

Reverse Asset Allocation: Using Bundled Alternatives as the “Core”

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CAPM

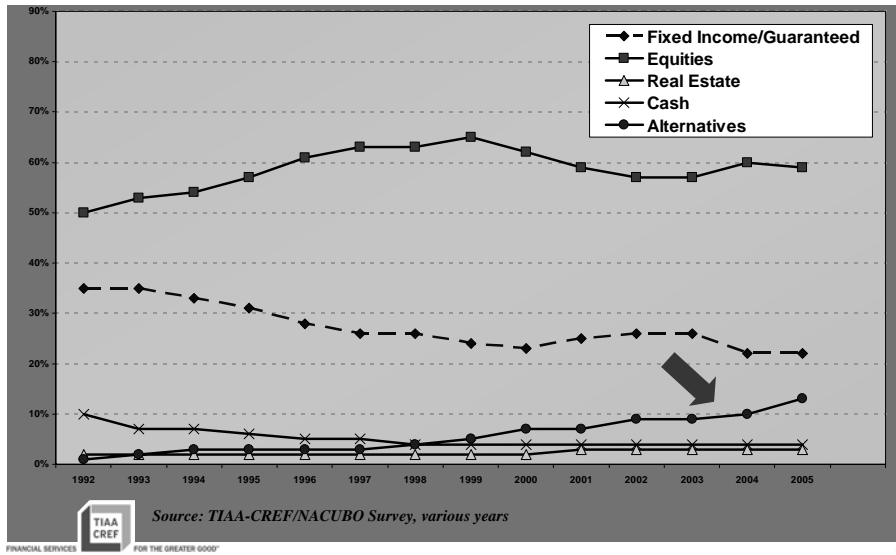
For an Individual Security or Asset Class i

$$E(R_i) = r_f + \beta_i [E(R_m) - r_f]$$

For a portfolio of Securities or Asset Classes

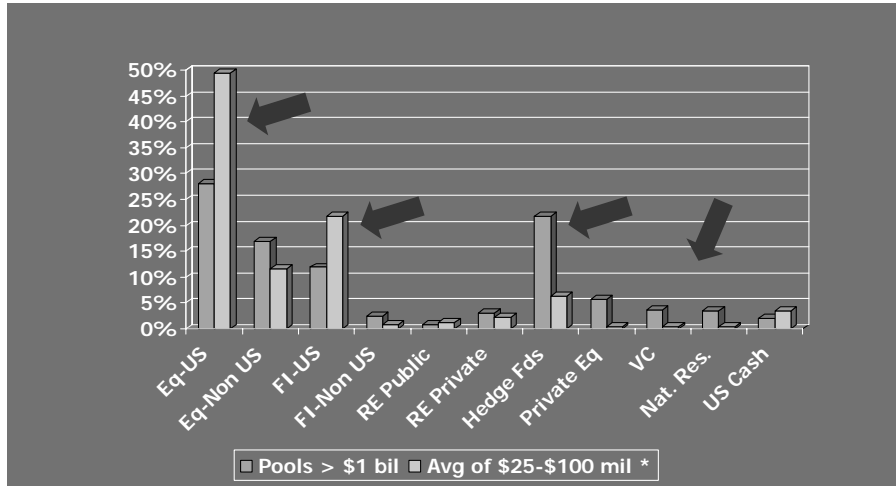
$$E(R_p) = r_f + [E(R_m) - r_f] \sum_{i=1}^n \omega_i \beta_i$$

Exhibit 1 Commitment to Alternatives has Grown College/University Endowment Asset Allocation



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Differences in Asset Class Allocation Larger vs. Smaller Investment Pools



*Data shown are based on a simple average of two category averages presented in the study.

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**Exhibit 2
Bigger Funds Have More Alternatives**

**2004 College and University Endowments
Equal-Weighted Average Asset Allocation (%)**

\$ Endowment Assets	Equity	Fixed Income	Cash	Real Estate	Other Alternatives
Greater than 1.0 Billion	46	15	3	4	29
500 Million – 1.0 Billion	57	16	2	3	22
100 Million – 500 Million	59	20	3	3	13
Less than 100 Million	63	22	5	3	7
Total	60	22	4	3	9



Source: TIAA-CREF/NACUBO Survey 2004

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**Exhibit 3
Alternative Asset Classes as a Percentage of Total Alternatives in
College and University Endowments and Foundations**

Hedge Funds	52.3%
Real Estate	21.9%
Private Equity	12.3%
Venture Capital	8.9%
Oil & Gas	3.0%
Commodities	1.2%
Timber	0.5%



Source: 2004 TIAA-CREF/NACUBO Survey

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Exhibit 4
Institutional Asset Allocations are Continuing to Shift

Defined-Benefit Plans, Endowments and Foundations
 Expected Asset Allocation Changes as of Spring 2005

% Share Expected to Significantly:

	<u>Decrease</u>	<u>Increase</u>
Domestic Equities	13	4
International Equities	12	9
Fixed Income	10	3
Equity Real Estate	3	25
Private Equity	1	30
Hedge Funds	0	33

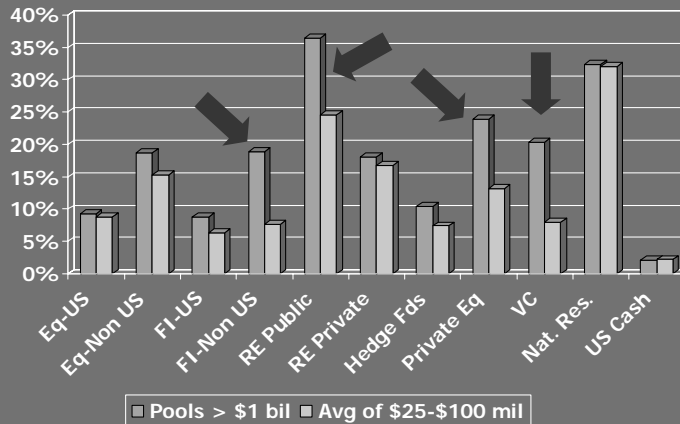


Source: Greenwich Associates

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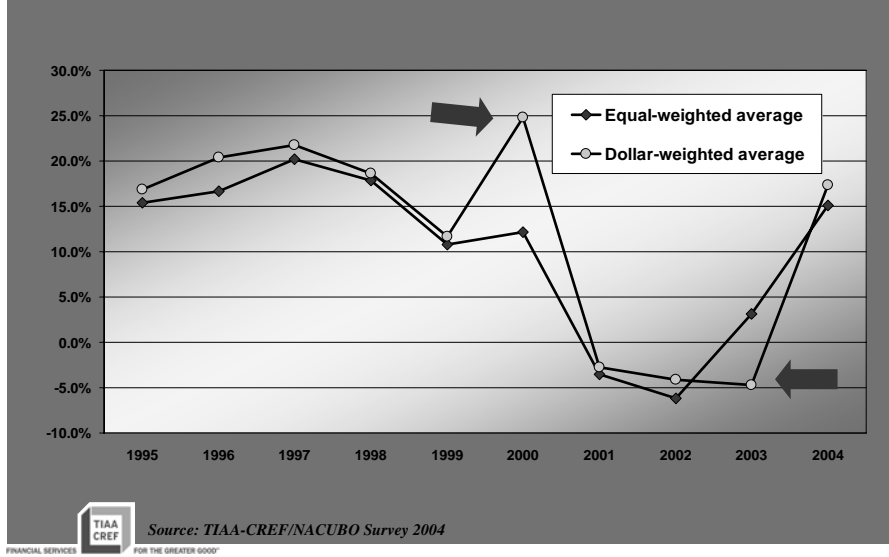
Differences in Asset Class Returns

Larger vs. Smaller Investment Pools



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Exhibit 5 College/University Endowment Investment Returns Plummeted and Then Recovered



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Exhibit 6 Asset Class Beta, Return, Sigma, Correlation

	Return	Sigma	Alpha	Beta	U.S. Eq	Int Eq	Emerg Eq	Abs Ret	Eq Hedge	Ven Cap	PI Eq	REITS	Real Est	Commod	Gov Bond	All Bond	TIPS	Bond Cash
U.S. Equity	7.25	16.50	0.00	1.00	1.00	0.65	0.45	0.50	0.85	0.35	0.70	0.55	0.10	-0.25	0.35	0.30	0.35	0.35
International Equity	7.25	19.50	1.39	0.77	0.65	1.00	0.60	0.55	0.55	0.30	0.60	0.40	0.15	-0.10	0.20	0.20	0.20	0.20
Emerging Mkt Equity	9.25	28.00	3.42	0.76	0.45	0.60	1.00	0.50	0.65	0.35	0.30	0.20	-0.30	-0.05	-0.20	-0.15	-0.10	0.00
Absolute Return	5.25	9.25	2.32	0.28	0.55	0.55	0.50	1.00	0.65	0.10	0.35	0.55	-0.05	-0.05	0.10	0.15	0.15	0.20
Equity Hedge Funds	5.75	12.75	0.56	0.66	0.85	0.55	0.65	0.65	1.00	0.50	0.60	0.50	0.00	-0.05	0.10	0.15	0.25	0.35
Venture Capital	12.25	27.75	7.47	0.59	0.35	0.30	0.35	0.10	0.50	1.00	0.65	-0.05	0.15	0.20	-0.30	-0.25	-0.15	0.05
Private Equity	10.25	23.00	3.15	0.98	0.70	0.60	0.30	0.35	0.60	0.65	1.00	0.20	0.20	-0.05	-0.15	-0.10	0.05	0.25
REITS	6.50	14.50	2.35	0.48	0.55	0.40	0.20	0.55	0.50	-0.05	0.20	1.00	0.00	-0.20	0.35	0.30	0.30	0.20
Real Estate	5.50	12.00	3.82	0.07	0.10	0.15	-0.30	-0.05	0.00	0.15	0.20	0.00	1.00	-0.05	0.00	0.00	0.20	0.40
Commodities	5.25	19.00	5.73	-0.29	-0.20	-0.10	-0.05	-0.05	-0.05	0.20	-0.05	-0.20	-0.05	1.00	-0.20	-0.10	-0.20	-0.20
U.S. Bonds Govt	3.50	7.00	1.36	0.15	0.20	0.20	-0.20	0.10	0.10	-0.30	-0.15	0.35	0.00	-0.20	1.00	1.00	0.75	0.50
U.S. Bonds All	3.75	7.50	1.69	0.14	0.00	0.20	-0.15	0.15	0.15	-0.25	-0.10	0.30	0.00	-0.10	1.00	1.00	0.75	0.45
U.S. Bonds TIPS	3.25	6.50	1.18	0.14	0.35	0.20	-0.10	0.15	0.25	-0.15	0.05	0.30	0.20	-0.20	0.75	0.75	1.00	0.75
Cash	1.50	2.00	0.00	0.04	0.35	0.20	0.00	0.20	0.35	0.05	0.25	0.20	0.40	-0.20	0.50	0.45	0.75	1.00

Source: Morgan Stanley Research

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Exhibit 6
Asset Class Beta, Return, Sigma, Correlation

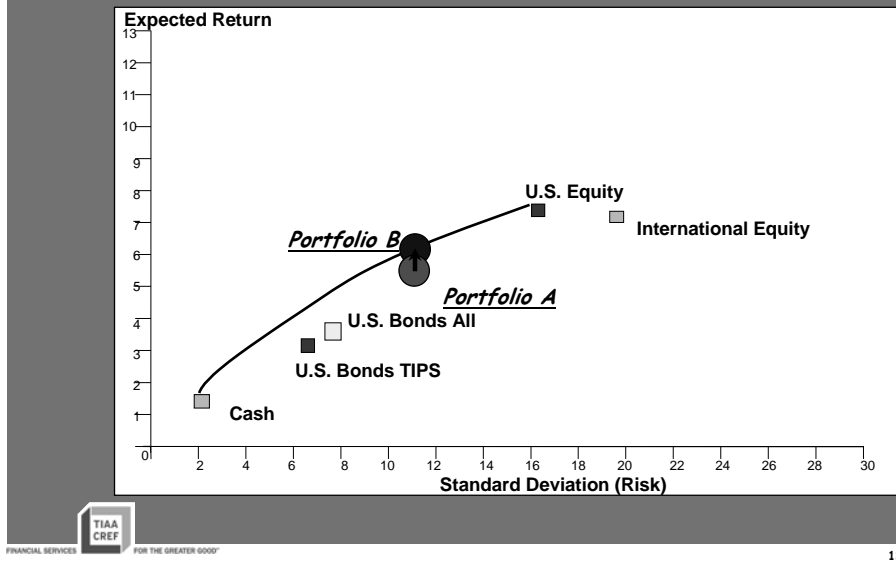
	Return	Sigma	Alpha	Beta
U.S. Equity	7.25	16.50	0.00	1.00
International Equity	7.25	19.50	1.39	0.77
Emerging Mkt Equity	9.25	28.00	3.42	0.76
Absolute Return	5.25	9.25	2.32	0.28
Equity Hedge Funds	5.75	12.75	0.56	0.66
Venture Capital	12.25	27.75	7.47	0.59
Private Equity	10.25	23.00	3.15	0.98
REITS	6.50	14.50	2.35	0.48
Real Estate	5.50	12.00	3.82	0.07
Commodities	5.25	19.00	5.73	-0.29
U.S. Bonds Govt	3.50	7.00	1.36	0.15
U.S. Bonds All	3.75	7.50	1.69	0.14
U.S. Bonds TIPS	3.25	6.50	1.18	0.14
Cash	1.50	2.00	0.00	0.04

Exhibit 7
Efficient Portfolios A-E*

	A	B	B'	C	D	E
U.S. Equity	60	45	0	13	0	0
International Equity	∧	18	50	6	0	0
Emerging Mkt Equity	∧	∧	∧	∧	10	16
Absolute Return	∧	∧	∧	∧	0	0
Equity Hedge Funds	∧	∧	∧	∧	0	0
Venture Capital	∧	∧	∧	35	24	∧
Private Equity	∧	∧	∧	∧	8	33
REITS	∧	∧	∧	∧	31	20
Real Estate	∧	∧	∧	∧	20	20
Commodities	∧	∧	∧	∧	7	12
U.S. Bonds All	40	37	50	46	0	0
Cash	0	0	0	0	0	0
Expected Return	5.85	5.95	5.51	7.37	8.19	7.83
Beta-Based Structural Alpha	0.67	0.88	1.54	3.45	4.30	3.47
Standard Deviation	11.17	11.17	11.17	11.17	11.17	11.17
Sharpe Ratio	0.52	0.53	0.49	0.66	0.73	0.70
Beta	0.65	0.64	0.45	0.45	0.44	0.52

* Portfolio Composition:
 A - US Equities, US Bonds, Cash
 B - US Equities, International Equities, US Bonds, Cash
 B' - Same as B, with US Equities expected return less 2% (5.25%)
 C - Same as B, with addition of Venture Capital
 D - All Asset Classes
 E - All Asset Classes except Venture Capital

Exhibit 8
Efficient Frontier with Basic Asset Classes (Portfolio B)



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Exhibit 7
Efficient Portfolios A-E*

	A	B	B'	C	D	E
U.S. Equity	60	45	0	13	0	0
International Equity	^	18	50	6	0	0
Emerging Mkt Equity	^	^	^	^	10	16
Absolute Return	^	^	^	^	0	0
Equity Hedge Funds	^	^	^	^	0	0
Venture Capital	^	^	^	35	24	^
Private Equity	^	^	^	^	8	33
REITS	^	^	^	^	31	20
Real Estate	^	^	^	^	20	20
Commodities	^	^	^	^	7	12
U.S. Bonds All	40	37	50	46	0	0
Cash	0	0	0	0	0	0
Expected Return	5.85	5.95	5.51	7.37	8.19	7.83
Beta-Based Structural Alpha	0.67	0.88	1.54	3.45	4.30	3.47
Standard Deviation	11.17	11.17	11.17	11.17	11.17	11.17
Sharpe Ratio	0.52	0.53	0.49	0.66	0.73	0.70
Beta	0.65	0.64	0.45	0.45	0.44	0.52

* Portfolio Composition:
 A - US Equities, US Bonds, Cash
 B - US Equities, International Equities, US Bonds, Cash
 B' - Same as B, with US Equities expected return less 2% (5.25%)
 C - Same as B, with addition of Venture Capital
 D - All Asset Classes
 E - All Asset Classes except Venture Capital

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Exhibit 9
Efficient Frontier With Full Range of Asset Classes (Portfolio D)

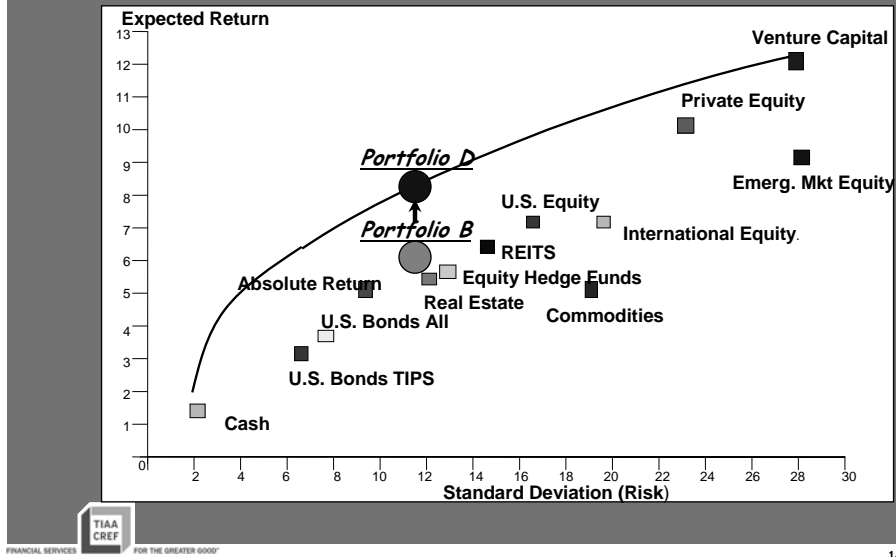


Exhibit 10
Expected Returns and the Sigma Line

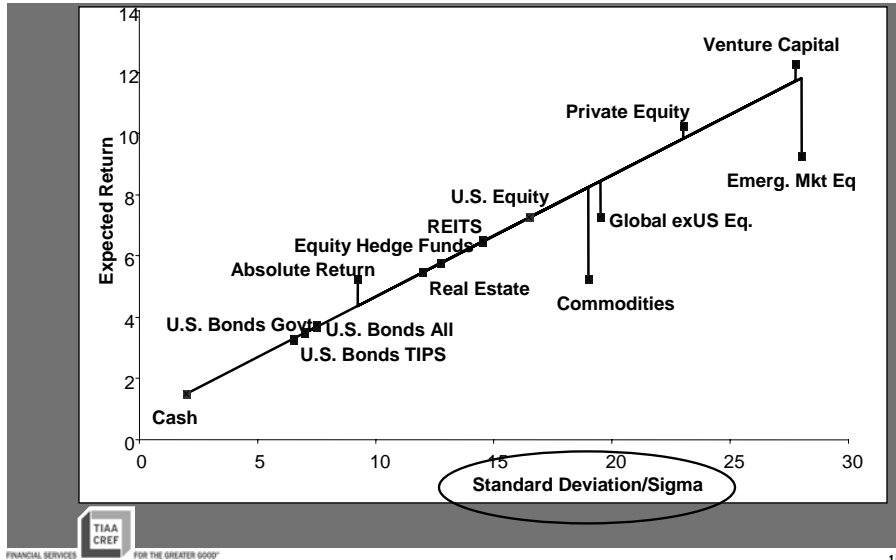
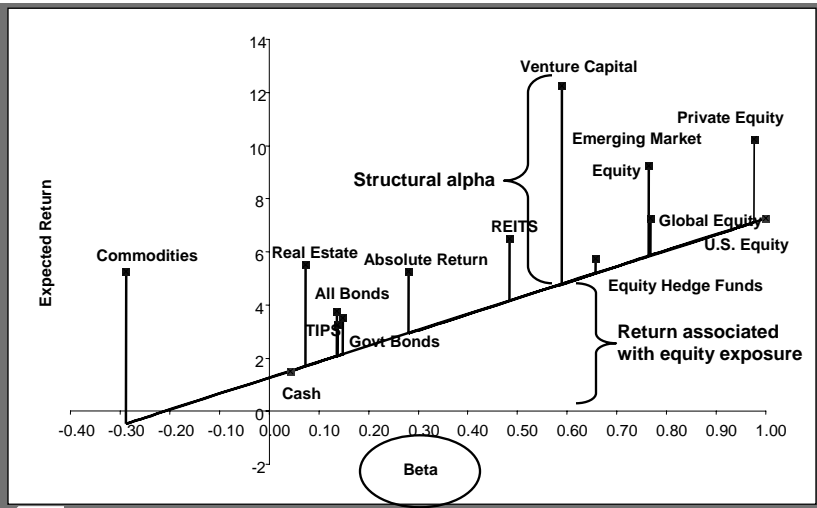


Exhibit 11 Structural Alphas and the Beta Line



Beta-Based Alphas and Returns

For an Individual Security or Asset Class

$$E(R_i) = \alpha_i + \beta_i [E(R_m)]$$

For a portfolio of Securities or Asset Classes

$$E(R_p) = \sum_{i=1}^n \alpha_i \omega_i + E(R_m) \sum_{i=1}^n \beta_i \omega_i$$

Exhibit 12
Efficient Portfolios B, D, F – I*

	B	D	F	G	H	I
U.S. Equity	45	0	40	37	34	30
International Equity	18	0	12	10	8	5
Emerging Mkt Equity	∧	10	3.75	5	6.25	7.50
Absolute Return	∧	0	3.75	5	6.25	7.50
Equity Hedge Funds	∧	0	3.75	5	6.25	7.50
Venture Capital	∧	24	3.75	5	6.25	7.50
Private Equity	∧	8	3.75	5	6.25	7.50
REITS	∧	31	3.75	5	6.25	7.50
Real Estate	∧	20	3.75	5	6.25	7.50
Commodities	∧	7	3.75	5	6.25	7.50
U.S. Bonds All	37	0	18	13	9	5
Cash	0	0	0	0	0	0
Expected Return	5.95	8.19	6.69	6.89	7.07	7.23
Beta-Based Structural Alpha	0.88	4.30	1.56	1.80	2.05	2.31
Standard Deviation	11.17	11.17	11.17	11.17	11.17	11.17
Sharpe Ratio	0.53	0.73	0.60	0.62	0.63	0.65
Beta	0.64	0.44	0.65	0.64	0.63	0.61

* Portfolio Composition:

- B – US Equities, International Equities, US Bonds, Cash
- D – All Asset Classes
- F – 30% to Alternatives
- G – 40% to Alternatives
- H – 50% to Alternatives
- I – 60% to Alternatives

