



TRS Risk Management Committee



April 2016

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

(Committee Chair and Members are Subject to Change at the April Board Meeting. Ms. Charleston, Committee Chair; Mr. Barth; Mr. Corpus; Mr. Kelly; & Mr. Moss, Committee Members)

AGENDA

**April 7, 2016 – 12:45 p.m.
TRS East Building, 5th Floor, Boardroom**

*All or part of the April 7, 2016 meeting of the TRS Board of Trustees and Risk Management Committee may be held by telephone conference call as authorized under Section 551.130 of Texas Government Code. The committee and board intend to have a quorum physically present at the following location: **1000 Red River Austin, Texas 78701 in the TRS East Building, 5th Floor, Boardroom.***

1. Consider the approval of the proposed minutes of the November 19, 2015 committee meeting – Committee Chair.
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 19, 2015

The Risk Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on November 19, 2015 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
David Kelly
Christopher Moss

Others present:

Joe Colonna, TRS Trustee	Rebecca Smith, TRS
Anita Palmer, TRS Trustee	Cristi Woods, TRS
Dolores Ramirez, TRS Trustee	Michelle Pagán, TRS
Nanette Sissney, TRS Trustee	Kyle Weigum, TRS
Brian Guthrie, TRS	Dan Junell, TRS
Ken Welch, TRS	Lynn Lau, TRS
Britt Harris, TRS	Jay LeBlanc, TRS
Jerry Albright, TRS	Dr. Keith Brown, Investment Advisor
Amy Barrett, TRS	Steve Huff, Fiduciary Counsel, Reinhart Boerner Van Deuren s.c.
Chris Cutler, TRS	Steve Voss, Aon Hewitt
Carolina de Onís, TRS	Mike Comstock, Aon Hewitt
Jase Auby, TRS	Philip Mullins, Texas Retired Teachers Association
Chi Chai, TRS	Ted Melina Rabb, Texas American Federation of Teachers
James Nield, TRS	Ann Fickel, Texas Classroom Teachers Association
Ronnie Bounds, TRS	

Ms. Charleston called the meeting to order at 2:30 p.m. All committee members were present.

1. Consider the approval of the proposed minutes of the September 24, 2015 committee meeting – Committee Chair.

On a motion by Mr. Barth, seconded by Mr. Moss, the committee approved the proposed minutes of the June 11, 2015 meeting, as presented.

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

Mr. LeBlanc stated that the enterprise risk management (ERM) reports consist of three parts: (1) the Stoplight Report, which provides the overall landscape of TRS' risk areas; (2) the Risk Profile Report, which provides more detailed information about each risk area; and (3) the Appendix which contains the risk reports and specific details about the current risk categories. Ms. Pagán noted two category name changes: "Active Health Care Affordability" changed to "TRS-ActiveCare Affordability" and "Retiree Health Care Funding" changed to "TRS-Care Funding."

Ms. Pagán highlighted four risk categories in the Stoplight Report that had increased their risk levels. She stated that the risk levels for Customer Service and Pension Benefit Administration both changed from green (low) to blue (guarded) due to: (1) the addition of Benefit Accounting to

the Benefit Services division, which increased the number and type of customers served; (2) continued and increased involvement of subject matter experts in the TEAM program; and (3) other benefit-related issues, including reporting errors from reporting entities, employment-after-retirement issues, and eligibility determinations that may result in increased demands for customer service. She stated that the risk level for Health Care Plans Administration had changed from blue (guarded) to yellow (caution) because a majority of the administration had been outsourced. However, the risk level was expected to decrease over time due to enhanced administrative support from vendors and access to additional resources. She stated that the risk level for Records Management had changed from yellow (caution) to orange (elevated) due to recent audit findings and succession planning issues. She also described activities designed to mitigate the risk and referred the committee to detailed reports contained in the appendix regarding mitigations and action plans for these risk categories.

3. Receive overview of Disaster Recovery and Business Continuity Initiatives – Jay LeBlanc, Cristi Woods, and Kyle Weigum.

Mr. LeBlanc introduced the business continuity program. He stated that the program involves three teams: an incident management team which makes critical and key decisions in the event of a disaster; a disaster recovery team which works to restore systems after the disaster; and business continuity teams which carry on the day-to-day operations serving our members.

Mr. Weigum provided an update on the new co-location data center. He stated that staff had run tests of the co-location data center located in north Austin. He also stated that production data is being replicated or copied at the co-location site on a regular basis which will provide for much faster restoration of services, including the network, LAN-to-LAN Internet services, and voice services. Compared with the pre-co-location environment, he stated that the test shows that the establishment of the co-location site significantly reduces the time needed for service recovery. In response to a question from Mr. Kelly regarding the condition of the co-location site, Mr. Weigum provided a brief profile of the facility. He also stated for Mr. Kelly that staff had other methods for recovering data in other facilities and still stored backup tapes offsite on a monthly basis. Mr. Weigum stated that staff also looked into software to assist with recovery efforts. He noted that with the new co-location site, staff would be able to recover the agency's entire infrastructure.

Ms. Woods provided an overview of the business continuity test conducted by critical business units, including TEAM/TRUST Phase 1A, Benefit Counseling, Benefit Processing, General Accounting, and Risk Management. She stated that the test involved validating the data recovered, following existing business continuity procedures, tracking new process flows, and identifying new reconciliation capabilities. She reported that the test results were very successful and participants had submitted positive feedback. Responding to a question from Ms. Charleston regarding procedures to ensure staff's safety during a disaster, Mr. LeBlanc stated that each department has business continuity plans in place with designated individuals responsible for parts of the process, which includes safety. He also explained for Ms. Charleston the TRS Alert system which notifies employees of emergency issues via voice, SMS text, and e-mail. He confirmed that the Executive Director will make a decision regarding an emergency situation before an alert will be sent to employees.

In response to a question from Mr. Kelly regarding the takeaway from the test, Mr. LeBlanc stated that on the IT side, staff conducted a postmortem meeting in which strengths and weaknesses were addressed and suggestions were made to improve the process. Mr. Weigum reported that one weakness found from the test involved communication and coordination issues with the vendor. This weakness has now been addressed and should not be an issue going forward. Ms. Woods reported that the only setback identified was the lack of clear procedures for reconciling lost data. She stated that staff would draft those procedures and test them in the upcoming exercise. Ms. Barrett reported that the testing exercise went very well and much faster than expected. She stated the importance of continued testing in the future. Ms. Woods noted that the current test design follows guidance issued by the State Office of Risk Management and Federal Emergency Management Agency (FEMA) regarding the continuity of operations. Mr. Weigum stated that testing in the future will involve different business units with different requirements and staff will continue to improve and refine the process.

Without further discussion, the meeting adjourned at 3:00 p.m.

APPROVED BY THE **RISK MANAGEMENT COMMITTEE** OF THE BOARD OF TRUSTEES OF THE TEACHER RETIREMENT SYSTEM OF TEXAS ON THE 7TH DAY OF APRIL 2016.

ATTESTED BY:

Dan Junell
Secretary to the TRS Board of Trustees

Date



Investment Risk Report

Jase Auby, Chief Risk Officer
James Nield, Deputy Chief Risk Officer
April 2016

Agenda

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

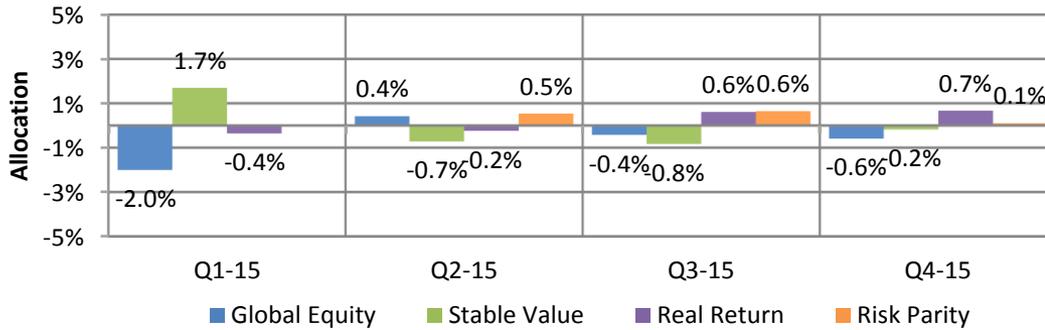
As of December 31, 2015

Policy Requirements	Description	In compliance?
1. Asset Allocation	In compliance with policy	✓
2. Value at Risk	6.9% (56% of the VaR limit range)	✓
3. Tracking Error	109 bp (36% of maximum)	✓
4. Leverage	In compliance with policy	✓
Total Trust		
Net Leverage	102.6% (Within historical norm)	✓
Gross Leverage	121.3% (Within historical norm)	✓
Securities Lending		
Net Leverage	100.3% (Within historical norm)	✓
Gross Leverage	114.4% (Within historical norm)	✓
Hedge Fund		
Net Leverage	69.0% (Within historical norm)	✓
Gross Leverage	308.9% (Within historical norm)	✓
Strategic Partners		
Net Leverage	103.4% (Within historical norm)	✓
Gross Leverage	199.5% (Within historical norm)	✓
Real Assets		
Loan to Value	40.7% (Within historical norm)	✓
5. Liquidity	In compliance with policy	✓
6. Counterparty	In compliance with policy	✓
Exposure	In compliance with policy	✓
Rating	In compliance with policy	✓
7. Derivative Exposures	In compliance with policy	✓

1. Asset Allocation

As of December 31, 2015

Group Active Allocation

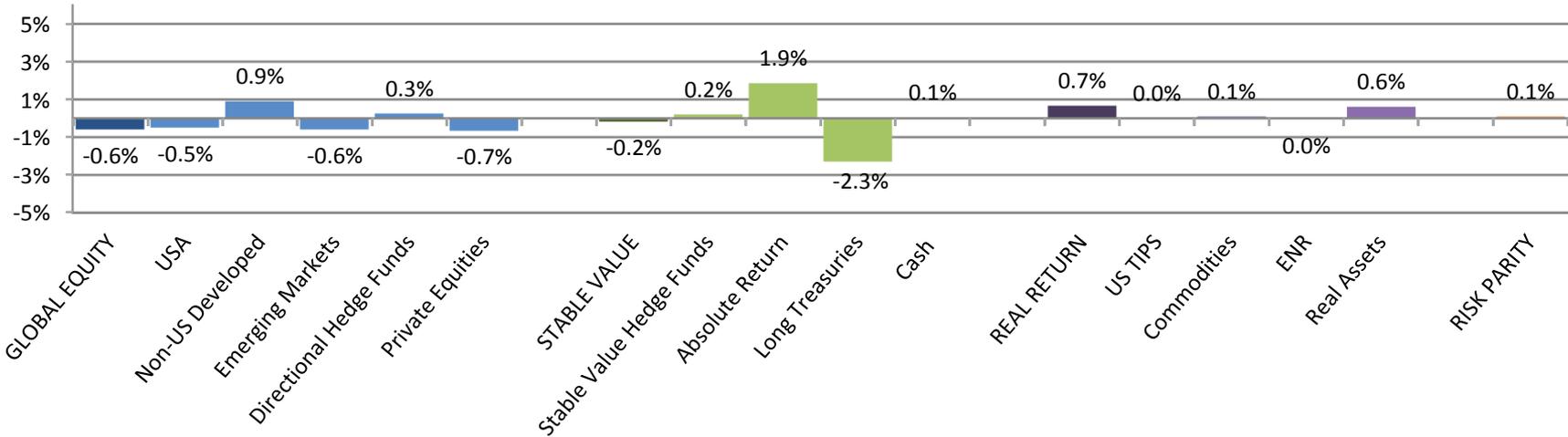


Top Three Overweights	
Absolute Return	1.9%
Non-US Developed	0.9%
Real Assets	0.6%

Top Three Underweights	
Long Treasuries	-2.3%
Private Equities	-0.7%
Emerging Markets	-0.6%

Asset Group/Class Active Allocation

(In Compliance with Policy)



Source: State Street Bank

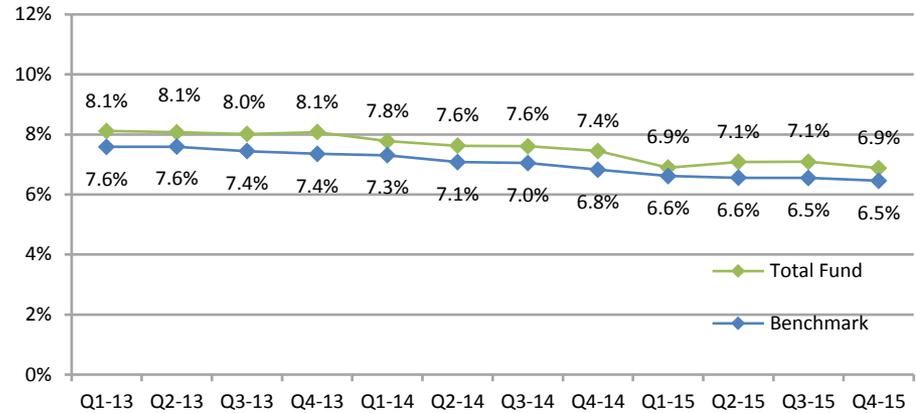
2. Value at Risk (VaR)

As of December 31, 2015

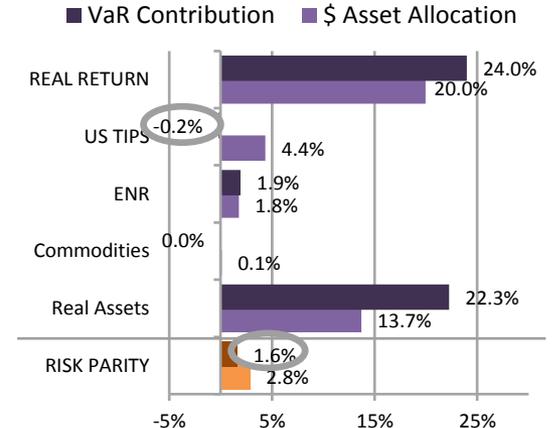
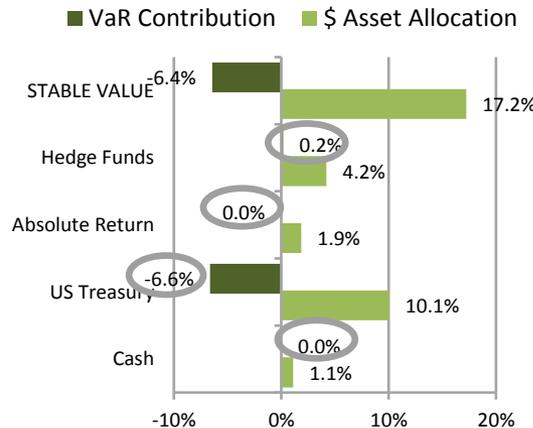
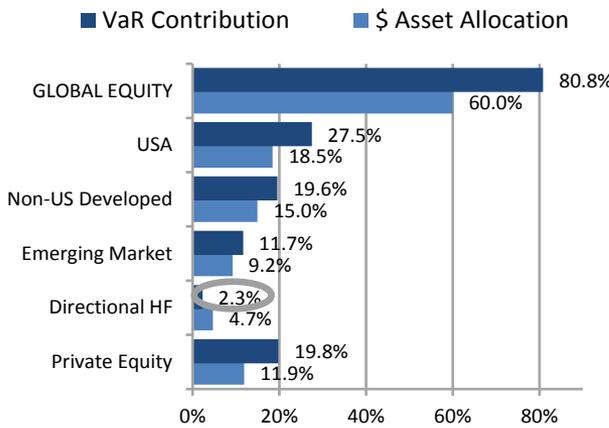
VaR as a Percent of Market Value (One Month, 95% Confidence)



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



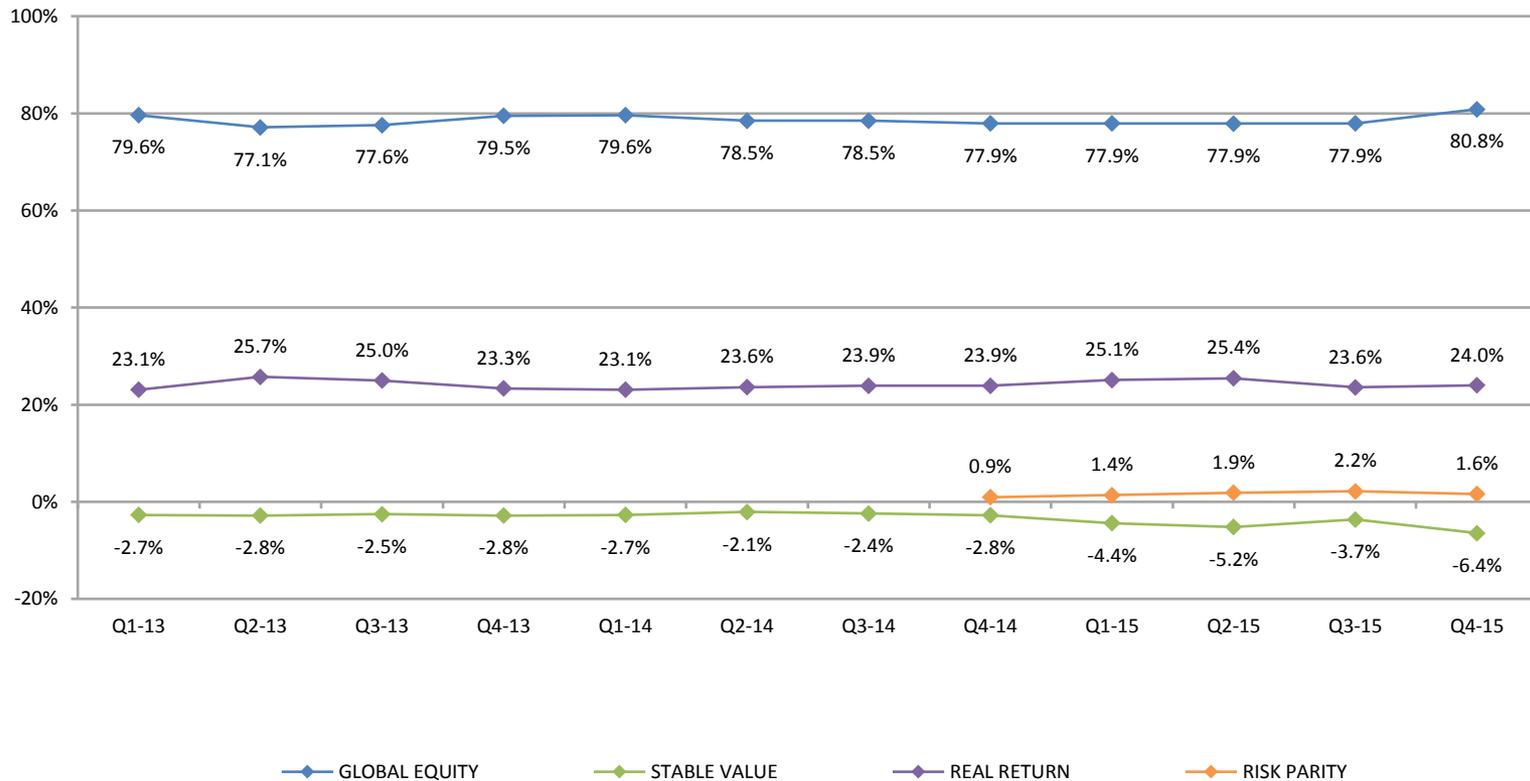
Source: State Street Bank

¹Minimum 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, 2015

History of VaR Contribution



Source: State Street Bank

3. Tracking Error

Annualized as of December 31, 2015

Policy Asset Class Tracking Error

Policy Assets	Market Value (\$, billions)	Current Forecast (bp) ¹	3-Year Realized (bp)
USA	\$23.4	141	114
Non-US Developed	19.0	233	228
Emerging Market	11.7	165	169
Directional Hedge Funds	6.0	296	225
US Treasuries	12.7	222	210
Absolute Return	2.4	306	1211
Stable Value Hedge Funds	5.3	285	222
Cash	1.4	32	87
Global Inflation Linked Bonds	5.5	27	16
Commodities	0.1	2621	1990
Total Public Assets	\$91.0	88	109
Private Equity	\$15.1	169	209
Energy and Natural Resources	2.2	378	NA ²
Real Assets	17.4	522	156
Total Private Assets	\$34.7	337	127
Total Risk Parity	\$3.6	198	NA²
Total Assets	\$126.6	120	37

Policy neutral is 100 bp and policy maximum is 300 bp

Source: State Street Bank

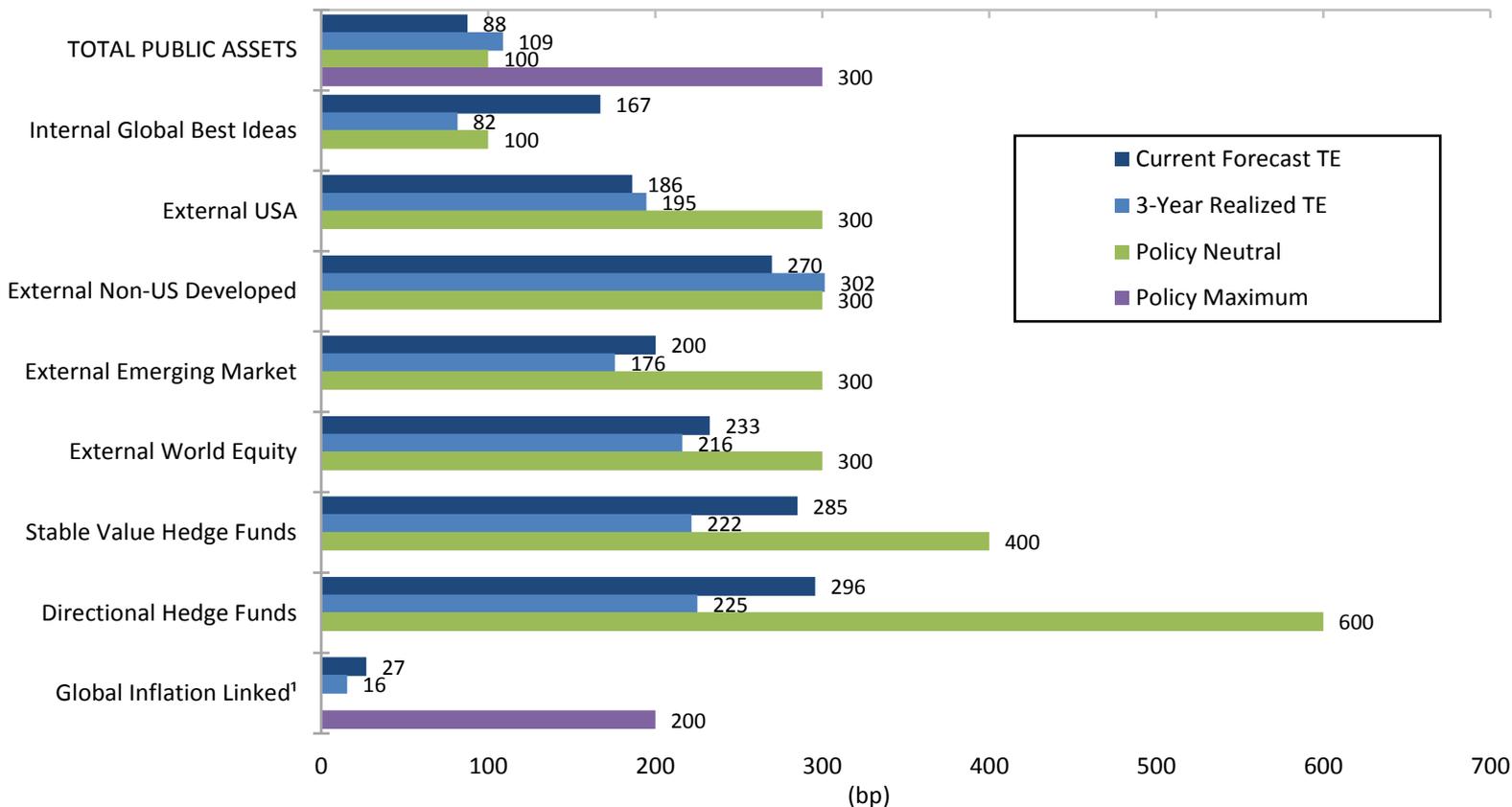
¹Current forecast uses past experiences from January 1, 2008 to today and therefore includes the effects of the Global Financial Crisis.

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

Policy Tracking Error

Annualized as of December 31, 2015

Tracking Error vs. Policy Requirement



Source: State Street Bank

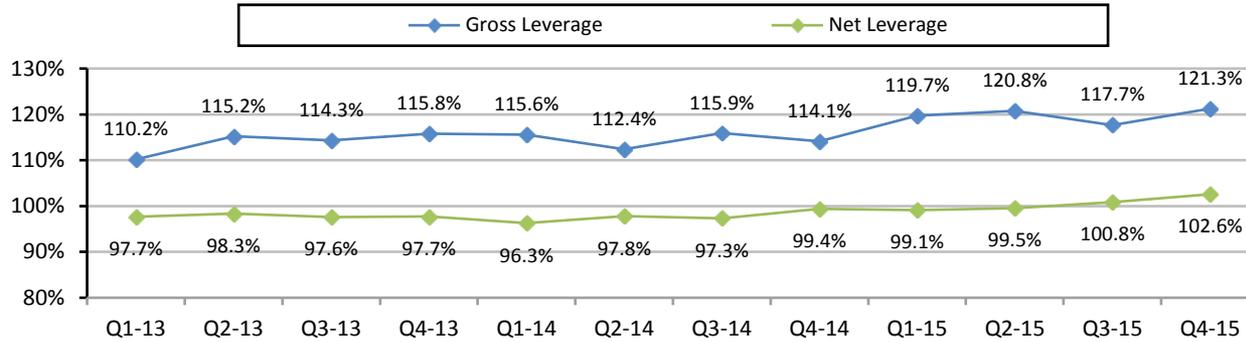
¹No policy neutral tracking error is set for Global Inflation Linked Bonds



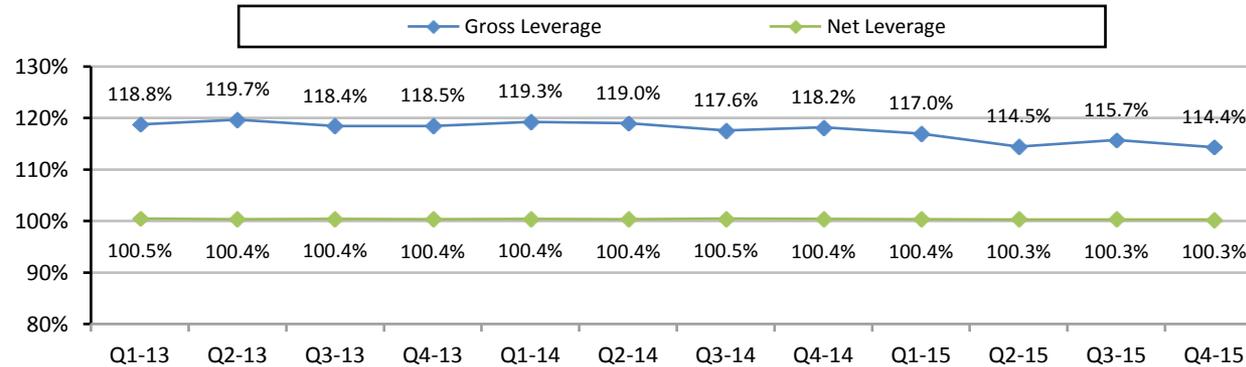
4. Leverage

As of December 31, 2015

Trust-Level Leverage (Excludes Securities Lending)



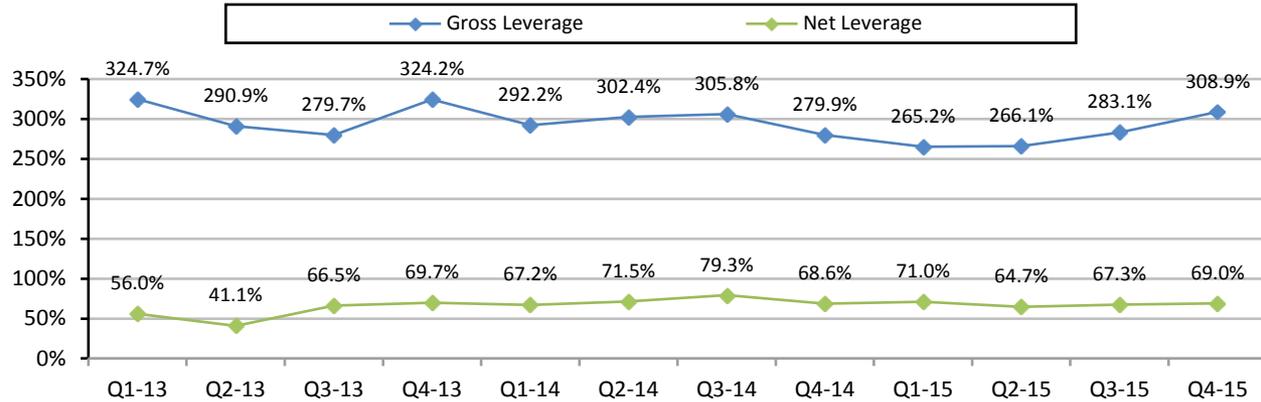
Securities Lending Leverage



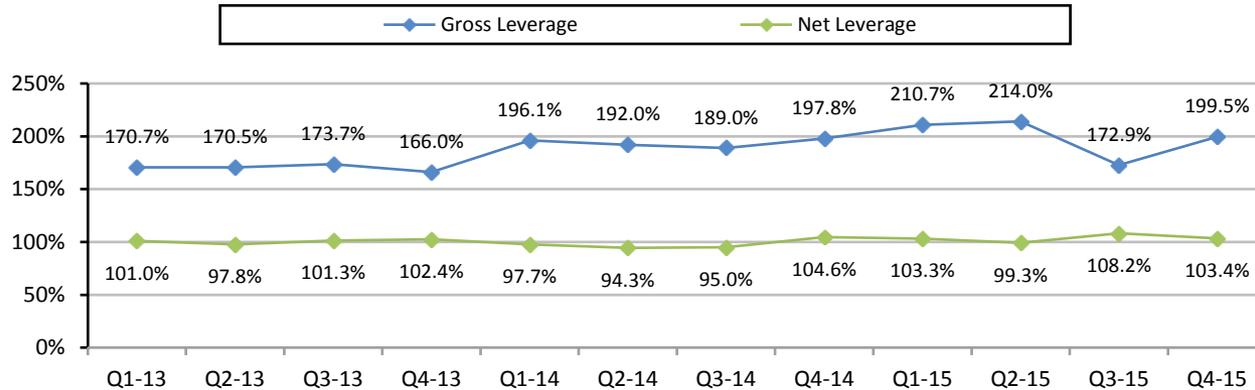
Leverage

As of December 31, 2015

Hedge Fund Leverage



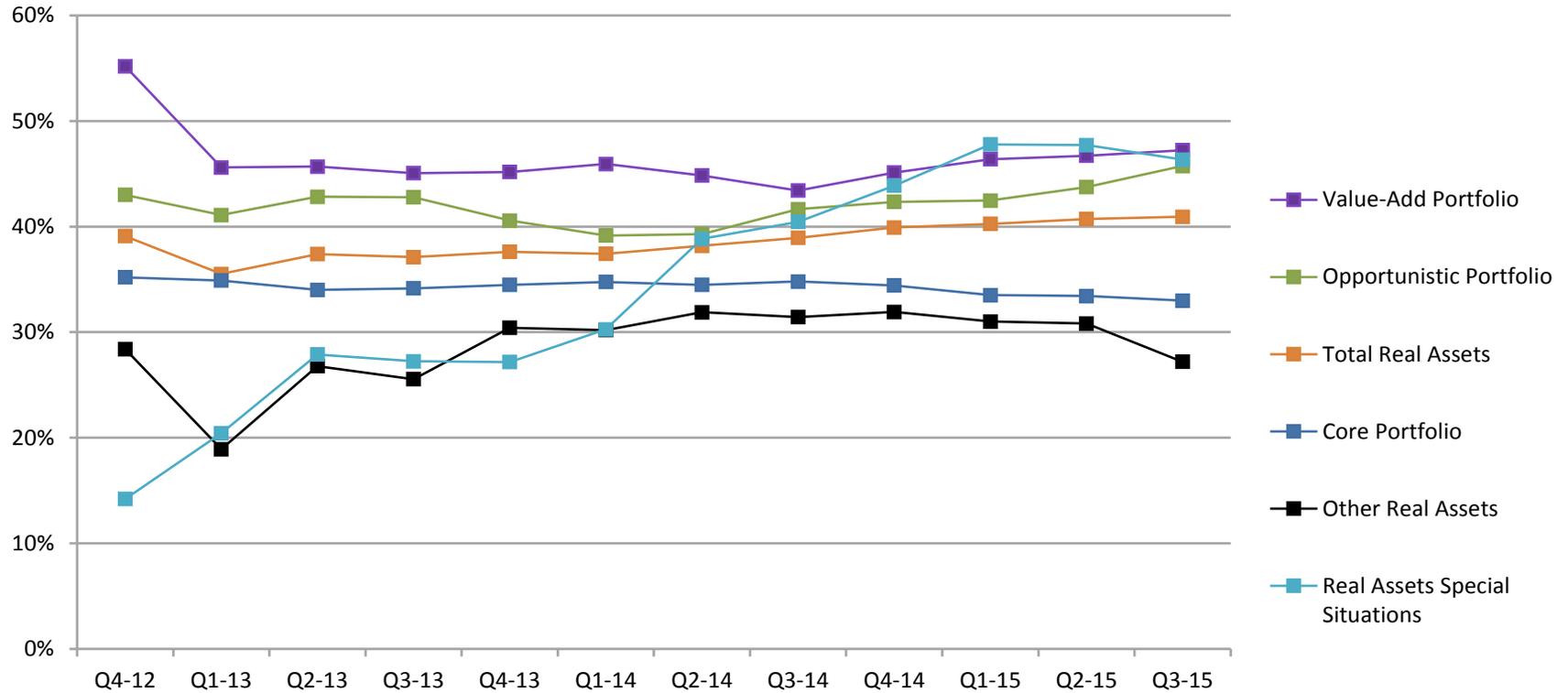
Strategic Partners Leverage



Leverage

As of September 30, 2015

Real Assets Leverage (Loan to Value)



5. Liquidity

As of December 31, 2015

Sources of Liquidity (\$, billions)	Market Value	Stressed Value
Liquid Assets Not on Loan (Cash, UST, TIPS, Equity, Commodities)	60.3	32.5
Securities Lending Collateral (Cash, Fixed Income)	17.1	13.5
Total Sources of Liquidity	77.4	46.0
<i>Note: Excluded Illiquid Assets (Private Equity, Real Assets, Hedge Funds, Other)</i>	51.4	NA
<i>Note: Excluded Liquid Assets remaining on loan</i>	15.3	NA

Uses of Liquidity (\$, billions)	Market Value	Stressed Value
Normal Uses of Liquidity	0.6	0.6
Stressed Securities Lending		-2.1
Stressed Derivatives		0.0
Stressed Private Markets		-3.9
Total Uses of Liquidity	0.6	-5.5

Liquidity Ratio	
Sources of Liquidity	46.0
Uses of Liquidity	-5.5
Ratio (Sources/Uses)	8.4
Alert Threshold	4.0
Fail Threshold	3.0
Test Result	Pass
<i>Note: Net Liquidity (Sources less Uses)</i>	40.5
<i>Note: 12 Months Benefit Payments (at 3% Annual)</i>	3.8

Source: State Street Bank

Assumptions: In the stress case, Liquid Assets are valued at 54% and Securities Lending collateral is valued at 79% 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, 2015

Counterparty Exposure

Counterparty	Number of Contracts				Counterparty Exposure (\$, millions)
	Swaps	Forwards	Futures	OTC Options	
Over the Counter¹					
Bank of America, N.A.	4	4		1	\$0.8
Barclays Bank PLC	16	18			0.0
BNP Paribas SA		3			0.0
Citibank N.A.	13	76			5.5
Credit Suisse International		4	1		0.3
Deutsche Bank AG	5	100			5.2
Goldman Sachs International	151	189		20	0.0
JPMorgan Chase Bank N.A	21	129	1	8	18.7
Macquarie Bank Limited	2				0.0
Morgan Stanley & Co. International P	26	56		6	5.9
Societe Generale	4	38			2.0
Toronto Dominion Bank		4			1.3
UBS AG	15	100			6.2
Exchange Traded²					
Credit Suisse Securities (USA) LLC	3		127		89.4
Goldman Sachs & Co	1		46	10	316.4
JP Morgan Securities LLC			168	1	123.3
Grand Total	261	721	343	46	\$575.0

Source: State Street Bank

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

²Counterparty exposure is initial margin posted.

Counterparty

As of December 31, 2015

Counterparty Ratings and Capital Assessment

Counterparty	S&P	Moody's	Fitch	Capital Ratios ¹	
				Tier 1	Common
Over the Counter²					
Bank of America, N.A.	A	A1	A+	13.8	11.9
Barclays Bank PLC	A-	A2	A	13.0	12.7
BNP Paribas SA	A+	A1	A+	13.8	11.2
Citibank N.A.	A	A1	A+	13.1	13.3
Credit Suisse International	A	A1	A	17.1	12.0
Deutsche Bank AG	BBB+	A3	A-	16.1	13.5
Goldman Sachs International	A	A1	A	13.8	12.2
JPMorgan Chase Bank N.A.	A+	Aa3	AA-	11.6	10.1
Macquarie Bank Limited	A	A2	A	11.0	14.7
Morgan Stanley	A	A1	A	14.1	12.1
Societe Generale	A	A2	A	12.6	13.9
The Toronto-Dominion Bank	AA-	Aa1	AA-	13.8	10.8
UBS AG	A	A2	A	19.4	20.5
Exchange Traded Futures³					
Credit Suisse Securities (USA) LLC	A	NR	NR	17.1	12.0
Goldman Sachs & Co	A	NR	A+	13.8	12.2
JP Morgan Securities LLC	A+	Aa3	AA-	11.6	10.1

Source: Ratings Agencies and Bloomberg

¹ Basel 3 requires 8.5% Tier 1 capital and 7.0% Common capital.

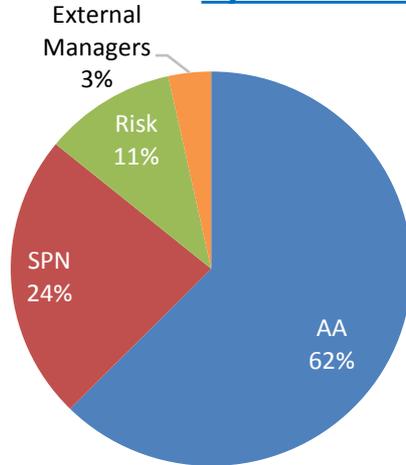
² Rating of counterparty or counterparty's credit support provider. Policy requirement is A- or A3 by at least one of Fitch, Moody's or S&P.

³ Credit Suisse Securities parent company is rated A1 by Moody's and A by Fitch. Goldman Sachs & Co. parent company is rated A3 by Moody's.

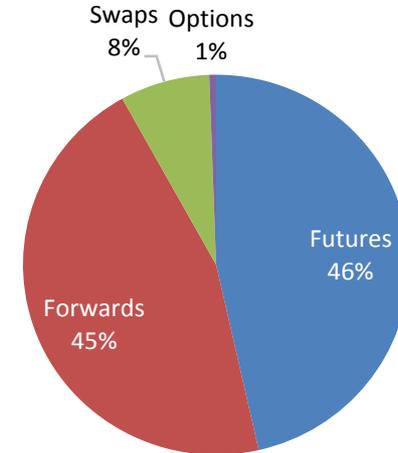
7. Derivatives

As of December 31, 2015

Gross Notional by Portfolio



Gross Notional by Instrument Type



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

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

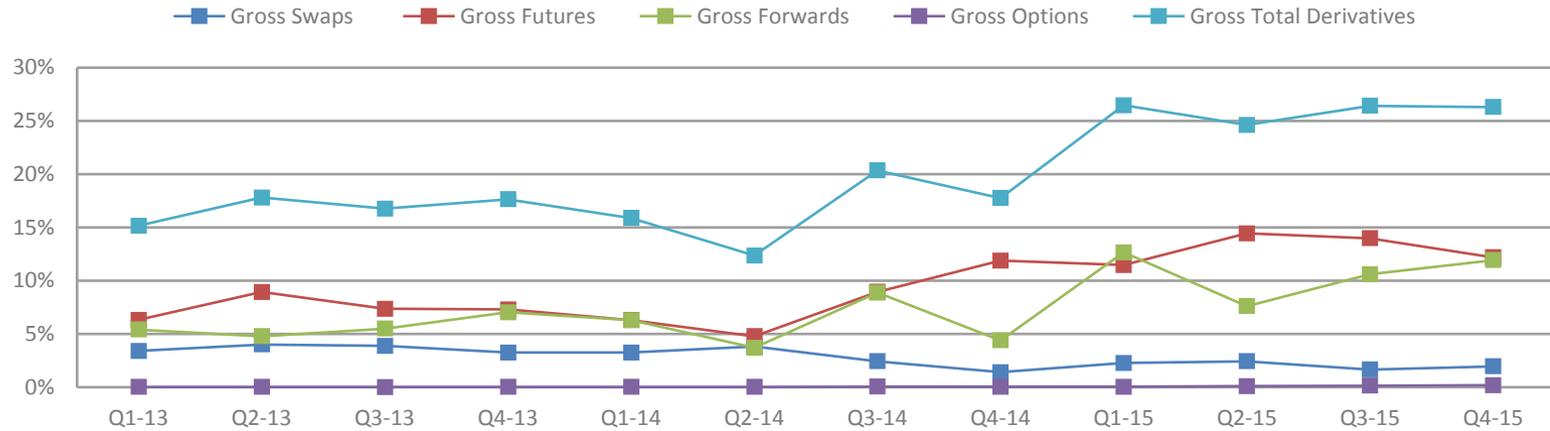
Portfolio	Gross Notional (\$, millions)	Net Notional (\$, millions)
AA	\$20,736.0	-\$147.4
SPN	7,794.0	728.4
Risk	3,546.4	1,181.0
External Managers	1,143.1	-567.1
Total	\$33,219.5	\$1,194.9

Instrument	Gross Notional (\$, millions)	Net Notional (\$, millions)
Futures	\$15,434.1	\$2,745.0
Forwards	15,102.2	-1,619.3
Swaps	2,492.3	64.3
Options	190.8	4.9
Total	\$33,219.5	\$1,194.9

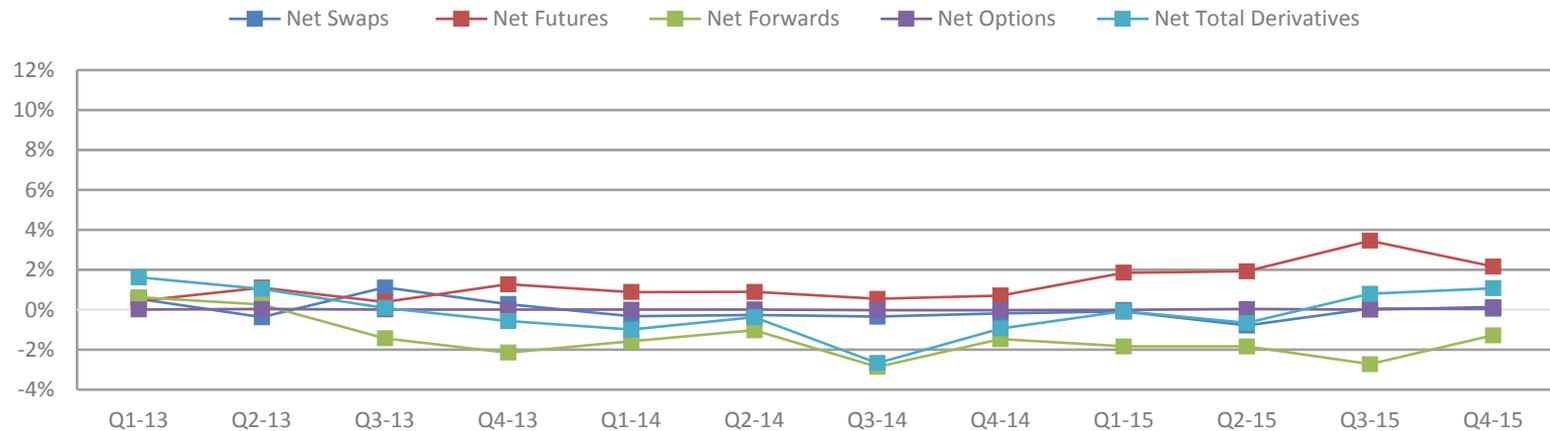
Derivatives

As of December 31, 2015

Gross Notional (% of Total Trust)



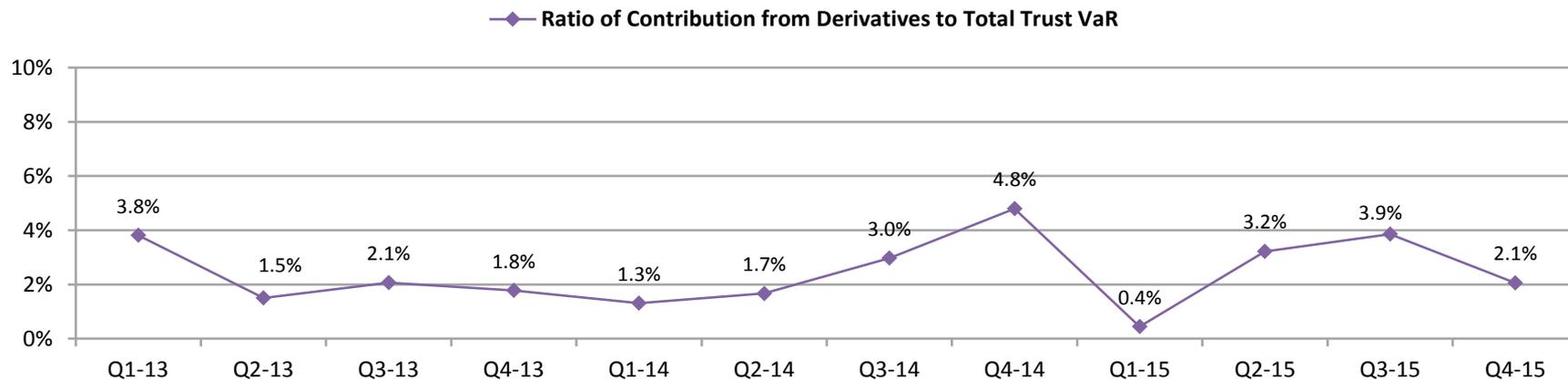
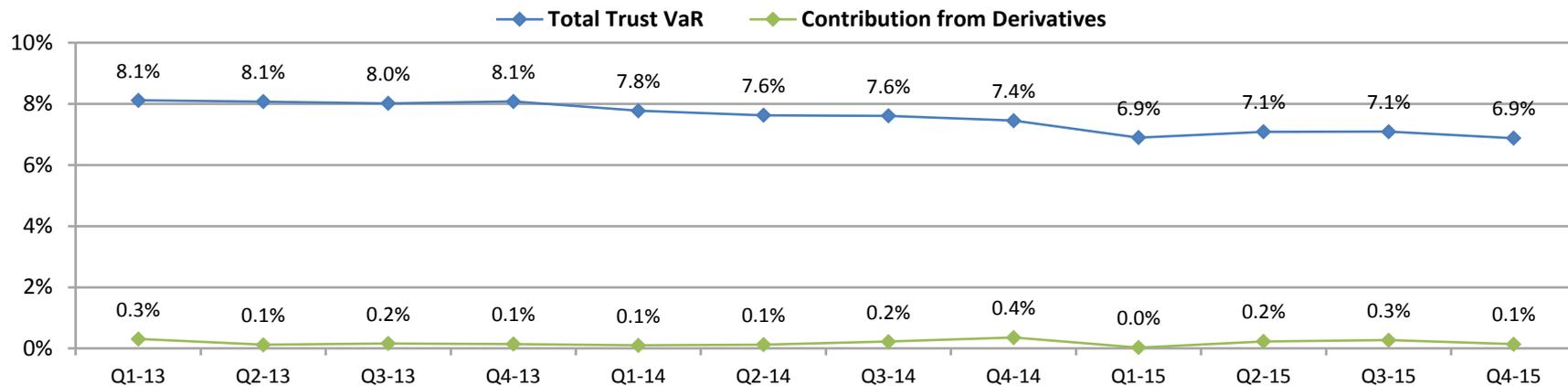
Net Notional (% of Total Trust)



Source: State Street Bank

Derivatives

As of December 31, 2015



Derivatives

As of December 31, 2015

Gross Notional

(\$, millions)	AA	SPN	Risk	External Managers	Total
Futures	9,350.4	4,209.8	1,717.4	156.4	15,434.1
Forwards	10,362.9	2,448.7	1,628.5	662.1	15,102.2
Swaps	1,022.7	1,135.3	166.0	168.4	2,492.3
Options	0.0	0.2	34.4	156.2	190.8
Total	\$20,736.0	\$7,794.0	\$3,546.4	\$1,143.1	\$33,219.5

The bulk of derivatives usage is AA (\$20.7 billion) and the SPN (\$7.8 billion)

Net Notional

(\$, millions)	AA	SPN	Risk	External Managers	Total
Futures	182.8	923.2	1,687.1	-48.2	2,745.0
Forwards	-509.0	102.4	-706.5	-506.2	-1,619.3
Swaps	178.7	-297.0	166.0	16.6	64.3
Options	0.0	-0.2	34.4	-29.3	4.9
Total	-\$147.4	\$728.4	\$1,181.0	-\$567.1	\$1,194.9

AA's \$20.7 billion gross notional nets to a much lower (-\$.1 billion) net position.

The Trust's \$33.2 billion gross notional nets to a much lower (\$1.2 billion) net position.

Derivatives

As of December 31, 2015

Mark-to-Market

(\$, millions)	AA	SPN	Risk	External Managers	Total
Futures	-6.9	9.5	-8.3	-1.4	-7.1
Forwards	-0.5	2.2	11.1	6.4	19.2
Swaps	3.2	10.6	1.6	3.1	18.4
Options	0.0	0.0	1.6	-0.6	0.9
Total	-\$4.2	\$22.4	\$5.9	\$7.4	\$31.5

Average Tenor in Years

	AA	SPN	Risk	External Managers	Total
Futures	0.20	0.23	0.22	0.21	0.21
Forwards	0.04	0.07	0.17	0.39	0.08
Swaps	0.93	2.52	4.47	0.71	1.88
Options	0.00	0.14	0.04	0.35	0.35
Total	0.16	0.52	0.40	0.40	0.28

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

Conclusion

- As of December 31, 2015, TRS investment exposures are in compliance with the Investment Policy Statement
 - TRS was overweight Real Return (+0.7%) and underweight Global Equity (-0.6%) and Stable Value (-0.2%)
 - At the asset class level, TRS was overweight Absolute Return, Non-US Developed and Real Assets while underweight Long Treasuries, Private Equities, and Emerging Markets
- Risk metrics are within established perimeters

APPENDIX

Derivative Exposure

As of December 31, 2015

Futures Notional¹

Futures by Asset Class	Number of Contracts	Gross Exposure (\$, millions)	Gross Exposure (% of Asset Class)	Gross Exposure (% of Total Trust)
USA	21	\$799.5	56.5%	0.6%
Non-US Developed	70	4,220.3	26.6%	3.3%
Emerging Markets	13	1,285.1	40.0%	1.0%
US Treasury	21	5,321.5	100.0%	4.2%
Cash	5	154.2	10.6%	0.1%
Absolute Return	7	1,248.8	87.5%	1.0%
Inflation Linked Bonds	67	513.4	81.7%	0.4%
Commodities	7	48.9	4.8%	0.0%
World Equity	3	124.9	16.9%	0.1%
Risk Parity	129	1,717.4	77.7%	1.4%
Futures Total	343	\$15,434.1		12.2%

Source: State Street Bank

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



Derivative Exposure

As of December 31, 2015

Swap Notional¹

Swaps by Asset Class	Number of Contracts	Gross Exposure (\$, millions)	Gross Exposure (% of Asset Class)	Gross Exposure (% of Total Trust)
USA	33	\$317.0	22.4%	0.3%
Non-US Developed	134	343.6	2.2%	0.3%
Emerging Markets	42	374.0	11.7%	0.3%
Absolute Return	1	178.9	12.5%	0.1%
Inflation Linked Bonds	5	107.1	17.0%	0.1%
Commodities	35	979.8	95.2%	0.8%
World Equity	8	25.8	3.5%	0.0%
Risk Parity	3	166.0	7.5%	0.1%
Swaps Total	261	\$2,492.3		2.0%

Source: State Street Bank

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



Derivative Exposure

As of December 31, 2015

Forwards and Options Notional¹

Non-Currency Forwards by Asset Class	Number of Contracts	Gross Exposure (\$, millions)	Gross Exposure (% of Total Trust)
Non-US Developed	0	\$0.0	0.0%
Emerging Markets	0	0.0	0.0%
Non-Currency Forward Total	0	0.0	0.0%
USA	45	190.6	0.2%
Global TIPS	1	0.2	0.0%
Options Total	46	190.8	0.2%
Euro Currency	106	2,303.8	1.8%
Japanese Yen	55	885.2	0.7%
Pound Sterling	103	1,912.6	1.5%
Canadian Dollar	58	2,656.1	2.1%
Other Non-US Developed	209	5,531.8	4.4%
Emerging Markets	0	0.0	0.0%
Forwards Total	721	\$15,102.2	11.9%

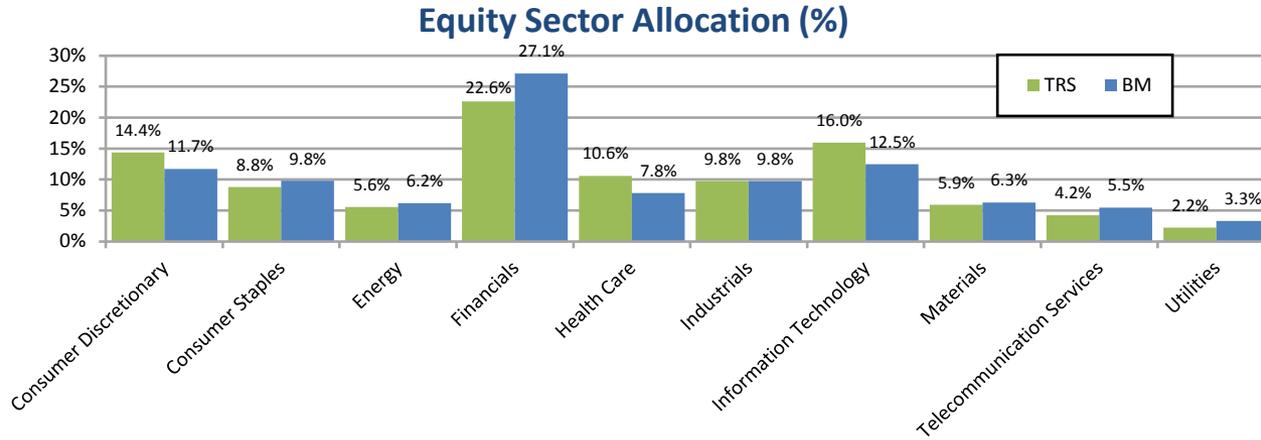
Source: State Street Bank

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

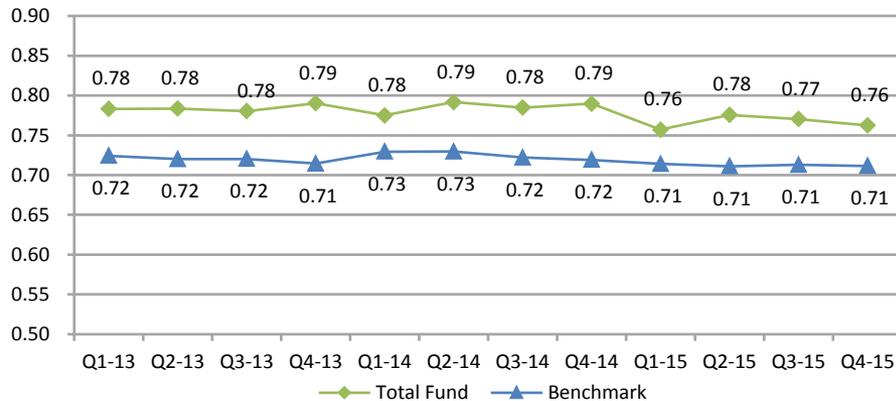


Sector Allocation, Beta and Scenario Analysis

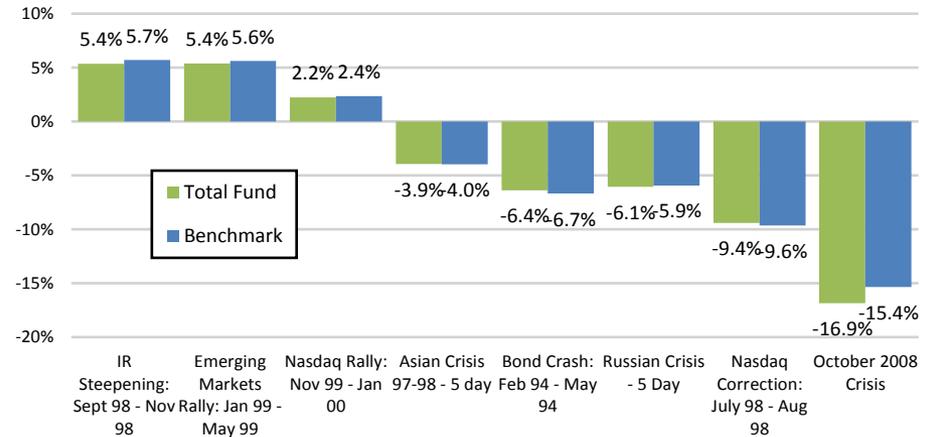
As of December 31, 2015



Beta Analysis MSCI World Index



Scenario Analysis (% Gain/Loss in Market Value)

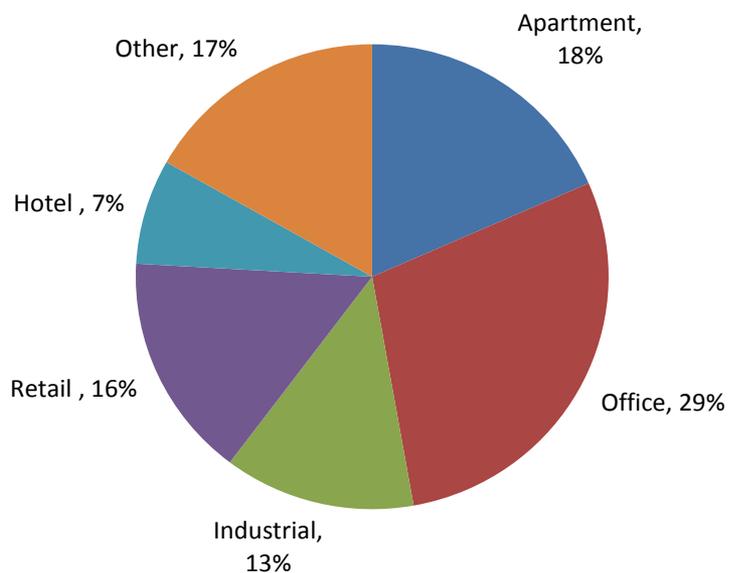


Source: State Street Bank

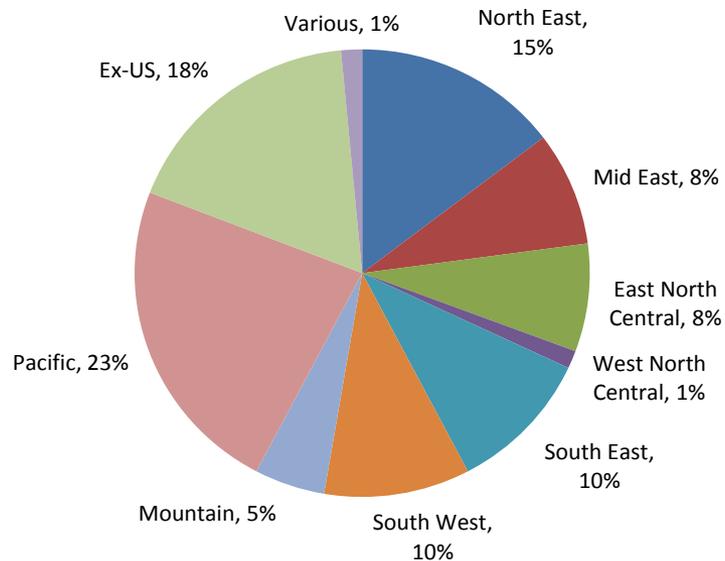
Real Estate Diversification

As of September 30, 2015

Property Type Diversification



Geographic Diversification



Securities Lending

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