



INVESTMENT MANAGEMENT COMMITTEE



November 2014

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

*(Mr. Barth, Committee Chair; Mr. Colonna; Mr. Corpus; Mr. Kelly; & Ms. Sissney,
Committee Members)*

AGENDA

**November 20, 2014 – 12:00 p.m.
TRS East Building, 5th Floor, Boardroom**

1. Consider the approval of the proposed minutes of the September 18, 2014 committee meeting – Todd Barth.
2. Review the Asset Allocation Group – Mohan Balachandran and Mark Albert.
3. Review Risk Management and Strategies – Jase Auby and James Nield.

NOTE: The Board of Trustees (Board) of the Teacher Retirement System of Texas will not consider or act upon any item before the Investment Management Committee (Committee) at this meeting of the Committee. This meeting is not a regular meeting of the Board. However, because the full Investment 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 Investment Management Committee

September 18, 2014

The Investment Management Committee of the Board of Trustees of the Teacher Retirement System of Texas met on September 18, 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:

Todd Barth, Chair
Joe Colonna
David Corpus
David Kelly
Nanette Sissney

Others present:

Christopher Moss, TRS Trustee
Anita Palmer, TRS Trustee
Karen Charleston, TRS Trustee
Brian Guthrie, TRS
Ken Welch, TRS
Carolina de Onis, TRS
Britt Harris, TRS
Jerry Albright, TRS
Michael Aluko, TRS
Jase Auby, TRS
Mohan Balanchandran, TRS
Ronnie Bounds, TRS
Grant Birdwell, TRS
Susanne Gealy, TRS
Brad Gilbert, TRS
Katy Hoffman, TRS

Janis Hydak, TRS
Dan Junell, TRS
Eric Lang, TRS
Lynn Lau, TRS
Denise Lopez, TRS
David Veal, TRS
Dale West, TRS
Dr. Keith Brown, Investment Advisor
Steven Huff, Fiduciary Counsel
Steve Voss, Hewitt EnnisKnupp
Ann Fickel, Texas Classroom Teachers Association
John Claisse, Albourne
Tathata Lohachitkul, Albourne
John Ide, JPM
Tom Rogers, Texas Retired Teachers Association & Austin Retired Teachers Association

Mr. Barth called the meeting to order at 2:29 p.m. All committee members were present.

1. Consider the approval of the proposed minutes of the June 5, 2014 committee meeting – Committee Chair.

On a motion by Ms. Sissney, seconded by Mr. Corpus, the committee approved the minutes of the June 5, 2014 meeting, as presented.

The committee took up item 3 on the agenda.

3. Public Strategic Partnership Network Update – David Veal and Grant Birdwell.

Mr. Veal stated that the Public Strategic Partner Network comprised about 5 percent of the Trust Fund and that its returns placed it in the top quartile of peers. He stated that the systematic sharing of knowledge and research within the network had contributed positively across all trust profit centers. Mr. Veal stated for Mr. Barth that the network acted as a headlight system both quantitatively and qualitatively in feeding signals to the Tactical Asset Allocation process.

In response to a request from Mr. Barth, Mr. Birdwell highlighted the best attributes of each partner. He highlighted team priorities and accomplishments relating to research and the integration of network partner positioning into trust asset allocation. In response to a question from Mr. Colonna about partner positioning, Mr. Harris stated that the positioning demonstrated by a particular partner would send a certain signal that would allow such activity to become a part of the trust's asset allocation signaling. Mr. Birdwell discussed the value that was added to the trust from the Strategic Partnership Network Summits. He also discussed the strategic benefits to the trust that resulted from collaboration amongst network partners on various active research projects.

2. Receive a review of the External Public Markets Portfolio – Dale West, Susanne Gealy, and Brad Gilbert.

Mr. West highlighted the strong return performance of the External Public Markets (EPM) group over the past year. That performance, he said, added \$264 million in generated trust assets. He addressed the priorities of the EPM portfolio pertaining to alpha production, building portfolio management and due diligence expertise, fostering strategic relationships with the group's external managers, and cooperating with other trust business units on ideas. Mr. West described where the EPM group fits within the context of the trust's overall portfolio, its key parameters, and its critical processes pertaining to external manager identification, development, and selection.

Ms. Gealy described performance results for the global equity external manager program. She stated that the \$30 billion allocated among five equity asset class portfolios achieved a 21.7 percent return over the last year.

Mr. Gilbert described the performance results for the Hedge Fund Portfolio. He stated that \$11.5 billion was allocated among two separate hedge fund portfolios last year. The directional hedge fund portfolio, he said, achieved a 13.2 percent and the stable value hedge fund portfolio had a 5.1 percent return over the last year. Mr. Gilbert explained how both the directional hedge fund portfolio and the stable value hedge fund portfolio delivered alpha to the trust on a beta-adjusted basis. He highlighted how the hedge fund team deepened relationships with existing managers to leverage their strengths and skills.

Mr. West described the EPM priorities for the coming year. He stated that the group would continue to focus on execution, external manager performance, streamlining research, due diligence, monitoring, and negotiation processes, and solid risk management.

The meeting adjourned at 3:00 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 NOVEMBER, 2014.

ATTESTED BY:

Dan Junell
Secretary to the TRS Board of Trustees

Date





Asset Allocation

Mohan Balachandran, Senior Managing Director

Mark Albert, Senior Director

November 2014

Agenda

- I. Performance and Investment Summary
- II. Organizational Structure
- III. Update on 2014 Priorities
- IV. Strategic Asset Allocation
- V. Tactical Asset Allocation
- VI. Fixed Income Management
- VII. Quant Equity Strategies
- VIII. Other Initiatives
- IX. Preliminary 2015 Goals

Executive Summary

As of September 30, 2014

Impact Assessment		Returns			Alpha		
Strategy	Assets (\$MM)	1-Year	3-Year	5-Year	1-Year	3-Year	5-Year
Stand-Alone Strategies							
Long Treasuries	15,857.6	11.8%	2.3%	7.4%	0.2%	0.3%	0.4%
TIPS	5,864.8	1.8%	1.5%	4.7%	0.2%	0.2%	0.2%
Quantitative Equity Strategies	1,056.2	13.9%	20.1%	12.0%	2.6%	3.5%	1.9%
Special Opportunities	204.3	12.7%	-	-	9.5%	-	-
TOTAL	\$22,982.9						

Overlay Strategies							
Integrated TAA*		-7.9 bps	-3.4 bps	-	-7.9 bps	-3.4 bps	-

*Integrated TAA performance represented in trust level bps. Other strategies presented as % return on portfolio.

Asset Allocation (AA) Group

Asset Allocation Group Highlights

Four PhDs
Ten Masters Degrees
Four CFAs
One CAIA



Mohan Balachandran, PhD
Sr. Managing Director
*PhD, Physics,
Brown University*



Mark Albert, CFA
Sr. Director
*MBA, University of
Michigan
BA, Brandeis University*



Ashley Baum, CFA, CPA
Sr. Investment Manager
MPA and BBA, UT Austin



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



Matt Talbert, PhD
Investment Manager
*PhD, Economics,
UT Austin*



Komson Silapachai, CFA
Investment Manager
*BA, Finance, Texas
A&M University*

ANALYTICS/ RESEARCH



Wayne Speer, CFA
Sr. Investment Manager
*MBA, SMU
BA, University of New
Mexico*



Ken Standley, CAIA
Associate
*BA, Economics, The
George Washington
University*



Jingshan Fu, PhD
Investment Manager
*PhD, Demography,
MA/MS, Public Health,
Harvard University*



Teresa Lwin, PhD
Sr. Associate
*PhD, Finance
MBA, Chicago Booth
School of Business*



Patrick Zerda
Associate
*MPA and BBA,
UT Austin*



Solomon Gold
Sr. Associate
*MS, Economics,
UT Austin
BA & BS, UC San Diego*



Don Stanley
Associate
*BA, Finance
UT Austin*



Kyle Schmidt
Associate
*MBA, SMU
BS, Engineering,
University of Oklahoma*



Hasim Mardin
Contractor
*MS, Economics,
UT Austin*



Sibe Wen
Contractor
*MS, Statistics
UT Austin*

RELATIONSHIP MANAGEMENT



Paul Waclawsky
Administrative
Contractor
*BS, Accounting
University of Maryland*

Update on 2014 Top Priorities

2014 Goals	Timeline	Explanation
Complete Strategic Asset Allocation	1Q-3Q14	<ul style="list-style-type: none"> • Final recommendation of +5% to Private Markets and addition of a 5% line-item allocation to Risk Parity was approved at the September Board Meeting • New Strategic Asset Allocation with Alpha is expected to exceed TRS's long-term return target of 8% • Multi-year Transition Plan underway as Private Markets and Risk groups ramp up their allocations • Increased probability of achieving 8% long term from 55% to 61%
Integrated Tactical Asset Allocation	1Q-2Q14	<ul style="list-style-type: none"> • Developed and completed comprehensive model validation process • Fully integrated new and old TAA models • Worked with IT to develop robust systems to support daily portfolio measurement
Develop Special Opportunities Platform	1Q14	<ul style="list-style-type: none"> • Established Special Opportunity framework (peer benchmarking, investment process, cross-Trust Council, legal and operational terms, and focus relationships) • Created two customized partnerships to capture attractive co-investments • Expanding discussions with additional managers and service providers
Investigate Alternative Risk Premia Portfolio	4Q14	<ul style="list-style-type: none"> • Initiated paper portfolio October 2013 • Performance in line with expectations (IR = 1.0) • Funded AQR Style Premia Fund in December 2013 • Continued refinement of strategies within paper portfolio in collaboration with external partners

Strategic Asset Allocation (SAA)

Asset Allocation Group

Strategic Asset Allocation



Ashley Baum, CFA, CPA
Sr. Investment Manager
MPA and BBA, UT Austin

Ken Standley

Management
Committee

Hewitt EnnisKnupp

Objectives:

- Conduct full SAA Study
 - Trust Asset Allocation
 - Risk boundaries
 - Market conditions

2014 In Review:

- Reviewed market conditions
- Refined policy to add +5% to Private Markets and a 5% line-item allocation to Risk Parity
- Maximized long-term returns within prudent risk parameters
- Increased probability of achieving 8% long term

2015 Goals:

- Coordinate implementation of Risk Parity sleeve

Strategic Asset Allocation (SAA)

Completed 2014 Strategic Asset Allocation Study

Asset Allocation	Prior Policy	New Policy (Oct 2014)	Change
Global Equity			
USA ¹	20%	18%	-2%
Non-US Developed	15%	13%	-2%
Emerging Markets	10%	9%	-1%
Directional Hedge Funds	5%	4%	-1%
Private Equity	11%	13%	2%
TOTAL GLOBAL EQUITY	61%	57%	-4%
Stable Value			
US Treasuries	13%	11%	-2%
Absolute Return	0%	0%	0%
Stable Value Hedge Funds	4%	4%	0%
Cash	1%	1%	0%
TOTAL STABLE VALUE	18%	16%	-2%
Real Return			
Global Inflation-Linked Bonds	5%	3%	-2%
Commodities	0%	0%	0%
Energy and Natural Resources	3%	3%	0%
Real Assets	13%	16%	3%
TOTAL REAL RETURN	21%	22%	1%
Risk Parity	0%	5%	5%
TOTAL TRUST	100%	100%	0%

	Prior Policy	New Policy (Oct 2014)	Change
Global Equity	61%	57%	-4%
Stable Value	18%	16%	-2%
Real Return	21%	22%	1%
Risk Parity	0%	5%	5%
Non-US Exposure	25%	22%	-3%
Hedge Fund Total	9%	8%	-1%
Public Equity	45%	40%	-5%
Total Liquid + HF	73%	63%	-10%
Total Private	27%	32%	5%
Expected Return (with alpha)	8.4%	8.7%	0.3%
Volatility	11.4%	11.6%	0.2%
Sharpe Ratio	0.50	0.52	0.02
Liquidity Score	2.82	3.05	0.24

New Policy Allocation



¹USA line-item combines US Large Cap and US Small Cap

Tactical Asset Allocation (TAA)

Asset Allocation Group

Tactical Asset Allocation



Matt Talbert, PhD
Investment Manager
*PhD, Economics,
UT Austin*



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

Jase Auby:
Bubbles, Valuation,
Environmental

David Veal:
SPN

Objectives:

- Annualized alpha of 25 basis points on total Trust
- Trading public market assets only

2014 In Review:

- One year alpha -7.9bps, three year alpha -3.4bps
- Fully integrated new and existing models (7 total)
- Developed and completed systematic model governance and validation process

2015 Goals:

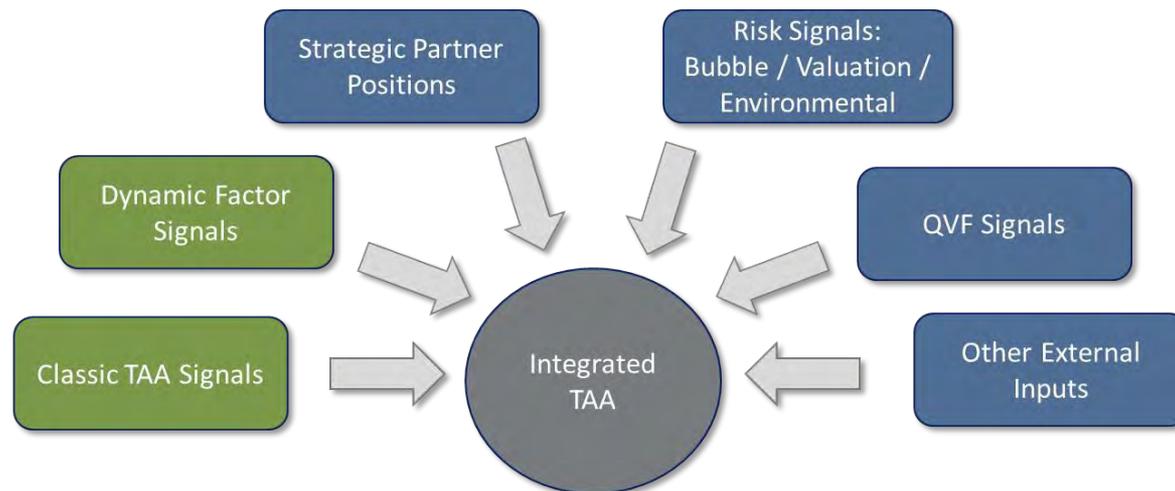
- Inclusion of Alternative Risk Premia (ARP) model
- Expansion of current process through inclusion of new strategies and enhancement of current strategies

Tactical Asset Allocation (TAA)

Underlying Model Strategies

OBJECTIVE: Combine existing processes and systems into one unified portfolio

- **Factor:** Strategies that seek to forecast next month return
 - **Classic:** Assumes only a few macro factors matter at all times
 - **Dynamic Factor:** Assumes only a few macro factors matter for short periods of time
 - **QVF:** Assumes all macro factors matter at all times
- **External:** Extracts positions from external Strategic Partners
- **Valuation:** Ranks assets based on profit margin, mean reversion, earnings growth, and dividend yield
- **Regime:** Environmental Model allocates based on global GDP and CPI expectations
- **Price:** Bubble model finds pairs of distressed and overvalued assets based on price

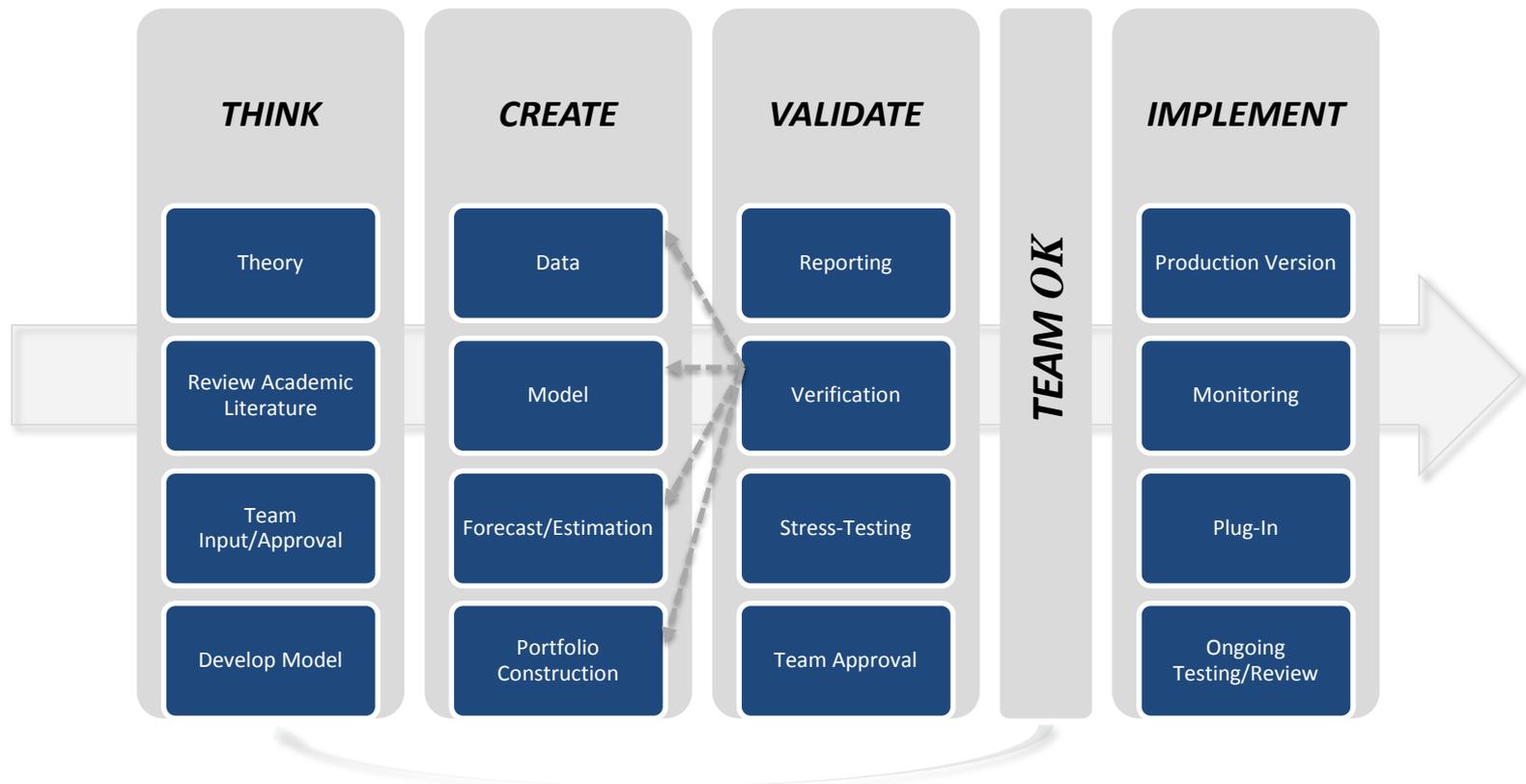


Tactical Asset Allocation (TAA)

Model Governance and Validation

OBJECTIVE: Act as **gate** for models coming in and out

- Focus is to make sure models are **statistically and theoretically sound** with respect to underlying data, model parameters, estimation windows, and portfolio construction
- **Ensures robustness** of models and prevents in-sample bias, back-fit tendencies, and overly sensitive parameters



Fixed Income Portfolio

Asset Allocation Group

Fixed Income Portfolios



Komson Silapachai, CFA
Investment Manager
BA, Finance, Texas
A&M University

Hasim Mardin

Ken Standley

Patrick Zerda

Objectives:

- \$21.7 billion allocation, 16.8% of Trust
- Effective index replication
- Alpha generation through low tracking error strategies
- Prudent securities lending
- Proprietary quantitative analytics

2014 In Review:

- One year return 11.8%, one year alpha 0.2%, Tracking Error: 0.1%
- Established internal risk analytics infrastructure
- Developed interest rate / monetary policy research capabilities

2015 Goals:

- Investigate quantitative fixed income applications
- Develop new team members in fixed income expertise

Fixed Income Portfolio

Characteristics

AA Long Treasuries Portfolio	
Benchmark:	Barclays Long Treasury Index
Trust Allocation:	12.3%
Portfolio Statistics:	
Number Of Bonds:	59
Portfolio Yield:	3.0%
Benchmark Yield:	3.1%
Portfolio Duration:	16.2 Years
Benchmark Duration:	16.2 Years

AA TIPS Portfolio	
Benchmark:	Barclays TIPS Index
Trust Allocation:	4.5%
Portfolio Statistics:	
Number Of Bonds:	35
Portfolio Yield:	0.3%
Benchmark Yield:	0.3%
Portfolio Duration:	7.7 Years
Benchmark Duration:	7.7 Years

Quantitative Equity Strategies (QES)

Asset Allocation Group

Quantitative Equity Strategies



Mark Albert, CFA
Sr. Director
MBA, University of
Michigan
BA, Brandeis University

Solomon Gold
Wayne Speer

Bernie Bozzelli:
Trading Group

Objectives:

- \$1.1 billion allocation, 0.8% of Trust
- Objective to generate 100bps in alpha
- Trades public equities only

2014 In Review:

- One year return 13.9%, one year alpha 2.6%
- Inception: 2.7% annualized alpha
- Transitioned to Asset Allocation Group

2015 Goals:

- Increase Impact of Global QES
- Coordinate with Risk team to transition Low Vol with Overlay from R&D to Trust allocation
- Research additional applications

Quantitative Equity Strategies (QES)

Theory

Fundamental*

- Based on human experience, can envision a future different from the past
- Understands the power of exceptions
- Applies depth and breadth of knowledge to a narrower opportunity set

Quantitative*

- Based on objective rules, envisions future based on the past
- Understands the power of averages
- Applies narrow set of quantitative information to a broader opportunity set

PHILOSOPHY:

All models are wrong, but some models are useful.

~ George E.P. Box

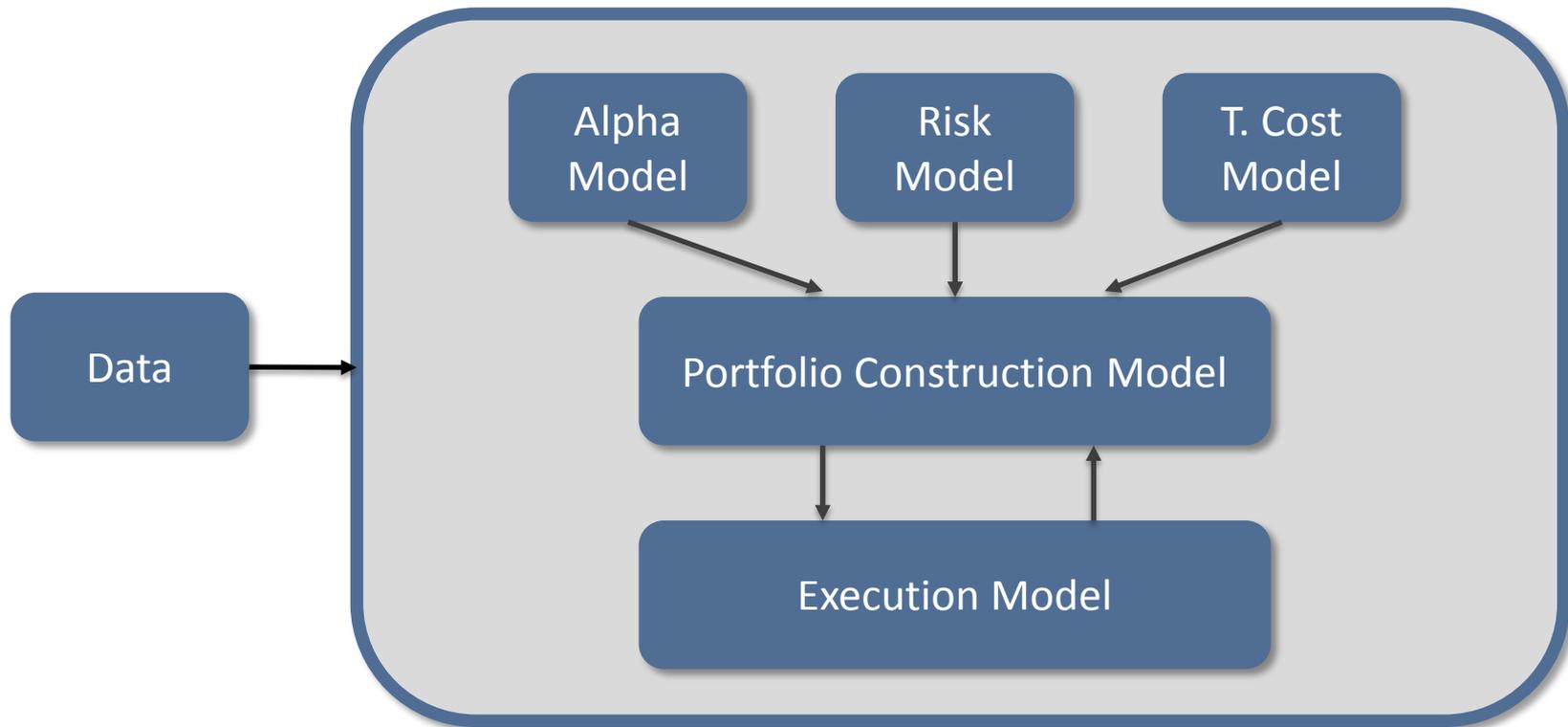
Bargain securities defined by valuation measures, outperform over long periods of time.

Patience and perseverance are required during periods of underperformance.

*From Macquarie Global Quant Conference, Quant Panel, Sept 2013, Stuart Rae, CIO Basin Value Equities, Alliance Bernstein

Quantitative Equity Strategies (QES)

Background



Quantitative Equity Strategies (QES)

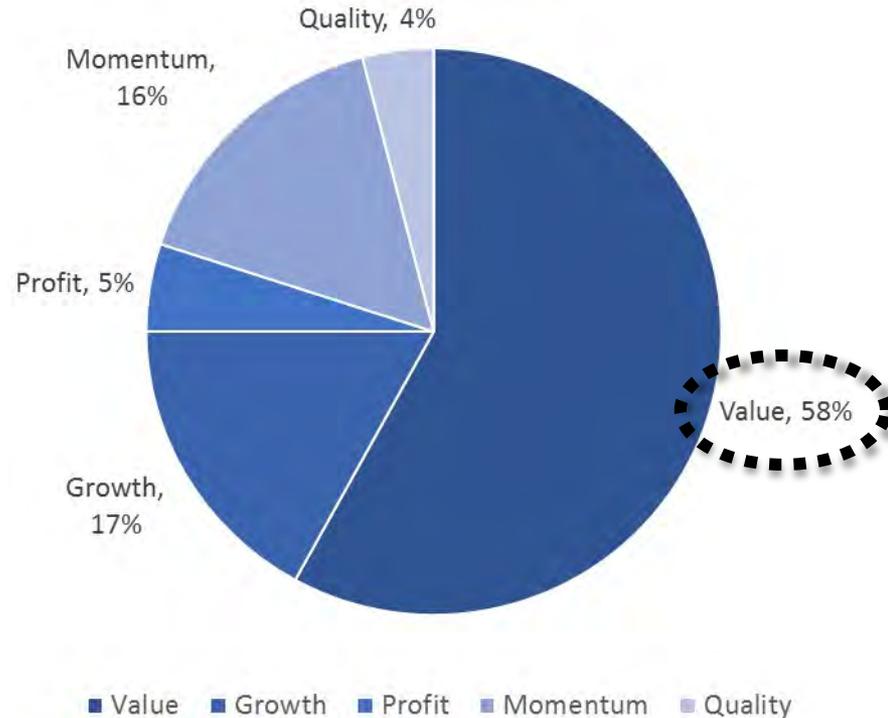
Highlights

One Portfolio with Three Distinct Strategies (\$1.1B)		
Strategic	Dynamic	Macro Distance
\$529 million 50%	\$265 million 25%	\$262 million 25%
50 Models Long-term Static Factors & Equal Weights	48 Models Dynamic Flexible Factors & Weights	1 Model Macro Regimes Flexible Factors & Weights
Developed Markets • Region / Sector Models Emerging Markets • Country Models	Country Models	Global Sector Neutral
Launched June 2009	Launched September 2009	Launched March 2012

Quantitative Equity Strategies (QES)

Diversity of Factor Type

- Factors Chosen based on Long Term Factor Effectiveness
- Core Portfolio Dominated by Value Factors



Special Opportunities

Asset Allocation Group

Special Opportunities



Ashley Baum, CFA, CPA
Sr. Investment Manager
MPA and BBA, UT Austin

Don Stanley

SPN &
External Public

Private Markets

Objectives:

- \$204.3 million current NAV, 0.2% of Trust
- Access unique investments that are accretive to the overall Trust with acceptable risk and liquidity

2014 In Review:

- One year return 12.7%, one year alpha 9.5%
- Established Special Opportunity framework
- Created two customized partnerships to capture attractive co-investments
- Funded three opportunistic ideas
- Reviewed over 50 inbound opportunities

2015 Goals:

- Implement “Gold Status” relationship structure
- Enhance best practices and cross-Trust collaboration

2015 Goals

The following are preliminary goals for the 2015 fiscal year:

Strategic Asset Allocation (SAA)

Manage transition to new Strategic Asset Allocation

Support rollout of Internal Risk Parity

Special Opportunities

Implement “Gold Status” relationship structure

Invest in \$300 - \$500 million high reward/risk investments

Fixed Income Portfolio

Investigate quantitative fixed income applications

Tactical Asset Allocation (TAA)

Provide 25bps of alpha to Trust

Include Alternative Risk Premia portfolio as additional model

Leverage Strategic Partners for key quantitative insights and proprietary factor research

Quantitative Equity Strategies (QES)

Expand current quant platform/allocation

Develop/enhance proprietary technological developments to support all quantitative strategies across AA/Risk Groups

Personnel

Facilitate personnel development into single asset class specialists and multi-asset portfolio managers (Mastery)

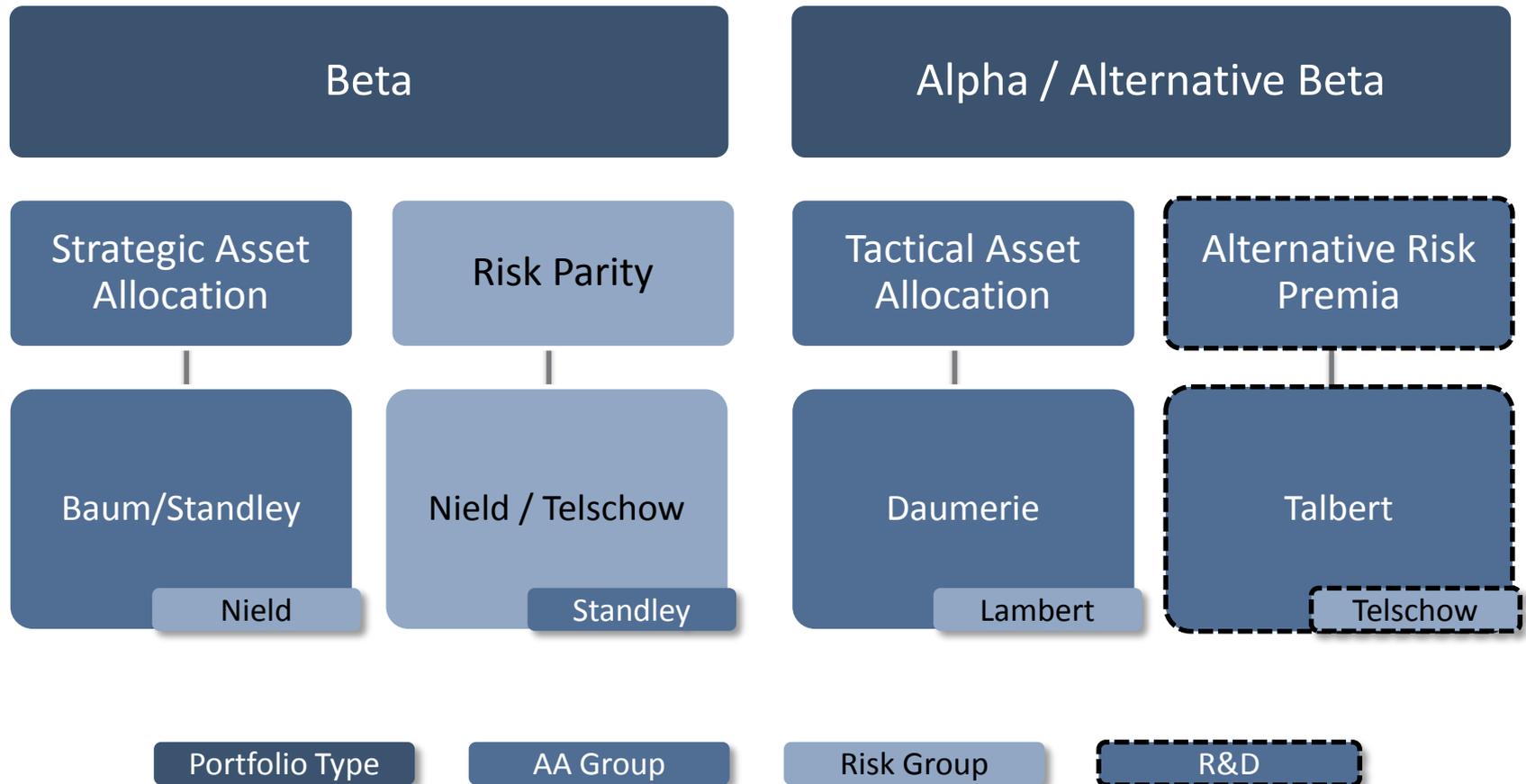
Retain, recognize, and reward employees who create value, enhance processes, and operate consistently with IMD Culture

APPENDIX

AA Group Collaboration With Risk Group

Multi-Asset Strategies

- Asset Allocation function split between Beta and Alpha functions
- Strong oversight, communication, and collaboration with Risk Group



AA Group Collaboration With Risk Group

Single Asset Strategies

- Sub-teams are single asset experts, and backups on second asset
- Four broad categories: Equity, Fixed Income, Commodities, and Currencies
- Single asset experts work effectively in TAA and risk parity implementation

Equity

Fixed Income, Commodities, and Currencies

Single
Name
Equity

Index Equity

US
Treasuries

US TIPS

Credit /
Special Ops

Commod-
ities

Currencies

Albert /
Speer / Gold /
Schmidt

Daumerie /
Schmidt

Silapachai
/ Standley /
Mardin / Zerda

Silapachai
/ Standley /
Mardin / Zerda

Baum / Stanley

Daumerie /
Zerda

Mardin / Zerda

Telschow

Telschow

Nield

Nield

Simmons

Nield

Simmons

Asset Type

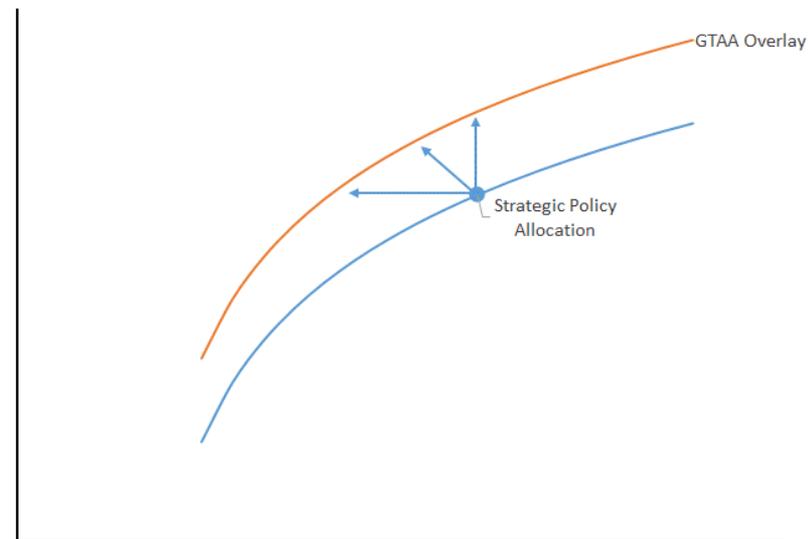
AA Group

Risk Group

Tactical Asset Allocation (TAA)

Theory

- **Exploits short term market mispricing** and relies on index movements instead of specific security selection
- **Adds to alpha** of the trust by taking advantage of strategic bands around major asset classes
- **Net zero** overlay portfolio construction where $\sum \text{underweights} = \sum \text{overweights}$
- **Efficient derivatives implementation** to express country-level long/short views



	STRONGLY BEARISH -5.0% <-> -3.0%	MODERATELY BEARISH -3.0% <-> -1.0%	SLIGHTLY BEARISH -1.0% <-> -0.1%	NEUTRAL -0.1% <-> 0.1%	SLIGHTLY BULLISH 0.1% <-> 1.0%	MODERATELY BULLISH 1.0% <-> 3.0%	STRONGLY BULLISH 3.0% <-> 5.0%
GLOBAL EQUITIES							
US Equities							
LCV							
LCG							
SC							
EAFE							
EM							
STABLE VALUE							
Absolute Return							
Treasuries							
Cash							
REAL RETURN							
TIPs							
REITS							
Commodities							

Tactical Asset Allocation (TAA)

'Integrated' TAA Highlights

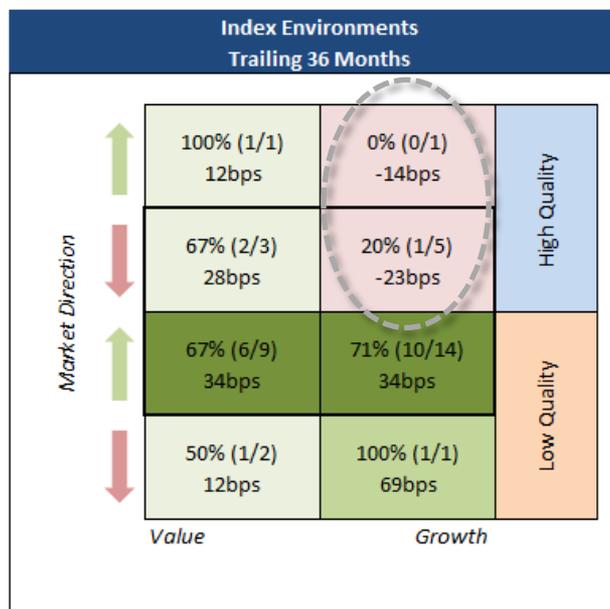
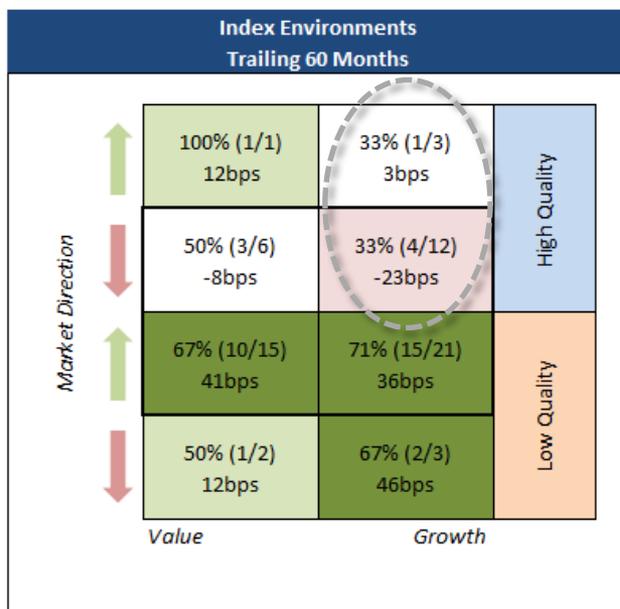
END GOAL: Create a world-class, modular Tactical Asset Allocation (TAA) system that touches on all major liquid asset classes and provides 25bps of alpha at the trust level with 50bps volatility target.

- **Major, liquid asset class exposure** touching international equities, currencies, bonds, and commodities
- **Diversifying strategies** contribute to higher total risk adjusted return
- **Quantitative, model-driven** approach to forecasting returns
- **Efficient implementation** with derivatives, resulting in lower fees, netting of positions, and lower gross exposure
- **Robust model validation** reduces potential of biased or theoretically incorrect models
- **Transparent** reporting, operations, and communication
- **Advanced technology** for error checking, factor discovery, and trade entry
- **Systematic investment process** applicable to future strategies and ideas

Quantitative Equity Strategies (QES)

When Does Quant Equity NOT Work?

Parma – Index Environments



Interpreting “Index Environments”

Index environments are defined using monthly index returns as follows:

- “Value” vs. “Growth” Style environments are defined by the sign of the difference in return of the value and growth variants of the core benchmark for this strategy.
- “Up” vs. “Down” Market Direction environments are defined by the sign of the total return of the benchmark used for this report.
- “High” vs. “Low” Quality environments are defined by the sign of the difference in return between the Barclays US Aggregate Bond Index and the Barclays US Corporate High Yield Bond Index.

Quantitative Equity Strategies (QES)

When Does Quant Equity NOT Work?

Parma – Factor Environments

Factor Environments Trailing 60 Months			
Momentum ↑ ↓ ↑ ↓	31% (4/13) -5bps	58% (7/12) 2bps	Risk Off
	80% (4/5) 36bps	0% (0/1) -128bps	
	77% (10/13) 32bps	29% (2/7) 7bps	Risk On
	80% (8/10) 70bps	100% (2/2) 29bps	
	Value	Anti-Value	

Factor Environments Trailing 36 Months			
Momentum ↑ ↓ ↑ ↓	22% (2/9) -4bps	83% (5/6) 26bps	Risk Off
	67% (2/3) 38bps	None	
	78% (7/9) 34bps	33% (1/3) 1bps	Risk On
	80% (4/5) 49bps	100% (1/1) 56bps	
	Value	Anti-Value	

Interpreting “Factor Environments”

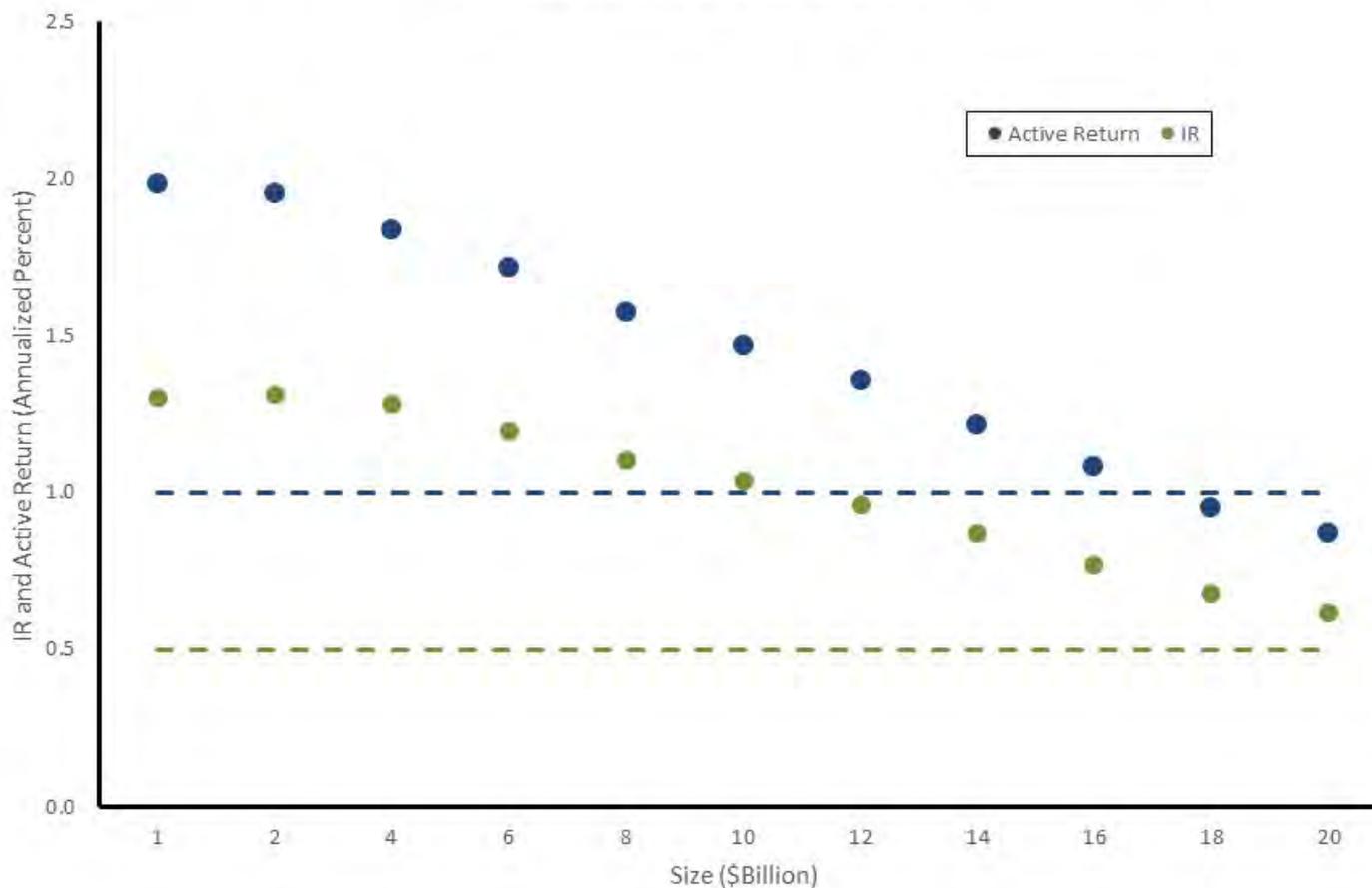
Factor environments are defined using monthly factor returns of the Barra risk model selected as follows:

- “Value” vs. “Anti-Value” environments are defined by the sign of the sum of the factor returns of Earnings yield and Book-to-Price.
- “Momentum” environments are defined by the sign of the Momentum factor return.
- “Risk On” vs. “Risk Off” environments are defined by the sign of the sum of the factor returns of Beta, Residual Volatility, and Small Size (negative of the Size factor return).

Quantitative Equity Strategies (QES)

Capacity Study

Quant Aggregate: Strategic (50%), Macro Distance (25%), Dynamic (25%)
Active Return and IR vs. Size





Risk

Jase Auby, Chief Risk Officer

James Nield, Deputy Chief Risk Officer

November 2014

Agenda

- I. Executive Summary
- II. Risk Group Personnel and Risk Mandate
- III. Risk Parity Update
- IV. Key Risk Signals
 - Bubbles
 - Environmental
 - Valuation
 - CUSUM
- V. 2014 Priorities
 - Integrate Risk Signals into TAA
 - Risk Factors
 - Hedge Fund Risk Model
- VI. Risk Strategies
- VII. 2015 Priorities (Preliminary)

Executive Summary

As of September 30, 2014

In 2014, the Risk Group:

- Executed our mandate to enable efficient risk taking

Manage Risk	Monitor Risk
Signals	Reporting
Budgeting	Certification
Strategies	Compliance

- Completed five priority projects – (1) contribute to SAA, (2) integrate risk signals into TAA, (3) develop Trust Risk Factor analysis, (4) review Trust liquidity and (5) review Hedge Fund risk modeling
- Contributed to the Trust's alpha

RISK GROUP											
Portfolio ¹	Total Assets		Return		Alpha (bp)		Tracking Err (bp)		Info Ratio		Incept Date
	\$, mill	% Trust	1-Year	Incept	1-Year	Incept	1-Year	Incept	1-Year	Incept	
External Risk Parity ²	\$584	0.5%	10.0%	3.7%	-1	-2	3	2	-0.47	-0.76	Oct-12
Internal Risk Parity ²	119	0.1%	11.8%	14.8%	174	395	200	327	0.87	1.21	Jul-13
Low Vol with Overlay	109	0.1%	22.2%	24.4%	288	149	202	337	1.43	0.44	Jan-13
Reinsurance	137	0.1%	16.8%	16.8%	1115	1115	226	226	4.92	4.92	Oct-13
Total Risk Group²	\$949	0.7%	12.6%	7.0%	181	113	41	58	4.40	1.96	Oct-12

¹ All returns, alphas and tracking errors are annualized

² For Risk Parity, alpha and tracking error are versus the new risk parity policy benchmark. Using the prior policy benchmark, since inception alpha is -268 bp (External) and 845 bp (Internal) and since inception tracking error is 798 bp (External) and 845 bp (Internal). Similarly, using the prior policy benchmark for Risk Parity, the Total Risk Group since inception annualized alpha is -116 bp and since inception tracking error is 677 bp.

Risk Group



Jase Auby, CFA
Chief Risk Officer, Senior Managing Director
*BS, Electrical Engineering,
Harvard College
Lehman Brothers, Goldman Sachs*



James Nield, CFA
**Deputy Chief Risk Officer,
Senior Director**
*MBA, Finance,
New York University
Ford Motor Co.*



Mark Telschow, CFA
Investment Manager
*BS, Civil Engineering,
UT Austin
Austin Capital Management*



Mike Simmons
Associate
*MPA, Accounting,
UT Austin*



Steven Lambert
Senior Analyst
*BS, Business Management,
Saint Joseph's College
State Street*



Stephen Kim
State Street Risk Consultant
*MBA, Finance,
UT Austin*



Paul Waclawsky
**Administrative
(Contractor)**
*BS, Accounting,
Univ. of Maryland*

Risk Mandate

Enable efficient risk taking		
Manage	Signals	<ul style="list-style-type: none">• Identify and monitor key statistical thresholds, which when crossed, will cause specific investigation and action• Bubble Signals and CUSUM Signals are important types of Risk Signals
	Budgeting	<ul style="list-style-type: none">• Manage how Trust allocations and correlations combine to either overweight or underweight the risk of the Trust• Focus upon Tracking Error and Value-at-Risk
	Strategies	<ul style="list-style-type: none">• Investment strategies to improve the return and risk profile of the Trust• Current strategies are Risk Parity, Reinsurance, and Low Volatility with Overlay• Additionally, three sub-strategies within TAA (Bubbles, Environmental, Valuation)
Monitor	Reporting	<ul style="list-style-type: none">• Prepare useful Risk Reports• Monitor Trust risks which include Market, Leverage, Liquidity, Concentration, Currency, Counterparty and other risks
	Certification	<ul style="list-style-type: none">• Certify all new External Public investments with respect to Market Factors, Leverage, Drawdown History, Liquidity, Risk Management Systems and Audit History• Review new strategies within External Private investments
	Compliance	<ul style="list-style-type: none">• Monitor and resolve Compliance Issues raised by the Investment Compliance group

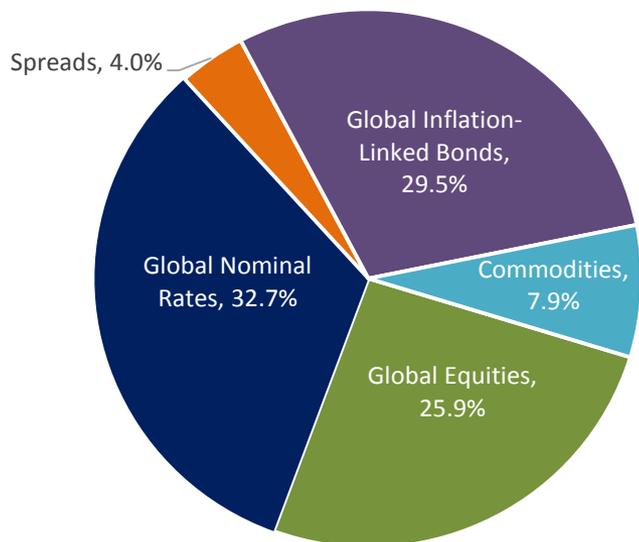
Risk Parity

As of September 30, 2014

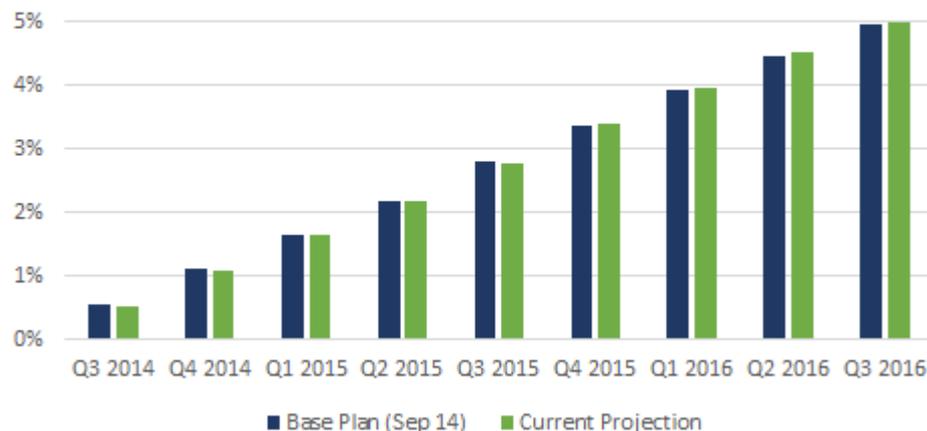
- Performance

Fund	\$, millions	1-Year Return
External	\$584	10.0%
Internal	119	11.6%
Total	\$703	10.4%

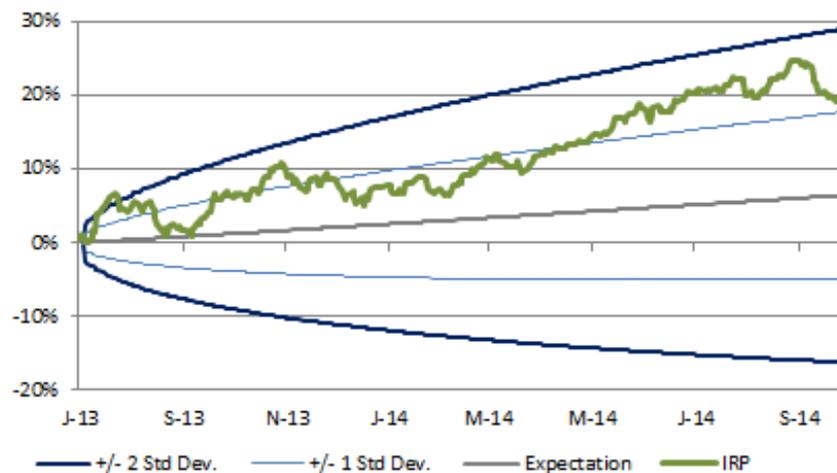
Internal RP Portfolio Weights



Risk Parity Funding Projections
(% of Trust)



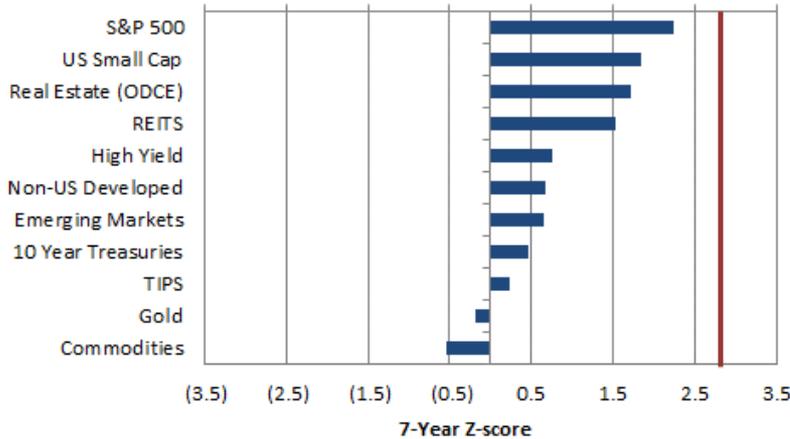
Internal RP Cumulative Performance



Key Risk Signals

Bubbles

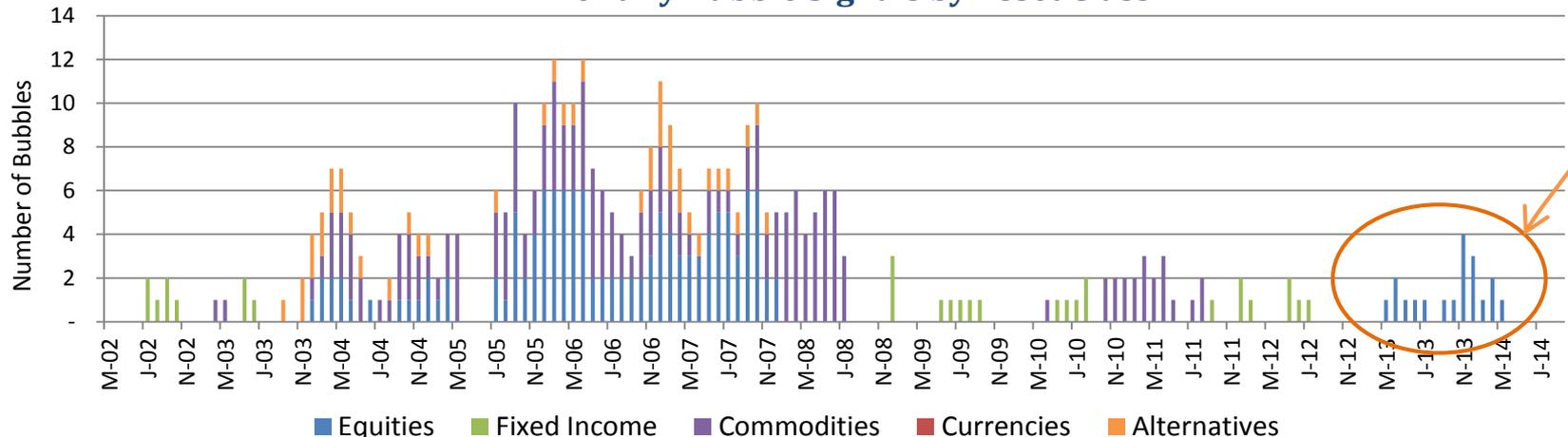
Bubble Level Monitor: September 2014



Most Recent Bubble Signals	Signal ¹
Healthcare Sector	Apr 14
Nasdaq	Mar 14
Nasdaq	Dec 13
Small Cap	Dec 13
Consumer Discretionary Sector	Nov 13
Healthcare Sector	Jul 13
Consumer Staples Sector	Apr 13

- Most recent bubble signals are in equity markets
- On average, those assets generating a signal have continued to modestly outperform the benchmark
- This environment differs from the mid-2000s when we saw more signals across more asset classes
- Current environment does not appear to be extreme

Monthly Bubble Signals by Asset Class



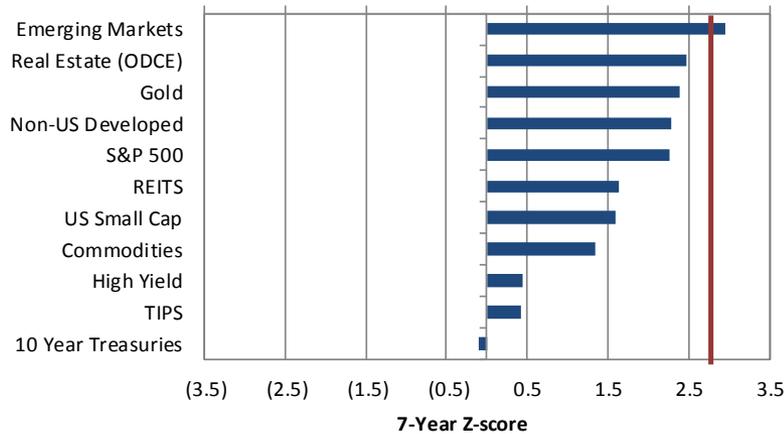
Bubble Monitor signal is based on 3 factors: 1) A rolling 7-year Z-score; 2) Change in correlation to a benchmark; 3) Absolute change in price within the past 7 years

¹Returns through September 30, 2014 versus MSCI ACWI, signal commences when asset exits bubble territory

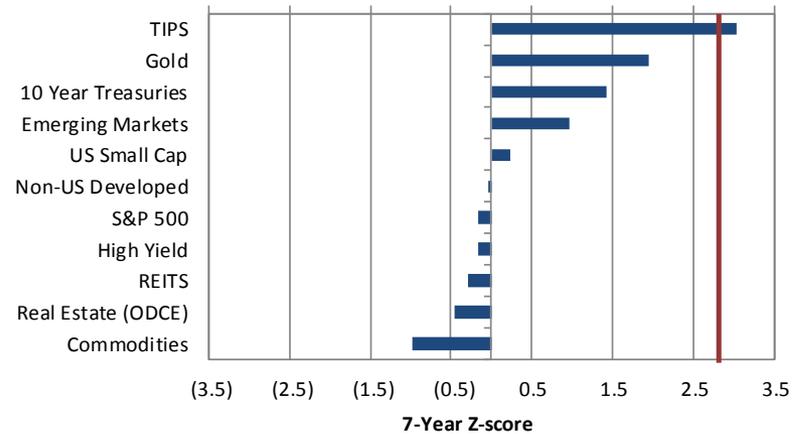
Key Risk Signals

Bubbles

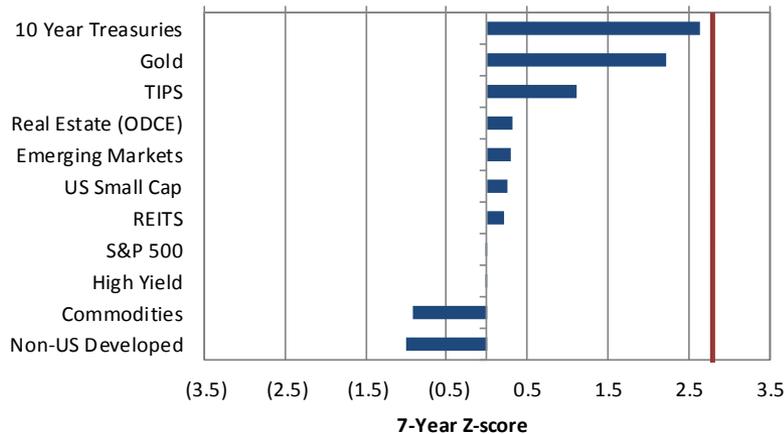
Bubble Level Monitor: September 2007



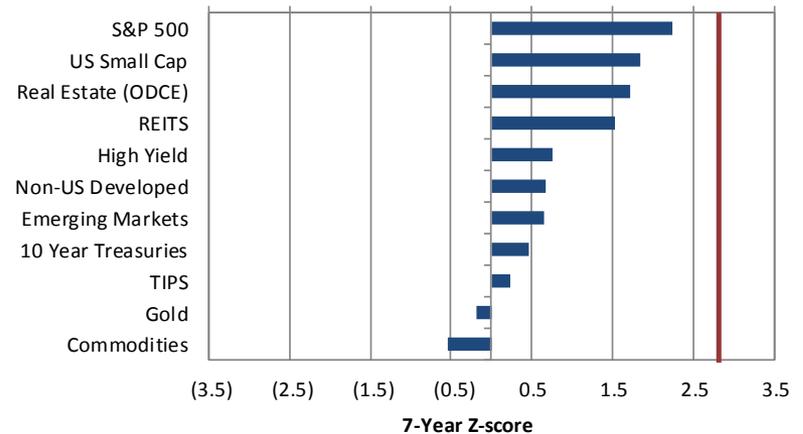
Bubble Level Monitor: September 2009



Bubble Level Monitor: September 2011



Bubble Level Monitor: September 2014

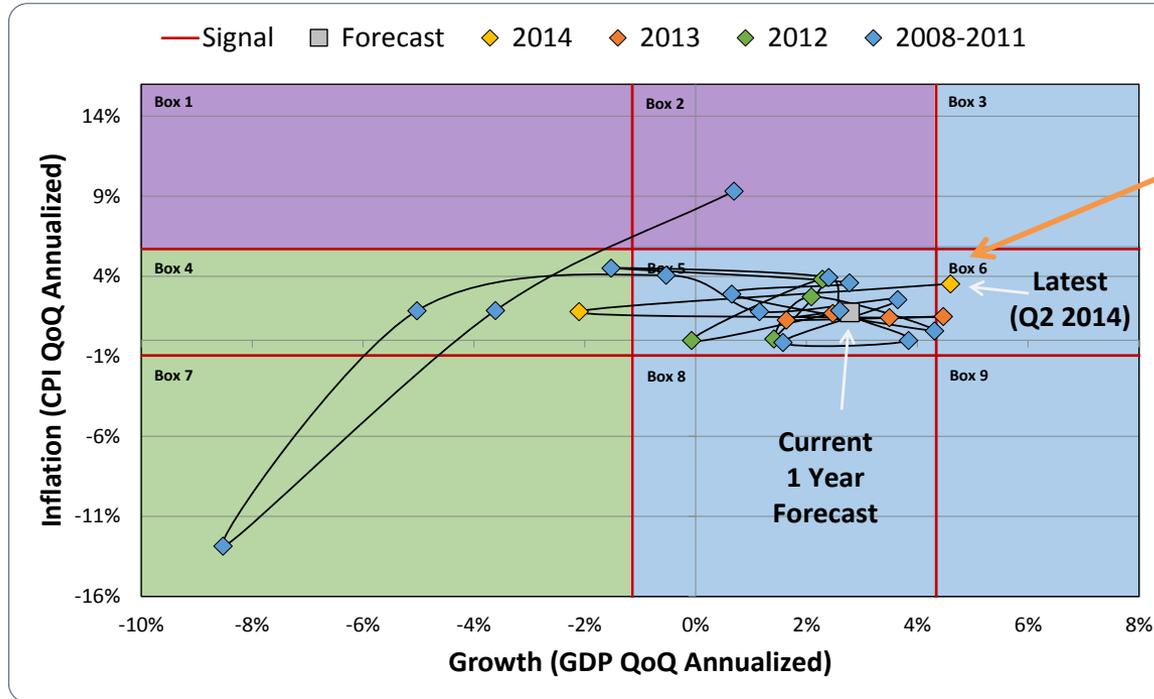


Key Risk Signals

Environmental

Real Return	Global Equity
Stable Value	Equity

US Macro Environment



- US is currently in Box 6 and is projected to move back to Box 5

Global Macro Environment

Region	Q3 2013	Q4 2013	Q1 2014	Q2 2014
US	Box 6	Box 5	Box 4	Box 6
Europe	Box 5	Box 8	Box 8	Box 8
Japan	Box 2	Box 2	Box 2	Box 2
EM ex-China	Box 5	Box 5	Box 5	Box 5
China	Box 4	Box 4	Box 4	Box 4

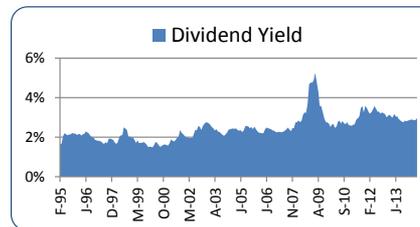
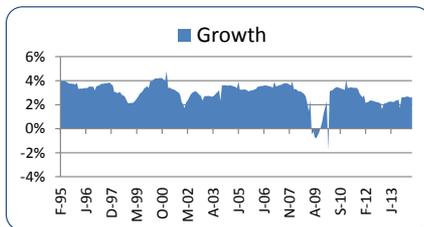
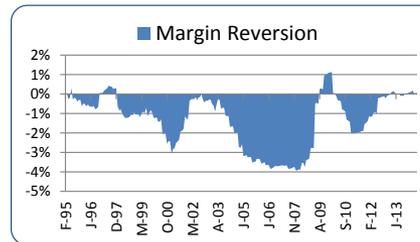
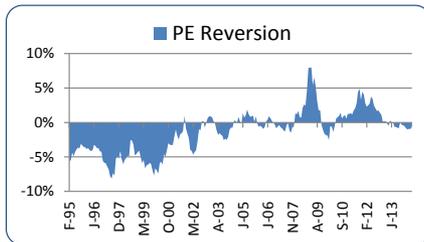
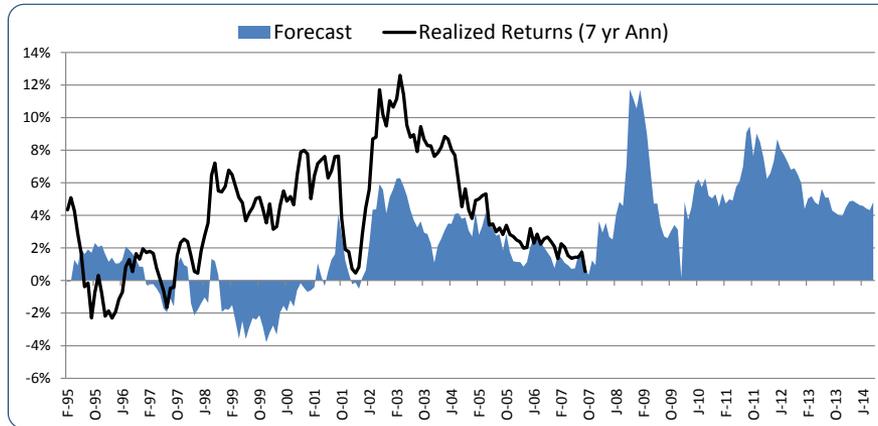
- With the exception of Japan and China, the world has been predominantly in a Global Equity regime throughout the year

Key Risk Signals

Valuation Signals

- Long-term asset class valuation models are used to monitor divergence between asset classes

Valuation Forecast - Global Equity, Simple Average over All Countries



Methodology

Valuation Signals use valuation models to forecast long-term asset class returns.

- Universe: 15 developed equity markets, 6 emerging markets countries, 6 sovereign rates
- Each month, overweight / underweight positions are taken based on asset class relative value and held for 12 months

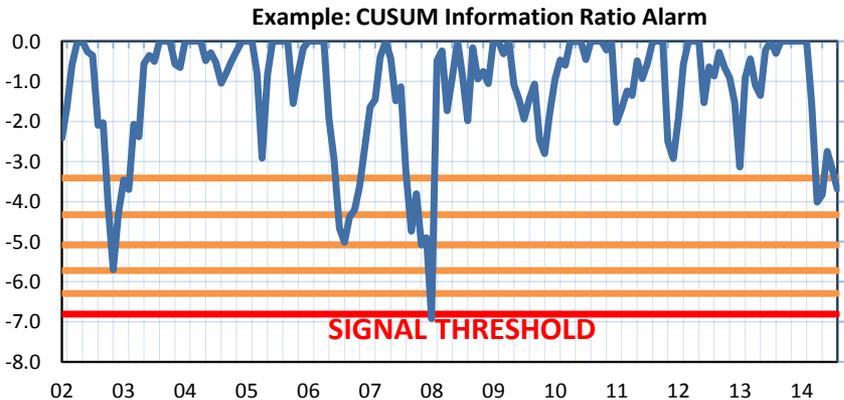
5 Highest Value Forecasts	7y Forecast (Real)	1y Change in Forecast
Taiwan (Equity)	15.8%	+1.5%
China (Equity)	13.5%	+0.2%
Italy (Equity)	11.8%	+8.8%
Hong Kong (Equity)	11.5%	+1.6%
Spain (Equity)	8.1%	+1.2%

5 Lowest Value Forecasts	7y Forecast (Real)	1y Change in Forecast
Japan (Bonds)	-1.8%	-0.8%
Netherlands (Equity)	-1.2%	-0.8%
Germany (Bonds)	-1.1%	-0.5%
South Africa (Equity)	-0.8%	-0.5%
UK (Bonds)	-0.6%	-0.3%

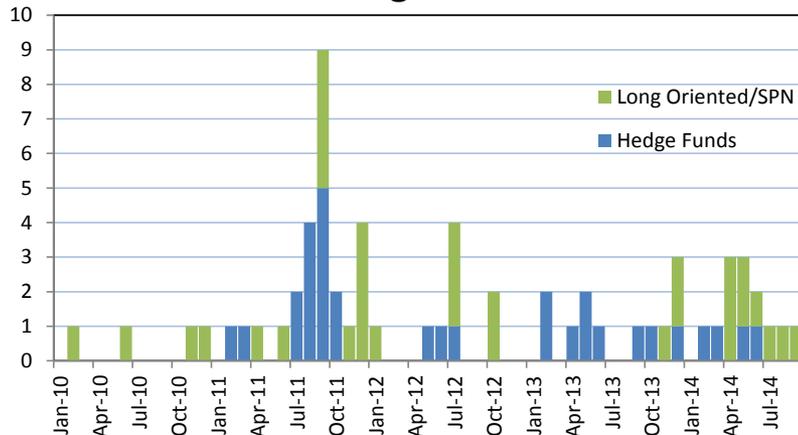
Key Risk Signals

CUSUM: TRS Public Portfolios

- **CUSUM Signal:** a tool designed to identify patterns of persistent underperformance within portfolios; signal initiates a buy/sell decision
- CUSUM Signals program launched in January 2010



CUSUM Signals to Date



- 64 Portfolio CUSUM Signals to date:
 - 45 buys, 16 sells, 3 pending
- **Results are encouraging:**
 - Managers that received a “Buy” rating outperformed the benchmark by **+1.3%** on average over the next 12 months
 - Managers that received a “Sell” rating underperformed the benchmark by **-0.4%** on average over the next 12 months

2014 Priorities

	Priority	Description
SAA	1 Strategic Asset Allocation	Assist in the 2014 strategic asset allocation process
Strategies	2 Integrate Risk Signals	Integrate risk signals (bubbles, valuation, environmental) into the TAA process
Budget	3 Risk Factors	Develop a risk factor attribution process for the total Trust
	4 Liquidity	Quantify the value of Trust liquidity
Monitoring	5 Hedge Fund Risk Proxying	Research potential improvements to hedge fund risk proxy process

Items **highlighted in blue** were presented to the Board during 2014 as part of the SAA process
 Items **highlighted in green** will be discussed further in this presentation on the following slides

2014 Priorities

Integrate Risk Signals

- The Risk Group contributes three risk signals to TAA which accounts for 15% of the TAA tracking error budget
- Each risk signal uses futures to produce a market neutral signal with an equal amount of asset overweights and underweights

As of 9/30/14	Environmental	Valuation	Bubbles
Risk (% of TAA)	5%	5%	5%
Return to Total Trust since launch (1/1/14)	-1.3 bp	-0.3 bp	0.0 bp
Input data	Current GDP / CPI Box for 19 countries and historic performance for 21 equity markets	Historic valuation data for 21 equity markets (growth, yield, P/E, profit margins) and 6 sovereign rate forward yields	Historic performance for 22 equity markets, 8 bond markets and 4 commodity markets
Forecast process	Forecast one month performance (return, consistency, relevance) during each country's current box	Forecast 7 year performance based on mean reversion	Identify pairs of assets with high difference in historic performance (three standard deviation difference)
Overweight / underweight process	Rank order of forecasts, positions held for one month	Rank order of forecasts, positions held for twelve months	Positions initiated as pairs are identified – no pairs have been identified to date

2014 Priorities

Hedge Fund Risk Proxying

- The Risk Group maintains a model for the risk of the Trust's hedge fund investments
 - We use Risk Factors to estimate the risk exposure, utilizing current and historic manager exposures to inform our risk "proxy"



Manager 1
Hedge Fund Proxy Report

DHF Equity Long/Short

As of September 30, 2014



Average R-Sq: 0.87
Average Alpha: 74 bps

Top 5 Exposures:

<u>Long</u>	<u>Short</u>
US2Yr	Aus10Yr
USLargeVal	Japan10Yr
IndiaEq	IndianRupee
FranceEq	JapaneseYen
UKEq	KoreanWon

- This project reviewed our current model and compared it to current industry best practice
 - **Conclusion: Our hedge fund risk model is state of the art and accurately captures the risk of the Trust's hedge fund investments**



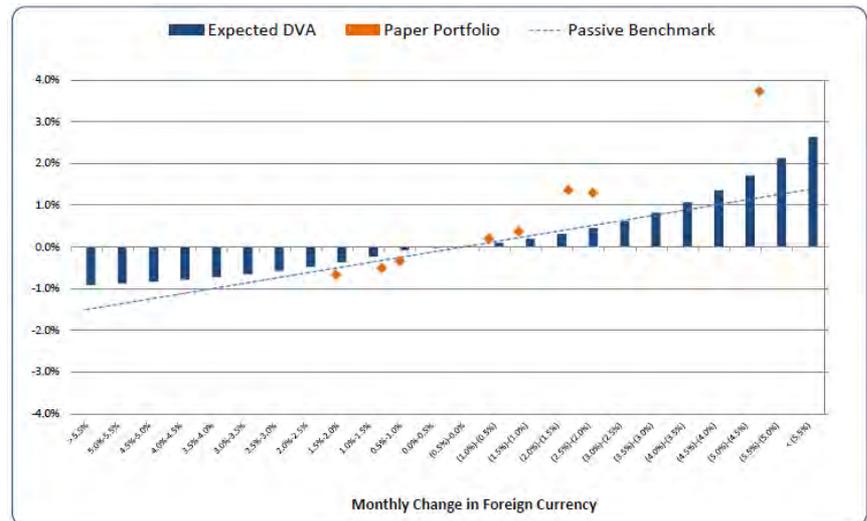
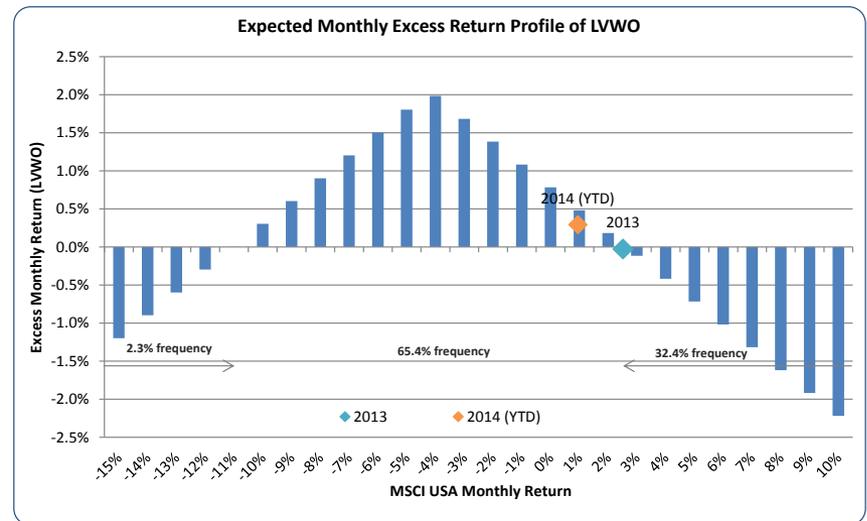
Risk Strategies

Low Volatility with Overlay

- Portfolio launched January 2013
- \$100 million funding
- Return of 24.4% (Annualized)
- Alpha of **+1.5%** (Annualized)
- Performance vs. peers of +5.5% (Ann)

Currency Hedging

- Paper Portfolio launched February 2014
- Return of 4.5%
- Alpha of **+2.3%** versus passive benchmark
- Dollar strength has led to strong returns
- Up to 4% of currency exposure is hedged
- Hedges dynamically turned on and off



2015 Priorities (Preliminary)

	Priority (Preliminary)	Description
Strategies	1 Risk Parity	Increase allocations to External Managers and to Internal Portfolios
	2 Low Volatility with Overlay	Increase allocation, research expansion to Non-US Developed and Emerging Markets
Budgeting	3 ENR Risk Model	Review best practice and update Energy and Natural Resources Risk Model
Monitor / Manage	4 Stress Testing	Review best practice for stress testing trust exposures
	5 Risk Signals	Expand risk signals to incorporate additional performance data, trust holdings data, macro indicators and risk indicators