



# TRS Risk Management Committee



March 2015

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**TEACHER RETIREMENT SYSTEM OF TEXAS MEETING  
BOARD OF TRUSTEES  
AND  
RISK MANAGEMENT COMMITTEE**

*(Ms. Charleston, Committee Chair; Mr. Barth; Mr. Corpus; Mr. Kelly; & Mr. Moss, Committee Members)*

**AGENDA**

**March 26, 2015 – 1:00 p.m.  
TRS East Building, 5<sup>th</sup> Floor, Boardroom**

*The March 26-27, 2015 meeting of the Risk Management Committee and TRS Board of Trustees will be held by telephone conference call as authorized under Texas Government Code Section 551.130. The Board and committee intend to have a quorum physically present at the following location: **1000 Red River Austin, Texas 78701 in the TRS East Building, 5<sup>th</sup> Floor, Boardroom.***

1. Consider the approval of the proposed minutes of the November 20, 2014 committee meeting – Karen Charleston.
2. Review the Investment Risk Report – Jase Auby.

NOTE: The Board of Trustees (Board) of the Teacher Retirement System of Texas will not consider or act upon any item before the Risk Management Committee (Committee) at this meeting of the Committee. This meeting is not a regular meeting of the Board. However, because the full Risk Management Committee constitutes a quorum of the Board, the meeting of the Committee is also being posted as a meeting of the Board out of an abundance of caution.



## Minutes of the Risk Management Committee

November 20, 2014

The Risk Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on November 20, 2014 in the boardroom located on the fifth floor of the TRS East Building offices at 1000 Red River Street, Austin, Texas.

The following committee members were present:

Karen Charleston, Chair  
Todd Barth  
David Corpus  
Christopher Moss

Others present:

Joe Colonna, TRS Trustee	Dan Junell, TRS
Anita Palmer, TRS Trustee	Lynn Lau, TRS
Nanette Sissney, TRS Trustee	Jay LeBlanc, TRS
Brian Guthrie, TRS	James Nield, TRS
Amy Barrett, TRS	Hugh Ohn, TRS
Carolina de Onís, TRS	Jamie Pierce, TRS
Jase Auby, TRS	Shaun Powell, TRS
Ronnie Bounds, TRS	Eric McDonald, Former TRS Trustee
Chris Cutler, TRS	Steve Huff, Reinhart Boerner Van Deuren s.c.
Tom Guerin, TRS	Steve Voss, Hewitt EnnisKnupp
Cindy Haley, TRS	Ann Fickel, Texas Classroom Teachers Association
	Philip Mullins, Austin Retired Teachers Association

Ms. Charleston called the meeting to order at 2:35 p.m. A quorum of the committee was present. Mr. Kelly was absent.

### **1. Consider the approval of the proposed minutes of the September 18, 2014 committee meeting – Committee Chair.**

On a motion by Mr. Moss, seconded by Mr. Corpus, the committee approved the minutes of the September 18, 2014 meeting, as presented.

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

Mr. LeBlanc presented two Enterprise Risk Management (ERM) reports – the Stoplight Report and the Risk Profile Report. He explained the adjusted risk levels for the risk categories as follows:

- The active health care risk level increased due to funding concerns, recent premium increases, and continued rising health care costs.
- The investment accounting risk level decreased due to the re-selection of the custodian bank and by having the official investment book of record maintained with the custodian.
- The retiree health care risk level increased due to the projected insolvency of the fund.
- The TEAM program risk level increased due to issues with the line of business project.

He concluded his presentation by reviewing ERM activities for 2015.

The meeting adjourned at 2:44 p.m.

APPROVED BY THE **RISK MANAGEMENT COMMITTEE** OF THE BOARD OF TRUSTEES OF THE TEACHER RETIREMENT SYSTEM OF TEXAS ON THE 26TH DAY OF MARCH, 2015.

ATTESTED BY:

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Dan Junell  
Secretary to the TRS Board of Trustees

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Date





# Investment Risk Report

Jase Auby  
Chief Risk Officer  
March 2015

# 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

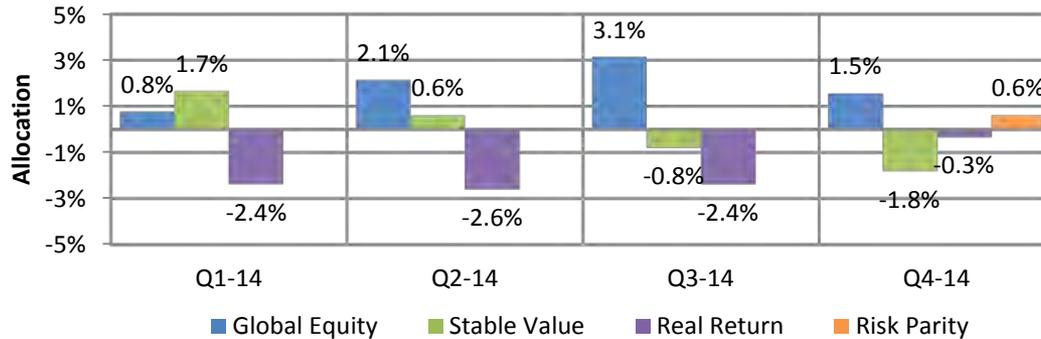
*As of December 31, 2014*

Policy Requirements	Description	In compliance?
<b>1. Asset Allocation</b>	<b>In compliance with policy</b>	✓
<b>2. Value at Risk</b>	<b>7.4% (62% of the VaR limit range)</b>	✓
<b>3. Tracking Error</b>	<b>68 bp (23% of maximum)</b>	✓
<b>4. Leverage</b>	<b>In compliance with policy</b>	✓
Total Trust		
Net Leverage	99.4% (Within historical norm)	✓
Gross Leverage	114.1% (Within historical norm)	✓
Securities Lending		
Net Leverage	100.4% (Within historical norm)	✓
Gross Leverage	118.1% (Within historical norm)	✓
Hedge Fund		
Net Leverage	68.6% (Within historical norm)	✓
Gross Leverage	279.9% (Within historical norm)	✓
Strategic Partners		
Net Leverage	104.6% (Within historical norm)	✓
Gross Leverage	197.8% (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 December 31, 2014

## Group Active Allocation

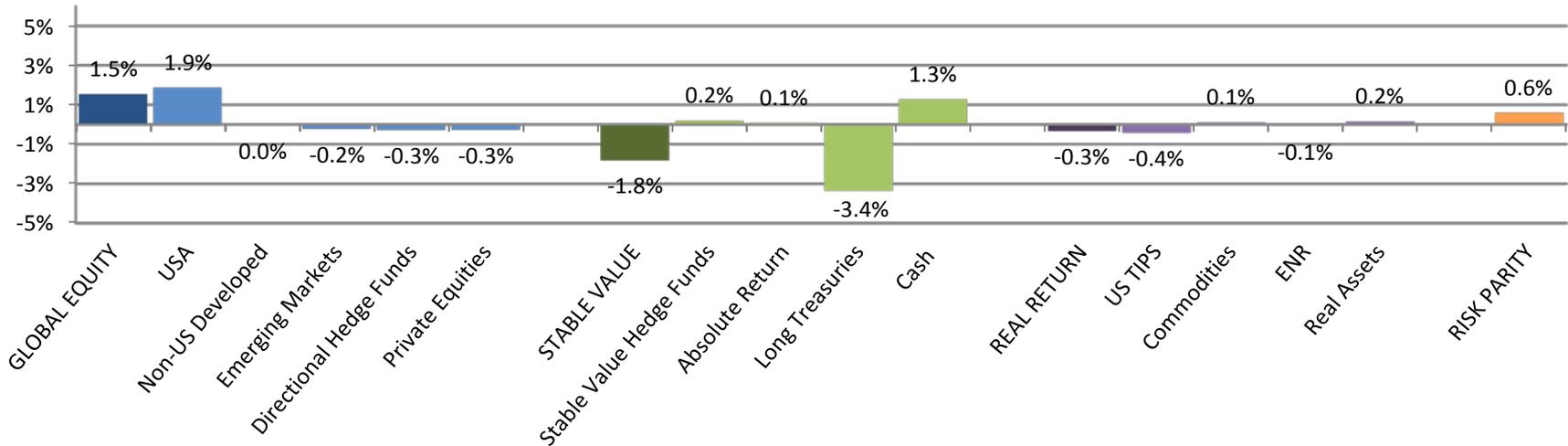


Top Three Overweights	
USA	1.9%
Cash	1.3%
Risk Parity	0.6%

Top Three Underweights	
Long Treasuries	-3.4%
US TIPS	-0.4%
Directional Hedge Funds	-0.3%

## Asset Group/Class Active Allocation

(In Compliance with Policy)



Source: State Street Bank

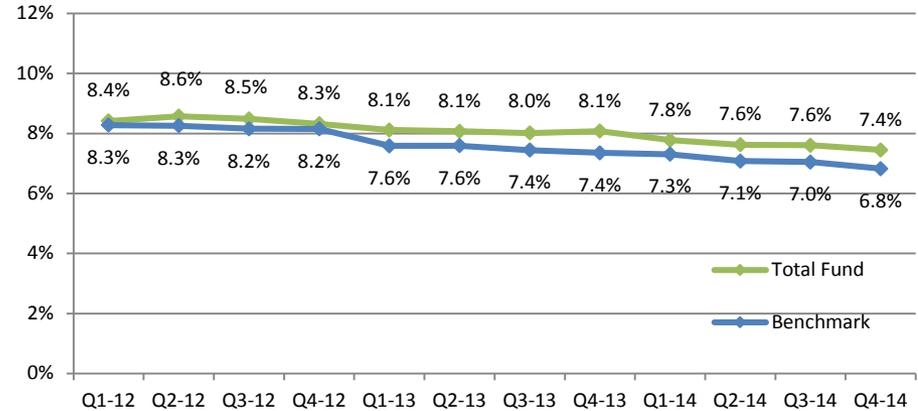
# 2. Value at Risk (VaR)

As of December 31, 2014

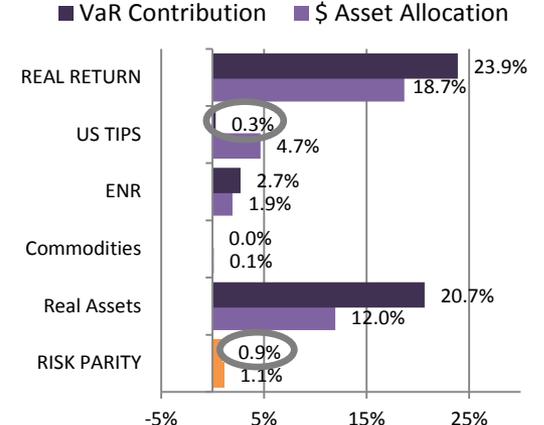
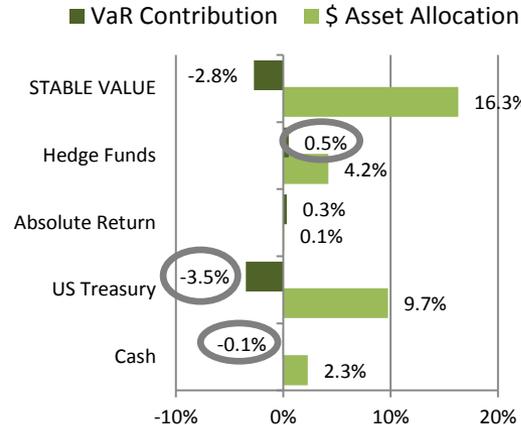
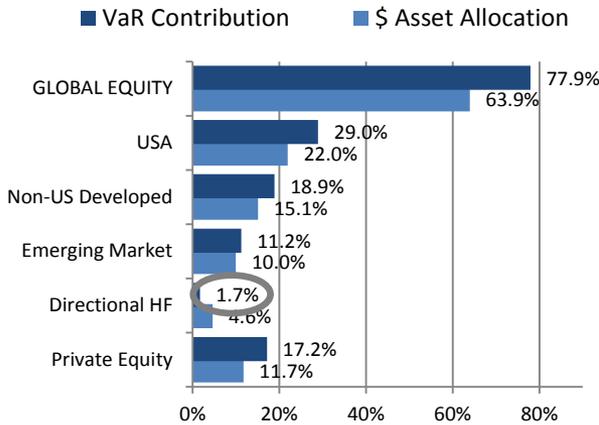
## VaR as a Percent of Market Value (One Month, 95% Confidence)



## VaR History (as Percent of Market Value)



## VaR vs. \$ Allocation



Source: State Street Bank

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

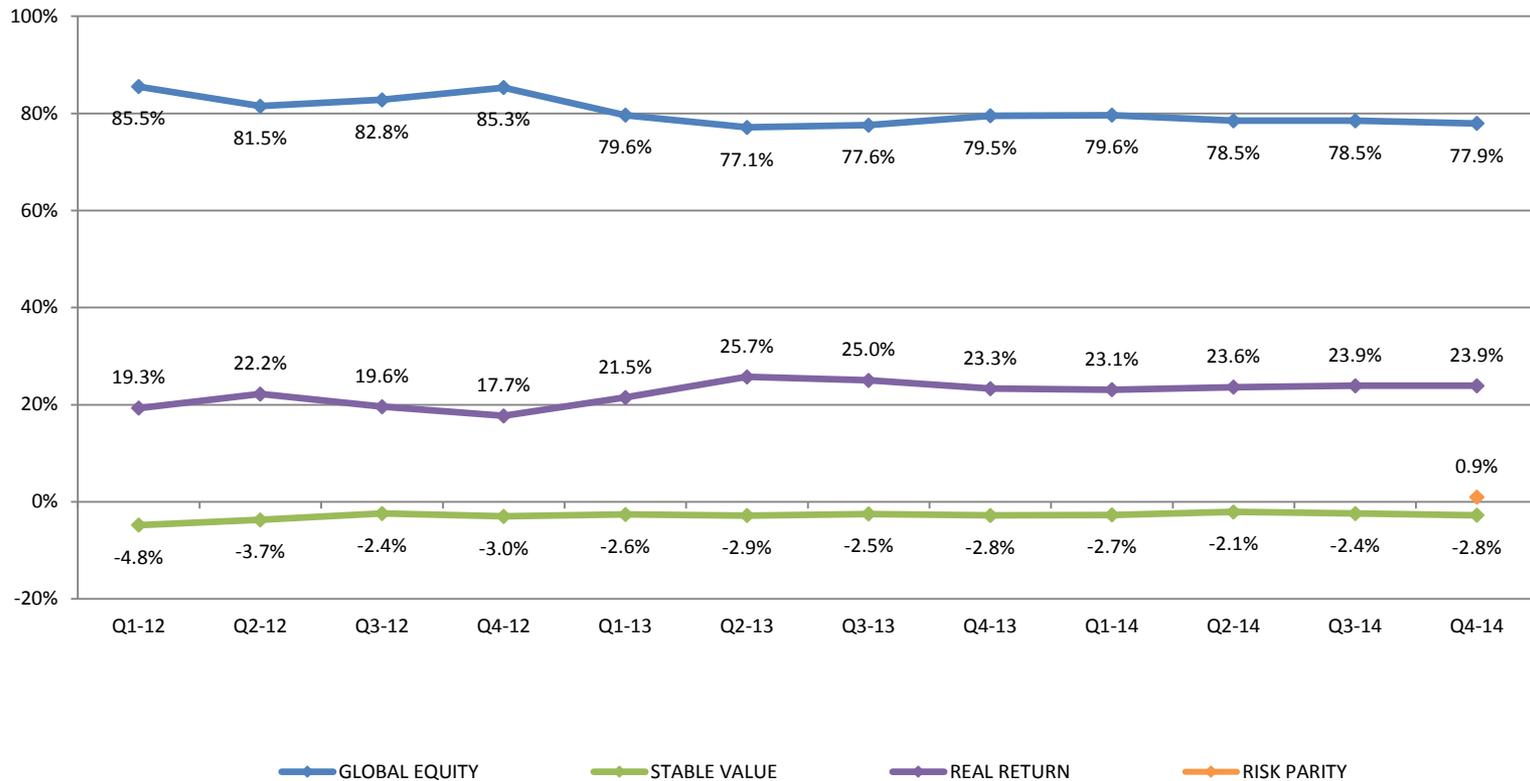


<sup>1</sup>Minimum and maximum VaR levels are determined by adjusting the allocation to each policy asset class within the allowable policy range such that VaR is minimized and maximized.

# VaR Contribution by Asset Groups

As of December 31, 2014

## History of VaR Contribution



Source: State Street Bank

# 3. Tracking Error

Annualized as of December 31, 2014

## Policy Asset Class Tracking Error

Policy Assets	Market Value (\$, billions)	Current Forecast (bp)	3-Year Realized (bp)
USA	\$28.5	145	126
Non-US Developed	19.6	260	192
Emerging Market	13.0	223	142
Directional Hedge Funds	6.0	339	181
US Treasuries	12.6	361	113
Absolute Return	0.1	958	1323
Stable Value Hedge Funds	5.4	85	219
Cash	3.0	20	142
Global Inflation Linked Bonds	6.1	32	12
Commodities	0.1	2313	1764
<b>Total Public Assets</b>	<b>\$94.5</b>	<b>159</b>	<b>68</b>
Private Equity	15.2	186	210
Energy and Natural Resources	2.5	241	NA <sup>1</sup>
Real Assets	15.5	581	138
<b>Total Private Assets</b>	<b>\$33.3</b>	<b>330</b>	<b>117</b>
<b>Total Risk Parity</b>	<b>\$1.4</b>	<b>96</b>	<b>NA<sup>1</sup></b>
<b>Total Assets</b>	<b>\$129.2</b>	<b>162</b>	<b>75</b>

Policy neutral is 100 bp and policy maximum is 300 bp

Source: State Street Bank

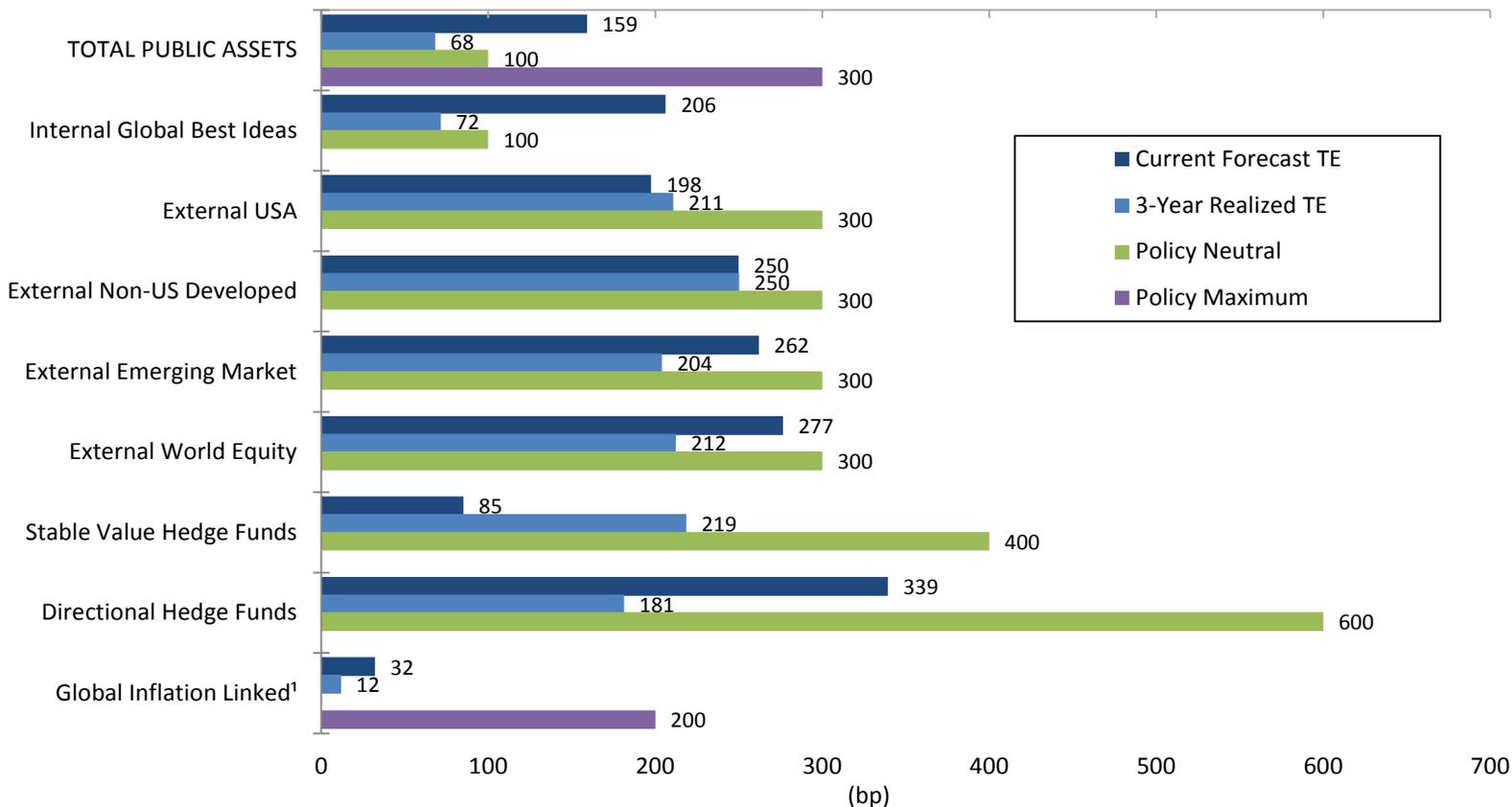
<sup>1</sup> Realized tracking error cannot be calculated due to the short history of these portfolios



# Policy Tracking Error

Annualized as of December 31, 2014

## Actual Tracking Error Level vs. Policy Requirement



Source: State Street Bank

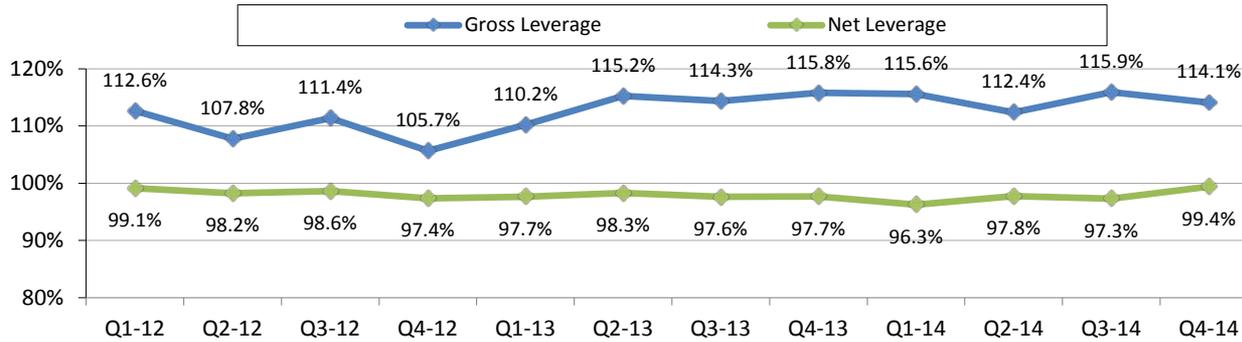
<sup>1</sup> No policy neutral tracking error is set for Global Inflation Linked Bonds



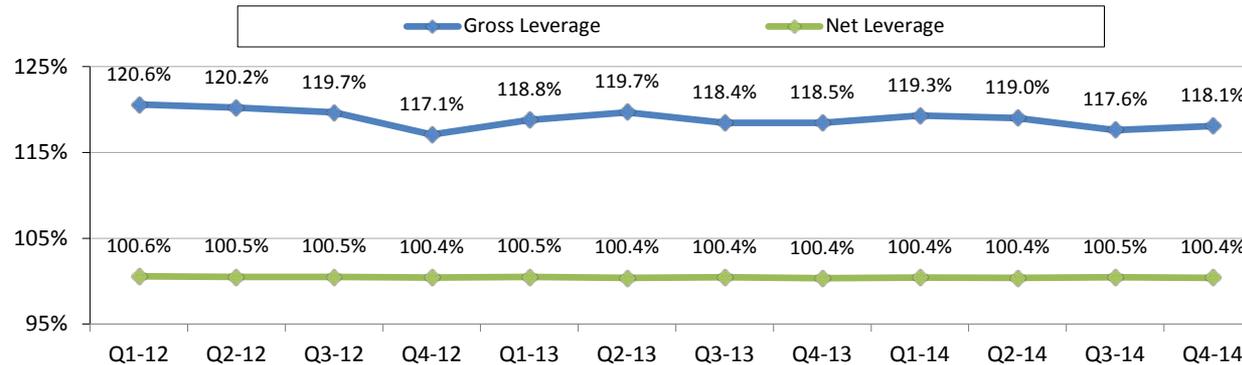
# 4. Leverage

As of December 31, 2014

### Trust-Level Leverage (Excludes Securities Lending)



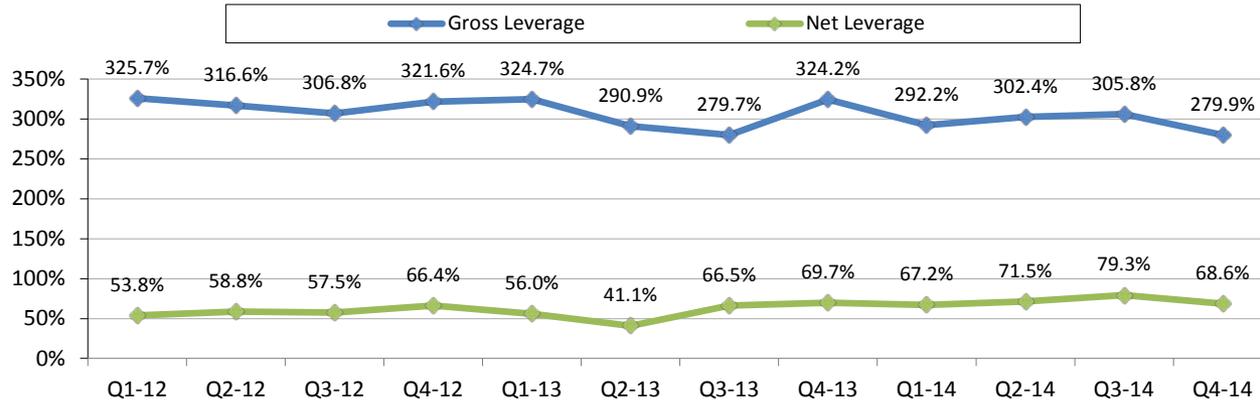
### Securities Lending Leverage



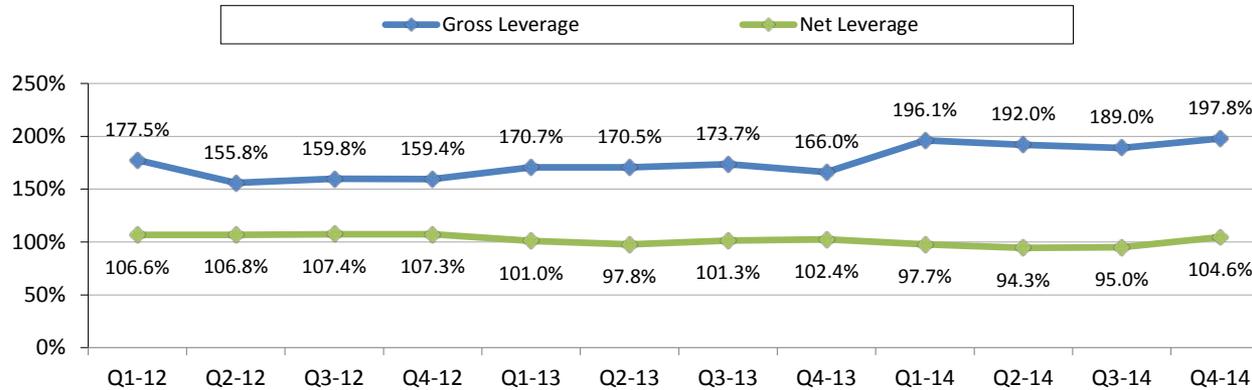
# Leverage

As of December 31, 2014

## Hedge Fund Leverage



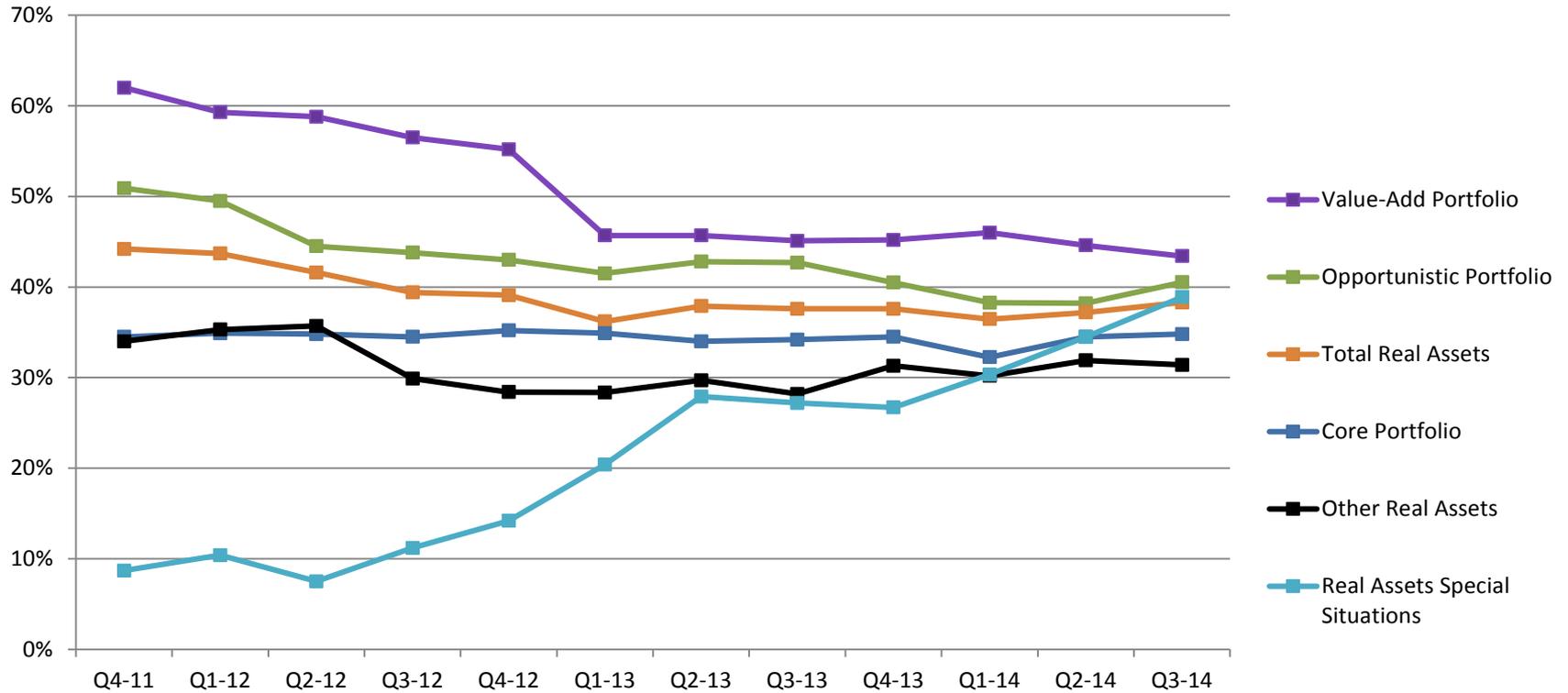
## Strategic Partners Leverage



# Leverage

As of September 30, 2014

## Real Assets Leverage (Loan to Value)



# 5. Liquidity

As of December 31, 2014

Sources of Liquidity (\$, billions)	Market Value	Stressed Value
Liquid Assets Not on Loan (Cash, UST, TIPS, Equity, Commodities)	62.4	36.1
Securities Lending Collateral (Cash, Fixed Income)	22.7	17.5
<b>Total Sources of Liquidity</b>	<b>85.1</b>	<b>53.6</b>
<i>Note: Excluded Illiquid Assets (Private Equity, Real Assets, ENR, Hedge Funds)</i>	47.3	NA
<i>Note: Excluded Liquid Assets remaining on loan</i>	20.2	NA

Uses of Liquidity (\$, billions)	Market Value	Stressed Value
Normal Uses of Liquidity	0.1	0.1
Stressed Securities Lending		-2.2
Stressed Derivatives		-2.3
Stressed Private Markets		-1.8
<b>Total Uses of Liquidity</b>	<b>0.1</b>	<b>-6.2</b>

Liquidity Ratio	
Sources of Liquidity	53.6
Uses of Liquidity	-6.2
<b>Ratio (Sources/Uses)</b>	<b>8.7</b>
Alert Threshold	4.0
Fail Threshold	3.0
<b>Test Result</b>	<b>Pass</b>
<i>Note: Net Liquidity (Sources less Uses)</i>	47.5
<i>Note: 12 Months Benefit Payments (at 4% Annual)</i>	3.9

Source: State Street Bank

Assumptions: In the stress case, Liquid Assets are valued at 58% and Securities Lending collateral is valued at 77% 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 investment are assumed to not return any capital and experience capital calls at 6x the normal amount expected for a month.



# 6. Counterparty

As of December 31, 2014

## Counterparty Exposure

Counterparty	Number of Contracts				Counterparty Exposure (\$, millions)	Net Notional (\$, millions)
	Swaps	Forwards	Futures	OTC Options		
<b>Over the Counter<sup>1</sup></b>						
Bank of America, N.A	2	2			\$0.3	-\$14.0
Barclays Bank PLC	9	18			5.8	-337.4
Citibank N.A.	2	263			19.0	-1,146.2
Credit Suisse International		2			0.2	-12.5
Deutsche Bank AG	17	36		1	4.6	14.1
Goldman Sachs International	30	34			3.8	-158.1
JPMorgan Chase Bank N.A	49	110			23.2	8.3
Macquarie Bank Limited					0.0	0.0
Morgan Stanley	6	22			0.4	-47.9
Societe Generale	2	103		1	3.1	-151.2
Toronto Dominion Bank					0.0	0.0
UBS AG	6	92			0.6	-239.6
<b>Exchange Traded Futures<sup>2</sup></b>						
Goldman Sachs & Co.	9		58		322.1	-144.8
JP Morgan Securities LLC	2		163		93.4	1,069.5
<b>Grand Total</b>	<b>134</b>	<b>682</b>	<b>221</b>	<b>2</b>	<b>\$476.5</b>	<b>-\$1,159.8</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.

# Counterparty

As of December 31, 2014

## 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	A2	A	16.7	11.1
Barclays Bank PLC	A-	A3	A	15.7	12.9
Citibank N.A.	A	A2	A	13.6	15.3
Credit Suisse International	A	A1	A	16.8	12.4
Deutsche Bank AG	A	A3	A+	16.9	11.6
Goldman Sachs International	A	A2	A	16.7	15.4
JPMorgan Chase Bank N.A	A+	Aa3	A+	11.9	10.8
Macquarie Bank Limited	A	A2	A	10.6	14.9
Morgan Stanley	A	A3	NR	15.7	13.6
Societe Generale	A	A2	A	13.4	12.0
Toronto Dominion Bank	AA-	Aa1	AA-	16.7	9.5
UBS AG	A	A2	A	18.5	18.2
<b>Exchange Traded Futures</b>					
Goldman Sachs & Co.	A	NR	A	16.7	15.4
JP Morgan Securities LLC	A+	Aa3	A+	11.9	10.8

Source: Ratings Agencies and Bloomberg

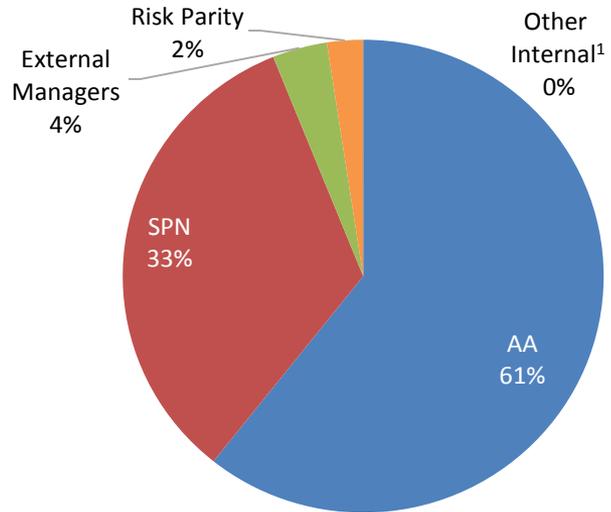
<sup>1</sup> When fully implemented, Basel 3 will require 8.5% Tier 1 capital and 7.0% Common capital.

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

# 7. Derivatives

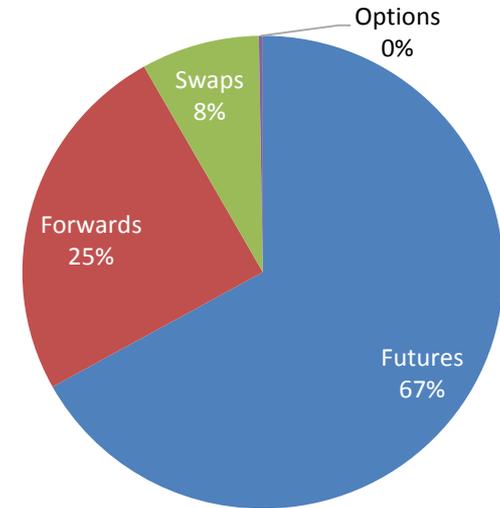
As of December 31, 2014

**Gross Notional by Portfolio**



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

**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

Portfolio	Gross Notional (\$, millions)
AA	\$13,996.1
SPN	7,656.4
External Managers	849.0
Risk Parity	558.1
Other Internal <sup>1</sup>	1.1
<b>Total</b>	<b>\$23,060.6</b>

Source: State Street Bank

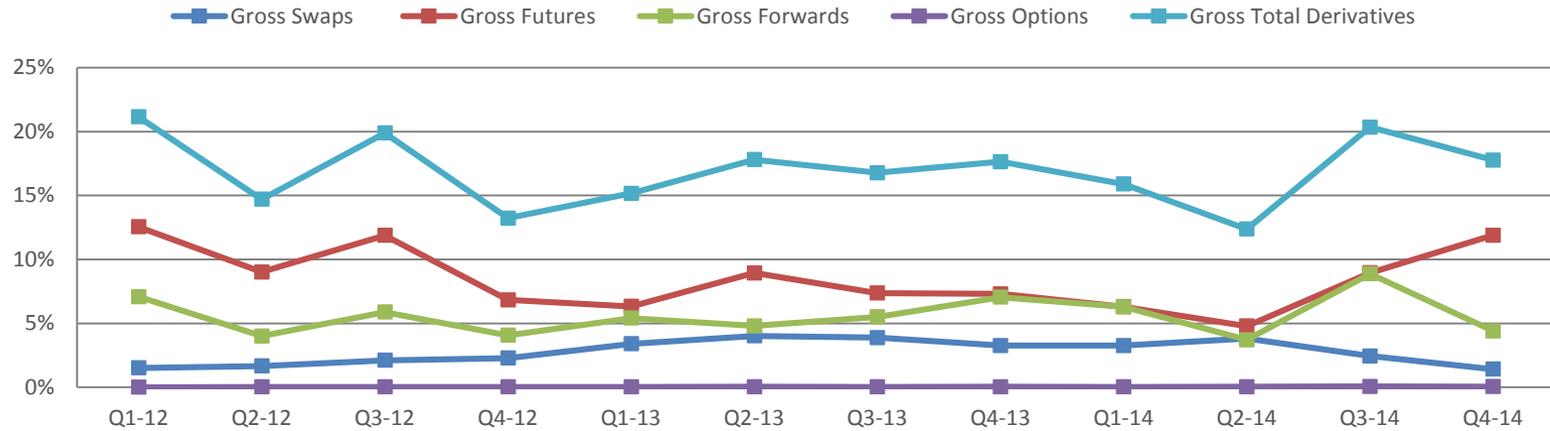
Instrument	Gross Notional (\$, millions)
Futures	\$15,438.2
Forwards	5,725.8
Swaps	1,835.7
Options	61.0
<b>Total</b>	<b>\$23,060.6</b>

<sup>1</sup>Other Internal includes Low Volatility with Overlay portfolio and FX Forwards used for settlements.

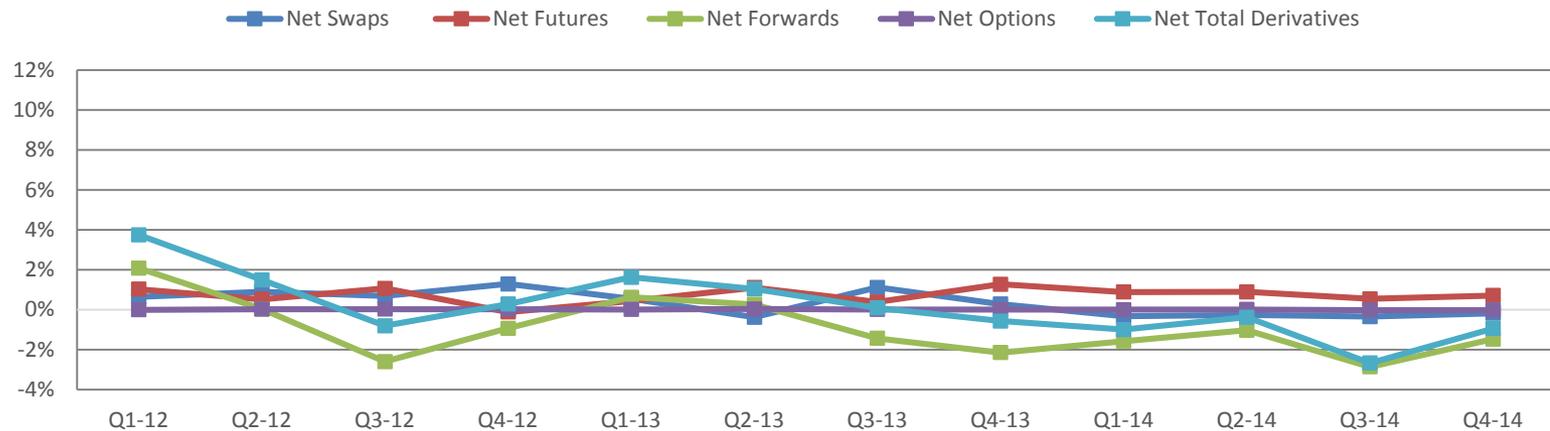
# Derivatives

As of December 31, 2014

## Gross Notional (% of Total Trust)



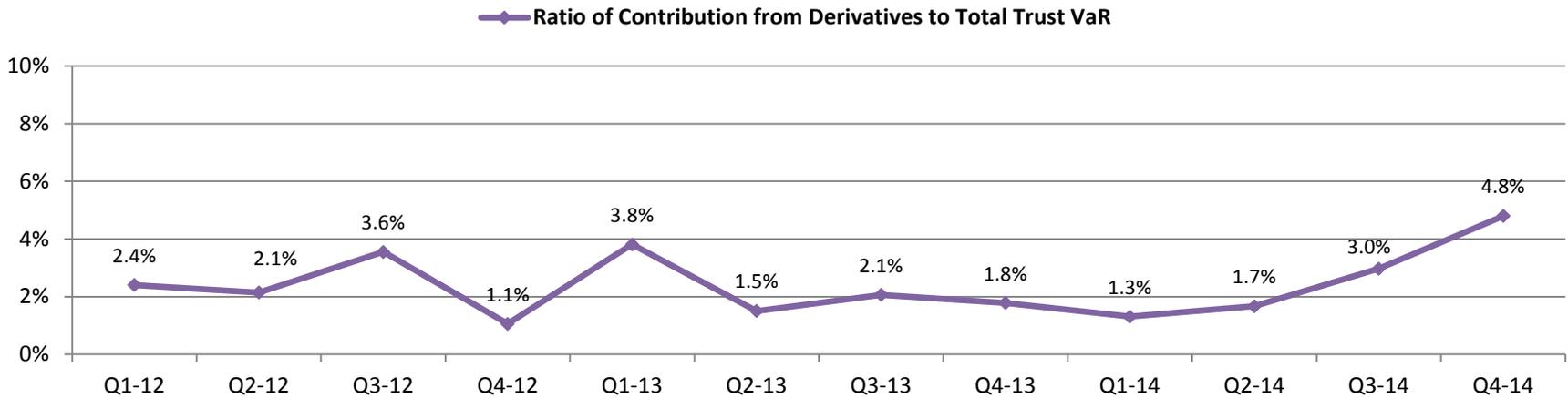
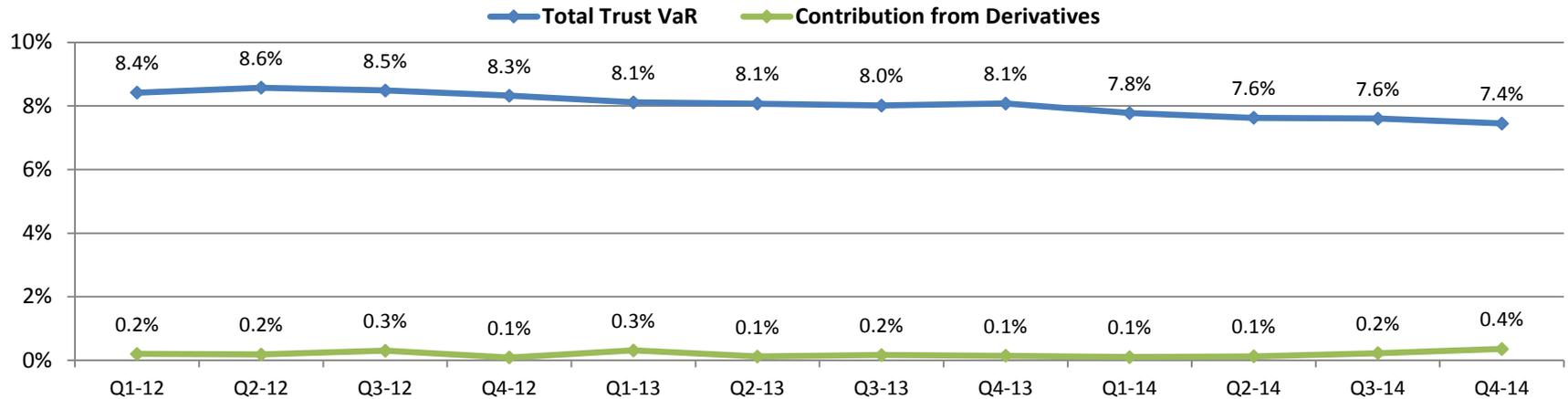
## Net Notional (% of Total Trust)



Source: State Street Bank

# Derivatives

As of December 31, 2014



# Derivatives

As of December 31, 2014

## Gross Notional

(\$, millions)	AA	SPN	External Managers	Risk Parity	Other Internal <sup>1</sup>	Total
Futures	10,579.2	4,388.0	70.6	400.4	0.0	15,438.2
Forwards	2,856.8	2,127.1	653.5	88.2	0.3	5,725.8
Swaps	560.1	1,128.6	77.4	69.6	0.0	1,835.7
Options	0.0	12.7	47.5	0.0	0.8	61.0
<b>Total</b>	<b>\$13,996.1</b>	<b>\$7,656.4</b>	<b>\$849.0</b>	<b>\$558.1</b>	<b>\$1.1</b>	<b>\$23,060.6</b>

The bulk of derivatives usage is AA (\$13.5 billion) and the SPN (\$7.7 billion)

## Net Notional

(\$, millions)	AA	SPN	External Managers	Risk Parity	Other Internal <sup>1</sup>	Total
Futures	-728.8	1,323.7	-70.6	400.4	0.0	924.7
Forwards	-1,251.4	-93.0	-469.0	-88.2	-0.2	-1,901.8
Swaps	-21.4	-220.1	-52.9	69.6	0.0	-224.8
Options	0.0	-12.7	-4.5	0.0	0.8	-16.4
<b>Total</b>	<b>-\$2,001.7</b>	<b>\$997.9</b>	<b>-\$597.0</b>	<b>\$381.8</b>	<b>\$0.6</b>	<b>-\$1,218.4</b>

AA's \$13.5 billion gross notional nets to a much lower (-\$2.0 billion) net position.

The Trust's \$23.0 billion gross notional nets to a much lower (-\$1.2 billion) net position.

Source: State Street Bank

<sup>1</sup>Other Internal includes Low Volatility with Overlay and FX Forwards used for settlements.



# Derivatives

As of December 31, 2014

## Mark-to-Market

(\$, millions)	AA	SPN	External Managers	Risk Parity	Other Internal <sup>1</sup>	Total
Futures	70.9	47.8	-1.7	5.7	0.0	122.7
Forwards	53.3	0.4	5.5	1.2	0.0	60.4
Swaps	0.9	3.5	2.8	-2.7	0.0	4.5
Options	0.0	0.0	2.9	0.0	0.3	3.2
<b>Total</b>	<b>\$125.1</b>	<b>\$51.7</b>	<b>\$9.4</b>	<b>\$4.2</b>	<b>\$0.3</b>	<b>\$190.8</b>

## Average Tenor in Years

	AA	SPN	External Managers	Risk Parity	Other Internal <sup>1</sup>	Total
Futures	0.21	0.23	0.22	0.21	0.00	0.15
Forwards	0.23	0.04	0.23	0.04	0.02	0.09
Swaps	0.04	1.40	0.46	1.51	0.00	0.58
Options	0.00	0.14	0.50	0.00	0.04	0.11
<b>Total</b>	<b>0.12</b>	<b>0.45</b>	<b>0.35</b>	<b>0.44</b>	<b>0.01</b>	<b>0.28</b>

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

The low mark-to-market is mainly due to the short term maturity of the derivatives positions – on average 0.28 years

Source: State Street Bank

<sup>1</sup>Other Internal includes Low Volatility with Overlay and FX Forwards used for settlements



# Conclusion

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- As of December 31, 2014, TRS investment exposures are in compliance with the Investment Policy Statement
  - TRS was overweight Global Equity (+1.5%) and underweight Stable Value (-1.8%) and Real Return (-0.3%)
  - At the asset class level, TRS was overweight USA, Cash and Risk Parity while underweight Long Treasuries, US TIPS, and Directional Hedge Funds
- Risk Parity has been added to the report and is currently 1.1% of the Trust's assets and 0.9% of the Trust's risk (VaR)
- Risk metrics are within established perimeters

# APPENDIX

# Derivative Exposure

As of December 31, 2014

## 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	\$3,740.4	90.1%	2.9%
Non-US Developed	65	2,197.6	30.8%	1.7%
Emerging Markets	14	654.8	56.3%	0.5%
US Treasury	31	7,757.3	99.3%	6.0%
Cash	4	107.7	100.0%	0.1%
Absolute Return	3	8.6	1.6%	0.0%
Inflation Linked Bonds	62	500.9	65.4%	0.4%
World Equity	2	70.6	12.4%	0.1%
Risk Parity	20	400.4	71.7%	0.3%
<b>Swap Total</b>	<b>221</b>	<b>\$15,438.2</b>		<b>11.9%</b>

Source: State Street Bank

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



# Derivative Exposure

As of December 31, 2014

## 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	14	\$221.1	5.3%	0.2%
Non-US Developed	26	267.6	3.7%	0.2%
Emerging Markets	7	174.7	15.0%	0.1%
US Treasury	6	58.5	0.7%	0.0%
Cash	0	0.0	0.0%	0.0%
Absolute Return	10	537.5	98.4%	0.4%
Inflation Linked Bonds	26	240.3	31.3%	0.2%
Commodities	22	237.9	100.0%	0.2%
World Equity	15	28.6	5.0%	0.0%
Risk Parity	8	69.6	12.5%	0.1%
<b>Swap Total</b>	<b>134</b>	<b>\$1,835.7</b>		<b>1.4%</b>

Source: State Street Bank

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



# Derivative Exposure

As of December 31, 2014

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

Non-Currency Forwards by Asset Class	Number of Contracts	Gross Exposure (\$, millions)	Gross Exposure (% of Total Trust)
Non-US Developed	1	\$641.9	0.5%
Emerging Markets	1	39.6	0.0%
<b>Non-Currency Forward Total</b>	<b>2</b>	<b>681.5</b>	<b>0.5%</b>
USA	10	48.3	0.0%
Global TIPS	2	12.7	0.0%
<b>Options Total</b>	<b>12</b>	<b>61.0</b>	<b>0.0%</b>
Euro Currency	141	1,084.9	0.8%
Japanese Yen	58	637.0	0.5%
Pound Sterling	97	385.6	0.3%
Canadian Dollar	54	1,253.7	1.0%
Other Non-US Developed	280	1,196.8	0.9%
Emerging Markets	50	486.3	0.4%
<b>Forwards Total</b>	<b>680</b>	<b>\$5,044.3</b>	<b>3.9%</b>

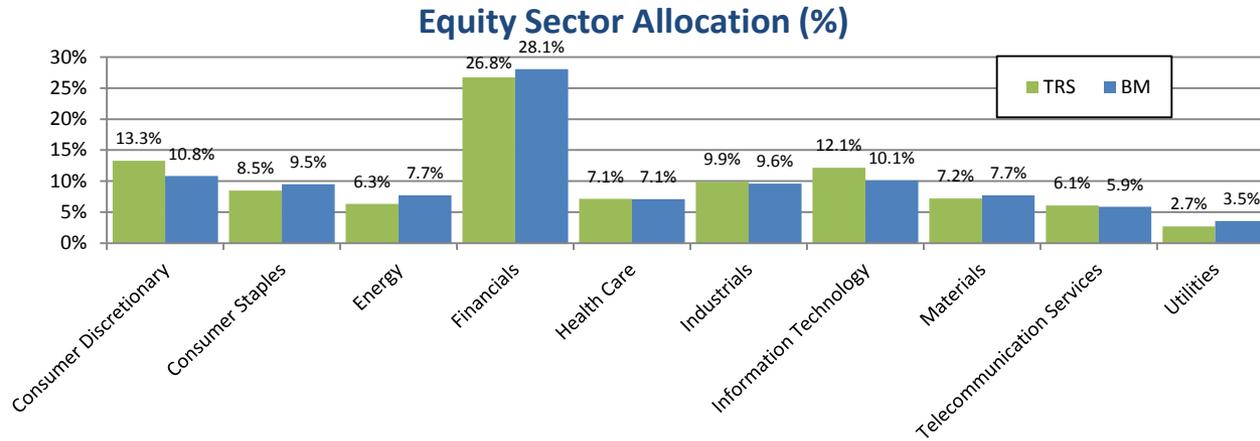
Source: State Street Bank

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

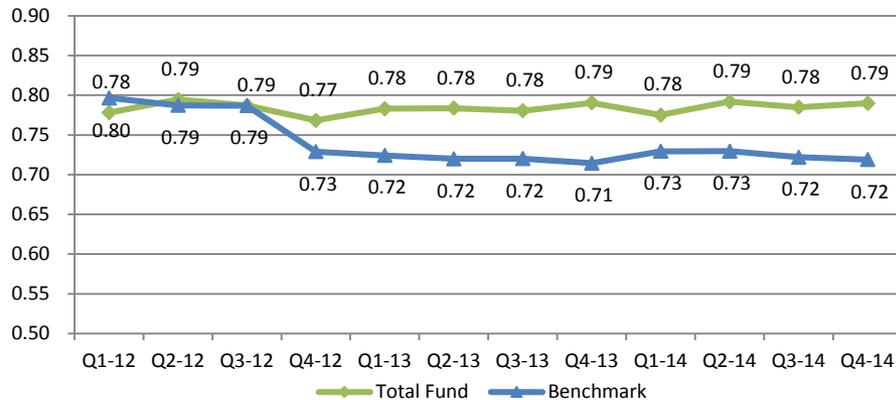


# Sector Allocation, Beta and Scenario Analysis

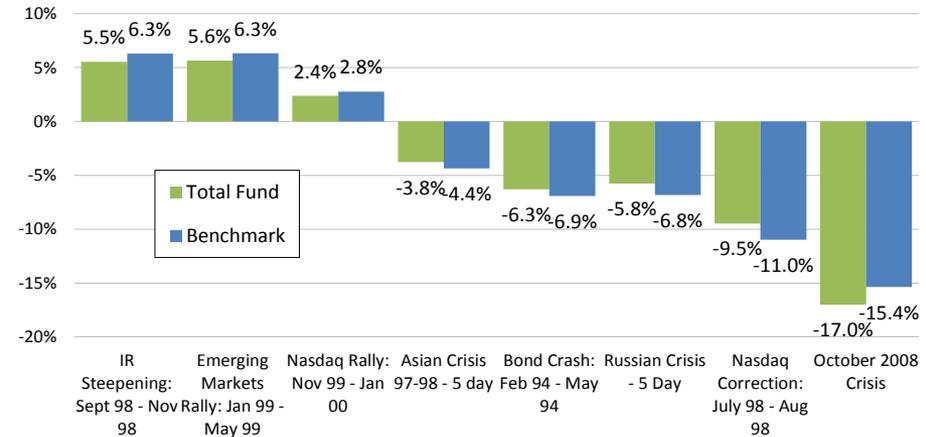
As of December 31, 2014



### Beta Analysis MSCI World Index



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

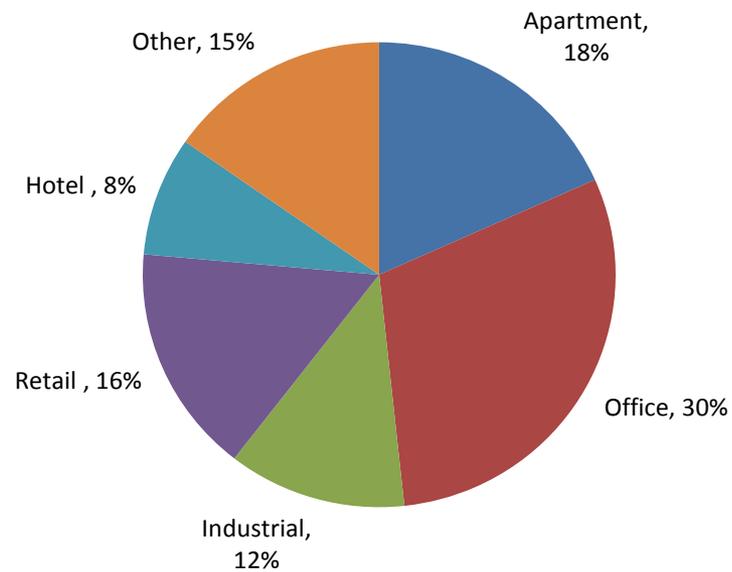


Source: State Street Bank

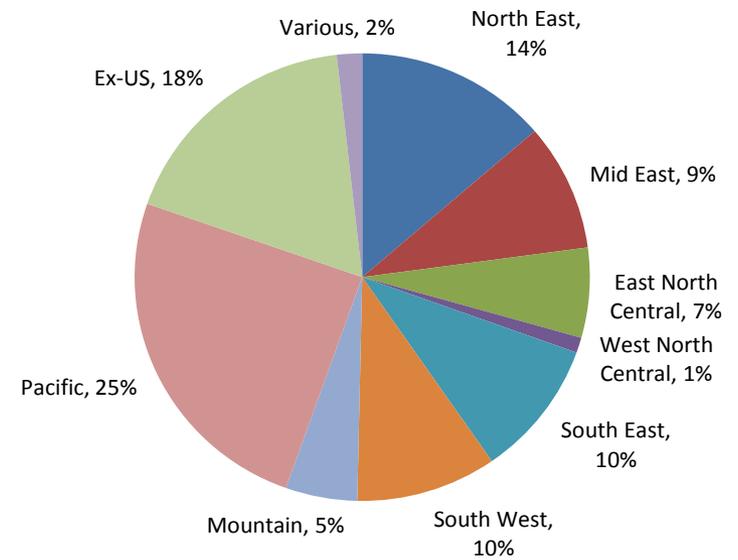
# Real Estate Diversification

As of September 30, 2014

## Property Type Diversification



## Geographic Diversification



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# Securities Lending