2013 Capital Market Assumptions

February 2013

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CONSULTING LLC

INTRODUCTION

Sellwood Consulting updates its capital markets assumptions on an annual basis. Our 2013 assumptions reflect information as of December 31, 2012, unless otherwise noted. Our assumptions are forward-looking in nature and reflect a ten-year horizon.

This report documents our process for creating these capital markets assumptions, and we provide detailed methodology for each. Several over-arching principles, however, inform all of our analysis:

1. We believe that forward-looking capital market assumptions are an important, but far from the only important, input for properly constructing portfolios. Great care should be taken not to rely only on mean-variance analysis when constructing portfolios. Generally speaking, an analysis that relies only on mean-variance analysis will over-allocate to assets with insignificantly superior risk/return estimates, and assets that are less liquid or less frequently priced.

2. Our assumptions utilize a build-up approach based on the current values of the individual drivers of expected return that are unique to each asset class.

3. For asset classes where the market provides a current view of forward-looking returns, our assumptions heavily weight the market view.

4. Where possible, all of our assumptions incorporate current valuations. We assume reversion toward a long-term valuation mean over the prospective ten-year period. Where we have identified a current valuation and its long-term mean, our estimates consider a 50% reversion from the current valuation level to its long-term mean over the prospective ten-year period.

5. Our assumptions are presented in nominal terms. Where we have used historical returns in our input analysis, we have always transformed them to real, after-inflation, returns, so as to strip out historical inflation. At the end of the build-up process, where appropriate, we add the market's current measure of forward-looking inflation back to the assumptions to create nominal forward-looking return assumptions.

6. Our base calculations are of and for compound returns. After calculating a compound return and a risk assumption, we combine the two mathematically to calculate an arithmetic expected return, which is a necessary input for mean-variance analysis.

7. Our assumptions are passive in nature and assume no active management.

8. Our approach to modeling the expected risk of each asset category is multi-faceted. First, we examine the historical standard deviation of the returns for a proxy index for the asset category (both the full history and most recent 10 years). Next, we examine the historical worst-case annual return experience (or in the case of asset categories that are not priced to market, the maximum two-year peak-to-trough experience) for the asset class. If necessary, we adjust our risk estimates to ensure that the actual worst-case experience had at least a 2% probability of occurring (once every 50 years) under our return and risk assumed distribution parameters. Finally, for asset classes where our confidence in the data available for examination is limited, we qualitatively adjust our risk assumption to reflect this uncertainty.

9. Our correlation coefficient assumptions are mostly derived from history, with an emphasis on the recent past. We seek a proxy for each asset category we have modeled with as long a history as possible, and then calculate our correlation assumptions using a simple average of the following, for each pair of asset categories:

   - Longest-term correlation
   - 10-year correlation
   - 5-year correlation
   - 3-year correlation

   This approach purposefully overweights the recent past, while acknowledging the long-term past. It is also a more conservative measure for correlation benefit to a portfolio, because recent correlations have been higher than they have been historically.

10. We round our assumptions to the nearest 10 basis points, in the case of arithmetic return, and nearest 25 basis points, in the case of risk.

In summary form, our 2013 forward-looking assumptions follow on the next page.

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2013 Sellwood Consulting Capital Market Assumptions
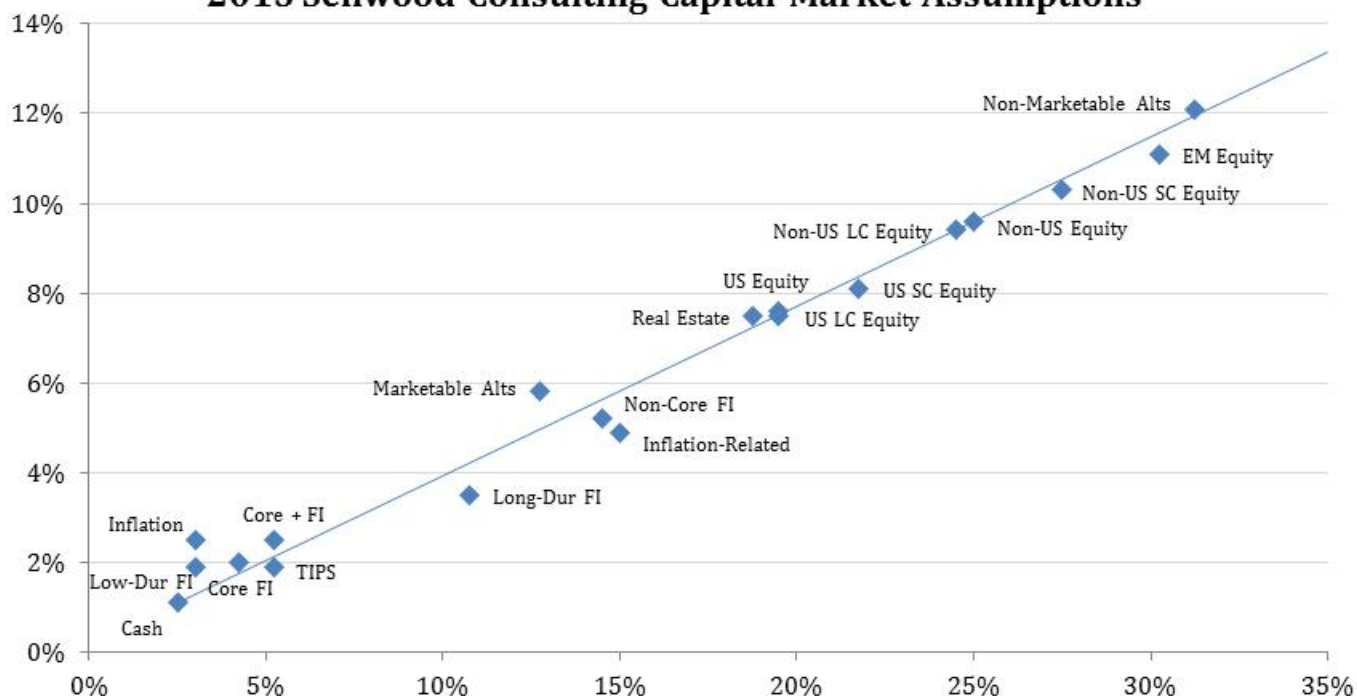
|	Nominal Compound Return	Risk	Nominal Arithmetic Return	Sharpe Ratio
Inflation	2.45%	3.00%	2.50%	---
Cash Equivalents	1.04%	2.50%	1.10%	---
Low-Duration Fixed Income	1.88%	3.00%	1.90%	0.28
Core Fixed Income	1.87%	4.25%	2.00%	0.20
Core-Plus Fixed Income	2.33%	5.25%	2.50%	0.25
Non-Core Fixed Income	4.17%	14.50%	5.20%	0.22
Long-Duration Fixed Income	2.89%	10.75%	3.50%	0.17
TIPS	1.78%	5.25%	1.90%	0.14
US Equity	5.83%	19.50%	7.60%	0.25
US Large-Cap Equity	5.76%	19.50%	7.50%	0.24
US Small-Cap Equity	6.01%	21.75%	8.10%	0.23
Non-US Equity	6.83%	25.00%	9.60%	0.23
Non-US Large-Cap Equity	6.78%	24.50%	9.40%	0.23
Non-US Small-Cap Equity	7.03%	27.50%	10.30%	0.22
Emerging Markets Equity	7.22%	30.25%	11.10%	0.20
Real Estate	5.90%	18.75%	7.50%	0.26
Diversified Inflation-Related	3.79%	15.00%	4.90%	0.18
Marketable Alternatives	5.01%	12.75%	5.80%	0.31
Non-Marketable Alternatives	8.00%	31.25%	12.10%	0.22

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INFLATION

The market tells us its expectation for forward-looking ten-year inflation, and our assumption reflects that market assumption.

On December 31, 2012, the market's yield for a 10-Year US Treasury Bond was 1.78%, and the real yield for a 10-Year TIPS security was -0.67%. The difference between the two is an approximation of the market's inflation expectation over the next ten years, 2.45%.

FIXED INCOME

All of our fixed income assumptions use an identical building-block model as our base analysis, but we have made some qualitative adjustments to the analysis, where noted.

Our building block model begins with the fixed income asset class's current real yield (or nominal yield spread) and duration (or spread duration). We then examine the long-term average of the yield or spread measure, and assume that over the prospective ten-year period, the asset's yield (spread) reverts halfway to that average. We assume that long-term average default and recovery rates will persist into the prospective ten-year period. Given these inputs, we can calculate the asset's forward-looking 10-year return.
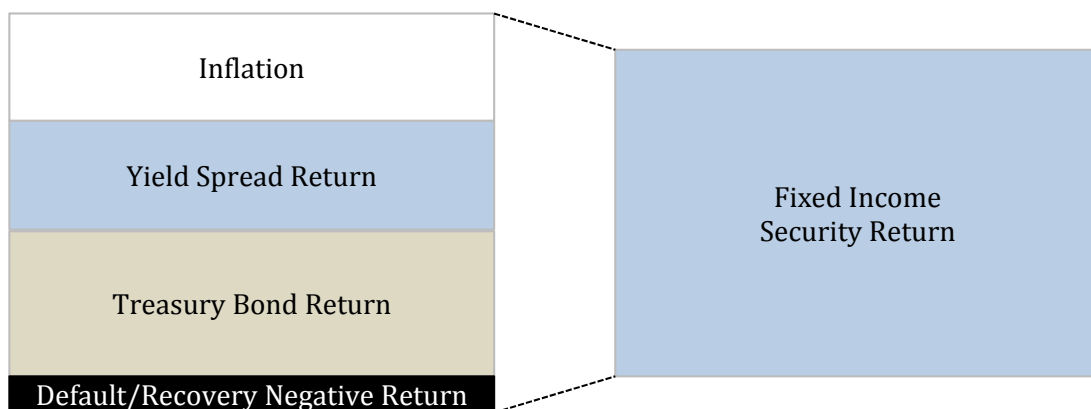
In most cases, we have used the 5-Year Treasury Bond as our first fixed income building block – the block upon which we add yield spreads and inflation. To calculate its forward-looking five-year return, we begin with today's real yield, -1.00%. We assume ten-year reversion halfway to the long-term average mean real yield of 2.16%. In order to capture the longest time horizon possible, we calculate all real yields by adjusting the nominal yield by the prior 12 months' CPI-U. We assume that this reversion will occur in even increments in each of the future ten years. We assume further that the security's duration will stay constant over the ten-year period. The last building block,

though it is assumed to be zero for a Treasury security, is an assumed default rate, adjusted for an assumed recovery rate. Finally, because all of this analysis is calculated in real terms, we add back the market's inflation assumption to arrive at a nominal return assumption.

Following is our calculation for the 5-Year US Treasury Bond. Our assumptions are:

Maturity:	5 years
Current Real Yield:	-1.00%
Duration:	4.85 years
Long-Term Average Real Yield:	2.16%
Cumulative Yield Change (10 Years):	+1.58% (halfway from current to long-term average)
Expected Default Rate:	0%
Expected Default Recovery Rate:	N/A

5-Year Treasurys -- Total Return after Reversion

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Real Yield	-1.00%	-0.84%	-0.68%	-0.53%	-0.37%	-0.21%	-0.05%	0.10%	0.26%	0.42%	0.58%		
Duration	4.85	4.85	4.85	4.85	4.85	4.85	4.85	4.85	4.85	4.85	4.85		
Parallel Yield Change		0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	1.58%	
12-month return		-1.77%	-1.61%	-1.45%	-1.29%	-1.13%	-0.98%	-0.82%	-0.66%	-0.50%	-0.35%		
Compound Factor		98.23%	98.39%	98.55%	98.71%	98.87%	99.02%	99.18%	99.34%	99.50%	99.65%	-10.08%	-1.06%

market 10-year inflation	2.45%
nominal 10-yr annualized return	1.39%

Under the assumptions we have outlined, the security expects to earn a real annualized compound return of –1.06% over the next 10 years. Adding the market's 2.45% inflation, we arrive at our compound return assumption for the security: 1.39% annualized.

Cash Equivalents

Modeled: 91-Day T-Bills
Compound Return: 1.04%
Arithmetic Return: 1.10%
Risk: 2.50%

Our model is nearly identical for Cash Equivalents. Our only adjustment to the model is to have 91-day T-Bill yields revert halfway to their long-term mean in the last five years of the ten-year period, rather than evenly over the ten-year period. This adjustment reflects the Federal Reserve's guidance that short-term interest rates will be low for an extended period of time.

Assumptions:

Maturity:	91 days
Current Real Yield:	-1.64%
Duration:	0.25 years
Long-Term Average Real Yield:	0.99%
Cumulative Yield Change (10 Years):	+1.31% (halfway from current to long-term average)
Expected Default Rate:	0%
Expected Default Recovery Rate:	N/A

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These assumptions yield a nominal compound return expectation of 1.04%:

91-Day T-Bills -- Total Return

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Real Yield	-1.64%	-1.64%	-1.64%	-1.64%	-1.64%	-1.64%	-1.38%	-1.11%	-0.85%	-0.59%	-0.33%		
Duration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25		
Parallel Yield Change		0.00%	0.00%	0.00%	0.00%	0.00%	0.26%	0.26%	0.26%	0.26%	0.26%	1.31%	
12-month return		-1.64%	-1.64%	-1.64%	-1.64%	-1.64%	-1.71%	-1.44%	-1.18%	-0.92%	-0.65%		
Compound Factor		98.36%	98.36%	98.36%	98.36%	98.36%	98.29%	98.56%	98.82%	99.08%	99.35%	-13.24%	-1.41%

market 10-year inflation 2.45%

nominal 10-yr annualized return **1.04%**

Low-Duration Fixed Income

Modeled: 1-3 Year Aggregate Fixed Income
Compound Return: 1.88%
Arithmetic Return: 1.90%
Risk: 3.00%

We use our base model for Low-Duration Fixed Income.

Assumptions for 2-Year US Treasury Bond:

Maturity:	2 years
Current Real Yield:	-1.46%
Duration:	1.91 years
Long-Term Average Real Yield:	1.98%
Cumulative Yield Change (10 Years):	+1.72% (halfway from current to long-term average)

These assumptions yield a nominal compound return expectation of 1.43%:

2-Year Treasurys -- Total Return

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Real Yield	-1.46%	-1.29%	-1.12%	-0.95%	-0.77%	-0.60%	-0.43%	-0.26%	-0.09%	0.09%	0.26%		
Duration	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91		
Parallel Yield Change		0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	1.72%	
12-month return		-1.79%	-1.62%	-1.45%	-1.28%	-1.10%	-0.93%	-0.76%	-0.59%	-0.42%	-0.24%		
Compound Factor		98.21%	98.38%	98.55%	98.72%	98.90%	99.07%	99.24%	99.41%	99.58%	99.76%	-9.73%	-1.02%

market 10-year inflation 2.45%

nominal 10-yr annualized return **1.43%**

To this Treasury Bond yield, we add a spread for corporate bonds:

Assumptions:

Proportion in Corporates:	50%
Current Spread:	0.95%
Long-Term Average Spread:	1.41%
Spread Duration:	1.94 years
Cumulative Spread Change (10 Yrs):	+0.23% (halfway from current to long-term average)

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1-3 Year Corporates -- Spread Effect (over Treasuries) after Reversion

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Spread	0.95%	0.97%	1.00%	1.02%	1.04%	1.06%	1.09%	1.11%	1.13%	1.16%	1.18%		
Duration	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94		
Parallel Yield Change		0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.23%	
12-month return		0.91%	0.93%	0.95%	0.97%	1.00%	1.02%	1.04%	1.07%	1.09%	1.11%		
Compound Factor		100.91%	100.93%	100.95%	100.97%	101.00%	101.02%	101.04%	101.07%	101.09%	101.11%	10.55%	1.01%

	Proportion	50.00%
	Spread Effect (Total)	0.50%

Finally, we make assumptions for the expected default rate and recovery rate for defaulted securities. These figures represent the historical average for the asset class:

Assumptions:

Expected Default Rate:	0.10%
Expected Default Recovery Rate:	45%

In summary:

2-Year Treasury Return	1.43%
Spread Effect	+0.50%
Default Effect	-0.06%
Return Assumption	**1.88%**

Combining the 2-Year Treasury Bond return and the expected return from spread, and then subtracting the expected default rate after adjusting for recovery, yields our return assumption of 1.88% in compound terms.

Core Fixed Income

Modeled: US Investment-Grade Aggregate and Hedged Non-US Aggregate Fixed Income
Compound Return: 1.87%
Arithmetic Return: 2.00%
Risk: 4.25%

The base level of our building-block approach for Core Fixed Income is the 5-Year Treasury Bond, outlined above. To this expected return, we add an expectation for spread return:

Current Spread (BC Aggregate):	0.53%
Long-Term Average Spread:	0.57%
Spread Duration:	2.99 years
Cumulative Spread Change (10 Yrs):	+0.02% (halfway from current to long-term average)

BC Aggregate -- Spread Effect (over Treasuries) after Reversion

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Spread	0.53%	0.53%	0.54%	0.54%	0.54%	0.54%	0.54%	0.55%	0.55%	0.55%	0.55%		
Duration	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99		
Parallel Yield Change		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	
12-month return		0.53%	0.53%	0.53%	0.53%	0.54%	0.54%	0.54%	0.54%	0.54%	0.54%		
Compound Factor		100.53%	100.53%	100.53%	100.53%	100.54%	100.54%	100.54%	100.54%	100.54%	100.54%	5.49%	0.54%

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Our assumptions for default and recovery rates are in line with history:

Assumptions:

Expected Default Rate:	0.10%
Expected Default Recovery Rate:	45%

In summary:

5-Year Treasury Return	1.39%
Spread Effect	+0.54%
Default Effect	-0.06%
Return Assumption	**1.87%**

Adding the 5-Year US Treasury Bond return, the expected spread return, and adjusting for defaults yields a compound return expectation of 1.87%.

We believe that this approach works equally well for US Aggregate fixed income and for Non-US Aggregate fixed income where the currency exposure is hedged back to the US dollar. By stripping out currency exposure, the Non-US fixed income investor is left with a portfolio of fixed income securities expecting similar characteristics to the US fixed income portfolio.

Non-Core Fixed Income

Modeled: US and Non-US Below-Investment-Grade & Emerging Markets Fixed Income
Compound Return: 4.17%
Arithmetic Return: 5.20%
Risk: 14.50%

Our Non-Core Fixed Income assumption combines US below-investment-grade (high yield) bonds and emerging markets sovereign bonds.

For high yield bonds, we begin with the expected nominal return for 5-Year US Treasury Bonds outlined above, and then add our spread building block, and subtract a default building block. We calculate a spread over the average of expected returns for 5- and 10-year US Treasury Bonds, because the duration of their index is currently approximately 7.5 years.

Maturity:	7.5 years
Current Spread:	5.31%
Long-Term Average Spread:	6.03%
Spread Duration:	3.89 years
Cumulative Spread Change (10 Yrs):	+0.36% (halfway from current to long-term average)
Expected Default Rate:	4.20%
Expected Default Recovery Rate:	40%

High Yield -- Spread Effect (over Treasuries) after Reversion

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Spread	5.31%	5.35%	5.38%	5.42%	5.45%	5.49%	5.53%	5.56%	5.60%	5.63%	5.67%		
Duration	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89		
Parallel Yield Change		0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.36%	
12-month return		5.17%	5.21%	5.24%	5.28%	5.31%	5.35%	5.39%	5.42%	5.46%	5.49%		
Compound Factor		105.17%	105.21%	105.24%	105.28%	105.31%	105.35%	105.39%	105.42%	105.46%	105.49%	68.11%	5.33%
												Proportion	50.00%
												Spread Effect (Total)	2.67%

Our assumed return contribution from high yield spread effect, before accounting for defaults, is 2.67%.

For emerging markets sovereign bonds, we calculate a spread over the average of expected returns for 10- and 20-year US Treasury Bonds, because the duration of their index is currently approximately 15 years. Further, to reflect the fact that credit quality amongst the universe of emerging markets sovereign issuers has improved substantially relative to history, we assume only ¼ reversion to historical spreads. In this sense, we forecast that the forward-looking mean for emerging markets sovereign spreads will be lower than its history.

Maturity:	15 years
Current Spread:	2.43%
Long-Term Average Spread:	4.20%
Spread Duration:	7.39 years
Cumulative Spread Change (10 Yrs):	+0.44% (1/4 from current to long-term average)
Expected Default Rate:	1.0%
Expected Default Recovery Rate:	55%

Historical long-term average cumulative ten-year default rates for emerging markets issuers are 6.31% for all issuers, and 0.67% for investment-grade issuers. Currently, approximately 60% of the universe of issuers is investment grade, so we assume a 1.0% expected default rate. Our expected default recovery rate is in line with long-term historical experience.

These assumptions yield an assumption for return contribution from emerging markets debt spread, before accounting for defaults, of 1.15%:

EMD -- Spread Effect (over Treasuries) after Reversion

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Spread	2.43%	2.47%	2.52%	2.56%	2.61%	2.65%	2.70%	2.74%	2.78%	2.83%	2.87%		
Duration	7.39	7.39	7.39	7.39	7.39	7.39	7.39	7.39	7.39	7.39	7.39		
Parallel Yield Change		0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.44%	
12-month return		2.10%	2.15%	2.19%	2.24%	2.28%	2.32%	2.37%	2.41%	2.46%	2.50%		
Compound Factor		102.10%	102.15%	102.19%	102.24%	102.28%	102.32%	102.37%	102.41%	102.46%	102.50%	25.56%	2.30%
												Proportion	50.00%
												Spread Effect (Total)	1.15%

Our final building block is an adjustment for expected default and recovery rates. We subtract the expected unrecovered default from the total yield:

	Default Rate	Recovery Rate	Unrecovered Rate	Default Effect on Return
High Yield	4.2%	40%	60%	-2.52%
EM Debt	1.0%	55%	45%	-0.45%

In summary:

	High Yield	EM Debt	Combined
Treasury Return	1.65%	2.03%	---
Spread Effect	+5.33%	+2.30%	---
Default Effect	-2.52%	-0.45%	---
Return Assumption	4.47%	3.88%	**4.17%**

We average the High Yield and Emerging Markets Debt assumptions to arrive at our forward-looking compound return expectation for non-core fixed income, 4.19%.

Core-Plus Fixed Income

Modeled: 80% US Investment-Grade Aggregate; 20% Non-Core Plus Sectors
Compound Return: 2.33%
Arithmetic Return: 2.50%
Risk: 5.25%

This return assumption expects a return calculated as follows:

80% of the expected return of Core Fixed Income
+ 20% of the expected return of Non-Core Fixed Income

This process yields an expected compound return of 2.33%.

Long-Duration Fixed Income

Modeled: US Long-Term Government/Credit Fixed Income
Compound Return: 2.89%
Arithmetic Return: 3.50%
Risk: 10.75%

Our model assumes 50% each in (i)10- and 20-Year US Treasury Bonds and (ii) long-duration US investment-grade corporate bonds. While the composition of most long-duration fixed income indexes differs slightly from this approach, we believe that most differences will cancel each other out.

For the Treasury component, we use our basic model to average the expected returns for 10- and 20-year Treasury Bonds:

Assumptions (10-Year Treasury):

Maturity:		10 years
Current Real Yield:		+0.04%
Duration:		9.28 years
Long-Term Average Real Yield:		2.45%
Cumulative Yield Change (10 Years):		+1.21% (halfway from current to long-term average)
Expected Default Rate:		0%
Expected Default Recovery Rate:		N/A

10-Year Treasurys -- Total Return after Reversion

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Real Yield	0.04%	0.16%	0.28%	0.40%	0.52%	0.64%	0.76%	0.89%	1.01%	1.13%	1.25%		
Duration	9.28	9.28	9.28	9.28	9.28	9.28	9.28	9.28	9.28	9.28	9.28		
Parallel Yield Change		0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	1.21%	
12-month return		-1.08%	-0.96%	-0.84%	-0.72%	-0.60%	-0.48%	-0.35%	-0.23%	-0.11%	0.01%		
Compound Factor		98.92%	99.04%	99.16%	99.28%	99.40%	99.52%	99.65%	99.77%	99.89%	100.01%	-5.23%	-0.54%
											market 10-year inflation		2.45%
											nominal 10-yr annualized return		1.91%

Assumptions (20-Year Treasury):

Maturity:		20 years
Current Real Yield:		0.72%
Duration:		15.00 years
Long-Term Average Real Yield:		2.51%
Cumulative Yield Change (10 Years):		+0.98% (halfway from current to long-term average)
Expected Default Rate:		0%
Expected Default Recovery Rate:		N/A

20-Year Treasurys -- Total Return after Reversion

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Real Yield	0.72%	0.82%	0.92%	1.01%	1.11%	1.21%	1.31%	1.41%	1.51%	1.60%	1.70%		
Duration	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00		
Parallel Yield Change		0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.98%	
12-month return		-0.76%	-0.66%	-0.56%	-0.46%	-0.36%	-0.26%	-0.17%	-0.07%	0.03%	0.13%		
Compound Factor		99.24%	99.34%	99.44%	99.54%	99.64%	99.74%	99.83%	99.93%	100.03%	100.13%	-3.09%	-0.31%
											market 10-year inflation		2.45%
											nominal 10-yr annualized return		2.14%

We add a spread component consisting of long-term US investment-grade corporate bonds:

Assumptions:

Proportion in Corporates:		50%
Current Spread:		1.80%
Long-Term Average Spread:		1.70%
Spread Duration:		11.35 years
Cumulative Spread Change (10 Yrs):		-0.05% (halfway from current to long-term average)
Expected Default Rate:		1.0%
Expected Default Recovery Rate:		55%

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Long Corporates -- Spread Effect (over Treasuries) after Reversion

Year	0	1	2	3	4	5	6	7	8	9	10	Cumulative	Annualized
Starting Spread	1.80%	1.80%	1.79%	1.79%	1.78%	1.78%	1.77%	1.77%	1.76%	1.76%	1.75%		
Duration	11.35	11.35	11.35	11.35	11.35	11.35	11.35	11.35	11.35	11.35	11.35		
Parallel Yield Change		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.05%	
12-month return		1.86%	1.85%	1.85%	1.84%	1.84%	1.83%	1.83%	1.82%	1.82%	1.81%		
Compound Factor		101.86%	101.85%	101.85%	101.84%	101.84%	101.83%	101.83%	101.82%	101.82%	101.81%	19.92%	1.83%

Proportion 50.00%

Spread Effect (Total) 0.92%

In summary:

Treasury Return	2.03%
Spread Effect	+0.92%
Default Effect	-0.05%
Return Assumption	**2.89%**

Our return assumption for the combined Treasury and corporate Long-Duration Fixed Income basket assumes 50% in each. This compound return assumption is 2.89%.

US Treasury Inflation Protected Securities (TIPS)

Modeled: US TIPS
Compound Return: 1.78%
Arithmetic Return: 1.90%
Risk: 5.25%

The market tells us the expected return for 10-Year US TIPS, so we use it. Given that the first TIPS issue was in 1997, we are hesitant to rely on any "long-term" yield or spread averages to further model the asset class.

We add the market's inflation expectation to the market's real yield for 10-Year TIPS to arrive at our expected nominal return of 1.78% in compound terms.

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EQUITY

To derive our equity return assumptions, we evaluate two methodologies: (i) a building-block approach using the so-called Shiller price-to-earnings (P/E) measure and (ii) an equity risk premium estimate that averages the current implied equity risk premium based on the Damodaran free cash flow to equity model and the historical geometric average equity risk premium.

Where our building blocks call for a P/E measure, we assume that this current valuation metric will revert halfway to its long-term mean over the prospective ten-year period. Our approach employs "Shiller earnings," which represent a ten-year average, adjusted for inflation. We believe that this approach appropriately smoothes the impact of year-to-year earnings volatility.

Our building block approach is consistent across equity categories:

> Assumed (Expected) US Inflation
> + Current Dividend Yield
> + Expected Real Earnings Growth
> + Reversion effect of P/E (halfway to long-term mean, over 10 years)
> + Capitalization Premium (if applicable)
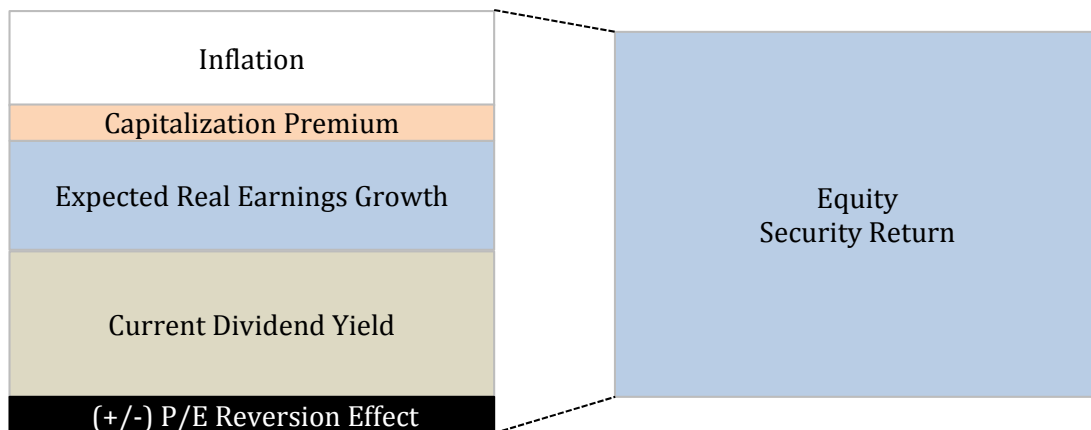
For the implied equity risk premium, we reference a model created by Professor Aswath Damodaran of the Stern School of Business that uses a free cash flow to equity approach to account for dividends as well as stock buybacks in the calculation. The equation utilized is as follows:

$$\text{Value of Equity} = \sum_{t=1}^{t=N} \frac{E(FCFE_t)}{(1+k_e)^t} + \frac{E(FCFE_{N+1})}{(k_e - g_N)(1+k_e)^N}$$

Where:

> N = years of forecasted free cash flow to equity growth
> $E(FCFE_t)$ = expected free cash flow to equity (potential dividend) in year t
> k_e = rate of return expected by equity investors
> g_N = stable growth rate (after year N)

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The equation is solved for k_e and then the risk-free rate (10-year Treasury yield) is subtracted to derive the current implied equity risk premium. We then take the average of the current implied equity risk premium and the long-term historical geometric average equity risk premium to derive an equity risk premium estimate.

US Large-Cap Equity	
	Modeled: US Mid- and Large-Capitalization Equities
	Compound Return: 5.76%
	Arithmetic Return: 7.50%
	Risk: 19.50%

We create our building blocks from the S&P 500 Index:

> 2.45% Inflation
> 2.14% Current Dividend Yield
> 1.73% Long-Term Average Real Earnings Growth

We measure expected P/E reversion halfway to long-term mean:

	Shiller P/E
Current	22.44
Long-Term Average	16.46
Annual reversion effect	-1.53% (halfway to long-term average)

The building blocks approach results in an expected compound return for US Large-Cap Equity of 4.79%.

Our equity risk premium estimate for US Large-Cap Equity is derived by taking the average of the Damodaran implied equity risk premium for the S&P 500 index as of the end of 2012 (5.78%) and the long-term historical geometric average equity premium (4.10%), which equals 4.94%. Adding back the current 10-year US Treasury yield of 1.78% results in an expected compound return of 6.72%.

Averaging these two methodologies yields an expected compound return of 5.76%.

US Small-Cap Equity	
	Modeled: US Small- and Mid-Capitalization Equities
	Compound Return: 6.01%
	Arithmetic Return: 8.10%
	Risk: 21.75%

To our US Large-Cap Equity assumption, we add a small-cap compound return premium of 0.25%, which is consistent with long-term return experience and recent research by Professor Damodaran. This yields a compound return assumption of 6.01%.

US Equity

Modeled: US Equities, All Capitalizations
Compound Return: 5.83%
Arithmetic Return: 7.60%
Risk: 19.50%

Our return assumption for US Equity is intended to model the entire US equity market. It assumes the current weighting of large- and small-capitalization equities in the US equity market – 70% large, and 30% small. These weights are applied to the underlying US Large-Cap and US Small-Cap assumptions to yield 5.83% in compound terms.

Non-US Large-Cap Equity

Modeled: Non-US Large-Capitalization Equities, Developed and Emerging
Compound Return: 6.78%
Arithmetic Return: 9.40%
Risk: 24.50%

Our assumed building blocks are as follows:

> 2.45% Inflation
> 3.43% Current Dividend Yield
> 1.75% Long-Term Average Real Earnings Growth

We measure expected P/E reversion halfway to long-term mean:

	Shiller P/E
Current	14.89
Long-Term Average	16.48
Annual reversion effect	+0.51% (halfway to long-term average)

This approach yields an expected compound return of 7.89%. Finally, given the comparatively limited history for public-market proxy for the asset class, we make a qualitative adjustment downward so that our expected return for Non-US Equity (defined below) will not be more than 1.00% higher, in compound terms, than our US Equity return assumption. This adjustment yields a compound expected return of 6.78%.

Non-US Small-Cap Equity

Modeled: Non-US Small-Capitalization Equities, Developed and Emerging
Compound Return: 7.03%
Arithmetic Return: 10.30%
Risk: 27.50%

To our Non-US Large-Cap Equity assumption, we add a compound return premium building block of 0.25%, the same premium we used for US small-cap equities. This yields a compound return assumption of 7.03%.

Emerging Markets Equity

Modeled: Emerging Markets Equity
Compound Return: 7.22%
Arithmetic Return: 11.10%
Risk: 30.25%

Our assumed building blocks are as follows:

> 2.45% Inflation
> 2.35% Current Dividend Yield
> 2.62% Real Earnings Growth

We conservatively assume forward-looking real earnings growth to be 1/3 of its historical average of 7.87%, measured since 1995.

We measure expected P/E reversion halfway to long-term mean:

	Shiller P/E
Current	14.90
Long-Term Average	14.31
Annual reversion effect	-0.20% (halfway to long-term average)

Adding this P/E reversion measure to the other building blocks yields an expected compound return of 7.22%.

Non-US Equity

Modeled: Non-US Equities, All Regions & Capitalizations
Compound Return: 6.83%
Arithmetic Return: 9.60%
Risk: 25.00%

Our return assumption for Non-US Equity is intended to model the entire Non-US equity market. It assumes the current weighting of large-cap and small-cap markets equities in the international equity market – 80% large-cap and 20% small-cap. These weights are applied to the underlying Non-US Large-Cap Equity and Non-US Small-Cap Equity assumptions. This weighting yields a compound return assumption of 6.83%.

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ALTERNATIVES

Alternative assets share a common element of not easily being modeled with public-market index proxies. As well, we are more reluctant to rely on their long-term history, given growth in their assets under management over the last several decades and the dynamic nature of strategies employed.

Real Estate

Modeled: Public (REITs) and Open-Ended Private Core Real Estate
Compound Return: 5.90%
Arithmetic Return: 7.50%
Risk: 18.75%

Our expected return reflects going-in cap rates for core private real estate, based on the Urban Land Institute consensus estimate of the NCREIF capitalization rate as of December 31, 2012: 5.9% in compound terms.

This cap rate reflects current income return on an unlevered basis and excludes capital appreciation. We note that the primary driver of return for core real estate over the long term has been income, not appreciation.

Diversified Inflation-Related

Modeled: Bundled Products Offering Inflation-Related Exposures
Compound Return: 3.79%
Arithmetic Return: 4.90%
Risk: 15.00%

We model a generic portfolio consisting of 1/3 each to public REITs, commodities, and TIPS. For each, we have calculated a historical inflation beta. Their average inflation beta is 1.54. When applying this beta to our inflation assumption, our expected return is 3.79% in compound terms.

Knowing our separate return assumptions for Real Estate and TIPS, this methodology implies an expected return to commodities of approximately 3.70% in compound terms.

Marketable Alternatives

Modeled: Hedge Funds of Funds, Global GTAA, Daily-Valued Alternative Strategies
Compound Return: 5.01%
Arithmetic Return: 5.80%
Risk: 12.75%

We assume a diversified portfolio that will tend to approximate the following market exposures over time:

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30% US Equity
30% Non-US Equity
20% Core Fixed Income
20% Non-Core Fixed Income

Weighting those assumptions accordingly results in a compound return assumption of 5.01%.

Non-Marketable Alternatives
Modeled: Venture Capital, Private Equity, Distressed Credit, in Lockup Vehicles *Compound Return: 8.00%* *Arithmetic Return: 12.10%* *Risk: 31.25%*

We assume a diversified portfolio that will tend to approximate the following market exposures over time, plus a premium for leverage and illiquidity:

50% US Equity
50% Non-Core Fixed Income
+ 3.00% illiquidity/leverage premium

Weighting those assumptions accordingly results in a compound return assumption of 8.00%

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RISK

Our risk assumptions are mostly derived from history, but we have enhanced historical metrics with qualitative overlays in several asset categories.

For each asset category, we began by examining the following historical annual returns:

Inflation	US CPI
Cash Equivalents	91-Day T-Bills
Low-Duration Fixed Income	Barclays 1-3 Year Government/Credit
Core Fixed Income	Barclays US Aggregate
Non-Core Fixed Income	50% ML High Yield Master II, 50% JP Morgan EMBI back to 1994; 100% ML High Yield Master II before 1994
Long-Duration Fixed Income	Barclays Long Government/Credit
TIPS	Barclays US TIPS
US Equity	Russell 3000 back to 1979; S&P 500 before 1979
US Large-Cap Equity	Russell 1000 back to 1979; S&P 500 before 1979
US Small-Cap Equity	Russell 2000
Non-US Equity	MSCI ACWI ex US IMI back to 1994; MSCI EAFE before 1994
Non-US Large-Cap Equity	MSCI ACWI ex US back to 2001; MSCI EAFE before 2001
Non-US Small-Cap Equity	MSCI ACWI ex US Small Cap
Emerging Markets Equity	MSCI Emerging Markets
Real Estate	FTSE NAREIT, NCREIF Property, and NCREIF ODCE (separately)
Diversified Inflation-Related	33.3% each Barclays TIPS, DJ Commodity, and FTSE NAREIT back to 1997; 50% each DJ Commodity and FTSE NAREIT before 1997
Marketable Alternatives	HFRI Fund of Funds; and 30% our US Equity series, 30% our Non-US Equity series, 20% our Core Fixed Income series, and 20% our Non-Core Fixed Income series (separately)
Non-Marketable Alternatives	Average of 2x our US Equity series and 2x our Non-Core Fixed Income series

In each case, we calculated the longest-term standard deviation of returns possible for the category. Then, we calculated the standard deviation of returns over the last ten years. The average of these two figures represents our base-case risk assumption.

Next, we examined the worst annual return for each proxy index, going back as far as possible into history. We assumed this return as the worst-case scenario. In some cases, the normal return distribution implied by our return and risk assumptions suggested that the worst-case scenario had less than a 2% probability (1 in 50 years) of occurring. In those cases, we adjusted our risk assumption upward until the worst-case scenario had at least a 2% probability of occurring under our assumed normal return distribution. To perform this probability analysis for private real estate, we examined rolling two-year periods to account for the fact that declines, as measured by appraisals and illiquidity, occur more slowly than in public markets.

Finally, based on this analysis and our qualitative assessment of the quality and longevity of our return data, we made several qualitative adjustments, where noted.

The results of this risk analysis follow.

The following table depicts actual standard deviations of annual return, measured in the long term (as far back as history will allow), for the last ten years, and the average of those two figures.

Adding or subtracting our qualitative adjustment results in the Risk Assumption at the far right.

| | Standard Deviation of Returns | | | | |
	Long Term	10 Years	Average	Qualitative Adjustment	Risk Assumption (Rounded)
Inflation	5.00%	1.15%	3.08%		3.00%
Cash Equivalents	3.13%	1.87%	2.50%		2.50%
Low-Duration Fixed Income	4.42%	1.83%	3.12%		3.00%
Core Fixed Income	6.84%	1.63%	4.23%		4.25%
Core-Plus Fixed Income	5.18%	3.36%	4.27%	1.00%	5.25%
Non-Core Fixed Income	13.31%	15.78%	14.55%		14.50%
Long-Duration Fixed Income	10.91%	5.72%	8.31%	2.50%	10.75%
TIPS	5.30%	5.12%	5.21%		5.25%
US Equity	17.63%	19.03%	18.33%	1.25%	19.50%
US Large-Cap Equity	17.70%	18.89%	18.29%	1.25%	19.50%
US Small-Cap Equity	19.44%	22.09%	20.76%	1.00%	21.75%
Non-US Equity	23.53%	26.51%	25.02%		25.00%
Non-US Large-Cap Equity	23.00%	25.95%	24.48%		24.50%
Non-US Small-Cap Equity	27.88%	33.27%	30.58%	-3.00%	27.50%
Emerging Markets Equity	35.84%	36.85%	36.34%	-6.00%	30.25%
Real Estate	21.15%	24.52%	22.83%	-4.00%	18.75%
Diversified Inflation-Related	12.70%	15.48%	14.09%	1.00%	15.00%
Marketable Alternatives	10.54%	10.30%	10.42%	2.25%	12.75%
Non-Marketable Alternatives	28.52%	34.07%	31.30%		31.25%

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The following table examines the probability of the actual experienced worst case occurring under our assumed normal distribution of returns, as implied by our expected return and standard deviation of returns.

	Worst Year		Actual Worst Case, in Sigmas from Assumption	Implied Probability of Actual Worst Case Occurring
Cash Equivalents	0.04%	(2011)	0.41	68.14%
Low-Duration Fixed Income	0.55%	(1994)	0.44	65.86%
Core Fixed Income	-2.92%	(1994)	1.15	24.93%
Core-Plus FI	-4.26%	(1994)	1.28	20.16%
Non-Core Fixed Income	-18.86%	(2008)	1.65	9.86%
Long-Duration Fixed Income	-7.65%	(1999)	1.03	30.43%
TIPS	-2.35%	(2008)	0.82	41.32%
US Equity	-37.31%	(2008)	2.29	2.19%
US Large-Cap Equity	-37.60%	(2008)	2.31	2.11%
US Small-Cap Equity	-33.79%	(2008)	1.93	5.41%
Non-US Equity	-45.99%	(2008)	2.22	2.64%
Non-US Large-Cap Equity	-45.24%	(2008)	2.23	2.55%
Non-US Small-Cap Equity	-50.01%	(2008)	2.19	2.87%
Emerging Markets Equity	-53.33%	(2008)	2.12	3.36%
Real Estate	-42.23%	(1974)	2.64	0.83%
Diversified Inflation-Related	-28.61%	(2008)	2.22	2.66%
Marketable Alternatives	-21.37%	(2008)	2.14	3.23%
Non-Marketable Alternatives	-56.17%	(2008)	2.18	2.91%

Alternate benchmarks for Real Estate and Non-Marketable Alternatives:

NCREIF Property (2 Years)	-22.23%	(2008-9)	1.58	11.43%
NCREIF ODCE (2 Years)	-36.79%	(2008-9)	2.35	1.87%
Marketable Alternatives (build-up)	-27.71%	(2008)	2.64	0.83%

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Our qualitative adjustments to Risk were as follows:

Core-Plus Fixed Income (+1.00%)

> While long-term volatility for our modeled Core-Plus series has been lower than that for Core Fixed Income, because of diversification effects, recent (last 10 years) volatility has been more than twice as high. Our modest upward adjustment further weighs our calculation toward the recent past.

Long-Duration Fixed Income (+2.50%)

> We adjusted the risk expectation upward by 250 basis points. Recent volatility (last ten years: 5.72%) has been approximately half of long-term volatility (10.91%), in a declining rate environment. Our adjustment acknowledges the potential for rising rates.

US Equity, US Large-Cap Equity, and US Small-Cap Equity (+1.25%, +1.25%, +1.00%)

> These categories were adjusted upward to make their actual worst-case experience greater than a 2% probability of occurring under the assumed distribution.

Non-US Small-Cap Equity (-3.00%)

> Given the limited history for a public-market proxy for this asset class, we are reluctant to rely too heavily on historically measured volatility. As such, we adjusted the risk downward such that its actual worst-case (2008) represents an approximately 3% probability of occurrence under the assumed distribution.

Emerging Markets Equity (-6.00%)

> Given the limited history for a public-market proxy for this asset class, we are reluctant to rely too heavily on historically measured volatility. As such, we adjusted the risk downward such that its actual worst-case (2008) represents an approximately 3% probability of occurrence under the assumed distribution.

Real Estate (-4.00%)

> This downward adjustment acknowledges that the public market proxy we have chosen to represent Core Real Estate includes some riskier non-core elements. We have adjusted the assumption such that the 2008 experience for REITs, and the combined 2008/2009 experience for core open-ended private real estate funds, represents an approximate 2% probability of occurrence under our assumed distribution. Under this revised risk assumption, the NCREIF ODCE's actual 2008/2009 experience had a 1.87% probability of occurring (approximately 1 in 50 years).

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Diversified Inflation-Related (+1.00%)

This increase to risk reflects the fact that the measured volatility of the asset category uses data only back to 1991, a period of benign inflation. It also makes the worst-case experience of our asset proxy at least a 2% probability of occurrence.

Marketable Alternatives (+2.25%)

This adjustment averages our two approaches for modeling the history for this asset category. The upward adjustment makes the risk assumption halfway between the historically measured volatility of each approach.

CORRELATION COEFFICIENTS

Our forward-looking correlations are more conservative than history has delivered. Our process first identifies a reasonable proxy for each asset category, typically an index that represents the asset class. For several asset classes, we have used our judgment to construct a proxy return stream for the asset class that either has a longer history for evaluation, or to construct a marketable proxy for a non-marketable asset.

Our correlation assumptions are based on these return streams:

Inflation	US CPI
Cash Equivalents	91-Day T-Bills
Low-Duration Fixed Income	Barclays 1-3 Year Government/Credit
Core Fixed Income	Barclays US Aggregate
Non-Core Fixed Income	50% ML High Yield Master II, 50% JP Morgan EMBI back to 1994; 100% ML High Yield Master II before 1994
Long-Duration Fixed Income	Barclays Long Government/Credit
TIPS	Barclays US TIPS
US Equity	Russell 3000 back to 1979; S&P 500 before 1979
US Large-Cap Equity	Russell 1000 back to 1979; S&P 500 before 1979
US Small-Cap Equity	Russell 2000
Non-US Equity	MSCI ACWI ex US IMI back to 1994; MSCI EAFE before 1994
Non-US Large-Cap Equity	MSCI ACWI ex US back to 2001; MSCI EAFE before 2001
Non-US Small-Cap Equity	MSCI ACWI ex US Small Cap
Emerging Markets Equity	MSCI Emerging Markets
Real Estate	FTSE NAREIT, NCREIF, and NCREIF ODCE
Diversified Inflation-Related	33.3% each Barclays TIPS, DJ Commodity, and FTSE NAREIT back to 1997; 50% each DJ Commodity and FTSE NAREIT before 1997
Marketable Alternatives	HFRI Fund of Funds
Non-Marketable Alternatives	Average of 2x the Non-Core Fixed Income series and 2x the US Equity series

Using those streams, we constructed a correlation matrix that takes the simple average of four other correlation matrices – constructed with 3 years, 5 years, and 10 years of data, and one with as much data as possible going back to each series' inception.

We made qualitative adjustments only to the real estate correlation coefficients. Our assumed coefficients for real estate average the calculated coefficients for public REITs and private core real estate.

Finally, we ran our calculated correlation coefficients through the Ibbotson statistical correlation matrix tester, which made slight adjustments to ensure that the matrix is positive semi-definite.

Our assumed correlation matrix follows on the next page.

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Sellwood Consulting 2013 Correlation Coefficient Assumptions

	Inflation	Cash Equivalents	Low-Duration Fixed Income	Core Fixed Income	Core-Plus Fixed Income	Non-Core Fixed Income	Long-Duration Fixed Income	TIPS	US Equity	US Large-Cap Equity	US Small-Cap Equity	Non-US Equity	Non-US Large-Cap Equity	Non-US Small-Cap Equity	Emerging Markets Equity	Real Estate	Diversified Inflation-Related	Marketable Alternatives	Non-Marketable Alternatives
Inflation	1.00	0.23	-0.10	-0.18	-0.10	0.04	-0.24	0.07	0.06	0.06	0.07	0.04	0.04	0.10	0.07	0.05	0.15	0.20	0.07
Cash Equivalents	0.23	1.00	0.17	-0.08	-0.09	-0.07	-0.14	-0.08	-0.02	-0.02	0.00	0.00	0.00	-0.02	0.01	0.00	0.05	0.11	-0.03
Low-Duration Fixed Income	-0.10	0.17	1.00	0.78	0.70	0.27	0.53	0.57	0.01	0.01	-0.05	0.09	0.09	0.07	0.06	0.10	0.19	0.03	0.08
Core Fixed Income	-0.18	-0.08	0.78	1.00	0.88	0.31	0.91	0.71	-0.03	-0.03	-0.10	0.02	0.02	0.01	0.00	0.11	0.17	-0.06	0.07
Core-Plus Fixed Income	-0.10	-0.09	0.70	0.88	1.00	0.71	0.75	0.74	0.29	0.30	0.22	0.36	0.35	0.38	0.37	0.37	0.49	0.28	0.45
Non-Core Fixed Income	0.04	-0.07	0.27	0.31	0.71	1.00	0.19	0.43	0.71	0.71	0.66	0.75	0.74	0.78	0.77	0.55	0.74	0.66	0.84
Long-Duration Fixed Income	-0.24	-0.14	0.53	0.91	0.75	0.19	1.00	0.60	-0.10	-0.09	-0.16	-0.05	-0.06	-0.07	-0.08	0.04	0.07	-0.12	-0.02
TIPS	0.07	-0.08	0.57	0.71	0.74	0.43	0.60	1.00	0.09	0.09	0.04	0.16	0.16	0.21	0.20	0.20	0.41	0.19	0.21
US Equity	0.06	-0.02	0.01	-0.03	0.29	0.71	-0.10	0.09	1.00	1.00	0.94	0.84	0.84	0.84	0.81	0.61	0.75	0.71	0.93
US Large-Cap Equity	0.06	-0.02	0.01	-0.03	0.30	0.71	-0.09	0.09	1.00	1.00	0.93	0.84	0.84	0.84	0.81	0.61	0.74	0.70	0.93
US Small-Cap Equity	0.07	0.00	-0.05	-0.10	0.22	0.66	-0.16	0.04	0.94	0.93	1.00	0.79	0.79	0.81	0.78	0.62	0.73	0.67	0.88
Non-US Equity	0.04	0.00	0.09	0.02	0.36	0.75	-0.05	0.16	0.84	0.84	0.79	1.00	1.00	0.97	0.90	0.51	0.76	0.78	0.85
Non-US Large-Cap Equity	0.04	0.00	0.09	0.02	0.35	0.74	-0.06	0.16	0.84	0.84	0.79	1.00	1.00	0.96	0.89	0.52	0.77	0.76	0.86
Non-US Small-Cap Equity	0.10	-0.02	0.07	0.01	0.38	0.78	-0.07	0.21	0.84	0.84	0.81	0.97	0.96	1.00	0.93	0.51	0.77	0.83	0.86
Emerging Markets Equity	0.07	0.01	0.06	0.00	0.37	0.77	-0.08	0.20	0.81	0.81	0.78	0.90	0.89	0.93	1.00	0.49	0.73	0.79	0.83
Real Estate	0.05	0.00	0.10	0.11	0.37	0.55	0.04	0.20	0.61	0.61	0.62	0.51	0.52	0.51	0.49	1.00	0.83	0.48	0.76
Diversified Inflation-Related	0.15	0.05	0.19	0.17	0.49	0.74	0.07	0.41	0.75	0.74	0.73	0.76	0.77	0.77	0.73	0.83	1.00	0.64	0.81
Marketable Alternatives	0.20	0.11	0.03	-0.06	0.28	0.66	-0.12	0.19	0.71	0.70	0.67	0.78	0.76	0.83	0.79	0.48	0.64	1.00	0.73
Non-Marketable Alternatives	0.07	-0.03	0.08	0.07	0.45	0.84	-0.02	0.21	0.93	0.93	0.88	0.85	0.86	0.86	0.83	0.76	0.81	0.73	1.00

SOURCES

We are grateful to several sources for our analysis. They were:

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