2016 Real Return Asset Class Review

June 23-24, 2016
Tom Masthay, Director – Real Assets
Eddie Schultz, Investment Analyst
Rachel Cleak, Investment Analyst
Agenda

I. Executive Summary
II. Performance & Implementation Review
III. IPS Compliance & Portfolio Review
IV. Market Update: Real Return
V. Milestones & Initiatives
VI. Appendix – Manager Scorecards
I. Executive Summary
Real Return Asset Class Objectives

IPS Stated Objective for the Real Return Portfolio:
“The Real Return asset class is used for inflation protection, return enhancement and diversification.”

A primary goal of the annual review presentation is to discuss the real return portfolio and its construction relative to IPS stated performance goals:

- Long term performance objective is a rate of return of CPI + 4%, net of investment management fees.

  The performance review section analyzes this objective and associated benchmark indices.

- The real return portfolio is expected to generate returns net of all fees and expenses, in excess of their respective indices, over rolling five year investment time horizons.

  An initiative for 2015-2016 is to initiate a benchmark enhancement study.
Comprehensive Annual Review Process

Why do we conduct annual reviews?

Per the TMRS IPS, comprehensive reviews are to be conducted and documented at least annually. The goal is to formally review managers’ performance, current investment strategy or style relative to that which was communicated, and other issues related to the managers’ organization, personnel, or investment philosophy. The annual review process is part of the IPS manager retention framework.

The annual review & ongoing monitoring processes may include but are not limited to:

- SEC Form ADV reviews
- SSAE16 and other operational audit reviews
- Compliance Certifications
- Detailed Performance Analyses
- Manager Meetings
- Quarterly Monitoring Documentation
- Manager Annual Meetings
- Limited Partnership Advisory Committees
- Strategic Portfolio Reviews
- Meetings with comparable managers
- Market Research
- Attending Conferences

The Annual Review process holds TMRS accountable for being self-critical of its portfolio management process in order to preempt manager specific, strategic, or other potential problems.
# Real Return Timeline Review (2015-2016)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2 2015</td>
<td>• Contract with real return consultant Albourne signed.</td>
</tr>
<tr>
<td>Q3 2015</td>
<td>• Real Return allocation is doubled from 5% to 10% of the total plan allocation. Colchester Global, an inflation linked bond manager, was the only allocation at the time representing $1B of a $24B total TMRS portfolio.</td>
</tr>
<tr>
<td>Q4 2015</td>
<td>• December 2015 Board Meeting: Board approves $700 million of liquid real return mandates, $100 million of private real return mandates and a 2016 search processes in an amount up to $800 million in net new commitments.</td>
</tr>
<tr>
<td>Q1-Q2 2016</td>
<td>• Board approves 3 new private real return funds totaling $350 million in new commitments to bring the portfolio to approximately 84% allocated.</td>
</tr>
</tbody>
</table>
Manager Allocation & Market Value Summary

**Current Portfolio by Manager Weight**

- Colchester: 47%
- Nuveen: 17%
- Cohen & Steers: 17%
- Brookfield: 7%
- Magnetar: 4%
- AMERRA: 4%
- Orion: 4%

**2015 – 2016 Allocation Activity**

- Nuveen (liquid) - $350mm
- Cohen & Steers (liquid) - $350mm
- Brookfield (private) - $150mm
- Magnetar (private) – 100mm
- Orion (private) - $100mm
- AMERRA (private) - $100mm

$1.15 Billion

**Real Return Portfolio Value**

- 12/31/15 = $940mm
- 3/31/16 = $1,344mm

**Liquid Investments**

- Nuveen – Funded $350mm in March 2016
- Cohen & Steers – Funded $350mm in May 2016

**Private Investments**

- Magnetar – Closed December 2015
- Orion – Closed May 2016
- Brookfield – Closed May 2016
- AMERRA – Closing Expected June/July 2016

**As of 12/31/15 Colchester was the only manager with invested capital**
II. Performance & Implementation Review

Performance Review as of December 31, 2015
Colchester GILBs Performance

Performance Factors in 2015:
- Detractors: Overweight positions in Emerging Market Currencies
- Contributors: Bond Selection & Underweight to US TIPS

ITD Performance Analysis
- Strong Dollar has driven currency performance. Colchester may hedge exposures back to USD.
- Duration – Approximately 60% of bond returns are due to lower interest rates.

Cumulative Performance Inception to Date (since Feb. 2011)

<table>
<thead>
<tr>
<th></th>
<th>Bonds</th>
<th>Currency</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colchester</td>
<td>25.36%</td>
<td>-6.88%</td>
<td>18.48%</td>
</tr>
<tr>
<td>Benchmark</td>
<td>24.60%</td>
<td>-9.41%</td>
<td>15.19%</td>
</tr>
<tr>
<td>Relative to Benchmark</td>
<td>0.76%</td>
<td>2.53%</td>
<td>3.29%</td>
</tr>
</tbody>
</table>

*Returns Annualized – Colchester was the only manager as of 12/31/15 – Inception date of February 2011
The Real Return asset class is used for inflation protection, return enhancement and diversification. CPI + 400bps is the Strategic Benchmark.

Return Enhancement & Inflation Protection are contradictory objectives.
### TMRS Aggregate Liquid Real Return Benchmark

<table>
<thead>
<tr>
<th>Sector</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REITS</strong></td>
<td>10.0%</td>
</tr>
<tr>
<td>FTSE EPRA NAREIT Developed RE Index</td>
<td>5.7%</td>
</tr>
<tr>
<td><strong>Listed Infrastructure</strong></td>
<td>12.6%</td>
</tr>
<tr>
<td>S&amp;P Global Listed Infrastructure Index</td>
<td>5.8%</td>
</tr>
<tr>
<td>Wells Fargo Hybrid &amp; Preferred Securities REIT Index</td>
<td>3.7%</td>
</tr>
<tr>
<td>Dow Jones Brookfield Global Infrastructure Index</td>
<td>3.1%</td>
</tr>
<tr>
<td><strong>Commodities &amp; Natural Resource Equities</strong></td>
<td>9.8%</td>
</tr>
<tr>
<td>Bloomberg Commodity Index Total Return</td>
<td>5.7%</td>
</tr>
<tr>
<td>S&amp;P Global Natural Resources Index</td>
<td>3.1%</td>
</tr>
<tr>
<td>Gold Spot Price (Bloomberg)</td>
<td>1.0%</td>
</tr>
<tr>
<td><strong>Inflation Linked Bonds</strong></td>
<td>58.8%</td>
</tr>
<tr>
<td>Barclays World Inflation Linked Bonds Total Return</td>
<td>58.8%</td>
</tr>
<tr>
<td><strong>Corporate Fixed Income</strong></td>
<td>8.9%</td>
</tr>
<tr>
<td>Barclays US Corporate High Yield Index</td>
<td>3.7%</td>
</tr>
<tr>
<td>Barclays Global Capital Securities Index (High Yield)</td>
<td>3.1%</td>
</tr>
<tr>
<td>BofA Merrill Lynch 1-3 year US Corporate Index</td>
<td>2.1%</td>
</tr>
</tbody>
</table>

### Current TMRS Liquid Real Return Allocation by Sector

- **REITS**: 9%
- **Listed Infrastructure**: 10%
- **Commodities / Natural Resource Equities**: 12%
- **Inflation Linked Bonds**: 59%
- **Corporate Fixed Income**: 10%

**TMRS’ Benchmark is currently driven by Global Inflation Linked Bond Exposure.**

The TMRS Liquid Real Return Benchmark is a roll-up of underlying manager benchmarks. The portfolio has three positions: 1) Global Inflation linked bonds managed in an active-index strategy by Colchester Global ($1.0B); Diversified income focused mandate managed by Nuveen ($350mm); and 3) Equity and commodity oriented multi-asset mandate managed by Cohen & Steers ($350mm).
Private Real Return Portfolio Construction

Sources of Return

Magnetar Return Bridge

Orion Return Bridge

Brookfield Return Bridge

AMERRA Return Bridge

TMRS has focused on contracted yield with upside participation rights.
Real Return Portfolio Construction
A two-dimensional framework

- **Higher (E)Return**
  - Orion (Private Mining)
  - Magnetar (Private Energy)
  - Brookfield (Private Infrastructure)
  - AMERRA (Private Agriculture)
  - Nuveen (Traded Infrastructure, REITS)
  - Cohen & Steers (Diversified Public Markets)

- **Lower (E)Return**
  - Colchester (GILBS)

**Private Assets** will have inflation sensitivity depending on underlying assets, however, these assets will be marked to market more slowly.

**Public Assets** vary in the level of inflation beta. A mandate may do well in inflationary periods, but will it do well enough to provide inflation protection for TMRS’ total portfolio?
Real Return Portfolio Construction
Four Quadrant Approach

<table>
<thead>
<tr>
<th>Stock &amp; Bond Returns</th>
<th>Both Above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocks Below, Bonds Above</td>
<td></td>
</tr>
<tr>
<td>Protect Here</td>
<td>Stocks Above, Bonds Below</td>
</tr>
<tr>
<td>Both Below (22% of all observations)</td>
<td>Stocks LT Avg. 6.0% Bonds LT Avg.: 3.6%</td>
</tr>
</tbody>
</table>

Early implementation of the real return portfolio has focused on getting broadly diversified quickly. More refined tools help guide decisions regarding strategic levels of inflation beta, liquidity and targeted return profiles.

Diversified Real Assets Perform Strongly in Lower Left Quadrant

Sources: Cohen & Steers
In order to research and build into a strategic real return approach, TMRS has utilized a two staged process during its liquid mandate search process. Stage 1 of the process was comprised of requests for answers to three questions:

1) Given an opportunity cost of capital equivalent to that of a GILBs portfolio and an overall real assets portfolio performance goal of CPI + 400bps, please describe how your firm’s product will help TMRS accomplish its goals in the contexts of targeted returns and diversifying existing GILBs exposure. Specifically please address how it is anticipated the portfolio will respond to absolute inflation levels and changes in inflation expectations.

2) Please describe how your firm considers the dual objective of return maximization and correlation with inflation. To the extent your firm believes it can deliver both, please explain in the contexts of downside protection and CPI upside participation/optionality. To the extent a non-CPI concept of inflation is most pertinent in your firm’s opinion, please address this question in that framework.

3) Please address your firm’s beliefs regarding differences or likenesses between fundamentally driven inflation and monetarily driven inflation. Additionally, to the extent your firm believes there is a difference, please address which type of inflation your product is better designed to be beneficially responsive to and why.

In addition to assessing managers relative to each other, the search process has sought out portfolio management thought leadership and constructive criticism of the current portfolio.
Stage 1 resulted in the selection of Cohen & Steers and Nuveen, mandates that did not own inflation linked bonds. Stage 2 of the real return search process is aimed at a more comprehensive solution to complete the liquid portfolio and refine answers to strategic approaches for inflation beta and targeted return profiles. TMRS used a presentation format for stage 2.

What data can we use to best justify a long term strategic outlook for sector allocations?

Or, are we better served in real return by maintaining greater tactical flexibility?
Performance & Implementation Conclusions

• TMRS real return portfolio performance has been in line to be in excess of manager benchmark performance inception to date. The GILBs mandate in place is not expected to return the long term strategic goal of CPI + 400bps. Recent allocations have been aimed at increasing the return profile of the real return portfolio, consistent with the IPS stated goal of return enhancement.

• TMRS’ private real return will be expected to experience some J-curve effects going forward as these allocations will be going through early stages of fund life cycles. The substantial capital deployed into liquid real assets and fee discounts that were successfully negotiated for are expected to mitigate this effect.

• Manager selections from 2015-16 have focused on appropriate scaling and efficiency of capital deployment. Currently at 84% allocated, it is the goal to have the portfolio 100% allocated by year end though a completion portfolio of liquid real return strategies and continuing to research/deploy capital into private real return assets. Garnering a cohesive strategic framework coincident with a deeper look at benchmarking will help guide these decision making processes.
III. IPS Compliance & Portfolio Review
IPS Compliance Review

**Vehicle Concentration Guideline** – No more than 35% of the total net assets of the real return portfolio may be invested in any one vehicle.

*TMRS is not in compliance with this guideline – the Colchester GILBS portfolio represented 100% of the portfolio through year-end 2015. New allocations are reducing the concentration level and with implementation of real return mandates expected through the remainder of the year it is expected the portfolio will be in compliance.*

**Closed or Open-end Vehicle Concentration Limit** – TMRS is within guideline limits that no more than 15% of total net assets may be invested in a single vehicle.

**Commingled Open-End Concentration Limit** – TMRS is within guideline limits that no more than 20% of total net assets may be invested in a single vehicle.

**Percentage of Manager AUM Limit** – TMRS does not account for more than 25% of total AUM of any contracted manager’s total AUM.
Portfolio Review

Diversification Metrics

Portfolio Exposure by Geography

- US/North America: 49%
- Non-US Developed: 39%
- Emerging Markets: 12%

TMRS Portfolio Exposure by Sector

- Inflation Linked Bonds: 47%
- Energy: 15%
- Real Estate: 12%
- Agriculture: 6%
- Transport/Social Infra: 8%
- Minerals & Mines: 6%
- Utilities/Renewables: 3%
- Other: 3%

Portfolio Exposure by Asset Type

- GILBs: 47%
- Global Infrastructure: 20%
- Global REITS: 11%
- Commodities: 12%
- Private Assets: 5%
- Global Natural Resources: 3%
- Short Duration Credit: 2%

*Exposures by Adjusted Commitments
Portfolio Review

Diversification Metrics

Portfolio Exposure by Manager

- Colchester: 47%
- Nuveen: 17%
- Cohen & Steers: 17%
- Brookfield: 7%
- Magnetar: 4%
- AMERRA: 4%
- Orion: 4%

Funded/Committed Status

- Committed: 84%
- Unallocated: 16%

Post-Recommendation Portfolio Exposure by Asset Class

- Sovereign Debt: 47%
- Common Equity: 25%
- Credit Debt & Preferred Equity: 23%
- Commodities: 5%
IV. Market Update: Real Return
Slumping energy prices have been the major component keeping inflation below targets in the US while the fluctuating US dollar has made inflation management globally very difficult.

* Data Source: Bloomberg
Inflation Expectations
TIPS & GILBs Breakevens

Breakevens provide a snapshot of what the fixed income market is currently predicting for inflation.

- Data Source: Bloomberg
- Note: Breakevens are the difference in the yield between a nominal and inflation protected bond of similar maturity and grade
The US Dollar and commodities negative correlation makes the relative strength of the US currency highly impactful on countries reliant on importing or exporting commodities.

* Data Source: Bloomberg
Fundamental Commodity Cycle
Global Commodity Market Entering Phase 5

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
<th>Phase 6</th>
<th>Phase 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normalization (from peak)</td>
<td>Rebalancing (from deficit)</td>
<td>Loosening</td>
<td>Normalization (from trough)</td>
<td>Rebalancing (from surplus)</td>
<td>Tightening</td>
<td>Normalization (from peak)</td>
</tr>
<tr>
<td>Supply deficit &amp; high prices incentivize new production &amp; discourage demand</td>
<td>Rising production &amp; reduced demand cause prices to fall, returning the supply-demand to equilibrium</td>
<td>Growing supply surplus &amp; falling demand increases inventory pushing prices down</td>
<td>Over supply &amp; low prices push production cuts and small amounts of demand</td>
<td>Falling production &amp; rising demand lift prices returning to equilibrium</td>
<td>Demand greater than supply, reducing inventories pushing prices up</td>
<td>Supply deficit &amp; high prices incentivize new production &amp; discourage demand</td>
</tr>
</tbody>
</table>

* Data Source: Cohen & Steers
Since the peak of the commodity super cycle in 2008 the global commodities markets have trended below equilibrium and current indicators point toward a trough in the market.

* Data Source: Bloomberg
An imbalance in the global supply of oil caused a precipitous fall in oil prices in late 2014, but based on current capex expenditures the low prices have caused future production to fall below expected demand.

* Data Source: Bloomberg
V. Milestones & Initiatives
Milestones & Metrics

Key Real Asset Milestones & Metrics

• **17 new investment vehicles have been approved** (11 Real Estate, 6 Real Return) in the last 12 months. 16 have closed on legal docs to date. The portfolios had 17 total vehicles prior.

• **$2.4 billion of new investment mandates approved** ($1.3B Real Estate, $1.1B Real Return) in the last 12 months.

• In 12 months, Real Asset (RA) team took **450 manager meetings**: 283 In-Person meetings in Austin; 38 domestic travel meetings; 34 international travel meetings; 95 manager presentation calls.

• Real Estate progressed from approximately **55% allocated to 100% allocated** in trailing 12 months.

• Real Return progressed from approximately **41% allocated to 84% allocated** in trailing 12 months.

• 1-year **estimated fee savings of $3.1 million** on managers approved in last 12 months.

• The RA team now serves on **23 Limited Partnership Advisory Committees**.

• Analyst Eddie Schultz, Esq., **earned the CFA Designation** in fall of 2015.

• The RA team currently consists of three individuals. **Rachel Cleak has focused on RA as a third team member since joining in January 2016**. She commenced the CFA program this June.

Note 1: Portfolio progress presented as “percentage allocated” are based on numbers previously presented to the Board.
Real Assets – An Incredibly Productive Year

Among 17 Public Pension Plan Respondents managing real estate & real assets TMRS:

- Ranked #1 in total number of fund commitments
- Ranked #2 in total dollars committed (#1 was $100B+ plan)
- Ranked #1 in total funds committed per investment professional employed
- Ranked #1 in total dollars committed per professional

- Average Respondent Plan Size: $50 billion
- Median Respondent Plan Size: $27 billion
- Avg. 2015 Commitment Level: $550 million TMRS: $2.4 billion
- 16 of 17 plans more active in 2015 than 3 yr. avg.
- Avg. Plan has more mature portfolios than TMRS
- Average 2015 # of Commitments: 6.3 TMRS: 17

*TMRS Statistics prepared on Last Twelve Months basis (July 2015 – June 2016)
2016-2017 Real Asset Goals

“Get Better”

**TMRS Vision Statement:** TMRS will be the preferred provider of competitive retirement benefits and excellent customer service by improving plan funding, investment return, communication, and education.

**Real Estate & Real Return Initiatives**

- Allocate greater time resources to manager, market and portfolio research.
- Enhance operational & reporting functionalities.
- Initiate benchmark review project for real estate, and benchmark enhancement study for real return.
- Comprehensively re-evaluate core real estate portfolio and consider rebalancing initiatives. Research Real Estate co-investment opportunities more extensively.
- Progress Real Return Portfolio to 100% Allocated: i) add additional public markets real return strategies to fully fund; ii) continue to diversify private real return portfolio.
- Research and pursue Real Return co-invest opportunities as deals with strategic fit are sourced.
Manager scorecards are provided for managers under contract as of 12/31/16.
## Annual Manager Report Card for: Colchester

<table>
<thead>
<tr>
<th>Assessment Area</th>
<th>Grade</th>
<th>Update &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td></td>
<td>Colchester is meeting the expectations of TMRS in all material respects.</td>
</tr>
<tr>
<td>People</td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Philosophy/Strategy/Process</td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Portfolio(s)</td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
<td>Colchester has had satisfactory performance ITD.</td>
</tr>
<tr>
<td>Compliance</td>
<td></td>
<td>Compliant</td>
</tr>
<tr>
<td>Guideline Changes</td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Risk Management</td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Operations</td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Client Service</td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Excellent

### In Good Standing

### Fair (working with manager)

### Unsatisfactory (remedial action being taken)

### Comprehensive Review
### Annual Manager Report Card for: Magnetar

<table>
<thead>
<tr>
<th>Assessment Area</th>
<th>Grade</th>
<th>Update &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td></td>
<td>Magnetar is meeting the expectations of TMRS in all material respects.</td>
</tr>
<tr>
<td>People</td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Philosophy/Strategy/Process</td>
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<td>No Change</td>
</tr>
<tr>
<td>Portfolio(s)</td>
<td></td>
<td>No Change</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
<td>Magnetar is too early in the fund life for performance to be meaningful.</td>
</tr>
<tr>
<td>Compliance</td>
<td></td>
<td>Compliant</td>
</tr>
<tr>
<td>Guideline Changes</td>
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<tr>
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<th>Unsatisfactory (remedial action being taken)</th>
<th>Comprehensive Review</th>
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</thead>
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