



# TRS Risk Management Committee



September 2016

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## **Minutes of the Risk Management Committee**

**June 16, 2016**

The Risk Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on June 16, 2016, in the boardroom located on the fifth floor of the TRS East Building offices at 1000 Red River Street, Austin, Texas.

### **Committee Members present:**

Ms. Karen Charleston, Chair  
Mr. David Corpus  
Mr. David Kelly  
Mr. Chris Moss

### **Other Board Members present:**

Dr. Greg Gibson  
Ms. Anita Palmer  
Ms. Dolores Ramirez

### **Others present:**

Brian Guthrie, TRS  
Jay LeBlanc, TRS  
Michelle Pagán, TRS  
Cristi Woods, TRS

Risk Management Committee Chair Ms. Charleston called the meeting to order at 3:05 p.m. with a quorum of committee members present.

#### **1. Consider the approval of the proposed minutes of the April 7, 2016 committee meeting – Committee Chair Karen Charleston.**

On a motion by Mr. Moss, seconded by Mr. Corpus, the proposed minutes for the April 7, 2016, Risk Management Committee meeting were approved as presented.

#### **2. Receive report on Enterprise Risk Management – Jay LeBlanc and Michelle Pagán.**

Mr. Jay LeBlanc described the type of reporting Enterprise Risk Management provides the committee every other quarter regarding operational risk. Ms. Michelle Pagán provided the Enterprise Risk Management report. She stated that TRS-Care funding is the highest risk and TRS-ActiveCare affordability is an elevated risk. Ms. Pagán noted the next elevated risk is employer reporting and that it is expected to remain stable. She reported that legacy information systems is a moderate risk but is expected to become elevated. Ms. Pagan noted that staff resources are becoming a concern as key legacy support staff are eligible to retire and cannot be easily replaced. However, Ms. Pagán added that the TEAM program will help provide improved delivery mechanisms to members and business users. She cited records management as an elevated risk due to high growth volume of e-records as well as silos of files

managed manually by staff. Ms. Pagán stated that the TEAM program is an elevated risk due to the go-live stage, a critical phase of the program where risks and issues may materialize.

Ms. Pagán concluded that 14 risk categories on the TRS stoplight report received risk assessments. Two risk categories increased their risk levels, and TRS-Care funding continues to be a high risk. Ms. Pagán stated that management and staff have identified the risk mitigations and action items for these risk categories.

### **3. Risk Management Program Review Report – Jay LeBlanc and Cristi Woods.**

Ms. Woods provided a review of the State Office of Risk Management (SORM) program evaluation. She noted that SORM was very complimentary of TRS in their evaluations and praised TRS on the strength of its safety culture. Ms. Woods reported that SORM did provide a few minor recommendations, which have subsequently been resolved and completed.

The Risk Management Committee adjourned at 3:23 p.m.

Approved by the Risk Management Committee of the Board of Trustees of the Teacher Retirement System of Texas on September 22, 2016.

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Katherine H. Farrell  
Secretary of the TRS Board of Trustees

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Date



# Investment Risk Report

Jase Auby, Chief Risk Officer

James Nield, Deputy Chief Risk Officer

September 2016



# Agenda

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## Policy Requirements

1. Asset Allocation
2. Value at Risk (VaR)
3. Tracking Error
4. Leverage
5. Liquidity
6. Counterparty Risks
7. Derivatives

## Conclusion

## Appendix

## Securities Lending

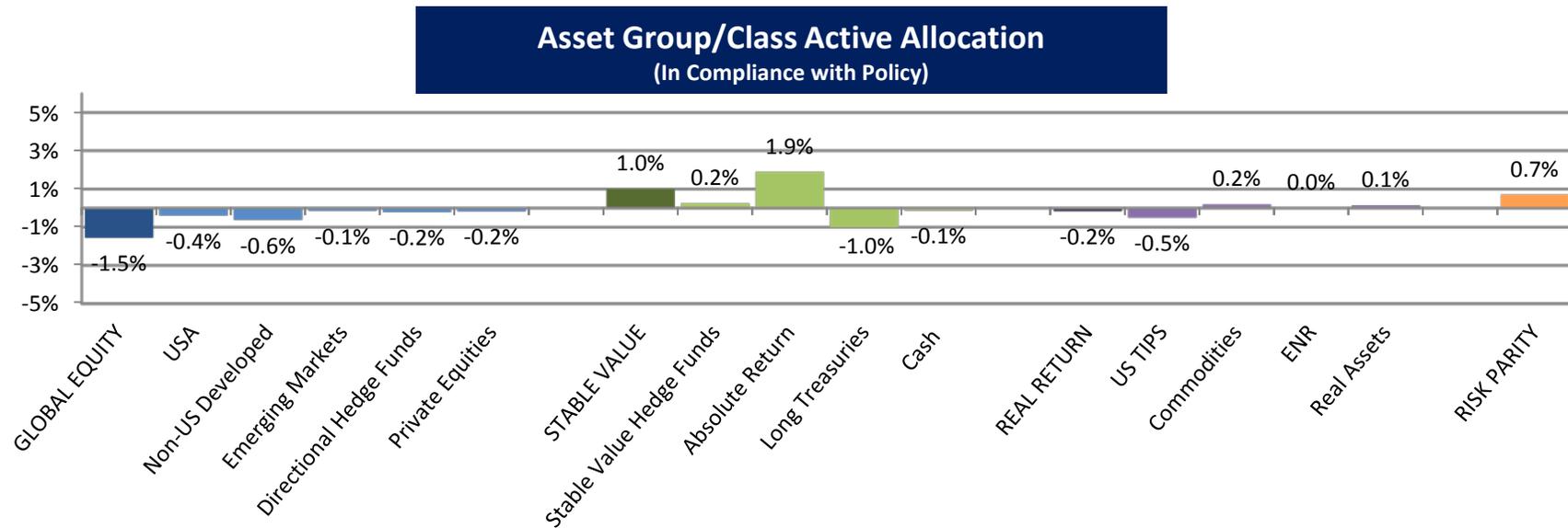
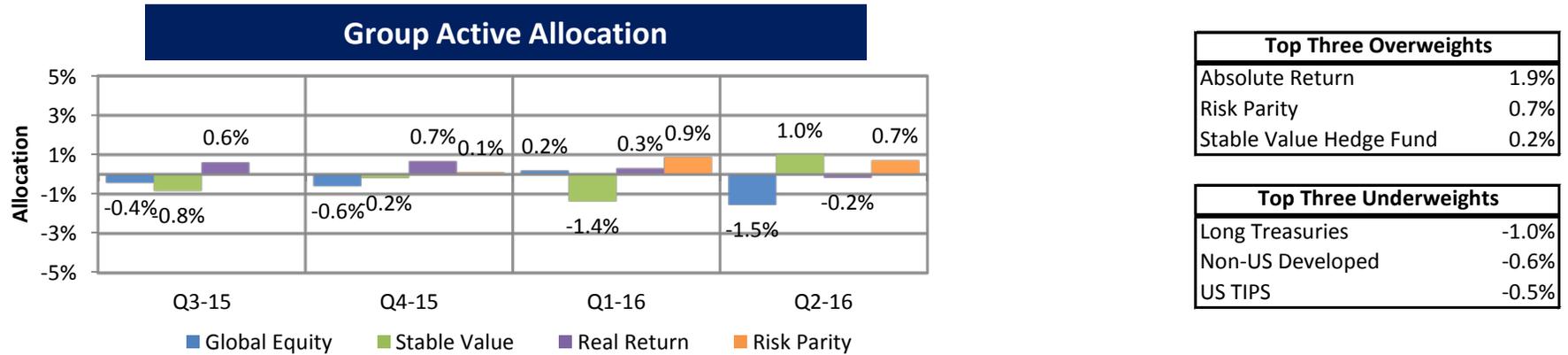
# Policy Requirements

As of June 30, 2016

Policy Requirements	Description	In compliance?
<b>1. Asset Allocation</b>	<b>In compliance with policy</b>	✓
<b>2. Value at Risk</b>	<b>6.8% (51% of the VaR limit range)</b>	✓
<b>3. Tracking Error</b>	<b>110 bp (37% of maximum)</b>	✓
<b>4. Leverage</b>	<b>In compliance with policy</b>	✓
Total Trust		
Net Leverage	103.3% (Within historical norm)	✓
Gross Leverage	114.5% (Within historical norm)	✓
Securities Lending		
Net Leverage	100.3% (Within historical norm)	✓
Gross Leverage	115.1% (Within historical norm)	✓
Hedge Fund		
Net Leverage	71.6% (Within historical norm)	✓
Gross Leverage	317.6% (Within historical norm)	✓
Strategic Partners		
Net Leverage	102.8% (Within historical norm)	✓
Gross Leverage	171.5% (Within historical norm)	✓
Real Assets		
Loan to Value	38.3% (Within historical norm)	✓
<b>5. Liquidity</b>	<b>In compliance with policy</b>	✓
<b>6. Counterparty</b>	<b>In compliance with policy</b>	✓
Exposure	In compliance with policy	✓
Rating	In compliance with policy	✓
<b>7. Derivative Exposures</b>	<b>In compliance with policy</b>	✓

# 1. Asset Allocation

As of June 30, 2016

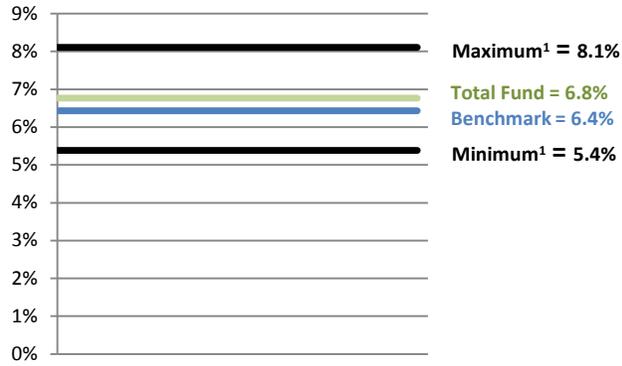


Source: State Street Bank

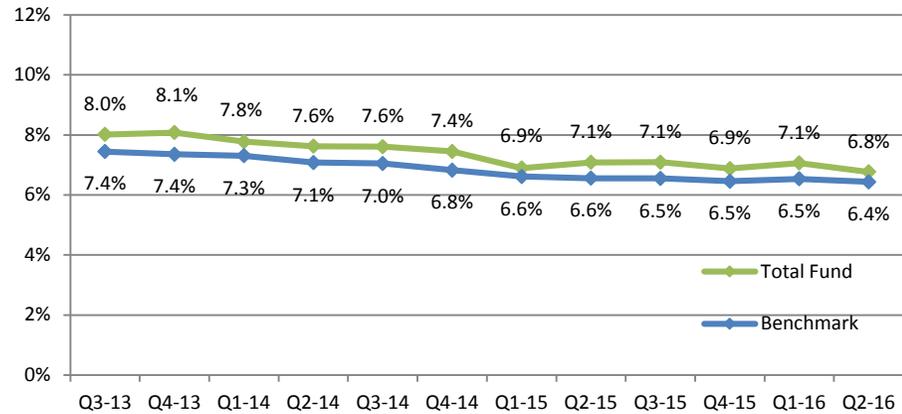
# 2. Value at Risk (VaR)

As of June 30, 2016

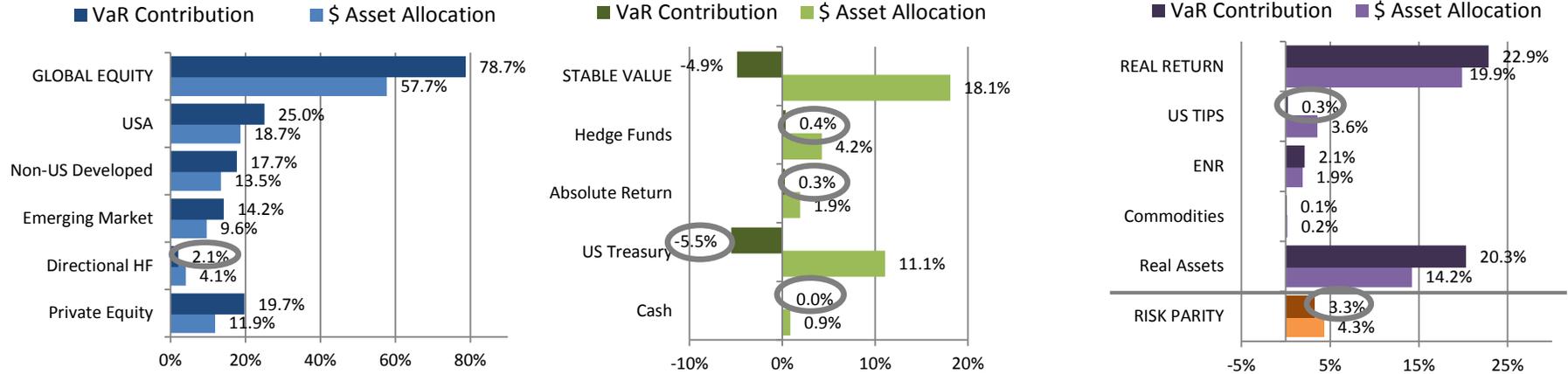
### VaR as Percent of Market Value (One Month, 95% Confidence)



### VaR History (as Percent of Market Value)



### VaR vs \$ Allocation



Risk-reducing assets are circled in grey and have risk contributions less than their portfolio weights

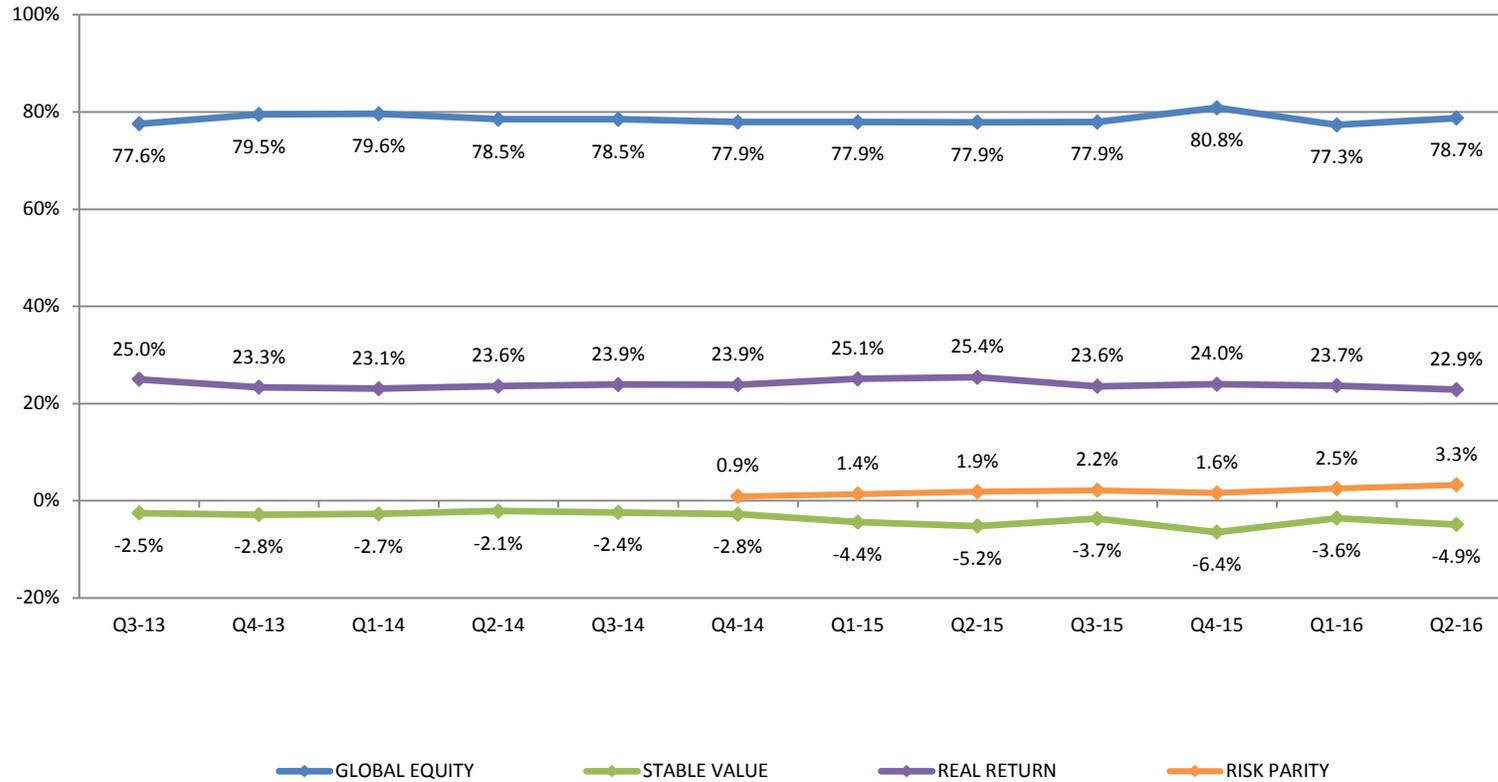
Source: State Street Bank

<sup>1</sup>Minimum and maximum VaR are determined by adjusting the allocation to each policy asset class within the allowable policy range such that VaR is minimized and maximized.



# VaR Contribution by Asset Groups

As of June 30, 2016



Source: State Street Bank



# 3. Tracking Error

Annualized as of June 30, 2016

Policy Assets	Market Value (\$, billions)	Current Forecast (bp) <sup>1</sup>	3-Year Realized (bp)
USA	\$23.6	117	125
Non-US Developed	17.0	211	279
Emerging Market	12.4	172	187
Directional Hedge Funds	5.3	307	263
US Treasuries	14.3	47	218
Absolute Return	2.5	429	1120
Stable Value Hedge Funds	5.5	312	257
Cash	0.9	0	3
Global Inflation Linked Bonds	4.6	16	16
Commodities	0.2	3640	2058
<b>Total Public Assets</b>	<b>\$91.9</b>	<b>73</b>	<b>110</b>
Private Equity	\$15.4	182	192
Energy and Natural Resources	2.4	386	NA <sup>2</sup>
Real Assets	18.4	481	141
<b>Total Private Assets</b>	<b>\$36.2</b>	<b>293</b>	<b>119</b>
<b>Total Risk Parity</b>	<b>\$5.6</b>	<b>265</b>	<b>NA<sup>2</sup></b>
<b>Total Assets</b>	<b>\$129.4</b>	<b>104</b>	<b>40</b>

Policy neutral is 100 bp and policy maximum is 300 bp

Source: State Street Bank

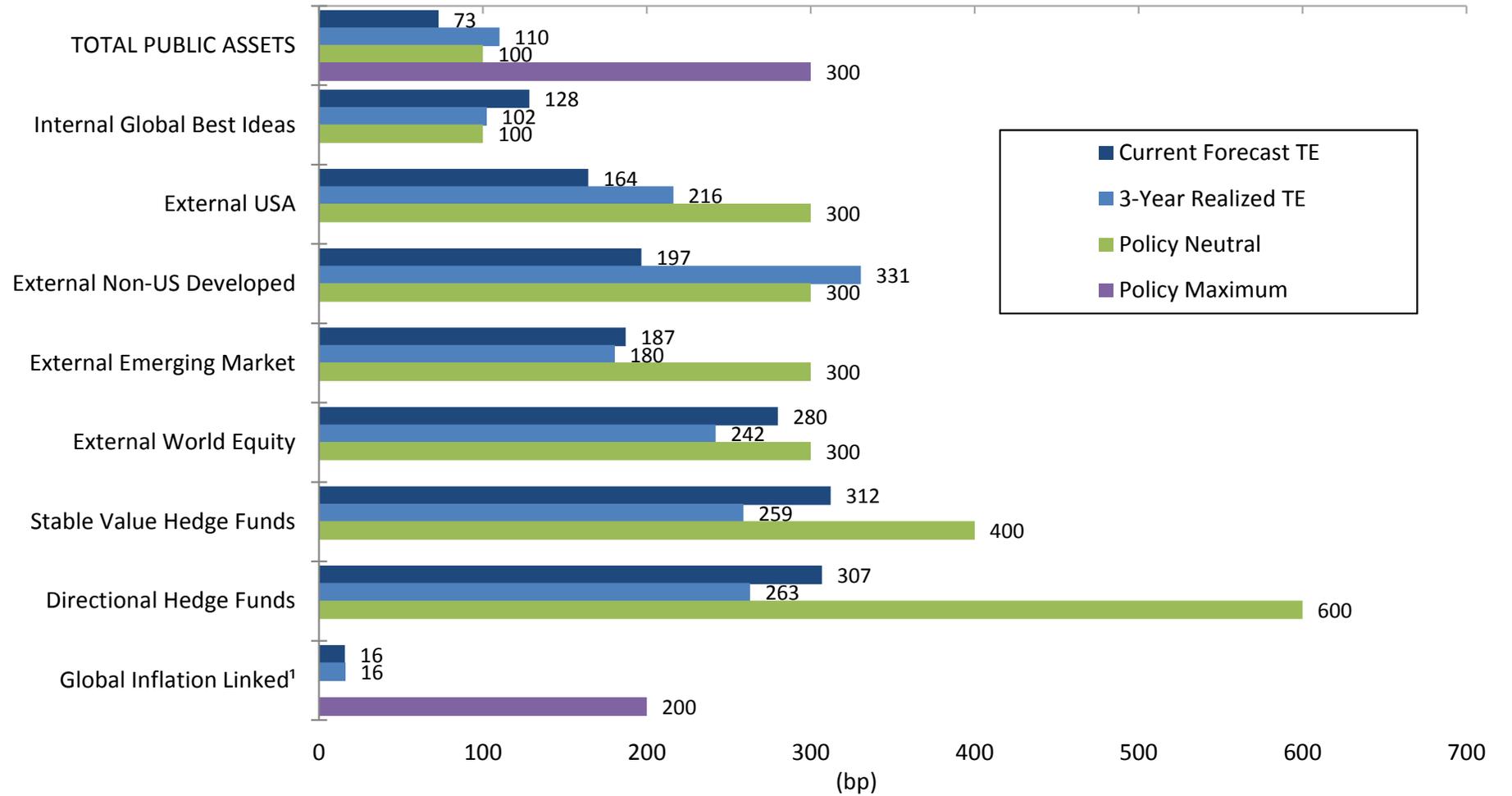
<sup>1</sup>Current forecast uses past experiences from January 1, 2008 to today and therefore includes the effects of the Global Financial Crisis.

<sup>2</sup>Realized tracking error cannot be calculated due to the short history of these portfolios.



# 3. Tracking Error

Annualized as of June 30, 2016



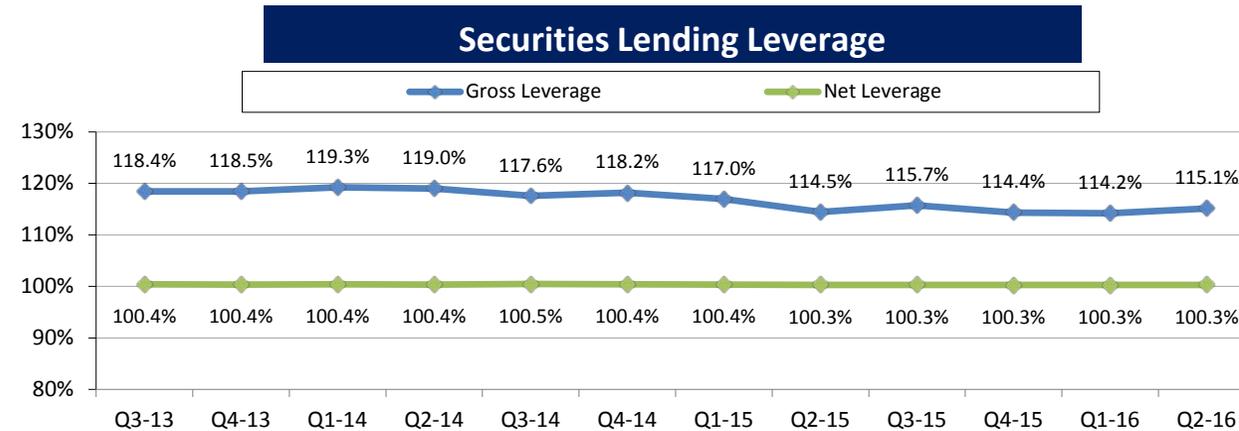
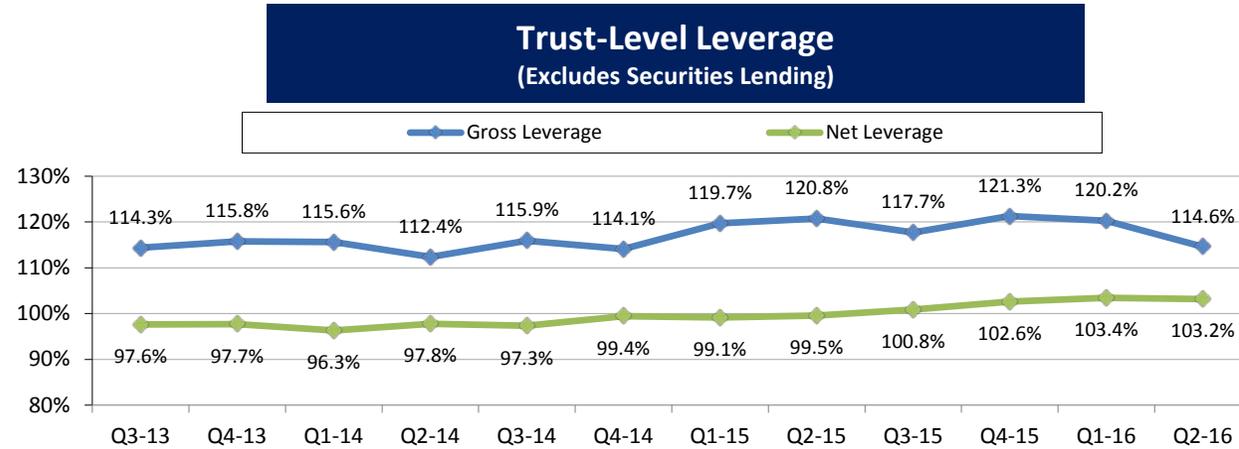
Source: State Street Bank

<sup>1</sup>No policy neutral tracking error is set for Global Inflation Linked Bonds



# 4. Leverage

As of June 30, 2016

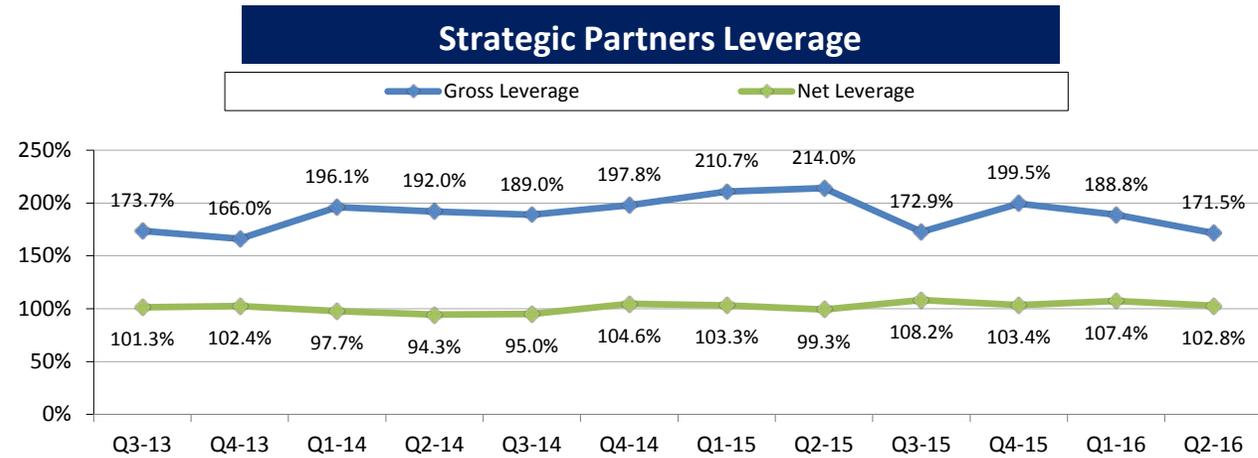
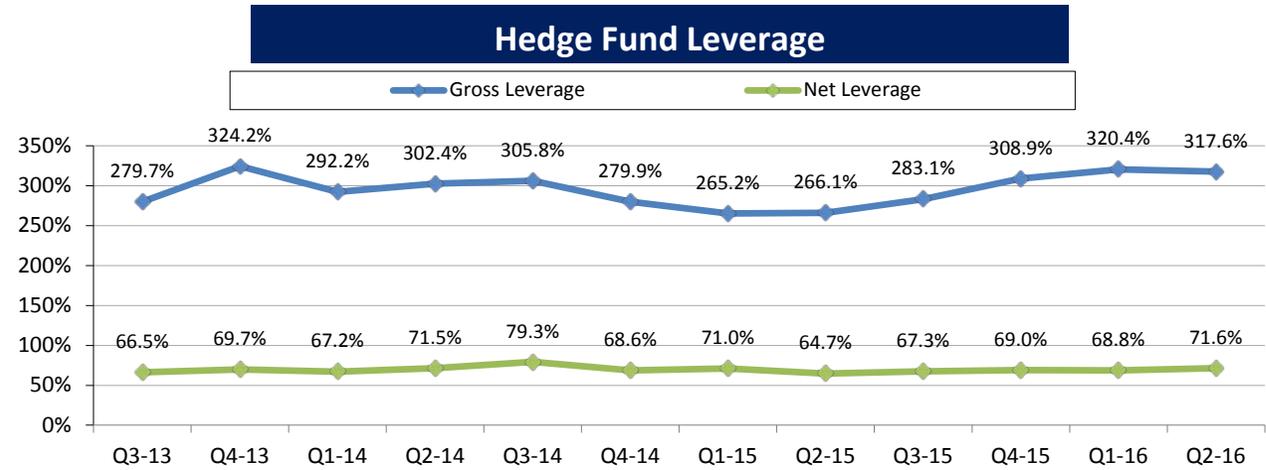


Source: State Street Bank  
 Note: Trust level leverage includes 0.1% of funded securities sold short



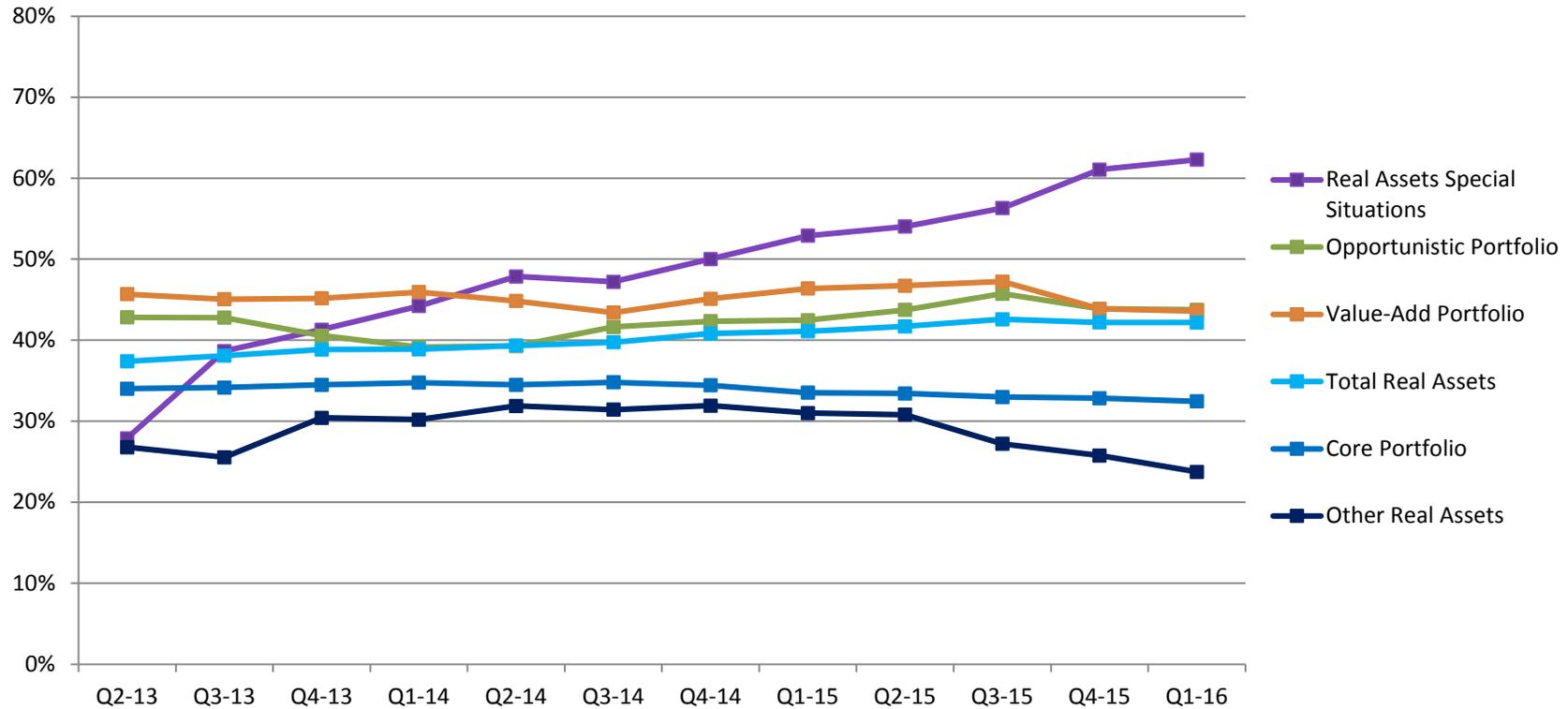
# 4. Leverage

As of June 30, 2016



# 4. Leverage

As of March 31, 2016



Source: The Townsend Group



# 5. Liquidity

As of June 30, 2016

Sources of Liquidity (\$, billions)	Market Value	Stressed Value
Liquid Assets Not on Loan (Cash, UST, TIPS, Equity, Commodities)	59.3	32.5
Securities Lending Collateral (Cash, Fixed Income)	19.0	15.5
<b>Total Sources of Liquidity</b>	<b>78.3</b>	<b>48.0</b>
<i>Note: Excluded Illiquid Assets (Private Equity, Real Assets, Hedge Funds, Other)</i>	54.4	NA
<i>Note: Excluded Liquid Assets remaining on loan</i>	16.3	NA

Uses of Liquidity (\$, billions)	Market Value	Stressed Value
Normal Uses of Liquidity	-1.0	-1.0
Stressed Securities Lending		-2.9
Stressed Derivatives		-0.3
Stressed Private Markets		-3.9
<b>Total Uses of Liquidity</b>	<b>-1.0</b>	<b>-8.1</b>

Liquidity Ratio	
Sources of Liquidity	48.0
Uses of Liquidity	-8.1
<b>Ratio (Sources/Uses)</b>	<b>5.9</b>
Alert Threshold	4.0
Fail Threshold	3.0
<b>Test Result</b>	<b>Pass</b>
<i>Note: Net Liquidity (Sources less Uses)</i>	39.9
<i>Note: 12 Months Benefit Payments (at 3% Annual)</i>	3.9

Source: State Street Bank

Assumptions: In the stress case, Liquid Assets are valued at 55% and Securities Lending collateral is valued at 81% which is meant to approximate 1.5x the worst monthly performance of these assets in the past ten years plus an additional liquidity stress. Within Securities Lending, 50% of equity on loan and 0% of US Treasuries on loan are assumed to be returned to TRS. Derivatives are assumed to experience the same market stress applied to the Liquid Assets. Private Market investments are assumed to not return any capital and experience capital calls at 6x the normal amount expected for a month.



# 6. Counterparty Risks

As of June 30, 2016

## Counterparty Exposure

Counterparty	Number of Contracts				Counterparty Exposure (\$, millions)
	Swaps	Forwards	Futures	OTC Options	
<b>Over the Counter<sup>1</sup></b>					
Bank of America, N.A.	4	12		1	\$0.0
Barclays Bank PLC	3	33		1	0.0
BNP Paribas SA		36			6.6
Citibank N.A.	8	160			0.7
Credit Suisse International	1		1	2	1.6
Deutsche Bank AG	2			1	9.6
Goldman Sachs International	128	258		22	16.1
JPMorgan Chase Bank N.A	12	55	1	13	0.0
Macquarie Bank Limited	2				0.1
Morgan Stanley & Co. International P	14	30		12	0.0
Societe Generale	2	38			0.0
Toronto Dominion Bank		11			0.0
UBS AG	1	158		1	0.0
<b>Exchange Traded<sup>2</sup></b>					
Credit Suisse Securities (USA) LLC	3		135		144.8
Goldman Sachs & Co	8		39	2	217.7
JP Morgan Securities LLC			157	2	93.0
<b>Grand Total</b>	<b>188</b>	<b>791</b>	<b>333</b>	<b>57</b>	<b>\$490.2</b>

Source: State Street Bank

<sup>1</sup>Counterparty exposure is positive market value of all OTC derivative positions less collateral posted. Policy limits this value to \$500 million per counterparty.

<sup>2</sup>Counterparty exposure is initial margin posted.



# 6. Counterparty Risks

As of June 30, 2016

## Counterparty Ratings and Capital Assessment

Counterparty	S&P	Moody's	Fitch	Capital Ratios <sup>1</sup>	
				Tier 1	Common
<b>Over the Counter<sup>2</sup></b>					
Bank of America, N.A.	A	A1	A+	11.3	10.0
Barclays Bank PLC	A-	A2	A	14.7	15.6
BNP Paribas SA	A	A1	A+	12.2	11.8
Citibank N.A.	A	A1	A+	13.5	14.6
Credit Suisse International	A	A2	A-	18.0	13.4
Deutsche Bank AG	BBB+	Baa2	A-	14.7	13.2
Goldman Sachs International	A	A1	A	13.5	12.4
JPMorgan Chase Bank N.A.	A+	Aa3	AA-	13.5	11.8
Macquarie Bank Limited	A	A2	A	11.8	15.0
Morgan Stanley	A	A1	A	17.4	15.1
Societe Generale	A	A2	A	13.5	14.9
The Toronto-Dominion Bank	AA-	Aa1	AA-	11.3	10.8
UBS AG	A+	A1	A+	21.0	22.9
<b>Exchange Traded Futures<sup>3</sup></b>					
Credit Suisse Securities (USA) LLC	A	NR	NR	18.0	13.4
Goldman Sachs & Co	A	NR	A+	13.5	12.4
JP Morgan Securities LLC	A+	Aa3	AA-	13.5	11.8

Source: Rating Agencies and Bloomberg

<sup>1</sup>Basel 3 requires 8.5% Tier 1 capital and 7.0% Common capital.

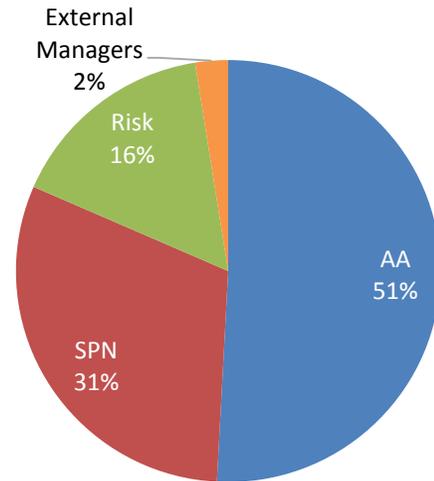
<sup>2</sup>Rating of counterparty or counterparty's credit support provider. Policy requirement is A- or A3 by at least one of Fitch, Moody's or S&P.

<sup>3</sup>Credit Suisse Securities parent company is rated A2 by Moody's and A- by Fitch. Goldman Sachs & Co. parent company is rated A3 by Moody's

# 7. Derivatives

As of June 30, 2016

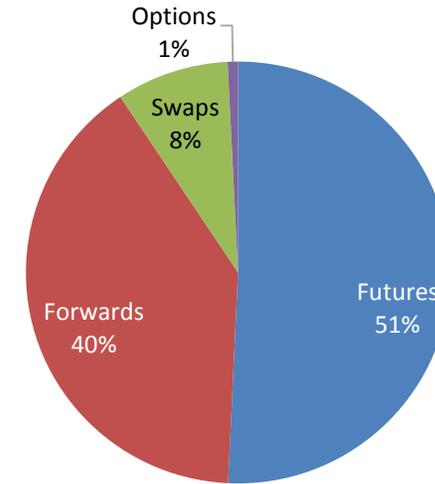
**Gross Notional by Portfolio**



The bulk of derivatives usage is AA (tactically adjusting the Trust's asset allocation) and the SPN's (TAA and benchmark replication)

Portfolio	Gross Notional (\$, millions)	Net Notional (\$, millions)
AA	\$13,109.0	-\$1,053.4
SPN	7,910.0	1,182.1
Risk	4,116.8	2,904.5
External Managers	644.0	-134.1
<b>Total</b>	<b>\$25,779.8</b>	<b>\$2,899.1</b>

**Gross Notional by Instrument Type**



Futures and forwards, which are among the most liquid forms of derivatives, constitute the bulk of the Trust's derivatives portfolio

Instrument	Gross Notional (\$, millions)	Net Notional (\$, millions)
Futures	\$13,082.3	\$4,707.6
Forwards	10,285.1	-1,971.3
Swaps	2,210.1	55.3
Options	202.3	107.6
<b>Total</b>	<b>\$25,779.8</b>	<b>\$2,899.1</b>

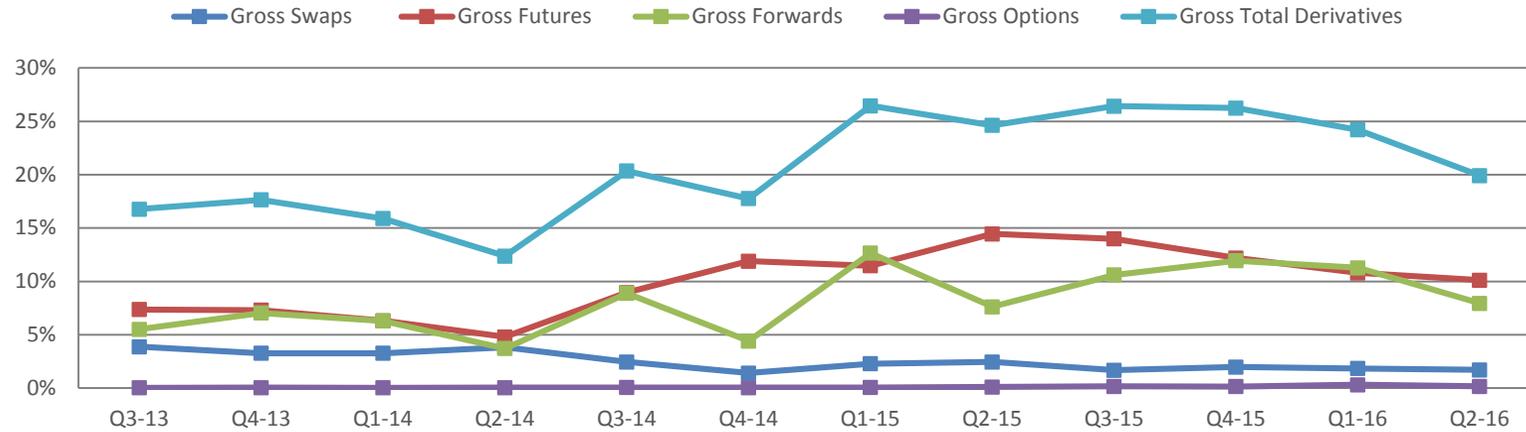


Source: State Street Bank

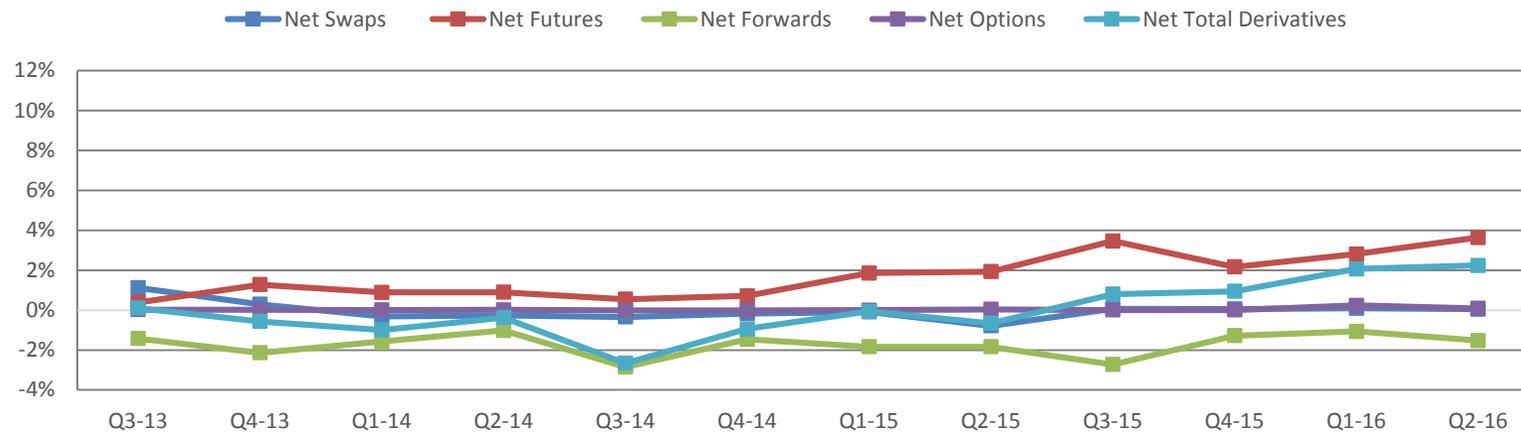
# 7. Derivatives

As of June 30, 2016

### Gross Notional (% of Total Trust)



### Net Notional (% of Total Trust)

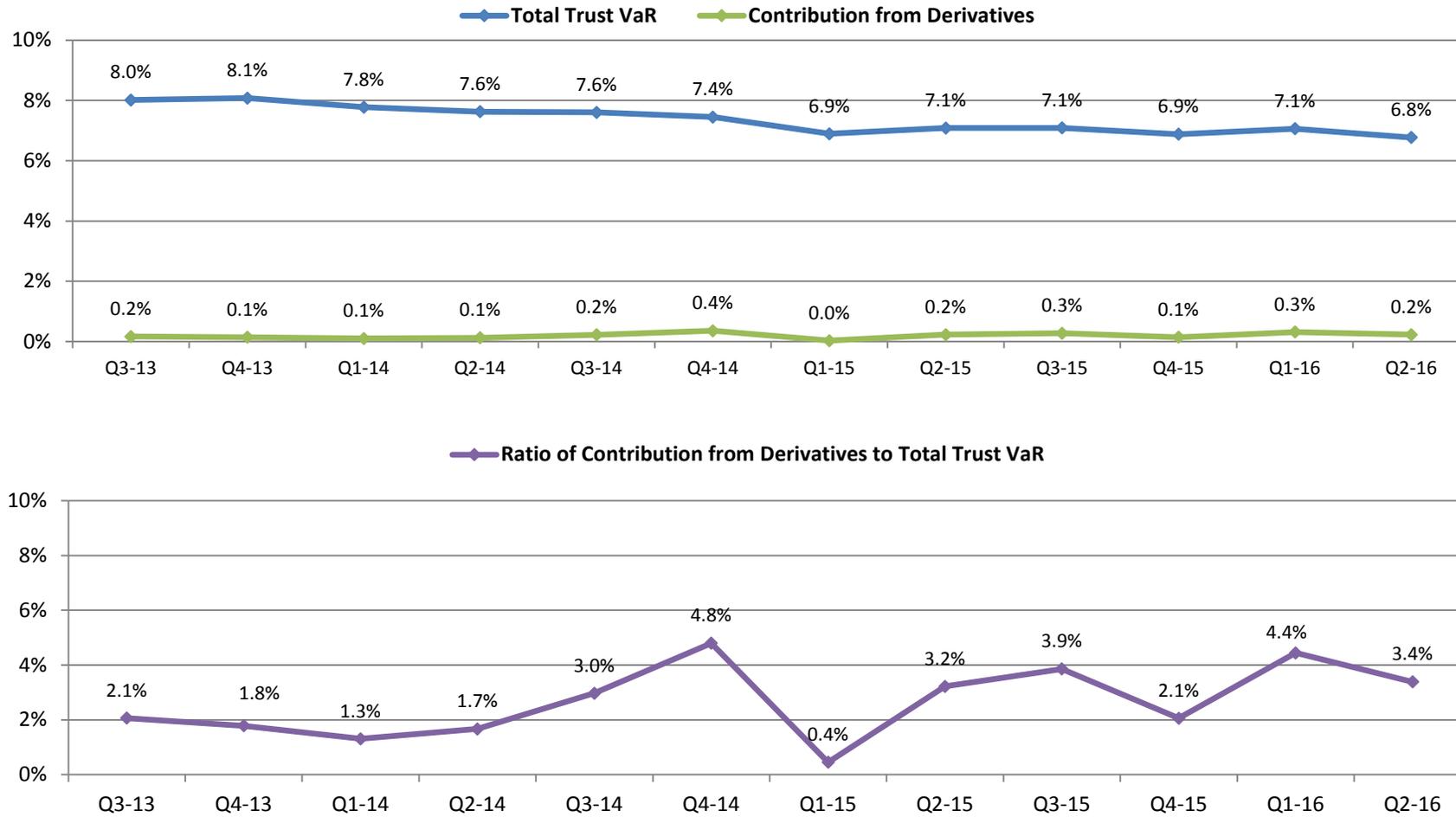


Source: State Street Bank



# 7. Derivatives

## As of June 30, 2016



Source: State Street Bank



# 7. Derivatives

As of June 30, 2016

The bulk of derivatives usage is AA (\$13.1 billion) and the SPN (\$7.9 billion)

AA's \$13.1 billion gross notional nets to a much lower (-\$1.1 billion) net position.

The Trust's \$25.8 billion gross notional nets to a much lower (\$2.9 billion) net position.

## Gross Notional

(\$, millions)	AA	SPN	Risk	External Managers	Total
Futures	5,992.7	3,894.9	3,176.9	17.8	13,082.3
Forwards	6,178.5	3,109.0	601.2	396.4	10,285.1
Swaps	937.7	900.9	259.7	111.8	2,210.1
Options	0.0	5.1	79.0	118.1	202.3
<b>Total</b>	<b>\$13,109.0</b>	<b>\$7,910.0</b>	<b>\$4,116.8</b>	<b>\$644.0</b>	<b>\$25,779.8</b>

## Net Notional

(\$, millions)	AA	SPN	Risk	External Managers	Total
Futures	237.7	1,331.2	3,120.9	17.8	4,707.6
Forwards	-1,345.7	83.3	-555.1	-153.8	-1,971.3
Swaps	54.7	-236.0	259.7	-23.1	55.3
Options	0.0	3.5	79.0	25.0	107.6
<b>Total</b>	<b>-\$1,053.4</b>	<b>\$1,182.1</b>	<b>\$2,904.5</b>	<b>-\$134.1</b>	<b>\$2,899.1</b>

Source: State Street Bank



# 7. Derivatives

As of June 30, 2016

The low mark-to-market is mainly due to the short term maturity of the derivatives positions – on average 0.37 years

## Mark-to-Market

(\$, millions)	AA	SPN	Risk	External Managers	Total
Futures	-38.8	35.7	71.5	0.5	68.9
Forwards	-30.4	-6.1	23.0	10.6	-3.0
Swaps	0.7	-1.0	1.2	-1.4	-0.5
Options	0.0	0.0	2.3	-4.8	-2.5
<b>Total</b>	<b>-\$68.5</b>	<b>\$28.6</b>	<b>\$98.1</b>	<b>\$4.8</b>	<b>\$63.0</b>

## Average Tenor in Years

Interest rate swaps and credit default swaps typically have longer tenors of 5-10 years

	AA	SPN	Risk	External Managers	Total
Futures	0.20	0.23	0.23	0.21	0.21
Forwards	0.14	0.11	0.09	0.57	0.14
Swaps	0.48	3.73	4.98	0.84	2.35
Options	0.07	0.17	0.00	0.40	0.26
<b>Total</b>	<b>0.19</b>	<b>0.58</b>	<b>0.52</b>	<b>0.57</b>	<b>0.37</b>

# Conclusion

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- As of June 30, 2016, TRS investment exposures are in compliance with the Investment Policy Statement
  - TRS was overweight Stable Value (+1.0%) and Risk Parity (+0.7%) and was underweight Global Equity (-1.5%) and Real Return (-0.2%)
  - At the asset class level, TRS was overweight Absolute Return, Risk Parity and Stable Value Hedge Funds and was underweight Long Treasuries, Non-US Developed, and US TIPS
- Risk metrics are within parameters

# APPENDIX

# Derivatives Exposure

As of June 30, 2016

## Futures Notional<sup>1</sup>

Futures by Asset Class	Number of Contracts	Gross Exposure (\$, millions)	Gross Exposure (% of Asset Class)	Gross Exposure (% of Total Trust)
USA	20	\$660.9	2.8%	0.5%
Non-US Developed	66	1,832.2	10.8%	1.4%
Emerging Markets	12	885.5	7.1%	0.7%
US Treasury	29	4,772.6	33.3%	3.7%
Cash	5	202.6	23.4%	0.2%
Absolute Return	4	1,068.3	43.3%	0.8%
Inflation Linked Bonds	58	465.5	10.1%	0.4%
Commodities	0	0.0	0.0%	0.0%
World Equity	2	17.8	0.3%	0.0%
Risk Parity	137	3,176.9	57.1%	2.5%
<b>Futures Total</b>	<b>333</b>	<b>\$13,082.3</b>		<b>10.1%</b>

Source: State Street Bank

<sup>1</sup>Exposures include TRS internally managed portfolios and externally managed separate accounts.



# Derivatives Exposure

As of June 30, 2016

## Swap Notional<sup>1</sup>

Swaps by Asset Class	Number of Contracts	Gross Exposure (\$, millions)	Gross Exposure (% of Asset Class)	Gross Exposure (% of Total Trust)
USA	28	\$306.7	1.3%	0.2%
Non-US Developed	124	520.3	3.1%	0.4%
Emerging Markets	2	73.3	0.6%	0.1%
Absolute Return	1	50.9	2.1%	0.0%
Inflation Linked Bonds	2	103.9	2.2%	0.1%
Commodities	26	858.7	353.9%	0.7%
Real Assets	2	36.6	0.7%	0.0%
Risk Parity	3	259.7	4.7%	0.2%
<b>Swaps Total</b>	<b>188</b>	<b>\$2,210.1</b>		<b>1.7%</b>

Source: State Street Bank

<sup>1</sup>Exposures include TRS internally managed portfolios and externally managed separate accounts.



# Derivatives Exposure

As of June 30, 2016

## Forwards and Options Notional<sup>1</sup>

Non-Currency Forwards by Asset Class	Number of Contracts	Gross Exposure (\$, millions)	Gross Exposure (% of Total Trust)
USA	51	177.5	0.1%
Non-US Developed	2	9.9	0.0%
Emerging Markets	2	9.7	0.0%
Global TIPS	2	5.1	0.0%
<b>Options Total</b>	<b>57</b>	<b>202.3</b>	<b>0.2%</b>
Euro Currency	119	1,962.2	1.5%
Japanese Yen	71	1,092.8	0.8%
Pound Sterling	90	1,795.5	1.4%
Canadian Dollar	60	461.7	0.4%
Other Non-US Developed	265	3,514.4	2.7%
Emerging Markets	186	1,458.5	1.1%
<b>Forwards Total</b>	<b>791</b>	<b>\$10,285.1</b>	<b>7.9%</b>

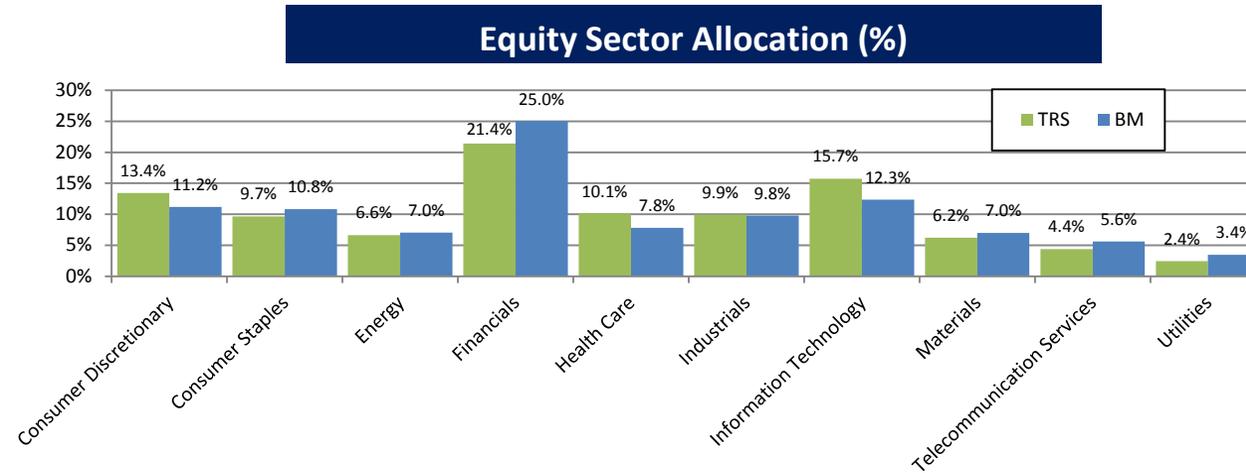
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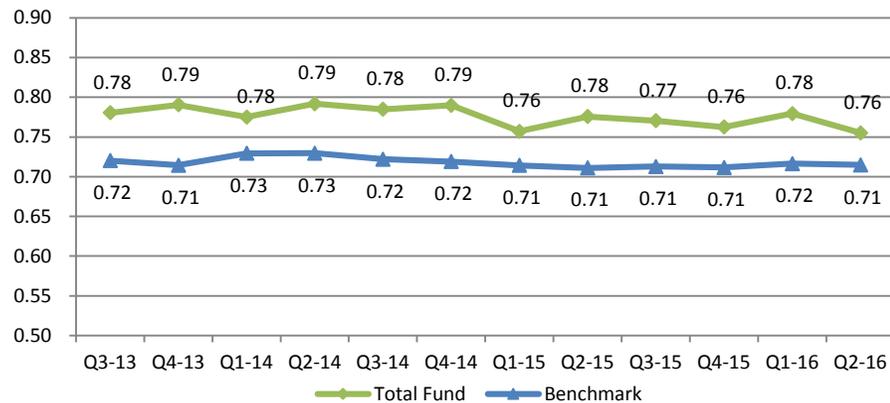


# Sector Allocation, Beta and Scenario Analysis

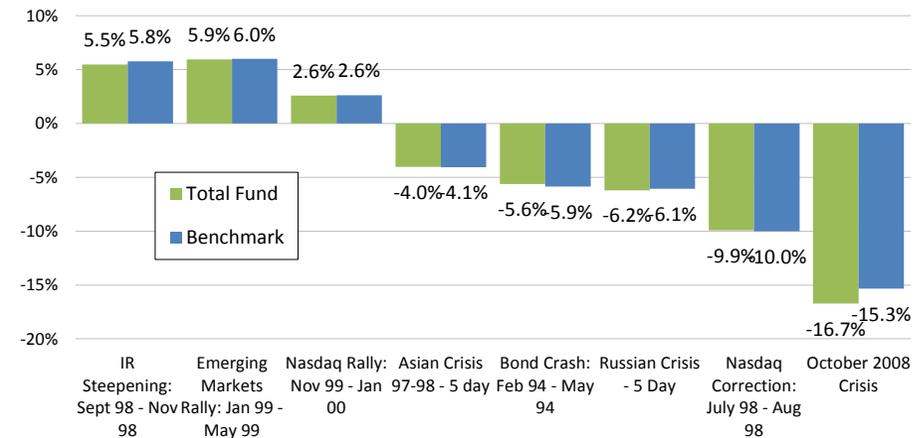
As of June 30, 2016



### Beta Analysis MSCI World Index



### Scenario Analysis (% Gain/Loss in Market Value)

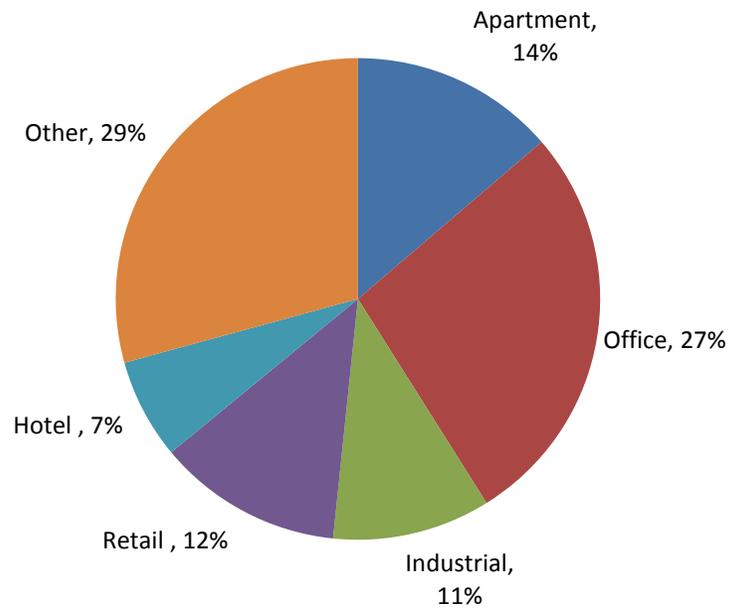


Source: State Street Bank

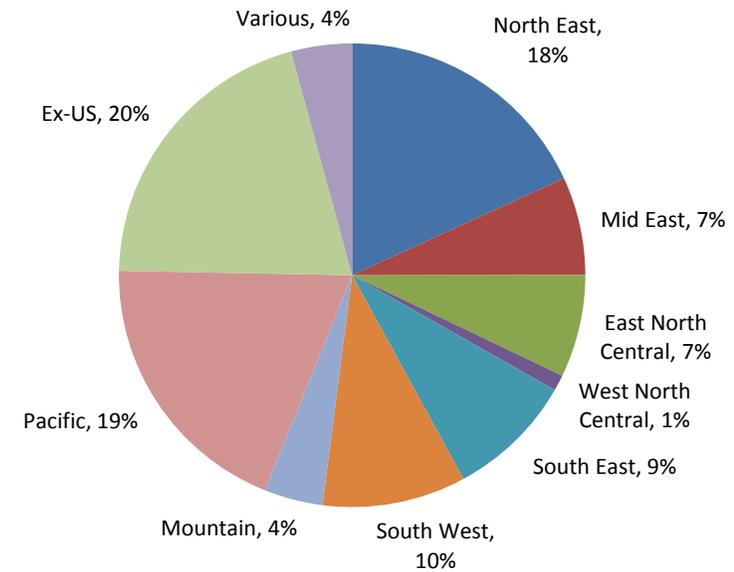
# Real Estate Diversification

As of March 31, 2016

## Property Type Diversification



## Geographic Diversification



# Securities Lending

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