Investment Management Committee Meeting

September 20, 2018

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS

TEACHER RETIREMENT SYSTEM OF TEXAS MEETING
BOARD OF TRUSTEES
AND
INVESTMENT MANAGEMENT COMMITTEE

(Committee Chair and Members: Mr. Colonnetta, Chair; Mr. Corpus; Mr. Hollingsworth; Mr. Moss and Ms. Ramirez)

All or part of the September 20, 2018, meeting of the TRS Investment Management Committee and Board of Trustees may be held by telephone or video conference call as authorized under Sections 551.130 and 551.127 of the Texas Government Code. The Board intends to have a quorum and the presiding officer of the meeting physically present at the following location, which will be open to the public during the open portions of the meeting: ***1000 Red River, Austin, Texas 78701 in the TRS East Building, 5th Floor, Boardroom****.*

The open portions of the September 20, 2018, meeting are being broadcast over the Internet. Access to the Internet broadcast is provided at www.trs.texas.gov.

AGENDA

September 20, 2018 – 12:30 p.m.
TRS East Building, 5th Floor, Boardroom

1. Call roll of Committee members.

2. Consider the approval of the proposed minutes of the July 26, 2018 committee meeting – Committee Chair.

3. Strategic Partnership and the Future of Asset Management– George Walker, Chairman and Chief Executive Officer of Neuberger Berman.

4. CIO Update and discussion regarding the lease of certain real property located in downtown Austin for additional TRS office space – Jerry Albright.

5. Discuss the Second Quarter 2018 Performance Review – Steve Voss, Mike McCormick and Mike Comstock, Aon Hewitt.

6. Market Update – Jase Auby.

7. Annual Review of the Public and Private Strategic Partnership Network – Michael Pia, Courtney Villalta and J.B. Daumerie.

8. Semi-Annual Risk Report – James Nield.

9. Consider recommending to the Board an investment in a core property index fund including consideration of a finding that deliberating or conferring on investment

transactions or potential investment transactions in an open meeting would have a detrimental effect on the position of the retirement system in negotiations with a third person or put the retirement system at a competitive disadvantage in the market — Eric Lang and Grant Walker.

TAB 2

Minutes of the Investment Management Committee

July 26, 2018

The Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on July 26, 2018, in the boardroom located on the fifth floor of the TRS East Building offices at 1000 Red River Street, Austin, Texas.

Committee Members present:
Mr. Joe Colonnetta, Chair
Mr. David Corpus
Mr. Jarvis Hollingsworth
Mr. Chris Moss
Ms. Dolores Ramirez

Other Board Members present:
Mr. John Elliott
Dr. Greg Gibson
Mr. James D. Nance
Ms. Nanette Sissney

Others present:

Brian Guthrie, TRS	Steve Huff, Fiduciary Counsel, Reinhart Boerner Van Deuren s.c.
Ken Welch, TRS	Steve Voss, Aon Hewitt
Don Green, TRS	Mike McCormick, Aon Hewitt
Carolina de Onis, TRS	Ann Fickel, TRTA
Jerry Albright, TRS	Ted Raab, Texas AFT
Jase Auby, TRS	
James Nield, TRS	
Eric Lang, TRS	
Grant Walker, TRS	
Carolyn Hansard, TRS	
Neil Randall, TRS	
Heather Traeger, TRS	
Katherine Farrell, TRS	
Dr. Keith Brown, Investment Advisor	
B. Dan Pickering, Tudor, Pickering Holt and Co.	

Investment Management Committee Chair Mr. Colonnetta called the meeting to order at 3:01 p.m.

1. **Call roll of Committee members.**

Ms. Farrell called the roll. A quorum was present.

2. **Consider the approval of the proposed minutes of the April 19, 2018 committee meeting – Committee Chair Mr. Joe Colonnetta**

On a motion by Ms. Ramirez, seconded by Mr. Corpus, the committee voted to approve the proposed minutes for the April 19, 2018, Investment Management Committee meeting as presented with Mr. Colonnetta abstaining.

3. **CIO Update – Jerry Albright.**

Mr. Jerry Albright provided an overview of what the Investment Management Division was focusing on. He said number one, an enormous amount of time was spent preparing for the fleet and hiring new people. He noted the McLagan compensation study was completed. He said that according to the report, the base compensation is on track and can be covered by the budget the Board implemented.

Mr. Albright said his priorities and the Investment Management Division's (IMD's) priorities remain the same as reported by in February: maintain current competitive advantage and total returns for the trust and manage the cost structure.

4. **State of the Energy Markets – B. Dan Pickering, Tudor, Pickering Holt and Co.**

Mr. Jase Auby introduced Mr. Dan Pickering who is the CIO of TPH Asset Management, the asset management arm of Tudor Pickering Holt. Mr. Pickering discussed the cyclical nature of the energy market. He noted the U.S. is one of the two most important players in the global oil business, OPEC being the other. In response to Dr. Brown's social investment question, Mr. Pickering said coal is easy story to divest. He did not understand why one would want to divest from natural gas which is part of the solution, a cleaner burning hydrocarbon.

5. **Discuss the First Quarter 2018 Performance Review – Steve Voss and Mike McCormick, Aon Hewitt.**

Mr. Mike McCormick provided an overview of the pension fund's performance. He reported the portfolio began and ended the one-quarter period with about $151 billion. He confirmed that the fund relative to the benchmark and peers received a higher return for slightly lower volatility. He said for private equities the fund has done well compared to peers and the opportunity set. He reported the decision to go private relative to public has significantly outperformed the five year period for private equities is up 14.6 percent compared to public equities at 8.5 percent. Mr. Steve Voss concluded by stating what is striking about the performance is the level of consistency, seven quarters in a row of consistent excess performance.

6. **Annual Update on External Private Markets – Eric Lang, Neil Randall, Grant Walker and Carolyn Hansard.**

Mr. Eric Lang provided the overview of external private markets. He said it has been a terrific year with a 15 percent return to the trust. He reported over the portfolio there was 130 principal investments, accounting for a little over 30 percent of the market value of the private markets portfolio. Mr. Lang discussed briefly the McKinsey report regarding private equity. He said in design, McKinsey suggested TRS move to the next step of principal investing which is co-underwriting. He said for real estate McKinsey recommended moving to a model working with operating companies as opposed to allocators.

Mr. Neil Randall reported for private equity alone over the past year has added $3 billion of value to the trust. He discussed the establishment of the investment committee for private equity. How the investment committee provides consistency to the process and adds further diligence through the process of approval. In response to Mr. Hollingsworth's inquiry, Mr. Lang stated the threshold for this investment committee is $100 million that most of the investments are in the $25 to $50 million. He said there are corresponding committees for energy and real estate. Mr. Randall concluded by saying they are well positioned for the next five years ahead in addition to executing on the key goal of increasing principal investments.

Mr. Grant Walker started by stating it was a really successful year for the real asset portfolio, the one year time-weighted return was 14 percent compared to the benchmark of 6.7 percent. He said for 2018 the plan is to commit $4.7 billion, 50 percent targeted to principal investments and 50 percent to funds.

Ms. Carolyn Hansard reviewed the history and performance of the energy natural resources (ENRI) portfolio. She reported since inception 18 principal investments were made. She said they are currently at 28.7 percent of the portfolio and have generated 17 percent returns since inception.

7. **Review of Proposed Modifications to Investment Policy Statement – Katy Hoffman and James Nield.**

Ms. Hoffman presented 10 proposed modifications to the Investment Policy Statement (IPS) for the Board's review. She noted four of the 10 were more substantive and reviewed them in greater detail. The first proposed modification was defining advisors and consultants and to remove the requirement for prudence letters on all the external investments. Another proposed modification was to define leverage and enhance the use of leverage in the system. The third proposal was to modify the emerging manager program from a fixed dollar target allocation to a percentage of the trust, as the trust grows the emerging manager program grows. The final proposed modification was regarding the rebalance authority. She said the proposal was to change rebalance authority to additional allocation authority to better reflect the practice of adding to previously approved ISE investments. Ms. Hoffman said the proposal also would be expanded to two more titles that are allowed to use this authority: risk parity and public markets.

8. **Receive an update on London satellite office and discussion of potential office in Asia – Jerry Albright.**

Mr. Albright reported that after the success in London, they started to explore other options. He noted TRS has $22 billion invested in the Asian markets. He said there are increasingly attractive investments in the area and it would be an opportunity to be closer to where the GDP growth of the world is. Mr. Albright stated they are developing a business case around a potential office and plan to come back to the Board sometime next summer to provide an update.

9. **Review Board Advisors roles including consider recommending to the Board approval of a Resolution selecting an Advisor consistent with 1.3 of the Investment Policy Statement; and consideration of a finding that deliberating or conferring on the selection of the Board Advisor in open meeting would have a detrimental effect**

on the position of the retirement system in negotiations with a third person – Jerry Albright.

On a motion by Mr. Corpus, seconded by Ms. Ramirez, the committee voted unanimously to find that deliberating or conferring on the selection of the Board advisors in open meeting would be a detrimental effect on the position of the Retirement System in negotiations with a third person.

At 5:21 p.m., Mr. Colonnetta announced, without objection that the committee would recess to go into executive session under Sections 551.071 and 825.11(e) of the Government Code to discuss Board procurement matters and to consult with legal counsel as needed.

At 5:37 p.m. the committee reconvened in open meeting.

On a motion by Mr. Moss, seconded by Ms. Ramirez, the committee unanimously voted to recommend to the Board the proposed resolution selecting an advisor.

Resolution
July 26 – 27, 2018

Whereas, Section 1.3(a) of the Board's Investment Policy Statement states that the Board selects a Board Investment Advisor to provide investment advice and related services primarily to the Board and, in aid of the services provided to the Board, to the Investment Management Division;

Whereas, Section 1.3(e) of the Board's Investment Policy Statement requires that the Board approve the engagement of Advisors, as defined in the Investment Policy Statement, to provide investment advisory and consulting services to the Board and the Investment Management Division;
Whereas, The Investment Management Division has performed procedures and due diligence relating to the Board Investment Advisor using an internal assessment procedure as permitted by the Board's Procurement Policy, and is recommending that the Committee recommend to the Board the engagement of Aon Hewitt Investment Consulting, Inc.; and

Whereas, The Investment Management Division has performed procedures and due diligence relating to the engagement of one or more firms to provide investment advisory and consulting services to the private markets and external public markets portfolios using an internal assessment procedure as permitted by TRS policies, and is recommending that the Committee recommend to the Board engagement of Albourne America LLC;
Now therefore, be it:

Resolved, That the Investment Management Committee hereby recommends that the Board of Trustees (the "Board") of the Teacher Retirement System of Texas adopt the following resolutions:

Resolved, That the Board hereby determines that the selection of Aon Hewitt Investment Consulting, Inc. represents the best overall value for TRS and authorizes the Executive

Director and his designees to negotiate, with the assistance and advice of legal counsel, an agreement with Aon Hewitt Investment Consulting, Inc. to serve as the Board Investment Advisor under the Investment Policy Statement for an initial term not to exceed five (5) years beginning with fiscal year 2019, with one or more options to extend for up to two additional years, on substantially the terms discussed with the Board; and

Resolved, That the Board hereby determines that the selection of Albourne America, LLC represents the best overall value for TRS and hereby authorizes the Executive Director and his designees to negotiate, with the assistance and advice of legal counsel, agreements and statements of work with Albourne America, LLC to provide private markets and external public markets investment advisory and consulting services, including but not limited to serving as an Advisor under the Investment Policy Statement as required or as requested, each for an initial term not to exceed five (5) years beginning with fiscal year 2019, with one or more options to extend for up to two additional years, on substantially the terms discussed with the Board; and

Resolved, That if the negotiations with Aon Hewitt Investment Consulting, Inc. and Albourne America, LLC, respectively, are deemed by the Executive Director in his discretion to be successful, then the Executive Director is hereby authorized to execute agreements with each firm on such terms and conditions as the Executive Director may deem in his discretion to provide the best overall value to TRS, and to execute and deliver all such other documents that the Executive Director and legal counsel may deem necessary or appropriate to implement this resolution, as conclusively evidenced by the taking of the action or the execution and delivery of the documents, and to incur, approve, and pay any budgeted expenses or costs associated with each of such agreements and deemed in the discretion of the Executive Director to be reasonably necessary or advisable with respect to each agreement.

Without further discussion, the meeting adjourned at 5:35 p.m.

APPROVED BY THE **INVESTMENT MANAGEMENT COMMITTEE** OF THE BOARD OF TRUSTEES OF THE TEACHER RETIREMENT SYSTEM OF TEXAS ON THE 20th DAY OF SEPTEMBER 2018.

_____ _____

Katherine H. Farrell
Secretary of the TRS Board of Trustees

Date

TAB 3

NEUBERGER | BERMAN

TRS Board of Trustees

September 20, 2018

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS
INVESTMENT
MANAGEMENT DIVISION

NEUBERGER | BERMAN

Neuberger Berman Overview

Breadth of independent perspectives across asset classes

	EQUITY	FIXED INCOME	ALTERNATIVES
AUM $304bn[1]	$103bn	$132bn	$77bn AUM and Committed Capital
Investment Professionals	228	164	149
Fundamental	Global, EAFE U.S. Value, Core, Growth Emerging Markets Regional EM, China Global Thematic, Disruptive Themes Sustainable Equity Income Strategies – MLP – REITs	Global Investment Grade Global Non-Investment Grade Emerging Markets, Regional EM, China Multi-Sector, Opportunistic Municipals Specialty Strategies – CLO Mezzanine – Currency – Corporate Hybrids	Private Equity: – Primaries – Co-Investments – Secondaries – Specialty Strategies – Minority stakes in alternative firms - Dyal Alternative Credit: – Private Credit – Residential Loans – Special Situations Hedge Funds: – Multi-Manager – Equity Long/Short – Credit Long/Short – Event Driven
Quantitative	Global U.S. Emerging Markets Custom Beta		Risk Premia Options Global Macro Commodities

NB LOCATIONS

32	Cities
20	Countries
14	Portfolio Management Centers

MULTI-ASSET CLASS SOLUTIONS AND STRATEGIC PARTNERSHIPS

Fundamental	Global Relative & Absolute Return Income Focused	Inflation Management Liability Aware
Quantitative	Risk Parity Global Tactical Asset Allocation	

1. As of June 30, 2018. Firm assets under management (AUM) includes $103.3 billion in Equity assets, $132.2 billion in Fixed Income assets and $68.9 billion in Alternatives assets. Alternatives "AUM and Committed Capital" includes assets under management for non-Private Equity businesses and Committed Capital since inception for the Private Equity businesses. Committed Capital since inception reflects all contractual commitments, including those still in documentation, to fund investments, including those which have since been realized, advised by NB Alternatives Advisers LLC and its affiliates or predecessors (the oldest mandate of which was founded in 1981).

Strategic Partnership Success Factors

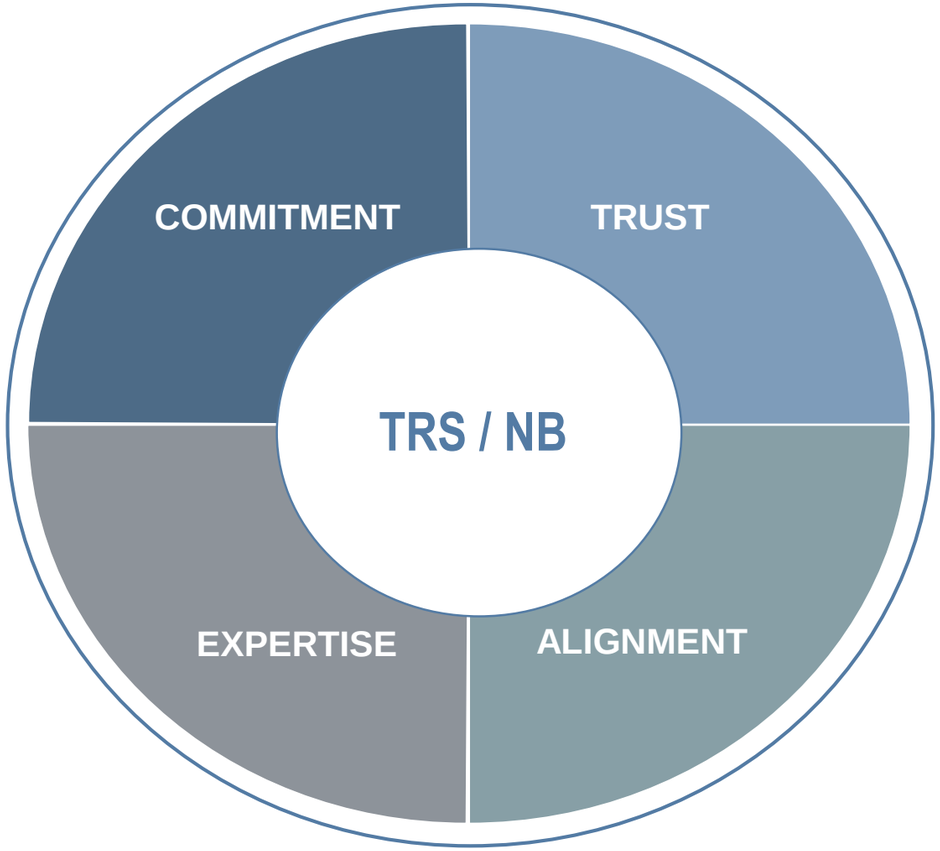
Success means a mutually beneficial partnership, designed to deliver positive results for the teachers of Texas

COMMITMENT
- Ownership at the most senior levels is key, on both sides
- Board engagement / buy-in essential
- Dedicated SP teams on both sides ensure focus / delivery

TRUST
- Honesty and transparency key to developing trust
- Feedback sought and incorporated, whether formal or informal
- Trust should lead to opportunities explored together

ALIGNMENT
- Performance-based fees ensure economic alignment
- Partnerships should and do challenge both sides to raise the bar

EXPERTISE
- Depth of experience across asset classes and markets
- Global footprint
- Highly engaged, seasoned investment professionals



TRS / NB Strategic Partnership

A mutually beneficial relationship serving your members for 10+ years

PERFORMANCE	Solid performance throughout our 10-year relationship across four mandates
IMPROVED NIMBLENESS	Ability to quickly and easily exploit market opportunities across asset classes
MARKET INSIGHTS	Communication of asset allocation views and market insights on a timely basis Deep engagement on investment opportunities, risks and challenges
KNOWLEDGE TRANSFER	Meaningful collaboration on 29 joint research projects since 2008 Participation in investment summits and conferences
ALIGNMENT OF INTERESTS	Incentive-based fees reinforce alignment NB portfolio managers invest alongside clients

From 2008 to 2018: That Was Then…

…This is now

	Then…	…Now
Global debt[1]	$116 trillion	$164 trillion
Federal Reserve, ECB and Bank of Japan balance sheets	$5.7 trillion	$14.8 trillion
Number of AAA bond issuers	6 corporates, 19 sovereigns	2 corporates, 11 sovereigns
Value of outstanding U.S. BBB corporate bonds	$760 billion	$2,700 billion
U.S. primary dealers corporate debt net positions	$112 billion	$18 billion
World's six biggest companies by market cap[2]	PetroChina; Exxon Mobil; General Electric; China Mobile; Industrial & Commercial Bank of China; Microsoft	Apple; Alphabet; Microsoft; Amazon; Facebook; Tencent
GDP of Brazil, Russia, India and China (current U.S. dollars)[3]	$9.2 trillion	$16.6 trillion
German Bund 10-year yield	4.6%	0.5%
New smartphone shipments worldwide	185 million	1,460 million
Global internet penetration (users as a percentage of population)	24%	49%
Number of U.S. private equity owned companies	4,643	7,265

1. Total private and public debt of 190 countries, as of December 31, 2007, and December 31, 2016.
2. As of December 31, 2007, and December 31, 2017.
3. As of December 31, 2007, and December 31, 2016.
Source: International Monetary Fund, Federal Reserve, European Central Bank, Bank of Japan, Standard & Poor's, Federal Reserve Bank of New York, World Bank, Bloomberg, Kleiner Perkins, PitchBook. Data as of 2008 and 2017 unless stated otherwise.

A New Era in Which Some Longstanding Divides are Being Dissolved

Our 10 Investment Implications			
1	Readying for the cyclical opportunity in corporate-debt downgrades	6	Private assets are becoming more essential—and more flexible
2	Rethinking risk diversification in long-term investment portfolios	7	Diminished banks mean more opportunities for investors
3	Sharper distinctions between passive, smart beta, quantitative and active management	8	Thematic analysis will be more important for active investors
4	Emerging markets will go mainstream	9	Big data will define our economic ecosystem and transform investing
5	The Great Disinflation is likely over	10	Active engagement will be more important to long-term investors

Facing the Coming Decade's Challenges, and Seeking its Opportunities

Our Five Guiding Principles	
1	Accept the new reality of lower market return outlooks, higher volatility and higher correlations
2	Pursue the full passive-to-active spectrum
3	Embrace private as well as public markets
4	Create an institutional governance structure that enables nimble opportunism
5	Look for more from asset managers

Asset Management Industry Trends

Various trends are creating both opportunities and challenges

GLOBALIZATION & CONSOLIDATION

- Growth of ex-U.S. flows as a % of global flows
- Increased M&A activity as margins come under pressure

EVOLVING CLIENT NEEDS

- Relationship consolidation across fewer partners
- Growing demand for alternatives
- Tailored capabilities for client segment

ACTIVE VS. PASSIVE

- Accelerated shift to passive in traditional equities and to a lesser extent, fixed income
- Allocation focused on specialty strategies

GROWING ROLE OF TECHNOLOGY

- Artificial intelligence & big data
- Dynamic client reporting
- Enhanced portfolio management tools

FOCUS ON FEES

- Elevated scrutiny and pressure on fees relative to alpha generation
- Flexibility in fee structures to increase alignment

CHANGING REGULATORY ENVIRONMENT

- Fiduciary rules
- Global: MiFID II, Solvency II, Brexit

Additional Disclosures

This material is provided for informational purposes only and nothing herein constitutes investment, legal, accounting or tax advice. This material is general in nature and is not directed to any category of investors and should not be regarded as individualized, a recommendation, investment advice or a suggestion to engage in or refrain from any investment-related course of action. Investment decisions and the appropriateness of this material should be made based on an investor's individual objectives and circumstances and in consultation with his or her advisors. Information is obtained from sources deemed reliable, but there is no representation or warranty as to its accuracy, completeness or reliability. All information is current as of the date of this material and is subject to change without notice. Any views or opinions expressed may not reflect those of the firm as a whole. This material may include estimates, outlooks, projections and other "forward-looking statements." Due to a variety of factors, actual events or market behavior may differ significantly from any views expressed. Neuberger Berman products and services may not be available in all jurisdictions or to all client types. The use of tools cannot guarantee performance. Diversification does not guarantee profit or protect against loss in declining markets. Indices are unmanaged and are not available for direct investment. Investing entails risks, including possible loss of principal. Investments in hedge funds and private equity are speculative and involve a higher degree of risk than more traditional investments. Investments in hedge funds and private equity are intended for sophisticated investors only. Indexes are unmanaged and are not available for direct investment. **Past performance is no guarantee of future results.**

The views expressed herein are generally those of the Neuberger Berman Multi-Asset Class (MAC) team or Neuberger Berman's Asset Allocation Committee. The Asset Allocation Committee is comprised of professionals across multiple disciplines, including equity and fixed income strategists and portfolio managers. The Asset Allocation Committee reviews and sets long-term asset allocation models, establishes preferred near-term tactical asset class allocations and, upon request, reviews asset allocations for large diversified mandates. Tactical asset allocation views are based on a hypothetical reference portfolio. Any currency outlooks are not against the U.S. dollar but stated against the other major currencies. As such, the currency outlooks should be seen as relative value forecasts and not directional U.S. dollar pair forecasts. Currency outlooks are shorter-term in nature, with a duration of 1–3 months. Regional equity and fixed income views reflect a 1-year outlook. Asset Allocation Committee members are polled on asset classes and the positional views are representative of an Asset Allocation Committee consensus. The views of the MAC team or the Asset Allocation Committee may not reflect the views of the firm as a whole and Neuberger Berman advisers and portfolio managers may take contrary positions to the views of the MAC team or the Asset Allocation Committee. The MAC team and the Asset Allocation Committee views do not constitute a prediction or projection of future events or future market behavior. This material may include estimates, outlooks, projections and other "forward-looking statements." Due to a variety of factors, actual events or market behavior may differ significantly from any views expressed.

A bond's value may fluctuate based on interest rates, market conditions, credit quality and other factors. You may have a gain or loss if you sell your bonds prior to maturity. Of course, bonds are subject to the credit risk of the issuer. If sold prior to maturity, municipal securities are subject to gain/losses based on the level of interest rates, market conditions and the credit quality of the issuer. Income may be subject to the alternative minimum tax (AMT) and/or state and local taxes, based on the investor's state of residence. High-yield bonds, also known as "junk bonds," are considered speculative and carry a greater risk of default than investment-grade bonds. Their market value tends to be more volatile than investment-grade bonds and may fluctuate based on interest rates, market conditions, credit quality, political events, currency devaluation and other factors. High yield bonds are not suitable for all investors and the risks of these bonds should be weighed against the potential rewards. Neither Neuberger Berman nor its employees provide tax or legal advice. You should contact a tax advisor regarding the suitability of tax-exempt investments in your portfolio. Investing in the stocks of even the largest companies involves all the risks of stock market investing, including the risk that they may lose value due to overall market or economic conditions. Small- and mid-capitalization stocks are more vulnerable to financial risks and other risks than stocks of larger companies. They also trade less frequently and in lower volume than larger company stocks, so their market prices tend to be more volatile. Investing in foreign securities involves greater risks than investing in securities of U.S. issuers, including currency fluctuations, interest rates, potential political instability, restrictions on foreign investors, less regulation and less market liquidity. The properties held by REITs could fall in value for a variety of reasons, such as declines in rental income, poor property management, environmental liabilities, uninsured damage, increased competition, or changes in real estate tax laws. There is also a risk that REIT stock prices overall will decline over short or even long periods because of rising interest rates. The sale or purchase of commodities is usually carried out through futures contracts or options on futures, which involve significant risks, such as volatility in price, high leverage and illiquidity.

Neither Neuberger Berman nor its employees provide tax or legal advice. All investors are strongly urged to consult their own tax or legal advisors with respect to the impact on their personal situation of any potential strategy or investment.
the forward looking statements will materialize. Due to various risks and uncertainties, including those set forth herein, actual events or results or the actual performance of any security referenced herein may differ materially from those reflected or contemplated in such forward looking statements.

All information as of the date indicated. Firm data, including employee and assets under management figures, reflect collective data for the various affiliated investment advisers that are subsidiaries of Neuberger Berman Group LLC (the "firm"). Firm history and timelines include the history and business expansions of all firm subsidiaries, including predecessor entities and acquisition entities. Investment professionals referenced include portfolio managers, research analysts/associates, traders, and product specialists and team dedicated economists/strategists.

Neuberger Berman Investment Advisers LLC is a registered investment adviser.

The "Neuberger Berman" name and logo are registered service marks of Neuberger Berman Investment Advisers LLC.

© 2018 Neuberger Berman Group LLC. All rights reserved.

TAB 4

Chief Investment Officer Update

Jerry Albright, Chief Investment Officer

September 2018

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS
INVESTMENT
MANAGEMENT DIVISION

CIO Update

General IMD Update

Trust Value is $151 billion as of Q2 2018

- **Fleet Strategy**
  - 32 hires in FY2019
  - Hiring strategy includes use of recruiting firms
  - Finalized expansion of 14th floor at 816 Congress
- **Talent Management**
  - Developed proposal with OE for IMD Performance Pay Plan modifications
  - Completed IMD 360 Reviews and Management Committee (MC) Offsite
    - Unconscious Bias Training for all MC
    - Diversity and Inclusion metrics incorporated
- **Internal Priorities**
  - Finalized McKinsey study and turning towards evaluation and implementation of findings
  - Conducted Semi-Annual Portfolio Reviews in August/Sept. 2018
  - Hosted SPN Joint Summit in New York City
  - Initiated 2019 Strategic Asset Allocation study

Upcoming IMD Items

- **Key Dates & Upcoming Events**
  - GCM Emerging Manager Conference (Chicago), October 9-10, 2018
  - SSB On-Site (Boston), October 16, 2018
  - CII Semi-Annual Fall Conference (Boston), October 24-26, 2018
  - SPN Summit (TRS – 816), November 27-28, 2018
  - TRS Emerging Manager Conference (Austin), February 7, 2019
  - TRS Hedge Fund Conference (Austin), February 28, 2019
- **December Investment Management Committee**
  - AON Hewitt Q3 ‘18 Performance Review
  - Annual update from Risk and Trading Groups
  - Annual update from MSG and Strategic Asset Allocation plan overview

TRS

This slide was intentionally left blank.

TAB 5

Teacher Retirement System of Texas

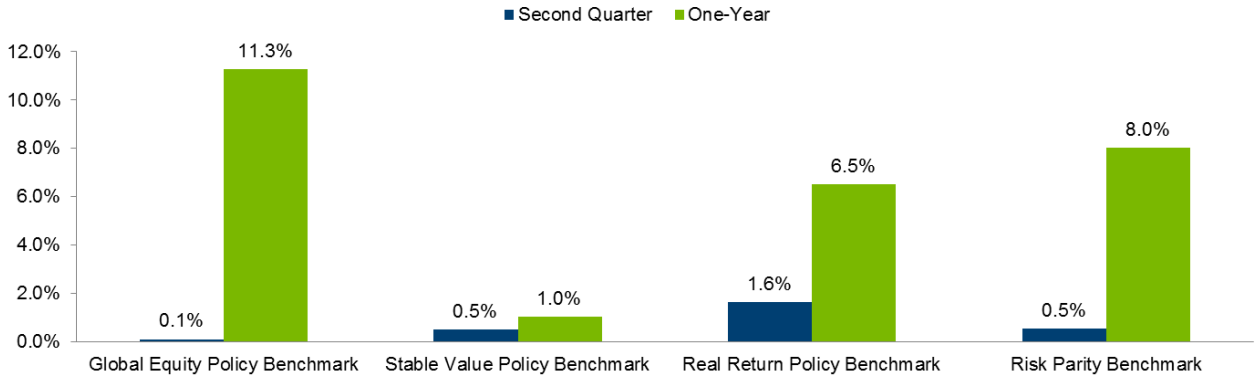
Performance Review: Second Quarter 2018

Investment advice and consulting services provided by Aon Hewitt Investment Consulting, Inc., an Aon Company.

Nothing in this document should be construed as legal or investment advice. Please consult with your independent professional for any such advice. To protect the confidential and proprietary information included in this material, it may not be disclosed or provided to any third parties without the approval of Aon Hewitt.

Empower Results®

Summary



- The second quarter saw the continuation of several trends including solid fundamentals for US GDP and earnings growth which was offset by slowing in European economic activity and declines in emerging market equity returns largely due to falling currencies; fixed income markets were also negatively impacted by rising rates
- Against this difficult backdrop, the TRS investment portfolio returned 0.4% for the quarter which was slightly below its benchmark return of 0.5%
  - Underweight positioning and active management within Total USA more than offset the positive impacts from active management in Private Equity and Real Assets
- For the trailing twelve months, TRS returned 9.2% and outperformed its benchmark by 0.7 percentage points
  - Active management in Real Assets and underweight positioning to Long Treasuries more than offset the negative impacts from underweight positioning to Total USA and overweight positioning to Absolute Return

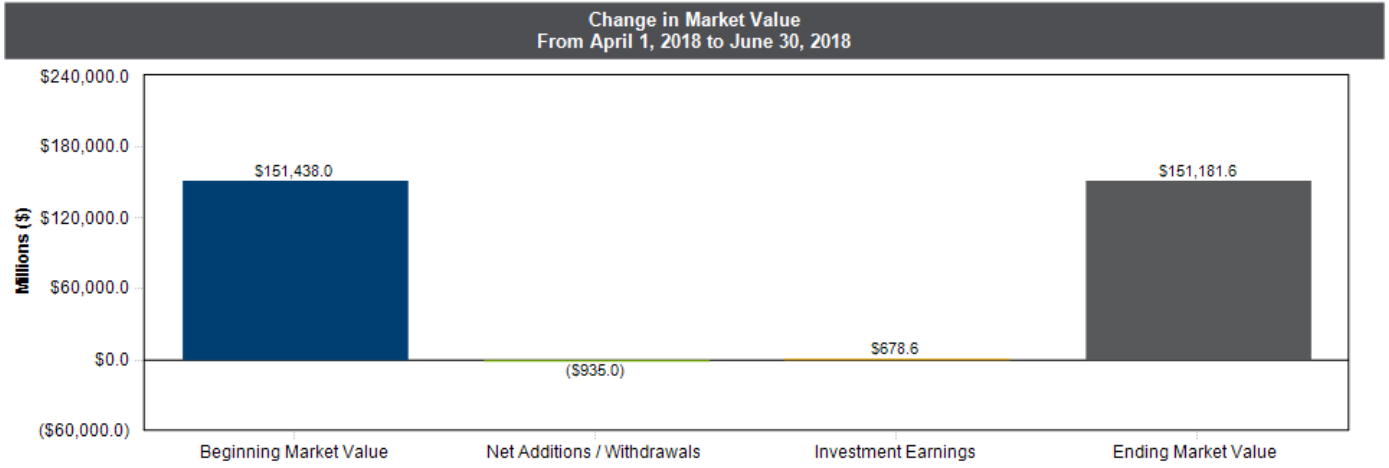
1. Market Summary – Second Quarter 2018

	Second Quarter	Year to Date	One Year	Three Years	Five Years	Ten Years
Global Equity:						
MSCI U.S.A. IMI Index	4.0%	3.3%	14.9%	11.6%	13.3%	10.3%
MSCI EAFE + Canada Index	-0.7	-2.8	7.0	4.9	6.2	2.6
MSCI Emerging Markets Index	-8.0	-6.7	8.2	5.6	5.0	2.3
HFRI Fund of Funds Composite Index	0.4	0.7	5.1	1.9	3.5	
State Street Private Equity Index (qtr lagged)	1.4	6.4	14.1	11.0	11.7	10.0
Global Equity Policy Benchmark	0.1	0.8	11.3	8.3	9.4	6.5
Stable Value:						
Bloomberg Barclays Long Treasury Index	0.3%	-3.0%	-0.1%	3.4%	4.5%	6.1%
HFRI Fund of Funds Conservative Index	1.0	1.6	4.1	1.9	3.0	1.2
3 Month LIBOR + 2%	1.1	2.1	3.8	3.1	2.8	2.7
90 Day U.S. Treasury Bill	0.5	0.8	1.4	0.7	0.4	0.4
Stable Value Policy Benchmark	0.5	-1.7	1.0	3.0	4.1	5.3
Real Return:						
Bloomberg Barclays U.S. TIPS Index	0.8%	0.0%	2.1%	1.9%	1.7%	3.0%
NCREIF ODCE (qtr lagged)	2.0	3.9	7.1	9.0	10.4	4.2
Energy, Natural Resources & Infrastructure Benchmark	1.4	4.6	9.1			
Goldman Sachs Commodities Index	8.0	10.4	30.0	-4.4	-9.4	-12.4
Real Return Policy Benchmark	1.6	3.2	6.5	7.0	7.6	4.7
Risk Parity:						
Risk Parity Benchmark	0.5	-1.1	8.0	5.1	4.7	
TRS Policy Benchmark	**0.5%**	**0.8%**	**8.5%**	**7.1%**	**8.1%**	**6.3%**

Proprietary & Confidential
Investment advice and consulting services provided by Aon Hewitt Investment Consulting, Inc., an Aon Company.

AON
Empower Results®

2. Market Value Change



Summary of Cash Flow

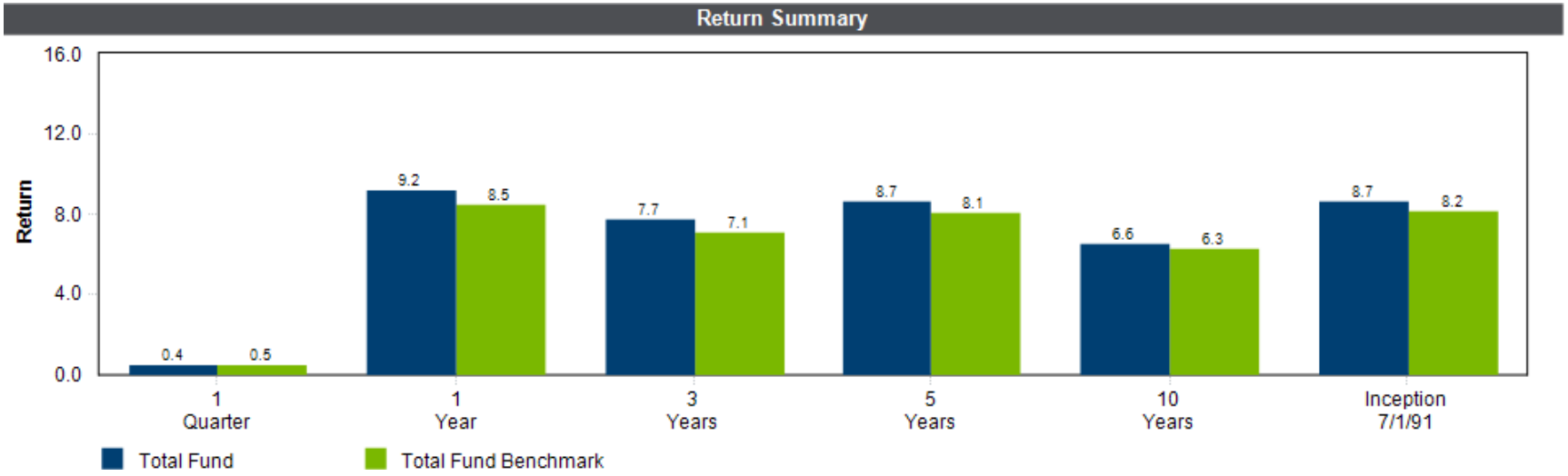
	1 Quarter	1 Year	3 Years	5 Years
Total Fund				
Beginning Market Value	151,438,006,376	142,039,096,944	131,466,247,364	115,949,007,780
+ Additions / Withdrawals	-935,000,000	-3,939,917,811	-10,838,751,979	-19,512,115,686
+ Investment Earnings	678,573,431	13,082,400,673	30,554,084,422	54,744,687,712
= Ending Market Value	**151,181,579,806**	**151,181,579,806**	**151,181,579,806**	**151,181,579,806**

3. Asset Allocation Detail

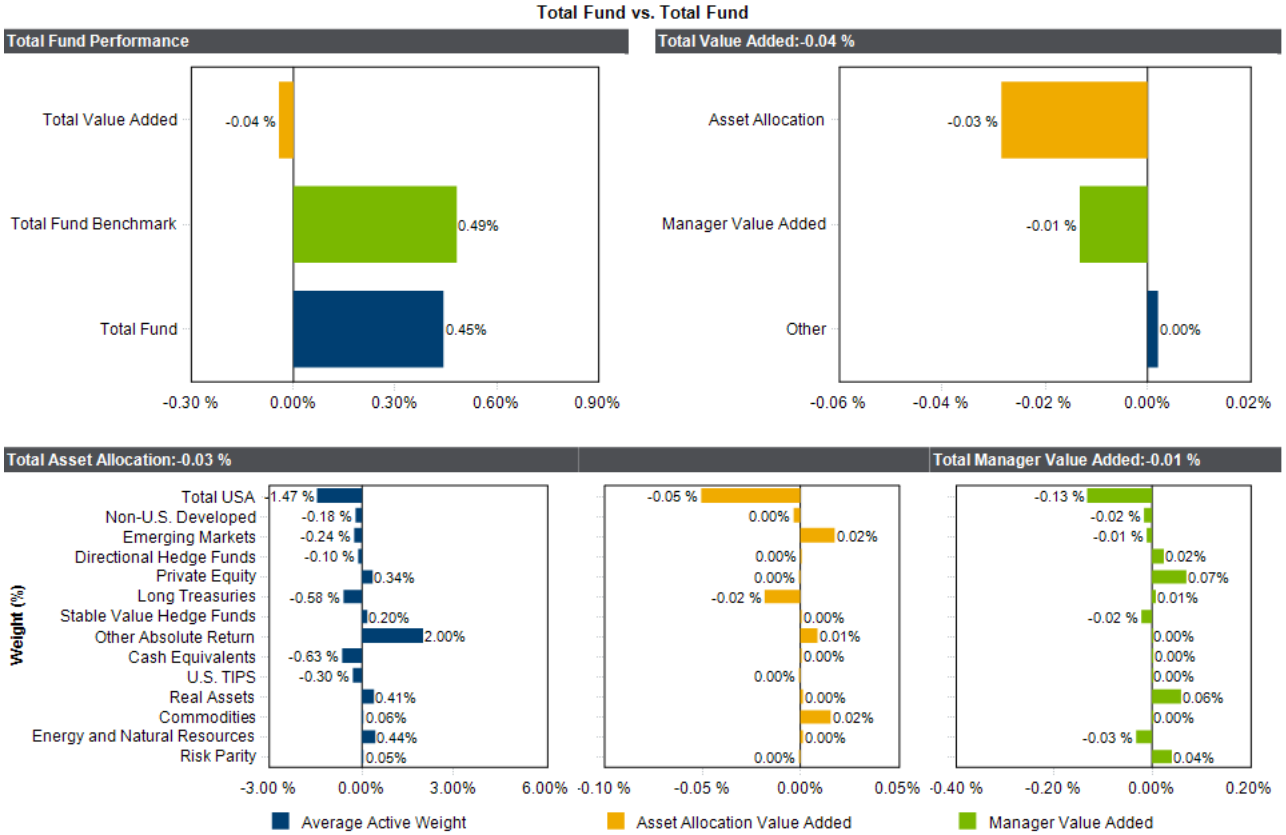
	Market Value ($ in millions) as of 6/30/2018		Interim Policy Target	Relative Allocation to Interim Policy Target	Long Term Policy Target	Long Term Policy Ranges
	($)	(%)				
Total Fund	$151,182	**100%**		**---**	**100.0%**	**--**
Total U.S.A.	$26,620	17.6%	18.6%	-1.0%	18.0	13-23%
Non-U.S. Developed	$20,143	13.3%	13.6%	-0.3%	13.0	8-18%
Emerging Markets	$13,827	9.1%	9.6%	-0.4%	9.0	4-14%
Directional Hedge Funds	$5,994	4.0%	4.0%	-0.0%	4.0	0-10%
Private Equity	$19,935	13.2%	12.9%	+0.3%	13.0	8-18%
Global Equity	$86,520	**57.2%**	**58.7%**	**-1.5%**	**57.0**	**50-64%**
Long Treasuries	$16,392	10.8%	11.6%	-0.8%	11.0	0-20%
Stable Value Hedge Funds	$6,508	4.3%	4.0%	+0.3%	4.0	0-10%
Absolute Return (including OAR)	$3,378	2.2%	0.0%	+2.2%	0.0	0-20%
Cash	$508	0.3%	1.0%	-0.7%	1.0	0-5%
Stable Value	$26,786	**17.7%**	**16.6%**	**+1.1%**	**16.0**	**11-21%**
TIPS	$4,949	3.3%	3.6%	-0.3%	3.0	0-8%
Real Assets	$17,833	11.8%	11.6%	+0.2%	14.0	9-19%
Energy, Natural Resource and Inf.	$7,385	4.9%	4.5%	+0.4%	5.0	0-10%
Commodities	$32	0.0%	0.0%	+0.0%	0.0	0-5%
Real Return	$30,199	**20.0%**	**19.7%**	**+0.3%**	**22.0**	**17-27%**
Risk Parity	$7,677	5.1%	5.0%	+0.1%	5.0	0-10%
Risk Parity	$7,677	**5.1%**	**5.0%**	**+0.1%**	**5.0**	**0-10%**

Note: Asset allocation information shown above is based upon PureView reporting. The excess returns shown above may not be a perfect difference between the actual and benchmark returns due entirely to rounding.

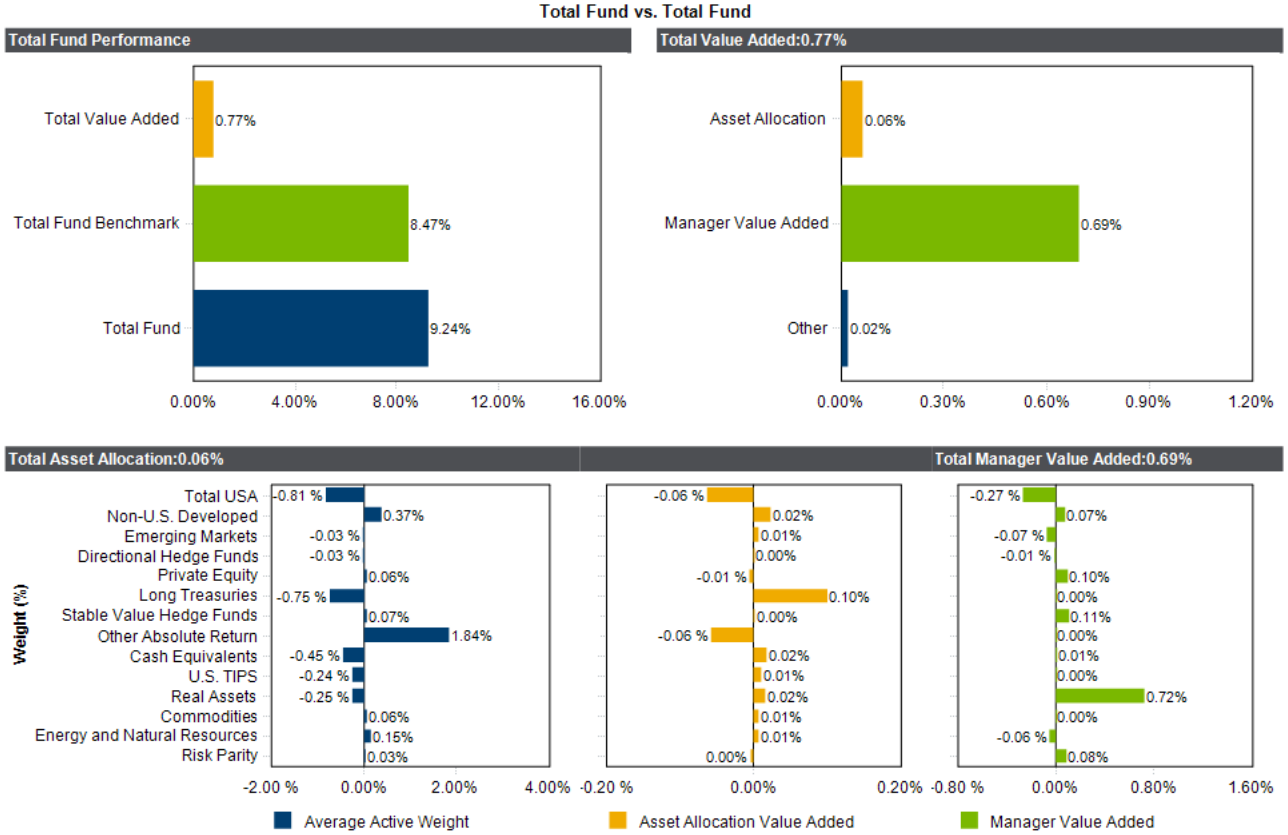
4. Total TRS Performance Ending 6/30/2018



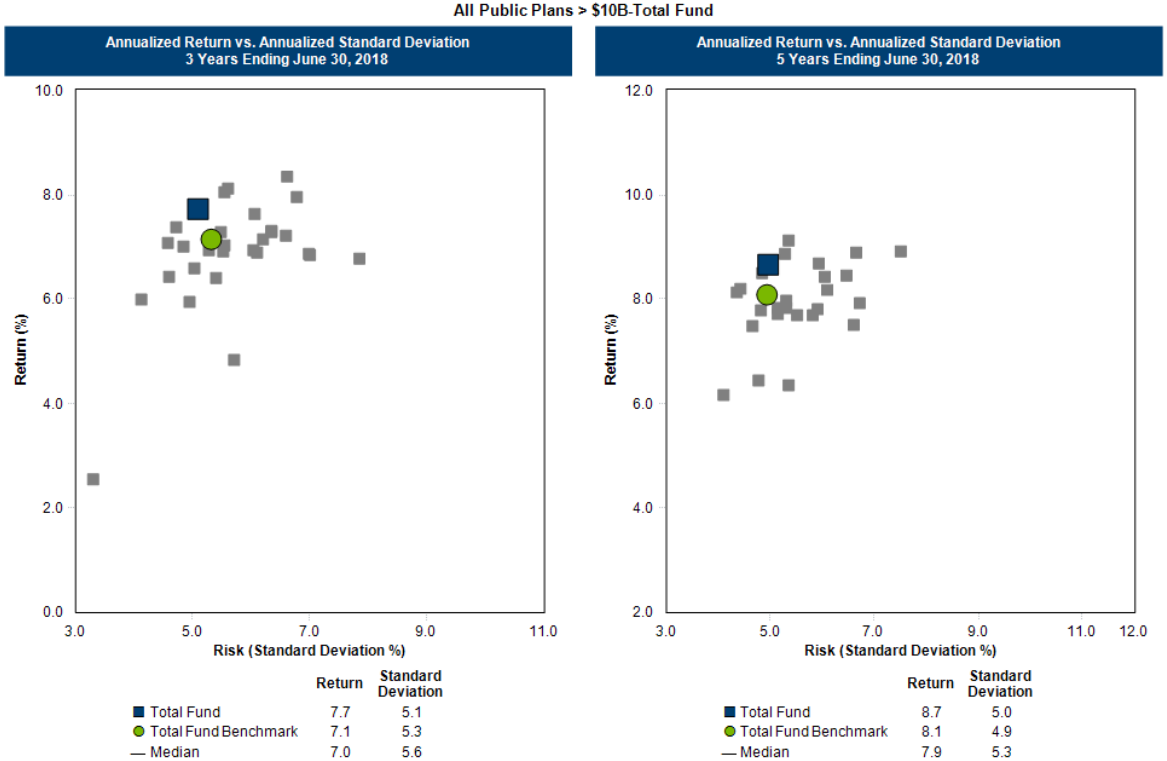
5. Total Fund Attribution – One Quarter Ending 6/30/2018



5. Total Fund Attribution – One Year Ending 6/30/2018

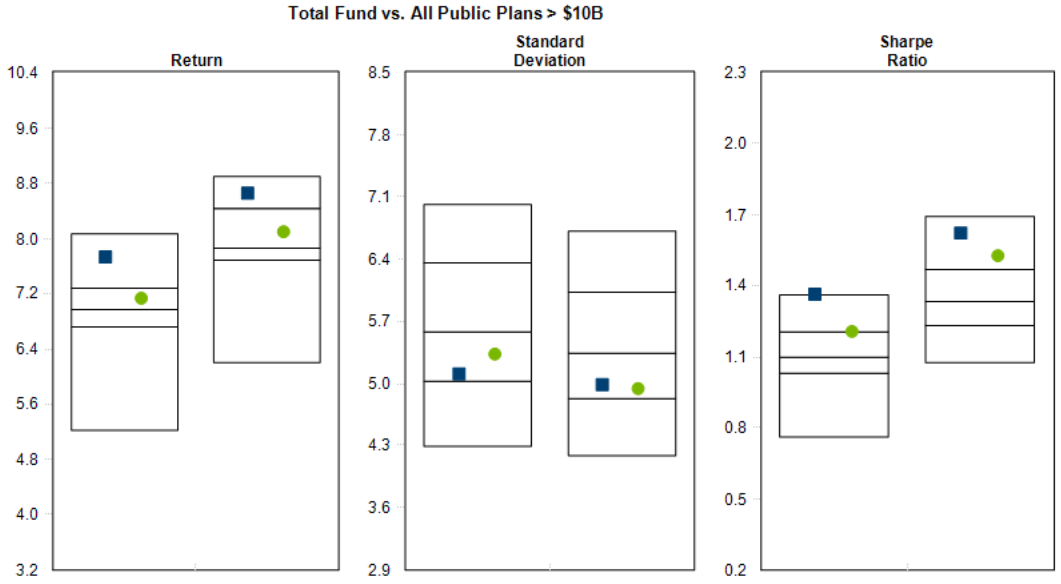


6. Risk Profile: Total Fund Risk-Return vs. Peers



Note: Public Plan peer group composed of 28 and 26 public funds with total assets in excess of $10B as of 6/30/2018 respectively for the periods above. An exhibit outlining the asset allocation of the peer portfolios is provided in the appendix of this report.

6. Risk Profile: Trailing 3-Year and 5-Year Risk Metrics Peer Comparison



	Return 3 Years	Return 5 Years	Standard Deviation 3 Years	Standard Deviation 5 Years	Sharpe Ratio 3 Years	Sharpe Ratio 5 Years
■ Total Fund	7.7 (14)	8.7 (17)	5.1 (74)	5.0 (71)	1.4 (5)	1.6 (9)
● Total Fund Benchmark	7.1 (38)	8.1 (41)	5.3 (70)	4.9 (71)	1.2 (26)	1.5 (19)
5th Percentile	8.1	8.9	7.0	6.7	1.4	1.7
1st Quartile	7.3	8.4	6.4	6.0	1.2	1.5
Median	7.0	7.9	5.6	5.3	1.1	1.3
3rd Quartile	6.7	7.7	5.0	4.8	1.0	1.2
95th Percentile	5.2	6.2	4.3	4.2	0.8	1.1
Population	28	26	28	26	28	26

Proprietary & Confidential
Investment advice and consulting services provided by Aon Hewitt Investment Consulting, Inc., an Aon Company.

Empower Results®

7. Global Equity: Performance Summary Ending 6/30/2018

	Second Quarter	YTD	One Year	Three Years	Five Years
Total Global Equity	**-0.1%**	**0.7%**	**10.9%**	**8.0%**	**9.5%**
Global Equity Benchmark	0.1	0.8	11.3	8.3	9.4
Difference	*-0.2*	*-0.1*	*-0.4*	*-0.3*	*+0.1*
Total U.S. Equity	**3.2**	**2.7**	**13.4**	**9.9**	**11.9**
Total U.S. Equity Benchmark	4.0	3.3	14.9	11.6	13.4
Difference	*-0.8*	*-0.6*	*-1.5*	*-1.7*	*-1.5*
Non-U.S. Equity	**-3.9**	**-4.1**	**7.5**	**5.6**	**6.4**
Non-U.S. Benchmark	-3.8	-4.4	7.6	5.3	5.9
Difference	*-0.1*	*+0.3*	*-0.1*	*+0.3*	*+0.5*
Non-U.S. Developed	**-0.9**	**-2.4**	**7.5**	**4.9**	**7.1**
MSCI EAFE + Canada	-0.7	-2.8	7.0	4.9	6.2
Difference	*-0.2*	*+0.4*	*+0.5*	*+0.0*	*+0.9*
Emerging Markets	**-8.1**	**-6.6**	**7.5**	**6.2**	**5.5**
MSCI Emerging Markets	-8.0	-6.7	8.2	5.6	5.0
Difference	*-0.1*	*+0.1*	*-0.7*	*+0.6*	*+0.5*

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

7. Global Equity: Performance Summary Ending 6/30/2018 (cont'd)

	Second Quarter	YTD	One Year	Three Years	Five Years
Directional Hedge Funds	**1.0%**	**0.9%**	**4.9%**	**2.1%**	**3.9%**
HFRI Fund of Funds Composite Index	0.4	0.7	5.1	1.9	3.5
Difference	*+0.6*	*+0.2*	*-0.2*	*+0.2*	*+0.4*
Total Public Equity	**-0.7**	**-1.0**	**9.6**	**7.1**	**8.5**
Public Equity Benchmark	-0.3	-0.8	10.4	7.6	8.7
Difference	*-0.4*	*-0.2*	*-0.8*	*-0.5*	*-0.2*
Total Private Equity	**2.0**	**6.8**	**15.2**	**11.6**	**13.8**
Private Equity Benchmark	1.4	6.4	14.1	11.0	11.7
Difference	*+0.6*	*+0.4*	*+1.1*	*+0.6*	*+2.1*

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

8. Stable Value: Performance Summary Ending 6/30/2018

	Second Quarter	YTD	One Year	Three Years	Five Years
Total Stable Value	**0.5%**	**-0.8%**	**2.3%**	**5.0%**	**5.7%**
Total Stable Value Benchmark	0.5	-1.7	1.0	3.0	4.1
Difference	*+0.0*	*+0.9*	*+1.3*	*+2.0*	*+1.6*
Long Treasuries	**0.4**	**-2.8**	**-0.2**	**3.6**	**5.1**
Treasury Benchmark	0.3	-3.0	-0.1	3.4	4.5
Difference	*+0.1*	*+0.2*	*-0.1*	*+0.2*	*+0.6*
Stable Value Hedge Funds	**0.5**	**2.6**	**6.7**	**5.4**	**5.3**
Hedge Funds Benchmark	1.0	1.6	4.1	1.9	3.0
Difference	*-0.5*	*+1.0*	*+2.6*	*+3.5*	*+2.3*
Other Absolute Return	**0.8**	**2.9**	**5.8**	**6.2**	**8.8**
Other Absolute Return Benchmark	1.1	2.1	3.8	3.1	2.8
Difference	*-0.3*	*+0.8*	*+2.0*	*+3.1*	*+6.0*
Cash Equivalents	**0.9**	**1.6**	**2.7**	**2.1**	**2.7**
Cash Benchmark	0.5	0.8	1.4	0.7	0.4
Difference	*+0.4*	*+0.8*	*+1.3*	*+1.4*	*+2.3*

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

9. Real Return: Performance Summary Ending 6/30/2018

	Second Quarter	YTD	One Year	Three Years	Five Years
Total Real Return	**1.9%**	**4.6%**	**10.1%**	**9.1%**	**8.9%**
Real Return Benchmark	1.6	3.2	6.5	7.0	7.6
Difference	*+0.3*	*+1.4*	*+3.6*	*+2.1*	*+1.3*
TIPS	**0.8**	**0.0**	**2.2**	**2.1**	**1.8**
U.S. TIPS Benchmark	0.8	0.0	2.1	1.9	1.7
Difference	*+0.0*	*+0.0*	*+0.1*	*+0.2*	*+0.1*
Real Assets	**2.5**	**5.9**	**13.4**	**12.0**	**12.5**
Real Asset Benchmark	2.0	3.9	7.1	9.0	10.4
Difference	*+0.5*	*+2.0*	*+6.3*	*+3.0*	*+2.1*
Energy, Natural Resource and Infrastructure	**0.8**	**4.9**	**7.8**	**--**	**--**
Energy and Natural Resources Benchmark	1.4	4.6	9.1	--	--
Difference	*-0.6*	*+0.3*	*-1.3*	--	--
Commodities	**26.5**	**17.4**	**13.0**	**9.5**	**-5.7**
Commodities Benchmark	8.0	10.4	30.0	-4.4	-9.4
Difference	*+18.5*	*+7.0*	*-17.0*	*+13.9*	*+3.7*

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

10. Risk Parity: Performance Summary Ending 6/30/2018

	Second Quarter	YTD	One Year	Three Years	Five Years
Total Risk Parity	**1.3%**	**-0.5%**	**9.7%**	**6.5%**	**6.8%**
Risk Parity Benchmark	0.5	-1.1	8.0	5.1	4.7
Difference	*+0.8*	*+0.6*	*+1.7*	*+1.4*	*+2.1*

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

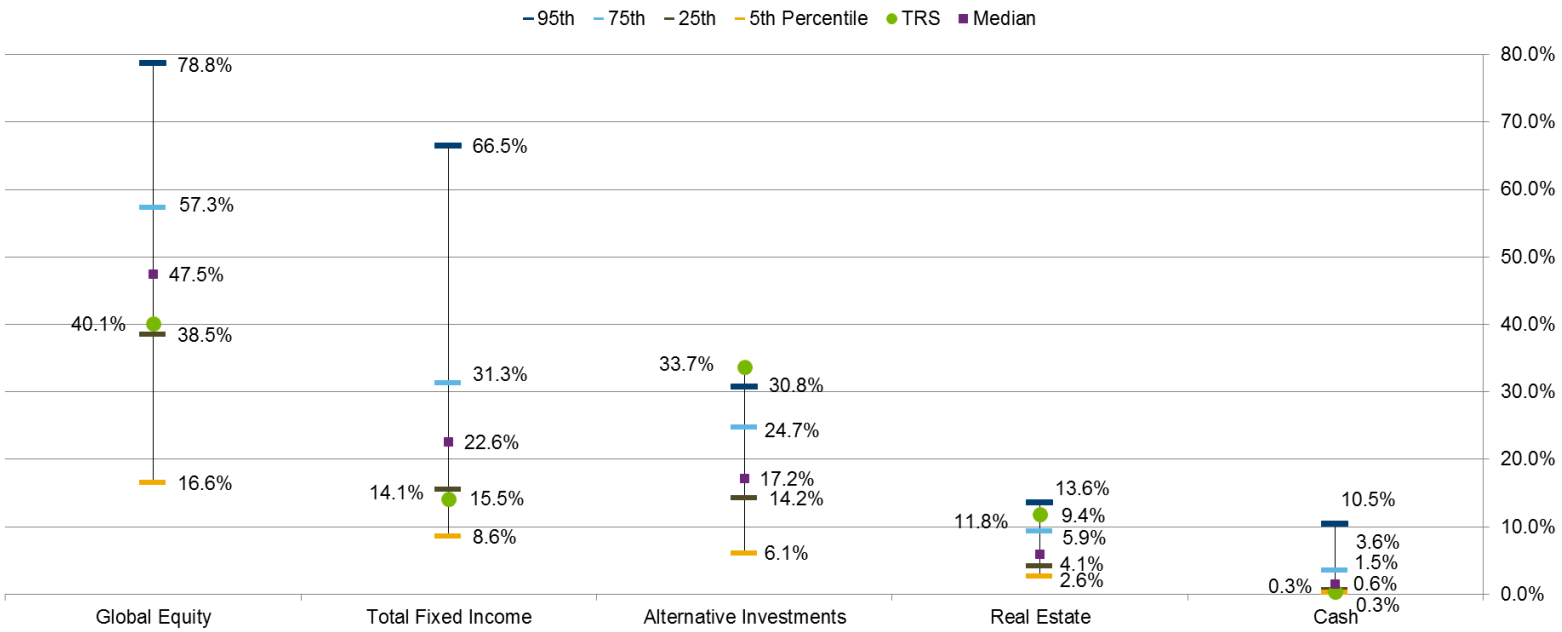
Appendix – Supplemental Reporting

Proprietary & Confidential
Investment advice and consulting services provided by Aon Hewitt Investment Consulting, Inc., an Aon Company.

Empower Results®

TRS Commitment Levels vs. Peers (>$10 Billion) as of 6/30/2018

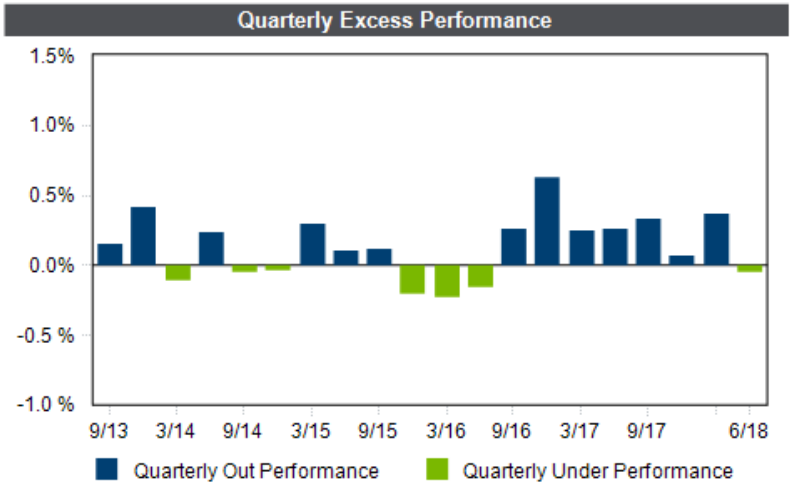
- The chart below depicts the asset allocation of peer public funds with assets greater than $10 billion.
  - The ends of each line represent the 95th and 5th percentile of exposures, the middle light blue and grey lines represent the 25th and 75th percentile of exposures, the purple square represents the median, and the green dot represents TRS exposure.

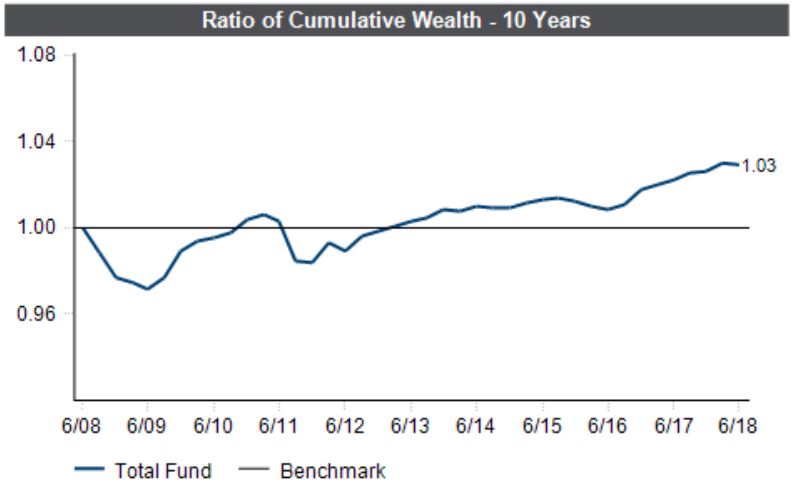


Note: The Public Plan peer universe had 29 observations for the second quarter 2018.

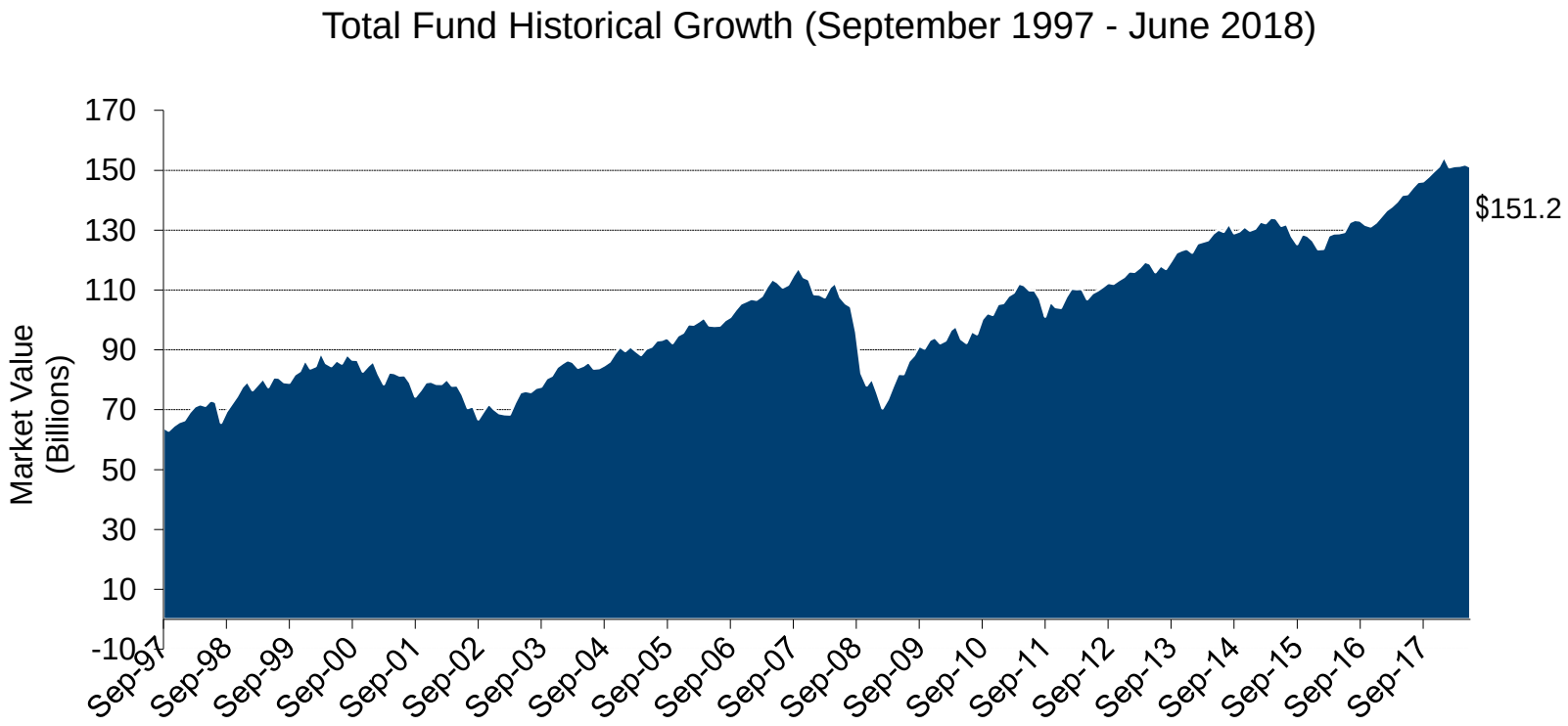
Historical Excess Performance Ending 6/30/2018

Quarterly and Cumulative Excess Performance
Total Fund vs. Total Fund Benchmark





TRS Asset Growth



Proprietary & Confidential
Investment advice and consulting services provided by Aon Hewitt Investment Consulting, Inc., an Aon Company.

Empower Results®

External Manager Program:
Public Equity Performance as of 6/30/2018

	Allocation ($ in billions)	Second Quarter	YTD	One Year	Three Years
EP Total Global Equity	**$29.7**	**-1.4%**	**-1.5%**	**8.8%**	**6.9%**
EP Global Equity Benchmark	--	-1.2	-1.4	9.3	7.0
Difference	--	*-0.2*	*-0.1*	*-0.5*	*-0.1*
EP U.S.A.	**$5.3**	**3.6**	**3.5**	**12.3**	**9.4**
EP U.S.A. Benchmark	--	4.0	3.3	14.9	11.6
Difference	--	*-0.4*	*+0.2*	*-2.6*	*-2.2*
EP Non-U.S. Developed	**$5.2**	**-0.9**	**-3.0**	**7.9**	**6.6**
MSCI EAFE + Canada Index	--	-0.7	-2.8	7.0	4.9
Difference	--	*-0.2*	*-0.2*	*+0.9*	*+1.7*
EP Emerging Markets	**$6.9**	**-8.5**	**-6.8**	**7.5**	**6.5**
MSCI Emerging Markets Index	--	-8.0	-6.7	8.2	5.6
Difference	--	*-0.5*	*-0.1*	*-0.7*	*+0.9*
EP World Equity	**$6.3**	**0.1**	**-0.6**	**11.2**	**8.6**
EP World Equity Benchmark	--	0.6	-0.3	11.1	8.5
Difference	--	*-0.5*	*-0.3*	*+0.1*	*+0.1*
EP Directional Hedge Funds	**$6.0**	**1.0**	**0.9**	**4.9**	**2.1**
HFRI Fund of Funds Composite Index	--	0.4	0.7	5.1	1.9
Difference	--	*+0.6*	*+0.2*	*-0.2*	*+0.2*

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

External Manager Program:
Stable Value/Total Program Performance as of 6/30/2018

	Allocation ($ in billions)	Second Quarter	YTD	One Year	Three Years
EP Total Stable Value	**$6.5**	**0.5%**	**2.6%**	**6.3%**	**5.5%**
EP Stable Value Benchmark	--	1.0	1.6	4.1	1.9
Difference	--	*-0.5*	*+1.0*	*+2.2*	*+3.6*
EP Stable Value Hedge Funds	**$6.5**	**0.5**	**2.6**	**6.7**	**5.4**
EP Stable Value Hedge Funds Benchmark	--	1.0	1.6	4.1	1.9
Difference	--	*-0.5*	*+1.0*	*+2.6*	*+3.5*
Total External Public Program	**$36.2**	**-1.1**	**-0.8**	**8.4**	**6.7**
EP External Public Benchmark	--	-0.8	-0.9	8.5	6.2
Difference	--	*-0.3*	*+0.1*	*-0.1*	*+0.5*

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

Public Strategic Partnership Program (SPN): Performance Summary as of 6/30/2018

The Public SPNs in aggregate outperformed the benchmark during the first quarter and also over the trailing one and three-year periods.

	Allocation ($ in billions)	Second Quarter	YTD	One Year	Three Years
Public Strategic Partnership	**$8.1**	**-0.4%**	**-0.9%**	**8.6%**	**7.1%**
Public SPN Benchmark	--	0.2%	-0.8%	7.9%	6.9%
Difference	--	*-0.6*	*-0.1*	*+0.7*	*+0.2*
Blackrock	**$2.1**	**0.2%**	**0.3%**	**10.2%**	**8.4%**
J.P. Morgan	**$2.1**	**-1.2%**	**-2.4%**	**7.8%**	**7.4%**
Neuberger Berman	**$2.0**	**-0.3%**	**-1.2%**	**8.6%**	**6.4%**
Morgan Stanley	**$1.9**	**-0.3%**	**-0.1%**	**7.6%**	**6.2%**

Note: The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

Benchmarks

- Total Fund Performance Benchmark – 18.6% MSCI U.S.A. IMI, 13.6% MSCI EAFE plus Canada Index, 9.6% MSCI Emerging Markets Index, 4.0% HFRI FoF Composite Index, 12.9% State Street Private Equity Index (1 quarter lagged), 11.6% Blmb. Barc. Long Term Treasury Index, 4.0% HFRI FoF Conservative Index, 1.0% Citigroup 3 Mo. T-Bill Index, 3.6% Blmb. Barc. U.S. TIPS Index, 11.6% NCREIF ODCE Index (1 quarter lagged), 4.5% Energy and Natural Resources Benchmark, and 5.0% Risk Parity Benchmark

- Global Equity Benchmark – 31.7% MSCI U.S.A. IMI, 23.2% MSCI EAFE plus Canada Index, 16.3% MSCI Emerging Markets Index, 6.8% HFRI FoF Composite Index, and 22.0% State Street Private Equity Index (1 quarter lagged)
  - TF U.S. Equity Benchmark - MSCI U.S.A. Investable Markets Index (IMI)
  - Emerging Markets Equity Benchmark – MSCI Emerging Markets Index
  - Non-US Developed Equity Benchmark– MSCI EAFE + Canada Index
  - Directional Hedge Funds – HFRI Fund of Funds (FoF) Composite Index
  - Private Equity Benchmark - State Street Private Equity Index (1 quarter lagged)

Note: Returns and market values (based on account level) reported are provided by State Street. Net additions/withdrawals are reported on a gross (adjusted for expenses) total fund level as provided by State Street. All rates of return for time periods greater than one year are annualized. The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

Benchmarks (cont'd)

- Stable Value Benchmark – 69.9% Blmb. Barc. Long Term Treasury Index, 24.1% HFRI FoF Conservative Index, and 6.0% Citigroup 3 mo. T-Bill.
  - US Treasuries Benchmark – Bloomberg Barclays Long Term Treasury Index
  - Stable Value Hedge Funds – HFRI Fund of Funds (FoF) Conservative Index
  - Other Absolute Return Benchmark - 3 Mo. LIBOR + 2%
  - Cash Benchmark - Citigroup 3 Mo. Treasury Bill Index

- Real Return Benchmark – 58.9% NCREIF ODCE Index, 18.2% Blmb. Barc. U.S. TIPS Index, and 22.9% Energy & Natural Resources Benchmark
  - Real Assets Benchmark – NCREIF ODCE Index (1 quarter lagged)
  - US TIPS Benchmark – Bloomberg Barclays U.S. TIPS Index
  - Energy and Natural Resources Benchmark – 75% Cambridge Associates Natural Resources Index (reweighted) and 25% quarterly Seasonally-Adjusted Consumer Price Index (1 quarter lagged)
  - Commodities Benchmark – Goldman Sachs Commodity Index

Note: Returns and market values (based on account level) reported are provided by State Street. Net additions/withdrawals are reported on a gross (adjusted for expenses) total fund level as provided by State Street. All rates of return for time periods greater than one year are annualized. The excess returns shown in this presentation may differ from State Street statements due entirely to rounding. These differences are generally within a few basis points and are not material.

Description of Performance Attribution

- A measure of the source of the deviation of a fund's performance from that of its policy benchmark. Each bar on the attribution graph represents the contribution made by the asset class to the total difference in performance. A positive value for a component indicates a positive contribution to the aggregate relative performance. A negative value indicates a detrimental impact. The magnitude of each component's contribution is a function of (1) the performance of the component relative to its benchmark, and (2) the weight (beginning of period) of the component in the aggregate.
- The individual Asset Class effect, also called **Selection Effect**, is calculated as

  Actual Weight of Asset Class x (Actual Asset Class Return – Asset Class Benchmark Return)
- The bar labeled **Allocation Effect** illustrates the effect that a Total Fund's asset allocation has on its relative performance. Allocation Effect calculation = (Asset Class Benchmark Return –Total Benchmark Return) x (Actual Weight of Asset Class – Target Policy Weight of Asset Class).
- The bar labeled **Other** is a combination of Cash Flow Effect and Benchmark Effect:
  - **Cash Flow Effect** describes the impact of asset movements on the Total Fund results. Cash Flow Effect calculation = (Total Fund Actual Return – Total Fund Policy Return) – Current Selection Effect – Current Allocation Effect
  - **Benchmark Effect** results from the weighted average return of the asset classes' benchmarks being different from the Total Funds' policy benchmark return. Benchmark Effect calculation = Total Fund Policy Return – (Asset Class Benchmark Return x Target Policy Weight of Asset Class)
- **Cumulative Effect**

  Cumulative Effect calculation = Current Effect t *(1+Cumulative Total Fund Actual Return t-1) +

  Cumulative Effect t-1*(1+Total Fund Benchmark Return t)

Disclaimers and Notes

Disclaimers and Notes

Disclaimers:

- Please review this report and notify Aon Hewitt Investment Consulting (AHIC) with any issues or questions you may have with respect to investment performance or any other matter set forth herein.
- The client portfolio data presented in this report have been obtained from the custodian. AHIC has compared this information to the investment managers' reported returns and believes the information to be accurate. AHIC has not conducted additional audits and cannot warrant its accuracy or completeness. This document is not intended to provide, and shall not be relied upon for, accounting and legal or tax advice.
- Refer to Hedge Fund Research, Inc. www.hedgefundresearch.com for more information on HFR indices

Notes:

- The rates of return contained in this report are shown on an after-fees basis unless otherwise noted. They are geometric and time weighted. Returns for periods longer than one year are annualized.
- Universe percentiles are based upon an ordering system in which 1 is the best ranking and 100 is the worst ranking.
- Due to rounding throughout the report, percentage totals displayed may not sum up to 100.0%. Additionally, individual fund totals in dollar terms may not sum up to the plan totals.

Legal Disclosures and Disclaimers

Investment advice and consulting services provided by Aon Hewitt Investment Consulting, Inc. (“AHIC”). The information contained herein is given as of the date hereof and does not purport to give information as of any other date. The delivery at any time shall not, under any circumstances, create any implication that there has been a change in the information set forth herein since the date hereof or any obligation to update or provide amendments hereto.

This document is not intended to provide, and shall not be relied upon for, accounting, legal or tax advice or investment recommendations. Any accounting, legal, or taxation position described in this presentation is a general statement and shall only be used as a guide. It does not constitute accounting, legal, and tax advice and is based on AHIC’s understanding of current laws and interpretation.

This document is intended for general information purposes only and should not be construed as advice or opinions on any specific facts or circumstances. The comments in this summary are based upon AHIC’s preliminary analysis of publicly available information. The content of this document is made available on an “as is” basis, without warranty of any kind. AHIC disclaims any legal liability to any person or organization for loss or damage caused by or resulting from any reliance placed on that content. AHIC. reserves all rights to the content of this document. No part of this document may be reproduced, stored, or transmitted by any means without the express written consent of AHIC.

© Aon plc 2018. All rights reserved.

TAB 6

Market Update

Jase Auby, Deputy Chief Investment Officer

September 2018

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS
INVESTMENT
MANAGEMENT DIVISION

Executive Summary

- The first half of 2018 was characterized by:
  - Moderate global growth and inflation
  - Tightening global monetary policy in developed markets led by the United States
  - Outperformance of Developed Markets vs. Emerging Markets
  - Geopolitical concerns, including the effect of a possible global trade war on global markets
  - Tighter financial conditions including a stronger US dollar

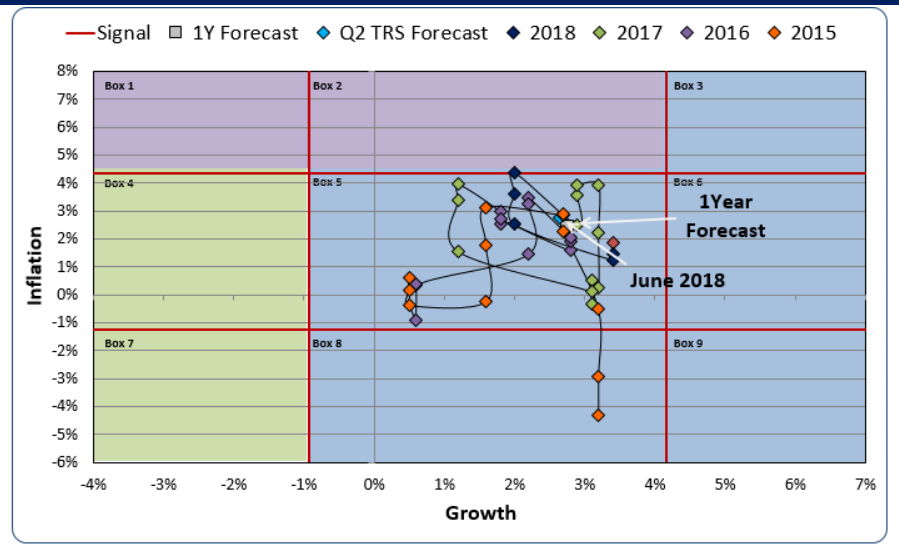
- In the second half of 2018, markets are focused on:
  - Moderation of global growth and close to target inflation
  - Continued tightening in global monetary policy in developed market economies
  - Volatility in global equity markets despite positive fundamental economic variables
  - Developed Markets to gain economic momentum over Emerging Markets
  - Geopolitical issues, specifically political tensions and a potential global trade war

Source: TRS IMD, JP Morgan Asset Management

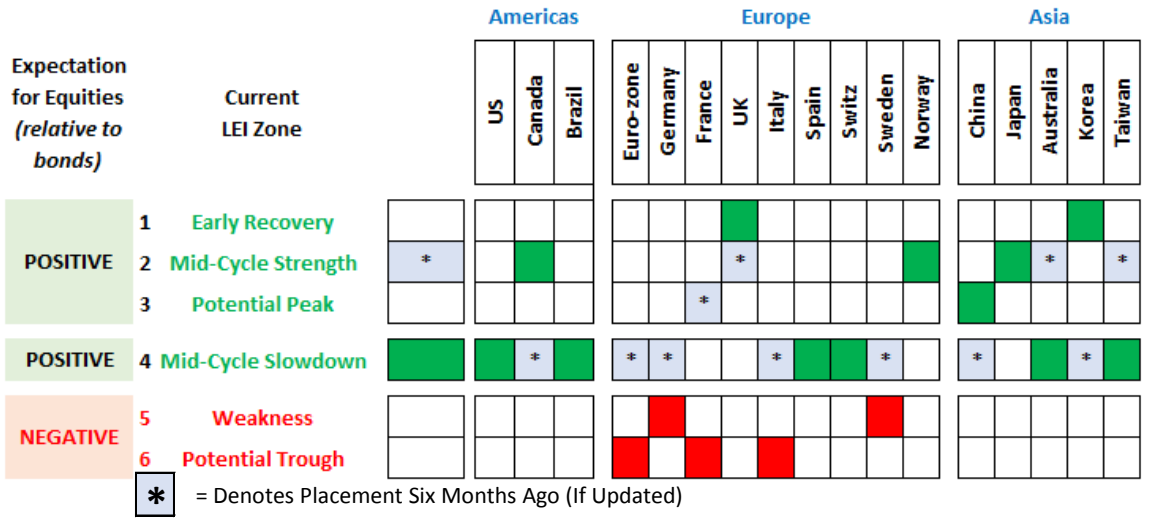
Macroeconomic Update

Inflation, Growth, LEI

USA 9-Box



Leading Economic Indicators



Global 9-Box

	December 2017	March 2018	June 2018
US	Box 5	Box 5	Box 5
Europe	Box 5	Box 5	Box 2
Japan	Box 2	Box 5	Box 5
China	Box 5	Box 5	Box 8
EM ex-China	Box 5	Box 5	Box 5

Government Bond Yields and ERP[1]

Region	10yr gov. bond yields[2]	Equity Risk Premium	
		Current	10-Year Average
USA	2.9%	3.2%	4.6%
Europe	0.5%	6.6%	6.7%
UK	1.3%	5.9%	6.1%
Japan	0.1%	7.4%	6.3%
Emerging Markets	3.3%	4.3%	4.8%

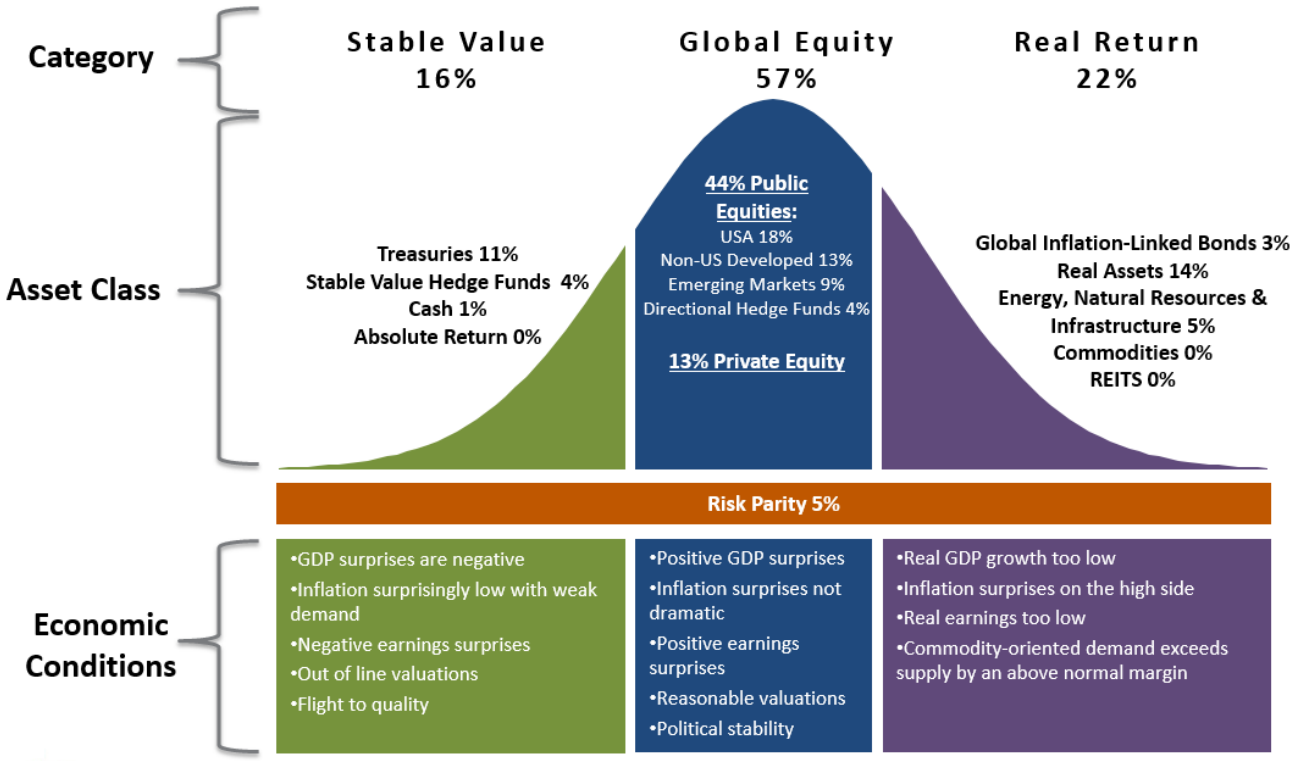
Source: Bloomberg, FactSet, TRS IMD, Blackrock as of 06/30/2018

[1] *Equity Risk Premium is the Earnings Yield on the local market index less applicable 10yr gov. bond yield*

[2] *For USA, 10yr US Treasuries; for Europe, 10yr German gov. bonds; for Japan, 10yr Japanese gov. bonds; for EM, a blend of 10yr Chinese, South Korean, and Brazilian gov. bonds*

TRS Strategic Asset Allocation

Diversification Framework



Strategic Asset Allocation

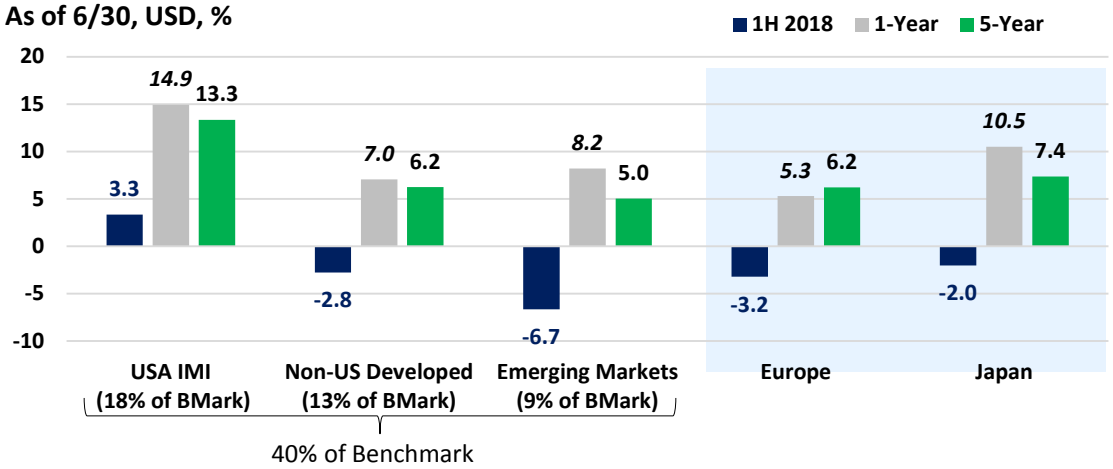
USA	18%	40% Public Equities
Non-US Developed	13%	
Emerging Markets	9%	
Directional Hedge Funds	4%	
Private Equity	13%	
Total Global Equity	**57%**	
US Treasuries	11%	
Absolute Return	0%	
Stable Value Hedge Funds	4%	
Cash	1%	
Total Stable Value	**16%**	
Global Inflation-Linked Bonds	3%	
Real Assets	14%	
Energy, Natural Resources & Infrastructure	5%	
Commodities	0%	
Total Real Return	**22%**	
Total Risk Parity	**5%**	
Total Trust	**100%**	

Source: TRS IMD

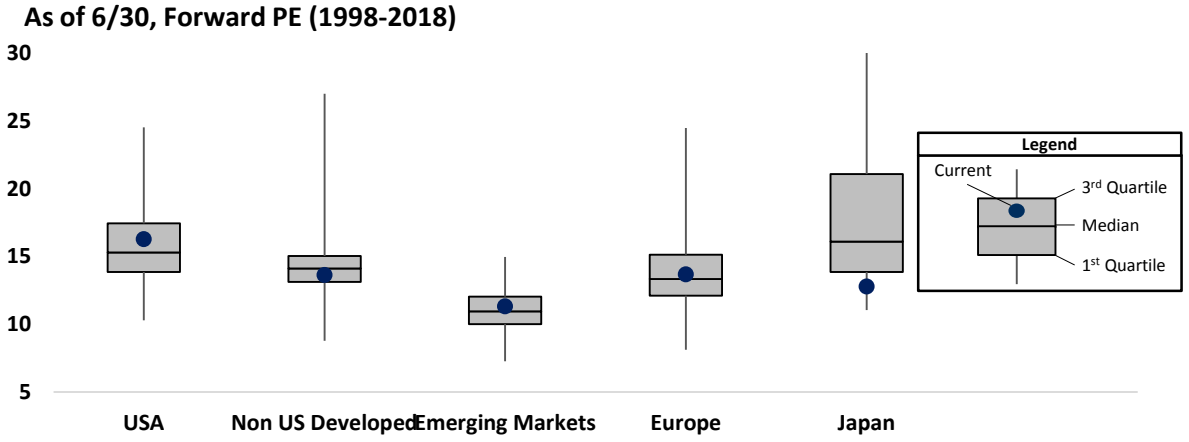
Public Equities

40% of TRS Policy Benchmark

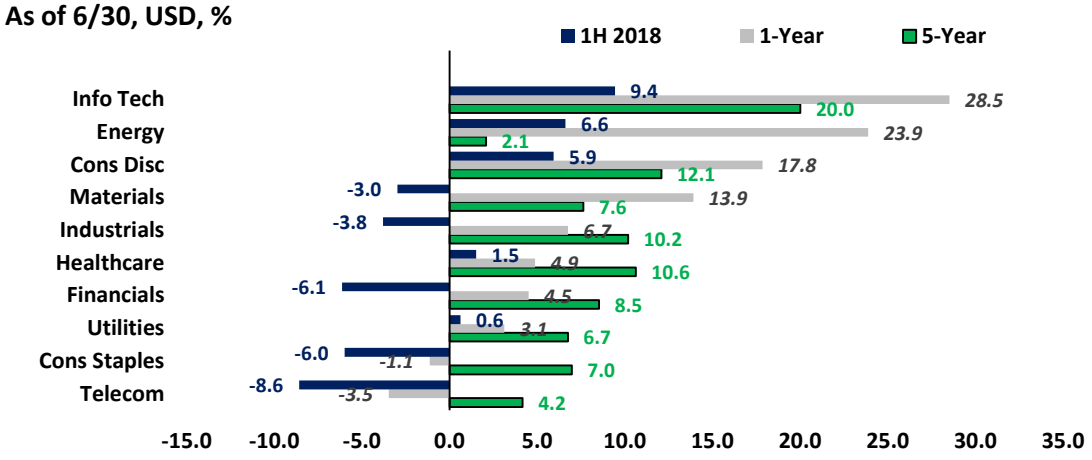
Regional Performance



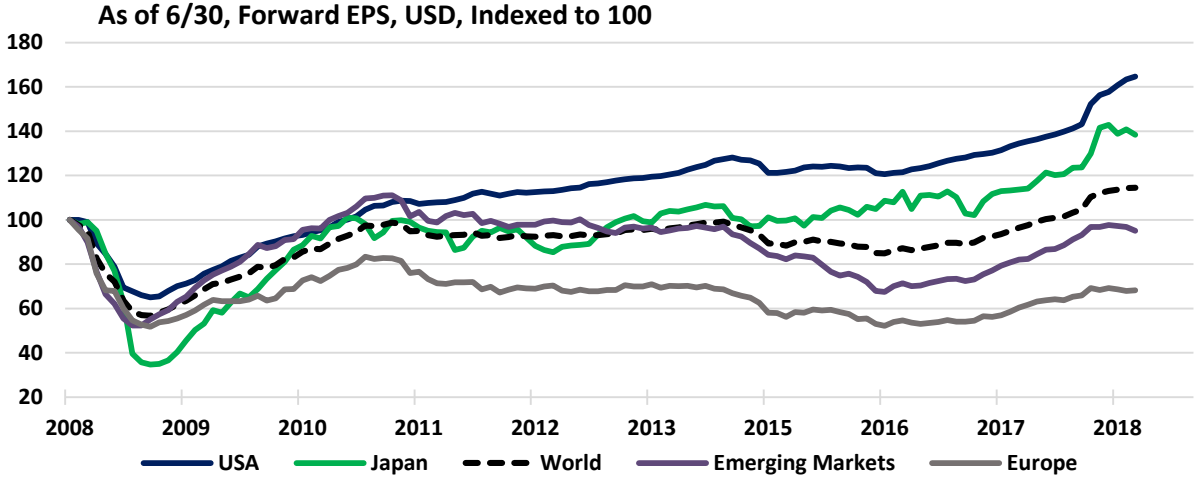
Regional Valuations



Global Sector Performance



Regional Earnings

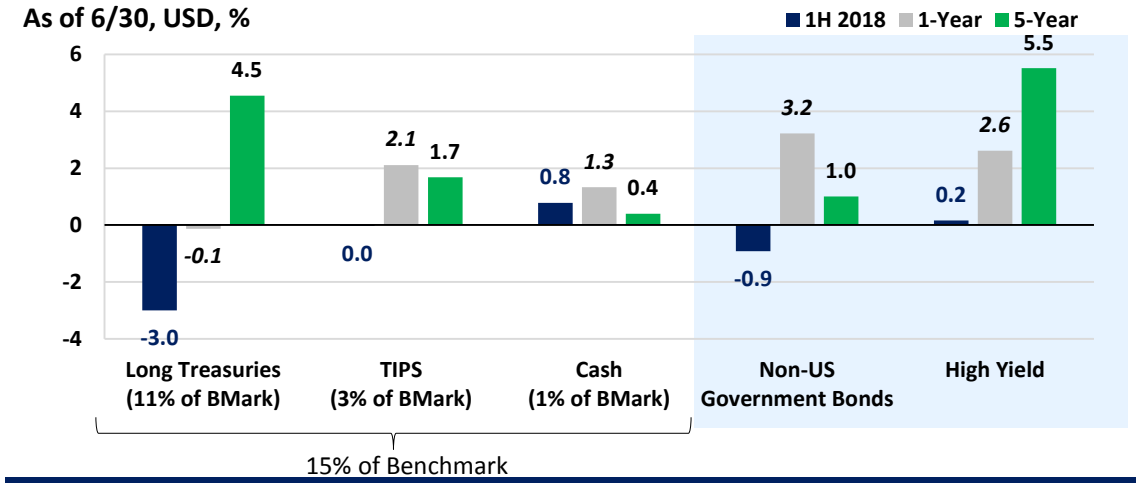


Source: Bloomberg, FactSet
Note: All returns are in US Dollar terms

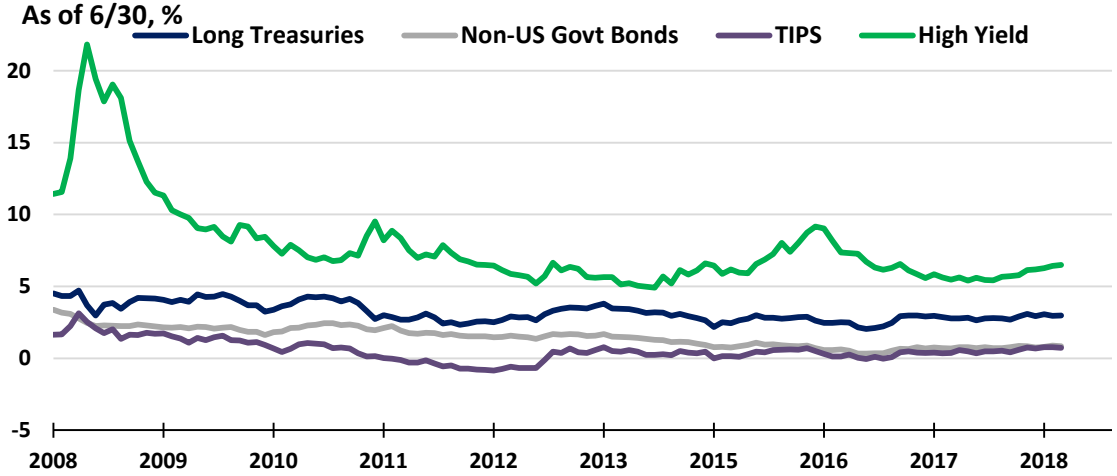
Fixed Income

15% of TRS Policy Benchmark

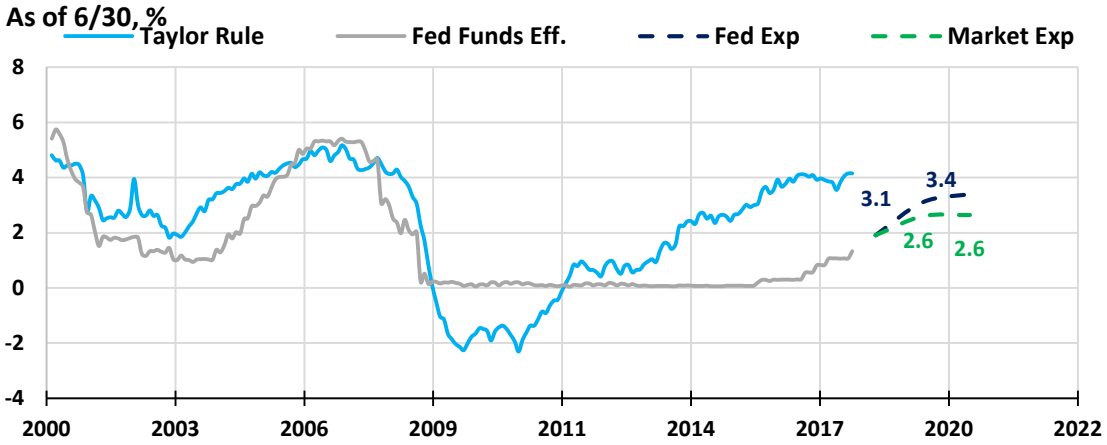
Performance



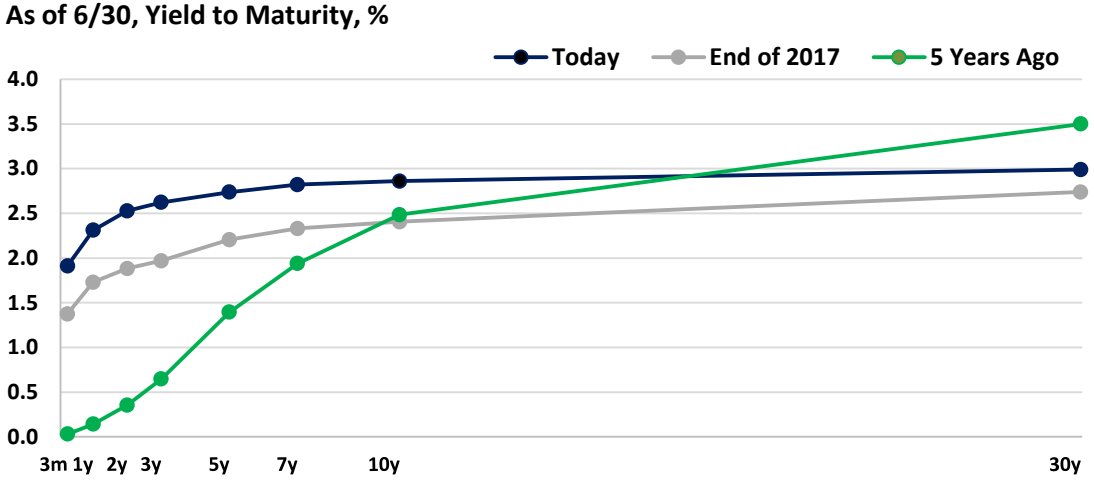
Yields



Cash Rate[1]



US Yield Curve



Source: Bloomberg, MSCI, FactSet (note all returns are in US Dollar terms)

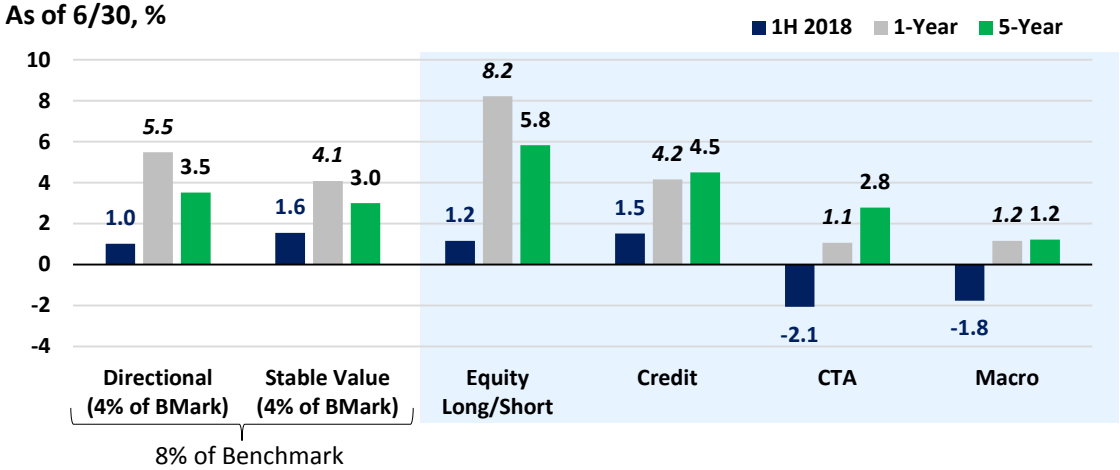
[1]Taylor Rule Definition: A central bank nominal policy rate set equal to a neutral real rate plus the current level of inflation, which responds to changes in the inflation gap (as measured by the difference between the current rate of inflation and the central bank's inflation target) and the output gap (as measured by the difference between NAIRU and the current unemployment rate).

Hedge Funds

8% of TRS Policy Benchmark

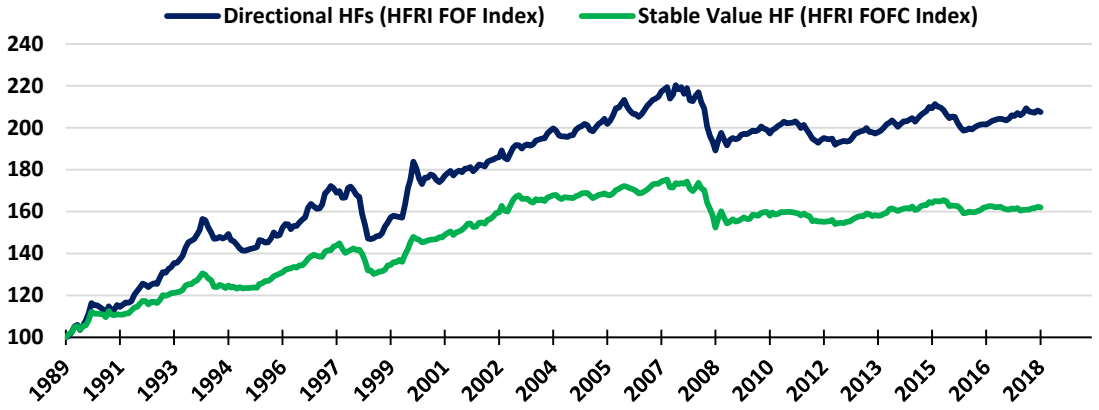
Performance

As of 6/30, %



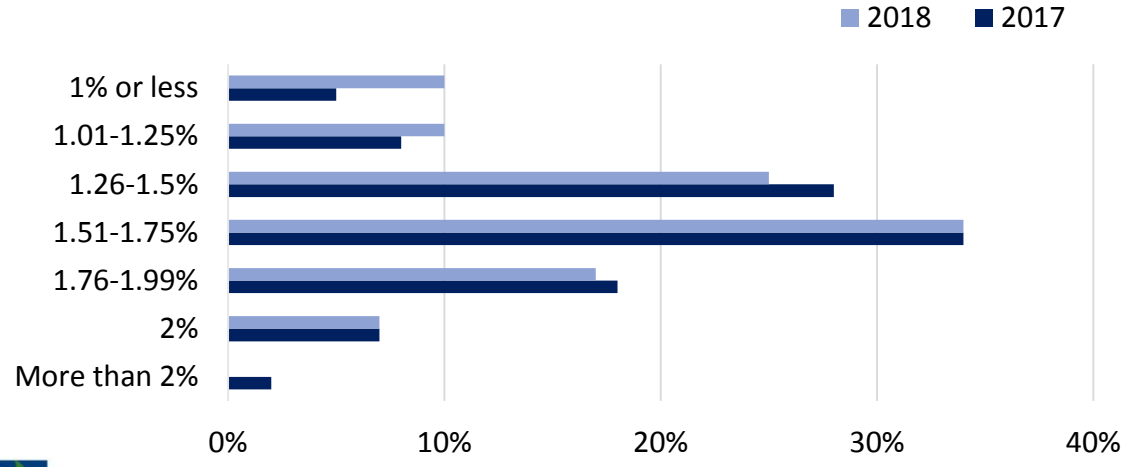
Alpha Versus Equivalent Risk Equity[1]

As of 6/30, Cumulative Jensen's Alpha, Indexed to 100



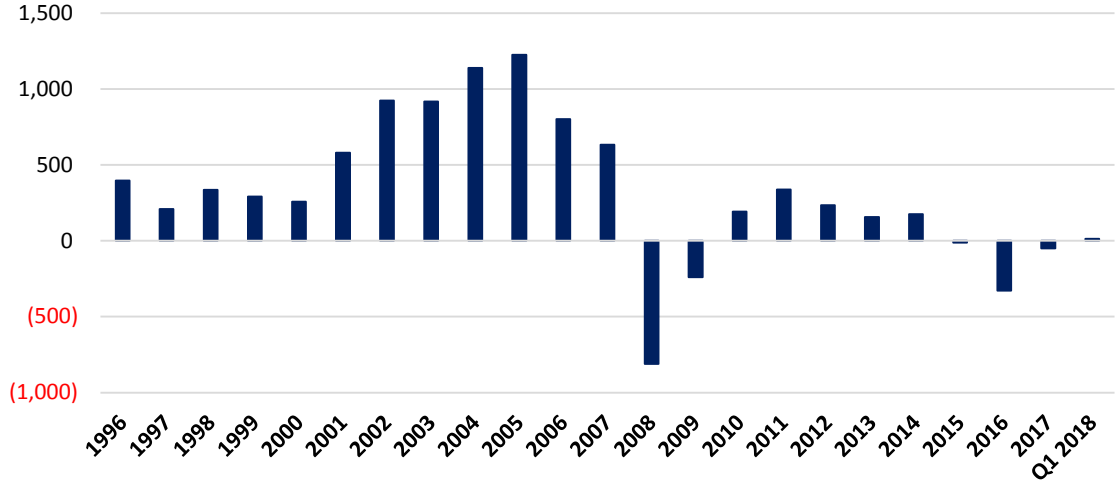
Hedge Fund Management Fees

As of 03/31, Breakdown of Investors Paying Fees (%)



Hedge Fund Launches v. Liquidations

As of 03/31, Count of Net Launches (Launches – Liquidations)



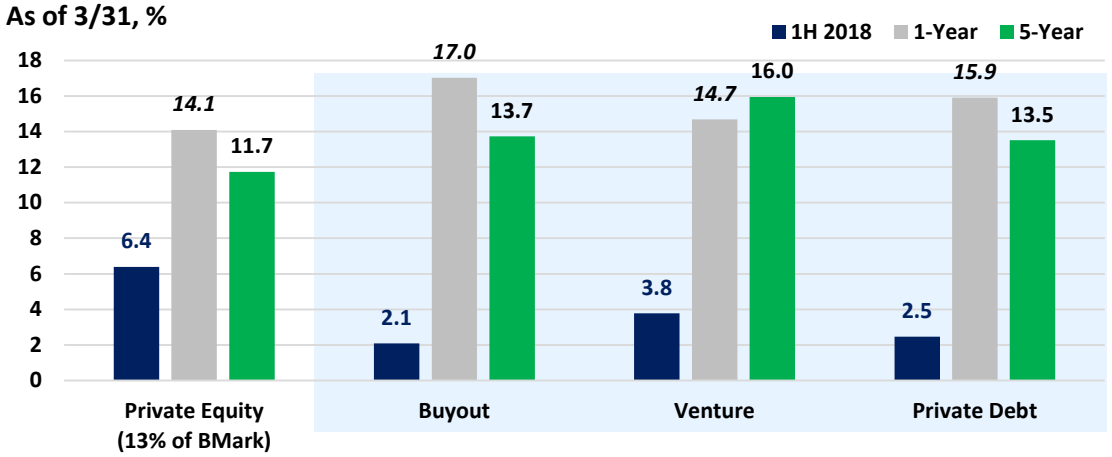
Source: Bloomberg, Financial Times, HFR

[1]Jensen's alpha is a measure of alpha versus the equity market at equivalent risk. For example, if hedge funds are 20% as risky as the market then they are judged to have a 20% equity/80% cash benchmark.

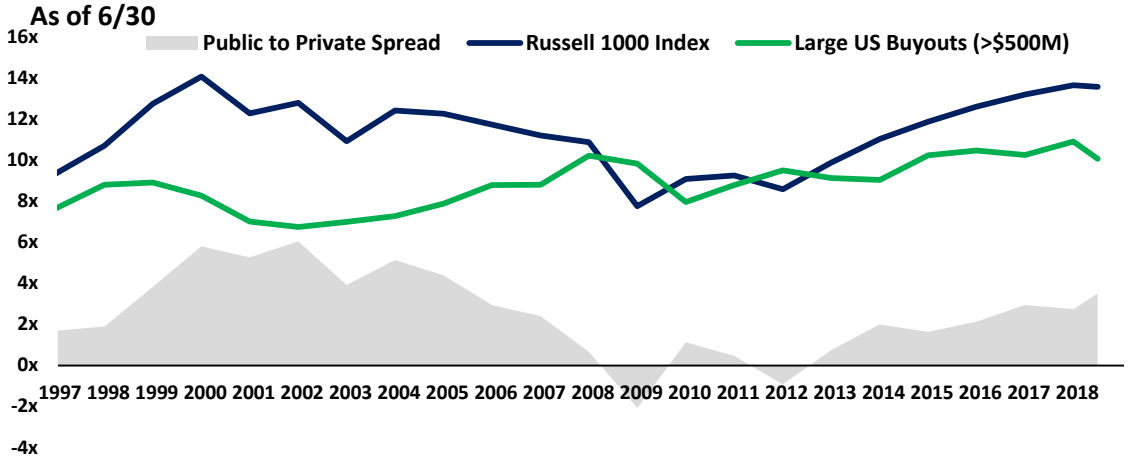
Private Equity

13% of TRS Policy Benchmark

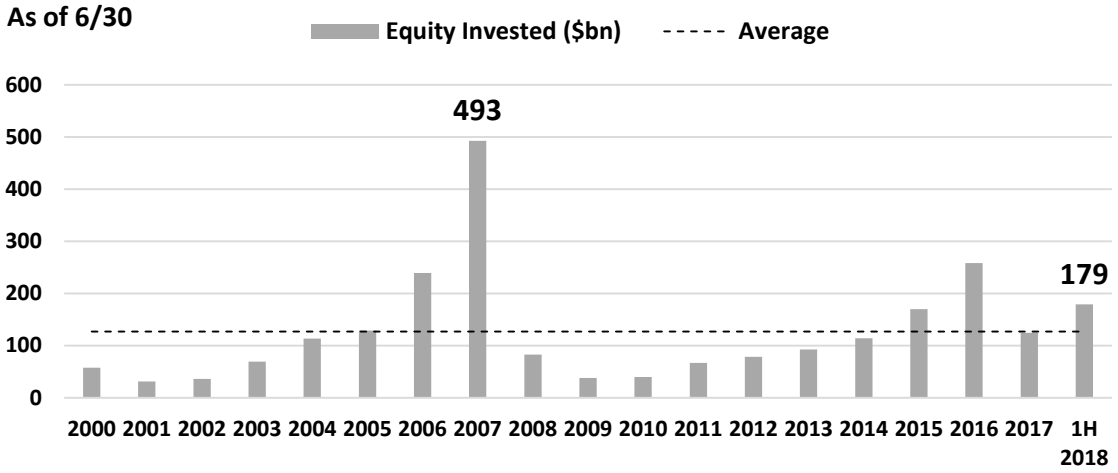
Performance[1]



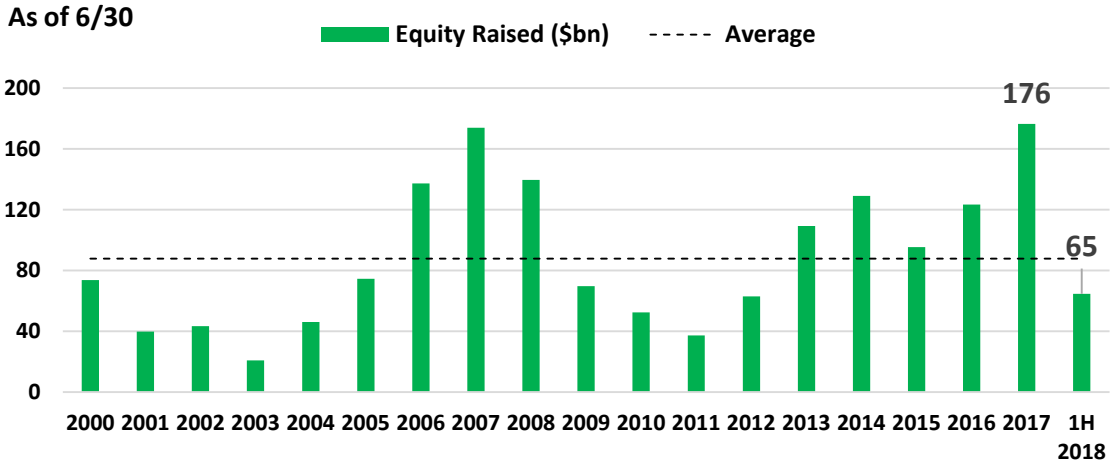
Multiples



Transaction Volume



Fundraising Activity

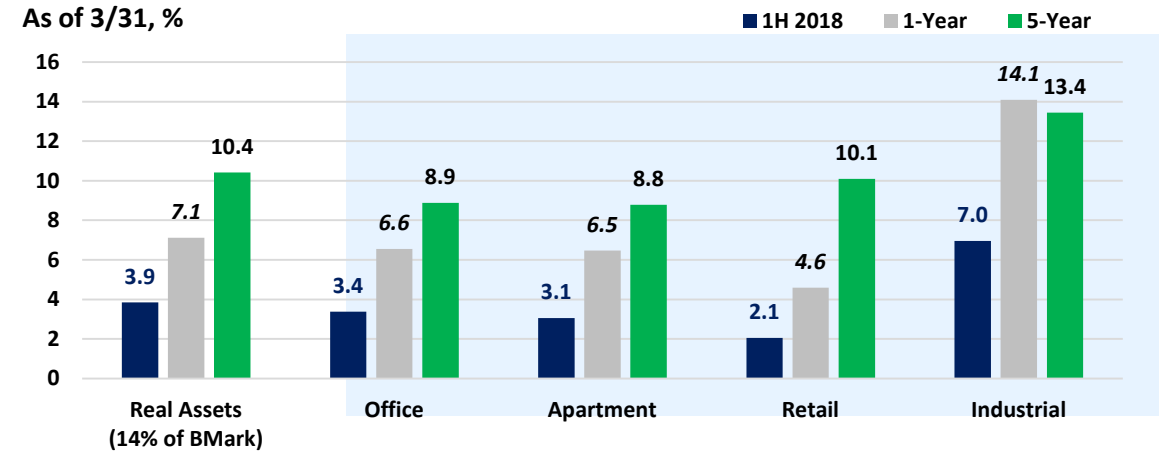


Source: State Street, Preqin, S&P, Dealogic
Market data for US Large Buyout Market unless specified otherwise
[1]PE Benchmark performance shown as TWRs; Strategy performance shown as IRRs (Buyout, Venture, Private Debt). Performance as of Q1 2018

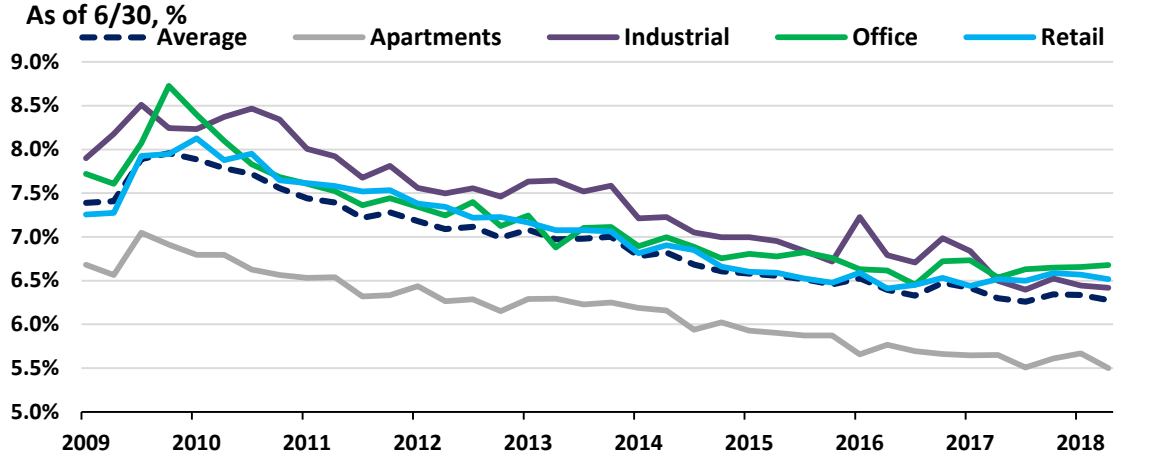
Real Assets

14% of TRS Policy Benchmark

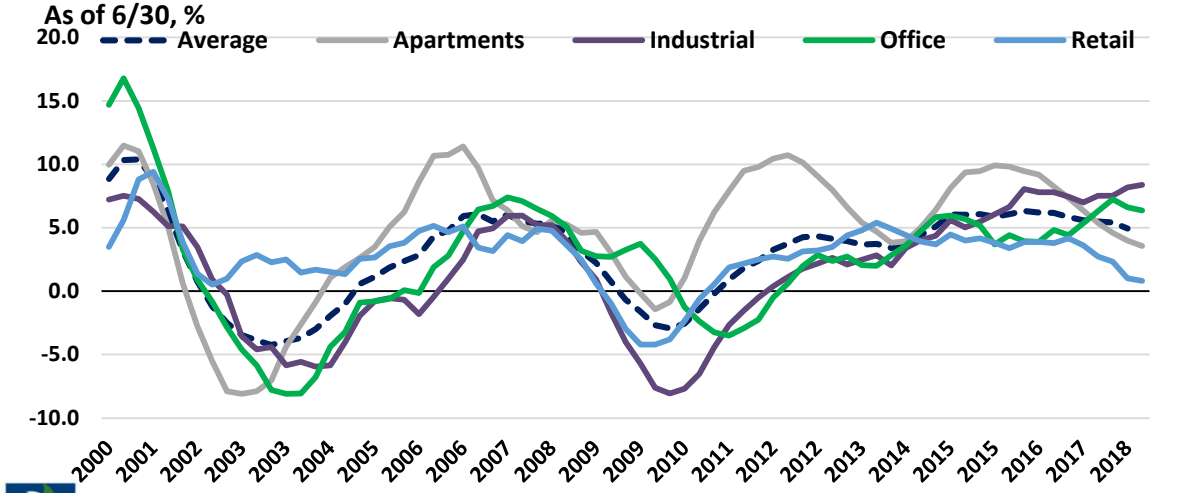
Performance[1]



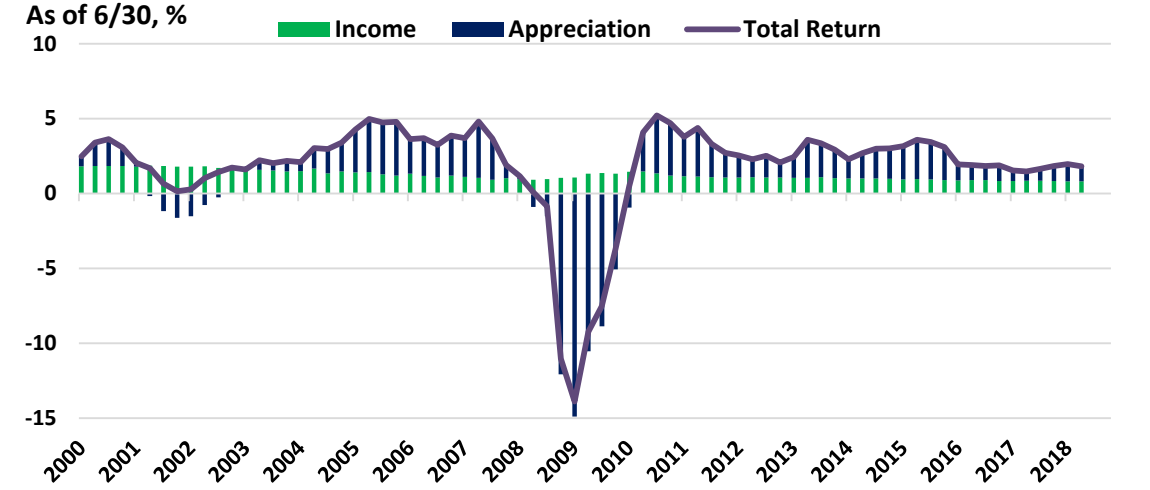
Cap Rates



Income Growth



Composition of Returns



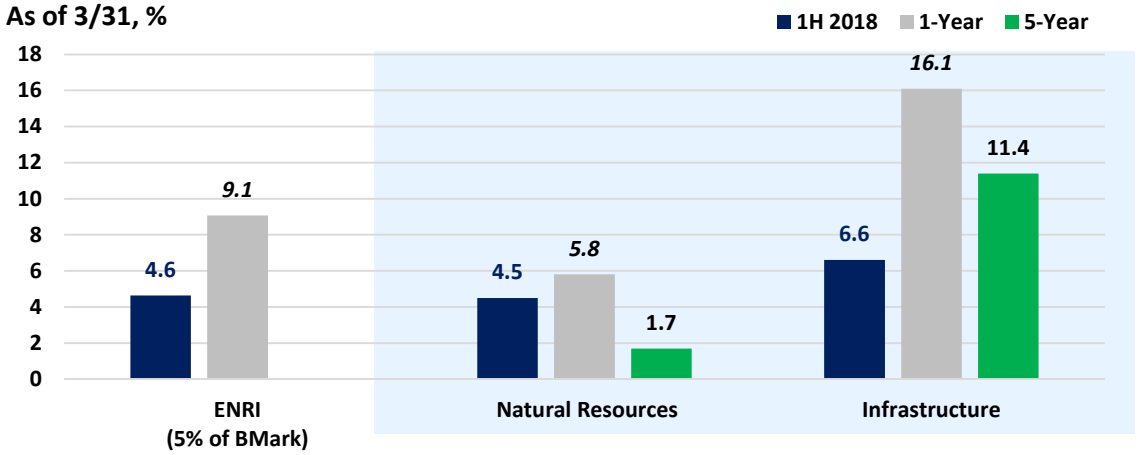
Source: Bloomberg, NCREIF, Real Capital Analytics, State Street

[1]Property Type Return Indices are Property-level indices and do not reflect leverage or asset management fees, whereas NCREIF ODCE is a fund-level index and is levered and net of fees. Returns are for US-based properties only

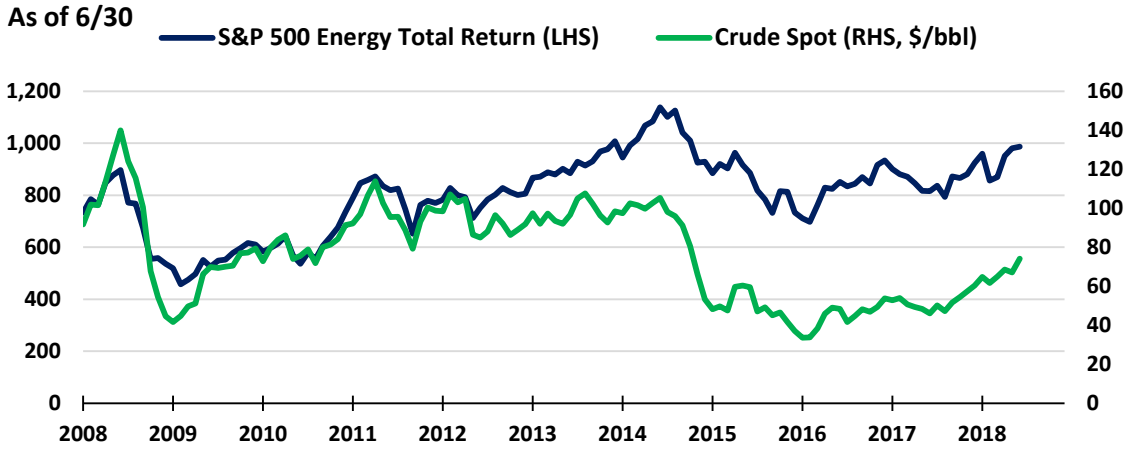
Energy, Natural Resources and Infrastructure

5% of TRS Policy Benchmark

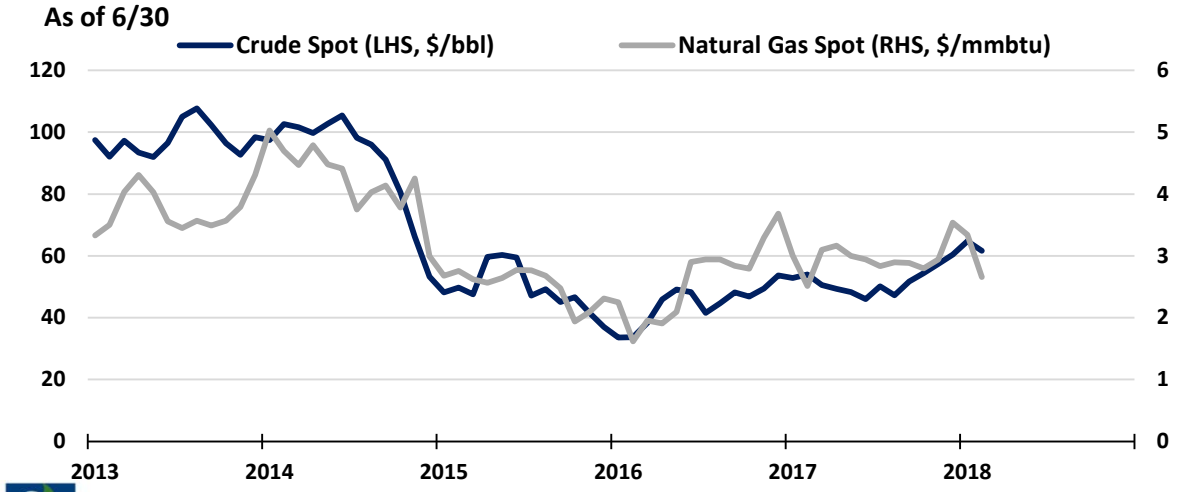
Performance[1]



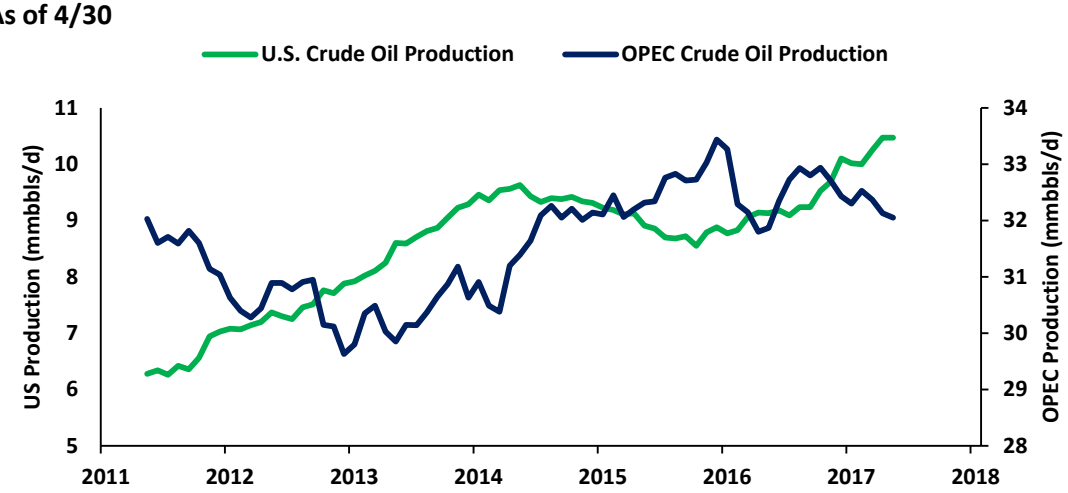
Energy Equity Performance



Energy Prices



Oil Market Production



Source: State Street, Bloomberg, Cambridge, Tudor Pickering Holt, EIA

[1]ENRI Benchmark and Strategy (Natural Resources and Infrastructure) performance shown as IRRs as of Q1 2018

Special Topic: Inflation

TRS

Special Topic: Inflation

Overview

Inflation is the Third Special Topic in Our Ongoing Series

Special Topic	Date
Recession	September 2017
Growth	February 2018
Inflation	**September 2018**
Strategic Asset Allocation	February 2019

Update on Recession Special Topic

As of 6/30

Recession Dashboard

Start of Recession	Yield Curve	Inflation Trends	Job Creation	Credit Perform	ISM Mfg.	Earnings Quality	Housing Market
Nov-73	↓	↓	↓	↓	↓	--	↓
Jan-80	↓	↓	↓	↓	↓	--	↓
Jul-81	↓	↑	↑	↓	↓	--	↓
Jul-90	↓	↓	↓	↓	↓	↓	↓
Mar-01	↓	↓	↓	↓	↓	↓	↔
Dec-07	↓	↓	↔	↓	↓	↓	↓
Present	↑	↔	↑	↑	↑	↑	↑

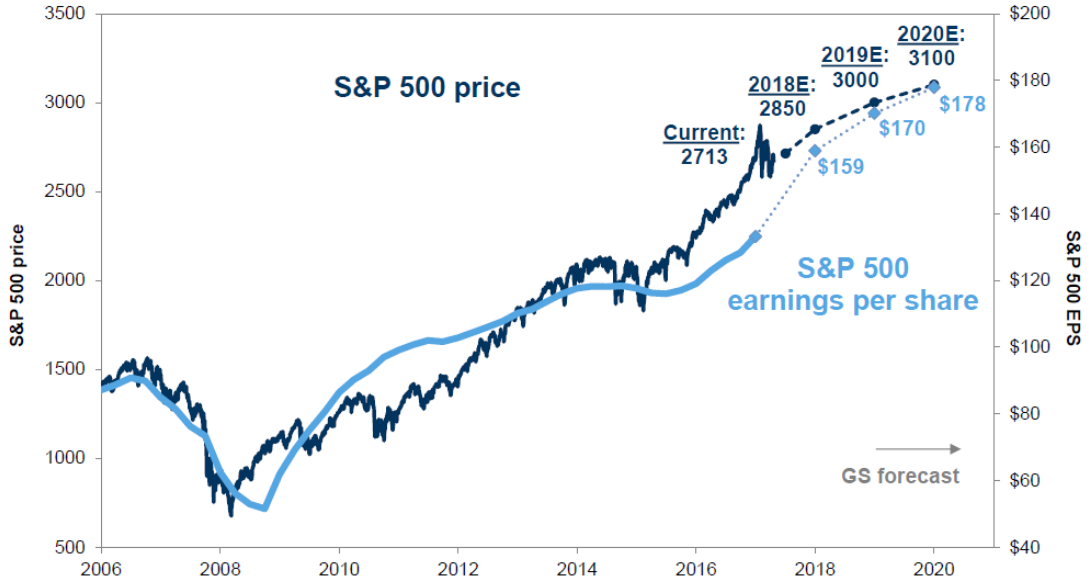
Key: ↓ Recessionary ↑ Expansionary ↔ Neutral

Source: Credit Suisse, Goldman Sachs

Update on Growth Special Topic

As of 6/30

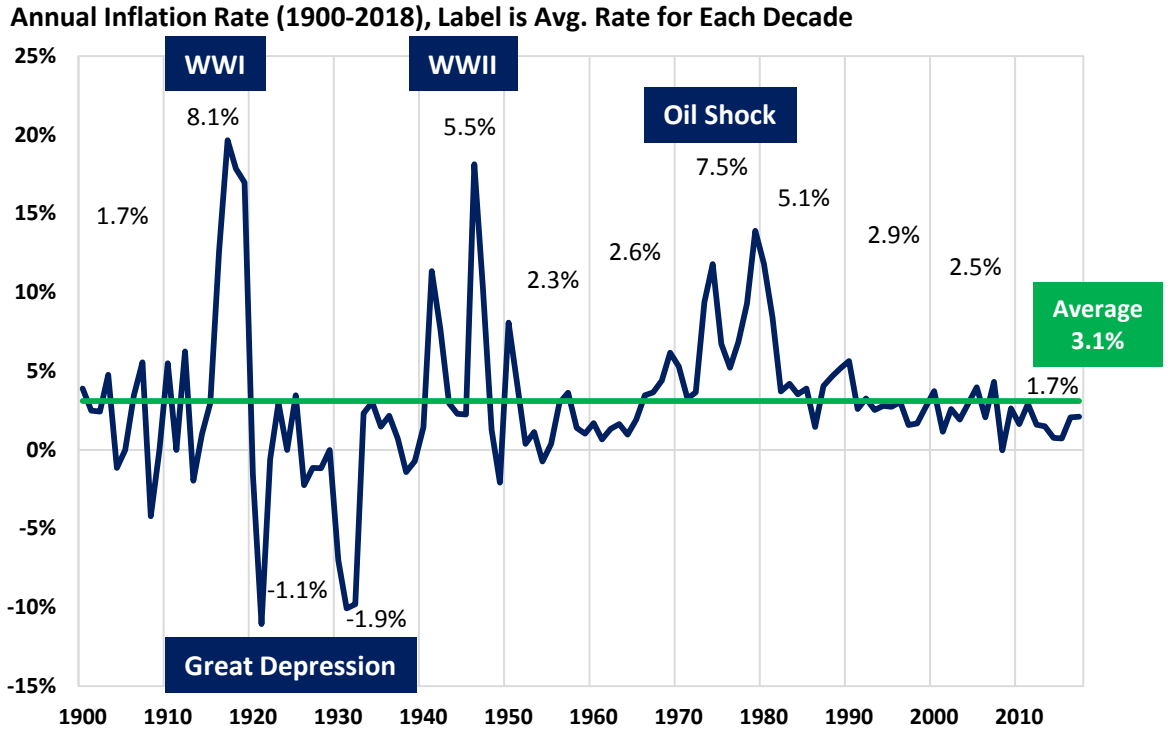
Earnings: S&P 500 earnings and index targets



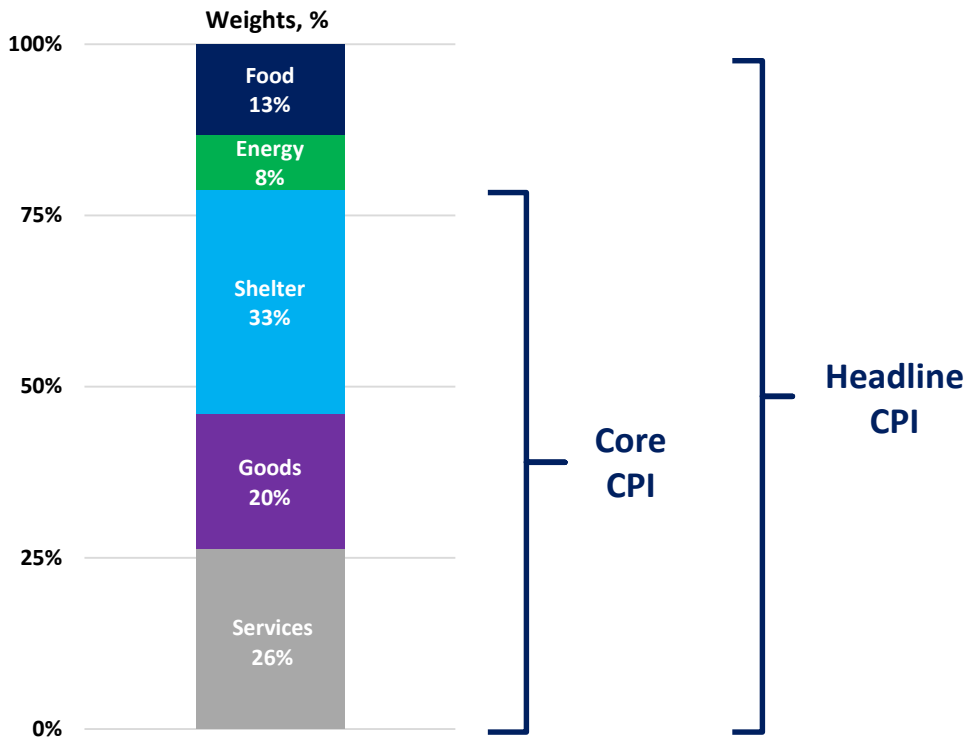
Special Topic: Inflation

What is Inflation?

US Inflation



US Consumer Price Index



- Inflation in the US has been low – the exception is in times of war or major commodity shocks

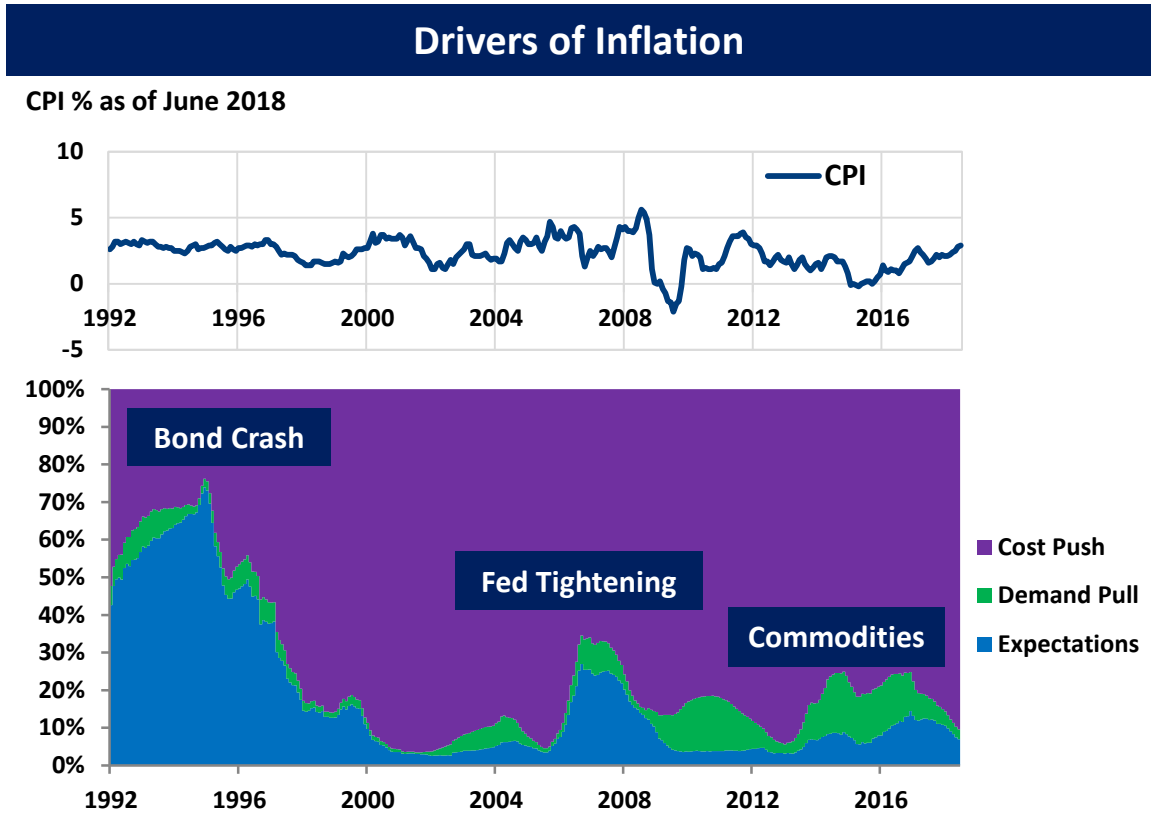
Source: Bloomberg, BLS

Special Topic: Inflation

Three Factor Inflation

- Economists have sought to explain inflation using three factors

Source	Description	Measurement Example
Cost-Push	Costs increase (especially for commodities like oil), directly driving up prices	**Commodities Prices,** Implied goods prices
Demand-Pull	Due to low unemployment, wages and consumer demand increase, driving up prices	**Unemployment,** The "Phillips Curve"
Expectations	Market expectations for future inflation and Federal Reserve actions	**Sentiment Surveys,** Inflation rate implied by TIPS market



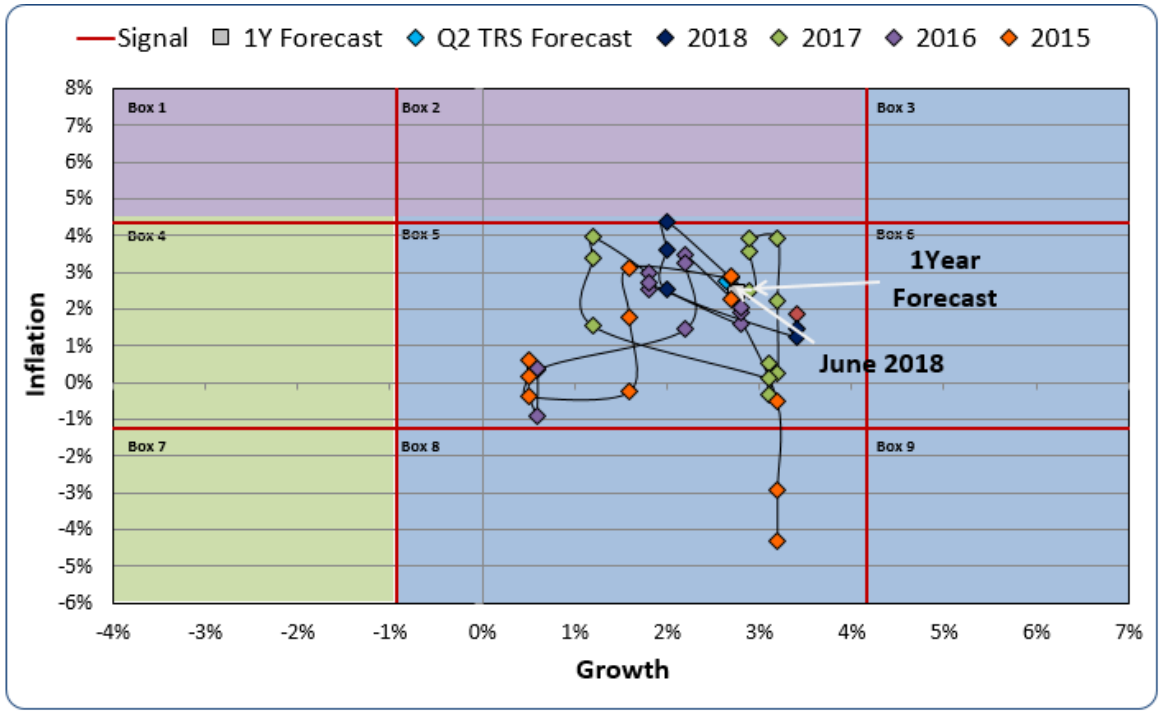
"Part of the reason inflation sends a weaker signal is undoubtedly the achievement of anchored inflation **expectations** and the related flattening of the **Phillips curve** [emphasis added]." – Fed Chairman Jerome Powell, 8/24/18

Source: Haver Analytics, JPMAM Multi-Asset Solutions

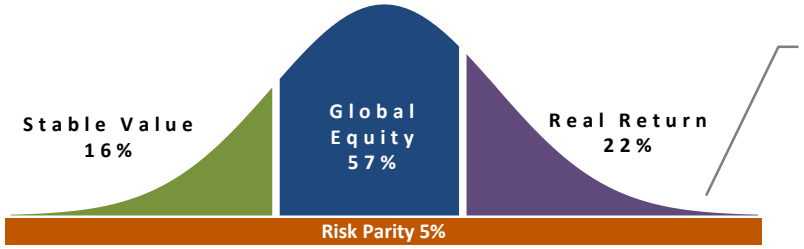
Special Topic: Inflation

Growth and Inflation

TRS Considers Growth and Inflation...



Key:



Global Inflation-Linked Bonds	3%
Real Assets	14%
ENRI	5%
Commodities	0%
Total Real Return	**22%**

Source: TRS IMD

...Because They Impact Our Asset Classes

Assets Expected to Do Well in Each Environment

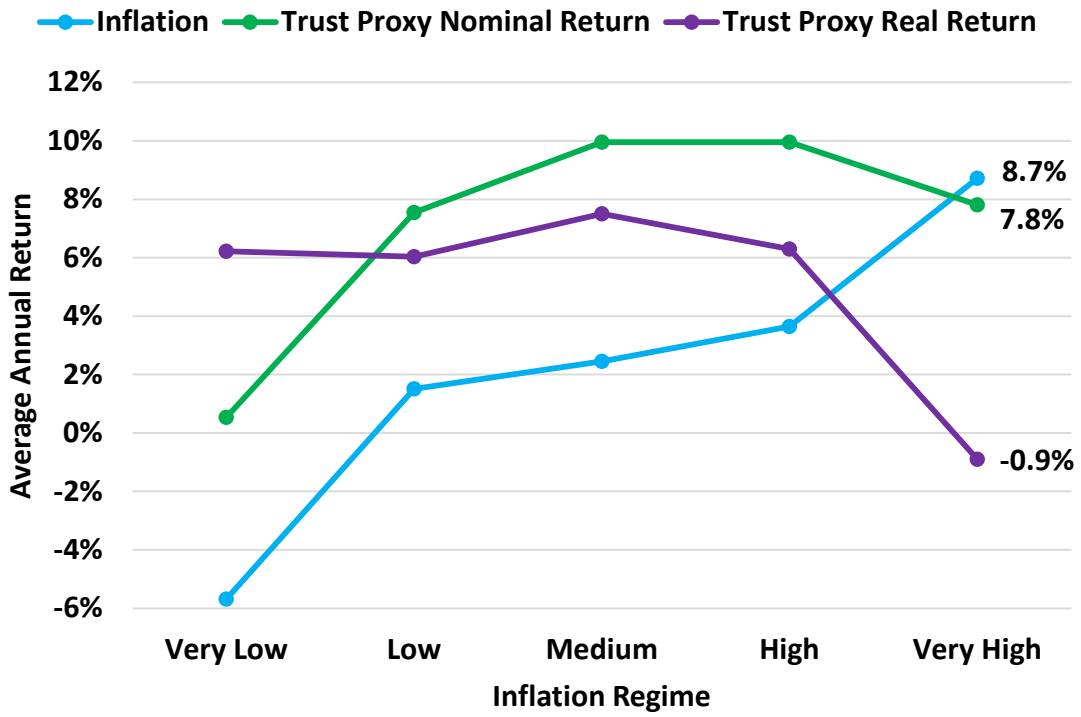
	Growth	Inflation	
Rising	Equities Real Assets ENRI Commodities Corporate Credit Emerging Market Credit	Real Assets ENRI Commodities Inflation-Linked Bonds Emerging Market Credit	Rising
Falling	Nominal Bonds Inflation-Linked Bonds	Nominal Bonds Equities	Falling

Special Topic: Inflation

Trust Sensitivity to Inflation

Total Trust Proxy Performance Across Inflation Regimes

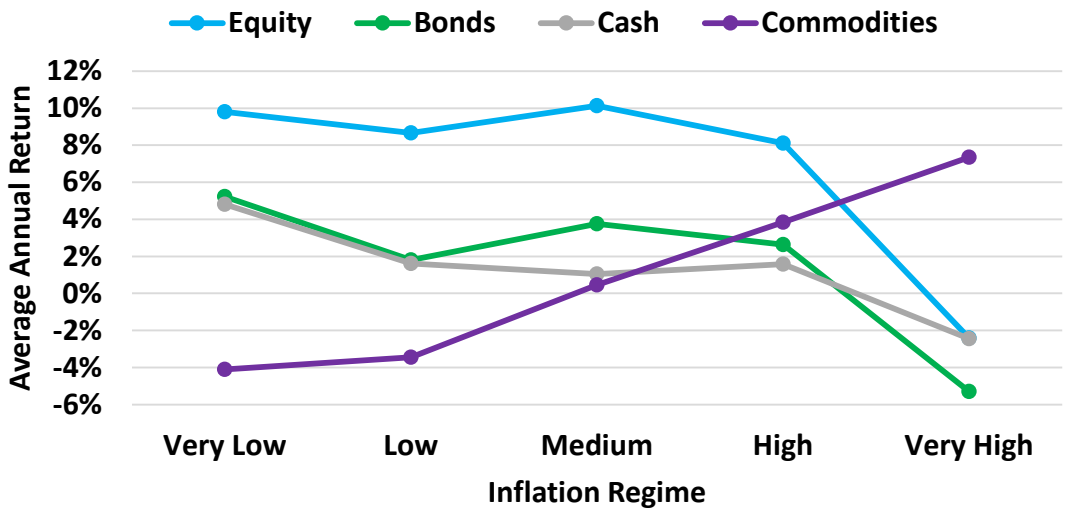
1900-2018, 3 Year Holding Period



- Trust returns will decrease in an inflationary regime with some mitigation from our Real Return assets
- The Trust investment policy targets both nominal return (7.25%) and real return (inflation plus 5%)

Major Trust Asset Classes

1900-2018, 3 Year Holding Period



Source: TRS IMD

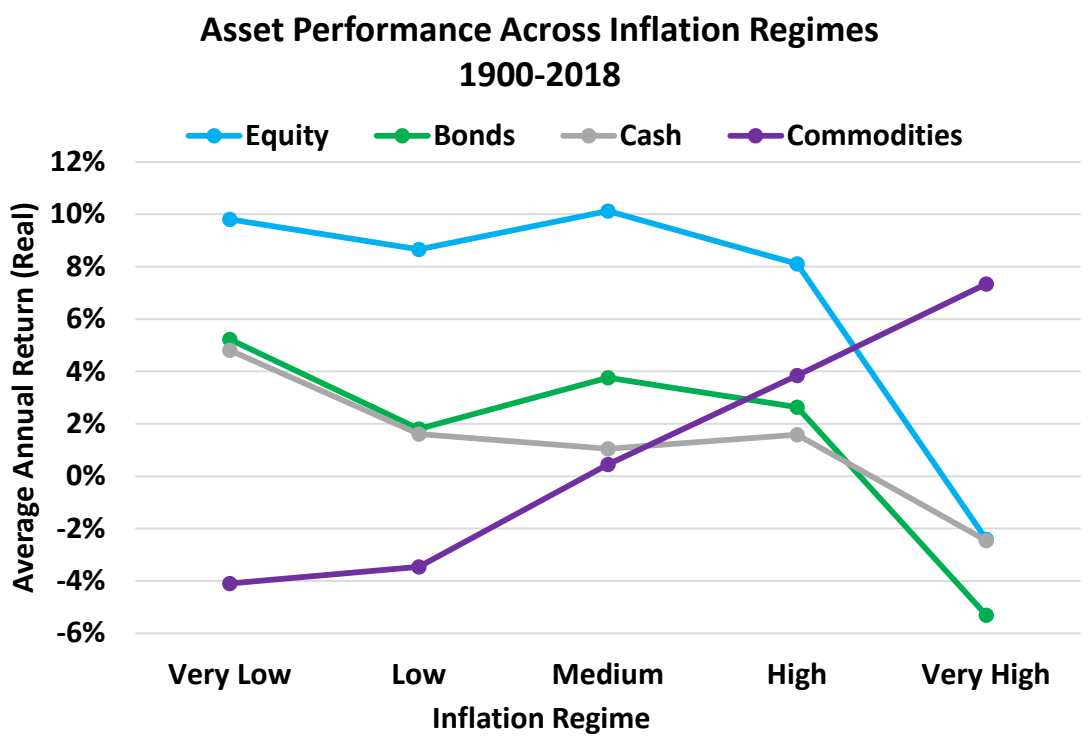
Note: Trust proxy benchmark weighted as 64% equity, 16% bonds, 16% CPI, 2% commodities, 2% cash. Equity: S&P 500 TR Index, backfilled with Shiller data prior to 1988. Bonds: Bloomberg Barclays US Long Treasury TR Index, backfilled prior to 1973 with Shiller data adjusted to a 24-year bond maturity; CPI: US CPI Urban Consumers NSA (Bloomberg), backfilled with Shiller data prior to 1950; Commodities: S&P GSCI TR, backfilled with BP Oil prices; Cash: ICE Libor USD 12-Month, backfilled with Shiller data prior to 1983.

Special Topic: Inflation

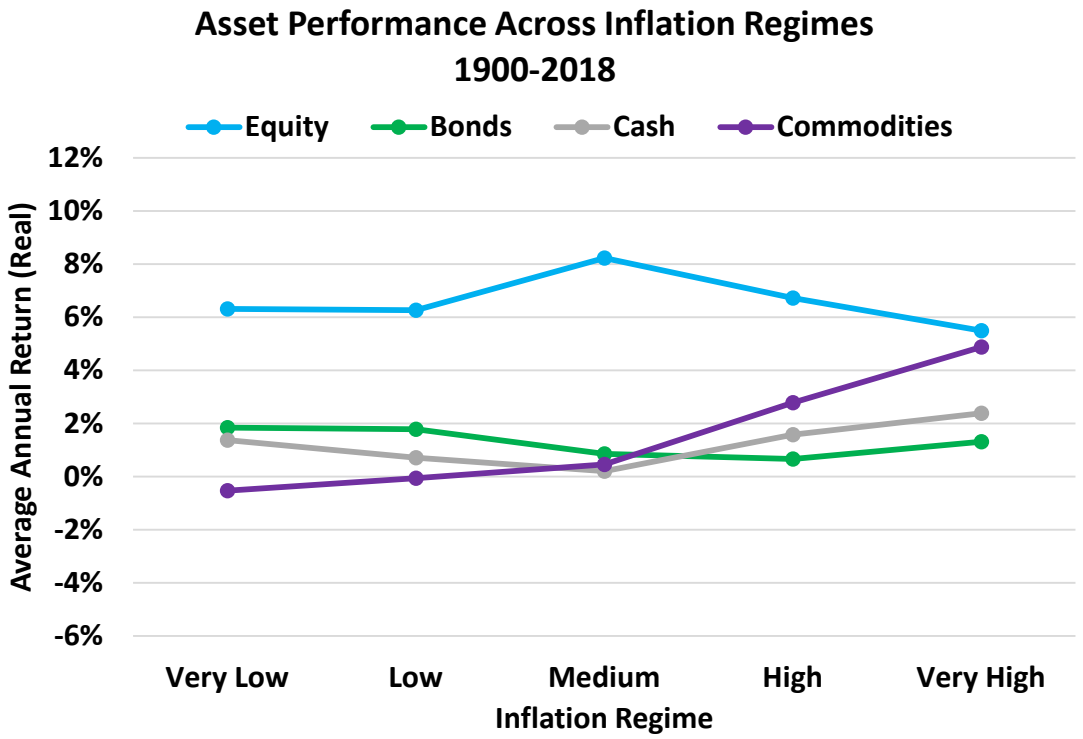
Long-Term Inflation

- Equities, which form the bulk of our asset allocation, can be an inflation hedge over the long-term

3 Year Holding Period



30 Year Holding Period



Source: Stocks for the Long Run, Jeremy J. Siegel; TRS IMD Calculations

Conclusion

- Market Update
  - The first half of 2018 was characterized by volatility in the global equity markets despite strong fundamental economic variables in the US
  - Over the second half of 2018, the market is cycle-aware with expectations of global volatility as growth moderations and inflation is managed close to target

- Special Topic: Inflation
  - Most Trust assets lose value in periods of high inflation
  - There are three main drivers of inflation: demand pressures driving prices upwards (“demand pull”), input costs driving prices up to maintain profit margins (“cost push”), and inflation expectations (“expectations”)
  - Equities (40% of target asset allocation) can maintain real purchasing power over the long-run as revenues and costs adjust to new pricing regimes

TRS

Appendix

Special Topic: Inflation

Phillips Curve Inflation Model

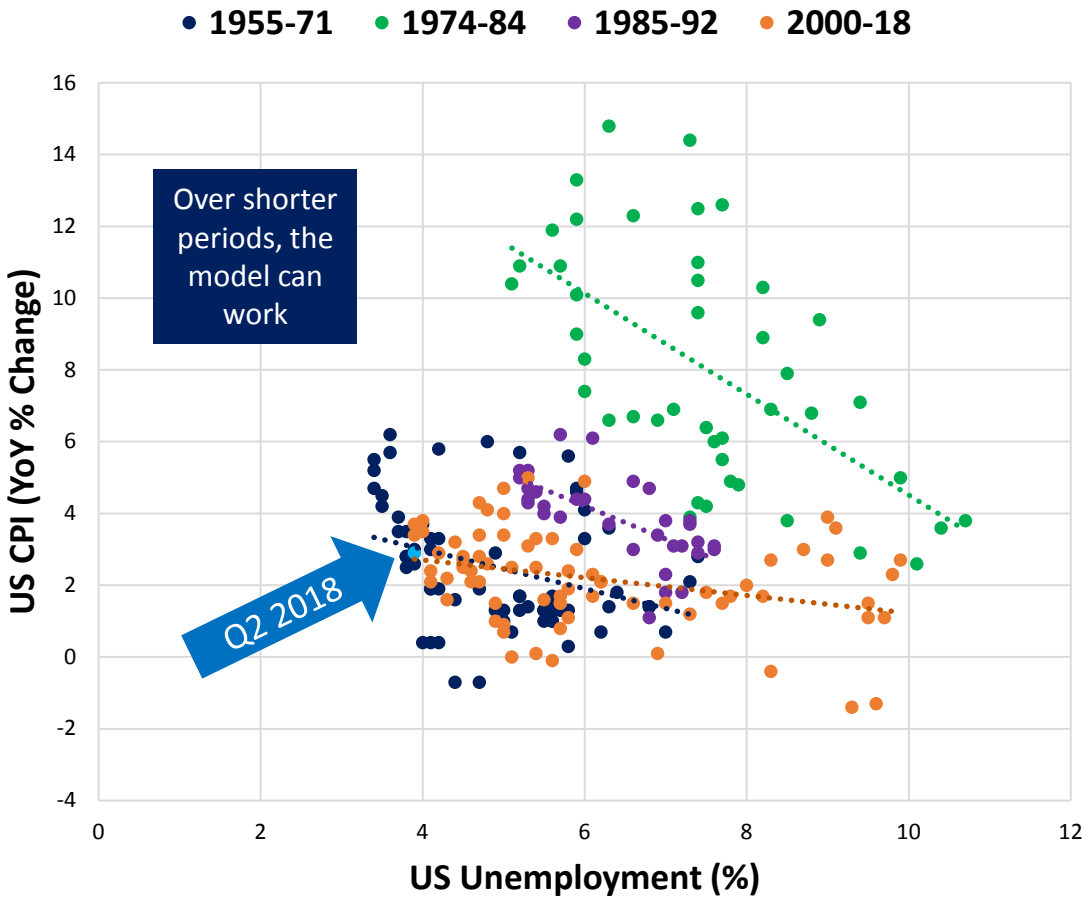
Overview

- The Phillips Curve is an economic model linking higher inflation to low unemployment and vice versa. The model holds that low unemployment causes wage inflation which in turn drives up costs and general price inflation
- The Phillips Curve illustrates the Federal Reserve's dual mandate of (1) low unemployment and (2) stable inflation

Phillips Curve (1948-2018)

Over longer periods, the model is not effective

Multi-Period Phillips Curves



Source: Bloomberg. US Unemployment: U-3 US Unemployment Rate Total in Labor Force Seasonally Adjusted; US CPI: US CPI Urban Consumers YoY NSA

TAB 7

Strategic Partnerships & Research

Mike Pia, Managing Director

Courtney Villalta, Senior Investment Manager

Jean-Benoit (JB) Daumerie, Investment Manager

September 2018

TRS

TEACHER RETIREMENT SYSTEM OF TEXAS

INVESTMENT

MANAGEMENT DIVISION

Agenda

I. Strategic Partnerships & Research (SPR) Overview

II. Public Markets Strategic Partnership Network (SPN) Deep Dive

III. Private Markets Strategic Partnership Network (SPN) Deep Dive

TRS

This slide was intentionally left blank.

SPR Overview

Summary Performance

Public Markets SPN Portfolio														
Portfolio	Assets		Annualized Returns (TWR)			Annualized Alpha			Tracking Error			Information Ratio		
	NAV ($, millions)	% of Trust	1-Year	3-Year	SI	1-Year	3-Year	SI	1-Year	3-Year	SI	1-Year	3-Year	SI
Total Public SPN	**$8,113**	**5.4%**	**8.6%**	**7.1%**	**7.0%**	**+64 bp**	**+23 bp**	**+88 bp**	**110 bp**	**127 bp**	**138 bp**	**0.6**	**0.2**	**0.6**

Private Markets SPN Portfolio										
Portfolio	Assets		Annualized Returns (IRR)		Annualized Alpha		% of Portfolio		TRS Private Markets Returns (IRR)	
	NAV ($, millions)	% of Trust	1-Year	3-Year	1-Year	3-Year	Private SPN	% TRS Private Markets	1-Year	3-Year
SPN-Strategic	**$4,223**	**2.8%**	**15.1%**	**12.5%**			**100.0%**	**9.2%**		
Private Equity	3,211	2.1%	18.1%	13.0%	2.2%	0.8%	77.3%	16.1%	16.6%	12.1%
Real Assets	449	0.3%	13.3%	11.6%	-0.3%	1.1%	10.8%	2.5%	13.4%	11.7%
ENRI	562	0.6%	-1.0%	10.2%	-10.8%	5.4%	11.9%	6.9%	8.0%	8.5%
SPN-Tactical Value[1]	**$1,292**	**0.9%**	**9.0%**	**13.8%**	**-1.0%**	**3.8%**				

Source: State Street and TRS IMD; Public SPN performance and capital as of 6/30/18; Private SPN capital amounts as of 6/30/18 (Performance as of 3/31/18). SI dates are 6/30/08 for Public SPN, 4/23/12, 5/14/12 and 9/30/13 for SPN Strategic PE,RA and ENRI strategies, respectively and 6/25/15 for SPN Tactical Value.

[1]Alpha for SPN Tactical Value is calculated using a 10% target for the Tactical Value portfolio. 3-Year annualized return and annualized alpha shown is based on 33 month return.

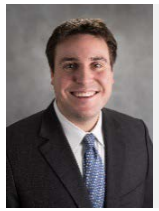
SPR Overview

Organization

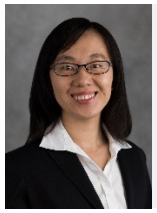
Mike Pia, CFA, CAIA
Managing Director
BS Mechanical Engineering,
United States Naval Academy
MS Software Engineering,
University of West Florida
MBA, Texas Christian University

INVESTMENTS TEAM

PUBLIC MARKETS



Jean-Benoit Daumerie, CFA
Investment Manager
BS Electrical Engineering,
University of Pennsylvania
MBA, Rice University



Sibei Wen, CFA, FRM
Contractor
BA Statistics, Hunan University
MS Statistics, UT Austin

PRIVATE MARKETS

Courtney Villalta
Senior Investment Manager
BS Finance, St. Edward's University

Mikhael Rawls
Senior Associate
BA Economics, Harvard University

Dan Judd, CFA
Senior Investment Manager
Bachelor of Business, Finance &
Financial Economics,
Griffith University
MBA Bond University

Maddie Kurapati, PE
Associate
BS Chemical Eng.,
Osmania University, India
MS Environmental Eng.,
Stanford University
MBA, Univ. of Texas at Austin

MARKET INTELLIGENCE

Curt Rogers, CAIA, CFA, FRM
Director
BS and MS Aeronautical Engineering,
Massachusetts Institute of Technology
MBA Finance, UT Austin

TEAM SUPPORT

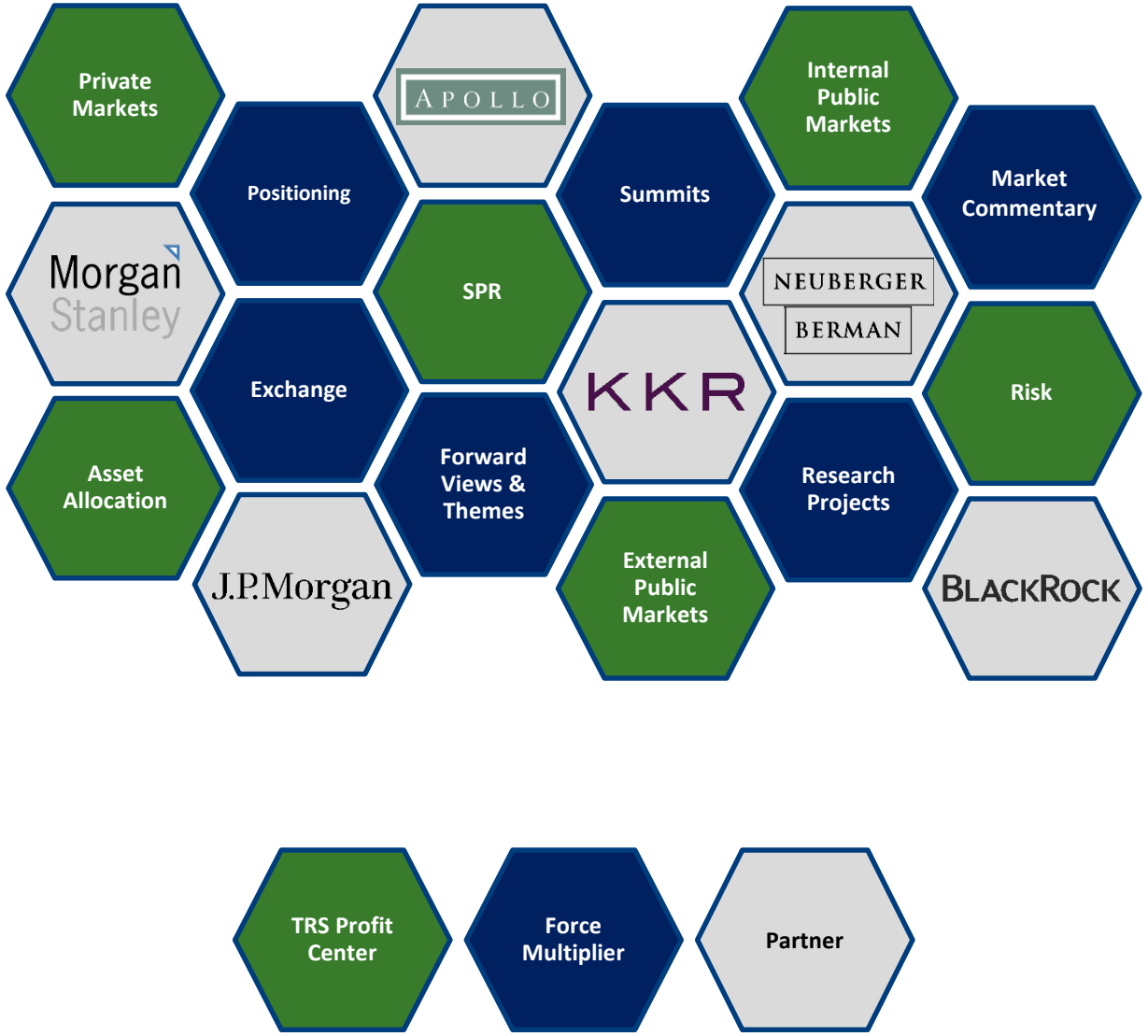
Susan White
Analytics and Support
BS French, Penn State University
CFA Investments Foundation
Certificate
CAIA Fundamentals of Alternative
Investment Foundations Certificate

SPR Team Experience Summary
9 Masters Degrees
7 Engineering Degrees
5 CFA, 2 CAIA, 2 FRM

TRS

SPN "Force Multiplier"

- **Summits**: held three times per year for Public SPN (two for Private SPN), one of which is a joint Public/Private
- **Views**: Public SPN positioning shared to inform IMD
- **Insights**: Market commentary from all aspects of partner firms
- **Research**: Proprietary projects with each partner
- **Exchange**: Institutionalized training program with Private SPN



This slide was intentionally left blank.

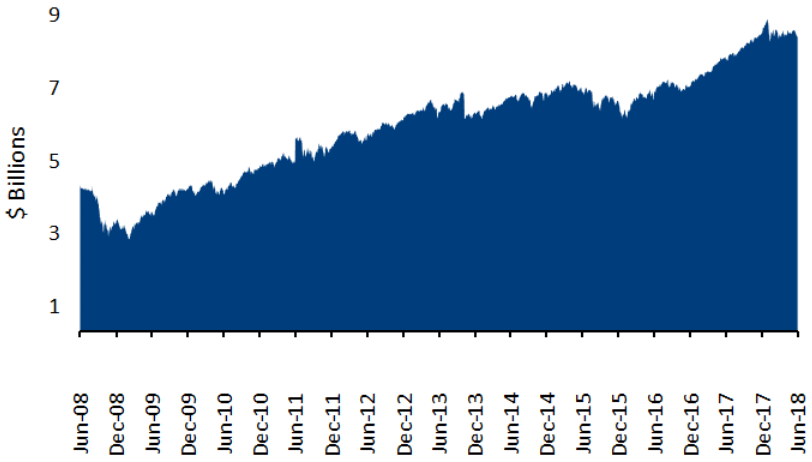
Public Markets SPN Portfolio

Public Markets SPN

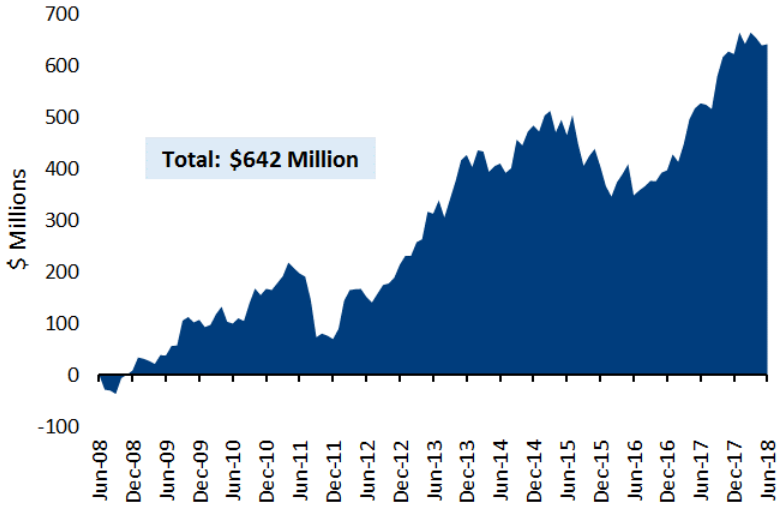
Performance as of June 30, 2018

Program	Assets		Annualized Return			Annualized Alpha			Tracking Error			Information Ratio		
	NAV ($, millions)	% of Trust	1-Year	3-Year	Since Incept.	1-Year	3-Year	Since Incept.	1-Year	3-Year	Since Incept.	1-Year	3-Year	Since Incept.
BlackRock	$2,074	1.4%	10.2%	8.4%	**7.3%**	+226 bp	+150 bp	**+117 bp**	176 bp	175 bp	**195 bp**	1.3	0.9	**0.6**
JP Morgan	2,136	1.4	7.8	7.4	**7.4**	-8	+50	**+134**	167	136	**208**	0.0	0.4	**0.6**
Morgan Stanley	1,949	1.3	7.6	6.2	**6.6**	-32	-67	**+50**	225	206	**197**	-0.1	-0.3	**0.3**
Neuberger Berman	1,954	1.3	8.6	6.4	**6.6**	+72	-47	**+46**	104	183	**203**	0.7	-0.3	**0.2**
Total Public SPN	**$8,113**	**5.4%**	**8.6%**	**7.1%**	**7.0%**	**+64 bp**	**+23 bp**	**+88 bp**	**110 bp**	**127 bp**	**138 bp**	**0.6**	**0.2**	**0.6**
Target						**Portfolio/Firm:**		**200 bp**	**Firm:**		**250 bp**	**Firm:**		**0.8**

Public Markets SPN Assets Under Management



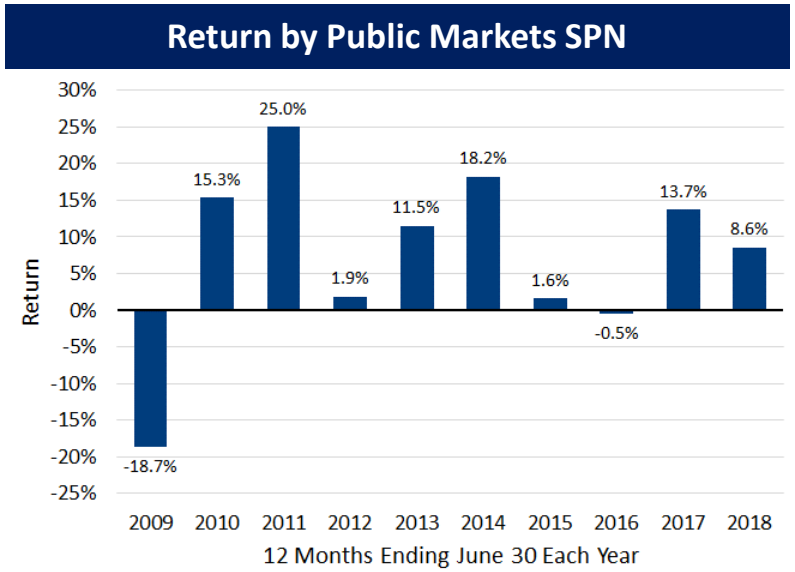
Total Public SPN Cumulative Alpha

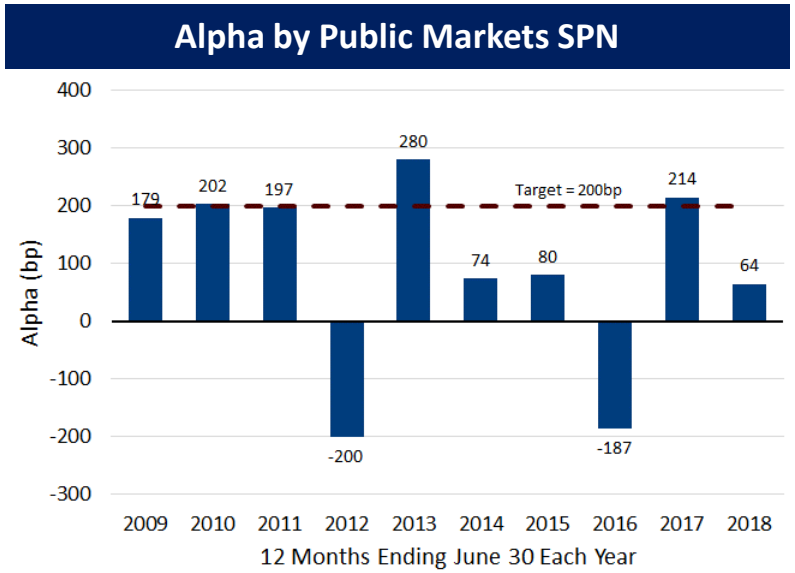


Source: State Street Bank and TRS IMD
Inception of Public SPN: June 2008

Public Markets SPN

Performance as of June 30, 2018





Performance Key Drivers:

- Synchronized global growth in 2017 transitioned to higher volatility, geo-politically sensitive environment in 2018
- An overweight to risky assets (global equities, emerging markets) detracted in 1H 2018 as late cycle uncertainty increased alongside trade war concerns
- Relative value asset allocations (particularly in currencies, fixed income) are renewed areas of focus
- Underlying security selection added value despite difficult asset allocation environment

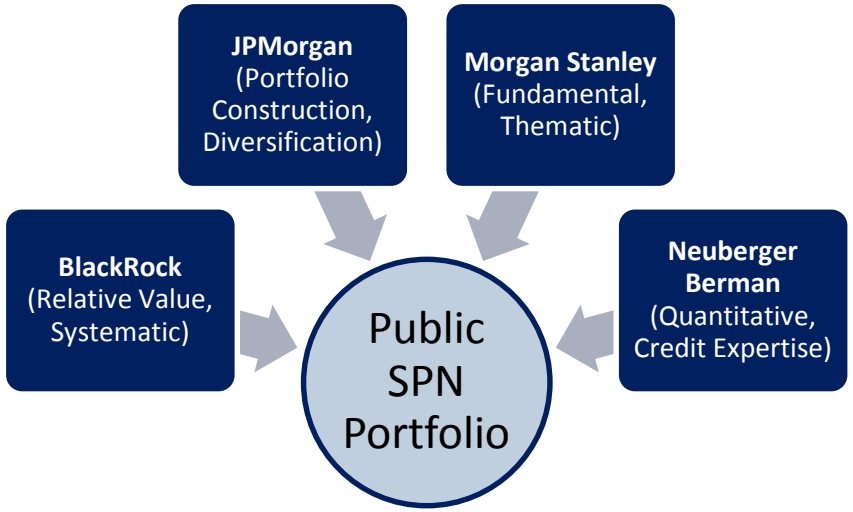
Source: State Street
Note: Fiscal year for the Public Markets SPN runs from July to June due to inception of the structure in June 2008

This slide was intentionally left blank.

Public Markets SPN Diversification

One Portfolio...Four Different Perspectives / Processes:

- Long-lasting cultures generate persistent strengths
- Diversifying opinions and processes can lead to similar or dissimilar views of the world
- Different implementations of views result in higher risk adjusted returns

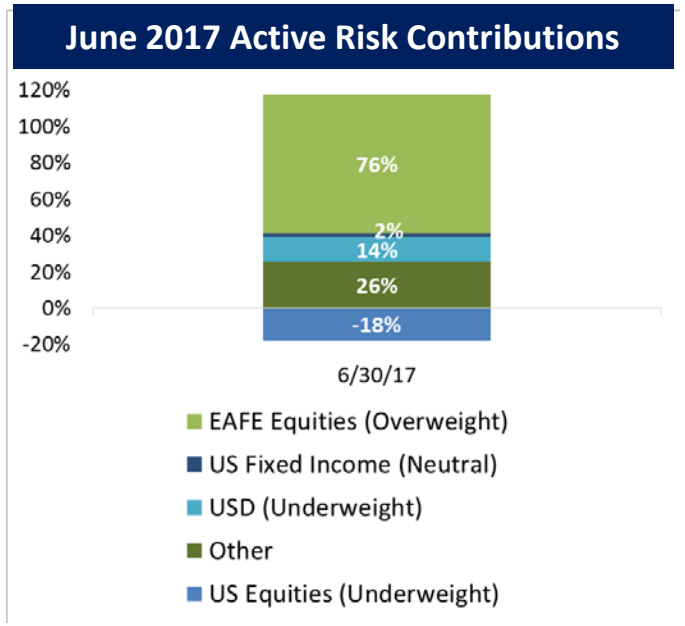


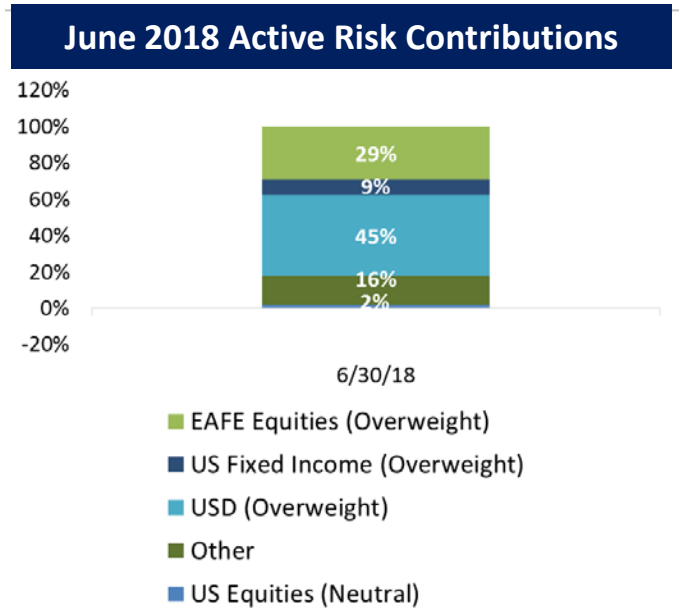
Example: "Late-Cycle" Theme – Four Different Implementations

Partner	Implementation	Average Correlation with Other Instruments	Instrument YTD Return (through 6/30/18)
BlackRock	Underweight US 30-Year Bond	-0.23	+3.3%
JPMorgan	Overweight US Equities / Underweight European Equities	0.07	+2.6%
Morgan Stanley	Underweight Machinery Equities / Overweight Developed Equities	0.05	+11.3%
Neuberger Berman	Underweight German 10-Year Bunds	-0.12	+1.9%

Source: TRS IMD
Note: AVG correlation is the 120 day correlation with the other three strategies. YTD return is for listed instrument, assuming position held constant for the holding period 12/31/17 to 6/30/18.

Public Markets SPN Positioning





<u>Full Transparency on Positioning Leads to Better Insights</u>:

- Regular reporting from partners results in "Common Language"
- Common reporting tool helps identify themes, trends, and high conviction trades across the portfolio
  - Sharing data and information across Trust acts as Force Multiplier
- Trends in past year:
  - The partners continue to reduce risk by being cautious about US trade uncertainty and late-cycle sentiment
  - Portfolio positions have shifted away from EAFE equities and towards FX and sovereign rates

Source: TRS IMD
Note: Risk contributions are calculated using average positioning within a month and a 120 month trailing covariance matrix. 'Other' contributions include EM equities, sovereign debt, credit, and commodities

This slide was intentionally left blank.

Private Markets SPN Portfolio

TRS

This slide was intentionally left blank.

This slide was intentionally left blank.

This slide was intentionally left blank.

This slide was intentionally left blank.

This slide was intentionally left blank.

APPENDIX

This slide was intentionally left blank.

Public Markets SPN Research Center

PUBLIC STRATEGIC PARTNERSHIP RESEARCH PROJECTS																			
Program	**2008**	**2009 1H**	**2009 2H**	**2010 1H**	**2010 2H**	**2011 1H**	**2011 2H**	**2012 1H**	**2012 2H**	**2013 1H**	**2013 2H**	**2014 1H**	**2014 2H**	**2015 1H**	**2015 2H**	**2016**	**2017 1H**	**2017 2H**	**2018 1H**
BlackRock	Currency Hedging	Inflation and Deflation	Portfolio Risk Analysis	NCREIF Modeling	NOI/Private Equity Model	Optimal Property Sector	Real Estate as Inflation Hedge	Thematic Trading	Forecasting Volatility	Global Opportunistic Screens	Role of Hedge Funds in SAA	Sentiment Based Signals	Trust TE Factor Exposures	Crowded Positions	China Local Macro Indicators	Blank Canvas	Alternative Risk Premia	Text Based Timing of Macro-economy	Revolutionary Ideas
JP Morgan	Currency Hedging	Downside Risk	Inflation and GDP Regimes	Regimes and Asset Classes		Regime Change	Tail Risk	Factor Rotation	Europe Country Switching	Switching between Risk Parity and Mean Variance	Inflation Shocks/ Hedging	Multi-factor Inflation Model with Asset Class Responses	Hedge Fund Portfolio Construction/ Risk Monitoring	Risk Premia Performance in Different Macro Environments	Business Cycle Indicator	Blank Canvas	Active vs. Passive	US Current Conditions Indicator	Revolutionary Ideas
Morgan Stanley	Currency Hedging	Inflation Regimes	Liquidity	Sentiment	Volatility Reduction	Earnings Forecasting		Gold vs. Cash Switching	European Country Switching Model	Tactical FX Overlay	U.S. Treasury Fair Value Model	EM Risk Premium Model	Study of US Profit Margins	Study on High Yield Default Cycle	Global Equity Quality Factor	Blank Canvas	Is the Great Disinflation Over?	Are Factor Risk Premia Episodic or Permanent?	Revolutionary Ideas
Neuberger Berman	Currency Hedging	Regime Analysis	Tactical Credit Allocation	Risk Based Asset Allocation		Risk Parity		Spanning Tree Analysis	Implications of Low Rates	Structured Alpha: Part I	Structured Alpha: Part 2	Multi-factor Cycle Model	Alternative Risk Premia Within TAA Part I	Alternative Risk Premia Within TAA Part II	Dynamic Currency Hedge Ratio	Blank Canvas	Pension Leverage	EMD vs. EM Equity	Revolutionary Ideas

INVESTMENT MODELS

- NCRIEF Modeling
- NOI/Private Equity
- Optimal Property Sector
- Factor Rotation
- European Country Switching
- Tactical FX Overlay
- Tactical Credit Allocation
- Text based timing of Macroeconomy

VALUATION FRAMEWORKS

- Inflation/Deflation Regimes
- Regimes and Asset Classes
- Regime Change
- Sentiment
- Earnings Forecasts
- Implications of Low Rates
- Opportunistic Global Screens
- Persistence of Hedge Fund Alpha
- Treasury Fair Value Model
- EM Risk Premium
- US Profit Margins
- High Yield Default Cycle

RISK MANAGEMENT

- FX Hedging
- Portfolio Risk Analysis
- RE as an Inflation Hedge
- Forecasting Volatility
- Tail Risk
- Liquidity Risk
- Volatility Reduction
- Spanning Tree Analysis
- Inflation Hedging
- Crowded Positions
- Hedge Fund Portfolio Construction/Risk Monitoring
- Pension Leverage

INVESTMENT STRATEGIES

- Alternative Risk Premia
- Risk-Based Asset Allocation
- Risk Premia Implementation
- Thematic Investing
- Switching Between Risk Parity and Mean Variance
- Structured Alpha
- Blank Canvas
- Active vs. Passive
- EMD vs. EM Equity

TRS

SPN Summits

- Held three times per year, one joint with Private SPN
- Topics covered include positioning, performance, and relevant market topics
- Key tool to encourage accountability and collaboration

	Key Topics of Discussion
April ’16 Public Summit	Global recession probability / **Monetary policy** efficacy
Aug ’16 Joint Summit	**Investing in a low return world / Geopolitics**
Nov ’16 Public Summit	**Blank Canvas** / Credit and risk premium
Apr ’17 Public Summit	Global **Reflation** / Tail Risks
Jul ’17 Joint Summit	**Politics & Policy**/ Business Environment
Nov’17 Public Summit	**Fed** Balance Sheet Normalization
May’18 Public Summit	**US Dollar,** Market and Macro **Volatility, Factor** Investing
Aug’18 Joint Summit	Future of **Asset Management**

Joint Public / Private SPN Summit: “The Future of…”

Wednesday, August 1, 2018

Lunch Speaker: Peter Zeihan

“A Guide to the Coming Disorder…An Intersection of Demographics & Geopolitics” ..... 11:45 AM

Break ..... 1:00 PM

TRS Executive Update (Jerry Albright/Jase Auby) ..... 1:10 PM

Public SPN Portfolio Review (Jean-Benoit Daumerie) ..... 1:25 PM

Private SPN Portfolio Review (Courtney Villalta) ..... 1:40 PM

SAA Preview (Debate: Will Private Equity Outperform Public Equity?) ..... 1:55 PM

Break ..... 3:15 PM

Special Topic Panel: Technology and Big Data’s Impact on Investing ..... 3:30 PM

Moderator: Geoff Duncombe, Two Sigma
Panelists: Sherry Marcus, BlackRock
Michael Recce, Neuberger Berman
Usman Rabbani, KKR

Special Topic Panel: Future of Asset Management ..... 4:45 PM

Moderator: Michael Cyprys, Morgan Stanley
Panelists: Larry Fink, BlackRock
Josh Harris, Apollo
Dan Simkowitz, Morgan Stanley

TRS Chairman Remarks (Jarvis Hollingsworth) ..... 5:45 PM

Additional Closing Remarks (Michael Pia) ..... 5:55 PM

TRS

TAB 8

Investment Risk Report

James Nield, Chief Risk Officer

September 2018

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS
INVESTMENT
MANAGEMENT DIVISION

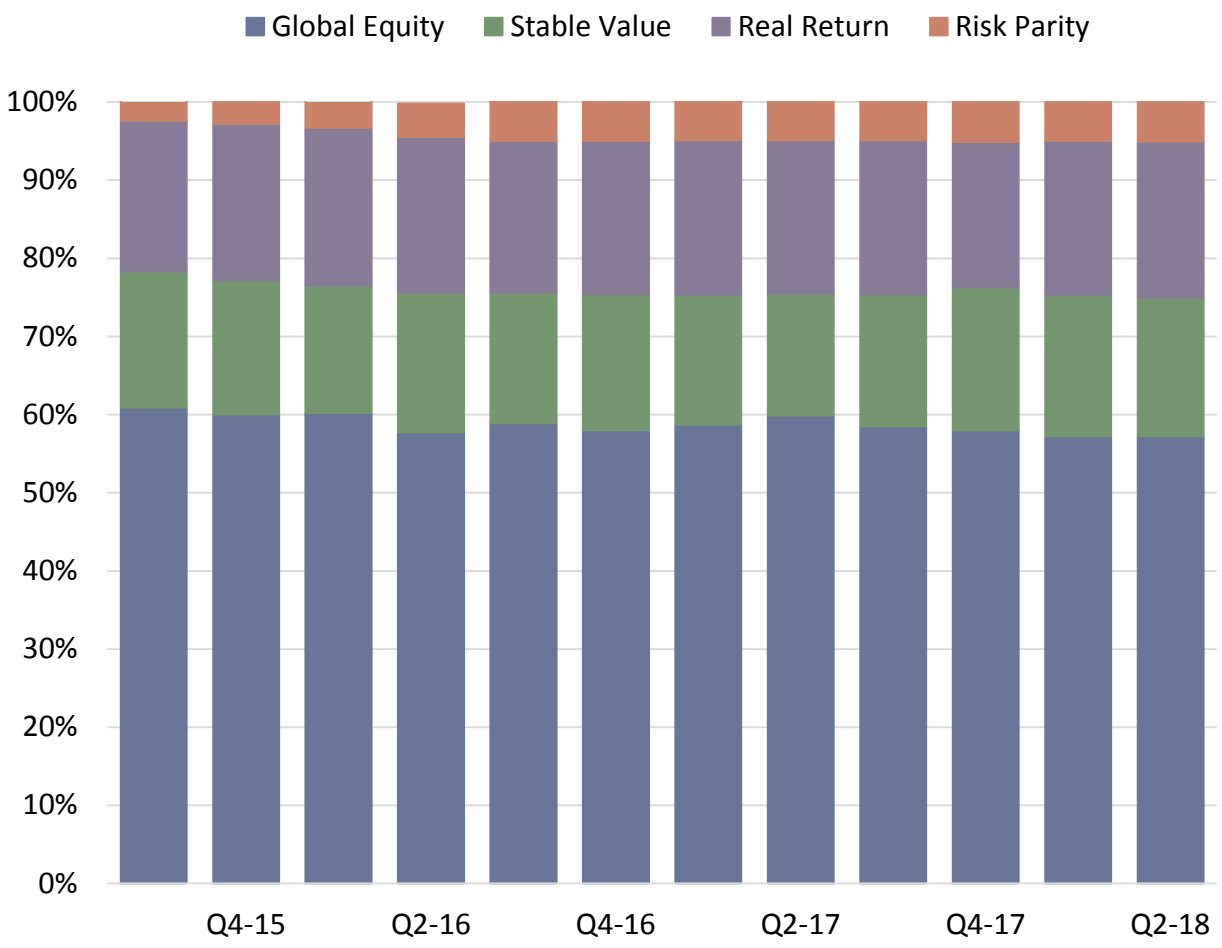
Agenda

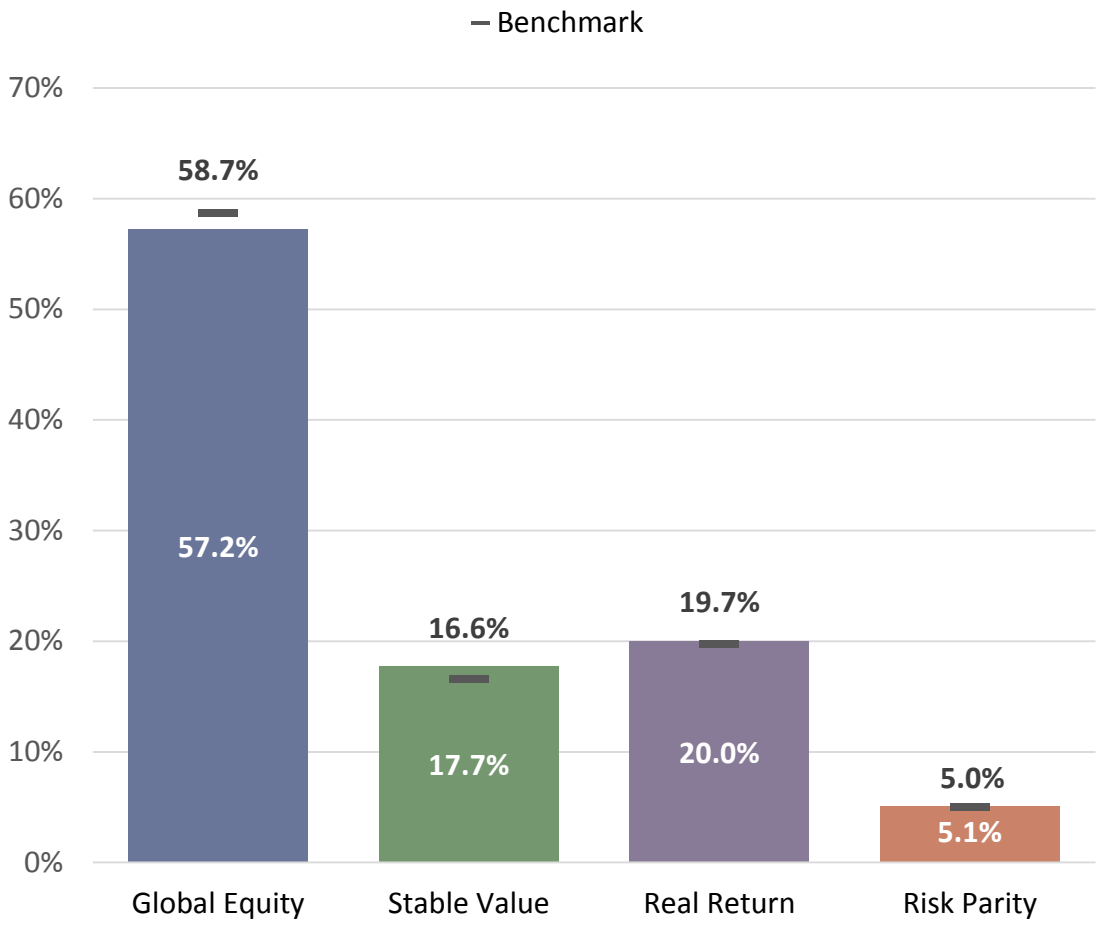
Risk Metric	Value	In Compliance?	Page(s)
1. Asset Allocation: Underweight Global Equity	Underweight -1.5%	✓	3 - 5
2. Drawdown Risk: VaR estimate stable	6.3% VaR	✓	6 – 8
3. Tracking Error: Total Trust TE increased	157 bp	✓	9 – 10
4. Leverage: Net leverage stable	115% Gross, 105% Net	✓	11
5. Liquidity: Remained strong	9.3 Coverage Ratio	✓	12
6. Counterparty Risk: Improved	Lowest Rating: BBB+	✓	13
7. Derivatives Exposure: Increased	18.8% Gross	✓	14 – 15
8. Securities Lending: Utilization increased	30%	✓	16

Unless otherwise noted, data presented as of **June 30, 2018**

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS

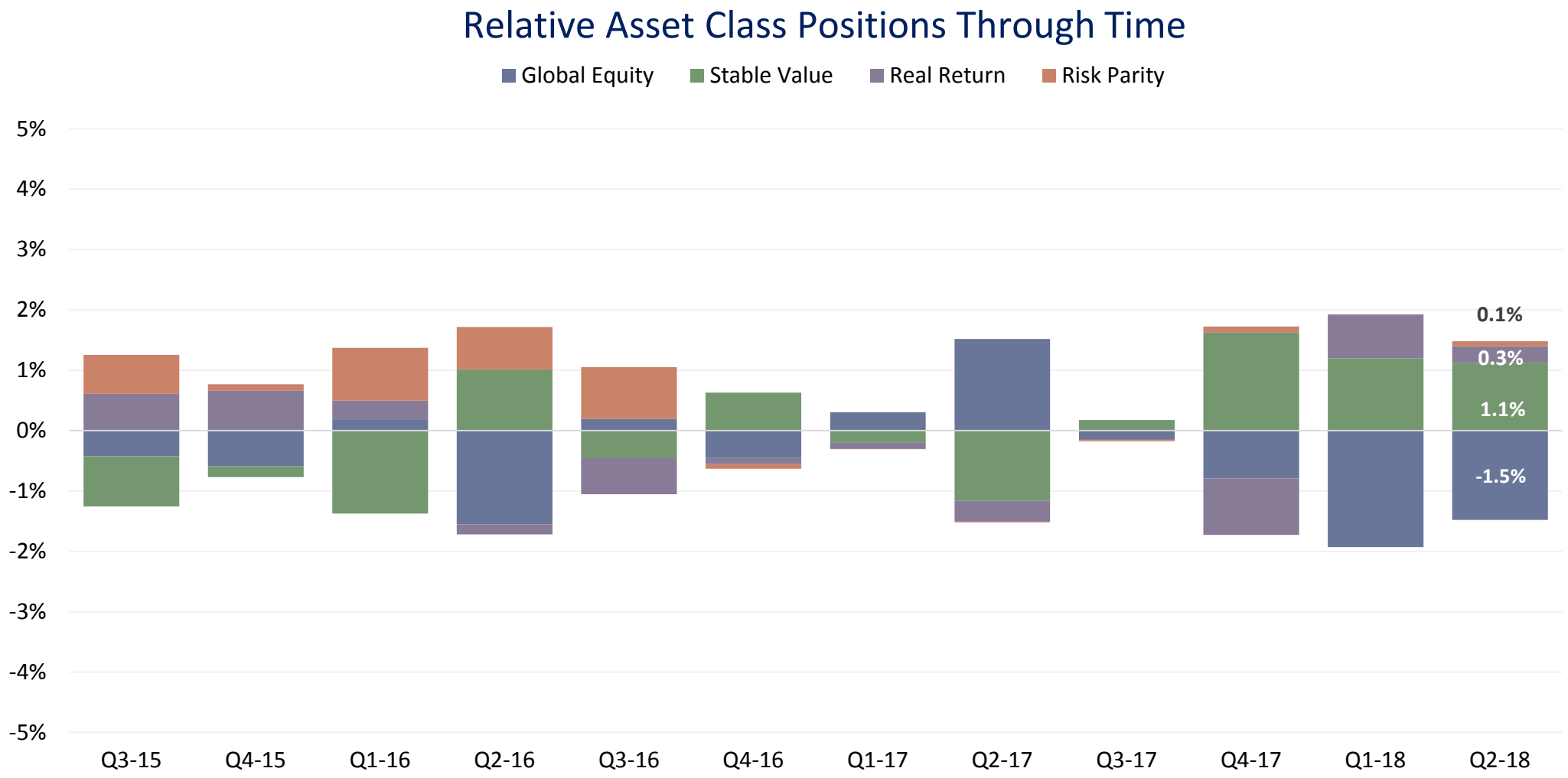
Trust asset allocation in line with policy





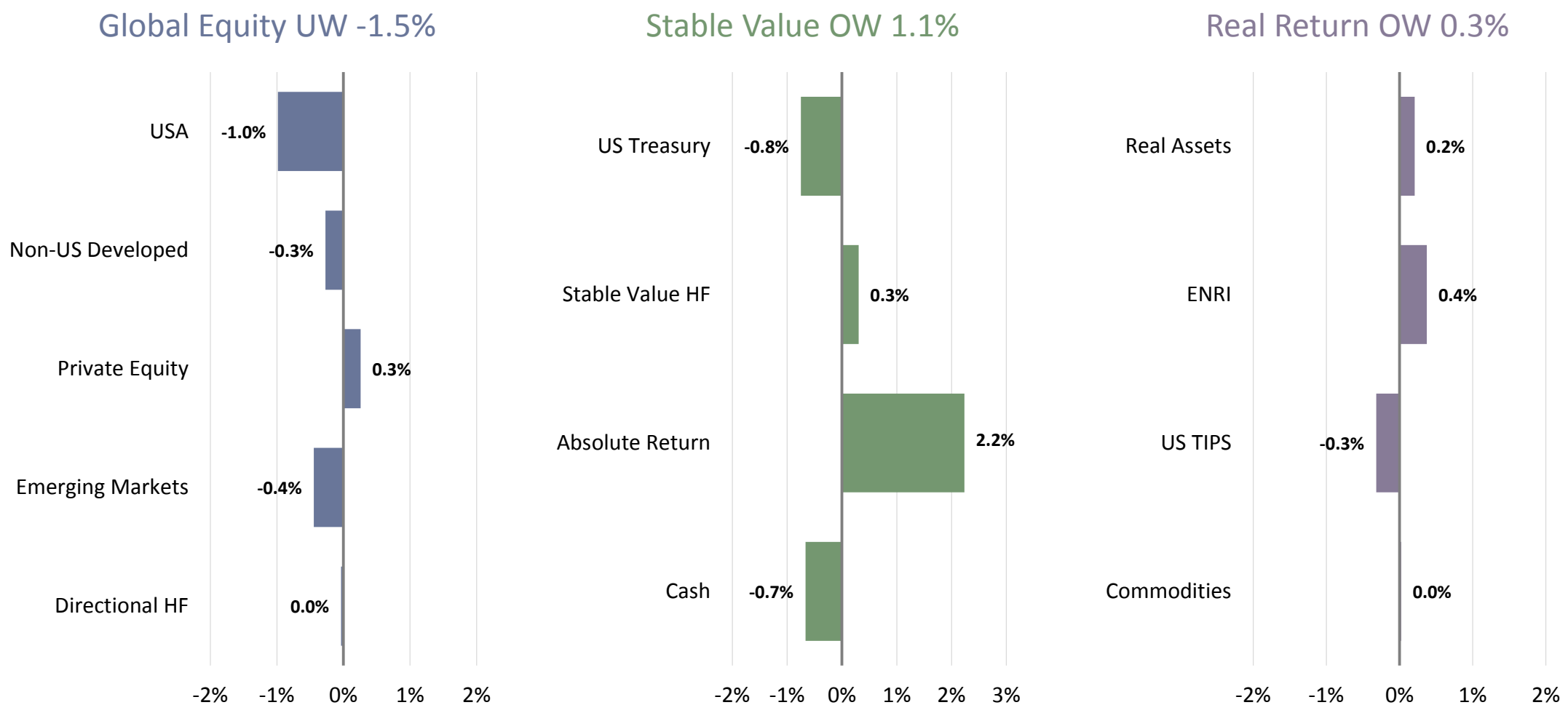
Source: State Street Bank

Remain underweight Global Equity



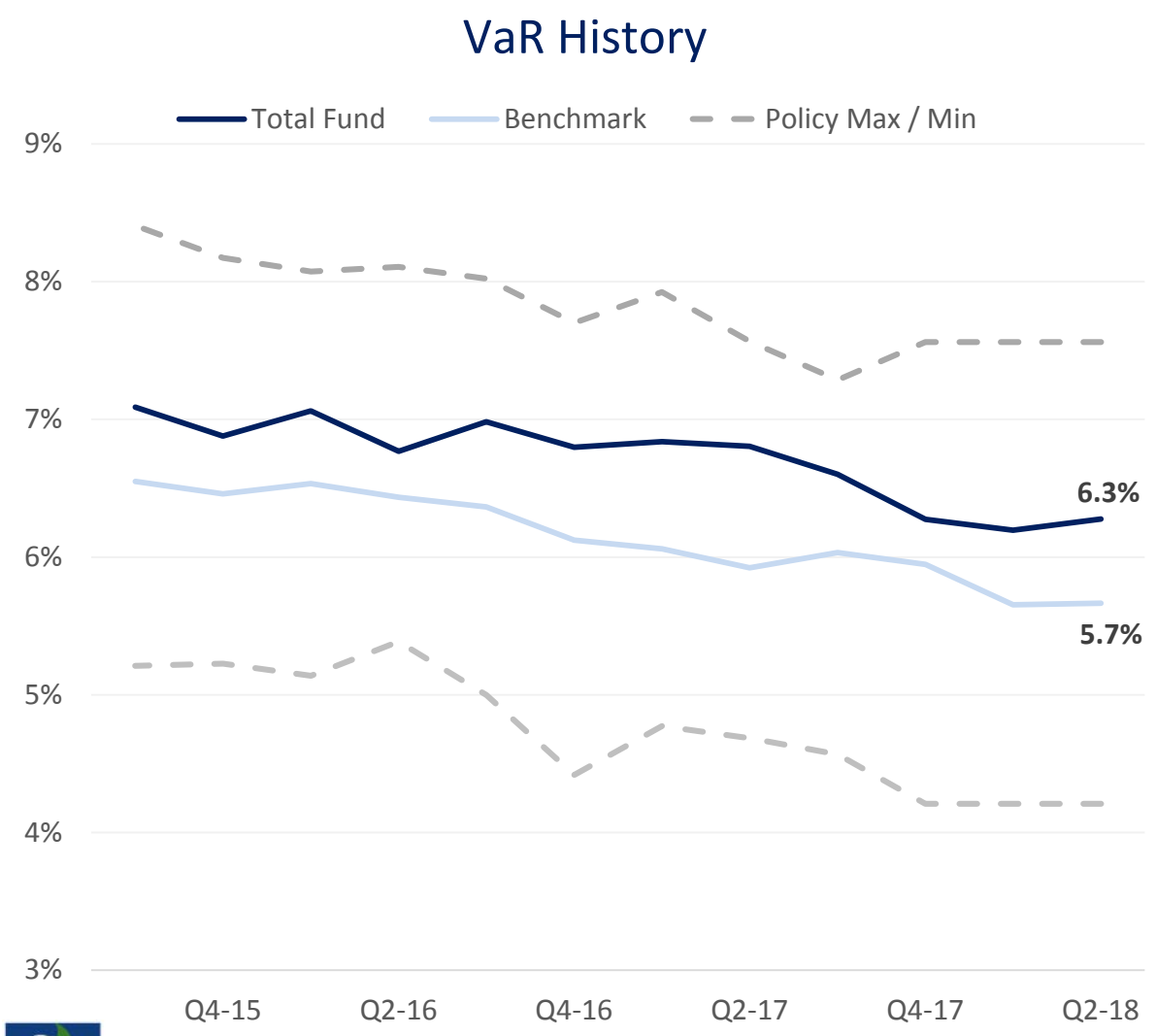
Source: State Street Bank; relative positions shown in comparison to prior quarter-end Trust benchmark weights as defined in policy

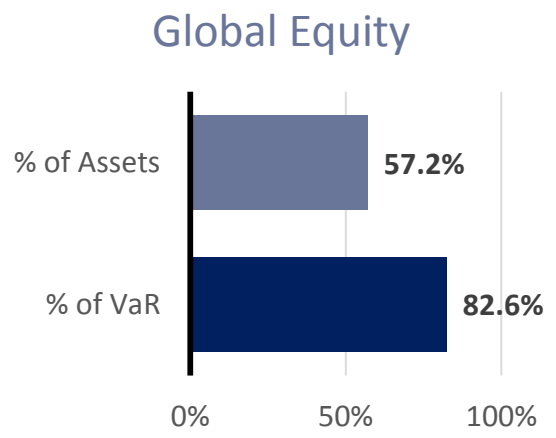
Stable Value overweight driven by absolute return allocation

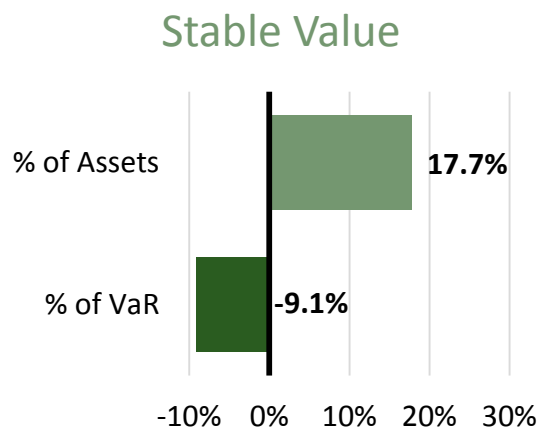


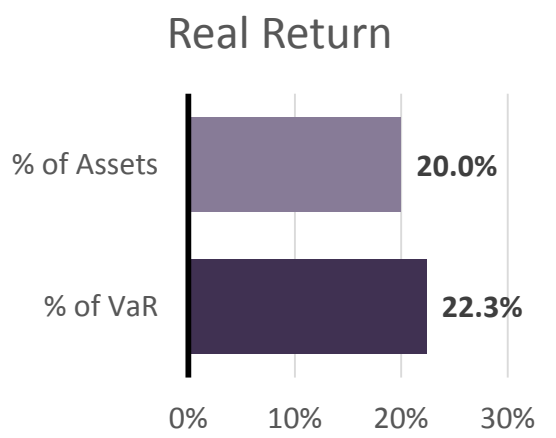
Source: State Street Bank; private credit allocation included in Absolute Return

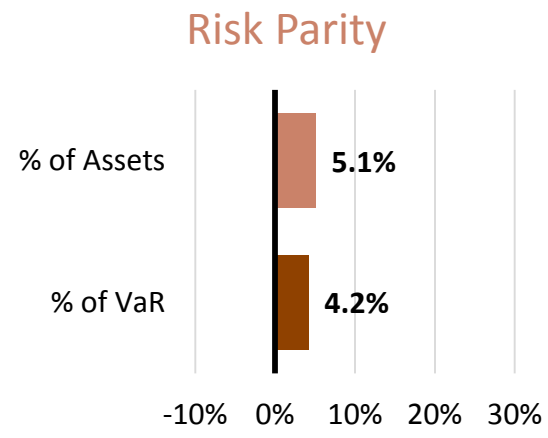
VaR estimate stable at 6.3%





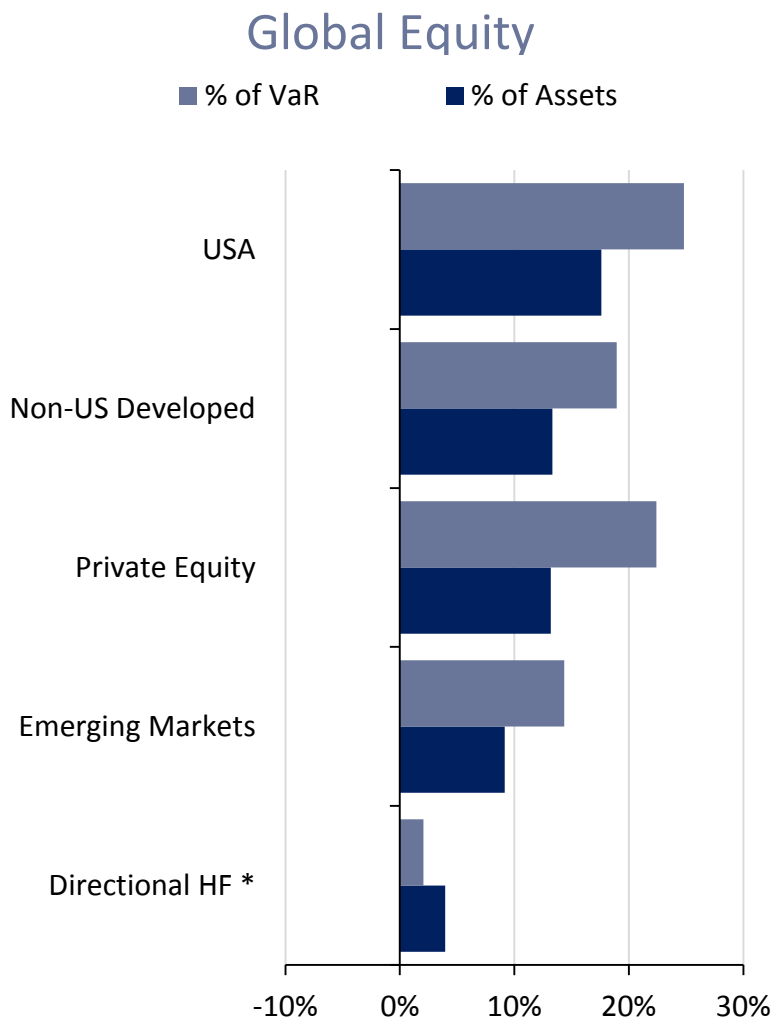


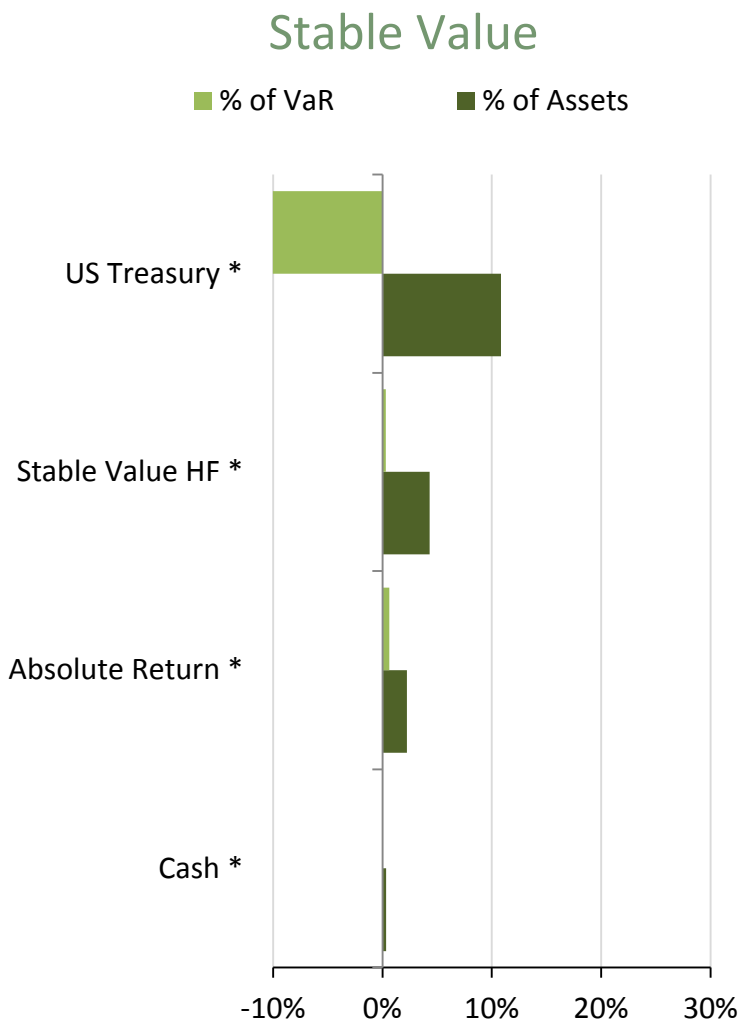


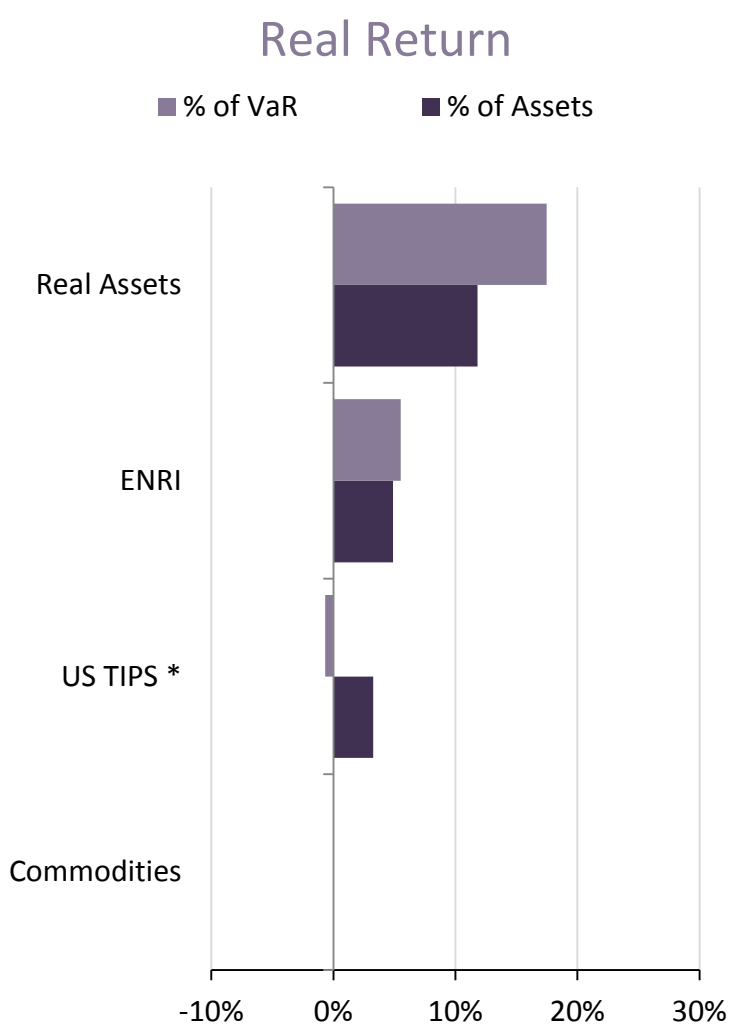


Source: State Street Bank

Stable Value assets are a key source of diversification



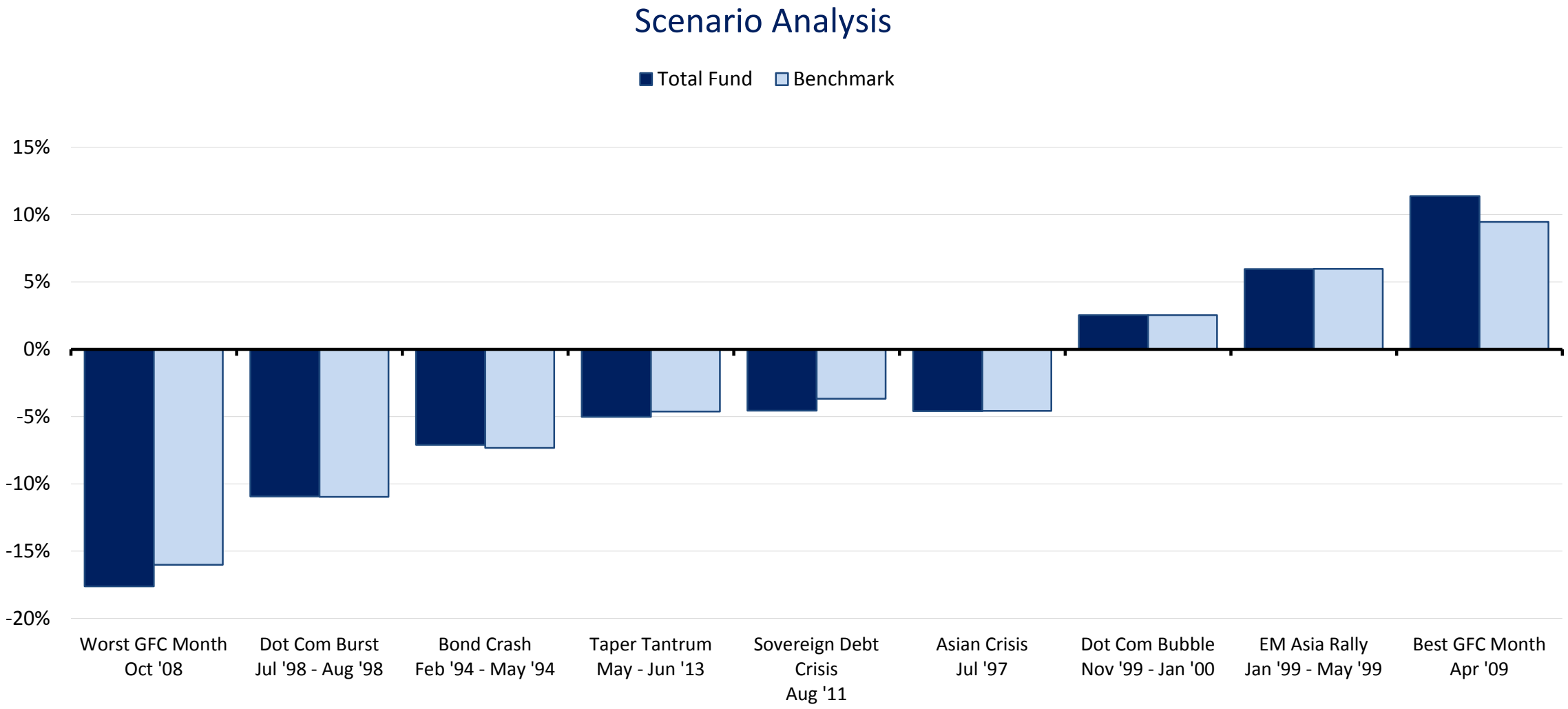




* These assets contribute less risk than their dollar allocation

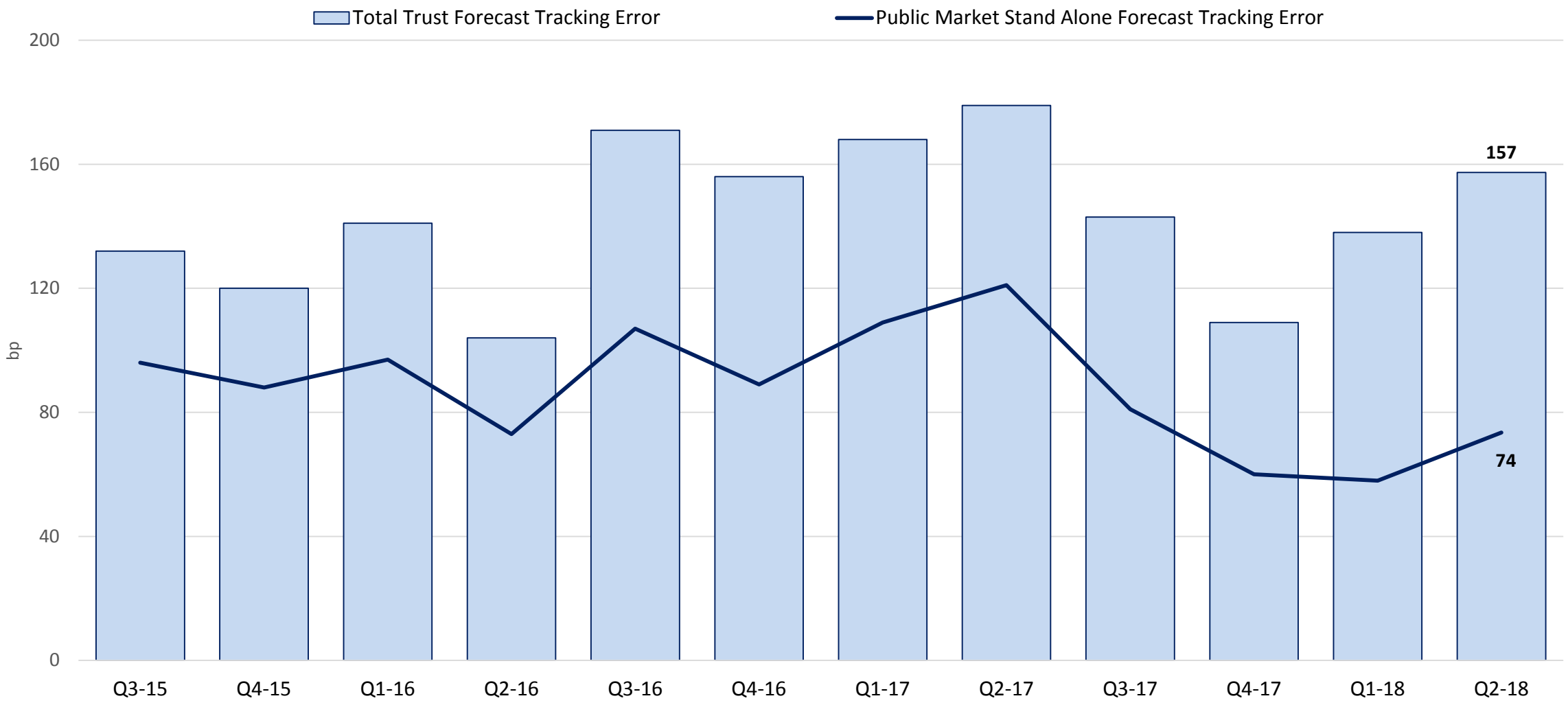
Source: State Street Bank

Trust expected to perform in line with benchmark



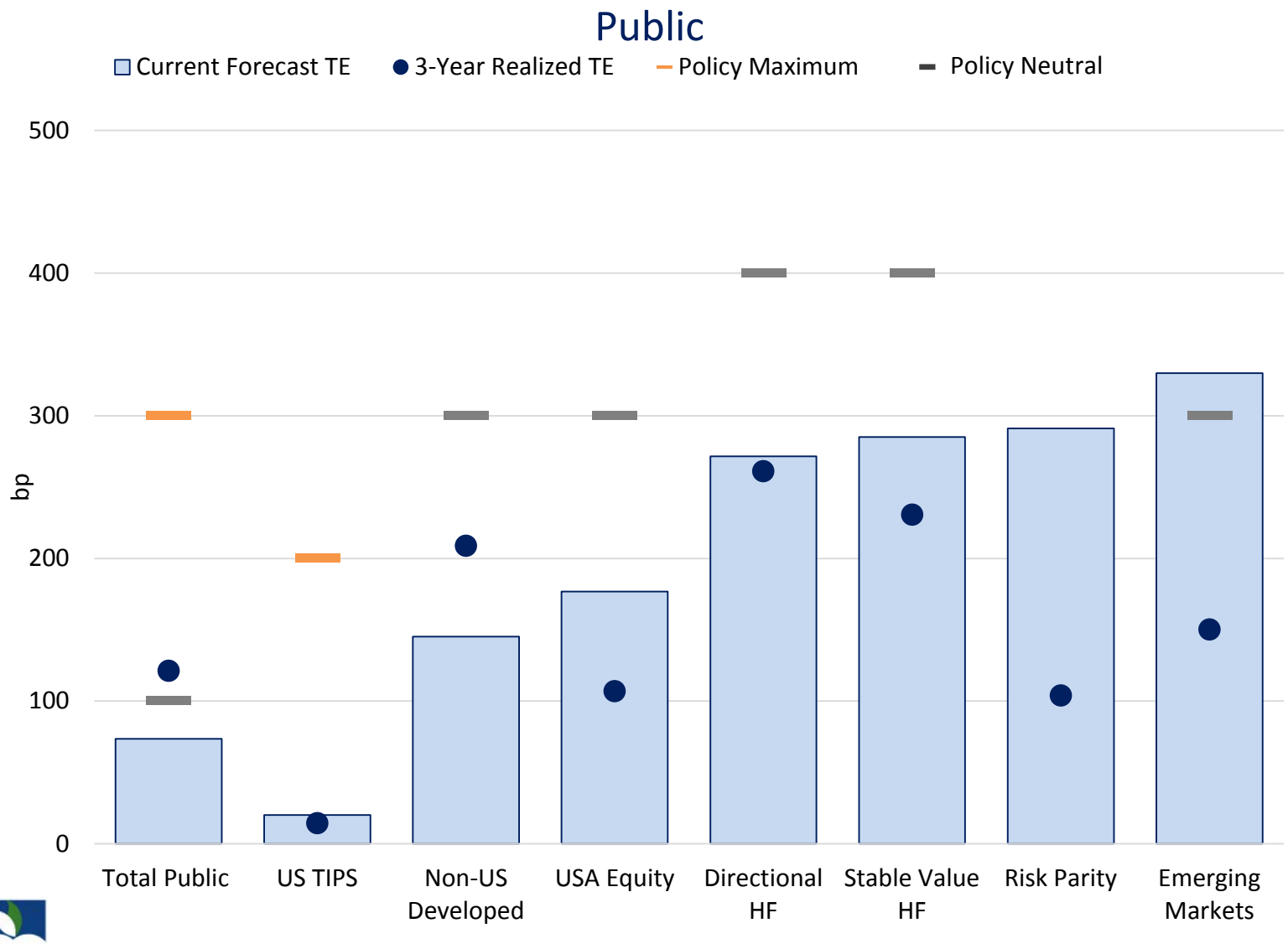
Source: State Street Bank

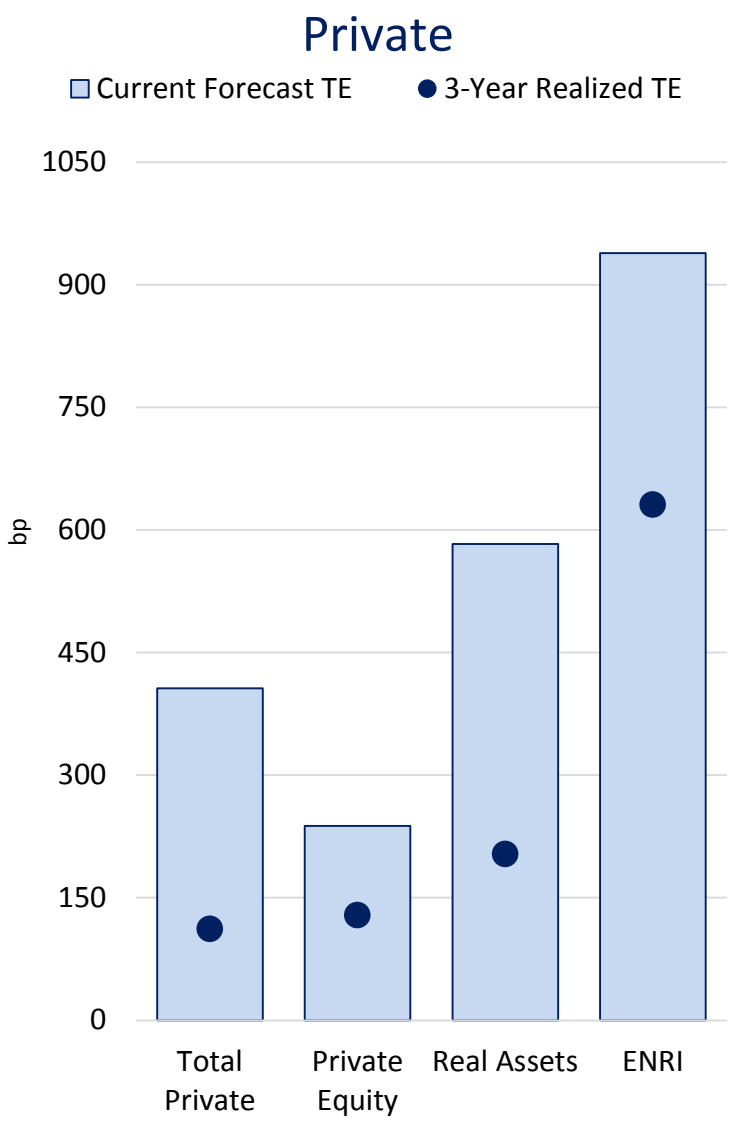
Forecasted Trust tracking error increased



Source: State Street Bank

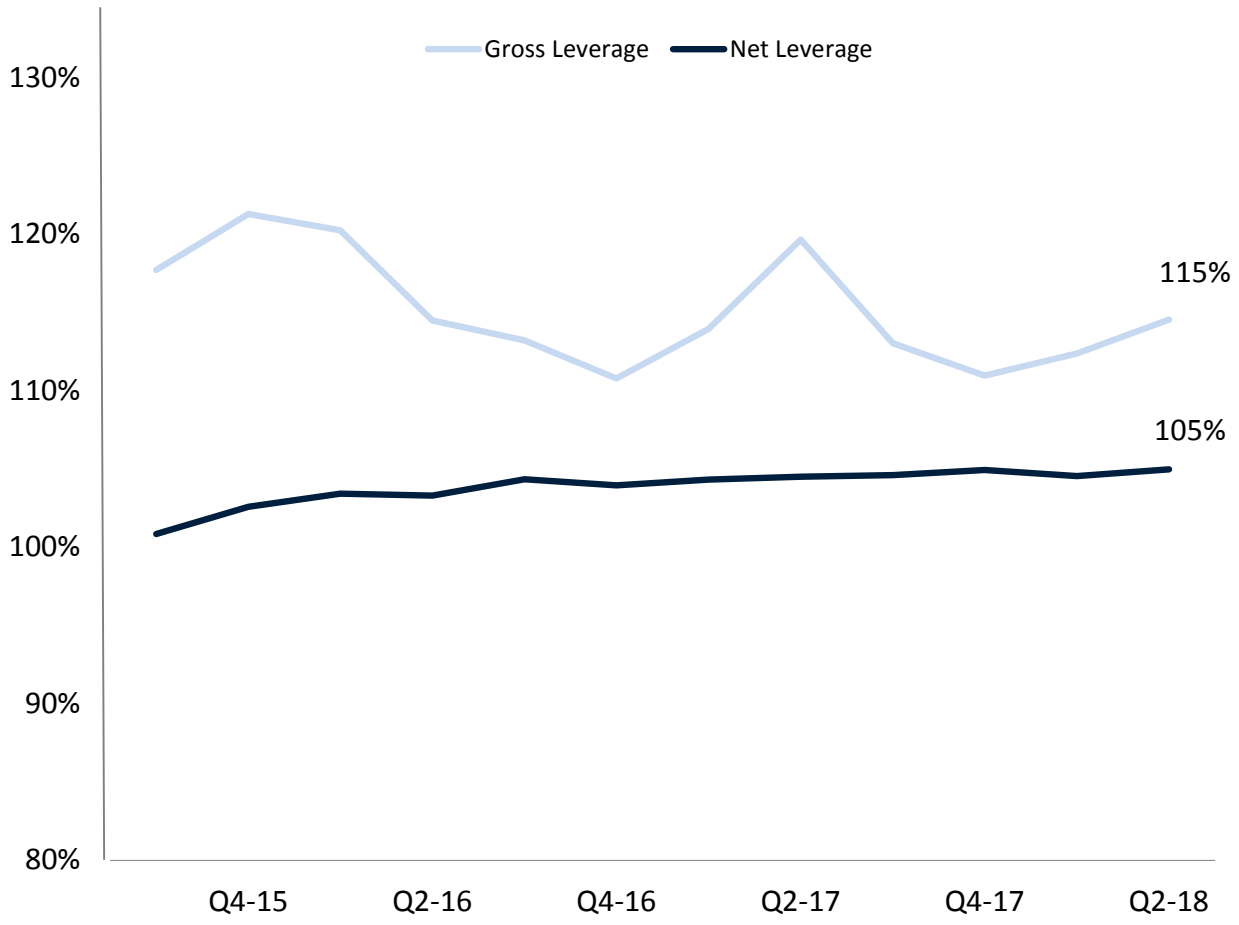
Public portfolio forecast tracking error below policy neutral

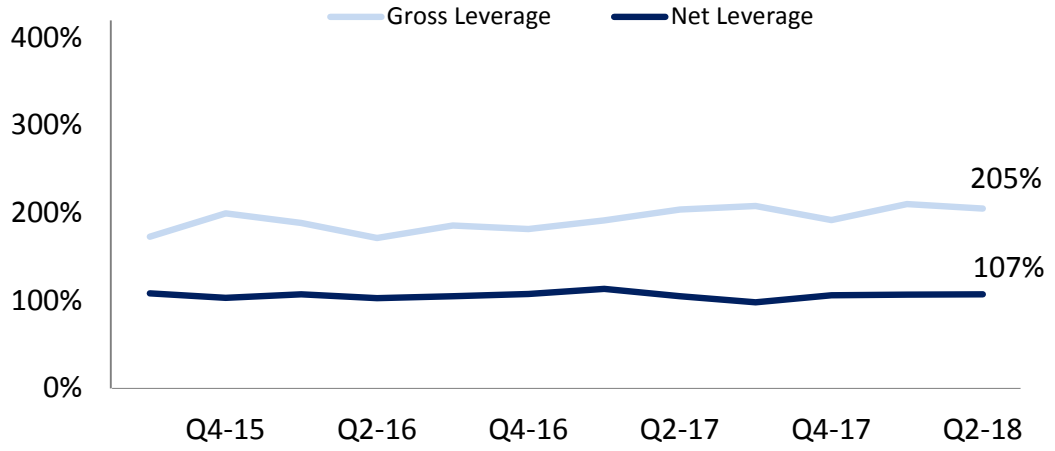


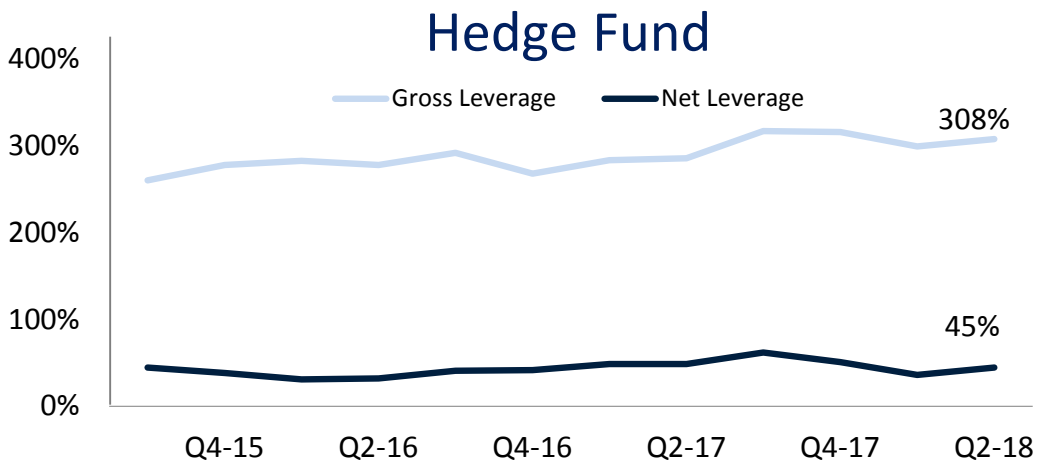


Source: State Street Bank; Current forecast tracking error uses past experiences from January 1, 2008 to December 31, 2017 and therefore includes the effects of the Global Financial Crisis.

Trust net leverage stable







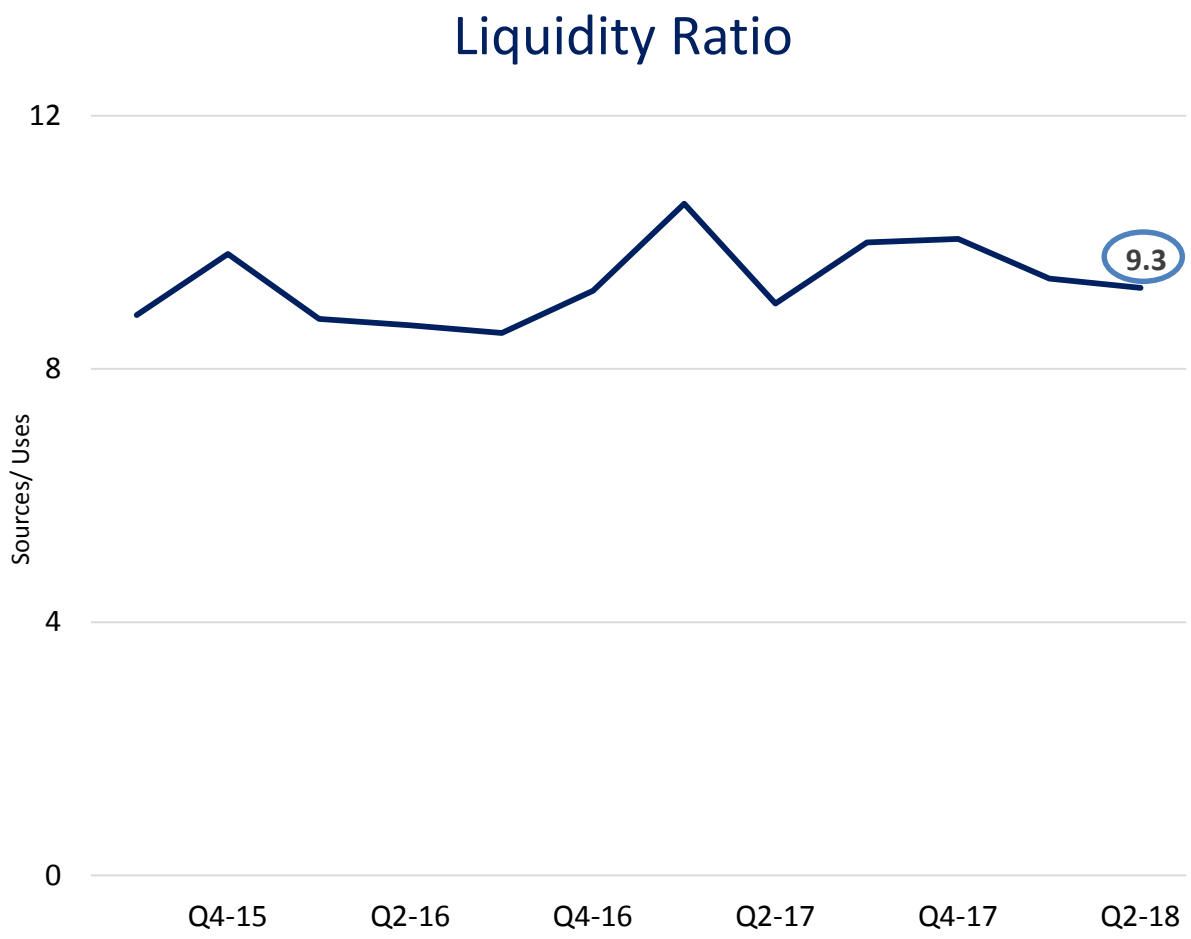
Source: State Street Bank; Total Trust leverage excludes securities lending which is reported separately

Trust liquidity remains strong

Sources of Liquidity ($, billions)	Market Value	Stressed Value
Internal Cash	$ 0.5	$ 0.5
US Treasuries and TIPS	21.4	20.3
Other Liquid Assets (Equity, Commodities)	59.9	31.0
Risk Parity	7.7	5.1
Total Sources of Liquidity	**$ 89.5**	**$ 56.9**
Note: Excluded Illiquid Private Assets and Hedge Funds	*$ 61.7*	*NA*

Uses of Liquidity ($, billions)	Market Value	Stressed Value
Operational Uses of Liquidity	$ 0.0	$ (0.3)
Stressed Securities Lending		(3.4)
Stressed Non-collateralized assets		-
Stressed Derivatives		(0.4)
Stressed Private Markets		(2.1)
Total Uses of Liquidity	**$ 0.0**	**$ (6.1)**

Liquidity Ratio	
Ratio (Sources/Uses)	**9.3**
Alert Threshhold	2.0
Test Result	**Pass**
Note: Net Stressed Liquidity (Sources less Uses)	*$ 50.8*
Note: Past 12 Months of Benefit Payments	*$ 3.9*

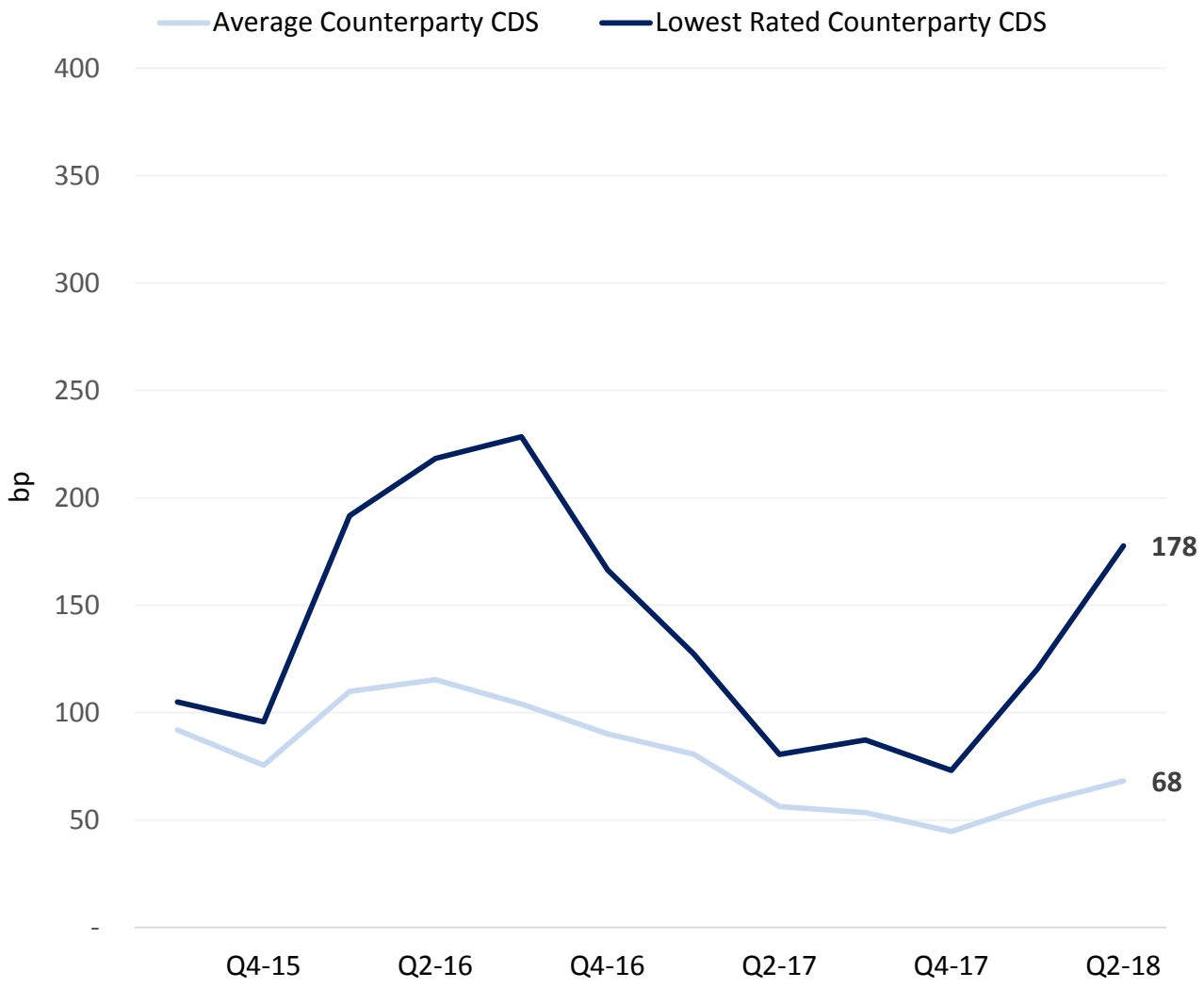


Source: State Street Bank, TRS IMD
Assumptions: The stress case assumes liquid assets experience 1.5x the worst rolling monthly return since 2008 plus an additional liquidity stress. Operational uses of liquidity reflects the lesser of forecasted cash flows or monthly benefit payments. Stressed securities lending reflects potential costs associated with termination including a liquidity stress. Stressed non-collateralized assets and derivatives reflect margin calls based on the same market stress applied to Liquid Assets. Private Market investments are assumed to return half as much capital as currently planned and experience capital calls equivalent to total unfunded commitments in equal installments over the course of 12 months.

Counterparty health remains strong

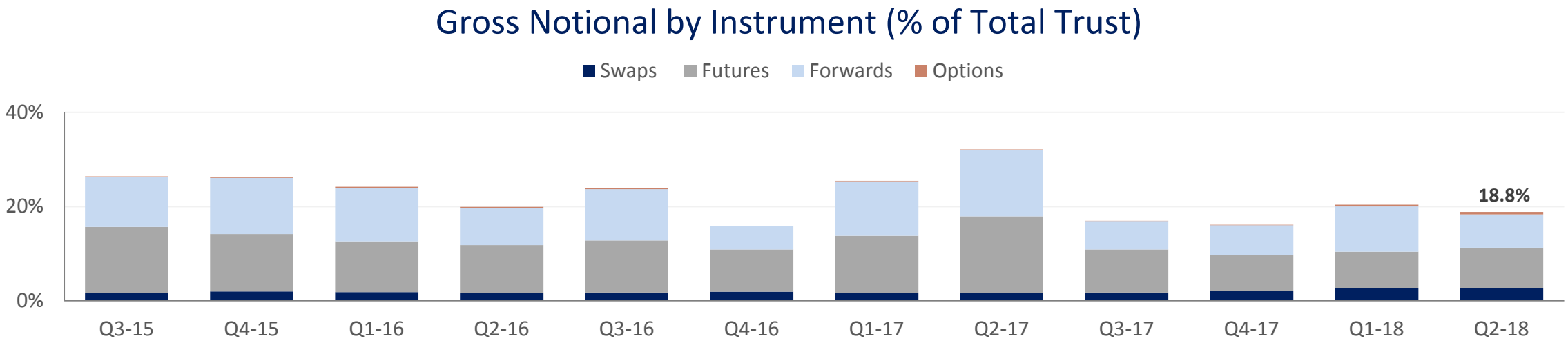
OTC Counterparty	S&P	Moody's	Fitch	Exposure
Over the Counter[2]				
Bank of America, N.A.	A+	Aa3	AA-	$0.2
Barclays Bank PLC	A	A2	A	0.0
BNP Paribas SA	A	Aa3	A+	4.0
CIBC	A+	Aa3	AA-	0.0
Citibank N.A.	A+	A1	A+	15.5
Credit Suisse International	A	A1	A-	0.0
Deutsche Bank AG	BBB+	A3	BBB+	0.0
Goldman Sachs International	A+	Aa3	A	17.6
JPMorgan Chase Bank N.A.	A+	Aa2	AA	13.6
Macquarie Bank Limited	A	A1	A	0.0
Morgan Stanley	A+	Aa3	A	0.1
Societe Generale	A	A1	A	0.0
The Toronto-Dominion Bank	AA-	Aa1	AA-	0.0
UBS AG	A+	Aa3	AA-	7.6

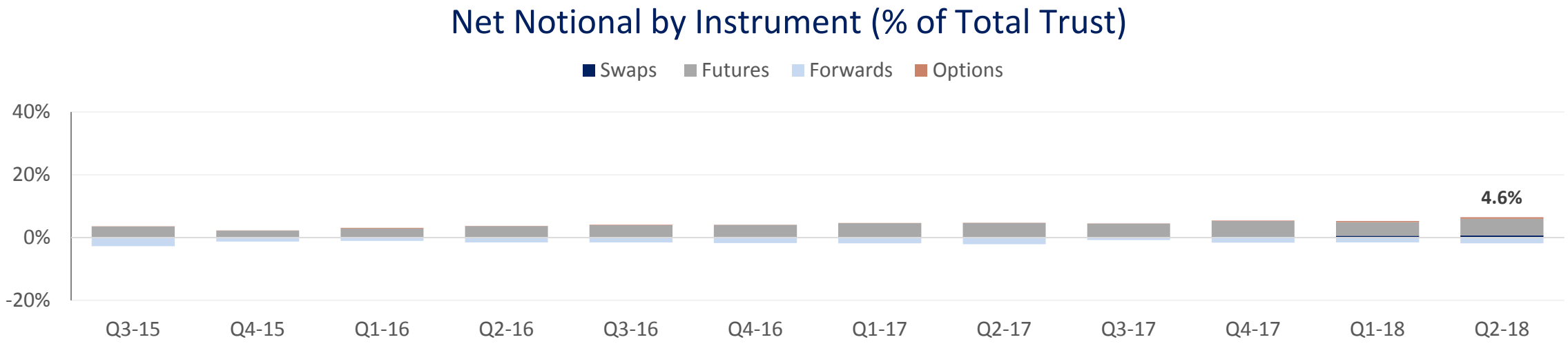
FCM Counterparty	S&P	Moody's	Fitch	Exposure
Exchange Traded Futures[3]				
Credit Suisse Securities (USA) LLC	A	NR	NR	$228.5
Goldman Sachs & Co	A+	NR	A+	73.3
JP Morgan Securities LLC	A+	Aa2	AA	85.0



Source: State Street Bank, Bloomberg; OTC counterparty exposure represents positive market value of all OTC derivative positions less collateral posted; Futures Commission Merchant (FCM) counterparty exposure reflects margin posted

Gross derivative notional exposure increased from Q4 2017

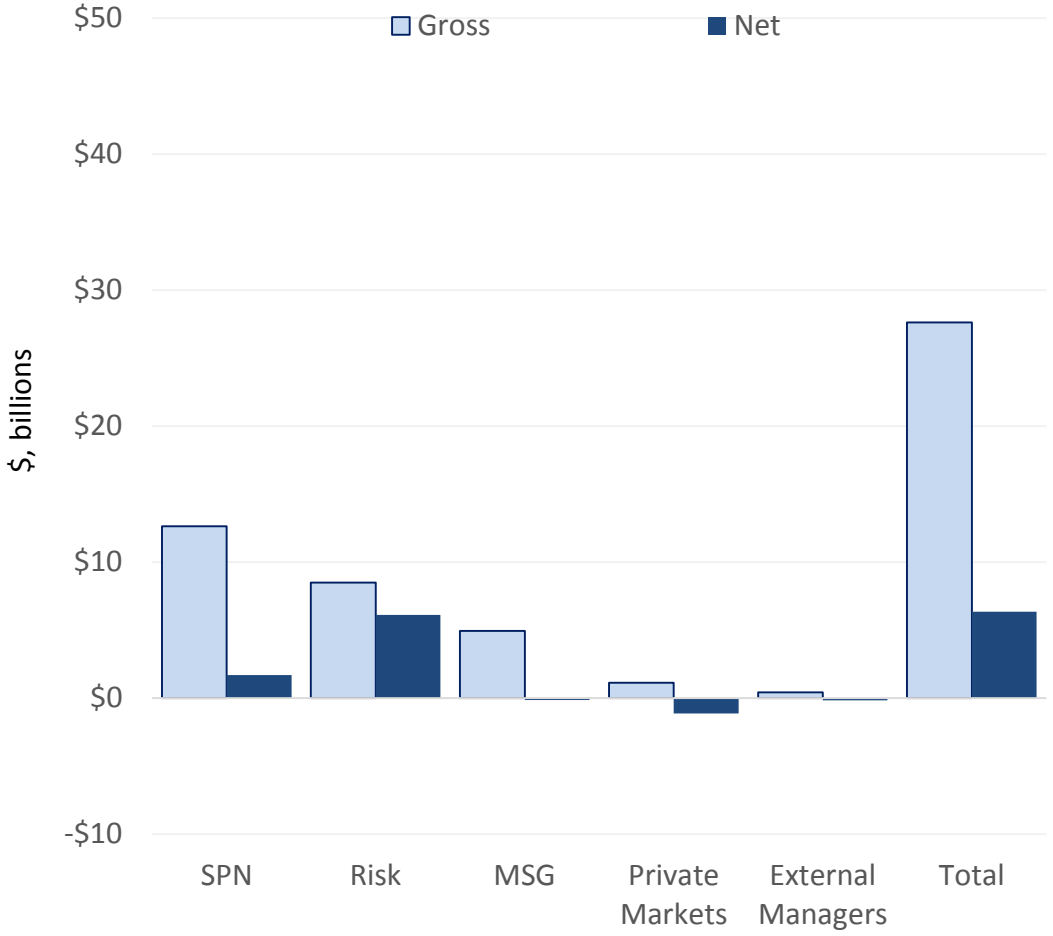




Source: State Street Bank; derivative positions represent transactions in which TRS is a counterparty

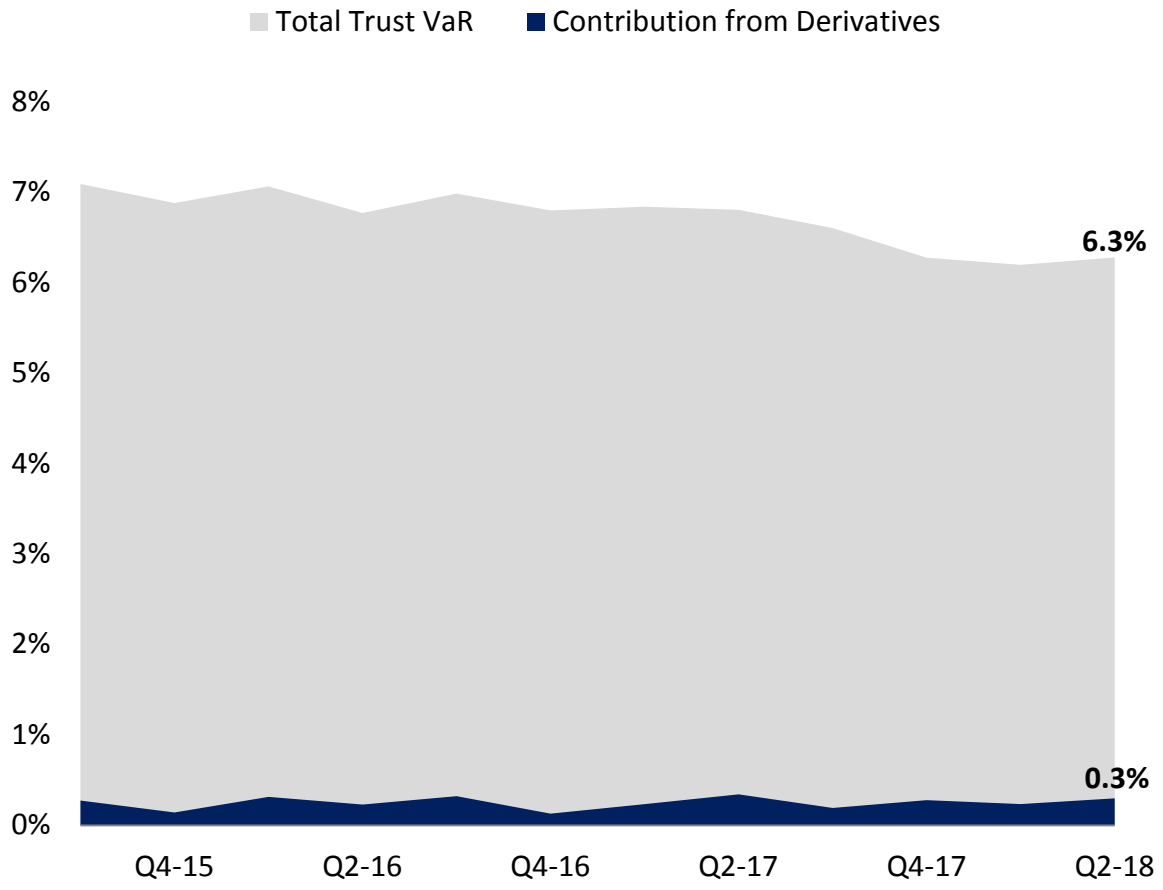
Derivatives contributed small portion of drawdown risk

Gross vs Net Derivatives Notional by Portfolio



- Total Gross = $27.6b
- Total Net = $6.4b

VaR Contribution from Derivatives



Source: State Street Bank; derivative positions represent transactions in which TRS is a counterparty

This slide was intentionally left blank.

In conclusion, key points are the following:

- Trust was underweight Global Equity
- Stable Value overweight driven by allocation to Absolute Return
- Trust tracking error increased
- Gross derivative usage ticked up in line with historical levels
- Risk metrics were within desired parameters

TRS
TEACHER RETIREMENT SYSTEM OF TEXAS