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JOSHUA COVAL

Partners Healthcare

In May 2005, Michael Manning, the deputy treasurer of Partners Healthcare System, was formulating a recommendation to the Partners Investment Committee. He had been asked to analyze the role that different "real assets" could play in Partners' $2.4 billion long-term pool (LTP) of financial assets. He was then expected, on the basis of that analysis, to recommend both a size and a composition for the real-asset portfolio segment within that LTP.

Background

Partners Healthcare System was the largest health-care network in New England, providing a range of primary, secondary, and tertiary health-care services to millions of patients from throughout eastern Massachusetts. The Massachusetts General Hospital and the Brigham & Women's Hospital, two world-famous acute-care hospitals in Boston, had joined together in 1994 to found the Partners network. Both Mass. General and Brigham not only provided acute clinical care but were also research and teaching hospitals affiliated with the Harvard Medical School. Over the next few years, four suburban hospitals had also joined the network, as had dozens of physician organizations (practices with multiple numbers of doctors) across eastern Massachusetts. A variety of important staff functions, including treasury functions like asset management, had been centralized at Partners headquarters in downtown Boston, but all the clinical care and research took place in the decentralized network of hospitals and physician offices (see **Exhibit 1**). Partners' Treasury Department, headed by Manning, reported up through a senior vice president of Treasury to the chief executive officer and the board. Importantly, there was also an investment committee consisting of well-known and respected investment professionals who determined the investment policy for Partners' pools of investments, several of whom also served as directors and trustees of Partners and its affiliated hospitals.

While Partners and each of its hospitals were nonprofits, they nonetheless had significant financial assets that played a critical role in their overall financial strategy. Like universities, the hospitals sought charitable contributions, often from grateful patients, and several of Partners' hospitals had accumulated significant endowments that helped to fund some of their clinical, research, and teaching programs. To varying degrees, the hospitals also had accumulated other general long-term funds that served as both a financial buffer against the possibility of operating losses and as a general long-term store of value. Since its founding, Partners' operating results had fluctuated, but operating margins had been quite modest on average relative to the 3% margin Partners management believed they needed to maintain a healthy rate of capital investment in new clinical and research facilities (see

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Professor Joshua Coval prepared this case. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

Exhibit 2). Since its founding, the investment returns from Partners' LTP had played a crucial role in maintaining the financial health of the organization (see **Exhibit 2**).

In order to accommodate the differing needs of the various hospitals in the network, Partners Treasury had established several centrally managed pools in which the networks' various hospitals and physician organizations could invest their financial resources. For purposes of this portfolio analysis, Manning focused on two of these pools, the short-term pool (STP) and the LTP.[1] The STP was managed internally by several fixed-income managers on Manning's staff, who invested it in very high-quality, short-term fixed-income instruments with an average maturity ranging from one to two years. Partners thought of this pool as a very safe pool that could be used by the various hospitals as the risk-free part of their holdings. In the spring of 2005, the average yield on this portfolio was 3.2%. The LTP, in contrast, held risky assets, primarily different forms of equity. Over 30 different external asset management firms that were selected and monitored by the Partners Investment Committee and investment staff managed those equities. There was also a smaller fixed-income segment in the LTP that was invested primarily in high-quality long-term bonds. The various hospitals in the Partners network each had very different characteristics including their geographic target markets, their operating margins, their vulnerability to underpayment by Medicaid and/or other various third-party payers, and especially the size of their endowment assets and other financial assets relative to their operating budgets. Manning and his Treasury staff worked with the CFOs of the network's hospitals to determine appropriate percentages of their financial assets to invest in the various pools. Not surprisingly, different hospitals chose different allocations to the long-term and short-term pools as a function of their own unique financial characteristics and also their risk tolerance.

Real Assets

Over the last several years, the Partners Investment Committee had introduced a new category of assets called real assets into the LTP. Concerned about the future risks and returns from traditional financial assets such as stocks and bonds, the Investment Committee had searched for untraditional asset classes that might help diversify the risks of the LTP. They were particularly interested in asset classes that might perform well in a rapidly expanding global economy and/or a resurgence of inflation. As two initial steps in this direction, they had invested a percent of the LTP in a diversified portfolio of publicly traded real estate investment trusts (REITs) and another percent in a diversified portfolio of commodity futures that approximately tracked the Goldman Sachs Commodity Index (GSCI). As it turned out, both of these newly added subportfolios had done extremely well in 2004, making the real-asset program a great initial success. "Better to be lucky than smart," thought Manning, for he knew that the more interesting questions concerned the long-run ways in which these two types of real assets might affect the risks and returns of the LTP, particularly if their allocations in the LTP were to be increased substantially. The Investment Committee was considering a major expansion of the real-asset segment of the LTP, but they wanted Manning to analyze the potential implications of this decision very carefully before proceeding.

Perform Well

[1] In addition, there was a money market pool for transactional balances, an ERISA pool for pension assets, and an intermediate-term pool for funds with a three- to five-year time horizon. These other pools will be ignored for the sake of simplicity in this case.

The Baseline Asset Mix of the Long-Term Pool

Prior to the addition of the real assets, the approximate asset mix of the LTP had been:

Baseline

Domestic Equity	55%
Foreign Equity	30%
Long-Term Bonds	15%
Real Assets:	
REITs	0%
Commodities	0%

Manning wanted to use this prior asset mix with only the three asset classes as the baseline allocation for his LTP analysis. He wanted to know whether there were other portfolio mixes, with possibly quite substantial allocations to one or both of the two real-asset categories, that might perform better in terms of future risks and/or returns than the baseline allocations.

The Analysis

Time Period:1926~2004

To begin with, Manning needed some assumptions about future expected returns, risks, and correlations of the various asset classes in order to compare and evaluate different potential portfolios. He had his staff collect and analyze information on each of the five asset classes. Using very long-term historical data from 1926 to 2004, they calculated the average realized returns from U.S. equities relative to U.S. long-term bonds in order to estimate the risk premium that equities had paid on average relative to bonds over this very long-term time horizon. Unfortunately, such very long-term data were not available for most asset classes. Using data on realized returns from 1970 onward, they calculated average annual returns, volatilities, and correlations for each of the asset classes. These historical data drove the assumptions about future returns, risks, and correlations that would be used in the analysis, which are displayed in **Exhibit 3**. **Exhibit 3** also includes a "risk-return" plot of these assumptions for the five asset classes, with the future expected returns on the vertical axis and the annualized future standard deviation of returns on the horizontal axis. The plot also displays the calculated future risk (12.02%) and expected return (11.65%) of the baseline 55/30/15 LTP given these assumptions (see the **Appendix** for the formulas used to calculate the future risks and returns of a multi-asset portfolio) and the current yield of the STP (3.2%).

At first glance, REITs seemed attractive with their low risk and reasonable expected returns. Commodities appeared as though they might be less attractive because of their much higher risk, notwithstanding their slightly higher expected returns. But how much these opportunities would increase the LTP's return or lower its risk clearly depended on how much capital Partners was willing to allocate to these investments and their correlations with assets in the baseline portfolio. Solving this problem would require portfolio analysis: calculating the expected return and risk of portfolios with different levels of investment in each of the asset classes and then asking which combination(s) offered the lowest risks and/or greatest expected returns.

Manning began by asking whether the baseline LTP allocation of domestic equities, foreign equities, and bonds had offered the best risk-return trade-off for investors relative to all other portfolio mixes that invested in just these same three asset classes. He first considered sets of different portfolio weights that deviated arbitrarily from the baseline allocations in the LTP, but where the

weights were constrained to be positive[2] and to add to 100%. **Exhibit 4a** reports the calculated future expected returns and standard deviations for 16 of these arbitrary alternative three-asset-class portfolios. **Exhibit 4b** presents a risk-return scatterplot of these 16 portfolios. Similarly, **Exhibit 4c** displays a risk-return scatterplot for a much larger sample of several hundred arbitrarily chosen three-asset portfolios.

Manning was not really sure whether any of these alternative portfolios were clearly better or worse than the baseline LTP. Some of the Partners hospitals might prefer some of the portfolios with lower risks, but others would probably prefer some of the portfolios with higher returns. Indeed, he wondered whether any of the portfolios could be considered superior or inferior to the others given that the hospitals and physician organizations all had somewhat different tolerances for risk. He hoped, though, that at least some of these potential portfolios could be eliminated from consideration on the grounds that they offered lower expected returns but higher risks relative to others.

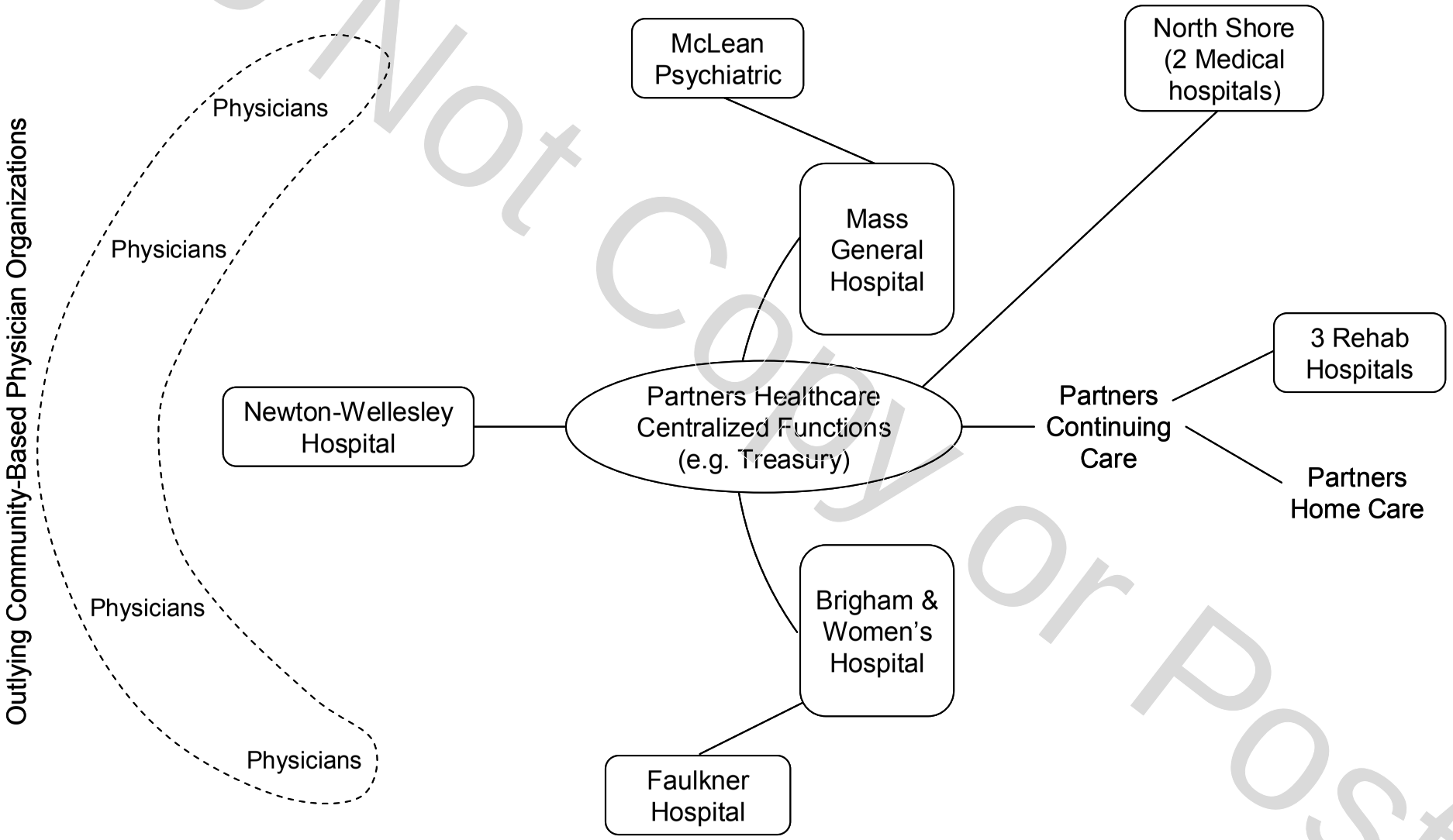
To better understand what the interests of particular hospitals might imply for the optimal mix of assets in the LTP, Manning considered the perspective of a hospital targeting 10% future expected returns. It was clear that many different combinations of U.S. equities, foreign equities, and bonds could achieve this goal. However, not all such combinations would offer identical risks. Therefore, Manning asked his staff to search across all combinations to identify the one that would deliver the 10% expected return but with the least amount of risk. They reported back to him that an investment of 23.4% in U.S. stocks, 40.4% in foreign stocks, and 36.2% in bonds could deliver the targeted 10% expected returns at 9.94% risk—a lower level of risk than any other possible set of allocations producing the 10% expected returns. Manning concluded that this combination must be optimal for any hospital wishing to achieve 10% expected returns. He then asked them to repeat their search procedure to identify the minimum level of risk required to achieve several other different target-return levels. These portfolios are reported in **Exhibit 5a** along with a plot in **Exhibit 5b** of their future expected returns and standard deviations.

Now, Manning thought that they were ready to analyze how much the introduction of REITs and/or commodities might improve the risk-return opportunities available for the LTP. Manning wondered whether REITs or commodities would be more helpful. Commodities had higher expected returns than REITs, but they also carried far greater risk. To analyze the problem, he again asked his staff to determine the minimum attainable risk level (standard deviation) for different target-return levels when REITs were added to the set of investable assets (see **Exhibits 6**), and similarly when commodities were added to the set of investable assets (see **Exhibit 7**). Because Partners could easily maintain investments in both of these new asset classes at relatively low setup and transaction costs, Manning knew that he should consider investing in both simultaneously. **Exhibit 8** reports the results of the same analysis when all five assets were available for investment.

Stepping back from the numbers, Manning wondered whether the addition of real assets would really make the hospitals better off. Their needs and preferences were quite varied. Some wished to keep the future risks of their overall financial assets quite limited; others were willing to take more risk in pursuit of substantially higher future returns. How would real assets in the LTP help them, if at all? Could a "one-size-fits-all" solution for the LTP reasonably meet the needs of the Partners hospitals?

[2] A negative weight corresponds to assuming a short position in the asset, something Partners was reluctant to do in risky investments.

Exhibit 1 The Structure of Partners Health Care Network



Source: Company.

Exhibit 2 Selected Operating and Income Statement Data of Partners for Fiscal Years 1995–2004

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Gross Patient Revenue										
Operating:										
Net Patient Service Revenue	1,511	1,571	1,660	1,998	2,287	2,487	2,820	3,137	3,361	3,678
Academic and Research Revenue	327	339	443	448	505	548	617	718	824	915
Other Revenue	141	181	106	213	242	291	335	363	367	397
Total Operating Revenue	1,979	2,091	2,209	2,659	3,034	3,326	3,772	4,218	4,552	4,990
Total Operating Expenses	1,965	2,104	2,221	2,679	3,091	3,325	3,724	4,148	4,520	4,885
Income from Operations	14	-13	-12	-20	-57	1	48	70	32	105
Long-Term Pool:										
Assets at Year-End:	636	716	887	891	1,235	1,398	1,365	1,399	1,839	2,253
Total Return during Year (%)	15.0	13.3	28.2	-4.7	25.2	18.1	-7.3	-3.3	21.1	16.7
Total Return (in $)	43	85	202	-42	225	224	-102	-45	295	307

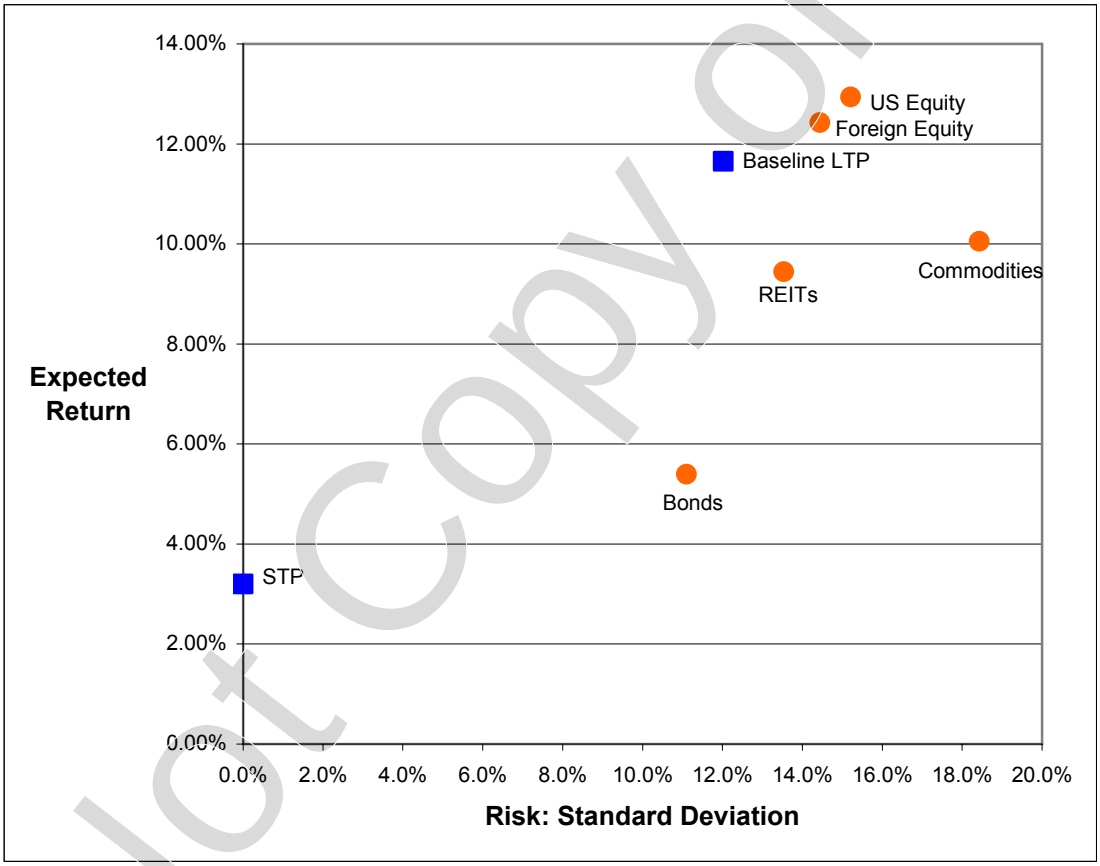
Source: Company documents.

Notes: Long-term pool inception was April 1, 1995 (1995 reflects return from April though September). Total returns on endowment funds, all of which are invested in the long-term pool, are included in the operating and income statements only when distributed.

Exhibit 3 Summary of the Assumptions To Be Used in the Portfolio Analyses

Annual Expected Returns, Standard Deviations, and Correlations

			Correlation with				
Asset Class	Expected Ret.	Stdev	US Equity	Foreign Equity	Bonds	REITs	Commodities
US Equity	12.94%	15.21%	1.00				
Foreign Equity	12.42%	14.44%	0.62	1.00			
Bonds	5.40%	11.10%	0.25	0.06	1.00		
REITs	9.44%	13.54%	0.56	0.40	0.16	1.00	
Commodities	10.05%	18.43%	(0.02)	0.01	(0.07)	(0.01)	1.00



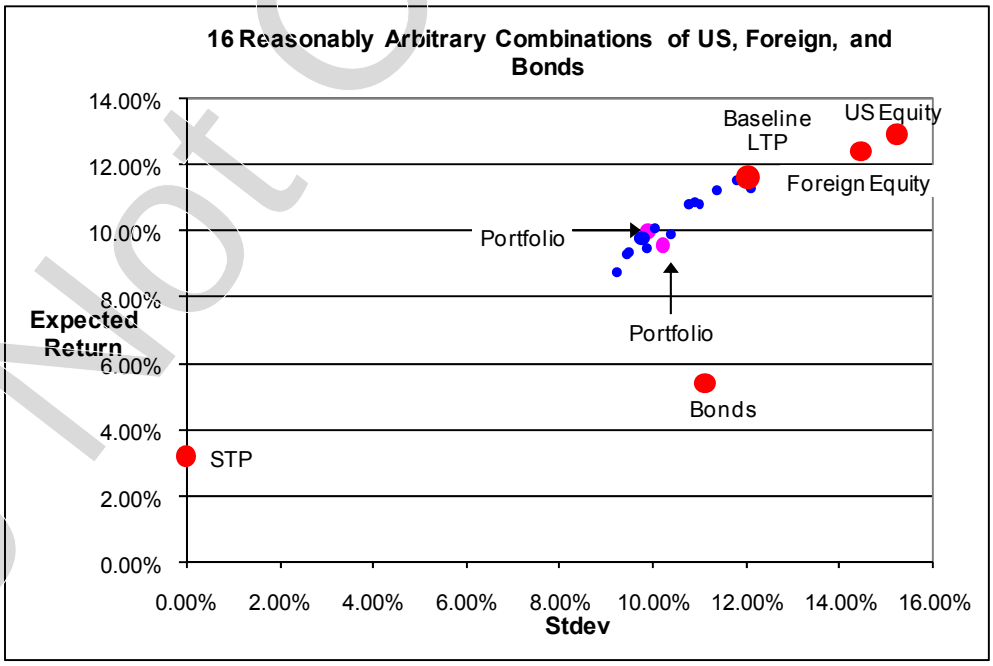
Source: Author's estimates using historical data from CRSP and Thomson Financial Datastream. Standard deviations and correlations are calculated using monthly returns from 1970 to 2004 (except REITs, which use monthly data from 1990 to 2004). Expected returns are calculated using a risk-free rate of 3.2% (the current yield of the STP) and a bond excess return estimated from 1970 to 2004. The U.S. equity risk premium (U.S. equity expected return minus bond expected return) is set to 7.2%, the difference in average return from 1926 to 2004. Foreign expected return is set so that the ratio of its risk premium to standard deviation (i.e., its Sharpe ratio) matches that of the U.S. Commodity excess returns are estimated from 1970 to 2004. The REIT excess return is estimated using data from 1995 to 2004 and then scaled by the ratio of the U.S. excess return to the U.S. excess return from 1995 to 2004.

Exhibit 4a Other Possible Portfolio Mixes Using Only the Three Asset Classes

16 Reasonably Arbitrary Combinations of US Equities, Foreign Equities, and Bonds					
			Mix of Portfolio		
Portfolio	Expected Ret.	Stdev	US Equity	Foreign Equity	Bonds
1	9.95%	9.91%	0.26	0.37	0.37
2	9.56%	10.20%	0.45	0.11	0.44
3	9.81%	9.79%	0.22	0.39	0.39
4	10.83%	11.01%	0.16	0.60	0.24
5	11.26%	12.11%	0.67	0.11	0.21
6	10.80%	10.76%	0.31	0.44	0.25
7	9.30%	9.43%	0.15	0.40	0.45
8	10.88%	10.90%	0.40	0.35	0.25
9	9.90%	10.40%	0.47	0.14	0.39
10	10.10%	10.05%	0.20	0.45	0.34
11	8.77%	9.21%	0.18	0.29	0.53
12	10.81%	10.77%	0.29	0.46	0.25
13	11.52%	11.81%	0.52	0.32	0.17
14	9.36%	9.48%	0.12	0.43	0.44
15	9.50%	9.86%	0.37	0.19	0.44
16	11.21%	11.39%	0.48	0.32	0.21

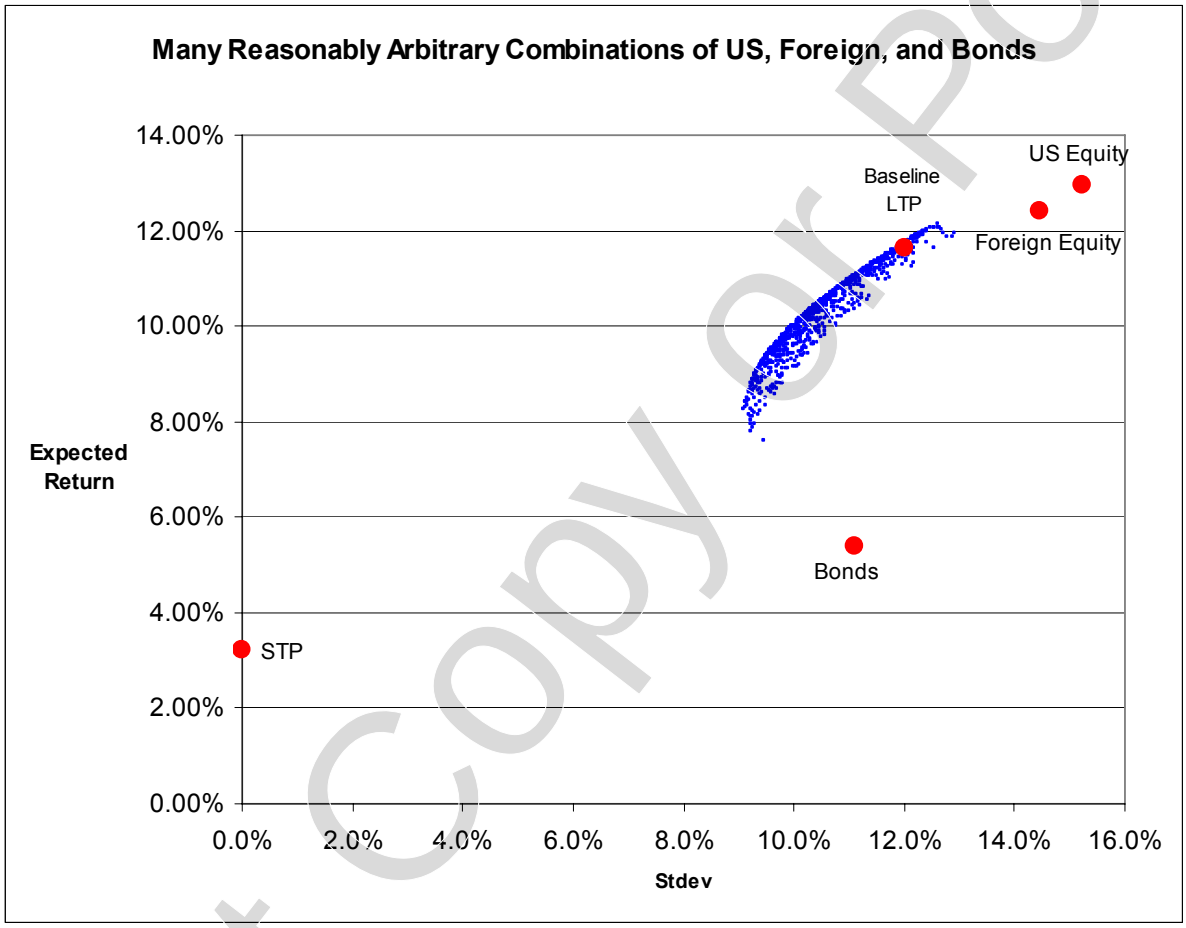
Source: Thomson Financial Datastream.

Exhibit 4b Risk-Return Plot of a Limited Number of Possible Portfolio Mixes



Source: Thomson Financial Datastream.

Exhibit 4c Risk-Return Plot of a Large Number of Possible Portfolio Mixes



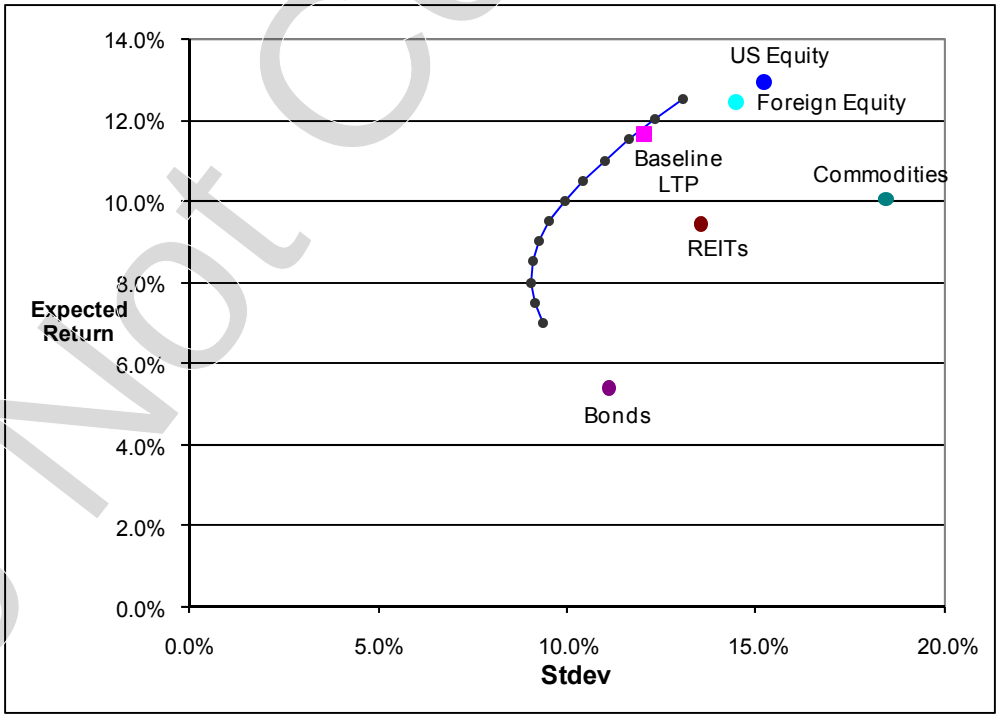
Source: Thomson Financial Datastream.

Exhibit 5a Array of Optimal Portfolios with only U.S., Foreign, and Bonds

			Asset Allocation		
Portfolio	**Expected Ret.**	**Stdev**	**US Equity**	**Foreign Equity**	**Bonds**
1	7.00%	9.38%	0.000	0.228	0.772
2	7.50%	9.14%	0.000	0.299	0.701
3	8.00%	9.06%	0.038	0.330	0.632
4	8.50%	9.10%	0.087	0.348	0.565
5	9.00%	9.27%	0.136	0.367	0.497
6	9.50%	9.55%	0.185	0.386	0.429
7	10.00%	9.94%	0.234	0.404	0.362
8	10.50%	10.43%	0.283	0.423	0.294
9	11.00%	11.00%	0.332	0.442	0.227
10	11.50%	11.64%	0.381	0.460	0.159
11	12.00%	12.33%	0.430	0.479	0.092
12	12.50%	13.08%	0.479	0.497	0.024

Source: Thomson Financial Datastream.

Exhibit 5b Risk-Return Plot of Optimal Portfolios with only U.S., Foreign, and Bonds



Source: Thomson Financial Datastream.

Exhibit 6 Array of Optimal Portfolios with Four Asset Classes: U.S., Foreign, Bonds, and REITs

			Asset Allocation			
Portfolio	Expected Ret.	Stdev	US Equity	Foreign Equity	Bonds	REITs
1	7.00%	8.93%	0.000	0.102	0.678	0.220
2	7.50%	8.66%	0.000	0.170	0.605	0.225
3	8.00%	8.57%	0.000	0.239	0.532	0.229
4	8.50%	8.66%	0.004	0.303	0.460	0.232
5	9.00%	8.89%	0.059	0.325	0.400	0.216
6	9.50%	9.24%	0.114	0.347	0.340	0.199
7	10.00%	9.69%	0.169	0.369	0.280	0.183
8	10.50%	10.23%	0.224	0.391	0.219	0.166
9	11.00%	10.85%	0.278	0.412	0.159	0.150
10	11.50%	11.52%	0.333	0.434	0.099	0.133
11	12.00%	12.25%	0.388	0.456	0.039	0.117
12	12.50%	13.04%	0.465	0.481	0.000	0.054

Source: Thomson Financial Datastream.

Exhibit 7 Array of Optimal Portfolios with Four Asset Classes: U.S., Foreign, Bonds, and Commodities

			Asset Allocation			
Portfolio	**Expected Ret.**	**Stdev**	**US Equity**	**Foreign Equity**	**Bonds**	**Commodities**
1	7.00%	8.61%	0.000	0.113	0.713	0.175
2	7.50%	8.23%	0.000	0.176	0.638	0.187
3	8.00%	8.02%	0.001	0.238	0.562	0.198
4	8.50%	7.98%	0.048	0.253	0.492	0.207
5	9.00%	8.07%	0.096	0.268	0.421	0.215
6	9.50%	8.30%	0.143	0.283	0.351	0.224
7	10.00%	8.65%	0.190	0.297	0.280	0.232
8	10.50%	9.10%	0.238	0.312	0.210	0.240
9	11.00%	9.66%	0.285	0.327	0.139	0.249
10	11.50%	10.29%	0.333	0.342	0.069	0.257
11	12.00%	10.98%	0.383	0.356	0.000	0.261
12	12.50%	12.44%	0.557	0.355	0.000	0.088

Source: Thomson Financial Datastream.

Exhibit 8 Array of Optimal Portfolios with All Five Asset Classes: U.S., Foreign, Bonds, REITs, and Commodities

			Asset Allocation				
Portfolio	**Expected Ret.**	**Stdev**	**US Equity**	**Foreign Equity**	**Bonds**	**REITs**	**Commodities**
1	7.00%	8.29%	0.000	0.020	0.643	0.180	0.158
2	7.50%	7.89%	0.000	0.082	0.567	0.182	0.170
3	8.00%	7.67%	0.000	0.144	0.491	0.183	0.181
4	8.50%	7.64%	0.000	0.207	0.415	0.185	0.193
5	9.00%	7.80%	0.036	0.239	0.348	0.174	0.203
6	9.50%	8.08%	0.089	0.257	0.285	0.156	0.213
7	10.00%	8.49%	0.143	0.275	0.222	0.138	0.223
8	10.50%	8.99%	0.197	0.292	0.159	0.119	0.232
9	11.00%	9.58%	0.250	0.310	0.097	0.101	0.242
10	11.50%	10.24%	0.304	0.328	0.034	0.083	0.251
11	12.00%	10.98%	0.387	0.354	0.000	0.010	0.250

Source: Thomson Financial Datastream.

Appendix

Calculating Portfolio Expected Returns and Risks

The Case of Two Risky Assets

The expected return of a portfolio consisting of two risky assets is simply the average of their expected returns, weighted by the fraction of the portfolio allocated to each asset:

$$E[R_p] = w\ E[R_1] + (1\text{-}w)\ E[R_2]$$

where w is the fraction of the portfolio allocated to asset 1 and hence (1-w) is allocated to asset 2. The variance of this portfolio's return is the sum of each asset's return variance times the square of the weight placed in each asset plus the correlation between the two assets' returns, scaled by their respective standard deviations and their respective weights:

$$Var[R_p] = w^2\ Var[R_1] + (1\text{-}w)^2\ Var[R_2] + 2\ w\ (1\text{-}w)\ Stdev[R_1]\ Stdev[R_2]\ Corr[R_1, R_2]$$

and the standard deviation of the portfolio's return is just the square root of the variance:

$$Stdev[R_p] = (Var[R_p])^{½}$$

The Special Case of One Risky Asset and One Risk-Free Asset

In the special case that one of the two assets is risk free, that is, with a zero standard deviation of future returns, the formula for risk simplifies to a very straightforward and simple form:

$$Var[R_p] = w^2\ Var[R_1]$$

and therefore

$$Stdev[R_p] = w\ Stdev[R_1]$$

So that, in this special case, both risk and expected return are linearly related to *w*, the weight in the risky asset, and to each other.

The General Case of Many Risky Assets

Similarly, the expected return of a portfolio of assets can be calculated as the weighted average of the expected returns of each of the individual holdings, where the weights sum to one:

$$E[R_p] = \Sigma_i\ w_i\ E[R_i]$$

The risk of a portfolio of assets (measured in terms of variance or $Var(R_p)$) is just the sum of every combination of assets' correlations multiplied by their respective standard deviations and their respective weights:

$$Var\ (R_p) = \Sigma_i \Sigma_j\ Corr(R_i,R_j)\ Stdev(R_i)\ Stdev(R_j)\ w_i\ w_j$$

and:

$$Stdev(R_p) = (Var(R_p))^{½}$$

Note that when i=j the correlation of an asset's return with itself is one and so the term becomes

$$\text{Stdev}(R_i)\ \text{Stdev}(R_i)\ w_i\ w_i = w_i^2\ \text{Var}(R_i)$$

which corresponds to the variance terms in the two-asset case. Also note that since i and j cycle through all assets, each combination of assets where i and j are different will be added twice. For example, a term capturing the correlation between asset 1 and asset 2 will appear when i=1 and j=2 and when i=2 and j=1.