REVISED AS OF 01.26.18

NOTICE OF A SPECIAL MEETING OF THE

BOARD OF RETIREMENT AND BOARD OF INVESTMENTS

LOS ANGELES COUNTY EMPLOYEES RETIREMENT ASSOCIATION

THE HYATT REGENCY
200 SOUTH PINE AVENUE, LONG BEACH, CA

THURSDAY, FEBRUARY 1, 2018
9:00 A.M. – BEACON BALLROOM

The Board may take action on any item on the agenda, and agenda items may be taken out of order.

I. WELCOME
Robert R. Hill, Interim Chief Executive Officer

II. PUBLIC COMMENT

III. ACTION ITEMS

A. Recommendation as submitted by Robert R. Hill, Interim Chief Executive Officer: That the Board approve rescheduling the March and November Board of Investments meeting to March 5, 2018 and November 8, 2018, respectively. (Memo dated January 23, 2018)

B. IN THE EVENT NOT ACTED UPON BY ONE OR BOTH OF THE BOARDS UNDER ITEM III.A OF THE JANUARY 30, 2018 AND JANUARY 31, 2018 AGENDAS: The Chairs of the Board of Retirement and Board of Investments (Boards) recommend that the Boards dissolve the Joint Organizational Governance Committee (JOGC), terminate its Charter and the Boards' prior delegation of duties to the JOGC, and rescind the Boards' September 11, 2017 action directing that the JOGC conduct the Chief Executive Officer recruitment. The former responsibilities of the JOGC will return to the Boards and their duly created committees for actions appropriate on a case-by-case basis, in accordance with applicable law and LACERA policy.
(Memo dated January 24, 2018)

III. ACTION ITEMS (Continued)

C. IN THE EVENT NOT ACTED UPON BY ONE OR BOTH OF THE BOARDS UNDER ITEM III.B OF THE JANUARY 30, 2018 AND JANUARY 31, 2018 AGENDAS: Board of Retirement and Board of Investments Elections of Joint Organizational Governance Committee Members.

IV. BRIDGING THE GAP: ACHIEVING ACTUARIAL TARGET IN A LOW EXPECTED RETURN ENVIRONMENT
Jon Grabel

Achieving LACERA's actuarial threshold return with acceptable risk is the key challenge in what is widely considered a low return environment. A range of potential asset allocation and portfolio implementation adjustments will be discussed to best confront this challenge and achieve LACERA's mission.

V. ADVANCES IN ASSET ALLOCATION AND RISK MANAGEMENT
Meketa Investment Group, Inc.

Meketa will build upon the asset allocation discussion from the July 2017 Board Offsite and present information on emerging trends. Meketa will introduce the role of big data, artificial intelligence, and machine learning in an asset allocation study and ongoing risk management.

VI. FIDUCIARY COUNSEL
Harvey L. Leiderman, Reed Smith LLP

Outside fiduciary counsel will provide the Board with perspectives on LACERA from the perspective as counsel for many of LACERA's peers. Counsel will present real world hypothetical questions for interactive discussions in an effort to provide practical fiduciary guidance on issues faced, or likely to be faced, by the Board of Retirement.

VII. REAL ASSETS: ROLE AND IMPLEMENTATION IN A PORTFOLIO
Meketa Investment Group, Inc., Stepstone Group, L.P., & The Townsend Group
Investment Staff

LACERA's investment consultants and investment staff provided an introduction to real assets in October. Investment staff will moderate an interactive discussion with the investment consultants about the role, sub-strategies, and implementation options for this asset category.

VIII. INVESTMENT EXPENSE ANALYSIS
Investment Staff

LACERA has several fee study initiatives underway. This session will build upon the discussion from the July 2017 Board Offsite and provide data regarding the cost to implement LACERA's total fund. Ideas will be presented to control costs in a manner consistent with LACERA's investment beliefs.

IX. CLOSING

Documents subject to public disclosure that relate to an agenda item for an open session of the Board of Retirement that are distributed to members of the Board of Retirement less than 72 hours prior to the meeting will be available for public inspection at the time they are distributed to a majority of the Board of Retirement Members at LACERA's offices at 300 N. Lake Avenue, Suite 820, Pasadena, CA 91101, during normal business hours of 9:00 a.m. to 5:00 p.m. Monday through Friday.

Persons requiring an alternative format of this agenda pursuant to Section 202 of the Americans with Disabilities Act of 1990 may request one by calling Cynthia Guider at (626) 564-6000, from 8:30 a.m. to 5:00 p.m. Monday through Friday, but no later than 48 hours prior to the time the meeting is to commence. Assistive Listening Devices are available upon request. American Sign Language (ASL) Interpreters are available with at least three (3) business days notice before the meeting date.

January 23, 2018

TO: Each Member
Board of Investments

FROM: Robert R. Hill
Interim Chief Executive Officer

FOR: Board of Investments Board Offsite Meeting of February 1, 2018

SUBJECT: **BOARD OF INVESTMENT MEETING CALENDAR**

RECOMMENDATION

It is recommended the Board of Investments reschedule the March and November meeting to March 5, 2018 and November 8, 2018, respectively.

DISCUSSION

At the January Board of Investment meeting, the Board requested for staff to survey the Board in rescheduling the March 14, 2018 and November 14, 2018 Board meetings due to the CII Conference scheduled on March 12-14, 2018 and the SACRS Fall Conference scheduled for November 13-16, 2018. Based on the survey, it is recommended that the Board of Investments meeting be rescheduled to March 5, 2018 and November 8, 2018, respectively.

A copy of the March and November educational calendar is attached for your reference

RH:lg

March 2018

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 AVCJ PE Forum - Australia ICGN – Tokyo, Japan	2	3 CALAPRS General Assembly – Indian Wells, CA
4 CALAPRS General Assembly - Indian Wells, CA	5	6	7 AHIP - Washington, D.C.	8 PREA - Beverly Hills, CA	9	10
11	12 CII Fall Conference - Washington, D.C.	13	14 BOI (Committees) PPI - Washington D.C.	15 BOR (Joint Meeting) (Disability/OOC/IBL Committees)	16	17
18	19 Info Security World Conference - Lake Buena Vista, FL	20	21 Audit Committee	22	23	24
25	26 Cesar Chavez Day	27	28 CALAPRS Advanced Principles of Pension - Los Angeles, CA	29	30	31

November 2018

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6 Election Day	7 BOR (Joint Meeting) (Disability/OOC/IBL Committees)	8	9	10
11 Veterans Day	12 Veterans Day (observed)	13 SACRS Fall Conference - Indian Wells, CA	14 BOI (Committees) SACRS Fall Conference - Indian Wells, CA	15 SACRS Fall Conference - Indian Wells, CA	16 SACRS Fall Conference - Indian Wells, CA	17
18	19	20	21	22 Thanksgiving Day	23 Thanksgiving Day	24
25	26	27	28	29	30	

LACERA

January 24, 2018

TO: Each Member,
Board of Retirement

Each Member,
Board of Investments

FROM: Steven P. Rice SPR
Chief Counsel

Harvey L. Leiderman, Reed Smith LLP
Fiduciary Counsel

FOR: January 30, 2018 and February 1, 2018
Board of Retirement and Board of Investments Offsite Meetings

SUBJECT: Dissolution of Joint Organizational Governance Committee

RECOMMENDATION

The Chairs of the Board of Retirement (BOR) and Board of Investments (BOI) (Boards) recommend that the Boards dissolve the Joint Organizational Governance Committee (JOGC), terminate its Charter and the Boards' prior delegation of duties to the JOGC, and rescind their September 11, 2017 action directing that the JOGC conduct the Chief Executive Officer (CEO) recruitment. The former responsibilities of the JOGC will return to the Boards and their duly created committees for actions appropriate on a case-by-case basis, in accordance with applicable law and LACERA policy.

LEGAL AUTHORITY

The Boards have "plenary authority" over the administration of the system under Article XVI, Section 17 of the California Constitution. Under the Constitution and Section 31595 of the California Government Code, such authority shall be exercised "solely in the interest of, and for the exclusive purposes of providing benefits to, participants and their beneficiaries, minimizing employer contributions thereto, and defraying reasonable expenses of administering the system." The Boards shall act "with the care, skill, prudence, and diligence under the circumstances then prevailing that a prudent person acting in a like capacity and familiar with these matters would use in the conduct of an enterprise of a like character and with like aims."

The Boards' authority and responsibility include the ability to adopt such governance policies, procedures, and processes, as the Boards deem appropriate in their discretion.

Approval by the Boards of the recommendation to dissolve the JOGC as set forth in this memo is consistent with, although not required by, the Boards' authority and responsibility. The Boards may appropriately and lawfully exercise their authority and responsibility by taking reasonable action with respect to the dissolution, maintenance, or modification of the JOGC.

BACKGROUND

A. The Legal Responsibilities of the Boards.

Under the County Employees Retirement Law of 1937 (CERL), Cal. Gov't Code §§ 31450, et seq., LACERA has two Boards – a Board of Retirement and a Board of Investments.

Section 31520 of CERL provides, "Except as otherwise delegated to the board of investment and except for the statutory duties of the county treasurer, the management of the retirement system is vested in the board of retirement." Section 31520.2(b) provides, "The board of investments shall be responsible for all investments of the retirement system." The BOR and BOI have joint authority over certain shared responsibilities, including: the appointment and evaluation of the CEO (Section 31522.2); classification and compensation of personnel (Sections 31522.1, 31522.4); adoption of LACERA's administrative budget (Section 31580.2(a)); and other matters as specified in CERL, including but not limited to Section 31459.1 defining the term "Board" as used in CERL.

Because certain of the Boards' responsibilities overlap under CERL as described above and because there are other matters of mutual interest that arise from time to time relating to the administration of the system, the Boards need to work together on issues. CERL does not address how the Boards should collaborate.

B. Historical Process for Collaboration and Joint Action by the Boards Before the JOGC Was Formed.

For many years before the JOGC, the Boards collaborated in four main ways. First, the Board established the Audit Committee, the Travel Policy Committee, and the CEO Performance Committee as standing joint committees. Second, sometimes, each Board separately debated and separately acted on the same subject matter, thereby resulting in joint action. Third, on other occasions, joint meetings of the Boards would take place. Fourth, in some circumstances, the Board Chairs appointed joint ad hoc committees to address issues of mutual interest.

While these four approaches generally worked well, Board members from time to time expressed concern that there was not a formal and consistent process.

In response to these concerns, in September 2016, staff presented, and both Boards adopted, a Policy on Joint Meetings. The Policy on Joint Meetings defined issues of joint concern and established a formal procedure by which the Chairs or individual Board members could call a joint meeting. A copy of the Policy on Joint Meetings is attached as Exhibit A. The policy remains in effect. Staff believes this policy continues to provide a sound procedure for the use of joint meetings.

C. Creation of the JOGC.

In early 2017, the Board Chairs at the time discussed the idea of forming a JOGC as a means of developing consensus and making recommendations to the Boards on joint issues. The Chairs formed an Ad Hoc Joint Organizational Governance Evaluation Committee of representatives from both Boards to discuss the feasibility of the JOGC and prepare a Charter for presentation to the Boards. The Ad Hoc Evaluation Committee held several meetings in April, May, and June 2017. The Committee worked with Funston Advisory Services as a consultant to prepare the JOGC Charter.

At a joint meeting of both Boards on August 10, 2017, the Ad Hoc Evaluation Committee presented its recommendation that the Boards adopt the JOGC Charter. Both Boards voted to adopt the Charter. A copy of the JOGC Charter is attached as Exhibit B.

Under the Charter, the JOGC has eight members: the Chair and Vice Chair of each Board; one member appointed by the Chair of each Board; and one member elected by each Board. (Charter, Section 8, page 7.) The JOGC generally meets five times per year, with special meetings as needed. (Charter, Section 10.1, page 8.) The JOGC is responsible to address the following subject matters:

- Litigation and Claims that raise Unusual and Material Risks to the organization. (Charter, Section 7.1, pages 4-5.)
- Legislation on issues that affect both Boards. (Charter, Section 7.2, page 5.)
- Staff compensation. (Charter, Section 7.3 pages 5-6.)
- New staff classifications. (Charter, Section 7.4, page 6.)

- Chief Executive Officer oversight, including search, evaluation, compensation, and succession planning. (Charter, Section 7.5, page 6.) The JOGC replaced the previous CEO Performance Committee. (Charter, Section 11, page 8.)

- Budget oversight. (Charter, Section 7.6, page 6.)

- Education and travel, replacing the previous Travel Policy Committee. (Charter, Section 7.7, page 6; Section 11, page 8.)

- Organizational philosophy. (Charter, Section 7.8, pages 6-7.)

- Miscellaneous matters that affect both Boards, including dispute resolution between the Boards and their members. (Charter, Section 7.9, page 7.)

D. Implementation of the JOGC.

After its formation, the JOGC held meetings on August 28, 2017, October 12, 2017, and December 13, 2017.

In these meetings, the JOGC developed the Fiduciary Counsel Policy, the Policy Concerning Employment of LACERA Board Members, and the Sexual Harassment Prevention Training Policy for LACERA Board Members. All three of these policies were adopted by the Boards.

The JOGC also discussed certain other issues, including the Chief Investment Officer and Chief Counsel reporting structures, broadcasting of Board meetings, and boardroom technology and branding. No formal actions or recommendations have been made on these issues.

In addition, on September 11, 2017, the Boards voted to direct the JOGC to conduct the CEO search process. In exercise of that authority, the JOGC approved the Request for Proposal (RFP) for Executive Search Services for the CEO recruitment. The RFP is expected to be completed, and a recruiter selected, in February 2018.

E. Review and Evaluation of the JOGC.

Following the Board elections in January 2018, the new Chairs reviewed and discussed the JOGC and how it fits into LACERA's governance and goals. Based on their evaluation, the Chairs decided to make a recommendation to the Boards to dissolve the

JOGC. The reasons for the Chairs' recommendation are stated in the next section of this memo. In developing their recommendation, the Chairs conferred with LACERA executive and legal staff and outside fiduciary counsel.

DISCUSSION

A. Reasons for the Chairs' Recommendation to Dissolve the JOGC.

The Chairs have indicated they believe the JOGC should be dissolved for the following reasons:

1. The JOGC adds a layer of bureaucracy and delay to the operation of the Boards that makes LACERA less nimble by requiring that issues go through the committee before reaching the Boards for decision. Scheduling JOGC meetings has also proven problematic. Dissolution of the JOGC will make the Boards more efficient.

2. The JOGC creates additional work for the eight Board members on the committee, including the Board Chairs and Vice Chairs, which diverts their attention from providing leadership to the Boards themselves.

3. The JOGC imposes additional burden on staff to support and prepare for additional committee meetings. For example, by requiring that the annual administrative budget go through the JOGC instead of directly to the Boards, administrative staff has found that the JOGC adds another month of work to the already lengthy and comprehensive budget preparation process.

4. Based on attendance at JOGC meetings to date, many Board members who are not on the committee nevertheless attend JOGC meetings so that they can participate in the discussion.

5. The important responsibilities of the JOGC can be filled through other existing and more efficient processes. For example:

    a. The CEO search process could easily be handled by an ad hoc search committee, instead of the JOGC. An ad hoc committee would not be subject to the Brown Act, and would actually be a better mechanism for handling the critical timing and confidentiality of an executive search process and to conduct initial screening interviews. Ultimately, the Boards themselves will vote on the hiring in a manner compliant with the Brown Act.

b. The annual CEO evaluation can be handled through a joint Board meeting.

c. The budget process has historically worked well without the JOGC. The addition of the JOGC adds time and complexity. Historically, LACERA has always scheduled budget hearings open to both Boards. To the extent discussion among the Boards is required (which has not been a need in the past), a joint meeting can be held.

d. The Education and Travel Policy can be handled by reestablishing the Travel Policy Committee, or perhaps better by simply taking proposed policy changes directly to the Boards to avoid the problem of obtaining a quorum for a joint committee.

e. Unusual litigation of joint interest to the Boards can be handled through ad hoc committees. This process has worked effectively to manage major litigation during the past few years.

f. Legislation concerning both Boards, which rarely arises, can be addressed through an ad hoc committee.

6. The Boards have an existing Policy on Joint Meetings that can be invoked by the Chairs and any individual Board member when there is a need for the Boards to discuss an issue together.

The Chairs recognize the good intentions behind the JOGC, which were motivated by a desire to enhance communication and decision-making on joint Board issues. The Boards have now tried the JOGC for several meetings. For the reasons set forth above, the Chairs believe that the JOGC is not the best mechanism to govern joint issues. Other tools, such as ad hoc committees and joint Board meetings, already exist and can be used when necessary. The Chairs do not perceive any “cons” to dissolving the JOGC. The Chairs understand that they will have to have good communication with each other to discuss pending issues and manage those that are of joint concern in an efficient and effective way tailored to specific matters that arise.

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B. Staff's View.

LACERA staff, including the executive and legal teams, as well as all other parts of the organization, are prepared to support whatever governance model the Boards adopt. Staff functioned within the JOGC model, although it did add additional work and some inefficiencies. Staff supported the JOGC model when it was adopted by the Boards in 2017. However, staff would also be able to effectively support the Boards and LACERA without the JOGC, as staff did before the JOGC was formed. Staff has been sensitized to the need to proactively anticipate issues of joint Board interest and recommend appropriate processes to the Boards when required.

Joint meetings and ad hoc committees are the main vehicles open to address issues of mutual interest. The Boards have a sound Policy on Joint Meetings that was recently adopted in September 2016. Ad hoc committees are permitted under the Board of Retirement Regulations, the Board of Investments Bylaws, and the Brown Act. Joint issues may also be taken separately to the two Boards, accompanied by proper advance communication between the Chairs and staff.

In the final analysis, taking all relevant considerations into account, the Interim Chief Executive Officer, Chief Counsel, and outside fiduciary counsel, Harvey Leiderman, support the Chairs' current recommendation. The Boards' staff and fiduciary counsel do not believe that dissolution of the JOGC will hamper the ability of the Boards to perform their fiduciary responsibilities and effectively administer LACERA. The choice between "JOGC" and "no JOGC" is a question of discretion for the Boards in determining the governance process that best fits the Boards' needs and duties. There is no right or wrong choice from a governance or fiduciary perspective, so long as the chosen structure permits the Boards to prudently administer the system in a timely manner.

CONCLUSION

For the foregoing reasons, and based on the information provided above, the Board Chairs recommend that the Boards dissolve the JOGC, terminate its Charter and the Boards' prior delegation of duties to the JOGC, and rescind their September 11, 2017 action directing that the JOGC conduct the CEO recruitment. The former responsibilities of the JOGC will return to the Boards and their duly created committees for actions appropriate on a case-by-case basis, in accordance with applicable law and LACERA policy.

Attachments

c: Robert Hill
James Brekk
John Popowich
Bernie Buenaflor
Richard Bendall
Fern Billingy
Frank Boyd
Johanna Fontenot
Michael Herrera
Christine Roseland
Harvey L. Leiderman

Exhibit A

Policy on Joint Meetings

LOS ANGELES COUNTY EMPLOYEES RETIREMENT ASSOCIATION
BOARD OF RETIREMENT AND BOARD OF INVESTMENTS
POLICY ON JOINT MEETINGS

I. INTRODUCTION

This policy sets forth the procedures that the Board of Retirement and Board of Investments (collectively, Boards) will follow in holding joint meetings. The policy is intended to facilitate consideration of issues that require discussion and action by both Boards under the County Employees Retirement Law of 1937 (CERL), Cal. Gov't Code §§ 31450 et seq.,[1] or where joint discussion is otherwise in the interest of administering the retirement system.

II. DEFINITIONS

For purposes of this policy, the following definitions apply:

A. "**Budget Issues**" means matters relating to adoption of and changes to the budget for the expenses of administering the retirement system in exercise of the power jointly given the Boards by Section 31580.2.

B. "**Personnel and Compensation Issues**" means matters relating to consideration, discussion, and adoption by the Boards of positions, compensation, revisions to the terms of the salary ordinance for LACERA employees, and other matters in exercise of the power jointly given the Boards under Sections 31522.1, 31522.2, and 31522.4, including, when necessary, adoption of a recommendation to the Los Angeles County Board of Supervisors with regard to such matters. The term includes employment litigation or claims concerning employees listed in Section 31522.2 and 31522.4 and the Chief Audit Executive; it does not include employment litigation or claims concerning employees within Section 31522.1, which will be administered by the Board of Retirement.

C. "**Other Joint Governance Issues**" means matters relating to formation of joint committees, recommendations from joint committees, joint policies, and all other matters which require joint action of the Boards under CERL or other governing law or which the Boards agree require Board action.

D. "**Issue**" and "**Issues**" means, individually and collectively, Budget Issues, Personnel and Compensation Issues, and Other Joint Governance Issues.

III. PROCEDURES

A. Methods of Requesting a Joint Meeting.

1. The Board Chairs and the Chief Executive Officer may confer concerning Issues to determine whether they should be brought, in the first instance,

[1] Except where indicated, all statutory references in this policy are to provisions of CERL.

to the Boards in separate meetings or to both Boards in a joint meeting, and if separately, in what order among the two Boards.

2. During consideration of an Issue first brought to the Boards separately, a Member of either Board may make a motion that action of the Member's Board be deferred pending a joint meeting of the two Boards on the Issue.

3. An individual Member of either Board may at any time request a joint meeting be held on an Issue. Such a request may be directed to the Member's Board Chair and the CEO for consideration under Section III.A.1 or may be made by motion to the Member's full Board.

B. Meeting Process.

1. If the Board Chairs agree under Section III.A.1 or if a motion for a joint meeting under Section III.A.2 or III.A.3 receives a majority vote of the Members of a Board who are present, a joint meeting of the Boards on the Issue will be held to consider the Issue. A joint meeting will be held even if one Board has already taken action on the Issue.

2. All joint meetings will be noticed and held in compliance with the Ralph M. Brown Act, Cal. Gov't Code §§ 54950 et seq., and Robert's Rules of Order.

3. All joint meetings will be scheduled for a date at which a quorum of Members of both Boards can reasonably be expected to be present. Joint meetings will alternate between regularly scheduled meeting dates of the two Boards, except when circumstances reasonably require that a different date be selected. The Board, and its Members, receiving a joint meeting request from the other Board will reasonably cooperate in participating in the joint meeting.

4. The Board Chairs and the CEO will confer to determine the agenda for joint meetings. The Board Chairs and the CEO will confer on who will preside over a joint meeting and other procedural matters relevant to the joint meeting.

C. Discussion and Action.

1. At a joint meeting, the Boards will jointly discuss the Issue for which the joint meeting has been noticed. The Boards will separately take action, if any, on the Issue during the meeting. Each Board Chair will preside over the making of a motion, action, and other procedural issues relevant to that Chair's Board.

Adopted: Board of Investments, September 14, 2016
Board of Retirement, September 15, 2016

Exhibit B

JOGC Charter

LOS ANGELES COUNTY EMPLOYEES RETIREMENT ASSOCIATION

Joint Organizational Governance Committee Charter

Adopted by Board of Retirement on August 10, 2017
Adopted by the Board of Investments on August 10, 2017
V9

Contents

1 Overview of the LACERA Board of Retirement and the Board of Investments

In 1937, Los Angeles County (County) established a pension trust fund (Fund) to provide defined retirement and death benefits to eligible County employees to be governed by the County Employees Retirement Law of 1937. In 1938, the Los Angeles County Employees Retirement Association (LACERA) was formed to administer the Fund. Since 1971, LACERA has also administered the Retiree Healthcare Benefits Program for the County and outside districts, through contractual agreements with the County.

LACERA is an independent governmental entity. LACERA is the largest county retirement system in America. LACERA is funded by the County, participating employers, employees, and investment earnings.

LACERA is governed by two Boards. Both Boards include a mix of trustees which are appointed and elected members and an ex-officio member, the sitting County Treasurer and Tax Collector. The Board of Retirement (BOR) is responsible for the overall management of the retirement system and the LACERA-administered Retiree Healthcare Benefits Program. The Board of Investments (BOI) is responsible for determining LACERA's investment objectives, strategies, and policies, as well as exercising authority and control over the investment management of the Fund. The BOI also invests and manages the Other Postemployment Benefits Program (OPEB) trust assets for participating employers. In addition, the BOI is responsible for obtaining actuarial valuations that serve as the basis for setting employer and employee contribution rates required to fund the system.

LACERA is a public pension system created in accordance with the County Employees Retirement Law of 1937 (the '37 Act or CERL) and administered pursuant to the '37 Act and the California Public Employees' Pension Reform Act of 2013 (PEPRA). CERL Section 31520 provides that "Except as otherwise delegated to the board of investment and except for the statutory duties of the county treasurer, the management of the retirement system is vested in the board of retirement." CERL Section 31520.2(b) provides that "The board of investments shall be responsible for all investments of the retirement system." The BOR and BOI have joint authority over certain shared responsibilities, including: the appointment and evaluation of the Chief Executive Officer (CEO) (CERL Section 31522.2); classification and compensation of personnel (CERL Sections 31522.1, 31522.4); adoption of LACERA's administrative budget (CERL 31580.2(a)); other matters as specified in CERL, including but not limited to CERL Section 31459.1 defining the term "Board" used in CERL; and as described in this Charter.

2 Purpose of this Document

The purpose of this document is to describe:

- the purpose, scope, responsibilities, meetings, and structure of the Joint Organizational Governance Committee (JOGC);
- the specific terms of reference for the JOGC;
- the committee's membership and leadership; and
- meeting frequency and dates.

3 Purpose of the JOGC

The purpose of the JOGC is to:

- serve and facilitate the work of both Boards when the two boards duties intersect;
- improve the combined oversight of both Boards;
- facilitate effective two-way communications and act as liaison between the Boards;
- ensure that both Boards are comfortable that their perspectives are properly represented;
- make recommendations, not decisions; and
- assist the Boards in resolving potential disputes effectively and at the earliest possible stage.

4 Scope

The scope of the JOGC includes:

- Litigation and Claims Impacting Both Boards
- Legislation Impacting Both Boards
- Staff Compensation
- Staff Classification
- Chief Executive Officer Review
- Budget
- Education and Travel
- Organizational Philosophy
- Miscellaneous Matters Impacting Both Boards

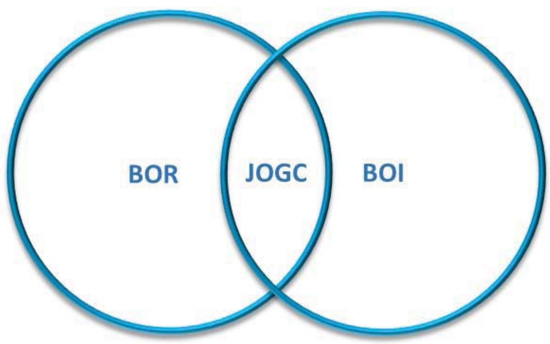
5 Powers Reserved for the BOR and BOI

The BOR reserves for itself all powers related to retirement benefit, disability and healthcare policy, legislation, litigation, operations, and administration, except as defined in its Board Charter and as described in this Charter.

The BOI reserves for itself all powers related to investment policy, legislation, litigation, operations, and administration, and actuarial valuations, except as defined in its Board Charter and as described in this Charter.

6 Authority

The JOGC will only make recommendations to each Board on matters that intersect and affect both the BOR and BOI as described in Section 7, Responsibilities of this Charter. The following figure visually highlights the JOGC role to facilitate the work of both Boards when the Boards' duties intersect.



7 Responsibilities

7.1 Litigation and Claims

Oversee and make recommendations about Litigation and Claims that, in the judgment of the Board Chairs, the Chief Executive Officer, or Chief Counsel, raise Unusual and Material Risks to the organization. Unusual and Material Risks may include Litigation and Claims making allegations of

(1) legal theories,

(2) conduct by LACERA, the Board, Board members, staff, members, vendors, or other third-parties,

(3) an amount or type of damages, or

(4) potential adverse reputational impact or publicity,

that are beyond the type of Litigation or Claims that each Board is generally expected to separately manage, as stated below. Unusual and Material Risks may include Litigation and Claims by or against or concerning the conduct of the Chief Executive Officer and those reporting directly to him. They may also include any other Litigation and Claims, including ones that each Board is generally expected to separately manage, that the Board Chairs, the CEO, or Chief Counsel reasonably believe justify the involvement of this Committee because of mutual interest and concern to both Boards.

Litigation and Claims are defined as court actions, pre-litigation demands or claims, potential court actions, demands, or claims, and other forms of dispute resolution, such as arbitration and mediation.

Each Board is generally expected to separately manage:

(1) As to the Board of Retirement, Litigation and Claims relating to the regular course of business regarding retirement, disability, and healthcare benefits, all LACERA personnel (other than the Chief Executive Officer and those reporting directly to him), and the general operations and administration of the retirement system and the OPEB plan,

(2) As to the Board of Investments, Litigation and Claims relating to the regular course of business regarding investments, actuarial services, and the OPEB Trusts, and

(3) Litigation and Claims concerning contracts approved only by that Board.

7.2 Legislation

Make recommendations about Legislation that impacts both Boards.

7.3 Staff Compensation

Make recommendations related to all types of compensation and compensation policy for:

- Union represented employees, including overseeing the collective bargaining agreements
- Non-represented employees
- Management employees

Administration of the Chief Audit Executive's compensation using the Boards' established compensation structure is reserved to the Audit Committee.

7.4 Staff Classification

Make recommendations to create all new staff classifications.

7.5 Chief Executive Officer

- Should a vacancy occur, conduct the initial search for the CEO and produce a short-list of recommended candidates to each Board (supported by a search consultant)
- Oversee the CEO evaluation and provide timely feedback based on input from all Board members
- Recommend CEO compensation
- Oversee CEO succession planning
- Any other issues related to oversight of the CEO not rising to the level of a joint meeting

7.6 Budget

Oversee the Administrative and Retiree Healthcare budgets according to the following process:

- Staff develop preliminary budget plan in February
- The budget's preliminary budget plan is presented to JOGC in March
- Draft budget package is presented to JOGC in April for release to the Boards
- Budget hearings are held in May
- Proposed budget package is presented to each Board for approval at the Board's June meeting
- The JOGC will provide on-going oversight of the budget-to-actual results during the fiscal year

7.7 Education and Travel

Oversee and make recommendations with respect to the:

- Education and Travel Policy according to its terms
- Other training issues relevant to both Boards as needed

7.8 Organizational Philosophy

Make recommendations regarding LACERA:

- Mission statement

- Values
- Vision
- Strategic planning
- General engagement

7.9 Miscellaneous Matters

Miscellaneous matters, including dispute resolution between the Boards and its members, that may need to be brought before the JOGC will be determined on a case by case basis by the respective Board Chairs and the Chair of the JOGC in consultation with the CEO. Additionally, miscellaneous matters may be brought before the JOGC by any JOGC member.

8 Membership, Quorum, and Rules

There will be eight (8) members with no designated alternates. The JOGC will be comprised of the BOR and BOI Chairs and Vice-Chairs plus one member appointed by each Chair and one member elected by each Board. If there is one JOGC member who represents both Boards (one overlap), then an additional appointment will be made by the BOR Chair in even years and by the BOI Chair in odd years. If there is more than one overlap, the BOR and BOI Chairs will make an equal number of additional appointments; if there are an odd number of overlaps, the final appointment, after the Board Chairs make their separate appointments, will be made following the rule as stated in the preceding sentence that applies in the case of one overlap.

A quorum exists when a majority of the members are present, without regard to the Board from which individual members were appointed.

The JOGC is subject to the Ralph M. Brown Act (Brown Act), and its meetings will be noticed, agendized, and conducted in accordance with the Brown Act. The JOGC may meet in closed session as provided in the Brown Act.

Robert's Rules of Order will also apply in the JOGC's meetings. A motion may be made or seconded by any member. A motion passes if a majority of the members present, without regard to the Board from which they were appointed, vote in favor of the motion.

9 Leadership

The Chair and Vice Chair of the JOGC will be elected by members of the JOGC at the first meeting of each year.

10 Meeting Frequency and Dates

10.1 Frequency

The regular meeting schedule will be established at the first meeting of each year. Generally, the meeting schedule will be March, April, June, September, and December. Special meetings may be called as needed in accordance with the Ralph M. Brown Act.

10.2 Dates

Meetings will alternate between scheduled BOR and BOI meetings, and as needed.

11 Elimination of Certain Committees

With the establishment of the JOGC, the following committees will be eliminated:

- CEO Performance Committee
- Education and Travel Committee

12 Charter Review

The BOR and BOI shall review and update this Charter at least once every three years.

This Charter was adopted by the Board of Retirement on August 10, 2017 and by the Board of Investments on August 10, 2017.

Bridging the Gap

Achieving the Actuarial Return Target in a Low Expected Return Environment

Board of Investments Offsite
February 1, 2018

Jonathan Grabel
Chief Investment Officer

LOS ANGELES COUNTY EMPLOYEES RETIREMENT ASSOCIATION

Overview

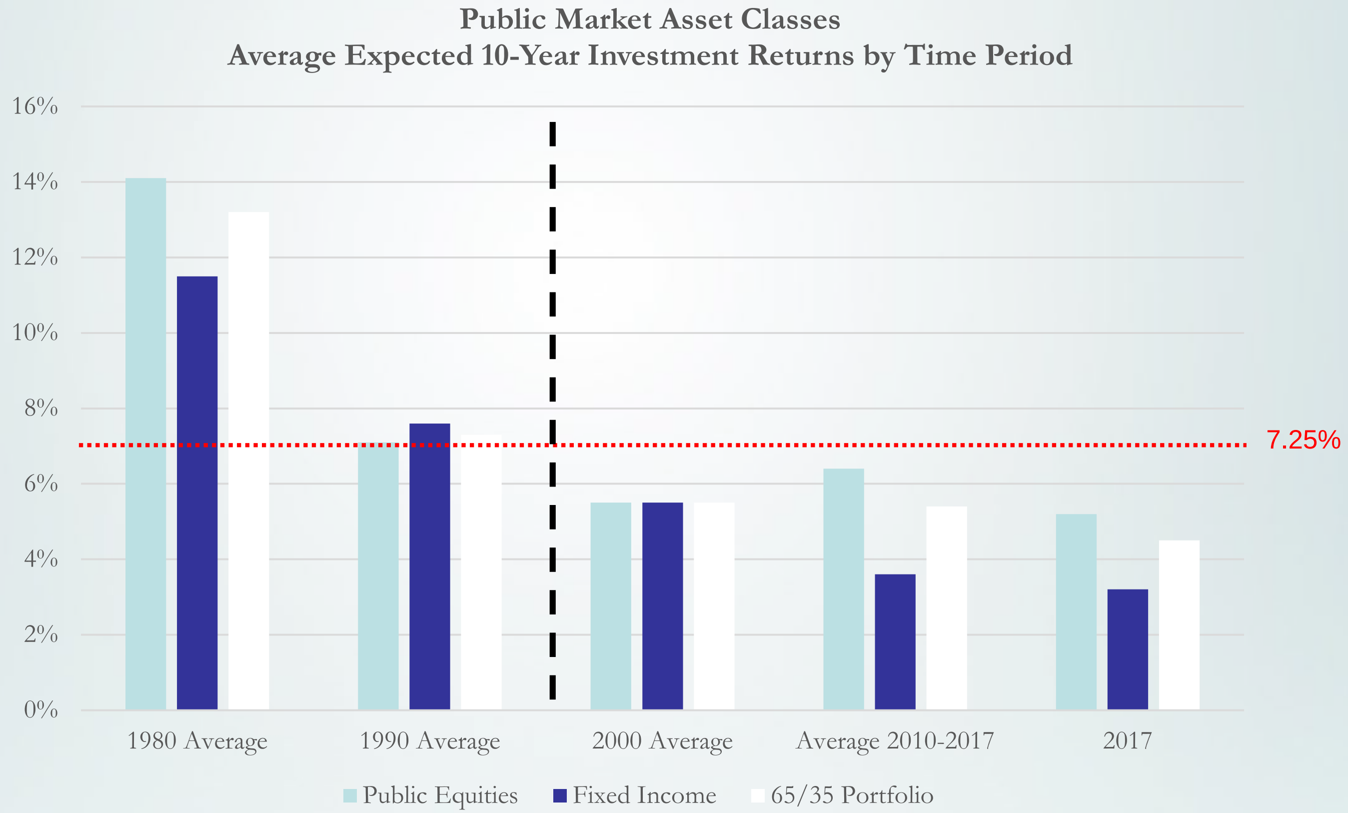
- Role of Investments in Fulfilling Pension Obligations
- The Secular Decline in Expected Returns
- Bridging the Gap: Incremental Sources of Risk-Adjusted Return
    - Risk Mitigation Strategies
    - Expanded Opportunities
    - Improved Implementation
- Conclusion

Role of Investments in Fulfilling Pension Obligations

LACERA's mission is to produce, protect and provide retirement benefits promised to its membership

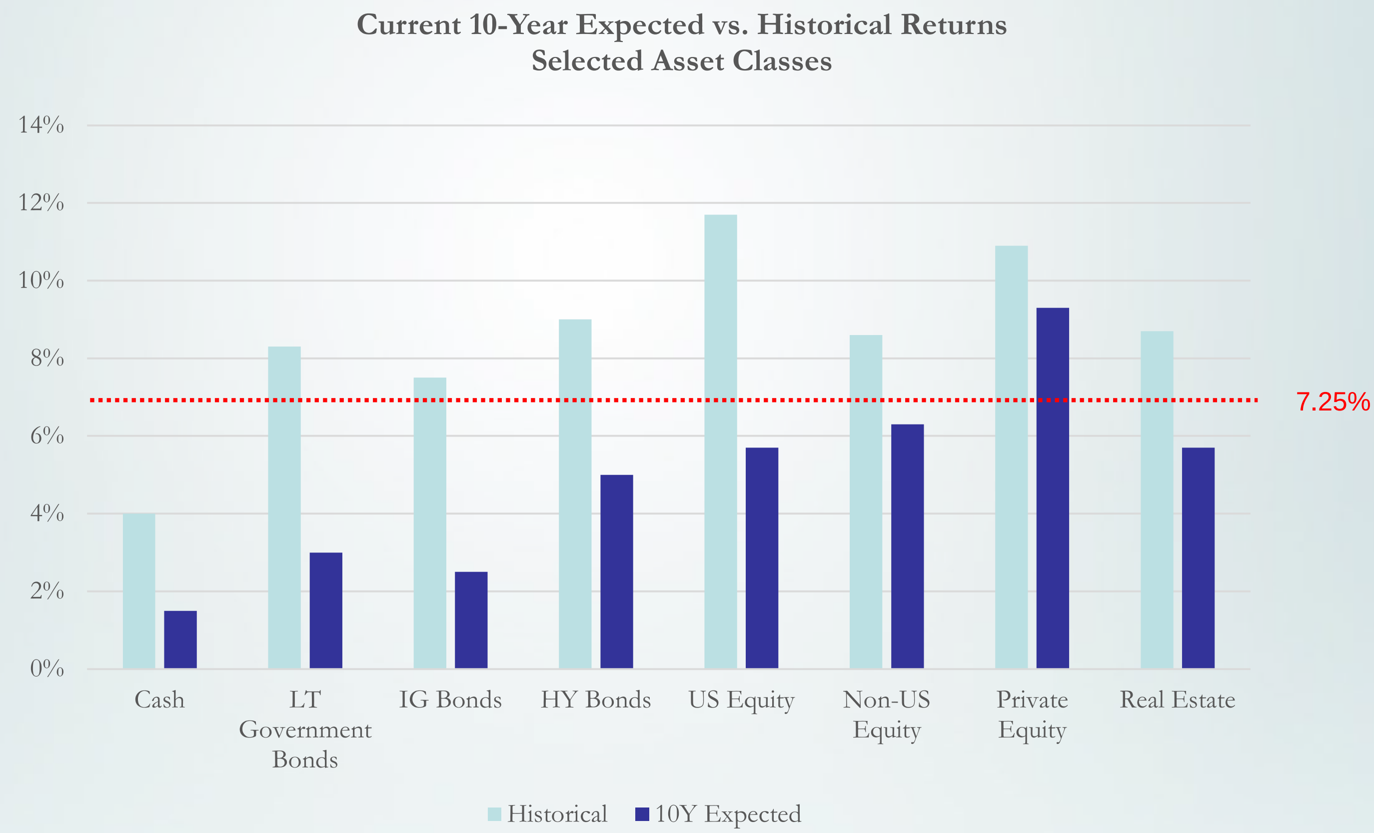
Contributions + Investments = Benefits + Expenses

Decline in Expected Long-term Investment Performance



Source: Meketa Investment Group, Capital Market Expectations, presentation to LACERA, September 11, 2017. Expected return assumptions for 1) bonds equals the yield of the ten-year Treasury plus 100 basis points, and 2) equities equals the dividend yield plus the earnings yield of the S&P 500 index (using the inflation-adjusted trailing 10-year earnings). Probability calculation is for the subsequent ten years.

Similar Trend Forecasted across Asset Categories



Source: Meketa Investment Group, Capital Market Expectations, presentation to LACERA, September 11, 2017. Private equity return projections are based on LACERA's target weights and assume 90% Buyouts and 10% Venture Capital. Projected real estate returns assume 15% REITS, 30% Core, 25% Value-Added, 20% Opportunistic, and 10% HY RE Debt.

Bridging the Gap

- Return needed to meet pension obligations[1] = 7.25%
- Median expected Fund return given current allocation and intermediate-term capital markets assumptions[2] = 6.5%
  - ➢ 75 basis points (bps)* needed to bridge the gap
- LACERA Investment Belief
  - "Long-term strategic asset allocation will be the primary determinant of LACERA's risk/return outcomes"

How can LACERA improve the prospects for meeting its return target over the intermediate-term without materially changing the Total Fund's risk profile?

1) Milliman, Inc., Los Angeles County Employees Retirement Association 2016 Investigation of Experience for Retirement Benefit Assumptions, December 14, 2016.
2) Meketa Investment Group, Capital Market Expectations, presentation to LACERA, September 11, 2017. 10-year expected investment returns.
* 1 basis point = .01%

Improving Risk-Adjusted Return

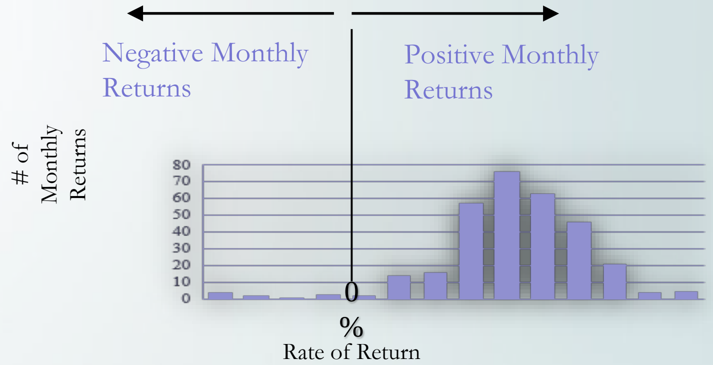
The Total Fund's risk-adjusted return can be enhanced, either by increasing return or by reducing risk

Risk Mitigation Strategies

Strategies to limit downside risk and magnitude of drawdowns – "win by not losing." The path of returns matters for mature pension plans.

Asymmetrical exposures can provide downside protection:

- Positively-skewed strategies
- Low volatility equity strategies
- High income-generating strategies



The potential gains are likely through risk reduction, rather than return enhancement

Potential Sources of Incremental Return[1]

Returns can be enhanced by expanding the opportunity set or through improved implementation:

Expanded Opportunities[2]	Improved Implementation
Credit	Alternative Structures
Real Assets	Enhanced Cash Management
	Minimization of Costs
	Total Fund Perspective

[1] While not guaranteed, these methods offer the potential for an increase in investment returns

[2] Expanded opportunities have diversification benefits in addition to potential incremental return

Expanded Opportunities

Expanded Opportunities: Incremental Sources of Return

Credit

Allocation to strategies with similar characteristics across multiple asset classes more optimally executed at portfolio level

- Separate Credit (return enhancement) from Investment Grade Fixed Income (risk reduction)
- Increase current ~10% allocation to Credit

Risk and return expectations:

	10 Year Expected Return (%)	Standard Deviation (%)	Sharpe Ratio
Current LACERA Pension	**6.5%**	**13.5%**	**0.37**
Investment Grade Bonds	*2.5*	*4.0*	*0.25*
Credit			
High Yield Bonds	5.0	12.5	0.28
Bank Loans	5.1	10.0	0.36
Emerging Market Bonds	5.1	13.3	0.27
Private Debt	6.1	18.0	0.26
High Yield Real Estate Debt	7.0	23.0	0.24

Potential increase in Total Fund return from an additional 5% allocation to Credit: approx. 5-10 bps

Source: Meketa Investment Group, Los Angeles County Employees Retirement Association Capital Markets Expectations, September 11, 2017

Expanded Opportunities: Incremental Sources of Return

Real Assets

Allocation to real asset strategies, including real estate, with different diversification characteristics could improve portfolio level return/risk efficiency

- Increase current ~20% allocation to diversifying real asset categories

Risk and return expectations:

	10 Year Expected Return (%)	Standard Deviation (%)	Sharpe Ratio
Current LACERA Pension	**6.5%**	**13.5%**	**0.37**
Real Assets			
Real Estate	5.7	18.0	0.23
Commodities	4.4	19.5	0.15
Core Infrastructure	6.0	16.0	0.28
Non-Core Infrastructure	8.8	23.0	0.32
Natural Resources	7.9	23.0	0.38

Potential increase in Total Fund return from an additional 5% allocation to Real Assets: approx. 10-15 bps

Source: Meketa Investment Group, Los Angeles County Employees Retirement Association Capital Markets Expectations, September 11, 2017

Improved Implementation

Improved Implementation: Return Enhancement – Alternative Structures

Opportunistic Strategies - new or larger opportunistic mandates or wider use of non-traditional implementation approaches could improve portfolio return/risk profile

Example: *Springing Mandates* – pre-approved strategies to which capital can be rapidly deployed in times of market dislocations

*Potential increase in Total Fund return: approx. 2-5 bps**

* Assumes an additional 2.0% of Total Fund allocated to springing mandates with an average return increase of 7.5%. Dislocations are expected to occur approximately once per decade across multiple asset classes.

Improved Implementation:
Return Enhancement – Enhanced Cash

Enhanced Cash Management – although essential to pay benefits, cash is a non-return seeking asset

- Optimize cash allocation, including cash held in externally managed accounts
- Utilize cash overlays to gain market exposure on residual cash
- Rebalance with overlays to adhere to allocation targets and take advantage of market dislocations

*Potential increase in Total Fund return: approx. 5-15 bps**

* Assumes approximately 10 basis points from incremental market exposure on excess operating cash and cash held by external managers (approximately $500 mm each) allocated according to LACERA's current strategic asset allocation (expected to return 6.5%, or 5% in excess of the expected 1.5% return on cash. An additional 5 basis point benefit is estimated from transaction cost savings that result from a structured rebalancing program using overlays.

Improved Implementation: Return Enhancement – Minimizing Costs

Minimization of Costs - maintain focus on all investment-related expenses

- Accomplish objectives with fewer managers and larger mandates (more concentrated core or strategic relationships)
- Convert higher-fee commingled funds to dedicated managed accounts and fund-of-fund relationships to direct mandates for savings across spectrum of service providers
- Private markets – use longer dated funds and synthetic replication strategies, participate in earlier rounds, expand secondary activity, increase co-investments

*Potential increase in Total Fund return: approx. 5-10 bps**

* Assumes potential savings of 1-5 basis points at the Total Fund level from conversion of eligible fund-of-fund relationships to existing mandates and 5 basis points of potential savings from the implementation of remaining listed items.

Improved Implementation: Total Fund Perspective

Total Fund Perspective – implementation decisions based on a Total Fund perspective can lead to improved risk management and portfolio construction

Individual Holding Example: AAPL (hypothetical)

All dollars in millions

Type of Equity Mandate	Mandate Size	% of portfolio in AAPL	Dollars invested in AAPL	Gain/Loss if AAPL appreciates 10%
Index Fund	$10,000	3%	$300	$30.0
Active Manager 1	$200	5%	$10	$1.0
Active Manager 2	$200	1%	$2	$0.2
Long/Short Manager 1	$50	-2%	-$1	-$0.1
Long/Short Manager 2	$50	2%	$1	$0.1
Total	**$10,500**		**$312**	**$31.2**

Enhanced Total Fund analytics can provide greater insight into net exposures and interrelationships across holdings, geographies, managers, and asset classes

Better understanding of cross-currents in the portfolio

Incremental Sources of Return Review[1]

	Potential Incremental Return (midpoint, bps)
Expanded Opportunities	
Credit	7.5
Real Assets	12.5
Improved Implementation	
Alternative Structures	3.5
Enhanced Cash Management	12.5
Minimization of Costs	7.5
Total Fund	**43.5 bps**

[1] While not guaranteed, these methods offer the potential for an increase in investment returns

Note: Excludes potential alpha and portfolio effects, such as correlation benefits

Bridging the Gap - Conclusion

- Short- to intermediate-term investment returns may not achieve the Plan's threshold return using existing asset categories and implementation methodologies
- This gap may be minimized with a more diversified, more intentional portfolio, incorporating additional portfolio management techniques
- In a low expected return environment, incremental gains matter more
- Longer-term, capital market returns are expected to revert to more normalized levels

Los Angeles County Employees Retirement Association

The Role of Artificial Intelligence In Asset Allocation And Risk Management

Leandro Festino and Edmund Walsh

January, 2018

Introduction

Background

- LACERA's Investment Beliefs state that, "Long-term strategic asset allocation will be the primary determinant of LACERA's risk/return outcomes" and that "Asset allocation has a greater effect on return variability than asset class investment structure or manager selection."
- The Board of Investments ("The Board") is responsible for establishing investment policy and determining the asset allocation for the Pension Fund and the OPEB Trusts.
  - The Pension Fund is scheduled for an asset allocation review in early 2018.
  - The asset allocation policy should be determined by the end of the current fiscal year.
- Today we will be discussing the role new technologies play in asset allocation.

Asset Allocation and Risk Management

- Asset Allocation represents the conscious decision to accept and manage risk.
  - Hence, asset allocation and risk management should be intricately linked with one another.
- The real world risks and objectives faced by investors are complex and often conflicting.
  - Can not be captured by a single metric.
  - Go beyond the limited number of dimensions used in traditional tools.
- Everything is connected.
  - Improving on one metric will effect all other objectives and risks.
  - Focus on any single metric can lead to ‘unseen’ losses in other places.
  - Finding a best-possible solution requires a *simultaneous* approach.
- Our approach builds on strong foundations and extends with advances in technology.
  - Foundations are based on fundamental insights and industry best practices.
  - Quantitative tools are already heavily used in the asset allocation process; new technology extends those same ideas/tools.
    - Extensions are based on Machine Learning, Big Data, and Artificial Intelligence.

The Usefulness of A.I. In Asset Allocation

- A quality asset allocation approach boils down to good old-fashioned hard work and fundamentals.
  - The usefulness of A.I. is extending this fundamental work, efficiency, deeper insight.
- Measurement and analysis.
  - The first step in any asset allocation is the measurement of the risk and opportunities available.
  - “What gets measured gets managed” – **Machine Learning** measures more.
- Find the best possible trade-off.
  - Real-world investment objectives are complex and conflicting. “Nothing in life is free”.
  - Using **Artificial Intelligence** allows us to *simultaneously* evaluate all of these complexities.
  - A simultaneous approach is the <u>only possible way</u> to find a best possible trade-off.
- Risk analysis.
  - Build a deeper understanding of the risks and exposures embedded in an asset allocation.
  - The introduction of the tools above means that the complexity and number of factors and connections being measured and evaluated have greatly increased.
  - Using **Big Data** tools is the <u>only way</u> that these types of risk analysis and simulations can be done.

Artificial Intelligence Extends Traditional Tools

- Artificial Intelligence can think more broadly and more deeply than traditional tools.
  - The spirit is “what gets measured gets managed”.
    - A.I. allows us to measures more
  - Traditional tools can incorporate only a small subset of real-world objectives.
- A.I. can simultaneously evaluate a much more realistic set objectives/dimensions:
  - Better “fat-tail” performance
  - Lower cost implementation
  - Lower tracking error
  - Better factor diversification
  - Simultaneous evaluation of other potential improvements
- A.I. can include any insight whether qualitative, quantitative, fundamental, or otherwise.
- A.I. isn’t magic – it has a transparent methodology.
  - A.I. is math heavy, but as a result it can point to every single input and has a clear intuition behind every output.
  - While math is always complicated, it also makes this the least ‘black-box’ model we are aware of.

How A.I. Is Used In Asset Allocation

How A.I. Is Used In Asset Allocation

- Artificial Intelligence requires a set of new technologies working together.
- While the usefulness of A.I. within asset allocation is wide ranging we will focus on the three most major buckets.
  - Each bucket focuses on extending traditional tools and working in unison with human insight.

    1. Machine learning in measurement and analysis.
    2. Artificial intelligence to find the best possible trade-off.
    3. Big data tools in risk analysis.

Extending What We Already Do

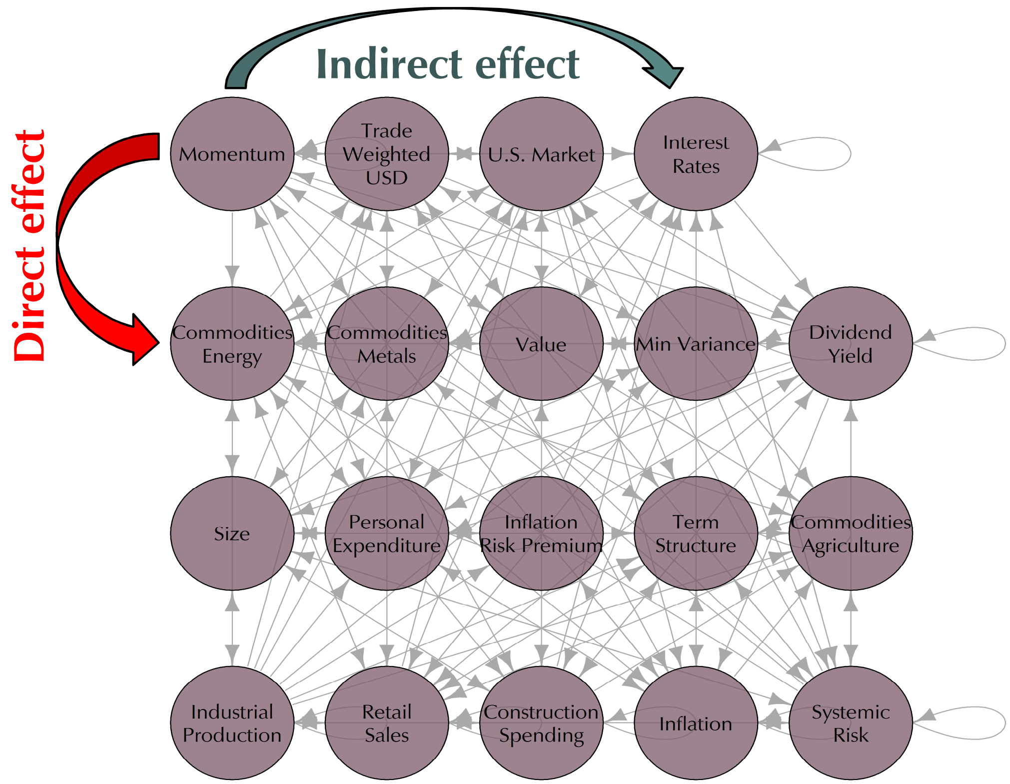
- The most important point is often the most overlooked.
  - A.I. is a natural extension of current methods and tools.
  - Builds on fundamental insights.
  - Allows computers to focus on tasks they are good at while allowing humans to focus on work best suited to human intelligence.
- Best of both worlds.
  - Makes current work more efficient and productive.
  - Frees up time for humans to be more creative.
- A collaborative approach.
  - Managing the interaction between human and artificial intelligence changes business processes.
  - We teach the A.I. while the A.I. teaches us.

Machine Learning

Machine Learning: Select and Test

- Rigorous selection and testing of what really matters.
- Any investment analysis must focus on what drives the performance of that investment.
  - Select which qualitative and quantitative factors really matter.
  - Empirical testing ensures that it works in practice.
- The use of machine learning greatly streamlines this process.
  - This is the type of work computers are well-suited for.
    - Can test a much wider range of factors.
    - Can perform robust empirical testing very quickly.
  - Using in tandem with human insight can ensure A.I. doesn't go 'off the rails'.
- Despite being very important, parsing through loads of information and empirical testing aren't the 'sexiest' jobs.
  - Computers are very good at these tasks, making the process more efficient.
  - Allows humans to be creative and find new factors to examine.

Economic Dynamics Through Time



- This graphic is an example of the connections found between economic factors using machine learning.
  - Everything is connected.
- Nothing can be managed in isolation.
  - Either directly or indirectly trying to managed any of these risks effects exposure to all others.

Macro-Financial Factor Surprise Correlation Matrix

	Industrial Production	Retail Sales	Construction Spending	Inflation	Personal Expenditure	Inflation Risk Premium	Interest Rates	Term Structure	Systemic Risk	Trade-Wtd USD	Commodities Agriculture	Commodities Energy	Commodities Metals	U.S. Market	Size	Value	Momentum	Min Vol
Retail Sales	27																	
Construction Spending	24	19																
Inflation	6	16	11															
Personal Expenditure	11	-3	10	35														
Inflation Risk Premium	-6	-9	14	2	6													
Interest Rates	20	32	18	16	9	-12												
Term Structure	0	-9	-19	17	0	10	-39											
Systemic Risk	8	-31	23	-5	7	16	-25	6										
Trade-Wtd USD	-1	-25	16	-26	-13	19	2	-2	42									
Commodities Agriculture	9	12	-15	13	2	-26	12	0	-20	-42								
Commodities Energy	8	20	2	47	21	-14	22	15	-27	-50	43							
Commodities Metals	12	27	-10	25	12	-17	24	11	-30	-57	55	54						
U.S. Market	11	34	1	10	-2	-10	21	-3	-46	-49	44	44	49					
Size	13	31	8	26	15	-5	38	-19	-32	-41	32	44	43	62				
Value	-20	-11	-12	-3	-9	1	-20	5	-4	16	-20	-14	-19	-37	-53			
Momentum	-26	-17	-4	-4	-9	0	-26	7	19	37	-31	-25	-32	-52	-70	71		
Min Vol	-7	21	-15	4	6	-12	9	-18	-34	-44	32	19	34	67	62	-42	-50	
Dividend Yield	6	-13	11	-8	11	-5	-23	-11	38	5	-15	-28	-27	-21	-15	-35	-2	3

- Machine learning doesn't stop with connections only, surprises/shocks across economic factors tend to be correlated through time.
  - Just like humans, machines are sometimes surprised but they seek to understand these surprises.

Machine Learning: Avoiding Noise

- How can machine learning avoid noise and false positives?
  - This is a difficult problem that both humans and machines are susceptible to.
- Again, this is an example of combining the skills of <u>both</u> humans and machines.
  - Let the <u>machines</u> focus where they have the advantage.
    - Rigorous testing, testing, and re-testing.
      - Cross-validation – basically, testing across every conceivable time period for consistency.
    - Searches for false connection driven by a few outliers and removes them.
    - Favors connections that have economic importance, not just statistical importance.
  - Let <u>humans</u> focus where they excel.
    - Human finance professional look for intuition in the machine learning results.
      - Only include insights from machine learning that you can understand -- **common-sense**
    - Having more time free because the machine learning takes care of much of the grunt work allows humans to focus on being creative.
      - Find new things to examine, look for deeper connections.

Machine Learning: Summary

- Machine learning is truly an extension of the rigorous hard work done today.
  - Improving both existing fundamental and quantitative tools.
- The real benefit to machine learning is making that process more *efficient*.
- Working together with human insight brings the best of both worlds.
  - More human creativity
  - Improving overall efficiency
- Focuses on the many connections between the fundamentals that drive investment returns.
  - Also seeks to understand when surprises/shocks occur.
    - Asks itself: “What did I miss?” and reduces the chance to future surprises.

Artificial Intelligence

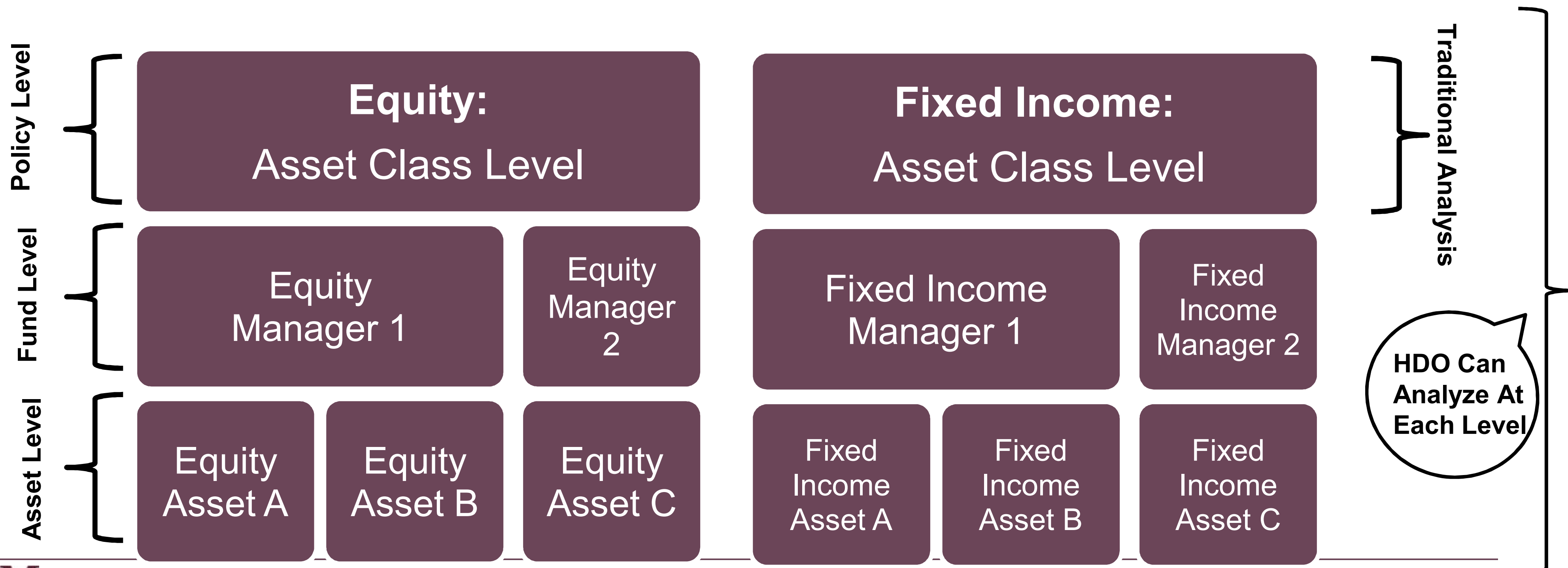
A.I.: High Dimension Optimization

- What gets measured gets managed.
  - A.I. allows us to take this to the limit.
- The main algorithm driving our A.I. process is High-Dimension Optimization (HDO).
  - High Dimension Optimization means exactly that, optimizing many, many things.
    - This is a major expansion on traditional tools/approaches.
  - HDO has the potential to incorporate all available insights.
  - It is a tool designed to aid human insight, learn, and <u>make more informed decisions</u>.
- HDO is just a tool.
  - The most complete tool available that we are aware of.
  - It utilizes artificial intelligence and machine learning.
  - It isn't bound by a limit on the number of inputs it can evaluate.
  - Every insight is still verified by a human financial professional.
- HDO is transparent.
  - We can point to every number and why every decision was made.

More Dimensions Equals More Granularity

A higher number of dimensions gives HDO the ability to perform analysis at a much more granular and deeper level than traditional approaches.

- Traditional analysis can only look at the top asset class level.
  - This misses a big part of the picture.
- HDO analysis can go much deeper and therefore have a much more granular view.



Advances on a Strong Foundational Model

Framework	Return Goals	Risk Goals	Intuition	Additional information it attempts to incorporate relative to MVO	
MVO - 1952	Expected return	Expected Variance	Foundation of all below. Investors like return but dis-like risking capital	NA	**Foundation of Risk/Return Frameworks**
Mean-cVaR - 1999	Expected return	Expected Tail Risk	Focuses on extreme losses as these are of more importance to investors	Asset behavior in extreme scenarios	
MVTE - 1992	Expected return	Expected Variance + Expected Tracking Error	Taking a position that is different from the market is a risk	Trade-off of relative risk	**Models that add/modify informational value on top of the foundation of MVO**
BL - 1992	Market Base Case (CAPM) + confidence weighted investor views	Market Base Case (CAPM) + confidence weighted investor views	Expressing a view that is different from the market is a risk and should be systematically weighted by confidence	Confidence weighted investor views	

- MVO is the foundation of all Modern Portfolio Theory (MPT).
- Since it’s creation many have added value on top of this foundational model.
- HDO does the same, but is designed to incorporate any and all.

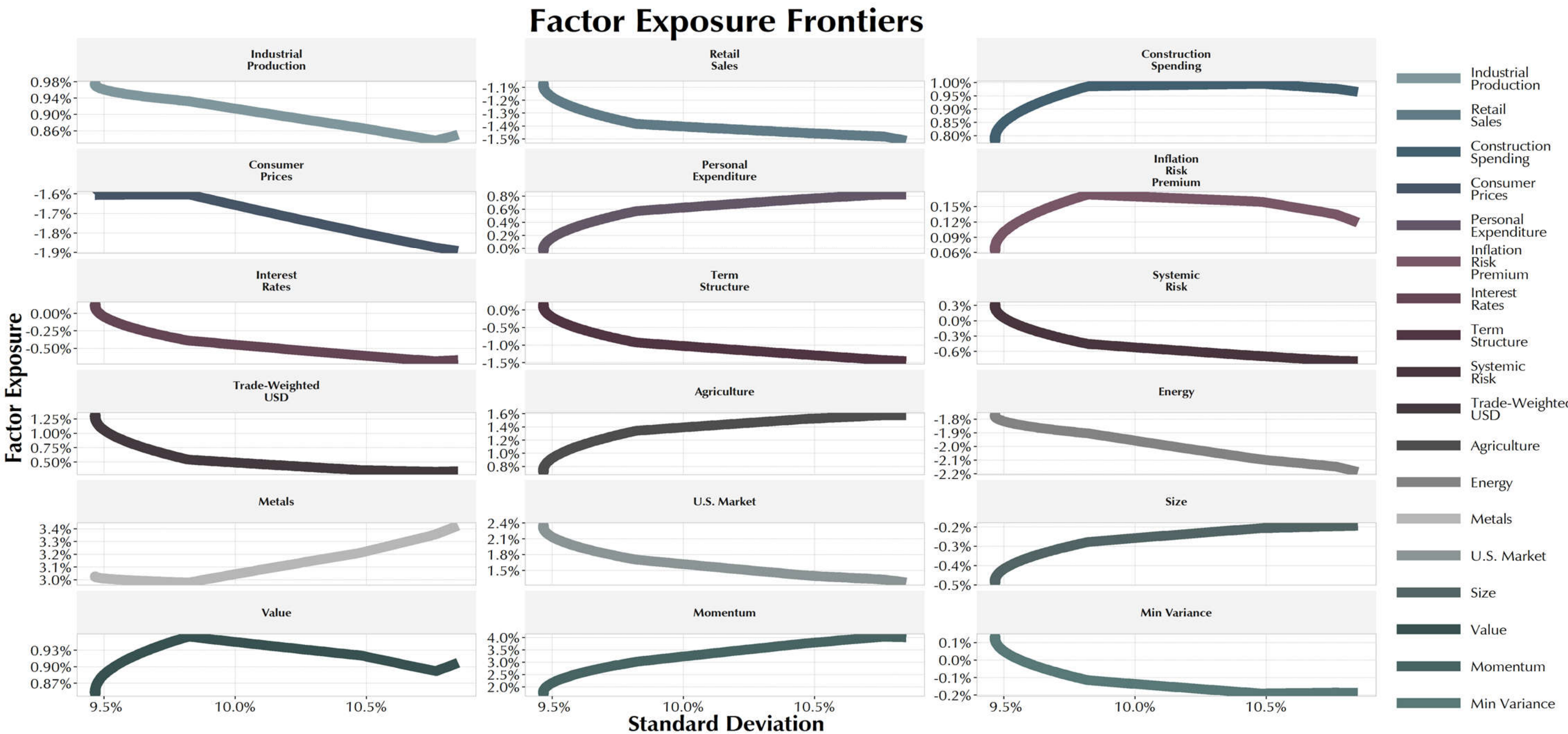
Where Does High Dimension Optimization Fit In?

- Modern Portfolio Theory in Formula(s):

$$Utility = \overbrace{\overbrace{\overbrace{\underbrace{\mu}_{\text{Return}} - \underbrace{\lambda_1 * \sigma}_{\text{Variance}}}^{\text{MVO}} - \underbrace{\lambda_2 * TEV}_{\text{Tracking Error Variance}}}^{\text{MVTE}} - \underbrace{\lambda_3 * TFS}_{\text{Total Factor Sensitivity}} \ldots \underbrace{\qquad\qquad}_{\text{Other Objectives Can Be Added}}}^{\text{HDO}}$$

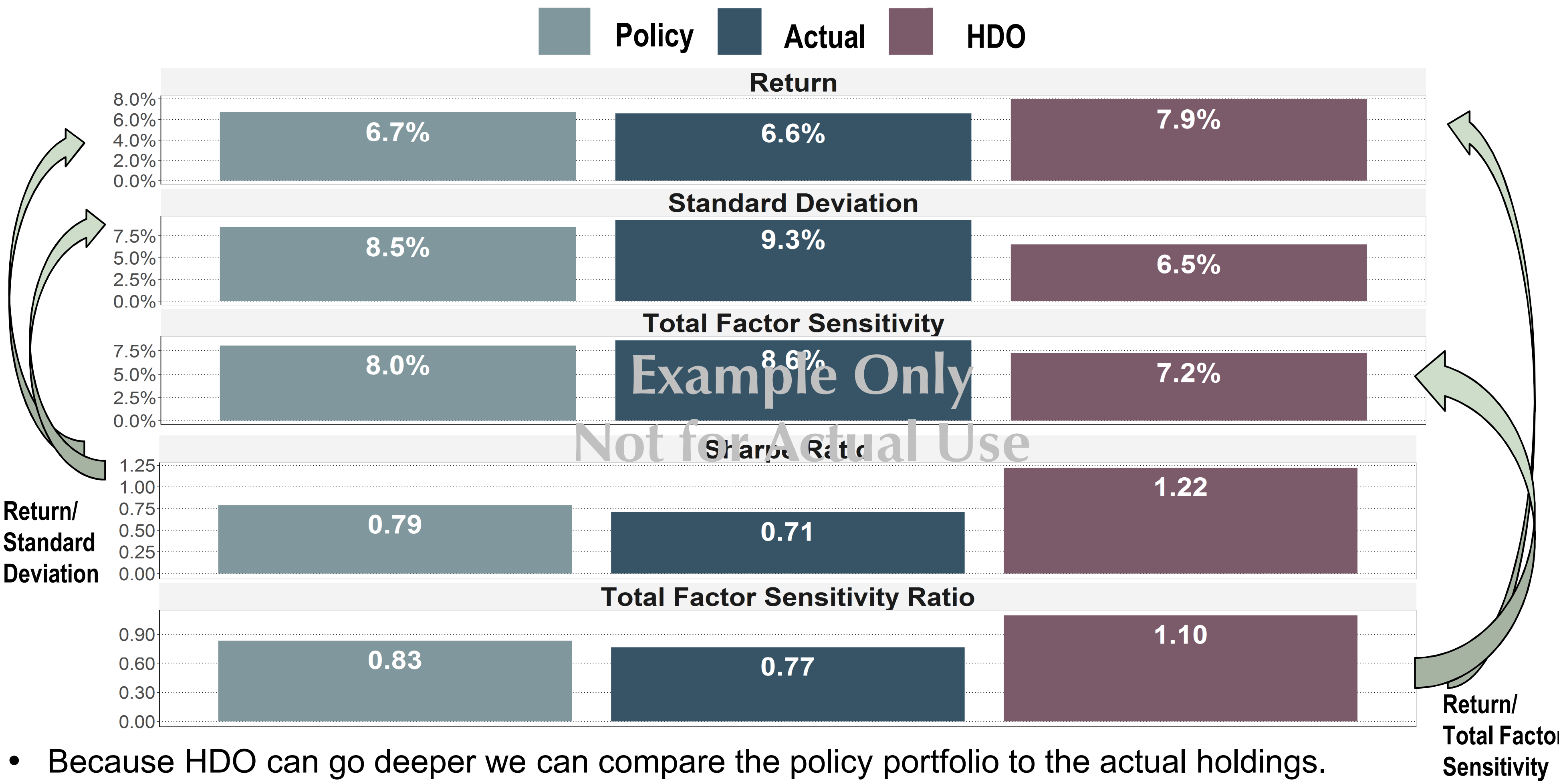
- Looking at the formula for HDO we can see how it builds on existing foundations.
- HDO also incorporates insights from the other models of MPT.
  - Tail-Risk:
    - This was the focus of Mean-cVaR and is controlled for within the Total Factor Sensitivity portion of HDO by trading off or targeting Systemic Risk.
  - Black-Litterman (BL) and confidence weighted expectations:
    - The insight of BL was about how to formulate forward looking returns.
    - This is addressed in the machine learning measurement process of HDO and the same insights of BL can be incorporated into HDO.

What Do "High Dimensions" Look Like?



- To find the best trade-off, i.e. to get the most for each risk you take requires simultaneous evaluation of each frontier.
- High Dimension Optimization is a necessary tool for this process.

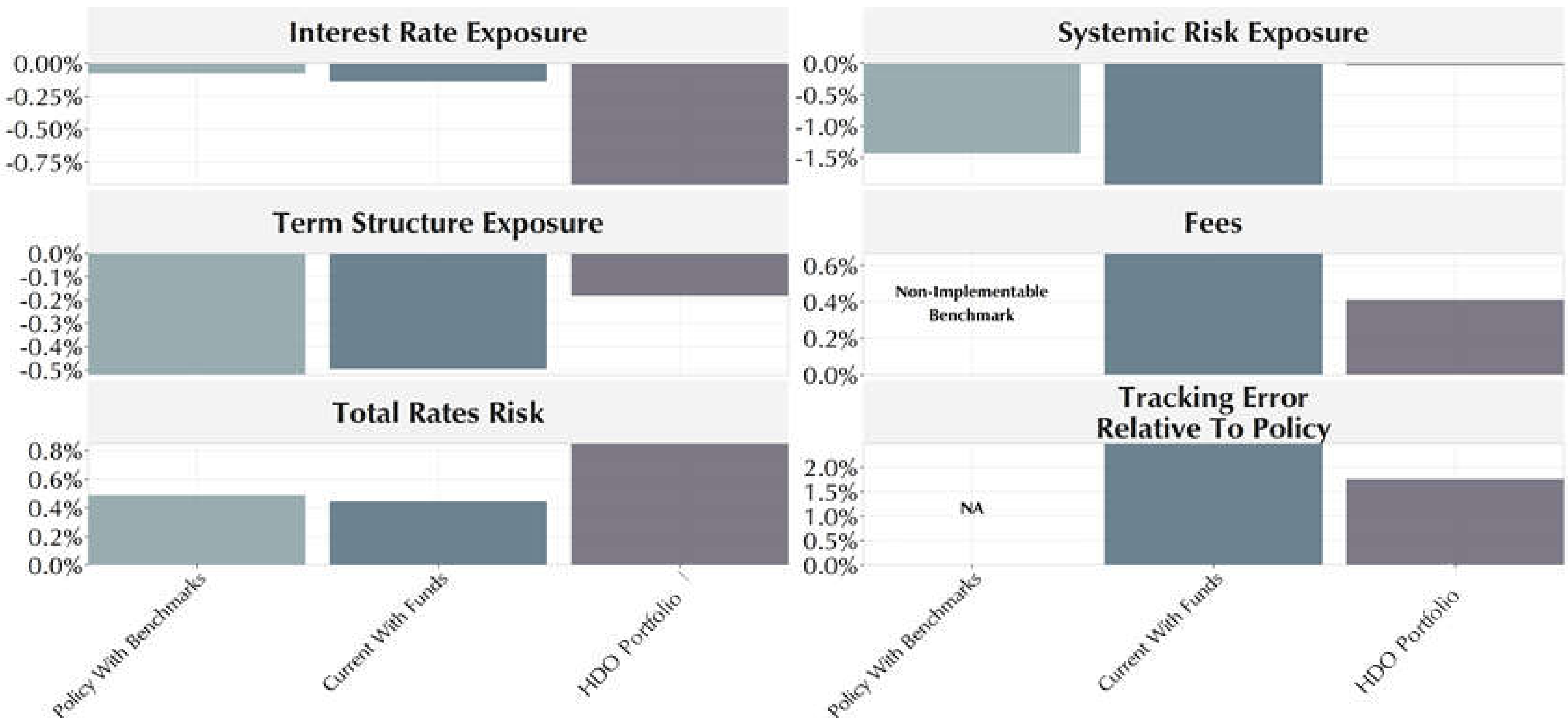
Portfolio Metrics



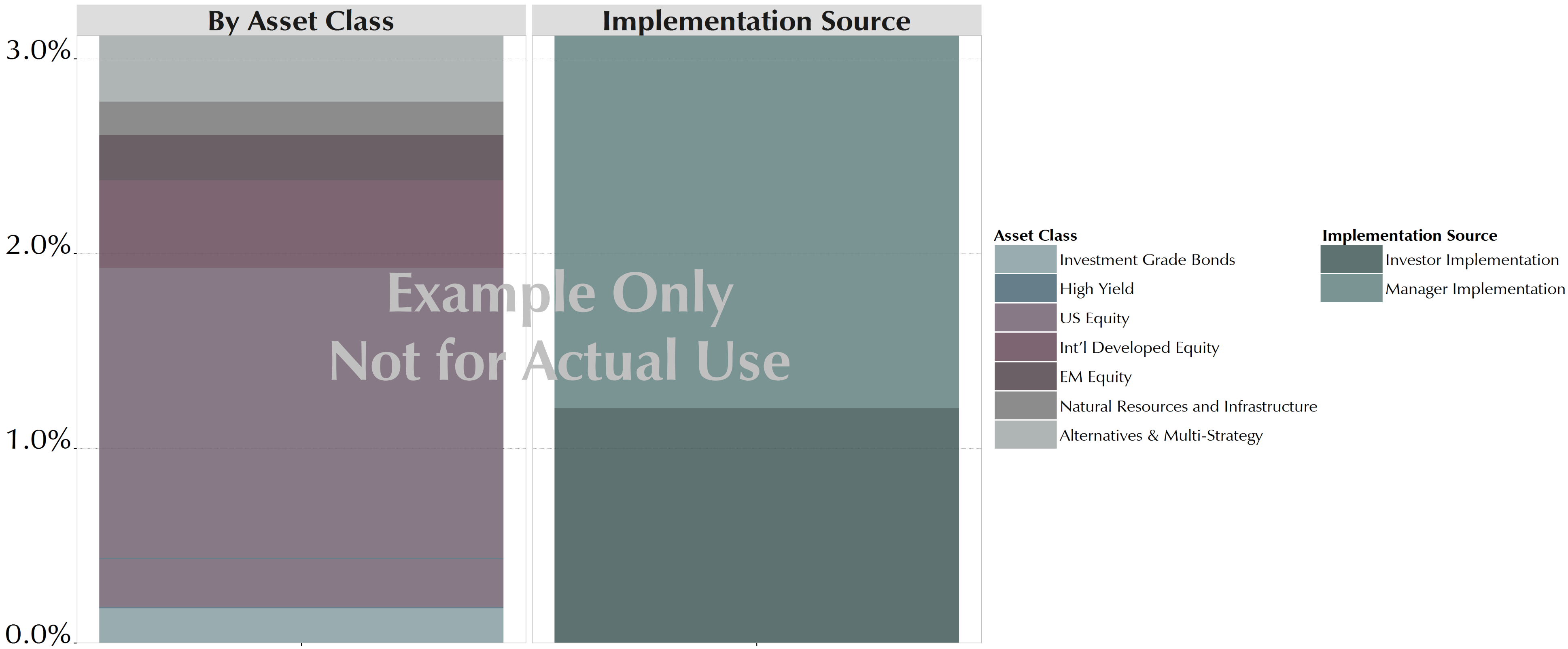
- Because HDO can go deeper we can compare the policy portfolio to the actual holdings.
- Total Factor Sensitivity is similar to Standard Deviation but specific to included factors.
- In short, HDO can get more from each factor.

More Refined Control

- Because A.I. measure in a simultaneous fashion, it can exert more control of specific metrics.
  - Understanding trade-offs at a deeper level allow for more refined and informed control.



A Deeper Multi-Level Example: Contribution to Tracking Error



- We have mentioned that A.I. can look at multiple levels for a deeper more informative analysis.
- In the example above we can see how A.I. allows us to manage both the asset class and implementation source of tracking error simultaneously.
  - By managing in a simultaneous way it is possible to 'get the most' from each source of risk.

A Multiple Objective Example: Portfolio Comparison

Metric	Current Portfolio	Alternative Portfolio
Expected Performance in a future crisis	-28.7%	-21.5%
Tracking Error	3.1%	3.3%
Manager Active Risk	1.6%	1.1%
Alpha Expectation (gross)	68 bp	46 bp
Active Management	83%	36%
Total Fund Expense	67 bp	29 bp
Expected Net Value-Add from Active Management	+1 bp	+17 bp

- To make the most efficient use of tracking error, a portfolio should focus on using active management in those areas where it can add the most value.
- Not just more deeply within tracking error and other factors.
- More broadly: fees, performance in future crisis, and net-value added as well as all other included factors.

Artificial Intelligence: Summary

- High Dimension Optimization is the main algorithm driven our A.I. process.
- High Dimension Optimization (HDO) means optimization over a very large number of objectives.
  - Traditional MVO describes investment goals in two dimensions: volatility and expected return.
  - In contrast, HDO allows for a more complete description of the complex objectives and constraints that investors face in the real world.
- HDO is a tool that finds the best possible trade-off between complex and potentially conflicting goals and risks.
  - Objectives could include better "fat-tail" performance, lower cost implementation, lower tracking error, better factor diversification, etc.
- HDO can evaluate all objectives simultaneously and be customized to the needs of a particular investor.

Big Data Simulations

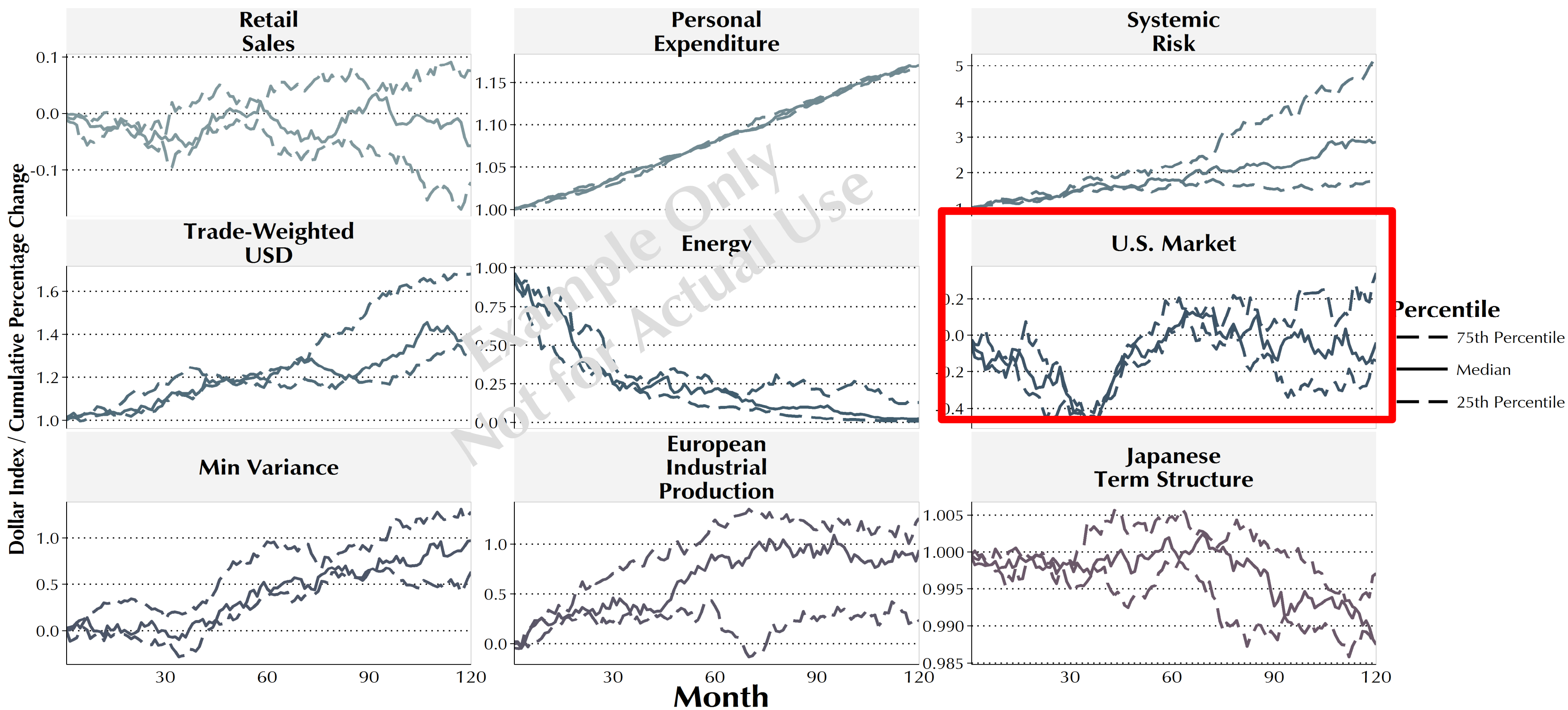
Big Data Simulations – Simulating At A New Scale

- More scale has important advantages.
  - We use 184,800,000 simulations in the base scenario.
  - More scale means we can run more specific scenarios than would otherwise be possible.
    - More accuracy for low probability (i.e. the most interesting) events.
    - Emergent properties are captured where they would otherwise be missed.
- We tested and continue to test this……a lot.
  - We use cross-validation (i.e., tested over and over to the limit).
  - This gives us higher confidence in results.
- Probabilistic vs. Deterministic
  - Deterministic is more common, but essentially chooses the outcome before the test.
  - Probabilistic is more rigorous and this scale allows us to run this type of test and still cover the type of specific scenarios that the deterministic approach is normally used for.
- A combination of fundamental and quantitative approaches.

Big Data Scenario Simulations: U.S. Market Crash

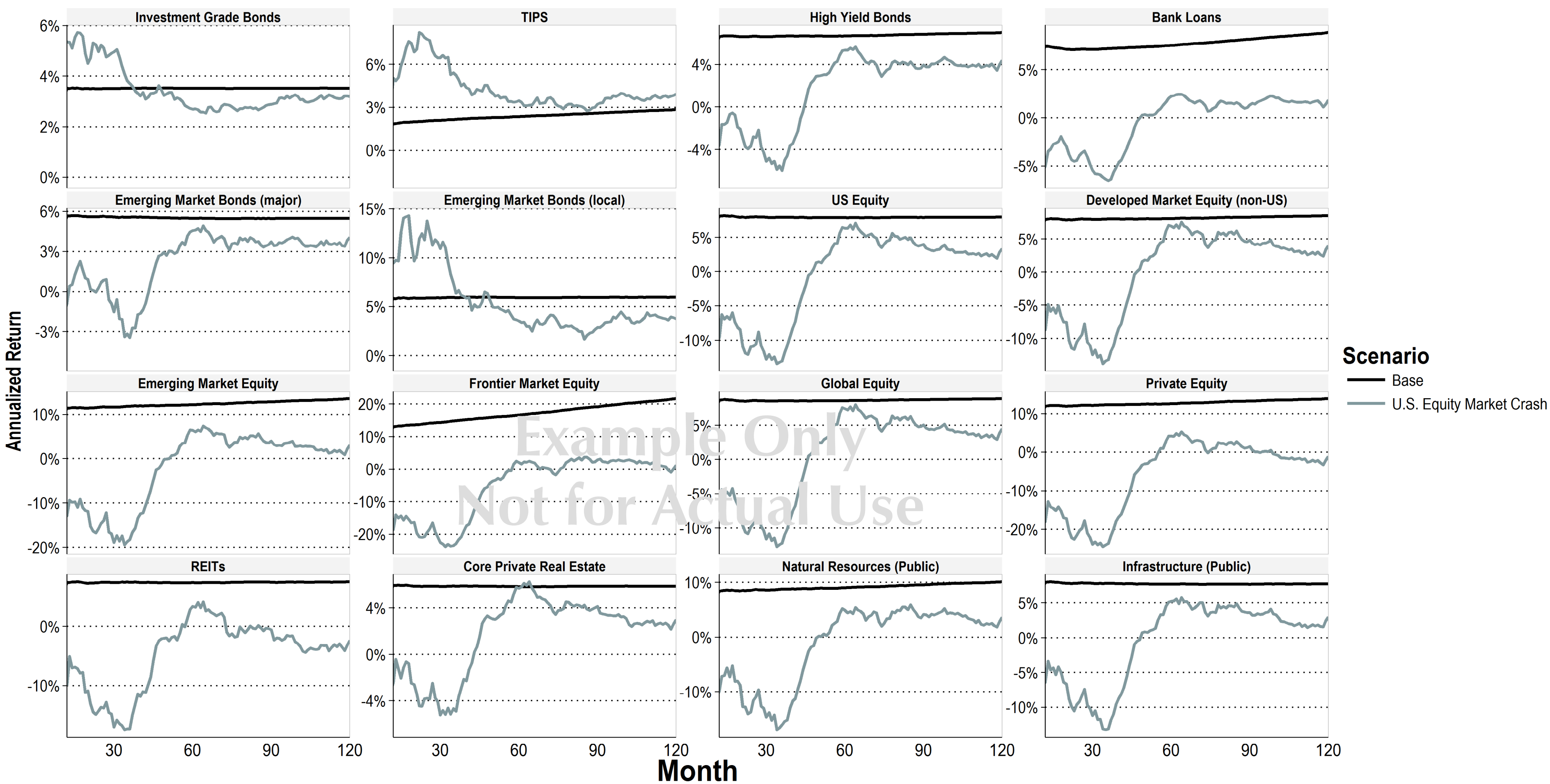
- Our walkthrough uses a basic scenario that sadly, most will be familiar with:
  - A crash in the U.S. Equity market.
- In this scenario we see a substantial crash in the U.S. Equity market which occurs over the next 3 years but is followed by a strong recovery over the following 2 years (5-year scenario in total).
  - Our scenario simulations are akin to a stress test as we 'stress' in this case the U.S. Equity market factor and allow other factors to respond based on our modelling.
  - The probability of a market crash of this size is 6%.
  - We also assume that this crash will be followed by a strong recovery.
    - The probability of a crash of this kind followed by such a recovery has an even lower probability of less than 1%.

Factors Driven by U.S. Equity Market Crash



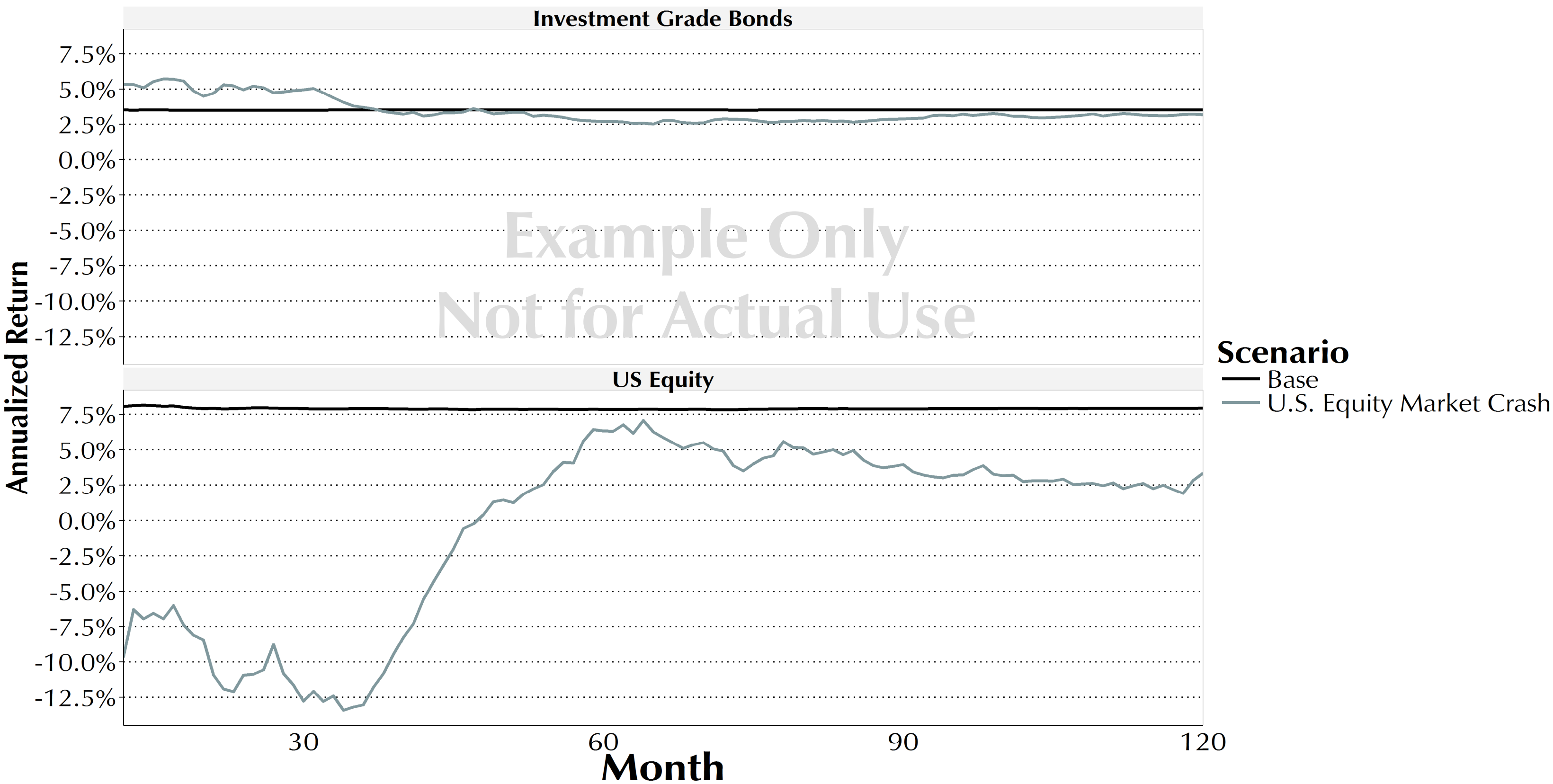
- In red we have highlighted the U.S. Market factor which is the only factor we 'shock' directly. Other changes happen as a result of this shock.

Total Returns: U.S. Equity Market Crash Simulation



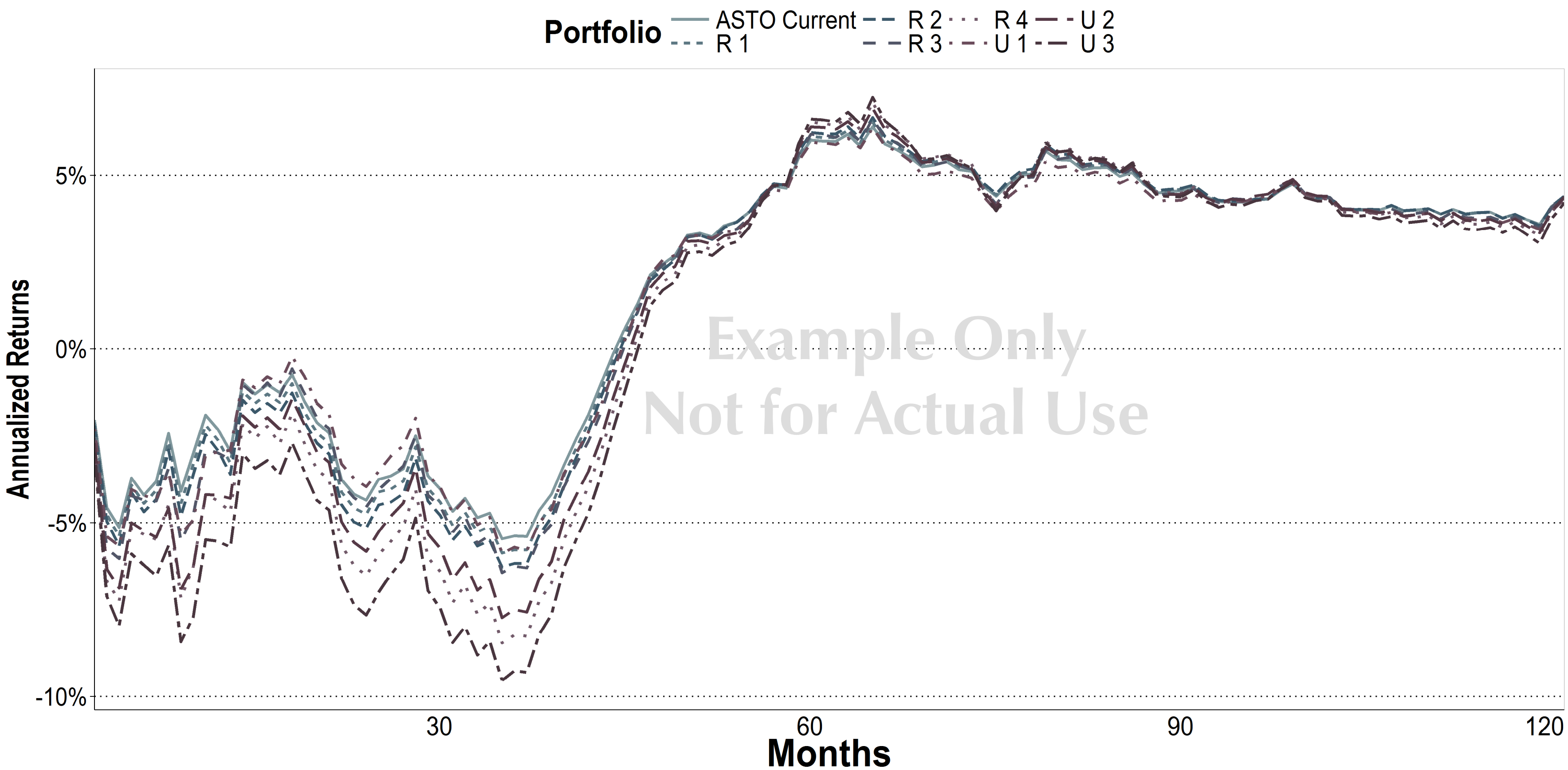
- In the chart above we can see that this scenario effects each asset class differently.

More Focus – Cumulative Annualized Returns



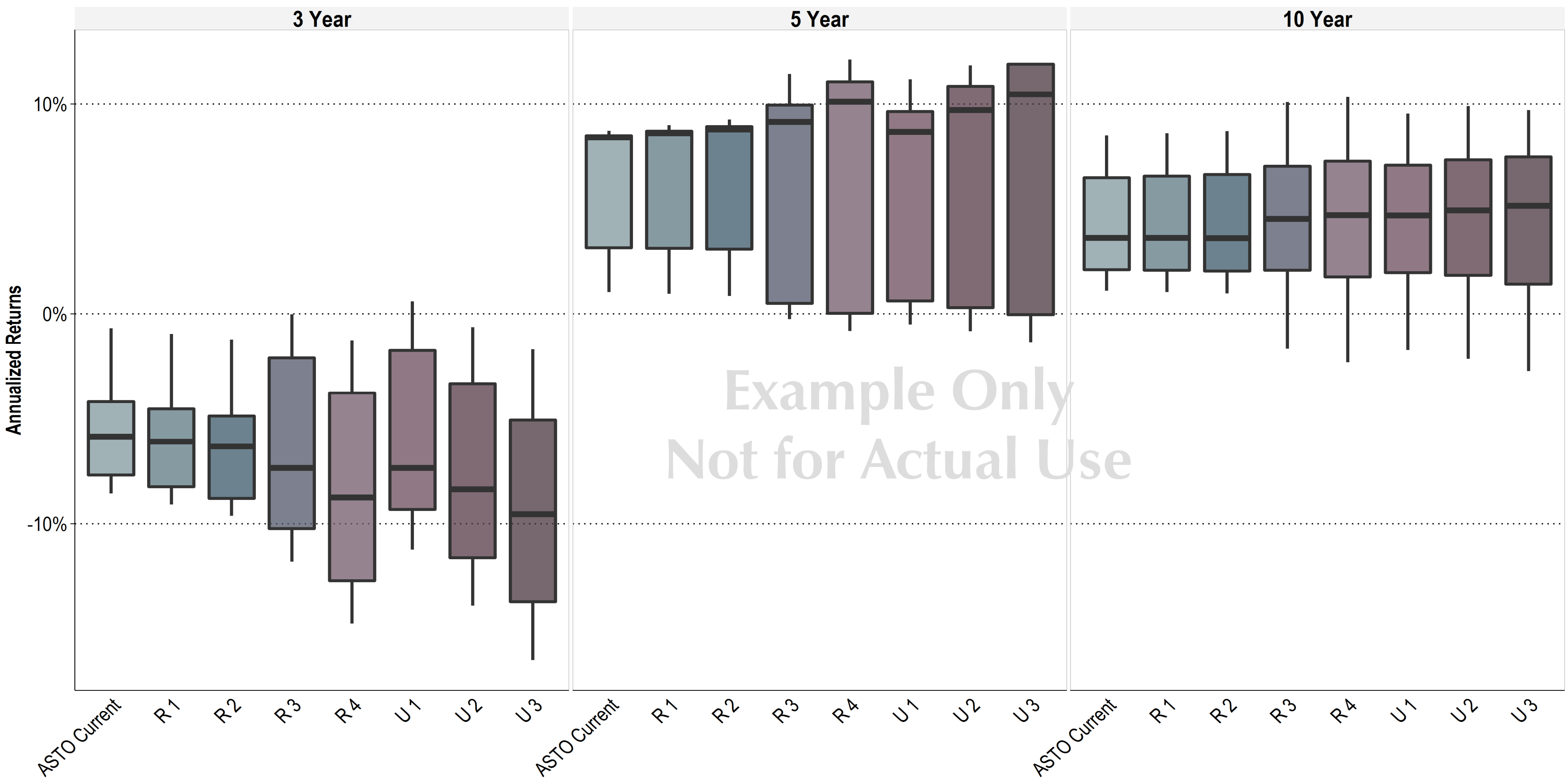
- To help us understand this scenario better we focus on two asset classes.
- Interestingly, our models show that without assuming more economic growth or other intervening factor in the future a strong recovery after a crash leads to stagnating returns.

Portfolio Comparison



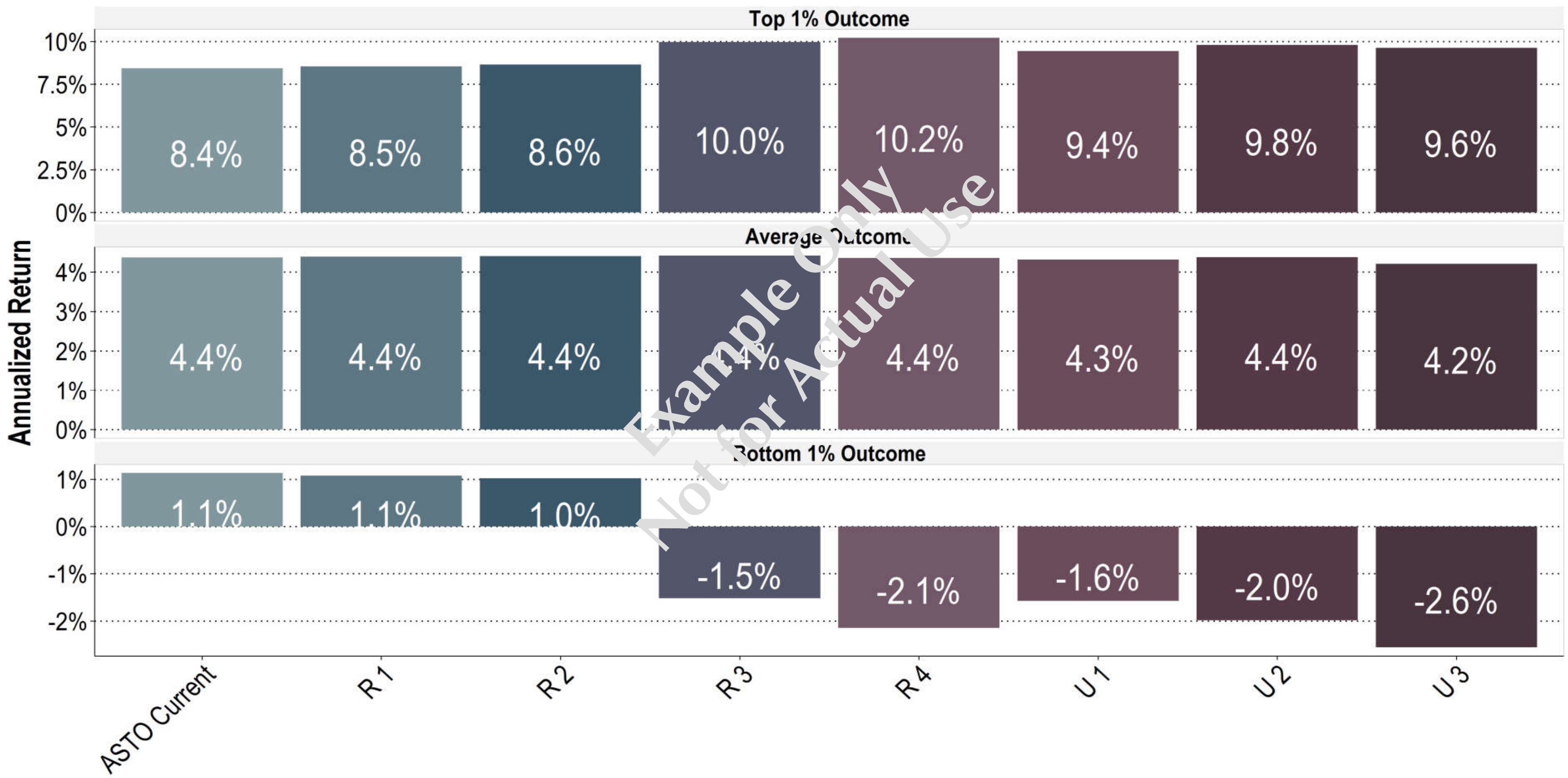
- In the chart above we can see that in this scenario each suggested portfolio is expected to suffer differ differently through the crash.

Portfolio Comparison at Trough of Drawdown



- In the chart above we can see both the average and the range of possible outcomes.

Portfolio Comparison: Range at 10 Years



- While at the end of 10 years many of these differences are expected ‘wash out’ on average but the top and bottom 1% outcomes can still be meaningfully different.

Big Data Scenario Simulations: Summary

- Big Data Simulations use unprecedented scale.
  - Brings greater accuracy.
  - Finds connections not previously visible .
- These scenarios are easily customizable so we can address any scenario.
  - With sufficient lead time (+1 week) we can add custom factors/risks of interest.
- Since this is a probabilistic process, it has several distinct advantages over other approaches:
  - Clear probabilities associated with events and/or chains of events.
    - Helps compare scenarios apples-to-apples.
  - Have more realistic ranges of outcomes than single numbers.
  - Immune to human biases.
    - If our modeling does not line up with expectations, going through the process to determine why can lead to a more profound understanding.
- A broader, deeper, and more complete analysis leads to better informed decisions.

Summary

Conclusion

- Asset Allocation represents the conscious decision to accept and manage risk.
  - Determining the mix of assets is one of the Board's most important tasks.
- The real world risks and objectives faced by the Board are complex and often conflicting.
  - Can not be captured by a single metric.
  - Go beyond the limited number of dimensions used in traditional tools.
- Our approach builds on strong, proven foundations, insights and industry best practices.
  - LACERA has been using quantitative tools heavily in the asset allocation process.
  - New technology (Machine Learning, Big Data, and Artificial Intelligence) improves on those same ideas/tools.
  - This new technology will be a necessary tool in an ever more complex investment landscape.

Next Steps

- We anticipate at the March meeting the Board will select asset categories and approve the framework.
- At the April meeting, we expect the Board will:
  - Review an initial set of asset allocations options, using a variety of tools including MVO-based risk analytics, risk budgeting, scenario analysis, liquidity analysis, peer comparisons, etc.
  - Evaluate model constraints
  - Refine the target risk and expected return range
- At the May meeting, the Board should review a refined set of allocation options, and may approve the Pension Fund’s 2018 strategic asset allocation.

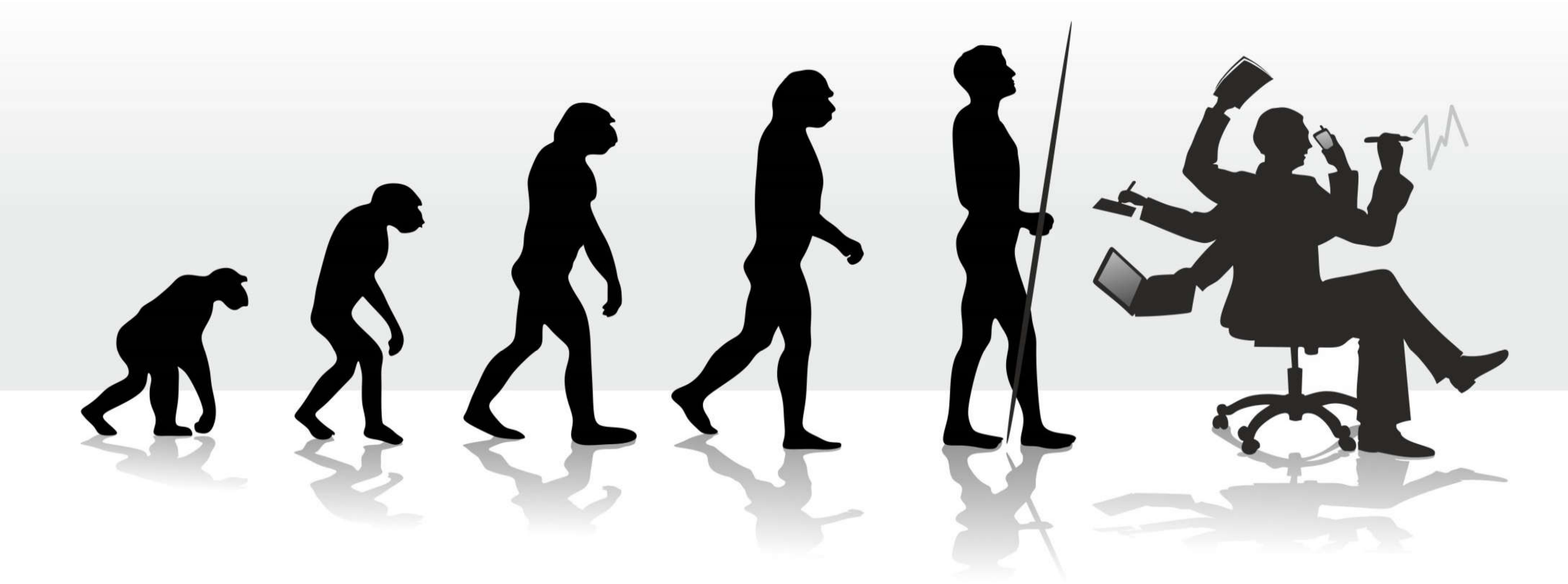
Appendix

Why Are We Talking About A.I.?

- Is this just a fad?
  - Promising technologies have come and gone before, how is A.I. any different?
    - Expands on skills and insights professionals are already using.
    - A necessary tool in an age of expanding data sources and collection.
    - It's the competitive edge that investors will need not just to succeed but to survive.
- What does A.I. really do?
  - It isn't magic.
  - The insights and tasks that A.I. performs are based on the same fundamental insights we have always had.
    - Simply more efficient and less prone to errors.
- How is that any different than what we do now? How is that better?
  - The biggest change is how A.I. is changing *how* we work.
  - Allows computers to focus on tasks/insights where they excel and allows **humans** to focus where they excel.
  - Leads to more informed decisions, deeper research, and more creativity.

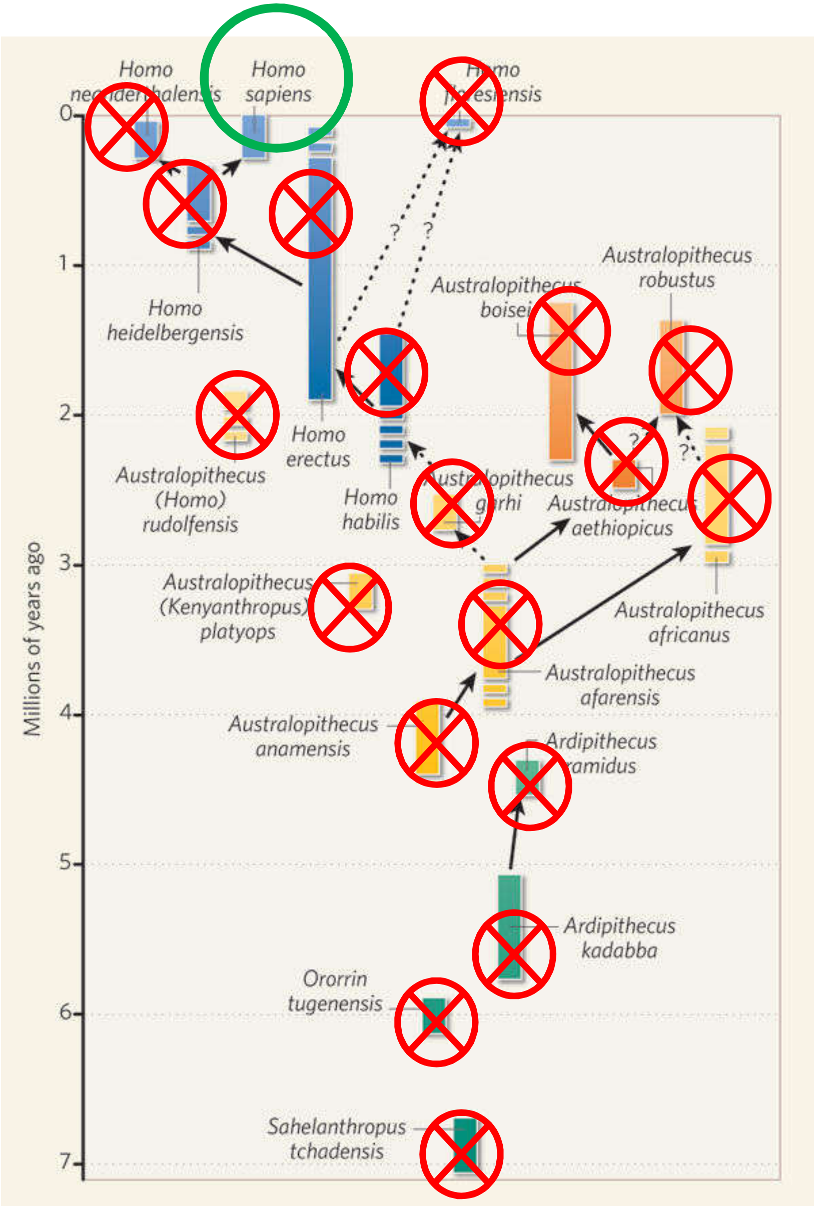
A.I. Is The Next Evolutionary Step

- Markets continue to evolve and learn over time.
  - As information and complexity increase humans are asked to do more and more.
  - A.I. is a tool designed to aid humans in this situation.



Making Use of More Data

- One of the biggest reasons A.I. is a necessary tool is the vast expansion of data and information.
- Taking in all of this information can be like drinking from a firehose.
- While skeptics will try to dismiss this data expansion as noise.
  - **Your** competitors in the market are utilizing this information.
  - For example, a recent survey by McKinsey found:
    - Almost every major financial institution list A.I. as a top priority.
    - Each have planned investments.
- Humans ability to make sense of all this information is limited.
- A.I. a necessary tool.



Survival Of The Fittest

- Previously, we discussed A.I. as an evolution.
  - In a nice, clean, linear fashion.
- Evolution is anything but clean.
  - Competitive and chaotic.
  - Most don't survive.
- A.I. is not a 'nice to have' addition.
  - As more market participants incorporate A.I. competition will increase.
  - Those too far behind the curve are likely to go extinct.

Motivation Overview

- A.I. is not just a fad but a necessary tool for future survival.
  - Builds on current fundamental insights and methods.
- Makes use of more information.
  - As more market participants incorporate A.I., markets are likely to become more competitive.
  - Human ability to incorporate all this information is limited.
    - A.I. is a necessary tool.
- Not a human replacement, a human aid.
  - Allows computer to do things computers are good at and humans to focus on work that humans are good at.
  - Leads to more informed decisions, deeper research, and more creativity.
- Building on fundamental and time-tested methods, A.I. extends traditional tools.

Where We Are Today

- When discussing artificial intelligence some folks tend to jump to extreme examples.
  - Artificial Intelligence ≠ Skynet
- The current and future development of A.I. can be thought of in stages.

1. Guided Learning.
   - Checked and approved by human intelligence.
   - Extends current tools, methods, and insights.
   - This is where we are today.
2. Unsupervised Learning.
   - Learns without human intervention.
   - Has the potential to learn in new ways.
   - This has been successful in some fields to-date but not within economics and financial markets.
     - The high correlations within market data can easily lead to false positives/connections.
3. Technological Singularity
   - The A.I. of movies but more fiction than science.

Where We Are Today – Summary Table

Type	Description	Potential Problems	Likely Outcomes	Time Of Use
Fundamental	Human Intelligence Only	Limited Ability To Use/Process All Information	Consistent but susceptible to human folly (greed/fear/emotion)	Since the advent of markets
Guided Learning	A combination of Human Intelligence and Artificial Intelligence	Requires close integration of both intelligence types so one cannot dominate the other	A 'best of both worlds' approach with improvements on Human-Only while managing risk of computers run-a-muck	Since the 1950s. Successful across all fields
Unsupervised Learning	Artificial Intelligence without human intervention	Highly correlated market information finds false positives	Works well until it doesn't	Since the 2010s. Successes in some fields but not yet in finance or economics.
Technological Singularity	Artificial Super-Intelligence, the A.I. of fiction	We don't understand how human intelligence really works, so may be impossible to create	1. Human Slaves 2. Transcendent Utopia	Never attempted, not likely in our lifetimes

FIDUCIARY EDUCATION

Board of Investments
Los Angeles County
Employees Retirement
Association

February 1, 2018

Harvey L. Leiderman
Reed Smith LLP

FUNDAMENTAL FIDUCIARY DUTIES

- Primary Loyalty Rule
- Exclusive Benefit Rule
- Duty of Prudence
- Duty to Diversify
- Follow the Plan

ReedSmith

FUNDAMENTAL FIDUCIARY DUTIES

- *Primary Loyalty Rule* – Duty to act in the best interests of the members and beneficiaries, not to promote personal or others' interests (this duty takes precedence over all others)
- *Exclusive Benefit Rule* – Duty to use plan assets solely for the purpose of paying the members' promised benefits and reasonable administrative expenses
- *Prudence Standard* – Duty to act "under the circumstances then prevailing" as would a prudent person "in a like capacity *and familiar with these matters*…in the conduct of an enterprise of like character and with like aims"

FUNDAMENTAL FIDUCIARY DUTIES

- ***Diversification*** – Duty to diversify the investments so as to minimize risk and maximize return, unless clearly not prudent to do so
- ***Follow the Plan Documents*** – Duty to administer the Plan in accordance with the Plan documents – including the Constitution, the CERL, IRC and regulations, Board regulations, charters and policies

WHAT IT MEANS TO BE "LOYAL"

- An "interested" board, but not a "representative" one
- A constituency of one - members
- Even if offices are not legally "incompatible," you cannot favor the other one over this one
- Avoid conflicts of interest – the strongest public policy
- Avoid abstaining from voting

ReedSmith

WHAT IT MEANS TO BE "LOYAL"

- Be impartial – treat all members fairly
  - Active and retired members may have different interests
  - Work to balance all members' interests
  - Avoid sacrificing long-term financial success to achieve short-term financial or other goals
  - Allowed discretion recognizes how difficult this balance can be to achieve

ONE COURT SAYS IT ALL

The fiduciary provisions of trust law were designed to prevent a trustee from being put in a position where he has dual loyalties, and therefore, he cannot act exclusively for the benefit of a plan's participants and beneficiaries. An employee benefit fund trustee is a fiduciary whose duty to the trust beneficiaries must overcome any loyalty to the interest of the party that appointed him. Thus, the statutes defining the duties of a management-appointed trustee make it virtually self-evident that trustees are not representatives.

* * *

One of the means of insuring neutrality in the administration of a trust was to give each side of the bargaining table an equal voice in the selection of trustees. It is also a recognition of the fact that the administration of a trust fund often gives rise to questions over which representatives of management and labor may have legitimate differences of opinion that are entirely consistent with their fiduciary duties.

The guarantee of impartiality in making decisions of this kind is not a total divorce of every trustee from the interests that appointed him. There is a distinction between the process by which a person is appointed to office and the manner in which he performs that office after he has been appointed.

NLRB v. Amax Coal Co., 433 U. S. 322 (1981)

ReedSmith

WHAT IT MEANS TO BE “PRUDENT”

- Heightened prudence standard – see CERL §31520.2 for appointees’ required experience
- Duty to delegate: If you don’t have the expertise, find it
- Don’t rubber stamp the experts – question carefully
- Don’t “set and forget” – monitor, audit and adjust
- Assure alignment with best interests of members
- Process matters more than results – so record it!

ReedSmith

ANOTHER COURT SAYS IT ALL

A fiduciary's investments are prudent if s/he has given appropriate consideration to those facts and circumstances that are relevant to the particular investment involved and has acted accordingly. Appropriate consideration includes a determination by the fiduciary that the particular investment is reasonably designed to further the purposes of the plan, taking into consideration the risk of loss and the opportunity for gain, in addition to consideration of the portfolio's diversification, liquidity, and projected return relative to the plan's funding objectives. In addition, under trust law, a fiduciary normally has a continuing duty of some kind to monitor investments and remove imprudent ones.

The test for determining whether a fiduciary has satisfied his duty of prudence is whether the individual trustees, at the time they engaged in the challenged transactions, employed the appropriate methods to investigate the merits of the investment and to structure the investment.

In other words, we must focus on whether the fiduciary engaged in a reasoned decision-making process, consistent with that of a prudent person acting in a like capacity. Courts have readily determined that fiduciaries who act reasonably - i.e., who appropriately investigate the merits of an investment decision prior to acting - easily clear this bar.

Pfeil v. State Street Bank and Trust Co. 806 F. 3d 377 (6th Cir. 2015)

ReedSmith

SCENARIO #1

Board member Charlie is a retiree who has a gemology degree. When he attends SACRS and other conferences, he likes to host a late night sales auction in his hotel room, where he auctions off various gems and jewelry to the highest bidders. The winning bidders are usually personnel of investment managers attending the conference, who can afford the $1,000+ prices.

Earlier on the day of an auction, the firm of one of the successful bidders responded to an open RFP issued by Charlie's Board.

What are the fiduciary issues raised by these events?

SCENARIO #2

Trustee Melissa works for a large retail investment firm. Melissa swears by index funds. She's convinced that no active manager can ever beat the broad indexes over any reasonable length of time, so paying fees to active managers is simply wrong when you can do better with a low cost 60/40 passive portfolio. "Set it and forget it!" is her motto.

Melissa goes to no educational conferences. She doesn't read any materials from the prospective managers. She has no interest in the consultant's capital markets views. She abstains on every vote on the asset allocation decision other than investing in the Russell 3000 and the Bloomberg Barclays US Aggregate Index.

Is Melissa a refreshing realist, or is she breaching her fiduciary duty?

SCENARIO #3

The Governor sponsors a bill that would require CERL systems to divest from any wholesaler or retailer that sells assault weapons anywhere in the United States.

The Governor then calls the Chair of the Board of Supervisors and says if the County and all of its agencies won’t publicly support the bill, he will cut off discretionary funding to County schools. The Chair quickly calls her retirement board appointees for support. At the next Retirement Board meeting, an appointee enthusiastically moves to have the Board declare its “support” for the measure. There is a quick second, no discussion and a unanimous vote in favor of the motion.

Any fiduciary issues raised here?

SCENARIO #4

The Board is considering a proposal to buy and hold $10 billion in 30-year corporate bonds to finance a new desalinization plant in a depressed community in Southern California. The issue pays 4% annually, interest only for 15 years. The bonds have a BB- rating. The system would be the sole holder of the bonds.

Three different groups have approached the Board in public session:

A. A labor alliance asks the Board to APPROVE the proposal, to promote minority job growth and improve the community's economic base, which will show how the pension plan supports local communities.
B. The County asks the Board to REJECT the proposal because the risk of the investment may increase the UAAL, thus triggering increases in employer contributions and downgrades in the County's own bond ratings.
C. The Fortune 100 company involved in the project asks the Board to APPROVE the proposal because it will increase its stock price, boosting the plan's investment returns.

What would be prudent under these circumstances?

ReedSmith

SCENARIO #5

Same situation as Scenario #4…

Two weeks before the meeting, a Board member, who also happens to sit on the local water district board, was flown to Norway first class, all expenses paid, by the primary corporate sponsor of the desalinization plant, to spend a week visiting an operating plant outside of Oslo. She spends most of the week in a spa with happy, prosperous workers from the plant.

At the Board meeting, she moves approval of the investment.

Any additional considerations for this Board member?

SCENARIO #6

The UAAL in a CERL system is attributable entirely to benefits earned by legacy employees. There is no PEPRA UAAL. The County says its high contributions are squeezing out services it can provide. A Board member moves that the Board extend the UAAL amortization period from 20 to 30 years, level % of pay, to ease the County's burden.

Legacy members argue for the change, saying it will help them get salary increases. PEPRA members argue that this will harm *their* ability to get future salary increases, since the County will be paying off the UAAL long after most of the legacy members retire.

Your primary fiduciary duty is to the members and beneficiaries of the system. What's the right thing to do?

January 16, 2018

TO: Each Member
Board of Investments

FROM: John McClelland
Principal Investment Officer – Real Estate

James Rice, CFA
Senior Investment Officer – Hedge Funds

FOR: February 1, 2018 Offsite Meeting

SUBJECT: **REAL ASSETS PANEL DISCUSSION**

A panel discussion is planned in order to further educate the Board on the potential benefits and risks of investing in real assets. Ultimately, the Board may elect to broaden the Fund's asset allocation to include some additional real asset categories. Staff will lead an interactive discussion about Real Assets with the Board's three consultants, Meketa Investment Group, The Townsend Group and Stepstone. Each participant has prepared background material intended to be used as reference during the panel discussion.

Attachment 1: Agriculture & Timber Overview was prepared by The Townsend Group.
Panelist: Jennifer Stevens, Principal, Townsend Group.

Attachment 2: StepStone Infrastructure & Real Assets Infrastructure Discussion was prepared by StepStone.
Panelist: Todd Lapenna, Stepstone Infrastructure & Real Assets.

Attachment 3: Natural Resources was prepared by Meketa Investment Group.
Panelist: Gerald Chew, Principal Real Assets, Meketa Investment Group, Inc.

Attachments

Noted and Reviewed:

Jonathan Grabel
Chief Investment Officer

JM/dr

ATTACHMENT 1

TOWNSEND® GROUP

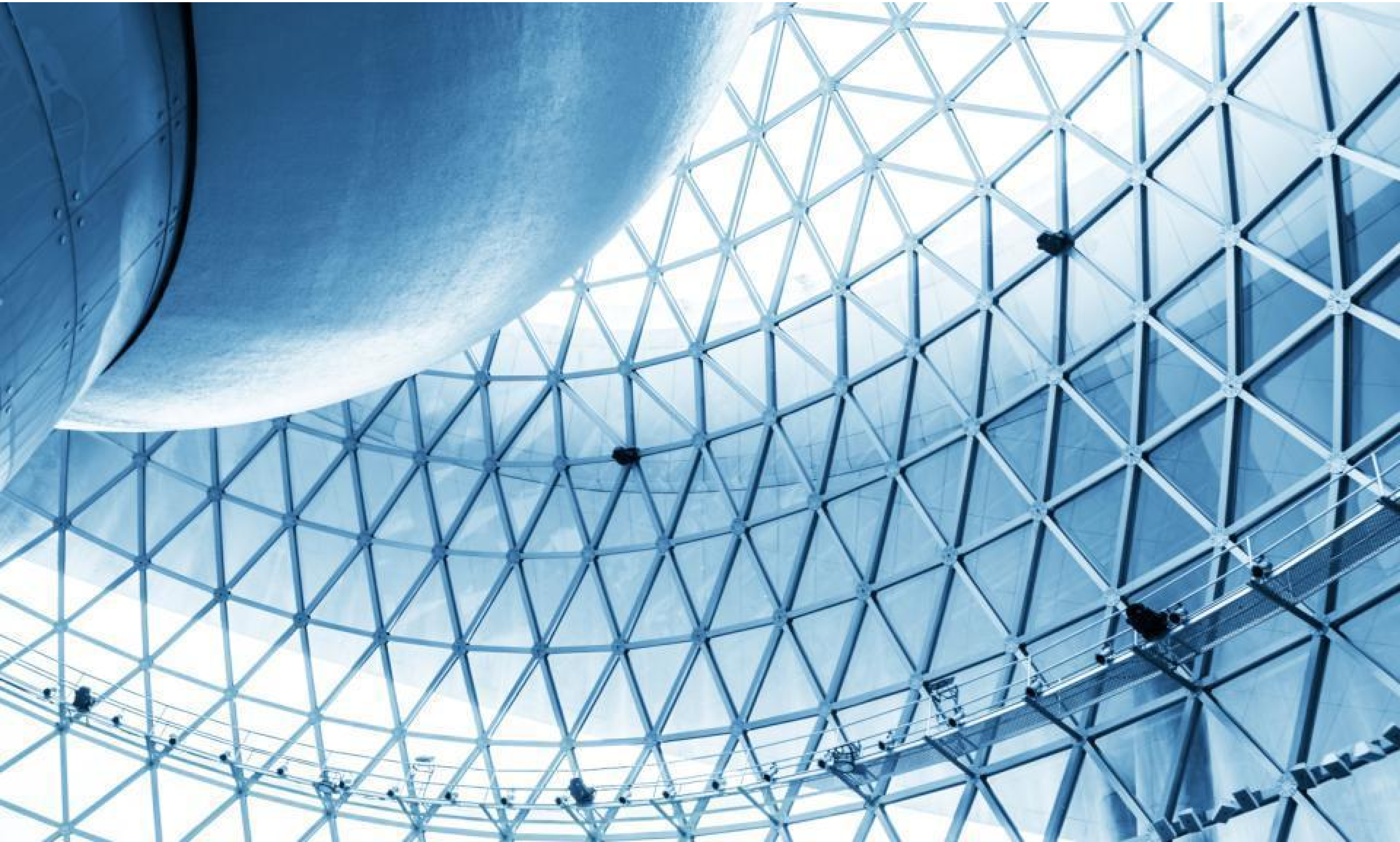
Agriculture & Timber Overview

LACERA Los Angeles County Employees Retirement Association

February 1, 2018

Table of Contents

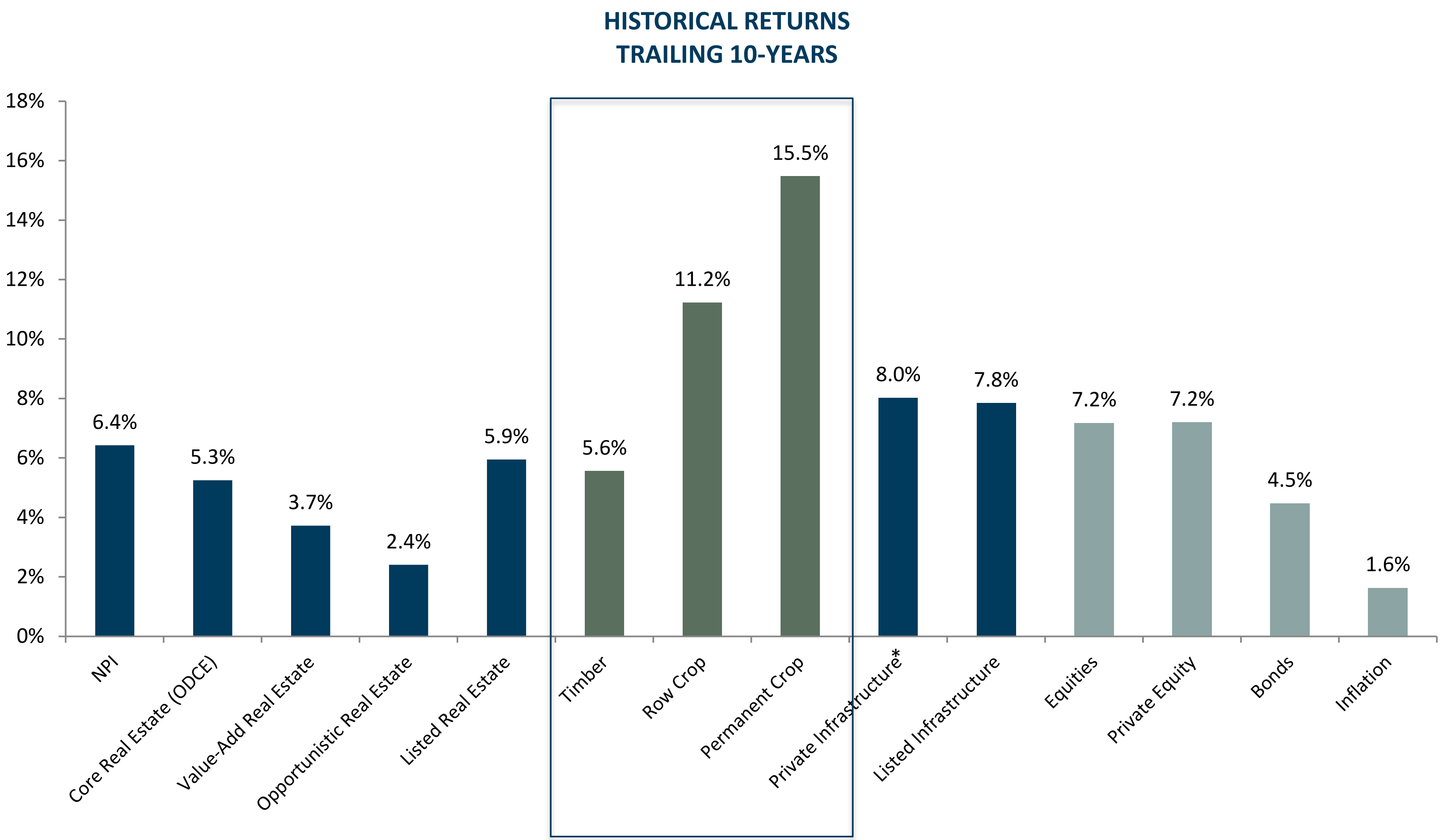
Why Invest in Real Assets?



Why Real Assets? Attractive Returns

TOWNSEND® GROUP

REAL ASSETS HAVE GENERATED ATTRACTIVE RETURNS RELATIVE TO EQUITIES

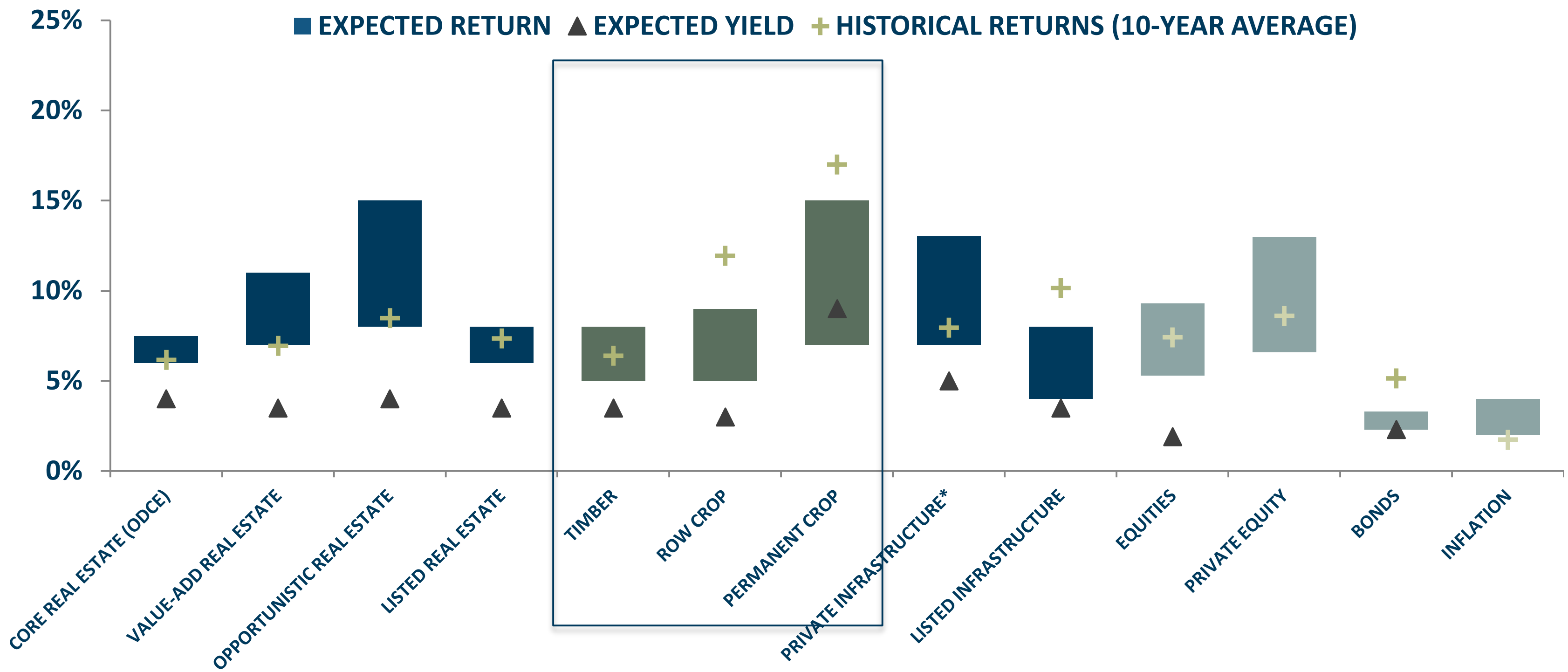


Source: Bloomberg, Preqin and NCREIF. Data as of 2Q17.
*Partial period performance beginning 1Q08.
Townsend's views are as of the date of this publication and may be changed or modified at any time and without notice. Past performance is not indicative of future results.

Why Real Assets? Enhance Risk-Adjusted Returns

STABLE INCOME RETURN WITH POTENTIAL FOR CAPITAL APPRECIATION

PROJECTED RETURNS

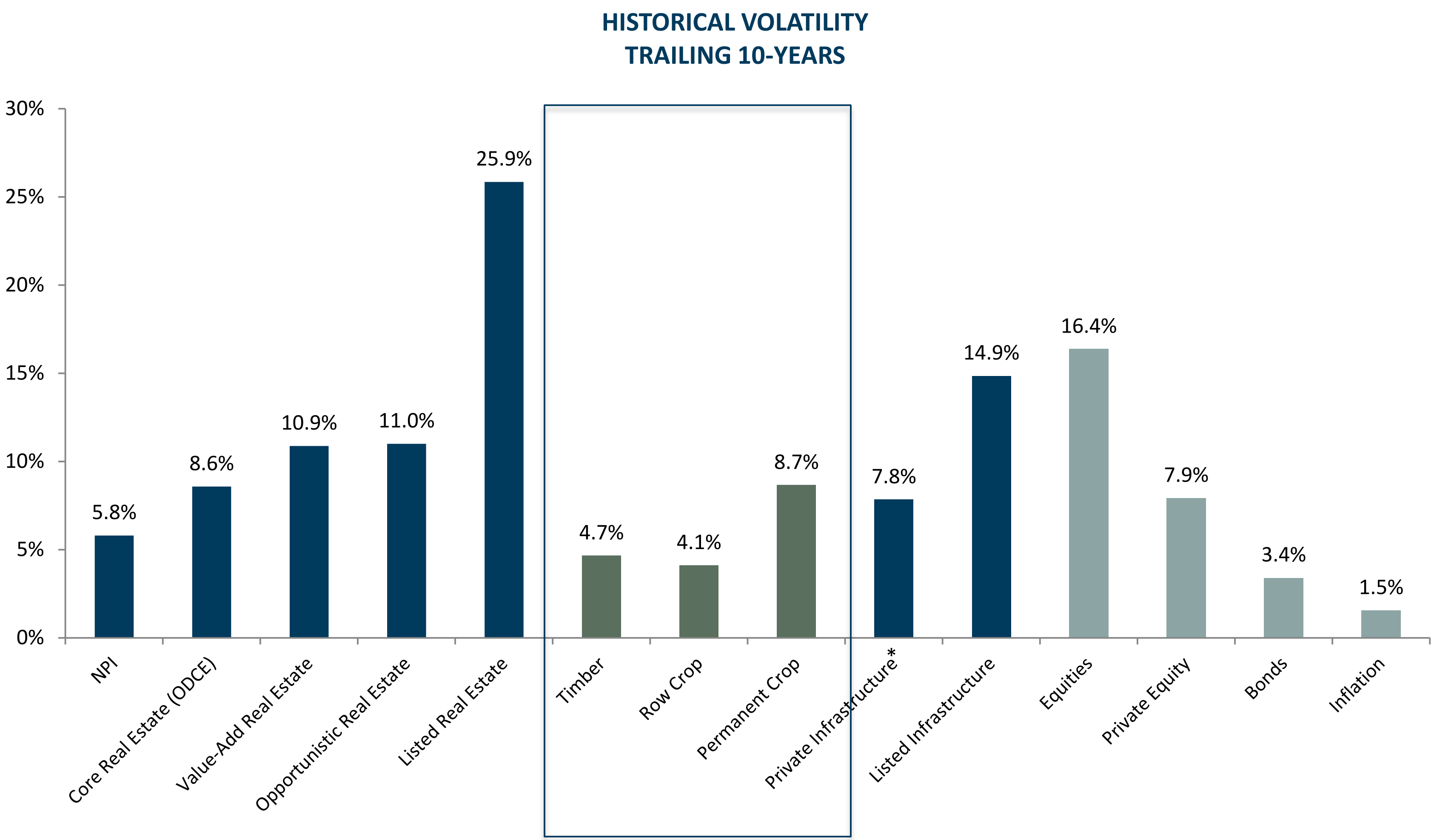


Historical Return data is Gross. Historical Returns are based on the following indices: Core Real Estate is based on the NCREIF Fund Index Open-End Diversified Core Returns ("NFI-ODCE"). Value Add Real and Opportunistic Real Estate are based on The Townsend Group's Value Add and Opportunistic Indices. Listed Real Estate is based on the MSCI U.S. REITS Index. Timber is based on the NCREIF Timberland Index. Private Infrastructure is based on the Preqin Global Infrastructure Report. Listed Infrastructure is based on the Dow Jones Brookfield Infrastructure. Equities are based on the S&P 500 10-Year Dividend. Bonds are based on Barclays Capital Aggregate Bond Index, current yield on 10-Year Treasury Note . Inflation is based on the Consumer Price Index (CPI). Expected Returns are developed by Townsend from multiple sources.

Source: Bloomberg, Preqin and NCREIF. Data as of 2Q16.
*Partial period performance beginning 1Q08.
Townsend's views are as of the date of this publication and may be changed or modified at any time and without notice. Past performance is not indicative of future results.

Why Real Assets? Lower Volatility

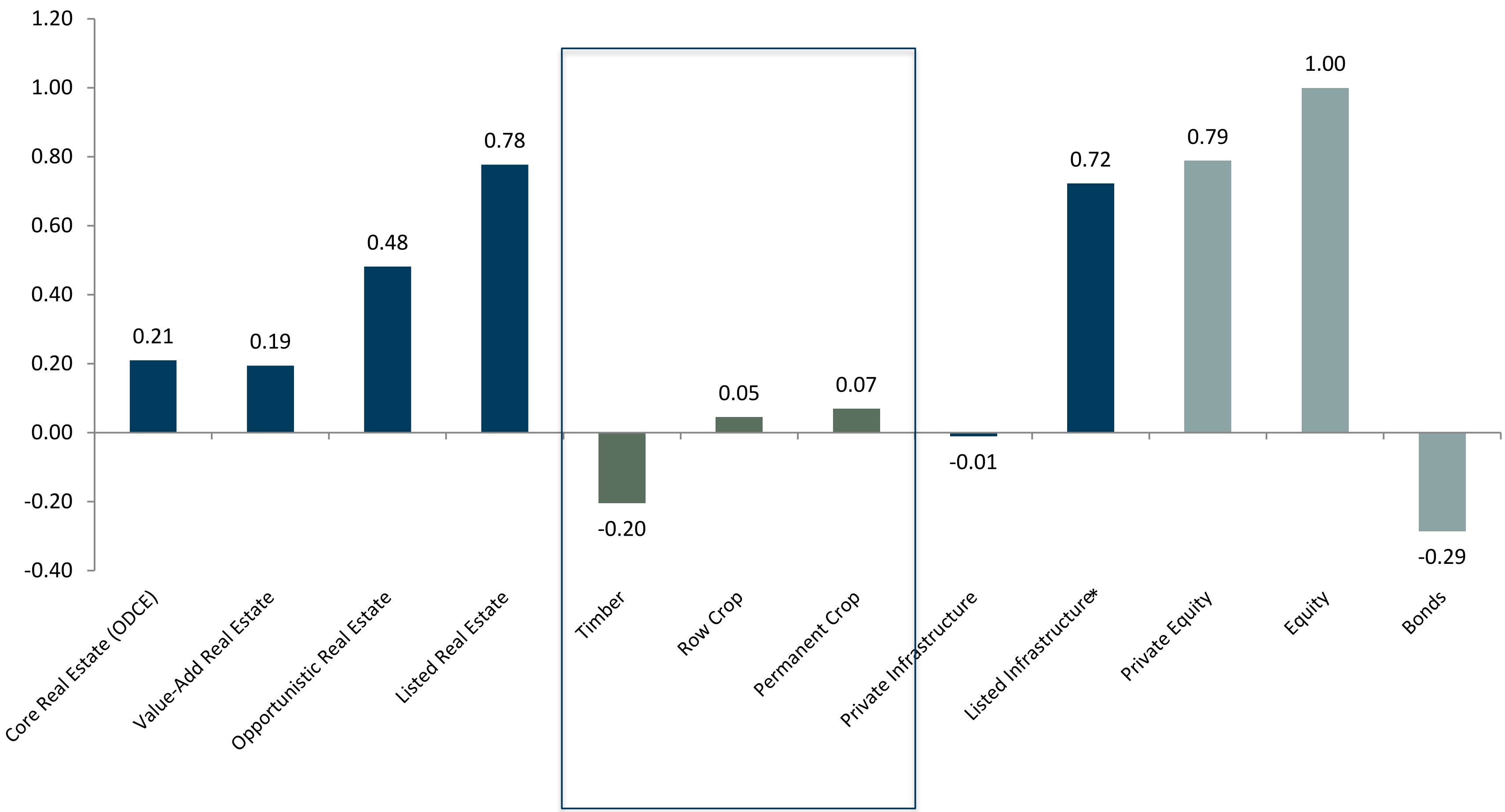
REAL ASSETS HAVE EXHIBITED LOWER VOLATILITY RELATIVE TO EQUITIES



Source: Bloomberg, Preqin and NCREIF. Data as of 2Q17.
*Partial period performance beginning 1Q08.
Townsend's views are as of the date of this publication and may be changed or modified at any time and without notice. Past performance is not indicative of future results.

Why Real Assets? Diversification Benefits

REAL ASSETS HAVE EXHIBITED LOWER CORRELATIONS RELATIVE TO EQUITIES



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*Partial period performance beginning 1Q08.
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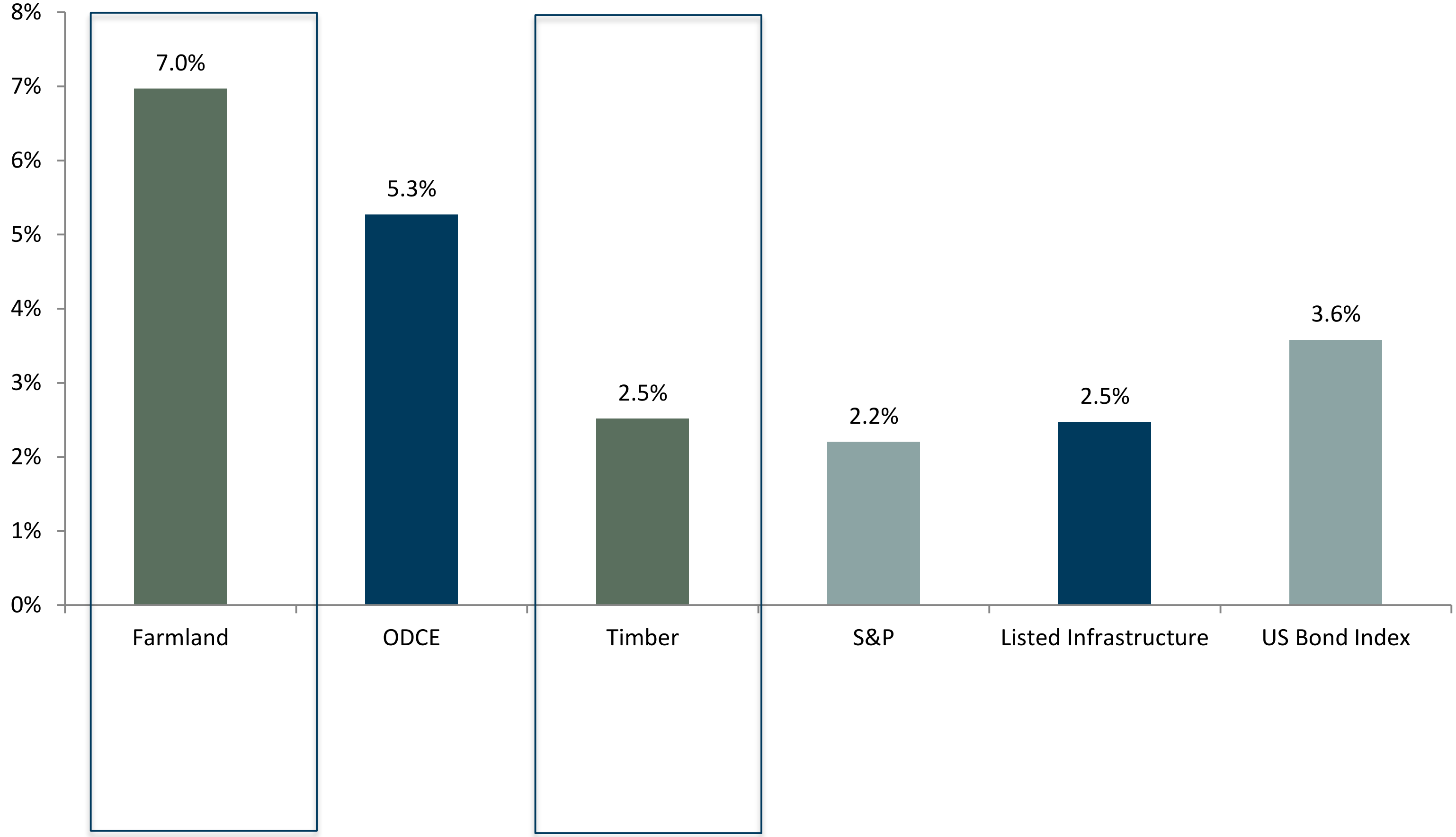
Why Real Assets? Higher Income Return

REAL ASSETS HAVE GENERATED STRONGER CASH YIELDS RELATIVE TO EQUITIES

10-YEAR INCOME RETURN



Source: Bloomberg, Preqin and NCREIF. Data as of 2Q17.
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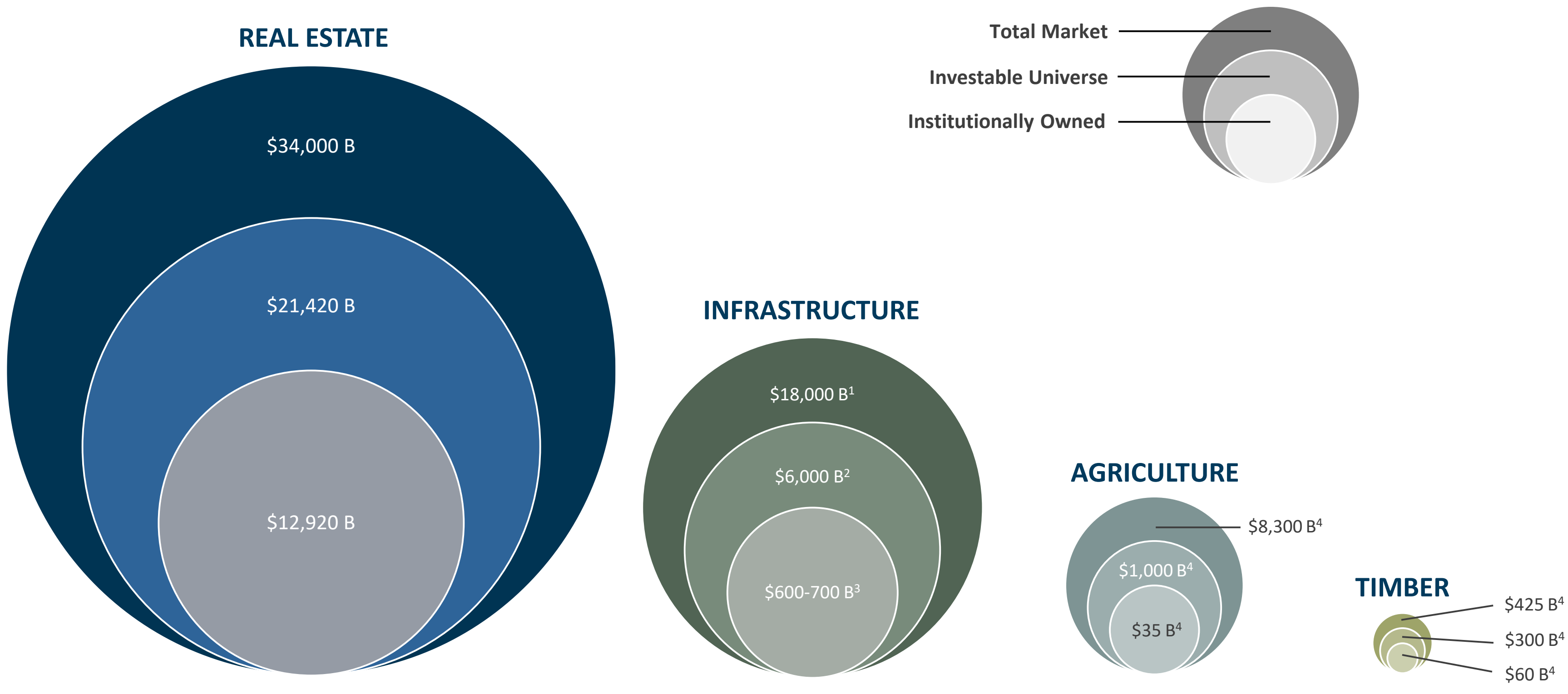
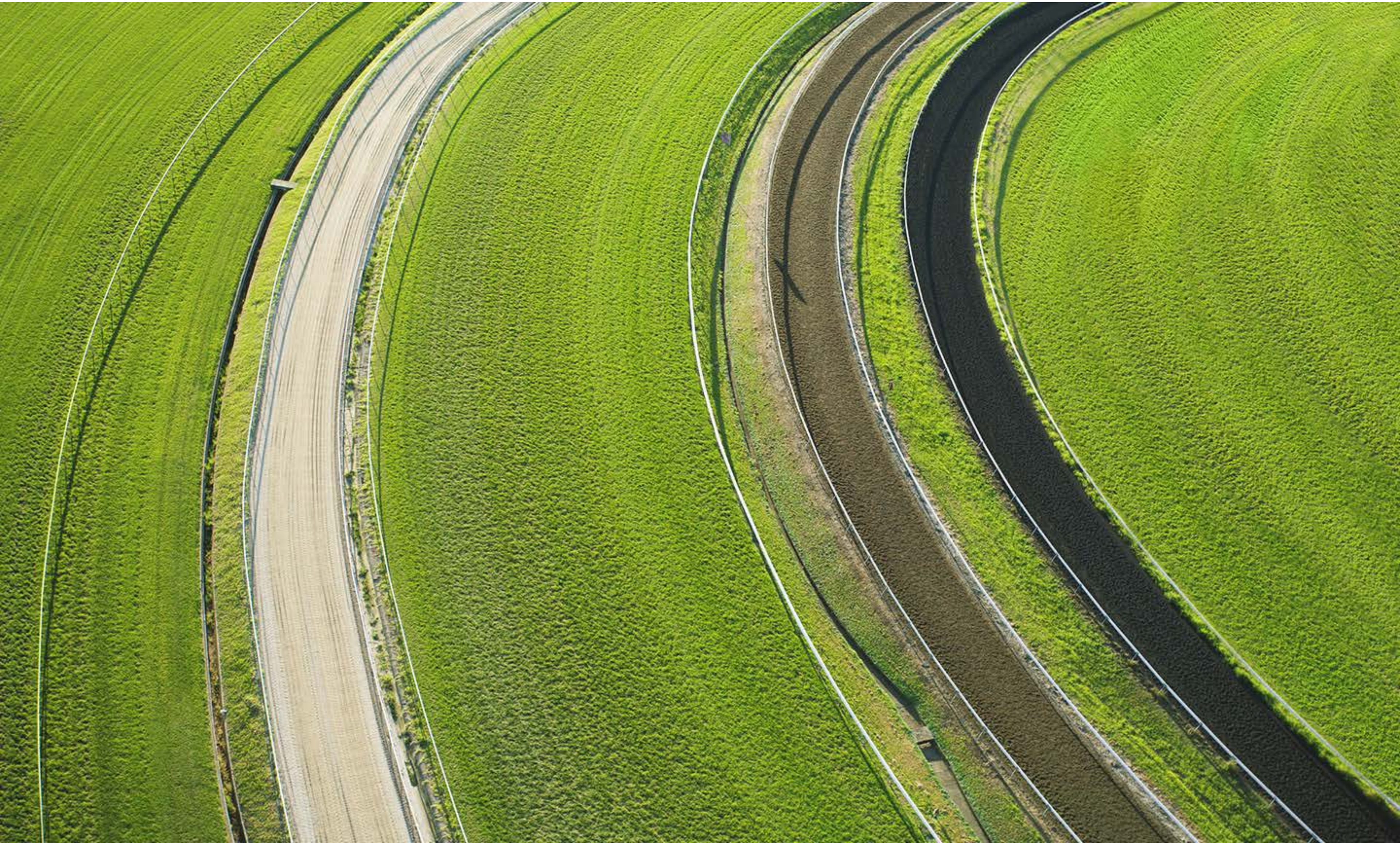
Investment Opportunity for Real Assets

SIZE AND SCALE OF INVESTMENT OPPORTUNITIES

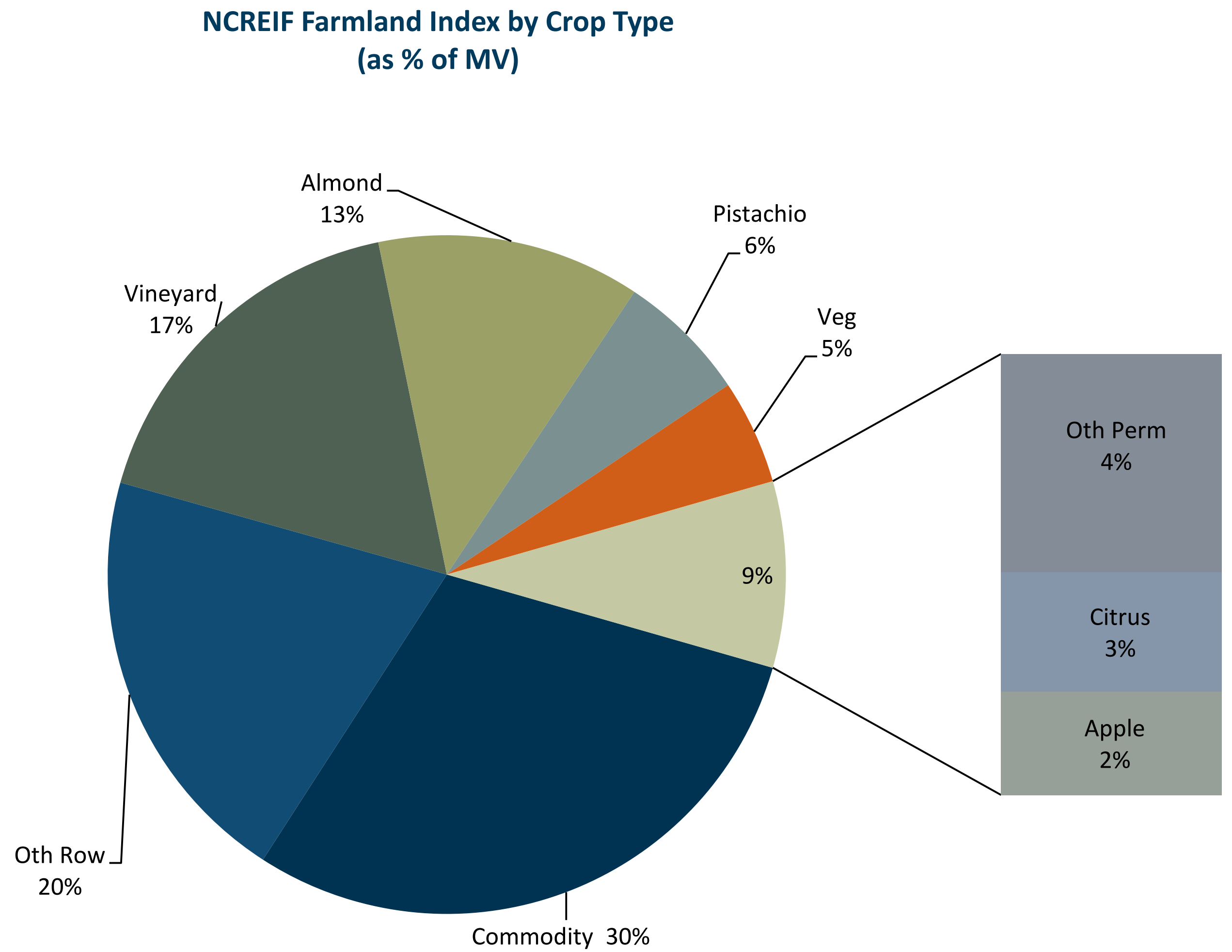


Source: 1. Marquette Associates (2011). 2. JPM Asset Management (2012). 3. EIB economic working paper (2013). 4. FAO 2011, GMO 2011, Global AgInvesting Research & Insight Estimates 2012, Timberland Investment Resources 2012, Macquarie Agricultural Funds Management 2012.

Agriculture Sector Overview

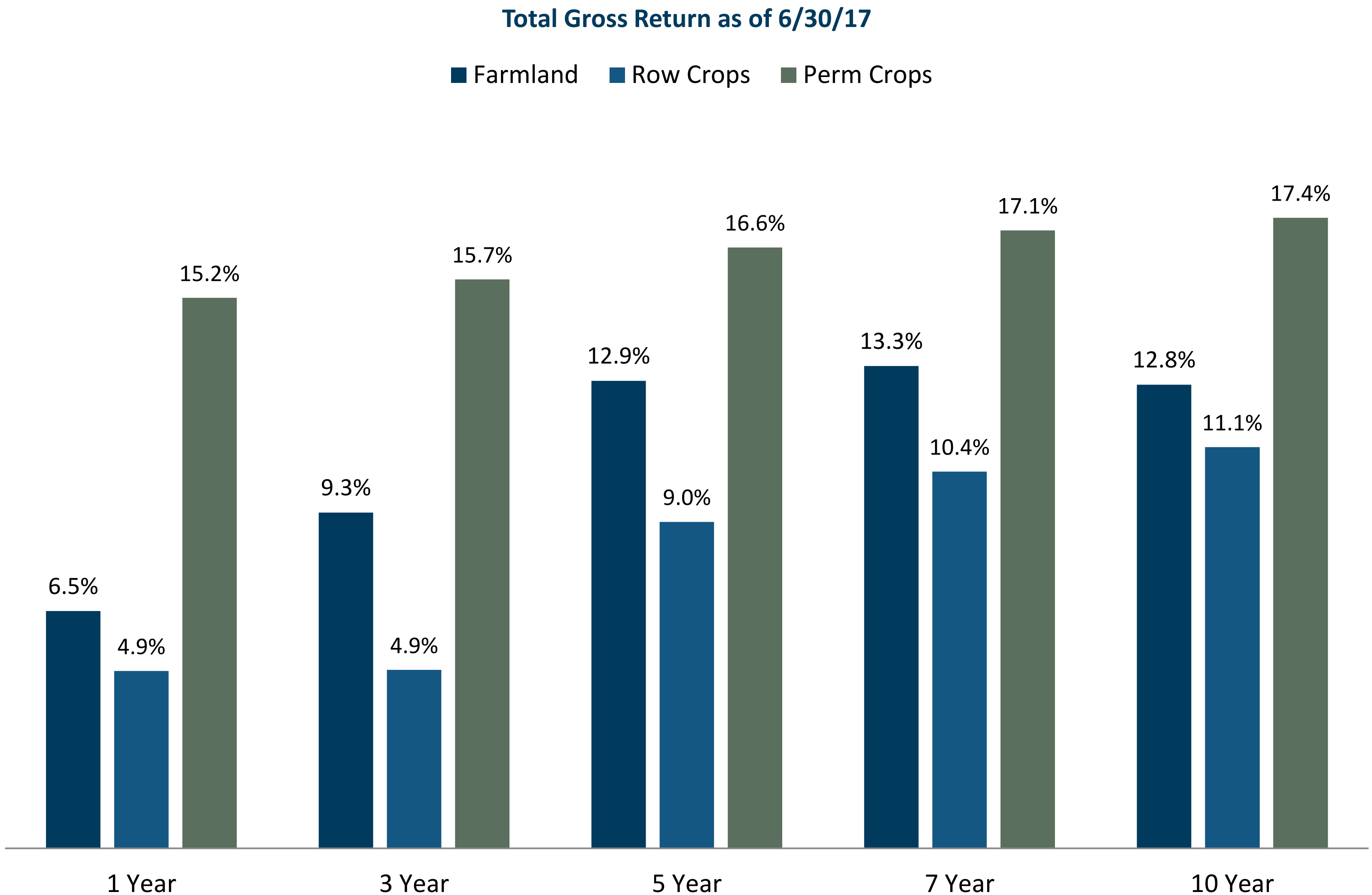


NCREIF Farmland Index Diversification Breakout



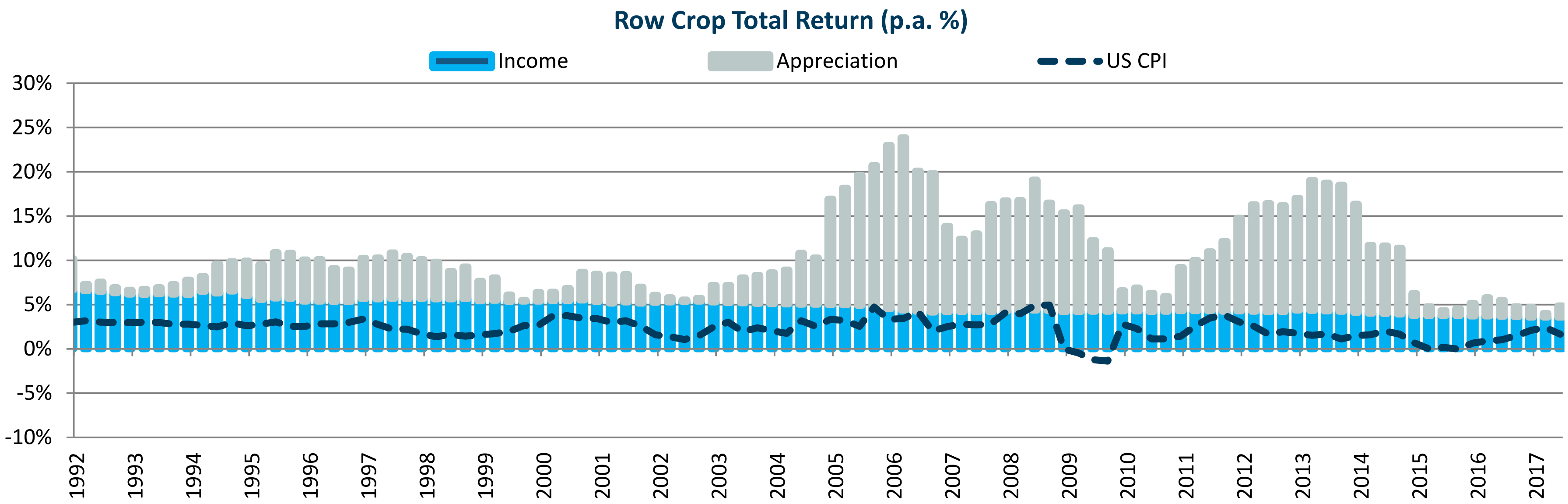
Source: NCREIF (2Q17)

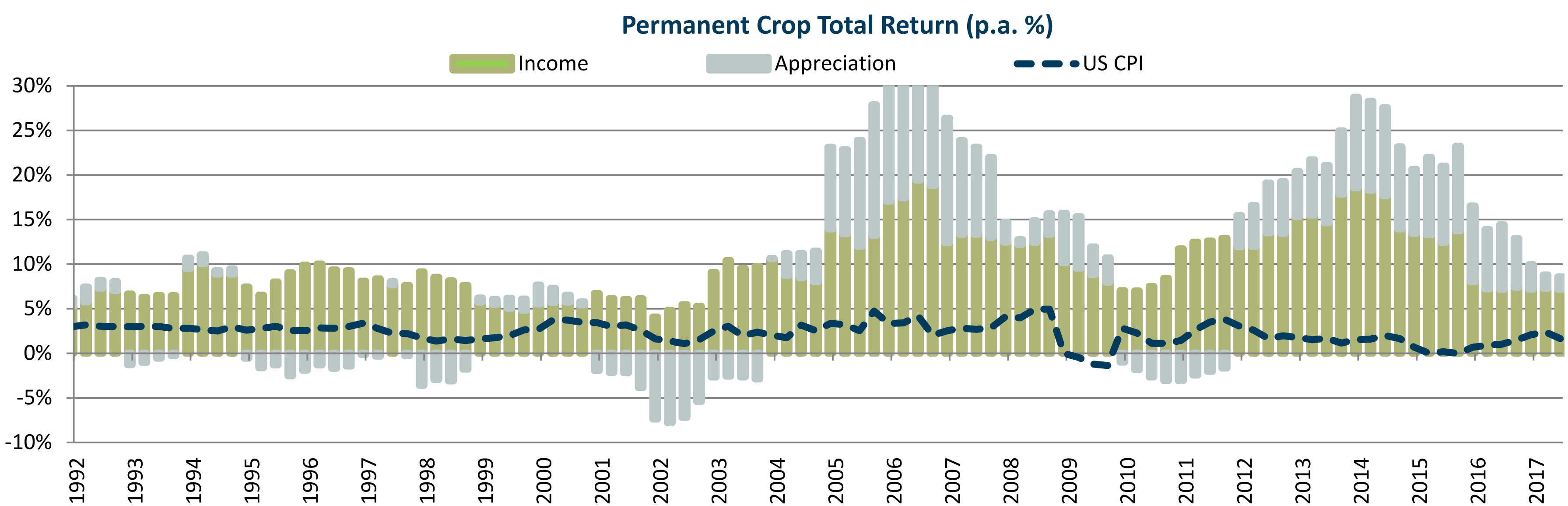
Farmland Returns Moderating, Especially Row Crops



Source: NCREIF (2Q17)

Permanent Crops Have Generated Higher Returns & Volatility



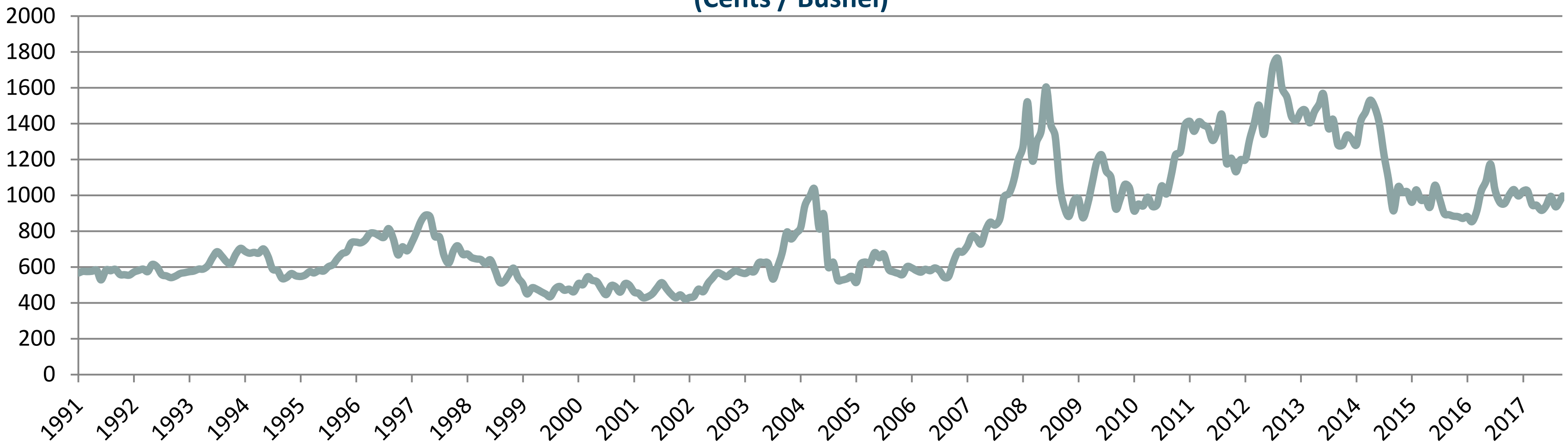


Source: NCREIF (2Q17)

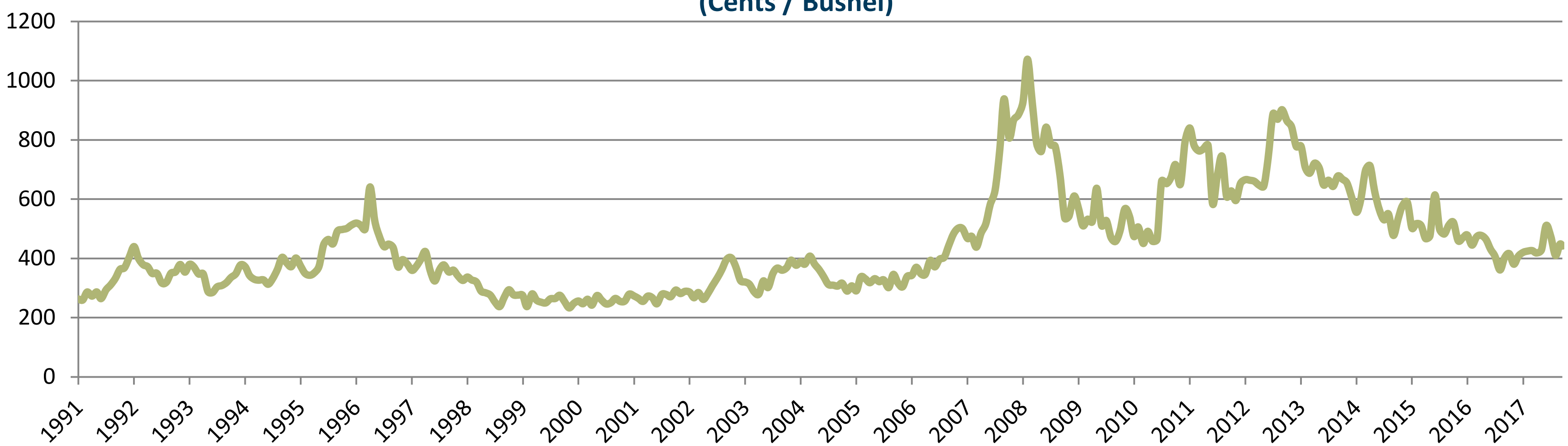
Similar to Corn, Major Row Crops Have Been On The Decline

TOWNSEND® GROUP

Soybean Pricing CBT (Cents / Bushel)

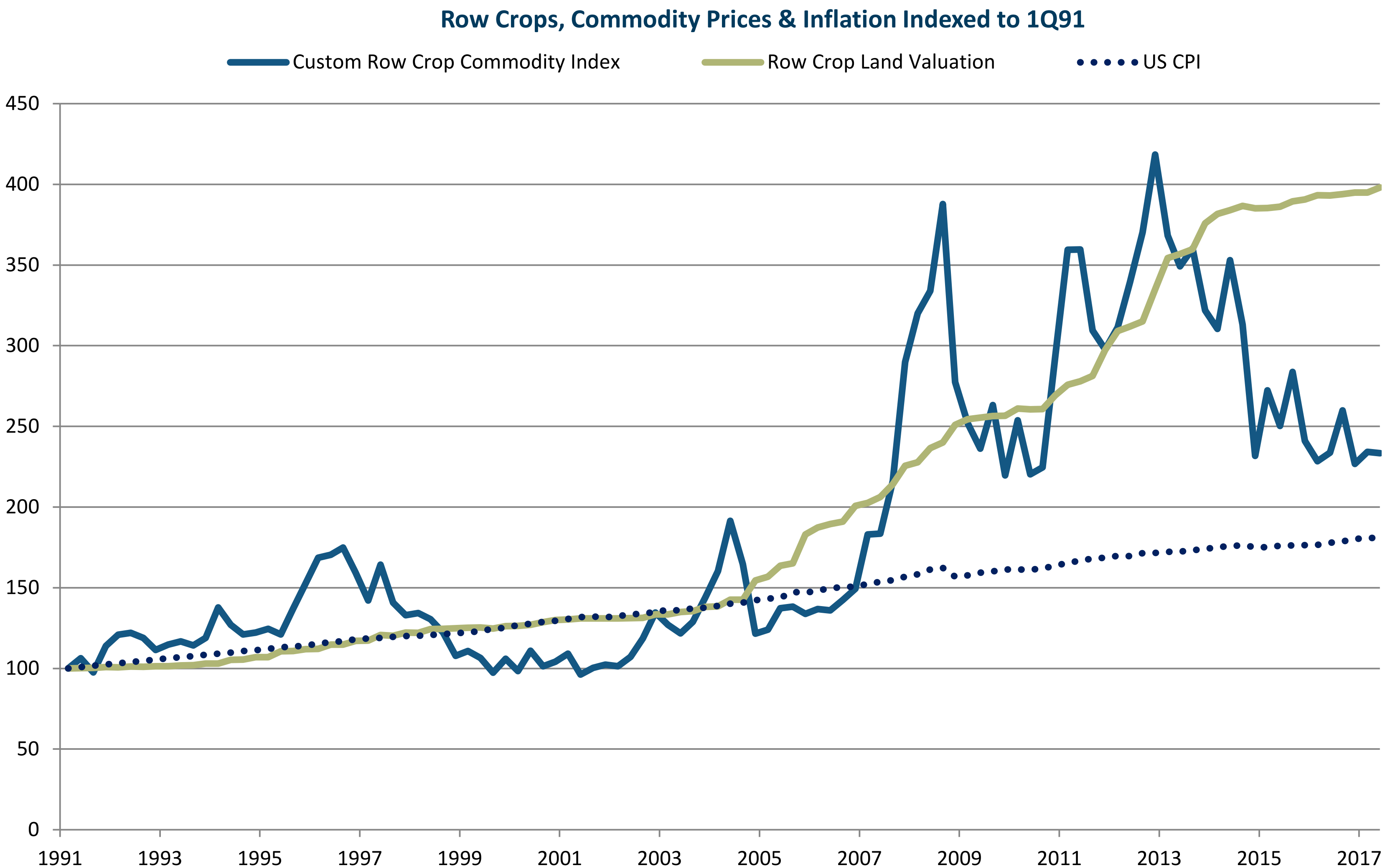


Wheat Pricing CBT (Cents / Bushel)



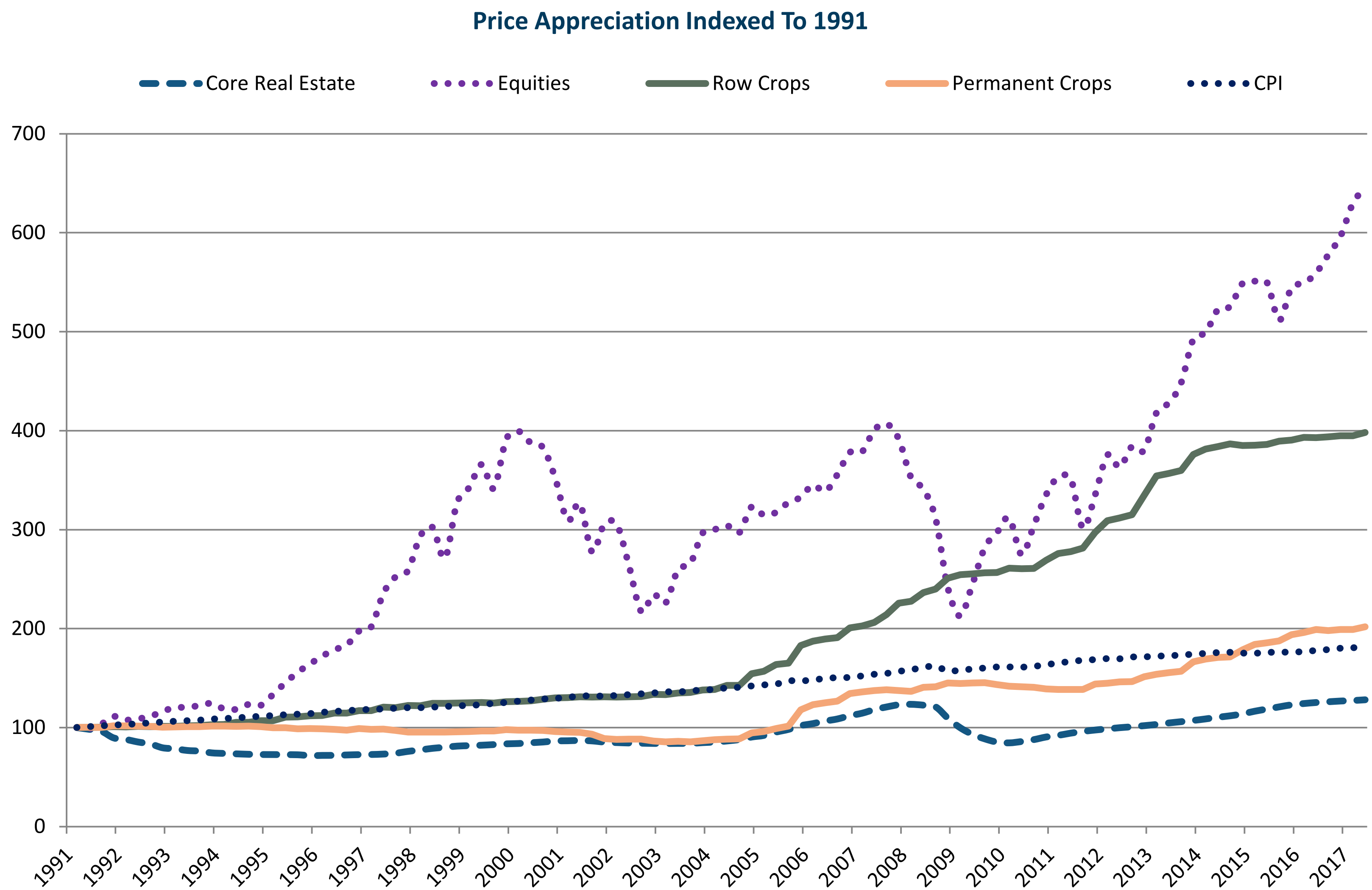
Source: Bloomberg (10.16.17)

Row Crop Farm Valuations Have Continued To Appreciate Despite Commodity Prices



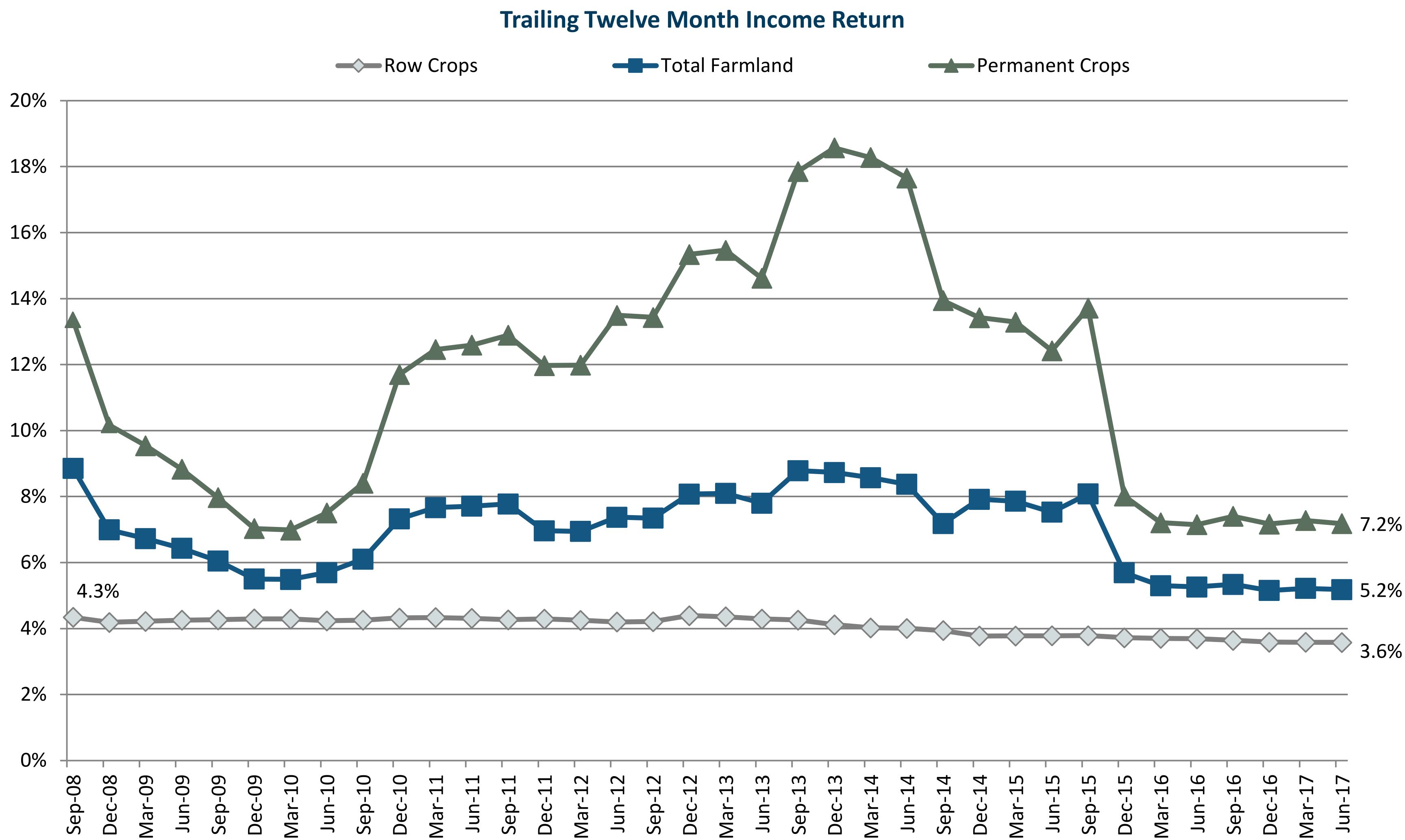
Custom Index: 50% Soy / 40% Corn / 10% Wheat (Based on Historical Commodity Pricing)
Source: NCREIF (2Q17), Bloomberg

Row Crop Farm Valuations Have Appreciated 2X Permanent Crop Farms



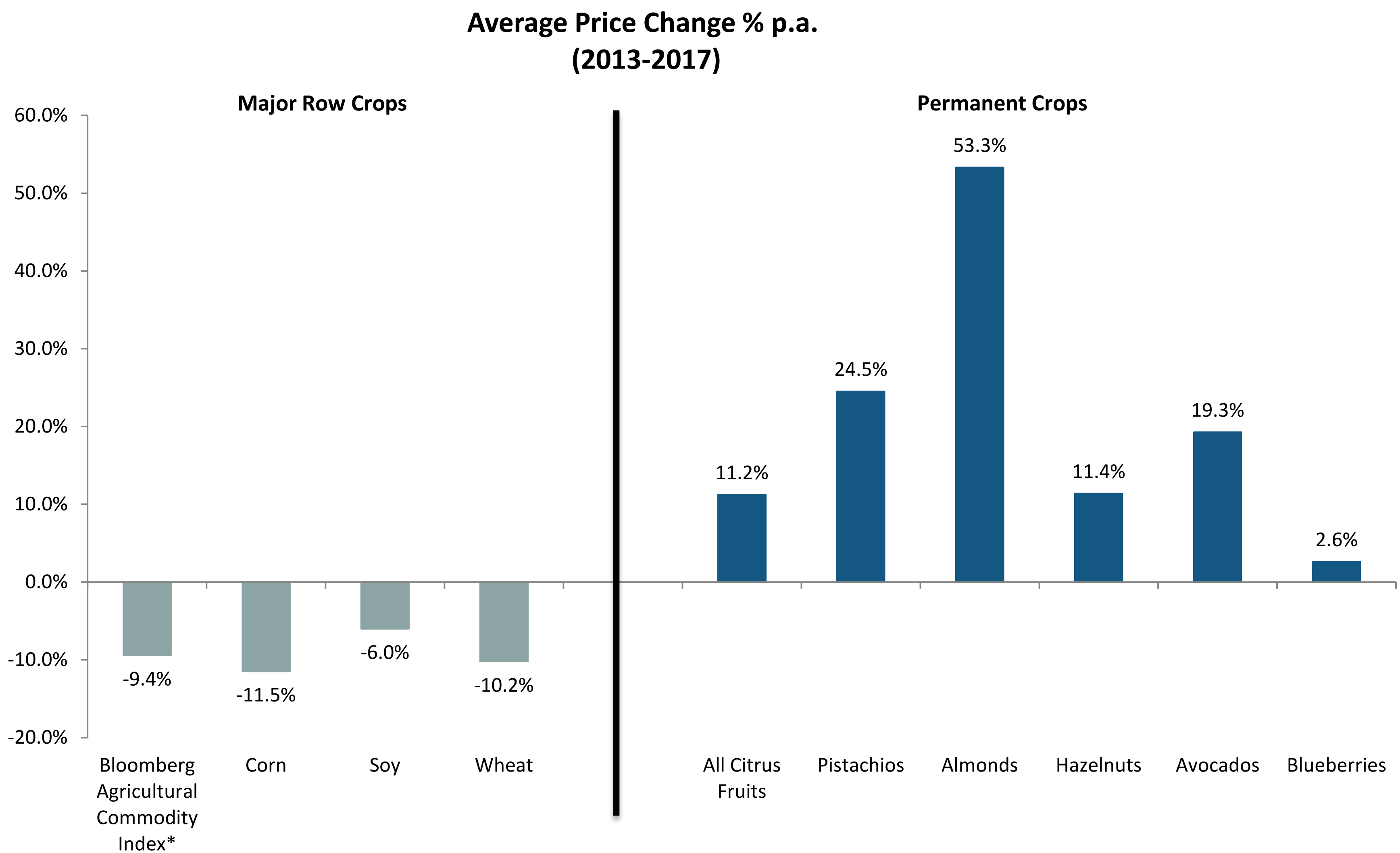
Source: NCREIF (2Q17), Bloomberg

Yield Compression Lowering Income



Source: NCREIF (2Q17)

Average % Price Change p.a. (Trailing 5 Years 2013-2017)
Niche Crop Can Buck Macro Trends



*Nominal - Includes Coffee, Corn, Cotton, Soybeans, Soybean Oil, Soybean Meal, Sugar, and Wheat
Source: USDA ERS, Bloomberg

US Permanent Crops – Agricultural Example Funds I and II

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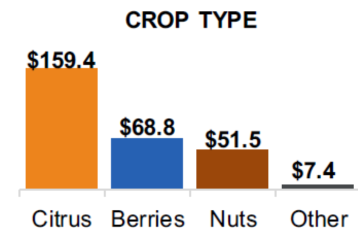
Investment Highlights			
Asset Class	Agriculture	Investment Date	2014 2016
Sector	Permanent Crops	Investment Structure	Primary Funds
Strategy	Crop Production and Midstream Operations	Total Commitments	$250M $550M
Region	US West	TTG Commitments	$15M $150M
Projected U/W Return Profile		**Realized Return Profile**	
Net IRR (%) Current Income (%)	12-14% 8-10%	Net IRR (%)	4.8% (15.3%)
Equity Multiple	2.0x	Equity Multiple	1.2x 1.0x
Hold Period	10 Years	Hold Period	2.5 yrs <1 yr

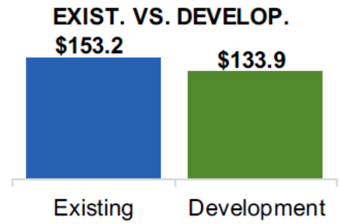
OPPORTUNITY DESCRIPTION

- Unique opportunity focused on western U.S. permanent crop sector.
- Targeting citrus, tree nuts, berries and table grapes.
- Mix of established turn-key permanent crop farms along with development opportunities.
- Fund I was 50% pre-seeded at time of commitment, offering attractive seed assets and portfolio transparency.
- Fund will establish integrated entities allowing for multiple exit options and additional return drivers via midstream operations.

FUND I TTM NOI YIELD & DIVERSIFICATION

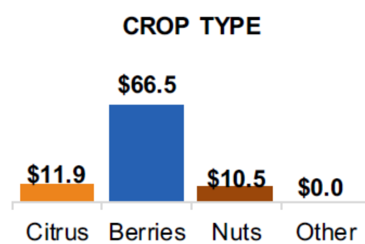
Investment	6/30/17 Q2'17	6/30/16 Q2'16	12/31/16 Q4'16	12/31/15 Q4'15
Producing	8.22%	11.79%	6.73%	1.93%
Development	0.07%	0.49%	0.45%	0.18%
Total investments	5.63%	8.01%	4.76%	1.36%

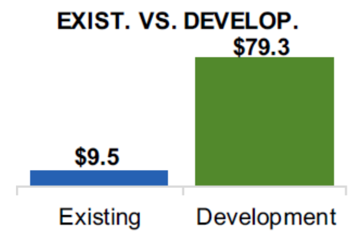




FUND II NOI YIELD & DIVERSIFICATION

Investment	NOI	Invested capital	NOI yield
Sustainable Farm	(175,108)	11,008,679	-1.59%
CA Ranch 1	(561,862)	37,178,188	-1.51%
CA Ranch 2	50,691	10,555,416	0.48%
Total investments	(686,279)	58,742,283	-1.17%





Note: The above example is for illustrative purposes only. It does not constitute a specific recommendation for the current investment. Townsend's view regarding this example may be changed or modified at any time without further notice to you. Past performance is not indicative of future results. Actual results and developments may differ materially from those expressed or implied herein.

Agriculture Case Study – Brazilian Row Crops

Investment Highlights			
Asset Class	Agriculture	Investment Date	2Q 2015
Sector	Row Crops	Investment Structure	Primary Fund
Strategy	Pastureland conversion for Row Crop Production	Total Commitments	$500 Million
Region	Brazil Cerrado	Townsend Commitments	$150 Million
Projected U/W Return Profile		**Realized Return Profile**	
Net IRR (%)	16.0% *BRL$*	Net IRR (%)	N/A
Net Equity Multiple	2.0x	Equity Multiple	N/A
Hold Period	12 Years	Hold Period	N/A

OPPORTUNITY DESCRIPTION

- Invest with firm holding over 100 years experience of investment operations in Brazil and approximately $33 billion of alternative investments in the country.
- Well established agriculture platform with strong farming experience and a deep operational team with over 700 personnel and professionals.
- Potential to achieve significant returns from land appreciation driven by strategy to convert/develop underutilized land to highly productive cropping farmland.

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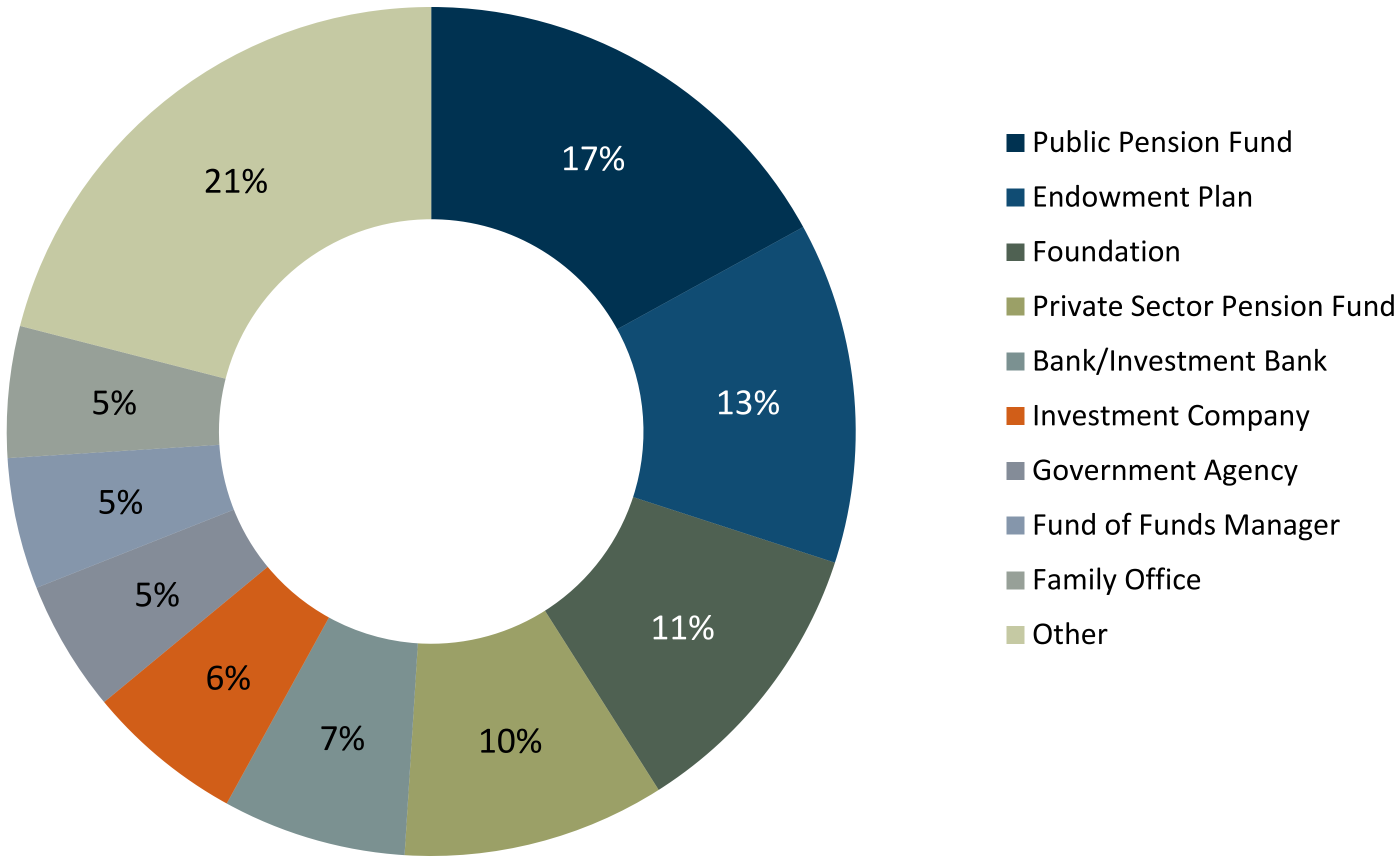
Agricultural Outlook: Investor Appetite

Agricultural Investors By Type



Source: Preqin April 2017

Capital Raising Remains Relatively Strong Despite Conditions

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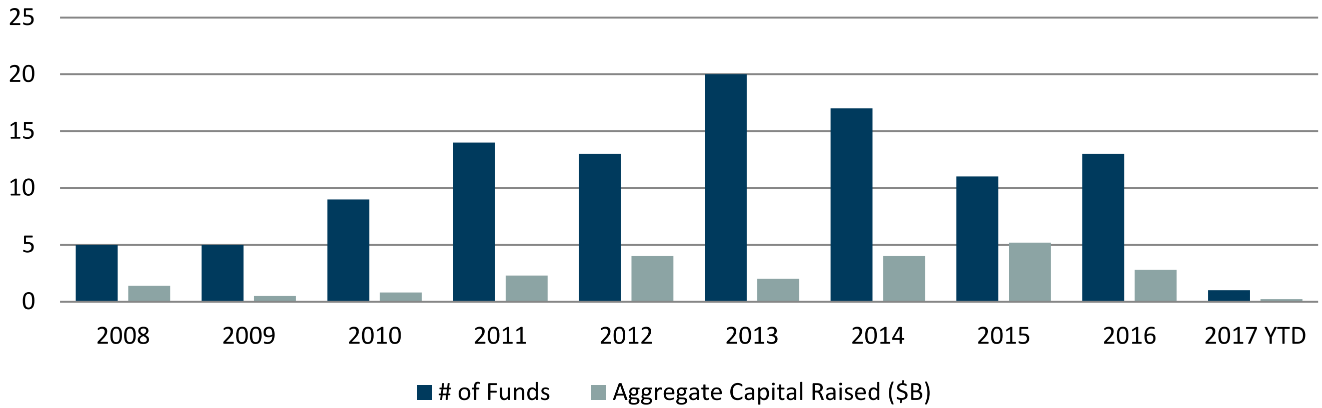
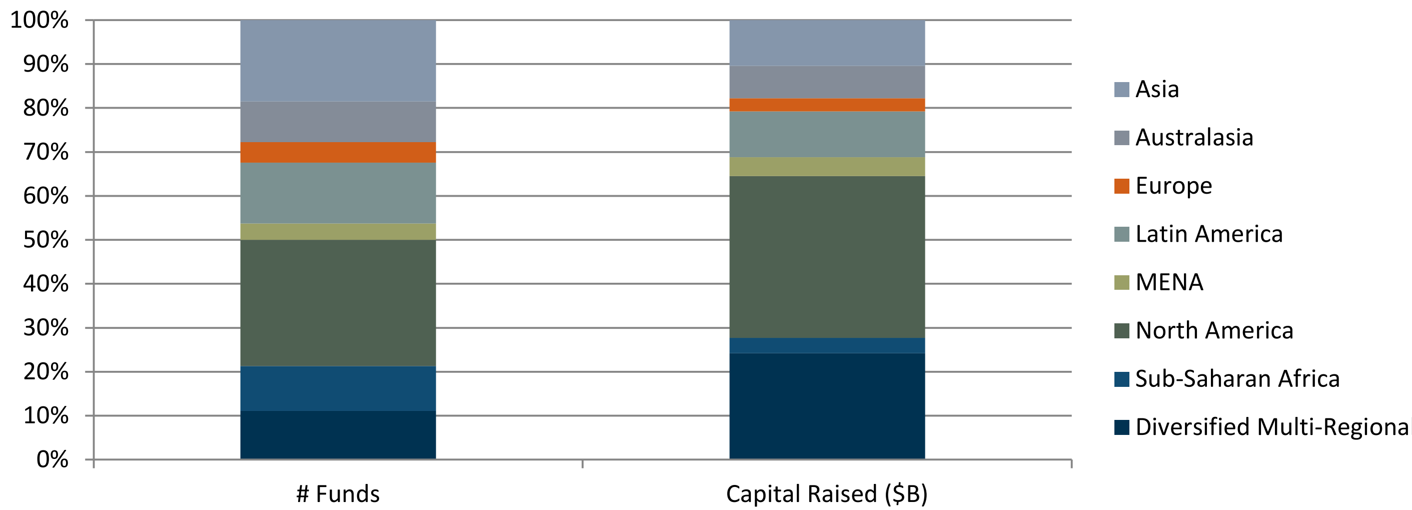
Annual Unlisted Ag/Farmland Fundraising (as of March 2017)



Unlisted Ag/Farmland Fundraising by Primary Geographic Focus (2008-1Q2017)



Source: Preqin June 2017

TTG U.S. Farmland Strategy Expected Return Ranges

TOWNSEND® GROUP

	Established "Turn-key" Farms Lower risk cash lease model Limited new development	Higher risk value enhancement Conversion/Development Land Tactical midstream operations
US Row Crops	Expected return: 6 – 7% • Low-risk ground lease model • Historically primary focus for Institutions • Land value correction slowly underway as commodity correction continues to limit profits	Expected return: 7 – 15%+ • Add efficiencies through crop conversion, productivity enhancement (e.g. irrigation) • Deeper operating capabilities required • Opportunities in Delta/South for lower land cost and higher productivity improvement potential • Select midstream opportunities can add efficiencies and return alpha; packing, processing, distribution
US Permanent Crops	Expected return: 8 – 10% • Attractive income return potential • Limited to no land appreciation underwritten • Opportunities in southern and western U.S. regions for tree nuts, citrus, blueberries, other	Expected return: 10 – 20%+ • Higher risk direct / custom farming model • Conversion of row crop farms to permanent crops • Acquire misunderstood / mismanaged cropland at discount to intrinsic value • Select midstream opportunities can add efficiencies and return alpha; packing, processing, distribution

Source: TTG 2017

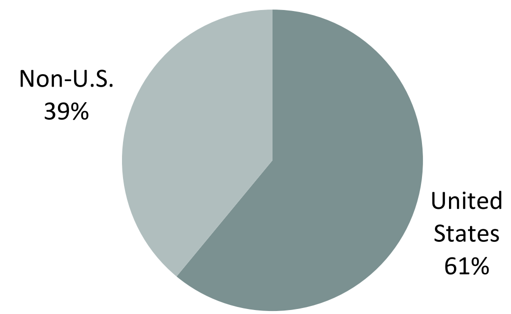
Timber Sector Overview

Timberland Manager and Investor Landscape

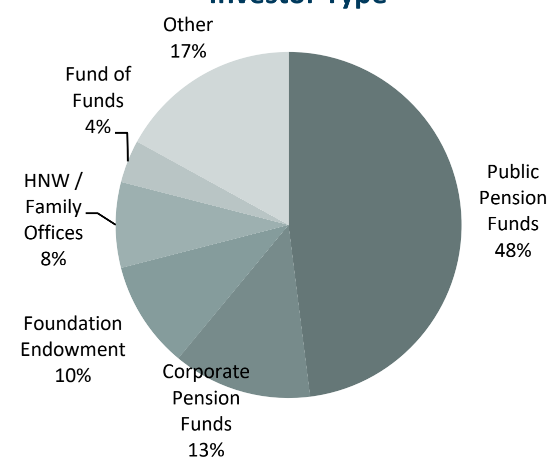
- Concentrated group of established TIMOs control majority of institutional capital; top 10 manage over 90% of institutionally owned assets.

Manager	AUM (USD Mil)	Acres Managed (net area)	HQ Country	Geographies
Hancock Timber Resource Group	10,700	5,189,100	USA	USA, Canada, Australia, New Zealand, Chile
Forest Investment Associates	5,500	2,718,100	USA	USA, Brazil
Campbell Global	5,300	2,471,000	USA	USA, Australia
RMS	4,500	2,718,100	USA	USA, China, New Zealand, Brazil, Australia
Global Forest Partners	3,100	988,400	USA	Brazil, Uruguay, Chile, Guatemala, Colombia, Australia, New Zealand, Cambodia
BTG Pactual	3,000	1,729,700	BRAZIL	USA, Brazil, Uruguay, South Africa, Hungary, Estonia, Guatemala
New Forests	2,800	988,400	AUSTRALIA	Australia, New Zealand, Malaysia, Indonesia, Laos, USA
Molpus Timberlands	2,800	1,976,800	USA	USA
The Forestland Group	2,400	3,212,300	USA	USA, Panama, Belize, Costa Rica, Canada
GMO Renewable Resources	2,200	1,482,600	USA	USA, Uruguay, Australia, Chile, Brazil, New Zealand, Costa Rica, Panama
Brookfield Timberlands	2,200	1,235,500	CANADA	Canada, Brazil, USA

Net Asset Value of Timberland by Investor Domicile



Net Asset Value of Timberland by Investor Type

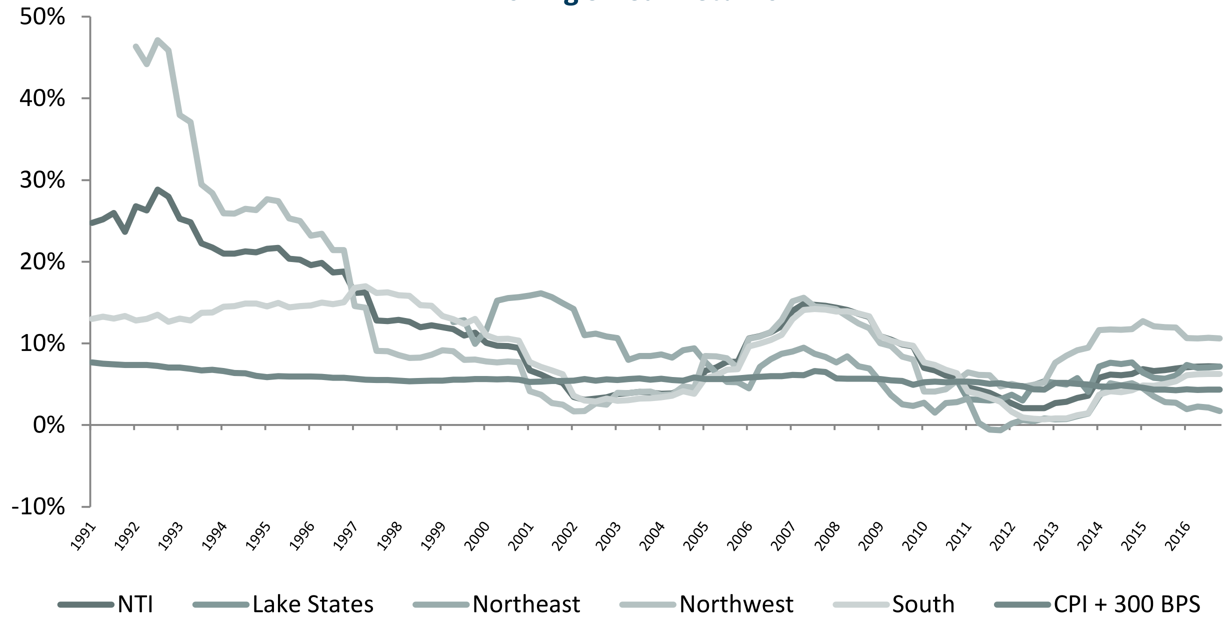


Source: The Townsend Group; TIR; Timberlink 2016 Investor Survey

Timberland Performance and Returns

- Timberland as an illiquid asset class is well-suited to a long-term hold, and has historically delivered an appropriate risk-adjusted return over longer time periods.
- Reported volatility is somewhat muted due to appraisal smoothing, although volatility still appears appropriate when a comparison is made to only other private market asset classes.
- Historically, timberland returns have exceeded traditional real return targets for many institutional investors (CPI +300) over most time periods.

NCREIF Timberland Index vs. CPI + 300 BPS
Rolling 5-Year Returns



Source: The Townsend Group; NCREIF

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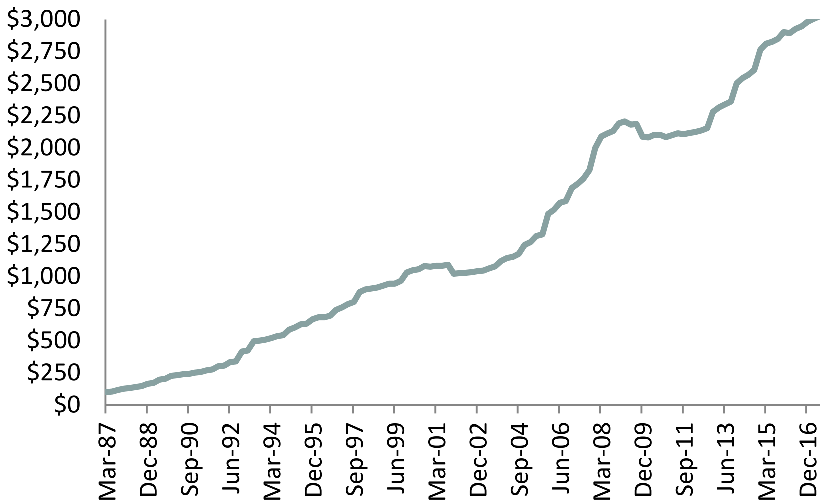
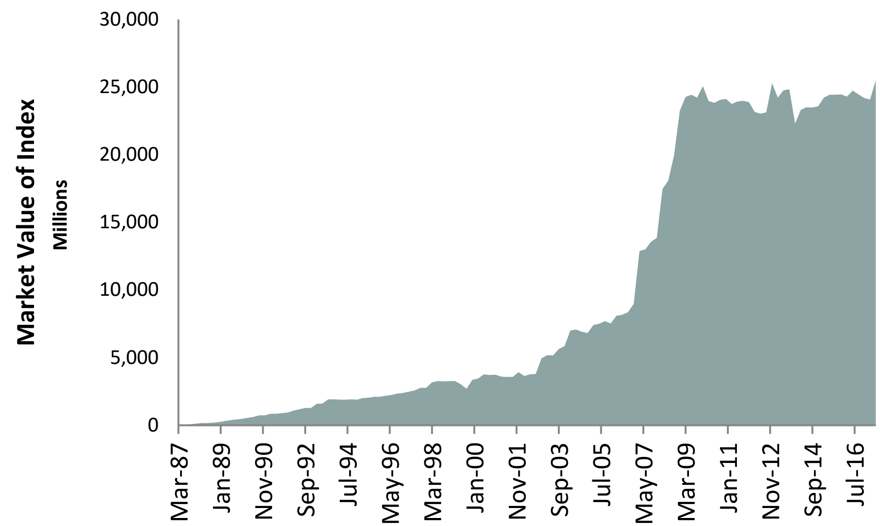
Timberland Sector Development

- Institutional investment in timberland began in the early 1980s and accelerated in 1986, when tax laws changed and removed an incentive for forest product companies (“FPC”) to own timberland.
- The sales of timberland from the FPCs to institutional investors gave way to the Timberland Investment Management Organization (“TIMO”) industry, where TIMOs served as the conduit between the institutional capital and the timberland operations.
- Increased institutional acceptance in the 1990s and 2000s caused additional capital to flow into the space, boosting values and drawing further interest and more “normalized” returns are expected today driven by biological growth rather than new capital into the sector.

NCREIF Timberland Index: Growth of $100



Growth of NCREIF Timberland Index



Source: The Townsend Group; NCREIF

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Timberland Key Risks and Mitigants

	Risks	
Disease & Insects	▪ Large scale insect infestation has been rare, but in a few cases has had devastating impact ▪ Diseases have become rare and with better detection the impact can be contained	Townsend recommends a portfolio diversified by regions (South, PNW, etc.) and by species to address weather, disease and insect risk
Weather	▪ Weather is a risk but to a lesser extent than agriculture ▪ Fire is a hazard during dry conditions or lightning requiring comprehensive fire prevention and fighting plans ▪ Wind, hurricane, and ice/snow can impact the trees, but timely intensive forest management practices like, salvaging the trees, can minimize loss	Investors need to diversify timberland investments to include other regions to achieve higher returns, but limit exposure to minimize country risk
Commodity & Financial	▪ Long-term timberland returns correlate with timber prices which adds earnings volatility, which is mitigated by tree growth ▪ International exposure may be desired but adds currency risk ▪ Even domestic exposure is impacted by currency movements as timber is a global commodity	While timber is a global commodity, local economic conditions and currency movements create multi-year variation in performance requiring a globally diversified portfolio
Country Risk	▪ Ownership rights are often not well defined in many countries around the world ▪ Finally, local timberland returns are correlated with economic performance of the region ▪ Conservation efforts in various countries can have an impact	Regions, even within the same country, have different customers (local mills, etc.), broker networks, hauling requirements, local products with specific timber needs, etc. As such manager's local execution capabilities are key to a successful investment
Operational Risk	▪ Harvesting decisions can impact timing of cash flows, IRRs and equity multiple due to 20 year or so tree replenishment cycle ▪ Sorting, hauling, working with brokers/customers require significant local expertise	

Source: The Townsend Group

Timberland Global Investment Themes

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Overweight
Neutral
Underweight

	North America	Oceania	Latin America	Other
KEY THEMES	Low risk and commensurately lower return	Improving domestic economy and continued long-term demand from Asian markets to drive returns	Slow local demand and still lagging demand from the U.S. limiting returns but valuations at cyclical lows	Growing institutionalization of high potential regions for investment opportunities
CORE TIMBERLANDS	Future above "normal" returns to be driven by timing of US housing market recovery that remains with sluggish forward momentum	Lower asset values provide higher long-term returns despite near-term China slowdown impact	Economy and related demand at cyclical lows, but longer term demand drivers intact. Better valuation entry point and ability to be more selective	Chile, Uruguay, South Africa , Europe - provide selective opportunities with higher return albeit at elevated risk levels
NON-CORE TIMBERLANDS	Prefer younger age-class timberland or Pre-merch; Prefer assets 5-7 years from maturation for higher returns	Additional supply from the region needed to serve growing domestic demand and serve fast urbanizing China and India markets	Tactical opportunities for greenfield development for fast-growth eucalyptus – i.e., 5-7 years for full growth cycle	Select tactical opportunities for fast growth timberland with exposure to growing emerging economies

Source: The Townsend Group

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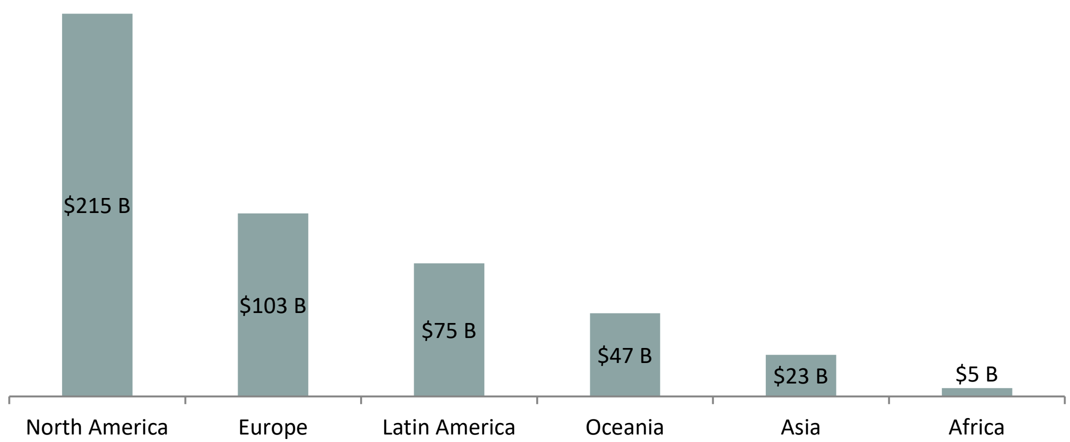
Return Compression in Developed Markets of North America and Oceania Continues to Slow, while Latin America Continues to Provide Return Premiums

- While the size of investable quality timberland assets varies significantly, most agree that the U.S. is the largest and most institutionalized market followed by Latin America (Brazil, Uruguay) and Australia/NZ
- U.S. and Canadian returns are commensurate with the lower risk profile of the investments in these markets. There is a good likelihood for investors to make higher returns if the housing market continues to improve
- Australian timberland investments carry a higher income yield which is also true of the real estate in that region. Additionally, there is a greater potential for higher returns as the Timber prices in that region have stagnated
- Brazil offers the highest return opportunity, but comes at higher country risk. The Brazilian timber prices are also depressed as the local economy is not doing as well as most expected. We believe that since the asset values have corrected from their 2009 highs, now is good entry point for long-term investors to benefit from higher income yield and total return overall

Market Value of Investable Timberland ($ Billions)



Net Return Expectations to Justify Investment (% p.a.)

	U.S.	Latin America	Oceania	Canada
Core Plus	6.5%	11.0%	7.0%	6.5%
Non-Core	8.0%	15.0%	8.5%	8.0%

Source: DANA, HTRG, Townsend

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The NCREIF Property Index (NPI) is a quarterly time series composite total rate of return measure of investment performance of a very large pool of individual commercial real estate properties acquired in the private market for investment purposes only. All properties in the NPI have been acquired, at least in part, on behalf of tax-exempt institutional investors - the great majority being pension funds. As such, all properties are held in a fiduciary environment.

The NFI-ODCE Index is a capitalization-weighted, gross of fees, time-weighted return Index with an inception date of 1/1/1978. Published reports may also contain equal-weighted and net of fees information. Open-end Funds are generally defined as infinite-life vehicles consisting of multiple investors who have the ability to enter or exit the fund on a periodic basis, subject to contribution and/or redemption requests, thereby providing a degree of potential investment liquidity. The term Diversified Core Equity style typically reflects lower risk investment strategies utilizing low leverage and generally represented by equity ownership positions in stable US operating properties (as defined herein). The NFI-ODCE is a quasi-managed Index based on the periodic review by the Index Policy Committee ("IPC") of the Index's criteria thresholds.

The Consumer Price Index (CPI) is a measure that examines the weighted average of prices of a basket of consumer goods and services, such as transportation, food and medical care. The CPI is calculated by taking price changes for each item in the predetermined basket of goods and averaging them; the goods are weighted according to their importance. Changes in CPI are used to assess price changes associated with the cost of living.

The S&P 500 Index is an unmanaged market capitalization weighted index of 500 common stocks chosen for market size, liquidity, and industry group representation to represent U.S. equity performance.

The Barclays U.S. Aggregate Bond Index is a broad-based benchmark that measures the investment grade, US dollar-denominated, fixed-rate taxable bond market. The index includes Treasuries, government-related and corporate securities, MBS (agency fixed-rate and hybrid ARM pass-throughs), ABS and CMBS (agency and non-agency).

Index figures do not reflect deduction of fees, expenses or taxes. One cannot invest directly in an index.

ATTACHMENT 2

StepStone inside private markets

LACERA Los Angeles County Employees Retirement Association

StepStone Infrastructure & Real Assets

LACERA 2018 Board Off-Site: Infrastructure Discussion

February 2018

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Prospective investors should inform themselves and take appropriate advice as to any applicable legal requirements and any applicable taxation and exchange control regulations in the countries of their citizenship, residence or domicile which might be relevant to the subscription, purchase, holding, exchange, redemption or disposal of any investments. Each prospective investor is urged to discuss any prospective investment with its legal, tax and regulatory advisors in order to make an independent determination of the suitability and consequences of such an investment.

An investment involves a number of risks and there are conflicts of interest. Please refer to the risks and conflicts disclosed herein.

Each of StepStone Group LP, StepStone Group Real Assets LP and StepStone Group Real Estate LP is an investment adviser registered with the Securities and Exchange Commission ("SEC"). StepStone Group Europe LLP is authorized and regulated by the Financial Conduct Authority, firm reference number 551580. Swiss Capital Invest Holding (Dublin) Ltd ("SCHIDL") is an SEC Registered Investment Advisor and Swiss Capital Alternative Investments AG ("SCAI") (together with SCHIDL, "Swiss Cap") is registered as a Relying Advisor with the SEC. Such registrations do not imply a certain level of skill or training and no inference to the contrary should be made.

All data as of December 31, 2017 unless otherwise noted.

PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS. ACTUAL PERFORMANCE MAY VARY.

Contents

I. Why Infrastructure?

Infrastructure Investment Rationale

STEPSTONE
inside private markets

Infrastructure often attracts capital allocation for the following reasons:

1) Opportunity for Inflation Correlation and an Attractive Spread Relative to Long-term Bond Yields

Infrastructure often provides a correlation to inflation and the opportunity for enhanced yield relative to fixed income – even following the recent compression in returns, core infrastructure equity continues to offer a significant margin over inflation and long-term bond yields, which are at historic lows in most OECD countries

2) Downside Protection

Core infrastructure offers stable returns relative to other investments (so long as a prudent level of leverage is applied), while Value-Added infrastructure offers the chance for higher returns, with an associated increase in risk, either through exposure to greater operational risk and/or GDP exposure.

3) Opportunity for Operational Upside

Infrastructure is a relatively nascent asset class, with many investments providing the opportunity for material operational upside through a focus on active capital expenditure planning and value optimization initiatives

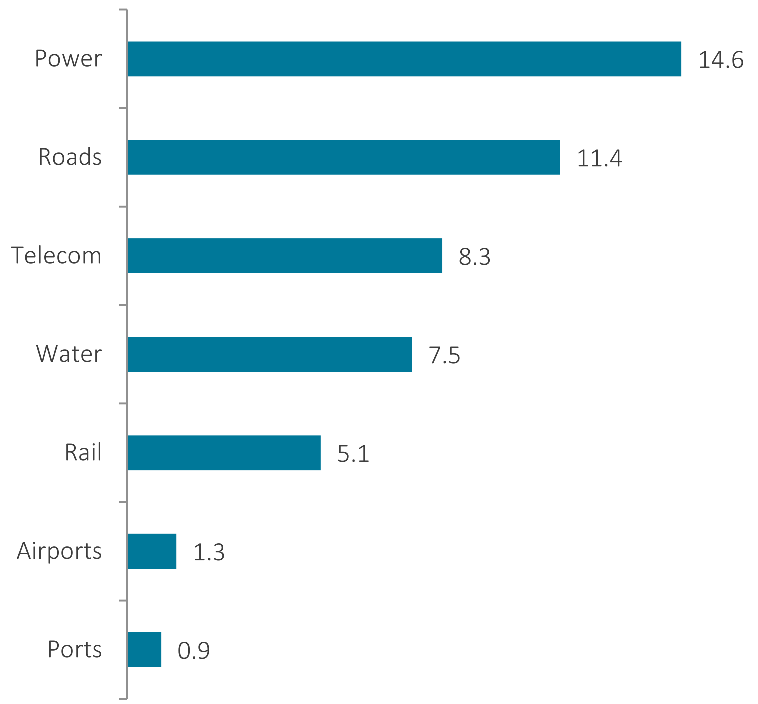
4) Diversification / Portfolio Benefits

Infrastructure has been shown to have a low level of correlation with traditional listed investments (which often comprise the bulk of an institutional investor's portfolio), providing attractive diversification / portfolio benefits

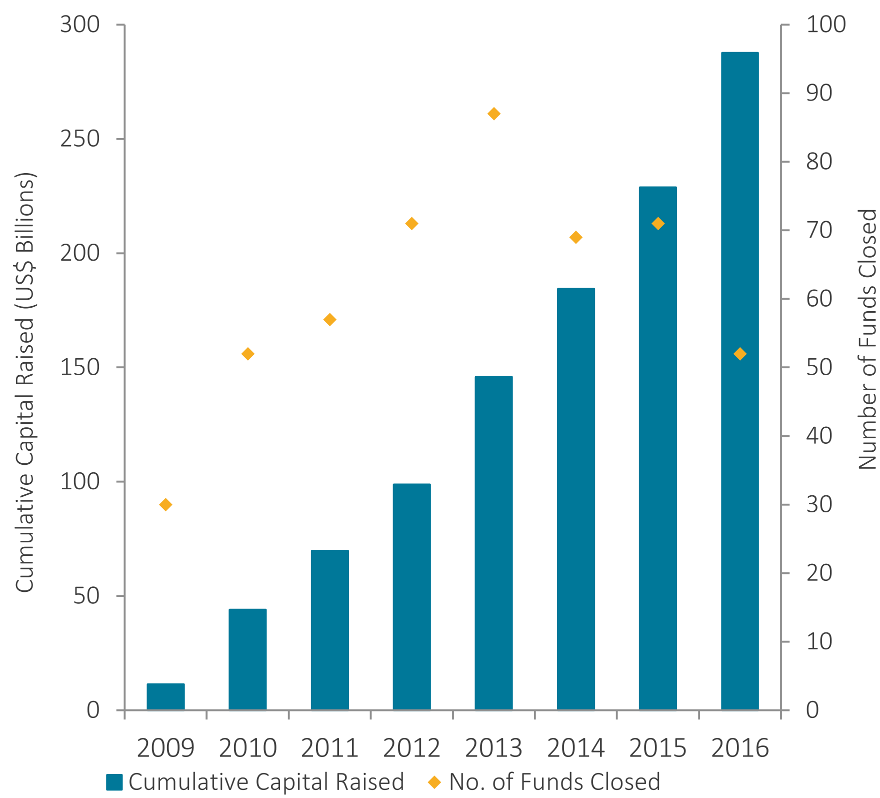
Global Capital Requirements Remain Significant

- McKinsey & Company estimates the world needs to invest US$49.1 trillion in economic infrastructure during 2016 to 2030
- This gap in funding is not expected to be filled by government entities, many of which are constrained by high levels of debt
- Mounting fiscal pressure in countries worldwide has accelerated the privatization schedule of infrastructure assets

SPENDING ON INFRASTRUCTURE: 2016-2030 (US$ TRILLIONS)



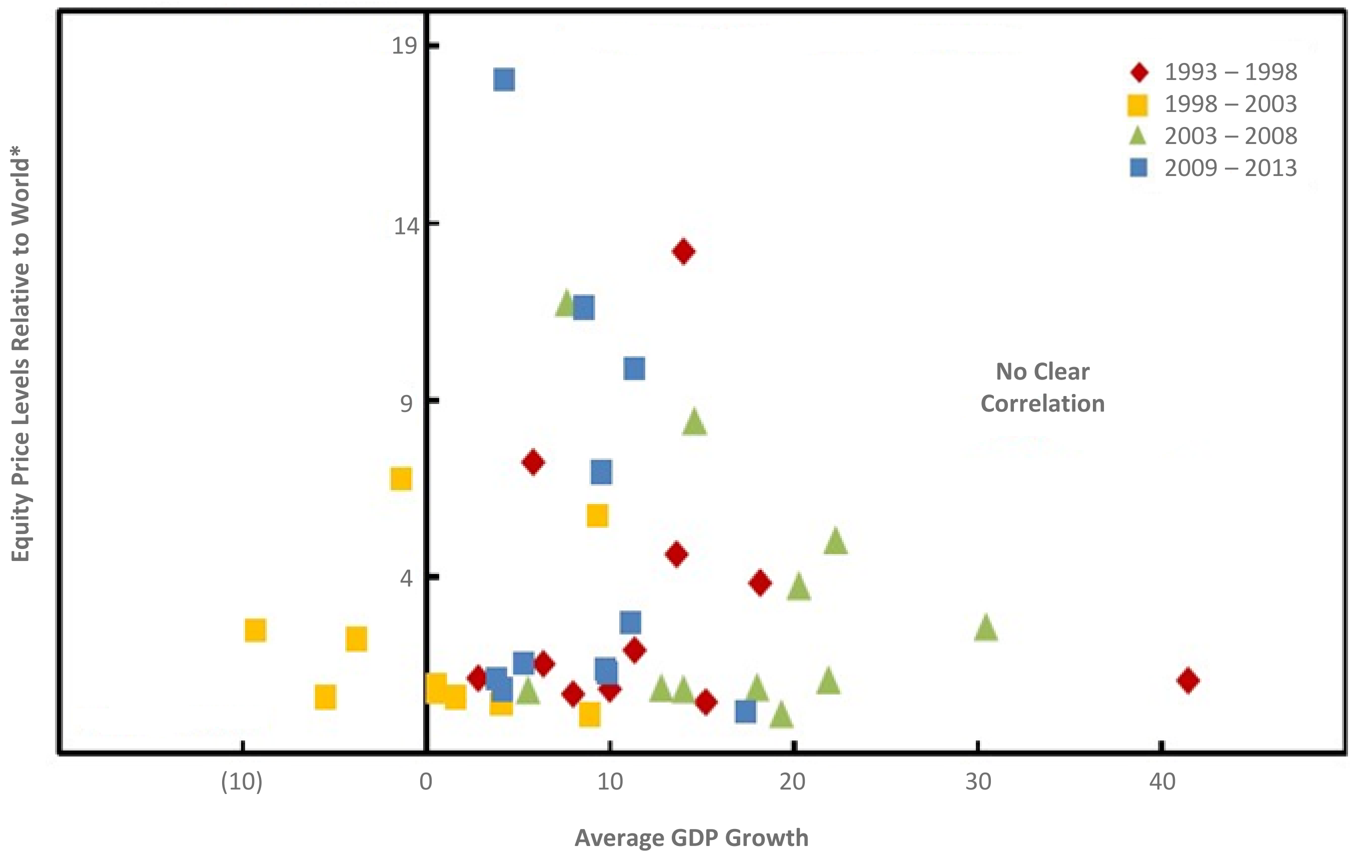
AGGREGATE CAPITAL RAISED



Source: McKinsey, June 2016; 2017 Preqin Global Infrastructure Report. Data subject to change as Preqin's database is updated continuously.

GDP Growth Provides No Signals

Growth ≠ Equity Returns



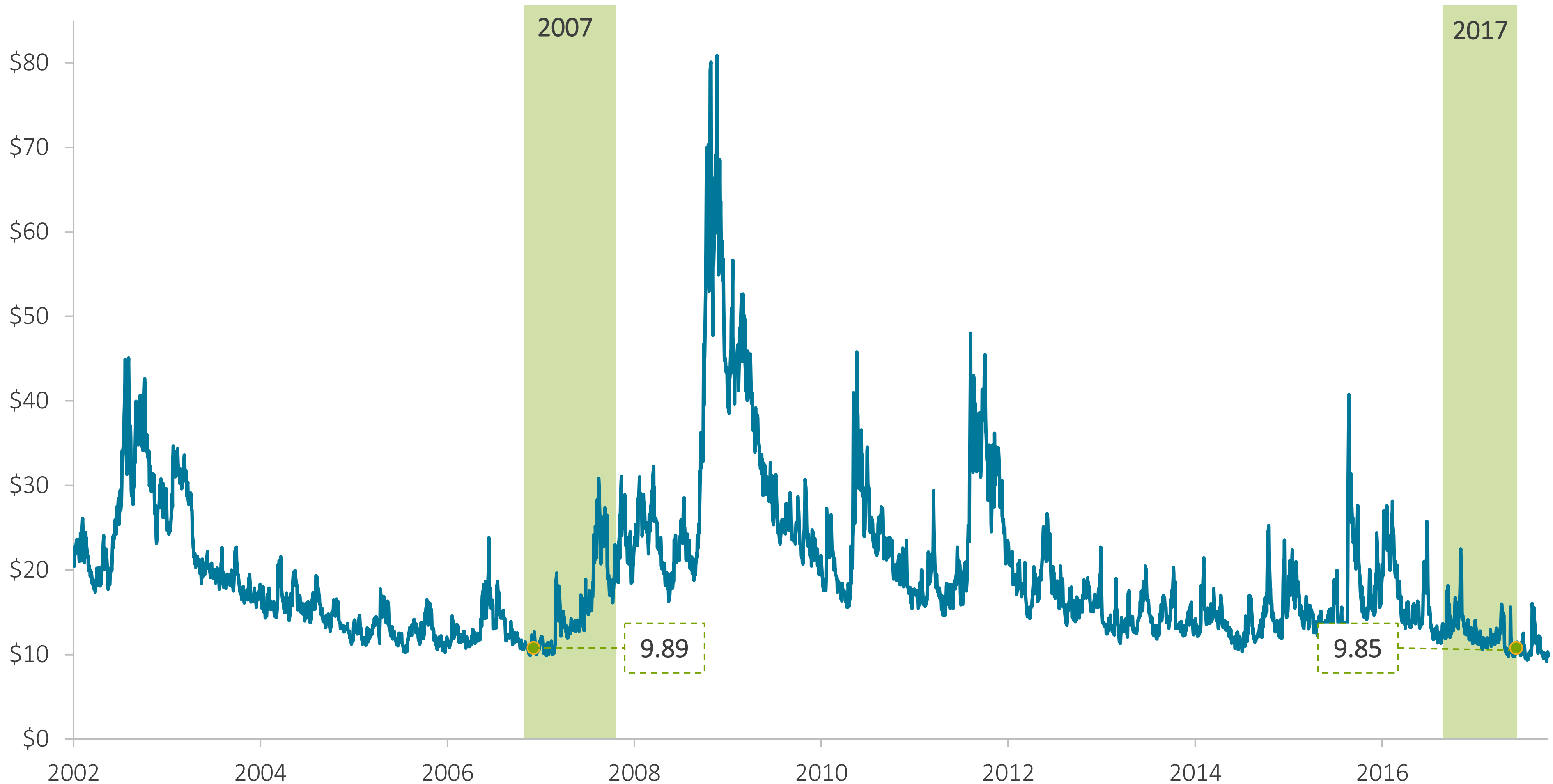
* Shown in common-currency terms. Source: MSCI
** Source: IMF World Economic Outlook
Note: Data points represent China, Brazil, India, Russia, South Africa, South Korea, Taiwan, Malaysia, Chile, Mexico, and Singapore in four time periods

Source: BCA Research, 2015

Lack of Fear In The Markets

Despite the potential threats to the recovery, the "Fear Index" is touching the lows last seen prior to the GFC; such indicators often happen prior to equity market dislocations

VIX DAILY CLOSING PRICES (US$)



Source: S&P Capital IQ as of September, 2017.

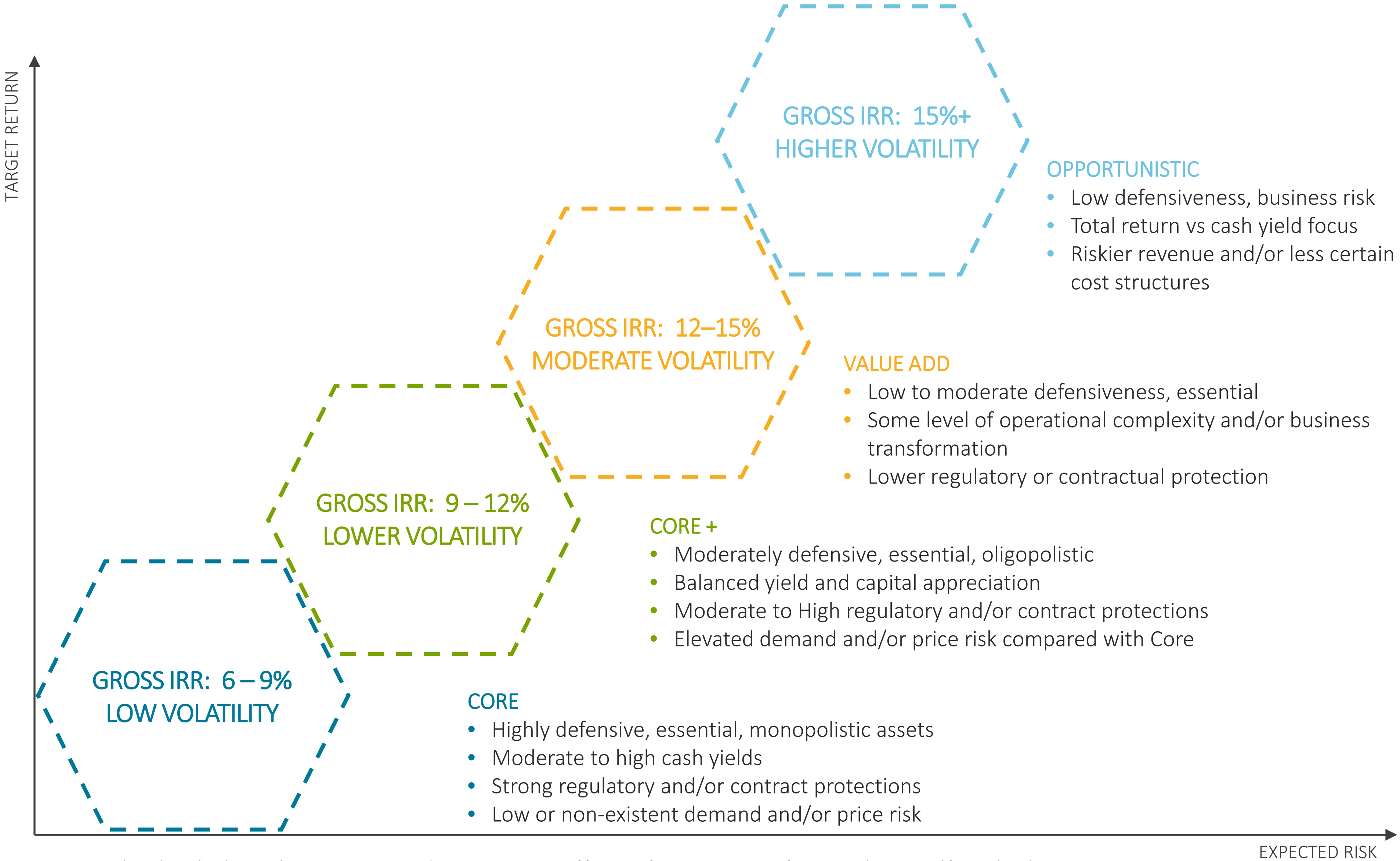
Attractive Real Returns, Yield & GDP Links

	Investment Grade Debt	Junior Debt	Core Equity	Core + Equity	Value-Added Equity	Opportunistic Equity
Return Assumptions	3.5-5.5%	5.5-9%	7-9%	9-12%	12-15%	15-17%
Key Risks	Operating assumptions, investment structure	Market risk, operating assumptions, strategy implementation	Operating assumptions, leverage levels, regulatory	Operating assumptions, construction	Strategy implementation	Market risk, political risk and currency risk
Revenue Certainty (Contracted)	Yes	No	Yes	Yes	No	In some cases
Main Return Driver	Income	Income & appreciation	Income	Income & appreciation	Appreciation	Appreciation
GDP Sensitivity	Low	High	Low	Low-Med	High	High
Greenfield or Brownfield	Both	Both	Brownfield	Both	Both	Both
Development Risk	In some cases	In some cases	No	In some cases	In some cases	In some cases
Return Driven by Exit?	No	No	No	Possibly	Yes	Yes
Operating Complexity	Low	Low	Low-Med	Medium	High	Medium/High

Source: Infrastructure rising: An Asset Class Takes Shape, BlackRock, 2016
Past performance is not necessarily indicative of future results. Actual performance may vary.

Infrastructure Risk / Return

Infrastructure can play a vital portfolio role of providing investment opportunity in parts of the risk / return continuum which are not met by private market debt and private equity



OPPORTUNISTIC
- Low defensiveness, business risk
- Total return vs cash yield focus
- Riskier revenue and/or less certain cost structures

VALUE ADD
- Low to moderate defensiveness, essential
- Some level of operational complexity and/or business transformation
- Lower regulatory or contractual protection

CORE +
- Moderately defensive, essential, oligopolistic
- Balanced yield and capital appreciation
- Moderate to High regulatory and/or contract protections
- Elevated demand and/or price risk compared with Core

CORE
- Highly defensive, essential, monopolistic assets
- Moderate to high cash yields
- Strong regulatory and/or contract protections
- Low or non-existent demand and/or price risk

Target returns are hypothetical and are neither guarantees nor predictions or projections of future performance. Future performance indications and financial market scenarios are no guarantee of current or future performance. There can be no assurance that such target gross IRRs will be achieved or that the investment will be able to implement its investment strategy, achieve its investment objectives or avoid substantial losses. Further information regarding target gross IRR calculation is available upon request. Source: StepStone analysis, September 2017.
Gross IRR will ultimately be reduced by management fees, carried interest, taxes and other fees and expenses

II. Allocation Considerations

A wide variety of investors are allocating capital to Infrastructure for its defensive characteristics and yield.

US Pension Funds

US pension funds are increasing allocations to the sector – while primarily through pooled funds to date, some of the larger funds are now developing direct, or 'assisted direct', investment mandates

Asian Life Companies

Life insurance companies, particularly out of Asia, are having restrictions lifted that will allow them to invest in infrastructure as a means of matching their long-tail liability profile

Japanese Pension Funds

Japanese pension funds, having historically invested primarily in fixed income and equities, have recently broadened their investment mandates to include infrastructure

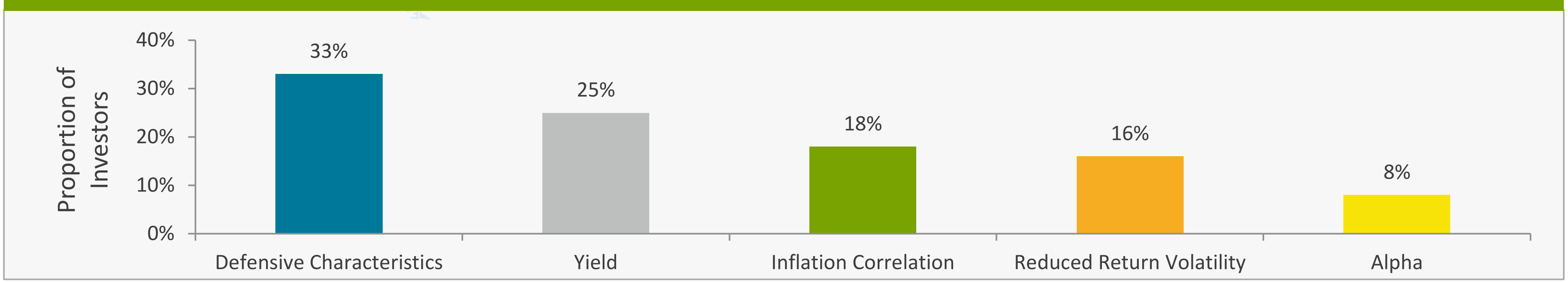
Other SWFs

Middle Eastern SWFs have been particularly active in recent years

Asian SWFs

Asian SWFs, along with Asian government Foreign Reserve funds, representing trillions of dollars of foreign reserve holdings, are one of the fastest growing pools of investors in recent years, with significant scope for further investment

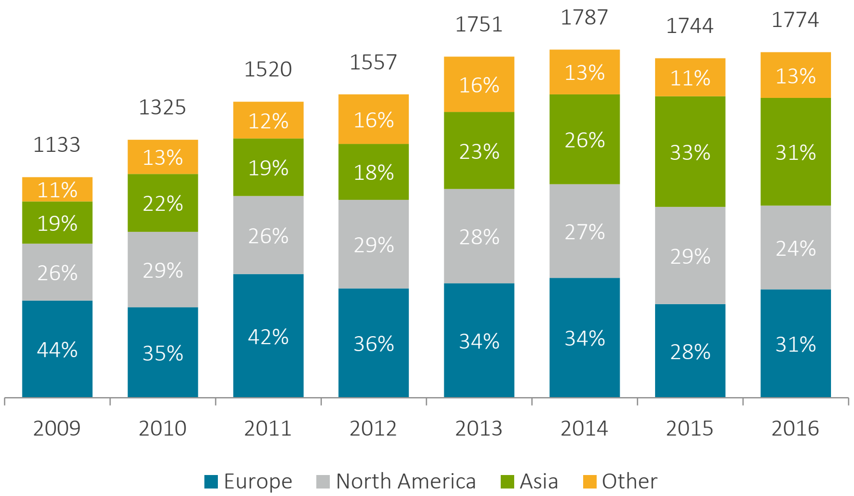
Primary Rationale for Investing in Infrastructure



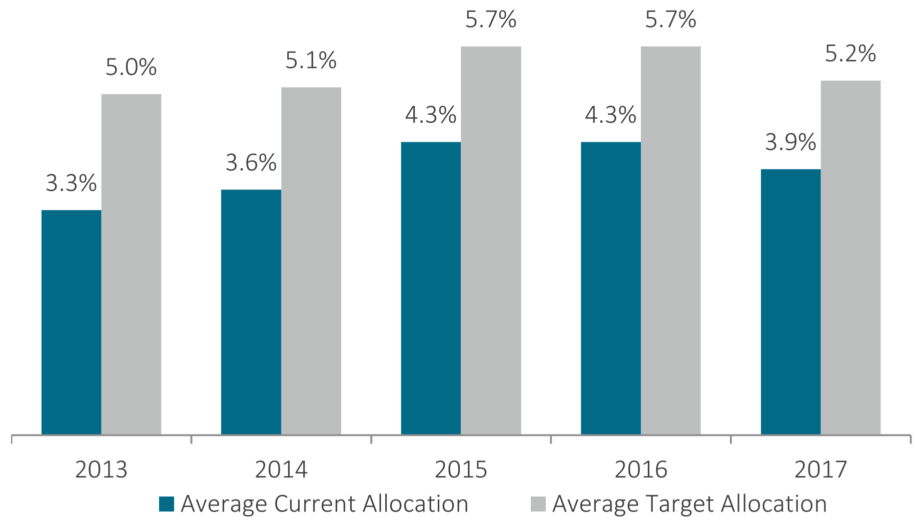
Source: StepStone survey, 2014 - 16

Investor Appetite Remains Strong

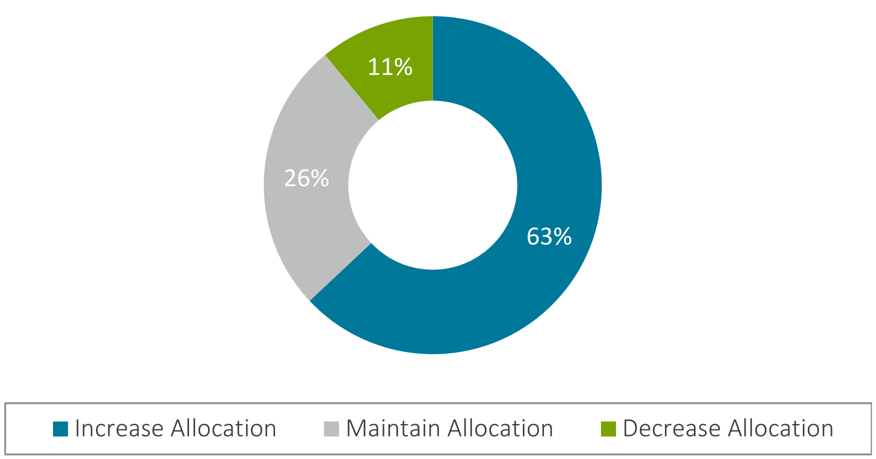
DEALS BY REGION



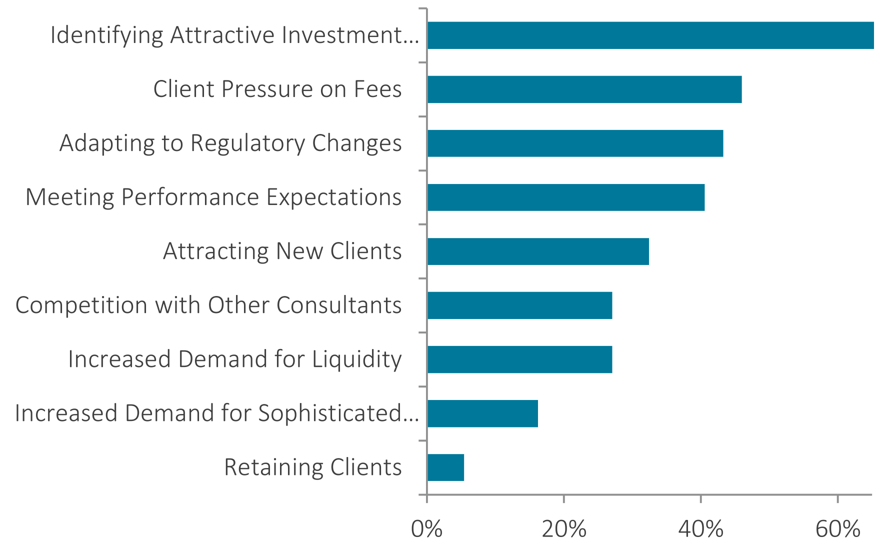
AVERAGE ALLOCATION: AS % OF AUM



INVESTORS' LONG-TERM INTENTIONS



BIGGEST CHALLENGES FACING UNLISTED GPs IN 2017

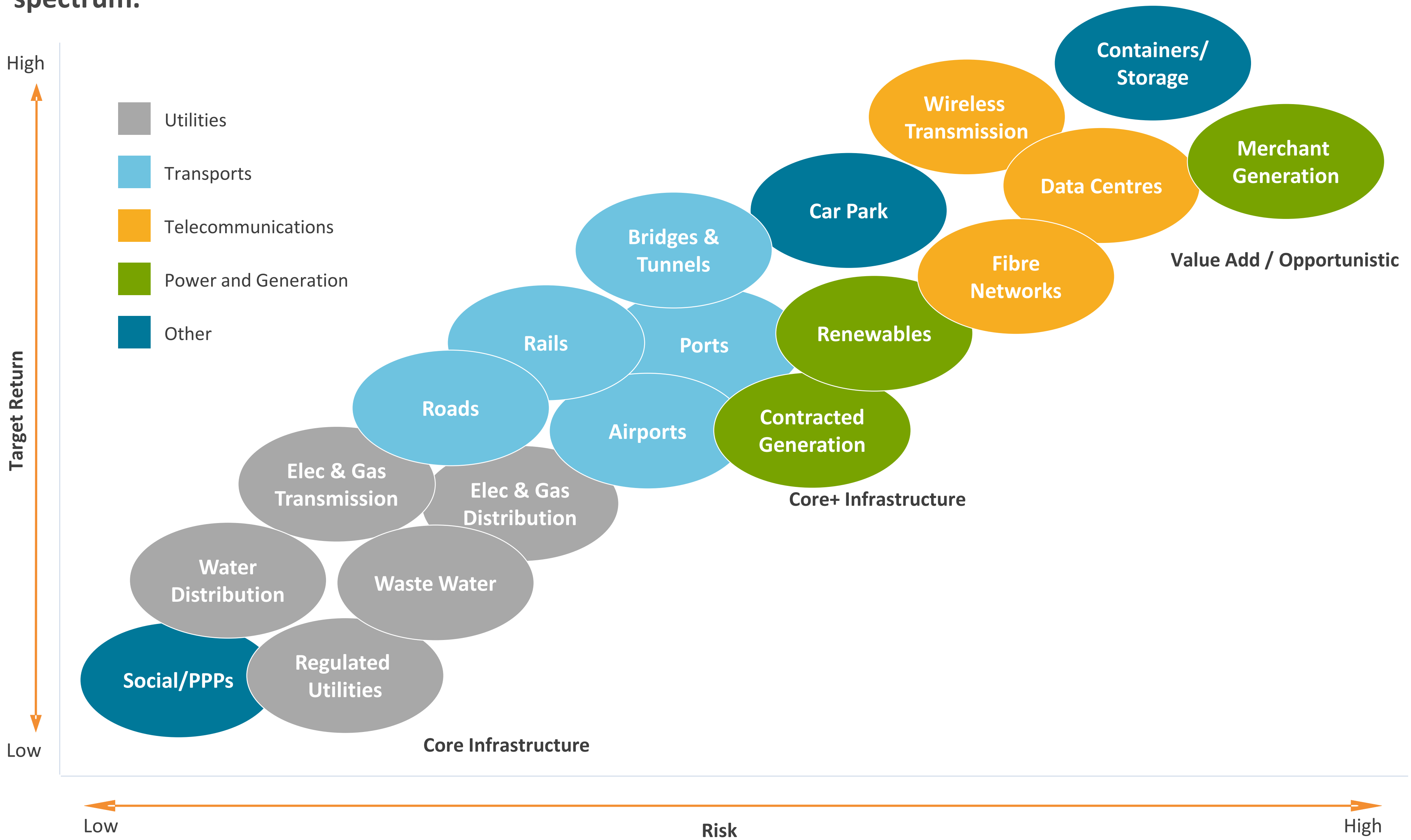


Source: *2017 Preqin Global Infrastructure Report*. Data subject to change as Preqin's database is updated continuously.
Past performance is not necessarily indicative of future results. Actual performance may vary.

III. Sector Considerations

Sectors and Subsectors

Each infrastructure sector and subsector has different risk factors, return drivers, and economic sensitivities. Asset level characteristics can place individual investments at higher or lower points on the risk/return spectrum.



Source: StepStone, September 2017. For Illustrative purposes only

Core vs Value-Added

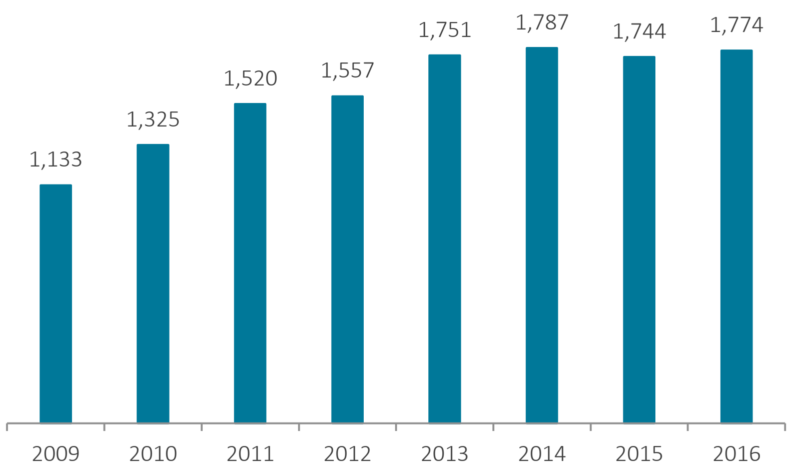
A wide array of sectors and wide range of risk provide investors with a wide range of portfolio solutions.

"Core"		"Value-Added"
Regulated utilities with transparent regulatory frameworks and appropriate capital structures	Utilities	Utilities with less established / transparent regulatory frameworks and/or material unregulated businesses
Availability payment toll roads or mature, operational toll roads with key defeinsive characteristics	Toll roads	Toll roads with material traffic risk, either due to competition (competing roads), location (eg. more rural areas) or lifecycle stage (eg. ramp-up)
Single till regulated airports and/or major hub airports	Airports	Dual till airports and/or airports outside of the major hubs
Major landlord container ports in strategic locations	Sea ports	Bulk ports, container ports in less strategic locations, stevedores
Mature, operational PPP assets with appropriate contractual proctections and risk-sharing mechanisms	Social / PPP	PPP projects in construction phase and/or projects with greater demand risk than traditional PPPs
Long-term contracted renewables assets with mature technologies and appropriate O&M arrangements	Renewables	Short-to-medium term contracted assets with tail demand risk, merchant assets, assets in construction

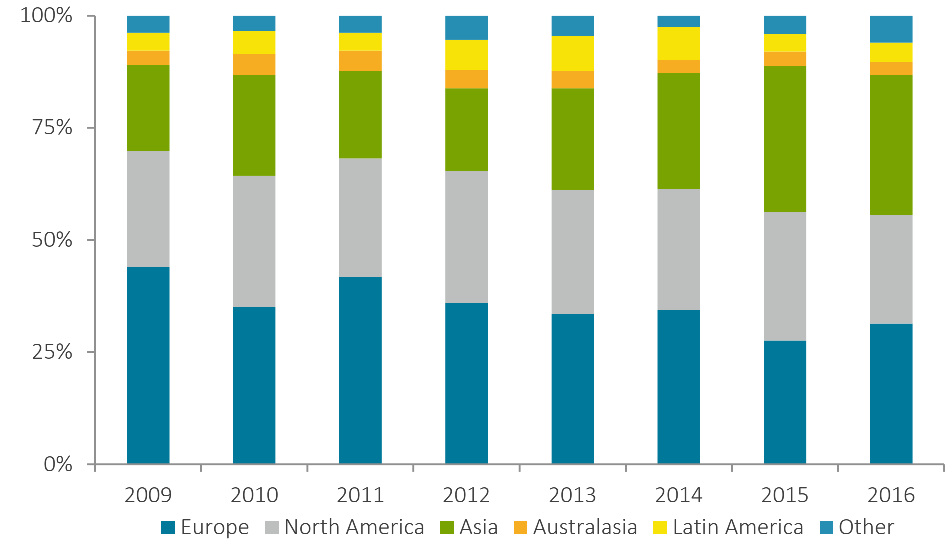
Source: StepStone, December 2017. For Illustrative purposes only

Overview of Deal Activity

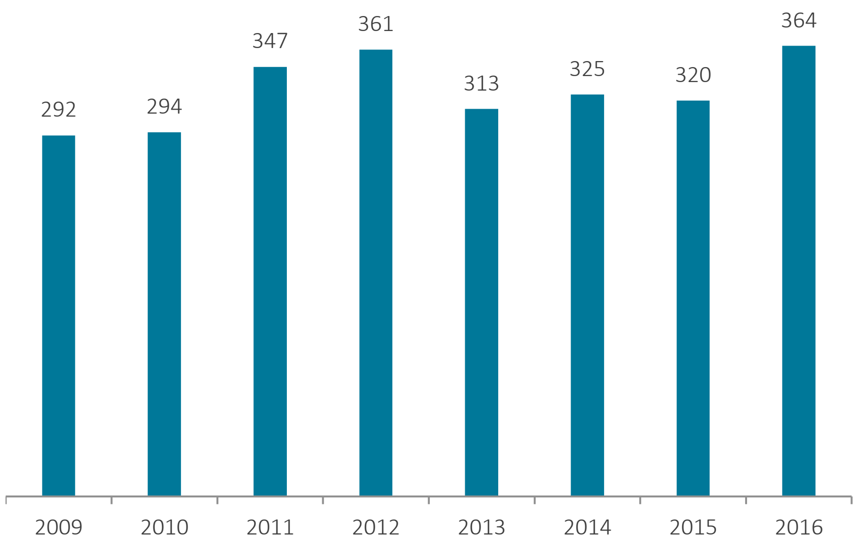
NUMBER OF DEALS COMPLETED GLOBALLY



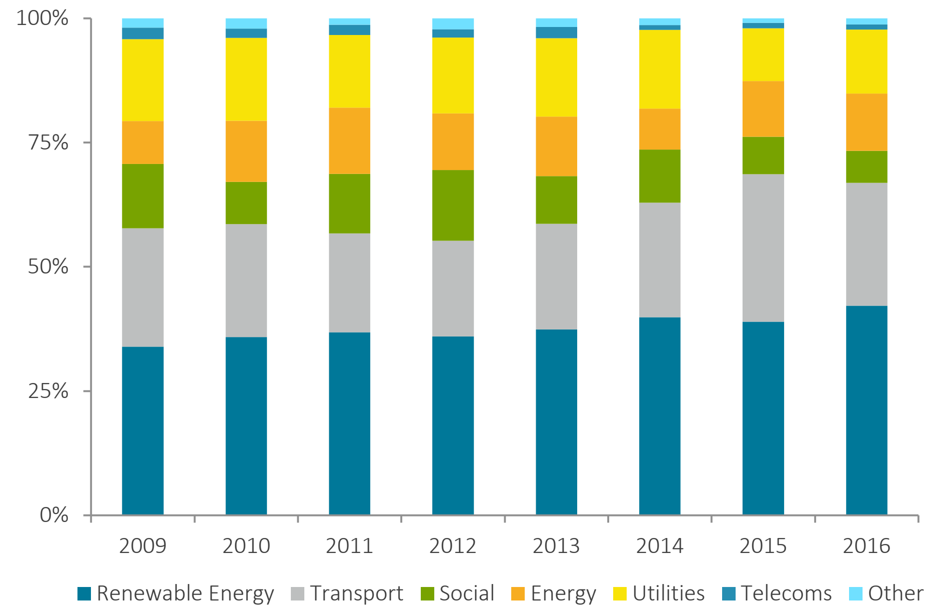
DEALS BY REGION



GLOBAL AVERAGE DEAL SIZE: TEV (US$ MILLIONS)



PRIVATE-SECTOR OWNED ASSETS BY INDUSTRY



Source: Preqin, November 2017. Data subject to change as Preqin's database is continuously updated.

IV. Correlations & Target Returns

Infrastructure Correlation Matrix

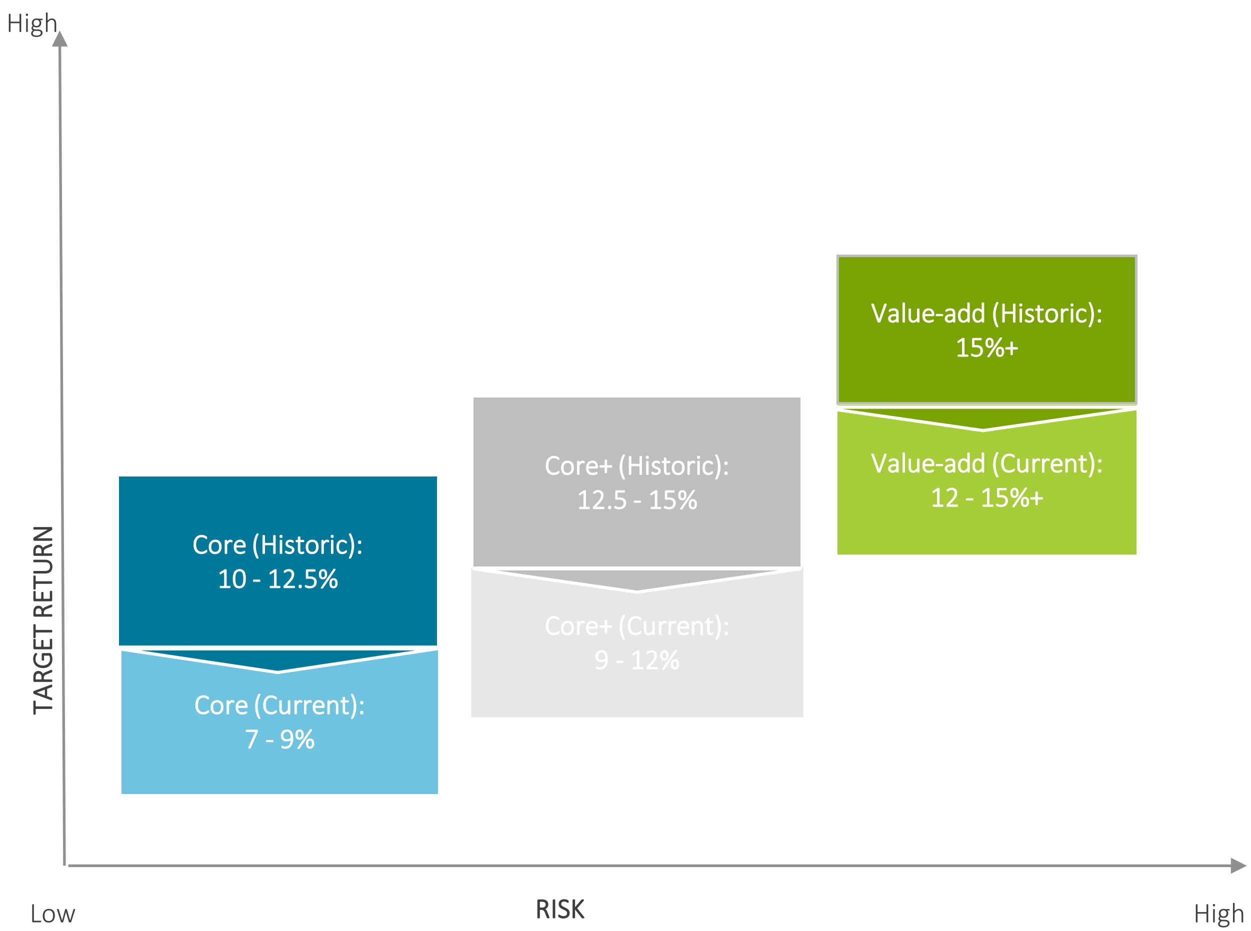
	Private Equity Buyouts Primary	Private Equity Buyout Secondary	Private Equity Venture Capital	Private Debt Syndicated Loans	Private Debt Direct Lending	Private Debt Distressed	Private Equity Infra Core	Private Equity Infra Growth	Private Equity Real Estate Core	Private Equity Real Estate Value Add	Private Debt Real Estate Senior	Private Debt Real Estate Mezz	MSCI World Equity Index TR (Net)
Private Equity Buyouts Primary	1.00	0.82	0.70	0.58	0.72	0.80	0.21	0.78	0.55	0.69	0.31	0.71	0.78
Private Equity Buyout Secondary	0.82	1.00	0.70	0.37	0.62	0.56	0.12	0.74	0.72	0.74	0.30	0.74	0.53
Private Equity Venture Capital	0.70	0.70	1.00	0.38	0.58	0.55	0.24	0.58	0.55	0.64	0.24	0.64	0.57
Private Debt Syndicated Loans	0.58	0.37	0.38	1.00	0.79	0.84	0.16	0.46	0.03	0.20	0.55	0.39	0.71
Private Debt Direct Lending	0.72	0.62	0.58	0.79	1.00	0.78	0.12	0.63	0.41	0.55	0.52	0.67	0.66
Private Debt Distressed	0.80	0.56	0.55	0.84	0.78	1.00	0.15	0.69	0.23	0.39	0.35	0.47	0.88
Private Equity Infrastructure Core	0.21	0.12	0.24	0.16	0.12	0.15	1.00	0.35	0.24	0.22	0.18	0.27	0.14
Private Equity Infrastructure Growth	0.78	0.74	0.58	0.46	0.63	0.69	0.35	1.00	0.58	0.67	0.29	0.69	0.61
Private Equity Real Estate Core	0.55	0.72	0.55	0.03	0.41	0.23	0.24	0.58	1.00	0.91	0.14	0.82	0.23
Private Equity Real Estate Value Add	0.69	0.74	0.64	0.20	0.55	0.39	0.22	0.67	0.91	1.00	0.15	0.92	0.37
Private Debt Real Estate Senior	0.31	0.30	0.24	0.55	0.52	0.35	0.18	0.29	0.14	0.15	1.00	0.53	0.21
Private Debt Real Estate Mezzanine	0.71	0.74	0.64	0.39	0.67	0.47	0.27	0.69	0.82	0.92	0.53	1.00	0.40
MSCI World Equity Index TR (Net)	0.78	0.53	0.57	0.71	0.66	0.88	0.14	0.61	0.23	0.37	0.21	0.40	1.00

Infrastructure, in particular infrastructure debt[1] and core infrastructure equity are significantly negatively correlated to other illiquid asset classes, offering material portfolio construction benefits

Note: All data is prepared for the time period from 31.03.2004 – 31.3.2017, using quarterly returns.
1. Infrastructure debt is excluded from the above matrix given the lack of available benchmark since 2015

Transaction Pricing Trends: Target Equity Returns

While strong competition for assets, driven by a global search for yield, has led to return compression across core and core plus infrastructure in recent years, this is largely in line with the global compression in long-term bond yields, suggesting that infrastructure equity continues to offer the same spread to long-term bond that it has historically.



Levered equity returns for core infrastructure assets have compressed from approximately 11-12% in the mid-2000s to high single digit IRRs in recent years

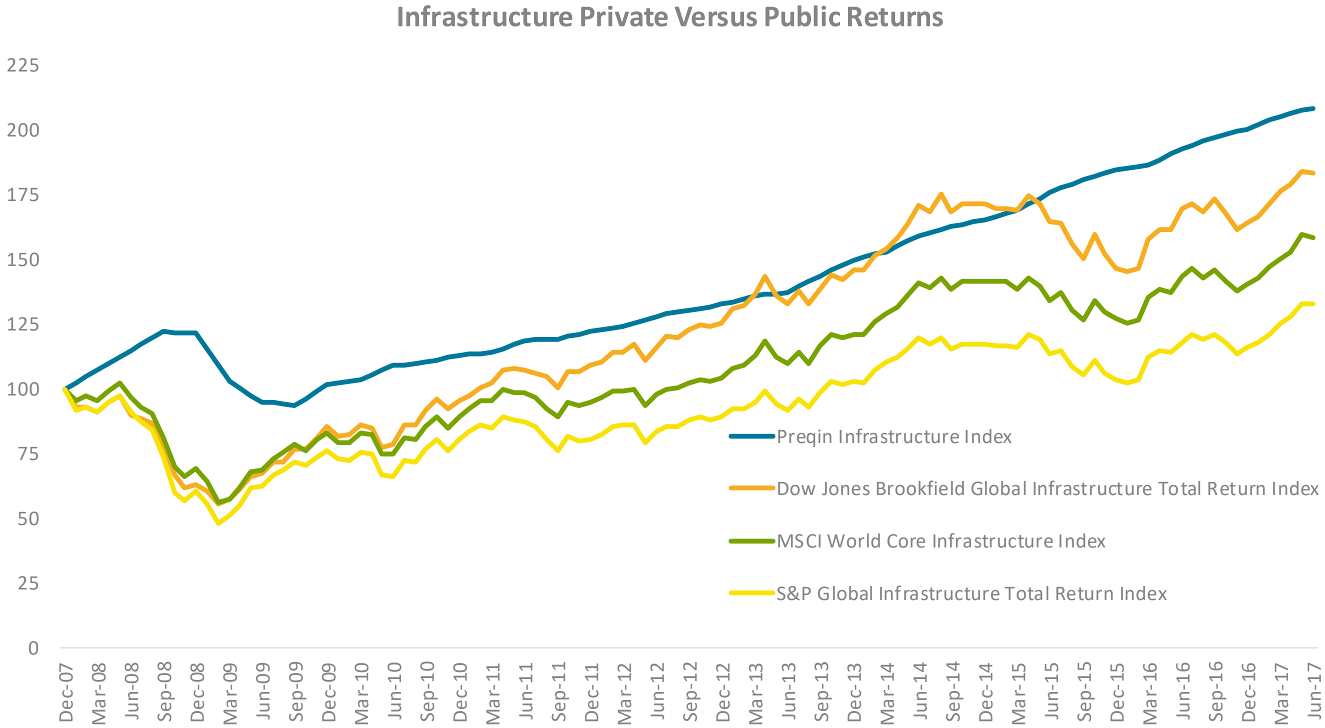
Source: StepStone Research.

Past performance is not necessarily indicative of future results and there can be no assurance that the investment will achieve comparable results or avoid substantial losses. Target expected returns are hypothetical and are neither guarantees nor predictions or projections of future performance. Future performance indications and financial market scenarios are no guarantee of current or future performance. There can be no assurance that such expected gross IRRs will be achieved or that the investment will be able to implement its investment strategy, achieve its investment objectives or avoid substantial losses. Gross IRR will ultimately be reduced by management fees, carried interest, taxes, and other fees and expenses. Further information regarding expected IRR calculation is available upon request.

V. Listed vs Unlisted

Listed vs Unlisted Infrastructure: Returns

Unlisted infrastructure has displayed lower volatility over the cycle than listed infrastructure – while listed infra has outperformed when markets are rising, it does not provide the downside protection of unlisted infra.



Annualized Returns (as of June 2017)				
Indices	1 Year	3 Year	5 Year	Since '07
Preqin Infrastructure Index	8.2%	9.4%	10.2%	8.0%
Dow Jones Brookfield Global Infrastructure Total Return Index	8.0%	2.4%	9.6%	6.6%
MSCI World Core Infrastructure Index	10.6%	4.0%	10.0%	5.0%
S&P Global Infrastructure Total Return Index	12.7%	3.5%	9.7%	3.0%

Source: Preqin, Infrastructure Performance Quarterly Index tool; Bloomberg

- Data available for unlisted infrastructure index is to June 2017
- StepStone believes that any return of volatility to the listed market, coupled with the potential for rising interest rates, would enhance the case supporting the resilience of unlisted infrastructure vs. listed infrastructure
- Further, in the current market, managers are increasingly driving returns through operational improvements – it is not clear that listed managers have the same capacity to influence management as private market managers do (given governance rights).

The referenced indices are shown for general market comparisons and are not meant to represent any particular fund. An investor cannot directly invest in an index. Moreover, indices do not reflect commissions or fees that may be charged to an investment product based on the index, which may materially affect the performance data presented.

Listed Infrastructure: Equity Market Correlation

StepStone believes that one of the potential shortcomings of listed infrastructure is that it is correlated with the broader listed equity market, removing the diversification benefits that many investors are seeking to gain by adding an infrastructure allocation to their portfolio.

Correlation with MSCI World Index			
Index	3 Year	5 Year	Since 2007
Dow Jones Brookfield Global Infrastructure Total Return Index	63.4%	68.4%	85.3%
MSCI World Core Infrastructure Index	68.4%	72.2%	89.4%
S&P Global Infrastructure Total Return Index	67.5%	72.4%	91.2%
FTSE Global Core Infrastructure 50/50 TR Index USD	60.6%	66.3%	86.6%

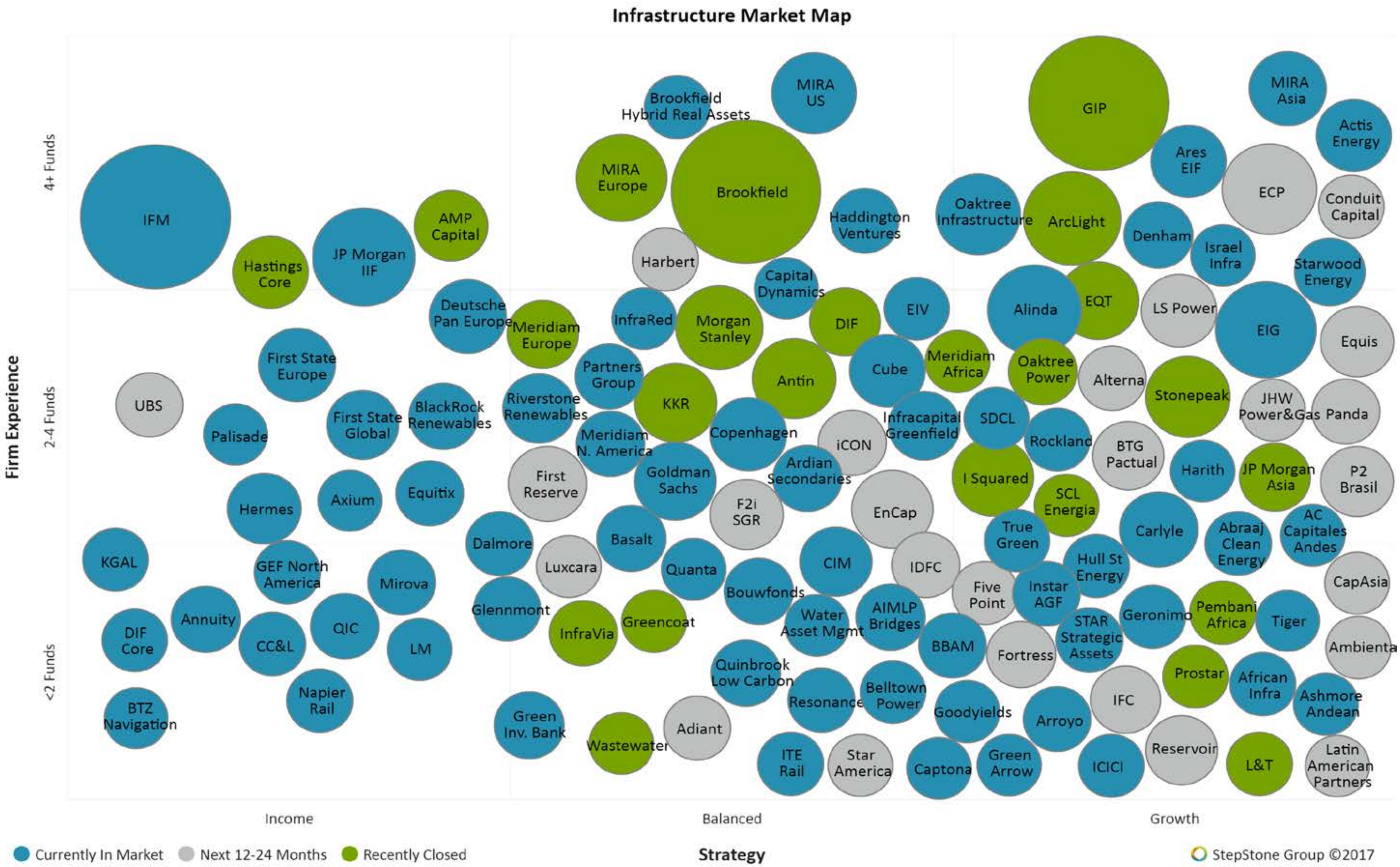
- Unlisted infrastructure provides particularly effective downside protection, due its substantially lower correlation with general equities markets.
- Separate analysis of the IPD Australia Unlisted Infrastructure Index undertaken by Colonial First State Global Management also highlighted the superior performance and significantly lower observed volatility that unlisted infrastructure has delivered for investors since 2007

Source: Bloomberg. The referenced indices are shown for general market comparisons and are not meant to represent any particular fund. An investor cannot directly invest in an index. Moreover, indices do not reflect commissions or fees that may be charged to an investment product based on the index, which may materially affect the performance data presented.
As of December 31, 2017

VI. Unlisted Investment Options

Infrastructure Market Map

The manager universe reveals a wide variety of styles and fund sizes



Source: StepStone Research Note: There can be no assurance that any or all of these funds will come to, or continue to be in, market, will be available to any particular investor, or will close as expected. StepStone has obtained the information shown above from various published and unpublished sources considered to be reliable. However, StepStone cannot guarantee its accuracy, and circumstances may change. Any potential investor should independently confirm all aspects of an offering with the general partner. Manager references are for illustrative purposes only and do not constitute investment recommendations.

Size of circle denotes deployment size

VII. Benchmarks

Infrastructure Benchmarks Currently Available

StepStone clients take a wide ranging approach to benchmarking, dependent on the objectives of their investment strategy. A comparison of various approaches is included below.

Basis of Comparison	Benchmark Options: Summary	Databases/ Benchmarks	Merits	Limitations
Real Return Benchmark	• Compares performance to the investment objective of inflation protection	• CPI +%	• A measure of the effectiveness of the inflation hedge • Widely used by institutional investors	• Non-investable • Unlevered • Geographic / market variation
Private Infrastructure Options	• Compares performance to the performance of infrastructure assets or funds	• Private iQ • Preqin • Pitchbook • MSCI (formerly IPD) • EDHEC	• Strongest similarity to the investment objectives of private infrastructure • Growing data set	• Limited data particularly for certain vintages and strategies • Data Integrity: may not be directly from GPs
Public Equity Benchmark – Infrastructure	• Compares performance relative to publicly traded infrastructure companies	• Dow Jones Brookfield • FTSE 50/50 Core • S&P Global Infrastructure	• Industry specific constituents • Easy access to precise and timely information • Investable	• Higher correlation to public equities • Limited sample sizes • Inherent survivorship bias • Purity (“Infrastructure characteristics”)
Blended options	• Combination of public benchmark with non-equity	• % Public Equity (Infrastructure or General) + % Fixed Income (Barclays Agg) or CPI	• Merits of public market options • Reduced volatility and correlation associated with private market exposure	• Limitations of public market options • Limitations of real return benchmark

Asset class maturation and LP pressure is expected to improve the quality of private benchmarking options

Source: StepStone analysis

Private Infrastructure Benchmark Options

There are four key providers of private infrastructure performance data. It should be noted that these benchmarks refer to infrastructure fund manager performance, not asset level. Data integrity is reliant on fund managers submitting their latest performance analytics.

— The table below outlines the number of underlying funds making up the constituents of each vintage.

Vintage	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Pitchbook	9	12	15	5	14	13	11	13	17	7	10	5
Preqin	4	12	6	6	11	13	13	13	12	11	11	4
Private iQ	15	12	11	6	12	5	13	14	14	15	13	5

When conducting due diligence on infrastructure managers, StepStone includes the Private iQ data to benchmark performance.

- Includes the largest number of underlying funds in recent years
- Tracking a total of 151 infrastructure funds
- Highest quality data (StepStone also uses Private iQ for Private Equity and Real Estate Benchmarks)

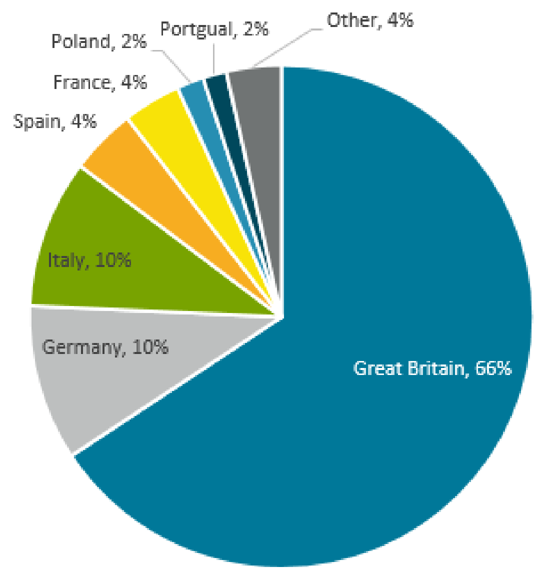
Sources: Pitchbook, Preqin, Private iQ as of June 30, 2017

Evolving Benchmarks: EDHECinfra Europe

The Singapore branch of the French business school Ecole des Hautes Etudes Commerciales or 'EDHEC' has recently launched European private infrastructure benchmark

- EDHECinfra was created to "address the knowledge gap faced by infrastructure investors by collecting and standardising private investment and cash flow"
- The Index represents the performance of 330 assets across 14 European countries valued at c.EUR300bn
- EDHECinfra collects cash flow data and the characteristics of underlying infrastructure projects and "single-asset" firms and utilities. Excludes data on investment funds or cash flows in and out of investment funds.
- The relevant data falls into three categories:
  - Data corresponding to investments' characteristics and the systematic determinants of their financial performance;
  - Forecast equity and debt cash flow data;
  - Realised equity and debt cash flow data.

EDHEC Infra Private Equity Europe All Infrastructure As at December 2016				
	1 year %	3 years % annualized	5 years % annualized	10 years % annualized
Return	10.2%	10.4%	11.0%	11.9%

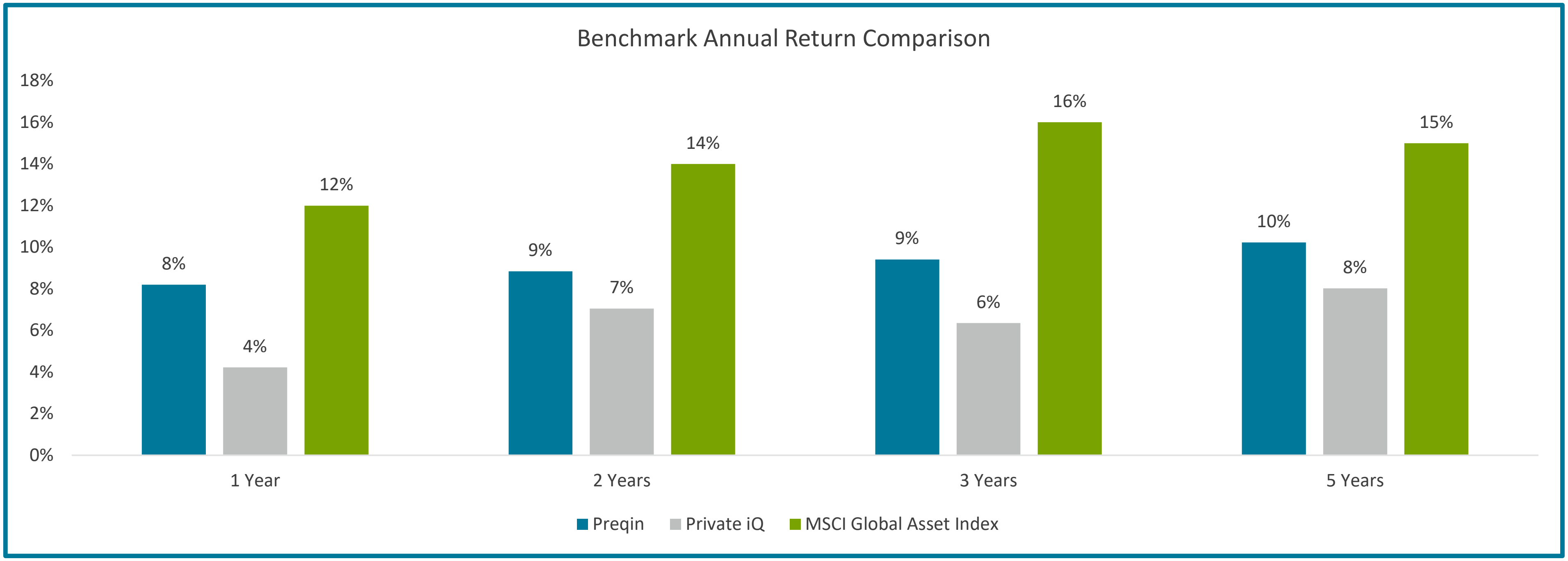


Source: EDHEC

Benchmark Return Comparison

The inconsistent approach to benchmarking is evident by comparing the different private benchmarks available. StepStone's currently preferred benchmark, Private iQ, reports the most conservative performance of the group.

Preqin and Private IQ represent net infrastructure fund performance whereas MSCI and EDHEC[1] represent asset performance



Data as of June 30, 2017

1. Not depicted, as EDHEC only reports on an annual basis and cannot therefore provide a direct comparison

Evolving Benchmarks: MSCI Global

StepStone expects MSCI Global Infrastructure Indices will become a key infrastructure benchmark as the data set evolves. MSCI is working to create a global index, covering both direct investors and fund managers

- The MSCI Global Quarterly Infrastructure Asset Index measures the equity performance of infrastructure assets globally on a quarterly basis
- The number of contributors and depth of data set is limited, dominated by Australian investors and assets (which currently account for 52% of the index), but growing
- The MSCI Unlisted Infrastructure Index includes Australian funds, so there is a current index overweight to Australian assets. To become more global over time.
- Index provides breakdown of performance by geography, sector, yield/total return and leverage.

MSCI Asset Index Features
Index size: 114 investments in database
Enterprise value: US$74 billion
Gearing: 48% debt/enterprise value
Index frequency: produced quarterly
Index time span: Since 2008

MSCI Global Quarterly Infrastructure Asset Index As at June 2017

Sector	No. of Assets	1 year %	2 years % annualized	3 years % annualized	5 years % annualized
Global	114	12.4	14.2	15.7	15.0
Power	42	9.5	10.1	9.1	10.7
Transport	45	14.2	16.9	19.5	18.2

MSCI Asset Index Constituents
Alberta Investment Management Corp
AMP Capital
AustralianSuper
Deutsche Asset & Wealth Management
Hastings Funds Management
Infrastructure Capital Group
JP Morgan
Palisade Investment Partners
Queensland Investment Corp
Whitehelm Capital

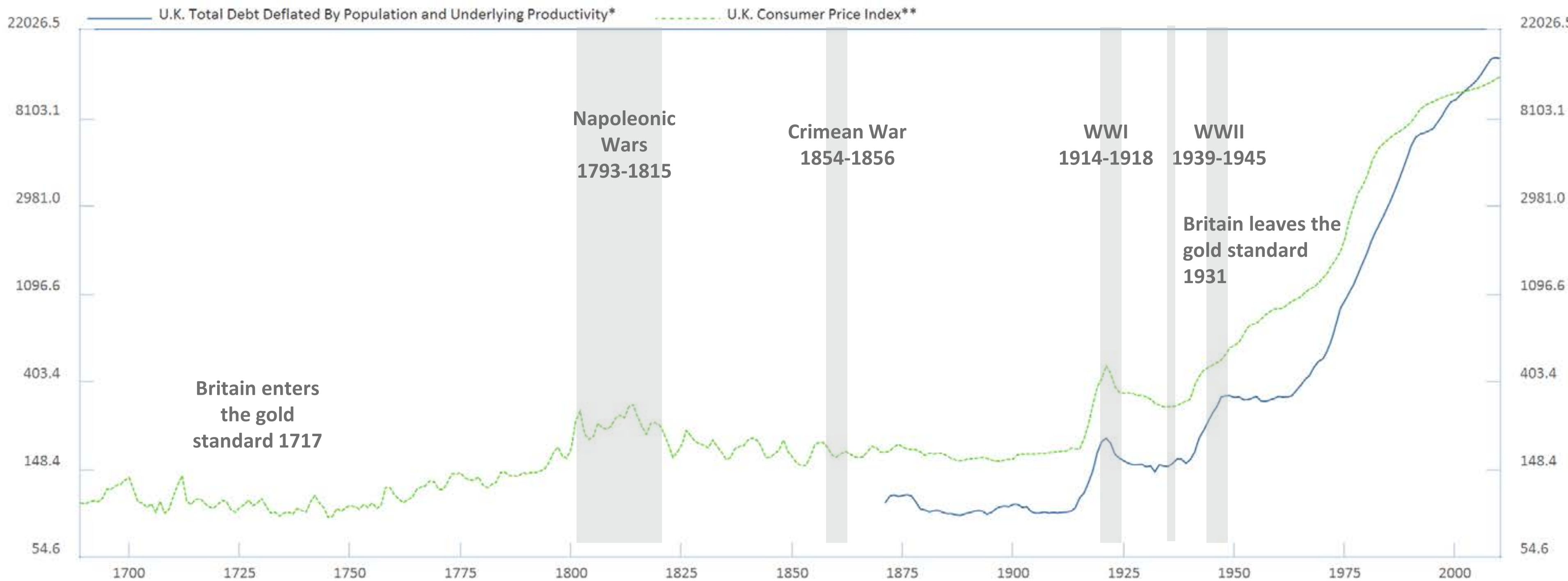
Source: MSCI

VIII. Key Considerations

Debt Super-cycle Moderating

Moderation of key underlying trends and extraordinary central bank policy since the GFC are key items of consideration for investors as they consider future portfolio allocations and the value of diversification.

300 Years of Price Stability, and Then a Credit Explosion



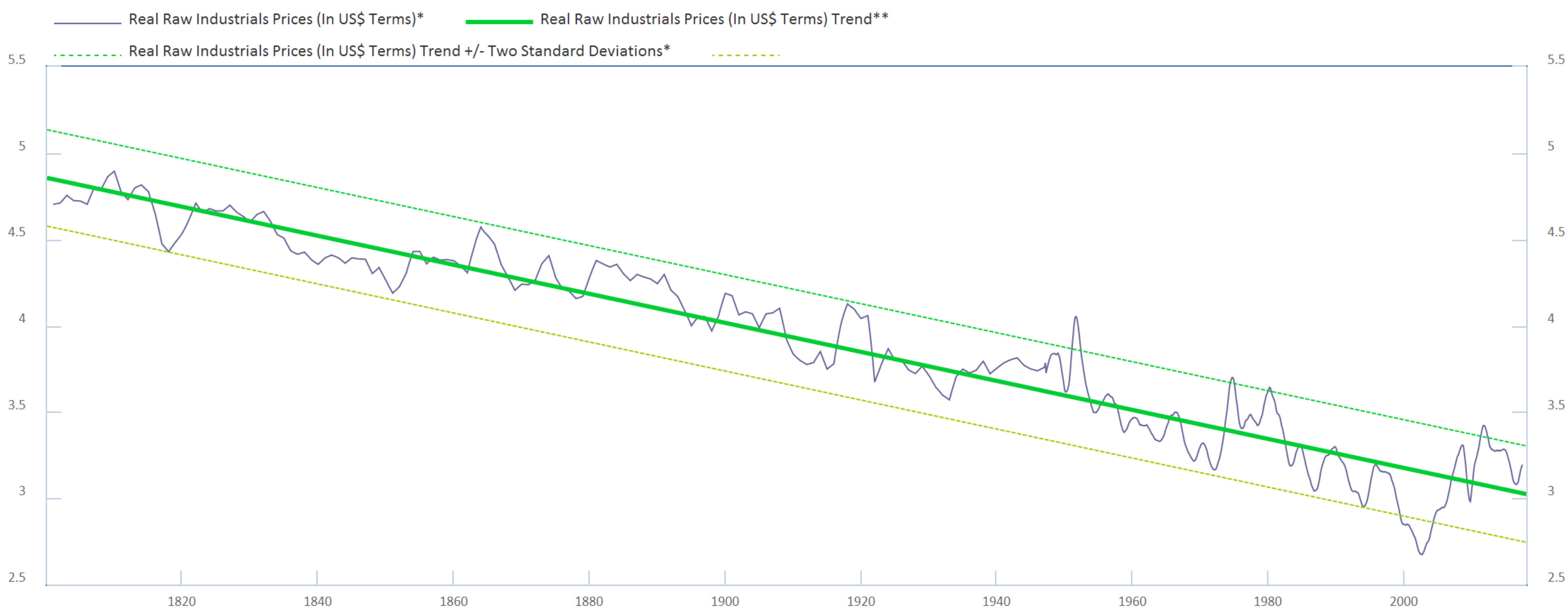
*Rebased to 1870 = 100; the combination of population and productivity is assumed to grow at a constant 2% a year;
** Rebased to 1688 = 100; Source: Bank of England.

Source: BCA Research 2015

Long-Term Commodity Real Commodity Price Trends

The long-term decline in commodity prices encourages consumption with supply increasing to meet the demands of growing global population and growing middle class. These increased commodity volumes require Infrastructure for transportation and distribution .

The Long-Run Trend in Real Commodity Prices



* Adjusted by U.S. GDP Deflator.
** Adjusted by U.S. GDP Deflator. Time-Trend from 1800 to Present.

Source: BCA Research 2015

Key Allocation Consideration: Benchmark Selection

Selecting an infrastructure benchmark can pose a challenge to institutional investors. Unlike more traditional asset classes, there is no common industry-accepted measure of historical infrastructure performance. There are a number of reasons for this:

- Infrastructure is a relatively new institutional asset class, with limited historical data when compared to more traditional asset classes such as equities and fixed income
- The infrastructure opportunity is diverse, defined by a range of strategies, sectors, regions, returns, and risk profiles
- Private infrastructure strategies typically target opportunities with low correlation to public markets. Public market performance is a week indicator of infrastructure markets

StepStone has evaluated the currently available benchmarks for private infrastructure investment, noting the limitations of the data sets:

- Data sourced is reliant on fund managers and limited partners releasing performance analytics on underlying assets
- The sample size is typically small by vintage and also coverage
- The benchmarks are a collation of private data and not 'investible'
- The data does not account for leverage applied to returns
- Data is typically at the fund manager level, not at the asset specific level.

As the infrastructure asset class matures, new benchmark providers are entering the market.

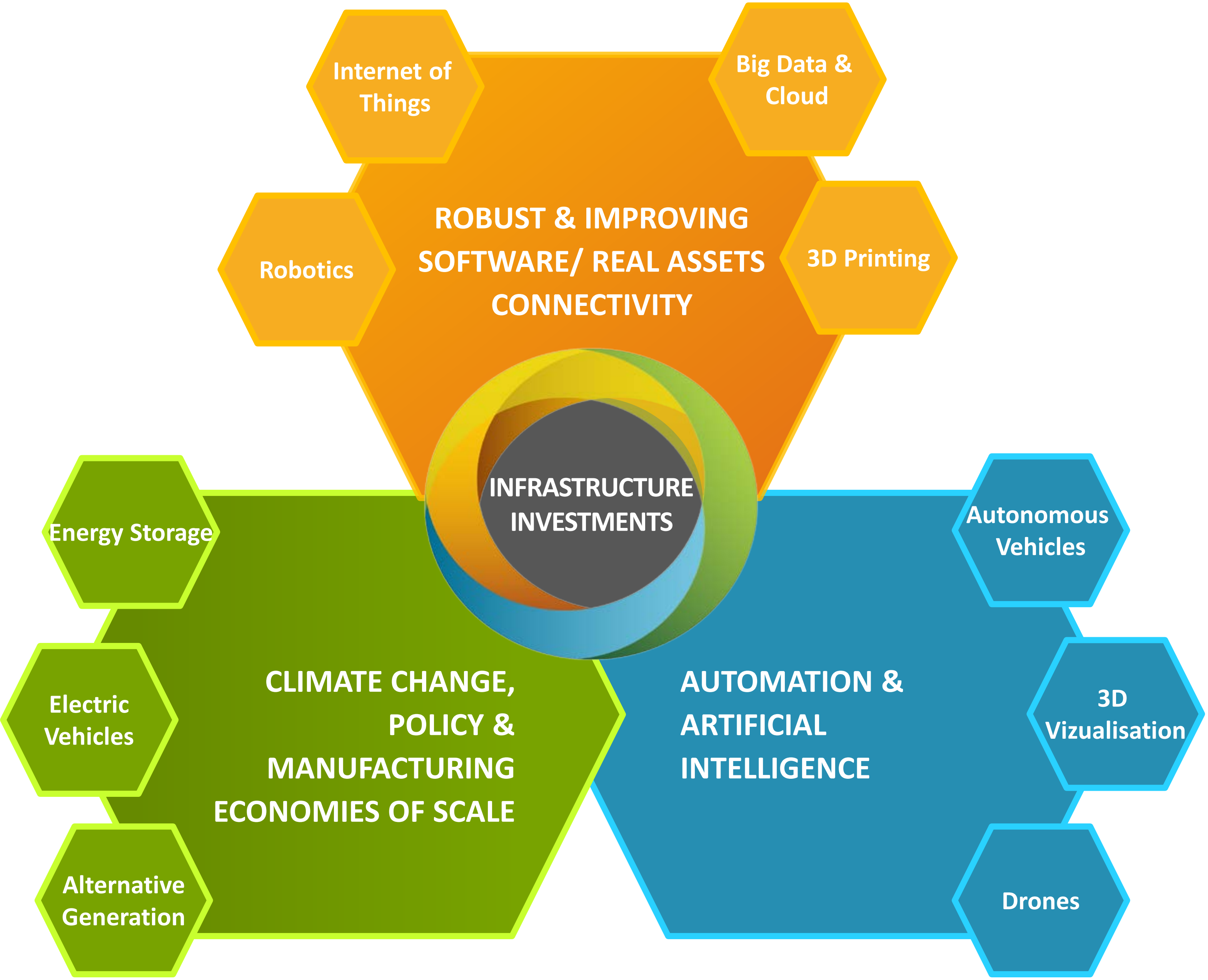
StepStone works with each client to understand the investment objectives of their infrastructure portfolio and select the most relevant benchmark currently available.

Key Investment Considerations

KEY ECONOMIC DRIVERS	• In an era of substantial uncertainty over economic growth in developed and developing markets, investors have been taking significantly different views on economic growth which has differentiated the winners from the losers in auctions
REGULATORY BEHAVIOR	• As consumer prices have continued to increase and regulatory bodies come under increasing political and social pressures, some regulated business have seen substantial reductions in the tariffs they are able to charge to customers. Some investors have been severely impacted by these regulatory action whereas others are willing to continue to invest in the transparency and inflation-linkages of regulated businesses
STRATEGIC POSITION	• While fundamentally many infrastructure assets are essentially monopolies, investors have increasingly taken different views on the likely impact of new competition, e.g., the development of a new port or airport
DISRUPTIVE TECHNOLOGIES	• Investors are increasingly focused on understanding potential risks to traditional infrastructure assets from disruptive technologies – automated vehicles, distributed generation etc. – both in terms of downside scenarios as well as potential opportunities created by these technologies
HOLD PERIOD / SALE PRICE	• While most institutional investors are essentially buy and hold investors, many are required to mark to market in some way that can bias the initial investment decision and perceptions of future performance • Buy and flip investors may be more competitive in high growth businesses which will achieve critical mass in relatively short order

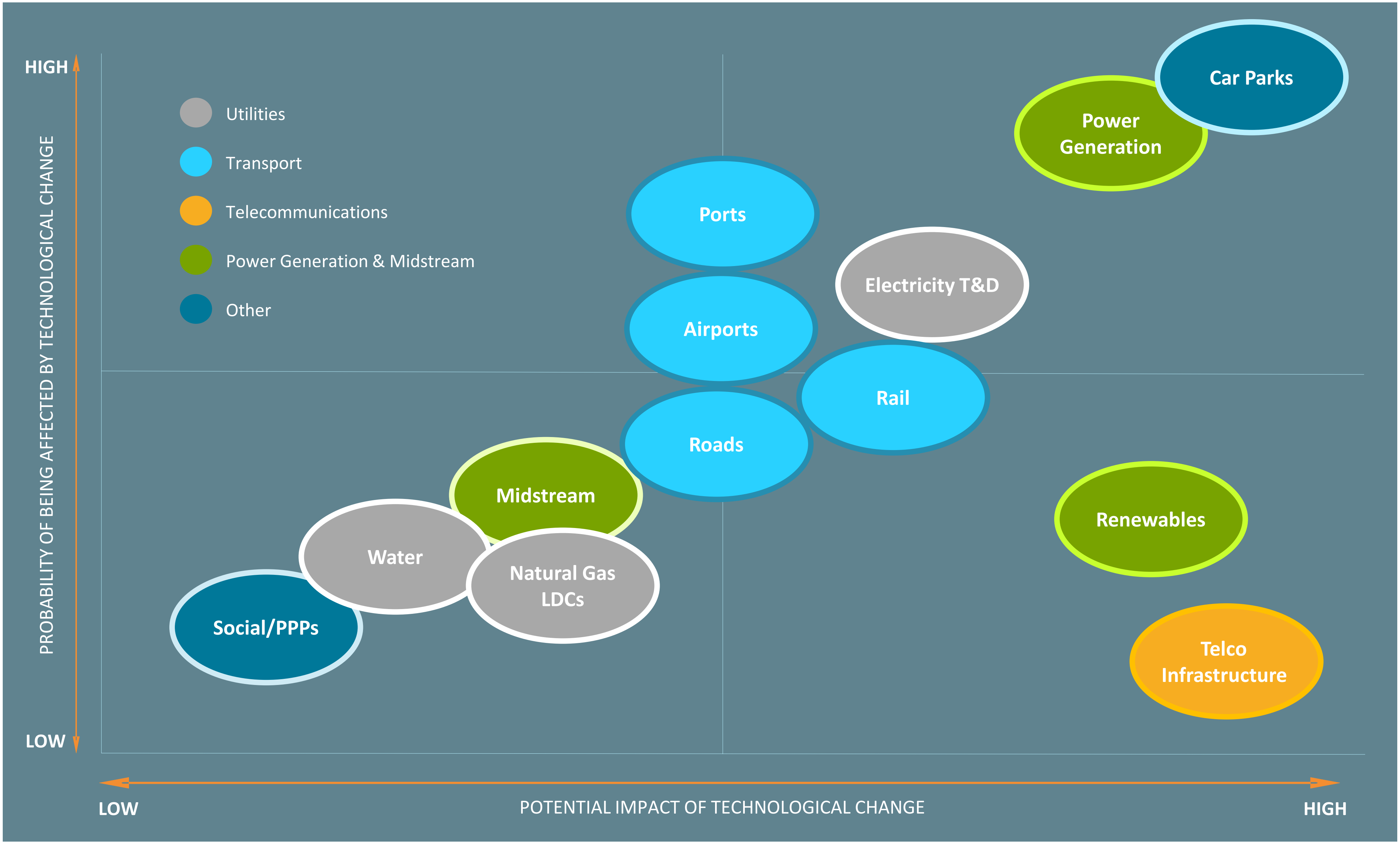
IX. Technology

Infrastructure's Technology Connection



For Illustrative purposes only

Potential for Opportunity & Disruption



For Illustrative purposes only

Risks and Other Considerations

Risks Associated with Investments. Identifying attractive investment opportunities and the right underlying fund managers is difficult and involves a high degree of uncertainty. There is no assurance that the investments will be profitable and there is a substantial risk that losses and expenses will exceed income and gains.

Restrictions on Transfer and Withdrawal; Illiquidity of Interests; Interests Not Registered. The investment is highly illiquid and subject to transfer restrictions and should only be acquired by an investor able to commit its funds for a significant period of time and to bear the risk inherent in such investment, with no certainty of return. Interests in the investment have not been and will not be registered under the laws of any jurisdiction. Investment has not been recommended by any securities commission or regulatory authority. Furthermore, the aforementioned authorities have not confirmed the accuracy or determined the adequacy of this document.

Limited Diversification of Investments. The investment opportunity does not have fixed guidelines for diversification and may make a limited number of investments.

Reliance on Third Parties. StepStone will require, and rely upon, the services of a variety of third parties, including but not limited to attorneys, accountants, brokers, custodians, consultants and other agents and failure by any of these third parties to perform their duties could have a material adverse effect on the investment.

Reliance on Managers. The investment will be highly dependent on the capabilities of the managers.

Risk Associated with Portfolio Companies. The environment in which the investors directly or indirectly invest will sometimes involve a high degree of business and financial risk. StepStone generally will not seek control over the management of the portfolio companies in which investments are made, and the success of each investment generally will depend on the ability and success of the management of the portfolio company.

Taxation. An investment involves numerous tax risks. Please consult with your independent tax advisor.

Conflicts of Interest. Conflicts of interest may arise between StepStone and investors. Certain potential conflicts of interest are described below; however, they are by no means exhaustive. There can be no assurance that any particular conflict of interest will be resolved in favor of an investor.

Allocation of Investment Opportunities. StepStone currently makes investments, and in the future will make investments, for separate accounts having overlapping investment objectives. In making investments for separate accounts, these accounts may be in competition for investment opportunities.

Existing Relationships. StepStone and its principals have long-term relationships with many private equity managers. StepStone clients may seek to invest in the pooled investment vehicles and/or the portfolio companies managed by those managers.

Carried Interest. The entitlement of StepStone and the underlying portfolio fund managers to carried interest over and above their basic management fees could create an incentive for StepStone and the portfolio fund managers to make investments that are riskier or more speculative than would otherwise be the case.

Other Activities. Employees of StepStone are not required to devote all of their time to the investment and may spend a substantial portion of their time on matters other than the investment.

Material, Non-Public Information. From time to time, StepStone may come into possession of material, non-public information that would limit their ability to buy and sell investments.

ATTACHMENT 3

Los Angeles County Employees Retirement Association
Investment Retreat 2018

Natural Resources

February 1, 2018

Real Assets Characteristics

Inflation Linkage

- Commodity price exposure
- Operating concessions with inflation adjustments

Diversification

- Low correlation to equities and bonds
- Private markets structure, commodity hedging reduces volatility

Cash Yield Potential

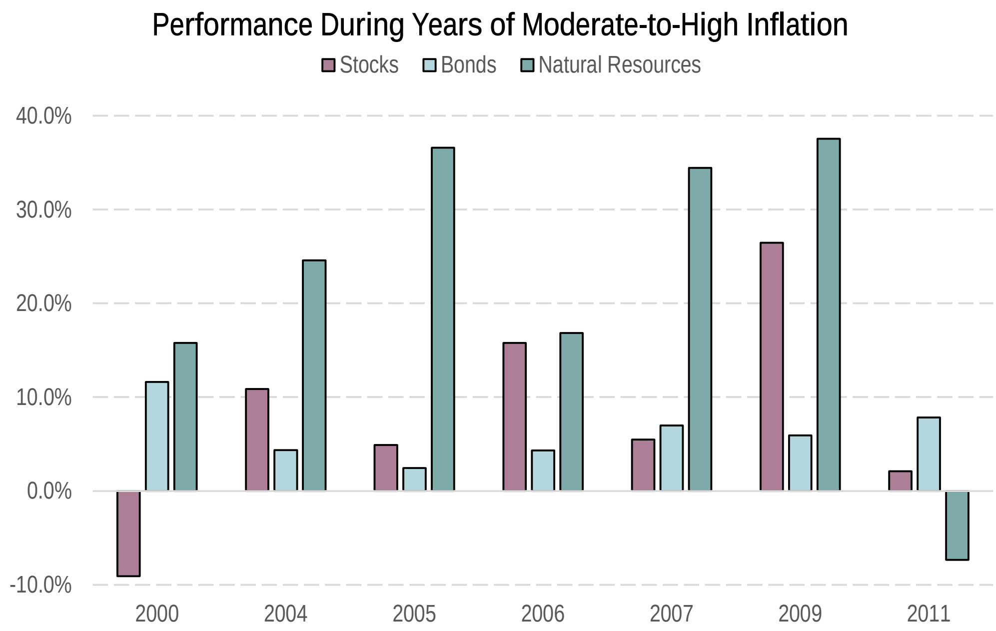
- May offer strong asset level cash flows
- May have contracted distributions
- Stable operating agreements

Focus on Defensive Risk

- Typically tangible assets
- Strong regulatory / legal frameworks
- Value-added growth opportunities
- Hedging can reduce price risk

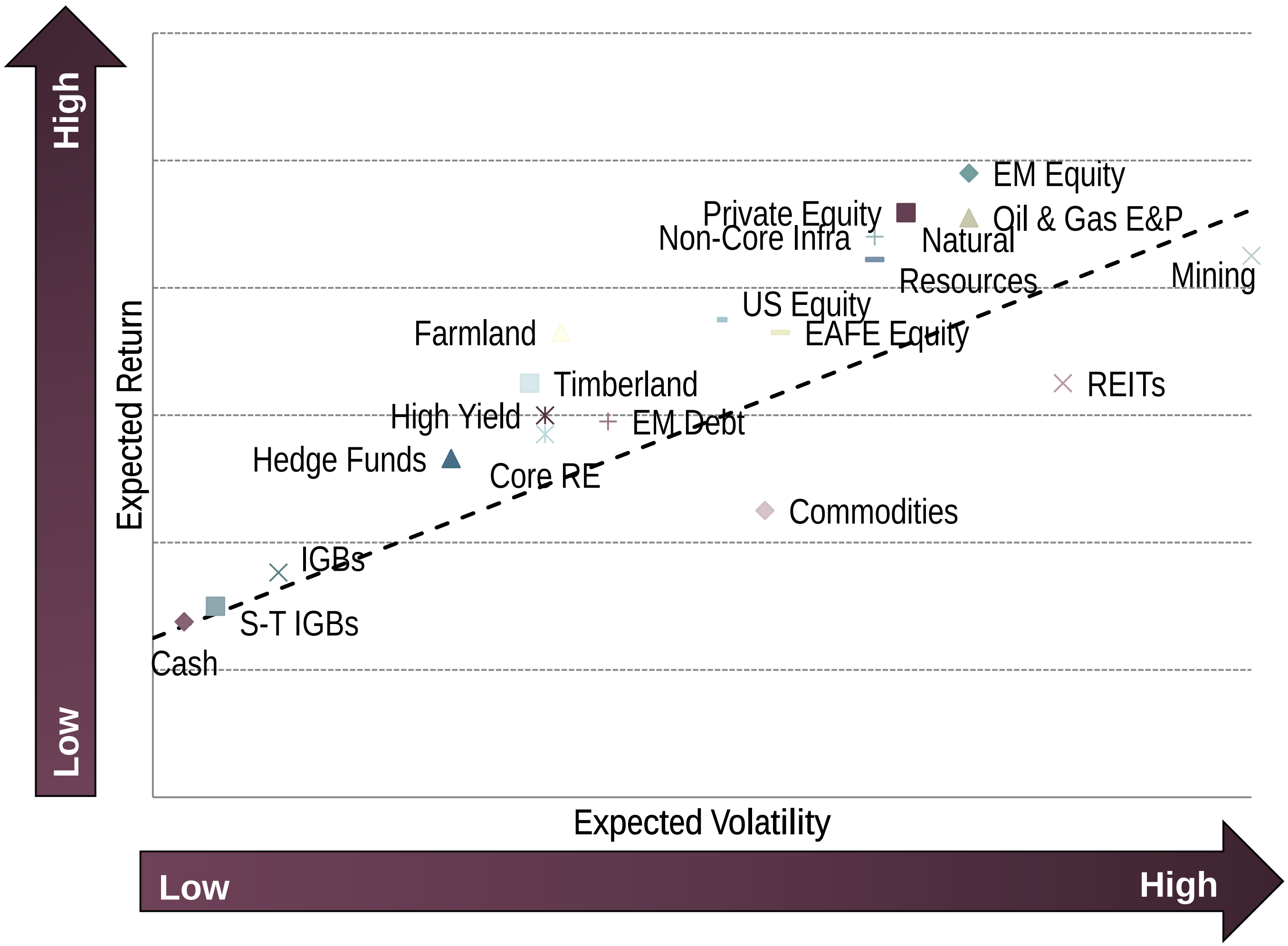
Natural Resources Equity Performance vs Inflation

- Since 2000, Natural Resources outperformed stocks and bonds in 6 of 7 years when inflation exceeded 2.5%.
- Since 2000, Natural Resources exhibited correlations to stocks and bonds of 0.67 and -0.04, respectively.



Note: Indices used include S&P 500 TR, Barclays U.S. Aggregate Bond Index, and S&P North America Natural Resources Total Return for stocks, bonds, and natural resources, respectively.

Expected Return and Volatility for Major Asset Classes



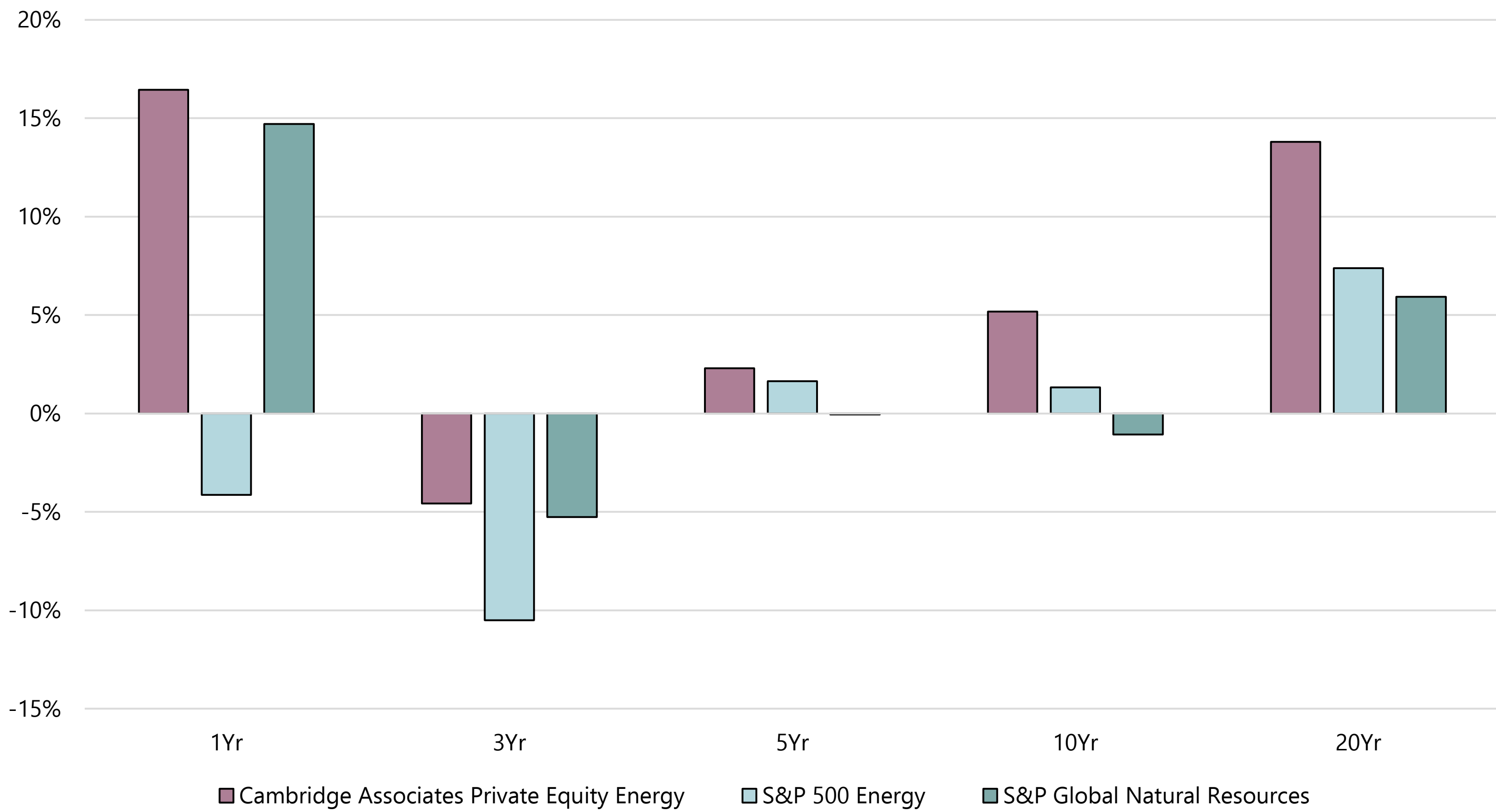
Source: Meketa Investment Group 2017 Asset Class Study

Energy Return Spectrum Risk/Reward Spectrum

8 - 10%	Target Returns* 10 - 15+%	>15%
• Royalties & Minerals Interests	• Producing Upstream Energy • Midstream Brownfield • Renewables	• Exploration & Development Energy • Midstream Greenfield • Services
• Significant cash yield • Strong inflation linkage • Higher revenue certainty	• Cash yield component • Potential for inflation linkage • Potential revenue predictability and business and operational upside	• Minimal cash yield • Potential for inflation linkage • Appreciation Focused

* Note: Target Gross IRR

Comparison of Private and Public Natural Resources Historical Performance
As of June 30, 2017



Source: Cambridge Associates and Bloomberg

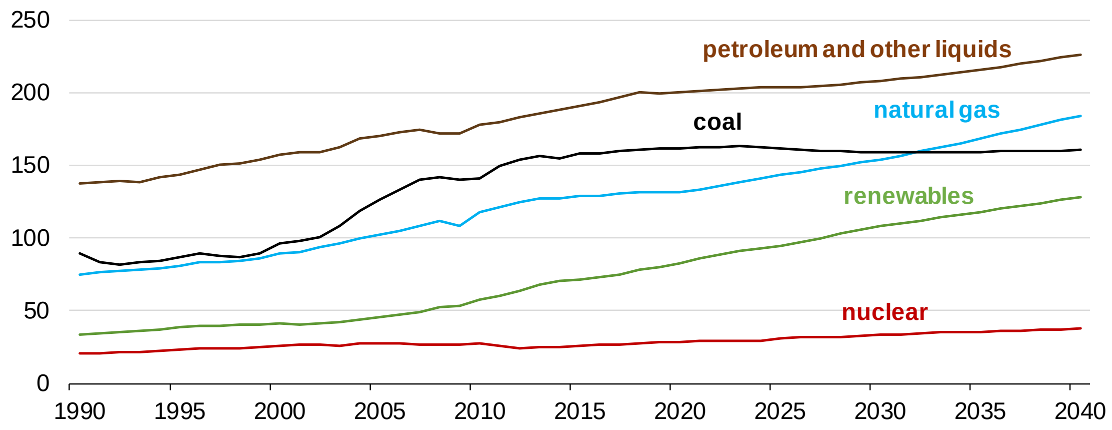
Benchmarking Options

	Private Benchmark	Public Market Equivalent ("PME")	Public Return
Sources	• Cambridge Associates • Preqin	• S&P Global Natural Resources • S&P Energy	• CPI + 5% • S&P Global Natural Resources • S&P Energy
Advantages	• IRR calculation the same as underlying fund for direct comparison • Comparing similar close-end strategies and vintage years for more accurate analysis • J Curve is part of the benchmark investments unlike a public benchmark that is ongoing	• Creates a direct comparison with the IRR calculated by private fund • Solves issue related to cash flow size and timing that a pure public return would not factor into calculation	• Simple and easily obtained calculation of a public return
Weaknesses	• Lack of transparency of underlying benchmark investments makes it difficult to determine appropriateness • Survivorship bias • Different data sets could create significantly different vintage year results between benchmarks	• Not an investable benchmark • Benchmark can be over sensitive to early distributions creating an over/under inflated comparison • Does not factor in transaction fees	• TWR (public) and IRR (private) calculations are not directly comparable • Does not take timing or cash flow size into consideration
Comments	• Private coverage is growing within the Natural Resource space. Must be aware of the number of funds that are included in each vintage year to determine the appropriateness	• There are several PME methods with advantages/disadvantages for each. The PME enables investors to determine appropriate public indices while calculating an IRR for direct comparison.	• Straight forward simple calculation but not a direct comparison to an IRR.

World Energy Consumption by Source

World consumption of energy is expected to increase over the long term as emerging markets become more developed. China has surpassed the U.S. in total energy consumption but is well below the U.S. on a per capita basis. Technological advances in drilling and extraction technology have resulted in a significant increase in energy reserves in North America.

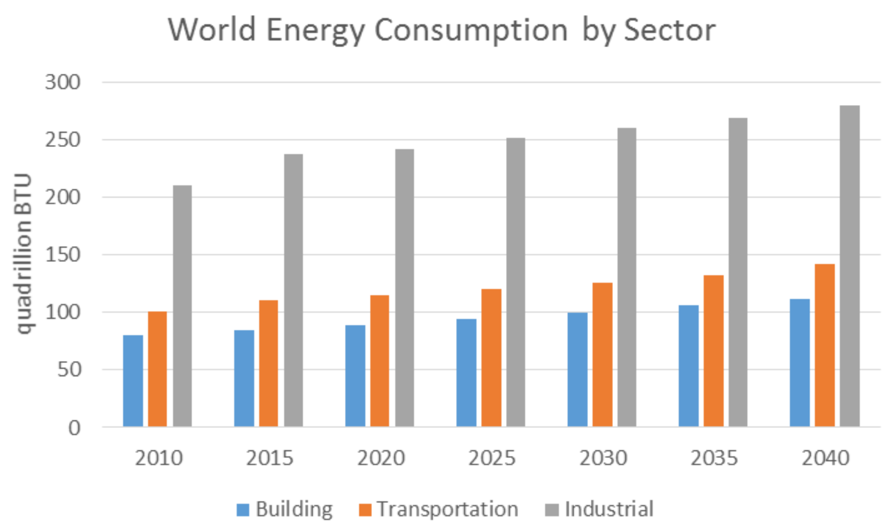
- Renewables are fastest growing energy source.
- Coal declines in the OECD and China offset by increases in India and other Asian countries.
- Natural gas is fastest growing fossil fuel energy source and is replacing coal primarily in the U.S.
- Oil expected to remain largest energy source but with decreasing world share.



Source: EIA, International Energy Outlook 2017.

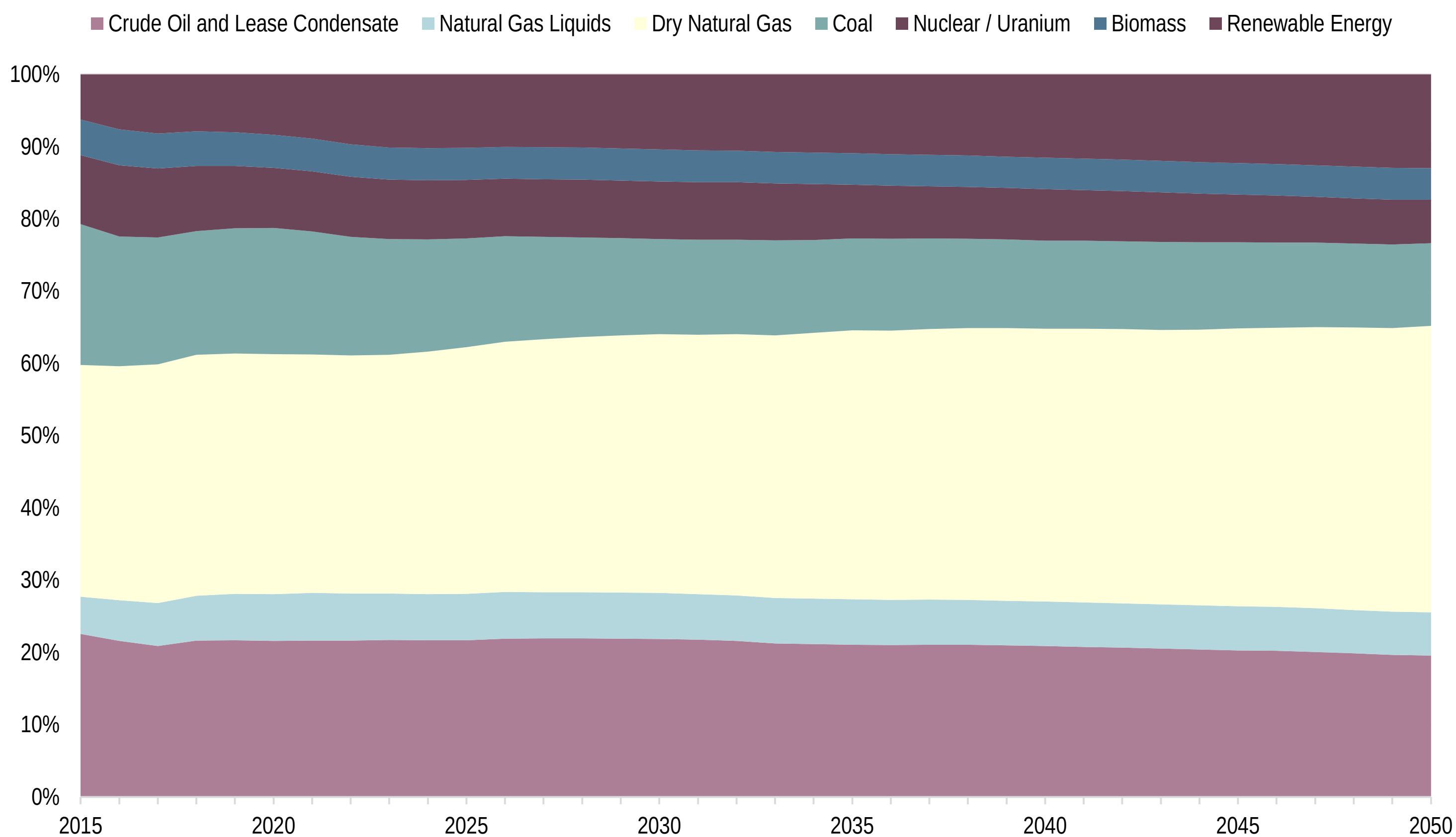
World Energy Consumption by Sector

- The industrial sector (mining, manufacturing, agriculture, and construction) has been and will continue to be the largest consumer of energy.
- The accelerated adoption of EV vehicles globally will having a meaningful impact on vehicle fuel source.
  - Transportation sector consumption to shift from petroleum-based fuels toward natural gas and renewables
  - Battery technology
  - Battery materials sourcing
  - Electrical grid and vehicle charging infrastructure



Source: EIA

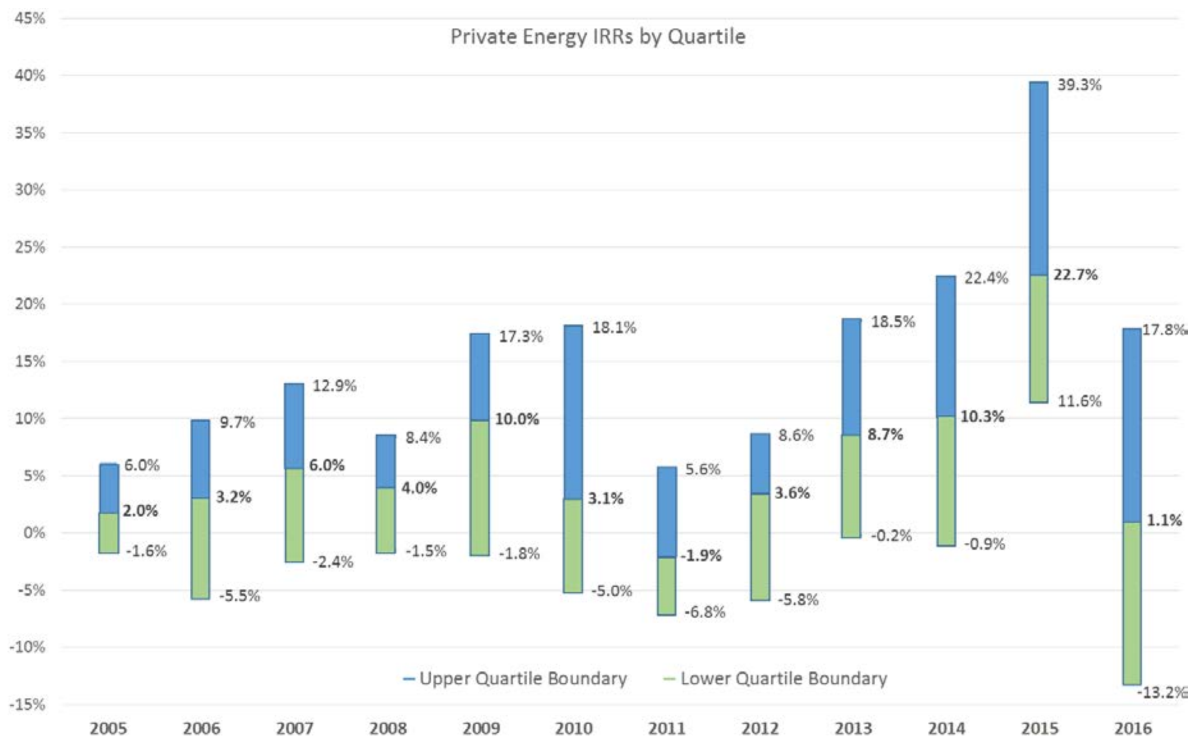
Projected U.S. Energy Production



- Renewable energy and natural gas expected to take market share from coal.
- Oil and NGLs expected to remain relatively flat.

Source: EIA.

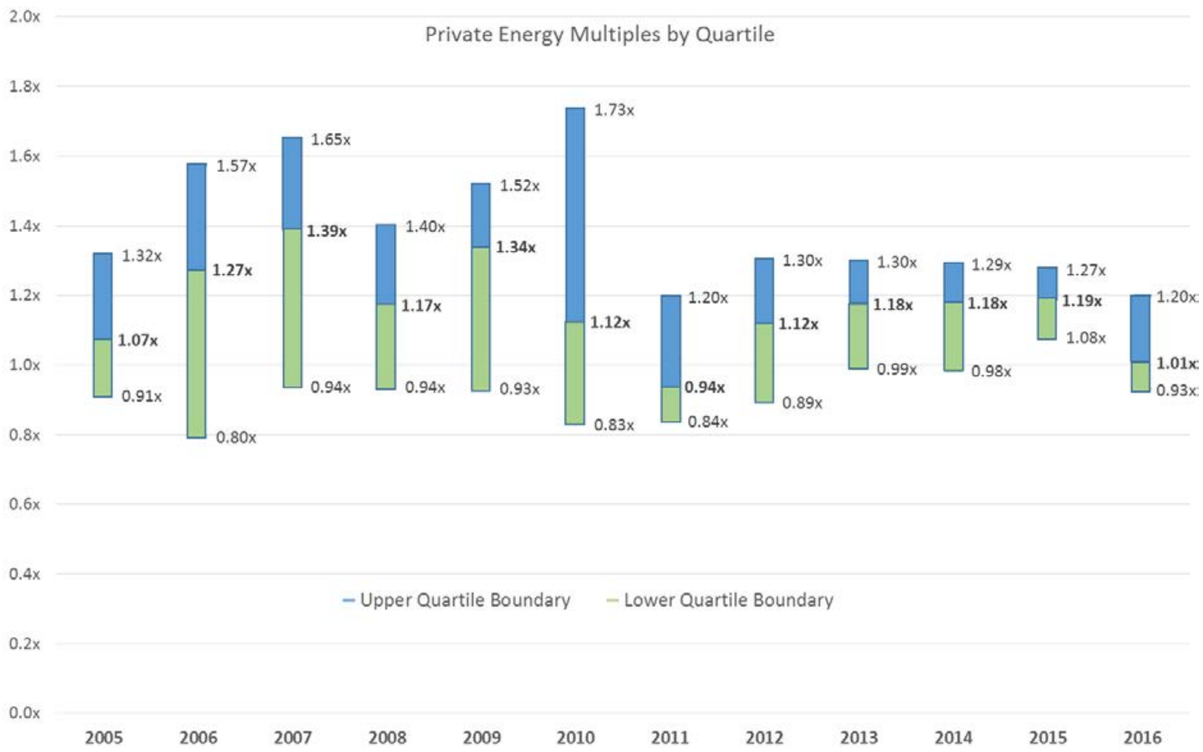
Private Energy Returns



- Inter-quartile IRR and investment multiple spreads are significant.
- Manager selection is critical for investments in private markets.
- Vintage year diversification helps mitigate commodity price volatility.

Source: Cambridge Associates, as of June 30, 2017.

Private Energy Returns (continued)



Source: Cambridge Associates, as of June 30, 2017.

Oil & Gas

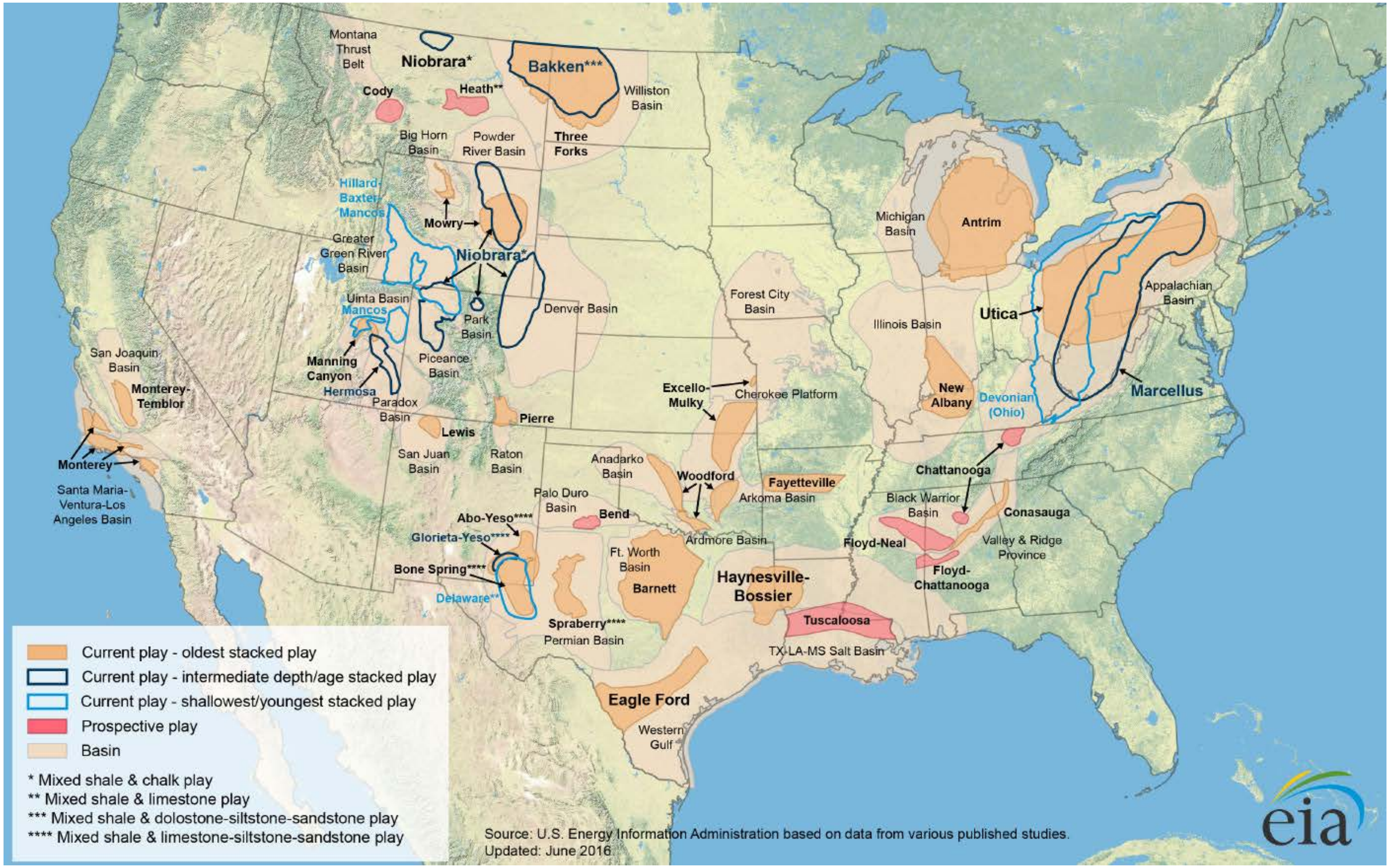
Activity broadly defined:

- Conventional: traditional oil and gas wells that are typically onshore and drilled vertically.
- Unconventional: horizontal drilling and fracture stimulated techniques in tight oil formations (e.g., shale and sandstone); deep water activity; Canada oil sands.

Major Oil & Gas strategies:

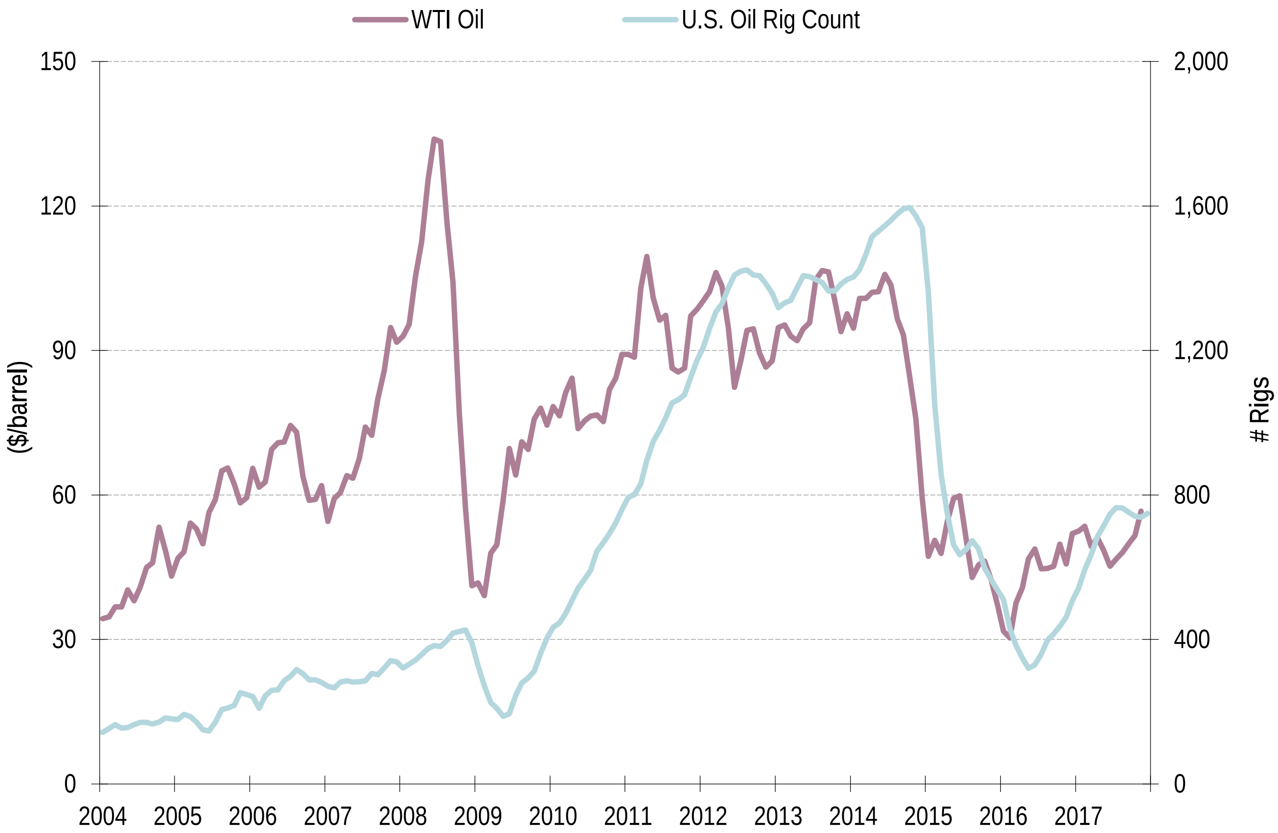
- Upstream Acquire & Exploit: target producing oil & gas assets and increase production, reduce costs, and increase proved reserves. Production may be hedged to reduce commodity price risk.
- Upstream Lease & Drill: financially support start-up teams or buyouts of existing companies. Teams typically aggregate a meaningful leasehold position, explore for oil & gas resources, establish proof of concept for asset development, and create an inventory of drilling opportunities.
- Midstream Energy Infrastructure: Systems that support and enable the movement of hydrocarbons to the market. Includes gathering lines, compression, fractionation, pipelines, and storage facilities.
- Energy Services: growth equity or buyouts of service related businesses that support the oil & gas industry including 3-D seismic imaging, drillers, trucking, logistics, maintenance, and waste disposal.

Major U.S. Oil and Gas Plays



Source: EIA.

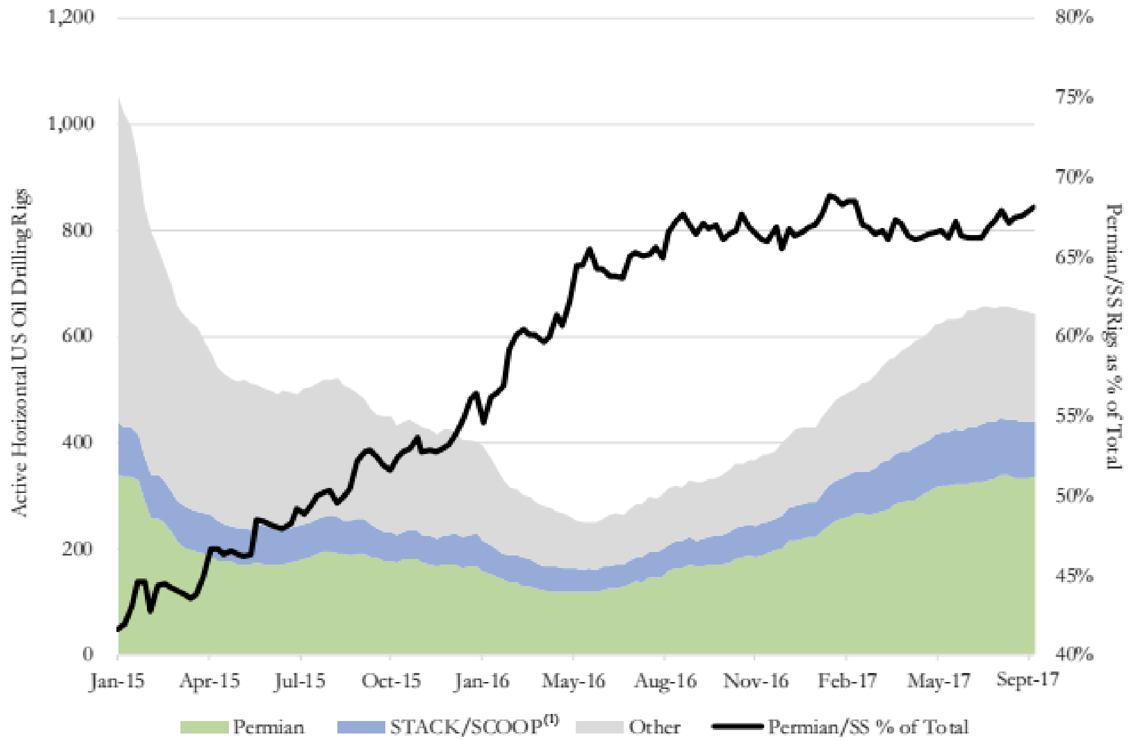
U.S. Oil Prices vs Rig Count



- Third year of low oil prices.
- U.S. rig count continues to increase after a low of 320 in May 2016.

Source: EIA, Baker Hughes.

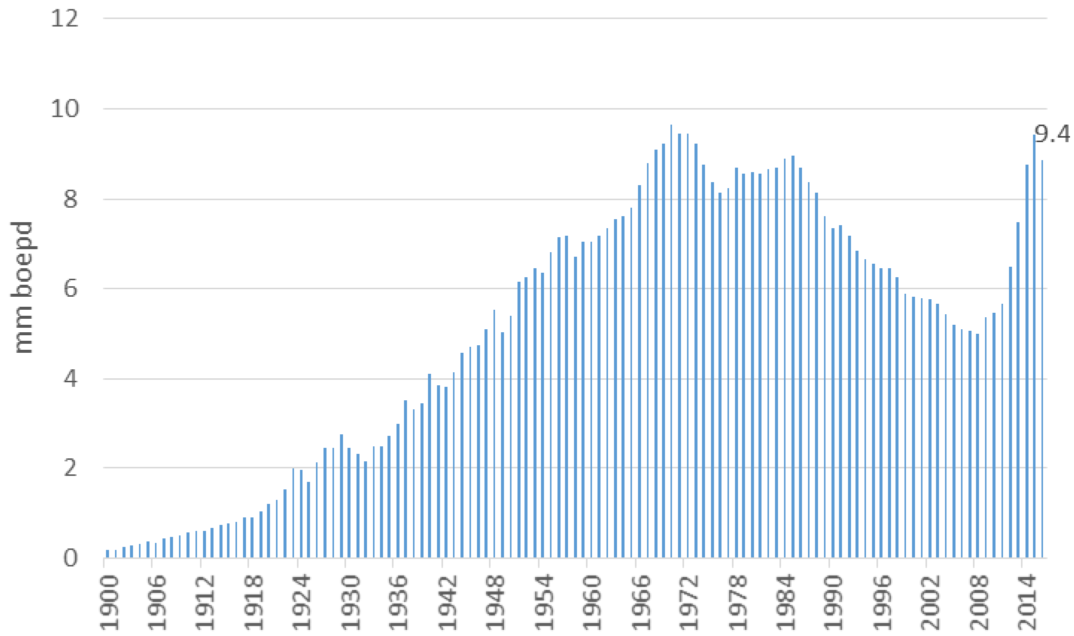
Rig Activity



- Over 65% of U.S. oil rigs are operating in the Permian and SCOOP/STACK.
- Oil from the Permian and Eagle Ford are likely to drive production growth over the next five years.

Source: EnCap Investments.

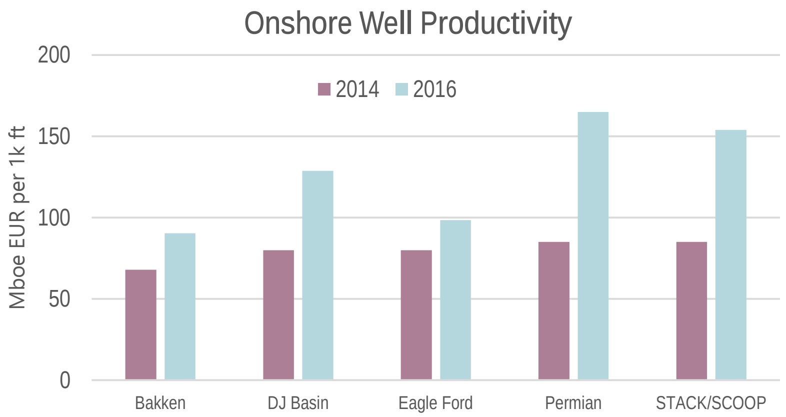
U.S. Oil Production

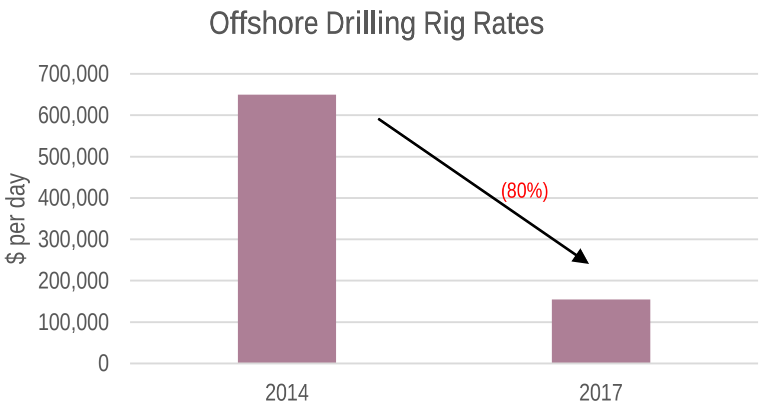


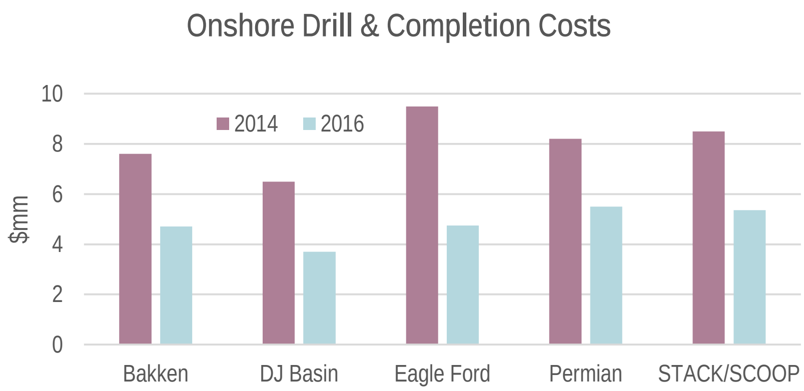
- U.S. oil production peaked in 1970 at 9.6 million barrels per day primarily from conventional drilling activity.
- Since then, production has been in decline up until the shale revolution in the mid-2000s.
- Despite the drop in oil prices and rig count, U.S. production has continued to increase as a result of reduced costs, enhanced recoveries, and operational efficiencies.
- The U.S. is currently producing approximately 9.4 million barrels per day.

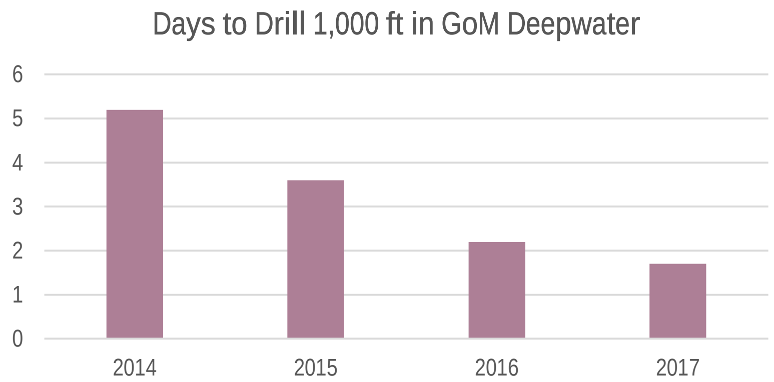
Source: EIA.

Operational Efficiencies and Cost Reductions



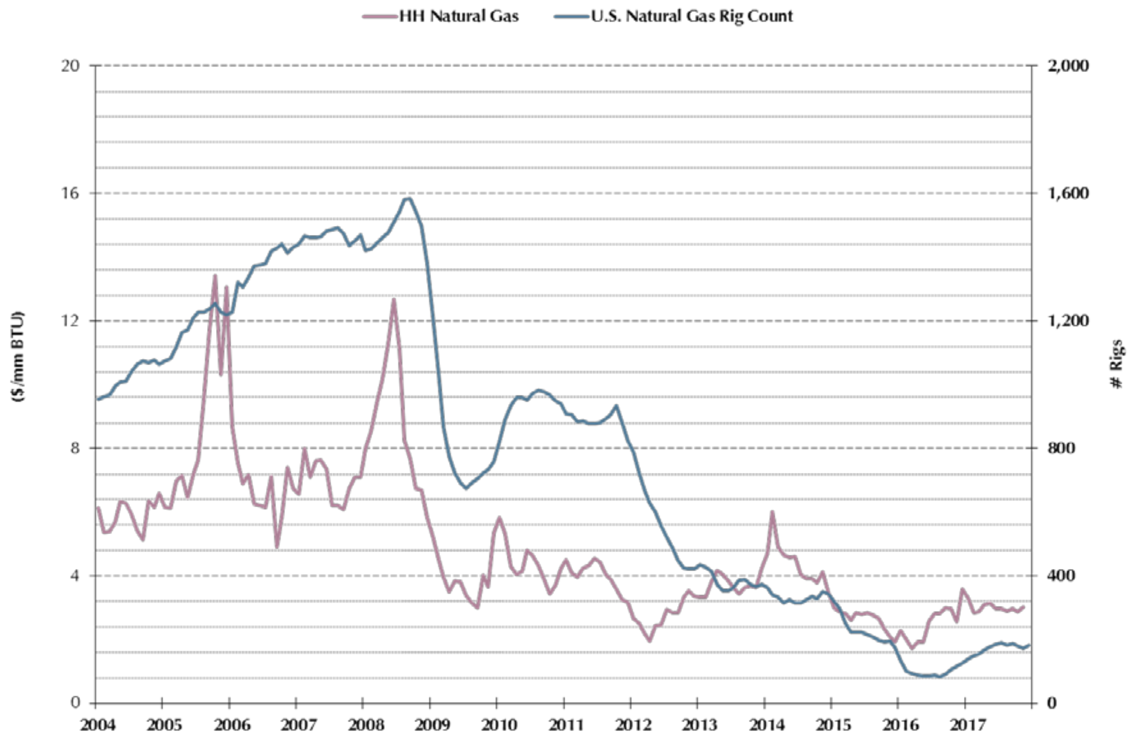






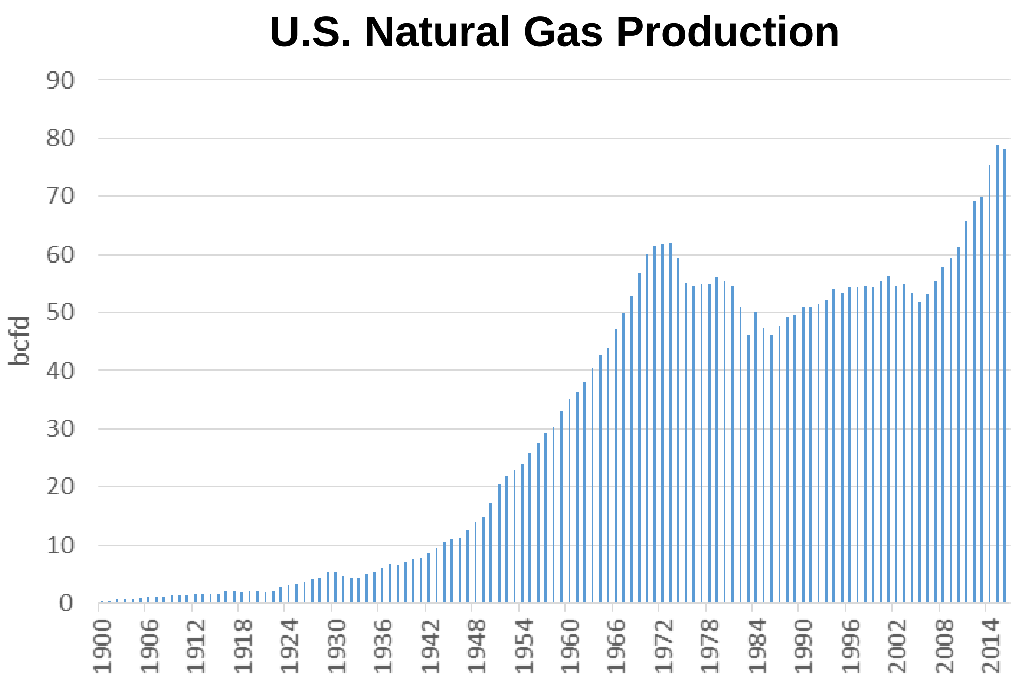
Source: EnCap Investments, Ridgewood Energy.

U.S. Natural Gas Prices vs Rig Count



- Low natural gas prices have resulted in increased demand from power generation and industrial sectors.
- U.S. natural gas grew 22% from 2010 to 2017. Growth expected to be 8% over next three years and 10% for next 10 years to 2030.

Source: EIA, Baker Hughes.



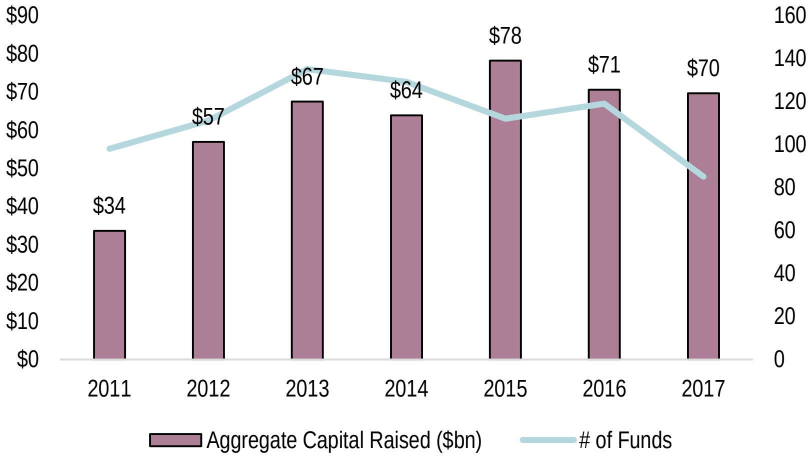
- U.S. is currently producing approximately 81 to 82 billion cubic feet of natural gas per day.
- 87 bcf/d expected by 2020 and 96 bcf/d by 2030.
- Approximately 75% of future natural gas production will come from the Northeast (Marcellus and Utica). Remainder will come from the Rockies, Southeast, and the Permian (associated gas from oil production).
- Midstream development will enhance Northeast natural gas production growth and facilitate pipeline exports to Mexico and LNG shipments globally.

Source: EIA.

How to Invest?

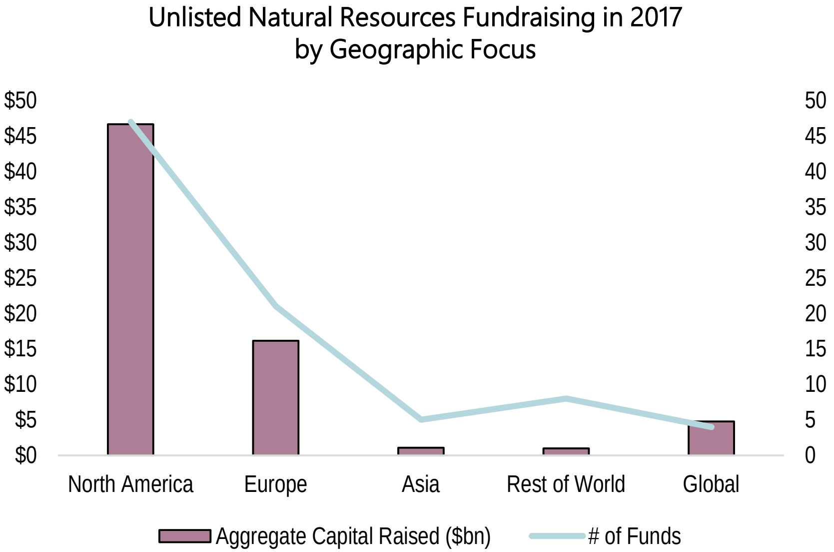
	Private Equity Partnerships	Separate Accounts	Public Markets
Fee Structure	• 1.5% to 2.0% management fee • 15% to 20% carried interest • Hurdle return	• 0.5% to 1.0% management fee • 10% to 20% carried interest • Hurdle return	• <1% management fee
Term	• 10 to 15 years • Extensions at manager discretion and LP approvals	• Term at client discretion	• No lockup
Liquidity	• Minimal liquidity	• Minimal liquidity	• High liquidity – daily
Investment Minimums	• Moderate – At least $10 million	• High – At least several $100 million to achieve diversification	• Low
Customization	• Low	• High	• High
Resources Required	• High	• High	• Low
Comments	• Managers seek control or influential minority positions to implement strategy • Resources required to manage cash flows, performance, and accounting.	• Clients may participate in investment decision making process • Resources required to manage cash flows, performance, and accounting.	• Publically listed stocks, funds, MLPs • Active or passive management • Increased correlation to public equity investments thus limiting diversification benefits.

Global Annual Unlisted Natural Resources Fundraising



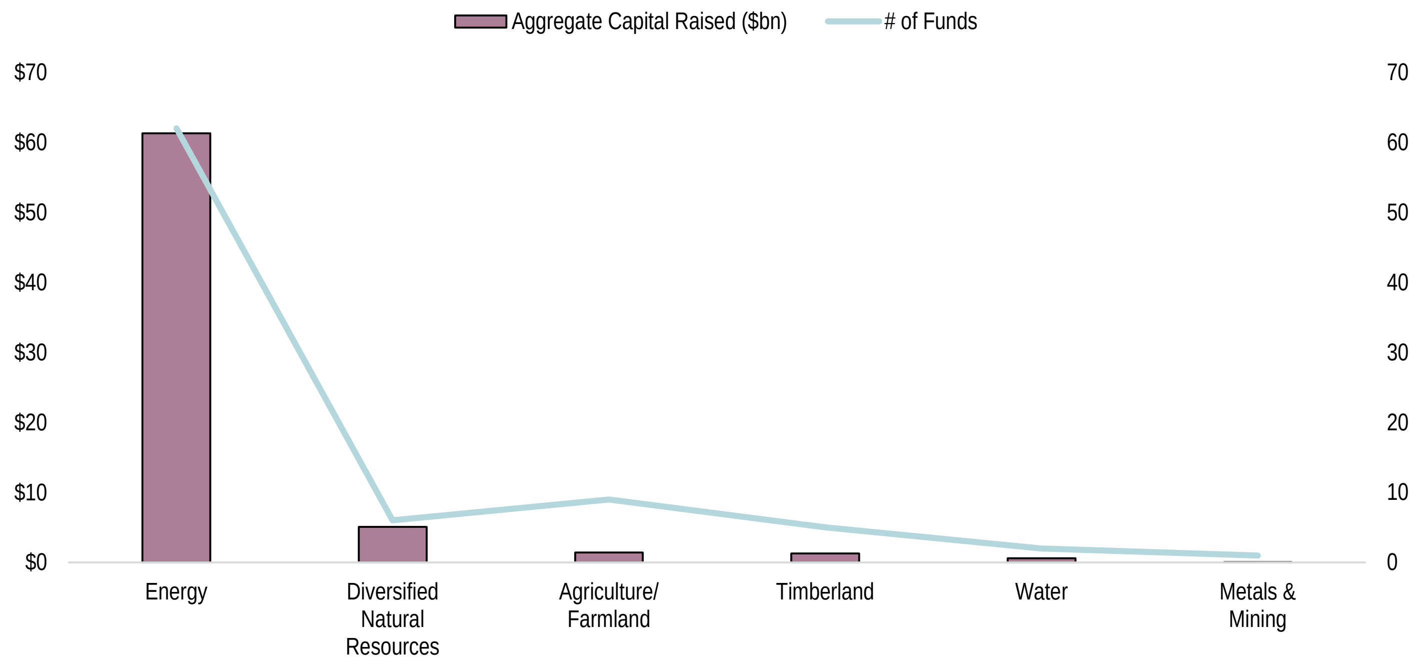
- Fundraising in 2017 expected to exceed 2016 totals.
- Dry powder decreased from $196 billion at year end 2016 to $181 billion, as of June 2017.
- At the start of 2018, there were 241 natural resource funds in the market seeking $124 billion in capital commitments.

- North America raised 47 funds comprising $47 billion in capital commitments in 2017.
- 2017 was a record year for Europe with $16 billion raised by 21 funds.



Source: Preqin.

Unlisted Natural Resources Fundraising in 2017



- In 2017, energy accounted for 73% of the number and 87% of capital raised for natural resources funds.
- At the start of 2018, there were 156 energy funds in the market seeking approximately $99 billion in capital commitments

Source: Preqin.

The information in this presentation regarding the past performance of the client portfolios of Meketa Investment Group (“Meketa” or “MIG”) has not been audited.

Past performance is not indicative of future results and there is a possibility of loss in connection with any investment, including an investments made by MIG.

Certain information contained herein is based on or derived from information provided by independent third-party sources. Meketa believes that such information is accurate and that the sources from which it has been obtained are reliable. Meketa cannot guarantee the accuracy of such information, however, and has not independently verified the assumptions on which such information is based.

This presentation does not contain all the information necessary to fully evaluate the potential risks of any of the investments described herein. Because of inherent uncertainties involved in the valuations of investments that are not publicly traded, any estimated fair values shown in this report may differ significantly from the values that would have been used had a ready market for the underlying securities existed, and the differences could be material. Note that for unlisted securities the valuations may be lagged by one or more calendar quarters, or may reflect original cost.

This document may contain certain forward-looking statements, forecasts, estimates, projections, and opinions (“Forward Statements”). No representation is made or will be made that any Forward Statements will be achieved or will prove to be correct. A number of factors, in addition to any risk factors stated in this material, could cause actual future results to vary materially from the Forward Statements. No representation is given that the assumptions disclosed in this document upon which Forward Statements may be based are reasonable. There can be no assurance that the investment strategy or objective of any fund or investment will be achieved, or that the Fund will receive a return of the amount invested.

While all private markets partnerships are audited by an independent entity, there is some discretion as to the method employed to price private companies and, therefore, private markets partnerships. At all times, Meketa Investment Group expects General Partners to utilize conservative and industry standard pricing procedures, and requires the General Partners to disclose those procedures in their reports. However, because of the inherent uncertainty of valuation, these estimated values may differ from the values that would be used if a ready market for the investments existed, and the differences could be significant.

Investment Expense Analysis

Board of Investments Offsite
February 1, 2018

Investments Team

LOS ANGELES COUNTY EMPLOYEES RETIREMENT ASSOCIATION

Investment Expense Analysis Genesis

- At the July 2017 Offsite, investment expense analysis project preview:
  - Asset Management Fees
  - Investment Manager Fund Expenses
    - Investment manager fund operating costs
  - Carried Interest
  - Internal Expenses
    - Staff, consultants, custodian, external legal, and other investment operations-related expenses

- LACERA Investment Belief
  - "Investment outcomes are determined by risk, returns, and costs. All three must be managed, and cost is the most certain."

LACERA Methodology

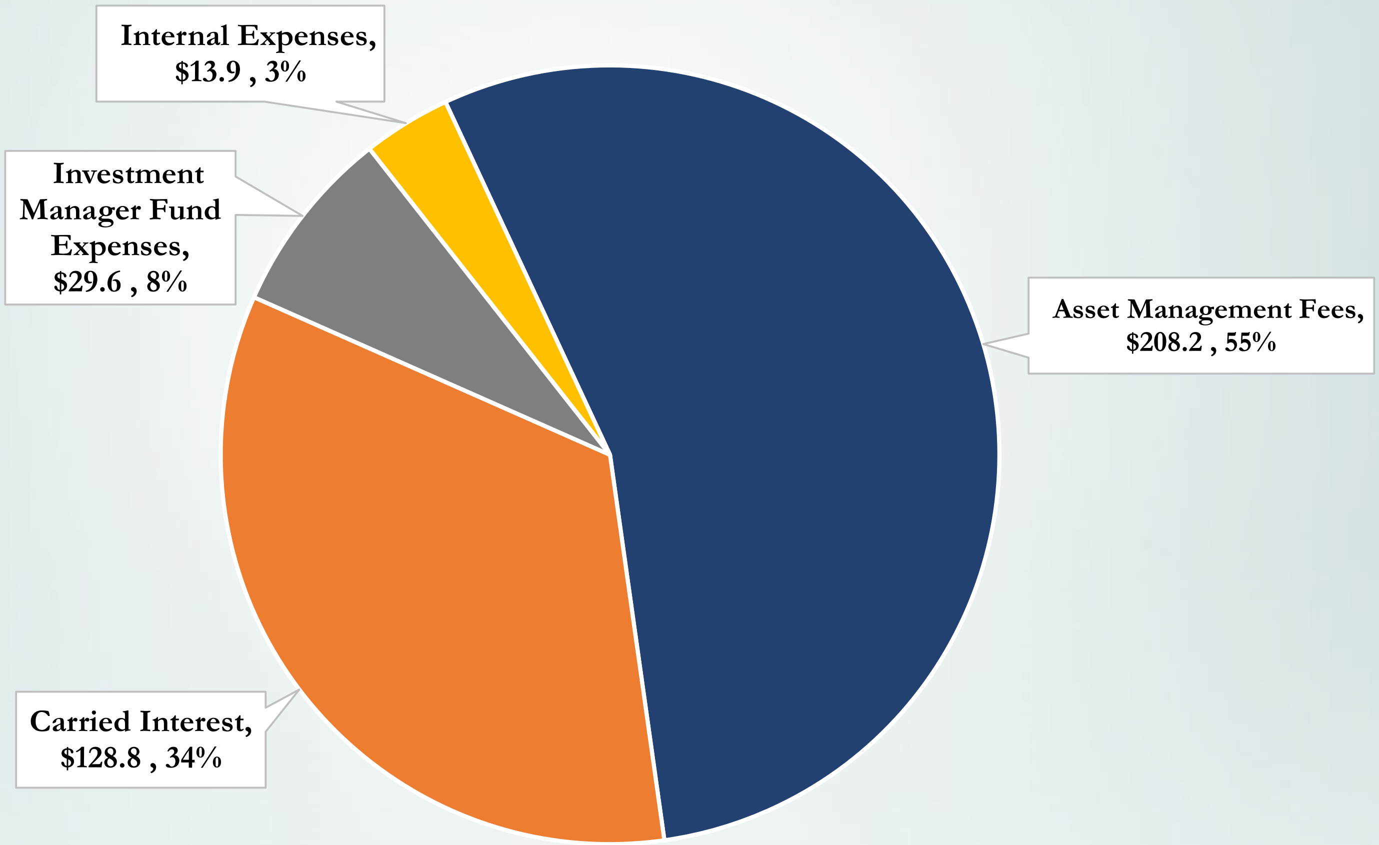
- Reviewed all investment office expenses[1], including asset management fees, internal expenses (staff salary and operating expenses), investment manager fund expenses, and carried interest
- Top-down comparative peer benchmark analysis adjusted for asset allocation
  - Participated in peer survey
  - Consistent measurement period with other participants (calendar year 2016)
- Asset category analysis including prospective savings initiatives
- Establish baseline to better assess efficacy of fee dollars

[1]Unaudited numbers

Total Portfolio Analysis

Total Investment Expenses – Calendar Year 2016

($ in Millions)

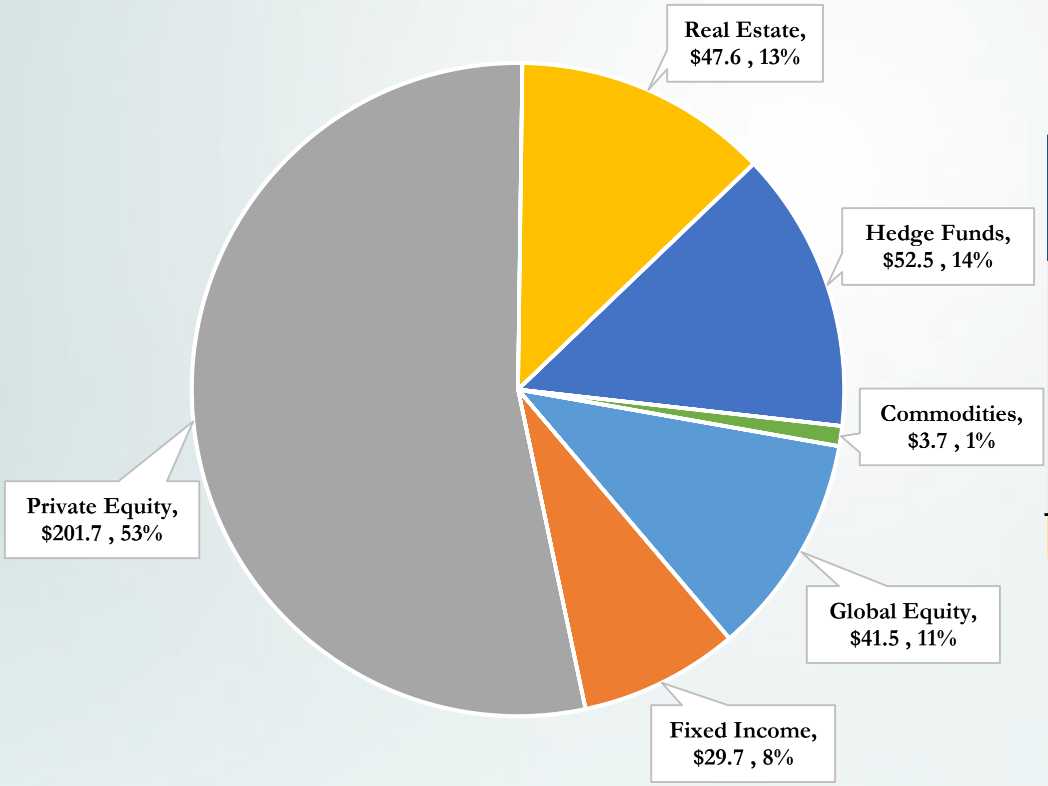


~$380 million total fees, expenses, and carried interest

Asset Category Analysis – Calendar Year 2016

Asset Category Total Investment Expenses[1]

($ in Millions)



Net of Fees Performance as of 12/31/16[2]	One Year Return	Five Year Return	Ten Year Return
Global Equity	9.8%	11.1%	4.5%
Fixed Income	6.6%	5.2%	5.6%
Private Equity	10.8%	14.2%	10.5%
Real Estate	8.2%	9.7%	3.5%
Hedge Funds	3.7%	5.0%	N/A[3]
Commodities	14.9%	-7.3%	N/A[3]
Total Fund	8.3%	8.7%	5.2%

[1] Total fees attributable to an asset category. Excludes Other Investment Office and Other LACERA Divisions expenses
[2] Annualized for the five and ten year returns
[3] 10 year return is not available, asset category strategies were implemented within the last ten years

Investment Expenses – Calendar Year 2016

2016 Investment Expenses ($ in millions)	Global Equity	Fixed Income	Private Equity	Real Estate	Hedge Funds	Commodities	Other Investment Office[7]	Other LACERA Divisions	Total	
Average Assets[1]	$ 23,045.6	$ 12,455.3	$ 4,568.1	$ 6,110.1	$ 1,305.5	$ 908.9			Dollars	Basis Points
Percentage of NAV[2]	47.6%	25.7%	9.4%	12.6%	2.7%	1.9%				
Asset Management Fees	$ 36.3	$ 28.5	$ 71.2	$ 43.1	$ 26.2	$ 2.9			$ 208.2	
Basis Points Asset Management Fees	15.7	22.9	155.9	70.5	201.0	31.8				43.0
Carried Interest	$ -	$ -	$ 109.3	$ 1.4	$ 18.2	$ -			$ 128.8	
Basis Points Carried Interest	-	-	239.3	2.2	139.1	-				26.6
Investment Manager Fund Expenses	$ 2.9	$ -	$ 17.9	$ 0.9	$ 7.3	$ 0.6			$ 29.6	
Basis Points Investment Manager Fund Expenses	1.3	-	39.2	1.4	55.5	7.0				6.1
Internal Expenses[3]	$ 2.3	$ 1.3	$ 3.2	$ 2.4	$ 0.9	$ 0.2	$ 1.4	$ 2.4	$ 13.9	
Basis Points Internal Expenses[4]	1.0	1.0	6.9	3.9	6.6	2.3	0.3	0.5		2.9
Total Investment Expenses[5]	**$ 41.5**	**$ 29.7**	**$ 201.7**	**$ 47.6**	**$ 52.5**	**$ 3.7**	**$ 1.4**	**$ 2.4**	**$ 380.5**	
Total Investment Expenses Basis Points	18.0	23.9	441.5	77.9	402.2	41.0	0.3	0.5		78.6

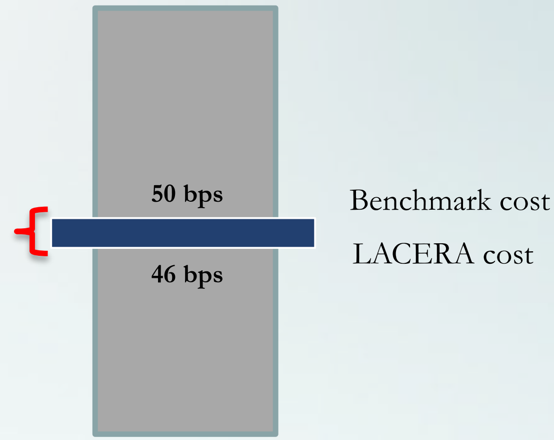
- LACERA returned 8.3% net of fees for calendar year 2016 and generated $3.7 billion in investment gains
- Policy return[6] through passive investing was 7.1%

[1] Average Assets as of 3/31/16, 6/30/16, 9/30/16, and 12/31/16
[2] Percentage of NAV (net asset value) is Average Assets of the asset category divided by the Total Fund's average asset
[3] All non-manager costs, such as staff, consultants, external legal, and other investment operations-related expenses
[4] Basis point relative to average asset of the Total Fund for costs associated with Other Investment Office and Other LACERA Divisions
[5] Cash allocation included in Fixed Income
[6] Policy return calculated by CEM based upon the Board's approved policy weights and target asset category allocations
[7] Non-asset category specific expenses such as CIO, corporate governance, and other shared expenses

CEM Results – Cost Advantage vs Peers

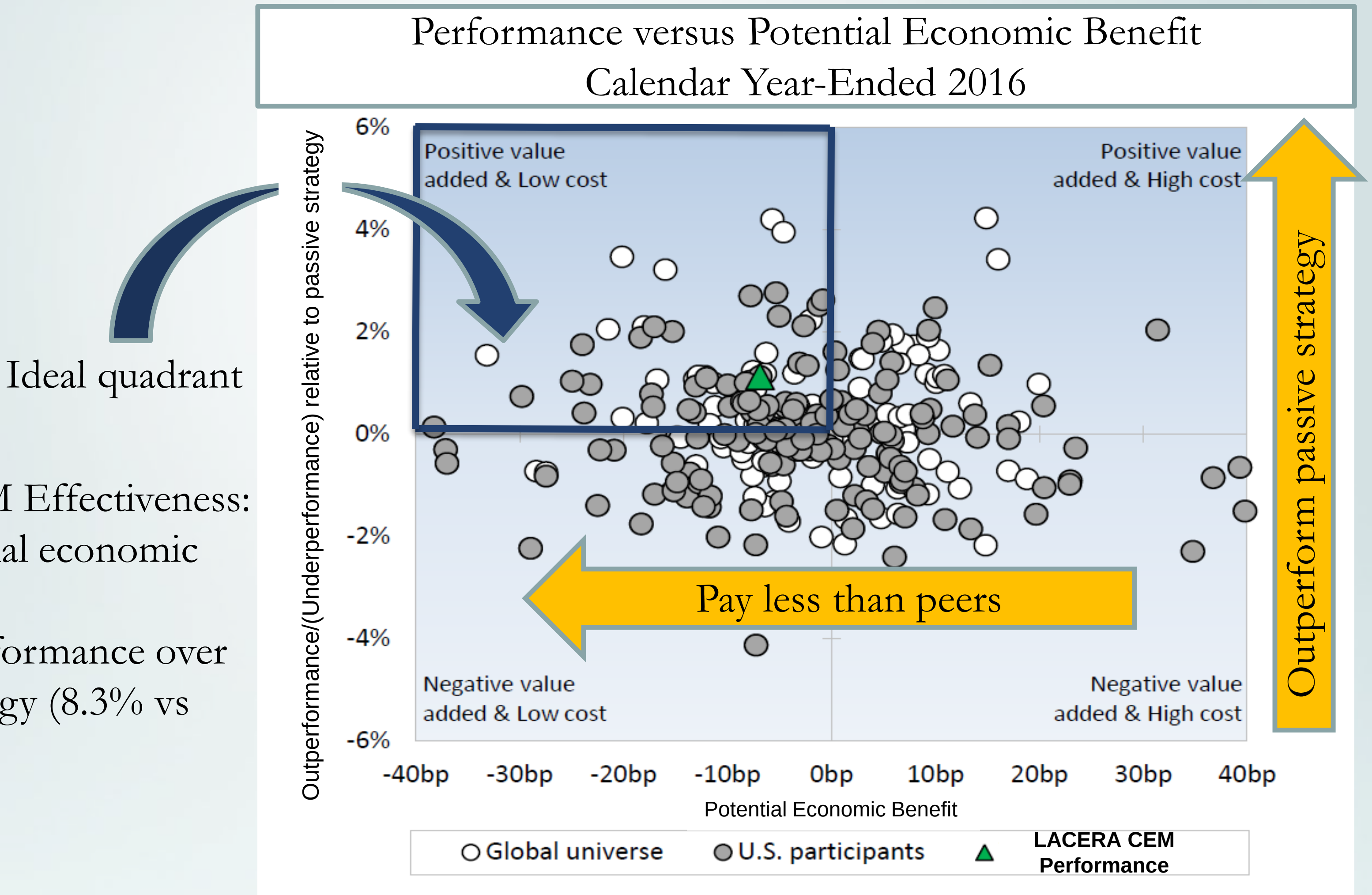
- Participated in cost data survey administered by CEM Benchmarking
  - U.S. participants includes 166 funds with plan size ranging between $154 million and $293 billion with a median plan size of $8.4 billion
  - Global universe consists of 118 international funds with aggregate assets of $4.6 trillion
  - Benchmark cost is the cost peers would have incurred if they had LACERA's asset allocation, fund size, and domiciled in the U.S.
- LACERA's total investment expenses[1] of 46 basis points (bps) is 4 basis bps below the benchmark cost of 50 bps due to:
  - Higher passive management allocation of the public market assets
  - Lower private equity asset management fees
  - Lower internal expenses

Benchmark cost is approximately $20 million higher than LACERA's cost



[1] CEM methodology includes asset management fees and internal expenses but excludes investment manager fund expenses and carried interest

CEM Results – Cost Effective Ranking

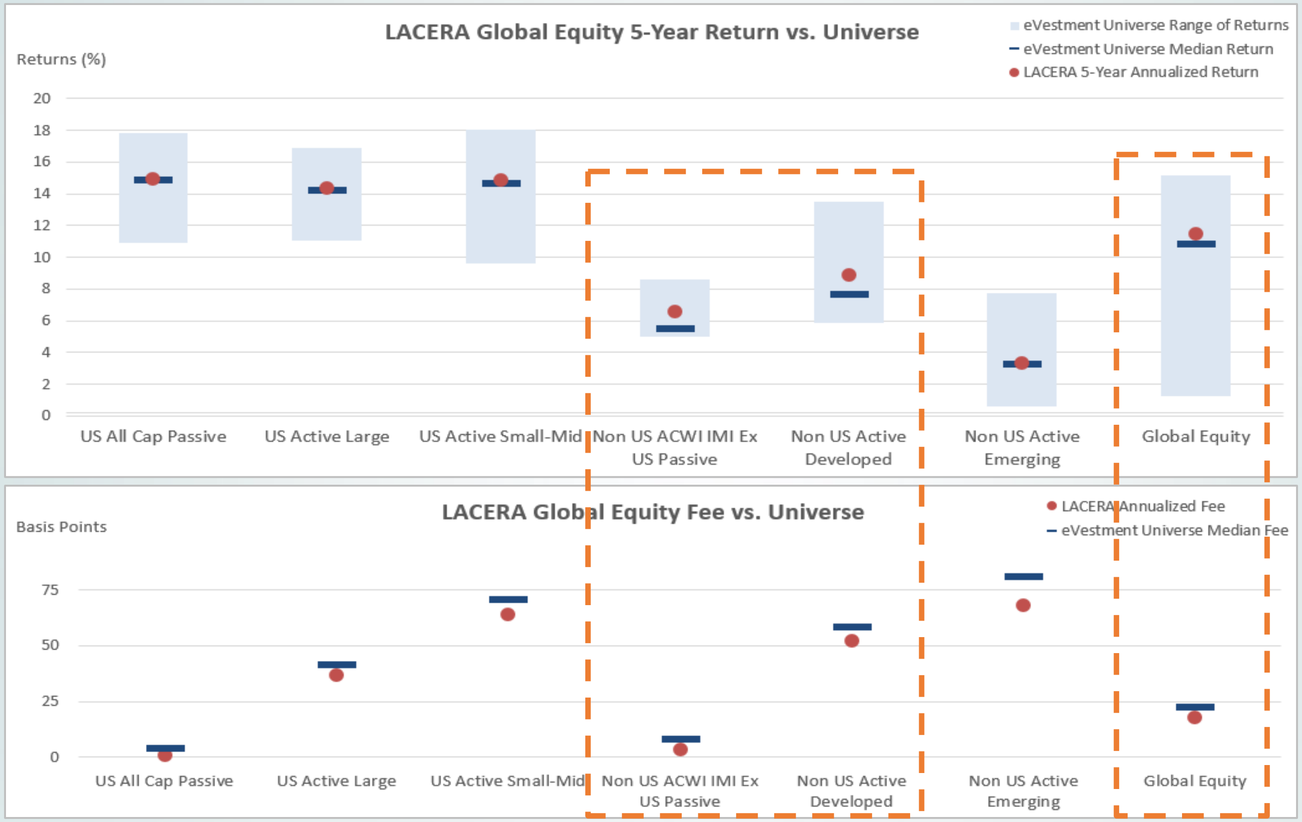


LACERA CEM Effectiveness:

- 4 bps potential economic benefit
- 1.2% outperformance over passive strategy (8.3% vs 7.1%)

Asset Category Analysis – Liquid Assets

Asset Category – Global Equity

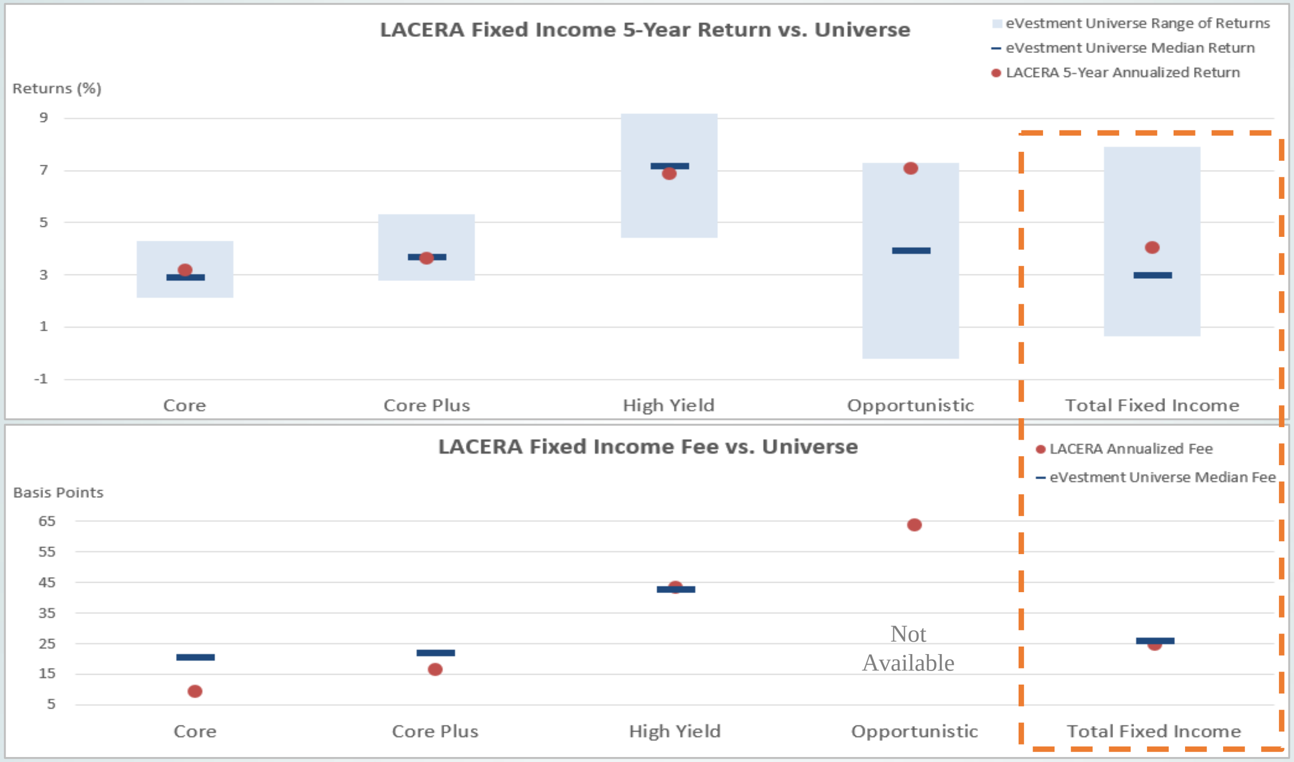


← Above median returns

← Below median fees

- Potential drivers of cost savings:
  - Bring LACERA's Equity Emerging Manager Program in-house to eliminate the fund of fund fee structure
  - Converting passive index funds from a commingled structure to a separate account vehicle
  - Continue selective manager consolidation (benefits of scale)

Asset Category – Fixed Income



← Above median returns

← Below median fees

- Potential drivers of cost savings:
  - Increase allocation to Core sub-composite and to passive strategy
  - Convert index fund from commingled to separate account: lower management fee and higher securities lending revenue
  - Spin off higher-cost sub-composites (High Yield and Opportunistic Credit) to a standalone asset category
  - Continue selective manager consolidation (benefits of scale)

Asset Category Analysis – Illiquid Assets

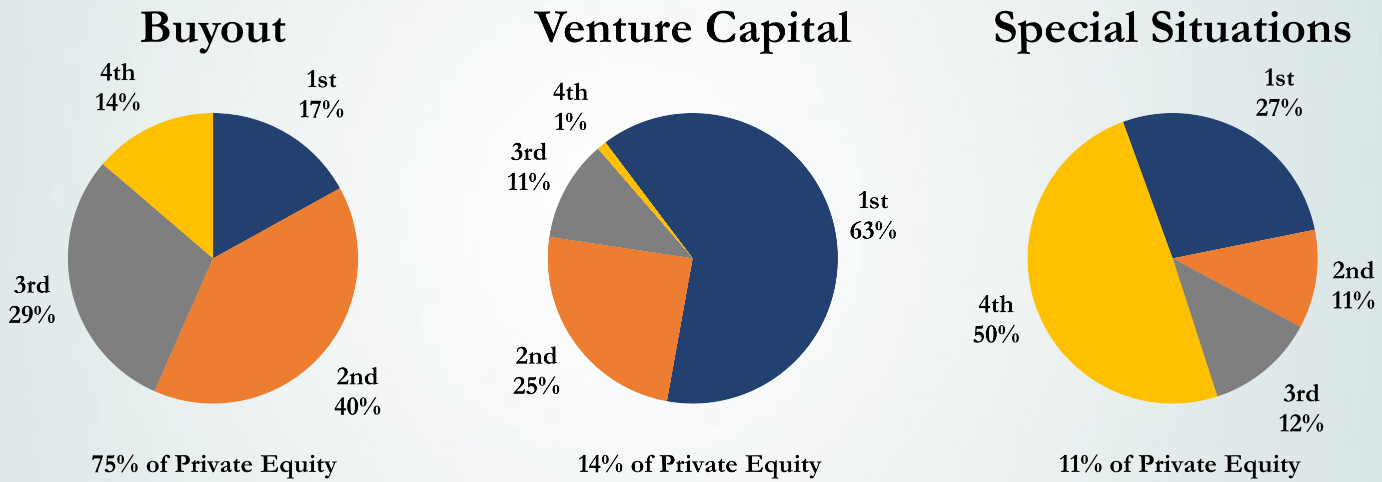
Challenges For Expense Analysis - Illiquid Asset Categories

- No standardized industry best practice established
- Inconsistent reported fee and expense data
  - Some investors report all fees and expenses
  - Other investors report only management fees
  - Investors may exclude fund of funds underlying fees and expenses
- Alternative investment vehicle terms are highly negotiated; many are shielded from public disclosure

Asset Category – Private Equity

NET IRR QUARTILE BY COMMITMENT FOR VINTAGE YEARS 2004-2013

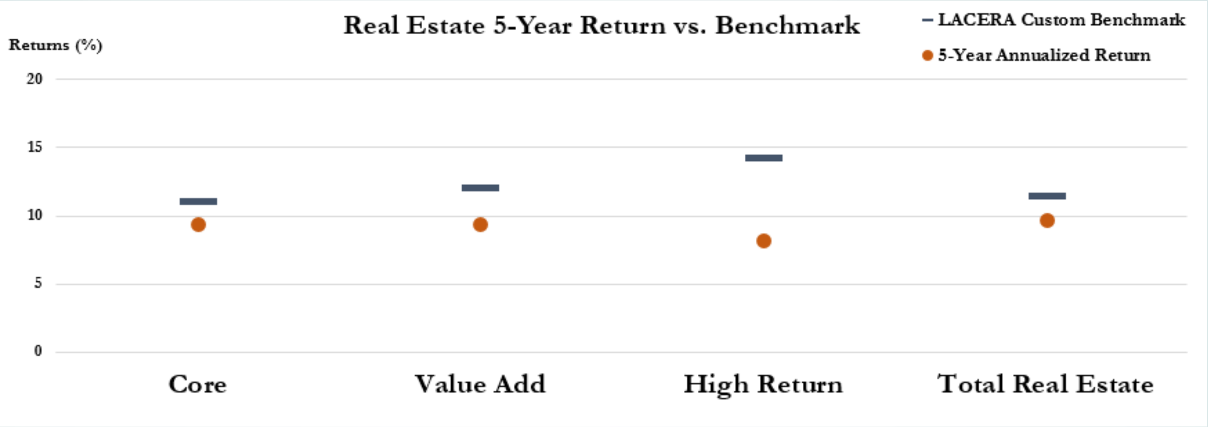
AS OF DECEMBER 31, 2016

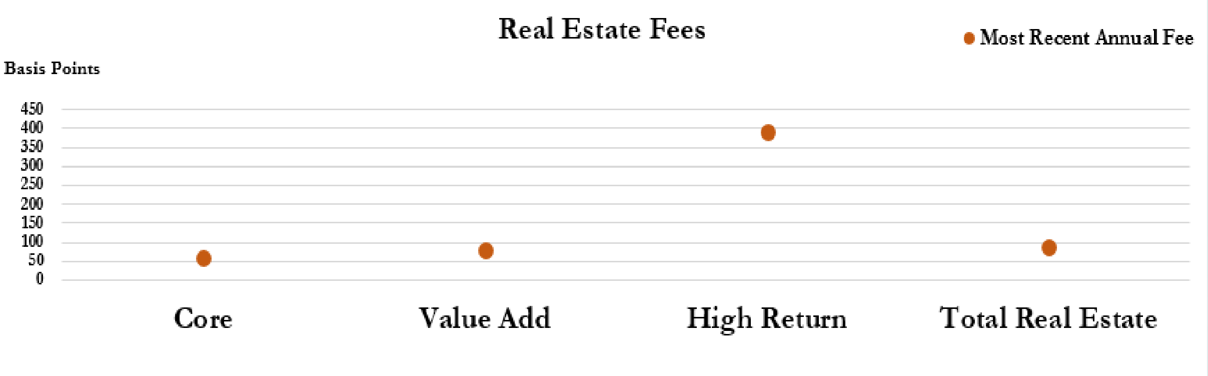


- Historical average IRR spread between 1st and 4th quartile for the portfolio is ~20%
- Persistent 2%/20% fee model
- Potential drivers of cost savings:
    - Explore long-dated funds
    - Expand secondary activity
    - Continue co-investing
    - Consider replication strategies
    - Concentrate core relationships
    - Participate in early fund closes

*IRR benchmark data provided by Burgiss Private IQ as of December 31, 2016 and represents comparable strategies for the respective vintage years aggregated by commitment amounts.

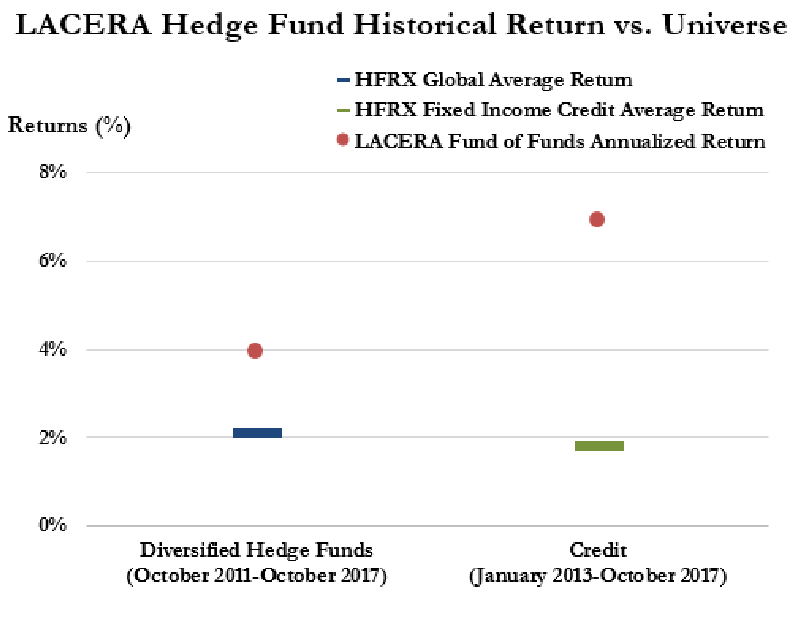
Asset Category – Real Estate

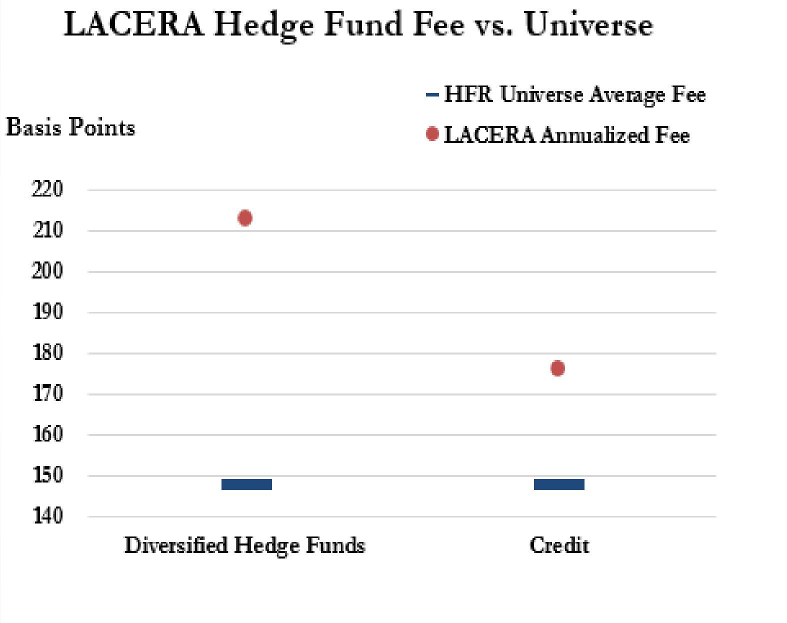




- Potential drivers of cost savings:
  - Use size, strategic relationships and more favorable structures to reduce costs
    - Example: LACERA sold a portfolio of assets to a manager and became a founding investor in a new open-end industrial commingled fund, substantially reducing fees
  - Look to replicate

Asset Category – Hedge Funds





- Potential drivers of cost savings:
  - Invest directly with hedge fund managers to reduce double layer of fees from the fund of fund structure
  - Implement direct hedge fund investments as managed separate accounts where possible to decrease operational costs

Conclusion

- Comparative Total Fund peer benchmark analysis was positive
- Continue to be cognizant of expenses
  - AB2833 fee tracking initiative
  - Internal fee validation process
- Maximize cost effectiveness without sacrificing return potential
  - Minimize fund of fund structures
  - Negotiate/renegotiate terms
  - Lower cost implementation strategies, where possible
- LACERA Investment Belief
  - "Investment outcomes are determined by risk, returns, and costs. All three must be managed, and cost is the most certain."