An Investment Portfolio Design for an Educational Endowment Fund
The Role of Human Capital

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Human capital, a non-tradable asset, plays an important role in the creation of wealth and generation of income for individuals and institutions. While the theoretical framework for analyzing the value of human capital was established about four decades ago, empirical results are fairly new. This is due, in part, to availability of data that are now available decade by decade since the 1960's. It appears that human capital plays an important role in explaining the behavior of the stock market, the varying asset allocations pursued by educational endowment funds, and the life cycle pattern of investment portfolios of individual investors.

INTRODUCTION

Capital assets generate return in the production process. For example, an apartment building generates rental income for its owner and factory equipment would produce income for the firm. Similarly, human labor and intellectual endeavors have created income for individuals and their organizations. Income resulting from employment at public and private enterprises comprises the primary source of funds for many individuals. Human labor and knowledge has further created value added for business enterprises. As of 2005, for example, about 33 percent of the market value of U. S. corporations consisted of intellectual property (Greenspan, 2007).

Human capital can be measured as the discounted value of the sum of future labor income as shown in eq. (1)

$$H_0 = \sum_{t=1}^{N} PV(L_t) \qquad (1)$$

where H denotes expected value of human capital,
0 denotes the current time,
t denotes years 1 to N,
PV denotes present value, and
L denotes expected future labor income from wages, pension and social security benefits.

Since the future labor income is risky, its discounted value should include a risk adjusted return. Given a constant risk adjusted rate of discount, the potential value of human capital is the highest for the young and would decline as the retirement approaches. Meanwhile, the risk of shortfalls

in human capital is higher during the early years in active life. This is because of the uncertainty in the future stream of labor income. The higher is the risk of shortfall in human capital, the safer should be the remaining capital assets in the investment portfolio.

Given an endowment of human capital, investors may include different assets in varying proportions of their wealth. Compare, for example, investments by a college professor and an independent construction contractor. The college professor, endowed with substantial human capital, is more likely to have a steady and predictable income due to the tenure privilege, whereas the independent construction contractor may have a highly variable and unpredictable income. Some scholars have concluded that common stock being risky with a highly variable return appears to be suitable for the college professor and that bonds which provide predictable and stable return is suitable for the independent construction contractor. The standard modern portfolio theory, however, prescribes the same mix of risky assets to both and advises the investor who cannot tolerate much risk, to allocate a small portion of his/her wealth to the risky asset.

This investment advice is within the guidelines of the standard capital asset pricing model and is formulated by the security market line (SML) which is shown in eq.(2). In this manner the expected return on a share of common stock is expected to be higher for an investment with a higher degree of risk as compared to a risk free asset.

$$R_i = R_F + ((R_M - R_F) * b_i) \quad (2)$$

where R denotes expected return,
F denotes risk free asset,
i denotes a risky asset,
M denotes a market index,
b denotes beta of the risky asset.

The capital asset pricing model as shown in eq.(2) estimates the required return as the combination of a risk free return and a reward for the risk involved in an investment. In this manner, the notion of risk, beta, is a measure of reaction of a risky asset to the entire group of risky assets. This is shown by the degree of co-movements of the stock with the market as shown in eq. (3).

$$b_i = covariance\ (R_i, R_M)/ variance\ (R_M). \quad (3)$$

An alternative representation of the capital asset pricing model is shown in eq. (4) and is known as the capital market line (CML) as follows.

$$R_P = R_F + ((R_M – R_F) / S_M) * S_P \quad (4)$$

where P denotes a portfolio,
S denotes standard deviation and,
All other terms are as defined in eq.(2).

The capital market line as shown in eq.(4) explains the relationship between risk and return on an investment portfolio and shows the location of all efficient portfolios that could be selected by investors based on their attitude towards risk. This is also known as the “mutual fund theorem,” since it states that all investors would select the market portfolio of risky assets and another investment which is risk free, with no correlation with the former. In effect all investors,

individuals as well as institutions, will hold the same percentage of a risky asset, only with varying dollar amounts depending on their ability and tolerance for risk.

INVESTMENT DECISIONS IN THE PRESENCE OF HUMAN CAPITAL

While the standard capital asset pricing model has played an important role in the development of the modern portfolio theory through the "mutual fund theorem," scholars have also paid attention to other pertinent characteristics of an investment portfolio such as age, wealth, and education or human capital. Empirical research shows that investment choices among varying age groups, wealth, and those endowed with human capital such as entrepreneurs differ from those prescribed by the standard capital asset pricing model (Elton et al. 2007, p. 318).

Mayers (1972) shows an expansion of capital asset pricing model to include human capital as shown in eq. (5).

$$R_i=R_F+ [((R_M–R_F)/(Var_M+((P_H/P_M) cov (R_M, R_H))]*((cov (R_i, R_M)+(P_H/P_M) cov (R_i, R_H)) \quad (5)$$

where H denotes human capital,

P_H denotes value of human capital,

P_M denotes value of the marketable assets, and all other terms are as defined in eq. (2).

Note that if P_H/P_M equals zero, eq. (5) would reduce to eq. (2). This will occur when there is no value for human capital. In the presence of human capital however, as shown in eq. (5), investors should choose from among risky assets those that are not highly positively correlated with the nature of their human capital.

In the context of the efficient market hypothesis, the prevailing market price for a share of common stock is expected to include all pertinent information regarding the value added benefits of capital, labor and technology. In that respect, the mutual fund theorem would provide the proper allocation among risky ventures. Edmans (2007), however finds an anomaly to the efficient market hypothesis since he shows that employee satisfaction is not fully reflected in common stock prices. He examines the return on a portfolio of common stock of the Fortune Magazine's "Best Companies to Work For in America" during 1998-2005, and finds significant performance over other stocks. Edmans takes data from CRSP value weighted index and uses four factors—market, market to book value ratio, size and momentum—and shows that the Fortune Magazine's listed stocks produced twice as much in return. The excess return is as a result of the value added effects of employee satisfaction and the impact of human capital.

The role of labor income in determination of the capital asset prices has further been examined by Santos and Veronesi (2001) who hypothesize that the rate of return on common stock depends on the ratio of labor income to consumption. They conclude that the required risk premium on common stock is tied to fluctuations in labor income. In particular, when the ratio of labor income to consumption is high and rising, the required risk premium on common stock is low and asset prices are rising. The authors show that during 1946-1999 the ratio of labor income to consumption has an R^2 of 6.1 percent in one year and 34.6 percent for the four-year ahead regressions. The R^2 results for the dividend yield are much lower, 3.9 percent and 20.7 percent, respectively. These conclusions appear to be time dependent since the dividend yield shows more of a predictive power in explaining the behavior of stock prices during 1952-1994. However by including both variables, labor income to consumption ratio and dividend yield

during 1952-1994, the explanatory power for changes in common stock returns improves substantially to R^2 of 25.1 percent and 60 percent for one year and four-year ahead, respectively. Viceria (2001) finds that positive correlation between unanticipated labor income and common stock returns reduces the allocations to the stock.

Statistics of income at the national level in the United Sates during past four decades shows that labor income has surpassed investment income. Piketty and Saez (2003), explain that it is now more likely for the stock market to be affected by changes in human capital as they find that the working rich have formed a new group of wealthy individuals since the 1970's. In particular, the financial capital of the early decades of the twentieth century wealthy individuals has significantly declined due to depressions and wars.

One important factor in reducing risk of an investment portfolio is the correlation between human capital and financial assets. Davis and Willen (2000) initially show that unanticipated changes in income are not correlated with aggregate stock returns, which is in support of the mutual fund theorem. They later observe that stock portfolios ranked according to firm size and selected industry-level are significantly correlated with unanticipated changes in income. Their empirical studies are a combination of time series and cross sectional analysis using current population surveys. Using the mean variance portfolio analysis, they show that the efficient portfolios are based on the level of human wealth, the variance of labor income and the covariance between changes in unanticipated labor income and stock returns. In particular, they show that as the correlation between labor income and stock returns rises, the dollar amounts allocated to common stock declines, however the mutual fund theorem holds true.

Gomes and Michaelides (2002) examine the relationship between personal earnings innovations or unexpected changes in earnings among households and common stock returns. Given a modest correlation between the two, they show that risky assets would hold a maximum of 45 percent of an individual's wealth. The authors cite statistics of the Survey of Consumer Finances (SCF), showing that only 49 percent of U. S. households own stocks either directly or through company sponsored pension plans. Another factor that plays an important role in the construction of an investment portfolio is the nature of the endowed human capital. Schwartz and Tebaldi (2004) show that two individuals with the identical wealth, risk preferences, and time horizon would invest in the same market portfolio in line with the mutual fund theorem, however with different percentages of their wealth due to their respective occupational income risk. For example, a school teacher for whom human wealth is independent of the stock market is expected to invest more in common stock than a stock broker.

Time horizon is an important constraint in the investment planning process. Benzoni, Collin-Dufresnce and Goldstein (2007) formulate an asset allocation guideline when human capital and common stock prices are co-integrated. They show that human capital is "stock like" for younger individuals and "bond like" for older ones. Consequently, young investors would in effect take a zero position in stock during the early stage of gainful employment. The percentage in common stock would then gradually rise and reach its peak about 6.6 years before retirement. These results are consistent with empirical findings by Porterba (2001), showing that stock ownership during the past five decades has been stable among those 45-60 years of age and only gradually declines thereafter.

Differences in the amount of wealth or the type of profession have caused diverse patterns in the structure of investment portfolios. Avery and Elliehausen (1986) using the 1983 Survey of Consumer Finances find that a major portion of wealth of high income families are invested in their own businesses and the value of their home dominated their asset portfolio when below age

45. For those above age 55, the non-liquid financial assets hold a large share of their assets. These results are further supported by Heaton and Lucas (2000) who find that entrepreneurs with a high variable business income hold a smaller portion of their wealth in common stock although they are among the top stockholding group, especially private equity. That is, entrepreneurs tend to maintain significantly safer marketable financial investments than other investors of the same wealth. It appears that a higher correlation between human capital and common stock tends to result in a lower allocation to common stock.

More importantly, the value of human capital to the investor depends on its correlation with common stock. Existence of negative correlations between human capital and common stock among global markets is in support of inclusion of financial assets around the world. Boyle and Guthrie (2005) find mostly negative correlations between human capital and global equity across various countries which would support holding of international equity as a hedge. These correlations are shown in Table 1 for eleven countries. Data are taken from the International Monetary Fund and the real stock returns are adapted from Dimson, Marsh and Staunton (2002). Table 1 shows correlations between human capital and common stock performance around the world during the decades of 1950's-1990's. As shown in Table 1, these correlations are relatively low or negative. For example, the correlation between human capital and equity returns of 0.38 for Ireland during 1949-2002 shows that about 38 percent of time the return from the stock market has moved alongside the return on human capital. As for Italy, the correlation of -0.25 during 1960-2002 shows that 25 percent of the time changes in return on human capital were positive while as for the stock market was negative. Relatively low correlations of below 0.50, zero, as well as negative correlations are desirable properties of capital assets for inclusion in a diversified portfolio. Thereby, information contained in Table 1 provides support for investors to diversify internationally.

TABLE 1
CORRELATIONS OF STOCKS AND HUMAN CAPITAL
AROUND THE WORLD

Country	Time Interval	Correlation
Australia	1963-2002	-0.29
Canada	1949-2002	-0.00
France	1950-2002	0.14
Ireland	1949-2002	0.38
Italy	1960-2002	-0.25
Japan	1949-2002	0.34
Netherlands	1950-2002	-0.02
Spain	1961-2002	-0.13
Sweden	1961-2002	-0.03
UK	1957-2002	-0.16
US	1949-2002	0.14

Source: Adapted, modified and aggregated from Boyle, Glenn W. and Graeme A. Guthrie. "Human Capital and Popular Investment Advice." *Review of Finance*, Vol. 9, 2005, pp. 139-164.

Campbell and Korniotis (2007) however find that while the aggregate level of human capital and the stock market show a negative correlation, the reverse is true for the higher income households. That is, the correlation between human capital and the stock market is positive and rises as upper level households are taken into account. More than half of the households in the top income group hold stock far exceeding the 21 percent at the aggregate level. Campbell and Korniotis find that human capital asset pricing model provides a much higher degree of explanation for the relationship between return and risk. In particular, during 1932-2005, they find a higher R^2, a higher estimated price of risk and a higher expected return when human capital is included in the capital asset pricing model. The estimation model employed by Campbell and Korniotis is show in eq. (6)

$$R_i = b_o + b_1 * R_{Financial} + b_2 * R_{Human} \quad (6)$$

Here R denotes expected returns for stock (i), financial assets and human capital, respectively. Return to human capital is taken from data compiled by the Internal Revenue Service and provided by Piketty and Saez (2003). In this manner the stock holding of affluent households is directly accounted for with its ties to the market. The results are shown in Table 2 which shows correlations between real per capita income growth and return on the stock market for the U. S. during 1932-2005. As shown in Table 2, while the stock return is negatively correlated with aggregate income, the correlation rises for the upper income group. For example, the correlation rises from 0.01 to 0.05 when considering the top 10 percent income versus the top 1 percent income household groups, respectively.

TABLE 2
CORRELATIONS BETWEEN REAL PER CAPITA INCOME GROWTH AND RETURN ON THE STOCK MARKET, 1932-2005

	Aggregate Income	Top 10% Income	Top 5% Income	Top 1% Income	Market Return
Aggregate Income	1	-	-	-	-
Top 10% Income	0.81	1	-	-	-
Top 5% Income	0.73	0.97	1	-	-
Top 1% Income	0.60	0.88	0.92	1	-
Market Return	-0.01	0.01	0.02	0.05	1

Source: Adapted, modified and aggregated from Campbell, Sean D. and George Korniotis. "The Human Capital That Matters: Expected Returns And The Income of Affluent Household." *Federal Reserve Board*. September 2007.

TABLE 3
YALE UNIVERSITY ENDOWMENT ASSET ALLOCATION
(IN PERCENT)

Assets	2008	2007	2006	2005	2004
Absolute Return	25.1	23.3	23.3	25.7	26.1
Domestic Equity	10.1	11	11.6	14.1	14.8
Fixed Income	4	4	3.8	4.9	7.4
Foreign Equity	15.2	14.1	14.6	13.7	14.8
Private Equity	20.2	18.7	16.4	14.8	14.5
Real Assets	29.3	27.1	27.8	25	18.8
Cash	-3.9	1.9	2.5	1.9	3.5
Total Market Value					
in million $	22869.7	22530.2	18030.6	15224.9	12747.2
Return	4.5	28	22.9	22.3	19.4

Asset Class	Actual as of June 2008	Target	Average for Educational Institutions
Absolute Return	25.1	21	21.7
Domestic Equity	10.1	10	21.7
Fixed Income	4	4	12.1
Foreign Equity	15.2	15	20.3
Private Equity	20.2	21	8.6
Real Assets	29.3	29	13.7
Cash	-3.9	0	1.9

Note: Objectives of Yale's endowment spending policy are to maintain a stable flow of income to the operating budget and preserving the real value of endowment over time. The current spending rate is 5.25%. The spending rate in any given year is based on 80% of the previous year's spending and 20% of the targeted investment rate. The allowable range in investment rate is 4.5 - 6.0% of the endowment's inflation adjusted market value of prior year.

Source: Adapted and modified from http://www.yale.edu/investments/yale_endowment_08.pdf

TABLE 4
HARVARD UNIVERISTY ENDOWMENT FUND

Asset Allocation	1991	1995	1996	1998	1999	2000	2002	2007	2008	2009
Equities:										
Domestic Equity	40%	38%	36%	32%	24%	22%	15%	12%	12%	11%
Foreign Equity	18	15	15	15	15	15	10	11	12	11
Emerging Market		5	9	9	9	9	5	8	10	11
Private Equity	12	12	15	15	12	15	13	13	11	13
Total Equities	70	70	75	71	60	61	43	44	45	46
Fixed – Income:										
Domestic Bonds	15	15	13	11	10	10	11	7	5	4
Foreign Bonds	5	5	5	5	4	4	5	3	3	2
Inflation Indexed Bonds					4	7	6	5	7	5
High Yield	2	2	2	2	3	3	5	3	1	2
Total Fixed Income	22	22	20	18	21	24	27	18	16	13
Real Assets:										
Liquid Commodities	6	6	3	3	3	3	3	7	8	8
Timber/agricultural Land				2	3	3	10	9	9	9
Real Estate	7	7	7	7	7	7	10	10	9	9
Total real Assets	13	13	10	12	13	13	23	26	26	26
Absolute Return				4	6	5	12	17	18	18
Cash	-5	-5	-5	-5		-3	-5	-5	-5	-3
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

	2008	2007	2006	2005	2004
Return on Investments	8.60%	23%	16.70%	9.20%	21.10%

Fair Value: $36,927 million as of June 30, 2008,
Actual Endowment payout rate was 4.8% ,
Target payout Rate : 5 – 5.5%.

Source: Adapted, modified and aggregated from Harvard University Financial Report, Fiscal Year 2008.

Asset Allocation for a University Endowment Fund

The common approach in managing an educational endowment fund is to ensure preservation of its assets while earning a reasonable return. Consequently, colleges and universities tend to pursue spending policies that would require withdrawals of about 5 percent of the endowment assets on an annual basis. This is in line with the long run real returns on a well diversified portfolio of common stock and bonds. Merton (1991) proves that a generic application of risk adjusted return optimization for university endowment funds, without accounting for pertinent factors and their unique characteristics, leads to asset allocation that is the same across all

universities. In this manner, the mutual fund theorem applies. Merton however specifies the importance of inclusion of a university's other assets, expenditure patterns and sources of cash flows in managing an endowment investment portfolio.

University endowment investments are, in principle, in line with modern portfolio theory guidelines. A review of selected educational institutions' endowment portfolio however show substantial allocations to private equity, venture capital and international equities, far exceeding the weights typically recommended by portfolio theory. Examples are shown in Table 3 through Table 5. An important issue in managing an educational endowment fund is to take into account the value of its human capital and progress in research and development as well as entrepreneurship. Heavy investments in private equity by major university endowment funds are for example supported by the finding of Campbell and Korniotis (2007), Avery and Elliehausen (1986) as well as Heaton and Lucas (2000) stating that that entrepreneurs tend to allocate their resources in their own line of business. In other words, major universities have made substantial resources available to research and development and these endeavors have resulted in innovations, new products and processes for popular use. Thereby, such private enterprises are expected to be a part of their endowment portfolio.

TABLE 5
UNIVERSITY OF TEXAS ENDOWMENT FUND
ASSET ALLOCATION, AUGUST 2008

	Actual	Target
Investment Grade Fixed Income	11.2	8.5
Credit Related Fixed Income	0	1.5
Real Estate	5.5	5.5
Natural Resources	5	5
Development Country Equity	18.3	22
Emerging Market Equity	9.5	11
Hedge Funds	31.8	33
Private Investments	18.7	13.5
Total	100	100
Total Assets	$ 11.4 Billion	

Note: The current distribution rate is 4.75% of the prior twelve quarters average net asset value. Distributions may not exceed 7% of the average net asset of the fund with the exception of payment of interest on borrowed funds.

Source: Adapted, modified and aggregated from http:UTIMCO.org/funds/allfunds/2008 annual.

TABLE 6
UNIVERSITIES' FINANCES AND CHARACTERISTICS
1983 - 1984 FISCAL YEAR THROUGH 2002 - 2003

	Mean	Median
Non-Financial Income	312,630,200	75,547,540
Research-to-Income	6.1%	0.2
Average Annual Donation	13,341,890	4,270,327
Debt-to-Assets	31.0%	29.8
Payout-to-Income	8.2%	3.9
Proportion of Applicants Admitted	68.3%	72.5

Source: Adapted, modified and aggregated from Dimmock, Stephen G. " Background Risk and University Endowment Funds." Working Paper, February 2009. Michigan Stat University.

A review of asset allocations shown in Table 3 through Table 5 helps in clarifying these conclusions. Table 3 shows asset allocation for Yale University Endowment Fund during 2004-2008. As shown in Table 3, there has been a gradual decline in investments in domestic common stock and bonds, but a persistent rise in allocation of funds to private equity and real assets. Table 4 shows asset allocation for Harvard University Endowment Fund during 1991-2009. As shown in Table 4 while the share of private equity has remained relatively stable, there is a dramatic decline in share of domestic equity. The weight of U. S. common stock has declined from 40 percent in 1991 to 11 percent in 2009. The same pattern is observed for foreign equity as it shows a decline from 18 percent in 1991 to 11 percent of the portfolio in 2009. In effect, the share of common stock has declined from 70 percent in 1991 to 46 percent in 2009. Meanwhile, an equal weight is assigned to domestic, foreign and emerging equities. The weight to private equity, however, dominates other equity groups. These results are in line with empirical observations shown in Table 1 and Table 2. Meanwhile the share of real assets has doubled during 1991-2009 emphasizing the role of inflation in endowment asset allocation. Table 5 shows endowment asset allocation for the University of Texas. As shown in Table 5, target weights of 33 percent and 13.5 percent are established for hedge funds and private equity, respectively, which signifies policies or the line of thinking in line with Yale and Harvard.

Researchers have further included human capital as an equity part of the portfolio mix of common stock and bonds. As for example, Benzoni, Collin-Dufrensnce and Goldstein (2007) observe that the ratio of ((bonds/(stock + human capital)) remains fairly stable as the institutional wealth changes. Thereby, given the heavy weights to private equity (human capital) the small allocation to domestic common stock in endowment funds of major universities is not a surprise. The above average allocations to private equity, venture capital and emerging international equities, however, should not be pursued by the average, local private colleges. This is because changes in demographic structure and the economy tend to directly influence the welfare of these institutions. Furthermore, due to their small endowment capital and the need for a steady cash

flow, bonds are a better investment. Following Gomes and Michaellides (2002), bonds are expected to amount to 55% of the portfolio. Bonds, however, are not a good hedge against inflation in the cost of higher education. Well endowed educational institutions appear to manage the inflation risk by allocating a substantial percentage of their capital to real assets. This is clearly shown in Table 4 as the share of real assets in Harvard University Endowment Fund has doubled from 13 percent to 26 percent during 1991-2009.

Another important factor to consider in managing an educational endowment fund is the nature of its business as well as its competitive position in the industry. Dimmock (2009) defines background risk as the volatility of non-financial or operating income of a university. A high degree of variations in tuition revenue and operating cost would tend to induce budgetary risk. In such a situation, the university's financial income resulting from endowment portfolio would need to augment its operating income. It is true that colleges and universities have a well defined spending rate policy which is usually based on a moving average of portfolio wealth, but even such smoothing processes are susceptible to the variance in investment portfolio value. Consequently, Dimmock shows that universities characterized with a high background risk tend to invest significantly more in fixed income securities and substantially less in alternative assets.

In effect it is the total risk of the university both from operating as well as investments that would need to be monitored and controlled within its perceived tolerance for risk. In addition, Dimmock finds that universities with a higher level of endowment wealth and substantial research tend to hold riskier endowment portfolios. This finding is quite interesting and intuitively appealing since these institutions are expected to benefit from the results of their discoveries, and are the primary "angle investors." Essentially, they are reinvesting in their own business for the purpose of enhancing their internal and organic growth. At the same time, due to ample income from traditional tuition income as well as evolving educational income, the major universities can be characterized with a lower degree of uncertainty in operating income. As a result of a more stable operating income, the major educational institutions are able and willing to undertake a higher degree of risk in their investments.

TABLE 7
ENDOWMENT FUND PORTFOLIO
SUMMARY STATISTICS

Asset Allocation	Value Weighted	Equal Weighted
Equities	48.7	57.4
Fixed Income	20.7	26.1
Real Estate	5.2	5
Alternative Assets	22.9	14.1
Cash	2.7	5.5

Source: Adapted, modified and aggregated data from Dimmock, Stephen G. "Background Risk and University Endowment Funds." Working paper February 2009. Michigan State University.

The reasons as to why universities are susceptible to financial shocks, as expressed by Hansmann (1990), are the poor collateral value of their assets, inflexible costs and lack of access

to the capital markets. A university's assets may be viewed as poor collateral since it cannot be easily sold or transferred to other institutions. It's human capital consisting of its teaching and research staff, as well as the value added effects of its personnel are non-tradable in the capital markets. One way of diversifying this risk and managing the variability of total revenue and cost of not-for-profit traditional educational institution is to allocate a portion of its endowment fund to the educational institutions that are operating as an on-line service within a for-profit framework. This is because on-line educational institutions are traded in the capital markets. They also have low fixed costs, limited full time staff, and have shown a high degree of flexibility in admission, thereby producing a continuous and persistent income.

TABLE 8
BACKGROUND RISK SUMMARY STATISTICS
(1983-1984 THROUGH 2002-2003)
CORR (INCOME, RM) IS THE CORRELATION OF THE GROWTH RATE OF NON –FINANCIAL INCOME AND THE CRSP VALUE WEIGHTED STOCK INDEX RETURNS

	Mean	25th%	Median	75th%
Growth Rate of Non-Financial Income	7.3%	5.6	6.8	8.2
Std. Deviation	10.6%	5.7	8.3	12.0
Growth Rate of Non-Financial Income per FTE Student	6.7%	2.3	5.9	9.6
Std. Deviation per FTE Student	11.3%	5.8	8.4	12.5
Corr (Income, R_M)	-0.011	-0.182	-0.001	0.159

Source: Adapted, modified and aggregated from Dimmock, Stephen G. " Background Risk and University Endowment Funds." Working Paper, February 2009. Michigan State University.

Dimmock (2009) further finds that the correlation between changes in income for a university and changes in the return on the stock market is low and close to zero. Such a low correlation is in support of allocation of an educational endowment fund to a well diversified portfolio of common stock in the context of modern portfolio theory. This follows the results in eq.(5) since a zero value for $cov\ (R_i, R_H)$ would reduce it to eq.(2) in which case the mutual fund theorem applies. The return on the market was approximated by the CRSP value weighted stock index. Dimmock's empirical results are summarized in Table 6 through Table 8. As shown in Table 6, the distributions of operating income, endowment asset size as well as the spending rate out of the endowment are skewed to the right reflecting a small number of more selective universities. Table 7 shows both the size weighted and equal proportion asset allocation for university endowment funds. As shown in Table 7, asset allocations among endowment funds disregarding the sizes of the respective universities' assets show much smaller weights to alternative assets. Table 8 shows that correlation of the rate of change in the university operating income and changes in returns in the U.S. stock market is negative for smaller colleges but positive for major universities.

TABLE 9
CROSS-SECTIONAL MEANS OF PORTFOLIO WEIGHTS
ANNUAL CROSS-SECTIONAL MEANS OF THE ACTUAL ASSET ALLOCATIONS (IN PERCENT) CONTAINED IN THE NACUBO DATABASE

Year	US Eq.	non-US Eq.	Fixed Income	Real Estate	Cash	Alternative Assets
1989	47.0	1.7	31.7	2.9	12.9	3.8
1990	47.5	2.3	35.6	2.9	10.3	1.3
1991	47.5	2.3	36.0	2.8	10.2	1.3
1992	48.1	3.0	35.9	2.4	9.4	1.3
1993	48.1	4.2	34.9	1.6	7.3	3.8
1994	46.2	7.4	31.8	1.9	7.4	5.4
1995	46.9	7.9	30.0	2.1	6.5	6.7
1996	51.8	9.4	27.7	2.0	5.4	3.9
1997	52.5	11.2	25.7	2.0	4.6	4.0
1998	53.1	10.9	25.5	3.4	2.2	4.8
1999	53.9	10.5	23.8	1.9	3.9	5.9
2000	50.7	11.6	23.4	1.9	4.0	8.4
2001	49.6	10.0	24.9	2.1	4.0	9.2
2002	46.4	10.1	27.0	2.6	4.0	9.8
2003	47.4	9.7	25.6	2.8	3.9	10.5
2004	48.7	11.1	21.9	2.8	3.6	11.9
2005	45.7	12.7	21.4	3.2	3.4	13.7

Source: Adapted, modified and aggregated from Brown, Keith C., Lorenzo Garlappi, and Christian TIU. " The Troves of Academe: Asset Allocation, Risk Budgeting and the Investment Performance of University Endowment Funds." McCombs Research Paper Series No. FIN-03-07, August 2007. Note: Alternative assets include hedge funds, venture capital, private equity and natural resources. Fixed income includes domestic and international bonds.

Profile analysis for university endowment funds has been performed by Brown, Garlappi and Tiu (2007) consisting of university endowments recorded by the National Association of College and University Business Officers (NACUBO) and TIAA-CREF as well as Cambridge Associates advisory agencies during 1984-2005. The total recorded value of assets of university endowments as of 2005 was $1.3 trillion. This compares in size with defined benefit pension plans of $4.7 trillion and mutual funds maintaining $8.9 trillion. Brown, Garlappi and Tiu find that endowments have generally increased their exposure to common stock and hedge funds during 1984-2005 and have generated small positive risk-adjusted returns according to their primary data. This better than average return, however, disappears as they refine the data. Performance is decomposed into policy asset allocations, tactical asset allocation, and security selection. Policy asset allocation provides a long term strategic asset allocation while tactical asset allocation strives at gaining from inefficiencies in the market. It is further observed that the policy asset allocation accounts for 70 percent of the endowment's performance. In addition,

performance ranking among endowment funds is highly influenced by their active security selection achievements. Table 9 shows the trend in asset allocation among university endowment funds during 1989-2005. As shown in Table 9, the proportions of money allocated to alternative assets and international equities shows a persistent upward trend while the share of fixed income securities have declined.

CONCLUSIONS

A review of components of investment portfolio of endowment funds at selected major private universities reveals divergence of asset class weights from the average endowment fund investments as well as the modern portfolio theory guidelines. This could perhaps be due to the superior performance of their money managers and well known in-house academicians engaged in portfolio policy asset allocations. Alternatively, their respective asset allocations could be due to their pertinent characteristics. Human capital constitutes the stock and flow of a production function for an educational institution. A review of functional expenses of Harvard University in 2008, for example, shows 88 percent for academic support of its faculty, staff and students (Adapted and extrapolated from Harvard University Financial Report, Fiscal Year 2008, page 6). The return on their stock of human capital would lead to discoveries, innovations, new products and well educated students. The issue then is an asset allocation that would address the needs of investors with substantial endowment of human capital. Researchers have examined the role of human capital in enhancing the firm's performance, explaining the behavior of domestic and international common stock prices, investment patterns of individual investors and entrepreneurs, as well as university endowment funds. Among the conclusions are:

a) investors who had paid attention to human capital were more likely to earn a superior return;
b) the variance in equity returns is explained, in part, by the fluctuations in labor income;
c) changes in the educated affluent households appear to explain stock price fluctuations;
d) the stock of human capital and the phases of the life cycle would both appear to influence individuals' asset allocation;
e) stockholdings of entrepreneurs are concentrated in their own business;
f) the special attention paid to private equity, venture capital and other alternative investments by major institutional endowment funds is due to the nature of their human capital;
g) small, local colleges should formulate their investment policies in line with their unique characteristics. The volatility of their operating income, size of assets, and budgetary needs would require a more stable, less risky, well diversified investment in domestic common stock and bonds. In particular, a large portion of the endowment portfolio should consist of quality bonds, especially inflation protected bonds.

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