Healthcare Partners

FINC-460 Investments

Kellogg School of Management

Introduction

- Investment comittee faces an asset allocating decision.
- Currently, hospitals choose between a STP and a LTP
- Investment comittee determines the asset mix in the LTP
  - ↪ Baseline LTP consists of US Equities, Foreign Equities and Bonds.
  - ↪ Fund manager is considering adding REIs, and/or Commodities to the mix.
- How should we approach this decision?

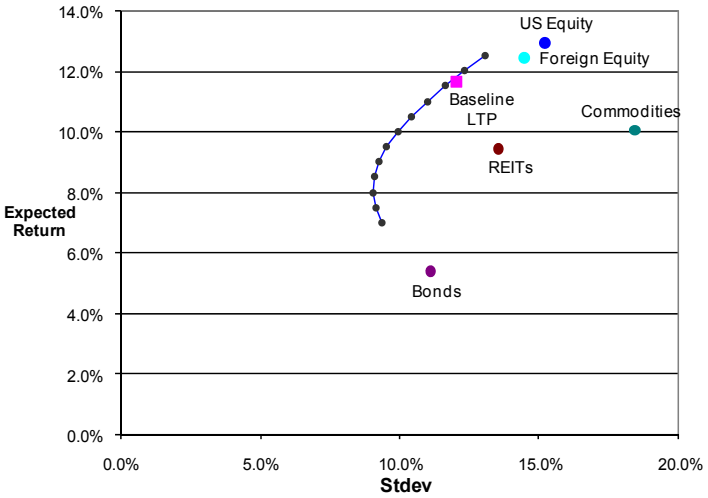
Asset classes

Asset Class	ER (%)	σ (%)	Sharpe Ratio	Correlation Matrix				
				US Eq.	For. Eq.	Bonds	REITs	Comm.
US Equity	12.94	15.21	0.640	1.00				
Foreign Equity	12.42	14.44	0.639	0.62	1.00			
Bonds	5.40	11.10	0.198	0.25	0.06	1.00		
REITs	9.44	13.54	0.461	0.56	0.40	0.16	1.00	
Commodities	10.05	18.43	0.372	-0.02	0.01	-0.07	-0.01	1.00
STP	3.2	-						

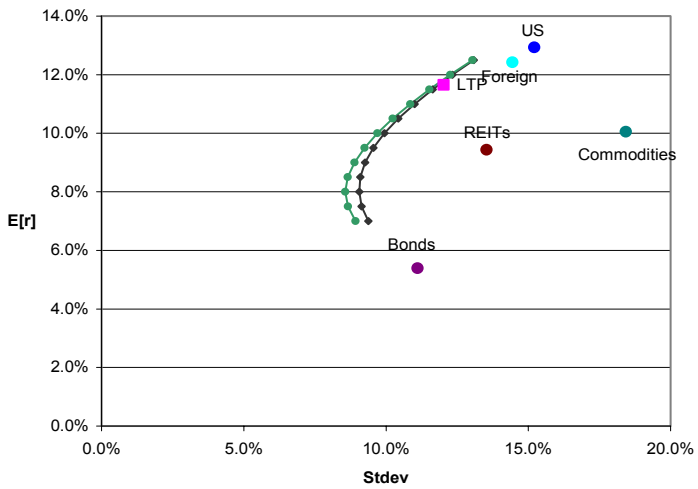
- Which assets look attractive?

Efficient frontiers

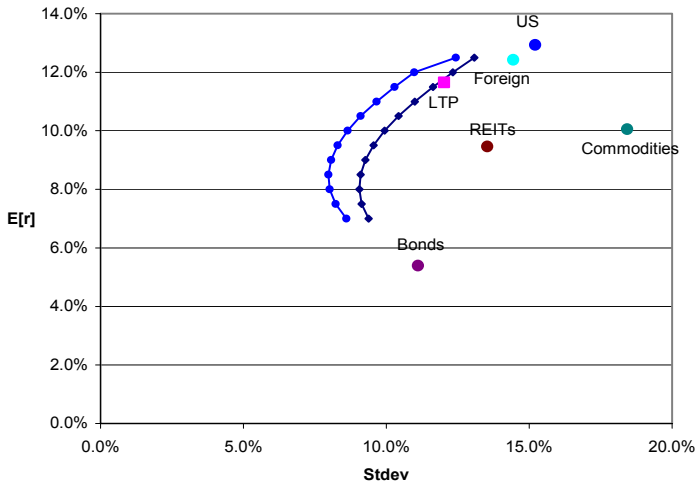
Baseline



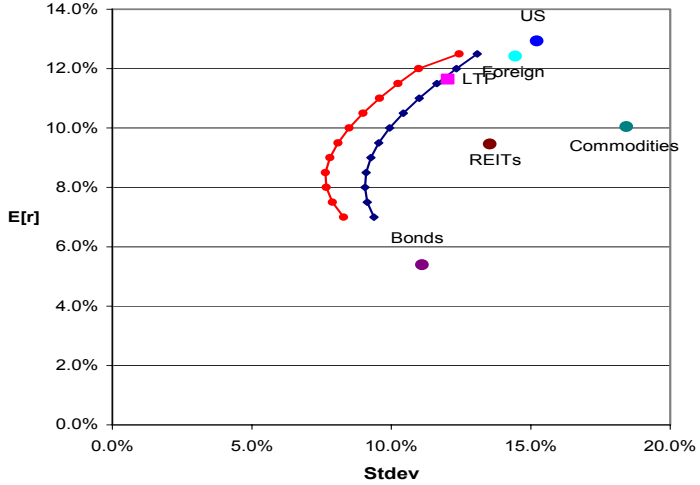
Baseline + REITs



Baseline + Commodities



All 5



Which allocation?

- How to quantify the improvement?
- What is the best combination of the STP, the LTP and the new assets?
- Optimal combination between STP and the MVE^{TM} will depend on risk tolerance.
- But what is the MVE? Markowitz to the rescue...

Portfolio Optimization - Baseline LTP

Number of securities: 5

No	Name	Fraction	Expected Return	Standard Deviation
1	US Equities	40.66%	12.94%	15.21%
2	Foreign Equity	47.00%	12.42%	14.44%
3	Bonds	12.33%	5.40%	11.10%
4	REITs	0.00%	9.44%	13.54%
5	Commodities	0.00%	10.05%	18.43%
		100.00%		

Correlations		1	2	3	4	5
1		1.0	0.62	0.25	0.56	-0.02
2			1.00	0.06	0.4	0.01
3				1.00	0.16	-0.07
4					1	-0.01
5						1

Corr OK? YES

Results:

Portfolio's Expected Return	0.1177
Portfolio's Standard Deviation	0.1198

Risk Free Rate 3.20%

Risk Aversion Coefficient: A= 10.00

Slope of CAL 0.7148

Weight on optimal risky portfolio: x*= 59.65%

Portfolio Optimization Baseline + REITs

Number of securities: 5

No	Name	Fraction	Expected Return	Standard Deviation
1	US Equities	32.27%	12.94%	15.21%
2	Foreign Equity	43.08%	12.42%	14.44%
3	Bonds	11.10%	5.40%	11.10%
4	REITs	13.55%	9.44%	13.54%
5	Commodities	0.00%	10.05%	18.43%
		100.00%		

Correlations		1	2	3	4	5
1		1.0	0.62	0.25	0.56	-0.02
2			1.00	0.06	0.4	0.01
3				1.00	0.16	-0.07
4					1	-0.01
5						1

Corr OK? YES

Results:

Portfolio's Expected Return	0.1140
Portfolio's Standard Deviation	0.1138

Risk Free Rate 3.20%

Slope of CAL 0.7212

Risk Aversion Coefficient: A= 10.00

Weight on optimal risky portfolio: x*= 63.40%

Portfolio Optimization + Baseline + Commodities

Number of securities: 5

No	Name	Fraction	Expected Return	Standard Deviation
1	US Equities	29.99%	12.94%	15.21%
2	Foreign Equity	33.14%	12.42%	14.44%
3	Bonds	11.70%	5.40%	11.10%
4	REITs	0.00%	9.44%	13.54%
5	Commodities	25.17%	10.05%	18.43%
		100.00%		

Correlations		1	2	3	4	5
1		1.0	0.62	0.25	0.56	-0.02
2			1.00	0.06	0.4	0.01
3				1.00	0.16	-0.07
4					1	-0.01
5						1

Corr OK? YES

Results:

Portfolio's Expected Return	0.1116
Portfolio's Standard Deviation	0.0982

Risk Free Rate 3.20%

Slope of CAL 0.8104

Risk Aversion Coefficient: A= 10.00

Weight on optimal risky portfolio: x*= 82.52%

Portfolio Optimization - All

Number of securities: 5

No	Name	Fraction	Expected Return	Standard Deviation
1	US Equities	24.32%	12.94%	15.21%
2	Foreign Equity	30.87%	12.42%	14.44%
3	Bonds	10.83%	5.40%	11.10%
4	REITs	9.91%	9.44%	13.54%
5	Commodities	24.07%	10.05%	18.43%
		100.00%		

Correlations		1	2	3	4	5
1		1.0	0.62	0.25	0.56	-0.02
2			1.00	0.06	0.4	0.01
3				1.00	0.16	-0.07
4					1	-0.01
5						1

Corr OK? YES

Results:

Portfolio's Expected Return	0.1092
Portfolio's Standard Deviation	0.0946

Risk Free Rate 3.20%

Risk Aversion Coefficient: A= 10.00

Slope of CAL 0.8160

Weight on optimal risky portfolio: x*= 86.24%

Mean Variance Efficient Portfolio

	US Eq. Only	Baseline	Baseline + REITs	Baseline +Comd.	ALL
Portfolio ER (%)	12.94	11.77	11.40	11.16	10.92
Portfolio σ (%)	15.21	11.98	11.38	9.82	9.46
Sharpe Ratio	0.640	0.715	0.721	0.811	0.816
Allocation					
US Equities	100	40.7	32.3	30.0	24.3
Foreign Equity	-	47.0	43.1	33.1	30.9
Bonds	-	12.3	11.1	11.7	10.8
REITs	-	-	13.6	-	9.9
Commodities	-	-	-	25.2	24.1

- Having more choices always improves the frontier
- Commodities raises our Sharpe Ratio by a considerable margin. Why?
- What if we had to pay a fee to invest in REITs or Commodities?

Maximum fee

	Baseline	Baseline + REITs	Baseline +Comd.	ALL
Portfolio's Expected Return (%)	11.77	11.40	11.16	10.92
Portfolio's Standard Deviation (%)	11.98	11.38	9.82	9.46
Sharpe Ratio	0.715	0.721	0.811	0.816
Max Fee (%)		0.06	0.94	0.95
Sharpe Ratio - post fee		0.715	0.715	0.715

- Maximum fee leaves us indifferent between adding these or not to our portfolio
- Commodities most desirable

Portfolios targeting a 6% returns

Portfolio ER (%)	6.00	6.00	6.00	6.00
Portfolio σ (%)	3.91	3.89	3.45	3.43
Fraction in LTP (%)	32.67	34.15	35.18	36.27
US Equities	13.3	11.0	10.5	8.8
Foreign Equity	15.4	14.7	11.7	11.2
Bonds	4.0	3.8	4.1	3.9
REITs	-	4.6	-	3.6
Commodities	-	-	8.9	8.7
Fraction in STP (%)	67.3	65.9	64.8	63.7
Total	100.0	100.0	100.0	100.0

- Investing in commodities allows us to reduce our portfolio risk considerably, without sacrificing expected return.

Beyond MV Analysis

- Is it possible that the problem is a little bit more nuanced?
- Suppose that the hospitals care more about the mean and variance of their *financial* wealth.
- For instance, a hospital may be planning a series of expansions.
  - ↪ Brigham Womens Hospital is planning a new Cancer Research unit.
  - ↪ It will need to acquire nearby real estate.
- How will this planned expansion affect the problem?
  - ↪ REITs provide hedge against increase in real estate prices
  - ↪ Liquidity?