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To: Investment Advisory Committee Members

From: Kevin SigRist

CC: Steve Toole, Sam Watts, and Blake Thomas

Date: January 5, 2016

Subject: January 8, 2016 Meeting Memo

The Retirement Boards are scheduled to consider the North Carolina Retirement Systems' ("NCRS") discount rate/investment return assumption on January 21, 2016. Mike Mebane and John Aneralla are members of the Retirement Boards and there is interest in having the full Investment Advisory Committee ("IAC") discuss:

1. What investment returns the NCRS can reasonably earn over various horizons.
2. The sensitivity of projected NCRS returns to different assumptions.

At the January 8, 2016, IAC meeting, our principal goal is to take input from the IAC and ascertain if there is a consensus on projected NCRS returns under the current asset allocation policy. The expectation is that IMD would present any IAC consensus and key discussion points to the Retirement Board later in January. If the IAC wants to refresh the asset liability modeling, we can put that item on the agenda for a future IAC meeting.

This memo is structured with four sections.

1. Background on the 2013-14 Asset Liability Study ("2013-14 Study") conducted by the Investment Management Division ("IMD") and Buck Consultants, including NCRS return projections.
2. Discussion of a hypothetical scenario that assumes an equity risk premium that is materially more conservative than historical experience ("Low Equity Risk Premium Scenario").
3. Investment return projections in a Low Equity Risk Premium Scenario.
4. Implications of the analysis.

To summarize the key points discussed below:

1. IMD remains comfortable with the assumptions and return projections from the 2013-14 Study.
2. Even after conservatively lowering the equity risk premium by an additional 100 basis points, over 30 years, the NCRS is still projected to annually earn close to the 7.25% actuarial assumed rate of return.
3. In the low return environment projected for at least the next 10 years, investment flexibility, active management, cost-effectiveness, and risk management become increasingly important.

Background on the 2013-14 Asset Liability Study

The 2013-14 Study was used to develop a Strategic Asset Allocation and to update the NCRS Investment Policy Statement (“IPS”). IMD partnered with Buck Consultants to conduct significant portions of the 2013-14 Study. Buck Consultants uses GEMS®, an economic scenario generator, to model economic and capital market environments in combination with an actuarial model of the NCRS’ liabilities. GEMS is recalibrated regularly to reflect changing market conditions and trends to long-term equilibriums that track historical experience in a variety of economic and capital market environments. In other words, the GEMS baseline exhibits a generalized long-term reversion to historical average returns.

The 2013-14 Study was conducted in the context of IMD’s long-term economic and financial market outlook and certain core investment beliefs. The baseline economic and financial market outlook included:

1. Initially very low interest rates, moderately rising over the intermediate-term.
2. Moderately rising inflation.
3. Modest public equity market returns for the intermediate-term, with reversion toward higher historical averages over the long-term.
4. Some benefits to diversification, but all investment approaches would be impacted by the low return environment.

Additionally, IMD believed that economic and financial market “fragility” would persist over the intermediate-term. The fragility was attributed to continued high reliance on global policy makers in the face of unprecedented fiscal and monetary interventions, cyclical headwinds, and structural imbalances. The fragility was an important consideration because it created two distinct risk scenarios as alternative outcomes to the baseline:

1. U.S. economy has less momentum than expected. Emerging-market balance of payment issues and delayed European normalization. Susceptibility to systemic shocks.
2. Global growth surprises on upside. Inflation rises more than expected. Susceptibility to supply shocks.

After consultation with Buck Consultants and the IAC in the fall of 2013, changes were made to the baseline GEMS assumptions to be more consistent with the IMD outlook and perspective on asset class risk. The most impactful changes were:

1. Initial Treasury yields were recalibrated to a more current date, and forecasts were modified from the baseline GEMS results to better correspond to the forward yield curve.
2. Lowering the equity risk premium by 100 basis points over the 30-year horizon. As indicated in the September 2013 IAC meeting, IMD’s research estimated a market consensus intermediate- to long-term equity risk premium of about 450 basis points compared to the GEMS baseline of 565 basis points.¹

Individual asset class assumptions will be discussed in more detail in the next section and Appendix 1. Table 1 is from the 2013-14 Study and contains projected NCRS annualized returns over various horizons given a passive implementation of the approved Strategic Asset Allocation. The projections support the long-term consistency of the Strategic Asset Allocation with the 7.25% actuarial assumed rate of return. The projections also show that, over the next ten years, the NCRS is unlikely to achieve the 7.25% return, although the lower returns are expected to be partially offset by low inflation and active investment management strategies.

¹ These figures are a geometric calculation of the equity risk premium. IMD’s market research included reviewing asset allocation assumptions of roughly 20 academics, consultants, investment managers, investment banks, and broker/dealers.

Table 1: Projected Annualized Compound Passive NCRS Investment Returns from 2013-14 Study

Horizon	5 th Percentile	25 th Percentile	Average	75 th Percentile	95 th Percentile
10 Years	0.0%	3.6%	6.1%	8.3%	11.9%
20 Years	2.6%	5.4%	7.3%	9.1%	11.7%
30 Years	3.8%	6.2%	7.8%	9.3%	11.8%

Source: IMD and Buck Consultants as of December 2013

As part of the 2013-14 Study, the IAC discussed adopting a Strategic Asset Allocation that would target a 7.25% annualized return over the next ten years, but recognized that such a strategy would increase the NCRS return volatility by more than 30%. There was no appetite to adopt such a strategy given the high aggregate funded status of the NCRS, the General Assembly's historical funding discipline, and the importance of conservatively managing trends/volatility in contribution rates. There was material concern about exposing the NCRS to potential contribution rate increases of a size that could threaten the long-term sustainability of the NCRS.

Low Equity Risk Premium Scenario

At previous meetings of the IAC and the Retirement Boards, interest was expressed in IMD updating the asset allocation assumptions to reflect 2016 capital market conditions and to explore a scenario where long-term public equity returns are more muted. Given time limitations around the Retirement Board's annual assumption review schedule, IMD worked with Buck Consultants to create a single Low Equity Risk Premium Scenario that is discussed in this section.

As a starting point, Buck Consultants provided the fourth quarter 2014 GEMS baseline asset class return, risk, and correlation assumptions. Next, IMD:

1. Updated data on various fixed income markets and tenors for yields (i.e., current market and forward curves) and inter-market spreads.
2. Polled consultants, investment managers, investment banks, and broker/dealers for their asset allocation assumptions and received 8 responses.
3. Reviewed the 2015 edition of the Survey of Capital Market Assumptions by Horizon Actuarial Services, LLC (www.horizonactuarial.com). This survey collates information from 29 investment advisors that predominantly serve multi-employer pension plans.
4. Reviewed the Credit Suisse Global Investment Returns Sourcebook 2015, authored by Elroy Dimson, Paul Marsh, and Mike Staunton. This publication is an annual update of a seminal long-term study of global capital markets that endeavored to address material "survivor" and "success" biases in commonly utilized historical equity, bonds, bills, currency, and inflation databases.² Based on their analysis of the factors driving global historical investment returns, the authors provide forward-looking estimates of certain key parameters that they believe are reasonable for long-term asset allocation, stock valuation, regulatory, and capital budgeting applications.
5. Reviewed updated real estate core and non-core fund performance from Courtland Partners, a recent academic study of real estate fund performance,³ and current real estate market conditions.

² Elroy Dimson, Paul Marsh, and Mike Staunton, *Triumph of the Optimists: 101 Years of Global Investment Returns*, Princeton University Press, 2002.

³ Joseph L. Pagliari, Jr., *Real Estate Returns by Strategy: Have Value-Added and Opportunistic Funds Pulled Their Weight*, October 2015.

To create the Low Equity Risk Premium Scenario, IMD had Buck Consultants make adjustments to the GEMS baseline assumptions for the 30-year horizon (Table 2). These adjustments have a cascading effect throughout the projection periods (i.e., 10-year and 20-year horizons) and across certain asset classes that have embedded common factors (notably fixed income). The resulting Low Equity Risk Premium Scenario assumptions and a comparison to those used in the 2013-14 Study are shown in Appendix 1.

Table 2: Description of IMD Requested Adjustments to create Low Equity Risk Premium Scenario

NCRS Asset Class	NCRS Sub Asset Class	Requested Adjustments to 30-Year Arithmetic GEMS Baseline	SAA Policy Weight
Public Equity	Long Only Public Equity	Reduce return assumption so equity risk premium over cash is about 500 basis points ⁴	39.06%
	Hedged Equity	Return assumption modeled as 0.4 * Public Equity + 250 basis points; risk adjusted similarly downward	2.94%
Private Equity	Private Equity	Return assumption equals US Small Cap + 300 bps	6.00%
Non-Core Real Estate	Non-Core Real Estate	Return assumption modeled as Core Real Estate + 200 basis points; risk approximates 20%	3.00%
Opportunistic Fixed Income	Distressed and Long-Short Credit	Use HFRI distressed hedge fund index to model returns and risk	3.50%
	High Yield	Return assumption should be modeled to 500 basis points over Intermediate Treasury Performance	3.50%
Investment Grade Fixed Income	Government Bonds	Use current yields and 3 year out forward curve combined with GEMS 5yr+ maturity index to model returns	7.56%
	Corporate Bonds	Use current yields and 3 year out forward curve combined with GEMS 5yr+ maturity index to model returns	8.82%
	Mortgage-Backed Securities	Use current yields and 3 year out forward curve	8.82%
Cash	Cash	Use current yields and 3 year out forward curve	3.80%
Inflation Sensitive	TIPS	Use current yields and 3 year out forward curve combined with GEMS short term TIPS (1yr-5yr) to model returns	1.98%
	Publicly Traded Natural Resources	Reduce return assumption so commodities return roughly 250 basis points over cash	1.02%
	Private Natural Resources/Real Assets	Model as infrastructure	3.00%
Core Real Estate	Private Equity Core Real Estate	Reduce return assumption so direct real estate return approximates 700 basis points; risk equaling 10%	4.00%
	Public Equity Core Real Estate	Use GEMS REIT assumptions	1.00%
Multi-Strategy	Multi-Strategy	Use GEMS diversified hedge fund assumptions	2.00%
Total			100.00%

Source: IMD

NCRS Investment Return Projections in Low Equity Risk Premium Scenario

Table 3 shows the projected outcomes of the NCRS' annualized returns over various horizons given a passive implementation of the Strategic Asset Allocation and the Low Equity Risk Premium Scenario assumptions. The projected returns are somewhat lower than those shown in Table 1 from the 2013-14 Study, but show a similar pattern of increasing returns over time and a wide dispersion of potential outcomes.

⁴ The intent is to use a lower equity risk premium that adjusts for what some argue are non-repeatable factors that favored equities in the past, e.g., historical expansion of price/dividend ratio, historical growth rate of dividends, and historical dividend levels. See the Credit Suisse Global Investment Returns Sourcebook 2015 for an example of this analysis.

Table 3: Projected Annualized Compound Passive NCRS Returns in Low Equity Risk Premium Scenario

Horizon	5 th Percentile	25 th Percentile	Average	75 th Percentile	95 th Percentile
10 Years	0.3%	3.5%	5.5%	7.5%	10.7%
20 Years	2.3%	4.8%	6.4%	7.9%	10.3%
30 Years	3.5%	5.5%	7.0%	8.4%	10.5%

Source: IMD and Buck Consultants as of January 2016

There are two major reasons for the lower projected returns in Table 3 for the Low Equity Risk Premium Scenario compared to the 2013-14 Study. First, assumed returns on long-term bonds are lower across the 30-year horizon reflecting the 2016 yield curve and GEMS' future interest rate and inflation dynamics. Second, IMD requested that Buck Consultants lower the equity risk premium by about 100 basis points more than in the 2013-14 Study to construct a much more conservative scenario. Table 4 illustrates the equity return and risk premium adjustments requested by IMD for the 30-year horizon for the 2013-14 Study and the Low Equity Risk Premium Scenario.

Table 4: Comparison of Equity Return and Implied Risk Premium Assumptions for 30-year Horizon

	2013-14 Study GEMS*	2013-14 Study IMD Adjusted	Current GEMS*	Low Equity Risk Premium Scenario
Equity Return (Arithmetic)	10.61%	9.44%	10.29%	8.29%
Equity Volatility	16.46%	17.00%	16.50%	16.50%
Cash Return	3.63%	3.63%	3.35%	3.35%
Equity Risk Premium (Geometric)	5.63%	4.37%	5.72%	3.69%
Equity Return (Geometric)	9.26%	8.00%	9.07%	7.04%

* These figures reflect a recalibration of GEMS to implement IMD's provided current and forward yield curve data.

Source: IMD and Buck Consultants

Investment Implications of the Analysis

Tepid global economic growth and low inflationary pressures over the last several years have pushed out material interest rate increases and could further depress longer-term returns on bonds. However, the assumptions utilized for the 2013-14 Study remain generally consistent with the updated information IMD obtained through direct and indirect surveys of market participants. As a result, IMD remains generally comfortable with the assumptions and the return projections of the 2013-14 Study. Nonetheless, we understand the importance of periodically updating the key assumptions and examining alternative scenarios and are not averse to updating the asset liability study.

We draw two primary investment implications from the analysis of the Low Equity Risk Premium Scenario:

1. The 30-year projection under the Low Equity Risk Premium Scenario remains reasonably close to the 7.25% actuarial assumed rate of return. Notably, IMD produced annual returns in excess of the passive benchmark of 0.40% - 0.50% after deduction of fees and expenses over the 10 and 15 years ended June 30, 2015.
2. Under both sets of assumptions a low return environment occurs for the next 10 years and may persist for longer. In such an environment, investment flexibility, active management, cost-effectiveness, and risk management become increasingly important.

- a. Allocating additional capital outside of public equity and investment grade bonds, such as to real estate and other longer-term private investments, may improve projected returns while maintaining an acceptable risk profile.
- b. Using active management strategies in an attempt to beat passive market returns implies a potentially more complex investment program and requires significant investment and resource flexibility.

Please contact me should there be any questions or additional information IAC members would like to receive before the meeting.

We look forward to discussing this important topic.

Appendix 1: Comparison of “2013-14 Study” Assumptions and “Lower Equity Risk Premium Scenario”

(For convenience, the Low Equity Risk Premium Scenario is labeled “2016” in the following table)

Capital Market Assumptions - Expected Returns							
NCRS Asset Class	NCRS Sub Asset Class	10 Year		20 Year		30 Year	
		2013	2016	2013	2016	2013	2016
Public Equity	Long Only Public Equity	8.40%	7.20%	9.16%	7.83%	9.44%	8.29%
	Hedged Equity	5.85%	5.38%	6.16%	5.63%	6.28%	5.82%
Private Equity	Private Equity	11.35%	11.39%	13.60%	12.80%	14.58%	13.77%
Non-Core Real Estate	Non-Core Real Estate	7.99%	6.91%	9.40%	8.22%	10.00%	9.22%
Opportunistic Fixed Income	Corporate - Non IG	6.56%	8.20%	8.93%	8.92%	10.20%	9.41%
IG Fixed Income	Government	3.19%	1.55%	4.69%	2.86%	5.49%	3.81%
	Corporate	4.09%	3.01%	5.73%	4.27%	6.58%	5.09%
	Mortgage	2.82%	1.81%	4.39%	3.16%	5.16%	4.00%
Cash	Cash	1.97%	1.86%	3.04%	2.76%	3.63%	3.35%
Inflation Sensitive	TIPS	1.79%	5.22%	3.00%	6.53%	3.65%	7.32%
	Publicly Traded Natural Resources	4.44%	3.51%	4.58%	4.84%	4.64%	5.69%
	Private Natural Resources/Real Assets	9.28%	7.81%	9.39%	8.64%	9.43%	9.28%
Core Real Estate	Private Equity Core Real Estate	5.15%	6.05%	6.78%	6.71%	7.76%	7.22%
	Public Equity Core Real Estate	5.78%	5.73%	7.01%	6.73%	7.53%	7.30%
Multi-Strategy	Multi-Strategy	6.48%	6.45%	8.59%	6.81%	9.65%	7.02%
* Arithmetic Expected Returns							

Capital Market Assumptions - Change in Expected Returns				
NCRS Asset Class	NCRS Sub Asset Class	10 Year	20 Year	30 Year
Public Equity	Long Only Public Equity	-1.20%	-1.33%	-1.15%
	Hedged Equity	-0.47%	-0.53%	-0.46%
Private Equity	Private Equity	0.04%	-0.80%	-0.81%
Non-Core Real Estate	Non-Core Real Estate	-1.08%	-1.18%	-0.78%
Opportunistic Fixed Income	Corporate - Non IG	1.64%	-0.01%	-0.79%
IG Fixed Income	Government	-1.64%	-1.83%	-1.68%
	Corporate	-1.08%	-1.46%	-1.49%
	Mortgage	-1.01%	-1.23%	-1.16%
Cash	Cash	-0.11%	-0.28%	-0.28%
Inflation Sensitive	TIPS	3.43%	3.53%	3.67%
	Publicly Traded Natural Resources	-0.93%	0.26%	1.05%
	Private Natural Resources/Real Assets	-1.47%	-0.75%	-0.15%
Core Real Estate	Private Equity Core Real Estate	0.90%	-0.07%	-0.54%
	Public Equity Core Real Estate	-0.05%	-0.28%	-0.23%
Multi-Strategy	Multi-Strategy	-0.03%	-1.78%	-2.63%
* Arithmetic Expected Returns				