based on my experience as a practitioner and teacher leading over the past two years a unique group of courses that integrate Bloomberg and its tools in student learning.

With the proliferation of extensive amounts of financial data across instruments and markets, as well as new and more complex financial instruments, there is an ever-increasing need for thoughtful users of that data to evaluate such data and instruments to solve important financial issues such as valuation of instruments, portfolio management and optimization, pricing of derivatives, and risk management. Information technology skills are therefore indispensable to professional success. Students trained and exposed to such tools have a unique edge when trying to pursue highly competitive and attractive internships and jobs at top finance firms. However, there is evidence that finance education, as well as its curricula and pedagogy, has not kept up with the rapidly growing technological demands of the profession (Bersin 2012, Pincus, Stout, Sorensen, Stocks, and Lawson, 2017). A number of schools use Bloomberg in their instruction and for experiential learning (Athavale,

Edwards, and Kemper 2016, Schmutz 2017, Siam 2005, Mallett, Belcher, and Boyd 2010, Clinebell and Murphy 2016).

In this paper, based on student surveys, I provide extensive evidence of the significant impact that a state - of the - art financial technology like Bloomberg can have on student experience, especially as part of an integrated, multi – course experiential finance program. I also provide suggestions to instructors on the integration of this technology in the context of several types of courses, including a SMIF course.

Introduction

There is extensive evidence documenting the benefits of experiential learning, trading room – like setting that replicates a professional environment, case studies and practical assignments that allow students to grapple with real life issues faced by practitioners (Holowczak 2005, King and Jennings 2004, Huffman, Beyer, Schellenger 2012, Moffitt, Stull, McKinney 2010, Noguera, Budden, and Silva 2011, Payne and Tanner 2011, Stewart, Houghton, Rogers 2012). A number of studies also provide evidence of the benefits of SMIF courses, including technical, leadership, organization, and interpersonal skills (Dolan and Stevens 2010, Clinebell and Murphy 2016, Mallett, Belcher, and Boyd 2010, Charlton, Earl, and Stevens 2015). Bruce (2020) discusses key topics regarding the organization and management of a SMIF course. Despite these documented advantages of experiential finance learning, there is a limited set of content for instruction that significantly integrate Bloomberg and provide relevant guidance to teachers (Athavale, Edwards, and Kemper 2016, Coe 2007, Gliner 2014, Johnson 2013, 2014, 2017, Lei and Li 2012, Moreale and Zaynutdinova 2018, Schmutz 2017). Wider adoption of Bloomberg content will also be consistent with the AACS (2020) guidance on accreditation. For example, Standard 4 on Curriculum lists "agility with current and emerging technologies" in section 4.1 and expects to schools to bring "…an innovative approach to curriculum, whether related to content, pedagogy, or delivery method, which demonstrates currency, creativity, and forward-thinking" in section 4.3.

My paper expands the relevant literature in two ways. It provides actual student feedback on the value of the use of Bloomberg in student learning from a number of courses that integrated Bloomberg. Based on the teaching experience during the full academic year, the paper also shares suggestions on the integration of Bloomberg tools in experiential finance learning in the context of a SMIF and two other finance courses. These courses were developed and taught by a single instructor, who is also an experienced practitioner.

The Bloomberg terminal - the gold standard in the finance industry - is a computer software system that provides finance professionals with on demand, real-time, state-of-the-art tools for research and analysis of markets, instruments, and company data from around the world. For example, these

tools allow for in-depth research of the state of the economy, a company's current and historical operating performance and valuation, portfolio management and stress testing, supply chain analysis, industry analysis, equity/bond/derivatives markets valuation and analysis and much more. A group of courses including a quantitative finance program developed by and taught at the Illinois Wesleyan University Gregg Yes '82 Bloomberg Finance Lab by me, an experienced practitioner, provide a unique and integrated set of learning opportunities for students, who can develop a real-world knowledge of investing and trading through class participation in lectures, case studies, presentations, research reports and model building while using Bloomberg tools. As part of this group of courses, students also get a unique opportunity to manage part of the University Endowment in a setting run as an institutional investment firm. At over $5mil, this student run fund is one of the largest SMIFs in the country and is quite rare in a liberal arts university setting. Students also have an opportunity to achieve Bloomberg Market Concepts (BMC) certification, which in addition to their relevant coursework, provides a significant advantage for their internship and job prospects in the lucrative and highly competitive finance career paths. The certification consists of the viewing of multiple videos of a few hours and the completion of a Bloomberg administered exam. It is a self – paced program and students can re-take an exam. While the BMC itself provides, in my view, only a very basic proficiency in the use of the terminal, it serves as an important signal to employers (Scott 2010) and provides a useful foundation for further skills development in relevant courses that integrate Bloomberg content. However, I want to emphasize that the use of Bloomberg related material is not just to allow students to differentiate themselves from other graduates with potential employers. Similar to any unique, high quality information technology, Bloomberg is in my view invaluable in encouraging and developing intellectual curiosity about finance. Bloomberg allows students to see the intellectual depth, rigor and complexity of a field like finance as well as its numerous career paths - it provides students with live and historical financial information for markets, countries and companies around the world; it allows for advanced financial modeling and analysis including robust Excel models that are integrated with live market data from Bloomberg; it also provides extensive library of news, historical filings, industry information, courses and networking. All these tools and more go well beyond what a typical finance textbook offers and give students a glimpse of the real world of institutional finance as well as relevant job expectations for research and analysis for a junior finance analyst at a top financial institution.

My institution is a historic, liberal arts university in the Midwest with the enrollment of about 1,600 undergraduate students. A SMIF course called Portfolio Management, as well as my four other courses, (Financial Statements Analysis, Investments, Quantitative Finance and Advanced Portfolio Management; a course on Trading was launched in the fall of 2024), meet twice a week for 75 minutes each. Beginning in the fall of 2022 when I joined the university, they are held at the recently endowed Greg Yess '82 Bloomberg Finance Lab that has twelve Bloomberg terminals. Course enrollment for the five courses I will be discussing below has so far ranged from 3 to 25 students. As a result, at worst, a

student might share a Bloomberg terminal with one more student during a class. The Portfolio Management course is taken by juniors or seniors while the other four courses might be taken as early as the sophomore year, depending on the progress made with various pre-requisites, or as late as the senior year. Before all five courses, students must complete basic accounting and finance pre-requisites. With some exceptions, I require that the Portfolio Management course be taken after completing at least one course with me that already integrates Bloomberg – based tools and projects and builds on previously learned finance concepts and expectations from a practitioner perspective. For example, students will have already learned in my prior courses how to use key Bloomberg functions and tools for the analysis of financial statements, cost of capital, prior company filings, the structure of an industry, Excel models integrating Bloomberg company and market data. The primary goal of the Financial Statements Analysis course is to develop competence in analyzing financial statements of a variety of businesses as an investor with the goal of determining the quality of a business and its management team as well as the quality of financial statements themselves. The primary goal of the Investments course is to develop competence in the valuation of key financial instruments such as stocks, bonds, and certain derivatives such as futures and options. The primary goal of the Portfolio Management course is to experience an institutional investment firm in a university setting. Students get a unique opportunity to manage around $5 million dollars of the University endowment. The primary goal of the Advanced Portfolio Management class, which creates a unique, one-year experiential learning of managing live capital, is to add to the experiences of the Portfolio Management class through the focus on alternative investments, international investing, and interviews of actual companies. As of now, the portfolio is allowed to be invested in domestic and international stocks as well as fixed income. Students are expected to evaluate a portfolio exposure in light of the economic cycle, conduct stress testing and other risk management exercises, develop understanding of their assigned industry sectors and screen and research securities within their sectors for a potential investment (including international securities) – all these steps integrate Bloomberg portfolio, screening and other tools. The primary goal of the Quantitative Finance course is to deepen the understanding of key finance tools and methods such as valuation and portfolio optimization models through the use and replication of Bloomberg tools in other platforms such as Excel as well as extensive financial modeling. In all five courses, Bloomberg is continuously integrated in lectures via demonstrations and illustrations of concepts with relevant and timely examples such as company case studies on cost of capital, valuation or profitability, market history, economic or industry research. Students are assigned a conventional finance textbook as well as a Bloomberg-based textbook such as Johnson (2014). Students are expected to complete a BMC certification and/or BMC course. They are also expected to complete an individually prepared, full-length company paper applying Bloomberg tools from the perspective of an investor (in a quantitative finance course, they regularly present results of their study and replication of various key finance tools). They are also expected to rely on Bloomberg-based,

institutional grades, Excel templates for company analysis, peer analysis, and valuation, adapting them to their chosen company and industry. Finally, they are expected to present their findings in class. Without Bloomberg, student learning opportunities would have significantly diminished, in my view. For example, while free or low-cost stock screening tools are available, they usually do not cover many metrics, and they have significant gaps in international coverage. Portfolio management tools including stress testing and scenario analysis are of problematic quality if they are free or low cost. High quality industry research is also typically not easily available. These and other alternative data sources are also typically not integrated with institutional grade Excel models. Bloomberg allows for a high quality, integrated and immersive learning experience of finance topics in a progressive context starting from the simple and getting as advanced as the level of student preparation and intellectual curiosity allow. In the context of a student run fund, the integrated Bloomberg approach is particularly useful as students can then apply what they learn in class in their investment research internships and jobs.

Student Surveys

Over the past two years, I have been asking students to complete surveys regarding the impact of the integration of Bloomberg in their courses. I have received close to 150 responses so far. So far, 29 Portfolio Management students have completed their surveys; 50 Financial Statements Analysis students completed their surveys; 67 Investments students completed their surveys; 3 Quantitative Finance students completed their surveys, and 3 Advanced Portfolio Management students completed their surveys. The response rate ranges from 50 to 100%. In my discussion, I will focus on the Portfolio Management course survey because of the greater complexity of the course that builds on the content and experiences of the other two courses. However, where relevant, I will comment on applicable student feedback that conflicts or sheds additional light on the information provided by students in the Portfolio Management course.

A significant majority (about 80%) of the Portfolio Management students had prior Bloomberg experience with me from prior courses (my introductory course, Financial Statements, usually has little prior Bloomberg experience). Despite prior exposure, students still felt that they made considerable progress in their Bloomberg competence. Bloomberg competence is important in my view before students get into Portfolio Management as this course requires application of more advanced Bloomberg tools for portfolio management, stock screening and international research. This was even true for my other courses, which might have many Bloomberg novices. In my view, this is impressive in light of the complexity, incredible depth, and richness of the available tools through Bloomberg. This is made possible by the fact that the course was held in the Bloomberg Lab. It allows for regular exposure and re-enforcement of Bloomberg learning. There is strong agreement among students that Bloomberg provided a unique experiential experience, deepened knowledge of real-world finance tools,

will provide an edge over other graduates and that more courses taught by an experienced Bloomberg instructor will be of interest. This was also consistently echoed by student feedback in my other courses. Bloomberg provides an almost infinite list of functions and tools for finance professionals working in various functions and markets. I surveyed students based on the most common functions presented during courses though they were also free to explore Bloomberg functionality on their own. Large portion of the course content involved the evaluation of the existing and proposed portfolio including sector exposures in light of the economic cycle and stress testing (e.g., PORT function) , sector and company screening/research (e.g., BI/EQS function), company analysis and valuation (e.g., BETA/WACC/DDM/FA functions; excel templates), peer analysis (e.g., RV function) and other related tools. The students found most useful to be the following: financial statement analysis, cost of capital, excel templates, portfolio analysis, equity screening, Bloomberg Intelligence, peer valuation, historical margin/multiple analysis. In the Advanced Portfolio Management course, the continuation of the Portfolio Management course, students found valuable greater exposure to international investing and opportunity to interview companies that the fund invested in. The Portfolio Management course consisted of lectures, case studies (live market examples as well as case studies provided by Bloomberg itself on various topics), individually completed company research reports that integrate Bloomberg tools and materials and class presentation of key findings (typically up to 10min). While lectures and case studies received very positive feedback, students found their class presentation to be even more useful as a learning opportunity, closely followed by the company research report itself – this was also consistent with the student feedback in my other courses. This is surprising since the paper is effectively a complex, semester long project, applying all key practitioner course content using Bloomberg tools and data (e.g., Excel models, industry research, etc. as noted above) and it also requires public speaking, which few are comfortable with. However, students appreciated the challenge and the opportunity to apply all these sophisticated industry tools and ideas. In the context of a student-run fund or even a simpler course, allowing students to explore and apply ideas, especially with Bloomberg (and to present them) is a core part of the educational experience and development. Finally, students clearly found this course to be more difficult and more time-consuming than other courses they completed. However, despite this difficulty and great time commitment, they would overwhelmingly recommend this course to others and half of the respondents took the course not because of the degree requirements but because of the interest due to the previously completed course with me.

Suggestions for Instructors

Having established a unique, multi-course, experiential finance program at the Bloomberg Lab that I have now been leading for two full academic years, I would like to share a few observations and suggestions for instructors. First of all, the pace of learning of such a complex and feature rich tool as

a Bloomberg terminal will be significantly slowed down if classes are not held at a Bloomberg Lab where students can follow along with the instructor as tools are introduced and applied. As a result, every effort should be made to hold classes at a Bloomberg Lab. Due to class size limitations, this might not be possible for larger schools. Alternatively, smaller schools might not have sufficient funding for many terminals though classes might be smaller. In such cases, my suggestion will be to limit the objectives of Bloomberg learning to a small number of tools/functions (e.g., beta and weighted average cost of capital) and attempt some lectures / demonstrations at the location where the terminal is set up to explore this functionality. I suggest that the instructor then creates a project that requires the application of these tools to a specific case. Some suggestions based on functions students found particularly useful to consider include a) the development of equity and/or the overall cost of capital for a company utilizing BETA/WACC/EQRP functionality; b) the study of a company's industry via a BI function; c) the study of a company's operating and financial performance via FA function and relevant Excel templates such as Company in Depth and Company in Depth Fundamentals; c) the valuation of a company via a DDM function or Excel templates for discounted cash flow modeling; d) the peer analysis and valuation via a RV function or relevant Excel templates; e) the study of a long history stock history of a company to explain large fluctuations via GP/CN/CACS/EVTS and other functions. Other projects to consider include a) the use of a TECH function to introduce technical analysis trading tools; b) the use of a SPLC function to study the supply chain of a company; c) the use of ECST and related functions to study economic indicators and their history; d) the use of PORT and related functions for more advanced students and content. Second, it will also be beneficial if an experienced teaching assistant can be assigned as a resource for students; this assistant can be a student who has already successfully completed the course and established some Bloomberg competence. Especially in my more introductory courses, students made regular use of this resource for more complex topics and projects such as the paper. Third, it is crucial that some reference materials on key commands are easily available for students as novices often find Bloomberg screen and keyboard overwhelming. The instructor can print some command collections and make them available at the terminal and to be emailed to students in addition to recommending the use of one of the books by Johnson (2013, 2014, 2017) that provide an introduction to a number of Bloomberg functions. Fourth, company research papers and more importantly student presentations of their results that integrate and incorporate robust Bloomberg tools and data are the consistent highlight of my courses for students. Public speaking is not taught, even though students will be expected to present and defend their ideas as junior staff. As a result, it is crucial preparation for finance students and quite often will be the only time or one of the few times when they individually presented their finance research in public. It is also a great opportunity to put together various Bloomberg tools in a comprehensive analysis of a company students are interested in. Again, due to class size limitations, this might not be feasible for larger schools despite the instructor's best efforts. As an alternative for larger classes, I would recommend having regular short class

assignments on finance topics (e.g., Wall Street Journal articles with questions as a resource for instructors) that a student can present at the start of each class on a rotating basis. With this adjustment and emphasis on class participation in discussions, students should receive at least some exposure to public speaking. My Portfolio Management and Advanced Portfolio Management courses include a final presentation to the Client Board – a group of experienced alums with investment experience who oversee the management of the SMIF. This is a very unique experience that introduces students to the client management aspect of portfolio management when they get to answer questions from and interact with their clients. Moreover, my students have used their papers and Bloomberg training in their internship and job applications with great success, including highly competitive opportunities with top tier firms. Fifth, to allow for even greater continuity and depth of learning, a one-year sequence of portfolio management for a SMIF can be created. It will allow for a broader range of topics to be explored for which there might not be sufficient time in a single semester course such as international investing or alternative investments. As importantly, students will get to review their ideas from the fall. In my case, I also introduced students to interviews of companies in which the fund invested, which received very positive feedback as a unique learning experience. Sixth, I will also recommend setting high expectations that will do justice to the value of the Bloomberg technology and challenge students to explore the richness and depth of the tools Bloomberg provides. This will allow them to get a realistic preview of professional finance life and expectations and will get them excited about their chosen field. From my experience, students will accept significant difficulty and significant time commitment if they can clearly see the unique nature of their learning and the long - term benefits that it can provide for them intellectually and professionally. Seventh, with sufficient interest, the use of a Bloomberg Lab can expand to relevant parts of non – finance courses that are in my view a natural fit for Bloomberg content and tools such as accounting and economics. Such courses can introduce research projects on such topics as economic indicators and company financial statements. This will further increase the use of the Lab (more on this below). Seventh, it is crucial to establish a timely IT support within the university since any down time when machines are not available for learning is very expensive in this case. In my case, Bloomberg Lab has its own IT problem reporting channel with a lot of dedicated support from the university's IT leadership who led the technical set up of the Lab. While Bloomberg provides 24/7 help desk, non-finance related questions should not be handled by students but rather the university's IT staff. Relatedly, it is crucial to ensure the safety and security of such a valuable resource e.g., at a minimum, no food/drink should be allowed as any repairs can be very costly and a card swipe for authorized staff and students should be installed to ensure that only those who need to be in the Lab actually use it. Finally, I strongly recommend that schools consider the hiring of experienced practitioners as long-term faculty to develop integrated, multi-course programs built around state-of-the-art industry tools such as Bloomberg. Academics are not well - familiar with Bloomberg, its complexity and its functionality nor do they have a good understanding of how it will be applied in a

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professional setting since such skills are learned on the job by practitioners. Additionally, from my direct experience, while better than nothing, one course is not sufficient to build competence with a tool like Bloomberg even if such a course is taught by a practitioner since due attention also needs to be paid to non – Bloomberg content, leaving little time to achieve Bloomberg competence. Moreover, as compared to long term faculty, ad hoc adjunct hires from the industry do not allow for the continuity and high expectations necessary for students to achieve competent understanding of industry tools and thus to differentiate themselves from other graduates while appreciating more fully the intellectual depth and richness of finance. At a minimum, schools are strongly encouraged to maintain consistency of faculty (long term or adjunct) that teach courses with Bloomberg content. Through tailored courses and programs, faculty with strong practitioner experience will grow the regular use of an expensive resource like a Bloomberg Lab and with relevant assignments like company research reports will help ensure that such a lab is utilized as much as possible. Integrated, multi – course experiential finance learning program built around the Bloomberg Lab is in my view an extraordinary learning opportunity for students and an extraordinary recruiting opportunity for schools to bring dedicated students and high- quality employers to achieve a very return on investment required to build the Bloomberg Lab and the time required to develop and accomplish Bloomberg-based learning.

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How to Structure and Operate a Student-Managed Investment Fund (SMIF) More Like a Professional Money Management Firm: A Case Study

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ABSTRACT

Student Managed Investment Funds (SMIFs) are an excellent teaching and learning tool, providing college students with hands-on experience in security selection and portfolio management while still in school. SMIFs act as a bridge between academia and the financial services industry, allowing students to gain valuable insights into how their prior coursework is applied in a real-world setting. Despite several positive aspects, the authors of this study believe many SMIFs fall short of replicating a true professional money management approach. This paper examines the multi-year evolution of the SMIF at Florida Gulf Coast University (FGCU), aka the "Eagle Fund", to provide a roadmap on how a university might structure and operate a SMIF more like a professional money management firm. In this paper, we will review several initiatives and enhancements that FGCU has implemented in its SMIF program over the past 5 years to meet that objective. What works at one university does not always work at another, so the authors of this paper encourage the reader to take the recommendations offered and tailor them for their specific university.

Introduction

Student Managed Investment Funds (SMIFs) are an excellent teaching and learning tool, providing college students with hands-on experience in security selection and portfolio management while still in school. SMIFs act as a bridge between academia and the financial services industry, allowing students to gain valuable insights into how their prior coursework is applied in a real-world setting. These programs, which allow undergraduate and graduate university students to manage "real

money" investment portfolios, have grown considerably in the past several decades. Lawrence (2008) counted only 12 universities with SMIFs in 1969. By 1980, that number had increased to just 19. However, between 1980 and 2007, the total number SMIFs grew rapidly to 268 in the U.S (and 314 globally). As of April 2021, according to the Intentional Endowments Network, there are nearly 600 student-run investment funds at U.S. colleges and universities.

History of the FGCU SMIF (the "Eagle Fund")

The Student Managed Investment Fund (SMIF) at Florida Gulf Coast University (FGCU), the Eagle Fund, was established in 2005 by the FGCU Foundation with initial funding of $200,000 (equally split between Large Cap U.S. Domestic Equities and Investment Grade Fixed Income). By September 30, 2024, the Eagle Fund's assets under management (AUM) had quintupled to just over $1 million (with no withdrawals, other than minor fees incurred by the Foundation). Growth in AUM was driven by overall financial market appreciation, strategy outperformance versus relevant benchmark indexes, and additional donor contributions. In the fall of 2020, the Eagle Fund launched a new quantitatively driven Small / Midcap Equity strategy (funded by a $100,000 donor gift).

Prior to 2020, FGCU's Eagle Fund was operated as a stand-alone one-semester, three-credit hour, applied finance elective offered by the school's Lutgert College of Business. To enroll in the course, students must be juniors or seniors and meet several grade requirements, coursework prerequisites (e.g. Principles of Investments), and submit a formal application, including an essay portion. Applications are reviewed and approved by the course professors and finance faculty. Typical class size ranges from 10-15 students per semester. Under the supervision of FGCU professors, FGCU Eagle Fund students are responsible for all aspects of the investment process, including securities analysis and portfolio management. The students' investment activity is governed by an Investment Policy Statement, which was provided by the Foundation at the inception of the program and is still in place today.

The focus of the SMIF is for students to draw upon knowledge gained from prior academic learning (including introductory Business Finance, Principles of Investments, Money and Capital Markets, and Securities Analysis) and apply it in a real-world setting. Since its inception, the FGCU SMIF has been taught by academically trained professors, utilizing a textbook (most recent edition, *Student-Managed Investment Funds: Organization, Policy, and Portfolio Management*, by Brian Bruce, 2020), and leaned heavily on locally based industry practitioners to serve as guest lecturers for the class throughout the semester. It is our observation that most university SMIFs operate under a very similar format. While this structure has many previously discussed benefits in terms of student learning, we believe there are several steps SMIF programs can take to advance their program to the next level and more closely mirror a professional money management experience.

In 2020, FGCU hired an industry practitioner with over 25 years of experience in equity research and portfolio management to help oversee and build upon the existing SMIF program. Until his retirement, he served as a senior portfolio manager and managing partner of an institutionally-focused buy-side firm overseeing $15 billion in assets under management as of 2015. An MBA and CFA charterholder, he supervised a 10-person analyst team and oversaw all aspects of the investment process. His firm's clients were some of the world's largest investors, including sovereign wealth funds, corporate and union pension plans, state and local government retirement funds, foundations, endowments, and wealth management sub-advisory programs. Many of the changes to the FGCU SMIF and suggestions in this paper arise from this former investment professional viewing the academic setting from "the inside" and making changes to the SMIF based on a practitioner's perspective. These changes, in many ways, were somewhat "out of the box" to the university, but completely status quo in the profession.

One goal of this paper is to highlight some of the recent changes to the FGCU SMIF and encourage other universities to think more along these lines if they are not doing so already. The authors review several new initiatives and enhancements that have been implemented in the SMIF program since 2020 to transition it from an applied academic studies approach to more of a real-world, professional style, money management experience. We believe many of these changes have already started to bear fruit and help contribute to the SMIF's strong absolute and risk-adjusted performance over the past 5 years, as noted in Exhibit 1. What works at one university does not always work at another, so the authors of this paper encourage the reader to take the recommendations offered below and tailor them to their specific university.

Exhibit 1: FGCU SMIF "Eagle Fund" Annualized Portfolio Returns (Net of Fees)[1]

	AUM 2024	YTD 2024	1-year	3-years	4-years[2]	5-years	7-years
Large Cap Core	$655k	21.1%	31.6%	13.4%	18.1%	17.2%	15.5%
S&P 500		22.1%	36.3%	11.9%	16.2%	15.9%	14.5%
Relative Perform.		-1.0%	-4.7%	1.5%	1.9%	1.3%	1.0%
Small/Mid Cap Value	$188k	10.9%	26.8%	10.5%	20.2%	N/A, inception Sep. 2020	
Russell 2500 Value		11.3%	26.4%	6.0%	16.4%		
Relative Perform.		-0.3%	0.4%	4.5%	3.8%		
Bond Portfolio	$186k	4.1%	11.6%	0.5%	0.5%	1.6%	2.6%
Bloomberg Corp. Index		5.3%	14.2%	-1.2%	-0.5%	1.2%	2.4%
Relative Perform.		-1.3%	-2.6%	1.7%	1.0%	0.4%	0.2%
Total AUM							

[1]Time weighted returns exclude the impact of deposits and withdrawals
[2]Time period since new initiatives were implemented in 2020

How SMIFs Differ from Professional Money Management Firms: Pros, Cons, and Obstacles to Overcome

When institutional investors such as corporate pension plans, sovereign wealth funds, state and local governments, unions, foundations, and endowments evaluate professional money management firms, they focus on the so-called "6 Ps" (Carson 2024):

1.) People
2.) Philosophy
3.) Process
4.) Portfolios
5.) Performance
6.) Price

Let us start with an area where SMIFs have a distinct advantage over large, professionally managed firms: the sixth "P," Price. Many SMIFs, including FGCU's Eagle Fund, incur zero management fees and transact on brokerage platforms such as Schwab or Fidelity that offer zero-commission trading. A larger and less obvious advantage of SMIFs versus professional firms is their relatively small asset size, which allows SMIFs to nimbly enter and exit security positions without creating market impact costs. According to the 2021 NACUBO-TIAA Study of Endowments, the median SMIF has assets under management (AUM) of approximately $800,000 as compared to professional firms that can manage tens to hundreds of billions of dollars. Multiple studies, including Almgren and Chriss (2001), Engle and Ferstenberg (2006) and Torre (1997), suggest that market impact costs on large volume trades can exceed 1 percent or 100 basis points.

Another area where SMIFs have the potential to compare favorably to professional investors is the fifth "P," Performance. According to Standard and Poor's 2023 SPIVA U.S. Scorecard (S&P 500 Index versus Active Managers), only 21%, 13%, and 12% of professional "active" equity managers have been able to outperform the S&P 500 index (net of fees) over the past 5, 10 and 15 years, respectively. Lawrence (2008) notes evidence showing some SMIFs have performed better than portfolios managed by professionals. Haddad and Redman (2006) examine SMIF performance and state that many schools in their study outperformed the Standard and Poor's 500 (S&P 500) over the period 1992-2002. Jones and Swaleheen (2014) provide an example of how a SMIF can outperform its benchmark and add value to the university endowment as well as to the student portfolio managers. Hughen, Strauss, and Tremblay (2018) discuss a strategy where students can add value to a fund by targeting investments in under-researched firms while using a well-defined sector allocation methodology. Berkow, Jakotowicz,

and Weber (2018) note the results of an SMIF whose decision-making process improves its performance over the period examined.

The focus of institutional investors and their consultants, however, is not purely on strong historical performance but rather on the ability to sustain and repeat that performance in the future. In this regard, the current investment Portfolio (the fourth "P") and its expected future Performance (the fifth "P") is thought to be a residual of the strength of all the other P's, including People, Philosophy, Process, and Price.

Virtually all professionally managed firms articulate a clear investment Philosophy (the second "P"). According to NYU professor Ashwath Damodaran (2024), an investment philosophy is a "set of core beliefs" and a "coherent way of thinking about markets." The Investment Philosophy is one of the easiest of the 6 P's for SMIFs to incorporate into their program. In his textbook, Bruce (2020) provides insights into how SMIFs can formulate an investment philosophy and provides numerous examples from both SMIFs and professionally managed firms.

FGCU's Eagle Fund philosophy has been relatively unchanged since its inception in 2005. It reads as follows:

> *The Eagle Fund seeks to generate actively managed investment performance above that of the relevant passive benchmarks for all portfolios under its management, while adhering to the policies and goals of the FGCU Foundation. Understanding the potential risks involved with an active approach, the Fund has adopted a long-term focused, well-diversified, and low transaction cost strategy to maximize investment returns and minimize risks. The student and faculty members of the Eagle Fund believe that the market is not completely efficient, and there are opportunities to exploit security mispricings through a repeatable investment process and deliver above-benchmark long-term investment results.*

The Process or strategy (the third "P") is "a way of putting into practice an investment philosophy" (Damodaran 2024). Virtually all SMIFs have robust investment policy statements and portfolio guidelines that govern all aspects of portfolio construction and risk controls, including eligible securities, position sizes, sector weightings, market cap structure, cash levels, and performance benchmarks. The governing points of Florida Gulf Coast University's SMIF's investment policy statement are as follows:

- The equity portfolio must only invest in equities traded on three principal U.S. Stock Exchanges: NYSE, AMEX, and NASDAQ.

- The use of American Depository Receipts (ADRs) or American Depository Shares (ADSs) in domestic equities is limited to 10% of the equity portfolio (as of 10/24, 3% invested in ADRs).
- Equity investments must be made in corporations with at least one billion dollars in market capitalization (as of 10/24, range $6.5b - $2.9T, weighted average $680b).
- Investment in any single corporation's stock shall not exceed 10% of the total market value of the equity portfolio, with no minimum (as of 10/24, average position size 2.5%, range 0.6% to 5.9%, in 40 stock portfolio).
- The investment in any individual market sector shall not exceed 150% of the market weight, as measured by the S&P 500 at the close of each quarter, with no minimum weight (as of 10/24, the largest overweight is financials at 133%, the largest underweight is technology at 72%).
- An investment in a single corporation's fixed income shall not exceed 10% of the total market value of the fixed income portfolio. Investments in US Treasury and Agency debt can exceed this cap.

These original guidelines from 2005 remain in place today. The goal of the Large Cap Equity, Small/Midcap Value, and the Investment Grade Fixed Income portfolios is to achieve total net returns above their respective benchmarks (S&P 500, Russell 2500 Value, and the Bloomberg/Barclays US Corporate Index, respectively) on an absolute and risk-adjusted basis, while being cognizant of a three-to-five-year investment horizon. Clinebell (2013) uses this same three-to-five-year investment horizon for the fund described in his study of SMIFs.

While an investment policy statement is necessary, we do not believe it is sufficient in lieu of an actual investment process and recommend *The Little Book of Investing like the Pros*, by Pearl and Rosenbaum (2020), which covers all the key aspects of implementing a professional style investment process. Based upon anecdotal evidence acquired from attending, hosting, and serving as judges at national SMIF competitions, the authors observe that many SMIFs do not possess investment processes like those of professional managers, and many SMIFs conflate policy statements with process. Many SMIFs allow students to select securities and manage portfolios using eclectic investment styles and techniques, often shifting over time, as long as they remain "in compliance" with guidelines. Many SMIFs do not use a consistent, repeatable, and systematic step-by-step research process for security idea generation, validation, monitoring, sell discipline, and replacement.

In 2020, based upon several new initiatives and program enhancements, FGCU's Eagle Fund formalized its investment process as follows:

> *The Eagle Fund uses a bottom-up approach utilizing both quantitative and fundamental research techniques to build and manage actively managed portfolios. We utilize a time-*

tested quantitative screening process to narrow down our selection universe to a Focus List of securities for the students to further analyze. The screening process is a multi-factor model that considers Valuation, Growth, Momentum, Profitability, Efficiency, Quality, Volatility, and Technical factors. The Focus List is not only a productivity tool in terms of generating new ideas but also a source of alpha versus its benchmark, as it has been rigorously back-tested over multiple market cycles. The Focus List is the primary source of new ideas for the students to further analyze. Students are grouped into sector-based teams that carry out the fundamental research process. Responsibilities include analyzing financial statements, providing company valuation assessments, and creating written research reports, including buy/hold/sell recommendations. Here, the students also delve into the qualitative 'story' behind the numbers, figure out whether current trends are sustainable, and identify catalysts for security price appreciation. Once purchased, portfolio holdings are closely monitored by the students to ensure they continue to meet the criteria set by the Fund. Securities are continuously re-ranked quantitatively and fundamentally monitored by the student teams. The sell discipline may be triggered by high valuation, fundamental deterioration, and/or opportunity costs. There are a number of portfolio risk controls including position and sector weighting limits to ensure prudent diversification and to minimize the volatility of returns.

In our view, the biggest challenge of adopting a professional style money management approach within a SMIF is the first "P," which is the People. In a professional setting, experienced portfolio managers and analysts work together for years and sometimes even decades. Information and knowledge regarding specific security investment rationales and portfolio positioning are retained and drawn upon to benefit future decision-making. In a university SMIF, novice student analysts change over every few months, the equivalent of 200%+ annualized turnover of the investment team. Without the proper structure, documentation, and oversight, a SMIF portfolio could easily devolve into a random collection of securities, where incoming students have no insight into the original investment thesis, important developments since purchase, what the security may be worth, or the key risks to be aware of. Time commitment is another key obstacle for SMIFs. It is not uncommon for investment professionals to log 50 to 60+ hours per week working on their portfolios. Given that many SMIFs are organized as 3-credit hour courses, student analysts/portfolio managers often formally meet only once or twice weekly plus another three hours or so for additional research, homework, and assignments. It is not feasible or desirable for our students to devote more than six to nine hours per week to the SMIF, given their other coursework, jobs, family responsibilities, and social activities.

New Initiatives of the FGCU SMIF

To sum up our comparison of SMIFs versus professionally managed firms using the "6 Ps" framework, we make the following observations:

Price – a clear advantage to SMIFs due to smaller AUM size and zero-fee/cost structure.
Performance – potential advantage to SMIFs, largely due to the aforementioned price advantage.
Philosophy – Tie. Most SMIFs and virtually all professional firms operate under a logical and clear set of beliefs, at least in writing, if not in practice.
Process – Advantage Pros. Most professional firms articulate a clear step-by-step investment process from
idea generation to sell discipline. Many SMIFs operate under a contractual investment policy statement put forth by the university but do not lay out a robust, clearly defined, and repeatable process.

In this paper, we offer several suggestions that could help SMIFs improve their process and close the gap with professionally managed strategies.

Portfolio – Advantage Pros. The characteristics and makeup of the portfolio, at any point in time, are a direct result of consistent adherence to and application of the investment process.
People – Advantage Pros. There is no substitute for years or even decades of experience and the continuity of working together as an investment team. In this paper, we offer several suggestions that could help SMIFs narrow the experience and continuity gap.

With these obstacles in mind (particularly as they relate to People and Processes), FGCU's SMIF has implemented several initiatives and enhancements to its SMIF program since 2020 to better mirror a professionally managed approach.

Eliminate "Dark" Periods

Over the winter and summer breaks, the overwhelming majority of SMIFs go "dark," where the portfolios go unmanaged. In the real world, this is completely unacceptable, a violation of fiduciary duty, and fraught with severe legal and regulatory consequences. Some SMIFs take measures to mitigate or minimize these risks, including using stop-loss orders and even liquidating active positions or going passive via ETFs and index funds. These stop-gap measures fall far short of an ideal solution in our view. During COVID-19 in 2020, FGCU offered the SMIF course during the summer to help our

students who missed out on internships that year due to the pandemic. This effort produced mixed results, as we found it difficult to execute a normal 15-week program during a 6-week compressed summer course. So, in 2021, we created the Eagle Fund Summer "Watch Group", a volunteer club-based format, which meets remotely once per week for 1-2 hours to review key developments in the portfolio and make buy/hold/sell decisions in accordance with the investment process. We have found no shortage of passionate student investors who want to extend their learning from the spring semester or get ahead on the upcoming fall semester. We also run a shorter version of the Watch Group during the winter break. We are the only university (that we are aware of) that provides year-round, continuous active management of their SMIF portfolios.

Allow Students to Take the SMIF Course More Than Once

In the Fall of 2024, FGCU, for the first time, allowed high-performing Eagle Fund students to take the course a second time, with their second semester focused more on portfolio management than security analysis. These student portfolio managers help guide and train the new incoming SMIF analysts. This program change has multiple benefits including increasing learning outcomes for high achieving students and providing fund management continuity from one semester to the next. Furthermore, Barnes and Buller (2021) suggest that SMIF programs that span over more than one semester tend to outperform those that do not.

Deploy a Quantitative Framework

Quantitative screening has become a widespread tool among professional investors. According to a 2023 survey by Invesco, nearly 73% of institutional investors in fixed income use a systematic or quantitative approach, while 98% apply it to equities. A survey by PwC (2023) reveals that nearly 90% of institutional investors believe that incorporating disruptive technologies, such as quantitative models, leads to better portfolio outcomes and returns. In 2020, FGCU's SMIF significantly improved its analysis by incorporating a well-defined and consistently applied quantitative framework. A new large-cap portfolio screening process narrows down the initial selection universe from the S&P 500 to approximately 50 stocks. Not only does this screen save time (by reducing the number of names for students to research by 90%), but it can also help improve the probability of picking a winning stock and help generate "alpha" for the portfolio. The screens were constructed based on rigorous "backtesting" studies, performed over multiple decades and inclusive of several full market cycles. The screen can also be used to re-rank existing holdings, assisting in identifying problem stocks, and triggering the sell discipline. Our university is fortunate to have access to 12 Bloomberg terminals that are used for screening and backtesting. For those universities that do not have Bloomberg, we recommend other investment software packages, such as FactSet, or even web-based tools, such as Yahoo Finance.

Focus the Fundamental Research Effort

After the universe of securities (e.g. S&P 500) has been screened, generating the "focus list" of stocks for our students to research, they perform what can be best described as a fundamental "overlay" on those individual companies. Due to the limited time availability of students, we believe the SMIF's fundamental analysis should focus only on the key drivers of a security's future performance, not minutia. The student analyst's goal is not to try to learn everything possible about a particular security, but to understand the handful of things that really matter in terms of the security's future performance. Our SMIF's fundamental research focuses on valuation assessment, balance sheet and cash flow analysis, the identification of key fundamental drivers and catalysts, and the assessment of major risks. This "overlay" style approach is very similar to Value Line and CFRA (formerly S&P Equity Research) style reports favored by many "buy-side firms" versus the more comprehensive "deep dive" tomes favored by Wall Street or "sell side" analysts. One of the authors of this paper, earlier in his career, was a consumer and commercial services analyst at S&P Equity Research and published hundreds of research reports in this style. The FGCU Eagle Fund students currently use this research report style and format when preparing their own research reports, which make up 20 percent of the course grade.

Document and Publish Student Research

For investment process continuity from one semester to the next, the Eagle Fund recently launched a web-based research report library/portal, so that incoming students can quickly get up to speed on existing fund holdings. By reading the prior students' research reports, new student analysts can quickly understand why the prior students liked the stock, what their expectations were, valuation parameters, price targets, and what to look out for in terms of catalysts and emerging risks on the horizon. New students may agree or disagree with the prior analysis, but the research portal saves them a lot of time by eliminating duplication of efforts. Norris (2002) advocates documenting a rationale behind why a stock is an attractive investment, specifying the set of conditions that would trigger a sale, and reviewing that rationale regularly. An additional benefit of documenting and providing public access to Eagle Fund research is the ability for students to repost their reports on LinkedIn or otherwise use this work to boost their profile among prospective employers.

Prioritize Monitoring of Existing Positions and Sell Discipline

During the first class each semester, new students are assigned to sector-based research teams. Student teams are informed that they need to take ownership and responsibility for the performance of the fund's current holdings within their assigned sectors. Based upon the author's experience serving as judges in national SMIF competitions, many current SMIF students can articulate a well-thought-out investment thesis on holdings they personally researched and recommended, but their knowledge of existing portfolio holdings often is very limited. Therefore, new student ideas will

often "push out" existing holdings that they are unfamiliar with. Just because new students are unfamiliar with an existing holding does not mean it is not a good idea or perhaps even superior to the new idea a student is recommending. At FGCU, before students start researching new companies (which they are extremely anxious to do), they must focus on stocks that the fund already owns. As Peter Lynch said, "Know what you own and why you own it," and "You don't get hurt by things that you don't own that go up. It's what you do own that kills you." And Warren Buffett once said, "The first rule of an investment is don't lose money. And the second rule of an investment is don't forget the first rule." Monitoring and sell discipline are not particularly exciting to students, but any good professional manager knows that these elements of the investment process are crucial to long-term success.

Leverage Investment Technology

As noted above, the SMIF students at our university have access to a state-of-the-art trading room equipped with 12 Bloomberg terminals. This lab was established in 2014 and gave the SMIF students a significant enhancement in the level of investment technology available to them. Bloomberg is extensively used throughout all aspects of the SMIF investment process, including stock screening, back-testing, portfolio record keeping, investment performance, portfolio attribution, fundamental research, financial statement modeling, valuation, position monitoring, and risk management. Additionally, several Excel templates, with links to Bloomberg, have been created to generate research report templates, perform financial statement modeling, discounted cash flow valuation assessment, M&A analysis, and more. In addition to the time-saving benefit of leveraging investment technology, students gain proficiency in the use of the Bloomberg terminal and Excel, which are great resume additions. A graded component of the SMIF course is that students are required to earn their BMC (Bloomberg Market Concepts) certification. This certification is a tangible line on their resume, in addition to teaching them the basics of the terminal.

Compete in SMIF Competitions

Maybe second only to sports, investing is one of the most competitive professions on the planet. A local investment practitioner and guest lecturer in our program often quips that former high-level athletes make good portfolio managers. He notes that the ability to think quickly learned in sports is very similar to investment decision-making. Professional manager returns are measured daily and compared to various benchmarks and peer groups over multiple time periods. Only the better-performing investment managers will attract additional clients and retain existing relationships and grow their businesses profitably over time. To acclimate our students to this incredibly competitive field, FGCU joined the Student Managed Investment Fund Consortium (SMIFC) in 2021. The SMIFC, comprised of over 130 universities with SMIF programs, holds an annual conference each fall in Chicago. One of the main conference events is the SMIF "poster" competition where dozens of university SMIFs

are judged based on their prior year's investment performance, a visual presentation (poster) of their investment philosophy, process, portfolio, and performance (the 6 Ps again), and their ability to answer questions from the judging panel about their portfolio strategy and holdings. This competition is very much like a real-world institutional manager search "finals presentation", where presenters have just a few minutes to convince an investment committee that they are the right money management firm for their portfolio allocation. After finishing fourth in 2022, the FGCU SMIF team placed first in the SMIFC poster competition in 2023. We also had the pleasure of hosting a satellite SMIFC conference in the spring of 2024 in Cape Coral, Florida.

Assignments Designed to Improve Student Communication Skills

Individuals who rise to the highest ranks in the investment industry are not those who can deliver outstanding long-term performance but those who can present well to prospective clients and convince them to give them their money to manage. Professional firms often bring in outside expert consultants to offer comprehensive presentation training to their client-facing employees. The CFA Institute's "Investment Professional of the Future" (2019) report highlights key trends in the investment profession, particularly emphasizing the growing need for client-facing investment professionals to enhance their communication and presentation skills. Warren Buffet was famously quoted as saying the easiest way to increase your net worth by 50% "is to hone your communication skills, both written and oral"; we agree. One of the best elements of the FGCU SMIF course since its inception in 2005 (20 percent of the grade) is the practitioner interview and follow-on class presentation. Students are asked to interview an experienced industry practitioner and ask them about their academic background, licenses, certifications, career path, advice they would give to graduating students, etc. SMIF students then prepare a PowerPoint to outline their interview with the rest of the class. Another way we help our students hone their presentation skills is to assign them a classic investment book to read during the semester (for example, Peter Lynch's *One Up on Wall Street* is a popular choice among our students). At the end of the semester, they prepare a PowerPoint and make a presentation to the class, which is also 20% of the course grade.

Make Presentations to the University Foundation

A presentation to the Foundation finance committee has been a part of the Eagle Fund since its inception, but the move toward making the class more like a professional money management experience has brought changes to this presentation. Professional managers are often contractually required to present a portfolio review to their clients on an annual basis (sometimes more often). Each spring, a small number of Eagle Fund students are selected to represent the SMIF and to present in front of the investment committee (just like the foundations' outside money managers do). Students conduct a performance review (including returns attribution), provide a portfolio update on key changes

(new buys, sells, sector weightings shifts), and give an outlook for the upcoming year. Recently, our students were invited to stay for the entire board meeting and were able to see firsthand the inner workings of the Foundation, including reviewing the fund's investment policy, manager selection procedures, performance monitoring, risk management, compliance, and governance. The Foundation's consultant gave an update on the funding status of the plan, its current asset allocation, and potential additions and other recommended changes to the plan. Students learned about the benefits of private equity investment and its various forms, including buyout, growth, and venture capital.

Involve Industry Experts

The SMIF at FGCU has had dozens of guest speakers over the past few years, including Wall Street strategists, fundamental analysts, technicians/chartists, portfolio managers, traders, investment bankers, and financial journalists. These experts provide students with unique information and perspectives on individual securities and the overall portfolio. Also, several Wall Street firms provide students with free access to their proprietary research and models via the Bloomberg Terminal and other sources. These are great tools that professional "buy-side" analysts often use to quickly get up to speed on their new stock research efforts. One word of caution as it relates to outside speakers. Each guest lecturer brings with them their own philosophy, process, and strategy. While it's beneficial for students to learn about different ways to invest, these sessions should not unduly influence how the SMIF is managed. Students should adhere to the SMIFs stated philosophy and process; otherwise, the SMIF could suffer unwanted portfolio turnover and severe style drift triggered by a rotation of guest lectures espousing the benefits of their own strategy, such as small-cap deep value or larger cap aggressive growth.

Consider Having a Dedicated SMIF Instructor, Optimally a Practitioner

Abukari et al. (2021) provide a broad understanding of how these funds are structured in academic settings and the role of faculty in managing them. It underscores that many SMIFs are part of formal academic courses with professors overseeing their operation. Most SMIFs are led by full-time career academics who teach multiple finance classes in addition to supervising the university's SMIF program. This may work well in a traditional "applied academic studies" approach, where prior student course learning is applied to the management of 'real money' university SMIF portfolios. This method is often augmented by utilizing a SMIF textbook and bringing in multiple guest lecturers to provide some real-world context. There is nothing wrong with this design, and it is one that FGCU used for 15 years prior to 2020. However, as alluded to in this and other papers (see Macy, 2010 and Yerkes, 2018), SMIF programs require significant faculty time and resources. It is our view that full-time professors with large course loads, research requirements, and other university service obligations, due

to time constraints, may struggle to adopt and implement some of the suggestions we recommend in the paper. As most readers of this paper will concur, the perspective of an academic is often different than someone who has spent their career in securities analysis and portfolio management. This perspective is important, as one of the primary goals of a SMIF program is to help their students prepare for a future career in the investment industry.

Therefore, if possible, the authors recommend that universities with a SMIF allocate resources to employ a full-time, part-time, or adjunct professor who is dedicated to teaching the SMIF course and overseeing this program. The Intentional Endowments Network (IEN) Report (2021) on Student Managed Investment Funds (SMIFs) discusses the structure and role of both practitioners and academics in guiding SMIFs and highlights the growing involvement of practitioners in providing industry-relevant experience to students in these funds. If a dedicated professor for the SMIF is not possible, we recommend that the university give course release time to the instructor who is to oversee the SMIF.

Conclusion

This paper discusses the history and recent initiatives and enhancements to Florida Gulf Coast's University's (FGCU) SMIF Program since 2020. It delves into the similarities and differences, as well as the advantages and disadvantages of traditional SMIF programs versus professionally managed investment firms, through the lens of the "6 Ps" of portfolio management: People, Philosophy, Process, Portfolios, Performance, and Price. The authors identify several areas where many SMIFs fall short of the best practices employed by professionally managed firms, especially as it relates to People and Processes. We then offered several specific suggestions on how to close that gap to provide students with a more realistic professional money management experience.

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A Stochastic Model for Forecasting Stock Prices Over a Short Time Period

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ABSTRACT

A Stochastic model designed to forecast stock price ranges over a very short time period is presented herein and applied to a real-world situation. A probability-based distribution of future share prices over short time spans can be helpful in making investment decisions. Students evaluating companies and share prices may find the application of a stochastic model useful over short-term periods such as a single trading day or over a period of several days.

For students in a Student Managed Investment Fund (SMIF), the implementation of stochastic modeling could help in investment decision-making, over the short term. The use of forecasted probability-based distribution share value ranges can serve as a guide to students who may wish to review and evaluate price changes within a single day or over a period of a few days. The application of such a model may also be useful when contemplating market buy/sell and stop-loss orders.

This paper expands and extends prior work on stochastic stock price model applications. In 2010, Bright Osu examined the conditions for stability and convergence in stock prices toward predicted equilibrium share values. Milan Svoboda, in 2016, applied stochastic modeling to predict short-term prices in the Czech stock market. A stochastic process was used in 2019 by Erdugan, Kulendran, and Natoli, incorporating volatility to forecast directional changes in returns in the Australian equity markets.[1] The principles and methods used are herein applied to specific stocks in the U.S. equity markets.

The paper is divided into two sections. First, a basic description of the model is presented and illustrated using a simple stock price example. This is then followed by the application of the model based on the described stochastic process on real stocks over a selected narrow time span.

[1] Each of the papers mentioned applied a stochastic process to predict and/or narrow the forecasted prices and values.

Basic Form

The stochastic model presented uses randomized variables to predict outcomes within a certain parametric range. The random variables used in this model are the expected mean return on a stock and the underlying volatility, or standard deviation of the stock under review. Origins of the model can be seen in John C. Hull's seminal text and although not detailed here, elements of the Black-Scholes option pricing approach are used as a basis for the model (Hull 2011).[2]

The basic form of the model is presented below.

$$\text{Ln } S_t \sim \Phi[\text{Ln } S_0 + (\mu - \sigma^2/2)\, T,\ \sigma \sqrt{T}]$$

Where:

S_t = Forecasted stock price

S_0 = Current stock price

μ = Expected mean return on the stock

σ = Volatility or standard deviation of the stock

T = Time (in years)

The formula uses historical, day-over-day price return volatility data to compute the standard deviation and mean return. As is generally known, stock prices are lognormally distributed around a mean, while stock price returns are normally distributed (Dubrofsky and Miller 2003).[3] Here, day-over-day stock returns are used to determine the predictive variables.

The calculation of these returns over time provides a normally distributed range of expected outcomes for a particular asset set, in this case, share price returns. Using this data, the average or expected mean return of the stock is determined and used as an input variable.

The equation indicates that the natural log of a future stock price (T) is a function of the natural log of today's stock price plus the expected mean return of the stock, less the standard deviation-squared (i.e., the variance) of the returns over a given period. That result is then divided by two and multiplied by a future time day reference, typically stated in years. The range is then adjusted by adding and subtracting the past averaged standard deviation, multiplied by the square root of time.

The last step is to adjust the range by the standard deviation of a selected confidence interval which represents an area under the normal distribution curve.

[2] See, Hull's Fundamentals of Futures and Options. Note, the Black-Scholes option pricing model is referenced here but is not the focus of this study.

[3] There are various excellent references and texts regarding the lognormal structure of stock prices. A good source of this application is David Dubofsky and Thomas Miller, Jr.'s book, "Derivatives.".

Example

The application of the model is fairly straightforward. The following simple illustration is used herein as an example. It is assumed that the current stock price of a target firm is $30 on the initial or Current Day (CD), while the volatility and expected return on the investment are 18% and 14%, respectively. The analyst, in this case, wishes to know the range of stock prices for the subsequent fifth day, that is, Current Day plus 5 (CD+5). The following criteria and assumptions are used in the equations and function (F) below.

S_o = $30 (current day stock price)
S_t = The forecasted stock price range at time T
σ = 18% (volatility, or standard deviation)
μ = 14% (expected return)
T = .01984 (for 5 business days, (CD+5)[4])

Thus: 1. $LnS_t \sim \Phi [Ln30 + (.14 - (.18^2/2)) .01984, .18 \sqrt{.01984}]$

2. $LnS_t \sim \Phi [3.4012 + (0.00246), 0.0254]$

3. $LnS_t \sim \Phi [3.4037, 0.0254]$

To determine the range of values associated with the assumptions above, a 95% confidence interval is used to establish the output range. That is a 1.96 standard deviation from the mean.[5]

Using the standard deviation associated with the 95% confidence interval to equation (3) above produces the following:

4. $[3.4037 - 1.96(.0254)] < LnS_t < [3.4037 + 1.96(.0254)]$

5. $[3.3539] < LnS_t < [3.4534]$

Converting the figures in equation (5) to share prices requires changing the natural log into the exponential function (e), as follows:

[4] A 252-day year convention is used so that a five-day time (T) is (5/252) = 0.01984.
[5] This is not meant to be a formal paper on statistics and for the purpose of advancing the model, a simple t-distribution is assumed where: $t = (-\mu)/(\sigma/\sqrt{n})$. The result of the calculation produces a factor of 1.96 assuming significant degrees of freedom.

6. $e^{3.3539} < S_t < e^{3.4534}$

The resulting stochastically generated share price range results, based on the data and given input variables, are shown below:

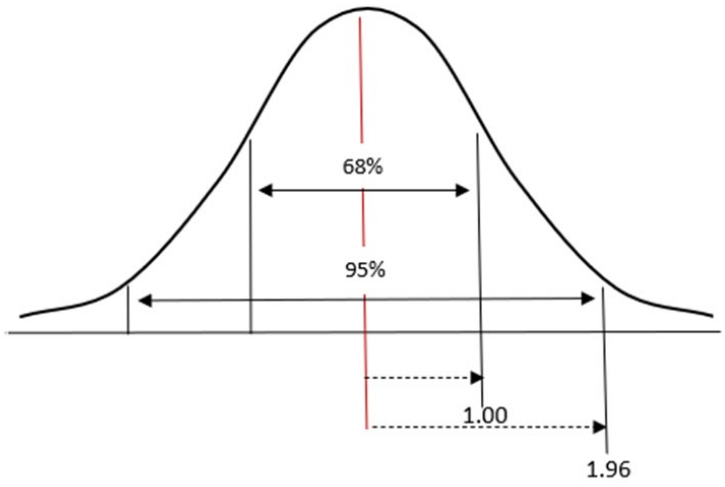
7. $\$28.62 < S_t < \$31.61$

Accordingly, the initial current day stock price of $30.00, with a 14% expected return and an 18% standard deviation, in five business days, will have, at the 95% confidence interval, an expected forecasted lognormally distributed range of between $28.62 to $31.61.

One interesting aspect of the model relates to the selection of the confidence interval. The higher the confidence interval, the wider the range. The lower the confidence interval, the narrower the range.

For example, lowering the confidence interval from 95% to 68%, narrows the area under a normal distribution curve as well as the resulting stock price range. The diagram below presents a simplified illustration of the relationship between confidence intervals and standard deviations with respect to a normal distribution curve.

Sample Normal Distribution Curve



To illustrate, reducing the confidence interval narrows the range of stock price estimates. Using the current example, changing the confidence to 68% changes the standard deviation to 1.00, and narrows the resulting stock price range to $29.32 to $30.85. This outcome is found by replacing the 1.96 standard deviation by 1.00 in equation (4) as follows:

8. $[3.4037 - 1.00(.0254)] < \ln S_t < [3.4037 + 1.00(.0254)]$

9. $[\ 3.3783\ ] < \ln S_t < [\ 3.4291\ ]$

Converting the natural logs into exponentials produces a range of stock prices.

10. $e^{3.3783} < S_t < e^{3.4291}$

11. $\$29.32 < S_t < \$30.85$

Lowering the confidence interval increases risk as the probability of the actual price falling outside the range increases. But, in this way, analysts can adjust, measure, and evaluate the resulting forecasted stock price range against the risk related and adjusted confidence interval.

Model Application

In this section, the application of the model is applied to a real-world situation. In this case, three firms and their corresponding industry sectors are studied. Data samples are comprised of daily share values over a three-year period using unadjusted stock price close figures.[6] Unadjusted closing stock price data were obtained from July 29, 2021, through July 31, 2024.

Day-over-day returns were then used and averaged over that period and annualized as input variables. The standard deviation of the daily data was calculated and annualized. Annualizing the data meant multiplying the results by the square root of 252 for daily data as by convention.

Note that the return and volatility data do not represent cumulative returns but individual expected returns for any given day within the period considered. Thus, return data do not match cumulative returns over a select period. In this instance, the results provide an expected forecast for a particular period on a discrete daily basis and do not assume a cumulative investment time horizon. That is, the predictive stock prices represent a discrete future stock price and are not based on cumulative returns on investment.

The input variables used here represent the annualized daily return and standard deviation for each stock. Since the period of time is short (i.e., 5 business days), no dividends were announced nor paid during the week under review and, accordingly, did not affect the analysis. The distribution range is based on a 95% confidence interval.

[6] Adjusted stock prices include dividend payouts and assume reinvestment of the cash proceeds. Unadjusted stock prices do not include dividend reinvestment and tend to reflect the likely price outcome observed directly by investors.

The stocks chosen for this study are DTE Energy (DTE), Amazon (AMZN), and Tandem Diabetes Care, Inc. (TNDM). DTE Energy is in the Utility sector, while Amazon is largely defined in the Consumer Discretionary sector, although Amazon's Web Service (AWS) alludes to a position in the Technology sector as well. Tandem is in the Health Care industry sector.

The model was applied to the three stocks and used the same date for the initial current day (CD) price. The model was then used to forecast the price ranges for the next five days. Specifically, for the three stocks observed, the initial current date as of July 31, 2024. The model then forecasts the distribution range over the next five business days, i.e., August 1 through August 7, 2024.

The dates for the model application are not coincidental. The markets moved significantly on Friday, August 2nd, and again on Monday, August 5th. On August 2nd, the Bureau of Labor Statistics published a report that the U.S. added far fewer jobs than had been expected, and the unemployment rate rose to 4.3%.[7] This compounded the negative economic news already released on Thursday, August 1st, wherein it was reported that Construction Spending was down in June by 0.3%. Supply Management in the manufacturing sector posted a decline for the fourth month in a row, once again below the 50% range, at 46.8%. Also, 249,000 workers filed for unemployment, the most since the previous August.

On Friday, August 2nd, the markets reacted to these economic disclosures and closed sharply down, the Dow falling 611 points (-1.5%), the S&P dropped 100 points (-1.8%), and the Nasdaq fell 418 points or by 2.4%.

This was followed by another sharp decline in the markets on Monday, August 5th, spurred on by Japan's Nikkei index, which fell, over the weekend, by 12%.[8] On Monday, the Dow dropped 1,034 points (-2.6%), the S&P fell 3.0%, and the Nasdaq closed down 3.4%.

These sharp declines in the markets serve as a unique opportunity to apply the model to the selected stocks.

The 95% confidence interval was used to predict the stock prices and test the model for the three firms, DTE Energy (DTE), Amazon (AMZN), and Tandem Diabetes Care, Inc. (TNDM). A summary of the resulting input variables, i.e., annualized returns and standard deviations, for each company, is presented in Exhibit 1.

Exhibit 1: Computed Input Variable Data

Variables	DTE	AMZN	TNDM
Annualized Average Monthly Return (m)	0.0004	0.0008	-0.02201
Annualized Monthly Volatility (s)	0.1993	0.3756	0.63996
Current Annual Dividend	$4.08	$ -	$ -

[7] On August 21st, the BLS further revised their previous jobs growth reports indicating that 818,000 fewer jobs were created over the past several months than originally reported.
[8] The sell-off was, in part, triggered by a hike in interest rates by the Japanese Central Bank.

A review of the stock price moves and performance over the selected time period is discussed with respect to share value predictability and the implied summary conclusions that may be drawn for each of the firms studied.

DTE Energy

During the dates evaluated (i.e., July 31 through August 7, 2024), DTE shares were fairly stable. While the Dow, as noted above, dropped 1.5% on August 2nd and by 2.6% on the following Monday, DTE fell by just 0.1% on Friday the 2nd and by 3.6% on Monday. The overall change by the close of business on Monday, August 5th (CD+3), was a decrease in the share price from $120.53 on July 31st to $118.79, a decrease of 1.4% compared to the initial day (CD+0) share value.

Exhibit 2 summarizes the actual closing share price results to the distribution range produced using the stochastic model. In all cases, the actual closing share price each day fell within the predicted ranges. On Thursday, August 1st (CD+1), the share price did rise to $123.38, a gain of 2.4% over the current price and very near the high price forecasted by the model of $123.53. Even so, the actual price did not exceed the predicted distribution range.

Exhibit 2: DTE Energy (DTE)

Stock Price Forecast versus Actuals			Percent Change		Forecasted Prices	
Period	Date	Actual	Prior Day	Initial Price	Low	High
Current Price	7/31/2024	$ 120.53				
Current +1	8/1/2024	$ 123.38	2.4%	2.4%	$ 117.59	$ 123.53
Current +2	8/2/2024	$ 123.24	-0.1%	2.2%	$ 116.38	$ 124.79
Current +3	8/5/2024	$ 118.79	-3.6%	-1.4%	$ 115.47	$ 125.76
Current +4	8/6/2024	$ 119.07	0.2%	-1.2%	$ 114.70	$ 126.58
Current +5	8/7/2024	$ 120.10	0.9%	-0.4%	$ 114.02	$ 127.31

These results suggest, for the period observed, that DTE stock was relatively stable and may imply that share prices move within a predictable pattern of outcomes. DTE pays dividends (currently at a rate of $1.02 per quarter), which may serve to moderate the share price.

Amazon

The results for Amazon are significantly different than for DTE. While there was just a modest decrease in the value of the stock on August 1st of 1.6%, shares fell sharply on the 2nd. On Friday, Amazon's share price fell by $19.08 to $167.90, or by 10.2% from Wednesday's close and by 8.8% against the Thursday close of $184.07. Amazon shares fell further on Monday (CD+3), closing at

$161.02, a decrease of 4.1% from the Friday close. By the close of Monday, Amazon shares had fallen 13.9% since Wednesday's initial price.

Exhibit 3 summarizes the results and the distribution ranges for Amazon for the days reviewed. The table shows that actual share prices for the four-day period, Thursday, August 2nd through Wednesday, August 7th (i.e., CD+2 through CD+5), fell significantly and outside the ranges predicted.

Exhibit 3: Amazon (AMZN)

Stock Price Forecast versus Actuals			Percent Change		Forecasted Prices	
Period	Date	Actual	Prior Day	Initial Price	Low	High
Current Price	7/31/2024	$ 186.98				
Current +1	8/1/2024	$ 184.07	-1.6%	-1.6%	$ 178.44	$ 195.82
Current +2	8/2/2024	$ 167.90	-8.8%	-10.2%	$ 175.00	$ 199.56
Current +3	8/5/2024	$ 161.02	-4.1%	-13.9%	$ 172.38	$ 202.48
Current +4	8/6/2024	$ 161.93	0.6%	-13.4%	$ 170.20	$ 204.95
Current +5	8/7/2024	$ 162.77	0.5%	-12.9%	$ 168.30	$ 207.16

The actual price values fell outside the predicted distribution range for the entire period reviewed except for Thursday, August 1st (CD+1). The results indicate that Amazon was less stable and, by implication, less predictable than DTE. Amazon may be more inclined to major market moves. Amazon might also be considered a market mover. That is, changes in Amazon's stock price may and likely will influence overall market direction. A stochastic distribution model for Amazon may be particularly useful in contemplating market trade orders.

Tandem Diabetes Care, Inc

Tandem shares present a uniquely volatile set of values over the period of time covered in this analysis.

The initial stock price of $36.98 at Wednesday's current day close fell to $35.21 or by 4.8% on Thursday, CD+1. However, and in contrast to DTE and Amazon, Tandem's share price rose to $41.67 on Friday, August 2nd (CD+2), a day-over-day gain of 18.3% and a 12.7% increase over the initial stock price on Wednesday. However, by the following Wednesday, August 7th (CD+5), the stock had fallen back to $37.04. The day-over-day drop of 14.6% on Wednesday, August 7th represents a decline to nearly the original current day stock price value. That is, the $37.04 value on Wednesday, August 7th was just $0.06 over the Wednesday, July 31st, price of $36.08.

Exhibit 4 presents the results for the volatile week for Tandem Diabetes Care, Inc. On Thursday (CD+1), the stock fell slightly under by 4.8% but remained within the predicted distribution range of values. However, the closing prices for the two days, August 2nd (CD+2) and August 6th (CD+4), were

$41.67 and $43.39, respectively, both rising outside and above the stochastically distributed and predicted ranges.

Exhibit 4: Tandem Diabetes Care, Inc. (TNDM)						
Stock Price Forecast versus Actuals			Percent Change		Forecasted Prices	
Period	Date	Actual	Prior Day	Initial Price	Low	High
Current Price	7/31/2024	$ 36.98				
Current +1	8/1/2024	$ 35.21	-4.8%	-4.8%	$ 34.14	$ 39.99
Current +2	8/2/2024	$ 41.67	18.3%	12.7%	$ 33.00	$ 41.28
Current +3	8/5/2024	$ 40.79	-2.1%	10.3%	$ 32.16	$ 42.30
Current +4	8/6/2024	$ 43.39	6.4%	17.3%	$ 31.45	$ 43.17
Current +5	8/7/2024	$ 37.04	-14.6%	0.2%	$ 30.84	$ 43.94

To summarize the above, shares of Tandem rose sharply against market trends on Friday, August 2nd (CD+2). Then, it fell back within the predicted distribution range on Monday, August 5th (CD+3). Tandem shares rose again beyond the modeled range on Tuesday (CD+4). Finally, on the last day, August 7th (CD+5), Tandem stock prices fell significantly back and within the forecasted value range.

This stock demonstrates a clear, high level of volatility. Stock price predictability is low over the period under review. Market order decisions would have to be carefully evaluated and monitored closely and perhaps best applied on an intraday (hourly) basis.

Conclusion

Application of a stochastic, probability-based model over a short period of time may offer value to students in relation to stock price predictability and be useful when contemplating market orders. This approach is best applied to intraday trading hours and/or over a short time of a few days. The companies selected for this study were chosen to demonstrate how contradictory results emerge, particularly during turbulent market conditions.

The firms were specifically selected to demonstrate the sharp contrasts that can emerge when evaluating share prices. The use of a stochastic model can aid in providing insight into price trend stability over a narrow time frame.

The purpose here is to offer and demonstrate a model for students in an SMIF course, which may be of use in providing supplemental information and value when combined with a deeper fundamental analysis of companies and share price behavior.

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The Theory and Practice of Kolb's Experiential Learning Theory in Student Investment Management Fund Programs – The Educator's Roles in Focus

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ABSTRACT

Already successful in achieving AACSB assurance of learning goals, student-managed investment programs will continue to hold important positions in business schools as additional experiential events are sought. Despite the success, experiential learning theory and practice suggest more can be done by educators to improve outcomes, including employing stories, knowledge connectivity techniques, and student-lived world experiences. Educators should recognize that roles and toolsets can and should vary depending upon the challenge engaged, thereby motivating the learner to move around the experiential learning cycle to broadly experience, reflect, conceptualize, and experiment as balanced learners.

Introduction

Because experiential approaches have improved learning and development outcomes in other disciplines (Kolb and Kolb 2006; Slavich and Zimbardo 2012), this paper outlines an experiential framework for student-managed investment fund programs (SMIF) that focuses on educator roles. While SMIFs have successfully met the challenges of providing experiential learning events in more than 400 colleges, more can be done (Buser 2020; Holzhauer, Krause, Judson, Harrell, and Bandopadhyaya 2020; Tashjian 2020; Boyd, Zaynutdinova, Burdette, and Burks 2019; Abukari Oldford, and Willcott 2021). Pursuant to enhanced learning and personal development, this paper proposes a top-down, holistic, philosophical-based process where educators use experiential principles and teach around the learning cycle, adopting the roles of facilitator, expert, evaluator, and coach to guide the student to experience,

reflect, conceptualize, and experiment during the event (Kolb, Kolb, Passarelli, and Sharma 2014).

The dynamic nature of Kolb's Experiential Learning Theory (KELT), this paper's proposed framework, presents a more complex, but also more robust model for constructing a SMIF educational practice than do recommendations to teach to personality styles, perceived cognitive abilities, or matched learning styles (Coffield, Moseley, Hall E., and Ecclestone 2004). In the pursuit of enhanced learning and growth outcomes and owing to the importance of recognizing and emphasizing enhanced educator-student learning relationships and advanced student development goals, KELT recommends that the SMIF educator consider linking the roles to the student, the specific learning goal, or the subject matter (Kolb et al. 2014).

Kolb's Experiential Learning Theory

Introduction to Kolb's Experiential Learning Theory – A Theory of Learning and Development

Kolb's Experiential Learning Theory provides a holistic framework of the learning process and a multi-linear model of individual development, both aligned with what the literature suggests about how students learn and grow (Kolb 1984; Sharma and Kolb 2010).

Research suggests that individuals vary in the speed and manner in which new skills, knowledge, behaviors, or attitudes are acquired (Kolb 1984; Kolb, Boyatzis, and Mainemelis 2001; Coffield et al. 2004). The pedagogical literature contends that individuals learn in different ways and that any one approach, however well designed by the instructor, will not work for everyone, every time. (Grasha 1996, 2002; Coffield et al. 2004; Pashler, McDaniel, Rohrer and Bjork 2009)

Compared to other learning approaches that focus on the characteristics of the learner (e.g. personality, cognitive ability), like Dewey (1938), Kolb's theory is unique because of its emphasis on the importance that experience plays (Dewey 1938, 1929; Kolb, 1984; Slavich and Zimbardo 2012). Beyond just creating knowledge, however, KELT contends that learning is a component of personal development and that the ways in which individuals learn shape the expanse, pace, and pathway of their personal growth (Kolb and Kolb 2005, 2018).

KELT as a Two-Dimensional Learning Process

With Kolb (1984), learning is defined as "the process whereby knowledge is created through the transformation of experience. More specifically, knowledge results from the combination of grasping and transforming experience (Kolb 1984)."

KELT is visualized by the four modes of concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE) (Kolb 1984). In any learning situation, (Kolb et al. 2014), Kolb suggests that during the CE mode, individuals engage themselves fully, honestly, and impartially with new experiences. In the RO stage, learners reflect on the experience. In

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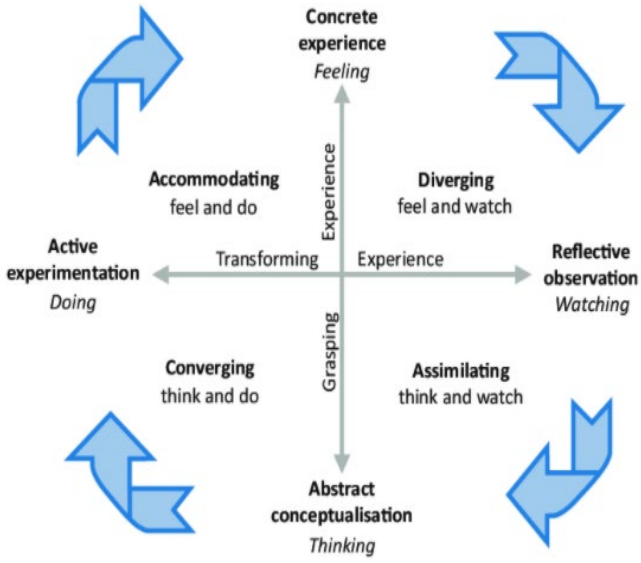
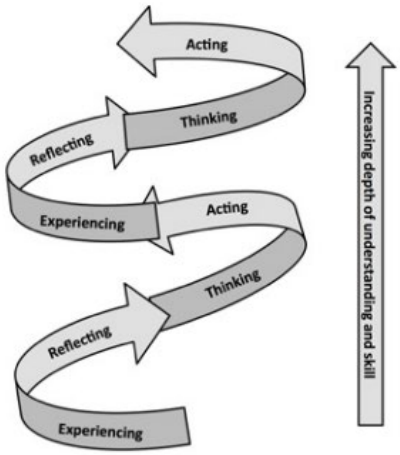
the AC stage, students seek to understand these new observations and integrate them into theories. Finally, in the AE stage, participants test these theories and apply them as foundations for new decision-making and problem-solving situations (Kolb 1984; Claxton and Murrell 1987; The Hay Group 2009). See Exhibit 1.

Exhibit 1: Kolb's Learning Cycle and Experiential Learning Styles



A completed cycle gives way to another ELC, oftentimes more complex and integrated, and the process begins again (Kolb 1984; Gagne, Yekovich, and Yekovich 1993; Hawk and Shah 2007; Buch and Bartley 2002). See Exhibit 2.

Exhibit 2: The Experiential Learning Spiral



Holistic Education That Seeks Development

"Educating is holistic" (Kolb et al. 2014). According to Kolb, educating the whole person means that the goals of education are not just gaining a cognitive knowledge of the facts but also the development of social, emotional, mental, etc. maturity. Per KELT, "it is about facilitating integrated development in affective, perceptual, cognitive, and behavioral realms" (Kolb et al. 2014).

Learning is best when situated in the person's lived world (Lave and Wenger 1991). Kolb contends people "create themselves" through the choice of learning events that they actively engage (Joy and Kolb 2007; Kolb and Kolb 2005, 2018), which in turn determines the unique pace and path of their life's experiences and knowledge development (Lave and Wenger 1991).

Integrated Instructor-Learner Relationships

With the preponderance of educational theories that exist, it is easy to overlook an important point – teaching is an integrated personal relationship (Kolb et al. 2014). KELT suggests that "learning is not something one does to students through the implementation of a set of techniques. Rather, it is what educators do with learners in the context of meaningful relationships and shared experiences" (Hickox, 1990, 2002; Kolb et al., 2014).

Kolb's Approach to Educator Roles

Beyond a holistic learning and development framework for the student, and central to the message of this paper, KELT recommends a framework for a more pedagogically sound philosophy of instruction, as opposed to simply selecting a tool from a "bag of teaching tricks" (Grasha 1996) or, staging an event that Hawk and Shah (2007) describe as little more than a "one-act magic show." This educator role framework helps the instructor to make informed choices about which role to adopt for a given challenge (Kolb et al 2014).

KELT contends that the process of the instructor teaching around the ELC introduces the need and means for adjustments in the educator's role (Passarelli and Kolb 2011). Importantly, this suggests that roles go beyond any singular teaching or matching-oriented approach (Timura 2012; Kolb et al. 2014). Kolb uses the terms facilitator, expert, evaluator, and coach to describe the four roles in conjunction with the ELC. See Figure 3.

KELT stresses that highly effective educators do not rely on any single role (Dede 2011; Passarelli and Kolb 2011); instead, they organize their interactions to address all four learning modes. In this way, balanced educators lead the student through the experiential learning cycle (i.e., to become a balanced learner), changing the role depending upon which stage of the cycle they are addressing (Kolb 2010; Kolb 2011; Passarelli and Kolb 2011).

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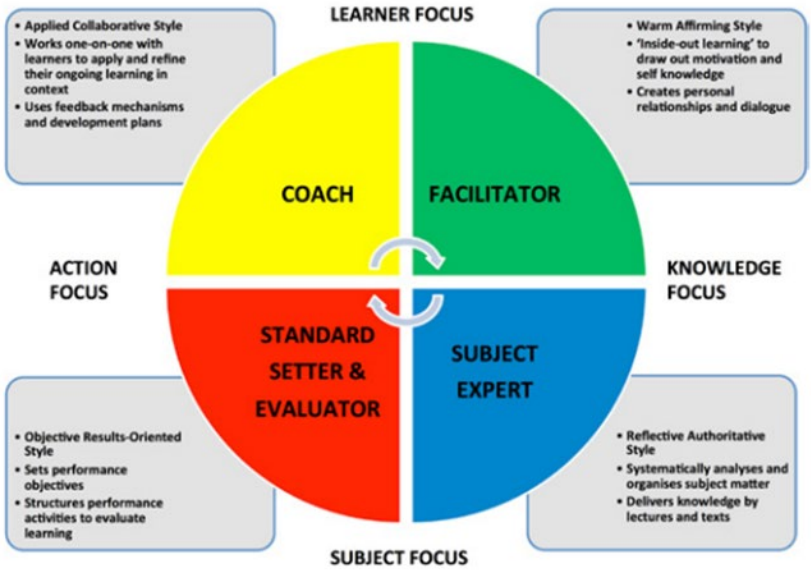
Importance of Educational Philosophy and Process

A learning philosophy and process is important because, as noted by Grasha, (1996, 2002) without an explicit philosophy of interaction, the act of teaching may be "intellectually hollow," a counter to approaches that focus on products, competencies, styles, etc. Grasha (1996, 2002) notes that when directed by a philosophy, "instructional processes are guided less by past habits, pressure to try the latest trends, or tendencies to conform to what everyone else is doing."

Exhibit 3: Educator Role Profile



Importance of Process versus Outcomes

Jerome Bruner, in Toward a Theory of Instruction, states, "The purpose of education is to broadly stimulate inquiry and skill in the process of knowledge building for some productive future use, not to simply memorize a body of knowledge for an outcomes exercise." Bruner (1966) also advocates a focus on delivering an educational message and experience that resonates with the learner, builds knowledge and experience at the correct level, and allows for future use Bruner (1966). "Knowing is a process, not a product" Bruner (1966). In this respect, Kolb and Bruner are aligned with Ausubel (1960), who earlier stressed the importance of meaningful learning (e.g., via a process) over rote memorization (e.g., an outcome).

Student-Managed Investment Fund Discussion

A Recommended SMIP Educator Role Framework

This paper suggests that KELT – and its focus on experience, development, and educator roles

to aid students in acquiring new knowledge and experiences – will enhance the learning outcomes of SMIF programs. Specifically, the thoughtful rotation of the educator through the roles of facilitator, expert, evaluator, and coach will help generate foundational knowledge discovery, new message connectivity, applications-based roadmaps, and future portability, respectively (Kolb et al. 2014). These critical actions allow the student analysts – who are being encouraged to move around the experiential learning cycle to experience, reflect, conceptualize, and experiment to effectively learn and secure improvements in knowledge, satisfaction, personal growth, and future behaviors.

Unlike Other Research

In contrast to bottom-up, SMIF recommendations for enhanced technology, increased student responsibilities, and more varied asset categories (Dolan Stevens, and Zucker 2018; Abukari, Oldford, and Willcott 2021), this paper's central message is that KELT and its focus on experience, development, and educator roles to help learners acquire new knowledge, skills, attitudes, and behaviors will provide a proven process to enhance learning and personal growth in the arenas of investment analysis, portfolio management, and market monitoring. Also, unlike other SMIF research, this study articulates the importance of constructing a holistic, top-down ELC process based on the varying educator roles, thereby addressing a recurring educator role challenge posed by Bolster and Platt (2018) or "the lack of depth and specific resources available" problem outlined by Phillips, Volker and Cockrell (2020).

The American University SMIF (AU-SMIF) Learning Cycle in Practice Part 1 – Equity Analysis

The following outline provides a glimpse into the AU-SMIF experiential learning cycle through the lens of time-varying educator roles. Focused on new knowledge connectivity and lived world experiences, it is noteworthy that this template can also be used with derivatives, real estate investment trusts (REITs), or environmental-sustainability-governance (ESG) investing constructs (Yerkes 2018). AU employs this framework for equities and REITs and has recently introduced it to derivatives, each in pursuit of what Holzhauer et al. (2020) describe as a means "to emphasize problem-solving, critical thinking, and communications" in the classroom.

Facilitator

The facilitator initiates the learning interaction by discovering the student's existing knowledge and experience, together defined as "foundational knowledge" (Timura 2012). Foundational knowledge provides essential insight into the everyday language and the lived worlds of the analyst.

Schema Theory

Schema provides the necessary mental maps that learners use to give a construct to new

information (Driscoll 1994). Kant (1929) is generally recognized as the first to address schemas as organizing structures that dictate how one views and interprets situations (Johnson 1987). Schema discovery reveals the frameworks that students already possess, suggesting clues about their preferred language and insight into lived worlds (Taylor and Crocker 1981; Labianca, Gray, and Brass 2000). Thus, schema theory is particularly important as new, more complex investment information requires assimilation or accommodation into existing schema (Piaget 1952) or, if none exists, developed and nurtured to allow any new knowledge to link (Bruner 1966).

While generally associated with the learner, schema theory has important implications for how the instructor views the interaction (Hacker 1980; Weaver 2002). Analogous to Dewey's continuum, Bruner 1966 states that there is "a continuity of knowledge" sought by the instructor that connects ideas in the past with the new ideas of today (Hacker 1980; Howard 1987; Saito 2000; Weaver 2002). These connections increase the odds that SMIF learners, for example, will be able to transition and port the new investment analysis and portfolio management knowledge into their lived lives (Gaffney and Anderson 2000; Widmayer 2005).

SMIF Facilitator in Practice

At this point, KELT suggests that "the facilitator adopts an affirming style to draw out student interests, intrinsic motivation, and self-knowledge, oftentimes necessitating creative question creation and a personal relationship" (Kolb et al. 2014).

As a facilitator, the instructor seeks to resurrect, if needed, the critical elements of the prerequisite coursework, including financial statement analysis, factor analysis, absolute and relative valuation modeling, economic analysis, sector and industry analysis, and technical analysis. With the basics of the student's schema reestablished, the SMIF educator aims to engage the student in a conversation that utilizes their knowledge and experience to better understand the learner's existing investment process, preferred analytical tools, etc.

Sample Discussions May Include:

What do you recall about discounted cash flow modeling? How do you calculate Free Cash Flow to the Firm or Free Cash to Equity, and why is it important?

What role can Arbitrage Pricing Theory, BARRA™, BIRR ™, or French Fama Carhart factor betas play in equity analysis, recommendations, or portfolio management?

How can the DuPont Analysis methodology aid in understanding Return on Equity (ROE) or Return on Assets (ROA) and, more specifically, in dissecting the fundamental drivers of profitability and growth?

What is the difference between market price and intrinsic value? What does fair value suggest?
What is technical analysis? Why could technical analysis be important in analyzing any stock?
How does economics get integrated into your analysis?

Expert

When foundational knowledge is uncovered or, more specifically, the underlying schema discovered, nurtured, or stimulated by the facilitator, research suggests that there is a higher probability that the newer message, delivered from the appropriate literacy level and in the language of the student's lived world, can be more effectively connected to the student's prior knowledge and experience via the role of expert. As an expert, the educator is instrumental in helping learners organize and connect their reflections to new knowledge and experiences.

The Advantage of Stories to Bridging the Learning Continuum

It has been suggested that the expert's stories, metaphors, analogies, and narratives (hereafter stories) may be among the best tools to develop new messages and satisfy the linkage requirement to her foundational knowledge. More specifically, it may be important for the educator to link new knowledge via stories - perhaps through problem-based learning, which is embedded in personal realities (Van Berkel and Schmidt 2000; Loviscek, Crowley, and Anderson 2003) to the student's foundational knowledge, thereby forming an information continuum; otherwise, if the new material is not properly connected while entertaining, it may be quickly forgotten (e.g. the "one act magic show" per Hawk and Shah 2007), misinterpreted, or incomprehensible.

SMIF Expert in Practice

In this role, Kolb suggests that "Instructors adopt an authoritative, reflective style and teach by example, modeling and encouraging critical thinking as they systematically organize and analyze the knowledge" (Kolb et al. 2014).

As an expert, the instructor seeks to further develop the foundational elements of business model analysis, relative and absolute valuation, financial statement analysis, and expectational, economic, technical, and factor analysis.

Advanced financial statement analysis seeks to engage the student in the fundamental driver conversation, including advanced mapping, modeling, and forecasting the free cash flows, understanding the expectation elements of the student's original research and recommendation, and integrating the behavioral importance of an objective stop-loss and target price (i.e., the price that differentiates noise from fundamentals and the midpoint of fair valuation, respectively). (Yerkes 2018). Enhanced factor analysis seeks to leverage statistical knowledge to discern systematic measures, employing the models of French-Fama-Carhart, Arbitrage Pricing Theory, BARRA™, BIRR™, and the

CAPM. The advanced free cash flow to the firm modeling and relative/comparative price metric construction are employed to generate an intrinsic valuation range. Finally, as the SMIF expert, the instructor seeks to build additional "deep dive" knowledge via ad hoc lectures, assigned readings, and 3rd party video services (e.g., Wall Street Prep ™ as in the case of AU-SMIF).

Evaluator

Once the message connection is made or the path of information continuity is established, the link of the new information to the prior knowledge can be made complete, better enabling the new message to resonate. When connected to foundational knowledge, new information may be effectively employed in an application-based roadmap, a step-by-step template developed by an evaluator to empower the learner to refine and communicate her message (or story) with the new knowledge and experiences gained.

SMIF Evaluator in Practice

At this point, clear standards and feedback are provided whereby the SMIF educator, adopting an objective results-oriented style, helps learners master the communication and application of knowledge to meet high-quality analytical, original research, and communication-oriented performance requirements (Kolb et al. 2014).

As the evaluator, for example, a discussion of the components of the fundamental analysis, factor, economic, and technical analysis, and relative and absolute valuations are integrated into "the story." At this point, the salient original research message and presentation are developed, including focusing on tables, graphs, models, power points, and charts to help others visualize the story. Finally, the instructor may partner with the student to anticipate issues, questions, and pushbacks with the analysis or recommendation. In all, the instructor seeks to leverage the knowledge, tools, experience, and techniques of effective investment analysis to produce a quality, insightful analysis, and focused presentation in the form of a story.

Sample Discussions May Include:

Is this a growth, value, fundamental, contrarian, or momentum story? Which tools helped you establish this?

What are the three or four salient takeaways from your analysis? What are your talking points?

Have you provided all the results from your original analysis to have the team make an informed decision?

Is there any unnecessary noise in your presentation?

What will your presentation roadmap look like? Does the presentation consistently link to the analysis?

What visuals will best help to tell your story?
Do you need to develop an appendix for reference during the presentation's Q and A?
What questions do you expect? What will be the pushback and how will you address it?
What fundamental shortfall(s) may trigger a stop-loss sale? Can you explain how you arrived at a price target?

Coach

The student, with the connectivity of new information to prior foundational knowledge formed and the particulars of an applications-based roadmap established, may be able to port the message into the future with a supportive coach who aids with motivation, momentum, and self-development plans. In the coaching role, the educator helps learners apply knowledge and experience to achieve their development goals and to grow into successful professionals.

Kolb suggests that: "coaches adopt a collaborative encouraging style, often working one-on-one with learners to help them learn from experience in their life context" (Kolb et al., 2014).

Motivation, Momentum and Self-Development Through Intentional Change Theory (ICT) and Self-Efficacy Theory (SET)

Boyatzis clarifies learning event obstacles with ICT, suggesting that individuals learn what they want to learn in the spirit of achieving their ideal self while other less important messages are soon forgotten (Specht and Sandlin, 1991; Boyatzis and Alkrivou, 2006). By personalizing the action recommendation within the context of the student's concept of her ideal self, the educator, acting as a coach, may discover that the student wants to take the necessary actions (Boyatzis and Alkrivou, 2006). To this end, educators should engage the students such that the event motivates the students to want to change to become their ideal self – i.e., in the case of SMIF, analyst, portfolio manager, risk manager, etc. (Boyatzis and Alkrivou, 2006).

Another key aspect of peoples' beliefs is their views about their learning ability. Self-efficacy theory suggests that if individuals do not believe they can learn, they will not, likely either withdrawing or quitting (Zimmerman 2000). The phenomenon introduced by instructors to accentuate positive self-efficacy should be that of "I can learn, and apply, this investment analysis and portfolio management material."

Researchers suggest that self-efficacy is a strong predictor of an individual's learning and motivation (Bandura 1986, 1977). Bandura (1977) writes that self-efficacy will play a larger role than any outcomes-based motivation in learning because "the types of outcomes people anticipate depend largely on their judgments of how well they will be able to perform in given situations." (Bandura 1986). Positive self-efficacy was also linked to higher energy and effort, both correlated with learning

persistence. Those individuals who believe that they can learn have a positive learning identity, embracing challenges, persisting in the face of obstacles, learning from constructive criticism, and witnessing inspiration from others; while those who have a negative learning identity avoid challenges, give up more easily, and avoid criticism (Bandura 1986, 1977).

SMIF Coach in Practice

As a coach, the SMIF educator seeks to provide constructive feedback and encouragement. As an example, because only the highest conviction recommendation is acted upon at AU-SMIF, there are always those who fail to generate the necessary support and are disappointed. At this point, the author reminds the student of the next round of recommendations, asks the question of what was learned, and seeks the answer to what the analyst will do differently next time.

Sample Discussions May Include:

What went well with your analysis (and presentation)? What did not that can be fixed for the next time you present?

Do you see you can do it? Are you excited about the next recommendation?

What did you learn about keeping the presentation to the talking points?

What did this exercise teach you about yourself?

Do you see yourself as more of a growth analyst, value analyst, fundamental analyst, momentum investor, top-down investor, or bottom-up investor?

Coincident Learning Cycles

A unique aspect of SMIF programs is that there can be several ELCs taking place at any one time. For example, the analyst can function as an equity analyst, portfolio manager, and market monitor, the latter taking the form of the student's role as a fund economist, technology sector analyst, technician, or risk manager, etc. It is here where the analyst is communicating recently revealed, actionable, market-based information.

With these three coincident cycles, the "balanced" instructor is likely engaging the student using multiple roles, perhaps, for example, as an expert for the market monitor function, facilitator for the analyst function, and evaluator for the portfolio manager function. It is for this reason, among others, that SMIFs tend to be unique learning experiences with positive outcomes for the student and myriad opportunities for the educator. (Kolb and Kolb 2014, 2018)

The AU-SMIF Learning Cycle in Practice Part 2 – Portfolio Management

In addition to developing the student as an analyst, it is also the goal of the AU-SMIP educator to build the learner's portfolio management, risk measurement, and performance awareness knowledge and experience.

To this end, the SMIF instructor, acting as a facilitator, re-establishes the foundational knowledge concepts of portfolio diversification, systematic risk, efficient frontiers, idiosyncratic risk, benchmarking, and performance attribution. As an expert, the instructor introduces and focuses advanced current market conversations into the portfolio management discussion. For example, the markets' expectations analysis, the key component of performance success, is further discussed as are concepts such as smart beta, tracking error, information ratios, Sharpe ratios, etc. As an evaluator, the instructor directs the portfolio analysts to a roadmap to focus on what – sector over-weights/under-weights, security selection, beta constructs, factors, fundamentals, technical insights, etc. - is generating relative and absolute performance. Finally, as a coach, the conversation about the student's future "successful" role in portfolio management is encouraged and reinforced.

The SMIF Cycle and the Recursive Nature of Learning

Whether for security analysis, portfolio management, or market monitoring, the educator roles of facilitator, expert, evaluator, and coach should overlay the learning issues of knowledge and experience discovery, new information connectivity, knowledge and skills applications, and finally, realistic and personalized growth projections with the new knowledge and experience allowing the educator to move the student analyst purposefully around the ELC. With the educator's varying roles in action, the motivated student touches the experiencing, reflecting, conceptualizing, and experimenting modes, thereby allowing the investment analysis and portfolio management message to resonate, connect, and port for future decision-making.

Conclusion

Already successful in achieving multiple AACSB assurance of learning goals, SMIF programs will likely continue to hold an important position in colleges as experiential learning events are sought. That said, within the experiential universe, Kolb et al. (2014) suggest that there is even more that can be done by educators to improve the events. In keeping with the pursuit of a holistic, top-down, philosophical-based process, KELT educators can recognize that their roles and toolsets can and should vary depending upon the specific learning challenge encountered in any SMIF learning event.

To this end, several instances of key linkages and pathways were illustrated for the educator-learner partnership. For example, learner schema and foundational knowledge need to be recalled or

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reestablished in their lived world by the SMIF facilitator; otherwise, new knowledge and experiences are a "one-act magic show" that does not form a learning continuum. Next, a SMIF expert's stories, narratives, and analogies oftentimes resonate or link new knowledge with learners more than do simple PowerPoint lectures or whiteboard formula derivations. Constructing a presentation "story" from the original analysis – another instance of the power of storytelling in experiential learning theory and practice - is a central goal of the SMIF evaluator, as it emphasizes the importance of focusing on the salient talking points and eliminating information overload. Finally, the SMIF coaching role entails constructive commentary and encouragement, and when this sequence is completed by the educator-learner partnership, another, more complex and robust ELT cycle begins anew.

For the educator, balance among the four KELT roles is sought. It is not enough to always be either a facilitator or coach or expert or evaluator but to vary their role and tools given the different student styles, challenges, and contexts, and in doing so, strive to become the balanced educator who in turn, encourages the student to themselves develop into a balanced participant by moving around the ELC and experiencing, reflecting, conceptualizing, and experimenting to effectively learn and secure improvements in knowledge, satisfaction, personal growth, and future behaviors.

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Student Portfolio Management and the TVA Investment Challenge

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ABSTRACT

Our student-managed investment program (SMIP) is a collaboration between The University of Tennessee at Martin (UTM) and the Tennessee Valley Authority (TVA), a federally owned corporation established to generate electricity for and provide economic development to the Tennessee Valley region. The TVA Investment Challenge Program provides students with the opportunity to manage a real portfolio for a real client, TVA. The Program was created in 1998 in support of TVA's goal to promote economic development within its service area, and UTM has been a participant from the beginning.

TVA Investment Challenge

Student-managed investment funds are a proven tool for experiential learning (Bruce 2020). The literature reveals a variety of successful methods for offering this experience (e.g., Yerkes 2018, Barnes and Buller 2021. The specifics of one such approach are described in this paper.

Our student-managed investment program (SMIP) is a collaboration between The University of Tennessee at Martin (UTM) and the Tennessee Valley Authority (TVA), a federally owned corporation established to generate electricity for and provide economic development to the Tennessee Valley region. The TVA Investment Challenge Program provides students with the opportunity to manage a real portfolio for a real client, TVA. The Program was created in 1998 in support of TVA's goal to promote economic development within its service area. UTM has been a participant from the beginning, and the program has undergone significant changes since its inception (Haddad and Redman 2006, Haddad, Redman, and Gullett 2020). The fiduciary relationships between the TVA and the student fund management teams are contractually defined. The student fund managers are tasked with constructing and managing portfolios of domestic equity market securities, and they must adhere to their client's

constraints regarding how the portfolio is to be managed, which mirrors the responsibilities of TVA's professional portfolio fund managers.

The original 19 university participants were allocated $100,000, for a total of $1,900,000, from the decommissioning fund TVA used to pay for the eventual closure of its nuclear electrical generating plants. The Program was expanded in 2003. Six universities were added, increasing the total number of participants to 25. Additionally, each participating university's allocation was increased to approximately $400,000 for a $10,000,000 Program investment by TVA. The original 19 universities were given the choice of combining the new funds with the first allocation to form one portfolio (as UTM has chosen to do) or to create a second portfolio with the new funds. Each year TVA rebalances the participating universities' portfolio values down to a $500,000 balance. If a portfolio value is less than $500,000, it is left unchanged. Funds returned to the retirement fund from these rebalancing efforts have totaled more than $6,500,000.

TVA allowed each participating university to choose how students manage its portfolio. Some universities offer the portfolio management experience through an undergraduate course, and others do so through a graduate class. Instead of using an academic course, a third alternative for providing this experiential opportunity is an extracurricular activity or an "investing club." As a result of the differences in how the experience is made available to students, the investment backgrounds of the student managers from the 25 universities also vary. Student managers may have no financial investment experience at some campuses, and students may have completed up to six hours of coursework in finance to be eligible for the opportunity at other campuses. Finally, the portfolio may be actively managed by students year-round, or it may be actively managed by students during the fall and spring semesters and monitored by finance faculty members during the summer to ensure the portfolios remain in compliance with TVA requirements. The competition aspect of the TVA Investment Challenge is a key strength of the Program. SMIPs are usually stand-alone programs, but the student management teams in the TVA Program compete with one another and are ranked each year in order of results. Each university's annual portfolio return is calculated as the change in the portfolio's value relative to the change in the market benchmark, the S&P 500 Total Return Index. Student management teams achieving superior performance are recognized and awarded financial prizes at a conference hosted by TVA each spring.

The program has been financially rewarding for TVA as well. The September 30, 2022 Performance Summary report for all participating universities shows that the student-managed funds have outperformed the S&P 500 since the Program's inception in 1998.

UTM's Student-Managed Investment Portfolio

UTM gives students the opportunity to manage the portfolio via an undergraduate course (Finance 411, Portfolio Management). A section is offered fall and spring semesters, and the portfolio is monitored by finance faculty members during the summer. Two faculty members alternate teaching the course, but their role more closely resembles that of a facilitator than a lecturer. Additionally, a student who took the class previously is invited to retake the class as a "topics in finance" course for credit and serve as a mentor to the new students. The student mentor attends class meetings and is available in the finance lab outside of class meetings to advise and assist student managers. To enhance the "real world" experience for the students, a TVA Advisory Board comprised of business faculty, Program alums, and financial industry professionals provides advice and support to the students. They are periodically apprised of program news and the portfolio's performance, and they are invited to attend the formal student presentations at the end of the semester. Students gain confidence in their ability to manage the portfolio as the semester progresses; and the course instructor's involvement transitions to logistical responsibilities of executing trades, filing reports with TVA, monitoring compliance with TVA investment guidelines, and arranging class travel to conferences.

Initially, the course was taught in a seminar room with internet-accessible computer hardware. The College building has been updated technologically, and significant private donations designated specifically for our portfolio management course have made it possible to set up a financial lab. The classroom is equipped with 11 Bloomberg trading stations, stock market ticker tape, a financial markets pricing monitor, a smart board, and whiteboards.

Most students electing to take the course are finance majors, but students from any major who have completed the six hours of finance prerequisites (Finance 301, Finance 311) with a grade of C or higher are eligible to enroll. The undergraduate managerial finance course (Finance 301) is a core requirement for all business majors and is the prerequisite for Finance 311, an introductory course on the basics of bond and stock investment and portfolio management. The principles of fundamental and technical investment analysis are presented in Finance 311, and each student manages a virtual portfolio, investing $800,000 in 20 companies from the 11 market sectors. Finance 311 is the prerequisite for Finance 411 (Portfolio Management).

The current UTM TVA portfolio holdings are presented during the early class meetings. An explanation of the TVA trading guidelines is also provided during the first weeks of the semester since these constraints will impact recommendations by the student managers. For example, the weighted average market cap of the portfolio is expected to be more than $10 billion, and no more than 35% of the portfolio can be invested in small-cap companies. Investment in companies with market caps less than $500 million is prohibited. American Depositary Receipts (ADRs) can comprise no more than 5%

of the portfolio value, and Exchange Traded Funds (ETFs) can comprise no more than 7.5% of the portfolio. To ensure diversification, portfolios must include at least 20 holdings, and no single holding should exceed 5% of the portfolio. Guidelines on concentration by sector are also specified. Student managers are not allowed to invest in several types of financial assets, including fixed-income securities, non-marketable securities, non-dollar-denominated securities, convertible securities, warrants, commodities, and real estate investments. Additionally, short sales, margin purchases, swaps, derivatives, and securities lending are among the prohibited transactions.

Students research the economic conditions expected for the next six months and reach a consensus on the six-month economic outlook, which becomes the basis for their trading goals, objectives, and strategy for the semester. For example, the Spring 2021 class forecasted the first quarter year-over-year GDP growth rate at 1.5% based on their research. The COVID-19 economic recovery and presidential election were also considered. They set a goal to beat the S&P 500 by 200 basis points and established a trading strategy that emphasized consumer discretionary, communication, healthcare, and information technology sectors. Finally, within the first weeks of the course, students will sign on to a Bloomberg terminal to create their Bloomberg access accounts, familiarize themselves with its capabilities, and complete an assignment that requires them to navigate the Bloomberg platform.

Next, students are grouped into teams of two and assigned responsibility for managing one or more of the 11 S&P Global Industry Classification Standard sectors in the portfolio throughout the semester. The teams are the security analysts for the companies in their assigned sector(s) and are the class “experts” on their sectors. A class size of 12-16 is optimal -- large enough to reasonably divide the sector analysis responsibilities but small enough to stimulate participation by all students in class discussion. Additionally, there are 11 workstations in the lab; and the room is small, approximately 500 square feet, when compared to a typical classroom.

Two assignments are given to the newly formed sector management teams. First, all teams develop an investment strategy for their assigned sector(s) to present to the class. Student managers must define downside loss limits and frequency of trading and decide what valuation strategy will be followed. For example, one team may choose to concentrate on growth stocks in their assigned sector, while another team may focus on value stocks in their sector. Next, each team will conduct an initial financial analysis of the portfolio’s stocks in their assigned sector(s). Student managers analyze securities in their sectors and recommend to hold all, sell all, or sell some of the shares of existing companies in the portfolio using fundamental (financial) and technical (charting) analytical tools. Teams may also recommend the purchase of shares in new companies within their sector(s). Follow-up security analysis reports will be prepared throughout the semester. Teams orally present their analyses and explain their reasoning for recommendations to the class. After a thorough discussion, the class will

vote to accept or reject the recommendations.

The TVA Advisory Board members suggested this "class presentation/class decision" approach as opposed to giving teams the authority to make investment decisions for their sector(s). The oral reports throughout the semester give students frequent opportunities to gain experience in security analysis. Students also gain experience in prepared and extemporaneous public speaking as they present their recommendations and answer questions from the other students in the class.

Our students usually attend two student investment conferences during the semester and give formal presentations on their portfolio's activity and performance. Past conferences attended include the Student Managed Investment Fund Consortium (SMIFC) Conference in Chicago, the G.A.M.E. Forum at Quinnipiac University, and the TVA Investment Challenge Conferences held each fall and spring. Most recently, UTM's portfolio management students presented at the 2022 SMIFC conference. They joined more than 400 students from 81 universities to improve their portfolio management skills, enjoy professional guest speakers, and tour the CBOE trading floor. Students participated in a poster competition, creating posters that explain their investment philosophy, and in firm analysis, performing and presenting a financial evaluation of the assigned company. UTM student managers were also invited to serve as presenters along with students from three other universities for a student-led panel discussion of portfolio management strategy, stock selection, and performance metrics. At the end of the session, the student presenters responded to questions from members of the audience.

At the end of the semester, sector management teams give formal final presentations of their strategy and all sector trading decisions for their performance valuation during the semester. Members of the TVA Advisory Board, Program donors, and University administrators are invited to this final presentation. Students are expected to field questions from attendees, and attendees are asked to evaluate the student presentations and to provide suggestions for Program improvement.

Program Outcomes

The TVA Investment Challenge Program is a "real world" experience in portfolio management. The student managers perform their functions as fiduciaries responsible for earning a return superior to that of a selected stock index benchmark, and they are responsible for managing the portfolio under constraints similar to those imposed by the TVA on its professional money managers. TVA is a real client with real investment guidelines regarding types of investment securities, sector diversification, and concentration of holdings which the student managers must adhere to as they seek to earn maximum returns relative to risk. The class receives detailed monthly reports from TVA on the portfolio's compliance with each guideline, and they have 30 days to decide on actions to bring the portfolio back into compliance when necessary.

The addition of the Bloomberg Terminals to the financial lab gives members of the class access to the same data and technology available to professional money managers. The terminals are available for students to use during class time and when the student mentor is scheduled to supervise the lab outside of class hours. Additionally, students are encouraged to take advantage of the opportunity to complete Bloomberg Certification requirements and enhance their resumes.

Students attend, participate, present, and network at investment conferences, including the Fall and Spring TVA Investment Challenge conferences, the SMIF Consortium Conference in Chicago, and the G.A.M.E. Forum at Quinnipiac University. The sessions at the various conferences provide opportunities for students to explain their portfolio decisions and demonstrate their investment acumen relative to peers from other universities. They interact with economists, professional managers, investment analysts, and student managers from other universities. The concluding semester presentations to the TVA Advisory Board members and other guests represent an additional dimension of the professional experience for students.

The numerous speaking and writing assignments improve students' verbal and written communication skills, and they gain confidence in their ability to advocate for their recommendations. The performance awards have provided a source of funding for activities our majors would not otherwise have. The awards have financed student travel to various investment and finance conferences and have partially funded our FMA chapter. Finally, the Investment Challenge experience and Bloomberg Certification have strengthened the resumes of the participating students.

TVA Investment Challenge Program advantages are not limited to students. Faculty from the 25 universities who work with the SMIP benefit from the collaboration with TVA. The spring TVA conferences include faculty sessions where ideas and best practices are shared. The SMIP administration is easier for faculty because TVA provides the funding for the portfolios, as well as the trustee, accounting, and program information services that would otherwise be the responsibility of the university. Faculty have also enjoyed observing students who have surpassed expectations and "come into their own" through this experiential opportunity. We have frequently been pleasantly surprised by the students who emerge as leaders in the course.

The University benefits from the positive publicity that has come with participation in the Program. UTM also benefits financially because our prize money has been reinvested in UTM students for conference travel and finance lab technology. Additionally, alumni and friends of the program represent a potential donor pool for the university's development staff; and the students' final presentation event is an opportunity for the development staff to connect with this group. Finally, the eventual employers of the student participants will also benefit because their new employees possess a stronger skill set as a result of the Program.

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Quantamental Investing for Student Investment Funds

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ABSTRACT

In this paper, we introduce quantamental investing, a frontier investment approach that emerged following the financial crisis of 2008. Quantamental investing combines fundamental and quantitative analysis, aiming to achieve both depth and breadth. We present a parsimonious view of quantamental investment, including rationale, principles, and examples. Specifically, we discuss how to perform quantamental investing in student-managed investment funds, given the special characteristics of these funds.

Introduction

There are many approaches to investing. In the context of how securities are selected, investment approaches generally fall under two categories: fundamental and quantitative. The former picks securities based on a fundamental understanding of companies and their prospects, while the latter picks securities based on statistical models incorporating various factors. Fundamental investment depends heavily on individual experience and judgment, while quantitative investment depends on historical data and modeling techniques.

Large-scale industry money management started with fundamental investing. Built upon the work of pioneers such as Benjamin Graham, the modern notion of fundamental investing emerged after the Great Depression. Since then, it has been further developed by figures such as Warren Buffett and numerous academic researchers. With the birth of computers and increasing data availability, quantitative investing emerged in the late 1970s, developed during the 1980s, and gained momentum in the late 1990s.

Exhibit 1: Quantamental Investment

	Fundamental	Quantitative	Quantamental
alpha source	company specifics	factors	company specifics expressed by factors
information	prospective	historical data	both historical and forward-looking data
value	personal experience	investment process	customized investment process
portfolio	concentrated	large number of securities	something in between
advantage	depth and proprietary insights	breadth and systematic	depth and breadth

The two left columns in Exhibit 1 describe the major differences between the fundamental and quantitative approaches. While the two approaches are different, they are not mutually exclusive. Rather, they can complement each other. Quantamental investing combines fundamental and quantitative analysis to achieve both depth and breadth, integrating company information about the future and statistical modeling based on historical data. During the 2008 financial crisis, several quantamental investment teams and products emerged, starting the quantamental trend that is still gaining momentum today. In this paper, we introduce quantamental investing, including its definition, rationale, principles, and examples. Then, we discuss how to perform quantamental investing for student-managed investment funds (SMIF), given the special characteristics of these funds.

The rest of the paper is organized as follows. The second section briefly reviews fundamental and quantitative investment approaches. The third section discusses aspects of quantamental investing. The fourth section presents two examples. The fifth section discusses specific issues associated with SMIF. The final section concludes the paper.

A Brief Review of Fundamental and Quantitative Approaches

In this section, we briefly discuss the fundamental and quantitative approaches with a focus on alpha sources, risk control, and portfolio construction.

Fundamental Approach: Depth with Company Specifics and Prospective Information

A fundamental approach is based on fundamental analysis of companies, industries, and related macro-events. Fundamental analysis is carried out by fundamental portfolio managers and financial analysts. The former are usually responsible for investment decisions and the overall portfolio performance, while the latter play more of a supporting role by providing prospective information and analysis. A fundamental portfolio manager usually starts their career as a financial analyst.

Due to limits of time and energy, each analyst can only cover about 20-30 companies within an industry. Typically, within a firm, there are two analysts covering an industry, with a senior analyst covering large companies and a junior analyst covering mid- and small-size companies. Company-specific fundamental information is collected through meetings, industry conferences, company visits,

and other channels. Both portfolio managers and financial analysts participate in such events. They try to collect any information that will impact the future price of a company. The collected information needs to be analyzed and integrated into investment decisions and portfolio construction. Some typical tools or approaches used by fundamental portfolio managers include:

- *Filtering process:* filter securities based on some criteria such as profitability ratios, market competitiveness, etc. For example, starting from an investment universe, first remove the stocks with negative earnings for the most recent quarter, then remove the stocks with decreasing market shares, etc.
- *Scenario analysis*: analyze companies and events based on different scenarios These are then used as inputs for the portfolio manager to decide the weights of securities. Some portfolio managers make investment decisions without any process or formula. Some make decisions with the help of an optimizer for risk control. Regardless, personal experience and judgment play significant roles in portfolio construction.

A typical fundamental portfolio is concentrated - that is, it consists of a few stocks with the potential to deliver outperformance. Risk control is more of an informal mental process. In other words, diversification and scenarios may all be considered implicitly when a fundamental portfolio is constructed, but usually not with an explicit quantifiable process. After the 2008 financial crisis, more and more fundamental portfolio managers started to adopt an explicit investment process with quantifiable risk metrics. The following are some key elements for a fundamental portfolio to achieve better than market and peer performance:

- A good understanding of the industry and company
- Capability to evaluate prospective information
- A meaningful way to transform such an understanding into a portfolio
- Avoiding personal and emotional bias

For student-managed investment funds, the fundamental approach can offer benefits by providing company-specific and prospective information that impacts the future prices of securities. Through fundamental investments, students learn about the financial markets, industry, and companies.

Quantitative Approach: Breadth with Factor and Modeling Based on Historical Data

A quantitative approach employs statistical modeling with multiple factors to identify sources and patterns of market inefficiency based on the Law of Large Numbers. Historical data are collected

and used to analyze pricing patterns from which alpha and risk models are derived. Risk-controlled alpha is used for portfolio construction, which is typically achieved through optimization. Constraints are usually set explicitly during the investment process, and portfolio performance is monitored quantitatively across constraints and alpha factors. A typical quantitative investment process can be summarized as follows:

Strategy with return/risk targets

- *Filtering process: filter*
- *Factor or signal building*
- *Alpha modeling*
- *Portfolio construction with constraints and risk controls*
- *Trading and rebalancing*
- *Performance attribution*

In the following, we briefly discuss the factor building, alpha modeling, and portfolio construction stages of the investment process.

Factor or signal building. Quantitative investing usually begins with building factors or signals that measure information related to future security returns from different angles. The information for signals can be derived from multiple categories, such as financial reports or pricing information. Factors or signals are tested using historical data to validate their forecasting efficacy.

Alpha modeling. An alpha model serves to generate forecasts of the returns of the securities in an investment universe. A common approach to building an alpha model is to use a multi-factor framework, with each factor capturing certain information about the future returns of the assets in the selected investment universe.

Portfolio construction. Once we have risk estimates and return forecasts, we can construct a portfolio to maximize returns given the risk level and other constraints defined in the strategy mandates. Optimization is often achieved by using an optimal objective function, with all targets and constraints expressed in mathematical terms.

A quantitative strategy is carried out by a quantitative investment team, which usually consists of a portfolio management group and a research team. Since quantitative products are based on modeling and process, research plays a significant role in the overall investment process and final portfolio performance, while portfolio management focuses on daily account management, execution, and trading. For student-managed funds, participating students can be grouped into two teams with one focusing on research and the other on daily management.

Compared with a fundamental portfolio, a typical quantitative portfolio has a large number of securities. Risk management and diversification are usually achieved in the modeling and portfolio construction parts of an investment process.

Quantamental Investing: Rationale, Principles, and Nonlinearity

Quant and fundamental approaches are not mutually exclusive; rather, they should be complementary. This is the central idea of quantamental investment. Loosely speaking, any kind of hybrid approach of quant and fundamental methods can be considered quantamental investment. Strictly speaking, however, quantamental investment should combine quant and fundamental analysis at every step of the investment process. We define quantamental investment as an investment methodology based on the combination of fundamental and quantitative principles in the following aspects:

- Alpha source: company specifics and factor statistics
- Information: both historical and prospective
- Value: customized investment process
- Portfolio: between concentrated and broad coverage
- Advantage: depth and breadth

The information listed above is also presented in the last column of Exhibit 1, which compares quantamental with quant and fundamental approaches. For student-managed investment funds, the quantamental approach would help them to obtain both depth and breadth, and hence potential portfolio performance improvement.

Why Do We Need Quantamental Investment?

Having defined quantamental investment, we now show that quantamental investment is not only possible but will add value. We use public equity markets for illustration purposes. Based on their sources, equity returns can be decomposed into four parts: market, industry, factors, and company specifics (Exhibit 2). The market and industry components are common returns, factor returns are the target of quant analysis, and company-specific returns are the target of fundamental analysis. However, factor and company-specific information are not disconnected: company specifics can be expressed by factors, and factor values serve to characterize company specifics. Thus, fundamental and quantitative analysis are just two different ways to describe the business performance of companies.

However, fundamental and quantitative approaches do focus on different aspects. First, fundamental approaches focus more on prospective information that will impact future prices, while

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quantitative approaches focus more on historical data proven to have forecasting power. Second, fundamental portfolio managers seek a deep understanding of company-specific information, while quants have a very broad view based on a large number of companies. Their common features ensure that quant and fundamental analysis can be combined, while their differences ensure that the combination adds value.

Exhibit 2: Return Decomposition: Quant and Fundamental

Fundamental Company specifics: business model, products, innovation, M&A, etc
Quant Factor statistics: value, momentum, profitability, earnings quality, etc
Industry: including seasonality
Market: including currency and commodity prices

We can also express the analysis above with equations. Suppose *R* is the total return for a security in financial market *M*. The security is issued by public company *C*, which belongs to industry *I*, with factor values *F*. The total return is decomposed into four parts: market, industry, factor, and company. The return from the company specifics is the focus of fundamental investment, while factor parsimony is the focus of quant investment (Exhibit 2).

$$\begin{aligned} R &= R_M + R_I + R_F + R_C \\ &= (R_M + R_I) + (R_F + R_C) \\ &= R_\beta + R_\alpha \end{aligned}$$

We can thus define the alpha from quantamental analysis as:

$$\begin{aligned} R_Q &= R_\alpha \\ &= R_F + R_C. \end{aligned}$$

Intuitively speaking, quantamental investment simply combines the alpha sources of company-specific and factor characteristics, which are pursued separately by fundamental and quantitative approaches.

Quantamental Investing Principles

There are many ways to practice quantamental investment. For example, there can be various degrees of combination between quant and fundamental, and there can be many places in the investment process where quant and fundamental are combined. Regardless of those differences, to be quantamental, investors all need to follow some key principles.

- Driven by fundamentals: ensure depth and avoid data mining
- Proven by data: ensure breadth and avoid personal bias
- Sound investment process: ensure transparency and consistency

For example, following the three principles above, a quantamental investment strategy can be built with the following practices: (1) factors and model: built on fundamental intuition, supported by historical data, and reflecting prospective information; (2) experience: supported by historical backtesting; (3) portfolio construction: alpha with prospective company-specific information and explicit risk management; (4) strategy: performance achieved through an investment process. A portfolio derived from these practices is a quantamental portfolio. It has both depth and breadth.

Next, we propose an intuitive approach that incorporates fundamental and quantitative analysis to construct a quantamental portfolio. In the first step, the factors are selected based on the driving force or characterization of the soundness of companies' business and their potential performance in the market. Thus, fundamental analysis contributes greatly during this step. The next step is learning how to utilize the information contained in the selected factors in the first step to deliver a powerful forecast. While an econometric model will accomplish this objective in a systematic and consistent way, building such a model is not an easy task. One challenge is that the model can be nonlinear in factors due to interactions among factors and nonlinear effects of factors on security returns. Capturing the true nonlinear relationship between factors and, finally, the nonlinear relationship between factors and returns requires a good understanding of not only the factors but also the statistical model. Thus, this hybrid quantamental approach to investing is not at odds with either the fundamental or quantitative approach. Rather, it takes advantage of the strengths of both approaches.

Nonlinear Investing Requires a Quantamental Approach

Pricing relationships are usually nonlinear. Broadly speaking, nonlinear investing can be defined as the characterization of a nonlinear relationship that occurs in any part of the investment process for an investment strategy. The word linear comes from the Latin word *linearis*, which means pertaining to or resembling a line. In mathematics, a linear map or linear function $f(x)$ is a function that satisfies the following two properties:

$$\begin{aligned} \text{Additivity:} \quad & f(x+y) = f(x) + f(y) \\ \text{Homogeneity of degree 1:} \quad & f(ax) = af(x), \text{ for a scalar a.} \end{aligned}$$

Simply put, nonlinearity is a deviation from linearity. Pricing relationships in financial markets are often nonlinear, which raises serious questions for investments. How can we characterize nonlinear patterns in asset pricing? Why do such nonlinear patterns occur? In what context? How can we know whether such relationships will persist in the future? And how much is the value added by a nonlinear over a linear model?

These questions cannot be answered by piecing together fundamental information based on personal experience and preference, which can be biased, or by torturing the data to make it confess whatever we want (particularly big data, which allows more freedom for data mining). Rather, nonlinear investing should rely on both fundamental insights and quantitative analysis: the former ensures that similar nonlinear patterns will occur in the future, and the latter validates the nonlinear pattern with historical data. In this way, quant marries fundamental: a quantamental approach!

It should be stressed here that quantamental as a methodology can be applied to both linear and nonlinear investing, but complications and challenges of nonlinear investing make a quantamental approach especially critical. To deliver effective solutions for nonlinear investing, there are four principles a quantamental approach should follow:

- Insights: should be based on both historical and prospective information.
- Persistence: historical patterns should be based on fundamental analysis to ensure that such a pattern is likely to persist in the future.
- Robustness: small changes won't cause significant changes in the relationship.
- Data-proven: fundamental understanding should be validated by historical data.

There are more details in Ma (2025) on nonlinear investment that are helpful for student-managed investment funds.

Recent Development

The emergence of the quantamental approach came from the realization of the shortcomings of both approaches---the lack of depth of quant analysis and the lack of breadth of fundamental analysis.

In detail, a typical quantitative approach suffers from:

- Blackbox: no one knows what is in the model and how the portfolio is derived except for the machine (computer) and the person who builds it; it looks like a blackbox to an outsider.

- Backlook: a quant portfolio is based essentially on historical data, which is a purely retrospective approach with the assumption that history will repeat itself.
- Fundamental Insight: lack of fundamental intuition.
- Data Mining: data can be tortured to confess whatever a quant wants to hear.
- Crowding: many quants use similar data sets, employ similar multi-factor models, and use similar optimization methods/tools, ending up with similar portfolio holdings for similar strategies

These shortcomings did not seem serious when quant emerged and gained momentum. However, as more and more funds were being managed by quants, the problems became very serious. Many quant strategies employ the same data sources, similar alpha and risk models, and the same optimizers, ending with similar portfolios. This creates two immediate issues: (1) the crowding of portfolio transactions and (2) profit opportunities being explored away fairly quickly. As a result, many quant strategies started to incorporate fundamental inputs, which helped differentiate and add depth to a quantitative approach. For example, quant shops started to use surveys to collect prospective information. This complements the information from historical data on which quants have traditionally relied on. Quant shops also sent their researchers and PMs to visit companies and attend conferences and meetings where fundamental analysts and PMs gather.

On the other hand, a typical fundamental approach suffers from:

- personal preference: the portfolio strongly reflects a portfolio manager's personal preference and mood
- concentrated investment: given the limited time and energy available to cover companies in depth, only a handful of names are picked from an investment universe
- bias due to past experience: a portfolio manager makes decisions based on personal experience for the companies he/she used to cover
- effects: a fundamental portfolio manager may be more likely to add a “hot" stock to their portfolio

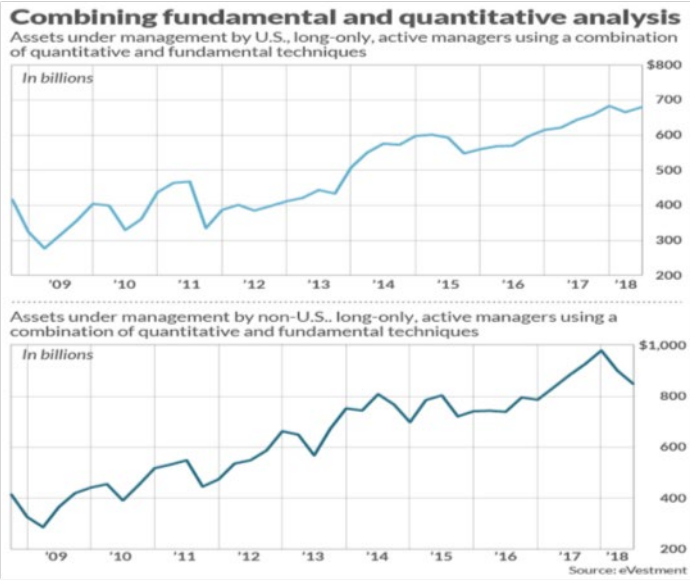
To add rigor and breadth to their portfolios, some fundamental investment professionals started to incorporate quant practices such as risk calibration and management, investment process, and factor backtesting. For example, fundamental portfolio managers added the risk exposure of their portfolios or used factors in risk models to enhance their portfolio performance. Fundamental portfolio managers also analyzed historical event data to confirm or reject subjective judgments. This enables fundamental investment professionals to observe and experience a large number of securities by adopting factor analysis.

Quantamental investment products emerged in the early 2000s, when many professionals realized the shortcomings of both quant and fundamental approaches. During this period, these professional investors stressed the importance of incorporating the other approach, and some even took action and added some colors of quantamental approaches here and there. However, not many funds were employing a systematic quantamental approach for investments. This only changed after the financial crisis in the 2010s when quantamental investment products began developing rapidly. Exhibit 3 presents the asset under management for quantamental strategies from 2008 to 2018. We see that the AUM increased dramatically from $300 billion to $700 billion for the actively managed US long-only funds, and from $300 billion to $1000 billion for the actively managed non-US long-only funds. Student-managed investment funds can be at or close to frontier industry practices by joining this quantamental momentum.

Quantamental Investing: Management Quality Assessment

In this section, we demonstrate how to conduct a quantamental investment with an example. This example explores the classic challenge of how to evaluate management, but now with a combined approach of both forward-looking fundamental information and historical-data-proven quant factors. Student-managed investment funds can apply this example to their funds.

Exhibit 3: Quantamental Strategies: Assets Under Management from 2008 to 2018



For any public company, its senior management team is critical for its business and stock market performance. A reasonable and fair evaluation of the senior management team is always an important

part of portfolio construction. People may think that business performance metrics, such as profits, projects, financial strength, etc., already reflect management quality. This is correct. However, these are just the results we observe as consequences of past decisions. A senior management team usually has a stable temperament and management style. It is the changes in the future the senior management team will make that will be important for future stock prices (Greenwald, et al. 2004). So, from this perspective, evaluating the senior management team is very important. Warren Buffett has an excellent discussion on this.

> *"When we own portions of outstanding businesses with outstanding managements, our favorite holding period is forever...Once management shows itself insensitive to the interests of owners, shareholders will suffer a long time from the price/value ratio afforded their stock (relative to other stocks), no matter what assurances management gives that the value-diluting action taken was a one-of-a-kind event. -- Warren Buffett"*

Regarding management quality, fundamental and quantitative investments have very different assessment methods as shown in Exhibit 4. (Ma 2020). Fundamental professionals collect information through meetings and due diligence, such as company visits. They also leverage sell-side analysts and other network connections. Fundamental professionals usually try to identify good teams and then overweight the associated companies directly or indirectly in their portfolio (Exhibit 5, the right tail). In contrast, quantitative investment tries to identify bad teams (Exhibit 5, the left tail). Management quality can be quantified to some degree: how does a senior management team spend money (capital expenditure) (Titman 2004), and where does it acquire money (external financing) (Richardson and Sloan 2003, Ma 2020)? There are other quant factors along this line, such as frequency and magnitude of acquisitions (Copper et al. 2008) and board dependence. Quantitative factors are built with time series data to measure changes and then compared across companies. Based on a large amount of historical data, the quantitative approach finds that companies with much greater capital expenditure, excessive external financing, and accelerated asset growth are associated with downward stock prices.

Exhibit 4: Fundamental and Quantitative Approaches to Evaluate Management Quality

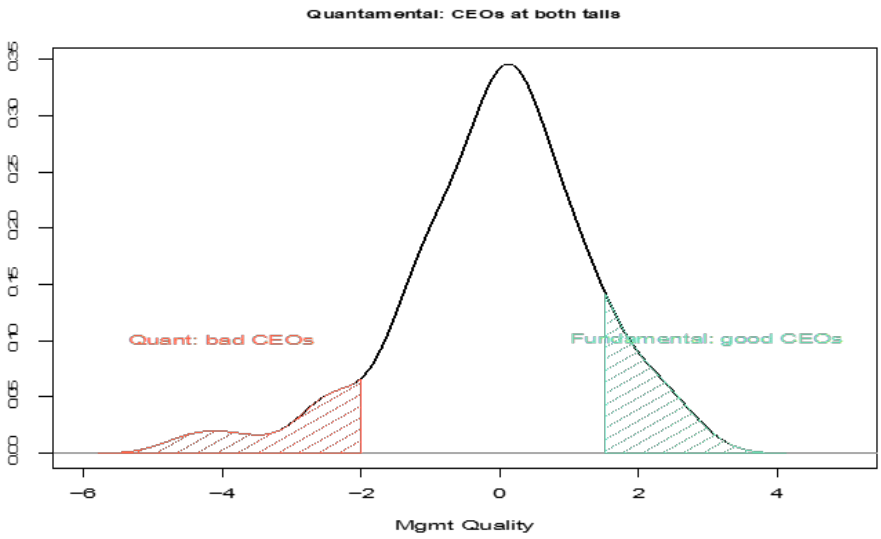
	Fundamental	**Quant**
Focus	identify good CEO	identify bad CEO
Impacts on portfolio	overweight	underweight
Horizon	short to medium	long
Methods	meetings with senior mgmt team company visits sell-side information network connections	capital expenditure external financing asset growth board independence
Data	description, scoring	continuous factor values

Apparently, for management team evaluation, there is little overlap between information from quant and fundamental approaches. Quantamental investments can use both directly.

$$\begin{aligned} MQ_Q &= f(MQ_F, MQ_C) \\ &= MQ_F + MQ_C \end{aligned}$$

where in MQ subscription, F is for quant (factor) and C is for fundamental (company). The equation specifies that the combination of quant and fundamental approaches can take the simplest form: A linear addition of quant measurement and fundamental assessment will add value by identifying both good and bad teams at the same time. Exhibit 5 shows that a quantamental approach captures both tails: the good CEOs at the right tail and bad CEOS at the left tail. Moreover, the fundamental sources of management evaluation can help portfolio managers make discrete decisions about corporate events when managing live portfolios on a daily basis.

Exhibit 5: Quantamental Approach: CEOS at Both Tails



By using the quantamental approach, we can achieve both breadth and depth in the evaluation of management quality.

Quantamental Investing for SMIFs

SMIFs are managed by students with advisors from the finance faculty. Students may have limited resources, such as access to industry data, networking, conferences, etc. However, students can still perform quantamental investing for their SMIFs with available resources.

Regarding quantitative skills, modeling and programming techniques (such as R) can be obtained in the classroom. To be as close to industry practices as possible, students should pay special attention to data quality, model assumptions, and nonlinear tail behaviors. In addition, it would be very helpful if students could learn to build factors from the original data sources, for example an E/P ratio using the data from a company's income statements and prices.

Data treatment for outliers. In the real world, data is not "normally" distributed, and outliers may be present. Unfortunately, outliers usually determine the outcomes of investments. For example, if you were to form a long-short portfolio based on the P/E ratio of 10 companies, the company with the highest P/E would be in the long position, and the lowest would be in the short position.

Exhibit 6: A Long/Short Portfolio Based on P/E

company name	price	earnings	P/E
ABC	16	0.1	160
XYZ	25	1000	0.025

Given the significant role outliers play in quantitative investment, knowing how to deal with outliers is very important. We list below a three-stage approach used widely in the investment industry (Ma 2000).

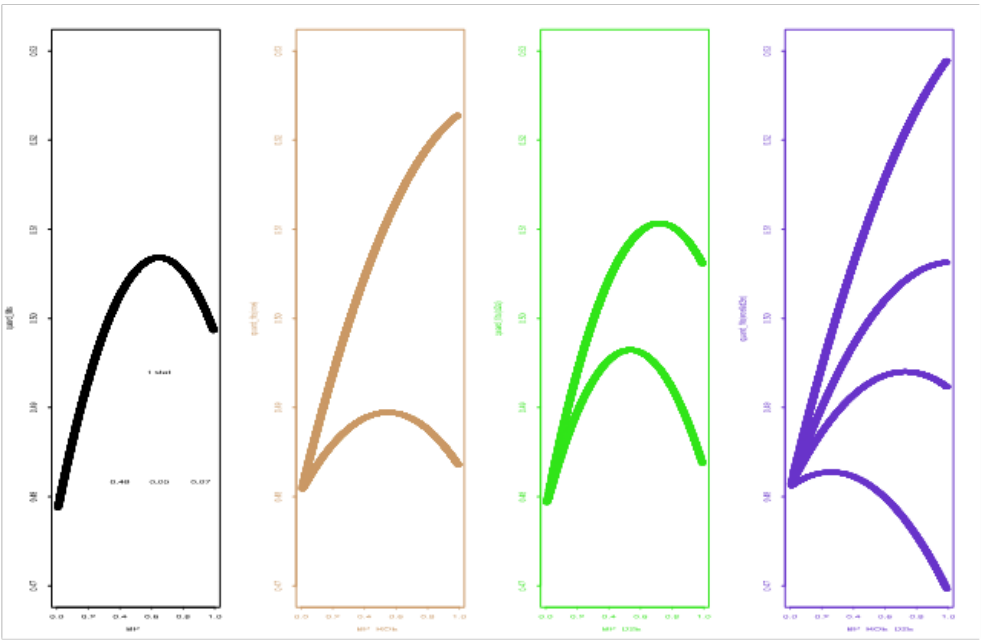
Detection => Judgment => Treatment

- Detection
  -Plot, visualization
  -Sigma, percentile
  -Output: flag
- Judgment
  -Correct or incorrect?
  -Structural or temporary?
- Treatment
  -Truncation or winsorization?
  -Further exploration, such as distribution forcement.

Nonlinear relationship at tails. Consider a simple example of one of the oldest signals: book-to-price (BP) ratio, which measures how over- or undervalued a public company is. We use real-world data from the Russell 1000 Value constituents. Exhibit 7 includes four plots. From left to right, the first plot

shows the nonlinear relationship between BP and returns. Deep value stocks are not associated with the highest returns, and some of them are cheap for a reason: they yield loss or low profits and/or they entail a heavy financial burden. The second plot adds information about profitability measured by a ratio of return-on-equity (ROE), splitting the BP curve into two curves: the lower curve with the lower ROE and the upper curve with higher ROE. The third plot is similar to the second plot but adds a debt-to-equity ratio (DTE). We see that cheap stocks with a large debt burden perform poorly. The fourth plot at the right includes both profitability and debt liability. The lowest curve represents the public companies with a low ROE and high DTE, while the highest curve represents the companies with a high ROE and low DTE. For investing purposes, this example illustrates that nonlinearity emerges not only for a single factor (BP) but also in the joint effects of this value factor with profitability and financial strength (Bruce and Morillo 2003, Ma 2025). Students need to explore quantamental analysis to develop nonlinear investing strategies for such cases (Lee and Swaminathan 2000).

Exhibit 7: Nonlinear Relationship Between a Value Factor and Stock Returns with Real-World Data



Regarding fundamental company specifics and prospective information, we would suggest that students connect with industries and companies. It would be best to visit a few companies and meet with a few senior company management teams to gain special insights into company specifics such as new projects or products, competitive edge, and their impacts on future stock prices. All of the above are hard to capture with a statistical model.

At a minimum, students need to understand the fundamentals of the industry, company, and macro events that would impact the prices of underlying securities.

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With a good understanding and practice of quantitative and fundamental investments, students can then combine the two as much as possible to practice quantamental investing for their SMIFs.

Regarding the role of faculty advisors for SMIFs, an advisor may organize students into different teams, such as quantitative, fundamental, and quantamental investment teams. This might illustrate better the differences between approaches and the benefits of the quantamental approach. Of course, the benefits would be best reflected in the portfolio performance. Moreover, different teams should learn from each other. Collaboration among team members is always very important.

Conclusion

We presented a parsimonious picture of quantamental investing in this paper with a focus on its special features, emergence, and recent development. Particularly, we showed the importance of the quantamental approach in exploring nonlinear pricing relationships in investments. We also give an example of evaluating senior management quality. It should be mentioned that quantamental investing is a general methodology for investments in different asset classes, such as equity, currency, and commodity.

For student-managed investment funds, we discussed special features and related issues in this context and proposed solutions as well. We hope that these discussions will be helpful for students and add value to their SMIFs.

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A Trading Primer for Students in SMIF

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ABSTRACT

The typical SMIF course covers security selection and portfolio management. Trading has received less attention. Placing the trade has historically been handed over to a third-party broker/dealer. The availability of tools that can help students select the ideal conditions during which to trade can empower students in this last step of including a new security or rebalancing their portfolio.

Introduction

Students in SMIF courses learn about investments and security analysis by identifying securities to be bought or sold. The typical process for identifying an investment to be held in a SMIF portfolio is to subject a candidate stock to a gamut of fundamental and technical analyses. The group of students assigned to conduct due diligence on the stock makes a presentation to the entire class following the completion of the task. The class votes on whether to include the stock in the SMIF portfolio. An affirmative vote is usually followed by sizing the position to ensure the SMIF portfolio is mean-variance efficient. The last step is to entrust a broker-dealer to execute the resulting buy or sell decisions. The broker-dealer is often a contracted third party unaffiliated with the University.

This paper posits that SMIF courses should extend their due diligence to the actual execution of their order. Transaction costs, which include the implicit costs of trading, can reduce the returns to a well-researched portfolio. An understanding of markets and market conditions will help students reduce their implicit trading costs, as described in the rest of the article.

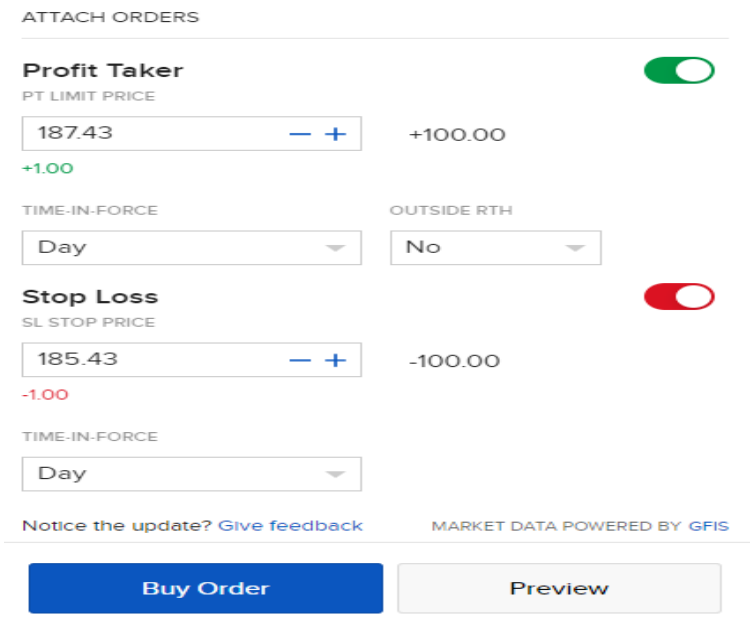
Anatomy of a Trade

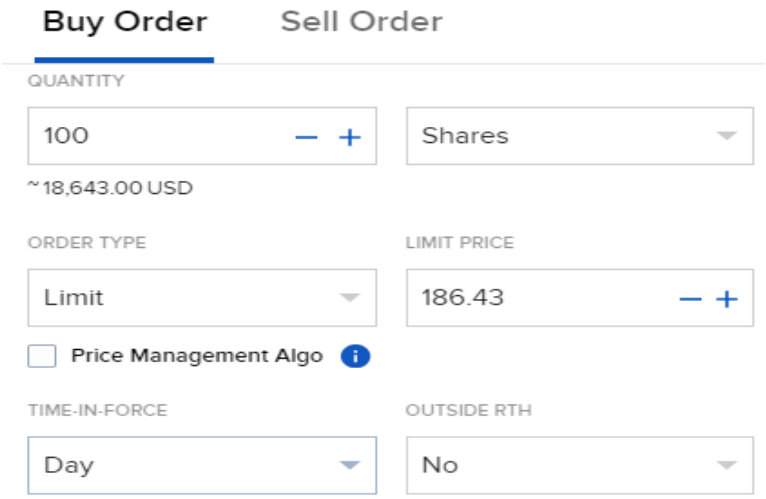
The anatomy of a typical trade is as follows:

1) Decide on the number of shares to trade based on the output of a portfolio optimization exercise.
2) Decide on the time of day to transmit the order to the broker.
3) Decide on the time sensitivity or the duration of the order – day order or a good-till-cancelled order (GTC).
4) Decide on whether to submit a market or a limit order.
5) Determine a stop-loss or take-profit strategy.

Exhibit 1 is a sample printout of the trading screen on Interactive Brokers that illustrates the decisions to be made by a trader placing a buy order.

Exhibit 1: Sample Screen from Interactive Brokers





The top half of the IB Trading screen has the inputs required by the trader: i) the number of shares, ii) whether the order is a market or limit order, iii) the time in force of the order, and iv) whether the order can be executed outside of regular trading hours (RTH). The bottom half of the IB trading screen has additional orders that traders can attach to the parent order that will be filled in the future if certain conditions are met. The profit-taker order allows the trader to lock in a profit by specifying a price at which the open position is to be closed. The stop-loss order allows a trader to limit losses by selling their shares when the price reaches or falls below the stop price.

The timing of order execution is determined by whether the trader placed a market or a limit order. A market order is placed with the objective of receiving immediate execution at the most competitive price, while a limit order does not guarantee execution. The objective of immediate execution is satisfied when the order is timed to coincide with the availability of market liquidity. Markets are liquid (Lippman and McCall 1986) when immediate execution (immediacy) is possible, the round-trip cost of a buy and sell is low (tightness), there are plenty of buy and sell orders close to the bid and ask prices (depth), and there is no permanent impact on price when large orders are traded (resiliency). The immediacy condition is mostly satisfied in the stock markets where trading occurs at nano-second frequencies.

The tightness of the bid-ask spread affects the returns earned by an investor. To illustrate, if the bid-ask spread is 25 cents, a trader buys at the asking price and sells the stock at a future date at the bid price. The bid price at this future date would have to rise by more than 25% if the trader is not to suffer a loss. To put this return in perspective, the S&P 500 index earns about 11% on average per year. Market makers widen the bid-ask spread to protect themselves against inventory risk and asymmetric information risk (Ho and Stoll 1981,1983). Inventory risk arises because market makers bear the cost of holding a non-diversified portfolio. Asymmetric information risk refers to the loss

suffered by market makers when they trade with informed traders: informed traders buy from the market maker when the true price is higher than the ask price and sell to the market maker when the true price is lower than the bid price. Subsequent adjustment of prices to the new price leave market makers with a loss.

Market makers use both the spread and depth to control the risk of trading with an informed investor. Order depth refers to the average of the number of shares sought to be bought at the best bid and the number of shares offered for sale at the best ask price. Order depth represents the quantity dimension of liquidity (Handa and Schwartz 1996). When market makers suspect they may have traded with an informed investor, they not only widen the spread but also reduce order depth on both sides. Low order depth affects the ability of traders to receive the best prices. For instance, if there are only five shares being offered at the best ask, traders who place an order to buy ten shares will end up with only five shares at that ask price. The remaining five shares are bought at less competitive prices, thereby affecting the average price received on the full order.

The cost of lower liquidity in the presence of informed traders is borne by uninformed traders or retail traders. These traders bear yet another implicit trading cost when trading with informed traders: Order impact refers to the positive relationship between bid and ask prices and the sign of the order flow; both bid and ask prices rise after an informed buy order and fall after an informed sell order. Uninformed traders bear the cost of order impact by paying a higher price on a buy order and by receiving a lower price on a sell order than they otherwise would pay in the absence of informed traders. Several measures of information asymmetry have been developed in the academic finance literature (Easley, Kiefer, O'Hara, and Paperman 1996). Until recently, these measures have not been readily available on databases that are typically used in a SMIF program. That is changing with a new web-based App called Vayu Financials that can provide information asymmetry and liquidity metrics in real-time using trading data from the exchanges.[1] Students can use ~~the~~ informed trader metrics on the Vayu App to postpone their trades to a time when the metrics indicate a lower presence of informed traders.

Volatility

Intra-day volatility is a critical input into the decisions on submitting a limit order and setting the limit price. A trader who wishes to buy a stock through a non-marketable limit order bears the risk that the stock price never falls to the limit price, forcing the trader to buy the stock at a later date at a higher price. A judicious selection of the limit and stop prices reduces the risk of non-execution.

[1] See http://vayufinancials.com. A login is required to access the App.

Selection of prices should be based on the expected path of stock prices in the short term. Stock prices follow a log-normal distribution (Black and Scholes 1973). Over short intervals of time, Δt, stock prices are lognormally distributed as:

$$\ln(S_T) \sim \emptyset\left[\ln(S_0) + \left(\mu - \frac{\sigma^2}{2}\right)T,\ \sigma\sqrt{T}\right] \quad (1)$$

where S_T is the stock price at the end of the interval, T, S_0 is the starting price, μ is the annualized mean return, and σ is the standard deviation (volatility) of annualized returns.

Equation (1) can be used to predict, with the desired accuracy, the highest and lowest values of the stock price in the near term. For instance, the following expression can be used to generate the range of stock prices within a 95% confidence interval:

$$\ln(S_0) + \left(\mu - \frac{\sigma^2}{2}\right)T - 1.96 * \sigma\sqrt{T} \ < \ln(S_T) < \ln(S_0) + \left(\mu - \frac{\sigma^2}{2}\right)T + 1.96 * \sigma\sqrt{T} \quad (2)$$

Equation (2) gives the price range within a 1.96 standard deviation from the mean. The range can be tightened to a 99% confidence interval by calculating the price range within a 2.576 standard deviation from the mean. Students who wish to place a limit buy order should set the limit price at the lower range of equation (2), and those who wish to place a limit sell order would set the limit price at the higher range.

The challenge that students will face in applying equation (2) is to estimate σ, the standard deviation of returns. Historical volatility calculated using either open-to-open or close-to-close historical daily returns can be used on a typical non-information day. On information-sensitive days, it is crucial to get the most recent estimate of volatility. 56% of publicly listed companies announce earnings before markets open at 9:30 a.m. The remaining announce their quarterly earnings after markets close.[2] An impending earnings announcement leads to unusual patterns in intra-day volatility. Volatility spikes towards the close of trading; on the previous day in the case of earnings announcements made before the market open, and on the same day for announcements made after the market close. Exhibit 2 illustrates these volatility spikes on August 1, 2024, in Apple (AAPL), which announced its second-quarter earnings after the close of markets on Aug 1, 2024.[3]

[2] "Earnings announcements sliced and diced", January 18, 2024, by Phil Mackintosh, Nasdaq Chief Economist.
[3] Graphs courtesy of Vayu Financials, Inc.

Exhibit 2: Volatility Pattern in Apple (AAPL) on an Earnings Announcement Day

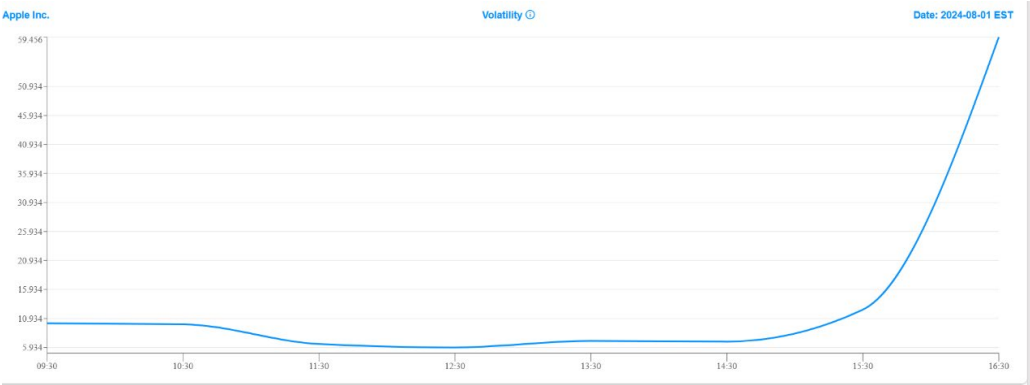


Exhibit 2 shows a spike in volatility starting at 3.30 p.m. (15:30 hours), half an hour before market close. This pattern in volatility stands in sharp contrast to the typical trading day when volatility follows an inverted J-shaped curve; highest at open, tapering off throughout the rest of the trading day. The closing price has become increasingly important as the reference price for mutual funds and for many exchange-traded products (Jegadeesh and Wu 2022). Traders try to influence the closing price by trading aggressively; traders with bullish expectations push up the price, while those who hold bearish expectations push down the price. The resulting bounce between the bid and ask leads to higher volatility into the market close. To set the limit order price on such an information-sensitive day, the best estimate of σ is the intra-day volatility in an hour within the intended trading interval. For instance, if students wish to place a limit order at 3 p.m. on this day, their estimate of s should be based on returns within the one-hour interval from 2 p.m. to 3 p.m., on the same day.

Consider the case of Johnson & Johnson (JNJ), which releases its earnings announcement before markets open. Its most recent earnings announcement occurred on October 15, 2024. Exhibit 3 shows the volatility pattern on October 14, 2024, the day before the earnings announcement.

Exhibit 3: Volatility Pattern in Johnson & Johnson (JNJ)

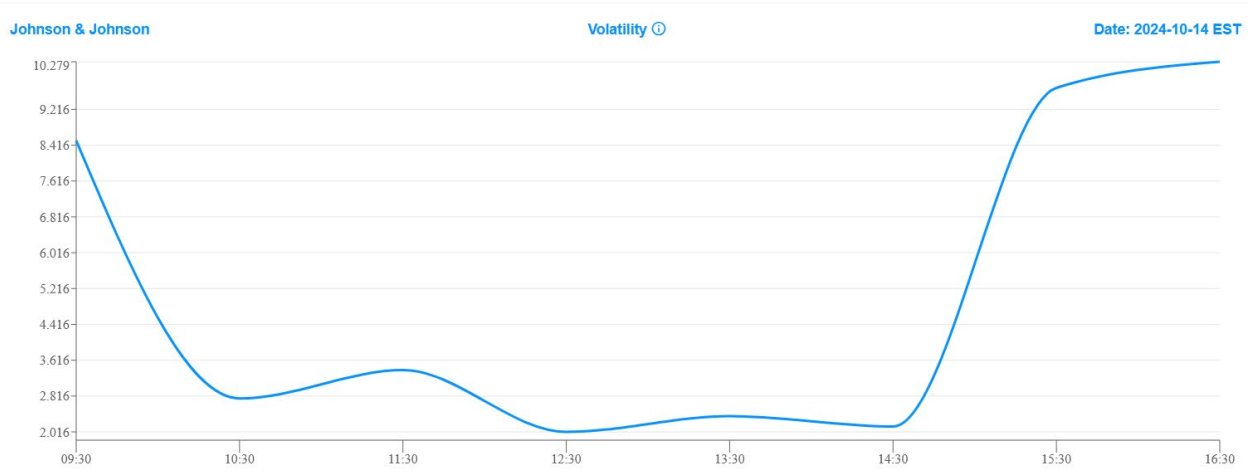


Exhibit 3 shows that volatility is high at the open and starts to decrease until 2:30 p.m. when it begins to climb sharply until 3:30 p.m., after which it continues to increase, but at a slower rate. Students who wish to place a limit order to buy around the last two trading hours should use the most recent volatility estimate to set the limit price. Doing so increases the probability that their order gets executed by the end of the trading day. These intra-day volatility estimates are readily available on the Vayu app.

Students now have access to real-time metrics on market liquidity, information asymmetry, and volatility measures through apps such as Vayu Financials. They can use these metrics to inform themselves about the best market conditions under which to trade. They can be active participants in that last step of including a new security in their SMIF portfolio. Active participation in placing the trades can improve portfolio returns by reducing implicit trading costs.

CONCLUSION

The typical SMIF course covers security selection and portfolio management. Trading has received less attention. Placing the trade has historically been handed over to a third-party broker/dealer. The availability of tools that can help students select the ideal conditions during which to trade can empower students in this last step of including a new security or rebalancing their portfolio.

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