TITLE: THE RELATIONSHIP BETWEEN THE TYPE OF MANAGEMENT AND DECISIONS TO INVEST IN LOCAL OR FOREIGN ASSETS: THE CASE OF UNIVERSITY ENDOWMENT FUNDS.

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research contains no material previously published or written by another person except where due reference is made in the Research Proposal itself.

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This Research has been submitted for examination with my approval as the Supervisor.

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ABSTRACT

Universities are known to follow different models when making asset allocation decisions such employing external fund managers to manage asset allocation strategies and manage their investments. At other times the university uses internal mechanisms for management. This paper studies the impact of type of management on the choice of assets. The findings show that management is not a major determinant of choice of assets in the USA but is a determinant in the UK.

DEFINITION OF TERMS

USA - UNITED STATES OF AMERICA

UK – UNITED KINGDOM

AIC – AKAIKE INFORMATION CRITERION

1. INTRODUCTION

Background

Endowment funds for universities can be described as funds raised through alumni contributions or donors. These funds are invested and used to run different activities for a university such as scholarships, fund entrepreneurial activities of students and expansion of facilities. Recently, there has been a lot of focus on management of university endowment funds. High profile endowment portfolios outperformed the market year after year in the 1990s and 2000s leading private researchers and academics to seek an understanding of the reason to behind this (Rosen.S.H & Sappington.J.W, 2015).

Endowment funds are part of a portfolio management process and most of the time the objective is to maintain the real value of the fund. From the general perspective of portfolio management, asset allocation explains about 90 percent of the variability of a fund's return over time but only about 40 percent of variation of returns among funds (Ibbotson.G.R & Kaplan.D.P, 2000). Endowment funds should be treated as if they were the only asset of the university as a consequence, endowment portfolios for different universities should have quite similar risky investment allocations (Merton.C.R, 1993).

The importance of endowment funds cannot be underestimated. Endowment payouts have become an increasingly important component of university revenues (Jeffrey.B, Dimmock.S.G, Kang.J, & Weisbenner.S, 2010). Their growth has far outpaced the growth of university expenditures which could be attributed to the shift of investments from fixed income to equities then alternative assets like venture capital (Lerner.J, Schoar.A, & Wang.J, 2008). Endowment funds play an important role in the perceived good standing of institutions as we see universities in the developed world defined and ranked according to the size of their endowment funds. A small endowment fund would spell financial insecurity for an institution. Endowment funds also hedge against changes in costs of university activities (Merton.C.R, 1993) .There are several factors that could influence performance such as size, level of donations and government grants, background risk, performance of the financial markets such as financial crisis and asset allocation.

This paper seeks to understand if the type of management of an endowment fund influences the choice of assets a fund is invested in. We compare endowment funds in the United States of America, which has most of the high profile university endowments and United Kingdom. It identifies the difference in asset allocation in endowment funds for universities in these countries. Asset allocation is the process of distributing investment capital across various asset classes in an allowable universe (Brown.C.K., Garlappi.L, & Tiu.C, 2010). Although strategic allocation is considered the most important determinant of a portfolio performance, mutual funds and pension funds seem to cast doubt in this belief (Brown.C.K., Garlappi.L, & Tiu.C, 2010).

The following are cases for investment philosophies in four top universities:

	HARVARD UNIVERSITY	**YALE UNIVERSITY**
Position	Largest endowment	Third largest endowment
Value	$36.4 billion	23.9 billion
Model	Use mixed management	Use internal management
Funding	Donations	Donations
Growth	Average of 12% over the last 20 years	Average of 13.9% over the last 30 years
Asset Allocation	As at 2013 invested 60% in traditional assets and 40 % in alternative assets	As at 2013 invested 56% in traditional assets and 44% in alternative assets.

Figure 1: Investment philosophies and Performance of Harvard[1] and Yale[2]

[1] http://www.hmc.harvard.edu/investment-management/performance-history.html
[2] http://investments.yale.edu/index.php/reports/endowment-update

	OXFORD UNIVERSITY	**CAMBRIDGE UNIVERSITY**
Value	£2 billion	£2.3 billion
Funding	Collegiate investors and donations	Donations
Returns	Average 9.3% since inception	Average 9.8% since inception
Assets;	Mainly traditional assets	Mainly equities

Figure 2: Investment philosophies of Oxford[3] and Cambridge[4]

[3] http://ouem.co.uk/
[4] https://www.cam.ac.uk/annual-report

REVIEW OF UNIVERSITY ENDOWMENT FUNDS IN KENYA

Such a study would have added value if done within African universities but African Universities experience limitations with consistency in data collection and many public universities rely on government grants. Endowment funds tend to be one off in nature with no consistent funding source or conscious investment effort. For instance, the European Union Fund in Strathmore was started after a donation from the European Union to generate interest income for bursaries to be given to needy students under the Strathmore Endowment Fund. The European Union fund in Strathmore is generally very small and the reason for this, according to parties involved, is the funding pattern of donors. Donors prefer to support a group of students or building of a particular structure than contribute towards an endowment. It is also not aggressively invested in risky asset classes. As of 2014, the fund was invested in term deposits only compared to 2013 when it was larger and more diversified. This fund is managed internally by the university. There might also be a problem of expertise in Africa because the performance of large endowment funds is also attributed to an expert team managing it and selecting the assets to invest in.

The major problem with African endowment funds is underfunding and reliance on government funding and most of the money the university gets is used to pay staff salaries leaving no residual to be used as endowment (Odebiyi.I & Olabisi.I, 1999).

PROBLEM STATEMENT

This study seeks to find out the impact of the type of management on the assets chosen for a fund, either local or foreign. Foreign assets are those traded internationally or in other financial markets other than the local market. Local assets are those traded in the local market. A fund can be managed internally by the university or some assets can be allocated to an external fund manager (Dimmock.S, 2012). The latter method will be described as a mixed strategy. Asset allocation has been proven to be one of the most significant factors affecting performance of endowment funds. The motivation for this study is the high growth experienced in funds that have greatly diversified to the risky foreign assets (Brown.K.C & Tiu.C, 2007). This study seeks to determine the role of management of the fund in influencing the choice of assets and their allocation.

RESEARCH OBJECTIVES

- To determine how the type of management, internal or mixed, influences the choice of investing in foreign assets.
- To determine other factors that influence the choice of assets.

RESEARCH QUESTIONS

1. Does the type of management influence the choice of assets of an endowment fund?
2. What other factors significantly affect the choice of assets?

JUSTIFICATION

The recent focus on performance of university endowment funds and the shift to investing in alternative assets has informed this research. The findings of this study could inform the emphasis to put on choice of management for Kenyan universities that are launching endowment funds. The current President, H.E. Uhuru Kenyatta recently called upon universities to build endowment funds, an initiative that the University of Nairobi has taken up[5]. The results of this study could help inform the emphasis on which type of management should be given.

In Strathmore University the main endowment fund is the European Union Fund which was funded by the European Union for interest income to give bursaries under the Strathmore Endowment Fund. It is supported by other endowment funds such as Drakard and Kamaljeet. There is also the Jim Mcfie Fund which was started in 2015 for School of Accountancy students[6]. As at 2013 the European Union fund was invested in cash, term deposits, corporate notes, government paper and quoted domestic equities but in 2014 it was invested in term deposits only. The fund had more assets in 2013 compared to 2014. The funds are allocated entirely in traditional asset classes compared to large USA and UK which invest in both traditional and alternative assets.

The Strathmore endowment fund is managed internally by the university while the USA and UK universities subscribe to different methods depending on the university.

[5] http://www.uonbi.ac.ke/content/varsity-launches-endowment-fund

[6] www.strathmore.edu/en/images/documents/Annual-Report-2014.pdf

2. LITERATURE REVIEW.

Introduction

There has been a lot of focus on university endowment funds, especially large endowment funds, because of the growth experienced over time. This growth can be attributed to the more aggressive strategies being employed by universities and change in asset allocation. This study will seek to determine whether the type of management influences the type of assets chosen. According to National Association of College and University Business Officers[7] 87% of endowment asset in the United States of America are managed by external managers. There has also been an evident trend of shift from internal management to external management of university endowment funds (Davidson.H.A, 1971).

Theoretical Framework

In the past, endowment funds have received less attention than pensions and mutual funds. Brown compares endowment funds to mutual funds and pension funds in the following way; like pension funds, endowment funds must be managed with regard to a well defined set of spending rules but endowment funds aim to preserve capital indefinitely; like mutual funds, endowment fund assets are managed without a safety net but endowment funds decisions on investment are decentralized (Brown.K.C & Tiu.C, 2007). Endowment funds can be internally managed but independent investment managers are sometimes hired and granted some discretion on asset allocation (Wilson.F.T, 1984). Recently there has been a lot of focus on endowment funds because of their performance (Rosen.S.H & Sappington.J.W, 2015)therefore endowments receive more attention than before.

The major difference between external and internal managers is that external managers are professionals who devote much of their time exclusively to fulfill their functions while internal managers are often charged with different activities (Davidson.H.A, 1971). Endowments have dramatically altered their asset allocation practices over time, generally increasing their equity exposure and hedge funds investment at the expense of their traditional fixed income securities (Brown.K.C & Tiu.C, 2007). Colleges and universities were investing too conservatively and giving up capital gain returns because of mistaken definitions of prudence (Dobris.C.J, 1993).

[7] http://www.nacubo.org/

Endowment teams have generally reduced allocations to traditional equities and fixed income and increased allocation to alternative assets (Lord.M, 2014) such as hedge funds, private equity and real estate. University endowment funds have led in this shift (A.Ang. & Goetzmann.N.W, 2013). The shift to alternative assets has increased university exposure to financial market risk (Jeffrey.B, Dimmock.S.G, Kang.J, & Weisbenner.S, 2010). By taking on higher financial risks, external endowment fund managers generated high returns for a time but at the cost of intensifying universities' exposure to rampant volatility of the global capital markets (Humphrey.J, 2009) Strategic allocations to alternative assets can explain much of the variation in performance of endowment funds as strong returns can be traced largely to the strong performance of alternative assets (Barber.B. & G.Wang., 2013).

The growth in market value of externally managed endowment funds is considerably greater than internally managed ones (Davidson.H.A, 1971). Alternative investments, such as private equity and hedge funds, are able to generate alphas because they are not easily replicable unlike public stock market that can be easily replicated and hence do not produce alphas (Barber.B. & G.Wang., 2013). Another school of thought suggests that hedge fund managers do not earn alpha but are compensated for bearing downside risk (Jurek.W.J & Stafford.E, 2015). University endowments move to alternative assets could have been influenced by the fact that assets such as hedge funds are designed to be absolute return investments profiting in all market environments whereas traditional equity and fixed income securities are relative return investments for which managers seek to outperform a benchmark (Schneeweis.T, Kazemi.H, & Martin.G, 2003). Diversified asset allocation to alternative investments has become the hallmark of the endowment model of investment (Humphrey.J, 2009).

Studies of the USA College and University endowments show a positive correlation between size and performance which can be attributed to the large number of staff, expertise and greater diversification for large endowments while for smaller endowments oversight and management of the endowment is only one of the many responsibilities of the Chief Financial Officer (Lord.M, 2014). Private universities with larger endowment funds have relatively higher alpha expectations compared to smaller endowments and larger holdings of alternative asset which suggests that endowment funds are accepting higher levels of uncertainty in exchange for higher

expected returns (A.Ang. & Goetzmann.N.W, 2013) while smaller endowment funds do not view alternative investments as valuable in reducing portfolio losses and volatility. Big endowment funds enjoy strong returns explained by their allocations to alternative assets (Barber.B. & G.Wang., 2013). In 2007, schools with endowments of over one billion, large enough to justify diversification into riskier and less liquid investments, obtained average annual investment returns of 11.1% while smaller endowment funds invested cautiously and paid the price for their caution earning only 7.9% (Weisbrod.A.B & Asch.D.E, 2010). These smaller endowment funds tend to change from one type of management to another when their value hits a given threshold (Davidson.H.A, 1971).

Endowment funds have formal payout policies intended to smooth payouts but over time universities are likely to deviate from these policies following negative shocks (Jeffrey.B, Dimmock.S.G, Kang.J, & Weisbenner.S, 2010). Endowments funds suffered a huge setback during the financial crisis in 2009 (Barber.B. & G.Wang., 2013). This has led commentators to conclude that external endowment managers had taken on excessive risk and failed to provide adequate financial support to their universities against negative revenue shocks (Rosen.S.H & Sappington.J.W, 2015). However there could be other factors aside from the financial crisis that influence this performance. Market declines, reduction in state allocations to higher education and donor giving has an added significance (Lord.M, 2014). The declining economy is cutting state governments revenue from sales and income taxes and increasing pressure to expand spending on welfare programs and one of the casualties of such pressure is state support for public colleges and universities (Weisbrod.A.B & Asch.D.E, 2010). The composition of endowment assets also matters for the resultant effect of a negative financial shock to university operations as well liquidity of the assets (Jeffrey.B, Dimmock.S.G, Kang.J, & Weisbenner.S, 2010).

Originally endowments were simply gifts of property bestowed upon an institution to provide it with a source of secure income. The role of tax deductible gift giving remains an extremely important source of income for educational institutions although finance has superseded fundraising as the main vehicle for growth of endowments (Humphrey.J, 2009). During the period 1993 to 2005 investment returns for public university endowment funds grew four percent per year than private schools suggesting a larger role for donations and government transfers although public schools have had much lower endowment values per student than private schools (Lerner.J, Schoar.A, & Wang.J, 2008). The financial crisis however, has seen the state reduce government transfers and focus more on the increased need for public programs (Altundemir.E.M., 2012) . New money from donations make it reasonable to permit spending at a rate higher than the real interest rate and still expect to maintain real spending but relying on donations to keep growing at the same rate is potentially dangerous because distant future donations are not certain (Dybvig.H.P, 1999).

Decisions on asset allocation and investment guidelines may generate a redistribution of income or wealth for example spending all investment income redistributes income to the benefit of current constituents of the institution from future generations (Wilson.F.T, 1984). However, equity does not call for a transfer of wealth to future or current generations through saving or excess consumption. Most major universities today employ an endowment spending rule that calls for spending an amount roughly equal to the real rate of return on the endowment including both cash income and capital gains (Hansmann.H, 1990). There is a significant difference between the annual rates of capital gains between internally and externally managed endowment funds with externally managed funds generating higher returns (Davidson.H.A, 1971).

Asset allocation and choice of spending rule must be linked, for example through the concept of protecting assets to fund committed expenditures. Endowment management involves an alternating sequence of spending decisions and asset allocation decisions (Dybvig.H.P, 1999). Internal endowment fund managers face an asset allocation problem where they are more interested in spending for current and future beneficiaries than growing value (Besnainou.I.B & Ogunc.K, 2006). The spend-income-only rule was to unfortunate investment decisions. Most modern spending rules appear designed to preserve the real value of the of underlying

endowment by setting a spending rate equal to the endowment's expected average real total return from investment (Dobris.C.J, 1993). The spending rates of university endowment funds fail to reflect the prosperity because of the large discrepancies between endowment returns and spending rates (Frey.D, 2002). In the USA there have been changes in legislation concerning spending of endowment funds. In January 2008 the Democratic and Republican leaders of the U.S. Senate Finance Committee instructed schools with endowments over $500 million to spend more of the endowments and use the money to reduce tuition (Weisbrod.A.B & Asch.D.E, 2010).

The difference between a business and an endowment fund is that a typical business enterprise finances a substantial fraction of its capital needs through borrowing while large universities operate on capital surplus (Hansmann.H, 1990). Investment and trading behavior of both businesses and endowment managers can consequently have feedback effects upon financial markets (Humphrey.J, 2009). Both businesses and endowment funds can be managed internally or externally. Externally managed endowment funds outperform internally managed ones in terms of capital management and fewer funds that are managed externally change to internal management compared to the internally managed funds that change to external management within a given period (Davidson.H.A, 1971)

Harvard prefers internal management over external management because it is cost effective gives a lot of flexibility and transparency and risk control however while its fixed income portfolio is internally managed, much of its public equities portfolio is managed by external managers (Kermond, 2014). According to (Davidson.H.A, 1971), many colleges have not factored in the cost of management. Those that are managed externally reveal that they do not incur any costs of managing the fund because of charitable relationships with alumni who are investment managers and perform this function at no cost to the school. However, for internally managed funds it was evident that the schools have not factored in the cost of the time spent by the financial administrators who may allocate part of their time to manage the fund (Davidson.H.A, 1971).

Conclusion

There are several factors that influence the performance of endowment funds from these studies such as size, level of donations and government grants, background risk and asset allocation. External endowment fund managers tend to take on greater risk than the more conservative internal mangers. The recent investment in alternative assets has changed the global view of the performance of endowment funds and the effects of decisions by endowment fund managers on the general performance. There is also an evident trend of shift in management from internal to eternal management. Larger endowment funds with diversified or mixed management perform better than smaller ones where the internal manager is bestowed with other duties. There are also different ways in which an endowment fund can be managed and this study will seek to determine the influence that different management styles have on asset choice which is a big determinant of endowment fund performance.

3. METHODOLOGY

Research Design

This study will use panel data to compare the impact of type of management on USA and UK universities.

This study will use a binary probit model to perform a regression in GRETL software. The study will use the binary probit model because the dependent variable takes on binary values. This study uses the probit to make use of the fact that the probit function is normally distributed. The study uses GRETL because it is free software that is easy to access and there is material, readily available to use as a guide.

Population and Sampling

Asset class allocations of the endowment portfolios will be used from the year 2003 to 2015. A sample of five of the largest universities from USA and five universities in the UK will be used; large is to control the effect of size on performance of endowment funds. The type of management that each university uses will also be extracted from their financial statements.

Data Collection

The data was collected from secondary sources. The study used the financial statements from the universities from 2003 to 2015 to get the assets invested in and how much was allocated to each asset class in the universities. The returns from the endowment fund were collected from the financial statements. The data collected shall control for size by picking the largest universities and impact of financial shocks by the long time horizon.

Method

The method will involve interpreting the results of the probit regression which is a limited dependent variable model.

This model overcomes the limitation of the linear model by using a link function to get estimated real values of the dependent variable. This is possible because the regression model is transformed so that fitted values are bounded within the interval of zero to infinity.

Traditionally the logit model, another type of linear dependent variable model, was preferred when the split between 0 and 1 is very unbalanced but recent developments make both methods very similar (Brooks.C, 2008).

The dependent variable will be the type of asset and the independent variables type of management, asset class and return on asset class.

Y= $\beta_0 + \beta_i x_i$

Where

Y=Type of asset (local (0), foreign (1))

β_o= constant

X_i = type of management, asset allocation$_i$, return on asset class$_i$

Once the relevant data has been collected and stored in excel, it is prepared for importation into GRETL. The study uses GRETL because it is free software that is easy to access and there is material, readily available to use as a guide. It is also easier to understand the commands in GRETL.

This stage involves defining variables and inputting the data in a format that can be exported into GRETL for example ensuring there are no blank spaces.

After exporting the data, define the dependent variables, regressors and the model. The model will be a binary probit. The probit model is also used because the range of the dependent variable is restricted and probit, as a limited dependent variable model, ensures the range does not exceed or is not below the range.

The limitation of the probit model is that:

It assumes a normal probability function.

It can also be difficult to interpret.

4. RESULTS AND INTERPRETATION

A probit regression is a type of non-linear regression

For a probit regression we will need a link function to convert the dichotomous Y, which is not continuous, to give us a continuous real valued Y' so that we can run the general equation:

$F(Y) = X\beta + \varepsilon$

The link function we use is a probit link which is written as

$F(Y) = \Phi^{-1}(Y)$

The value of $X\beta$ is taken as the z-value of the normal distribution and the higher the value, the more likely the event.

A probit regression will end up giving an s-shaped curve such as the one below. Changes at different points have different impacts on the dependent variable unlike the linear regression where the change is constant.

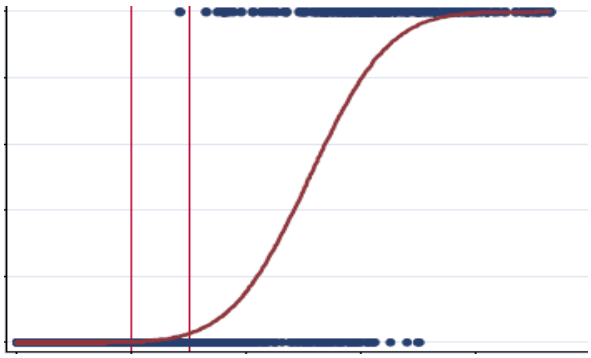

Figure 3: Sample s-shaped cumulative normal distribution curve from a probit regression

The study tests the hypotheses

H_0 – Type of management significantly influences choice of assets

H_1 – Type of management does not significantly influence choice of the assets

Assumptions

The errors terms are normally distributed.

95% confidence interval.

Results

```
Model 3: Probit, using observations 1-186
Dependent variable: Typeofasset
Standard errors based on Hessian

                        coefficient   std. error     z      p-value
  ---------------------------------------------------------------------
  const                  -2.69989     0.547366     -4.933   8.12e-07 ***
  Typeofmanagement        0.479876    0.270419      1.775   0.0760   *
  Returnonassetcla~      -7.23436     2.74904      -2.632   0.0085   ***
  Assetclasses            0.105070    0.0186210     5.643   1.68e-08 ***

Mean dependent var   0.188172   S.D. dependent var   0.391904
McFadden R-squared   0.353870   Adjusted R-squared   0.309397
Log-likelihood      -58.11449   Akaike criterion     124.2290
Schwarz criterion    137.1320   Hannan-Quinn         129.4578

Number of cases 'correctly predicted' = 156 (83.9%)
f(beta'x) at mean of independent vars = 0.157
Likelihood ratio test: Chi-square(3) = 63.6559 [0.0000]

           Predicted
              0     1
  Actual 0  140    11
         1   19    16

Test for normality of residual -
  Null hypothesis: error is normally distributed
  Test statistic: Chi-square(2) = 0.883454
  with p-value = 0.642925
```

Figure 4: Probit binary regression on UK data

```
Model 1: Probit, using observations 1-466
Dependent variable: Typeofasset
Standard errors based on Hessian

                      coefficient  std. error     z      p-value
  ------------------------------------------------------------------
  const                -1.19223     0.260252    -4.581   4.63e-06  ***
  Typeofmanagement     -0.137591    0.159592    -0.8621  0.3886
  Assetclasses          0.0704826   0.0105003    6.712   1.91e-011 ***
  Returnonassetcla~     0.838958    0.474558     1.768   0.0771    *

Mean dependent var    0.240343   S.D. dependent var    0.427751
McFadden R-squared    0.104047   Adjusted R-squared    0.088482
Log-likelihood       -230.2487   Akaike criterion      468.4975
Schwarz criterion     485.0742   Hannan-Quinn          475.0215

Number of cases 'correctly predicted' = 338 (72.5%)
f(beta'x) at mean of independent vars = 0.294
Likelihood ratio test: Chi-square(3) = 53.4776 [0.0000]

            Predicted
               0     1
  Actual 0   328    26
         1   102    10

Excluding the constant, p-value was highest for variable 5 (Typeofmanagement

Test for normality of residual -
  Null hypothesis: error is normally distributed
  Test statistic: Chi-square(2) = 32.1441
  with p-value = 1.04713e-007
```

Figure 5: Probit regression on USA data

```
Model 2: Logit, using observations 1-186
Dependent variable: Typeofasset
Standard errors based on Hessian

                        coefficient   std. error      z       p-value
  ---------------------------------------------------------------------
  const                  -4.86426     1.06559      -4.565    5.00e-06 ***
  Typeofmanagement        0.975016    0.487290      2.001    0.0454   **
  Assetclasses            0.186948    0.0361704     5.169    2.36e-07 ***
  Returnonassetcla~     -15.8566      6.09967      -2.600    0.0093   ***

Mean dependent var    0.188172   S.D. dependent var    0.391904
McFadden R-squared    0.353746   Adjusted R-squared    0.309274
Log-likelihood       -58.12562   Akaike criterion      124.2512
Schwarz criterion     137.1542   Hannan-Quinn          129.4800

Number of cases 'correctly predicted' = 156 (83.9%)
f(beta'x) at mean of independent vars = 0.071
Likelihood ratio test: Chi-square(3) = 63.6336 [0.0000]

            Predicted
               0     1
  Actual 0   140    11
         1    19    16
```

Figure 6: Logit regression on UK data

```
Model 2: Logit, using observations 1-466
Dependent variable: Typeofasset
Standard errors based on Hessian

                       coefficient  std. error      z       p-value
  ---------------------------------------------------------------------
  const                 -1.99531    0.456716     -4.369    1.25e-05  ***
  Typeofmanagement      -0.207336   0.279369     -0.7422   0.4580
  Assetclasses           0.115242   0.0182041     6.331    2.44e-010 ***
  Returnonassetcla~      1.49231    0.825810      1.807    0.0707    *

Mean dependent var    0.240343   S.D. dependent var    0.427751
McFadden R-squared    0.100328   Adjusted R-squared    0.084763
Log-likelihood       -231.2045   Akaike criterion      470.4090
Schwarz criterion     486.9858   Hannan-Quinn          476.9331

Number of cases 'correctly predicted' = 341 (73.2%)
f(beta'x) at mean of independent vars = 0.170
Likelihood ratio test: Chi-square(3) = 51.566 [0.0000]

            Predicted
               0     1
  Actual 0   328    26
         1    99    13
```

Figure 7: Logit regression for USA data

```
Model 1: Probit, using observations 1-186
Dependent variable: Typeofasset
Standard errors based on Hessian

                     coefficient   std. error     z      p-value
  ---------------------------------------------------------------
  const                -1.91021      0.361694    -5.281   1.28e-07 ***
  Typeofmanagement      0.672131     0.220175     3.053   0.0023   ***

Mean dependent var    0.188172   S.D. dependent var    0.391904
McFadden R-squared    0.053430   Adjusted R-squared    0.031194
Log-likelihood       -85.13681   Akaike criterion      174.2736
Schwarz criterion     180.7251   Hannan-Quinn          176.8880

Number of cases 'correctly predicted' = 151 (81.2%)
f(beta'x) at mean of independent vars = 0.258
Likelihood ratio test: Chi-square(1) = 9.61127 [0.0019]

            Predicted
               0     1
  Actual 0   151     0
         1    35     0
```

Figure 8: Regression with type of management as the only variable in UK

```
Model 1: Probit, using observations 1-466
Dependent variable: Typeofasset
Standard errors based on Hessian

                     coefficient   std. error     z      p-value
  ---------------------------------------------------------------
  const                -1.16668      0.241490    -4.831   1.36e-06 ***
  Typeofmanagement      0.275194     0.137912     1.995   0.0460   **

Mean dependent var    0.240343   S.D. dependent var    0.427751
McFadden R-squared    0.007873   Adjusted R-squared    0.000091
Log-likelihood       -254.9641   Akaike criterion      513.9283
Schwarz criterion     522.2167   Hannan-Quinn          517.1903

Number of cases 'correctly predicted' = 354 (76.0%)
f(beta'x) at mean of independent vars = 0.310
Likelihood ratio test: Chi-square(1) = 4.04677 [0.0443]

            Predicted
               0     1
  Actual 0   354     0
         1   112     0
```

Figure 9: Regression with type of management as the only variable in USA

Interpretation of results

The dependent variable was the type of asset, local or foreign.

The tables above shows the constant and independent variables, type of management, return on asset class and type of asset.

The R-squared coefficient shows the fit of the data to the model, the goodness of fit. Probit model aims to maximize the log likelihood function. The R-squared coefficient in this case is referred to as a pseudo- R^2 and it differs from that of the linear model because the linear model aims to minimize the residual sum of squares. The pseudo-R^2 can be manually calculated as

$$1 - \frac{LLF}{LLF_0} \; where\ LLF\ is\ the \log likelihood\ function$$

In this case the pseudo-R^2 is given as the McFadden's R^2. The UK data fits the model better than the USA data. However, small R- squared coefficients are common in limited dependent variable models (Brooks.C, 2008).

The matrix at the bottom is called a confusion matrix which represents the errors in the model and below it is the test for normality of errors. From the UK data, the model correctly predicted 156 observations and 33 incorrectly. From the USA data 354 observations were correctly predicted and 112 observations were incorrect. The model generally predicts more of the observations correctly. In both cases the p-value is less than the test statistic therefore we fail to reject the null hypothesis and conclude that the errors are normally distributed.

When the results of the logit regression are run the results are similar for both countries, as those run by probit. This study uses the probit to allow for the assumption that errors are normally distributed.

When this model is regressed with type of management only then in both the UK and USA, the type of management becomes a significant factor. This can be attributed to spread of errors when there are additional variables however, the additional variables are important because the decision about type of assets can be influenced by several other factors. According to (Dimmock.S, 2012) other factors such as liquidity needs, market imperfection and habits jointly

affect the types of assets held. These factors can be reflected in the asset classes of the endowment funds. This justifies the addition of asset classes in the regression model.

Another reason for using more variables compared to using management only is that one of the tests of model fit known as the Akaike information criterion shows that when we add the extra variables the model gets better.

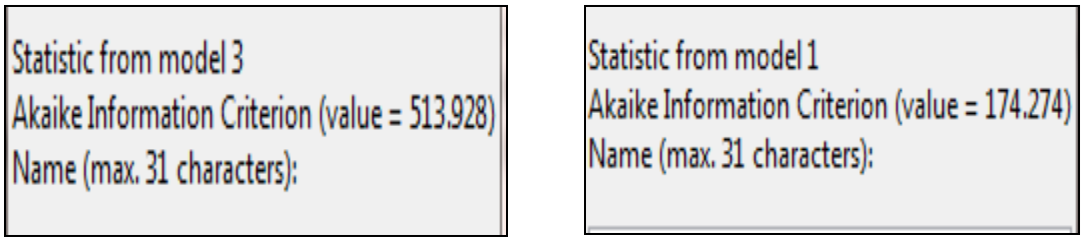

Figure 10: AIC with management as the only variable for USA and UK respectively

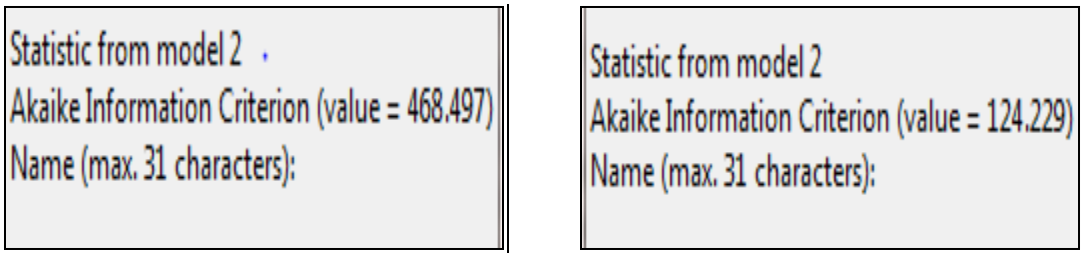

Figure 11: AIC with three variables USA and UK respectively

The conclusion from this criterion is that the value with a lower value is a better model.

These are the major observations to get from the probit regression.

Discussion

UK

Type of management has a coefficient 0f 0.479879 and is significant which means that a 1% increase in a given type of management will raise the z-score, or probability of a given type of asset, of the type of asset chosen by 0.479879 and this coefficient is different from 0 at the 5% level.

Return on asset class, a 1% change in the return will cause a change of -7.23436 on the z-score or probability of a given type of asset being chosen. It is significant.

Asset class has a coefficient of 0.105070 and is significant which means that a 1% change in mix of asset class will cause a change in z-score of 0.105070.

These results show the marginal impact of the different variables on the type of management. These changes do not translate into a constant effect on the type of asset chosen. The impact depends on the starting point. For some points on the s-curve the impact will be greater than at other points, given the shape.

The type of management has a higher z- value that return on asset class which means it is more likely to change and influence type of asset.

The type of management has an impact on type of assets chosen, and is more likely to change compared to return on asset class.

The type of asset has a positive coefficient and is statistically significant on influencing the type of asset chosen and so does the return on asset class

The type of management has little significance on the type of asset chosen. This could be attributed to the fact that management has no control over the availability of assets. They can only work with what is accessible and meets the risk and return characteristics of the fund.

The return would be a significant influence on the type of asset because every investor seeks to maximize their return.

USA

Type of management has a coefficient 0f -0.137591 and is not significant which means that a 1% increase in a given type of management will not raise the z-score, or probability of a given type of asset.

Return on asset class, a 1% change in the return will cause a change of 0.838958 on the z-score or probability of a given type of asset being chosen. It is significant.

Asset class has a coefficient of 0.0704826 and is significant which means that a 1% change in mix of asset class will cause a change in z-score of 0.105070

Again, these changes do not translate into a constant effect on the type of asset chosen. The impact depends on the starting point. For some points on the s-curve the impact will be greater than at other points, given the shape.

Type of management has the lowest z value which means it is unlikely to change and influence type of asset chosen.

These results show the marginal impact of the different variables on the type of management.

The management type has a negative coefficient and is not related to the type of asset in any way. It has a p value of 0.3886.

Asset class has a positive coefficient and has a strong statistical significance on the type of asset chosen

Return on asset class has a positive coefficient and has some statistical significance on the type of asset chosen although not as strong as the asset class.

In the USA as much as a large percentage of endowment funds are managed externally, it does not influence the type of assets that are chosen. The other factors however have an influence on the type of assets chosen.

This could be attributed to the fact that the investment managers, whether internal or external, can only invest in assets that are available and meet the risk return objectives of the fund.

Summary

This study investigated the impact that the management of an endowment fund of a university has on the types of assets chosen. It also considered other factors that influence choice of assets such as asset classes. This study used the UK and USA endowment funds to perform the investigation because of availability of data. The study, however, infers the results to the Kenyan situation where universities are being encouraged to start endowment funds but the country experiences different contribution patterns. The findings show that combined with other factors, management does not significantly affect the types of assets chosen. There are other factors that will determine the choice of assets such as liquidity needs and availability of the assets. In Kenya management may not also have a significant impact on the choice of assets; the objectives of the fund will determine the choice of assets. Management may have other impacts on endowment funds such as growth and performance depending on the level of expertise that the management has.

CONCLUSION

Type of management is not a major factor in influencing the types of assets in the USA; we reject the null hypothesis when it comes to the USA. Type of assets chosen will mainly depend on the return the investor can get from investing in an asset and how much risk they take on by investing in that asset. It will also depend on the availability of the assets in the financial markets and the ease to access them. There are greater factors in the financial markets such as availability of assets and their supply and demand which the investor has no control over. The investor will use the available assets and aim to maximize the returns.

In the UK, type of management is a significant factor and therefore we fail to reject the null hypothesis. Type of management will play a role together with other factors to influence the type of asset chosen.

Management will have other roles that impact the endowment fund. It will influence performance of the fund depending on the level of expertise that the managers employ while choosing the assets. Management will also influence the growth of endowment funds by the decisions they make concerning spending rates and the objectives they set for the fund.

RECOMMENDATION

The portfolios in the USA are more diversified and aggressive than the UK. The US portfolios also perform better than the UK portfolios. Future research could consider whether greater diversification is attributed to the type of management or availability of assets. There are no national laws restricting investments of endowment funds in both countries although universities can pass internal laws not to invest in certain industries such as armaments.

Research could also dig deeper on the African continent and the relevant model for university endowment funds in Africa given the donation patterns on the continent. Unlike the USA and UK, people tend to give one off contributions to institutions such as universities.

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APPENDIX

SOURCES OF DATA

Some of the sources where data will be collected:

USA

http://investments.yale.edu/index.php/reports/endowment-update Yale university

http://www.ucop.edu/investment-office/investment-reports/annual-reports/index.html university of California

http://finserv.uchicago.edu/reporting/statements.shtml university of Chicago

http://www.hmc.harvard.edu/investment-management/performance-history.html Harvard university

https://finance.princeton.edu/princeton-financial-overv/report-of-the-treasurer/index.xml Princeton university

UK

http://www.accounts.finance.ed.ac.uk/endowment-fund-report-0 university of Edinburgh

https://www.kcl.ac.uk/aboutkings/orgstructure/ps/finance/statements/financialstatements2013.pdf. King's College London

http://www.imperial.ac.uk/finance/about-us/publications/ Imperial College London

http://www.lse.ac.uk/intranet/LSEServices/financeDivision/pdf/2014AnnualAccounts.pdf. London School of Economics

https://www.ucl.ac.uk/finance/docs/docs-corporate/2015_UCL-annual-report.pdf University College London.