# Investment Returns and Distribution Policies of Non-Profit Endowment Funds

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**Abstract**

We present the first estimates of investment returns and distribution rates for U.S. non-profit endowment funds, based on a comprehensive sample of more than 28,000 organizations drawn from Internal Revenue Service filings for 2009-2016. Endowments badly underperform market benchmarks, with median annual returns 5.53 percentage points below a 60-40 mix of U.S. equity and Treasury bond indexes, and statistically significant alphas of -1.01% per year. Smaller endowments have less negative alphas than larger endowments, but all size classes significantly underperform. Higher education endowments, the majority of the $0.7 trillion asset class, do significantly worse than funds in other sectors. Distribution ratios are conservative, well below the funds' long-run returns. Donors increase contributions when endowment returns are strong, with an elasticity of about 0.13 between net-of-market investment returns and new donations.

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## I. Introduction

Endowment funds are repositories for gifts and operating surpluses generated by non-profit organizations. Often described by their parent organizations as "nest eggs" or "rainy day funds," endowments invest in stocks, bonds, and alternative asset classes such as hedge funds and private equity, and they pay income to their parents to subsidize operating costs and capital expenditures. In recent decades, many endowments have grown rapidly due to an influx of gifts as well as riskier investment policies that have increased their returns. Probably the best-known example is Yale University, which in 2018 reported having grown to $29.4 billion with an annualized return of 11.8% per year over the prior 20 years.[1] The exponential growth of Yale's and other high-profile universities' endowments has led to political scrutiny of the objective functions of their parent organizations[2] and, as of 2018, a new 1.4% federal income tax on a portion of their profits.

[1] https://news.yale.edu/2018/10/01/investment-return-123-brings-yale-endowment-value-294-billion. The same source indicated that annual endowment distributions currently represent more than one-third of Yale's net revenue, indicating the vital role its endowment plays in supporting the university's operating and capital budgets.

[2] "There is an old joke that describes Harvard as a $37 billion hedge fund with a university attached." Barry Ritholtz, "The Day Harvard Stopped Being a Hedge Fund," *Bloomberg View*, January 26, 2017.

Yet little is known about the overall size, performance, and use of endowments in the non-profit sector. The small number of papers on endowment returns have typically focused only on funds that support major universities. These studies all rely on self-reported information from voluntary samples that take no account of selection bias or survivorship bias. The best known study, Lerner, Schoar and Wang (2008), uses annual data from the National Association of College and University Business Officers (NACUBO) and studies an opt-in sample that increased from 533 schools in 1993 to 726 in 2005 (the NACUBO sample grew to 809 schools by 2017, the latest edition available today). The same source is used by Brown, Garlappi and Tiu (2007). Cejnek, Franz, Randl and Stoughton (2014) provide a literature review of the extensive academic and trade research into the university endowment sector, which seems to have crowded all other non-profit endowment research to the sidelines.

This paper presents a comprehensive survey of endowment returns and distribution policies for the period 2009-2016 in all U.S. non-profit sectors. We use data provided by non-profit organizations in annual Form 990 filings with the Internal Revenue Service (IRS), and our download of these filings yields a sample of 167,675 annual endowment observations reported by 28,696 organizations in all non-profit sectors. To our knowledge, the only other paper to use this IRS data up to now is Yermack's (2017) study of a much smaller sample of 120 major art museums. Within the universe of non-profits, colleges and universities account for 6% of the observations and 54% of the assets, and one of our conclusions is that they are not particularly representative. In our study, the subclass of higher education institutions significantly under-performs the community of other non-profit endowments that support organizations in diverse areas such as the arts, human services, health care, and religion, among others, and the

disappointing returns reported by educational institutions to the IRS appear to belie those touted in commercial surveys that have made their way into the press and academic papers.

Overall the funds in our study earn negative abnormal investment returns. The median annual investment return for endowments is 3.75% between 2009-2016. Weighting our observations by the time periods in which they occur, the benchmark returns on ten-year Treasury bonds are 4.89% per year and the equity market index returns 12.21% per year over the same measurement periods. In other words, the typical endowment fund under-performs a 60-40 combination of the equity and Treasury bond market indexes by about 5.53 percentage points annually. On a risk-adjusted basis, we use the standard Fama-French-Carhart four factor model to estimate alphas of -1.01% for our entire sample, statistically significantly below the 1% level, with the lowest alpha estimates applying to the largest size cohorts.

These poor investment results largely agree with those for other investor classes, which typically exhibit zero or negative alpha estimates in standard performance attribution regression models. See, e.g., the well known research into mutual funds by Fama and French (2010), individual investors by Barber and Odean (2000), hedge funds by Brown, Goetzmann, and Ibbotson (1999), and private equity by Franzoni, Nowak, and Phalippou (2012), among many other performance measurement studies.

We study the distribution policies of non-profit endowments to their parent organizations, which resemble the shareholder dividend policies that are an important research topic in corporate finance. We find that most endowments have conservative distribution policies that imply payouts below their long-run expected returns, and well below the actual returns realized during the sample period for our study. These cautious distribution policies would tend to cause endowments to grow without limit over time. The smallest endowment funds make no payouts

at all in most years, implying that organizations seek to grow them to a critical mass before using them as a permanent funding source. For the very largest endowments, those with asset values above $100 million, distributions occur almost every year, with mean and median distribution rates near 4.5%, which appears to have become a heuristic that enjoys wide acceptance in the non-profit sector without much theoretical justification.

The remainder of this paper is organized as follows. Section II presents a description of the dataset. Section III analyzes endowment funds' investment returns, and Section IV analyzes their distribution policies. Section V studies whether donations to the parent organization respond positively to good investment returns in the endowment. Section VI concludes the paper.

## II. Data description

Our data come from Form 990, a document filed annually with the IRS by most non-profit firms in the U.S. Since 2008, Part V of Schedule D for Form 990 has required those organizations with endowment funds to provide annual data including the fund balance at the beginning of the year, contributions, distributions, administrative expenses, and net investment earnings. These data are a matter of public record, but obtaining them for a large sample of organizations has been impractical up to now, because online databases of information from Form 990 filings such as Guidestar have all omitted coverage of this schedule.

We use Form 990 data that has been posted by the IRS since 2016 on Amazon Web Services (AWS) as a result of a lawsuit filed by Carl Malamud, an advocate for transparency in the nonprofit sector.[3] The website hosts annual schema of all electronic Form 990 filings

[3] The data are downloadable by the public from https://aws.amazon.com/public-datasets/irs-990/, although we found that considerable effort is required to parse the files, extract the relevant variables, and clean the data before it is

beginning in 2011. The electronic filing requirements, which have been phased in gradually since 2006, today cover all but the smallest public charities. We believe our sample, especially in the most recent years, covers substantially all of the endowment assets in the United States, since smaller organizations are far less likely than large ones to maintain endowments. However, a major exception occurs for religious organizations, which generally do not file financial disclosure forms with government regulators due to the constitutional principle of separation of church and state.[4]

Table 1 presents a tabulation of the observations in our sample. The available data on the AWS website has well over 1 million organization-year observations beginning in 2010, but most of these charities are too small to have permanent endowments. The IRS form for Schedule D includes space for organizations to report up to four years of historical endowment data alongside the current year, and we download this historical information when available, greatly increasing our sample size.[5] For purposes of reporting our results in calendar time, we assign each filing to the calendar year that includes the final month of its chosen fiscal year, and we

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suitable for large-sample research. A description of Malamud's successful federal lawsuit to compel the IRS to disclose the data in this way can be found at https://sunlightfoundation.com/2016/06/16/irs-opens-up-form-990-data-ushering-nonprofit-sector-into-the-age-of-transparency/.

[4] It is not clear how large religious organizations' endowment funds might be, but it is possible they are much smaller than those in sectors such as higher education. The Archdiocese of New York, surely one of the wealthiest religious non-profits in the U.S., voluntarily publishes excerpts form audited financial reports each year on its website at https://archny.org/financial-reports. For the most recent period ended August 31, 2017, the Archdiocese reported unrestricted net assets (presumably subsuming its several endowment funds) of $138 million and additional restricted net assets of $124 million. These totals are orders of magnitude below the fund balances held by major research universities. The most significant wealth of religious organizations may be held in real estate and fine art rather than financial investments. Endowment assets may also be held by individual parishes and not consolidated into the balance sheets of central administrative entities.

[5] In a limited number of cases, this retroactive data is useful for resolving observations with inconsistent or incomplete reporting in Schedule D.

collect all annual data for organizations with reporting periods ending up to December 31, 2016.[6] We exclude a small number of observations that exhibit data inconsistencies or have irregular tax years of fewer than 360 or more than 370 days, as well as any observations for 2008 or earlier years. We obtain 167,675 annual observations that include non-missing data for start-of-year and end-of-year endowment balances as well as investment earnings during the year. Table 1 shows that the sample sizes gradually increase up to 2015 and then drop off. The growth in annual observations likely occurs due to the gradual adoption of electronic filing by organizations during the sample period, and the shortfall in 2016 compared to 2015 is due to the long filing deadlines permitted for some organizations and follow-on delays for the IRS to digitize and post individual returns. As filings are added by the IRS in the future, we expect the number of 2016 observations to equal or exceed those for 2015. In all, we have data for 28,696 unique filing organizations, and the annual sample size peaks at 23,151 in 2015.

Our analysis focuses on the rates of return earned by endowment funds. As reported to the IRS, investment returns are based on dividends, interest, and capital appreciation of the fund's assets rather than only realized gains. An organization can either include its expenses as part of a report of "net investment earnings" on Line 1c of this schedule, or it can report gross investment earnings on Line 1c while listing administrative expenses separately on Line 1f. For the minority of organizations that follow the latter practice, we calculate net investment earnings by subtracting any value reported on Line 1f from Line 1c. We then calculate the annual investment return by taking the ratio of net investment earnings over the sum of start-of-year assets plus one-half of contributions. Contributions generally include bequests, gifts, and other

[6] Unlike for-profit companies that tend to have fiscal years coinciding with the calendar and ending in December, the most common fiscal year-end for non-profits is June 30, which is used by 42% of all observations in the sample. An additional 38% have December fiscal years, and the other 20% are scattered among the remaining 10 calendar months.

funds deposited into endowments, and our calculation implicitly assumes that the typical contribution is received halfway through the fiscal year and that any distributions from the fund do not occur until year-end.[7] We note that we do not have information about more precise performance measures such as the time-weighted returns commonly used to evaluate professional asset managers. We also have no information about asset allocation, although for many organizations this can be obtained through a careful reading of certain schedules and appendices (these tend to present the data in narrative form, so that downloading a large sample is impractical). Ideally we would also like to have more data about the organization and governance of each endowment, but the data required in the IRS disclosures typically does not include this information.

Table 1 presents further detail about the distribution of endowment assets by year and by industry sector. Aggregate U.S. endowment assets appear to have surpassed $700 billion as of 2015, and approximately half of this total is held by colleges and universities in the higher education sector, with the next largest holdings in the "Education (other)" sector that includes private secondary schools. Organizations with their main operations in the arts, hospitals, other healthcare sectors, social services, and other "Public and Social Benefit" areas account for most of the rest of the endowment funds. As shown in the table, several hundred religious organizations also file disclosures even though many could avail themselves of reporting exemptions.

[7] This assumption probably makes our estimate of returns slightly conservative. Distributions from endowments can occur at any time during the year. Inflows to endowments typically happen when an organization receives bequests or has a capital campaign to solicit donations from its constituents. Donations tend to cluster in the month of December for tax-timing reasons, and since many organizations have a June 30 fiscal year-end, our assumption would seem neutral. For the sizeable cohort of organizations with fiscal years ending December 31, the assumption is conservative. Bequests occur stochastically, so assuming they arrive halfway through a fiscal year is probably neutral for our estimates.

Table 2 presents descriptive statistics for the sample. The table shows endowment data for the sample of 167,675 observations alongside basic financial data for 125,486 fiscal years of their parent organizations (we have significantly more observations for annual endowment performance due to the availability of up to four years of historical performance data for endowment funds on Schedule D, as detailed above). The typical endowment size is quite small, with a mean of $27.2 million and median of $1.2 million, but the largest funds run into the tens of billions, with a maximum value of $36.4 billion (Harvard University, 2016). Outside the education sector, the largest fund is the $7.3 billion endowment of the Shriners Hospitals for Children (as of 2014). The median annual net investment return, calculated according to our method, is 3.75%, and the median distribution ratio is lower, 2.37%.

## III. Investment returns

This section presents our analysis of investment returns. Subsection III.A presents some basic overview statistics and comparisons with equity and debt market benchmarks. Subsection III.B uses the Fama-French four-factor model to estimate the risk-adjusted abnormal returns for endowment funds, and we analyze these results in size cohorts. Subsection III.C investigates the relation between endowments' abnormal returns and their geographic proximity to financial centers. In subsection III.D we analyze endowments in the healthcare industry to study whether their returns exhibit a negative association with stocks in the industry, a result that would imply a risk management strategy in endowment asset allocation. Subsection III.E investigates the returns of endowments in the higher education sector; we study these funds separately due to their prominence in prior research on the subject.

*A. Overview of endowment returns*

Table 3 presents summary statistics for annual endowment returns for the entire sample and four subsamples partitioned by size. We use average start-of-year assets for each fund to determine membership in the size cohorts. For comparison we show returns on the Center for Research in Securities Prices (CRSP) value-weighted equity index, the CRSP 10-Year U.S. Treasury Bond Index, and a "balanced portfolio" comprised of 60% of the equity index and 40% of the Treasury bond index.[8] All index returns are aligned with the fiscal year reporting periods for each endowment, which accounts for slight differences in the benchmark returns for the four size cohorts. Data in the table represent medians and inter-quartile ranges for 12-month reporting periods and should not be interpreted as compound annual returns for the 2009-2016 period, because observations are not uniformly distributed through time. Many endowments' 12-month reporting periods end in June or December, and the number of observations generally rises over time to reflect increasing compliance with IRS electronic filing requirements especially by smaller organizations. We do not report mean returns because the data are heavily influenced by a small number of extreme outliers, many of which appear to be the result of erroneous reporting by a few endowments.

Data in Table 3 show a fairly dismal pattern of endowment returns. The median return for the entire sample is 3.75%, which falls not only 553 basis points below the 60-40 balanced portfolio return, but also 114 basis points below the 10-Year Treasury bond return. In other words, the typical endowment fund would have earned substantially higher returns if its trustees had followed a simplistic investment strategy of holding 100% Treasury bonds and taken no equity market risk whatsoever. Most of our sample period was characterized by a bull market in

[8] The 60% - 40% combination of the equity and bond indexes is a heuristic commonly used to evaluate the performance of asset managers. For example, Barber and Wang (2013) refer to "the 60/40 stock/bond portfolio used as a performance benchmark by many endowments."

equities, as our data begins in 2009 when asset values were depressed near their minimum points following the onset of the global financial crisis. At the same time, bonds earned strong returns due to a Federal Reserve policy of driving market interest rates to sustained record low levels. Endowment funds appear to have sat on the sidelines and missed most of this run-up in both stock and bond prices, implying that many funds may have held large amounts of cash and equivalents. More than 40% of the endowments have a June fiscal year-end. These endowments generated a mean annual return of 6.66% and median annual return of 2.76%. For comparison, the CRSP value weighted index over the same period generated a mean annual return of 10.95%, while the CRSP 10 year U.S. Treasury index returned an annual average of 5.68%, with returns weighted according to the number of observations in each year. Repeating this analysis for a sample of endowments with December fiscal year-end (38% of the sample) yields very similar estimates of underperformance relative to the equity and debt benchmarks. For the interested reader, the Appendix presents a more detailed version of Table 3, with the performance statistics reported for all observations with 12-month fiscal reporting periods ending in each of the 96 months during the 2009-2016 sample. Within the four size cohorts of Table 3, we find that the largest endowment funds, those with assets greater than $100 million, exhibit the highest median returns, an outcome that runs counter to the conclusions of our analysis of endowments' risk-adjusted abnormal returns below.

*B. Risk-adjusted abnormal returns*

To estimate risk-adjusted abnormal returns, we use the standard four-factor model of Fama and French (1993) and Carhart (1997):

$$\begin{aligned} ExcessReturn_{i,t} = {} & \alpha_i + \beta_{i,RMRF} \ln(1+RMRF_t) + \beta_{i,SMB} \ln(1+SMB_t) \\ & + \beta_{i,HML} \ln(1+HML_t) + \beta_{i,UMD} \ln(1+UMD_t) + \varepsilon_{i,t} \end{aligned} \qquad (1)$$

The Excess Return is estimated as $[\ln(1+R_{i,t}) - \ln(1+R_{f,t})]$, where $R_{i,t}$ is the annual return for endowment *i* for year *t*, defined as the 12-month fiscal reporting period for that non-profit organization. $RMRF_t$ is the excess return on a value-weighted market portfolio annualized over the same 12-months. $SMB_t$, $HML_t$, and $UMD_t$ are the zero-investment factor returns for size, book-to-market and one-year momentum stock return, respectively. These are also annualized over the same 12-month period as the endowment's fiscal year.

We face a challenge in implementing this model, because it requires estimating five parameters, including the alpha intercept term, separately for each endowment fund, but our 2009-2016 sample period yields at most eight annual observations of performance data per fund. Our overall sample includes 167,675 annual observations for 28,696 endowments, and we subsample the 13,791 endowment funds that have at least seven annual observations. This subsample includes 104,037 endowment-years, or about 62% of the overall sample. [9]

We start by estimating the OLS model described in equation (1) using the time-series annual returns for each of the 13.791 endowments, Thus, for each non-profit organization *i* we estimate

$$ExcessReturn_{i,t} = \hat{\alpha}_i + \hat{\beta}_{i,RMRF} \ln(1+RMRF_t) + \hat{\beta}_{i,SMB} \ln(1+SMB_t) + \hat{\beta}_{i,HML} \ln(1+HML_t) + \hat{\beta}_{i,UMD} \ln(1+UMD_t) + \hat{e}_{i,t} \qquad (2)$$

For each endowment *i*, we save the coefficient estimates ($\hat{\alpha}$, $\hat{\beta}_{RMRF}$, $\hat{\beta}_{SMB}$, $\hat{\beta}_{HML}$, $\hat{\beta}_{UMD}$) as well as the time series of residuals ($\hat{e}_{i,t}$). The cross-sectional average of alpha across the 13,791 endowments fund is reported in the first row of the first column of Table 4.

[9] We observe that many of the endowments that have fewer than seven observations simply have not filed their Form 990 returns for 2015 and especially 2016, or the documents have not yet been uploaded by the IRS to Amazon Web Services. For this reason, we expect to capture substantially more observations in future drafts of the paper.

To test the statistical significance of these alpha estimates, we employ the bootstrap methodology described by Kosowski *et al.* (2006), and the description in the following passages closely adheres to that source. For each non-profit endowment *i*, we draw a sample (with replacement) of the residuals of that fund estimated from equation (2) above. This yields pseudo-time series of resampled residuals $\{e(b)_{i,t}\}$, where *b* indexes the bootstrap iteration number. Thus, we scramble the time order of residuals for each endowment.

For the next step we create a time series of pseudo endowment returns imposing the condition of zero alpha:

$$\left[ ExcessReturn_{i,t} \right]^b = \hat{\beta}_{i,RMRF} \ln(1+RMRF_t) + \hat{\beta}_{i,SMB} \ln(1+SMB_t) + \hat{\beta}_{i,HML} \ln(1+HML_t) + \hat{\beta}_{i,UMD} \ln(1+UMD_t) + e(b)_{i,t} \qquad (3)$$

Note that the construction methodology for the pseudo return for endowment *i* for year *t* consists of predicted return with a zero alpha plus a randomly bootstrapped error term. Thus by construction the pseudo-time series of returns has a true alpha of zero. There is, however, the additional error term that adds randomization, since the residuals may be sampled more than once and the residuals have been scrambled across time.

Once the pseudo time series of zero alpha returns (with a randomly sampled residual added) has been constructed for every endowment-year, we re-estimate the four-factor model using these bootstrapped pseudo endowment returns similar to equation (1). Even though the true alpha is zero, the estimate for alpha from this regressions may be positive (or negative) if that bootstrap had drawn an abnormally high number of positive (or negative) residuals. Thus we are now able to generate a cross-section of bootstrapped alphas for all 13,791 funds. We save the cross-section average of the alphas. This process is repeated for 5,000 bootstrap iterations, (*b* = 1, …. , 5,000). This repetition yields a distribution of 5,000 average (cross-sectional) alphas.

Comparing the observed average alpha of -0.0101 in the top left cell of Table 4 to this distribution allows us to make statistical inference. We find that the probability of average alpha being -0.0101 is less than 1% if the true alpha was zero. In other words, in our 5,000 bootstraps we obtained an average alpha of that magnitude in less than 1% of the cases. Thus, we can reject the null hypothesis that average alpha is zero below the 1% significance level.

In addition to illustrating our main result, that endowment funds have mean risk-adjusted returns 1.01% below their benchmarks, Table 4 also shows the fraction of alpha estimates that are negative (59%) in our subsample 13,791 endowments, and it shows the cross-sectional average estimates for the four risk factors without testing their statistical significance. The estimate of 0.4941 for the market risk factor implies that endowments invest conservatively, with slightly less than half of their endowment excess return exposed to the equity markets.

We continue the analysis by examining separately each of the four size cohorts introduced in Table 3 above. The table shows two clear patterns across the size cohorts. First, even though all cohorts earn average alphas that are negative, performance is better for smaller endowments compared to larger ones. Second, systematic risk decreases with endowment size, as shown by the estimates for the market return factor which decline across the size cohorts. This is consistent with a wealth effect that leads to decreasing absolute risk aversion as the value of an endowment grows (Merton, 1993). Note that the larger endowments, which have the worst performance, account for a minor number of observations by number, but an overwhelming fraction of the invested capital in the non-profit sector. For instance, the “large” cohort of endowments, those worth more than $100 million, account for 4.9% of the observations and 79.6% of the assets. In contrast, the very smallest endowments, those with asset values below $1

million which we label as "tiny," comprise 35.7% of the observations in the sample but account for only 0.3% of the assets invested.

The inverse relation we find between endowment size and performance echoes the pattern found for mutual funds in several studies. This pattern is regarded as something of a puzzle, since larger funds should enjoy advantages in trading costs and access to research and other information. Chen et al (2004) proposes a range of explanations for the pattern, including the costs of investing in illiquid securities, which are more commonly held by larger funds, and the administrative costs of team management that is often used by larger funds. Pollet and Wilson (2008) discuss the costs of diversification and fund family membership as possible explanations, but neither of these issues would seem relevant for endowments, which are typically the only funds overseen by their parent organizations. The liquidity explanation is possibly the most sensible, as some non-profit endowments are known to be over-weighted in individual securities donated by university alumni or other benefactors who found their own companies and contribute a slice of the equity to their favorite charities.[10] The costs of hedging and eventually unwinding these block ownership positions may create a drag on the overall returns for the fund.

### *C. Returns and proximity to financial centers*

We study the access to investment advice in analysis presented in Table 5. Based on a hypothesis that firms obtain better investment advice if they are located geographically close to financial experts, we use STATA's *geodist* function to calculate the distance between the office address of each non-profit organization and Wall Street, for which we use the address of

[10] There are numerous examples, but perhaps the best known is the connection between Emory University and the founders of The Coca Cola Co.

Goldman Sachs headquarters in New York. We save the alphas estimated for each endowment fund in Table 4 above, and we regress these alphas against an intercept and a variable measuring this mileage. Results of these estimations, which are partitioned according to the same size cohorts used above, appear in Panel A of Table 5. In Panel B, a more refined analysis replaces the distance from Wall Street variable with the minimum distance of each organization from one of four financial centers where many asset management firms are located: New York, Boston, Chicago, or San Francisco. For the latter three, we use the headquarters addresses of Fidelity Investments, Northern Trust, and Charles Schwab, respectively.

For the largest funds in our sample, comprising the vast majority of investment assets, we find a striking pattern: investment performance deteriorates if the fund is located closer to Wall Street or to another major financial center. The pattern is reversed for smaller endowments, which tend to perform better when they are located closer to expert financial advice.

We are not aware of any result in the investments literature consistent with the idea that access to professional investment advice leads to superior performance; indeed, much of the research on the underperformance of professional managers and the virtues of passive indexed investing suggests quite the opposite, which is our finding for larger endowment funds.[11] Our positive results for smaller endowments may be consistent with a number of potential explanations other than access to professional investment advice. For instance, smaller non-profits near financial centers are probably much more likely to have better-informed board members, and they may establish superior investment policies for these organizations' endowments. Larger funds may already have qualified board members but may be susceptible to

[11] Many papers have been published in recent years on loosely related topics such as the importance of geography in investment research (Coval and Moskowitz, 2001) and the tendency of individuals to invest in local stocks Seasholes and Zhu, 2010).

professional money managers' sales pitches that lead to over-investment in exotic products with high fee structures.

*D. Hedging of parent organizations' asset values*

In his discussion of the optimal investment policy for a non-profit endowment, Merton (1993) leans heavily on portfolio theory. He argues that endowments should be invested in assets whose value will have inverse relations with the other assets of the organization. In a university, these assets might include local real estate and intellectual property; in a symphony orchestra, they would include the instruments, fixtures, and access to the subscriber list. By their very nature, many of these assets can be difficult to value and hedge, so Merton's advice may seem mostly theoretical for most organizations. Yermack (2017) tests this hypothesis for his sample of 120 prominent art museums, using the Mei-Moses fine art index as the industry benchmark. That study finds no significant relation.

The healthcare industry offers an opportunity to test this hypothesis closely, however, since the U.S. economy includes numerous for-profit and non-profit companies in this sector. A non-profit hospital or medical clinic should avoid investing in shares of stock issued by pharmaceutical companies or for-profit hospital chains, for instance. We analyze the returns of 626 hospital sector endowments in regression models to test this hypothesis. We regress the hospital endowment returns against the standard four risk factors plus an additional factor, the return on the healthcare industry portfolio as calculated and made available for download on the website of Prof. French. Alternatively, we use the index of returns on pharmaceutical stocks and also for medical equipment stocks as additional risk factors.

In all three cases, including the health industry risk factors leads to little or no change in the size and significance of the alpha estimates. Moreover, the healthcare, pharmaceutical, and medical equipment risk factors have beta estimates quite close to zero. We conclude that little evidence supports the proposition that endowment managers hedge their investment strategies by over- or under-weighting healthcare stocks in their portfolios.

*E. College and university endowments*

Because colleges and universities represent such an important subgroup of the universe of non-profit endowments, we analyze their returns separately and display the results in Table 6. The estimates are striking: higher education institutions, whose endowments account for more than half of all assets in the sample despite representing just 6% of the observations, significantly underperform market benchmarks, with abnormal investment returns of minus 189 basis points per year. All other (non-higher education) endowment funds also earn negative alphas, with a statistically significant estimate of minus 93 basis points per year. The difference in these two estimates is itself significant below the 1% level. We confirm that this result is not size-driven by looking separately at the four size-based subsamples from above; we find that colleges and universities underperform other sectors in three out of four size cohorts, with the greatest difference occurring within the "tiny" group of endowments with assets below $1 million.

Prior research such as Lerner, Schoar and Wang (2008) has found that the self-reported returns for universities in the NACUBO sample tend to track the academic quality of the institutions, with more selective schools earning higher investment income. We find some evidence consistent with this in the right column of Table 6, which looks at the abnormal returns earned by endowments of the top 20 national universities (the Ivy League schools and others

such as MIT, Stanford, and Georgetown) as ranked by *U.S. News and World Report*. These schools earn almost exactly zero abnormal return, a result that gives no indication of superior performance but is nevertheless much better than other colleges and universities as a whole. While these results are not in line with earlier studies and copious media coverage about the out-performance of elite schools, they suggest that the most selective schools do better than others within their sector and basically earn returns that are no worse than average. However, they also support the conclusion that the investment wisdom of top universities is largely a myth, as one could expect to earn these types of returns simply by chance. Frequent mentions in the media of the out-performance of top schools seems likely due to the outsized success of just one university, Yale.

## IV. Distribution policy

Endowments exist to distribute funds to their parent organizations. In principle, these distributions could fund part of an organization's operating budget, or be used for non-recurring capital expenditures, or could occur as needed to close deficits when an organization cannot otherwise balance its budget. Little is known about the distribution policies for non-profit endowments other than two recent small-sample studies by Brown *et. al* (2014) and Yermack (2017) which appear to reach opposite conclusions. Brown *et. al* study approximately 200 large research universities and find a surprisingly pro-cyclical distribution pattern, in which universities experiencing negative financial shocks reduce their endowment payouts. Yermack (2017) studies 120 large art museums and finds that endowment withdrawals increase when the museums' operating surpluses decline.

Numerous papers beginning with Tobin (1974) have proposed spending rules for

endowments, and Brown *et. al* (2014) provide an excellent review of this literature. Many of these rules resemble the consumption-smoothing prediction of Tobin's permanent income hypothesis or the dividend-smoothing payout rules followed by corporations as first documented by Lintner (1956). The tenor of these policies implies that non-profits aim for a stable distribution rate from their endowments, with the rate equal to the long-run expected return of the fund. However, other papers have taken issue with this type of distribution policy, such as Hansmann (1990) and Merton (1993). Hansmann focuses on issues of intergenerational equity and concludes that an overly conservative distribution policy may give undue benefit to more affluent future generations. Merton notes that an endowment fund can be invested, and can follow distribution policies, that hedge an organization's cash flows from other assets, such as a university's streams of tuition revenue and donations.

Table 7 shows descriptive statistics about the distribution policies for the endowment funds in our sample. We calculate the distribution rate based on information in Part V, Schedule D of Form 990. The distribution rate equals the ratio of distributions for grants and scholarships (Line 1d) plus distributions for facilities and programs (Line 1e) over the sum of beginning-of-year assets (Line 1a) plus 50% of new contributions and transfers during the year (Line 1b). It should be thought of as similar to the dividend policy for a company deciding what fraction of its equity to pay out to shareholders each year. We present data for the sample overall in the left column of Table 7 and for each of the four size cohorts in the next four columns.

The data indicate that endowments have a mean distribution rate of 5.67% and a median rate of 2.37%, with more than one-third of funds not making any distribution at all. However, these statistics obscure a clear connection between endowment size and payout policies. In the second column of Table 7, data indicate that most large endowment funds have very stable

distribution policies, with mean and median distribution ratios of 4.86% and 4.35%, respectively, and more than 95% of all funds making a distribution in a given year.[12] In the right column of Table 7, the data indicate that the majority of tiny endowment funds make no distribution at all, but the mean distribution is higher than for large funds, at 5.29%. The other two size cohorts see the data trend monotonically between these two extremes.

The data suggest a number of high-level conclusions about the distribution policies of endowments. First, smaller endowments appear to follow an accumulation strategy, with a predisposition to make no distributions at all to their parent organizations, and they instead attempt to grow to a critical mass. However, the larger mean size of their distributions – especially with the high number of zero values – implies that these endowments are more vulnerable to extraordinary withdrawals to cover deficits or capital projects. Once endowments have grown large, they follow very different distribution strategies. The mean and median distribution rates for large endowments are very close, in the neighborhood of 4.5%. Extraordinary distributions from larger endowments seem to be rare, since the mean and median withdrawal rates are almost equal, and virtually all large funds make at least some distribution.

The 4.5% distribution rate appears to be a focal point that is commonly used by many large, established funds. This figure may approximate the real return that one might expect from a fund invested 60% in equities and 40% in risk-free debt, but if inflation is greater than zero, the 4.5% nominal distribution rate is likely to be less than the return of a typical fund, meaning that

[12] For comparison, Brown *et. al*'s (2014) survey of about 200 large universities drawn from the NACUBO sample between 1986-2009 shows mean and median payout rates of 5.2%, calculated with slightly different methodology than ours. Yermack's (2017) study of 120 art museums between 2008-2013 shows mean and median spending rates of 5.8% and 4.7%, respectively.

endowments will tend to grow over time.[13] This conservative distribution policy has been the focus of much of the external criticism that has focused especially on the growth of elite universities' endowments and contributed to Congress's decision to enact a 1.4% tax on large university endowment profits beginning in 2018. By comparison, private foundations are generally required to distribute at least 5.0% of their assets in order to maintain their non-profit status, and that number also has drawn criticism for being below the likely investment returns for funds held in these entities.

Table 8 presents a regression analysis of annual endowment distributions as a function of six potential sources of cash for the organization: operating income, cash on the balance sheet at the start of the year, new donations, new government grants, an increase in debt, and investment earnings on the endowment itself. Standard errors are clustered at the organization level, and we show estimates for the overall sample and for each of the four size cohorts.

In the left column of Table 8, estimates indicate that the dollar value of endowment distributions exhibits positive associations with three variables: cash available at the start of the year, operating deficits, and endowment earnings. Results for the four size-based subsamples shows that these entire effects can be attributed to the payout behavior of very large endowments. Medium, small, and tiny sized endowments generally see no associations between the amounts they pay to their parents and any of the six potential alternative sources for cash.

The point estimates in the first column of Table 8 show that when large endowments run operating deficits, about 16 percent of the deficit is covered by increased distributions from the endowment, a result close to Yermack's (2017) estimate of 13 percent for a much smaller sample of prominent art museums. This result seems to contradict Brown et. al's finding that

[13] Hansmann (1990, pp 9-10) writes, "nearly all discussions of spending rules simply take it for granted that the rate of spending out of endowment should not, over time, exceed the real rate of return on the investments constituting the endowment."

endowment payouts are reduced when an organization experiences negative financial shocks. However, that paper takes a different empirical approach, defining a "shock" not in terms of operating losses, but instead as a deterioration in the ratio of endowment assets over total expenses.

The other strong result in the first column of Table 8 shows that when an endowment's earnings rise or fall, the annual payout from the endowment to its parent can be expected to rise or fall by about 85% of the change in endowment earnings. This surprisingly high partial correlation may be an artifact of some institutions following a primitive distribution policy of simply paying out all of the annual realized income of the fund to the parent (Hansmann, 1990).

## V. Endowment performance and its impact on fundraising

Given the high public interest in the investment performance of endowment funds, a natural hypothesis to examine is whether donors respond to successful years in which funds earn strong investment returns. We test this hypothesis in regressions analysis shown in Table 9. The dependent variable in this table is based on total donations during the fiscal year. We calculate this from Part VIII of Form 990 as the sum of federated campaigns (Line 1a) plus fundraising events (Line 1c) plus all other contributions, gifts, and grants (Line 1f). We do not include membership dues (Line 1b), income from related organizations (Line 1d) or government grants (Line 1e). Our dependent variable in Table 9 is then $\ln(\text{donations}_t / \text{donations}_{t-1})$, and we regress this against the endowment investment return for the prior year with results shown in the left column. In the center column, we repeat this regression after subtracting the equity market index from the endowment return, so that the explanatory variable becomes the net-of-market return. In the right column, we subtract the 60% - 40% mix of the equity and Treasury bond indexes

introduced as a benchmark in Table 3 above. We lack a sufficient number of annual observations for each fund to fit a more elaborate model of expected returns.

Results in Table 9 indicate a positive and significant intercept around 0.02, implying a secular growth rate in donations of close to 2% per year, and estimates of 0.1544, 0.1315, and 0.1060 for the lagged raw returns, net-of-market returns, and net of 60-40 benchmark returns respectively, all significant at the 1% level based on standard errors clustered by endowment. These coefficient estimates indicate a modest but significant elasticity between investment performance and the willingness of donors to contribute in future periods. If a fund out-performs the equity market benchmark by 10%, for instance, donations would grow by about 1.3% in the following year, all else equal. These results parallel those found in other "flow-to-performance" studies in the asset management industry that document increased inflows of management fee income after years in which a money manager outperforms market benchmarks. Lewellen and Lewellen (2018) provide a recent contribution in this area and a review of the lengthy literature.

## VI. Discussion and conclusions

We study the investment returns and distribution policies of non-profit endowment funds, which have grown into a $0.7 trillion institutional investor class in the U.S. economy. Up to now, nearly all research on endowments has focused on a small, self-selected sample of major research universities, using self-reported survey data from these organizations. Although higher education endowments represent somewhat more than half of the total asset class, our results suggest that the research focus on them may be somewhat misleading, as they have inferior investment performance on an absolute basis and also when compared to endowments with parent organizations in other sectors.

In a sample of more than 28,000 endowment funds drawn from U.S. Internal Revenue Service filings, our regression analysis indicates that on average, endowment funds underperform their market benchmarks significantly. This pattern is heavily influenced by an endowment's size, as larger endowments tend to underperform the most. Endowments' returns also appear to be connected to the quality of investment advice they receive, since smaller organizations close to cities that are major financial centers earn significantly higher investment returns, while the opposite is true for the larger endowments.

Most endowments appear to follow distribution policies that are quite conservative, with a median payout ratio below 2.5% of their assets. Again, size plays a big role, as most tiny endowments make no distributions at all, and larger endowments tend to cluster around a distribution rate of about 4.5% of fair market value. This number would appear to resemble the expected long-run real return on a fund that is invested 60% in equities and 40% in debt.

Finally, we find an interesting connection between the endowment's investment performance and the willingness of donors to change their contributions in future years. We estimate an elasticity between investment returns and the growth of donations of approximately 0.13. This implies that the constituent donors of a non-profit, such as the alumni of a university, are aware of how well the organization performs as an investor and adjust their donations in a pattern that rewards stock market profits with the supply of new capital, much as one sees the inflows to a mutual fund increase when the fund outperforms the market.

**Appendix**

Table A1 provides month-by-month performance data for the endowment funds in our sample alongside the relevant equity and debt market benchmarks, in a format identical to Table

3. Each row of the table shows the sample size and summary statistics for endowment returns for those funds whose 12-month fiscal year reporting periods end in that month. Specifically, for each calendar month we identify all endowments with their fiscal years ending in that month. We calculate the median and inter-quartile returns for these subsets of endowments and report these statistics in columns two through four. We next calculate the returns for the CRSP value weighted index and the CRSP 10-Year U.S. Treasury Bond index over the same 12-month periods that match the fiscal years of the endowments. As shown in the table, a significant number of endowments have fiscal years ending in either June or December, with a smaller number ending in September and the rest scattered among the remaining nine months of each year. In addition, our sample size gradually increases over time, as more non-profit firms comply with electronic filing requirements phased in during our sample period by the IRS. We find that in 91 out of the 96 monthly subsamples, the median annual return for the set of endowments is below the return generated by a simple 60-40 mix of the stock index and U.S. government long bond index, as shown in the last column.

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**Table 1**

**Sample of Form 990 filings**

The table shows the sample of Internal Revenue Service Form 990 filings that we retrieve from Amazon Web Services. We retain all observations that have non-missing values for endowment assets at the start and end of the year as well for investment income and exhibit no contradictions or inconsistencies in Table V, Schedule D, where the endowment data is reported. Observations are classified according to each organization's National Taxonomy of Exempt Entities (NTEE) code.

Panel A: Number of unique Form 990 filers by year and NTEE code

| Year | Arts, culture, and humanities | Higher education | Education (other) | Hospitals | Environment | Health (other) | Human services | International | Mutual benefit | Public and societal benefit | Religion | Unknown or missing | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | 1,616 | 1,078 | 2,394 | 738 | 646 | 1,858 | 3,579 | 181 | 217 | 1,607 | 301 | 321 | 14,536 |
| 2010 | 2,393 | 1,165 | 3,390 | 872 | 896 | 2,476 | 4,880 | 244 | 308 | 2,212 | 434 | 408 | 19,678 |
| 2011 | 2,713 | 1,171 | 3,949 | 880 | 1,007 | 2,677 | 5,283 | 277 | 327 | 2,512 | 476 | 338 | 21,610 |
| 2012 | 2,912 | 1,181 | 4,266 | 884 | 1,098 | 2,796 | 5,718 | 302 | 337 | 2,695 | 514 | 250 | 22,953 |
| 2013 | 2,907 | 1,188 | 4,298 | 842 | 1,082 | 2,722 | 5,694 | 307 | 321 | 2,608 | 505 | 150 | 22,624 |
| 2014 | 2,978 | 1,169 | 4,273 | 861 | 1,132 | 2,809 | 5,855 | 310 | 315 | 2,700 | 527 | 93 | 23,022 |
| 2015 | 3,006 | 1,179 | 4,381 | 847 | 1,167 | 2,791 | 5,941 | 316 | 238 | 2,715 | 525 | 45 | 23,151 |
| 2016 | 2,688 | 1,155 | 4,128 | 610 | 998 | 2,293 | 5,196 | 262 | 54 | 2,273 | 427 | 17 | 20,101 |
| Total | 21,213 | 9,286 | 31,079 | 6,534 | 8,026 | 20,422 | 42,146 | 2,199 | 2,117 | 19,322 | 3,709 | 1,622 | 167,675 |

Panel B: Beginning-of-year endowment assets (millions) by year and NTEE code

| Year | Arts, culture, and humanities | Higher education | Education (other) | Hospitals | Environment | Health (other) | Human services | International | Mutual benefit | Public and societal benefit | Religion | Unknown or missing | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | $28,563 | $302,827 | $65,461 | $28,663 | $5,786 | $16,935 | $15,906 | $2,826 | $2,104 | $23,395 | $1,253 | $2,232 | $495,951 |
| 2010 | $27,347 | $234,978 | $68,747 | $30,554 | $6,234 | $18,161 | $18,127 | $4,050 | $2,369 | $28,211 | $1,944 | $2,156 | $442,878 |
| 2011 | $32,573 | $254,176 | $76,763 | $35,127 | $6,824 | $21,004 | $19,680 | $4,634 | $2,510 | $31,790 | $2,311 | $2,197 | $489,588 |
| 2012 | $36,410 | $297,933 | $92,053 | $37,284 | $7,670 | $23,841 | $22,183 | $5,225 | $2,791 | $37,429 | $2,654 | $1,894 | $567,367 |
| 2013 | $36,854 | $294,146 | $93,791 | $39,432 | $7,474 | $25,282 | $22,435 | $5,526 | $2,804 | $37,422 | $3,092 | $945 | $569,203 |
| 2014 | $42,339 | $322,075 | $102,863 | $43,558 | $8,791 | $28,949 | $25,511 | $7,313 | $2,259 | $43,762 | $3,541 | $571 | $631,533 |
| 2015 | $45,184 | $366,600 | $111,099 | $46,651 | $9,585 | $31,158 | $27,230 | $8,248 | $2,474 | $49,609 | $4,195 | $166 | $702,198 |
| 2016 | $38,150 | $378,770 | $108,818 | $33,707 | $8,263 | $25,694 | $24,113 | $4,170 | $460 | $37,860 | $2,032 | $44 | $662,082 |
| Total | $287,421 | $2,451,505 | $719,595 | $294,977 | $60,627 | $191,024 | $175,184 | $41,992 | $17,770 | $289,478 | $21,021 | $10,205 | $4,560,800 |

**Table 2**
**Descriptive statistics**
The table shows descriptive statistics for a sample of 28,696 non-profit organizations with reporting years ending between 2009-2016. Data are obtained from Internal Revenue Service Form 990 filings. Total revenue is reported in Part I of Form 990 (Line 12). Total assets and liabilities are reported as of the start of the fiscal year in Part X of Form 990 (Lines 16 and 26). Endowment assets at the start of year are reported in Part V of Schedule D of Form 990 (Line 1a), and other endowment data comes from the same schedule. Contributions to endowments are reported on the same schedule (Line 1b), and the endowment distribution rate is calculated as the sum of grants and scholarships (Line 1d) and other expenditures for facilities and programs (Line 1e) divided by start-of-year endowment assets plus 0.5 times endowment contributions. Net investment return equals net endowment investment gains/losses (Line 1c) net of any administrative expenses (Line 1f), divided by start of year endowment assets plus 0.5 times endowment contributions. Fundraising is sum of federated campaigns (Part VIII, Line 1a), fundraising events (Part VIII, Line 1c) and other gifts (Part VIII, Line 1f). All dollar values are in $ millions. The number of observations for endowment data exceeds the observations for revenue, assets, and liabilities due to the availability of up to four years of historical endowment data on Schedule D of Form 990.

| | Observations | Mean | Median | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Total revenue | 125,486 | 41.24 | 2.80 | 253.53 | (32.96) | 11,695.86 |
| Total assets BoY | 125,486 | 89.74 | 7.53 | 743.33 | (11.58) | 73,518.24 |
| Total liabilities BoY | 125,486 | 29.87 | 0.55 | 270.20 | (38.83) | 35,024.44 |
| Endowment assets BoY | 167,675 | 27.20 | 1.23 | 372.89 | 0.00 | 36,428.53 |
| Endowment additions | 167,675 | 1.07 | 0.006 | 12.78 | (25.83) | 1,415.68 |
| Endowment distribution rate | 167,675 | 0.0567 | 0.0237 | 1.95 | (25.67) | 645.19 |
| Net investment return | 167,675 | 0.0665 | 0.0375 | 3.52 | (1.00) | 1,183.63 |
| Donations | 167,675 | 3.79 | 0.25 | 29.44 | (1.18) | 2,375.99 |

**Table 3**
**Endowment returns**

The table shows summary statistics of net investment returns on endowment funds for a sample of 28,696 U.S. non-profit organizations between 2009-2016. Endowment data are obtained from Part V of Schedule D of Internal Revenue Service (IRS) Form 990 filings. The annual net investment return for each endowment fund is estimated as endowment investment gains/losses (Line 1c) net of any administrative expenses (Line 1f), divided by start-of-year endowment assets (Line 1a) plus 0.5 times endowment contributions (Line 1b). For comparison purposes, the table also shows mean benchmark returns based on the trailing 12-month returns on the Center for Research in Securities Prices (CRSP) value-weighted index, the CRSP 10-Year U.S. Treasury Bond Index, and a "balanced portfolio" comprised of 60% of the CRSP equity index and 40% of the Treasury bond index. Data in the table represent means and medians for 12-month reporting periods and should not be interpreted as compound annual returns for the 2009-2016 period. Observations are not uniformly distributed through time. Many endowments' 12-month report periods end in June or December, and the number of observations generally increases over time to reflect increasing compliance with IRS electronic filing requirements especially by smaller organizations. Each endowment is assigned to one of four size cohorts based on its average start-of-year size across all observations.

| | | Distribution of endowment returns | | | Trailing 12-month benchmark returns | | | |
|---|---|---|---|---|---|---|---|---|
| | Observations | 25th %ile | Median | 75th %ile | Equity | 10-year Treasuries | Balanced portfolio | Endowment median minus Balanced |
| Large: *assets* > $100 mm | 5,762 | -0.0103 | 0.0614 | 0.1281 | 0.1047 | 0.0540 | 0.0845 | -0.0230 |
| Medium: $100 mm > *assets* > $10 mm | 25,794 | -0.0042 | 0.0509 | 0.1175 | 0.1131 | 0.0514 | 0.0884 | -0.0375 |
| Small: $10 mm > *assets* > $1 mm | 60,497 | 0.0009 | 0.0442 | 0.1058 | 0.1222 | 0.0490 | 0.0929 | -0.0487 |
| Tiny: $1 mm > *assets* | 75,622 | 0.0004 | 0.0284 | 0.0937 | 0.1263 | 0.0476 | 0.0948 | -0.0665 |
| Full Sample | 167,675 | 0.0002 | 0.0375 | 0.1040 | 0.1221 | 0.0489 | 0.0928 | -0.0553 |

**Table 4**
**Abnormal net investment returns (four-factor model)**
The table shows regression estimates of investment alphas for a sample of 28,696 non-profit organizations between 2009-2016 using the standard four-factor model:

$$\ln(1+R_{i,t}) - \ln(1+R_{f,t}) = \alpha_i + \beta_{i,RMRF} \ln(1+RMRF_t) + \beta_{i,SMB} \ln(1+SMB_t) + \beta_{i,HML} + \ln(1+HML_t) + \beta_{i,UMD} \ln(1+UMD_t) + \varepsilon_{i,t}$$

The analysis is limited to 13,791 endowment funds that report at least seven years of performance data in U.S. Internal Revenue Service Form 990 filings. We fit a separate time series regression for each endowment fund, and the first row of the table reports the cross-sectional average of these alpha estimates. The second row reports the bootstrapped *p*-values of the four-factor alphas, calculated according to a method described more fully in the text. For the last four columns each endowment is assigned to one of the four size cohorts based on its average start-of-year assets.

| | Entire Sample | Large: Assets > $100 mm | Medium: $10 mm < Assets < $100 mm | Small: $1 mm < Assets < $10 mm | Tiny: Assets < $1 mm |
|---|---|---|---|---|---|
| Four-factor alpha (cross-sectional average) | -0.0101*** | -0.0139*** | -0.0142*** | -0.0095*** | -0.0078*** |
| Cross-sectionally bootstrapped *p*-value* | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Fraction of endowments with estimated alpha < 0 | 0.59 | 0.70 | 0.68 | 0.59 | 0.53 |
| | | | | | |
| Observations | 13,791 | 673 | 2,780 | 5,418 | 4,920 |
| Fraction of observations | 1.000 | 0.049 | 0.202 | 0.393 | 0.357 |
| Fraction of endowment assets | 1.000 | 0.796 | 0.162 | 0.038 | 0.003 |
| $\beta_{RMRF}$ (cross-sectional average) | 0.4941 | 0.5990 | 0.5736 | 0.5015 | 0.4267 |
| $\beta_{SMB}$ (cross-sectional average) | 0.0450 | 0.1847 | 0.0827 | 0.0263 | 0.0251 |
| $\beta_{HML}$ (cross-sectional average) | -0.0406 | 0.0017 | -0.0262 | -0.0429 | -0.0519 |
| $\beta_{UMD}$ (cross-sectional average) | -0.0802 | -0.0040 | -0.0714 | -0.0850 | -0.0903 |
| $R^2$ (cross-sectional average) | 0.89 | 0.96 | 0.93 | 0.89 | 0.85 |

Significant at 1% (***), 5% (**) and 10% (*) levels.

**Table 5**
**Endowment alphas and proximity to financial centers**
The table shows regression estimates of investment alphas as a function of the locations of non-profit endowments, for a sample of 28,696 non-profit organizations between 2009-2016. We save the alphas estimated for each endowment fund from the regressions in Table 4. We then regress these alphas against an intercept and location variables, based on the headquarters address of each endowment's parent organization, using standard ordinary least squares estimation. The analysis is limited to 13,649 endowment funds with complete headquarters addresses that report at least seven years of performance data in U.S. Internal Revenue Service Form 990 filings. For the regressions tabulated in Panel A, the location variable equals the distance in miles from Wall Street, based on STATA's ZIP code calculator and using the New York headquarters ZIP code of Goldman Sachs as the origin. Panel B changes the location variable to equal the distance from each endowment to the nearest of four financial centers: New York, Boston, Chicago, or San Francisco, measured in a similar way. Standard errors appear in parentheses. For the last four columns each endowment is assigned to one of the four size cohorts based on its average start-of-year assets.

Panel A: distance from Wall Street

| | Entire sample | Large: assets > $100 mm | Medium: $100 mm > assets > $10 mm | Small: $10 mm > assets > $1 mm | Tiny: $1 mm > assets |
|---|---|---|---|---|---|
| Intercept | -0.0107*** | -0.0108*** | -0.0137*** | -0.0094*** | -0.0101*** |
| | (0.0009) | (0.0020) | (0.0014) | (0.0013) | (0.0021) |
| Mileage from Wall Street x $10^{-3}$ | 0.0007 | -0.0038** | -0.0005 | -0.0001 | 0.0023* |
| | (0.0007) | (0.0017) | (0.0010) | (0.0010) | (0.0014) |
| Observations | 13,649 | 661 | 2760 | 5,374 | 4,854 |
| Adjusted $R^2$ | -0.000 | 0.006 | -0.000 | -0.000 | 0.000 |

Panel B: distance from nearest financial center

| | Entire sample | Large: assets > $100 mm | Medium: $100 mm > assets > $10 mm | Small: $10 mm > assets > $1 mm | Tiny: $1 mm > assets |
|---|---|---|---|---|---|
| Intercept | -0.0105*** | -0.0114*** | -0.0126*** | -0.0109*** | -0.0086*** |
| | (0.0009) | (0.0019) | (0.0014) | (0.0012) | (0.0019) |
| Mileage from nearest financial center x $10^{-3}$ | 0.0007 | -0.0082* | -0.0047* | 0.0040* | 0.0016 |
| | (0.0007) | (0.0043) | (0.0025) | (0.0024) | (0.0036) |
| Observations | 13,649 | 661 | 2760 | 5,374 | 4,854 |
| Adjusted $R^2$ | -0.000 | 0.003 | 0.001 | 0.000 | -0.000 |

Significant at 1% (***), 5% (**) and 10% (*) levels.

**Table 6**
**Abnormal net investment returns for higher education endowments**
The table shows alpha estimates for annual net investment returns for a sample of 28,696 non-profit endowment funds between 2009-2016 using the standard four-factor model:

$$\ln(1+R_{i,t}) - \ln(1+R_{f,t}) = \alpha_i + \beta_{i,RMRF} \ln(1+RMRF_t) + \beta_{i,SMB} \ln(1+SMB_t) + \beta_{i,HML} + \ln(1+HML_t) + \beta_{i,UMD} \ln(1+UMD_t) + \varepsilon_{i,t}$$

The analysis is limited to 13,791 endowment funds that report at least seven years of performance data in U.S. Internal Revenue Service Form 990 filings. We fit a separate time series regression for each endowment fund, and the first row of the table reports the cross-sectional average of these alpha estimates. The second row reports the bootstrapped *p*-values of the four-factor alphas, calculated according to a method described more fully in the text. The subsample of the Top 20 Universities is based on rankings from *U.S. News and World Report.*

| | Entire sample | Colleges and universities | All other organizations | Top 20 universities |
|---|---|---|---|---|
| Four-factor alpha (cross-sectional average) | -0.0101*** | -0.0189*** | -0.0093*** | 0.00001 |
| Cross-sectionally bootstrapped *p*-value* | <0.01 | <0.01 | <0.01 | <0.50 |
| Fraction of endowments with estimated alpha < 0 | 0.59 | 0.71 | 0.58 | 0.40 |
| Observations | 13,791 | 1,086 | 12,705 | 20 |
| $R^2$ (cross-sectional average) | 0.89 | 0.94 | 0.88 | 0.98 |

Significant at 1% (***), 5% (**) and 10% (*) levels.

**Table 7**
**Distribution rates for endowments of different sizes**
The table shows descriptive statistics about the annual distribution rates for non-profit endowments, for a sample of 28,696 non-profit organizations between 2009-2016. Data are obtained from IRS Form 990 filings on Schedule D, Part V. The distribution rate is calculated as the ratio of distributions for grants and scholarships (Line 1d) plus distributions for facilities and programs (Line 1e) over the sum of beginning-of-year assets (Line 1a) plus 50% of new contributions and transfers during the year (Line 1b).

| | Entire Sample | Large: Assets > $100 mm | Medium: $10 mm < Assets < $100 mm | Small: $1 mm < Assets < $10 mm | Tiny: Assets < $1 mm |
|---|---|---|---|---|---|
| Observations | 167,675 | 5,762 | 25,794 | 60,497 | 75,622 |
| Fraction of with zero distribution | 0.341 | 0.042 | 0.104 | 0.250 | 0.517 |
| Median distribution rate | 2.37% | 4.35% | 3.93% | 3.13% | 0.00% |
| Mean distribution rate | 5.67% | 4.86% | 4.99% | 6.50% | 5.29% |

**Table 8**
**Distributions by endowments as a function of other sources of cash**
The table shows least squares regression estimates of the amounts of cash distributed from non-profit endowments as a function of six potential sources of cash, for a sample of 28,696 non-profit organizations between 2009-2016. The operating surplus equals program service revenue minus program service expenses. New debt issued equals the year-over-year difference in bonds, loans, and notes outstanding. Government grants received equal cash from newly awarded grants minus changes in grants receivable. Cash on balance sheet is recorded at the start of the year. Data is based on non-profit organizations' Form 990 filings with the U.S. Internal Revenue Service. Standard errors clustered at the organization level appear in parentheses.

| | Entire Sample | Large: Assets > $100 mm | Medium: $10 mm < Assets < $100 mm | Small: $1 mm < Assets < $10 mm | Tiny: Assets < $1 mm |
|---|---|---|---|---|---|
| Cash donations | -0.0387 | -0.0581 | 0.0014 | 0.0019*** | -0.0002 |
| | (0.0366) | (0.0628) | (0.0021) | (0.0007) | (0.0001) |
| Operating surplus | -0.1592*** | -0.2810*** | 0.0002 | 0.0011* | -0.0002 |
| | (0.0459) | (0.0770) | (0.0015) | (0.0006) | (0.0001) |
| Endowment earnings | 0.8488*** | 0.6665*** | 0.0153 | 0.0059** | -0.0005 |
| | (0.2825) | (0.2352) | (0.0149) | (0.0030) | (0.0012) |
| Net change in long term debt | -0.0084 | 0.0028 | 0.0057 | -0.0005 | 0.0008 |
| | (0.0241) | (0.0308) | (0.0044) | (0.0004) | (0.0009) |
| Government grants received | -0.0140 | -0.1568* | 0.0040* | 0.0007 | -0.0000 |
| | (0.0547) | (0.0812) | (0.0023) | (0.0009) | (0.0002) |
| Cash on balance sheet | 0.0979*** | 0.1316*** | 0.0038 | 0.0004 | 0.0001 |
| | (0.0254) | (0.0319) | (0.0026) | (0.0006) | (0.0001) |
| Intercept | 2.0800* | 93.3599*** | 15.9541*** | 2.0973*** | 0.2174*** |
| | (1.1805) | (23.2052) | (0.6398) | (0.0406) | (0.0112) |
| Observations | 167,675 | 5,762 | 25,794 | 60,497 | 75,622 |
| $R^2$ | 0.481 | 0.519 | 0.003 | 0.003 | 0.001 |

Significant at 1% (***), 5% (**) and 10% (*) levels.

**Table 9**

**Investment returns and subsequent donations to parent organization**

The table shows regression estimates for a model of the growth in donations to the parent organizations of non-profit endowment funds, for a sample of 28,696 non-profit organizations between 2009-2016. The dependent variable is the log of the ratio of current year donations over prior year donations. Donations are estimated based on data reported in Part VIII of the Form 990 Filing. Total donations are defined as sum of Line 1a (Fed Campaigns), Line 1c (Fund raising events), and Line 1f (All other contributions). The main explanatory variables are the lagged endowment return, defined as ln(1+Annual Endowment Return), the net endowment return adjusted for return on the CRSP value weighted index, defined as [ln(1+Annual Endowment Return) –ln(1+Annual VWRETD)], and the net endowment return adjusted for a 60% - 40% combination of the CRSP value weighted index and the CRSP 10-Year U.S. Treasury Bond Index. Data are obtained from IRS Form 990 filings for the period 2009-2016. Standard errors, clustered for each endowment, appear in parentheses below each estimate.

| | Estimate | Estimate | Estimate |
|---|---|---|---|
| Intercept | 0.0187*** | 0.0204*** | 0.0332*** |
| | (0.0032) | (0.0030) | (0.0032) |
| Lagged endowment return, unadjusted | 0.1544*** | | |
| | (0.0437) | | |
| Lagged endowment return, net of equity market index | | 0.1315*** | |
| | | (0.0411) | |
| Lagged endowment return, net of 60%-40% equity-debt balanced portfolio | | | 0.1060*** |
| | | | (0.0440) |
| Observations | 85,930 | 85,930 | 85,930 |
| Adjusted $R^2$ | 0.000 | 0.000 | 0.000 |

Significant at 1% (***), 5% (**) and 10% (*) levels.

**Table A1**
**Endowment returns**

The table shows summary statistics of net investment returns on endowment funds for a sample of 28,696 U.S. non-profit organizations between 2009-2016. Each line of the table shows the distribution of annual endowment returns and the comparable trailing 12-month benchmark returns for observations whose 12-month fiscal year reporting periods end in that month. Endowment data are obtained from Part V of Schedule D of Internal Revenue Service Form 990 filings. The annual net investment return for each endowment fund is estimated as endowment investment gains/losses (Line 1c) net of any administrative expenses (Line 1f), divided by start-of-year endowment assets (Line 1a) plus 0.5 times endowment contributions (Line 1b). Benchmark returns are based on the Center for Research in Securities Prices (CRSP) value-weighted index, the CRSP 10-Year U.S. Treasury Bond Index, and a "balanced portfolio" comprised of 60% of the CRSP equity index and 40% of the Treasury bond index.

| | | Distribution of endowment returns | | | Trailing 12-month benchmark returns | | | |
|---|---|---|---|---|---|---|---|---|
| Fiscal year end | Observations | 25th %ile | Median | 75th %ile | Equity | 10-year Treasuries | Balanced portfolio | Endowment median minus Balanced |
| 2009m1 | 21 | -0.2069 | -0.1297 | 0.0102 | -0.3930 | 0.0828 | -0.2027 | 0.0729 |
| 2009m2 | 31 | -0.3178 | -0.1996 | 0.0183 | -0.4421 | 0.0708 | -0.2370 | 0.0374 |
| 2009m3 | 224 | -0.2688 | -0.2140 | -0.0812 | -0.3869 | 0.0938 | -0.1946 | -0.0194 |
| 2009m4 | 108 | -0.2565 | -0.2078 | -0.0869 | -0.3522 | 0.0722 | -0.1824 | -0.0254 |
| 2009m5 | 409 | -0.2300 | -0.1874 | -0.1035 | -0.3247 | 0.0748 | -0.1649 | -0.0225 |
| 2009m6 | 5,644 | -0.1888 | -0.1443 | -0.0556 | -0.2691 | 0.0664 | -0.1349 | -0.0094 |
| 2009m7 | 175 | -0.1360 | -0.0836 | 0.0070 | -0.1983 | 0.0697 | -0.0911 | 0.0074 |
| 2009m8 | 521 | -0.1194 | -0.0737 | -0.0077 | -0.1818 | 0.0642 | -0.0834 | 0.0097 |
| 2009m9 | 1,118 | -0.0157 | 0.0074 | 0.0309 | -0.0517 | 0.0743 | -0.0013 | 0.0087 |
| 2009m10 | 92 | 0.0215 | 0.0857 | 0.1336 | 0.1301 | 0.1019 | 0.1188 | -0.0331 |
| 2009m11 | 15 | -0.0068 | 0.0661 | 0.1525 | 0.3064 | 0.0345 | 0.1976 | -0.1315 |
| 2009m12 | 6,178 | 0.0402 | 0.1465 | 0.2078 | 0.3161 | -0.0583 | 0.1664 | -0.0199 |
| 2010m1 | 29 | 0.0109 | 0.1564 | 0.2043 | 0.3737 | 0.0060 | 0.2266 | -0.0703 |
| 2010m2 | 45 | 0.0461 | 0.1972 | 0.3196 | 0.5823 | 0.0100 | 0.3534 | -0.1562 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2010m3 | 363 | 0.0710 | 0.2333 | 0.3253 | 0.5485 | -0.0359 | 0.3147 | -0.0815 |
| 2010m4 | 162 | 0.0710 | 0.1797 | 0.2645 | 0.4226 | 0.0164 | 0.2601 | -0.0804 |
| 2010m5 | 552 | 0.0572 | 0.1159 | 0.1446 | 0.2264 | 0.0595 | 0.1596 | -0.0438 |
| 2010m6 | 7,810 | 0.0391 | 0.0902 | 0.1201 | 0.1658 | 0.0923 | 0.1364 | -0.0462 |
| 2010m7 | 257 | 0.0324 | 0.0844 | 0.1098 | 0.1536 | 0.0919 | 0.1289 | -0.0445 |
| 2010m8 | 714 | 0.0176 | 0.0466 | 0.0706 | 0.0689 | 0.1194 | 0.0891 | -0.0425 |
| 2010m9 | 1,484 | 0.0276 | 0.0687 | 0.0928 | 0.1172 | 0.1057 | 0.1126 | -0.0439 |
| 2010m10 | 131 | 0.0347 | 0.0841 | 0.1246 | 0.1947 | 0.1039 | 0.1584 | -0.0743 |
| 2010m11 | 30 | 0.0280 | 0.0634 | 0.0948 | 0.1362 | 0.0755 | 0.1119 | -0.0485 |
| 2010m12 | 8,101 | 0.0331 | 0.0853 | 0.1143 | 0.1789 | 0.0745 | 0.1371 | -0.0519 |
| 2011m1 | 35 | 0.0156 | 0.0971 | 0.1216 | 0.2491 | 0.0523 | 0.1704 | -0.0733 |
| 2011m2 | 60 | 0.0354 | 0.1272 | 0.1516 | 0.2531 | 0.0500 | 0.1719 | -0.0447 |
| 2011m3 | 424 | 0.0500 | 0.0895 | 0.1177 | 0.1806 | 0.0644 | 0.1342 | -0.0446 |
| 2011m4 | 205 | 0.0393 | 0.1018 | 0.1366 | 0.1899 | 0.0624 | 0.1389 | -0.0371 |
| 2011m5 | 636 | 0.0750 | 0.1495 | 0.1839 | 0.2743 | 0.0620 | 0.1894 | -0.0398 |
| 2011m6 | 8,920 | 0.0694 | 0.1555 | 0.1953 | 0.3193 | 0.0211 | 0.2000 | -0.0446 |
| 2011m7 | 304 | 0.0311 | 0.0974 | 0.1328 | 0.2027 | 0.0446 | 0.1394 | -0.0421 |
| 2011m8 | 802 | 0.0354 | 0.0835 | 0.1142 | 0.1842 | 0.0567 | 0.1332 | -0.0497 |
| 2011m9 | 1,628 | -0.0206 | -0.0017 | 0.0128 | -0.0074 | 0.0899 | 0.0315 | -0.0332 |
| 2011m10 | 141 | 0.0047 | 0.0209 | 0.0376 | 0.0655 | 0.0824 | 0.0723 | -0.0514 |
| 2011m11 | 37 | -0.0026 | 0.0228 | 0.0387 | 0.0531 | 0.0997 | 0.0718 | -0.0490 |
| 2011m12 | 8,418 | -0.0253 | -0.0020 | 0.0139 | -0.0090 | 0.1660 | 0.0610 | -0.0630 |
| 2012m1 | 39 | -0.0086 | 0.0058 | 0.0325 | 0.0237 | 0.1766 | 0.0849 | -0.0791 |
| 2012m2 | 63 | 0.0026 | 0.0148 | 0.0397 | 0.0271 | 0.1643 | 0.0820 | -0.0671 |
| 2012m3 | 457 | 0.0028 | 0.0203 | 0.0397 | 0.0500 | 0.1422 | 0.0869 | -0.0665 |
| 2012m4 | 221 | -0.0080 | 0.0036 | 0.0266 | 0.0142 | 0.1578 | 0.0716 | -0.0681 |
| 2012m5 | 666 | -0.0477 | -0.0252 | 0.0039 | -0.0385 | 0.1652 | 0.0430 | -0.0682 |
| 2012m6 | 9,573 | -0.0177 | 0.0004 | 0.0169 | 0.0173 | 0.1644 | 0.0761 | -0.0758 |
| 2012m7 | 344 | -0.0030 | 0.0142 | 0.0335 | 0.0526 | 0.1471 | 0.0904 | -0.0762 |
| 2012m8 | 861 | 0.0163 | 0.0525 | 0.0786 | 0.1478 | 0.0924 | 0.1256 | -0.0731 |
| 2012m9 | 1,751 | 0.0489 | 0.1239 | 0.1612 | 0.2868 | 0.0544 | 0.1938 | -0.0699 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2012m10 | 154 | 0.0326 | 0.0676 | 0.0918 | 0.1371 | 0.0642 | 0.1079 | -0.0404 |
| 2012m11 | 43 | 0.0410 | 0.0679 | 0.1038 | 0.1513 | 0.0649 | 0.1167 | -0.0488 |
| 2012m12 | 8,781 | 0.0383 | 0.0857 | 0.1124 | 0.1598 | 0.0359 | 0.1102 | -0.0245 |
| 2013m1 | 40 | 0.0182 | 0.0687 | 0.0934 | 0.1618 | 0.0115 | 0.1017 | -0.0329 |
| 2013m2 | 54 | 0.0148 | 0.0536 | 0.0716 | 0.1252 | 0.0342 | 0.0888 | -0.0352 |
| 2013m3 | 461 | 0.0357 | 0.0699 | 0.0904 | 0.1373 | 0.0587 | 0.1059 | -0.0359 |
| 2013m4 | 230 | 0.0308 | 0.0846 | 0.1106 | 0.1626 | 0.0475 | 0.1166 | -0.0320 |
| 2013m5 | 657 | 0.0784 | 0.1342 | 0.1592 | 0.2706 | -0.0161 | 0.1559 | -0.0217 |
| 2013m6 | 9,757 | 0.0487 | 0.0895 | 0.1150 | 0.2061 | -0.0392 | 0.1080 | -0.0185 |
| 2013m7 | 343 | 0.0325 | 0.0972 | 0.1379 | 0.2577 | -0.0584 | 0.1313 | -0.0341 |
| 2013m8 | 846 | 0.0313 | 0.0708 | 0.0989 | 0.1932 | -0.0682 | 0.0886 | -0.0178 |
| 2013m9 | 1,754 | 0.0369 | 0.0798 | 0.1137 | 0.2061 | -0.0455 | 0.1055 | -0.0257 |
| 2013m10 | 161 | 0.0470 | 0.0980 | 0.1401 | 0.2731 | -0.0360 | 0.1495 | -0.0515 |
| 2013m11 | 39 | 0.0452 | 0.0823 | 0.1543 | 0.2980 | -0.0567 | 0.1562 | -0.0738 |
| 2013m12 | 8,282 | 0.0485 | 0.1143 | 0.1541 | 0.3168 | -0.0690 | 0.1625 | -0.0482 |
| 2014m1 | 33 | 0.0023 | 0.0481 | 0.0813 | 0.2097 | -0.0212 | 0.1173 | -0.0693 |
| 2014m2 | 54 | 0.0145 | 0.1091 | 0.1318 | 0.2544 | -0.0282 | 0.1414 | -0.0322 |
| 2014m3 | 425 | 0.0441 | 0.0885 | 0.1167 | 0.2159 | -0.0357 | 0.1153 | -0.0267 |
| 2014m4 | 208 | 0.0375 | 0.0769 | 0.1056 | 0.1994 | -0.0443 | 0.1019 | -0.0250 |
| 2014m5 | 623 | 0.0659 | 0.0986 | 0.1190 | 0.1989 | 0.0053 | 0.1214 | -0.0229 |
| 2014m6 | 9,605 | 0.0833 | 0.1302 | 0.1543 | 0.2506 | 0.0338 | 0.1639 | -0.0336 |
| 2014m7 | 342 | 0.0402 | 0.0823 | 0.1058 | 0.1625 | 0.0383 | 0.1128 | -0.0305 |
| 2014m8 | 831 | 0.0692 | 0.1245 | 0.1498 | 0.2425 | 0.0716 | 0.1741 | -0.0496 |
| 2014m9 | 1,752 | 0.0349 | 0.0676 | 0.0914 | 0.1678 | 0.0416 | 0.1173 | -0.0497 |
| 2014m10 | 165 | 0.0396 | 0.0616 | 0.0807 | 0.1465 | 0.0480 | 0.1071 | -0.0455 |
| 2014m11 | 41 | 0.0414 | 0.0624 | 0.0744 | 0.1419 | 0.0760 | 0.1155 | -0.0532 |
| 2014m12 | 8,943 | 0.0158 | 0.0366 | 0.0560 | 0.1083 | 0.1015 | 0.1056 | -0.0690 |
| 2015m1 | 37 | 0.0073 | 0.0253 | 0.0441 | 0.1101 | 0.1087 | 0.1096 | -0.0843 |
| 2015m2 | 52 | 0.0342 | 0.0533 | 0.0717 | 0.1215 | 0.0762 | 0.1034 | -0.0500 |
| 2015m3 | 472 | 0.0220 | 0.0429 | 0.0624 | 0.1047 | 0.0892 | 0.0985 | -0.0556 |
| 2015m4 | 224 | 0.0204 | 0.0462 | 0.0675 | 0.1125 | 0.0716 | 0.0961 | -0.0499 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2015m5 | 647 | 0.0211 | 0.0373 | 0.0563 | 0.1019 | 0.0475 | 0.0801 | -0.0428 |
| 2015m6 | 9,929 | -0.0004 | 0.0116 | 0.0278 | 0.0510 | 0.0307 | 0.0429 | -0.0313 |
| 2015m7 | 349 | 0.0035 | 0.0219 | 0.0440 | 0.0869 | 0.0465 | 0.0707 | -0.0488 |
| 2015m8 | 821 | -0.0410 | -0.0181 | 0.0008 | -0.0191 | 0.0260 | -0.0011 | -0.0171 |
| 2015m9 | 1,743 | -0.0439 | -0.0213 | -0.0002 | -0.0287 | 0.0555 | 0.0050 | -0.0262 |
| 2015m10 | 149 | -0.0133 | 0.0030 | 0.0190 | 0.0223 | 0.0340 | 0.0270 | -0.0239 |
| 2015m11 | 32 | -0.0104 | 0.0009 | 0.0136 | 0.0032 | 0.0159 | 0.0083 | -0.0074 |
| 2015m12 | 8,696 | -0.0296 | -0.0126 | 0.0010 | -0.0160 | 0.0107 | -0.0053 | -0.0073 |
| 2016m1 | 37 | -0.0503 | -0.0304 | 0.0003 | -0.0461 | -0.0016 | -0.0283 | -0.0021 |
| 2016m2 | 49 | -0.0863 | -0.0603 | -0.0182 | -0.0970 | 0.0412 | -0.0417 | -0.0186 |
| 2016m3 | 439 | -0.0394 | -0.0214 | 0.0002 | -0.0223 | 0.0312 | -0.0009 | -0.0205 |
| 2016m4 | 194 | -0.0414 | -0.0215 | 0.0023 | -0.0193 | 0.0349 | 0.0024 | -0.0239 |
| 2016m5 | 637 | -0.0373 | -0.0216 | 0.0008 | -0.0152 | 0.0401 | 0.0069 | -0.0285 |
| 2016m6 | 9,776 | -0.0268 | -0.0073 | 0.0082 | 0.0066 | 0.0949 | 0.0419 | -0.0492 |
| 2016m7 | 325 | -0.0027 | 0.0102 | 0.0264 | 0.0329 | 0.0821 | 0.0526 | -0.0423 |
| 2016m8 | 778 | 0.0216 | 0.0468 | 0.0667 | 0.1029 | 0.0748 | 0.0916 | -0.0448 |
| 2016m9 | 1,688 | 0.0386 | 0.0701 | 0.0904 | 0.1453 | 0.0546 | 0.1090 | -0.0389 |
| 2016m10 | 118 | 0.0073 | 0.0250 | 0.0391 | 0.0422 | 0.0460 | 0.0437 | -0.0188 |
| 2016m11 | 25 | 0.0160 | 0.0418 | 0.0633 | 0.0836 | 0.0068 | 0.0529 | -0.0110 |
| 2016m12 | 6,035 | 0.0323 | 0.0550 | 0.0733 | 0.1294 | 0.0070 | 0.0805 | -0.0254 |