APPENDIX K

Capital Market Assumptions and Projections

Treasury 2010

To do the capital market modeling required to allocate the assets in the various funds managed by Treasury, the Department of Revenue employs an independent consulting firm to make capital market projections and to use those projections in capital market models. The firm currently under contract, Callan Associates, Inc., specializes in developing information to help fund managers make their asset allocation decisions.

The capital market projections consist of: (1) the expected returns of the pertinent asset classes; (2) the expected future volatility of those expected returns measured using the statistical benchmark, standard deviation; and (3) the correlations of the expected returns among the various asset classes.

Callan Associates uses four steps to form their capital market expectations:

1. Develop a five year economic outlook for the United States and other major industrial economies;
2. Examine the historical relationships between major economic and financial variables and five year asset returns;
3. Examine historical interrelationships of performance characteristics among the individual asset classes; and
4. Perform a qualitative review of the conclusions reached in items 1, 2 and 3 by a firm policy review committee.

To develop a five-year economic outlook, Callan Associates uses a combination of in-house empirical models and consensus forecasts from leading economists. The economic outlook broadly determines the capital market expectations for each asset class. Callan employs five-year projections because that is a sufficient amount of time to cover most market cycles.

Next, Callan examines the historical relationship between major economic variables and then projects the expected returns over subsequent five-year periods for each asset class. For example, equities are more likely to do well when the economy is expanding. Similarly, bonds are more likely to have strong returns when inflation is low. The estimates for economic growth and inflation are incorporated into the expected returns for each of the asset classes by accounting for the effects of a large number of variables.

Callan considers both market valuations and expected risk premiums to derive return projections. Market valuations indicate the prices investors would likely be willing to pay for the benefits of owning different types of securities. For example, in a stable, low inflation environment, investors are willing to accept a lower risk premium to invest in the equity market.

While the first two steps are forecasts of the economic and investment environment looking forward over the next five years, step three is an examination of the historic returns and risks, and the correlation of the returns of the respective asset classes that have persisted over the last several decades. The correlation measures (using the statistical measure of a “correlation coefficient”) the association or co-movement among the returns of various classes of assets. Correlation coefficients can vary from 1 to -1. If the returns of one security or asset class move in tandem with the returns of another security or asset class, the returns have a correlation of one. If the two securities’ or asset classes’ returns have a completely inverse relationship, the correlation coefficient will be

a minus one. If the two securities or asset classes' returns are completely unrelated to each other or are random, the correlation coefficient will be zero. The table on the following page sets forth Callan Associates' 2010 correlation matrix between asset classes:

Correlation Matrix																					
	Equity - Broad Market	Large Cap	Small /Mid Cap	Global Ex US	International Equity	Emerging Markets	Bonds Gov 1-5	Domestic Fixed	Intermediate Treasury	Treasury Bonds	TIPS	High Yield	Non US Fixed	Real Estate	Farmland/ Timber	Real Assets	Absolute Return	LEI Plus	Private Equity	Commodities	Cash Equivalents
Equity - Broad Market	1.00	0.98	0.94	0.78	0.72	0.83	0.00	0.13	0.12	0.15	0.03	0.60	-0.03	0.60	0.64	0.62	0.63	0.56	0.90	0.18	-0.12
Large Cap	0.98	1.00	0.92	0.78	0.72	0.82	0.00	0.15	0.12	0.32	0.05	0.60	-0.01	0.60	0.60	0.60	0.62	0.00	0.89	0.20	-0.10
Small/Mid Cap	0.94	0.92	1.00	0.73	0.67	0.77	0.00	0.12	0.12	0.28	-0.02	0.56	-0.07	0.55	0.55	0.55	0.56	0.00	0.87	0.16	-0.15
Global Ex US	0.78	0.78	0.73	1.00	0.98	0.85	-0.05	0.13	0.09	0.13	-0.02	0.50	0.09	0.56	0.58	0.57	0.55	0.00	0.88	0.23	-0.20
International Equity	0.72	0.72	0.67	0.98	1.00	0.74	-0.05	0.14	0.10	0.26	-0.01	0.47	0.15	0.54	0.54	0.54	0.53	0.60	0.84	0.23	-0.20
Emerging Markets	0.83	0.82	0.77	0.85	0.74	1.00	-0.10	0.07	0.01	0.20	-0.05	0.51	-0.07	0.52	0.52	0.52	0.52	0.00	0.84	0.20	-0.15
Bonds Gov 1-5	0.00	0.00	0.00	-0.05	-0.05	-0.10	1.00	0.85	0.78	0.80	0.50	0.05	0.30	0.00	0.00	0.00	0.15	-0.09	0.00	0.00	0.40
Domestic Fixed	0.13	0.15	0.12	0.13	0.14	0.07	0.85	1.00	0.85	0.88	0.60	0.25	0.38	0.15	0.15	0.20	0.33	0.13	0.04	0.04	0.30
Intermediate Treasury	0.12	0.12	0.12	0.09	0.10	0.01	0.78	0.85	1.00	0.97	0.44	0.06	0.50	0.11	0.04	0.13	0.18	-0.07	0.00	0.00	0.21
Treasury Bonds	0.15	0.32	0.28	0.13	0.26	0.20	0.80	0.88	0.97	1.00	0.45	0.04	0.47	0.10	0.10	0.14	0.20	0.00	0.02	0.00	0.19
TIPS	0.03	0.05	-0.02	-0.02	-0.01	-0.05	0.50	0.60	0.44	0.45	1.00	0.15	0.30	0.05	0.05	0.14	0.20	0.00	-0.05	0.25	0.20
High Yield	0.60	0.60	0.56	0.50	0.47	0.51	0.05	0.25	0.06	0.04	0.15	1.00	0.09	0.50	0.51	0.52	0.44	0.00	0.52	0.10	0.07
Non US Fixed	-0.03	-0.01	-0.07	0.09	0.15	-0.07	0.30	0.38	0.50	0.47	0.30	0.09	1.00	0.01	0.01	0.04	0.11	0.00	-0.01	0.10	0.10
Real Estate	0.60	0.60	0.55	0.56	0.54	0.52	0.00	0.15	0.11	0.10	0.05	0.50	0.01	1.00	0.88	0.97	0.43	0.00	0.60	0.10	-0.06
Farmland/Timber	0.64	0.60	0.55	0.58	0.54	0.52	0.00	0.15	0.04	0.10	0.05	0.51	0.01	0.88	1.00	0.92	0.43	0.00	0.62	0.12	-0.04
Real Assets	0.62	0.60	0.55	0.57	0.54	0.52	0.00	0.20	0.13	0.14	0.14	0.52	0.04	0.97	0.92	1.00	0.45	0.00	0.60	0.13	-0.03
Absolute Return	0.63	0.62	0.56	0.55	0.53	0.52	0.15	0.33	0.18	0.20	0.20	0.44	0.11	0.43	0.43	0.45	1.00	0.00	0.55	0.20	0.15
LEI Plus	0.56				0.60		-0.09	0.13	-0.07									1.00	0.00	0.00	-0.01
Private Equity	0.90	0.89	0.87	0.88	0.84	0.84	0.00	0.04	0.00	0.02	-0.05	0.52	-0.01	0.60	0.62	0.60	0.55		1.00	0.15	-0.10
Commodities	0.18	0.20	0.16	0.23	0.23	0.20	0.00	0.04	0.00	0.00	0.25	0.10	0.10	0.15	0.12	0.13	0.20		0.15	1.00	0.15
Cash Equivalents	-0.12	-0.10	-0.15	-0.20	-0.20	-0.15	0.40	0.30	0.21	0.19	0.20	0.07	0.10	-0.06	-0.04	-0.03	0.15	-0.01	-0.10	0.15	1.00

The final step in Callan's process is qualitative. Callan Associates' client policy review committee comprised of six of their senior consultants meets to evaluate the data they have used to insure its accuracy and relevance. The review typically requires many meetings and concludes with a formal adoption of the capital market projections. For 2010, the committee adopted the following five year annualized expected median returns:

Asset Class	Expected Return (%)	Expected Risk (%)
Equities		
Broad Market	8.52	17.29
Large Cap	8.30	16.00
Small/Mid Cap	9.00	23.00
Global Ex US	8.68	19.77
International Equity	8.30	19.30
Emerging Markets	8.80	27.00

Asset Class	Expected Return (%)	Expected Risk (%)
Fixed Income		
Domestic Fixed Income	4.48	4.50
Intermediate Treasury	4.21	3.50
Intermed. Term (Gov1-5)	3.76	3.00
Treasury Bonds	3.94	5.00
TIPS	4.19	6.00
High Yield	6.13	11.25
Non-US Fixed Income	4.01	9.60
Other		
Real Estate	6.82	16.10
Farmland/Timber	6.95	16.25
Real Assets	6.59	12.73
Absolute Return	6.10	10.00
LEI Plus	8.31	10.00
Alternative Investments	9.66	38.00
Commodities	4.40	22.50
Cash Equivalents	3.03	0.80

Economic Variables		
Inflation	2.75	1.40

Callan Associates reviews their capital market projections each year.