

# HOW...

---

## **ASRS Employees Deliver Service With PRIDE!**

---

### **PROFESSIONALISM**

*We promote, strive for and expect individuals, teams, and divisions to possess professional qualities and skills to lead the organization.*

- Displays a friendly, respectful and courteous demeanor even when confronted by adversity
- Has proactive and responsive approach to internal and external customer needs
- Possesses good communication and active listening skills
- Is a trusted contributor (manager, leader, SME, analyst, teammate)
- Takes personal accountability • Has subject matter expertise
- Has critical thinking skills • Has an honest, fair, non-judgmental mind-set
- Is adaptable to beneficial change • Adheres to the ASRS Code of Conduct

### **RESULTS**

*We treasure the achievements of individuals, teams, divisions and the agency that energize the organization.*

- Meets goals and objectives
- Completes projects
- Produces quality work products
- Satisfies customers
- Attains individual accomplishments
- Manages risks successfully

### **IMPROVEMENT**

*We appreciate individuals, teams or divisions who drive the agency forward with new, innovative ideas and solutions.*

- Promotes new ideas
- Enhances outcomes and performance
- Solves problems
- Enhances morale
- Improves relationships
- Increases efficiency, effectiveness or reduces costs

### **DIVERSITY**

*We recognize that utilizing different talents, strengths and points of view, strengthens the agency and helps propel outcomes greater than the sum of individual contributors.*

- Encourages an attitude of openness and a free flow of ideas and opinions
- Treats others with dignity and respect
- Works effectively to accomplish goals with teams comprised of dissimilar individuals
- Recognizes and promotes skills in others attained on and off the job

### **EXCELLENCE**

*We celebrate individuals, teams and divisions who exceed expectations and deliver service with a PRIDE that permeates the organization.*

- Surpasses member, stakeholder and associate expectations
- Demonstrates a willingness to go the extra mile to engender a positive public image
- Embraces change in a manner that inspires others
- Accepts responsibility and challenges with enthusiasm
- Takes a personal interest in promoting teamwork through effective use of communication (verbal, non-verbal, written and technological techniques)
- Creates a motivated, healthy and productive work environment that celebrates and rewards the accomplishments of others



**ARIZONA STATE  
RETIREMENT SYSTEM**



# ARIZONA STATE RETIREMENT SYSTEM

3300 NORTH CENTRAL AVENUE • PO BOX 33910 • PHOENIX, AZ 85067-3910 • PHONE (602) 240-2000  
4400 EAST BROADWAY BOULEVARD • SUITE 200 • TUCSON, AZ 85711-3554 • PHONE (520) 239-3100  
TOLL FREE OUTSIDE METRO PHOENIX AND TUCSON 1 (800) 621-3778

*Paul Matson*  
Director

## AGENDA NOTICE OF A COMBINED PUBLIC MEETING AND POSSIBLE EXECUTIVE SESSION OF THE ARIZONA STATE RETIREMENT SYSTEM INVESTMENT COMMITTEE

3300 North Central Avenue  
14th Floor Conference Room  
Phoenix, Arizona 85012

November 28, 2016  
2:30 p.m.

Pursuant to A.R.S. § 38-431.02, notice is hereby given to Trustees of the Arizona State Retirement System (ASRS) Investment Committee (IC) and to the general public that the IC will hold a public meeting on Monday, November 28, 2016, beginning at 2:30 p.m. in the 14<sup>th</sup> Floor Conference Room of the ASRS office, 3300 North Central Avenue, Phoenix, Arizona 85012. Trustees of the Committee may attend either in person or by telephone conference call.

This is a regularly scheduled meeting of the IC; however, due to possible attendance by other ASRS Board Trustees, this meeting may technically become a meeting of the Board or one of its Committees. Actions taken will be consistent with IC governance procedures. Actions requiring Board authority will be presented to the full Board for final decision.

The Chair may take public comment during any agenda item. If any member of the public wishes to speak to a particular agenda item, they should complete a Request to Speak form indicating the item and provide it to the Committee Administrator.

Pursuant to A.R.S. § 38-431.03(A)(3), the IC may vote to go into executive session, which will not be open to the public, for the purpose of obtaining legal advice on any item on the Agenda.

This meeting will be teleconferenced to the ASRS Tucson at 4400 E. Broadway Blvd., Suite 200, Tucson, AZ 85711. The conference call to Tucson will be disconnected after 15 minutes if there are no attendees in the Tucson audience.

The Agenda for the meeting is as follows:

1. Call to Order; Roll Call; Opening Remarks (estimated time 4 min.).....Board Member
2. Approval of the Minutes of the October 24, 2016, Public Meeting of the ASRS IC Meeting (Action item; estimated time 1 min.).....Board Member

3. Presentation, Discussion, and Appropriate Action Regarding the ASRS House Views and General Discussion (Informational and discussion item; estimated time 20 min.) .....  
..... Mr. Karl Polen  
Chief Investment Officer, ASRS  
..... Ms. Kerry White  
Assistant Chief Investment Officer for Reporting, Compliance & Administration, ASRS  
..... Mr. Al Alaimo  
Sr. Portfolio Manager of Fixed Income, Cash, and Liquid Alternatives, ASRS  
..... Mr. Eric Glass  
Sr. Portfolio Manager of Private Markets, ASRS  
..... Mr. Cole Smith  
Portfolio Manager of Equities, ASRS  
..... Mr. John Kwon  
Portfolio Manager of Equities, ASRS  
..... Mr. Micheal Copeland  
Assistant Portfolio Manager of Real Estate, ASRS  
..... Ms. Lupita Breland  
Sr. Portfolio Analyst, ASRS  
..... Mr. John Doran  
Assistant Portfolio Manager of Cash and Liquid Alternatives, ASRS

Objective:

The IC and the ASRS team will discuss House Views and other matters of interest. *No action is expected on this item, but the IC may express views or offer guidance on the matters discussed.*

*Pursuant to A.R.S. §§ 38-431.03(A)(2) and 38-718(P), the IC may vote to discuss the following matter in executive session, which will not be open to the public, to consider specific investment manager data that is confidential proprietary commercial information and a record exempt by law from public inspection.*

4. Presentation, Discussion, and Appropriate Action Regarding the Portfolio Position and Performance (Informational and discussion item; estimated time 15 min.) ..... Mr. Paul Matson  
Director, ASRS  
..... Mr. Karl Polen  
..... Mr. Al Alaimo  
..... Mr. Eric Glass  
..... Ms. Kerry White

Objective:

The Committee will discuss portfolio positioning, current tactical views and investment performance. *No action is expected on this item, but the IC may express views or offer guidance on the matters discussed.*

5. Presentation, Discussion, and Appropriate Action Regarding State Street's Risk Management Reporting (Informational and discussion item; estimated time 10 min.) ..... Mr. Steve Kim  
Assistant Vice President, Risk Services, State Street Analytics

Objective:

State Street will present a risk analysis report on the ASRS total fund investments. *No action is expected on this item, but the IC may express views or offer guidance on the matters discussed.*

6. Presentation, Discussion, and Appropriate Action Regarding the ASRS Investment Compliance and Monitoring of Public and Private Market Investments (Informational and discussion item; estimated time 10 min.) ..... Mr. Dan Gillespie  
Vice President and Unit Head, State Street

Objective:

State Street will present the results of their compliance monitoring for public markets portfolios.

*Pursuant to A.R.S. §§ 38-431.03(A)(2) and 38-718(P), the IC may vote to discuss the following matter in executive session, which will not be open to the public, to consider specific investment manager data that is confidential proprietary commercial information and a record exempt by law from public inspection.*

7. Presentation, Discussion, and Appropriate Action Regarding Independent Reporting, Monitoring and Oversight of the ASRS Investment Program – Includes Total Fund and Investment Performance Report Q3-16 (Informational and discussion item; estimated time 30 min.) ..... Mr. Allan Martin  
Partner, NEPC

Objective:

NEPC will report on their monitoring of IMD activities. *No action is expected on this item, but the IC may express views or offer guidance on the matters discussed.*

8. Presentation, Discussion, and Appropriate Action Regarding IMD Activities and Asset Class Committee Reports (Informational and discussion item; estimated time 10 min.) ..... Mr. Paul Matson  
Mr. Karl Polen

Objective:

The CIO will present recent activities and work plans for the IMD. The chairs of the asset class committees will report on any activity since the last IC meeting. *No action is expected on this item, but the IC may express views or offer guidance on the matters discussed.*

9. Presentation, Discussion, and Appropriate Action Regarding Interim Strategic Asset Allocation (SAA) Change (Action item; estimated time 30 min.) ..... Mr. Karl Polen  
Mr. Al Alaimo

Objective:

The IMD team is recommending an interim change to the SAA decreasing the allocation to High Yield Bonds to 2% from 4% and increasing the allocation to Private Debt to 12% from 10%. The proposed change establishes a range of 0% to 6% for High Yield and a range 8% to 16% for Private Debt. *The Committee will decide whether to recommend this change to the full board.*

10. Presentation, Discussion, and Appropriate Action Regarding Fixed Income Performance Analytics (Informational and discussion item; estimated time 20 min.) ..... Mr. Al Alaimo  
Mr. John Doran

Objective:

The fixed income team will present a performance analysis on the fixed income portfolio including returns based and holdings based analysis. *No action is expected on this item, but the IC may express views or offer guidance on the matters discussed.*

11. Presentation, Discussion, and Appropriate Action Regarding Inflation Linked Annual Asset Class Review (Informational and discussion item; estimated time 20 min.) ..... Mr. Eric Glass  
.....Mr. Micheal Copeland

Objective:

Mr. Glass and Mr. Copeland will provide an analysis of performance and an update on strategy for the inflation linked asset class. *No action is expected on this item, but the IC may express views or offer guidance on the matters discussed.*

12. Request for Future Agenda Items (Discussion item; estimated time 5 min.)..... Board Member  
.....Mr. Karl Polen

13. Call to the Public..... Board Member

Those wishing to address the IC are required to complete a Request to Speak form before the meeting indicating their desire to speak. Request to Speak forms are available at the sign-in desk and should be given to the IC Administrator. IC Trustees may not discuss items that are not specifically identified on the agenda. Therefore, pursuant to A.R.S. § 38-431.01(H), action taken as a result of public comment will be limited to directing staff to study the matter, responding to any criticism or scheduling the matter for further consideration and decision at a later date.

14. The next ASRS IC Meeting is tentatively scheduled for Friday, February 17, 2016 at 2:30 p.m., at 3300 N. Central Avenue, 14<sup>th</sup> Floor Conference room, Phoenix, Arizona.

15. Adjournment of the ASRS IC Meeting.

A copy of the agenda background material provided to IC Trustees (with the exception of material relating to possible executive sessions) is available for public inspection at the ASRS offices located at 3300 North Central Avenue, 14th Floor, Phoenix, Arizona, and 4400 E. East Broadway Boulevard, Suite 200, Tucson, Arizona 85711. The agenda is subject to revision up to 24 hours prior to meeting. These materials are also available on the ASRS website (<https://www.azasrs.gov/web/BoardCommittees.do>) approximately 48 hours prior to the meeting.

Persons with a disability may request a reasonable accommodation such as a sign language interpreter or alternate formats of this document by contacting Tracy Darmer, ADA Coordinator at (602) 240-5378 in Phoenix, at (520) 239-3100, ext. 5378 in Tucson or 1-800-621-3778, ext. 5378 outside metro Phoenix or Tucson. Requests should be made as early as possible to allow time to arrange the accommodations.

Dated November 17, 2016

ARIZONA STATE RETIREMENT SYSTEM

Signed Copy on File

Gloria Montiel  
Committee Administrator

Signed Copy on File

Karl Polen  
Chief Investment Officer

# Agenda Item #2



# ARIZONA STATE RETIREMENT SYSTEM

3300 NORTH CENTRAL AVENUE • PO BOX 33910 • PHOENIX, AZ 85067-3910 • PHONE (602) 240-2000  
4400 EAST BROADWAY BOULEVARD • SUITE 200 • TUCSON, AZ 85711-3554 • PHONE (520) 239-3100  
TOLL FREE OUTSIDE METRO PHOENIX AND TUCSON 1 (800) 621-3778

Paul Matson  
Director

## MINUTES OF THE PUBLIC MEETING OF THE ARIZONA STATE RETIREMENT SYSTEM INVESTMENT COMMITTEE

HELD ON  
Monday, October 24, 2016  
2:30 p.m.

The Arizona State Retirement System (ASRS) Investment Committee (IC) met at 3300 N. Central Avenue, 14<sup>th</sup> Floor, Phoenix, AZ 85012. The meeting was also teleconferenced to the ASRS office at 4400 E. Broadway Boulevard, Suite 200, Tucson, Arizona 85711.

Mr. Tom Connelly, IC Chair, called the meeting to order at 1:32 p.m.

### 1. Call to Order; Roll Call; Opening Remarks

Present: Mr. Tom Connelly, Chair  
Prof. Dennis Hoffman (called into the meeting at 1:35 p.m.)  
Mr. Lorenzo Romero

A quorum was present for the purpose of conducting business.

### 2. Approval of Minutes of the of the August 24, 2016, Public Meeting and Executive Sessions of the ASRS IC Meeting

**Motion:** Mr. Lorenzo Romero moved to approve the minutes of the August 22, 2016, public meeting and executive sessions of the IC meeting. Mr. Connelly seconded the motion.

By a vote of 2 in favor, 0 opposed, 0 abstention, and 1 excused, the motion was approved.

### 3. Presentation, Discussion, and Appropriate Action Regarding the ASRS House Views and General Discussion

Mr. Karl Polen, Chief Investment Officer, provided a brief overview of the portfolio position of the Total Fund. He provided his perspective on the market, the global economy and the macro environment and turned the meeting over to the Investment Management Division (IMD) Portfolio Managers.

Mr. Eric Glass, Senior Portfolio Manager of Equities and Real Estate, presented on Equities and Commodities, Mr. Al Alaimo, Sr. Portfolio Manager of Fixed Income, presented on the Fixed Income and Micheal Copeland, Assistance Portfolio Manager of Real Estate, presented on Real Estate.

### 4. Presentation, Discussion, and Appropriate Action Regarding the Portfolio Position and Performance

Mr. Polen briefly introduced the topic of discussion to the Committee noting the report for the agenda item details high-level summaries of different asset classes. He briefly reviewed the materials and noted the charts provided give a detailed analysis of each investment manager in the ASRS investment program and are there to assist the Committee in understanding the ongoing activities with investments, as well as an understanding of the IMD's perspective on their decision-making.

#### **5. Presentation, Discussion, and Appropriate Action Regarding State Street's Risk Management Reporting**

Mr. Steve Kim, State Street Investment Analytics, presented the State Street Risk Report. He discussed the monthly reallocation summary, month-end risk profile and total plan overview exposure. He noted historical risk for all asset classes remains constant for prior months. In aggregate, Total Plan risk increased 3 basis points as the asset allocation remained largely the same over the prior month.

#### **6. Presentation, Discussion, and Appropriate Action Regarding the ASRS Investment Compliance and Monitoring of Public and Private Market Investments**

Mr. Dan Gillespie, Vice President and Unit Head of State Street, presented the Committee with a brief description of the compliance services provided for the ASRS investment portfolios. State Street works closely with the Plan to interpret investment guidelines and ensure investments comply with the Plan provisions. Mr. Gillespie provided the Committee with a breakdown of the alerts brought to the attention of the IMD since the last IC meeting and further advised the Committee all investment limits have passed with respect to plan provisions and statutory requirements.

Mr. Jomar Ereso, RCLCO Director of Asset Management, presented the results of the 2015, Real Estate Separate Account Investment Compliance Review. Mr. Ereso explained the procedures of their compliance review process and advised the Committee that RCLCO has completed compliance reviews on eight separately managed accounts (SMA) that had at least one quarter of operations as of December 31, 2015. Each review of the accounts were summarized in their report to the Committee and all accounts passed in compliance with respect to the review of their audited financial statement, net asset value (NAV) calculation, management fee calculation, valuation policy and expense policy after addressing the issues and errors found in their review. As of the date of the report, compliance reviews covering three SMA ventures are still in process due to on-going discussions covering variances and observations in relation to the ASRS' NAV and/or the Asset Management Fee calculations or delays in the completion of the required year-end financials due to pending audit. He provided further commentary regarding their observations of the asset management fee calculations and net asset value calculations.

#### **7. Presentation, Discussion, and Appropriate Action Regarding Independent Reporting, Monitoring and Oversight of the ASRS Investment Program**

Mr. Allan Martin, NEPC Partner, provided the Committee with an overview of the oversight and compliance of the Fund. He noted since Mr. Polen had already covered the Fund Positioning as of October 8, 2016, his report would cover the oversight and compliance of the Fund as of September 30, 2016. Mr. Martin advised the Committee all fund positions are close to the ASRS' strategic targets, with all asset classes operating within the Board approved policy ranges. He concluded the meeting in stating the ASRS has performed at a higher level than expected given the low-return environment in the last quarter.

#### **8. Presentation, Discussion, and Appropriate Action Regarding IMD Activities and Asset Class Committee Reports**

Mr. Polen provided the Committee with the ongoing activities of the IMD. He referenced the summarized report of all Asset Class Committee meetings since the beginning of the calendar year and briefly reviewed the ongoing Working Group projects within the IMD.

**9. Presentation, Discussion, and Appropriate Action Regarding Workgroup Reports for the Internal Equity Portfolios**

Mr. Glass presented the Committee with a detailed review of the Internal Equity portfolios. The ASRS internally manages \$6.8 billion of enhanced passive strategies across large, mid and small-cap U.S. Equity, including two factor portfolios. Mr. Glass provided the Committee with the history of their performance, issues identified, enhancements made, as well as future projects.

**10. Presentation, Discussion, and Appropriate Action Regarding the Supplemental Salary Deferral Plan (SSDP) and the Supplemental Retirement Savings Plan (SRSP)**

Mr. Patrick M. Klein, Assistant Director, External Affairs Division, presented the Committee with a detailed summary of the SRSP and the SSDP and explained the structure of each plan. He detailed the dissimilarities between each plan and explained the evolution of their existence. Both the SSDP and SRSP plans are offered in addition to the ASRS Defined Benefit Plan 401(a) on a voluntary basis, and are currently administered by Nationwide.

**11. Request for Future Agenda Items**

There were no requests for future agenda items.

**12. Call to the Public**

No members of the public requested to speak.

**13. Adjournment**

The meeting adjourned at 3:43 p.m.

Respectfully submitted,

ARIZONA STATE RETIREMENT SYSTEM

\_\_\_\_\_  
Gloria Montiel Date  
Investment Committee Administrator

\_\_\_\_\_  
Karl Polen Date  
Chief Investment Officer

# Agenda Item #3

# House Views and Portfolio Positioning

Arizona State Retirement System

November 15, 2016

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

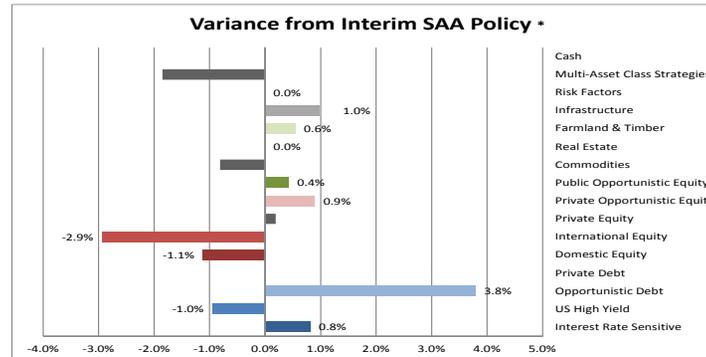
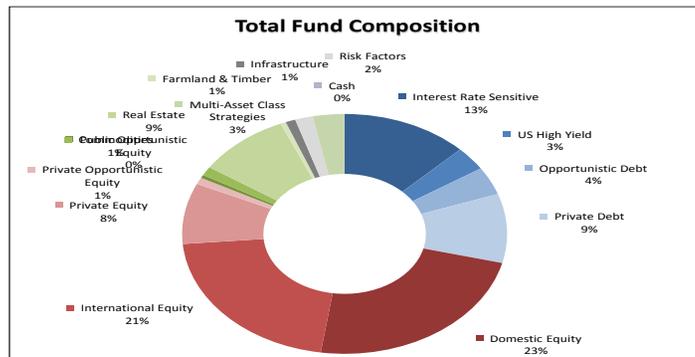
## Summary View

- Global economy continues to grow slowly with few warning signs of recession
- Notwithstanding the recent surge in U.S. equities, we remain cautious
  - Valuations are stretched in U.S.
  - International equities have currency headwind and negative momentum
  - We are positioned roughly neutral to U.S. equities (a little under in public equities but offset by opportunistic positions)
  - We are underweight international equities 2.5%
- Following the U.S. election, the market is expecting more assertive central bank policy on short term rates resulting in a sell-off in bonds
  - Prior to the election we made portfolio changes reducing duration and subsequently liquidated \$200 million in core bond exposure
  - With higher risk of inflation we used cash from bond sales to reduce our underweight to commodities

# Portfolio Position

*We are positioned slightly defensively with recent rebalance activity taking us "closer to home".*

## Total Fund Positioning November 14, 2016



All Private Markets asset classes' market values are reported on a quarter-lag basis and adjusted to include the current quarter's cash flow.

# Outline

- 1 Summary View and Positioning
- 2 **Macro Environment**
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

## Commentary

- Growth is slow globally
  - Employment improving and becoming tight in some markets
  - China growth is slowing
  - US growth may improve if government pursues stimulative policies
- Inflation generally low
  - Wage inflation appearing in US causing uptick in US inflation
  - But moderated by low commodity costs
  - Possible increase in inflation if government pursues stimulative policies

# Macro Indicators

*Slow growth, strong employment, inflation generally low but increasing in US*

11/15/2016

<b>Economy</b>		Moving Average		
			2 Yr.	1 Yr.
EHUPUS Index	US Unemp	4.9	5.3	5.0
EHUPEUN Index	EUR Unemp	9.2	9.5	9.1
EHUPGB Index	UK Unemp	4.9	5.7	5.3
EHUPJP Index	Japan Unemp	3.0	3.4	3.3
GDP CYOY Index	US GDP	1.5	2.3	1.7
EHGDEUR Index	EUR GDP	1.7	1.6	1.9
EHGDGB Index	UK GDP	2.3	2.4	2.0
EHGDJP Index	Japan GDP	2.2	0.7	0.6
EHGDCN Index	China GDP	6.7	7.0	6.9
CPI YOY Index	US CPI	1.5	0.8	0.4
CPI XYOY Index	US CPI X fd nrg	2.2	1.9	2.0
CPEXEUY Index	EU CPI X fd nrg	0.8	0.9	0.9
JCPNEFEY Index	Jpn CPI X fd nrg	0.0	1.5	0.8
CNCPIYOY Index	China CPI	2.1	1.7	1.7

# Global Interest Rates

*Rates generally moving up, but still low*

November 16, 2016

		Price	100 day moving average	50 day moving average	30 day relative strength	Hurst Exponent
<b>Global Interest Rates</b>						
USGG3M Index	US 3 Month	0.46	0.31	0.33	62	39
USGG10YR Index	US 10 Year	2.23	1.65	1.77	71	91
GETB1 Index	German 3 Month	-0.76	-0.79	-0.82	57	51
GDBR10 Index	German 10 Year	0.30	-0.01	0.06	64	70
GUKG3M Index	UK 3 Month	0.30	0.36	0.31	47	47
GUKG10 Index	UK 10 Year	1.38	0.86	1.01	65	78
GJTB3MO Index	Japan 3 Month	-0.28	-0.29	-0.31	54	89
JGBS10 Index	Japan 10 Year	0.01	-0.11	-0.05	61	35

# Currency

*Strong dollar against all major currencies*

November 15, 2016

Currency		Price	200 day moving average	100 day moving average	50 day moving average	30 day relative strength	Hurst Exponent	6 month return	6 month volatility annualized	Momentum Index
EURUSD Curncy	Euro/USD	1.07	1.12	1.11	1.11	36	122	-4.61	8.05	-0.57
GBPUSD Curncy	GBP/USD	1.24	1.36	1.29	1.26	44	30	-14.27	15.74	-0.91
JPYUSD Curncy	Yen/USD	0.0092	0.0094	0.0097	0.0097	36	109	0.73	13.06	0.06
CNY BGN Curncy	CNY/USD	0.1458	0.1513	0.1495	0.1487	74	103	-4.67	3.12	-1.50

# Consensus Economic Forecasts

## Economic Forecasts

**Contributor**

Composite

See Previous forecasts

**Period**

Yearly

See Last Actuals

	Real GDP (yoy %)			CPI (yoy %)			Unemployment (%)			Curr Acct (% of GDP)			Budget (% of GDP)		
	16	17	18	16	17	18	16	17	18	16	17	18	16	17	18
LatAm	-1.75	1.75	2.69	38.64	29.65	10.99	9.72	10		-2.59	-2.03	-1.99	-7.2	-6.58	
E. Europe & Africa	1.4	2.38	2.77	5.81	5.37	5.48	9.14	8.94	8.87	-0.37	-0.28	-0.86	-3.09	-2.77	-2.5
Middle East	2.15	2.48	2.74	3.86	3.92	4.42				-3.97	-1.29	0.36	-8.35	-5.23	-4.6
Asia	5.66	5.83	5.68	1.91	2.48	2.68	4.03	4.02	4.02	3.46	2.75	2.65	-2.56	-2.94	-3
China	6.67	6.4	6	2	2	2.2	4.1	4.1	4.1	2.45	2.5	2.5	-3.05	-3.5	-3.5
G-10	1.5	1.66	1.74	0.73	1.71	1.84	6.26	6.08	5.92	-0.11	-0.15	-0.43	-2.84	-2.68	-2.55
USA	1.5	2.1	2.1	1.2	2.2	2.2	4.9	4.7	4.6	-2.6	-2.7	-2.8	-3.1	-3	-2.95
Japan	0.6	0.8	0.7	-0.2	0.5	1	3.1	3	3	3.7	3.35	2.9	-5.8	-5.3	-5
Euro	1.6	1.3	1.5	0.2	1.3	1.5	10.1	9.8	9.4	3.15	2.8	2.55	-1.9	-1.75	-1.65
United Kingdom	1.9	0.9	1.45	0.7	2.4	2.35	5	5.4	5.5	-5.5	-4	-3.45	-3.7	-3.5	-3.3
Canada	1.2	1.8	1.9	1.6	2	1.95	7	6.95	6.8	-3.4	-2.5	-2.5	-1.3	-1.4	-1.05
Australia	2.9	2.8	2.9	1.3	2	2.3	5.7	5.6	5.5	-3.7	-3.5	-3.85	-2.45	-2	-1.4
Sweden	3.1	2.35	2.2	0.9	1.5	1.8	6.9	6.7	6.3	5	5	4.85	-0.4	-0.5	0.4
New Zealand	3.1	2.7	2.55	0.6	1.7	1.9	5.1	5.1	4.9	-3	-3.5	-3.2	0.35	0.3	
Switzerland	1.5	1.5	1.6	-0.4	0.3	0.7	3.4	3.4	3.4	9.5	9.5	9	-0.1	-0.1	0.2
Denmark	1	1.4	1.5	0.4	1.3		4.3	4.3		6.4	6.35		-1.9	-1.95	
Norway	0.95	1.55	1.9	3.1	2.2	1.8	4.8	4.8	5	6.5	6.5	8	5.5	5.7	6
Germany	1.8	1.4	1.5	0.4	1.5	1.6	6.1	6.2	6.3	8.7	8.2	7.4	0.4	0.2	0.2
France	1.3	1.1	1.3	0.3	1.2	1.35	10	9.8	9.6	-0.8	-0.9	-1.2	-3.4	-3.2	-3
Italy	0.8	0.8	0.95	0	0.9	1.3	11.6	11.3	10.9	2.7	2.3	2.15	-2.5	-2.4	-2.25
Europe	1.69	1.36	1.54	0.4	1.45	1.59	8.5	8.38	8.27	2.76	2.86	2.21	-1.92	-1.75	-1.55

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 **Equities**
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 **Equities**
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

## Commentary

- We are 3.4% of total fund underweight public equities (net of public opportunistic equities - MLPs) with 2/3 of the underweight in international equities
  - Reflects recent rebalance of 50 bps from US small cap to emerging markets
- On a valuation basis, US looks expensive vs ROW
- However. . .
  - Economic fundamentals of Europe are weak and Japan continues to try to stimulate
  - Likelihood of continued strengthening of the dollar is negative for international equities
  - EM has shown signs of improvement
- Fund flows have favored US vs ROW
- Comparatively strong economic fundamentals justify, to some extent, the differential valuation between US and international equities

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 **Equities**
  - Commentary
  - **Trends**
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

# Equity Price Trends

*US has momentum, rest of world (in dollar terms) on downward trend*

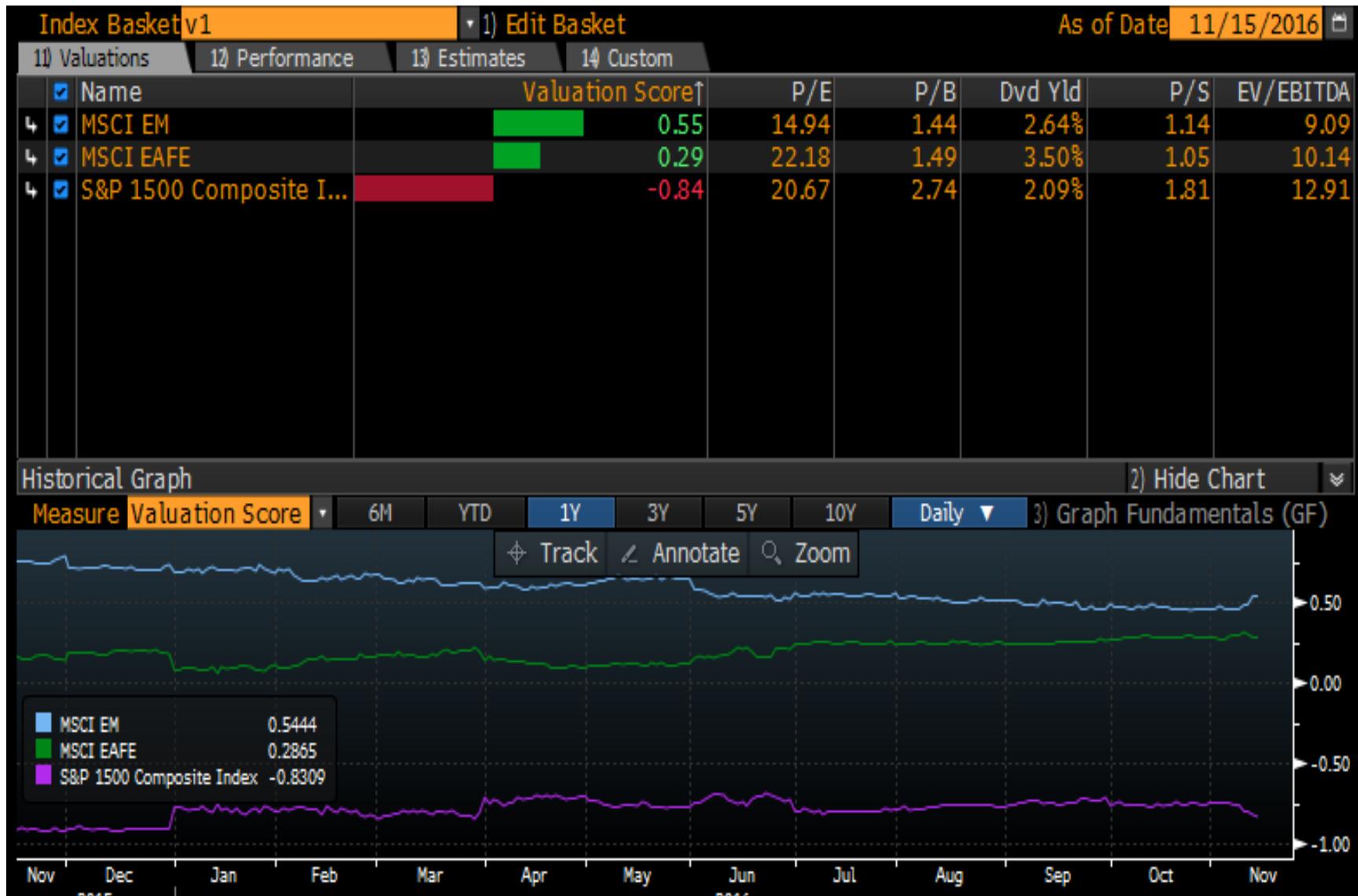
November 15, 2016

		Price	200 day moving average	100 day moving average	50 day moving average	30 day relative strength	Hurst Exponent	6 month return	6 month volatility annualized	Momentum Index
<b>Stocks</b>										
SPX Index	S&P 500	2171	2091	2149	2146	54	93	5.88	11.40	0.52
MID Index	S&P Mid	1590	1479	1536	1531	60	96	10.16	14.62	0.70
SML Index	S&P Small	793	707	739	743	64	113	17.07	17.19	0.99
MXEA Index	EAFE	1627	1651	1672	1680	41	26	-0.44	17.25	-0.03
MSDLEAFE Index	EAFE Local	973	949	965	975	51	111	4.17	14.44	0.29
MXEASC Index	EAFE Small	200	203	206	209	38	51	-1.91	16.45	-0.12
NCLDEAFE Index	EAFE Small Local	299	291	297	302	49	55	3.15	13.61	0.23
MXEF Index	EM	839	846	889	902	37	69	5.99	15.90	0.38
NDLEEGF Index	EM Local	439	432	452	459	39	34	7.34	11.17	0.66

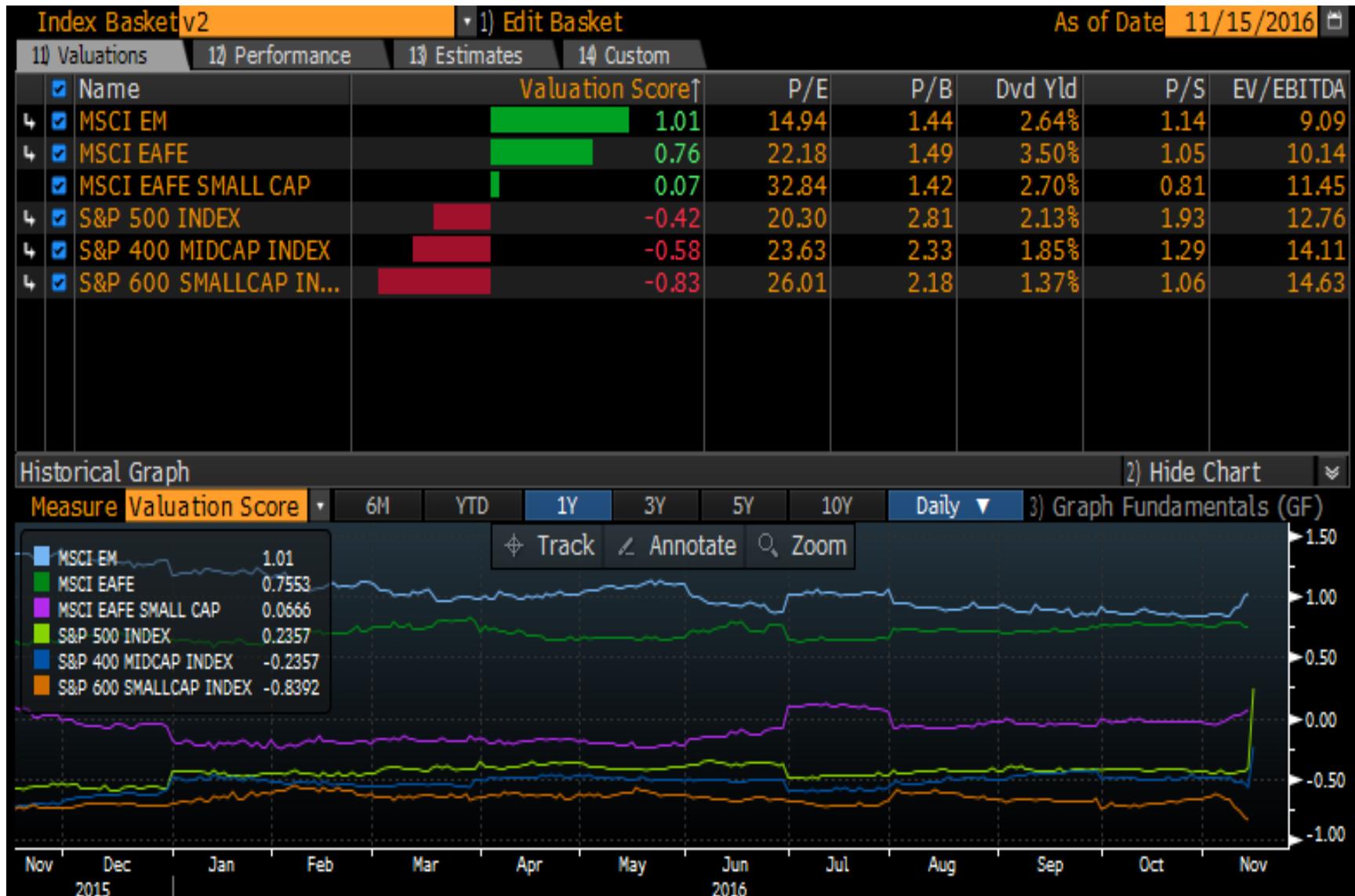
# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 **Equities**
  - Commentary
  - Trends
  - **Valuation**
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

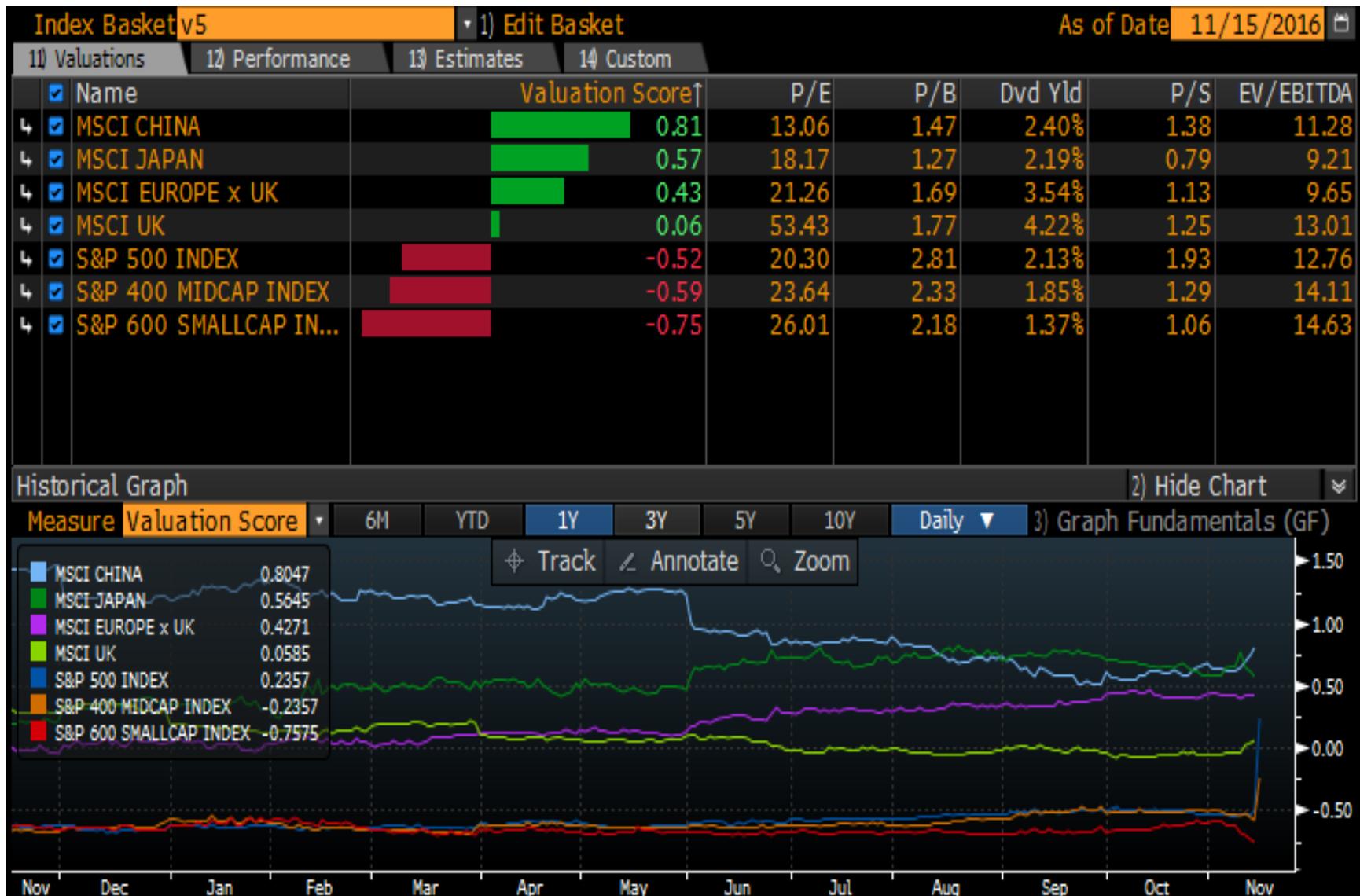
# Relative Valuation of Global Indices



# Relative Valuation of Global Indices (Continued)

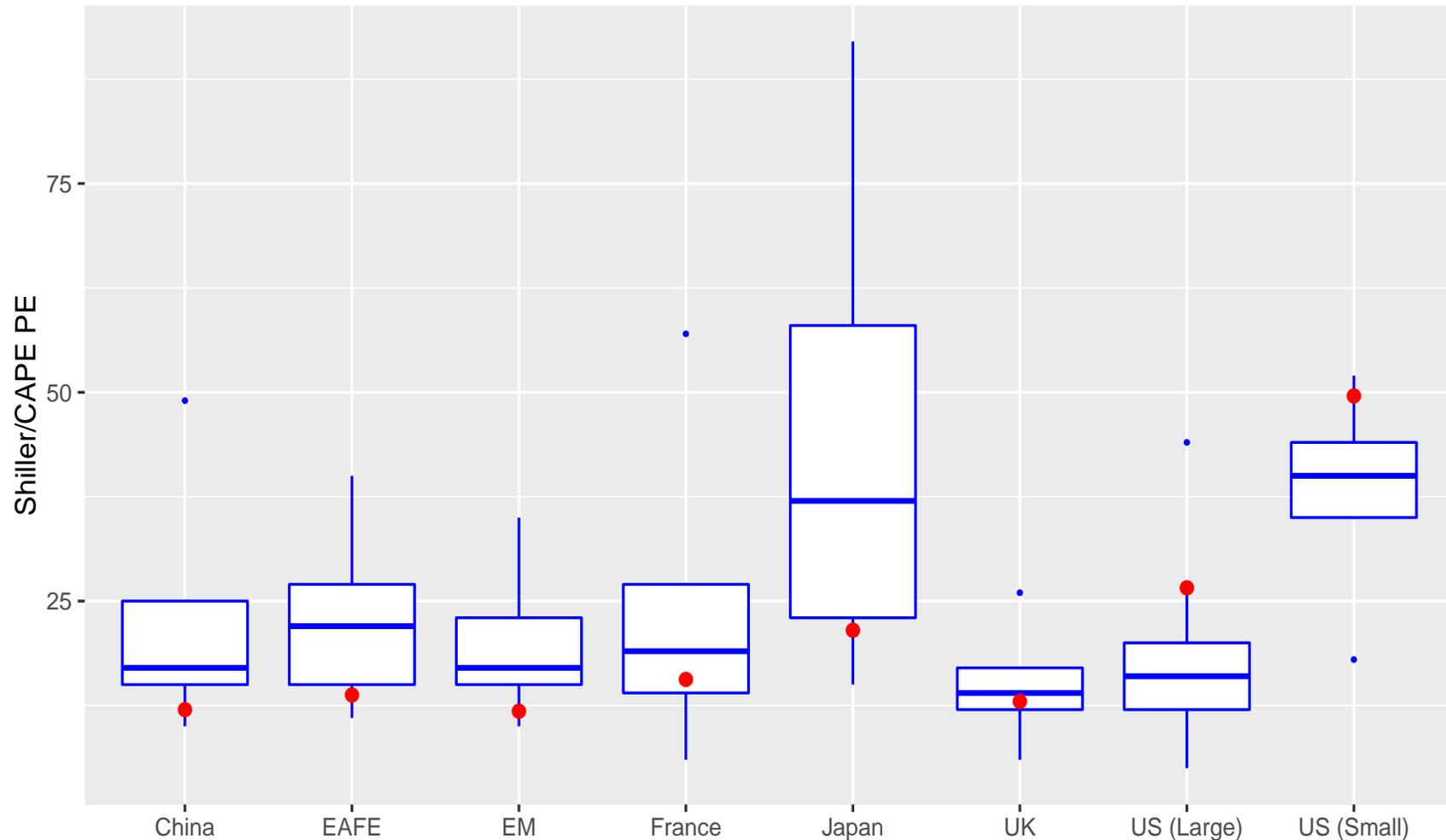


# Relative Valuation of Global Indices (Continued)



# Cyclically Adjusted PEs

Comparative Shiller/CAPE PEs  
(red dot is value at 10/2016)



# Currency Forecasts



# Fund Flows

99) Settings						ETF Flows						
View	Highest/Lowest	Chart	Netflow	Market	All	Period	3M	History	In Millions of USD			
Country	Netflow	Netflow	Flow%	Assets	#Funds	Inflow	In/Out	Outflow				
<b>Highest</b>												
10) United States		+73,346	+3.7	2,007,856	1,550	273,152		-199,803				
11) Japan		+15,122	+6.4	235,463	297	33,147		-18,024				
12) Canada		+889	+1.6	56,468	209	6,277		-5,387				
13) Hong Kong		+791	+4.1	19,181	31	1,870		-1,079				
14) Asia Pac ex Japan*		+729	+4.6	15,988	46	1,400		-671				
15) Mexico		+605	+14.8	4,095	27	2,031		-1,426				
16) Australia		+490	+3.6	13,620	109	1,233		-742				
17) Latam Region*		+466	+20.4	2,279	15	517		-52				
18) Europe ex UK*		+418	+10.2	4,096	8	793		-375				
19) United Kingdom		+407	+1.4	29,625	106	2,352		-1,945				
<b>Lowest</b>												
20) Italy		-101	-2.2	4,594	39	843		-944				
21) Spain		-111	-4.3	2,607	15	145		-256				
22) France		-130	-1.9	6,880	27	338		-468				
23) Philippines		-163	-79.7	205	4	3		-166				
24) Taiwan		-245	-2.7	9,119	32	845		-1,090				
25) Greater China*		-262	-6.7	3,878	19	689		-951				
26) Germany		-914	-2.2	40,765	146	3,271		-4,184				
27) Eurozone*		-2,122	-1.4	147,702	306	9,801		-11,924				
28) European Region*		-2,378	-2.5	94,232	327	8,411		-10,790				
29) China		-5,431	-5.7	95,133	302	9,123		-14,554				

# Outline

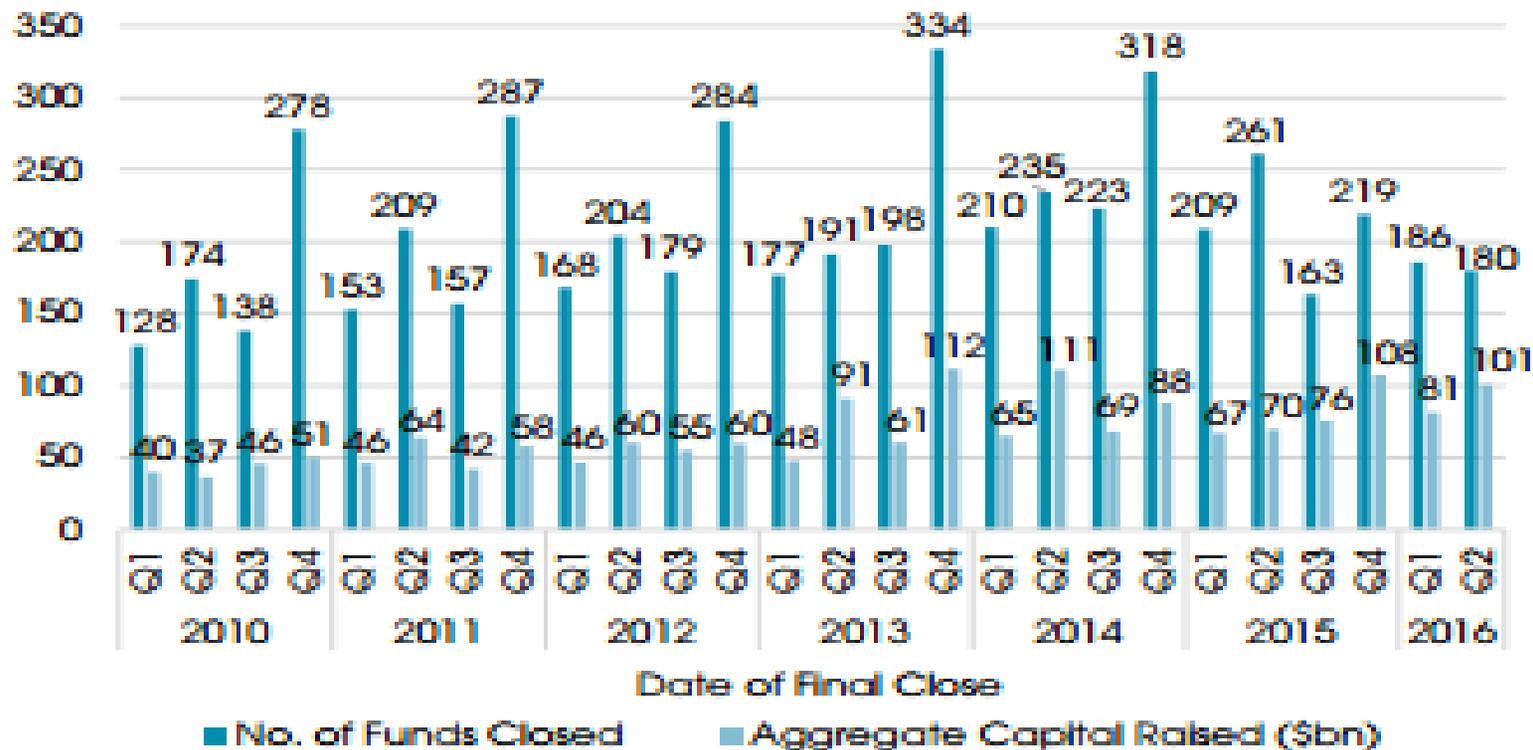
- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities**
  - Commentary
  - Trends
  - Valuation
  - Private Equity**
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

# Private Equity Fund Raising

- Pace of fundraising remains moderate
- Deal volume & size has ticked back up
- Exit volume and values have turned up
- Dry powder has steadily risen

# Private Equity Fund Raising

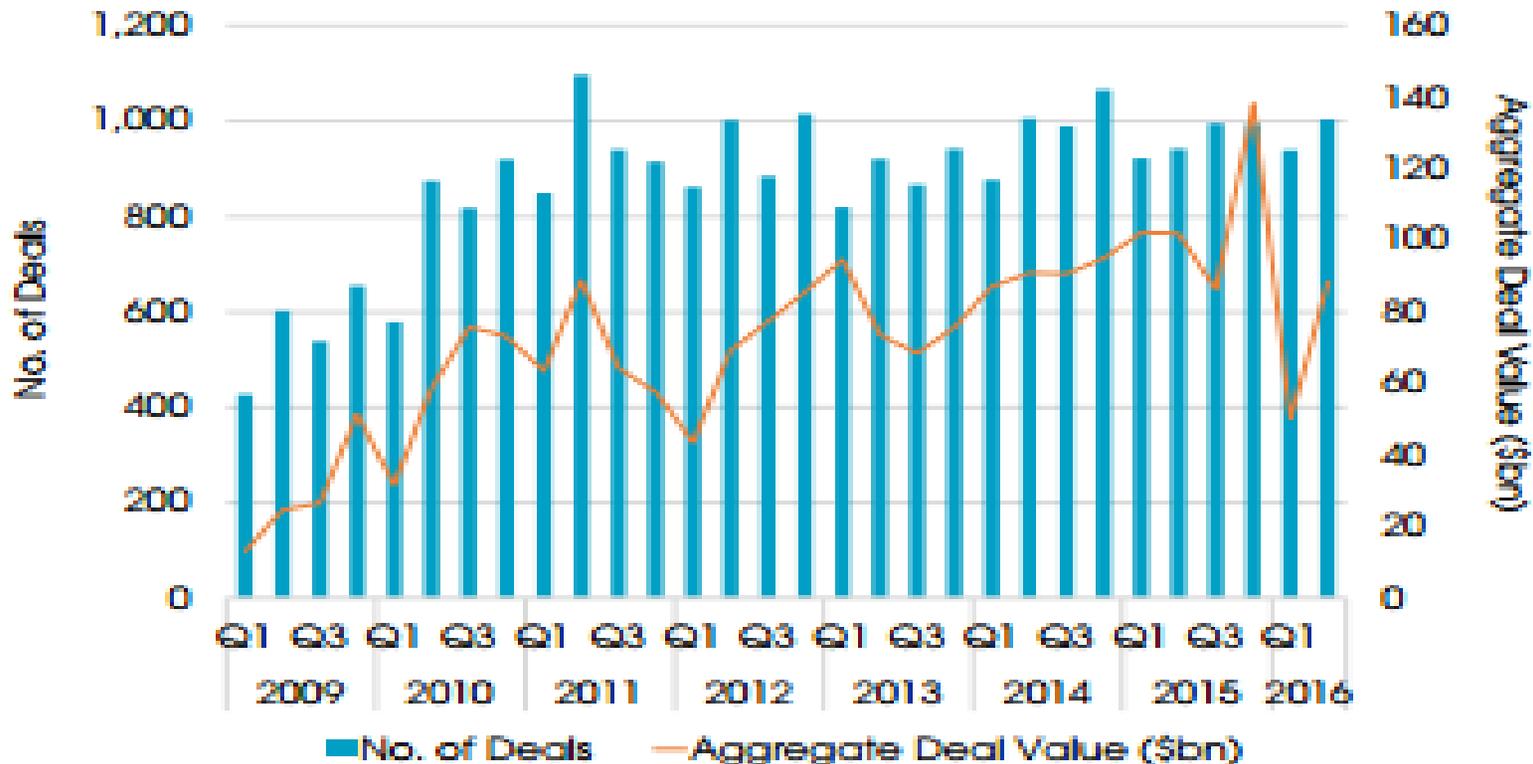
**Fig. 1: Global Quarterly Private Equity Fundraising, Q1 2010 - Q2 2016**



Source: Preqin Private Equity Online

# Private Equity M&A Deal Volume

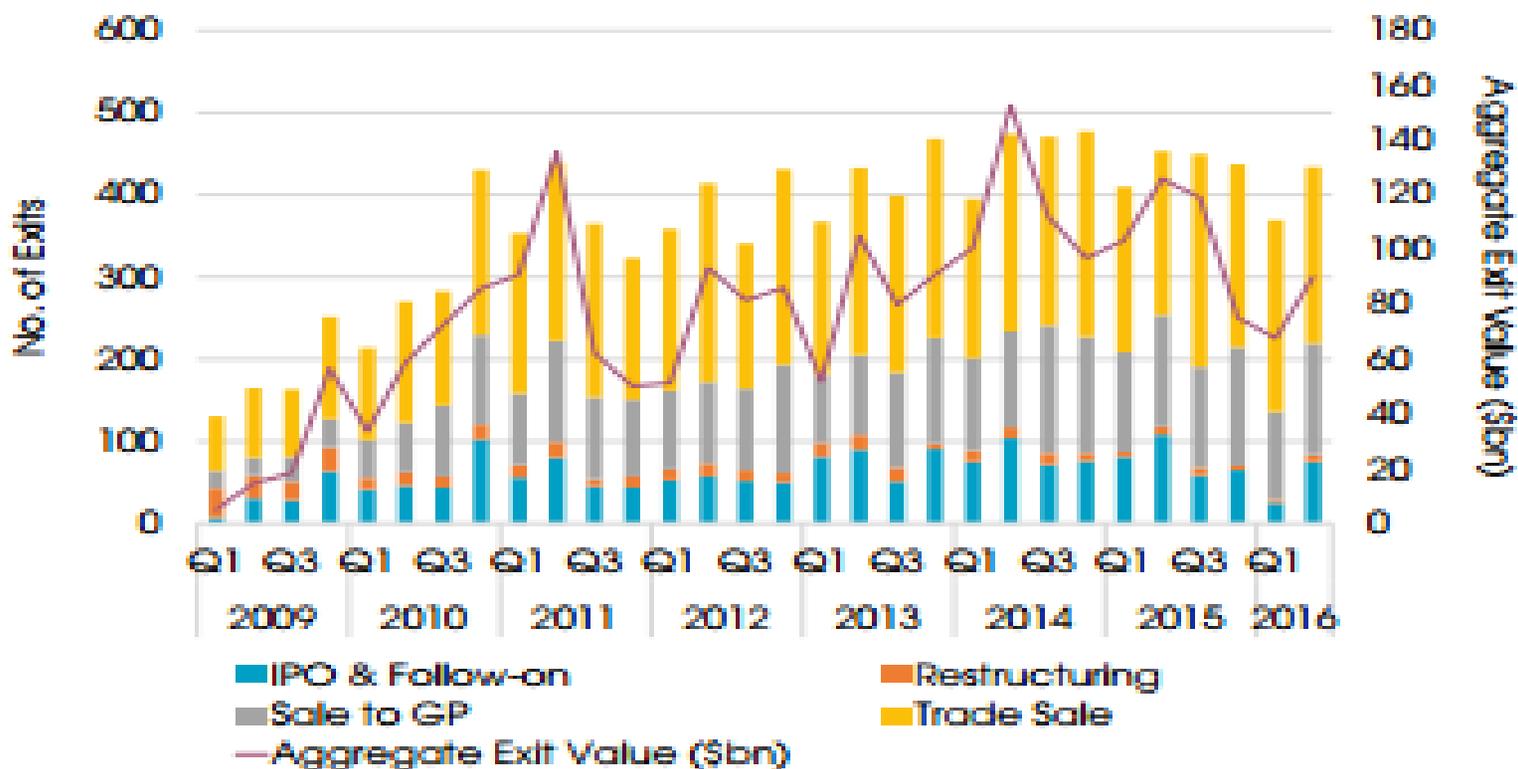
**Fig. 1: Quarterly Number and Aggregate Value of Private Equity-Backed Buyout Deals Globally, Q1 2009 - Q2 2016**



Source: Preqin Private Equity Online

# Private Equity Exits

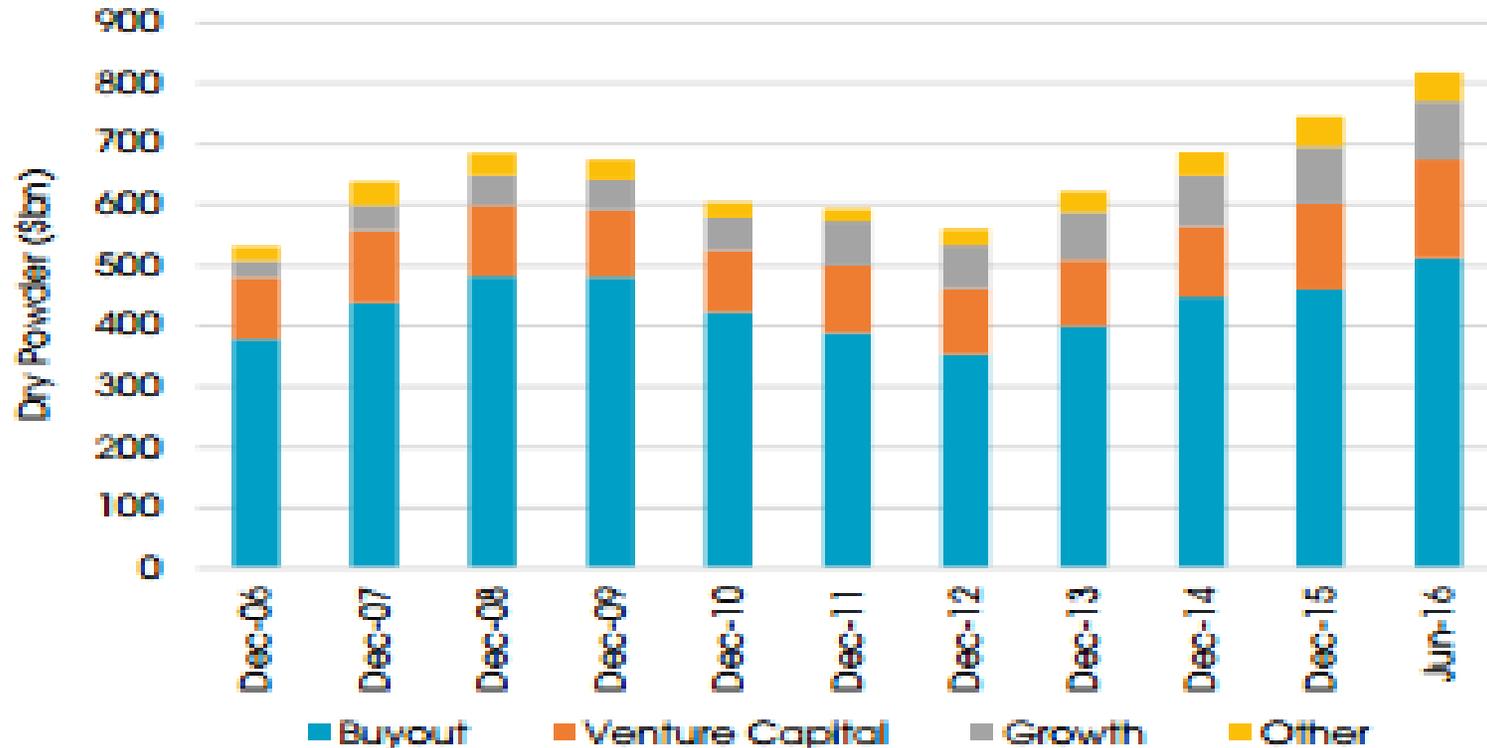
**Fig. 3: Global Number of Private Equity-Backed Exits by Type and Aggregate Exit Value, Q1 2009 - Q2 2016**



Source: Preqin Private Equity Online

# Private Equity Dry Powder

**Fig. 1: Private Equity Dry Powder by Fund Type, December 2006 - June 2016**



Source: Preqin Private Equity Online

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income**
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income**
  - **Commentary**
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

## Commentary

### Fixed Income

- We maintain an overweight allocation to Fixed Income with a recent weighting of 28.9% vs. the interim SAA target of 25.3%. The overweight in Fixed Income primarily reflects an overweight in Opportunistic Debt (3.8% vs. a 0.0% target). In addition, we are overweight Interest Rate Sensitive Fixed Income (12.6% vs. a 11.8% target) and underweight High Yield Fixed Income (3.2% vs. a 4.2% target).
- In mid November, due to concerns about the potential for rising interest rates and inflation expectations under a Trump administration, we transferred \$200 million from Interest Rate Sensitive Fixed Income to Commodities.
- We continue to believe that the Private Debt asset class offers the most attractive opportunity in fixed income. We have increased our allocation to approximately 9.3% of the total fund vs. a SAA policy target of 10%. We hope to reach the 10% target in the first half of 2017. Our partnership commitments represent approximately 14.5% of the total fund.

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income**
  - Commentary
  - Interest Rate Sensitive Fixed Income**
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

## Rates

# Interest Rate Sensitive Fixed Income

- Our overweight in Interest Rate Sensitive Fixed Income (12.6% vs. a 11.8% target) reflects a defensive reallocation of the total fund made in July in which we shifted funds from Non-US Equities to Interest Rate Sensitive Fixed Income following the Brexit vote in the United Kingdom.
- The US presidential election has resulted in a spike in long-term interest rates with the Barclays U.S. Long Treasury Index rising by nearly 40 bps, which effectively reversed a sharp decline in rates that occurred earlier in 2016. The jump in rates reflects initial perceptions that Trump Administration policies (aggressive tax cuts, heavy infrastructure and defense spending, less regulation) could be a paradigm shift that will lead to faster economic growth and higher inflation. This would likely lead to more rate hikes by the Federal Reserve than the market was previously anticipating.
- We do see a heightened risk that rates may continue to rise over the intermediate term. As a result, we reduced our weighting in Interest Rate Sensitive Fixed Income by \$200 million following the election. We may consider a further reduction in our allocation before year-end.
- While long-term U.S. interest rates may rise further, we believe that rates will likely remain relatively low by historical standards as global growth is relatively slow and U.S. rates remain attractive in the global sovereign bond market (see charts below of German and Japanese bond yields).

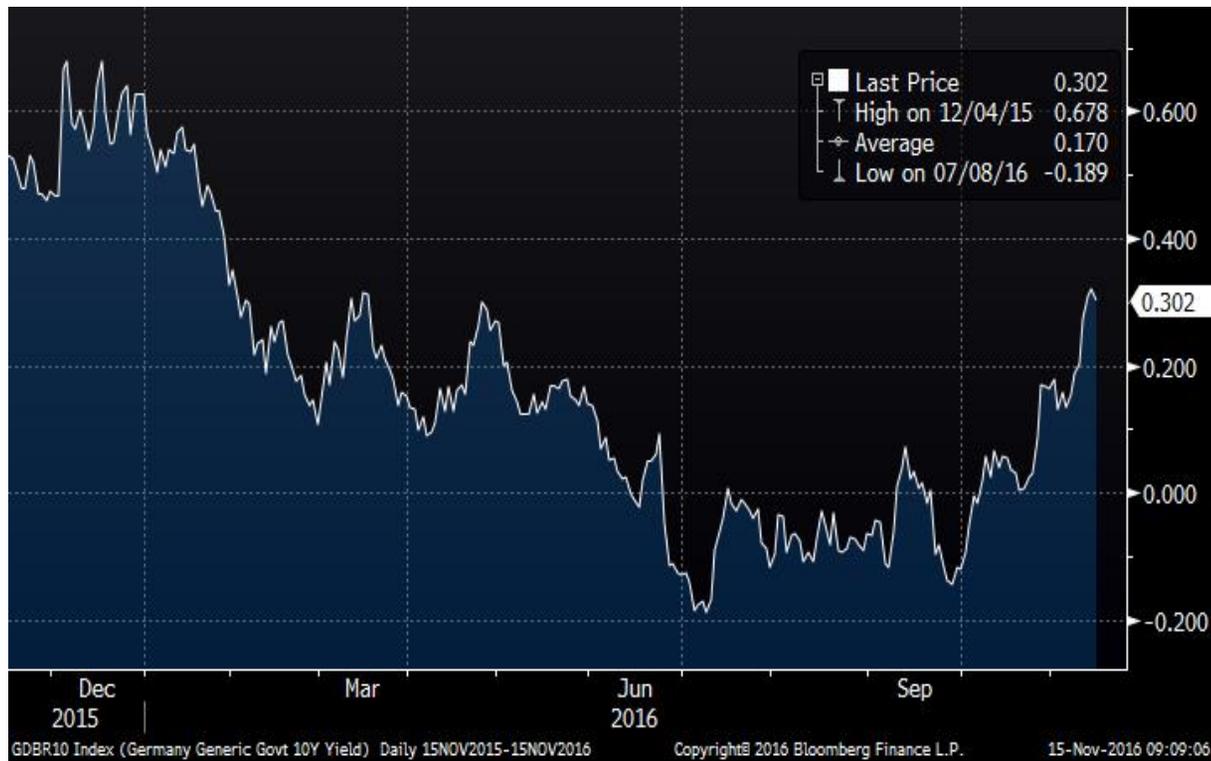
# Long Treasury

## Barclays U.S. Long Treasury Index Yield 2015 – 2016



# German Bund

## 10 Year German Bund Yield 2015 - 2016



4

# Japanese Bonds

## 10 Year Japanese Government Bond Yield 2015 - 2016



# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income**
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt**
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

## High Yield

# High Yield

- After a weak 2015, the high yield market has had a strong rally in 2016 with approximately a 15% return. The rally is due to a number of factors including a recovery in oil prices and other commodities off their lows, strong global demand for higher yielding assets, and continued low default rates outside of the energy sector.
- Yields and credit spreads in the high yield bond market have compressed significantly in 2016. As a result, the market is no longer cheap and, more likely, fairly valued. Since the presidential election, credit spreads have widened modestly.
- While we continue to believe that we are likely in the later stages of credit cycle (that began with an upturn in 2009), the opening of the credit markets which has accompanied the strong high yield rally this year has most likely elongated the credit cycle and pushed out a substantial uptick in defaults outside of energy. With sovereign rates low, a strong global demand for yield will likely continue to buoy the market.
- We are underweight High Yield with a weighting of 3.2% vs. an interim SAA target of 4.2%. Our underweight reflects our view that the Opportunistic Debt asset class will likely deliver higher returns over the long-term than the high yield bond market, particularly following the recent compression in spreads. ASRS' investments in Opportunistic Debt are primarily in distressed corporate debt both in the U.S. and Europe that tends to exhibit a correlation with the broader credit markets. Overall, we believe we have ample exposure to credit in the total fund.

## High Yield Credit Spread

### Barclays US Corporate High Yield Index Option Adjusted Spread (OAS) 2015 – 2016



7

## High Yield Yield-to-Worst

### Barclays US Corporate High Yield Index Yield-to-Worst 2015 – 2016



## Private Debt

# Private Debt

- We believe the Private Debt asset class offers the most attractive opportunity in the fixed income markets with double-digit yields readily available for investors willing to accept illiquidity. The market opportunity is principally driven by regulatory constraints that make it unattractive for banks to hold illiquid loans or other debt of below investment-grade credit quality.
- The opportunity in Private Debt has become more attractive in the past few years.
- Regulatory constraints limiting banks ability to make below investment-grade, illiquid loans (typically to middle market companies) has become more severe due to a number of policies: the adoption of Basel III, Dodd-Frank financial regulation and new “Leveraged Lending Guidelines” of US bank regulators.
- Business Development Companies (“BDCs”), a competing source of illiquid loans, have pulled back on lending due to their depressed equity valuations. However, a rally this year in the stock prices of BDC’s has enabled some to raise additional equity for new lending.
- Anecdotally, expected returns for middle market loans appear to be 50 - 100 bps higher or more since a year ago in many situations while the credit quality of the underlying loans has either improved or not deteriorated.
- When the public credit markets have “seized up” as they did in the latter part of 2015 and in the first quarter of 2016, our private debt managers quickly capitalized on very attractive investment opportunities that materialized when borrowers were forced to turn to the much more expensive private markets for financing. Going forward, we expect these periods of dislocation in the public credit markets to happen from time-to-time particularly with a weakening global growth outlook and the prospect that we are in the late stages of a credit cycle in the U.S.

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 **Real Estate**
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

## Commentary

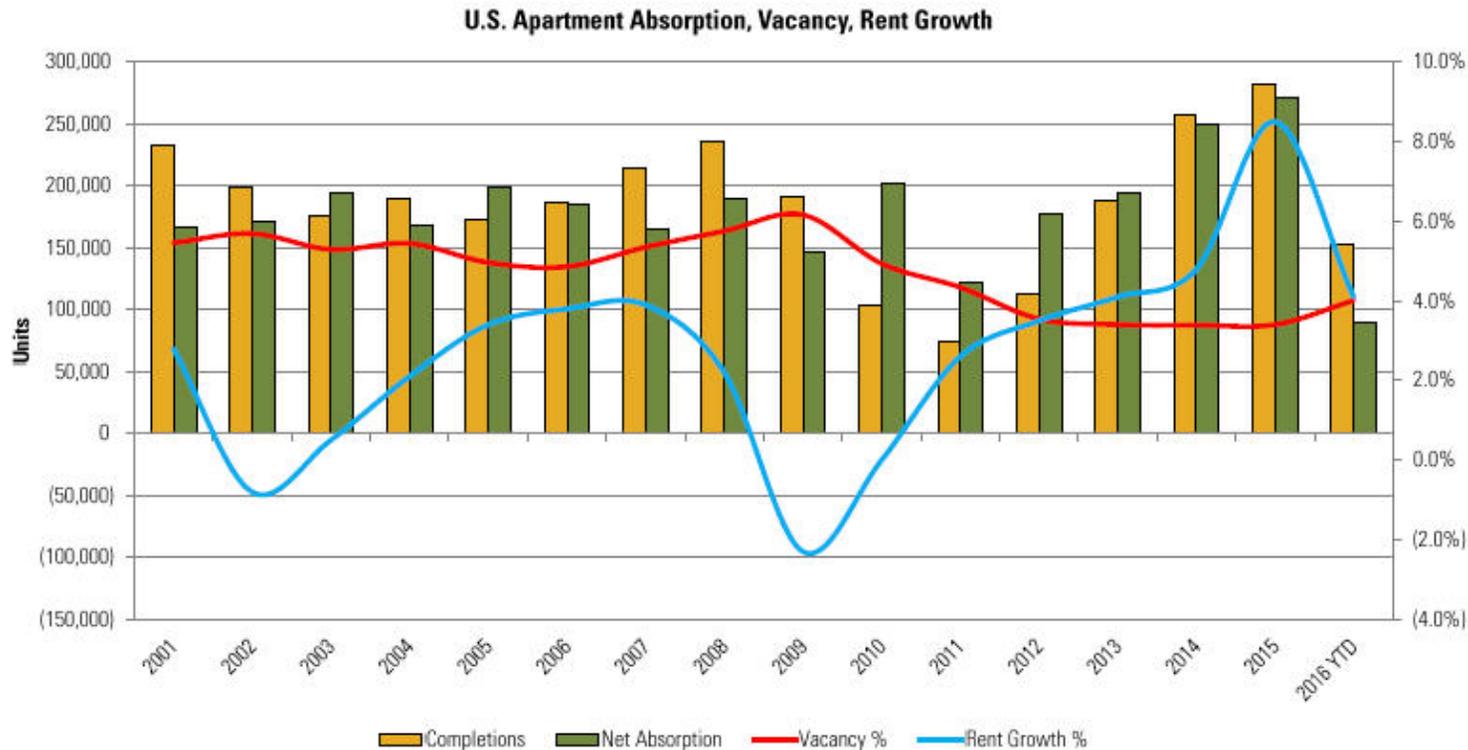
- Property markets are generally moving to the latter stages of the real estate cycle
- Fundamentals leads us to emphasize apartments, industrial properties, medical office buildings, senior housing, self-storage, and student housing for demographic and macro policy reasons
  - Suburban office and certain retail categories require a substantial discount because of weak demand fundamentals
  - For sale housing remains a potential target for opportunistic investing because financing and entitlement constraints have kept the market under-supplied
- CMBS spreads have largely compressed to mid 2015 levels which has resulted in an increase in new issuance
- North America focused dry powder remains robust and at post crisis highs but sentiment regarding future expected returns have decreased according to Preqin

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 **Real Estate**
  - Commentary
  - **Supply and Demand**
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

# Occupancy Trends and New Supply

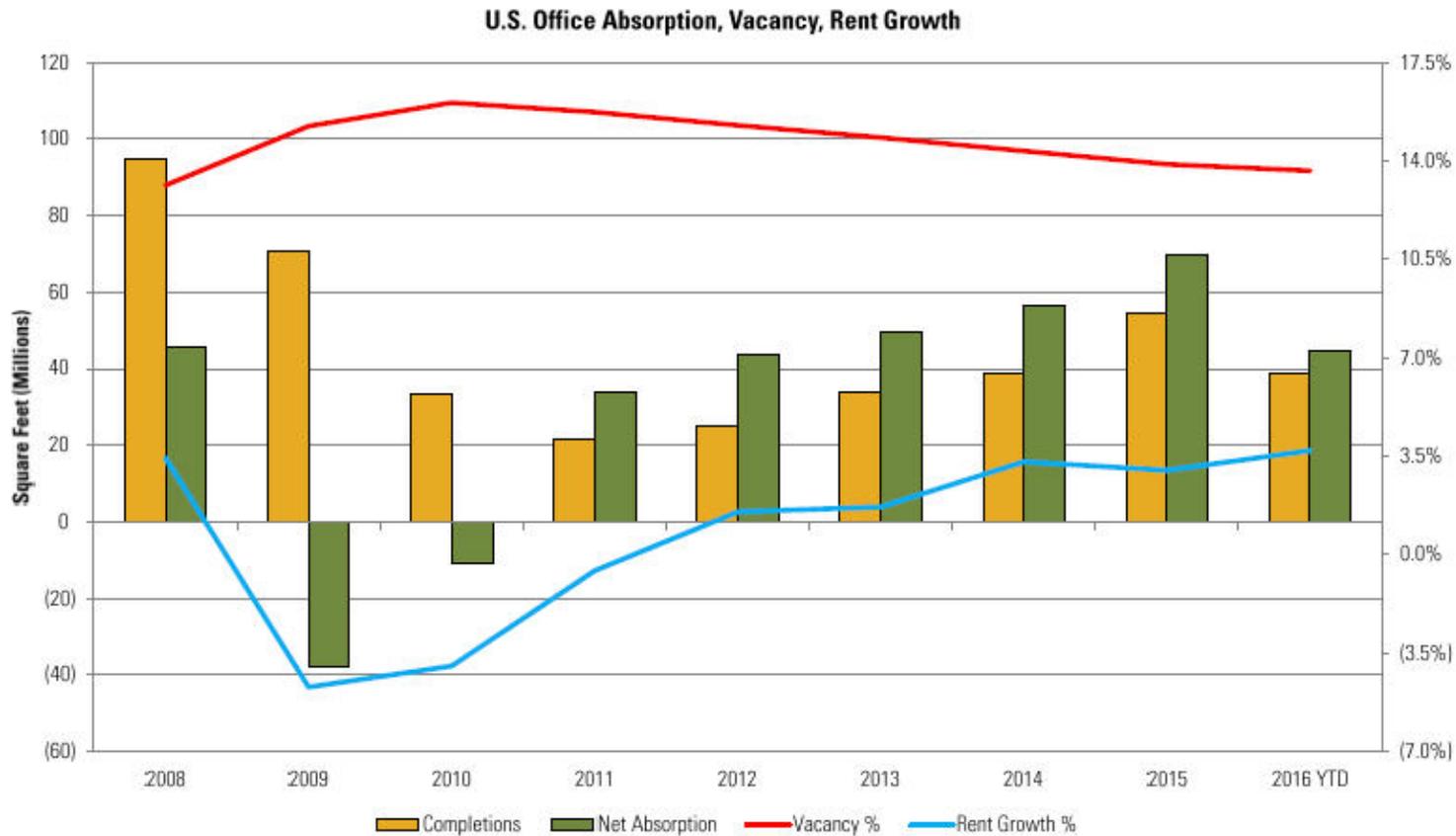
## Multifamily (As of 9/30/16)



Note: Apartment criteria filtered as follows: multifamily property (secondary type is apartment), 50+ units, and a 3-star or greater CoStar rating  
 Source: CoStar, RCLCO

# Occupancy Trends and New Supply

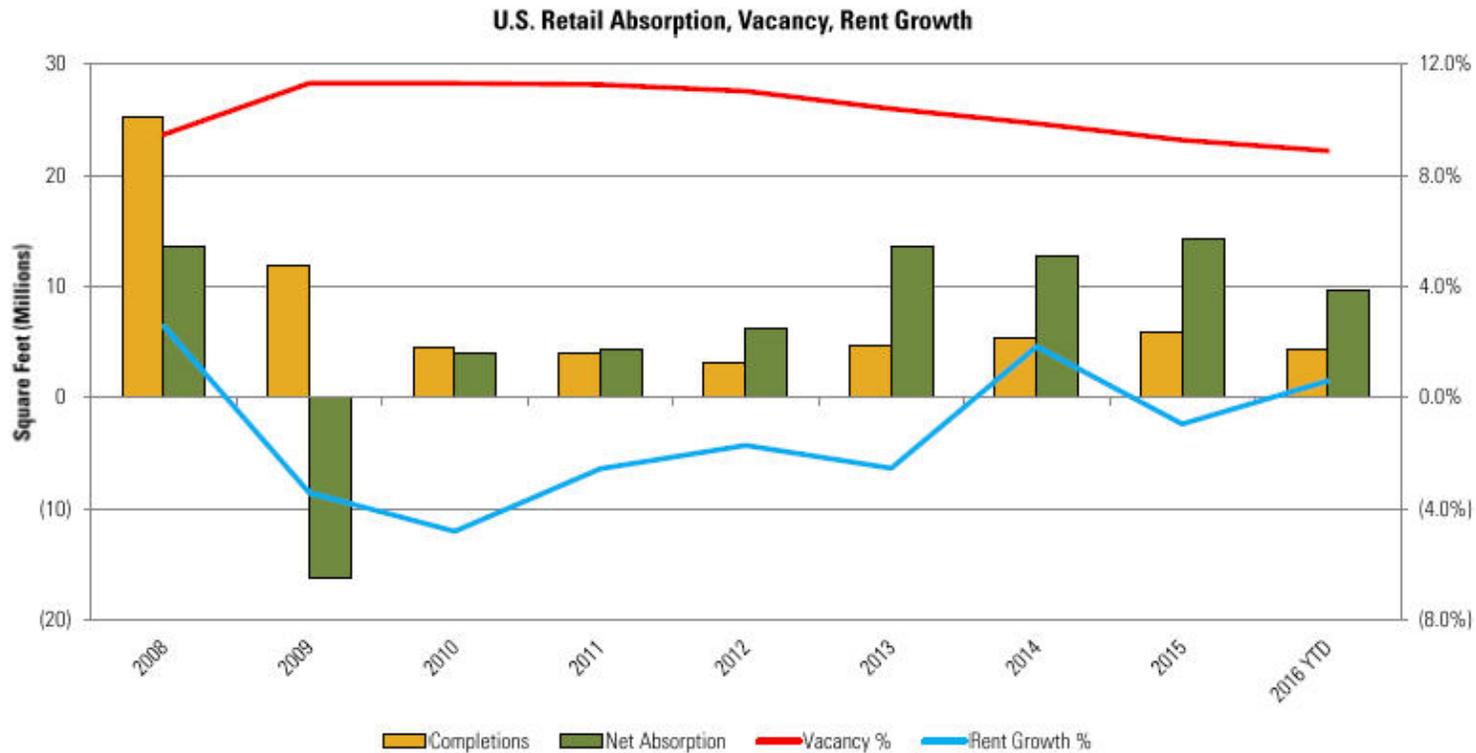
## Office (As of 9/30/16)



Note: Office criteria filtered as follows: office property, not owner occupied, 30,000+ SF, and a 3-star or greater CoStar rating  
 Source: CoStar, RCLCO

# Occupancy Trends and New Supply

## Retail (As of 9/30/16)



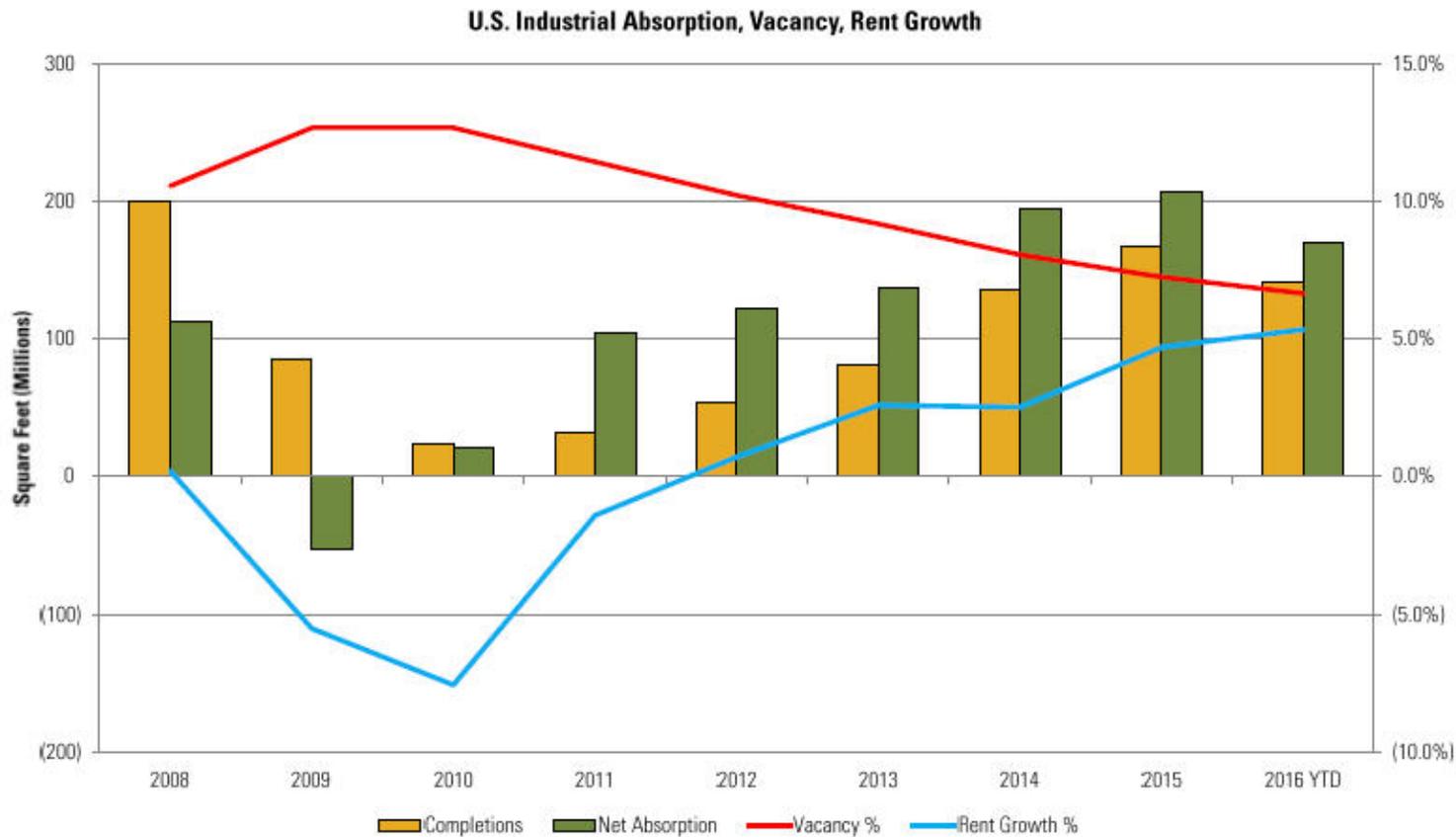
Note: Above data is for neighborhood and community centers only

Note: Retail criteria filtered as follows: retail property in a shopping center, not owner occupied, 30,000+ SF, multiple tenancy, and a 3-star or greater CoStar rating

Source: CoStar, RCLCO

# Occupancy Trends and New Supply

## Industrial (As of 9/30/16)



*Note: Industrial criteria filtered as follows: industrial property (secondary type is either distribution or warehouse), 30,000+ SF, and a 3-star or greater CoStar rating  
 Source: CoStar, RCLCO*

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 **Real Estate**
  - Commentary
  - Supply and Demand
  - **Capital Markets Dynamics**
- 6 Commodities
- 7 Historic Data

# Cap Rate Trends

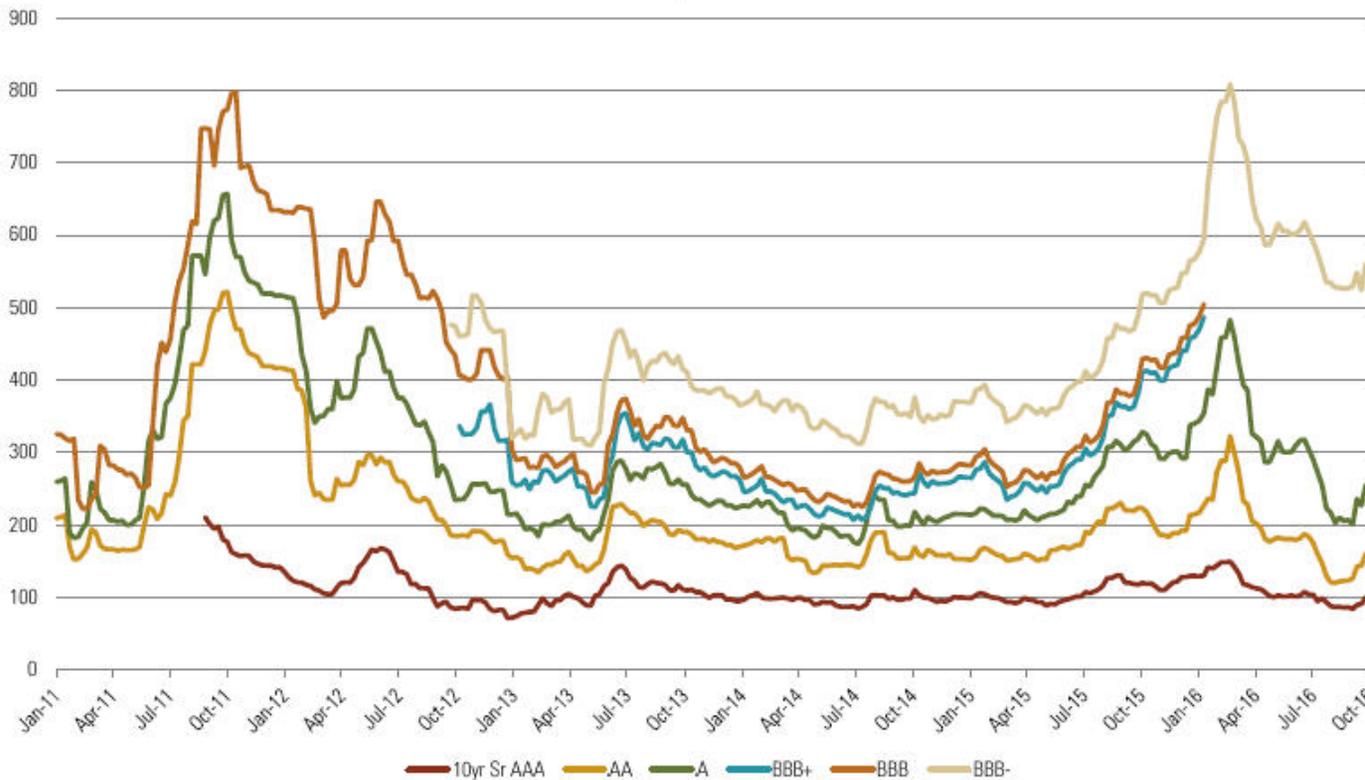
Cap Rates by Property Type  
 1989 – Q3 2016



Source: RERC, RCA

# Credit Availability

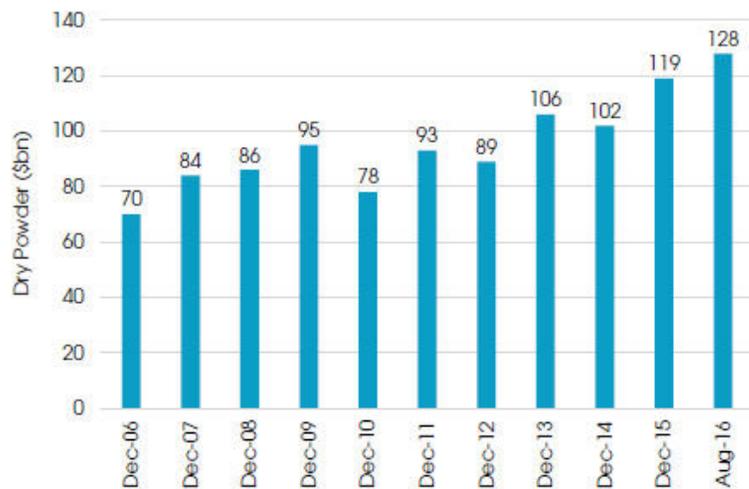
U.S. CMBS Spread to Treasuries



Source: Commercial Real Estate Finance Council; JP Morgan; Urban Land Institute (ULI); RCLCO

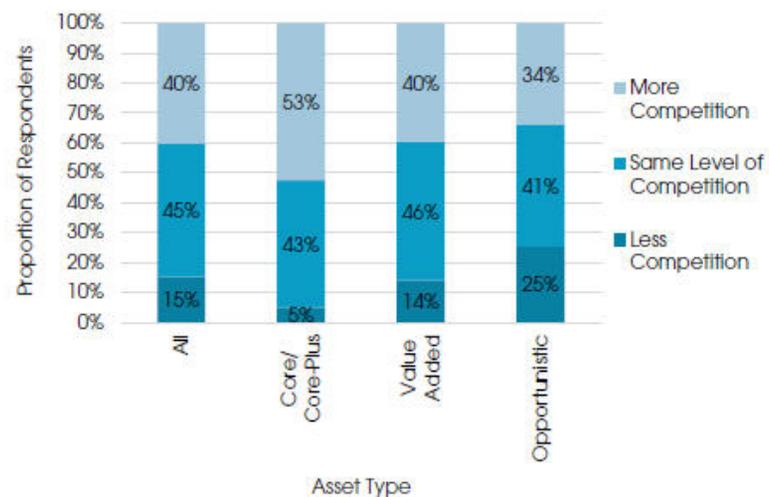
# Investor Demand & Sentiment

North America-Focused Closed-End Private Real Estate Dry Powder, December 2006 - August 2016



Source: Prequin Real Estate Online

North America-Based Fund Manager Views on the Level of Competition for Real Estate Assets Compared to 12 Months Ago by Asset Type



Source: Prequin Fund Manager Survey, June 2016

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 **Commodities**
- 7 Historic Data

## Commentary

- Bottoms up model shows a moderate expected decrease
  - flat in energy markets
  - down in ags
  - flat in metals
- Top down model also shows a small expected decline
  - dollar weakness offset by slow projected global growth is negative for commodities

# Bottoms up model

1-3 month horizon											
as of:	Index	Current	60 day								
11/15/2016	DJUBS	price	volatility	-1 st dev	+1 st dev	prob +	prob -	prob price	% ret	wght'd ret	
<b>AGRICULTURE</b>											
Corn	8.0%	349.25	9%	317	381	50%	50%	349	0%	0.0%	
Soybeans	5.7%	989.50	7%	918	1,061	50%	50%	990	0%	0.0%	
Wheat	4.4%	418.75	9%	381	456	50%	50%	419	0%	0.0%	
Soybean Meal	2.5%	312.30	8%	286	338	50%	50%	312	0%	0.0%	
Soybean Oil	3.2%	34.21	9%	31	37	50%	50%	34	-1%	0.0%	
Group SubTotal	23.7%										
<b>ENERGY</b>											
Crude Oil WTI	7.4%	45.82	15%	39	53	50%	50%	46	-1%	-0.1%	
Crude Oil Brent	6.3%	46.97	14%	40	54	50%	50%	47	-2%	-0.1%	
Heating Oil	3.1%	144.57	13%	126	163	50%	50%	145	-1%	0.0%	
Natural Gas	8.8%	2.71	14%	2.33	3.09	50%	50%	2.71	-6%	-0.6%	
Unleaded Gas (RB)	4.2%	133.58	14%	115	152	50%	50%	134	0%	0.0%	
Group SubTotal	29.8%										
<b>INDUSTRIAL METALS</b>											
Aluminum	4.7%	1731.00	6%	1,628	1,834	32%	68%	1,694	-2%	-0.1%	
Copper (NY)	7.1%	250.60	8%	232	269	32%	68%	244	-3%	-0.2%	
Nickel	1.5%	11230.50	12%	9,939	12,522	50%	50%	11,231	0%	0.0%	
Zinc	2.2%	2599.75	10%	2,347	2,852	32%	68%	2,509	-4%	-0.1%	
Group SubTotal	15.5%										
<b>LIVESTOCK</b>											
Live Cattle	3.3%	106.53	9%	97	116	50%	50%	107	0%	0.0%	
Lean Hogs	1.8%	52.90	13%	46	60	50%	50%	53	0%	0.0%	
Group SubTotal	5.1%										
<b>PRECIOUS METALS</b>											
Gold	12.7%	1227.50	6%	1,154	1,301	68%	32%	1,254	2%	0.3%	
Silver	4.3%	17.07	12%	15	19	50%	50%	17	0%	0.0%	
Group SubTotal	17.0%										
<b>FOODS &amp; FIBERS</b>											
Cotton	1.9%	70.48	9%	64	77	50%	50%	70	0%	0.0%	
Sugar	5.0%	21.15	11%	19	23	50%	50%	21	3%	0.1%	
Coffee (ICE)	2.0%	165.30	11%	147	184	32%	68%	159	-4%	-0.1%	
Group SubTotal	8.9%										
	100.0%										
									Total	-0.9%	
total weighted expected return: bottoms up											

## Top down model

$$\Delta p = -16.8 + 5.3 * \Delta \text{WorldGDP} - 0.9 * \Delta \text{Dollar}$$

1

2.9%	World GDP
-2.3%	USD
0.6%	expected price change

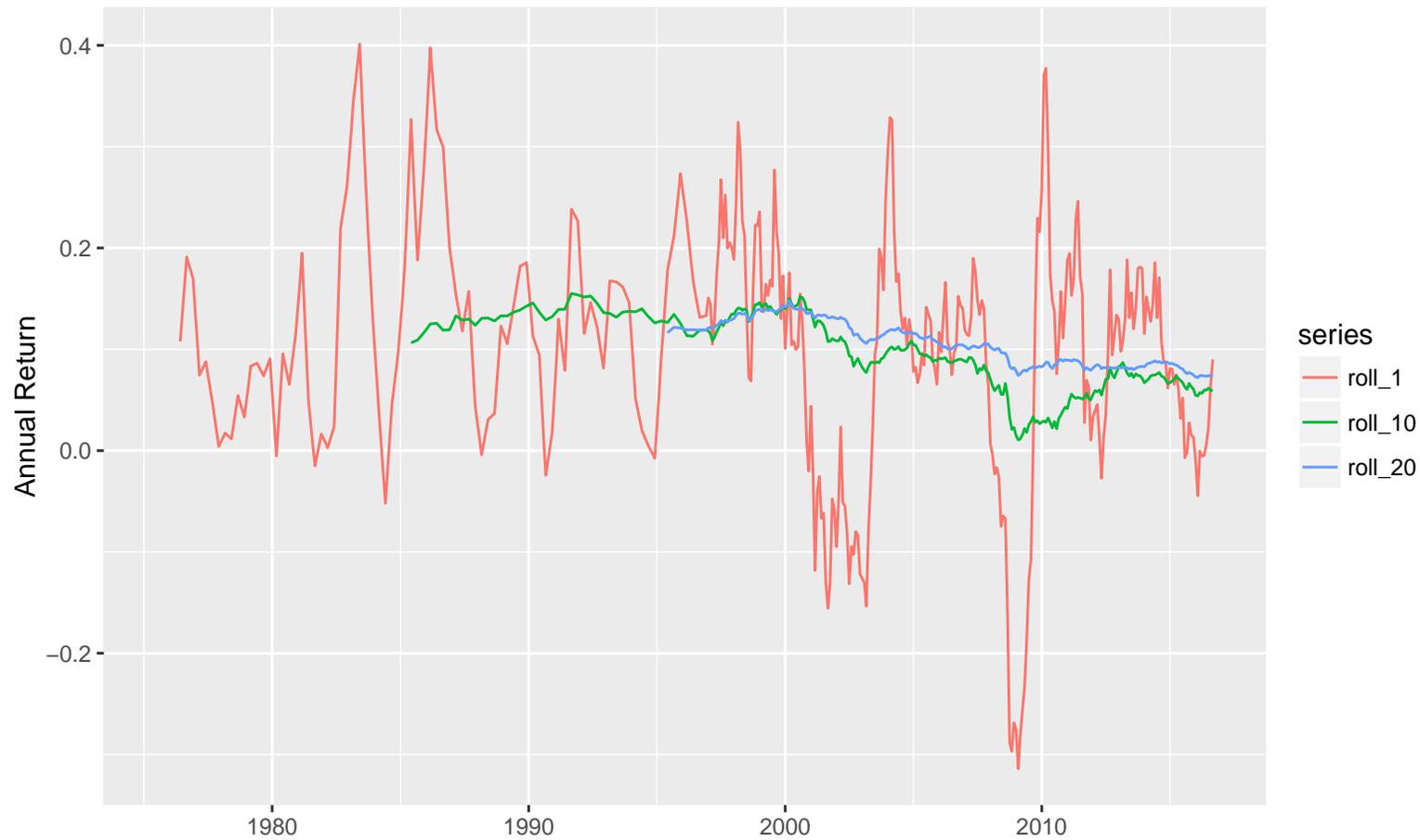
<sup>1</sup> <http://libertystreeteconomics.newyorkfed.org/2016/03/what-tracks-commodity-prices.html>

# Outline

- 1 Summary View and Positioning
- 2 Macro Environment
- 3 Equities
  - Commentary
  - Trends
  - Valuation
  - Private Equity
- 4 Fixed Income
  - Commentary
  - Interest Rate Sensitive Fixed Income
  - High Yield and Private Debt
- 5 Real Estate
  - Commentary
  - Supply and Demand
  - Capital Markets Dynamics
- 6 Commodities
- 7 Historic Data

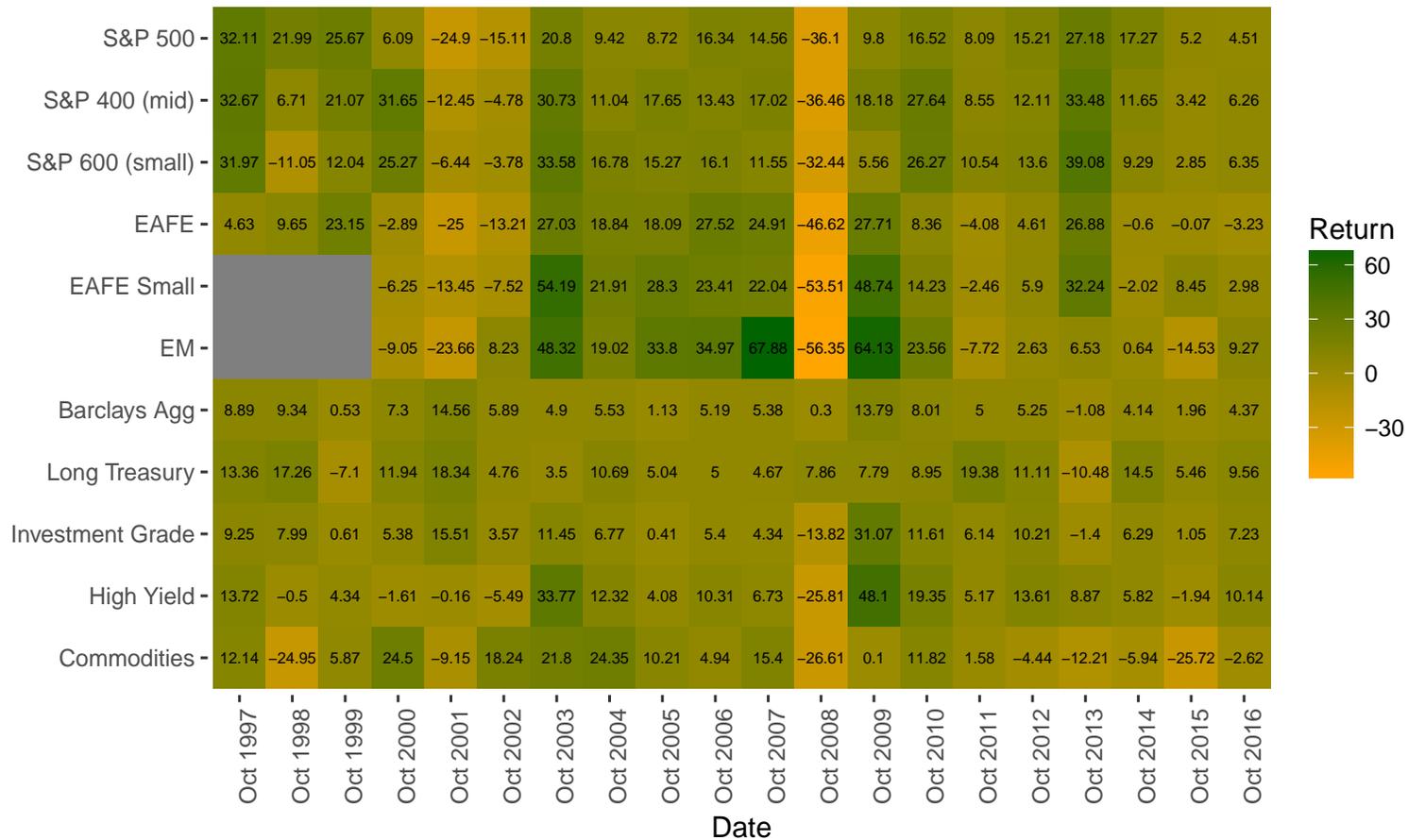
# ASRS Returns

ASRS Total Fund One Ten and Twenty Year Rolling Returns



# Asset Class One Year Returns

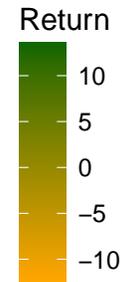
One Year Returns  
 for indicated end dates



# Asset Class Hold Period Returns

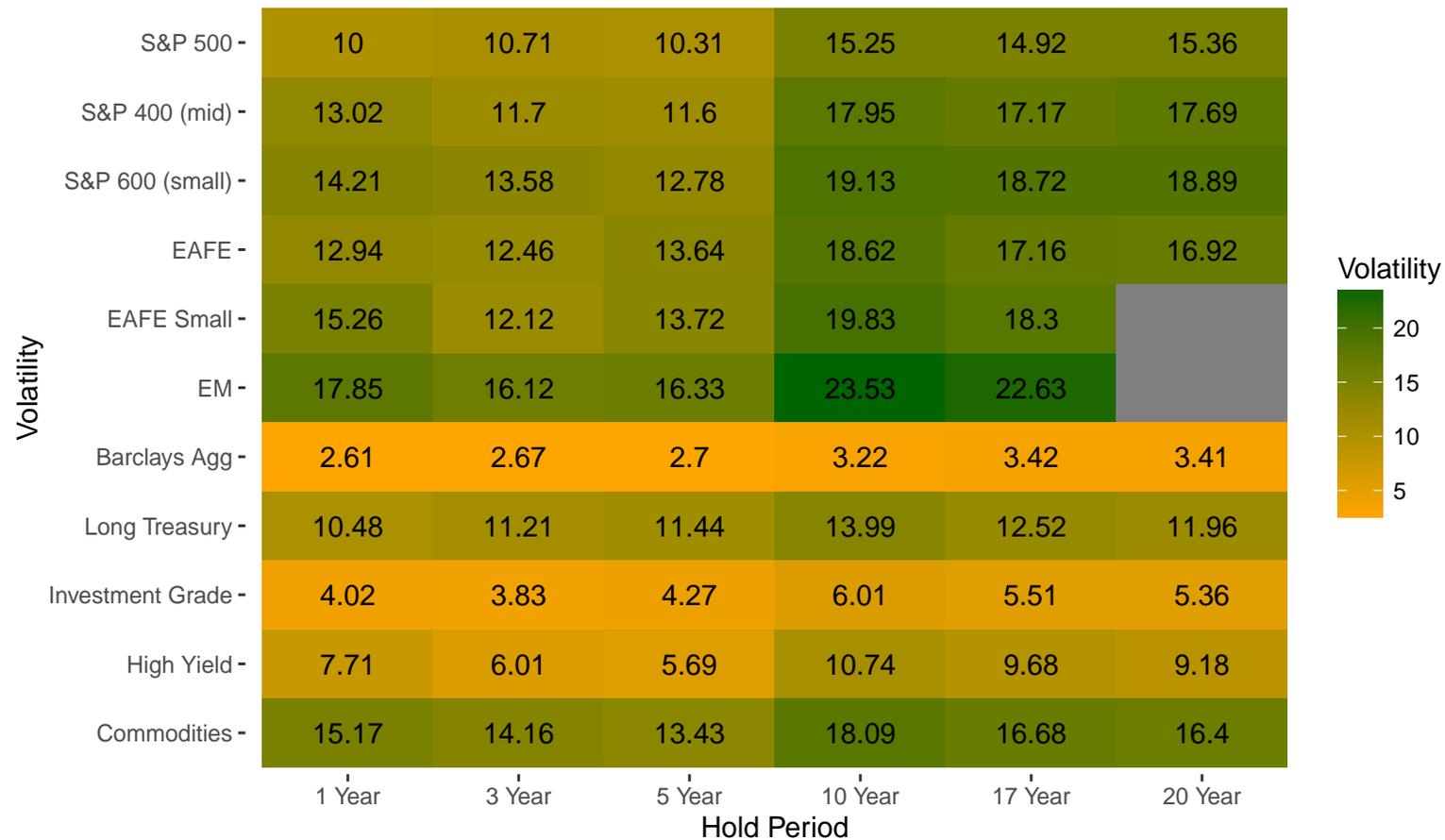
Annualized Returns and Growth of a Dollar  
 for hold periods ending Oct 2016

Asset Class	Annualized Return/Growth of \$					
	1 Year	3 Year	5 Year	10 Year	17 Year	20 Year
S&P 500 -	4.51/1.05	8.84/1.29	13.57/1.89	6.7/1.91	4.64/2.16	7.66/4.38
S&P 400 (mid) -	6.26/1.06	7.06/1.23	12.92/1.84	8.38/2.24	9.6/4.75	11.06/8.15
S&P 600 (small) -	6.35/1.06	6.13/1.2	13.56/1.89	7.69/2.1	9.85/4.94	9.81/6.49
EAFE -	-3.23/0.97	-1.31/0.96	4.99/1.28	1.22/1.13	2.89/1.62	4.24/2.29
EAFE Small -	2.98/1.03	3.05/1.09	8.91/1.53	3.72/1.44	7.12/3.22	NA/NA
EM -	9.27/1.09	-2.05/0.94	0.55/1.03	3.49/1.41	7.42/3.38	NA/NA
Barclays Agg -	4.37/1.04	3.48/1.11	2.9/1.15	4.64/1.57	5.32/2.41	5.45/2.89
Long Treasury -	9.56/1.1	9.78/1.32	5.64/1.32	7.61/2.08	7.92/3.65	7.82/4.51
Investment Grade -	7.23/1.07	4.82/1.15	4.59/1.25	5.74/1.75	6.19/2.77	6.14/3.29
High Yield -	10.14/1.1	4.55/1.14	7.17/1.41	7.6/2.08	7.34/3.33	7.09/3.94
Commodities -	-2.62/0.97	-12.05/0.68	-10.61/0.57	-5.81/0.55	1.5/1.29	0.69/1.15



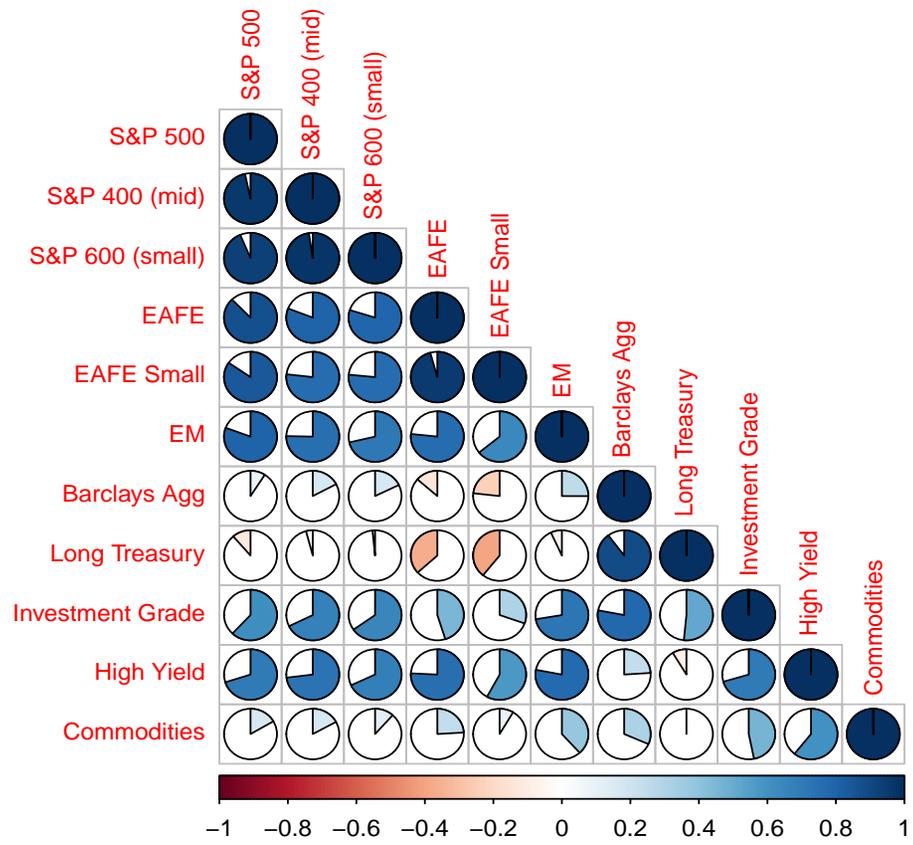
# Asset Class Volatility

Volatility  
 for hold periods ending Oct 2016



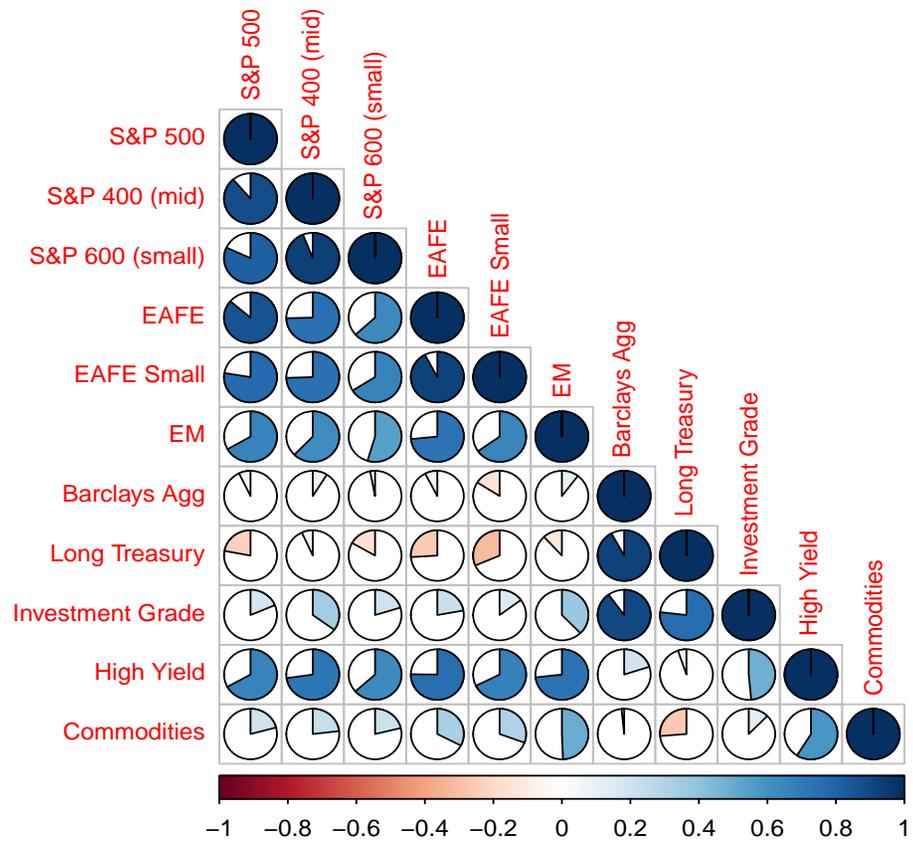
# One Year Correlation

1 Year Correlation Matrix



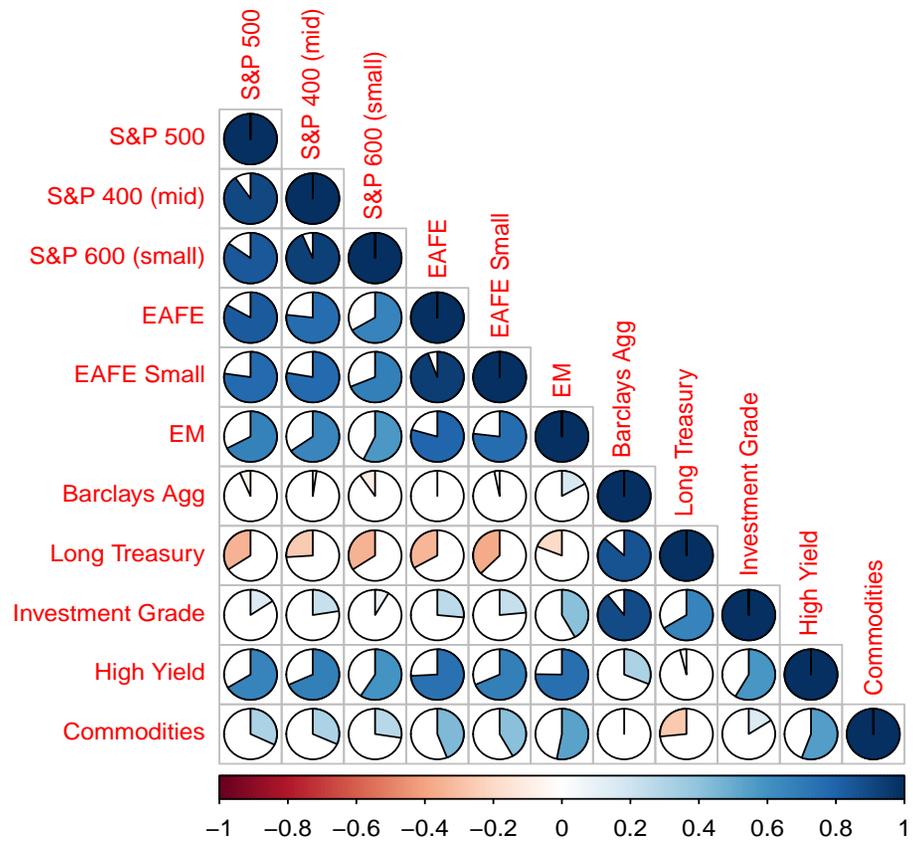
# Three Year Correlation

### 3 Year Correlation Matrix



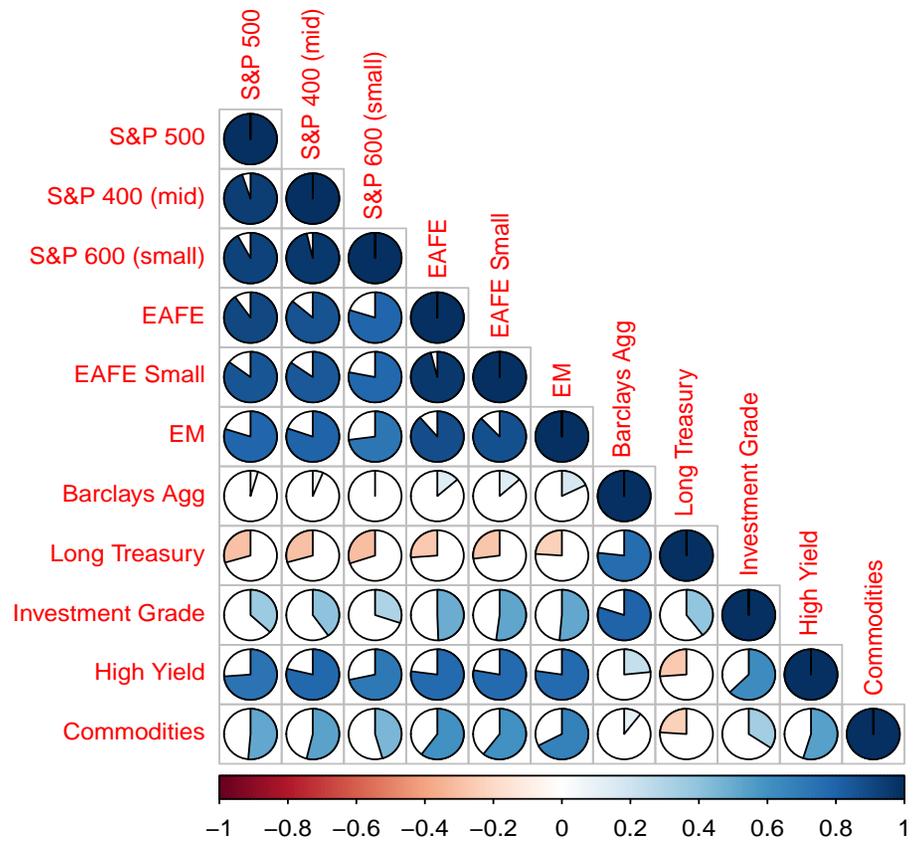
# Five Year Correlation

5 Year Correlation Matrix



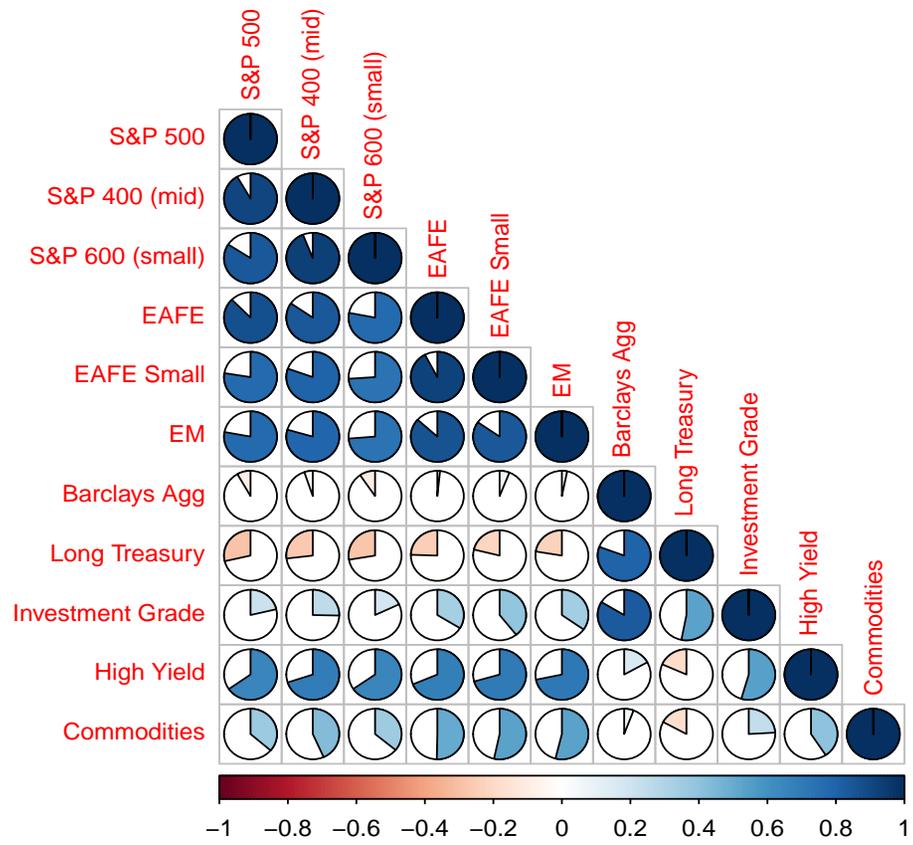
# Ten Year Correlation

10 Year Correlation Matrix



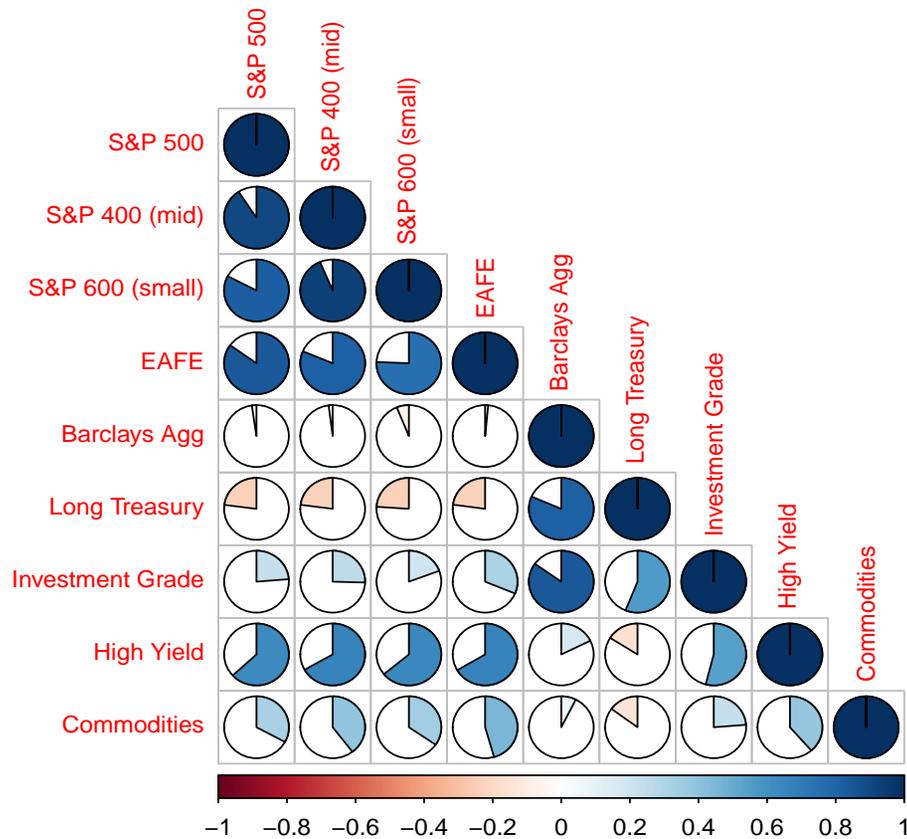
# Seventeen Year Correlation

17 Year Correlation Matrix



# Twenty Year Correlation

20 Year Correlation Matrix



**Confidential Materials  
Removed**

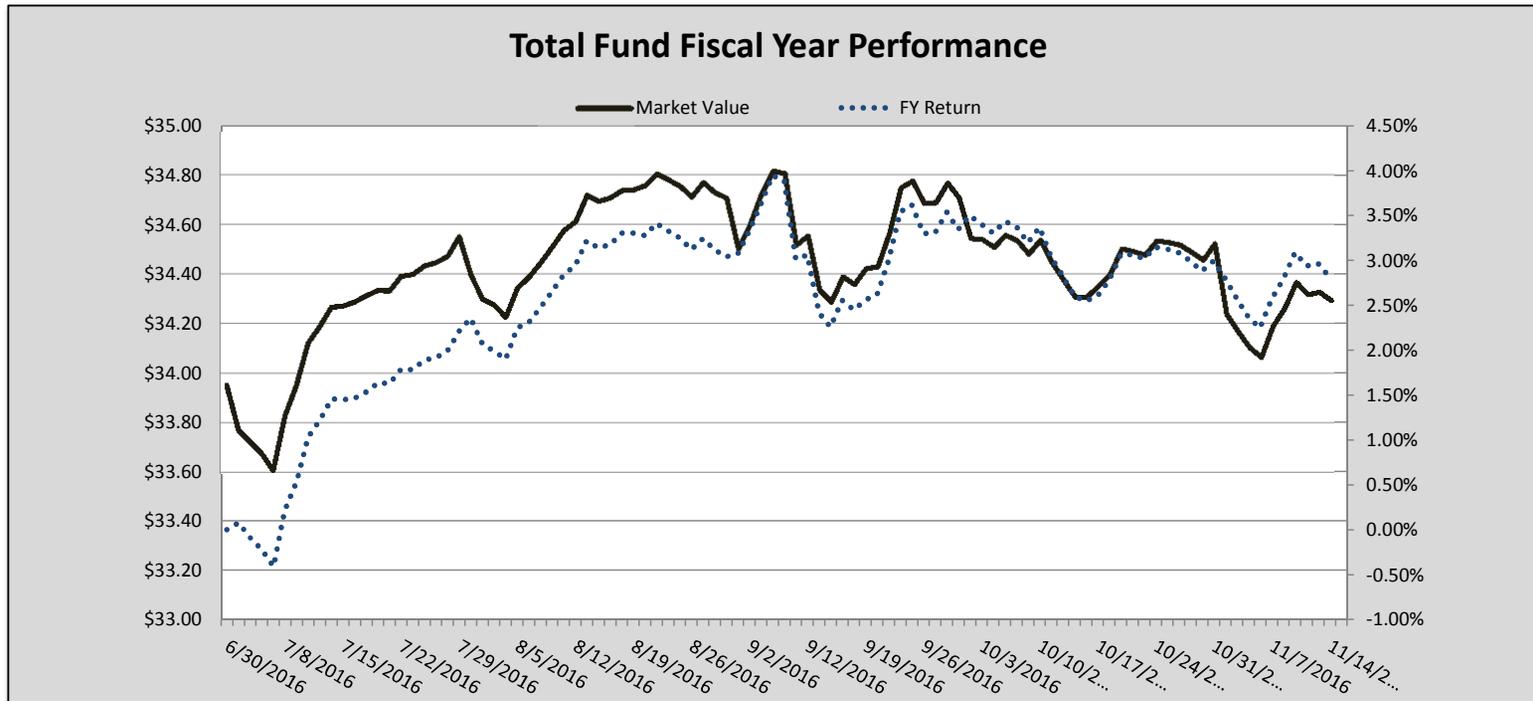
# Agenda Item #4

# Investment Report

Arizona State Retirement System

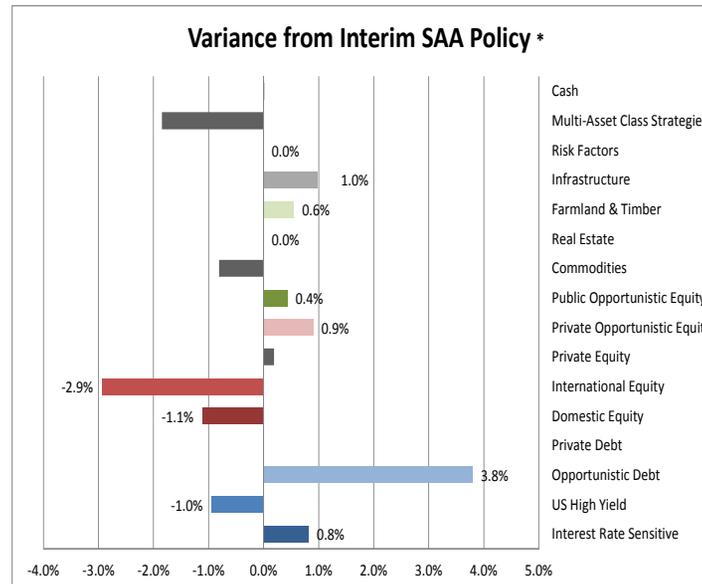
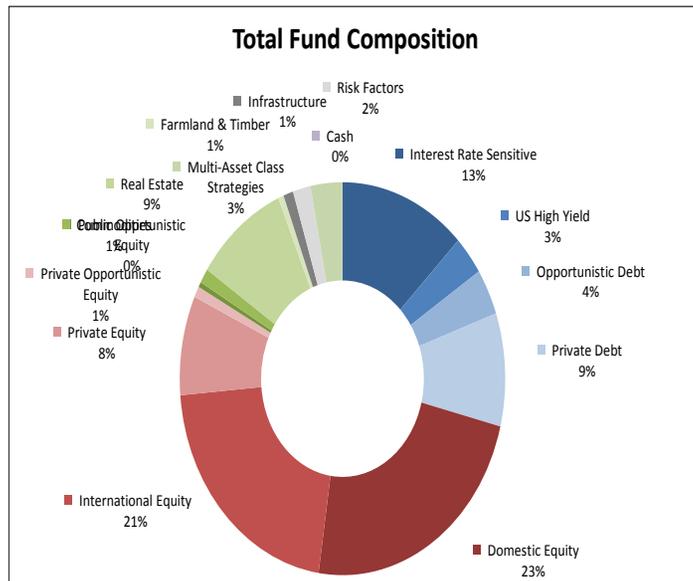
November 28, 2016

# Fiscal Year Performance



# Total Fund Positioning

## Total Fund Positioning November 14, 2016



All Private Markets asset classes' market values are reported on a quarter-lag basis and adjusted to include the current quarter's cash flow.

# Asset Allocation

Total Fund		ASRS Market Value Report						Monday, November 14, 2016	
Account Manager	Account Manager Style	Fixed Income		Equity		Inflation Linked	Multi-Asset	Market Value	%
		Active	Passive	Active	Passive				
Master Cash	Operating Cash (non-assetized)		2,017,148					2,017,148	0.01%
	<b>Cash Total</b>							<b>\$2,017,148</b>	<b>0.01%</b>
	<b>Treasuries (Long Duration) Total</b>							<b>\$0</b>	<b>0.00%</b>
ASRS: Phoenix	Enhanced Passive F2		1,872,755,020					1,872,755,020	5.47%
Blackrock: San Francisco	Passive (US Debt Index)		2,234,315,772					2,234,315,772	6.52%
Assetized Cash	US Treasuries		199,697,638					199,697,638	0.58%
	<b>Core Fixed Income Total</b>							<b>\$4,306,768,430</b>	<b>12.58%</b>
	<b>Interest Rate Sensitive</b>							<b>\$4,306,768,430</b>	<b>12.58%</b>
Columbia: Minneapolis	Active	729,789,728						729,789,728	2.13%
JP Morgan: Indianapolis	Active	377,807,773						377,807,773	1.10%
	<b>High Yield Fixed Income Total</b>							<b>\$1,107,597,509</b>	<b>3.23%</b>
	<b>Opportunistic Debt</b>	1,300,358,692						<b>\$1,300,358,692</b>	<b>3.80%</b>
	<b>Private Debt Total</b>	3,186,355,865						<b>\$3,186,355,865</b>	<b>9.30%</b>
	<b>Fixed Income Total</b>							<b>\$9,901,080,497</b>	<b>28.91%</b>
								<b>Total Fixed Income (Range: 18% - 35%)</b>	<b>25.00%</b>
LSV: Chicago	Active (Value)			619,579,556				619,579,556	1.81%
ASRS: Phoenix	Passive E2				4,623,452,125			4,623,452,125	13.50%
ASRS: Phoenix	Enhanced Passive E7				433,255,856			433,255,856	1.27%
ASRS: Phoenix	Enhanced Passive E8				536,237,184			536,237,184	1.57%
	<b>Large Cap Equity Total</b>							<b>\$6,212,613,485</b>	<b>18.14%</b>
								<b>U.S. Equity Large Cap Policy</b>	<b>20.00%</b>
Wellington: Boston	Active (Core)			207,909,648				207,909,648	0.61%
ASRS: Phoenix	Passive E3 (Growth)				320,335,137			320,335,137	0.94%
ASRS: Phoenix	Passive E4 (Value)				327,826,593			327,826,593	0.96%
	<b>Mid Cap Equity Total</b>							<b>\$856,071,378</b>	<b>2.50%</b>
								<b>U.S. Equity Mid Cap Policy</b>	<b>3.00%</b>
TimesSquare: New York	Active (Growth)			336,152,511				336,152,511	0.98%
DFA: Santa Monica	Active (Value)			266,267,652				266,267,652	0.78%
ASRS: Phoenix	Passive E6				357,025,912			357,025,912	1.04%
	<b>Small Cap Equity Total</b>							<b>\$959,446,075</b>	<b>2.80%</b>
	<b>U.S. Equity Total</b>							<b>\$8,028,130,938</b>	<b>23.44%</b>
								<b>U.S. Equity (Range: 16% - 36%)</b>	<b>26.00%</b>
Brandes: San Diego	Active (EAFE)			558,591,354				558,591,354	1.63%
American Century	Active (EAFE)			514,476,768				514,476,768	1.50%
Trinity Street	Active (EAFE)			309,900,725				309,900,725	0.90%
Thompson Siegel Walmsley	Active (EAFE)			294,540,302				294,540,302	0.86%
Blackrock: San Francisco	Passive (EAFE)				3,938,805,259			3,938,805,259	11.50%
	<b>Large Cap Developed Non-US Equity Total</b>							<b>\$5,616,831,293</b>	<b>16.40%</b>
								<b>Large Cap Developed Policy</b>	<b>17.00%</b>
AQR: Greenwich	Active (EAFE SC)			95,575,887				95,575,887	0.28%
DFA: Santa Monica	Active (EAFE SC)			107,301,765				107,301,765	0.31%
Franklin Templeton: San Mateo	Active (EAFE SC)			102,142,952				102,142,952	0.30%
Blackrock: San Francisco	Passive (EAFE SC)				124,944,952			124,944,952	0.36%
	<b>Small Cap Developed Non-US Equity Total</b>							<b>\$429,967,921</b>	<b>1.26%</b>
								<b>Small Cap Developed Policy</b>	<b>2.00%</b>
William Blair: Chicago	Active (EM)			464,940,704				464,940,704	1.36%
Eaton Vance: Boston	Active (EM)			283,746,123				283,746,123	0.83%
LSV: Chicago	Active (EM)			123,442,129				123,442,129	0.36%

## Investment Report

								<b>Emerging markets Policy</b>	<b>3.00%</b>
								<b>\$7,292,816,254</b>	<b>21.30%</b>
								<b>Non-US Equity (Range: 14% - 34%)</b>	<b>24.00%</b>

# Asset Allocation (Continued)

William Blair: Chicago	Active (EM)			464,940,704				464,940,704	1.36%
Eaton Vance: Boston	Active (EM)			283,746,123				283,746,123	0.83%
LSV: Chicago	Active (EM)			123,442,129				123,442,129	0.36%
Blackrock: San Francisco	Passive (EM)				373,888,085			373,888,085	1.09%
	<b>Emerging Markets Equity Total</b>							<b>\$1,246,017,040</b>	<b>3.64%</b>
	<b>Non-US Equity Total</b>							<b>\$7,292,816,254</b>	<b>21.30%</b>
								<b>Non-US Equity (Range: 14% - 34%)</b>	<b>24.00%</b>
ASRS: Phoenix	Risk Factor Portfolio			601,960,808				601,960,808	1.76%
Total Equity Transition	ASRS Transition			1,412,641				1,412,641	0.00%
	<b>Public Equity Total</b>							<b>\$15,924,320,641</b>	<b>46.50%</b>
	<b>Private Equity Total</b>			2,804,882,446				<b>\$2,804,882,446</b>	<b>8.19%</b>
								<b>Private Equity (Range: 6% - 10%)</b>	<b>8.00%</b>
	<b>Private Opportunistic Equity</b>			308,068,289				<b>\$308,068,289</b>	<b>0.90%</b>
								<b>Private Opportunistic Equity Policy:</b>	<b>0.00%</b>
	<b>Public Opportunistic Equity</b>			148,394,898				<b>\$148,394,898</b>	<b>0.43%</b>
								<b>Public Opportunistic Equity Policy:</b>	<b>0.00%</b>
	<b>Equity Total</b>							<b>\$19,185,666,274</b>	<b>56.02%</b>
								<b>Total Equity (Range: 48% - 65%)</b>	<b>58.00%</b>
Gresham: New York	<b>Commodities Total</b>					412,172,122		412,172,122	1.20%
								<b>\$412,172,122</b>	<b>1.20%</b>
								<b>Commodities (Range: 0% - 4%)</b>	<b>2.00%</b>
	<b>Real Estate Total</b>					3,142,577,642		<b>\$3,142,577,642</b>	<b>9.18%</b>
								<b>Real Estate (Range: 8% - 12%)</b>	<b>10.00%</b>
	<b>Infrastructure Total</b>					335,794,042		<b>\$335,794,042</b>	<b>0.98%</b>
								<b>Infrastructure (Range: 0% - 3%)</b>	<b>0.00%</b>
	<b>Farmland &amp; Timber Total</b>					188,959,819		<b>\$188,959,819</b>	<b>0.55%</b>
								<b>Farmland &amp; Timber (Range: 0% - 3%)</b>	<b>0.00%</b>
	<b>Inflation Linked Total</b>							<b>\$4,079,503,624</b>	<b>11.91%</b>
								<b>Inflation Linked (Range: 10% - 16%)</b>	<b>12.00%</b>
Bridgewater	<b>Multi-Asset Class Strategies</b>						1,077,303,041	1,077,303,041	3.15%
								1,077,303,041	3.15%
								<b>Multi-Asset Class (Range: 0% - 12%)</b>	<b>5.00%</b>
	<b>TOTAL Amounts</b>	<b>\$5,594,312,067</b>	<b>\$4,308,785,578</b>	<b>\$7,546,099,303</b>	<b>\$11,639,566,971</b>	<b>\$4,079,503,624</b>	<b>\$1,077,303,041</b>	<b>\$34,245,570,584</b>	<b>100.00%</b>
	<b>TOTAL Percent</b>	<b>16.34%</b>	<b>12.58%</b>	<b>22.04%</b>	<b>33.99%</b>	<b>11.91%</b>	<b>3.15%</b>		

# Asset Allocation (Continued)

Asset Class	Actual Portfolio	SAAP		Interim SAA		Actual - Interim SAA		Policy Band check Actual - Adj Policy
		Target	Range	Adj Policy	Range	% diff	\$ diff	
Tactical Cash	0.00%	0%	(0-3%)	0.00%	(0-3%)	0.00%	0	
Cash	0.01%	0%		0.00%		0.01%	2,017,148	
<b>Total Cash</b>	<b>0.01%</b>	<b>0%</b>	<b>(0-3%)</b>	<b>0.00%</b>	<b>(0-3%)</b>	<b>0.01%</b>	<b>\$2,017,147.86</b>	
Interest Rate Sensitive	12.58%	11%		11.76%		0.82%	280,480,966	
High Yield	3.23%	4%		4.19%		-0.95%	-\$325,745,632	
Opportunistic Debt	3.80%	0%		0.00%		3.80%	\$1,300,358,692	
Private Debt	9.30%	10%	(8-12%)	9.30%	(7-11%)	0.00%	\$0	
<b>Total Fixed Income</b>	<b>28.91%</b>	<b>25%</b>	<b>(18-35%)</b>	<b>25.25%</b>	<b>(18-35%)</b>	<b>3.66%</b>	<b>\$1,255,094,026</b>	<b>OK</b>
Large Cap	18.14%	20%		18.79%		-0.65%	-\$222,060,381	
Mid Cap	2.50%	3%		2.77%		-0.27%	-\$93,040,834	
Small Cap	2.80%	3%		3.00%		-0.20%	-\$67,921,043	
<b>US Equity</b>	<b>23.44%</b>	<b>26%</b>	<b>(16-36%)</b>	<b>24.56%</b>	<b>(15-35%)</b>	<b>-1.12%</b>	<b>-\$383,022,258</b>	<b>OK</b>
Developed Large Cap	16.40%	17%		17.24%		-0.84%	-\$285,983,416	
Developed Small Cap	1.26%	2%		2.00%		-0.74%	-\$254,943,491	
Emerging Markets	3.64%	5%		5.00%		-1.36%	-\$466,261,489	
<b>Non-US Equity</b>	<b>21.30%</b>	<b>24%</b>	<b>(14-34%)</b>	<b>24.24%</b>	<b>(14-34%)</b>	<b>-2.94%</b>	<b>-\$1,007,188,397</b>	<b>OK</b>
Total Equity Transition	0.00%	0%		0.00%		0.00%	\$0	
Risk Factors	1.76%	0%		1.76%		0.00%	\$0	
<b>Total Public Equity</b>	<b>46.50%</b>			<b>1.76%</b>		<b>0.00%</b>	<b>\$0</b>	
Private Equity	8.19%	8%		8.00%	(6-10%)	0.19%	\$65,236,799	<b>OK</b>
Private Opportunistic Equity	0.90%	0%		0.00%		0.90%	\$308,068,289	
Public Opportunistic Equity	0.43%	0%		0.00%		0.43%	\$148,394,898	
<b>Total Equity</b>	<b>56.02%</b>	<b>58%</b>	<b>(48-65%)</b>	<b>58.56%</b>	<b>(48-65%)</b>	<b>-2.54%</b>	<b>-\$868,510,668</b>	<b>OK</b>
Commodities	1.20%	2%	(0-4%)	2.02%	(0-4%)	-0.81%	-\$278,378,878	<b>OK</b>
Real Estate	9.18%	10%	(8-12%)	9.18%	(7-11%)	0.00%	\$0	<b>OK</b>
Infrastructure	0.98%	0%	(0-3%)	0.00%	(0-3%)	0.98%	\$335,794,042	<b>OK</b>
Farmland & Timber	0.55%	0%	(0-3%)	0.00%	(0-3%)	0.55%	\$188,959,819	<b>OK</b>
Opportunistic I/L	0.00%	0%		0.00%		0.00%	\$0	
<b>Total Inflation Linked</b>	<b>11.91%</b>	<b>12%</b>	<b>(10-14%)</b>	<b>11.19%</b>		<b>0.72%</b>	<b>\$246,374,983</b>	<b>OK</b>
Multi-Asset Strategies	3.15%	5%	(0-12%)	5.00%	(0-12%)	-1.85%	-\$634,975,488	<b>OK</b>
<b>Total</b>	<b>100.00%</b>	<b>100.00%</b>		<b>100.00%</b>		<b>0.00%</b>	<b>\$0</b>	

Internally Managed Portfolios:	
\$8,470,887,826	25%

\*Interim SAA includes a proration of unfunded Private Equity, Private Debt, and Real Estate  
\*\*Private Equity is prorated to domestic equity; Real Estate is prorated to equity, commodities, and fixed income; Private Debt is prorated to Interest Rate Sensitive and High Yield

**Opportunistic definitions:**

An investment in a category that is not included in the ASRS Asset Allocation policy and represents an investment opportunity that is tactical in nature.  
Opportunistic investments have a 0% target (0%-10% range), regardless of asset class.

<b>Total Opportunistic</b>		
Opportunistic Debt	\$1,300,358,692	3.8%
Private Opportunistic Equity	\$308,068,289	0.9%
Public Opportunistic Equity	\$148,394,898	0.4%
Opportunistic IL	\$0	0.0%
	<b>\$1,756,821,879</b>	<b>5.1%</b>

# Public Equity Performance

## Public Equity Performance

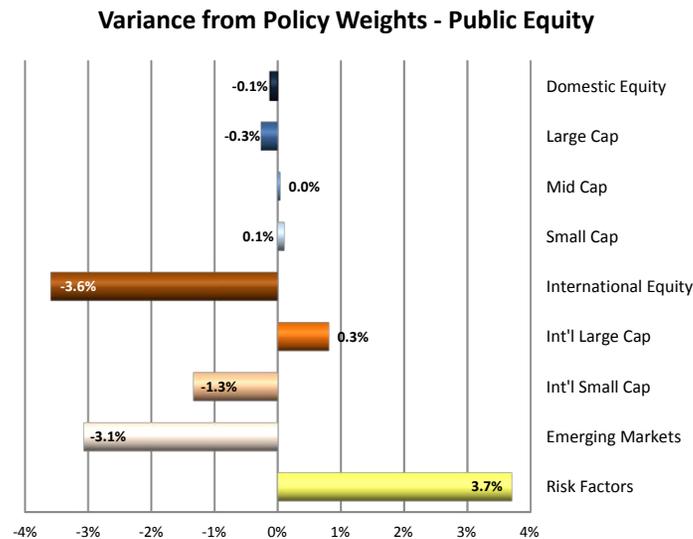
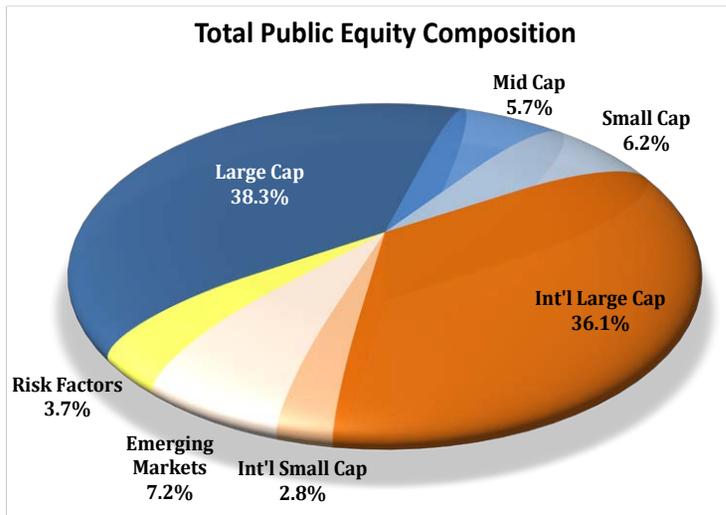
*Investment Management Division*

*Performance through September 30, 2016*

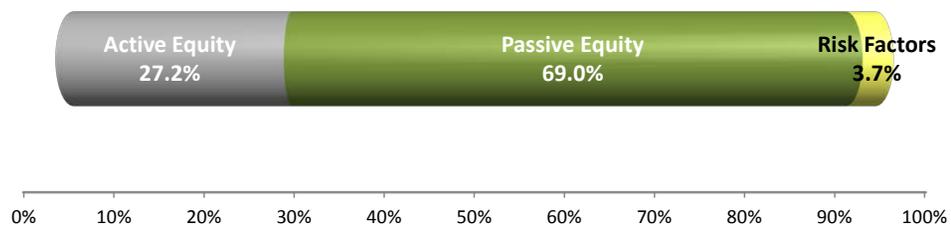
### Contents

Total Public Equity Snapshot . . . . .	2
Total Public Equity Performance . . . . .	3
Public Equity Trailing Return Performance . . . . .	4
Public Equity Decomposition of Excess Return . . . . .	5
Domestic Equity Performance . . . . .	7
Domestic Equity Trailing Returns . . . . .	8
Domestic Equity Decomposition of Excess Return . . . . .	9
International Equity Performance . . . . .	10
International Equity Trailing Returns . . . . .	11
International Equity Decomposition of Excess Return . . . . .	12

# Public Equity Performance (Continued)



### Active/Passive Composition

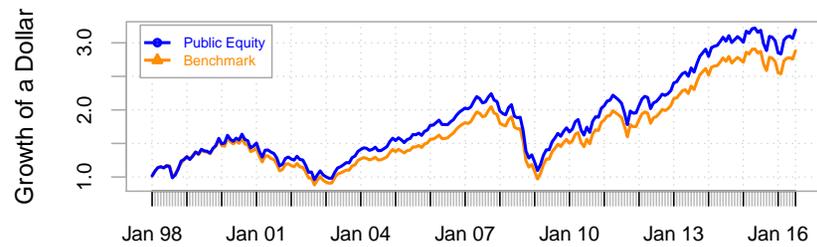


\*All sum differences are due to rounding

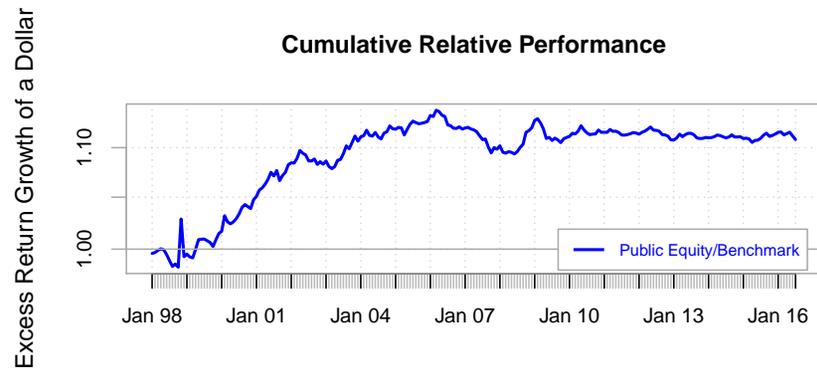
# Public Equity Performance (Continued)

## Total Public Equity Performance

Cumulative Performance

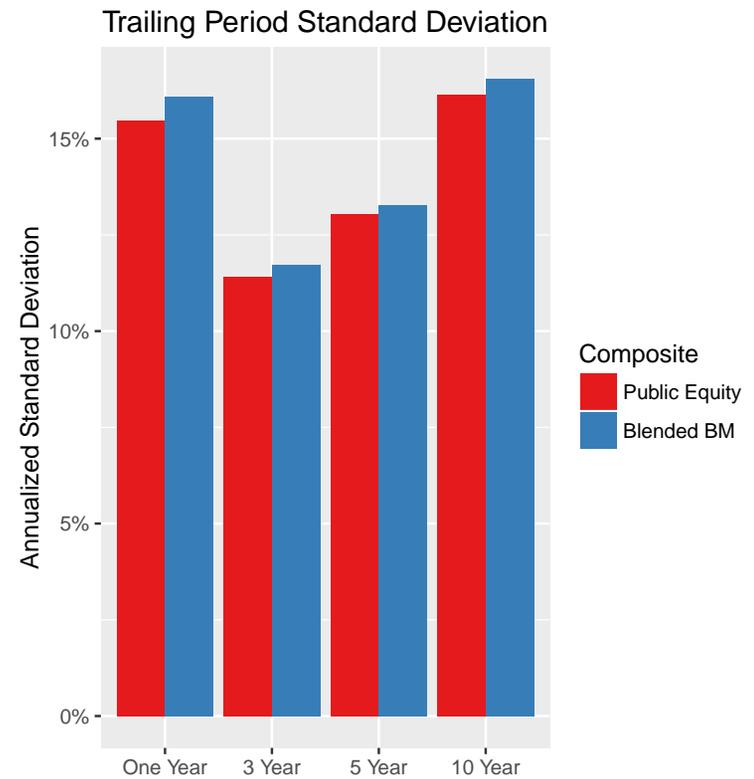


Cumulative Relative Performance



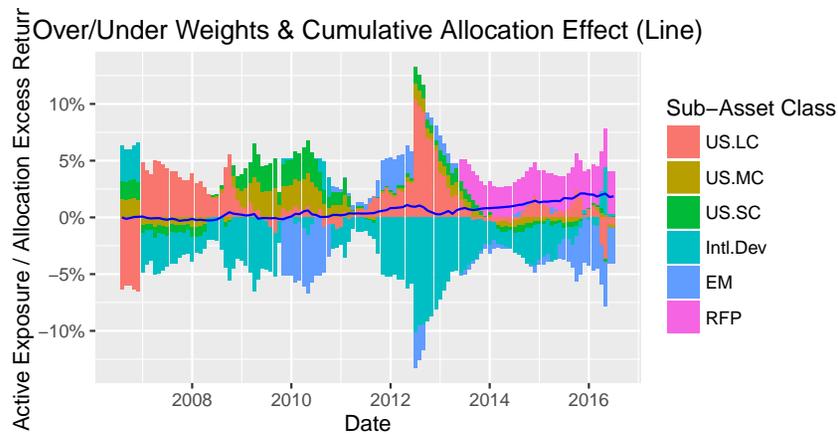
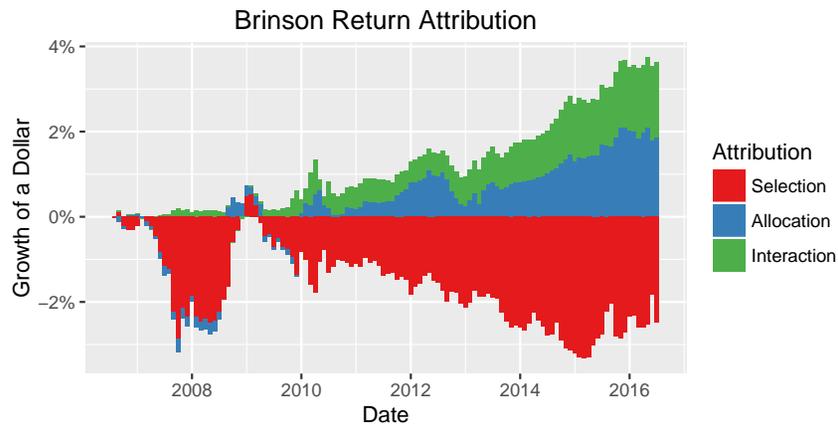
# Public Equity Performance (Continued)

Public Equity Trailing Return Performance

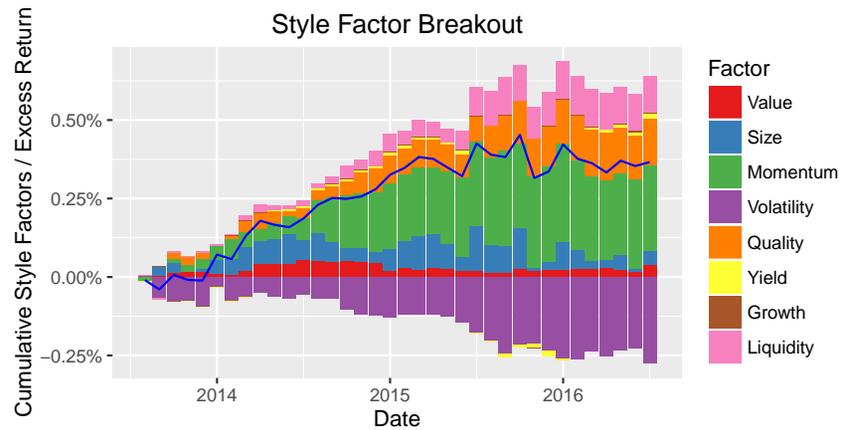
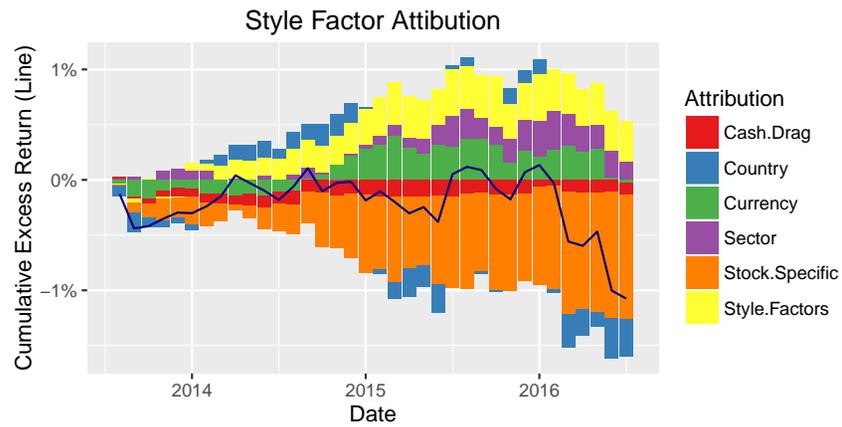


# Public Equity Performance (Continued)

Public Equity Decomposition of Excess Return



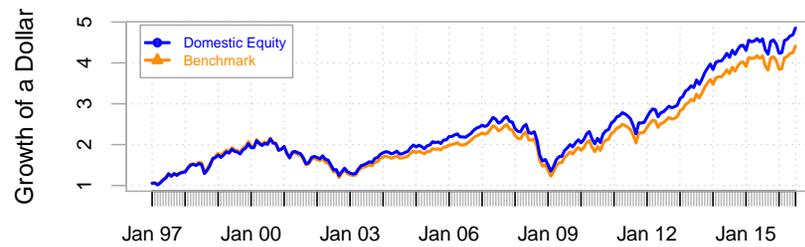
# Public Equity Performance (Continued)



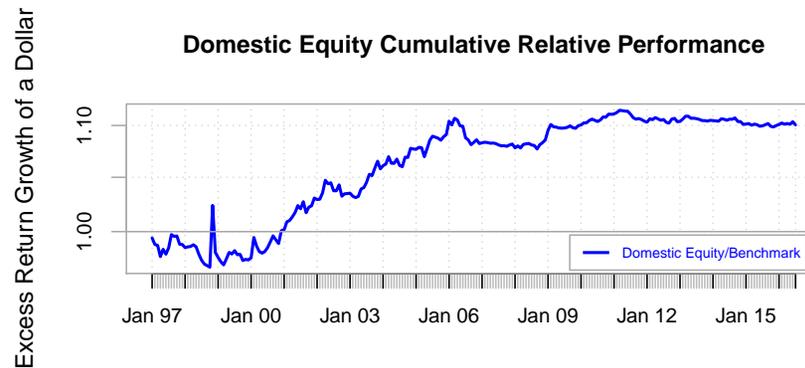
# Public Equity Performance (Continued)

## Domestic Equity Performance

Domestic Equity Cumulative Performance

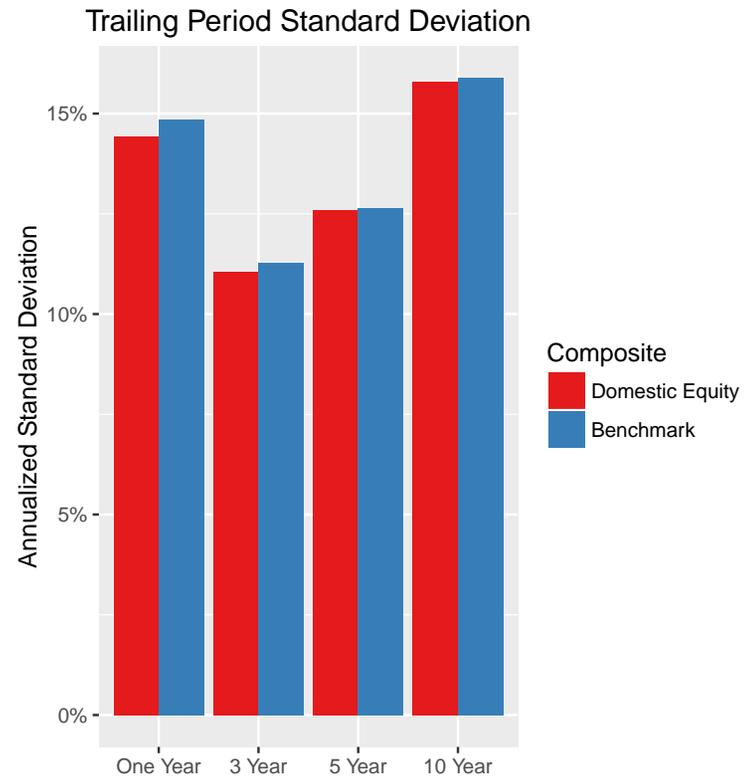
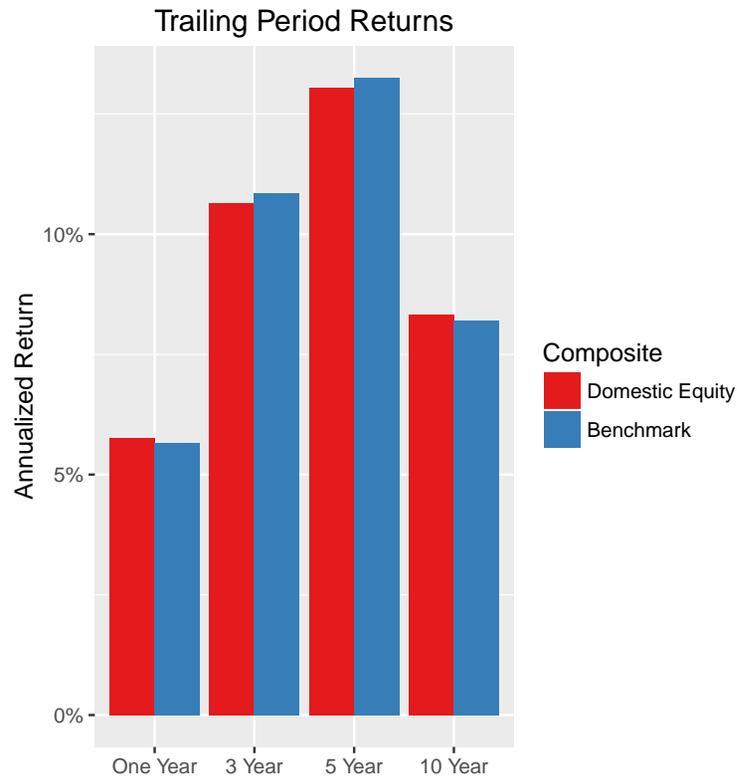


Domestic Equity Cumulative Relative Performance



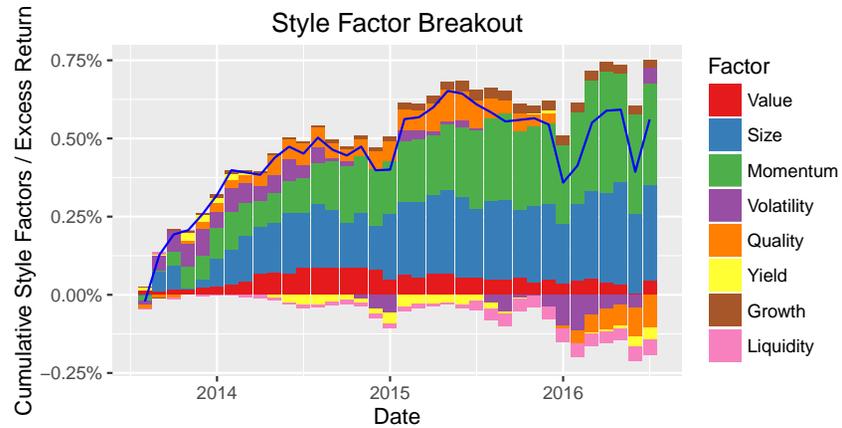
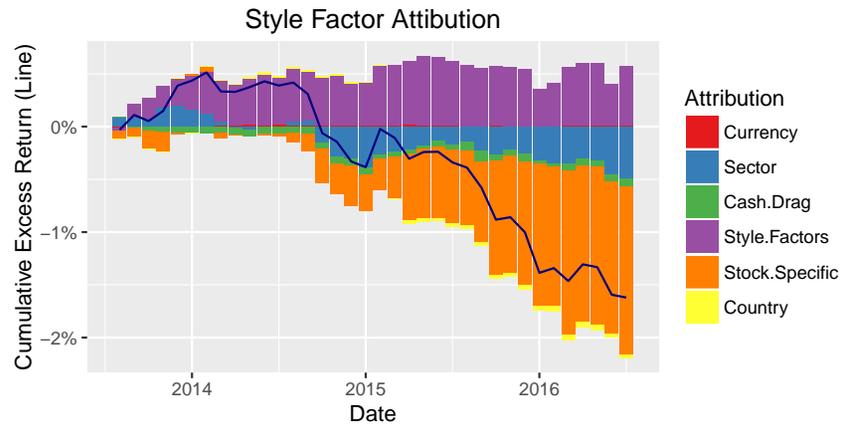
# Public Equity Performance (Continued)

Domestic Equity Trailing Returns



# Public Equity Performance (Continued)

Domestic Equity Decomposition of Excess Return



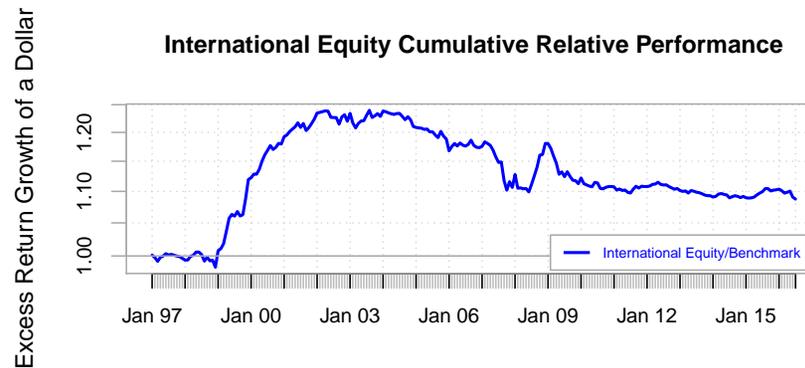
# Public Equity Performance (Continued)

## International Equity Performance

International Equity Cumulative Performance

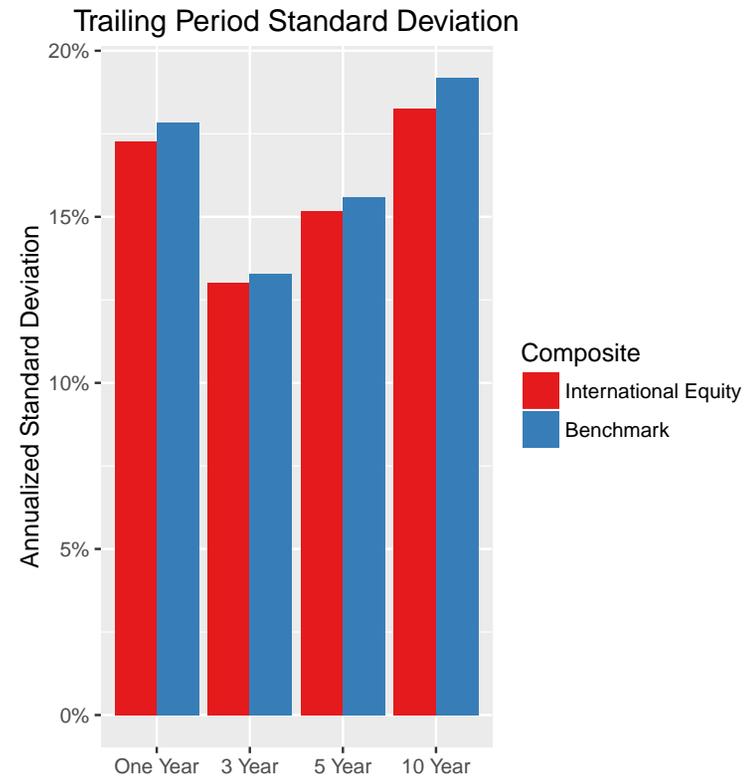
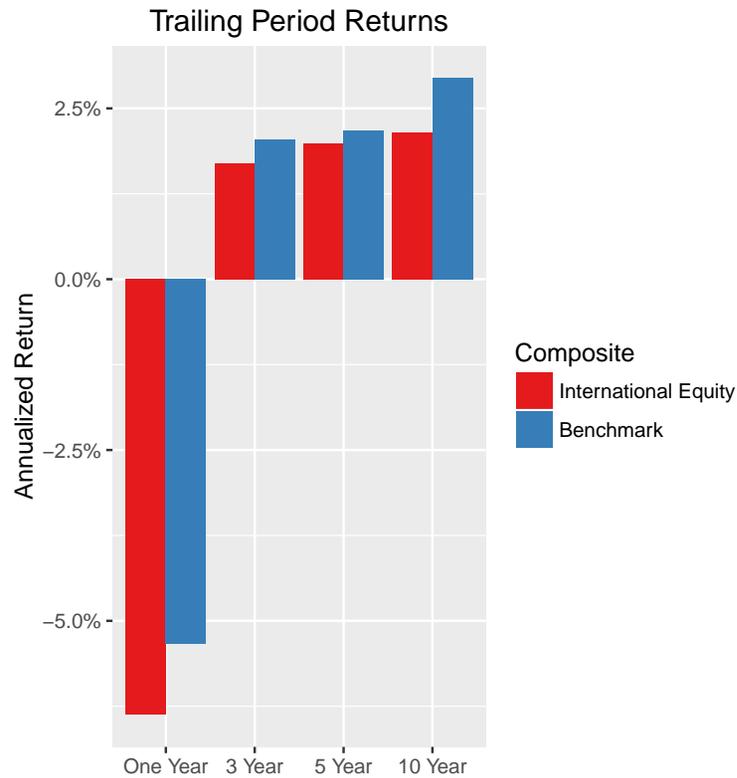


International Equity Cumulative Relative Performance



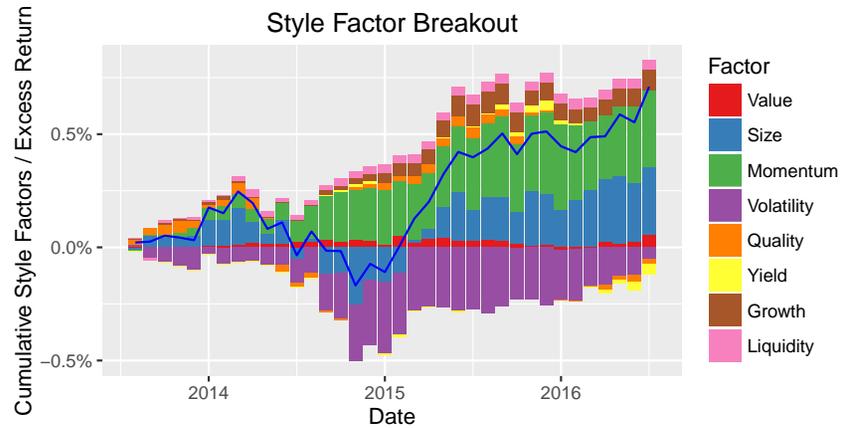
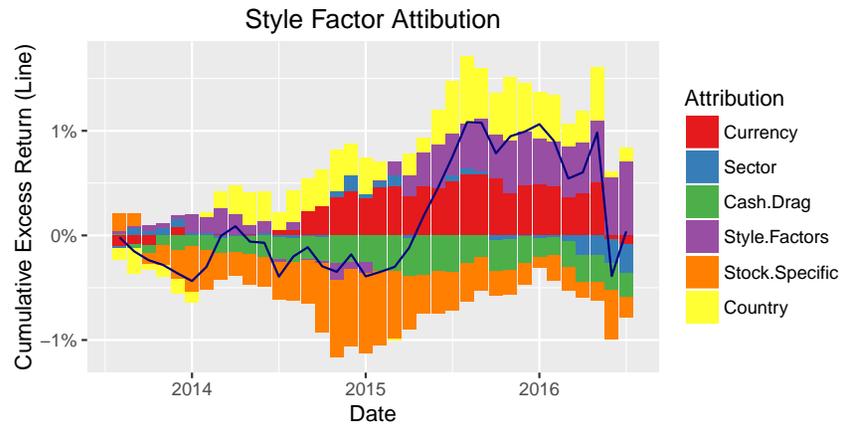
# Public Equity Performance (Continued)

International Equity Trailing Returns



# Public Equity Performance (Continued)

## International Equity Decomposition of Excess Return



# Total Public Equity Returns as of September 30, 2016

## Arizona State Retirement System

### Total Domestic and International Equity Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total Domestic and International Equity</b>	<b>16,389,461,963</b>	<b>47.48</b>	<b>0.66</b>	<b>5.11</b>	<b>6.37</b>	<b>11.74</b>	<b>6.18</b>	<b>12.59</b>	<b>5.67</b>	<b>6.44</b>	<b>Jan-98</b>
ASRS Custom Total Equity Benchmark			<u>0.67</u>	<u>5.65</u>	<u>7.10</u>	<u>12.60</u>	<u>6.29</u>	<u>12.74</u>	<u>5.80</u>	<u>5.87</u>	Jan-98
Over/Under			-0.01	-0.54	-0.73	-0.86	-0.11	-0.15	-0.13	0.57	
Equity Risk Factor Portfolio	602,333,128	1.74	0.28	3.41	7.17	13.93	11.54	--	--	11.56	Jun-13
ASRS Custom Total Equity Benchmark			<u>0.67</u>	<u>5.65</u>	<u>7.10</u>	<u>12.60</u>	<u>6.29</u>	<u>12.74</u>	<u>5.80</u>	<u>7.33</u>	Jun-13
Over/Under			-0.39	-2.24	0.07	1.33	5.25			4.23	
<b>Total Domestic and Int'l Equity ex-Equity Risk Factor Portfolio</b>	<b>15,787,128,836</b>	<b>45.73</b>	<b>0.68</b>	<b>5.18</b>	<b>6.35</b>	<b>11.68</b>	<b>6.06</b>	<b>12.55</b>	<b>5.66</b>	<b>6.43</b>	<b>Jan-98</b>
ASRS Custom Total Equity Benchmark			<u>0.67</u>	<u>5.65</u>	<u>7.10</u>	<u>12.60</u>	<u>6.29</u>	<u>12.74</u>	<u>5.80</u>	<u>5.87</u>	Jan-98
Over/Under			0.01	-0.47	-0.75	-0.92	-0.23	-0.19	-0.14	0.56	

1. Total Domestic and International Equity market value includes \$2,083,261 remaining in terminated manager and transition accounts.

2. Performance of ASRS Total Domestic and International Equity includes the performance of the ASRS Domestic Equity and ASRS International Equity asset classes and the Equity Risk Factor Portfolio with an inception date of 6/1/2013. NEPC began calculating Total Domestic and International Equity performance in January 2009.

Monthly performance data from January 1998 - December 2008 was provided by State Street.

Note: Performance is based on net of fee performance data.

Composition of ASRS Custom Total Equity Benchmark can be found in the appendix.



September 30, 2016

# Domestic Equity Returns as of September 30, 2016

## Arizona State Retirement System

### Domestic and Large Cap Equity Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total Domestic Equity</b>	<b>8,318,965,309</b>	<b>24.10</b>	<b>0.07</b>	<b>3.82</b>	<b>8.95</b>	<b>15.46</b>	<b>10.48</b>	<b>16.53</b>	<b>7.89</b>	<b>11.13</b>	<b>Jul-75</b>
ASRS Custom Domestic Equity Benchmark			0.02	4.27	9.04	15.75	10.68	16.69	7.71	11.21	Jul-75
Over/Under			0.05	-0.45	-0.09	-0.29	-0.20	-0.16	0.18	-0.08	
<b>Total Large Cap Equity</b>	<b>6,221,844,138</b>	<b>18.02</b>	<b>-0.05</b>	<b>3.34</b>	<b>8.36</b>	<b>15.80</b>	<b>11.20</b>	<b>16.26</b>	<b>7.28</b>	<b>7.92</b>	<b>Jul-02</b>
S&P 500			0.02	3.85	7.84	15.43	11.16	16.37	7.24	7.84	Jul-02
Over/Under			-0.07	-0.51	0.52	0.37	0.04	-0.11	0.04	0.08	
<b>Active Large Cap Equity</b>											
LSV	584,923,388	1.69	-0.28	4.69	6.15	10.90	8.30	17.06	6.80	10.26	Jan-03
S&P/Citigroup 500 Value			-0.37	2.94	9.36	15.98	9.34	15.87	5.53	8.58	Jan-03
Over/Under			0.09	1.75	-3.21	-5.08	-1.04	1.19	1.27	1.68	
<b>Enhanced/Passive Large Cap Equity</b>											
Internally Managed E2	4,640,314,155	13.44	0.03	3.88	7.84	15.49	11.16	16.36	7.26	7.60	Apr-97
S&P 500			0.02	3.85	7.84	15.43	11.16	16.37	7.24	7.53	Apr-97
Over/Under			0.01	0.03	0.00	0.06	0.00	-0.01	0.02	0.07	
Internally Managed E7	440,618,040	1.28	0.08	2.20	13.15	22.20	12.55	--	--	13.58	Aug-12
MSCI USA High Dividend Yield Index			0.08	2.19	13.24	22.30	12.69	16.06	8.51	13.61	Aug-12
Over/Under			0.00	0.01	-0.09	-0.10	-0.14	--	--	-0.03	
Internally Managed E8	555,988,554	1.61	-0.62	-1.11	10.35	17.39	13.53	--	--	13.89	Aug-12
MSCI USA Minimum Volatility Index			-0.65	-1.15	10.50	17.47	13.50	15.97	8.82	13.63	Aug-12
Over/Under			0.03	0.04	-0.15	-0.08	0.03	--	--	0.26	

1. Total Domestic Equity includes \$86,853 in terminated manager and transition accounts

2. In mid-December, 2005 the S&P/Citigroup style indices replaced the S&P/Barra style indices. Returns are a blend of S&P/Barra indices prior to mid-December 2005 and S&P/Citigroup indices going forward.

Note: Performance is reported net of fees.

Composition of ASRS Custom Domestic Equity Benchmark can be found in the appendix.



September 30, 2016

# Domestic Equity Returns as of September 30, 2016

## Arizona State Retirement System

### Mid Cap Equity Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total Mid Cap Equity</b>	<b>929,276,068</b>	<b>2.69</b>	<b>-0.10</b>	<b>4.27</b>	<b>11.04</b>	<b>13.88</b>	<b>9.28</b>	<b>16.61</b>	<b>9.09</b>	<b>9.95</b>	<b>Jul-02</b>
S&P 400 MidCap			<u>-0.64</u>	<u>4.14</u>	<u>12.40</u>	<u>15.33</u>	<u>9.35</u>	<u>16.50</u>	<u>9.11</u>	<u>9.96</u>	<u>Jul-02</u>
Over/Under			0.54	0.13	-1.36	-1.45	-0.07	0.11	-0.02	-0.01	
<b>Active Mid Cap Equity</b>											
Wellington	292,661,840	0.85	1.09	4.37	7.30	10.13	9.70	17.51	9.77	10.82	Jul-02
S&P 400 MidCap			<u>-0.64</u>	<u>4.14</u>	<u>12.40</u>	<u>15.33</u>	<u>9.35</u>	<u>16.50</u>	<u>9.11</u>	<u>9.96</u>	<u>Jul-02</u>
Over/Under			1.73	0.23	-5.10	-5.20	0.35	1.01	0.66	0.86	
<b>Passive Mid Cap Equity</b>											
Internally Managed E3	320,897,219	0.93	-1.30	3.81	9.89	13.01	9.31	15.78	10.45	8.52	Dec-00
S&P/Citigroup 400 Growth			<u>-1.36</u>	<u>3.73</u>	<u>9.59</u>	<u>12.78</u>	<u>9.26</u>	<u>15.60</u>	<u>9.87</u>	<u>8.02</u>	<u>Dec-00</u>
Over/Under			0.06	0.08	0.30	0.23	0.05	0.18	0.58	0.50	
Internally Managed E4	315,717,010	0.91	0.05	4.64	15.36	17.90	9.23	17.24	8.56	10.01	Jul-02
S&P/Citigroup 400 Value			<u>0.02</u>	<u>4.52</u>	<u>15.24</u>	<u>17.79</u>	<u>9.28</u>	<u>17.33</u>	<u>8.29</u>	<u>9.83</u>	<u>Jul-02</u>
Over/Under			0.03	0.12	0.12	0.11	-0.05	-0.09	0.27	0.18	

1. In mid-December, 2005 the S&P/Citigroup style indices replaced the S&P/Barras style indices. Returns are a blend of S&P/Barras indices prior to mid-December 2005 and S&P/Citigroup indices going forward.

Note: Performance is reported net of fees.



September 30, 2016

# Domestic Equity Returns as of September 30, 2016

## Arizona State Retirement System

### Small Cap Equity Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total Small Cap Equity</b>	<b>1,014,989,968</b>	<b>2.94</b>	<b>0.77</b>	<b>6.35</b>	<b>10.05</b>	<b>13.46</b>	<b>7.15</b>	<b>16.89</b>	<b>8.62</b>	<b>10.05</b>	<b>Jul-02</b>
ASRS Custom Small Cap Equity Blended Benchmark			0.64	7.20	13.88	18.12	9.04	17.86	8.81	9.91	Jul-02
Over/Under			0.13	-0.85	-3.83	-4.66	-1.89	-0.97	-0.19	0.14	
<b>Active Small Cap Equity</b>											
TimesSquare	377,703,277	1.09	0.44	5.32	5.97	9.82	6.59	17.14	10.60	11.06	Apr-05
Times Square Blended Benchmark			1.44	9.22	7.48	12.12	7.44	16.21	8.83	9.13	Apr-05
Over/Under			-1.00	-3.90	-1.51	-2.30	-0.85	0.93	1.77	1.93	
<b>Active Small Cap Equity</b>											
DFA - US Small Cap	292,240,320	0.85	1.36	6.63	11.44	13.20	6.16	16.57	7.30	11.24	Sep-98
DFA Blended Benchmark			0.83	7.23	16.62	20.94	8.66	18.09	7.83	10.75	Sep-98
Over/Under			0.53	-0.60	-5.18	-7.74	-2.50	-1.52	-0.53	0.49	
<b>Passive Small Cap Equity</b>											
Internally Managed E6	345,046,371	1.00	0.63	7.24	13.53	17.81	9.00	17.82	--	8.22	Feb-07
S&P 600 SmallCap			0.64	7.20	13.88	18.12	9.04	17.86	8.71	7.94	Feb-07
Over/Under			-0.01	0.04	-0.35	-0.31	-0.04	-0.04		0.28	

Note: Performance is reported net of fees.

Composition of ASRS Custom Small Cap Equity Blended Benchmark, Times Square Blended Benchmark and DFA Blended Benchmark can be found in the appendix.

# Domestic Equity Returns as of September 30, 2016

## Arizona State Retirement System

### Public Opportunistic Equity Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total Public Opportunistic Equity</b>	<b>152,768,283</b>	<b>0.44</b>	<b>0.44</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>0.44</b>	<b>Sep-16</b>
ASRS Custom Domestic Equity Benchmark			0.02	4.27	9.04	15.75	10.68	16.69	7.71	0.02	Sep-16
Over/Under			0.42							0.42	
Tortoise Capital Advisors	152,768,283	0.44	0.44	--	--	--	--	--	--	0.44	Sep-16
Alerian MLP Index			1.85	1.07	15.94	12.74	-4.82	4.96	9.01	1.85	Sep-16
Over/Under			-1.41							-1.41	

1. Tortoise Capital Advisors was funded in late August 2016. Inception date for performance reporting purposes is September 1, 2016.

Note: Performance is reported net of fees.

Composition of ASRS Custom Domestic Equity Benchmark can be found in the appendix.

# International Equity Returns as of September 30, 2016

## Arizona State Retirement System

### International Developed Markets Equity Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total International Equity</b>	<b>7,466,704,730</b>	<b>21.63</b>	<b>1.37</b>	<b>6.75</b>	<b>3.44</b>	<b>7.38</b>	<b>0.42</b>	<b>6.43</b>	<b>1.97</b>	<b>5.78</b>	<b>Apr-87</b>
ASRS Custom Int'l Equity Benchmark			<u>1.38</u>	<u>7.16</u>	<u>4.96</u>	<u>9.18</u>	<u>0.69</u>	<u>6.83</u>	<u>2.85</u>	<u>5.51</u>	Apr-87
Over/Under			-0.01	-0.41	-1.52	-1.80	-0.27	-0.40	-0.88	0.27	
<b>Total International Developed Markets Equity</b>	<b>6,309,039,554</b>	<b>18.28</b>	<b>1.40</b>	<b>6.58</b>	<b>1.76</b>	<b>6.32</b>	<b>0.89</b>	<b>7.83</b>	<b>2.69</b>	<b>6.03</b>	<b>Apr-87</b>
ASRS Custom Int'l Developed Markets Equity Benchmark			<u>1.42</u>	<u>6.68</u>	<u>2.11</u>	<u>7.15</u>	<u>1.02</u>	<u>8.08</u>	<u>3.60</u>	<u>5.77</u>	Apr-87
Over/Under			-0.02	-0.10	-0.35	-0.83	-0.13	-0.25	-0.91	0.26	
<b>Active Large Cap International Equity</b>											
Brandes	568,514,530	1.65	0.93	5.74	1.16	4.40	1.49	7.74	1.98	8.17	Oct-98
Brandes Custom Benchmark			<u>1.23</u>	<u>6.43</u>	<u>1.73</u>	<u>6.52</u>	<u>0.49</u>	<u>7.60</u>	<u>3.17</u>	<u>5.53</u>	Oct-98
Over/Under			-0.30	-0.69	-0.57	-2.12	1.00	0.14	-1.19	2.64	
American Century	553,896,399	1.60	2.77	5.65	-1.69	2.64	--	--	--	-2.52	Jul-14
MSCI EAFE			<u>1.23</u>	<u>6.43</u>	<u>1.73</u>	<u>6.52</u>	<u>0.49</u>	<u>7.59</u>	<u>2.16</u>	<u>-3.84</u>	Jul-14
Over/Under			1.54	-0.78	-3.42	-3.88				1.32	
Trinity Street	324,664,725	0.94	0.28	7.96	0.35	3.87	--	--	--	-3.62	Jul-14
MSCI EAFE			<u>1.23</u>	<u>6.43</u>	<u>1.73</u>	<u>6.52</u>	<u>0.49</u>	<u>7.59</u>	<u>2.16</u>	<u>-3.84</u>	Jul-14
Over/Under			-0.95	1.53	-1.38	-2.65				0.22	
TS&W International	304,610,479	0.88	1.11	8.31	2.09	7.00	--	--	--	-2.15	Jul-14
MSCI EAFE			<u>1.23</u>	<u>6.43</u>	<u>1.73</u>	<u>6.52</u>	<u>0.49</u>	<u>7.59</u>	<u>2.16</u>	<u>-3.84</u>	Jul-14
Over/Under			-0.12	1.88	0.36	0.48				1.69	

1. Total International Equity market value includes \$537,611 in terminated manager and transition accounts.

2. Total International Developed Markets Equity market value includes \$195,332 in terminated manager accounts.

3. American Century, Trinity Street and TS&W were funded in mid-June 2014. Inception date for performance reporting purposes is July 1, 2014.

Note: Performance is reported net of fees.

Composition of ASRS Custom Int'l Equity Benchmark, ASRS Custom Int'l Developed Markets Equity Benchmark, and Brandes Custom Benchmark can be found in the appendix.



September 30, 2016

# International Equity Returns as of September 30, 2016

## Arizona State Retirement System

### International Developed Markets Equity Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Passive Large Cap International Equity</b>											
BlackRock EAFE Equity Index	4,109,259,793	11.90	1.26	6.47	2.08	6.90	0.76	7.69	--	6.99	Jul-09
MSCI EAFE			1.23	6.43	1.73	6.52	0.49	7.59	2.16	6.95	Jul-09
Over/Under			0.03	0.04	0.35	0.38	0.27	0.10		0.04	
<b>Active Small Cap International Equity</b>											
DFA - International Small Cap	109,143,725	0.32	2.73	10.91	6.44	10.11	2.40	9.53	3.38	5.06	Sep-05
MSCI EAFE Small Cap			2.97	8.64	5.19	12.33	5.09	11.22	4.65	5.93	Sep-05
Over/Under			-0.24	2.27	1.25	-2.22	-2.69	-1.69	-1.27	-0.87	
Franklin Templeton	103,583,358	0.30	1.25	5.49	-3.92	-2.54	-1.80	9.01	--	4.99	Apr-11
MSCI EAFE Small Cap			2.97	8.64	5.19	12.33	5.09	11.22	4.65	6.32	Apr-11
Over/Under			-1.72	-3.15	-9.11	-14.87	-6.89	-2.21		-1.33	
AQR Capital	102,333,387	0.30	3.44	8.20	3.11	10.22	6.30	--	--	9.09	Jun-13
MSCI EAFE Small Cap			2.97	8.64	5.19	12.33	5.09	11.22	4.65	8.01	Jun-13
Over/Under			0.47	-0.44	-2.08	-2.11	1.21			1.08	
<b>Passive Small Cap International Equity</b>											
BlackRock EAFE Small Cap Equity Index	132,835,347	0.38	3.11	8.81	5.66	12.84	5.31	11.21	--	10.55	Jun-10
MSCI EAFE Small Cap			2.97	8.64	5.19	12.33	5.09	11.22	4.65	10.57	Jun-10
Over/Under			0.14	0.17	0.47	0.51	0.22	-0.01		-0.02	

Note: Performance is reported net of fees.



September 30, 2016

# International Equity Returns as of September 30, 2016

## Arizona State Retirement System

### International Emerging Markets Equity Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total International Emerging Markets Equity</b>	<b>1,157,325,375</b>	<b>3.35</b>	<b>1.17</b>	<b>7.71</b>	<b>14.92</b>	<b>14.85</b>	<b>-0.64</b>	<b>3.42</b>	<b>--</b>	<b>-0.33</b>	<b>Oct-10</b>
<i>MSCI Emerging Markets</i>			<i>1.29</i>	<i>9.03</i>	<i>16.02</i>	<i>16.78</i>	<i>-0.55</i>	<i>3.18</i>	<i>4.17</i>	<i>-0.28</i>	<i>Oct-10</i>
Over/Under			-0.12	-1.32	-1.10	-1.93	-0.09	0.24		-0.05	
<b>Active Emerging Markets Equity</b>											
Eaton Vance	292,856,242	0.85	0.98	5.56	15.58	13.99	-1.82	2.69	--	-0.65	Dec-10
<i>MSCI Emerging Markets</i>			<i>1.29</i>	<i>9.03</i>	<i>16.02</i>	<i>16.78</i>	<i>-0.55</i>	<i>3.18</i>	<i>4.17</i>	<i>-0.32</i>	<i>Dec-10</i>
Over/Under			-0.31	-3.47	-0.44	-2.79	-1.27	-0.49		-0.33	
LSV Emerging Market	128,164,635	0.37	1.09	11.24	18.52	15.59	-1.17	3.28	--	-0.20	Dec-10
<i>MSCI Emerging Markets</i>			<i>1.29</i>	<i>9.03</i>	<i>16.02</i>	<i>16.78</i>	<i>-0.55</i>	<i>3.18</i>	<i>4.17</i>	<i>-0.32</i>	<i>Dec-10</i>
Over/Under			-0.20	2.21	2.50	-1.19	-0.62	0.10		0.12	
William Blair	389,615,028	1.13	1.24	7.15	12.63	13.92	1.46	5.57	--	1.16	Nov-10
<i>MSCI Emerging Markets</i>			<i>1.29</i>	<i>9.03</i>	<i>16.02</i>	<i>16.78</i>	<i>-0.55</i>	<i>3.18</i>	<i>4.17</i>	<i>-0.76</i>	<i>Nov-10</i>
Over/Under			-0.05	-1.88	-3.39	-2.86	2.01	2.39		1.92	
<b>Passive Emerging Markets Equity</b>											
BlackRock Emerging Markets Equity Index	346,689,470	1.00	1.28	8.93	15.72	16.50	-0.76	2.81	--	-0.65	Oct-10
<i>MSCI Emerging Markets</i>			<i>1.29</i>	<i>9.03</i>	<i>16.02</i>	<i>16.78</i>	<i>-0.55</i>	<i>3.18</i>	<i>4.17</i>	<i>-0.28</i>	<i>Oct-10</i>
Over/Under			-0.01	-0.10	-0.30	-0.28	-0.21	-0.37		-0.37	

Note: Performance is reported net of fees.



September 30, 2016

# Fixed Income Returns as of September 30, 2016

## Arizona State Retirement System

### Fixed Income and Interest Rate Sensitive Fixed Income Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total Public Markets Fixed Income</b>	<b>5,551,306,564</b>	<b>16.08</b>	<b>0.04</b>	<b>1.41</b>	<b>7.81</b>	<b>7.14</b>	<b>4.01</b>	<b>3.39</b>	<b>5.10</b>	<b>8.25</b>	<b>Jul-75</b>
ASRS Custom Public Markets Fixed Income Benchmark			0.14	1.82	8.28	7.24	3.25	2.90	4.64	--	Jul-75
Over/Under			-0.10	-0.41	-0.47	-0.10	0.76	0.49	0.46		
<b>Total Interest Rate Sensitive Fixed Income</b>	<b>4,420,057,549</b>	<b>12.80</b>	<b>-0.09</b>	<b>0.52</b>	<b>6.78</b>	<b>6.11</b>	<b>4.44</b>	<b>3.42</b>	<b>5.07</b>	<b>8.24</b>	<b>Jul-75</b>
Barclays Aggregate			-0.06	0.46	5.80	5.19	4.03	3.08	4.79	--	Jul-75
Over/Under			-0.03	0.06	0.98	0.92	0.41	0.34	0.28		
<b>Core Fixed Income</b>											
BlackRock US Debt Index	2,500,099,552	7.24	-0.05	0.47	5.89	5.28	--	--	--	4.07	May-14
Barclays Aggregate			-0.06	0.46	5.80	5.19	4.03	3.08	4.79	3.93	May-14
Over/Under			0.01	0.01	0.09	0.09				0.14	
Internally Managed F2	1,919,957,639	5.56	-0.10	0.39	5.70	5.10	4.21	3.28	5.04	5.45	Oct-00
Barclays Aggregate			-0.06	0.46	5.80	5.19	4.03	3.08	4.79	5.29	Oct-00
Over/Under			-0.04	-0.07	-0.10	-0.09	0.18	0.20	0.25	0.16	

1. Total Public Markets Fixed Income market value includes \$367 remaining in terminated manager accounts.  
 2. BlackRock US Debt Index was funded in mid-April 2014. Inception date for performance reporting purposes is May 1, 2014.  
 Note: Performance is reported net of fees.  
 Composition of ASRS Custom Public Markets Fixed Income Benchmark can be found in the appendix.

# Fixed Income Returns as of September 30, 2016

## Arizona State Retirement System

### Total High Yield Fixed Income Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total High Yield Fixed Income</b>	<b>1,131,249,015</b>	<b>3.28</b>	<b>0.54</b>	<b>5.01</b>	<b>12.05</b>	<b>11.40</b>	<b>5.78</b>	<b>8.31</b>	<b>--</b>	<b>8.35</b>	<b>Oct-09</b>
Barclays High Yield			<u>0.67</u>	<u>5.55</u>	<u>15.11</u>	<u>12.73</u>	<u>5.28</u>	<u>8.34</u>	<u>7.71</u>	<u>8.75</u>	Oct-09
Over/Under			-0.13	-0.54	-3.06	-1.33	0.50	-0.03		-0.40	
<b>Active High Yield Fixed Income</b>											
Columbia Management	745,283,542	2.16	0.42	4.65	10.96	11.32	6.05	8.70	--	8.70	Oct-09
Barclays High Yield			<u>0.67</u>	<u>5.55</u>	<u>15.11</u>	<u>12.73</u>	<u>5.28</u>	<u>8.34</u>	<u>7.71</u>	<u>8.75</u>	Oct-09
Over/Under			-0.25	-0.90	-4.15	-1.41	0.77	0.36		-0.05	
JP Morgan High Yield	385,965,465	1.12	0.77	5.72	14.21	11.54	5.33	--	--	5.61	Jul-13
Barclays High Yield			<u>0.67</u>	<u>5.55</u>	<u>15.11</u>	<u>12.73</u>	<u>5.28</u>	<u>8.34</u>	<u>7.71</u>	<u>5.60</u>	Jul-13
Over/Under			0.10	0.17	-0.90	-1.19	0.05			0.01	

1. Total High Yield Fixed Income includes \$8 in terminated manager and transition accounts.  
 Note: Performance is reported net of fees.

# Fixed Income and Commodity Returns as of September 30, 2016

## Arizona State Retirement System

### Inflation-Linked Assets Performance Summary

	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total Inflation-Linked Assets</b>	<b>222,389,700</b>	<b>0.64</b>	<b>2.67</b>	<b>-4.00</b>	<b>7.00</b>	<b>-4.62</b>	<b>-13.35</b>	<b>-8.97</b>	<b>--</b>	<b>-5.71</b>	<b>Feb-10</b>
ASRS Custom Inflation-Linked Benchmark			3.13	-3.86	8.87	-2.58	-12.34	-9.37	-2.53	-6.57	Feb-10
Over/Under			-0.46	-0.14	-1.87	-2.04	-1.01	0.40		0.86	
<b>Total Commodities</b>	<b>222,389,700</b>	<b>0.64</b>	<b>2.67</b>	<b>-4.00</b>	<b>7.00</b>	<b>-4.62</b>	<b>-13.35</b>	<b>-8.97</b>	<b>--</b>	<b>-5.83</b>	<b>Sep-10</b>
Bloomberg Commodity Index			3.13	-3.86	8.87	-2.58	-12.34	-9.37	-5.33	-6.69	Sep-10
Over/Under			-0.46	-0.14	-1.87	-2.04	-1.01	0.40		0.86	
Gresham	222,389,700	0.64	2.67	-4.00	7.00	-4.62	-13.35	-8.93	--	-5.57	Sep-10
Bloomberg Commodity Index			3.13	-3.86	8.87	-2.58	-12.34	-9.37	-5.33	-6.69	Sep-10
Over/Under			-0.46	-0.14	-1.87	-2.04	-1.01	0.44		1.12	

Note: Performance is reported net of fees.  
 Composition of ASRS Custom Inflation-Linked Benchmark can be found in the appendix.

# Multi-Asset Class Returns as of September 30, 2016

## Arizona State Retirement System

### Multi-Asset Class Strategies Performance Summary

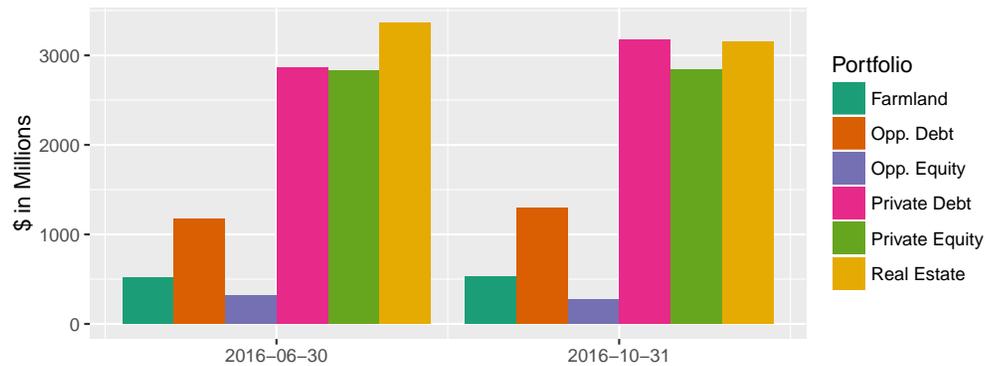
	Market Value (\$)	% of Portfolio	1 Mo (%)	3 Mo (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Return (%)	Since
<b>Total Multi-Asset Class Strategies</b>	<b>1,041,982,275</b>	<b>3.02</b>	<b>0.49</b>	<b>1.17</b>	<b>-6.45</b>	<b>-5.88</b>	<b>0.96</b>	<b>6.67</b>	<b>5.50</b>	<b>6.15</b>	<b>Jan-04</b>
<i>Multi-Asset Class Strategies Custom Benchmark</i>			<i>0.02</i>	<i>0.07</i>	<i>0.19</i>	<i>0.20</i>	<i>3.87</i>	<i>8.60</i>	<i>4.75</i>	<i>5.63</i>	<i>Jan-04</i>
Over/Under			0.47	1.10	-6.64	-6.08	-2.91	-1.93	0.75	0.52	
<b>Bridgewater</b>	<b>1,041,982,275</b>	<b>3.02</b>	<b>0.49</b>	<b>1.17</b>	<b>-6.45</b>	<b>-5.88</b>	<b>2.07</b>	<b>7.63</b>	<b>6.69</b>	<b>7.24</b>	<b>Jan-04</b>
<i>ASRS Bridgewater Custom Benchmark</i>			<i>0.02</i>	<i>0.07</i>	<i>0.19</i>	<i>0.20</i>	<i>4.43</i>	<i>8.95</i>	<i>4.92</i>	<i>5.76</i>	<i>Jan-04</i>
Over/Under			0.47	1.10	-6.64	-6.08	-2.36	-1.32	1.77	1.48	

Note: Performance is reported net of fees.  
 Composition of Multi-Asset Class Strategies Custom Benchmark and ASRS Bridgewater Custom Benchmark can be found in the appendix.

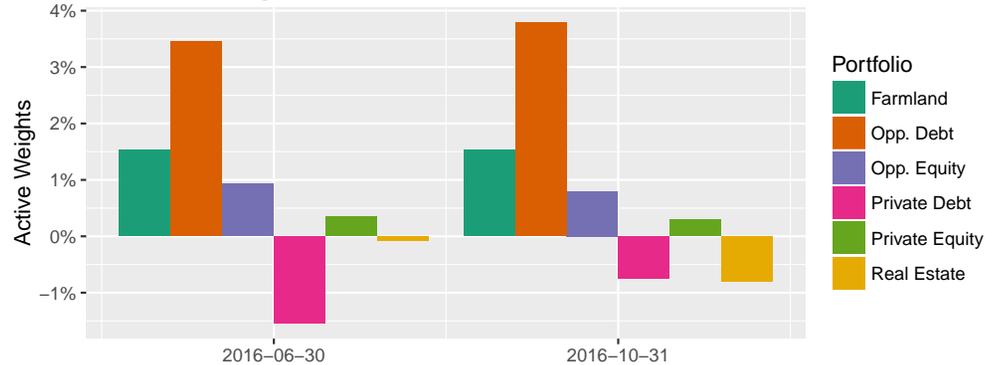
# Private Markets Summary

## Private Markets Summary

Private Markets NAVs @ 2016-06-30 & Est @ 2016-10-31

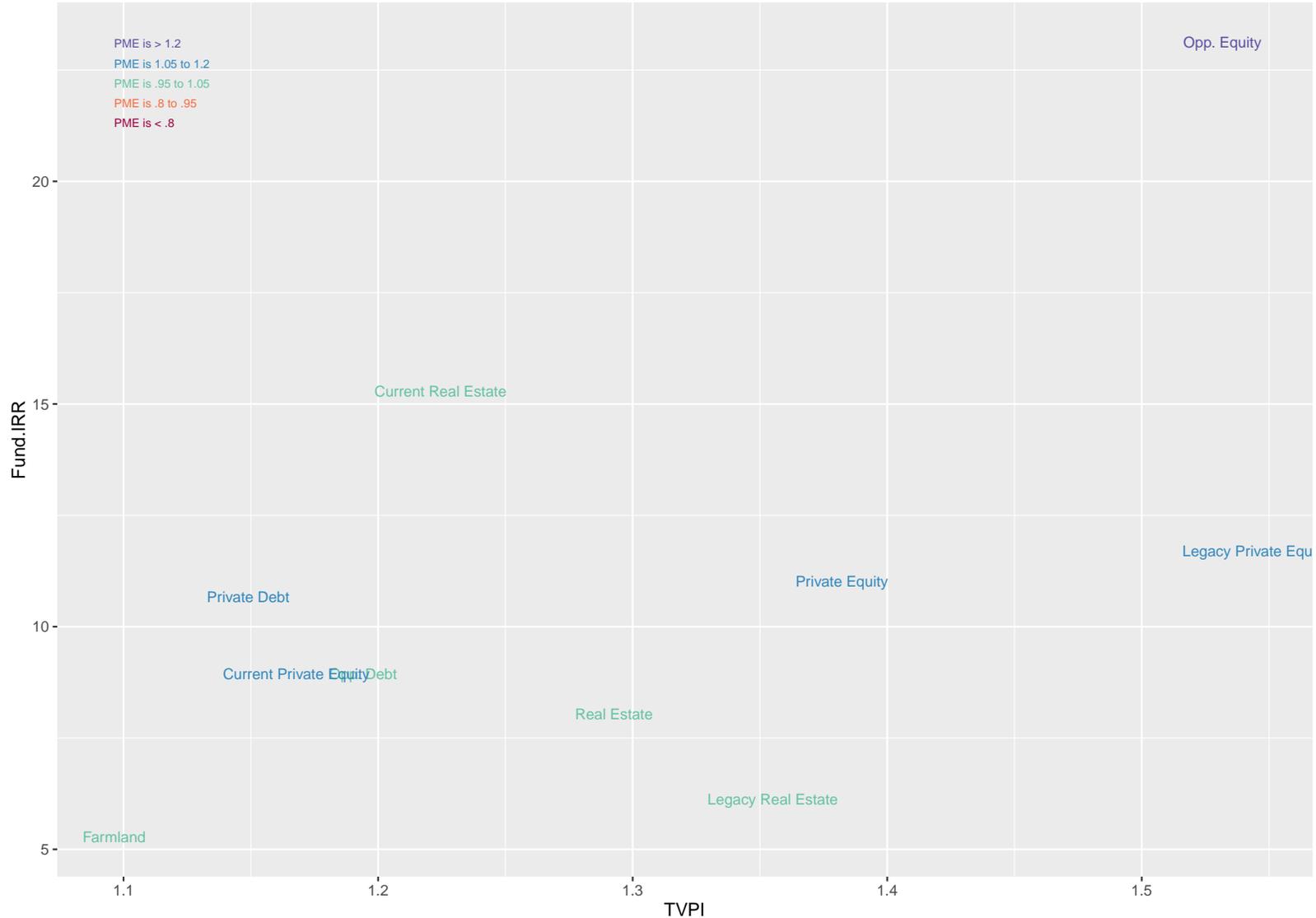


Active Weights @ 2016-06-30 & Est @ 2016-10-31



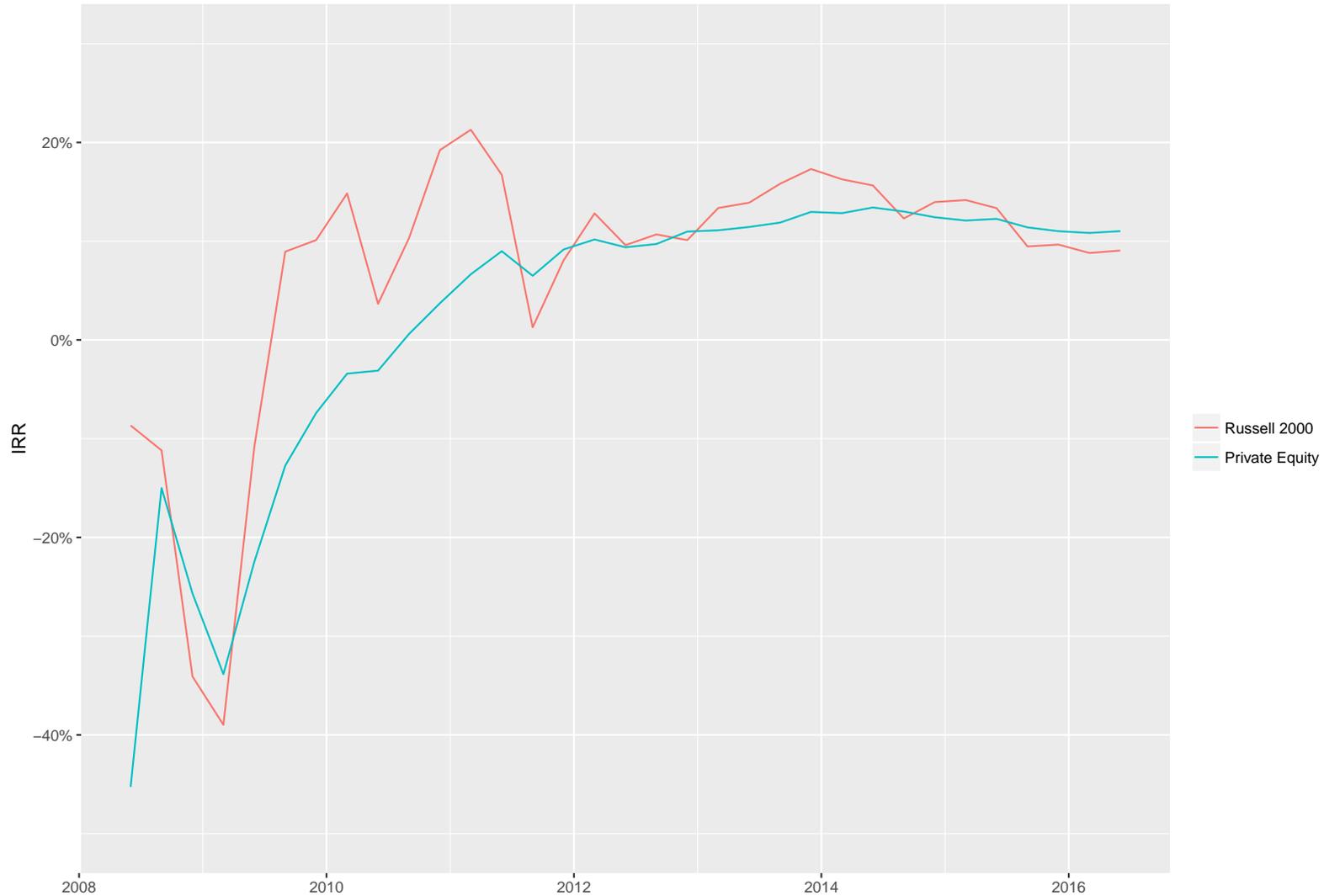
# Private Markets Performance Summary

Private Markets Summary



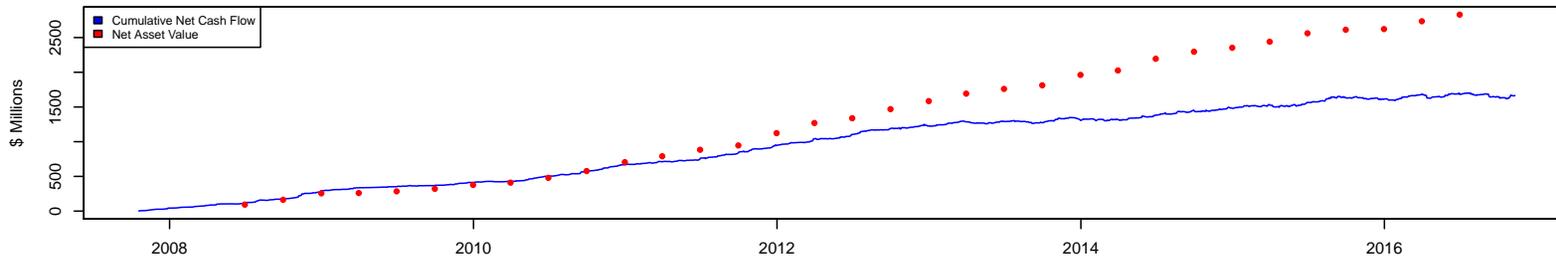
# Private Equity Performance

Private Equity IRRs compared to Russell 2000  
Inception through indicated date

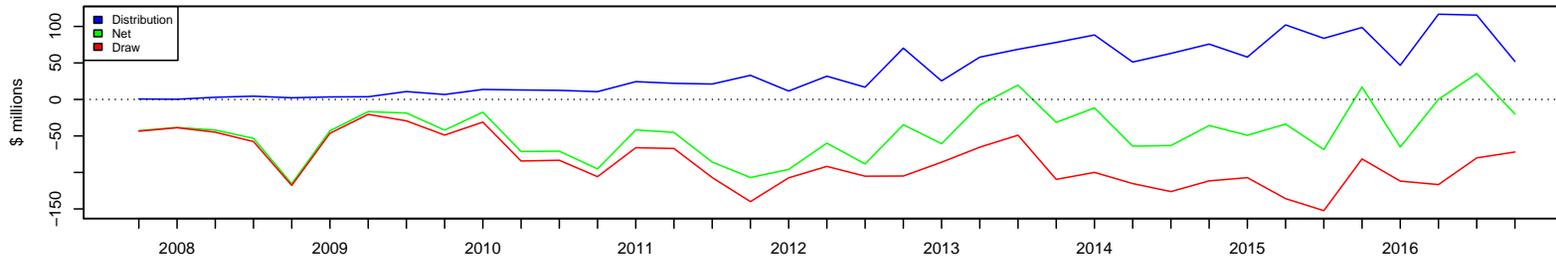


# Private Equity Performance (Continued)

Private Equity Cumulative Net Capital Contributed  
 Compared to Value

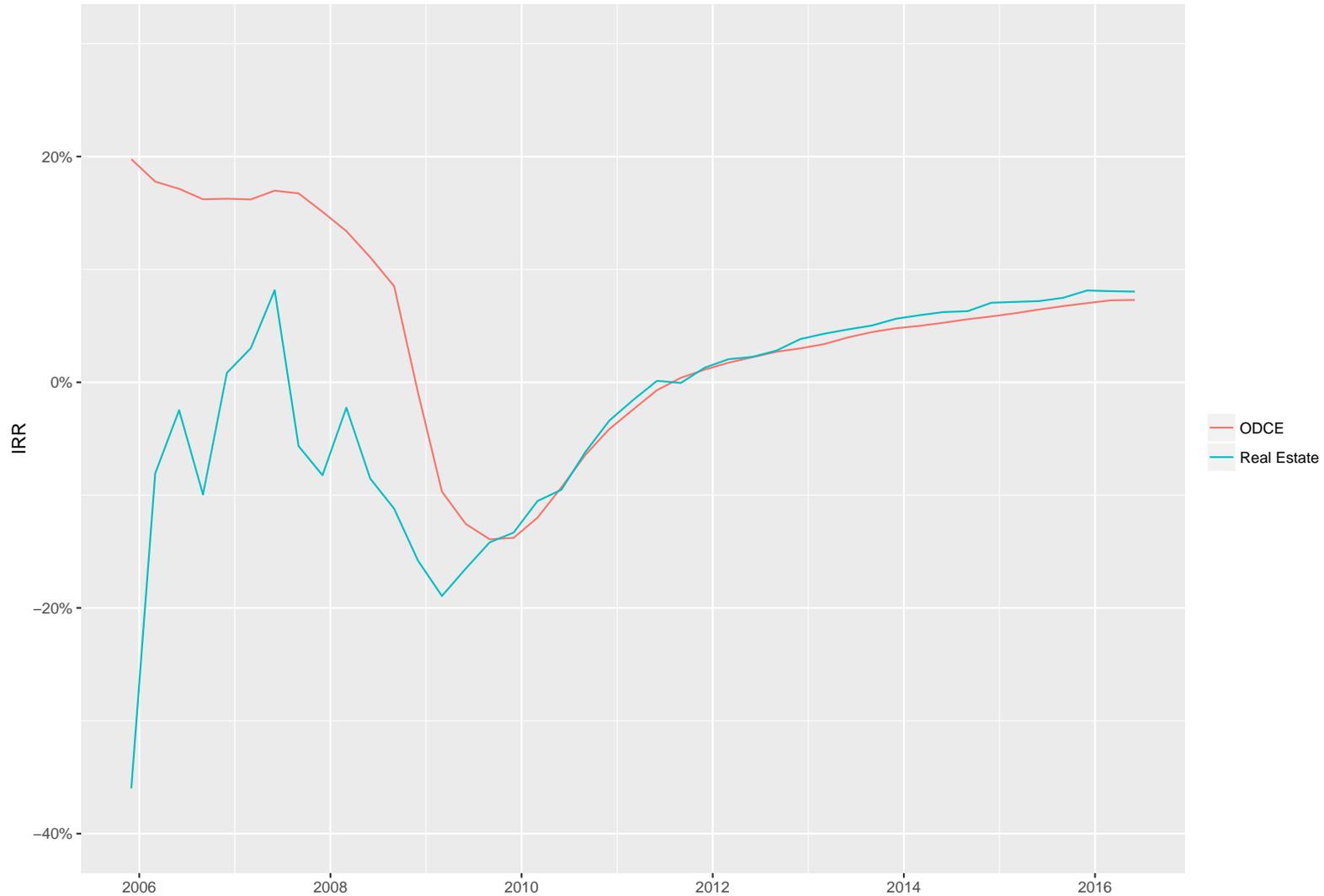


Private Equity  
 Quarterly Draws and Distributions



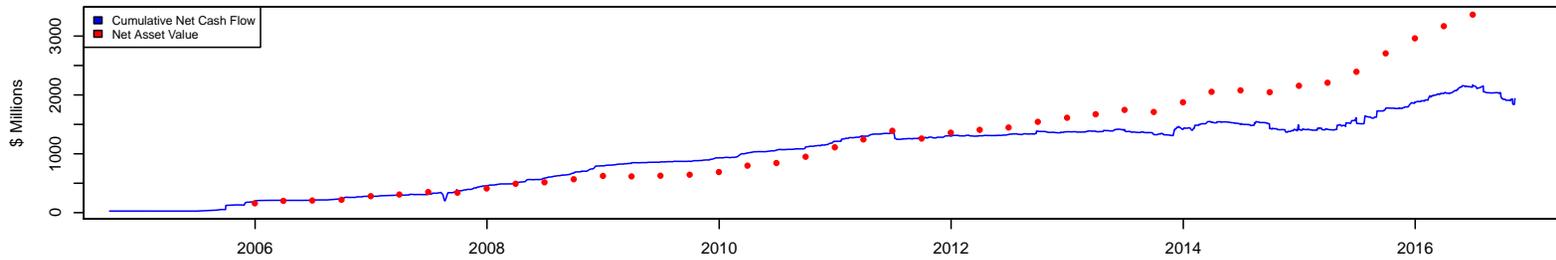
# Real Estate Performance

Real Estate IRRs compared to ODCE  
Inception through indicated date

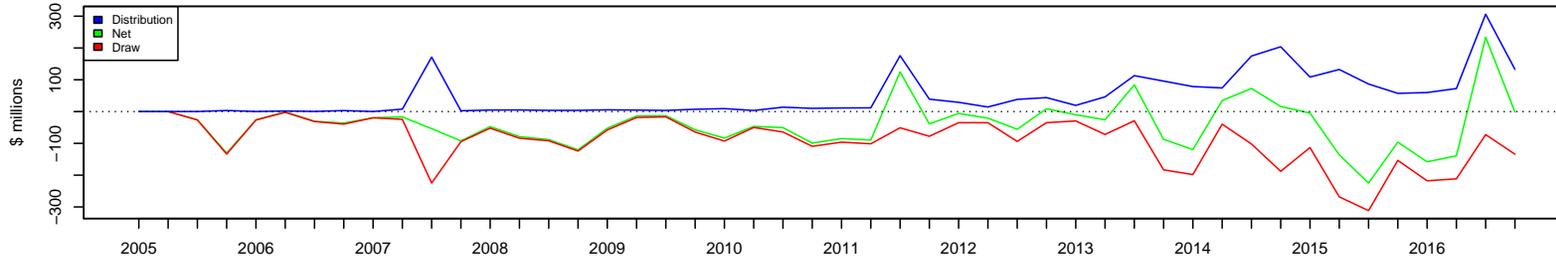


# Real Estate Performance (Continued)

Real Estate Cumulative Net Capital Contributed  
 Compared to Value

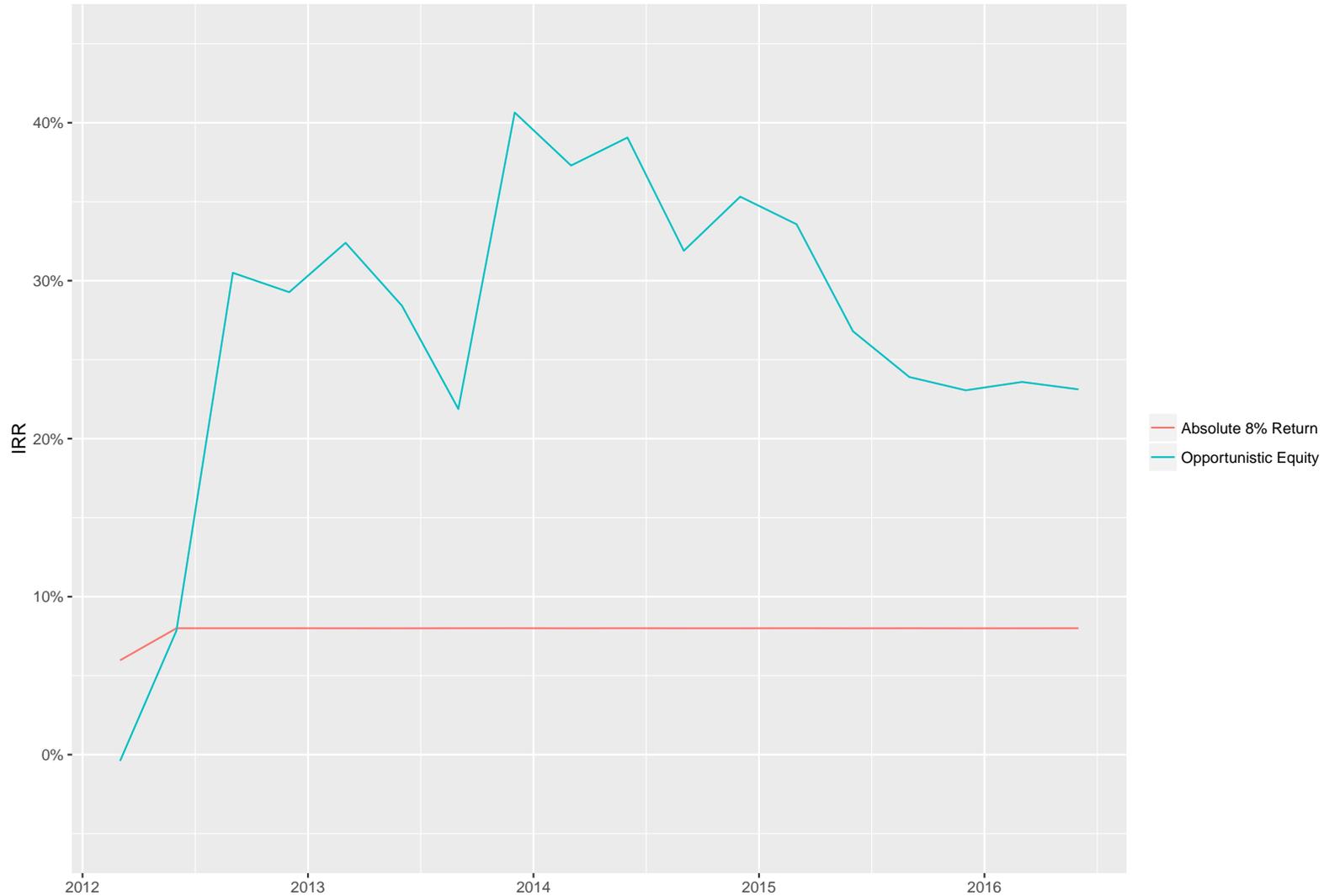


Real Estate  
 Quarterly Draws and Distributions



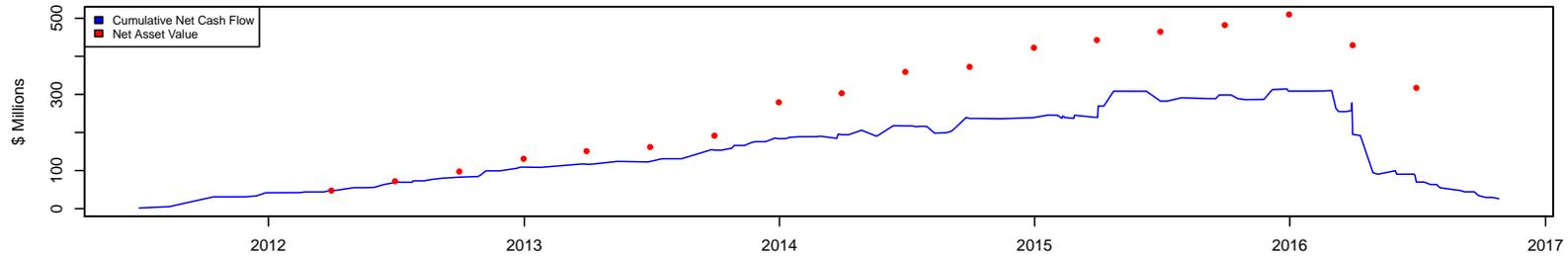
# Opportunistic Equity Performance

Opportunistic Equity IRRs compared to Absolute 8%  
Inception through indicated date

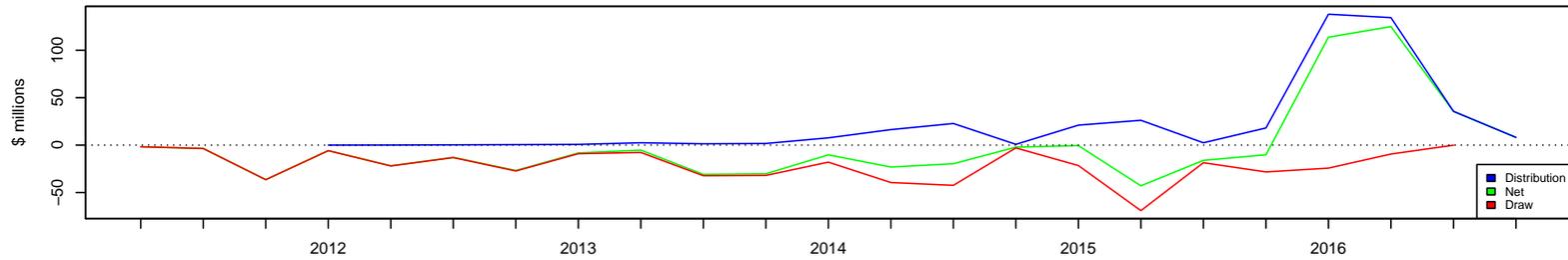


# Opportunistic Equity Performance (Continued)

Opportunistic Equity Cum. Net Capital Contributed  
 Compared to Value

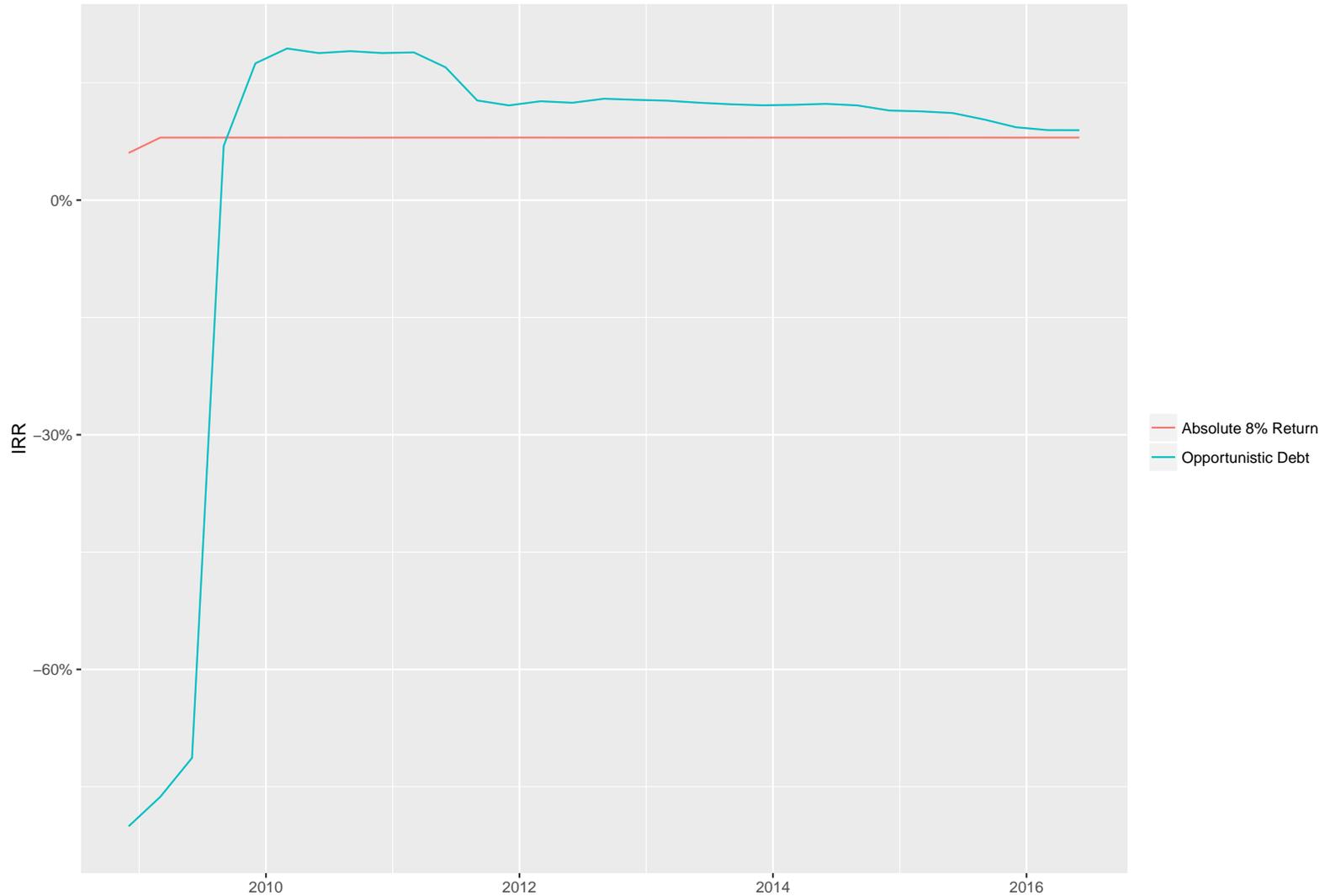


Opportunistic Equity  
 Quarterly Draws and Distributions



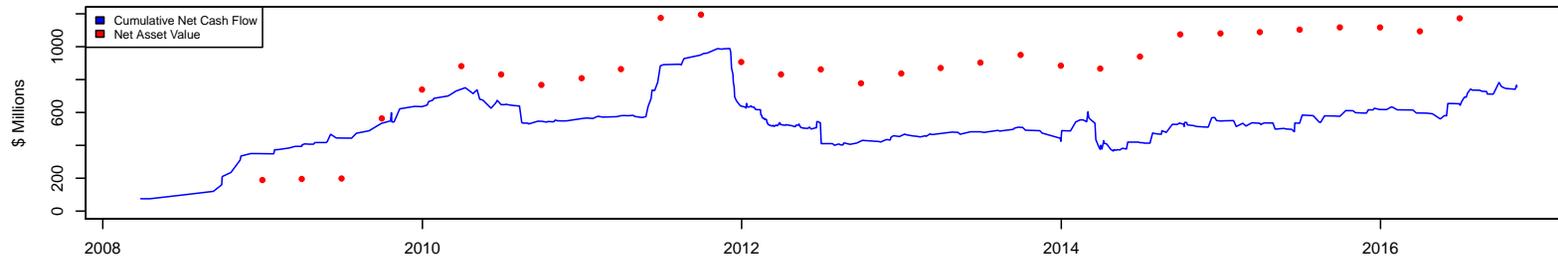
# Opportunistic Debt Performance

Opportunistic Debt IRRs  
compared to Absolute 8%

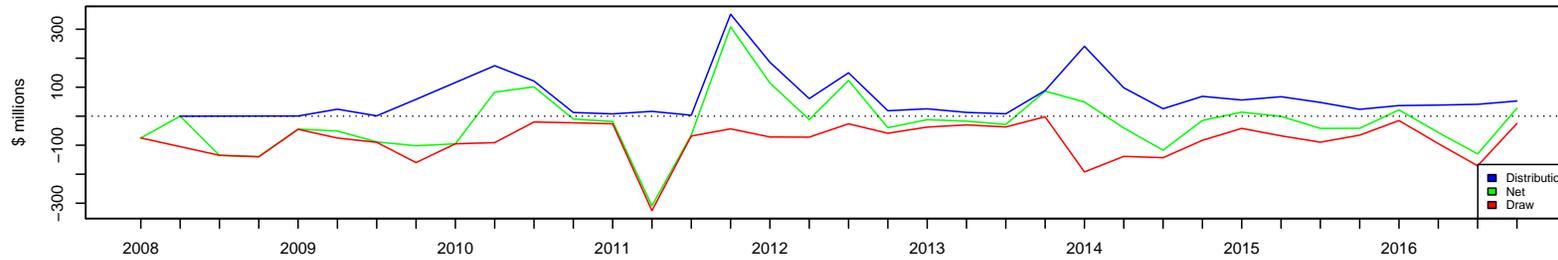


# Opportunistic Debt Performance (Continued)

Opp. Debt Cum. Net Capital Contributed  
 Compared to Value

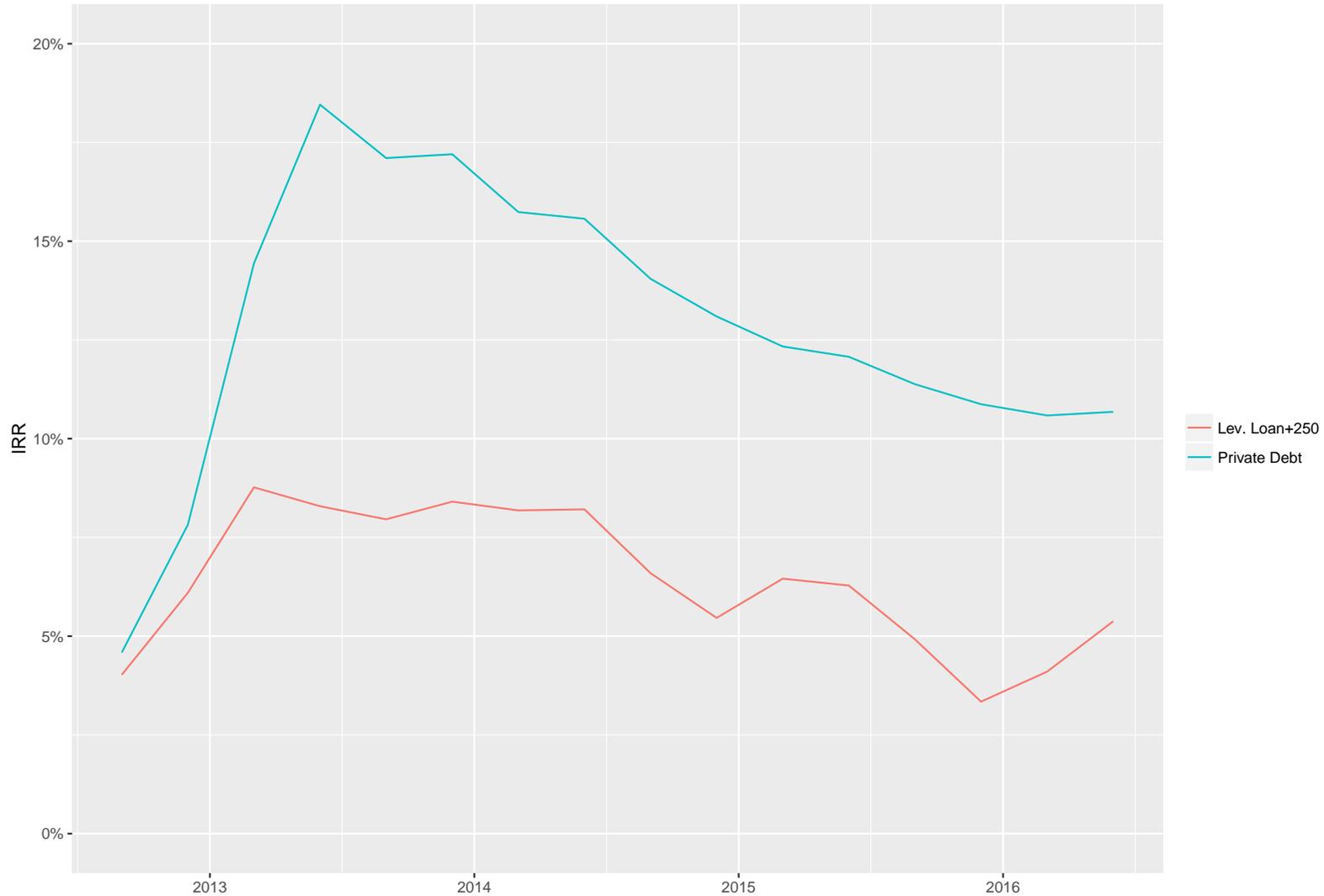


Opportunistic Debt  
 Quarterly Draws and Distributions



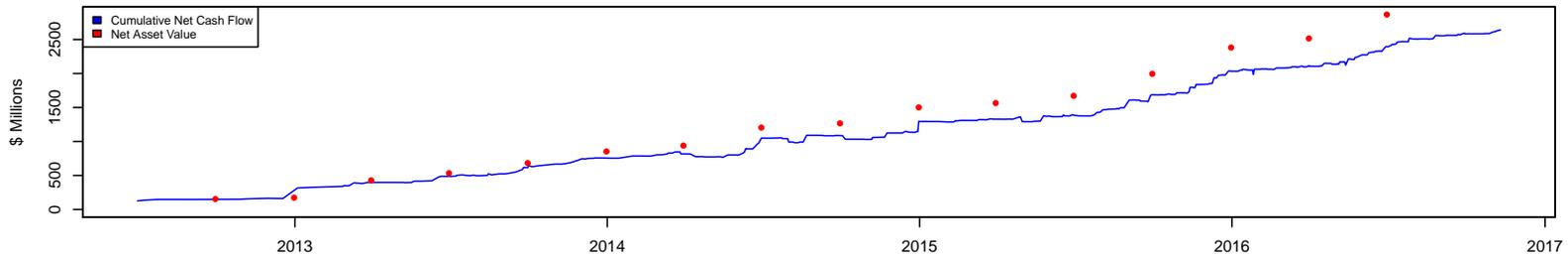
# Private Debt Performance

Private Debt IRRs  
compared to Lev Loan+250

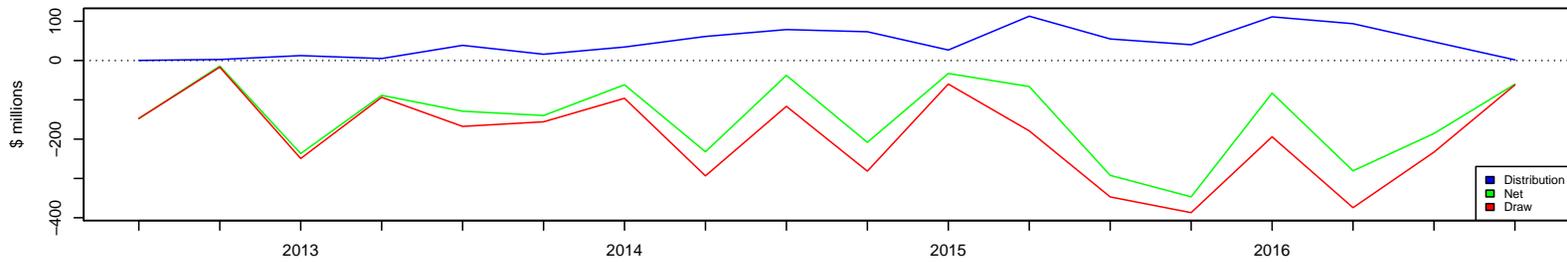


# Private Debt Performance (Continued)

Private Debt Cumulative Net Capital Contributed  
 Compared to Value

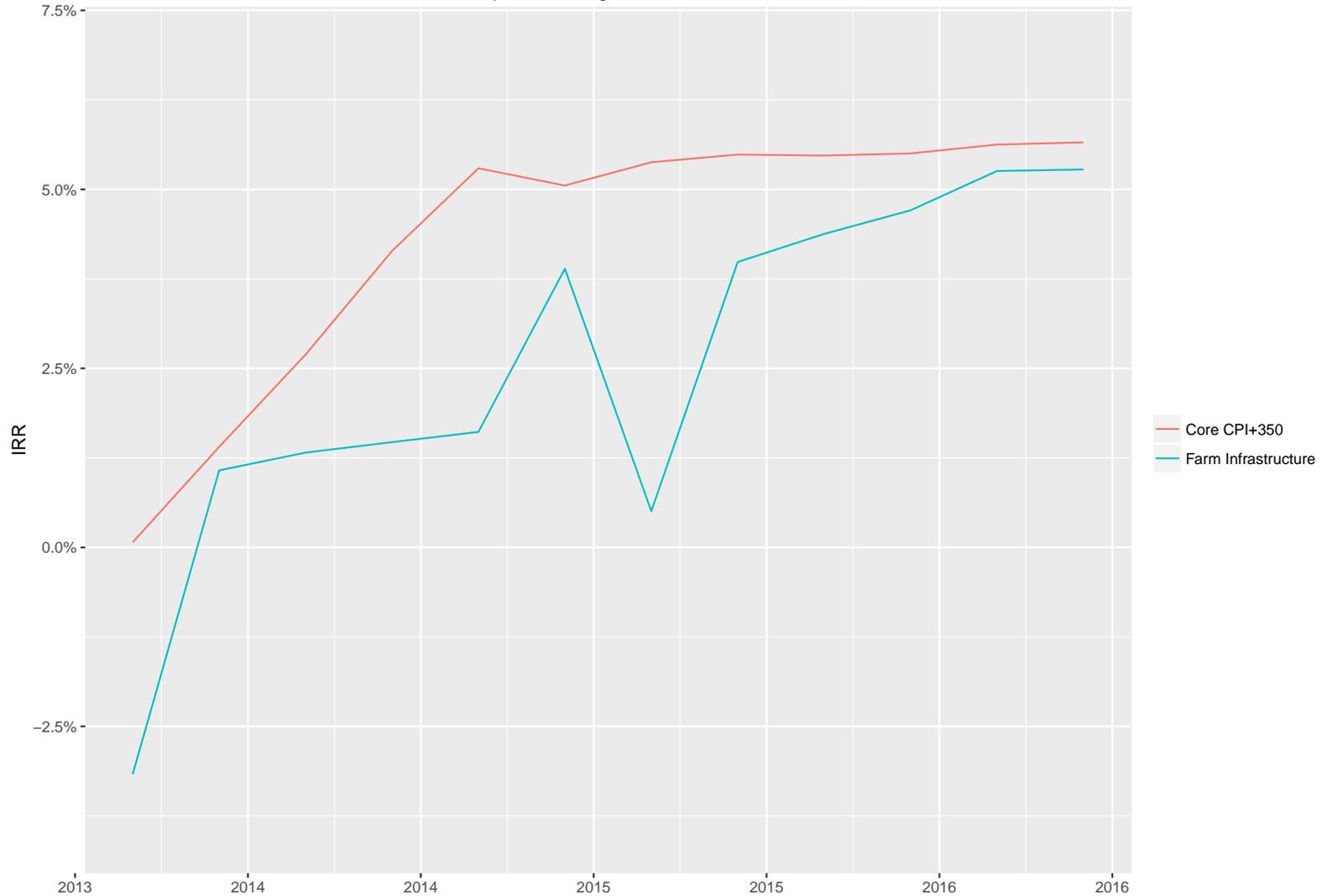


Private Debt  
 Quarterly Draws and Distributions



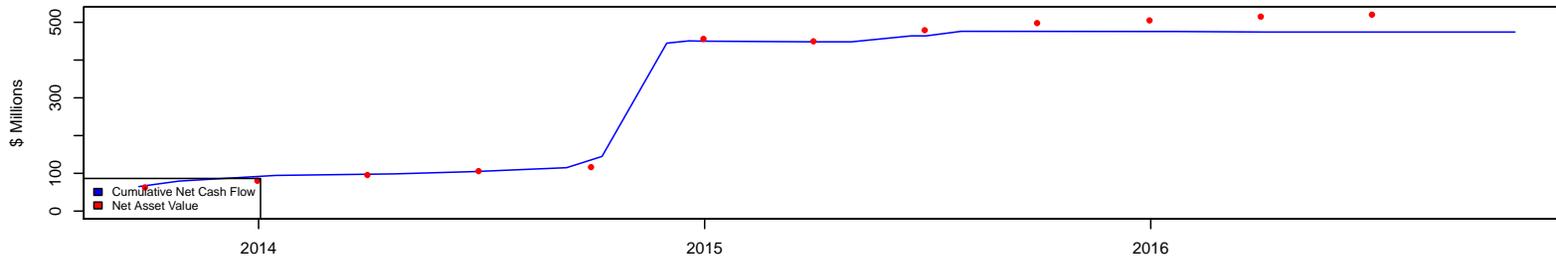
# Farmland and Infrastructure Performance

Farmland and Infrastructure IRRs compared to CPI+350  
Inception through indicated date

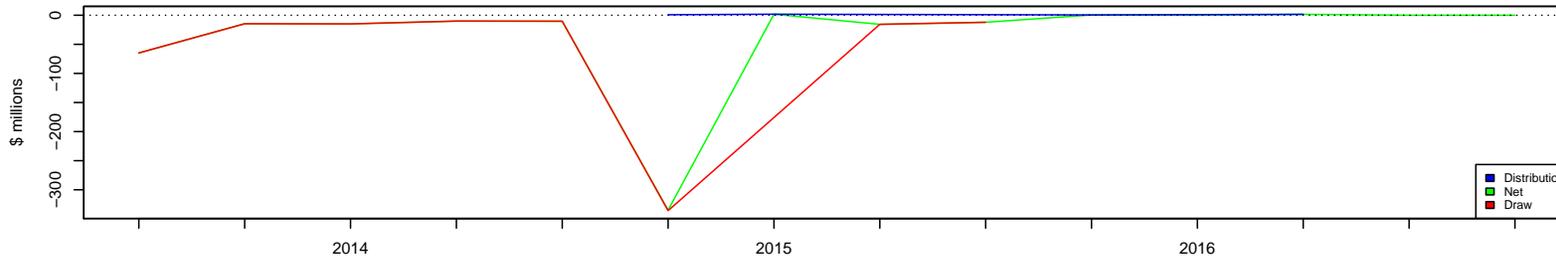


# Farmland and Infrastructure Performance (Continued)

Farm Infra Cum. Net Capital Contributed  
 Compared to Value



Farm Infra  
 Quarterly Draws and Distributions



## Private Markets Returns

### Returns as of June 30, 2016

	Benchmark	Portfolio Return	Benchmark Return	Excess Return
Private Equity	Russell 2000	11.02	9.05	1.97
Private Real Estate	ODCE Net	8.04	7.30	0.74
Private Opportunistic Equity	Absolute Eight	23.12	8.00	15.12
Opportunistic Fixed Income	Absolute Eight	8.94	8.00	0.94
Private Debt	Lev Loan+250	10.68	5.38	5.30
Farmland	Core CPI+350	5.28	5.66	-0.38



# Public Markets Performance Chart Pack

*Investment Management Division*

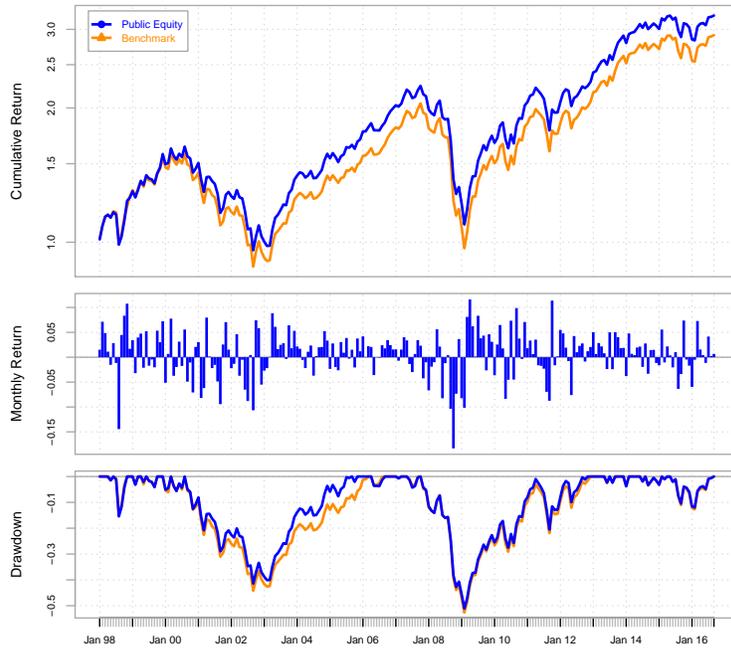
*Performance through September 30, 2016*

Table 1: Table of Contents

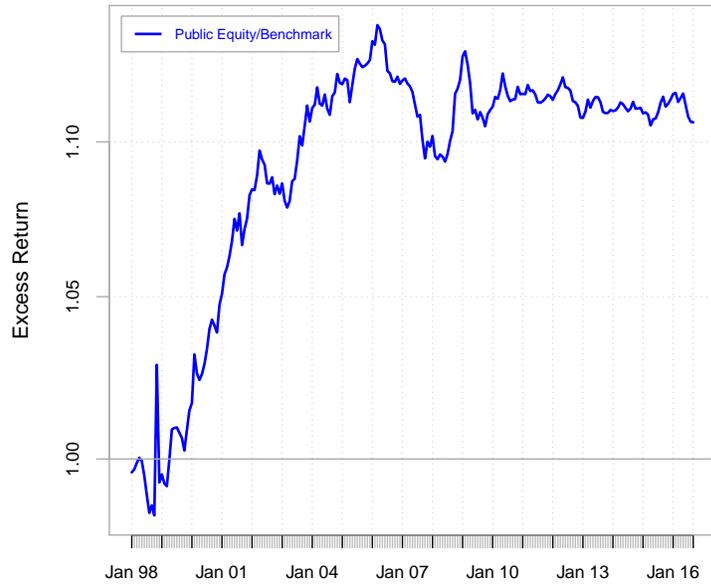
Contents	Manager	Page
Total Public Equity		2
Domestic Equity		10
US Large Cap Performance Summary		15
	LSV	22
US Mid Cap Performance Summary		28
	Wellington	35
US Small Cap Performance Summary		41
	DFA	48
	TimeSquare	54
International Equity		60
International Developed Large Cap		65
	American Century	71
	Brandes	77
	TSW	83
	Trinity	88
International Developed Large Cap		94
	AQR	100
	DFA International	106
	Franklin Templeton	112
Emerging Markets		118
	Eaton Vance	125
	LSV Emerging Markets	131
	William Blair	137

# Total Public Equity

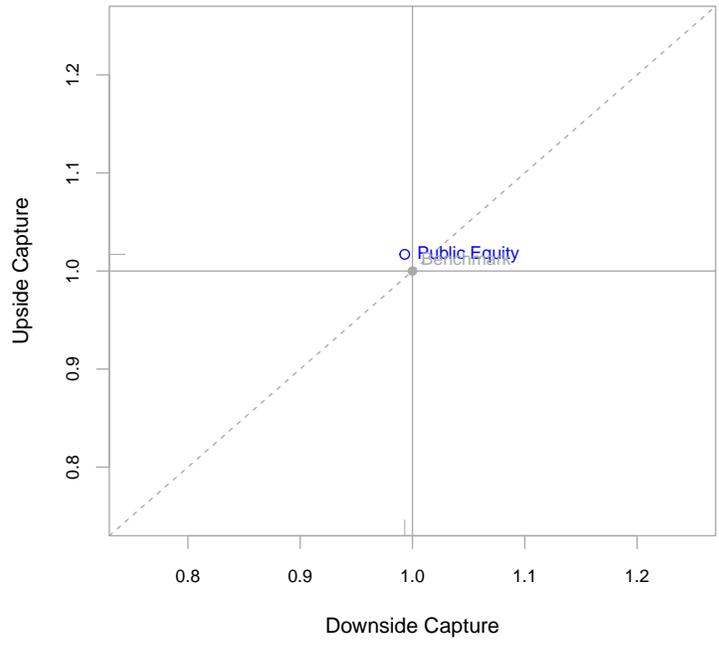
Public Equity Performance Summary



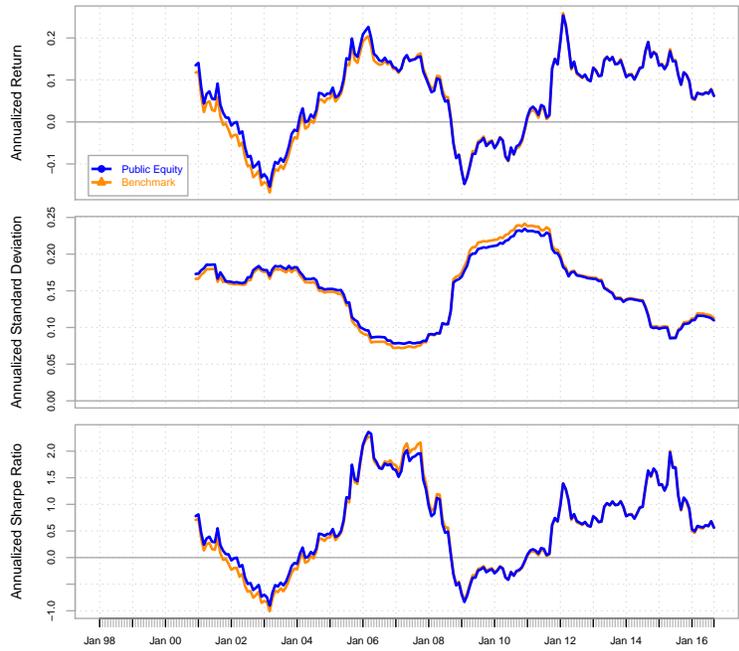
Public Equity Cumulative Relative Performance



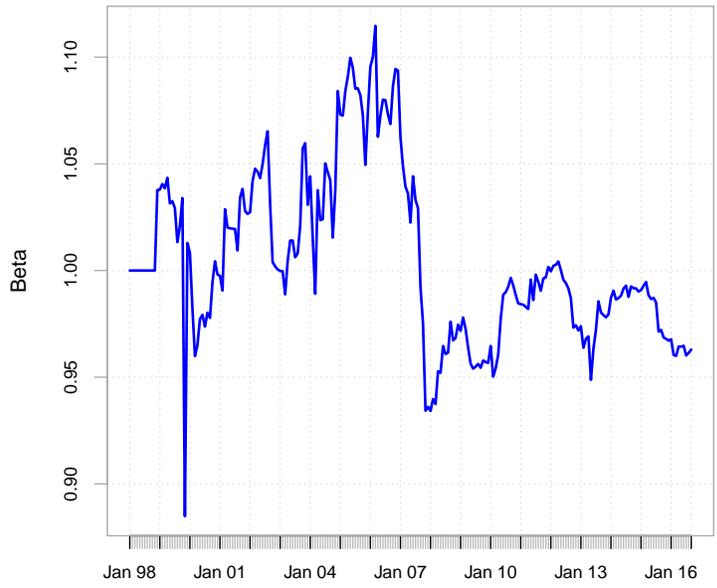
### Capture Ratio



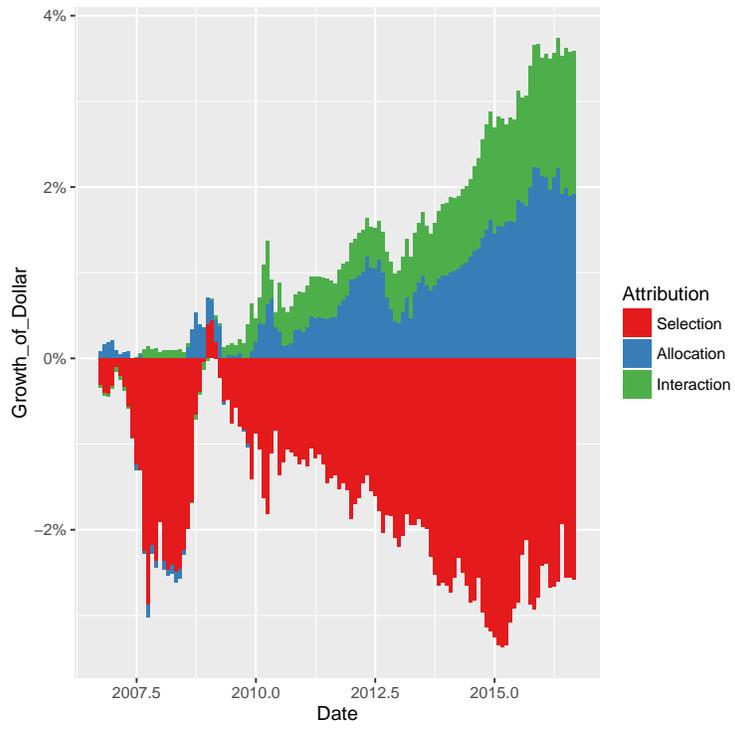
### Public Equity Rolling 3 Year Performance



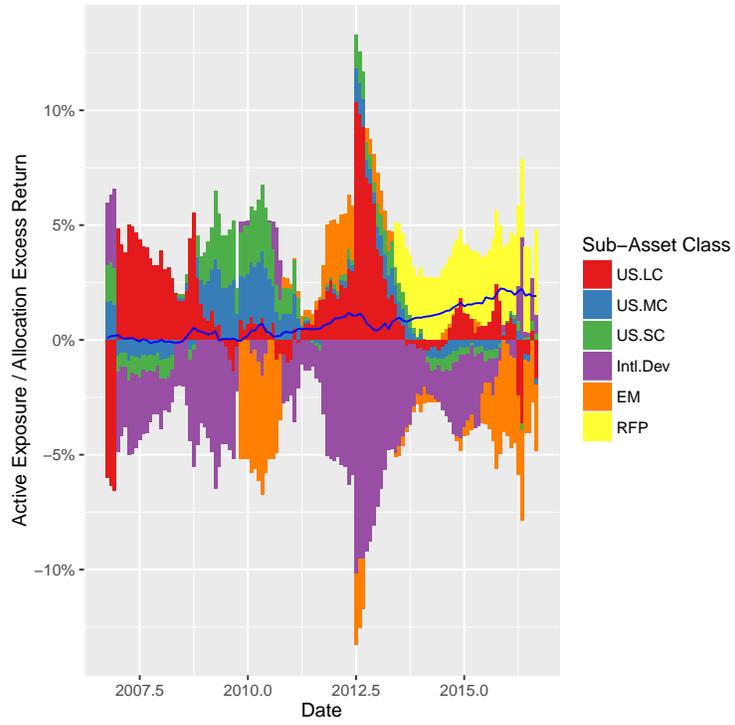
Public Equity Rolling 12 Month Beta



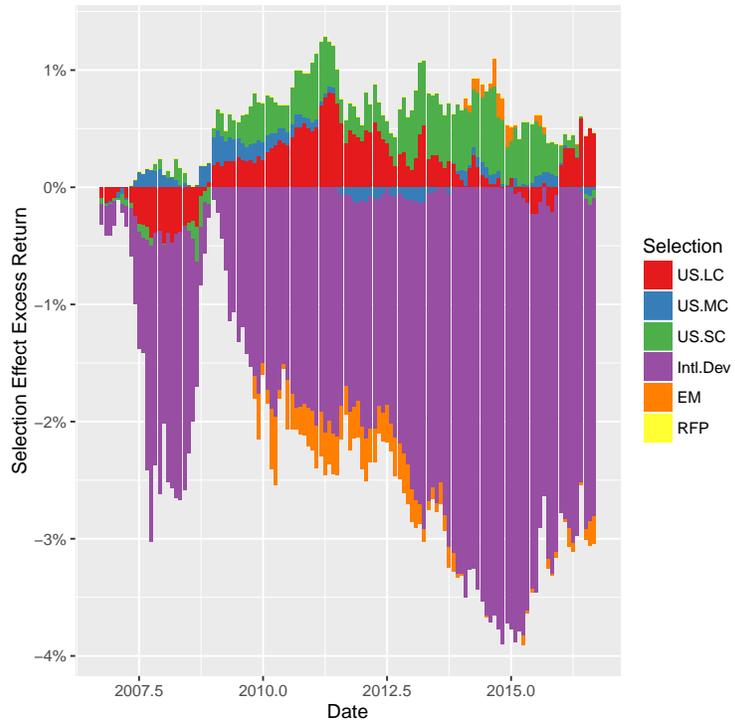
Brinson Return Attribution



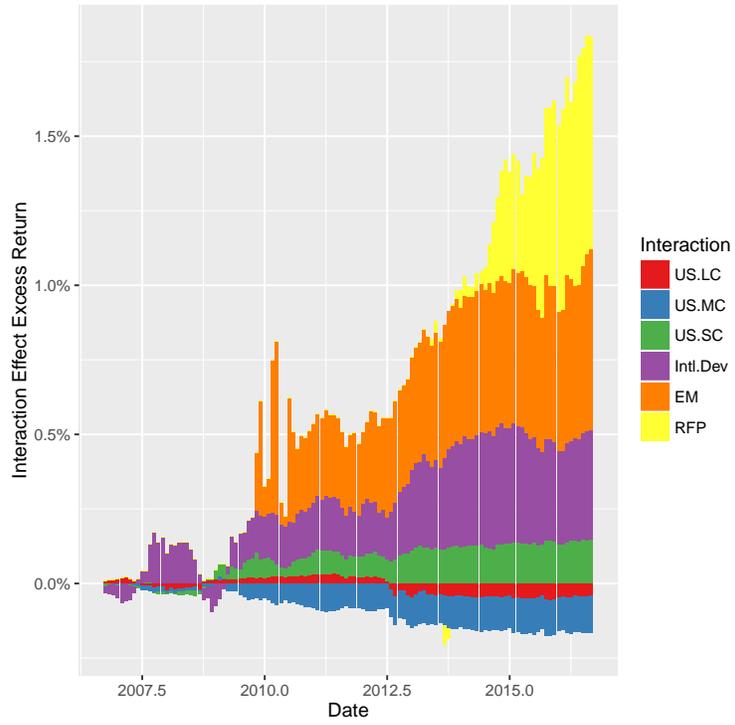
Over/Under Weights & Cumulative Allocation Effect (Line)



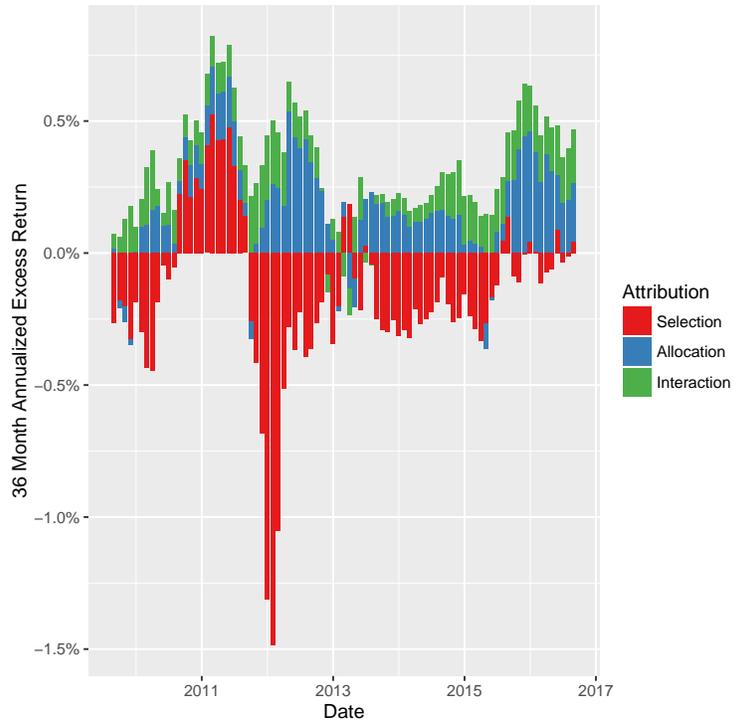
Cumulative Selection Effect



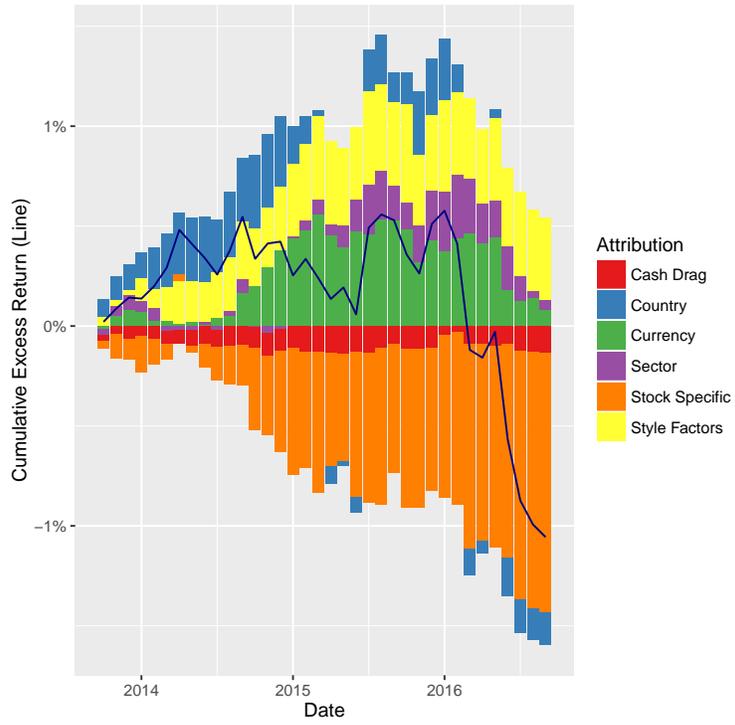
Cumulative Interaction Effect



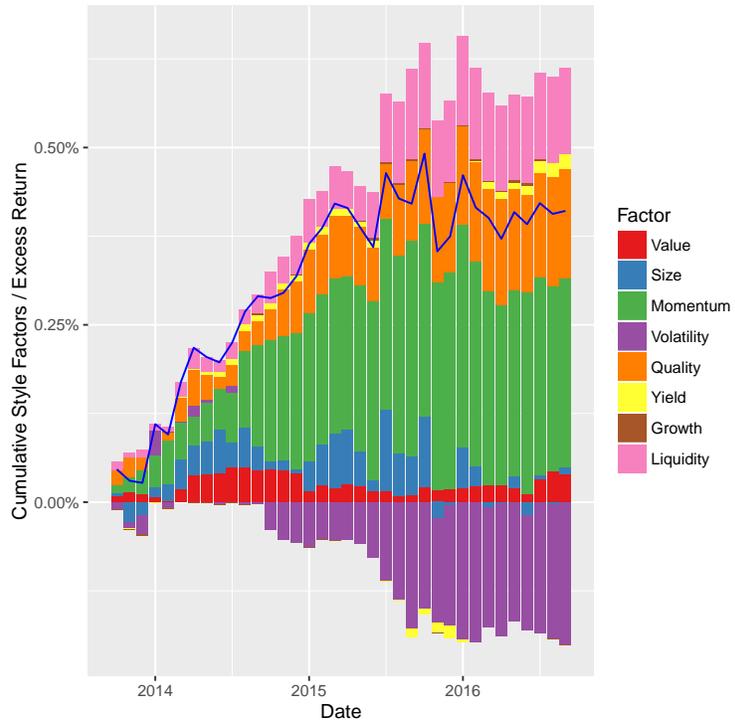
Rolling 36 Month Attribution Analysis



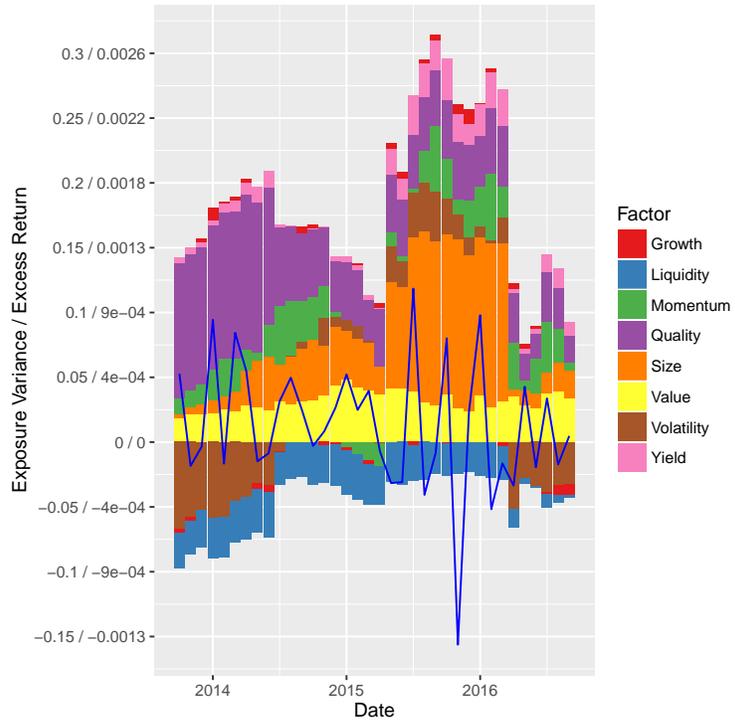
Public Equity Barra Factor Attribution



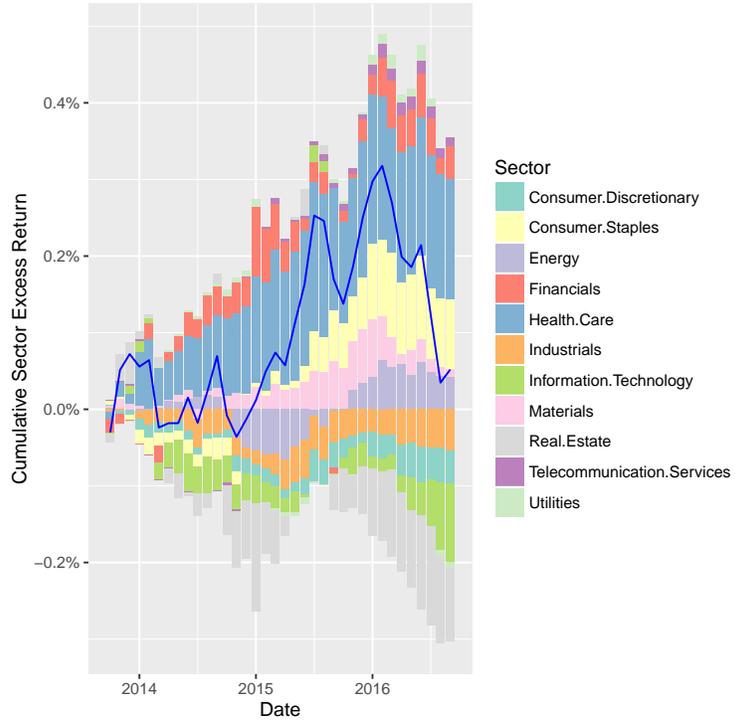
Public Equity Style Factor Breakout



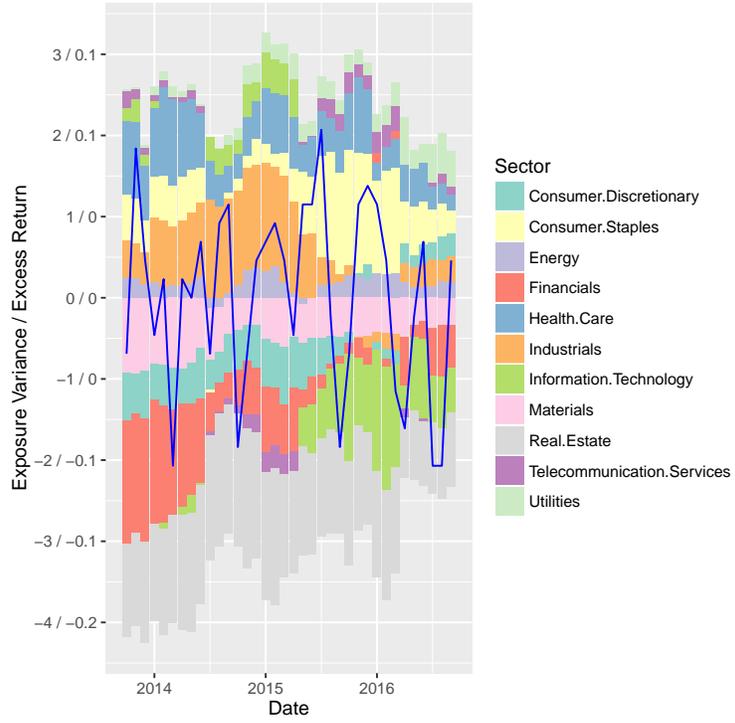
Public Equity Monthly Style Factors Active Exposure



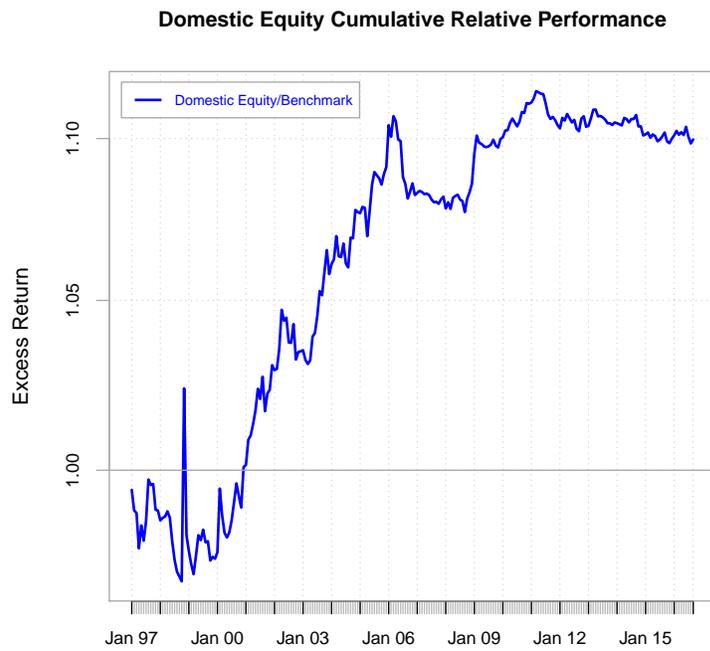
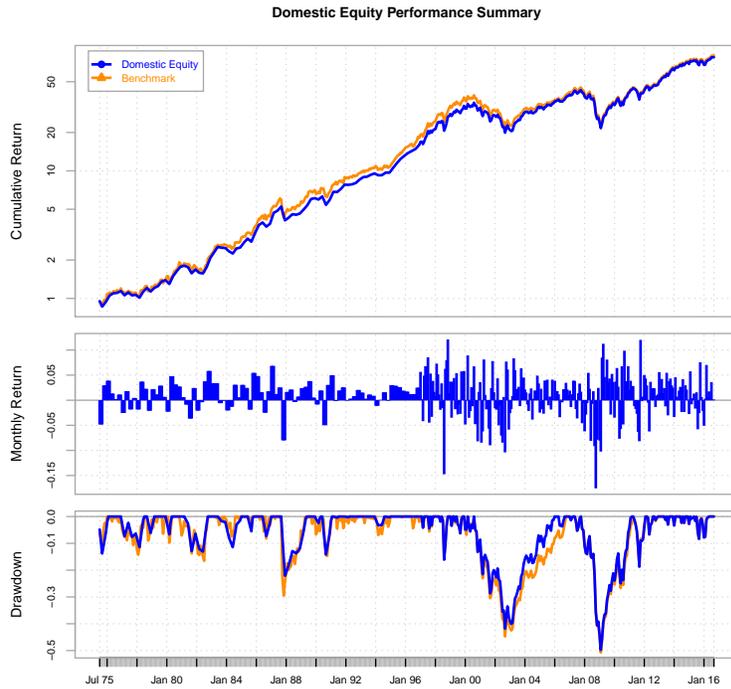
Public Equity Monthly GICS Sector Return



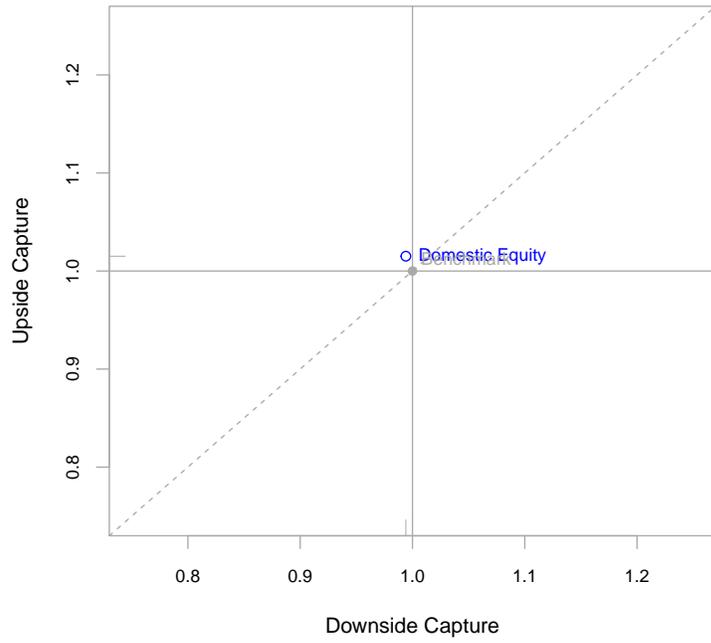
Public Equity GICS Sector Active Exposure



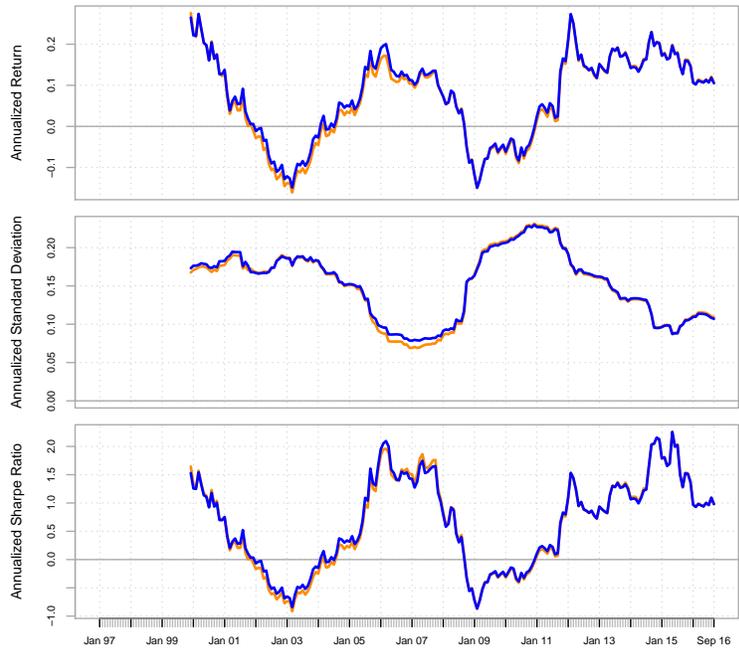
# Domestic Equity & International Equity



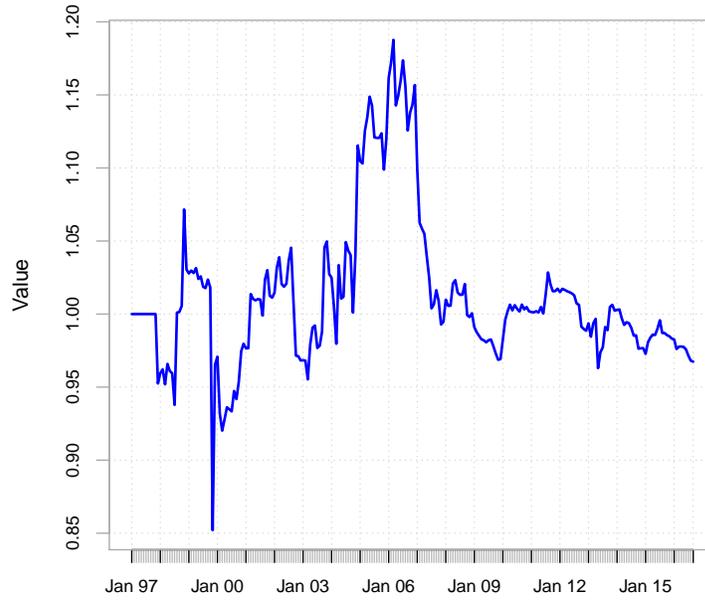
### Domestic Equity Capture Ratios



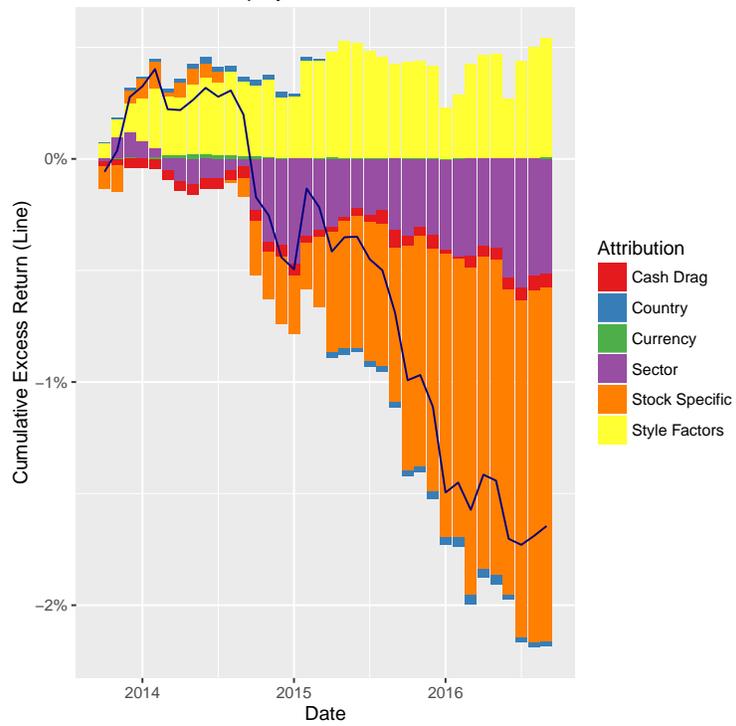
### Domestic Equity Rolling 3 Year Performance



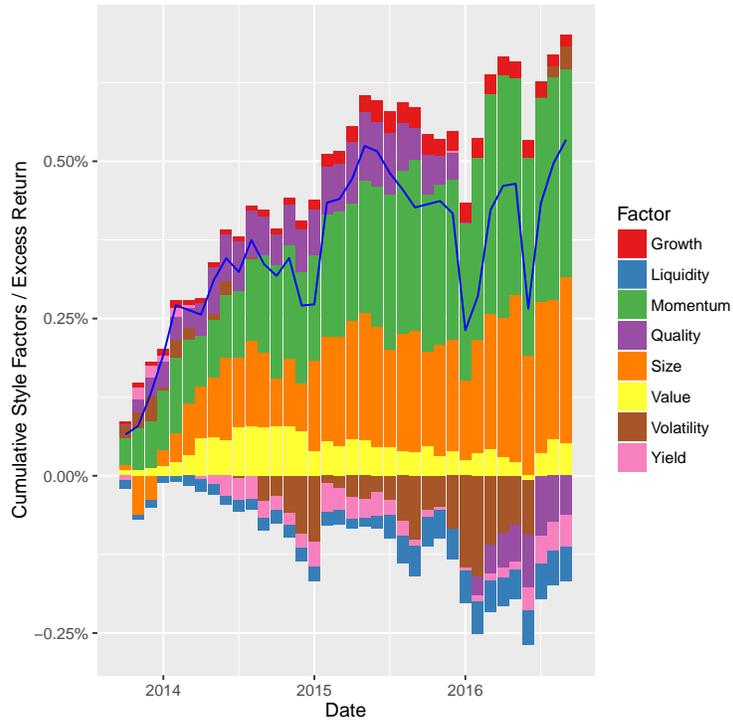
Domestic Equity Rolling 12 Month Beta



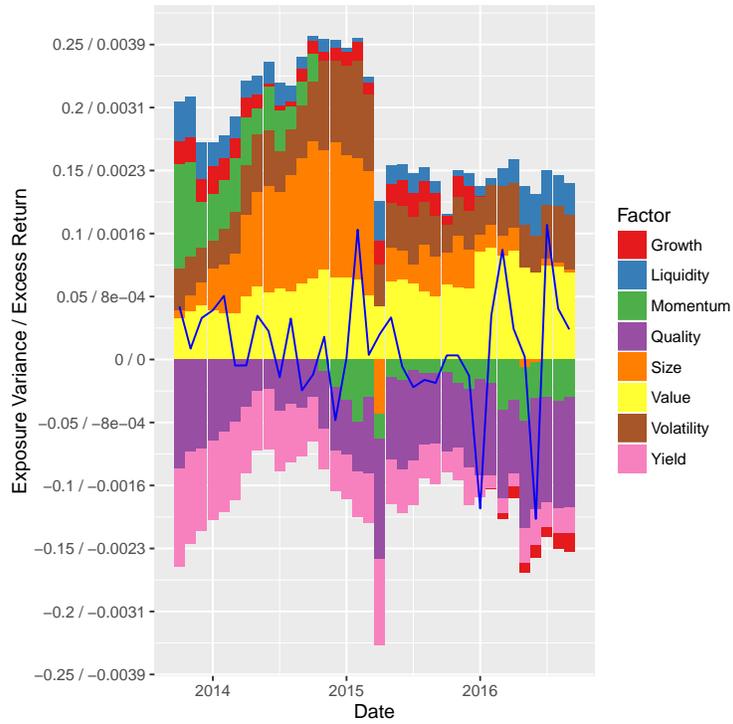
Domestic Equity Barra Factor Attribution



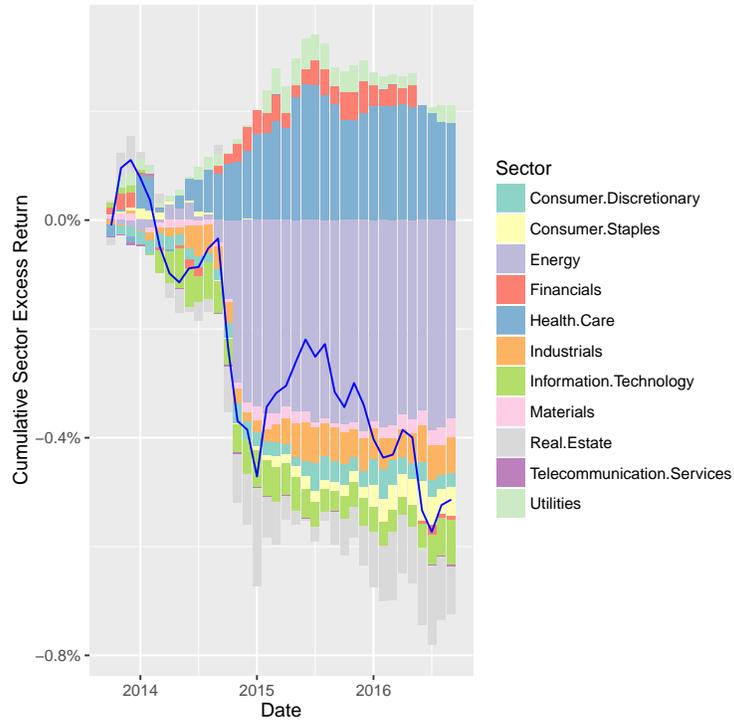
Domestic Equity Style Factor Breakout



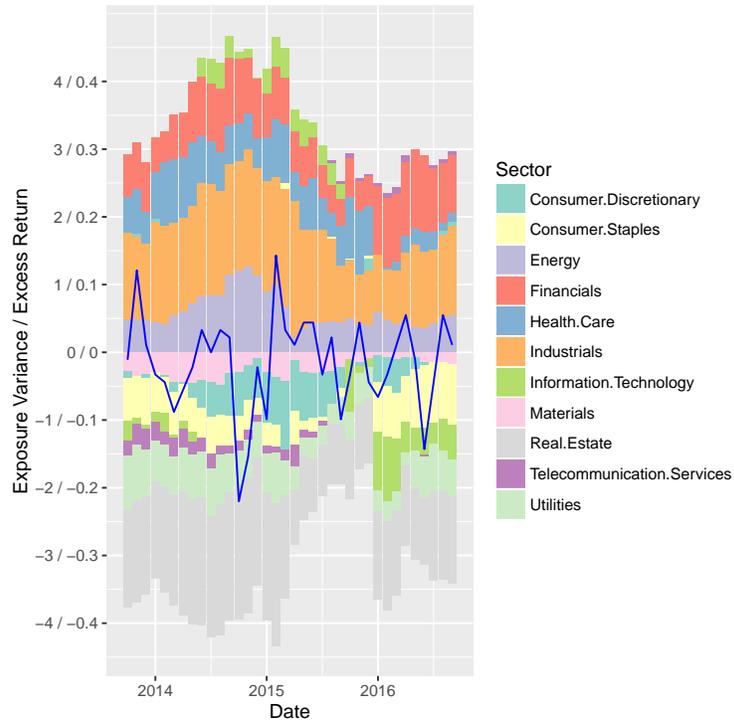
Domestic Equity Monthly Style Factors Active Exposure



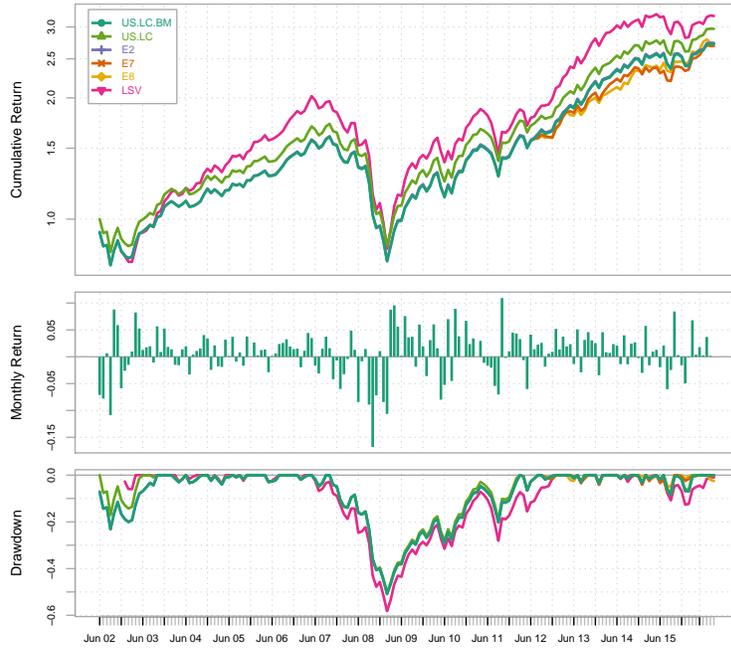
Domestic Equity Monthly GICS Sector Return



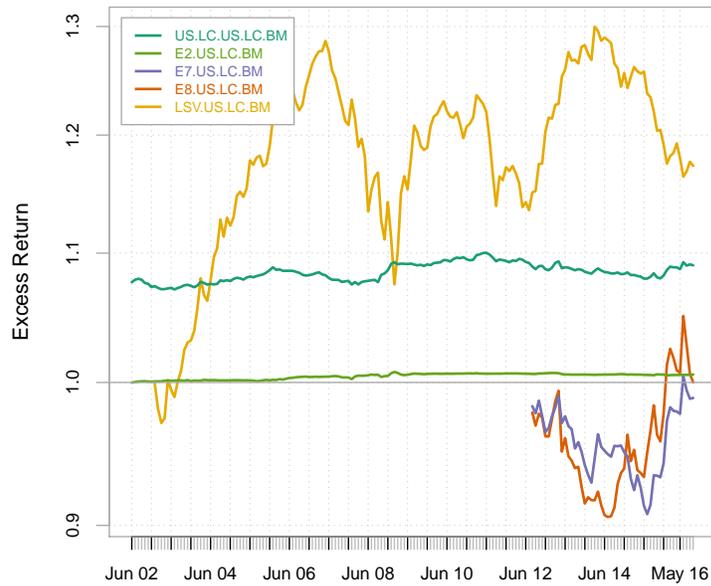
Domestic Equity GICS Sector Active Exposure



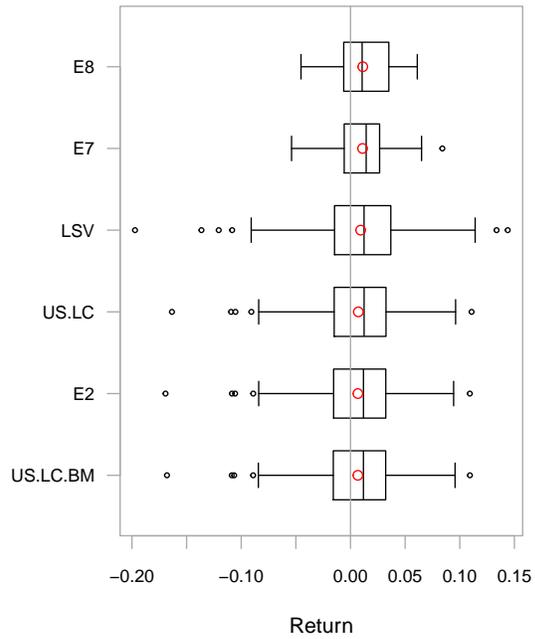
US Large Cap Performance Summary



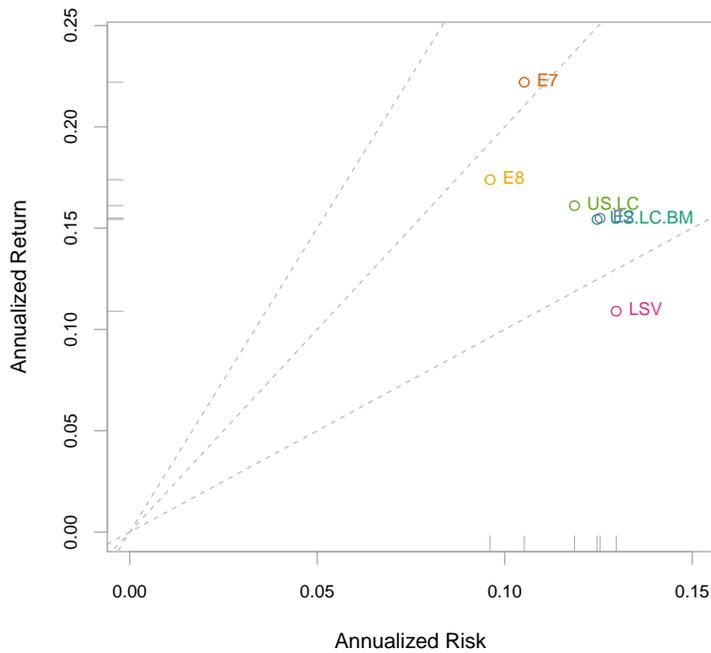
US Large Cap Cumulative Relative Performance



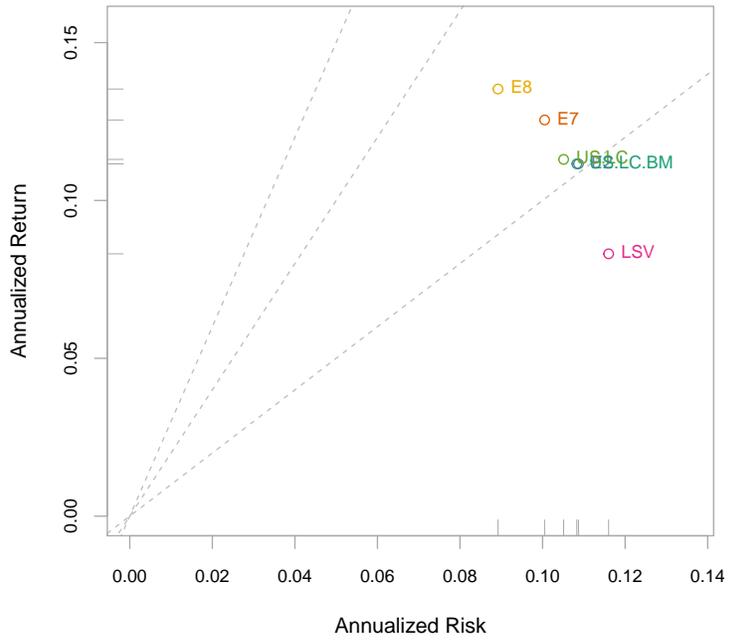
### Return Distribution Comparison



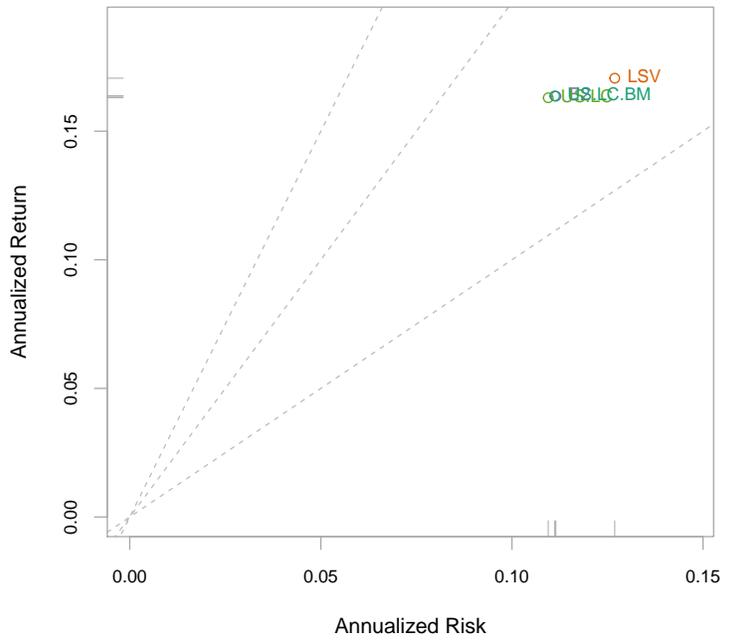
### US Large Cap Trailing 1 Year Performance vs Sharpe Ratios (1,2,3)



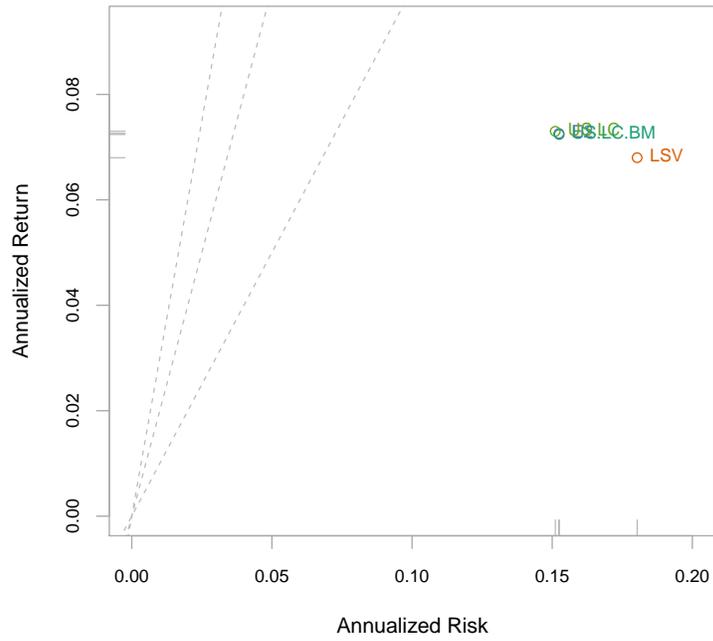
Trailing 3 Year Performance vs Sharpe Ratios (1,2,3)



Trailing 5 Year Performance vs Sharpe Ratios (1,2,3)



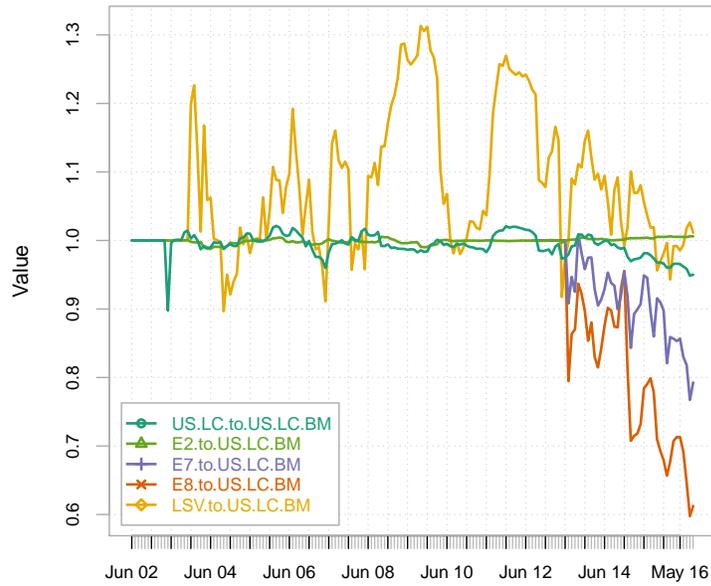
### Trailing 10 Year Performance vs Sharpe Ratios (1,2,3)



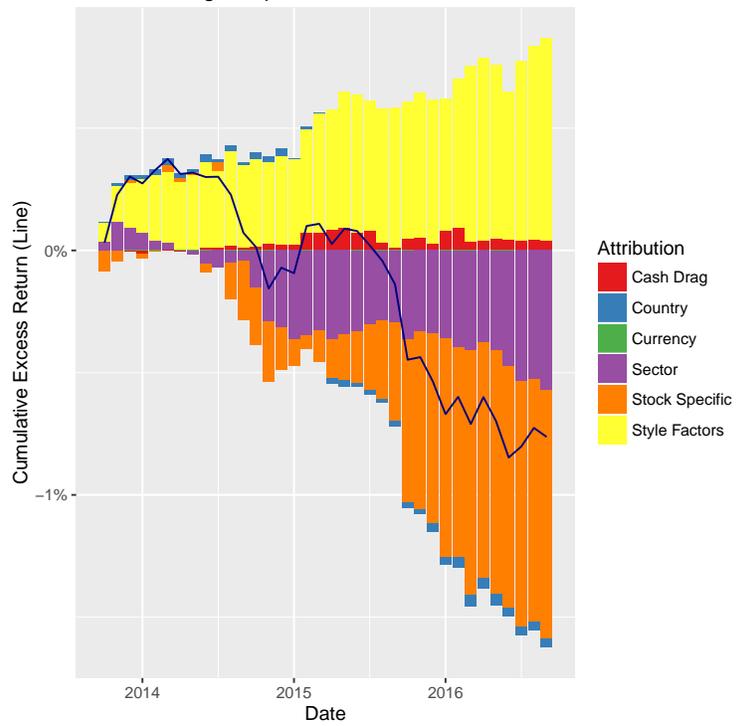
### US Large Cap Rolling 3 Year Performance



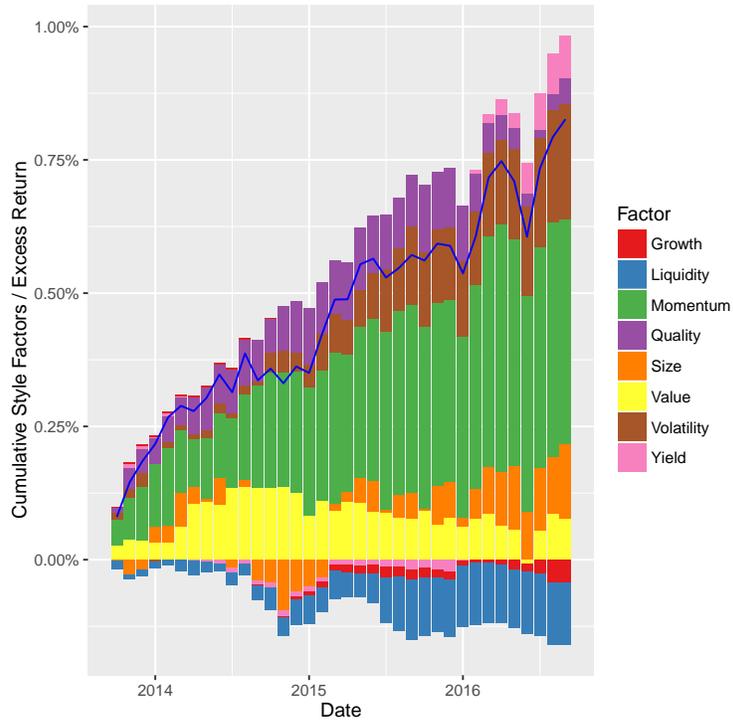
### US Large Cap Rolling 12 Month Beta



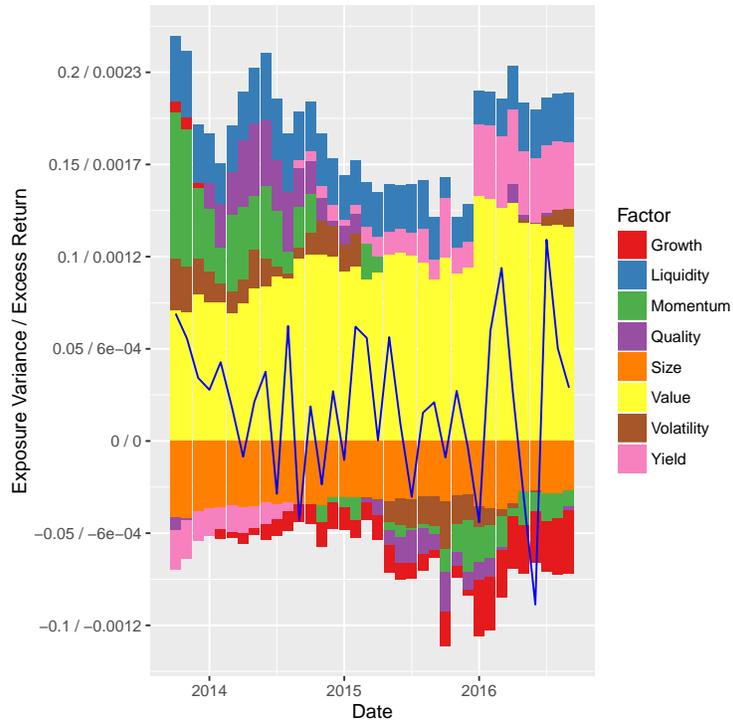
### US Large Cap Barra Factor Attribution



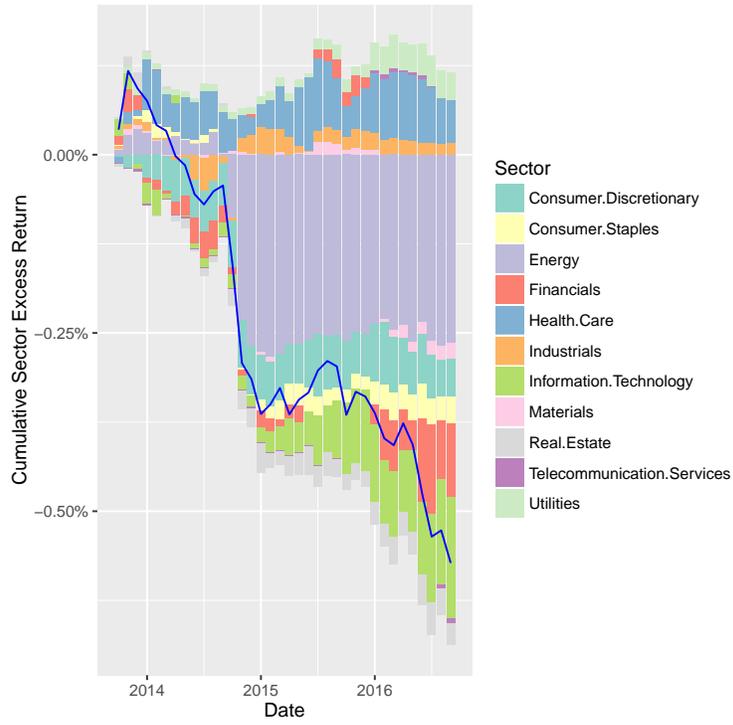
US Large Cap Style Factor Breakout



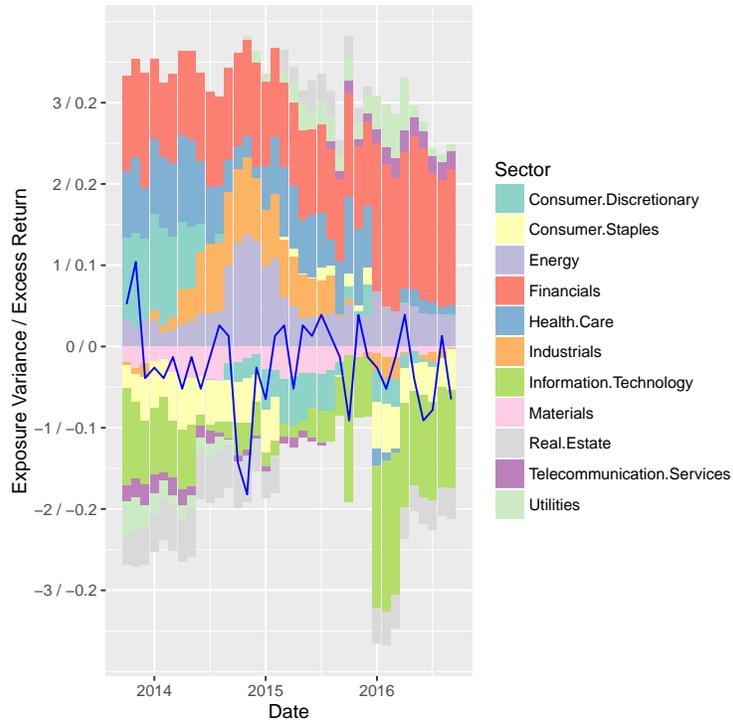
US Large Cap Monthly Style Factors Active Exposure

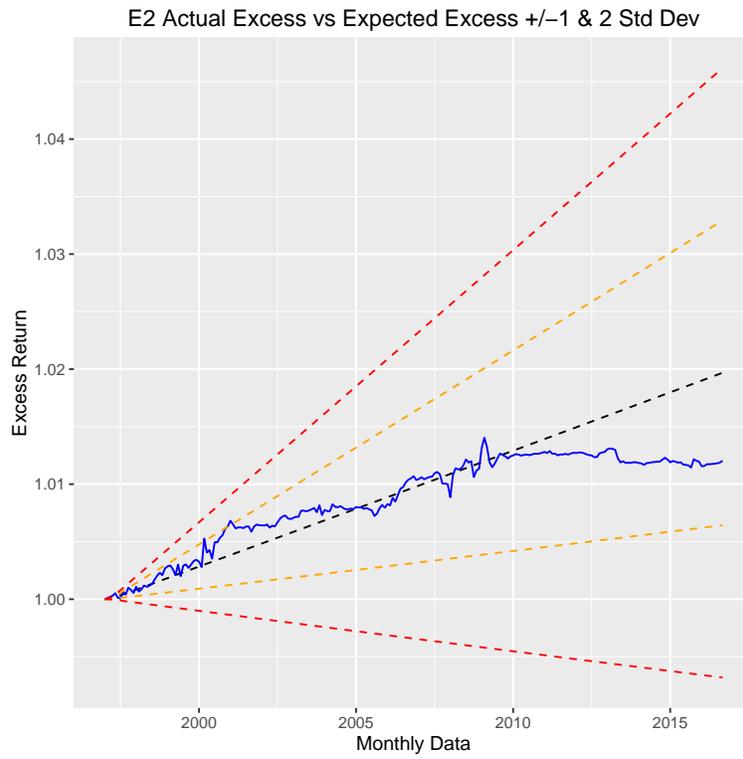
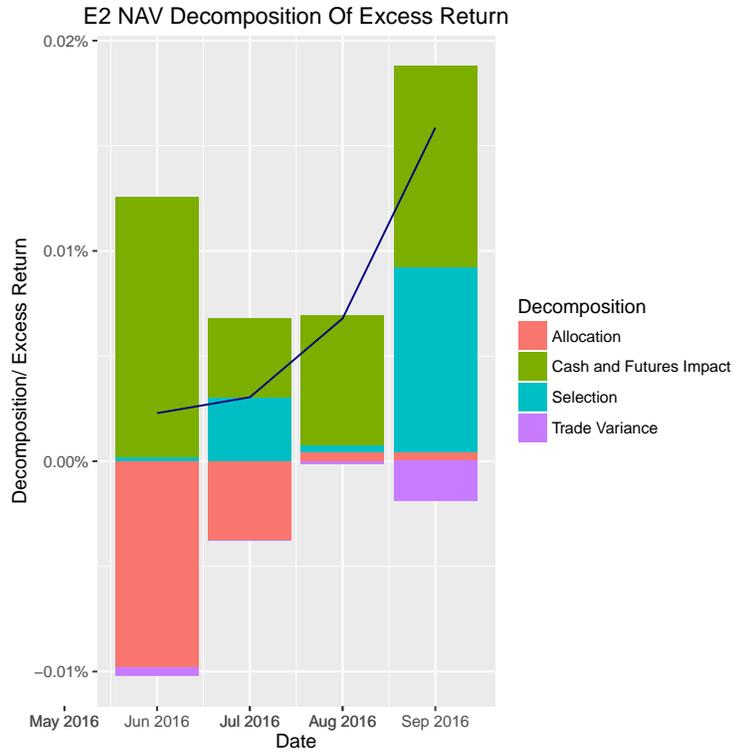


US Large Cap Monthly GICS Sector Return

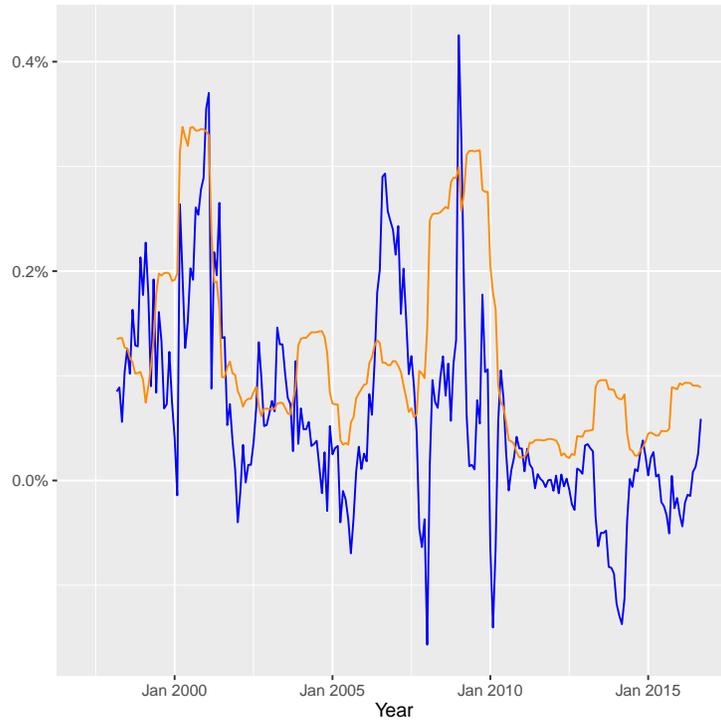


US Large Cap GICS Sector Active Exposure

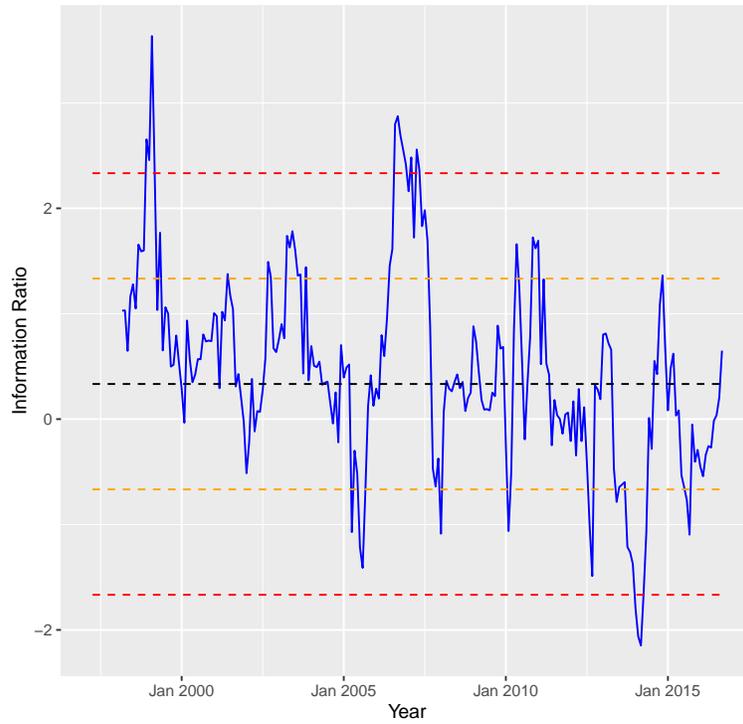




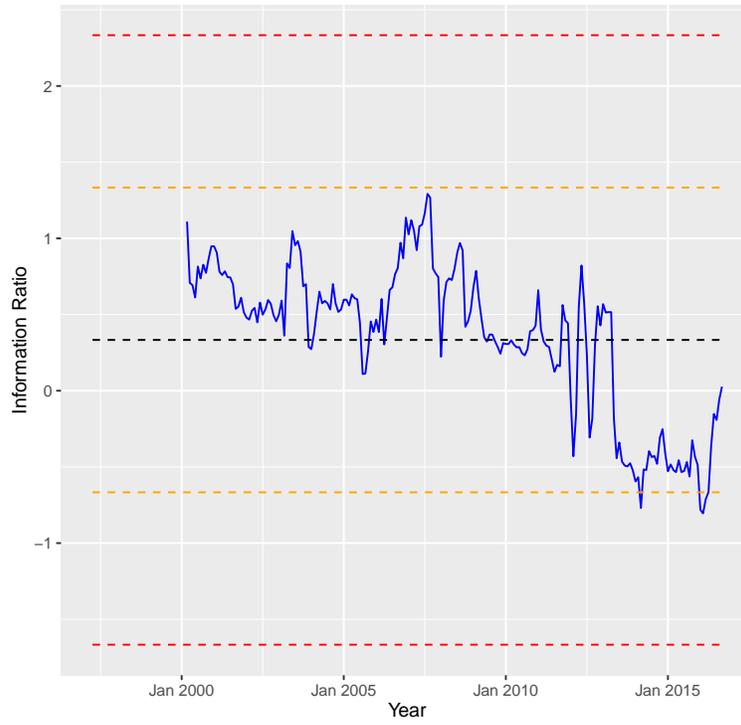
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



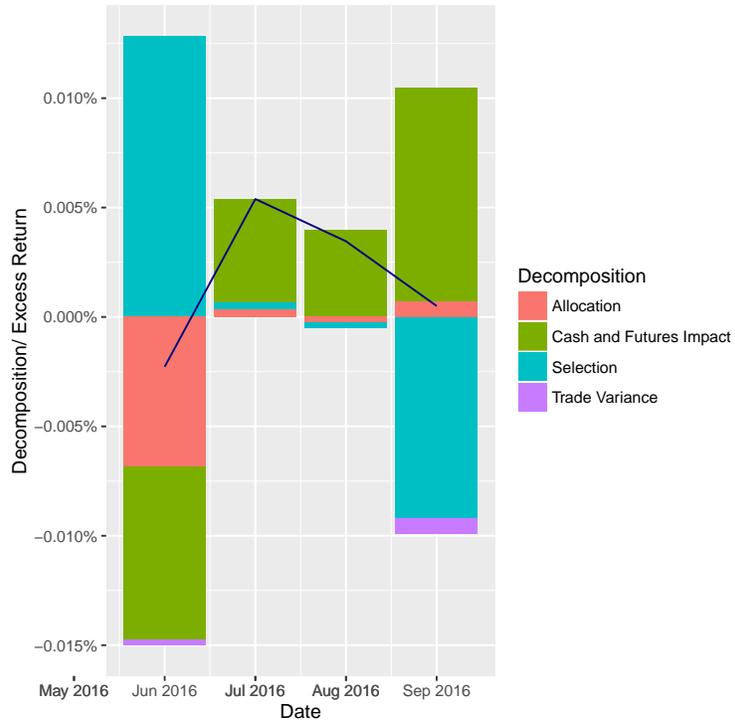
E2 Rolling 12 Month Information Ratio



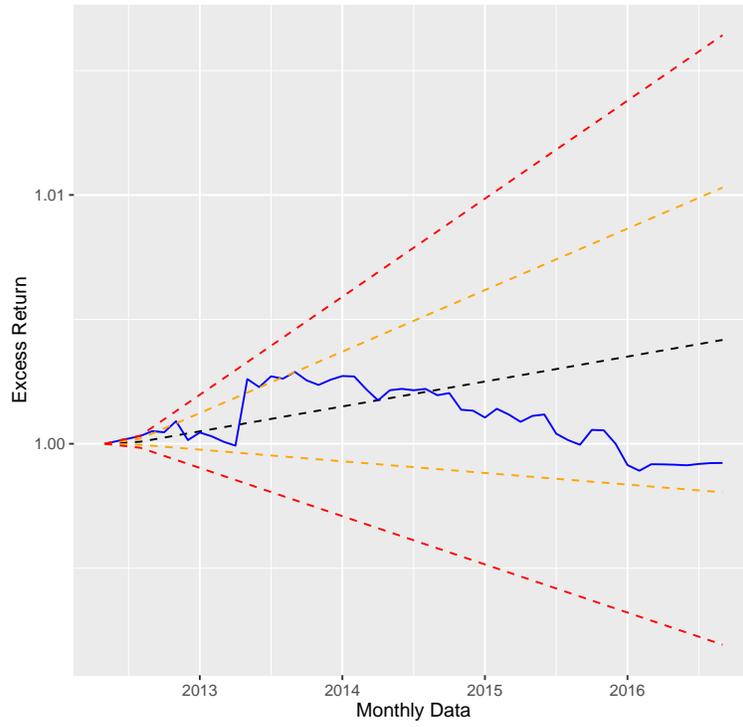
E2 Rolling 36 Month Information Ratio



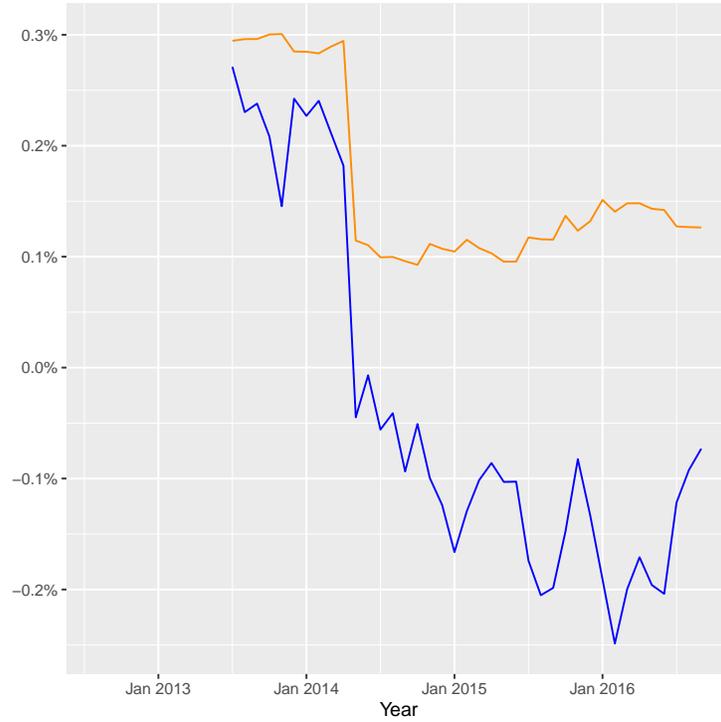
E7 NAV Decomposition Of Excess Return



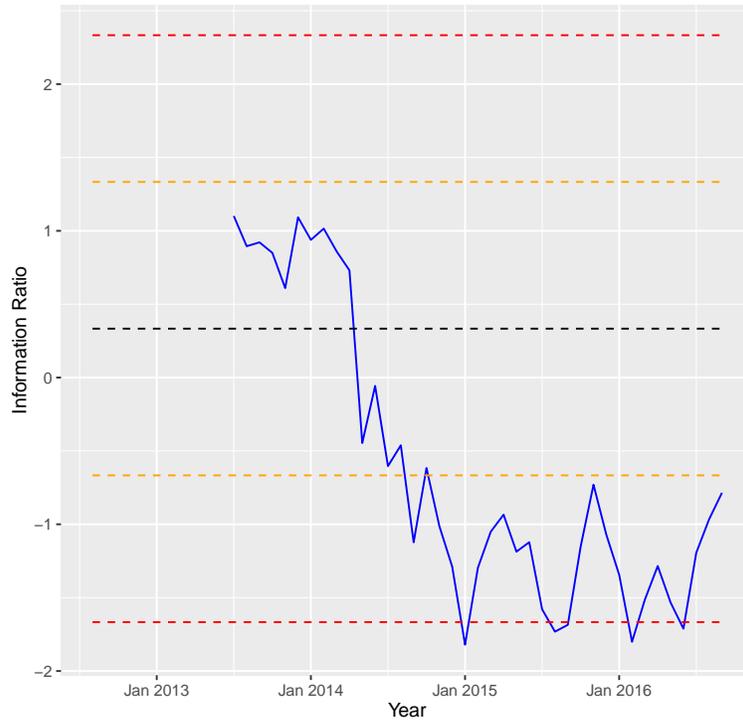
E7 Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



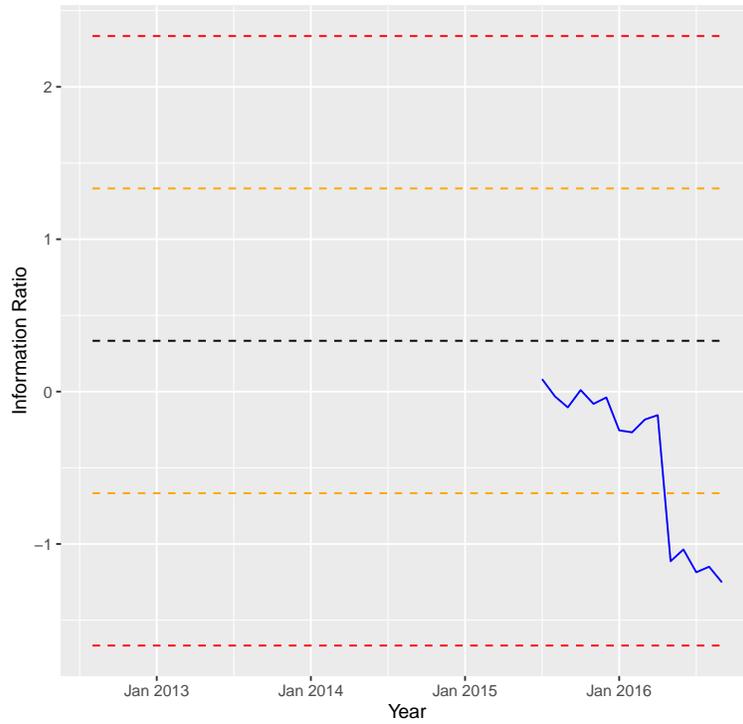
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



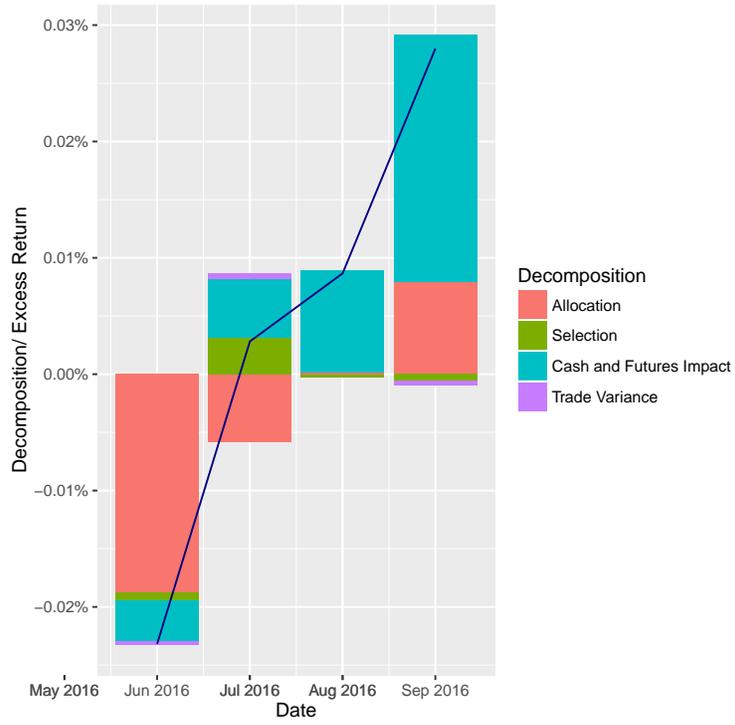
E7 Rolling 12 Month Information Ratio



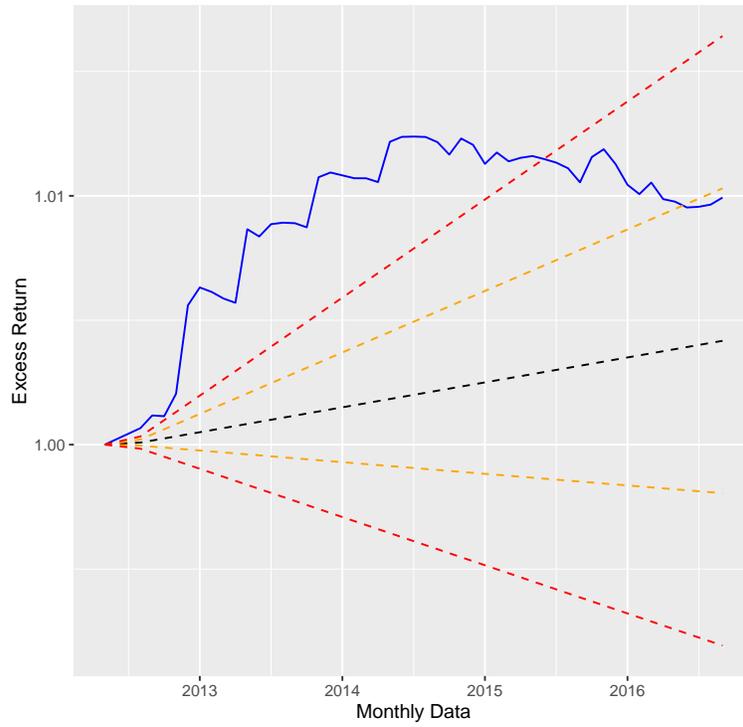
E7 Rolling 36 Month Information Ratio



E8 NAV Decomposition Of Excess Return



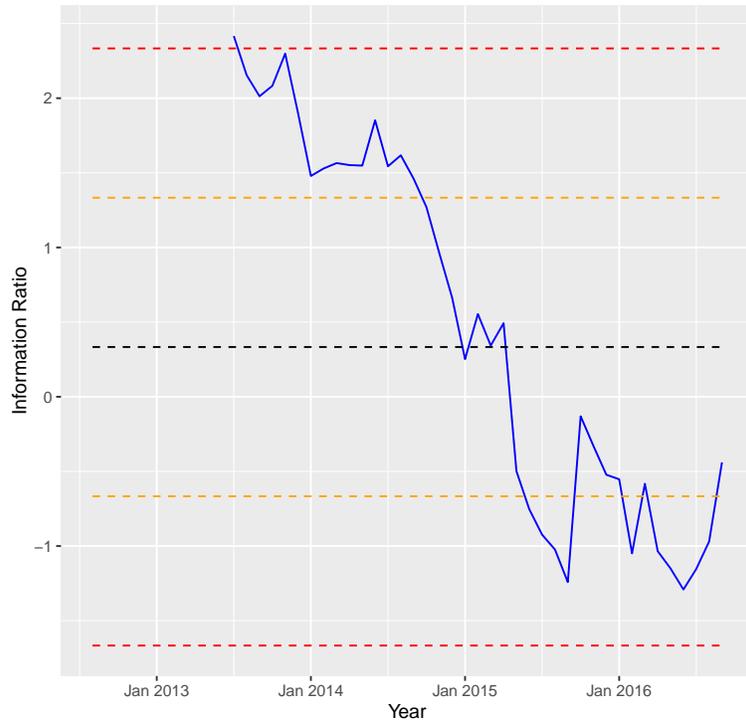
E8 Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



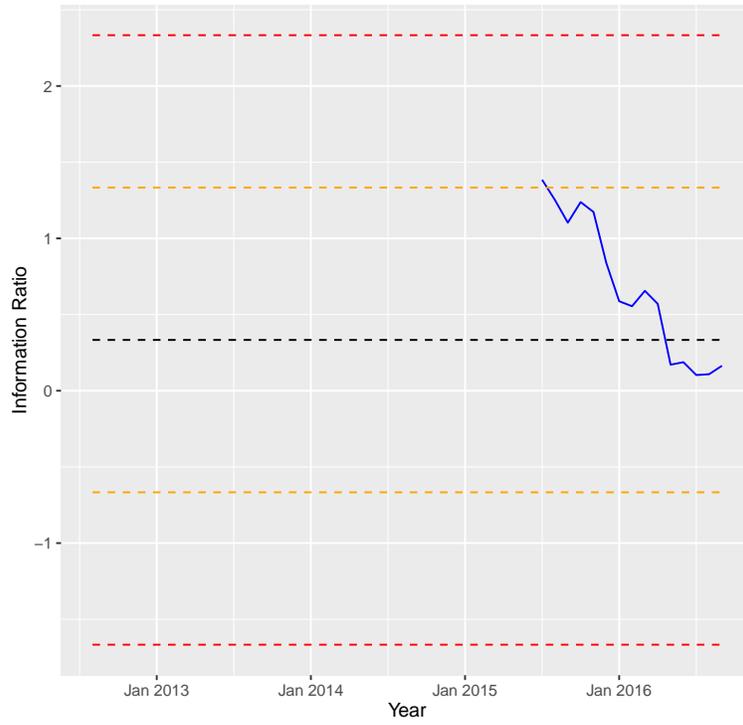
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



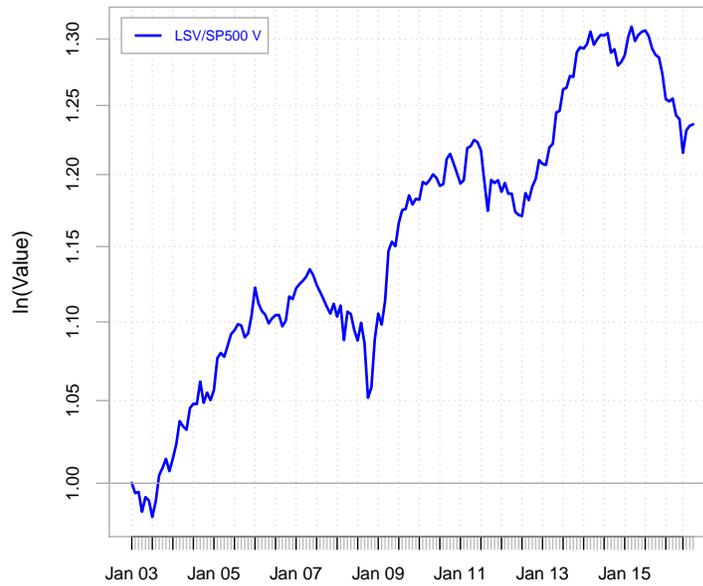
E8 Rolling 12 Month Information Ratio



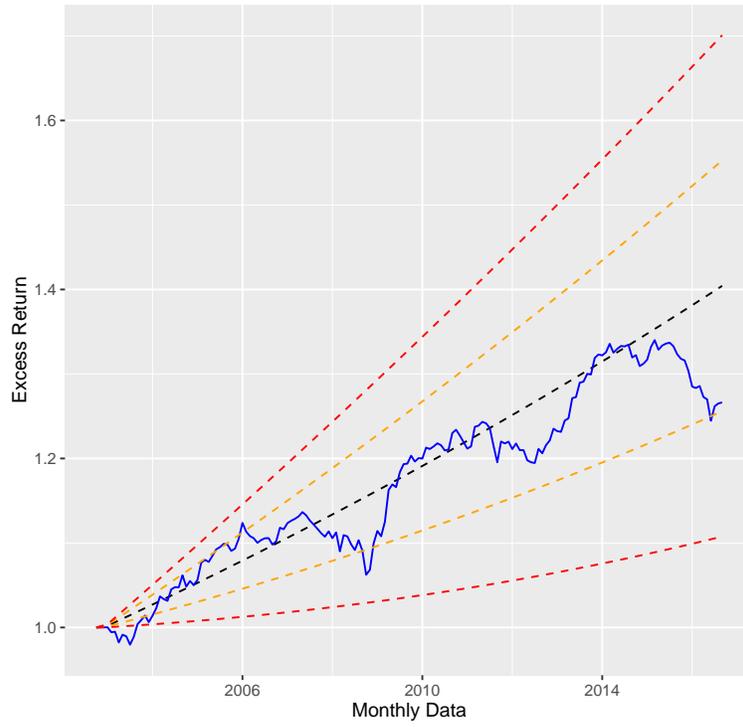
E8 Rolling 36 Month Information Ratio



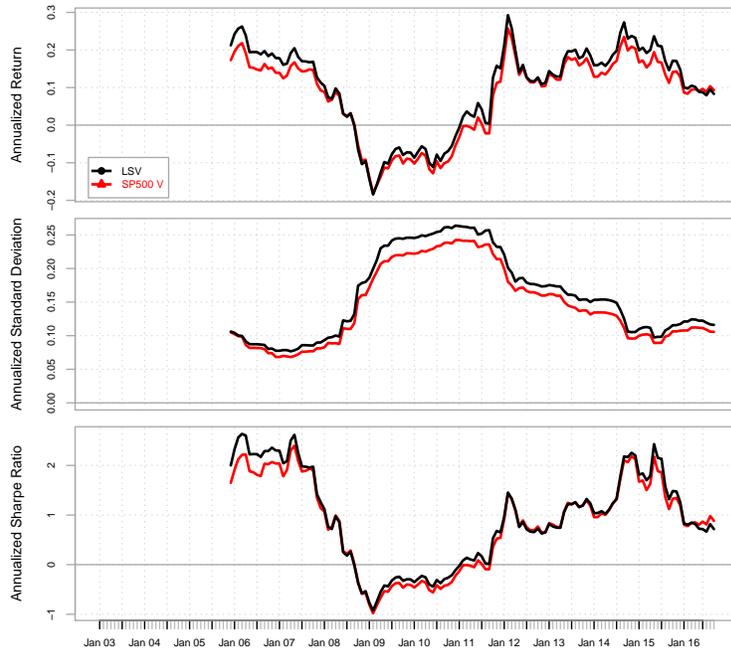
LSV Cumulative Relative Performance



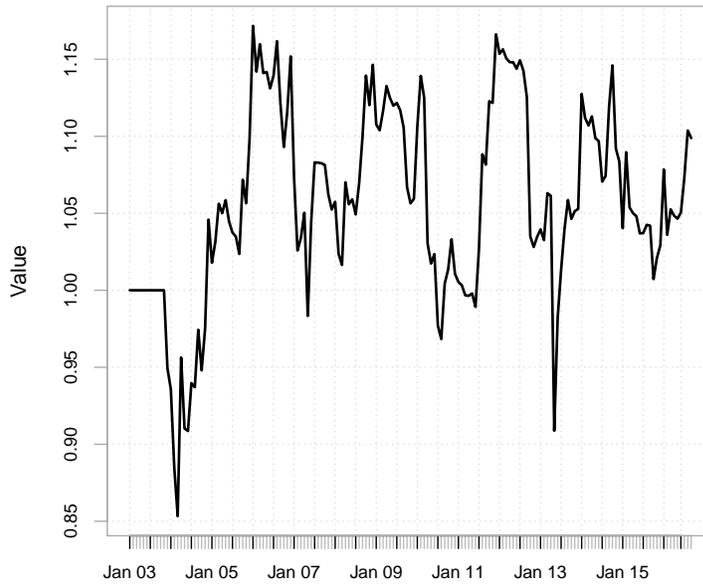
LSV Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



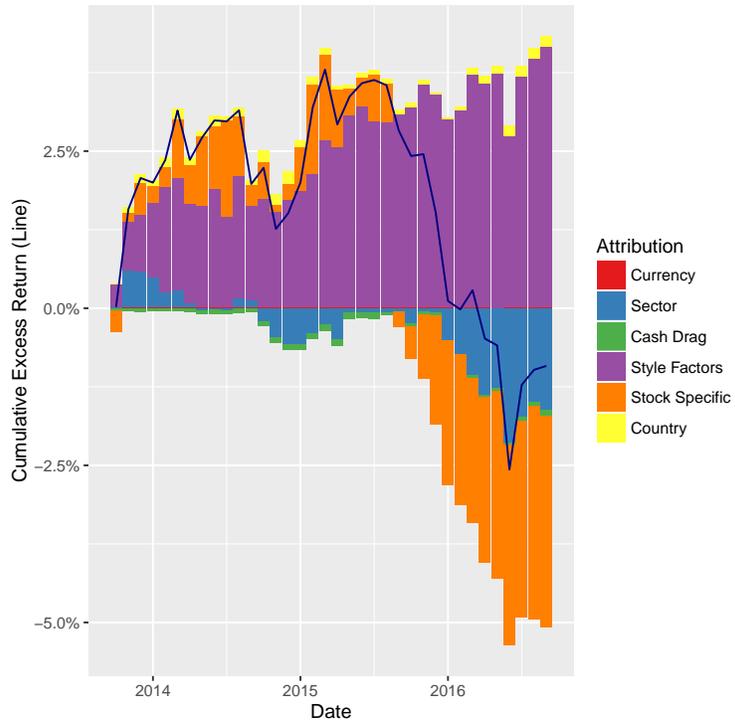
LSV Rolling 3 year Performance



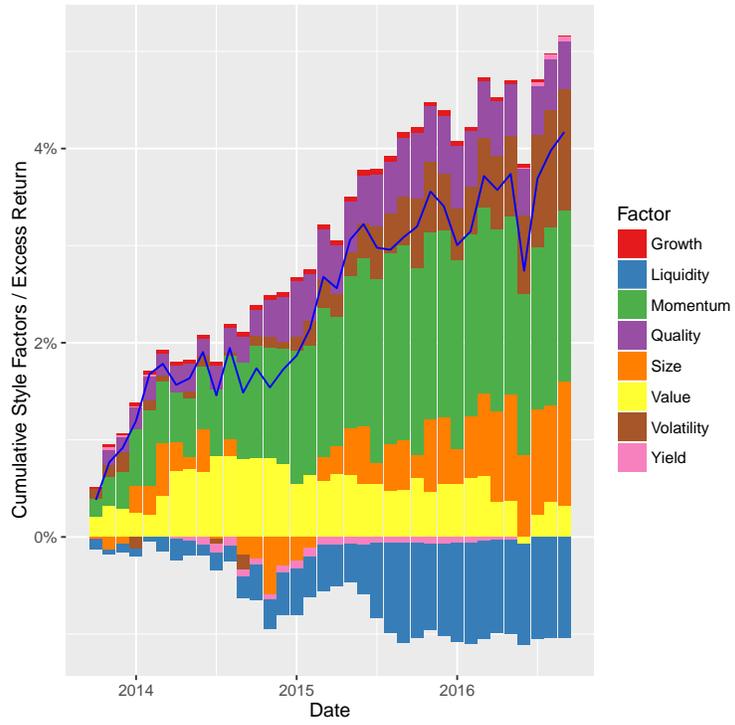
LSV Rolling 12 Month Beta



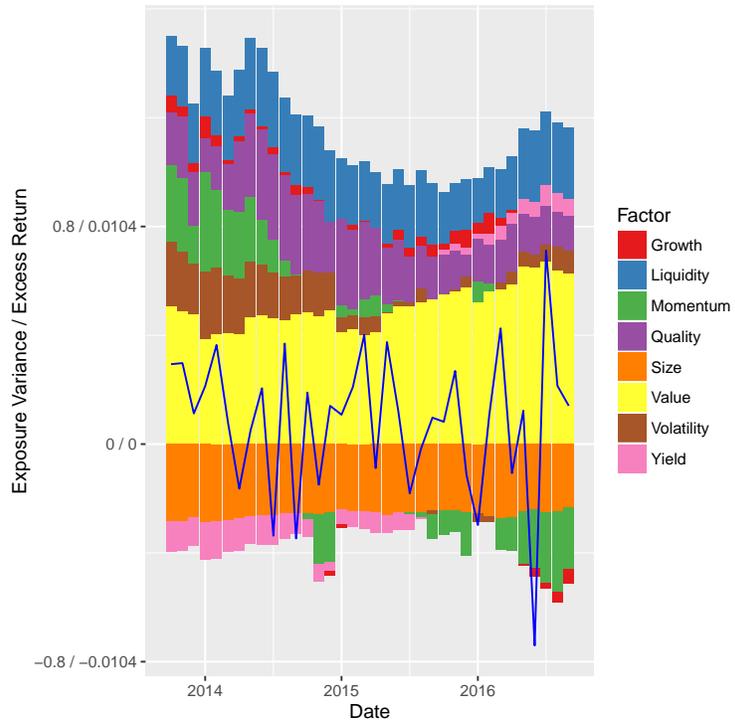
LSV Barra Factor Attribution



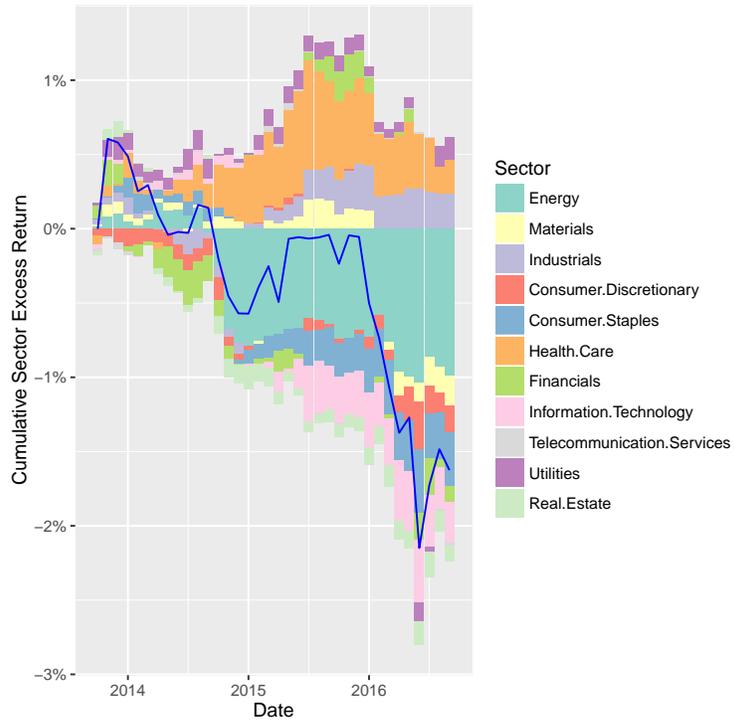
LSV Style Factor Breakout



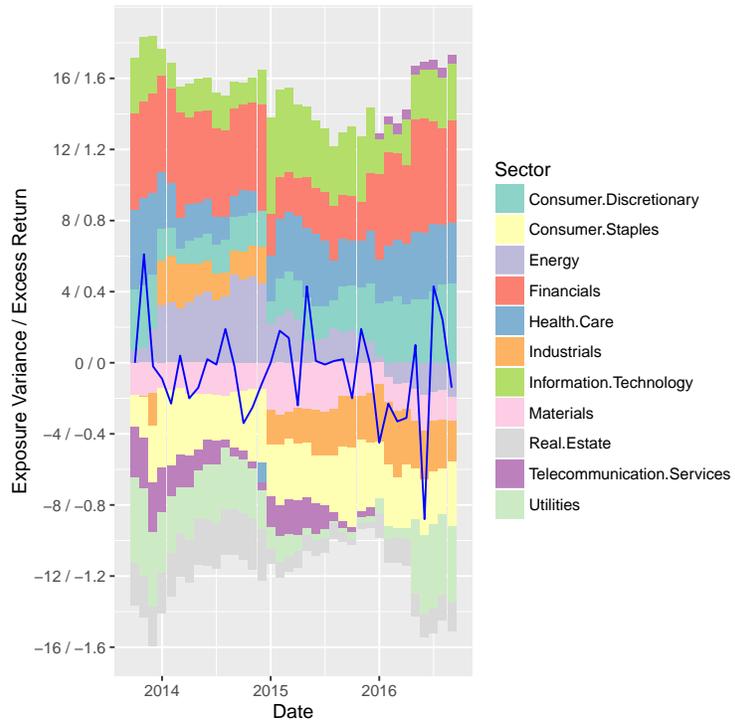
LSV Monthly Style Factors Active Exposure



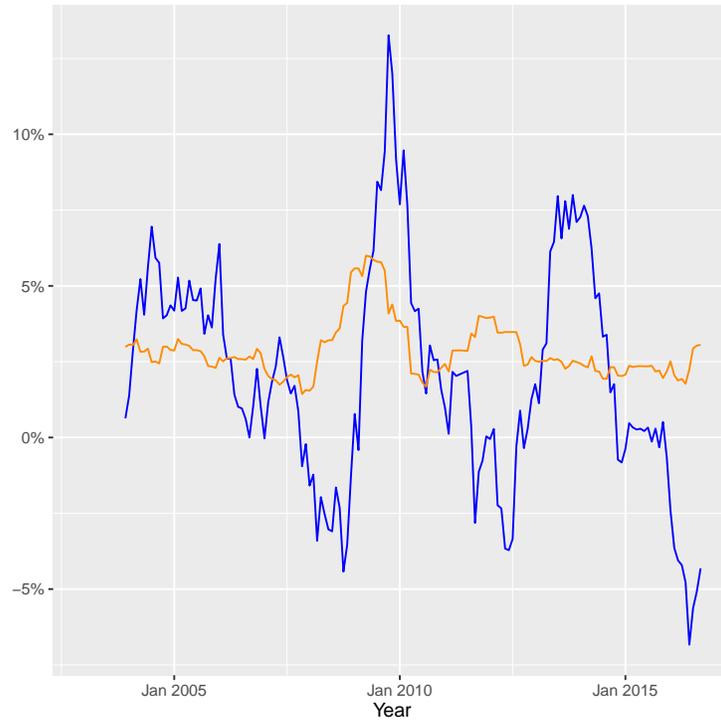
LSV Monthly GICS Sector Return



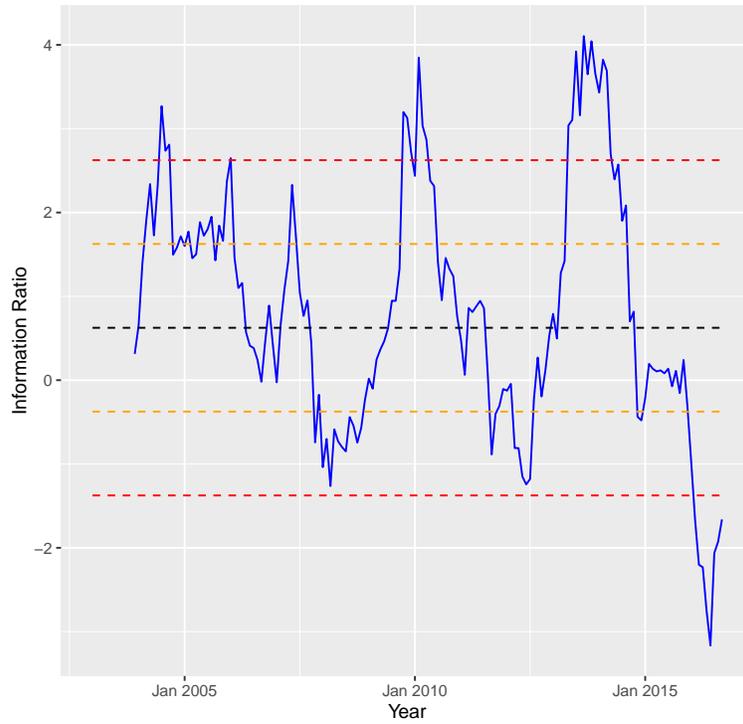
LSV GICS Sector Active Exposure



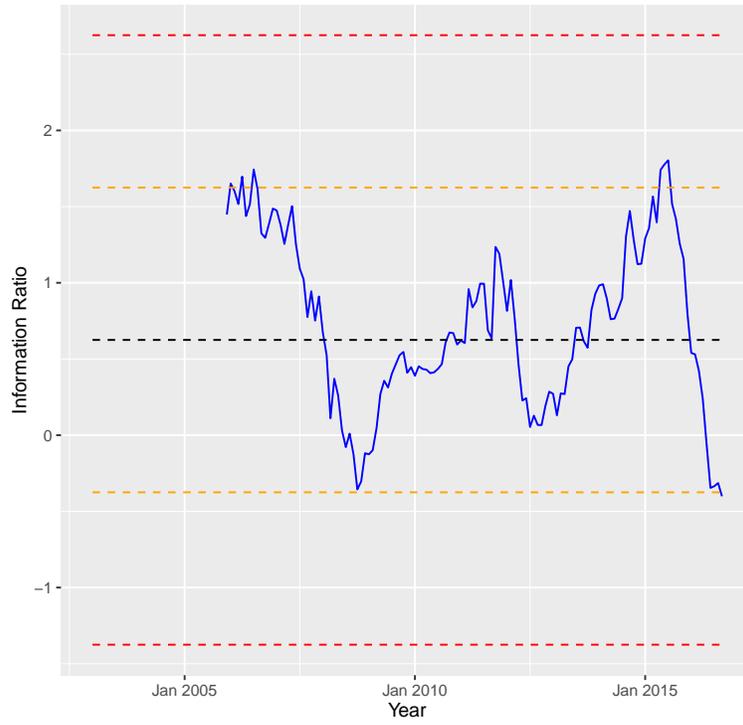
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



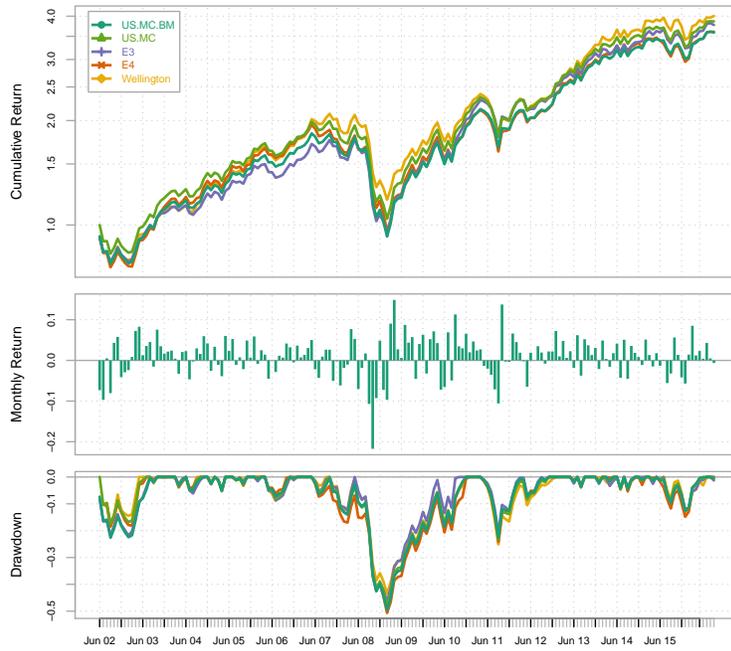
LSV Rolling 12 Month Information Ratio



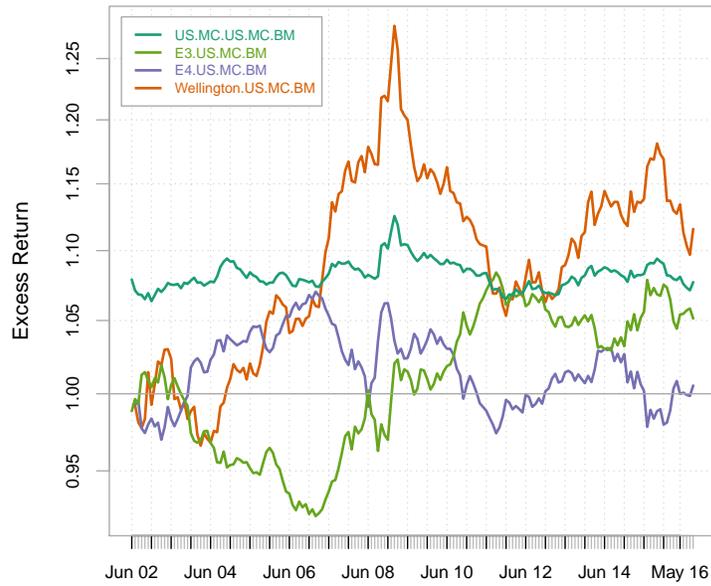
LSV Rolling 36 Month Information Ratio



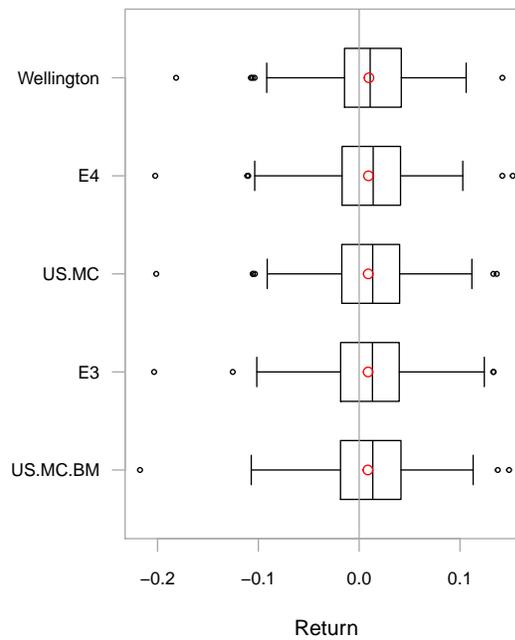
US Mid Cap Performance Summary



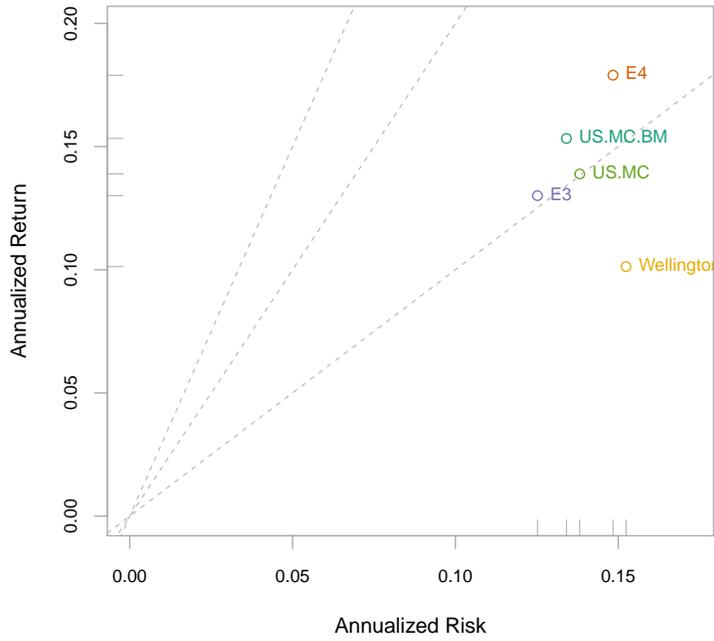
### US Mid Cap Cumulative Relative Performance



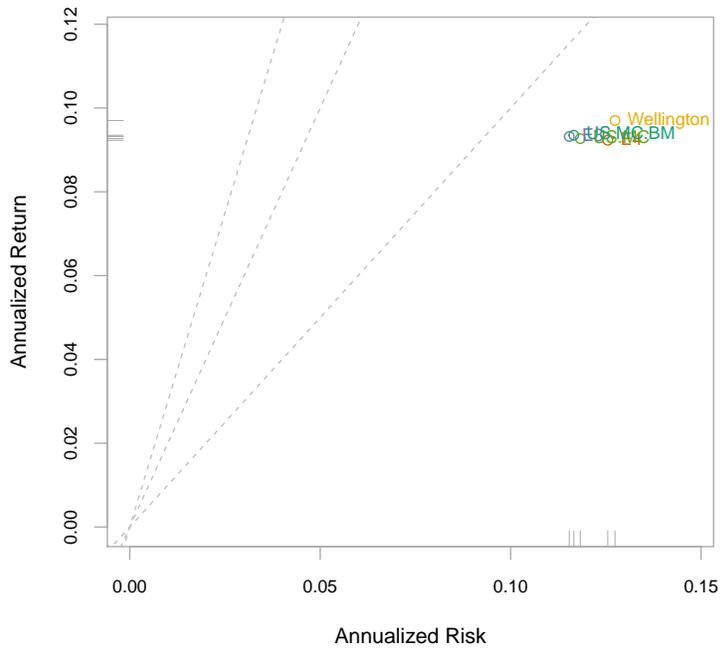
### Return Distribution Comparison



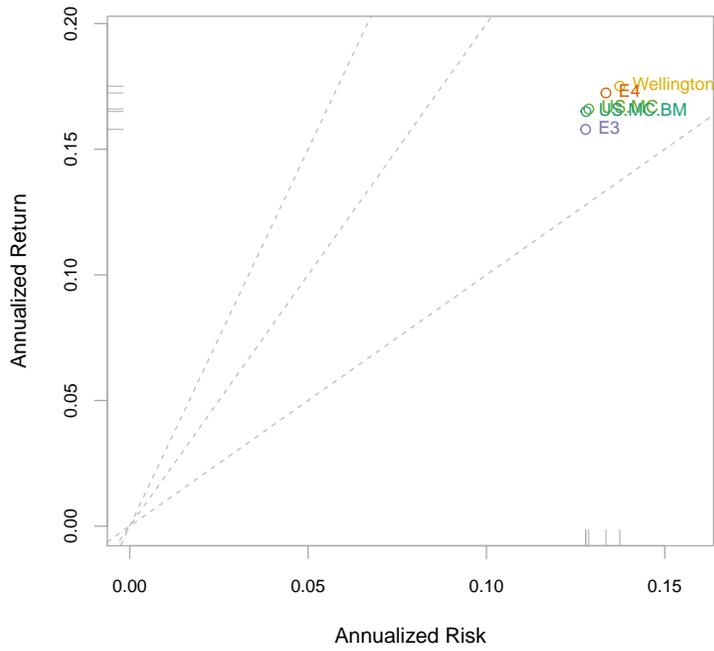
**US Mid Cap Trailing 1 Year Performance vs Sharpe Ratios (1,2,3)**



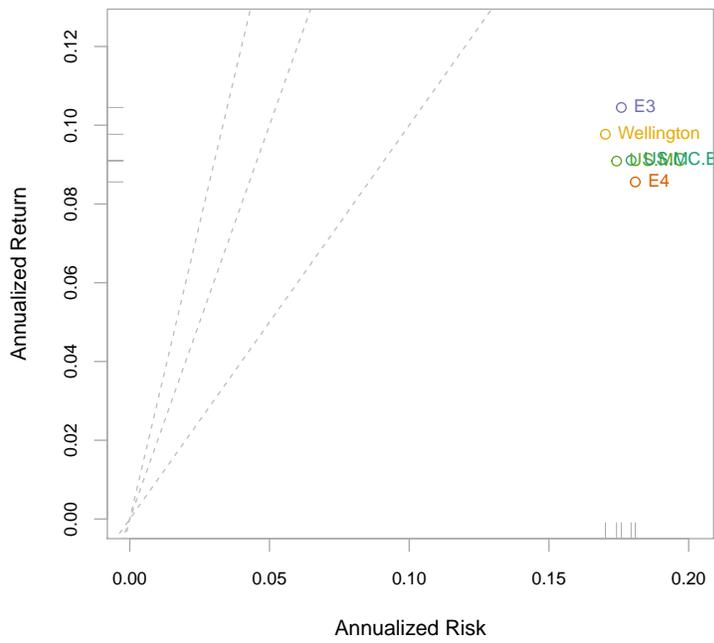
**Trailing 3 Year Performance vs Sharpe Ratios (1,2,3)**



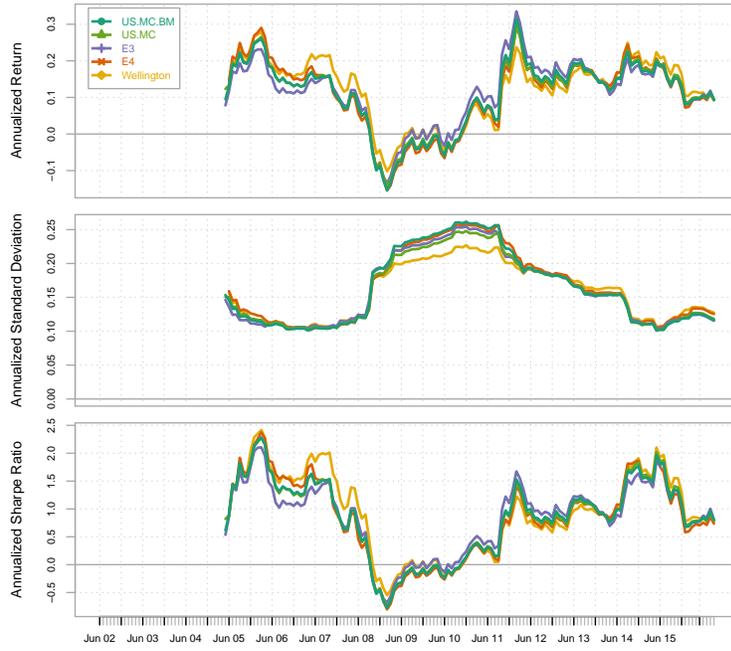
Trailing 5 Year Performance vs Sharpe Ratios (1,2,3)



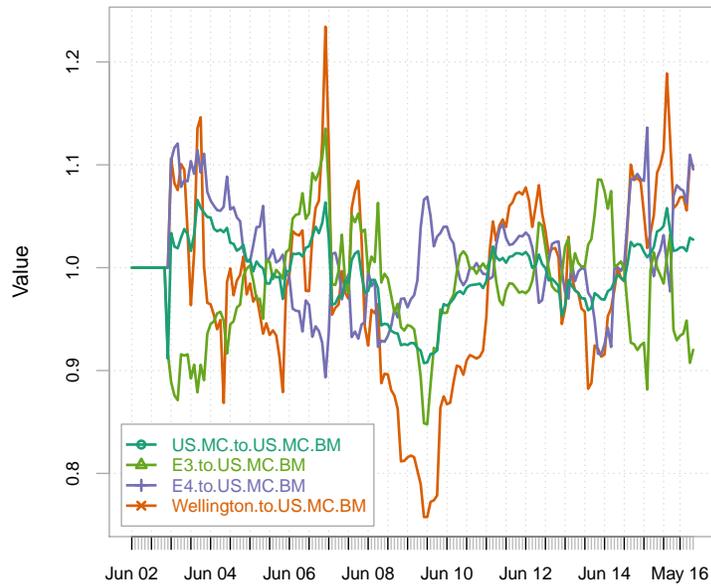
Trailing 10 Year Performance vs Sharpe Ratios (1,2,3)



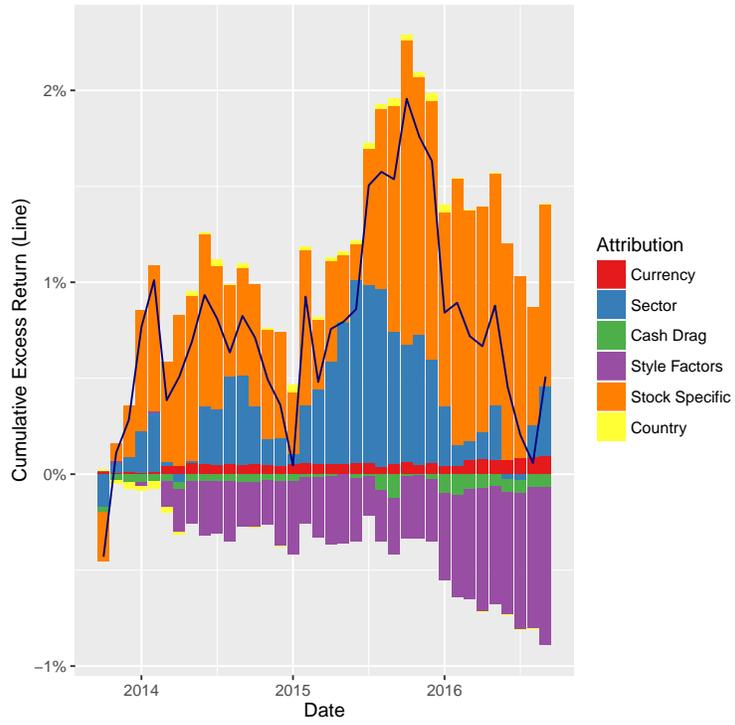
US Mid Cap Rolling 3 Year Performance



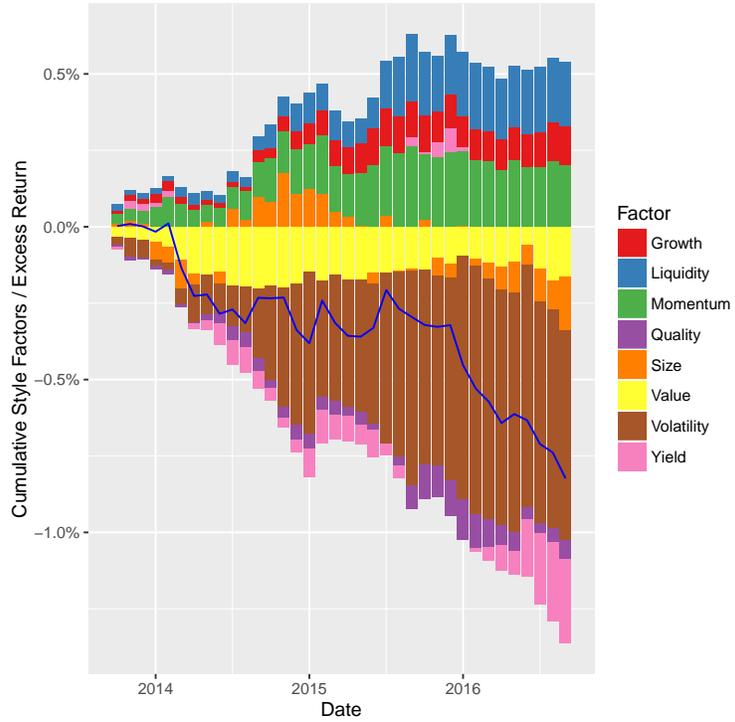
US Mid Cap Rolling 12 Month Beta



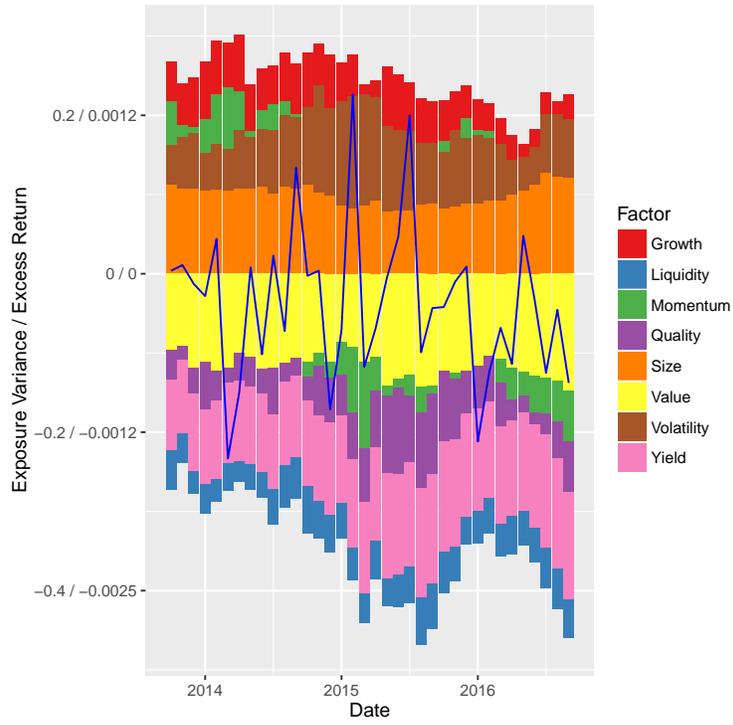
US Mid Cap Barra Factor Attribution



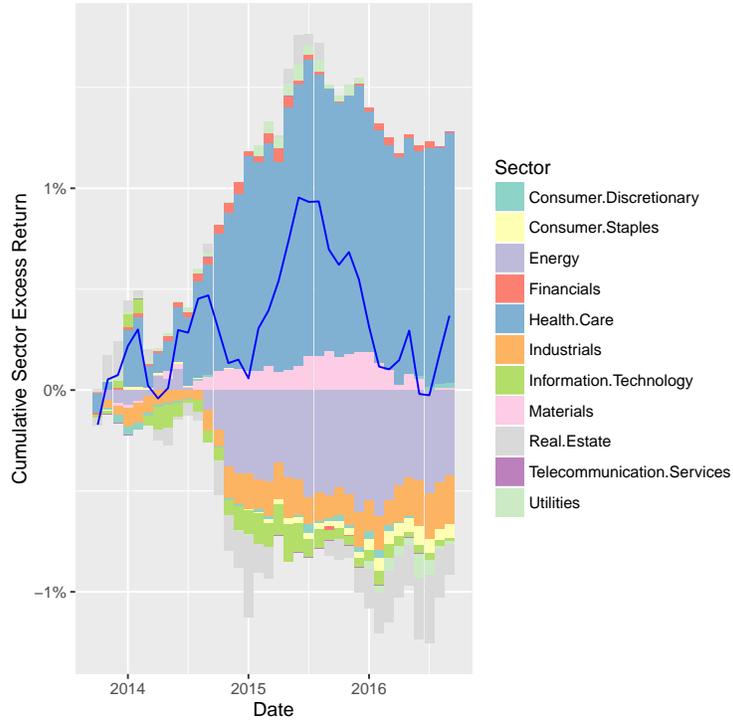
US Mid Cap Style Factor Breakout



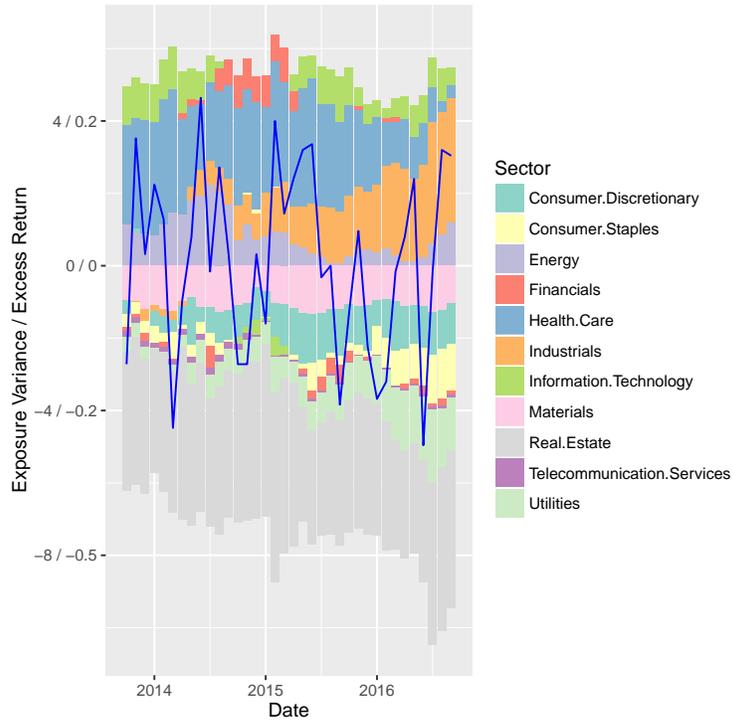
US Mid Cap Monthly Style Factors Active Exposure



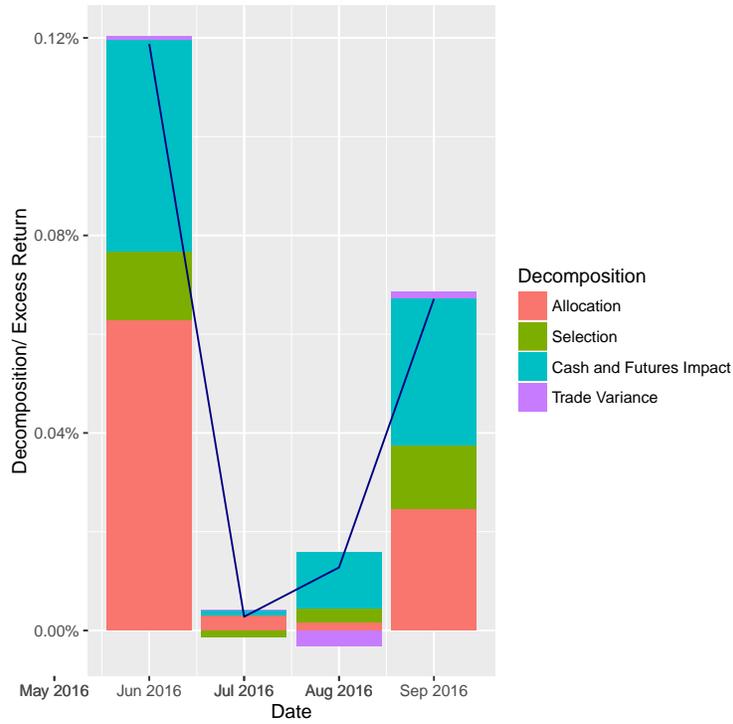
US Mid Cap Monthly GICS Sector Return



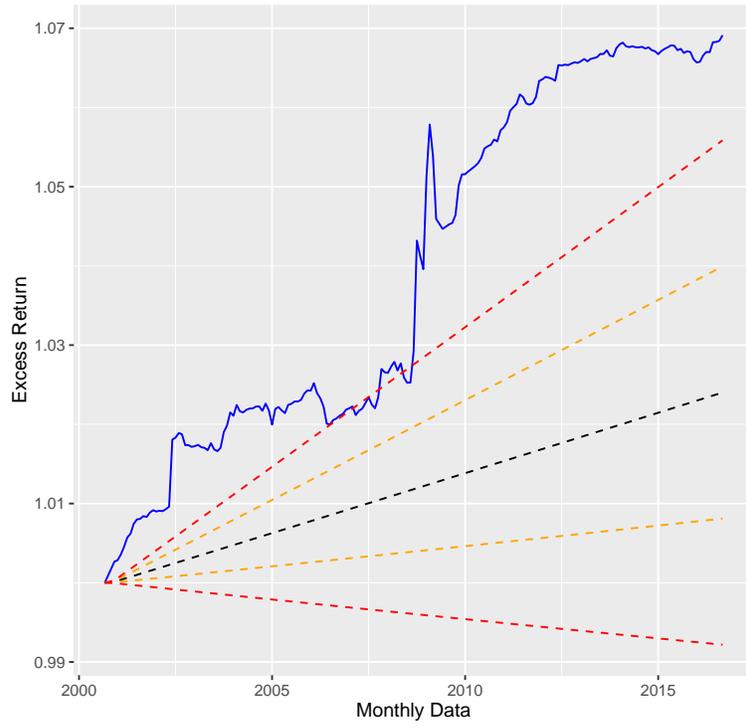
US Mid Cap GICS Sector Active Exposure



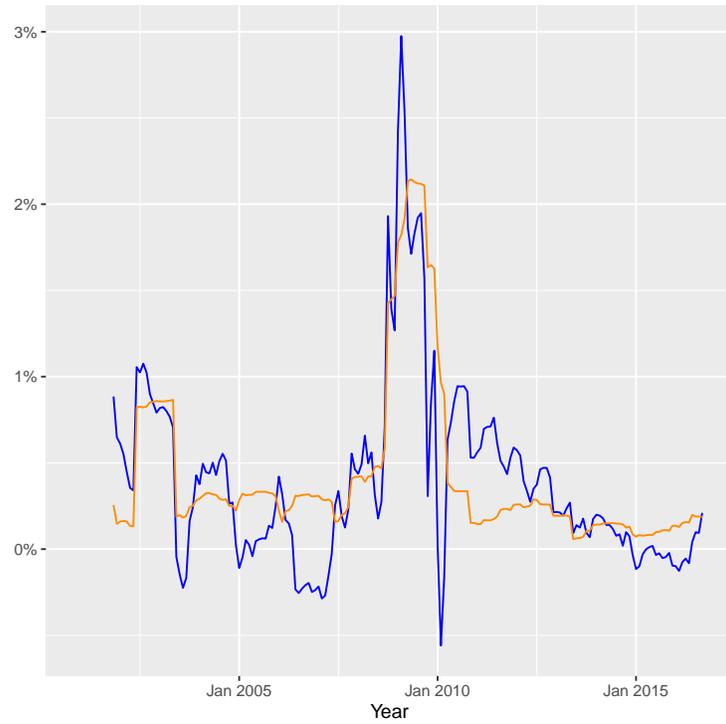
E3 NAV Decomposition Of Excess Return



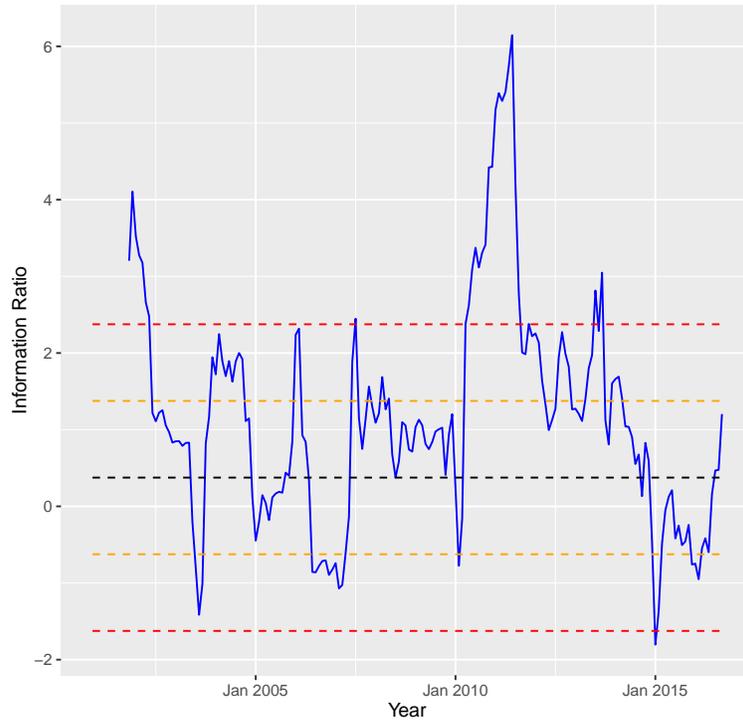
E3 Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



E3 Rolling 12 Month Information Ratio



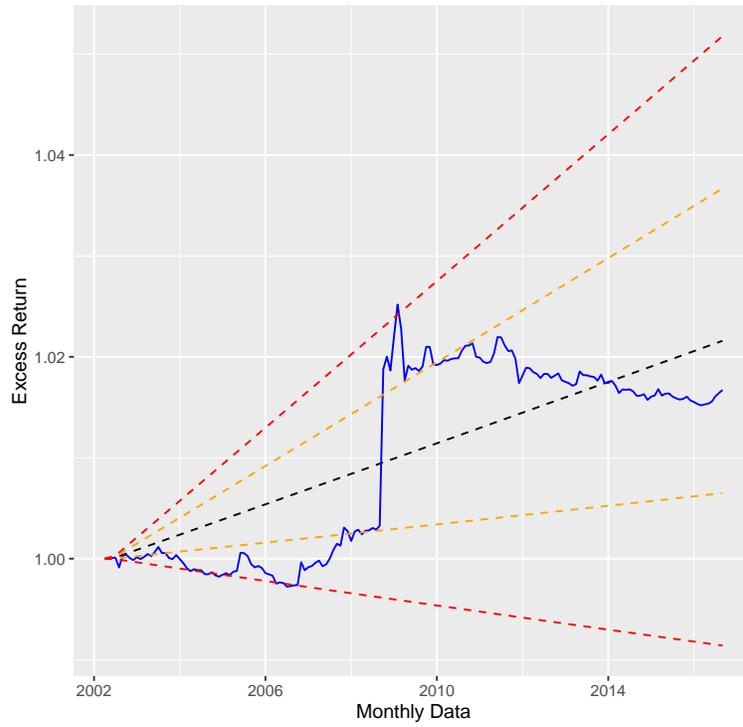
E3 Rolling 36 Month Information Ratio



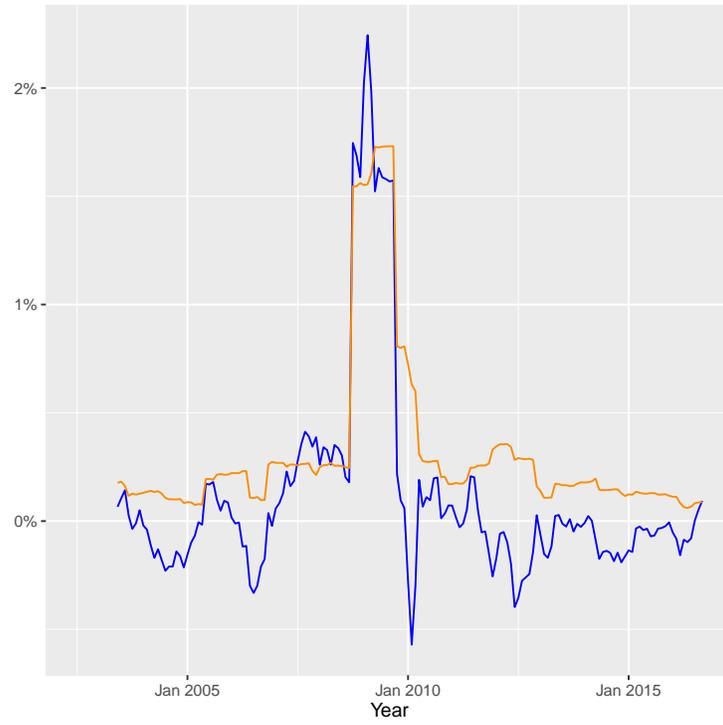
E4 NAV Decomposition Of Excess Return



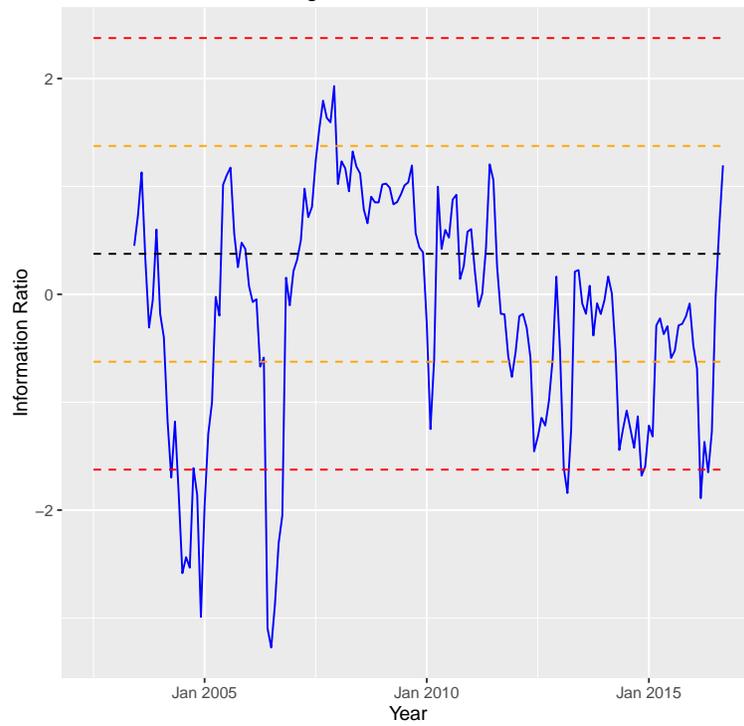
E4 Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



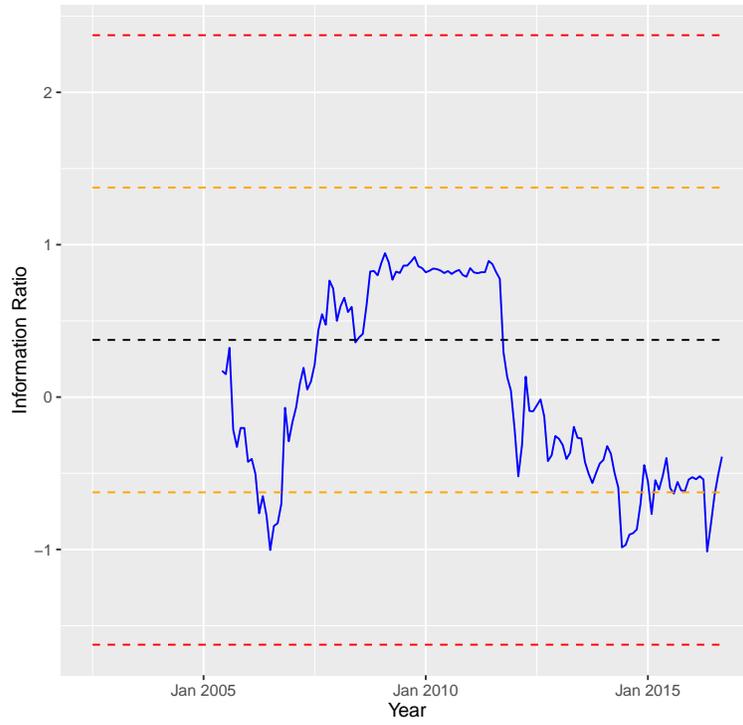
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



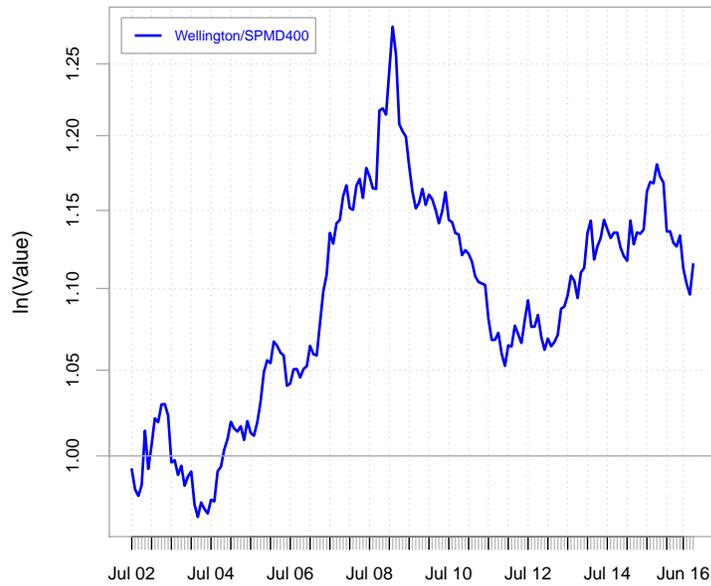
E4 Rolling 12 Month Information Ratio



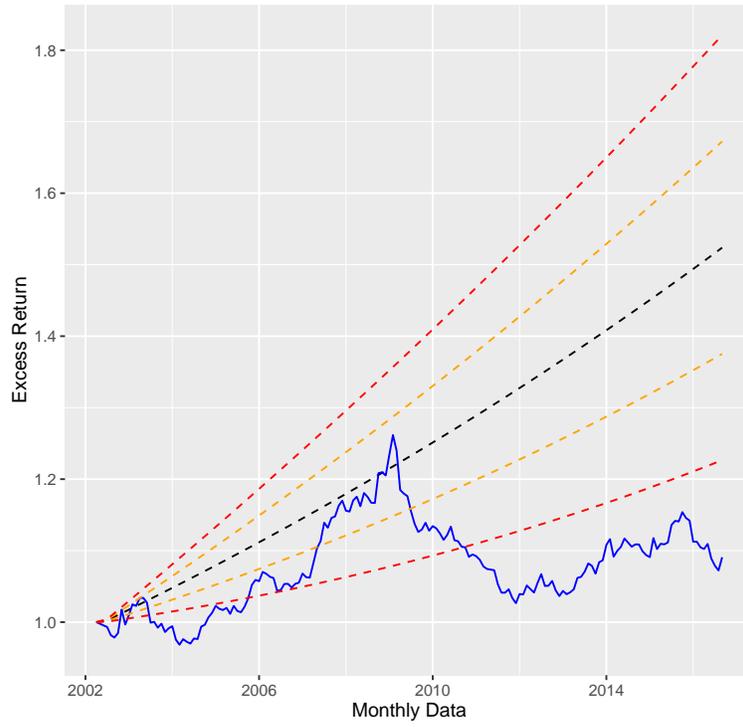
E4 Rolling 36 Month Information Ratio



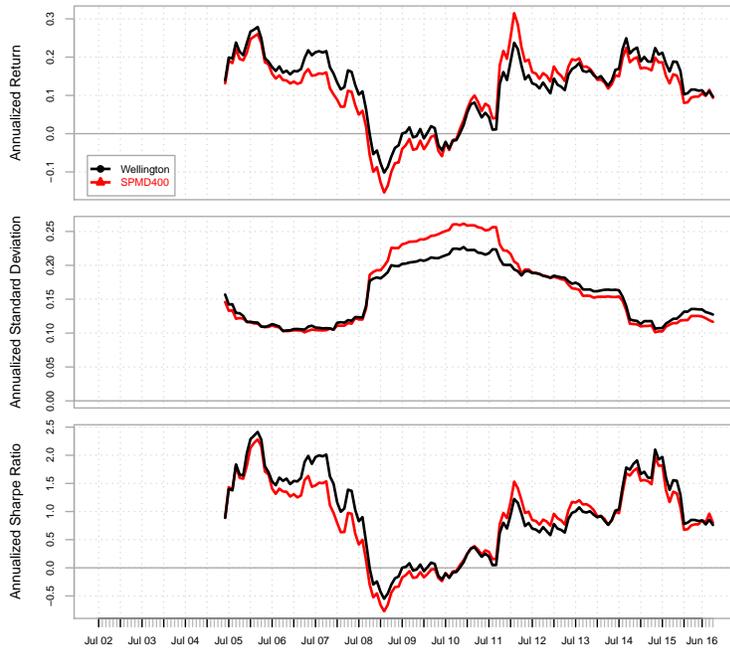
Wellington Cumulative Relative Performance



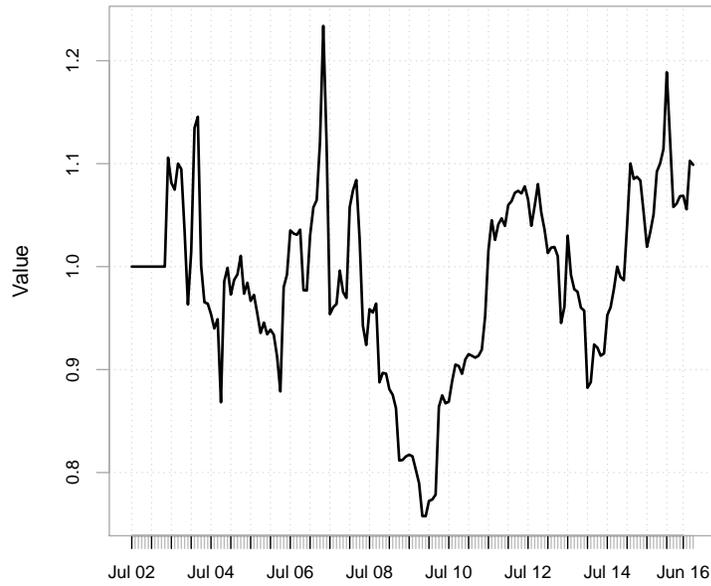
Wellington Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



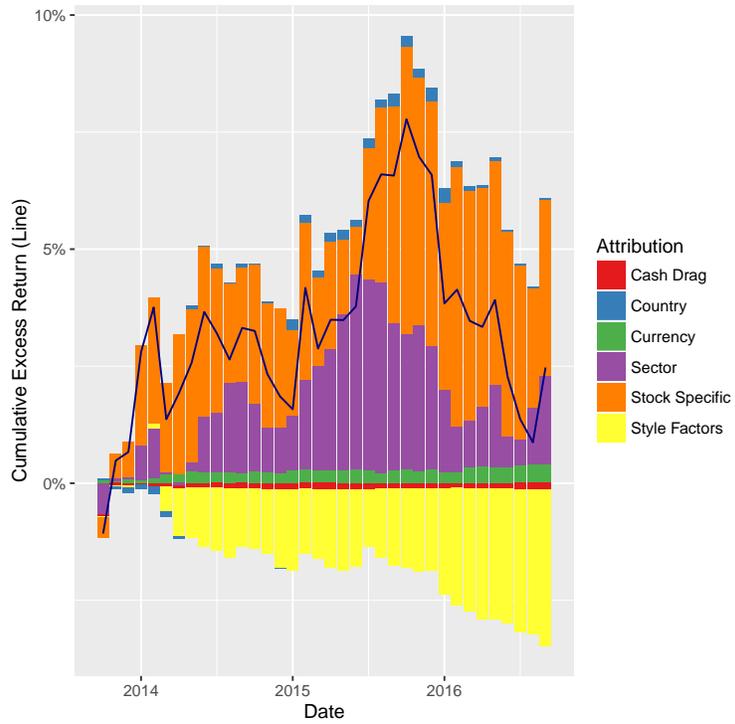
Wellington Rolling 3 year Performance



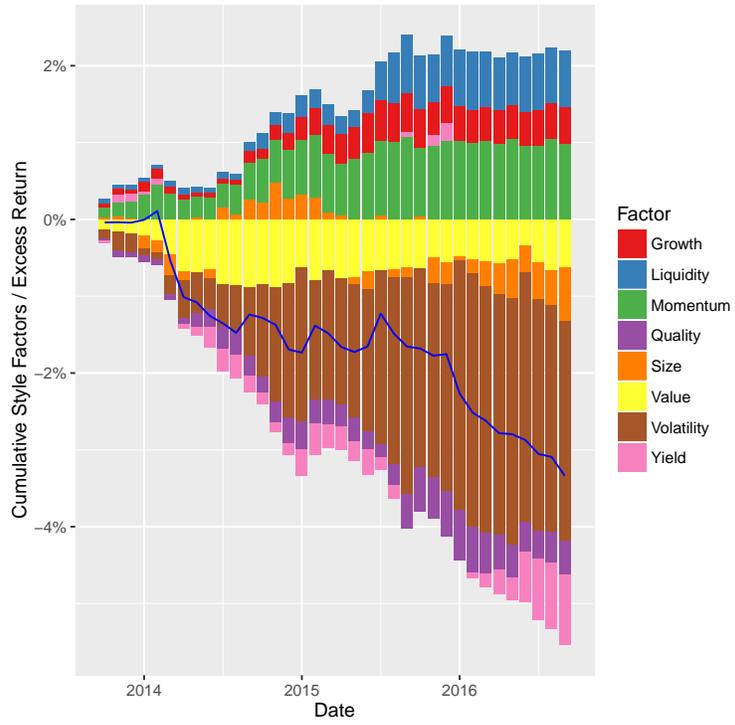
Wellington Rolling 12 Month Beta



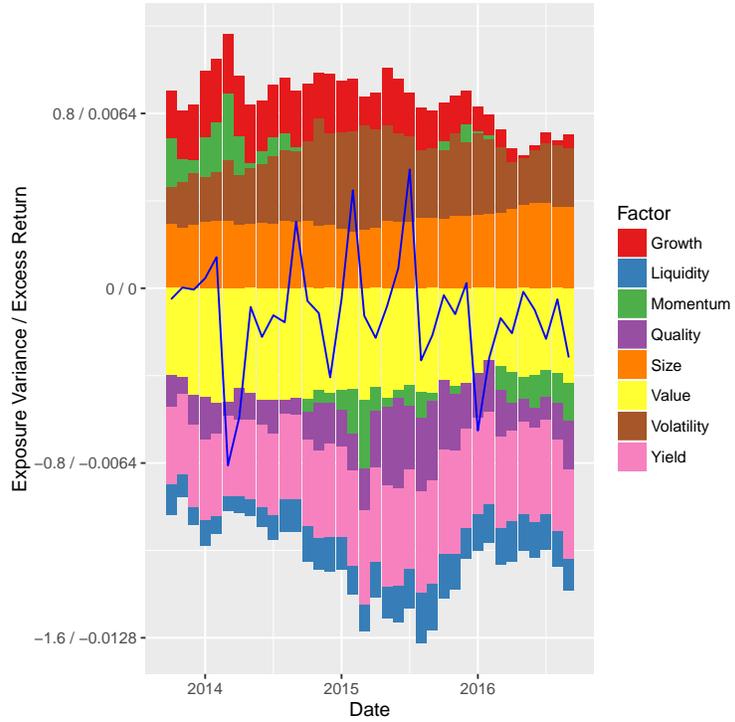
Wellington Barra Factor Attribution



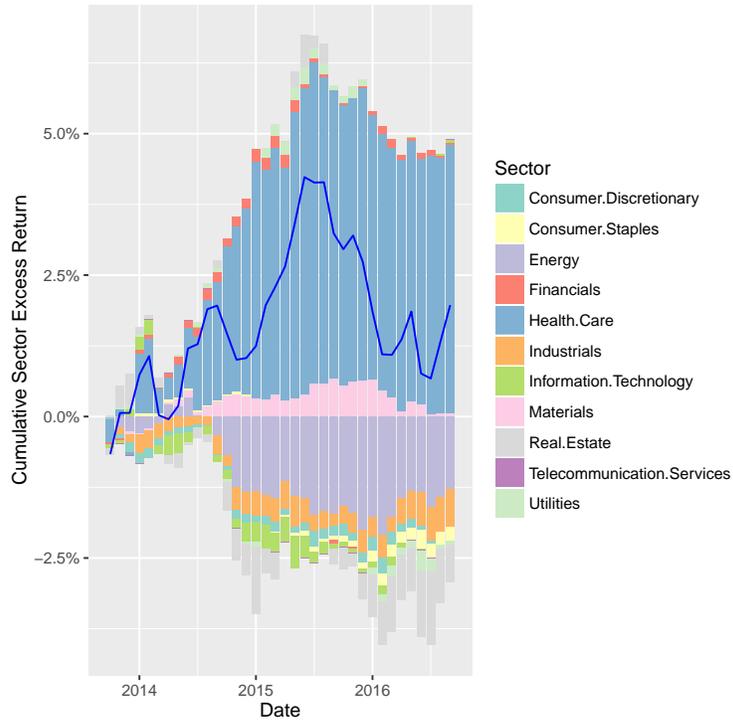
Wellington Style Factor Breakout



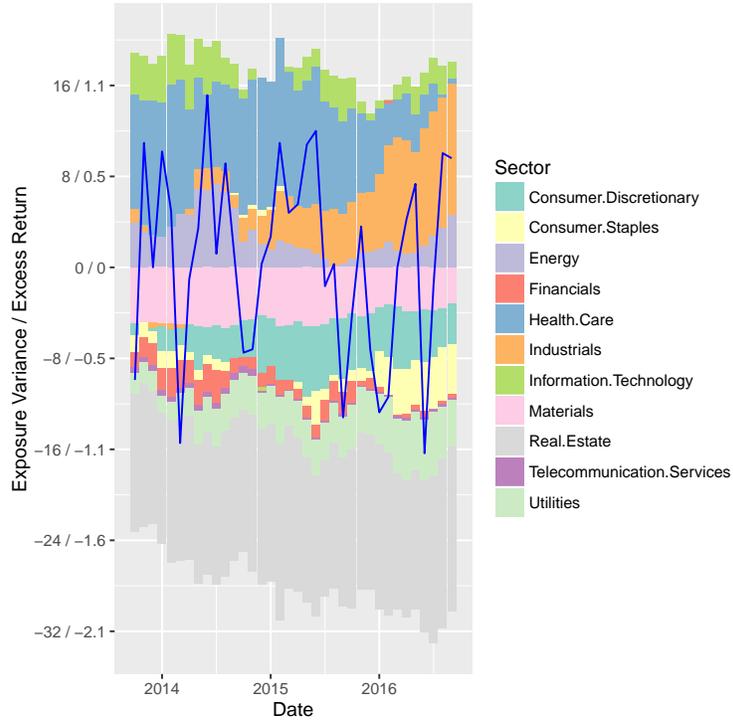
Wellington Monthly Style Factors Active Exposure



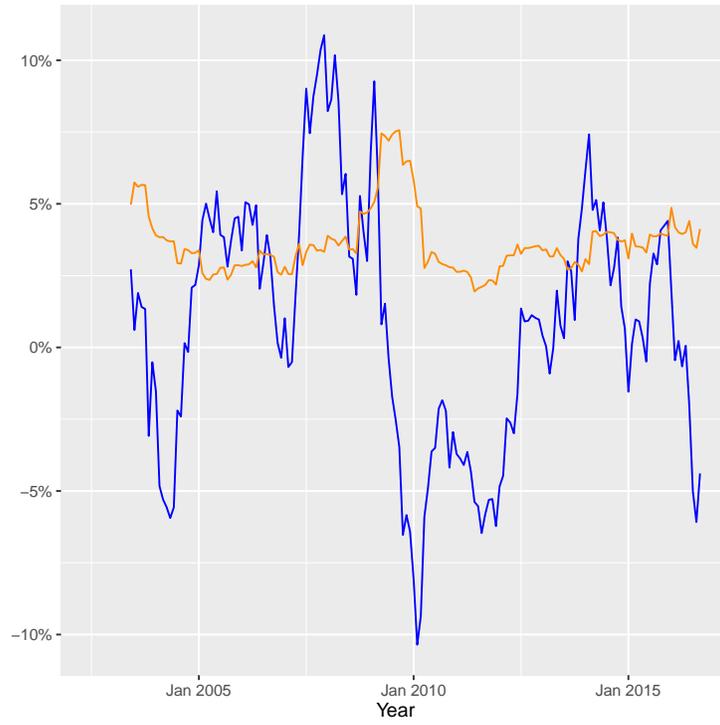
Wellington Monthly GICS Sector Return



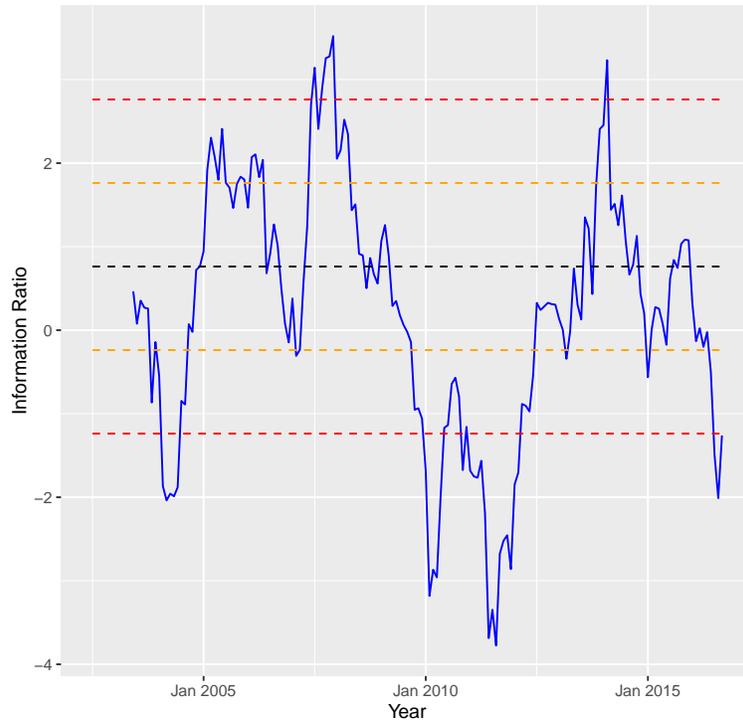
Wellington GICS Sector Active Exposure



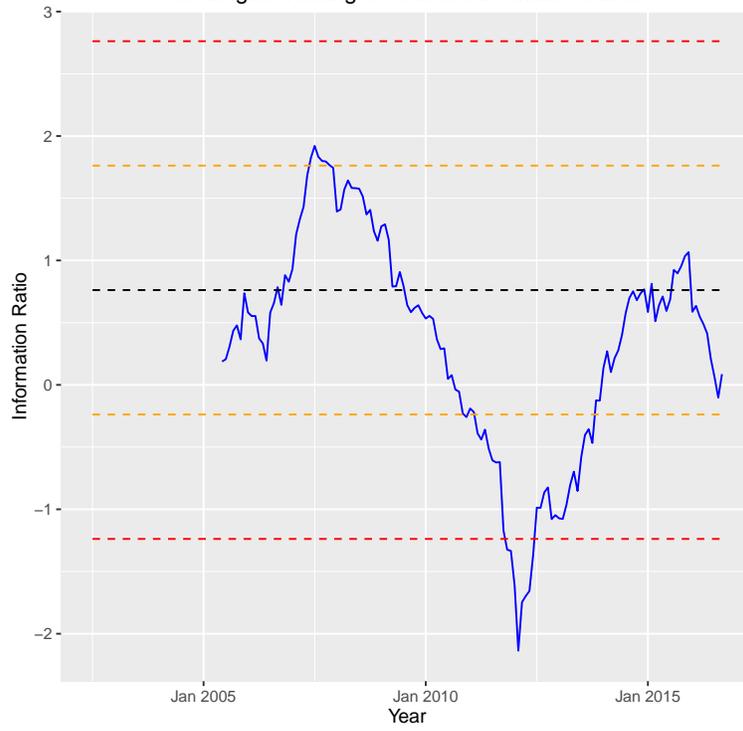
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



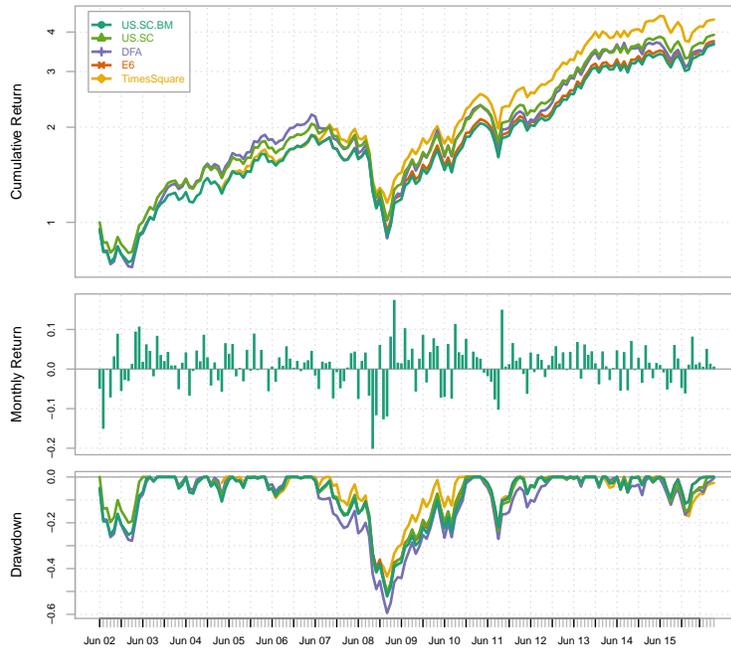
Wellington Rolling 12 Month Information Ratio



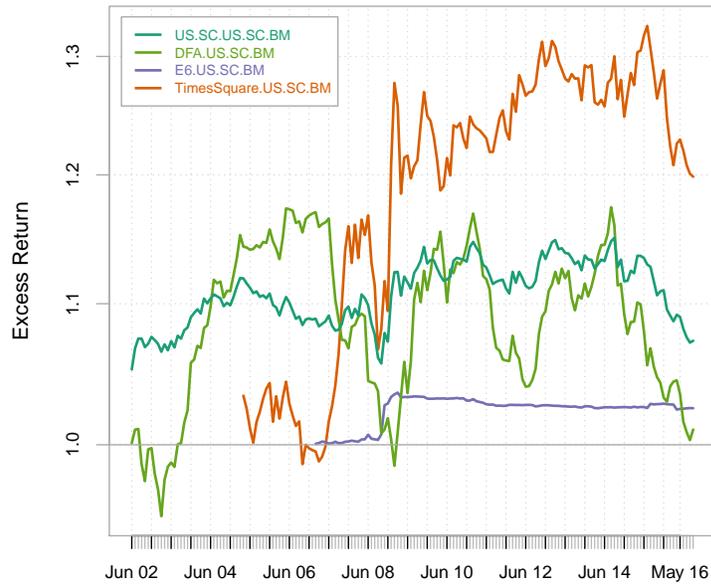
Wellington Rolling 36 Month Information Ratio



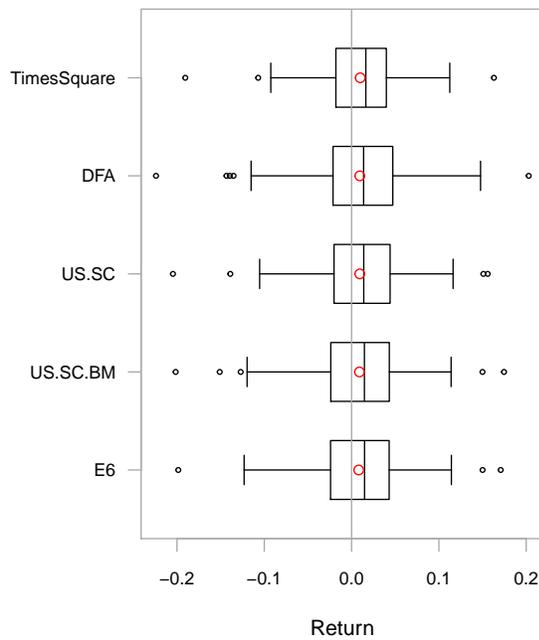
US Small Cap Performance Summary



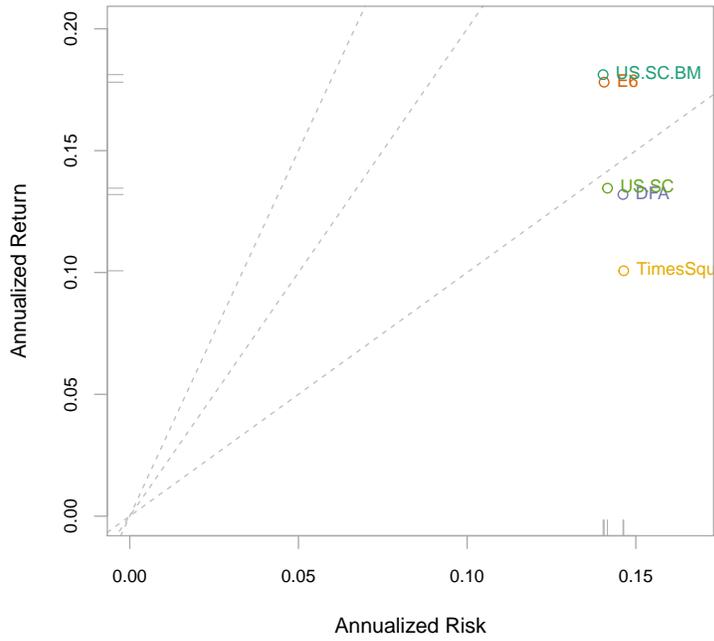
### US Small Cap Cumulative Relative Performance



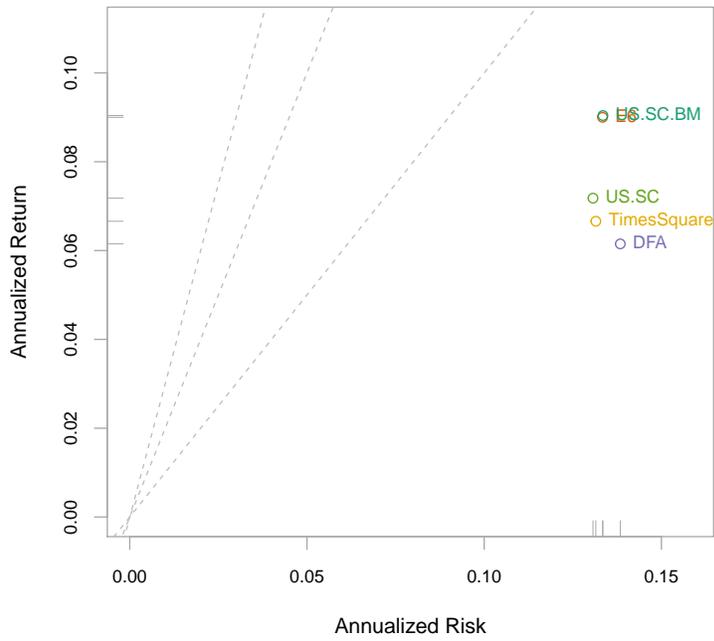
### Return Distribution Comparison



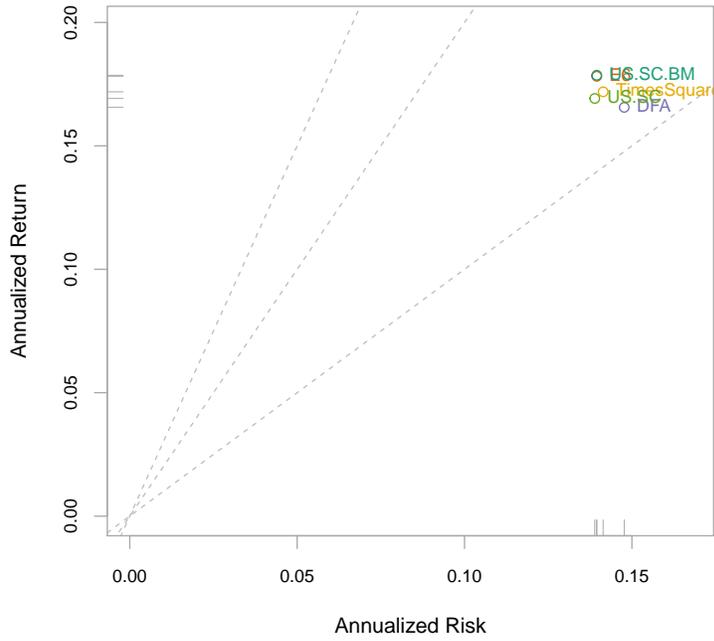
**US Small Cap Trailing 1 Year Performance vs Sharpe Ratios (1,2,3)**



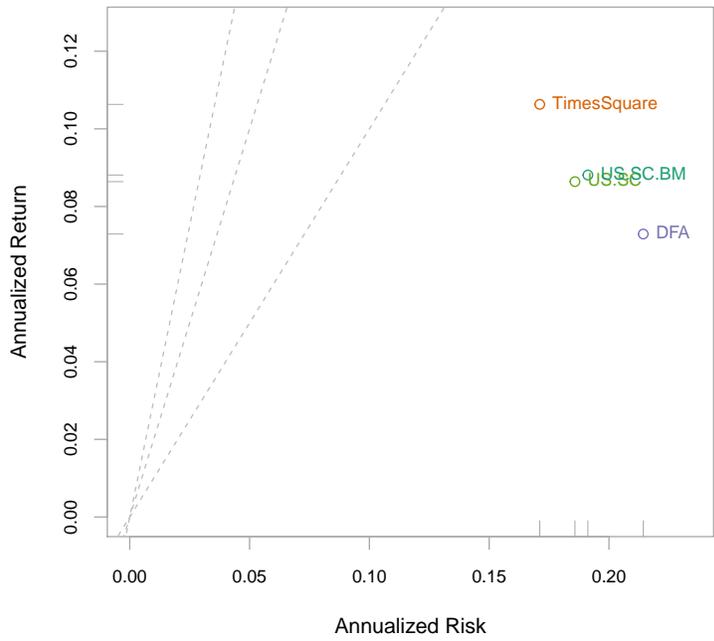
**Trailing 3 Year Performance vs Sharpe Ratios (1,2,3)**



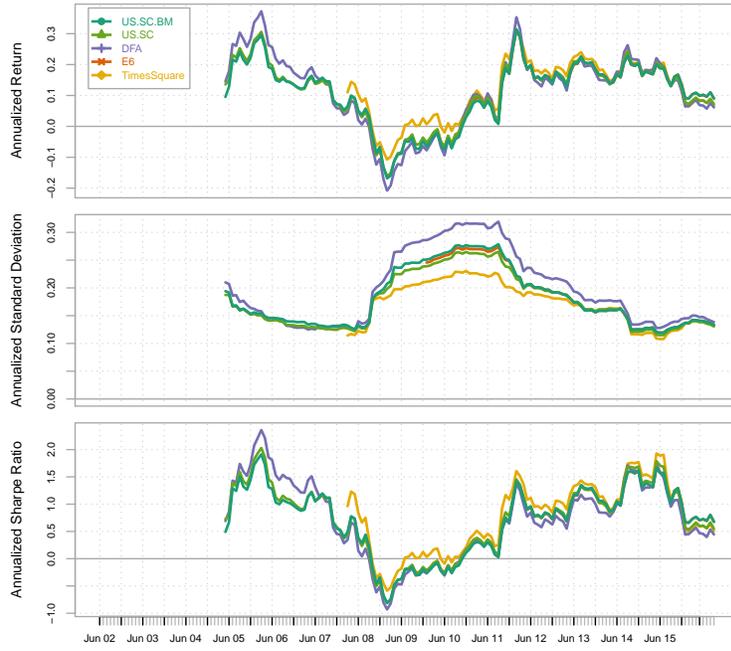
Trailing 5 Year Performance vs Sharpe Ratios (1,2,3)



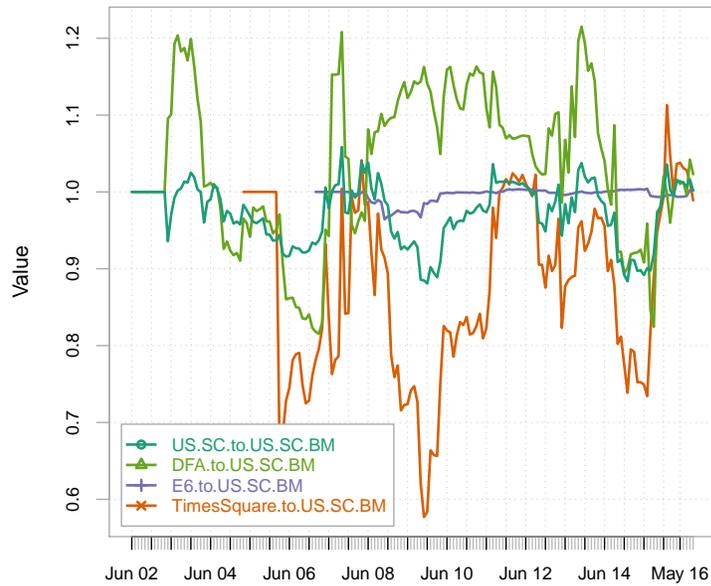
Trailing 10 Year Performance vs Sharpe Ratios (1,2,3)



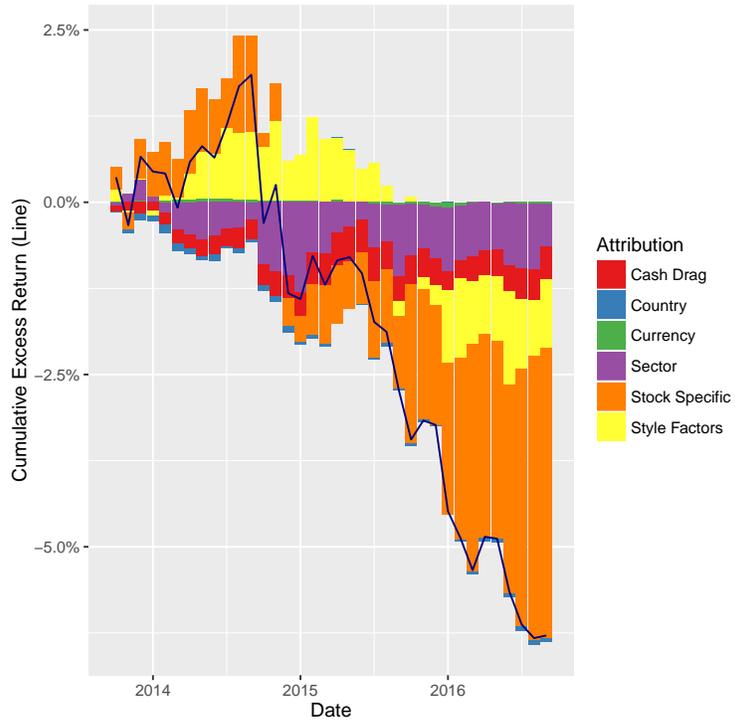
US Small Cap Rolling 3 Year Performance



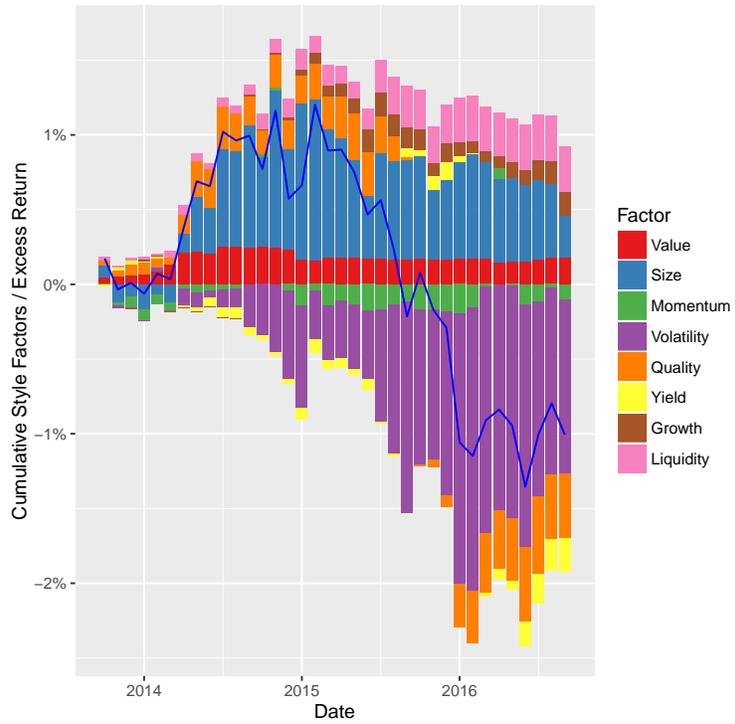
US Small Cap Rolling 12 Month Beta



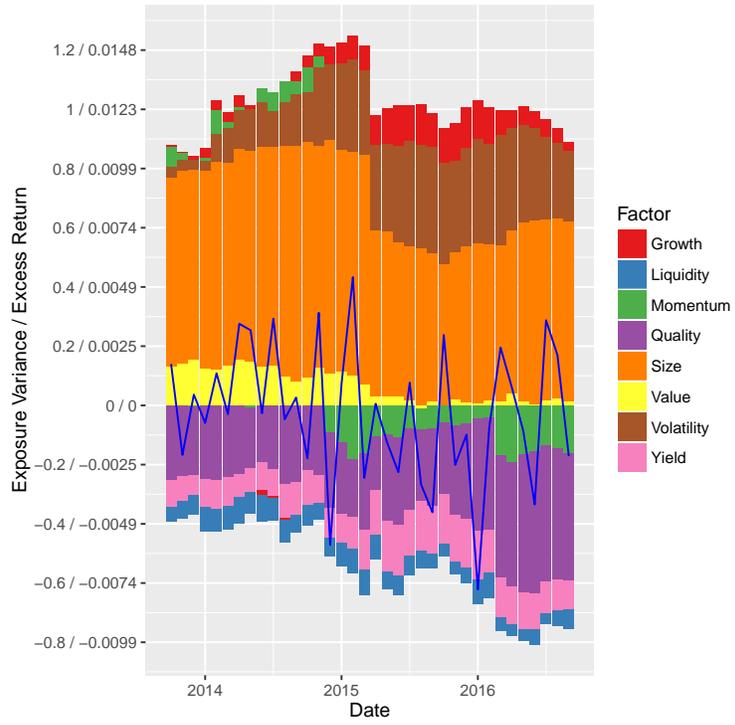
US Small Cap Barra Factor Attribution



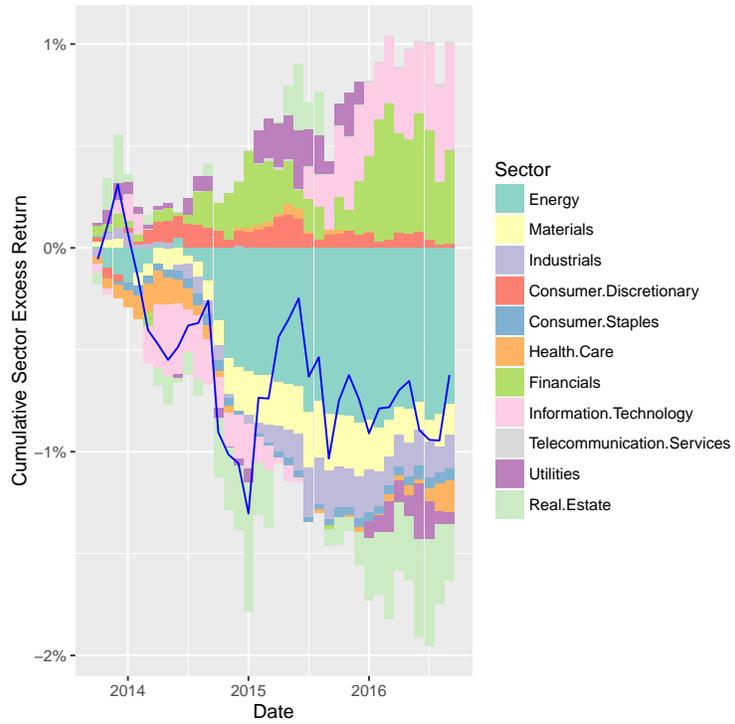
US Small Cap Style Factor Breakout



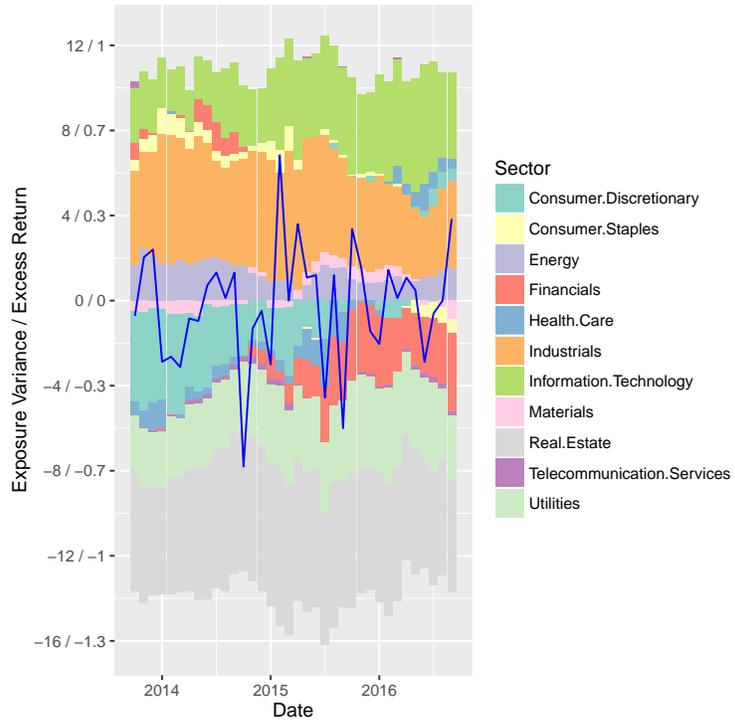
US Small Cap Monthly Style Factors Active Exposure



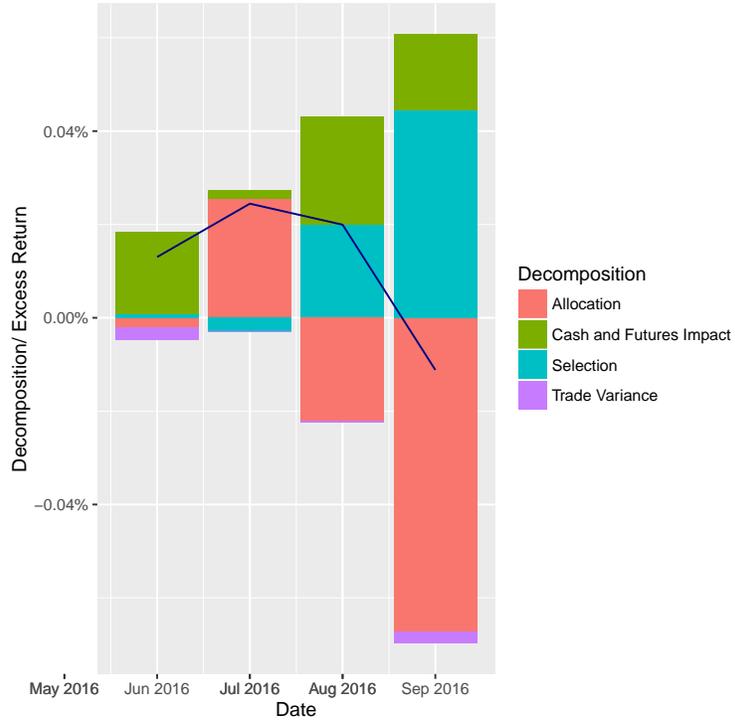
US Small Cap Monthly GICS Sector Return



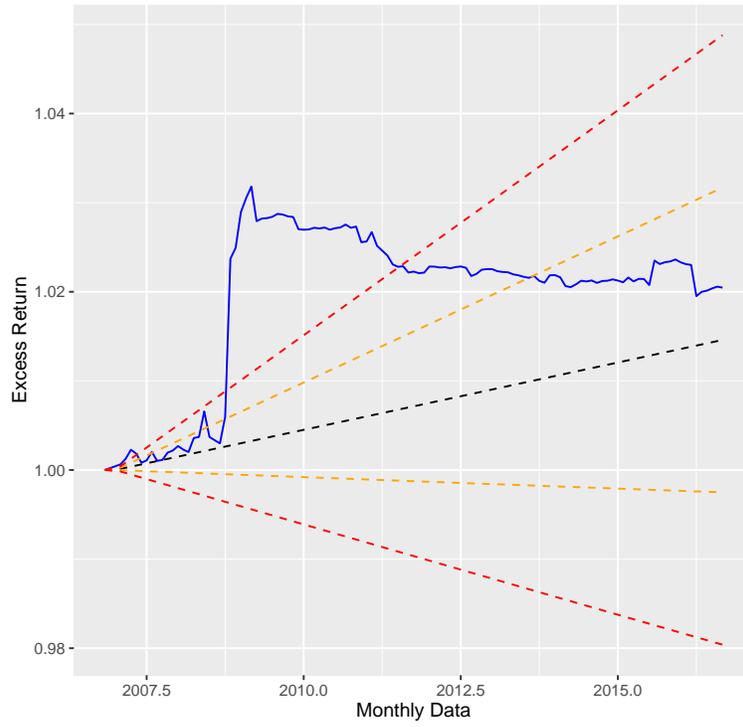
US Small Cap GICS Sector Active Exposure



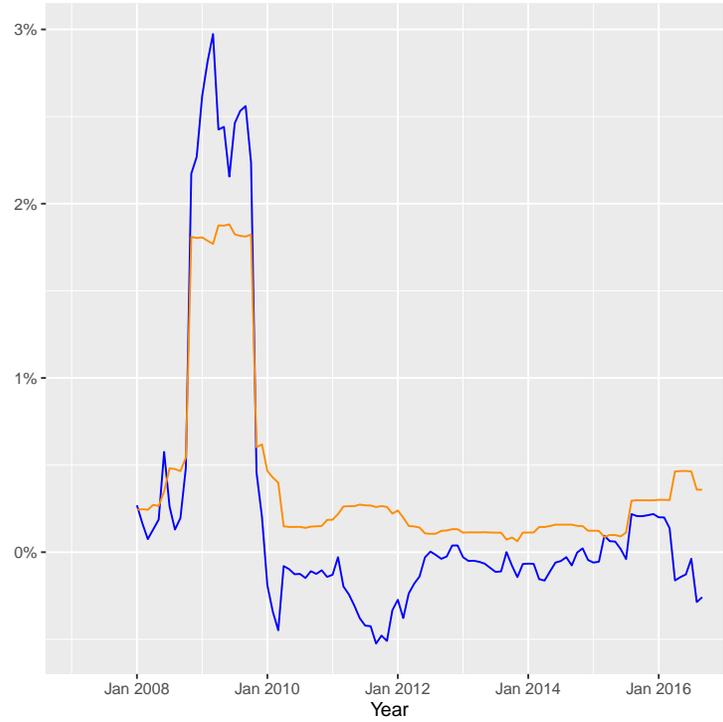
E6 NAV Decomposition Of Excess Return



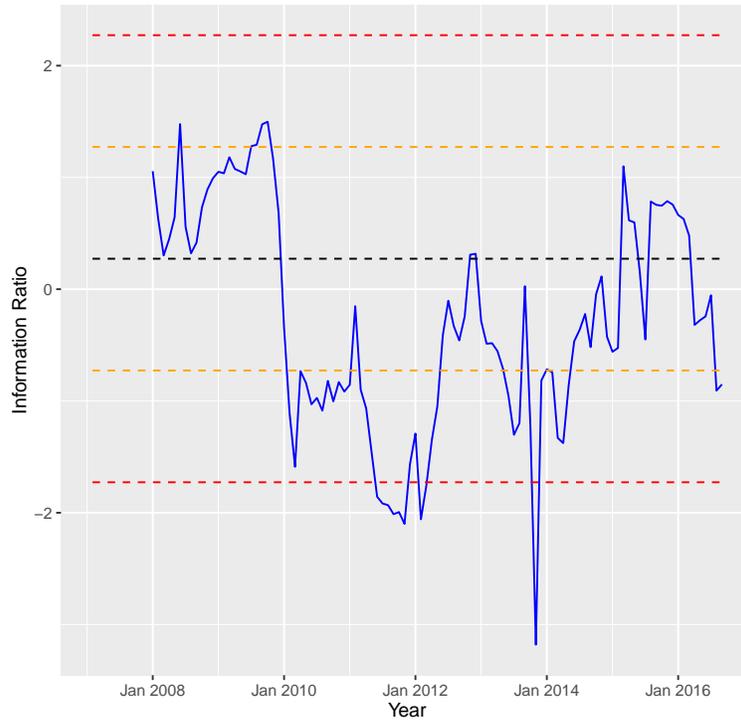
E6 Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



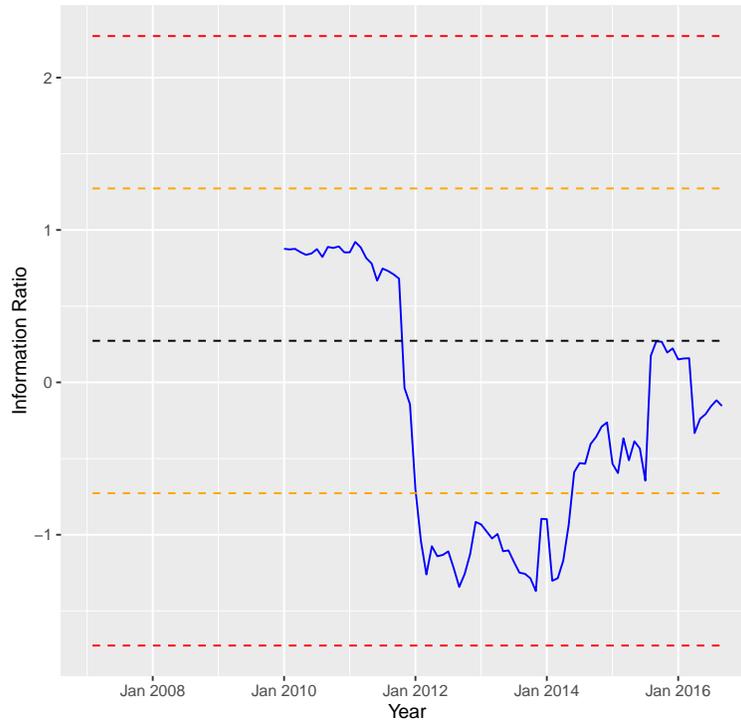
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



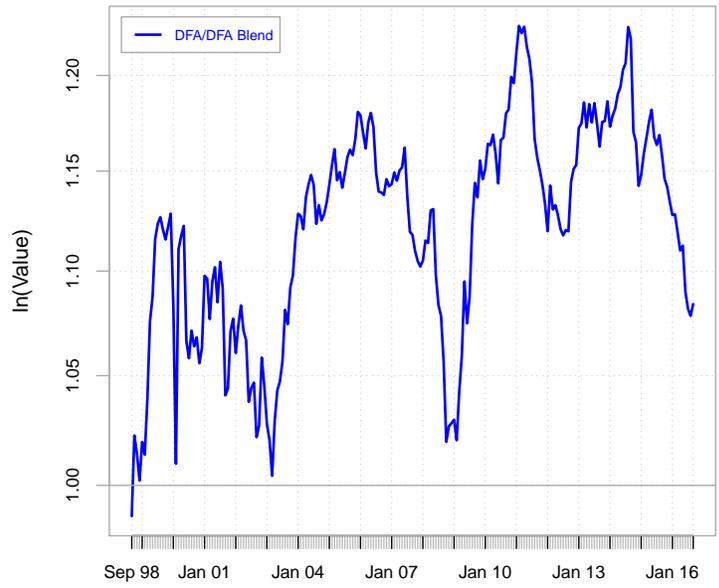
E6 Rolling 12 Month Information Ratio



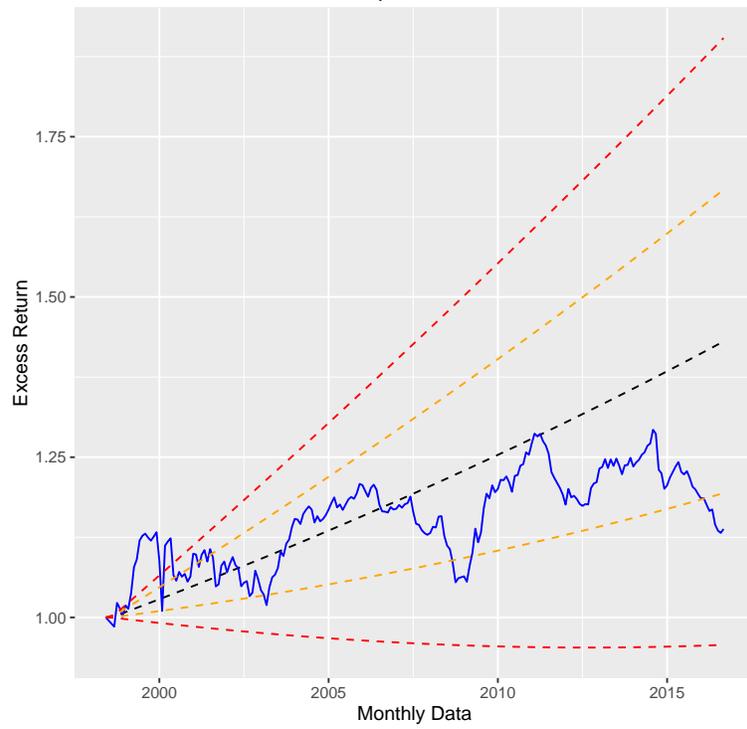
E6 Rolling 36 Month Information Ratio



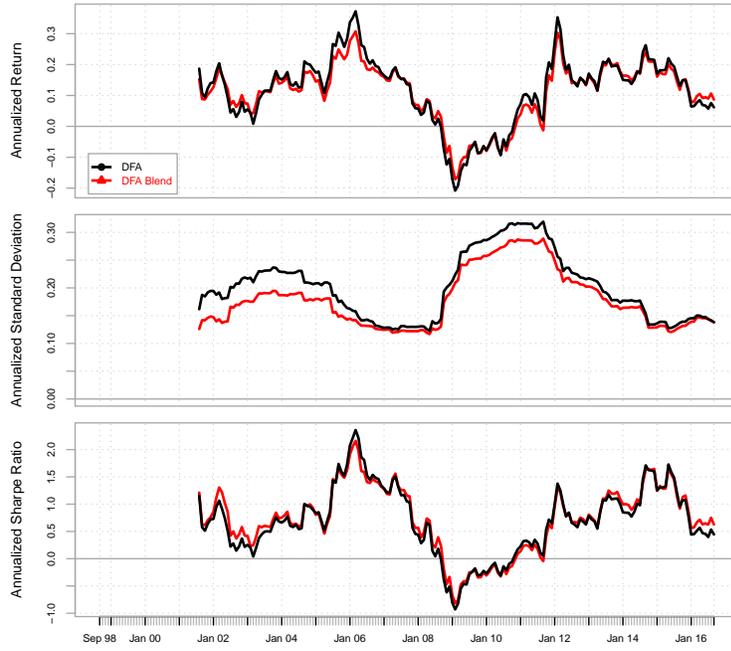
DFA Cumulative Relative Performance



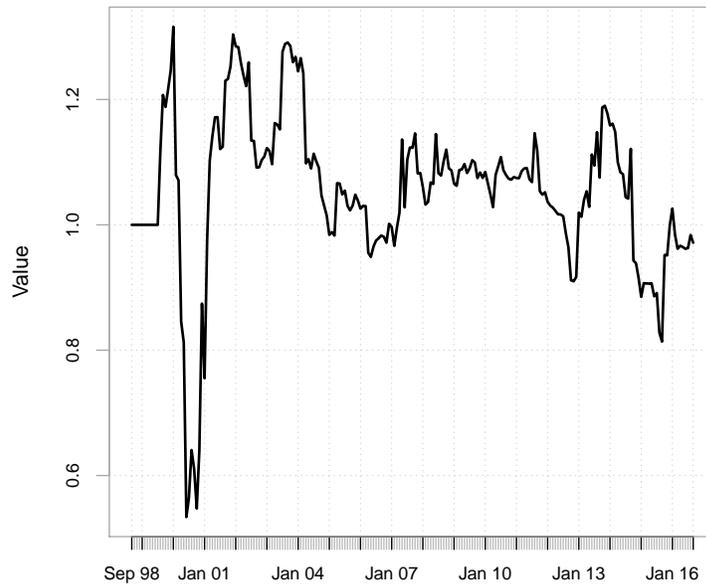
DFA Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



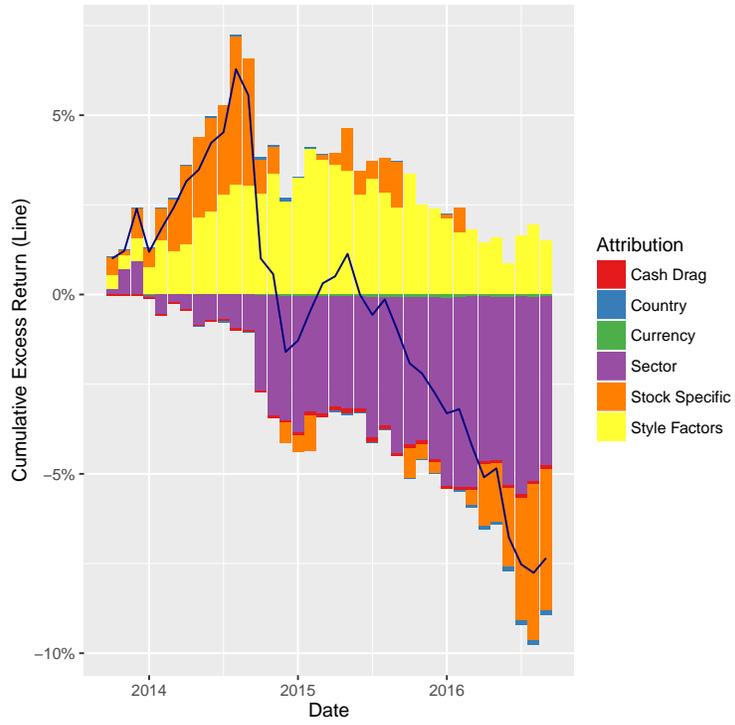
DFA Rolling 3 year Performance



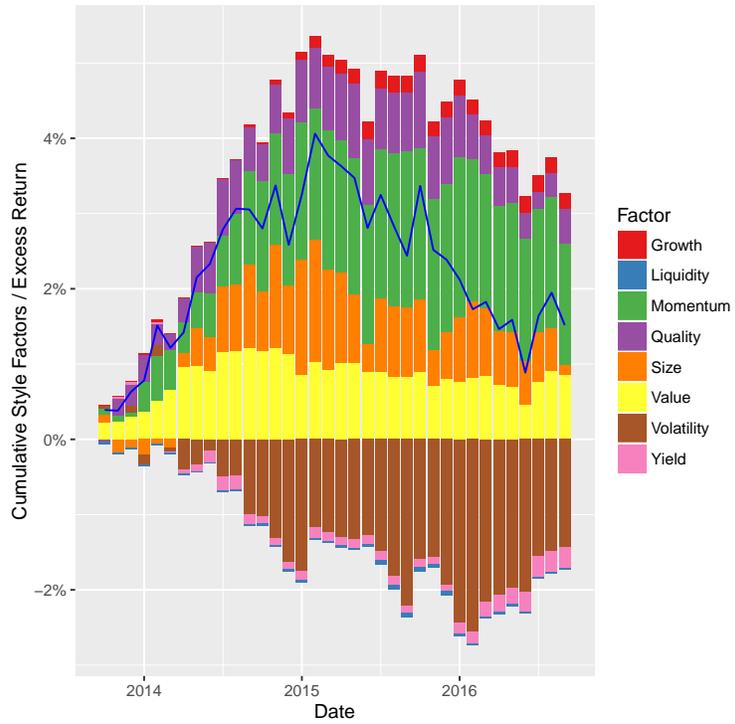
DFA Rolling 12 Month Beta



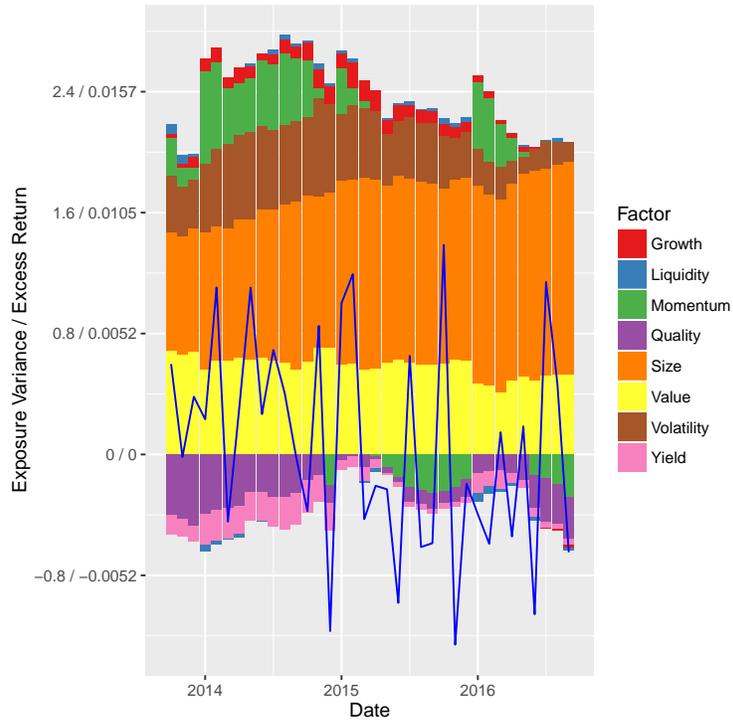
DFA Barra Factor Attribution



DFA Style Factor Breakout



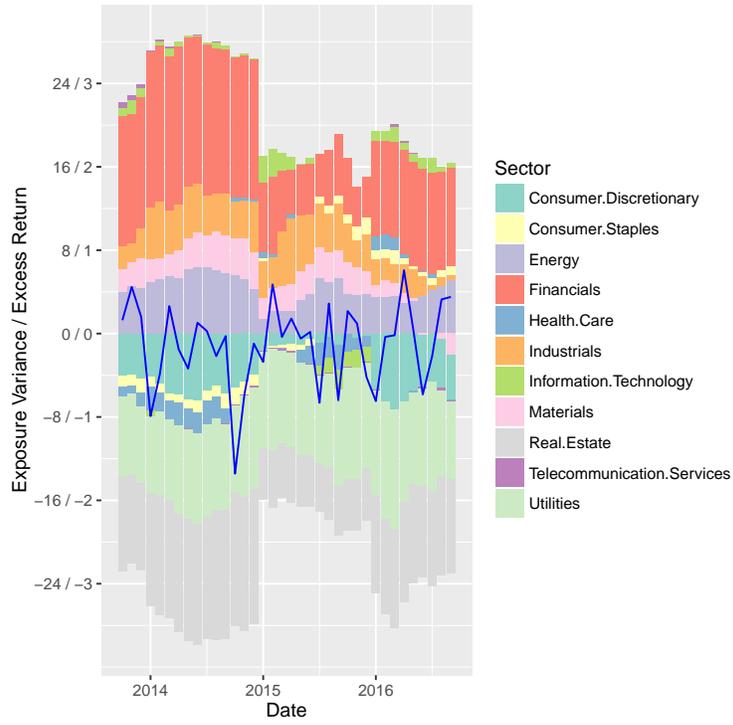
DFA Monthly Style Factors Active Exposure



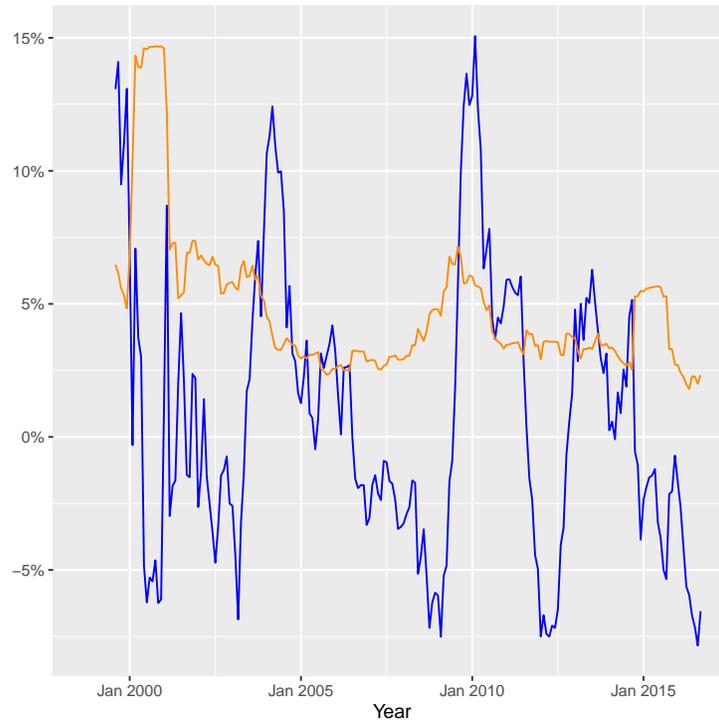
DFA Monthly GICS Sector Return



DFA GICS Sector Active Exposure



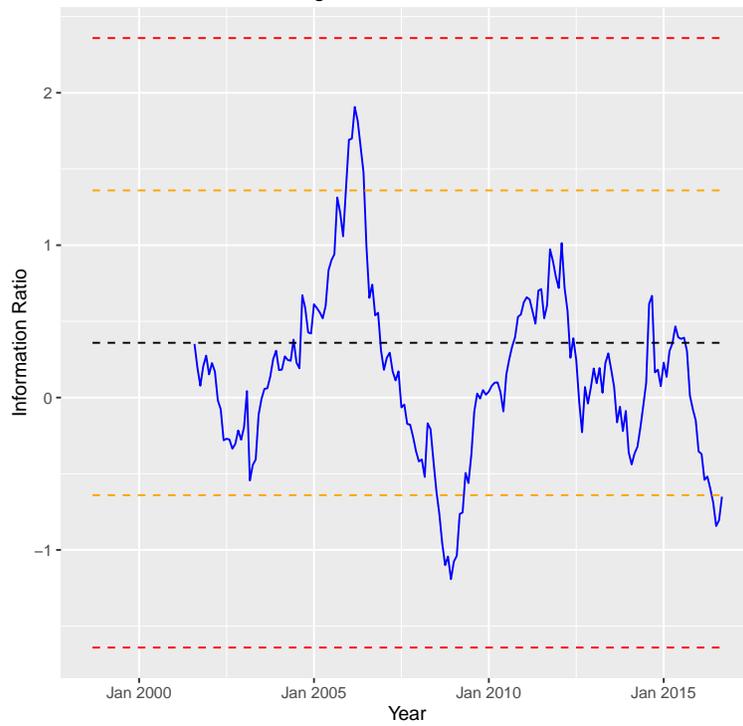
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



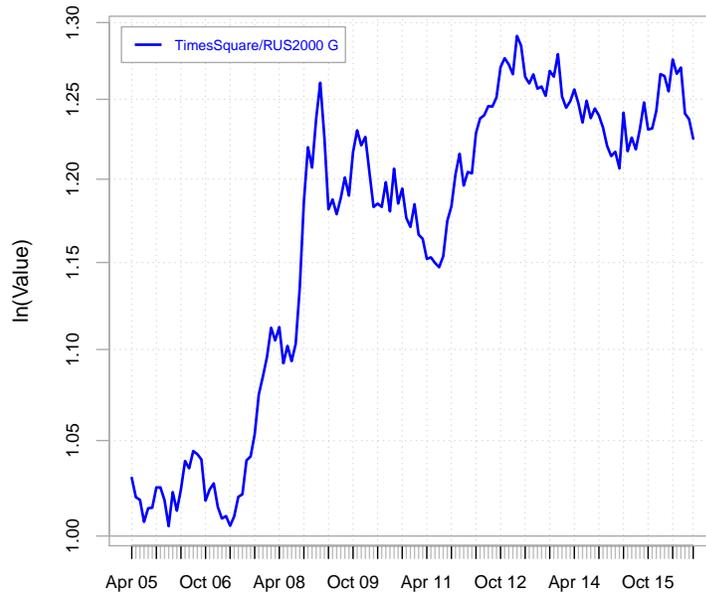
DFA Rolling 12 Month Information Ratio



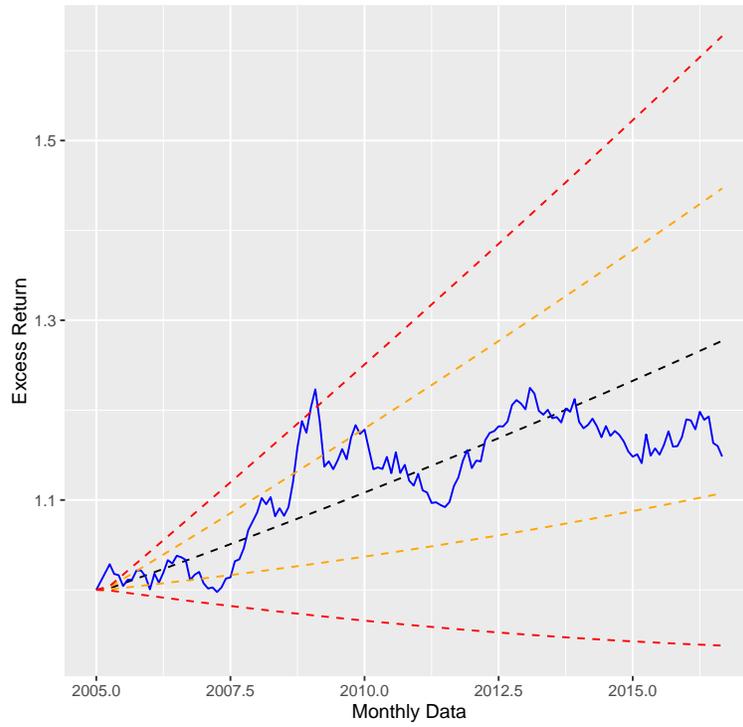
DFA Rolling 36 Month Information Ratio



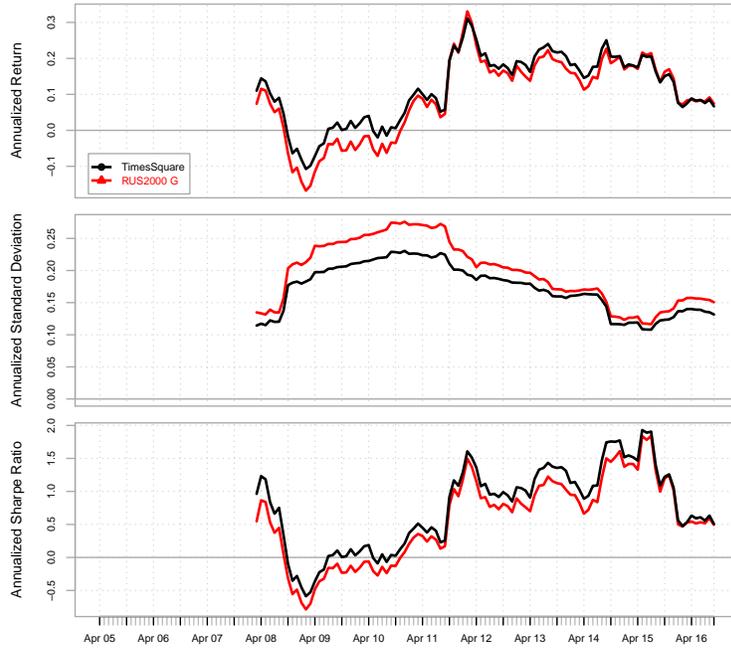
TimesSquare Cumulative Relative Performance



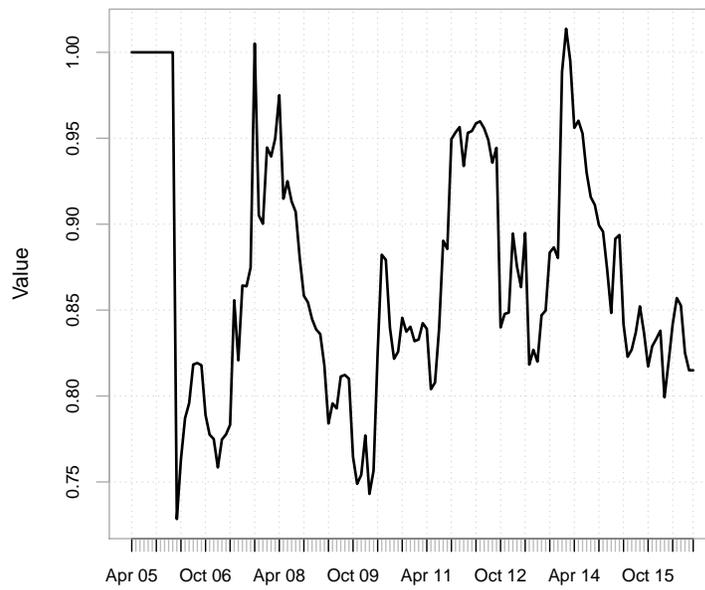
TimesSquare Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



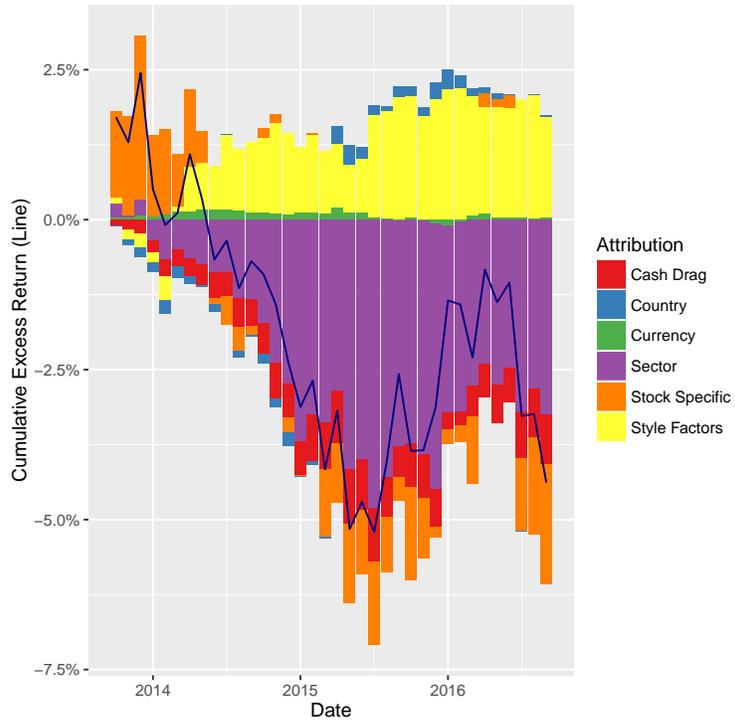
TimesSquare Rolling 3 year Performance



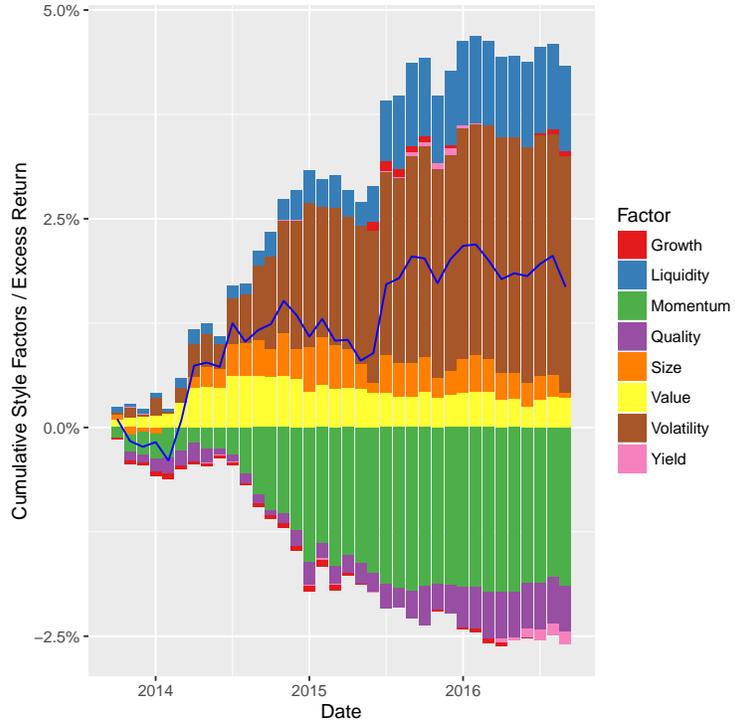
TimesSquare Rolling 12 Month Beta



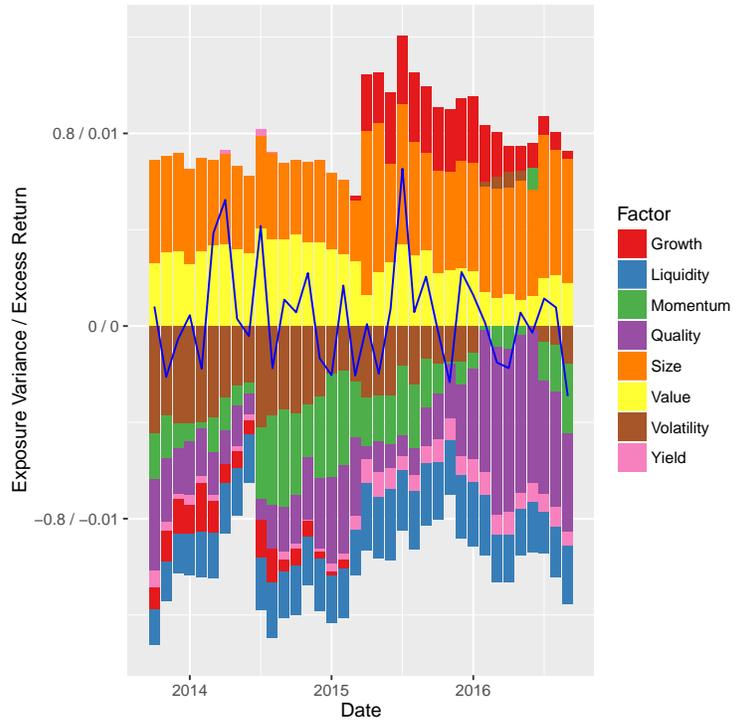
TimesSquare Barra Factor Attribution



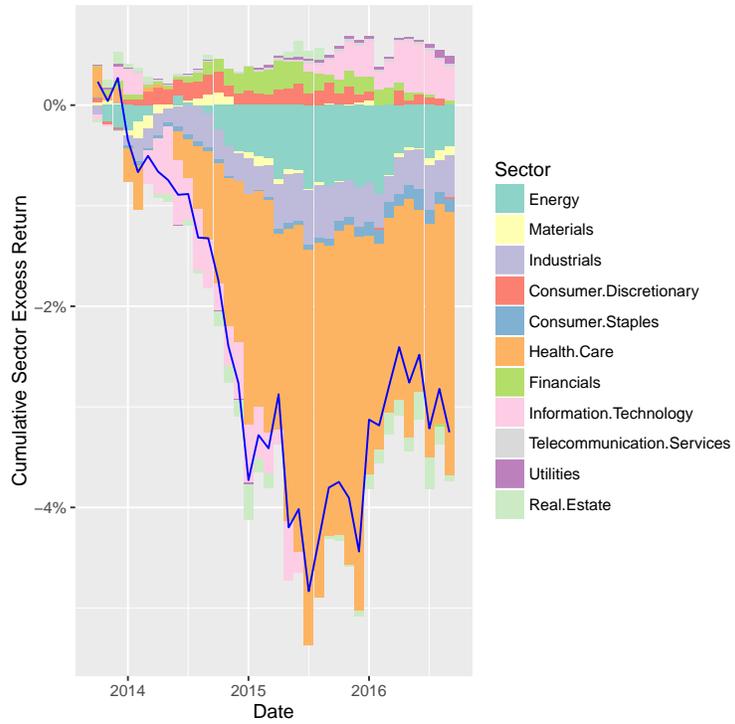
TimesSquare Style Factor Breakout



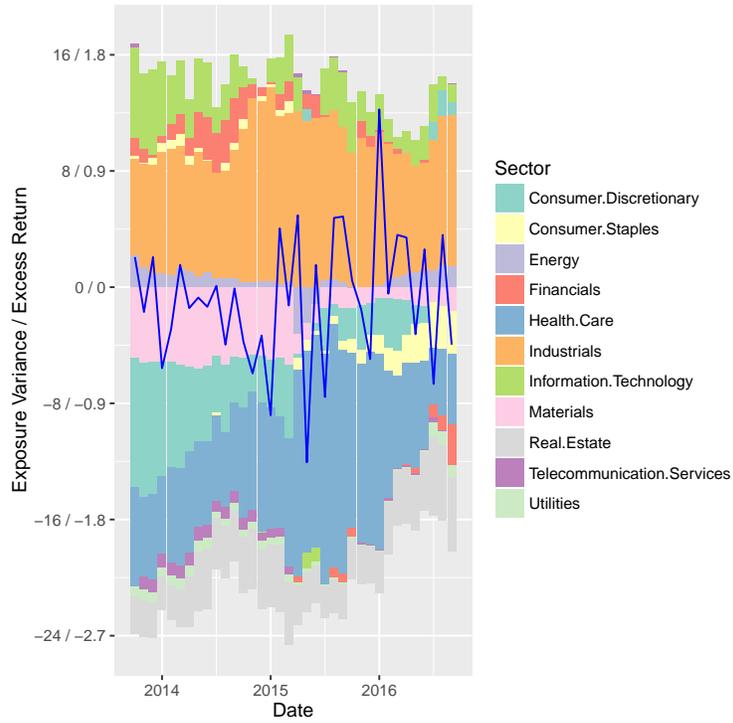
TimesSquare Monthly Style Factors Active Exposure



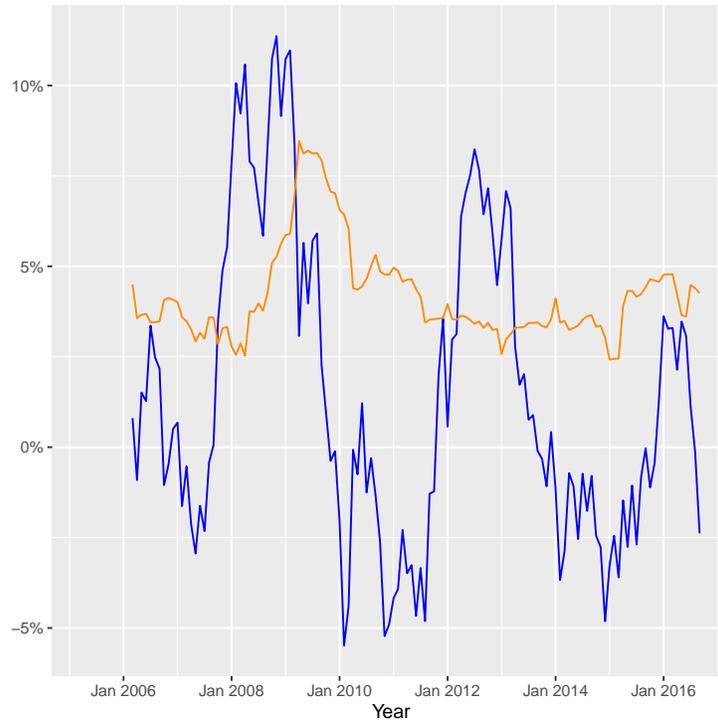
TimesSquare Monthly GICS Sector Return



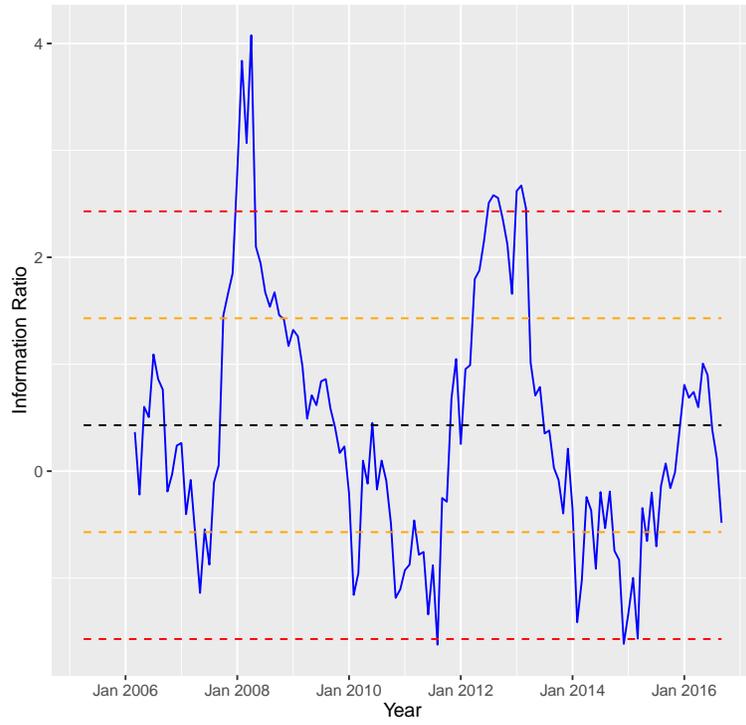
TimesSquare GICS Sector Active Exposure



Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



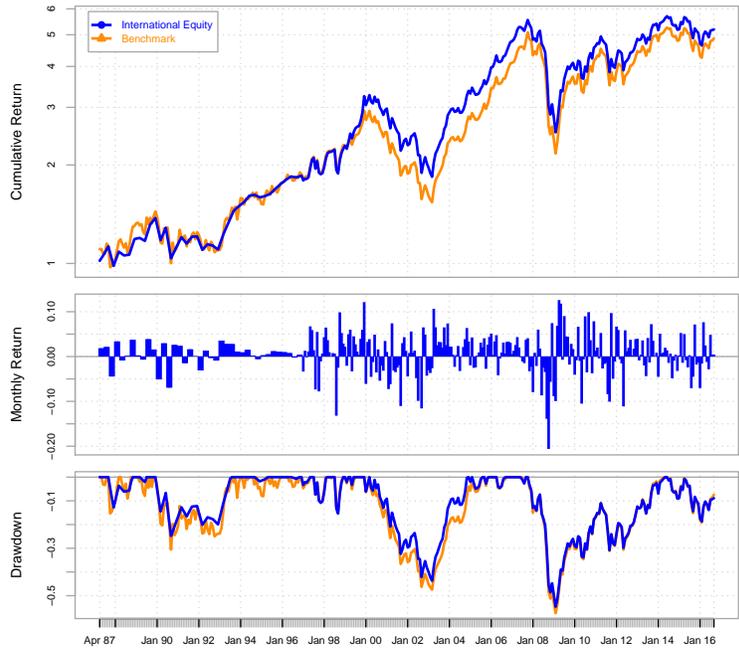
TimesSquare Rolling 12 Month Information Ratio



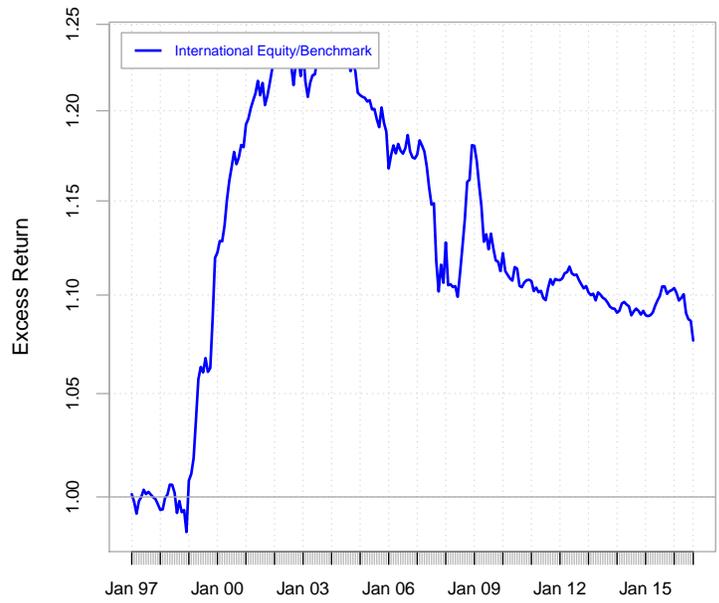
TimesSquare Rolling 36 Month Information Ratio



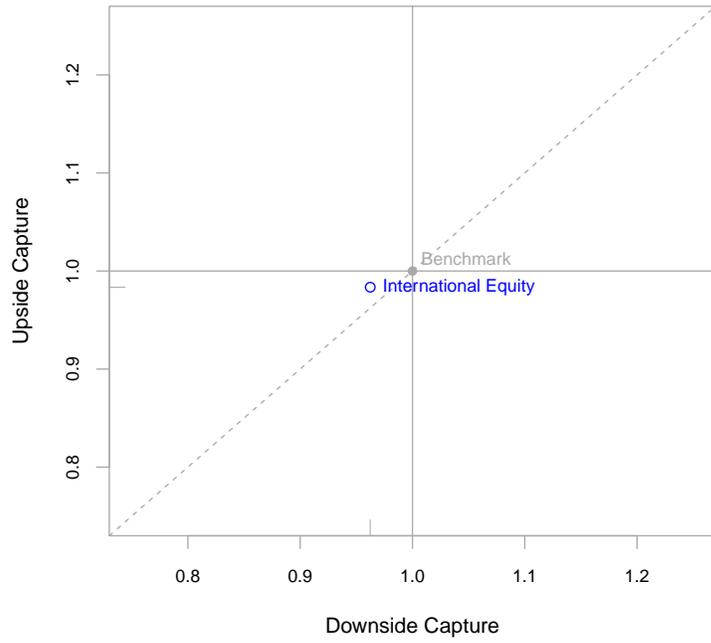
International Equity Performance Summary



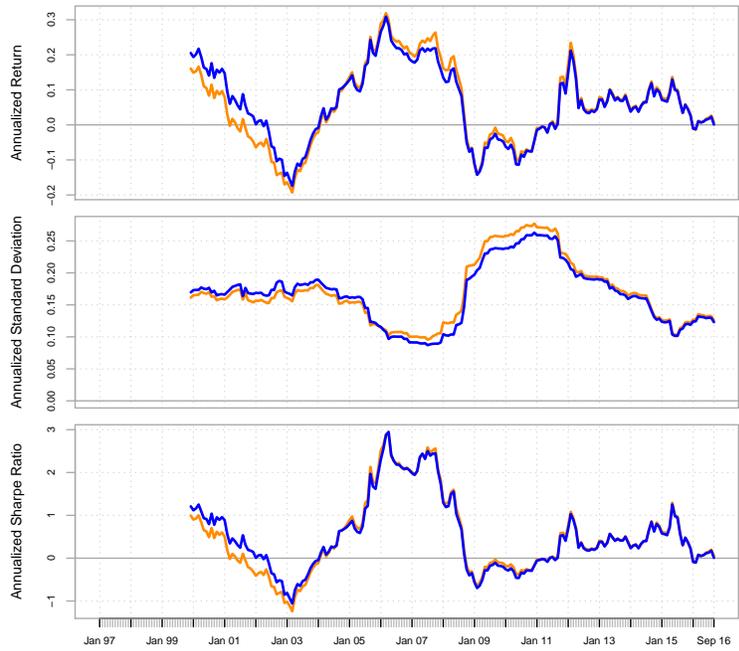
International Equity Cumulative Relative Performance



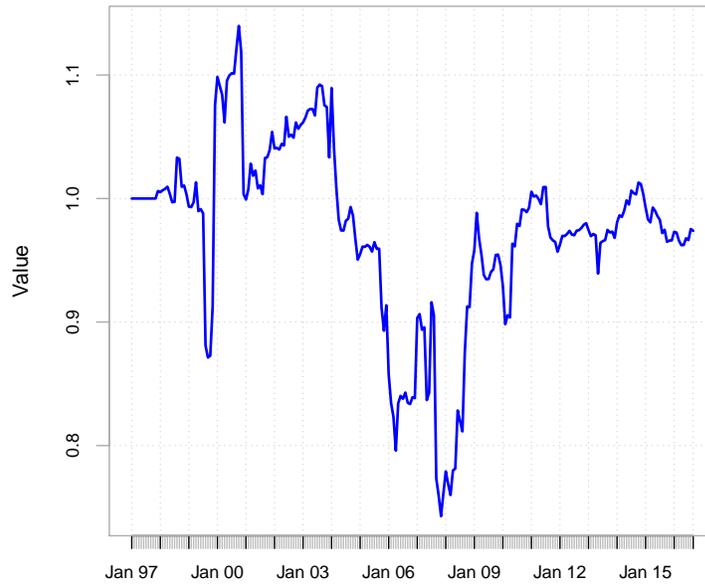
### International Equity Capture Ratios



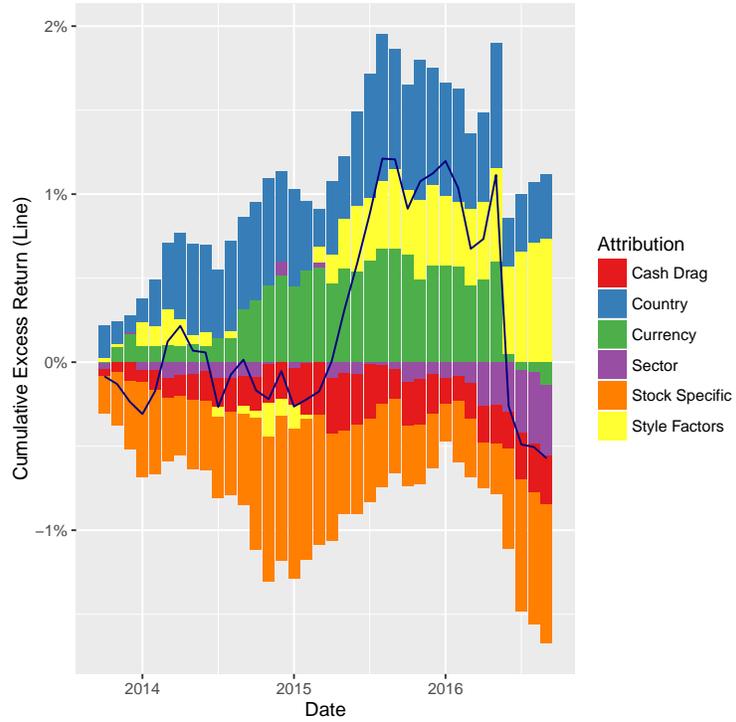
### International Equity Rolling 3 Year Performance



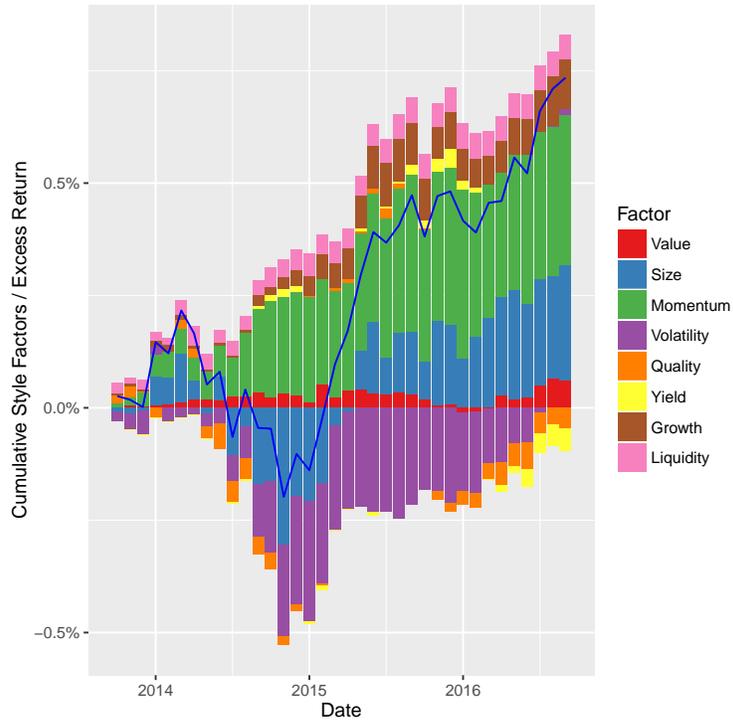
International Equity Rolling 12 Month Beta



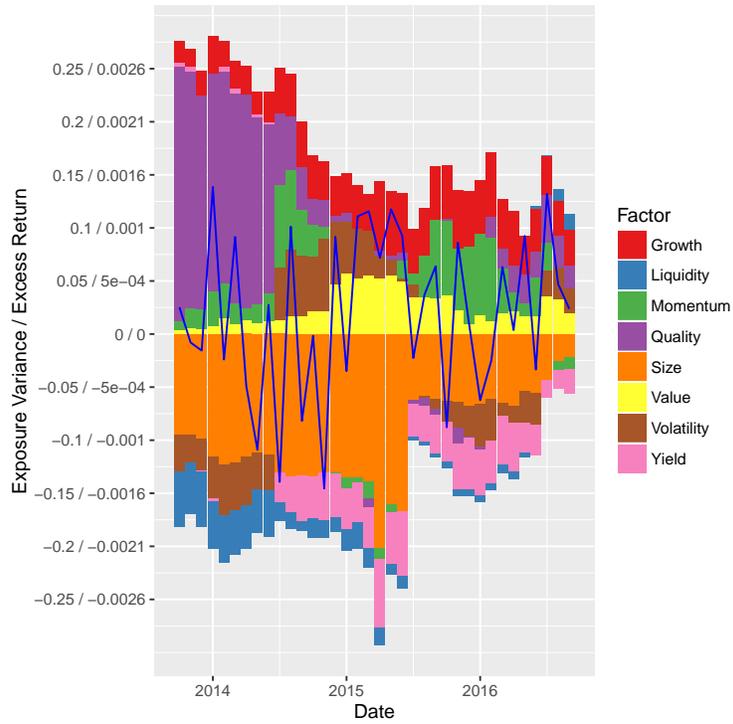
International Equity Barra Factor Attribution



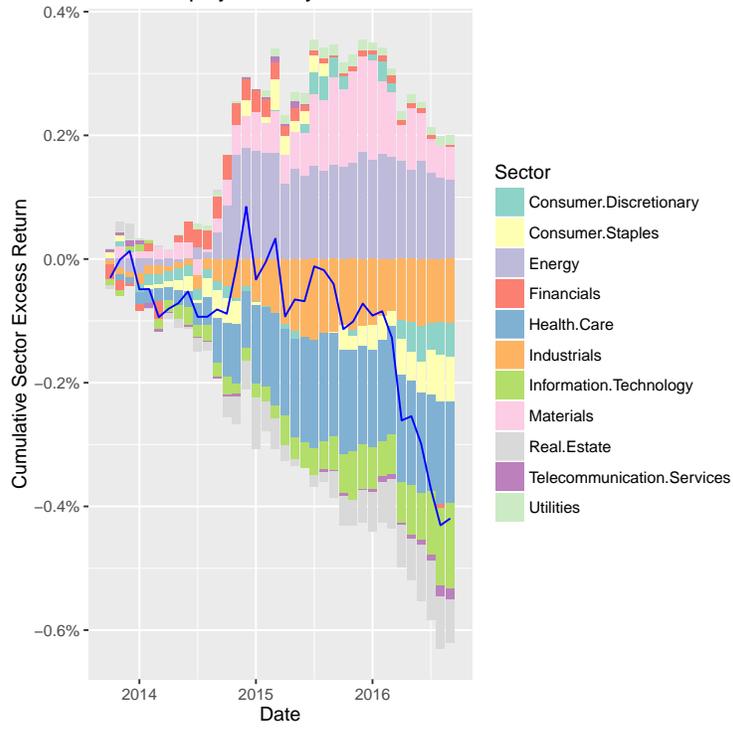
International Equity Style Factor Breakout



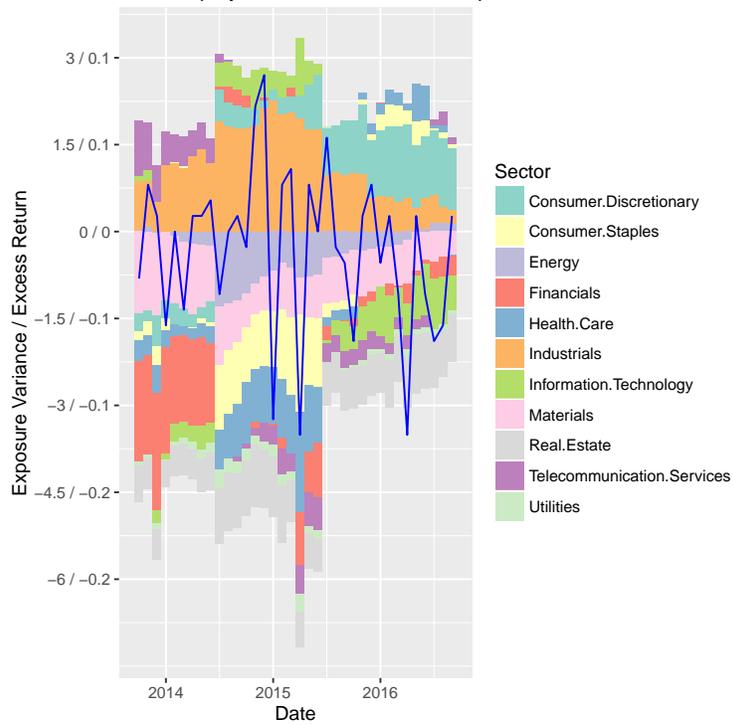
International Equity Monthly Style Factors Active Exposure



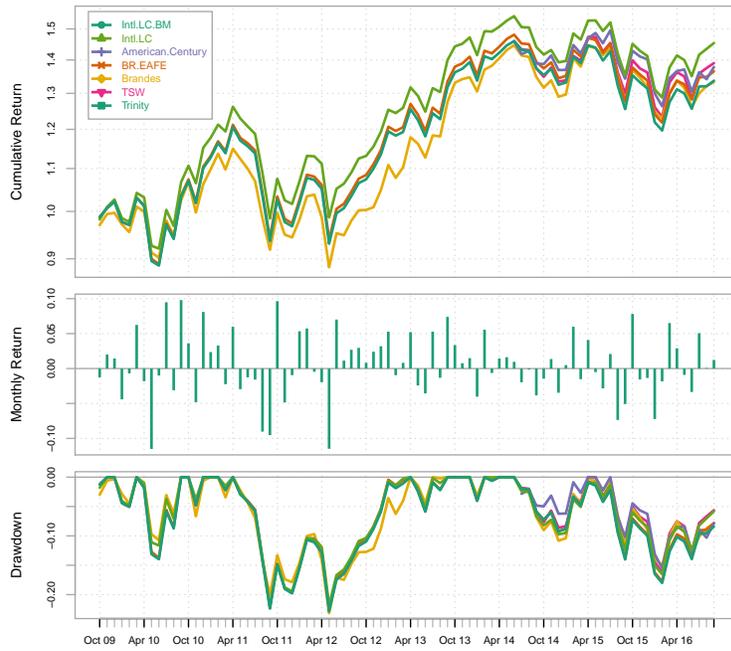
International Equity Monthly GICS Sector Return



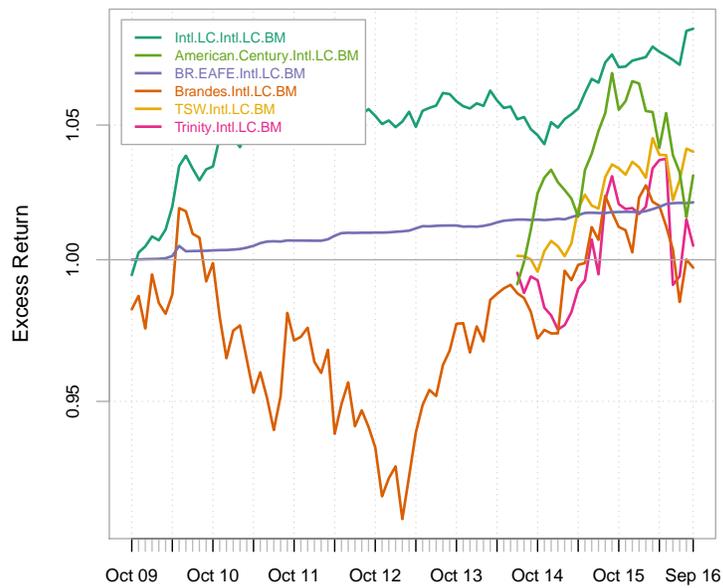
International Equity GICS Sector Active Exposure



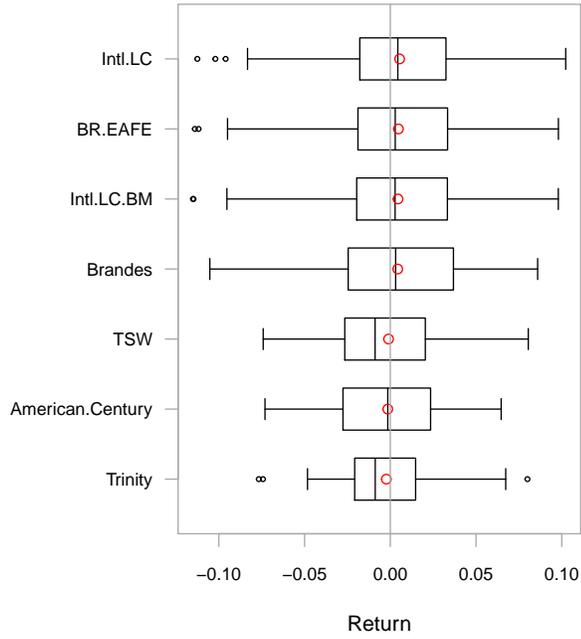
**Intl Developed Large Cap Performance Summary**



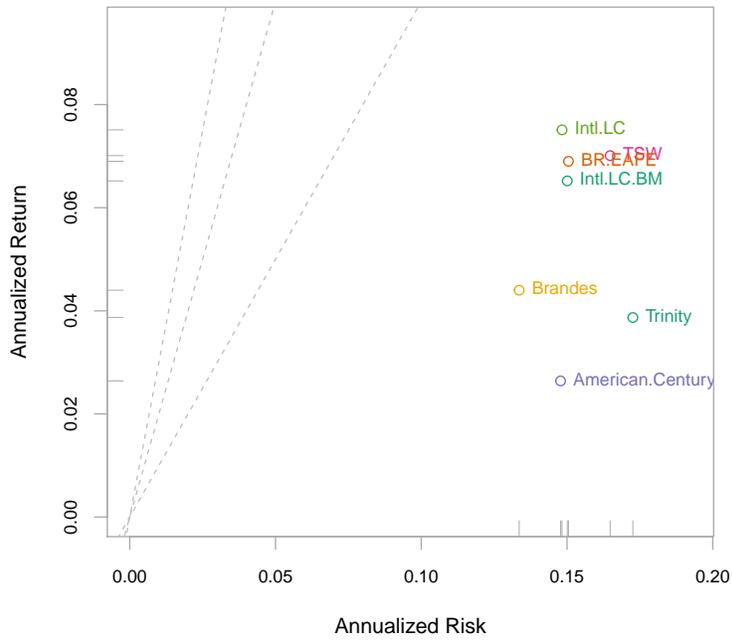
**Intl Developed Large Cap Cumulative Relative Performance**



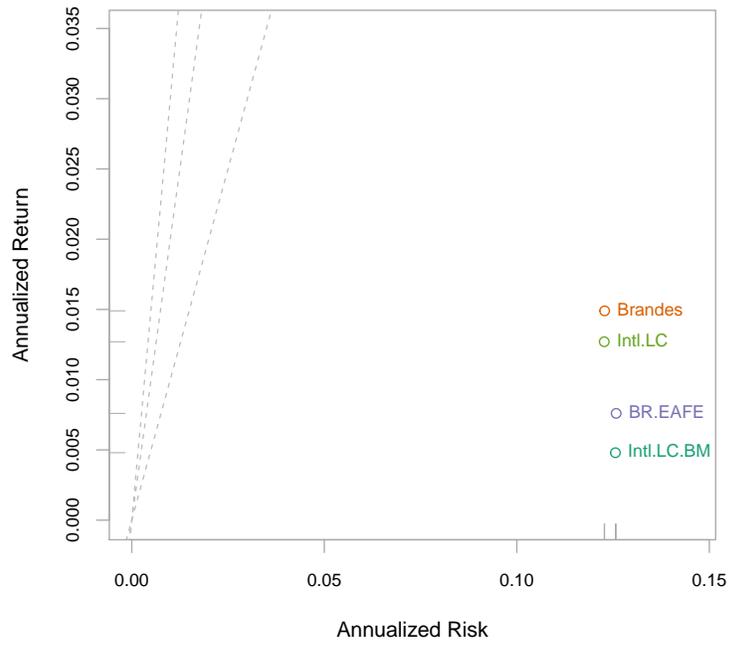
### Return Distribution Comparison



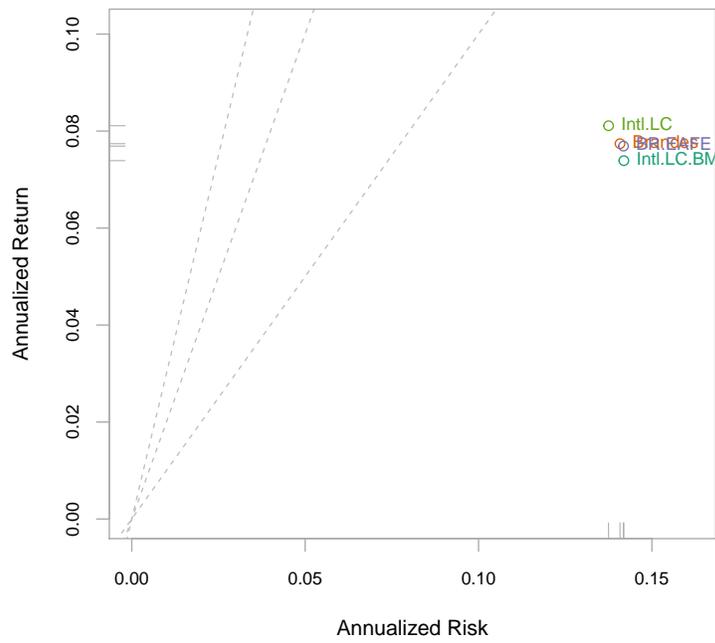
### Intl Developed Large Cap Trailing 1 Year Performance vs Sharpe Ratios (1,;



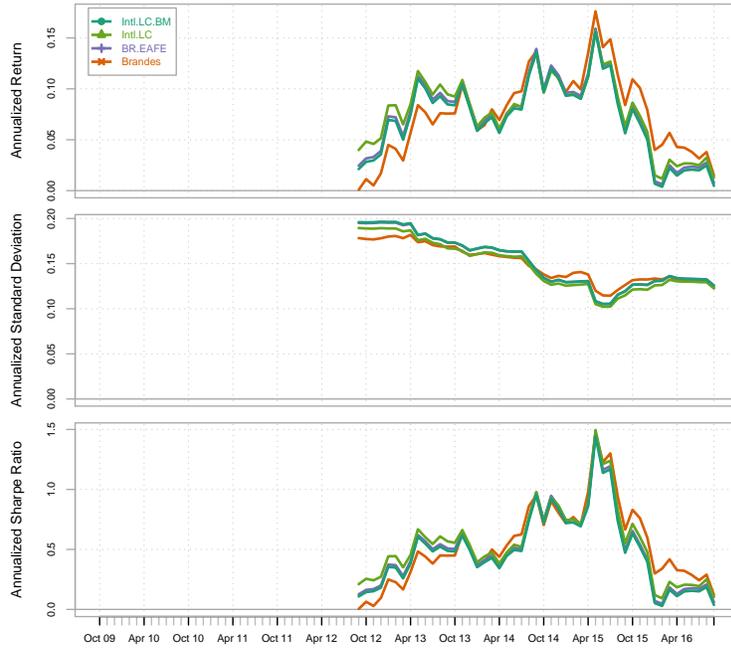
Trailing 3 Year Performance vs Sharpe Ratios (1,2,3)



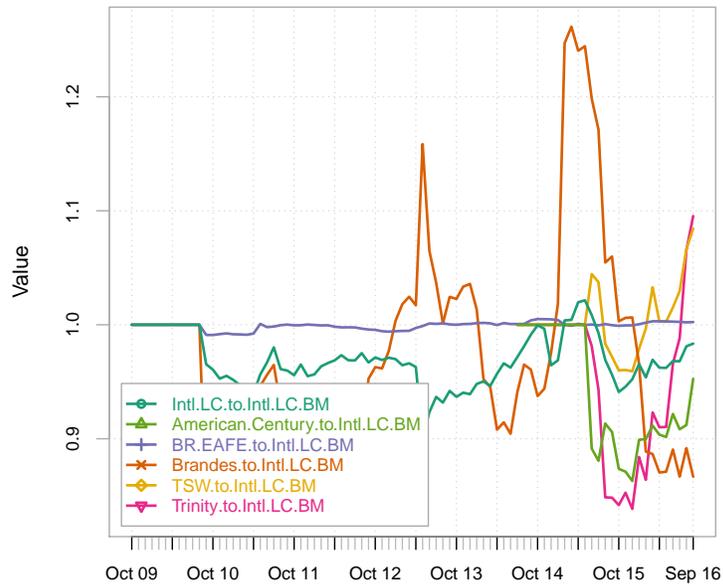
Trailing 5 Year Performance vs Sharpe Ratios (1,2,3)



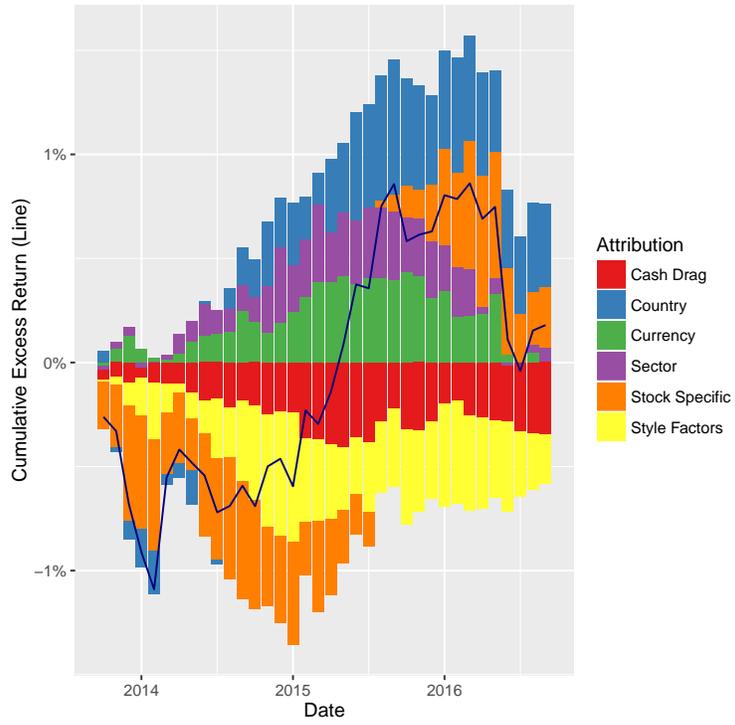
Intl Developed Large Cap Rolling 3 Year Performance



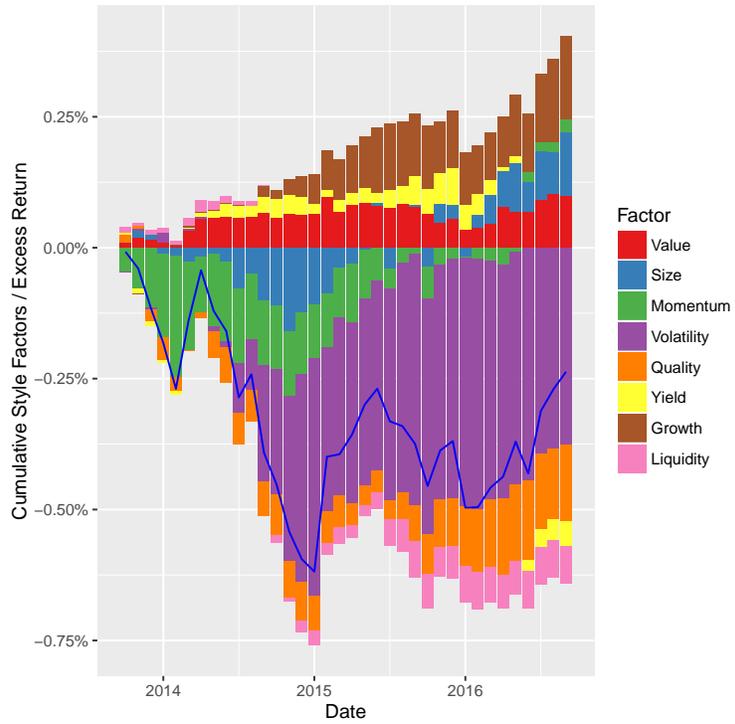
Intl Developed Large Cap Rolling 12 Month Beta



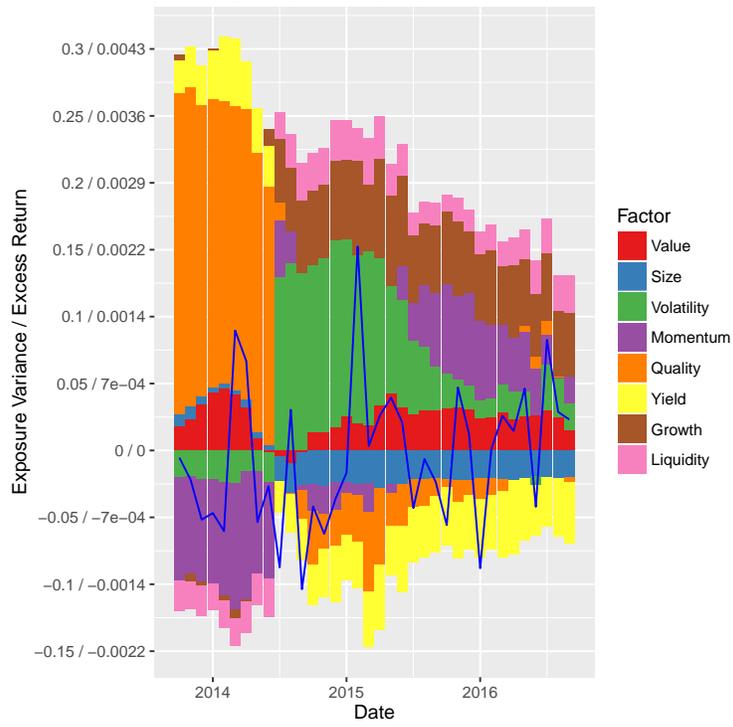
Intl Developed Large Cap Barra Factor Attribution



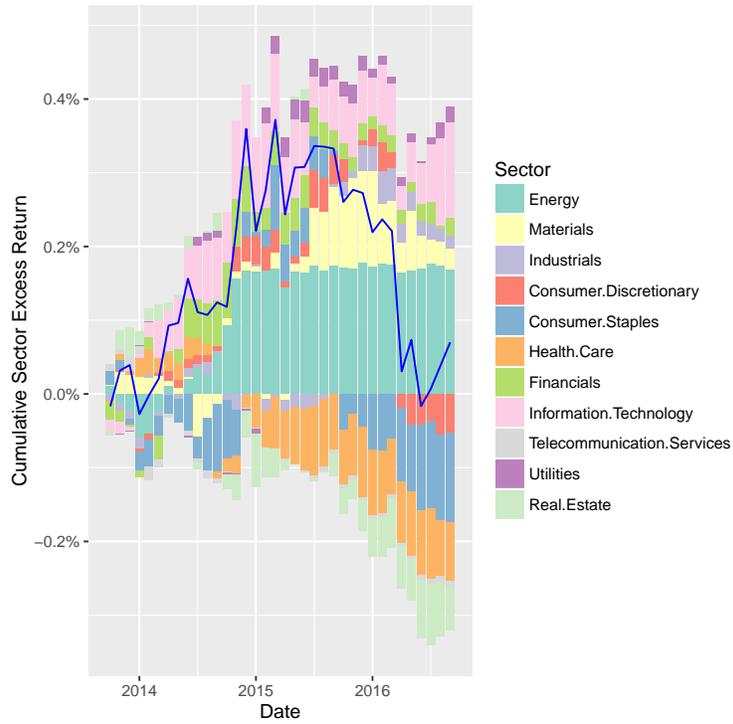
Intl Developed Large Cap Style Factor Breakout



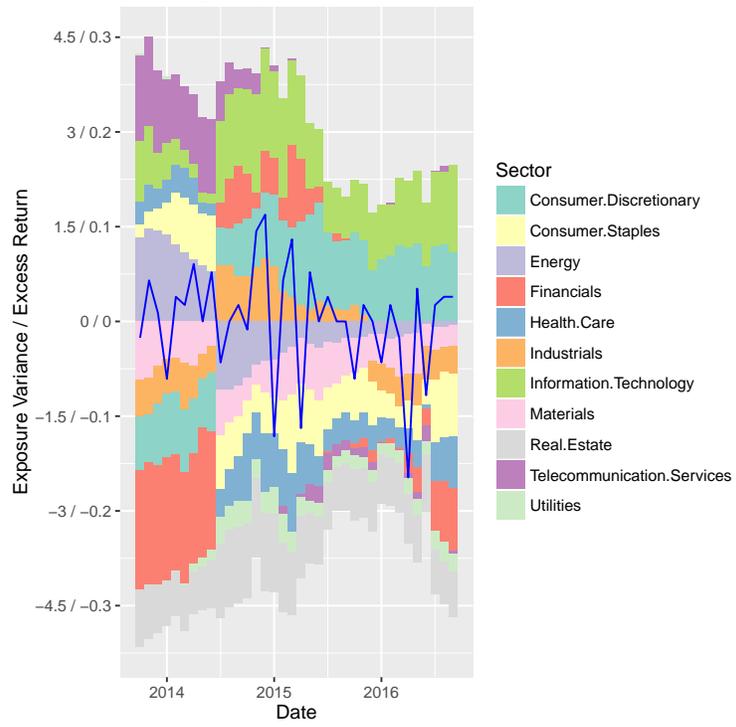
Intl Developed Large Cap Monthly Style Factors Active Exposure



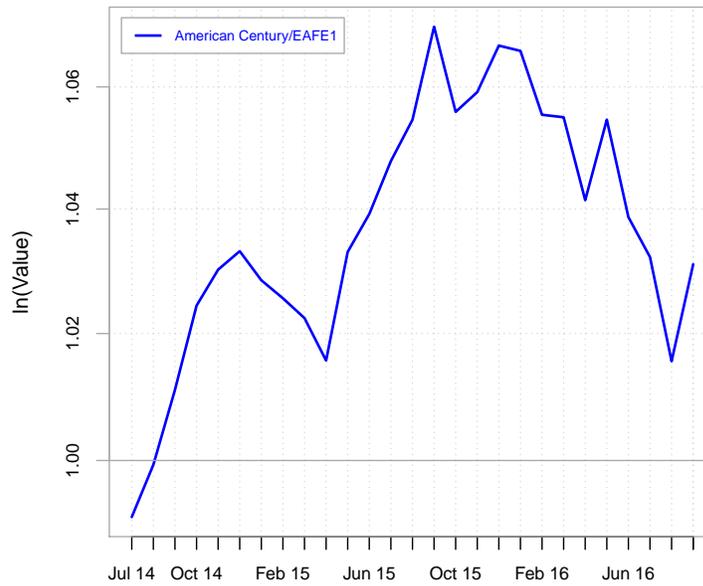
Intl Developed Large Cap Monthly GICS Sector Return



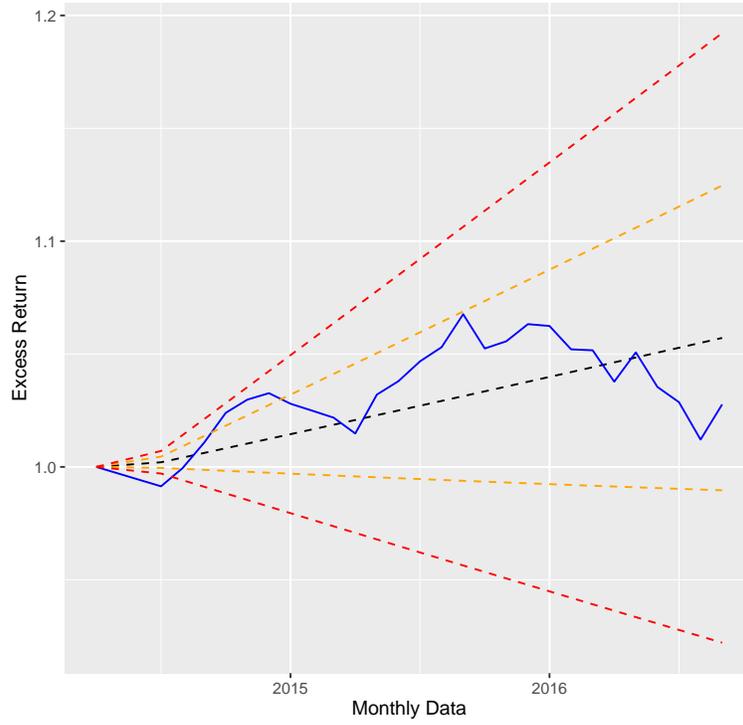
**Intl Developed Large Cap GICS Sector Active Exposure**



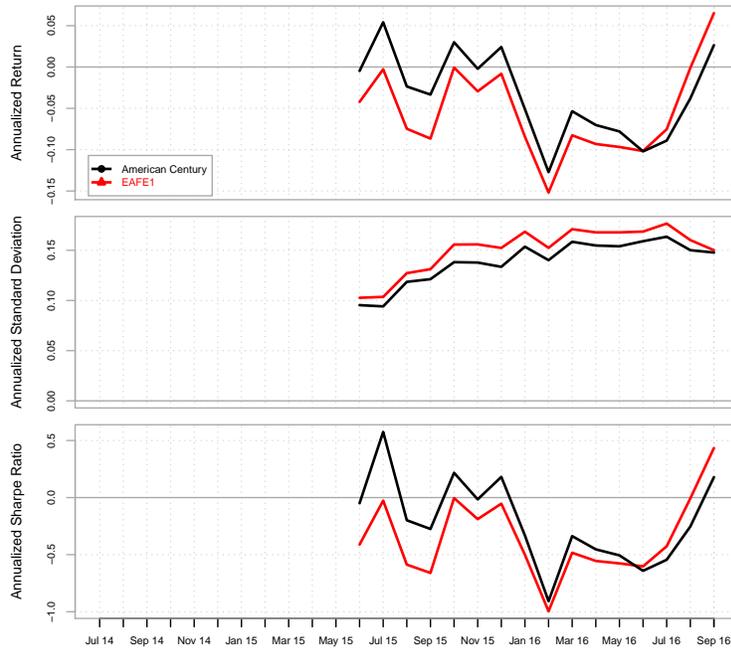
**American Century Cumulative Relative Performance**



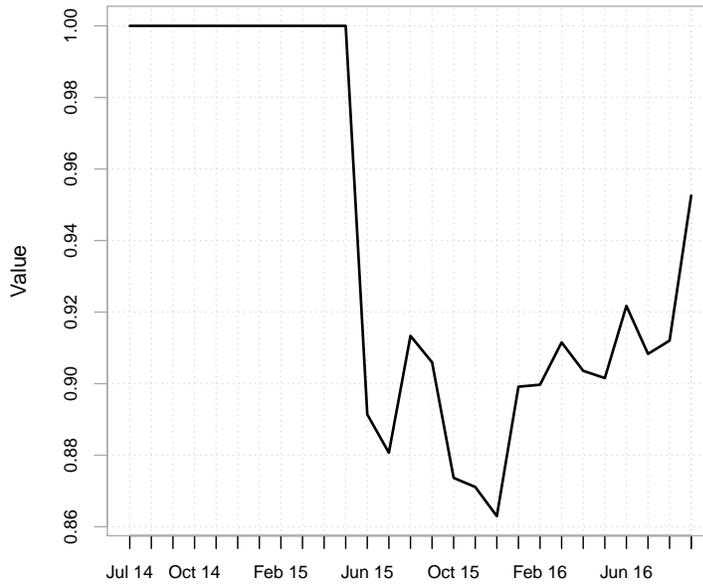
American Century Actual Excess vs Expected Excess +/- 1 & 2 Std De



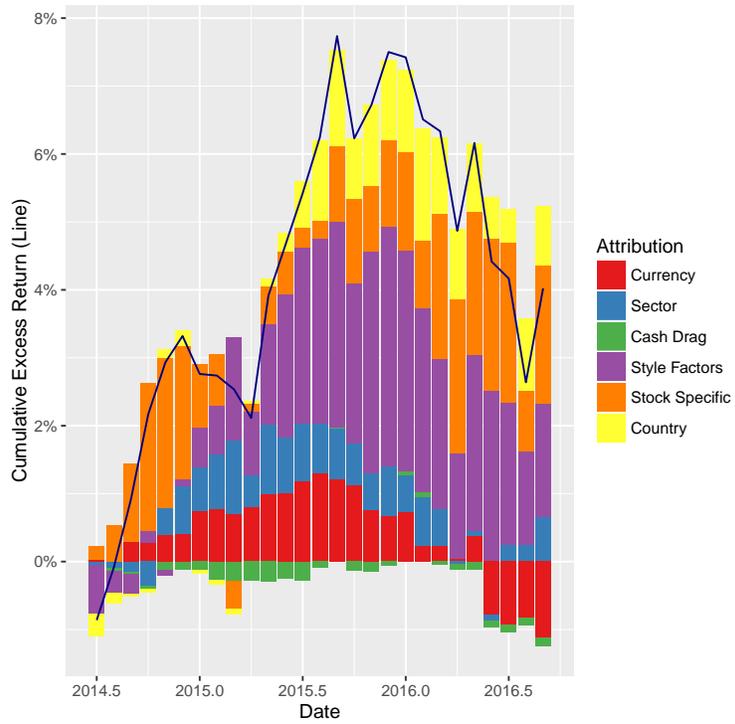
American Century Rolling 1 year Performance



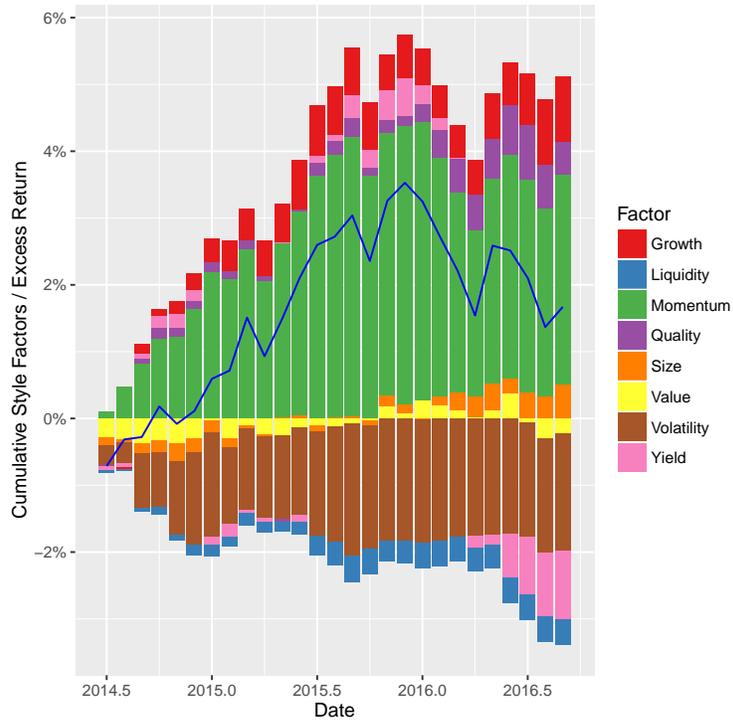
American Century Rolling 12 Month Beta



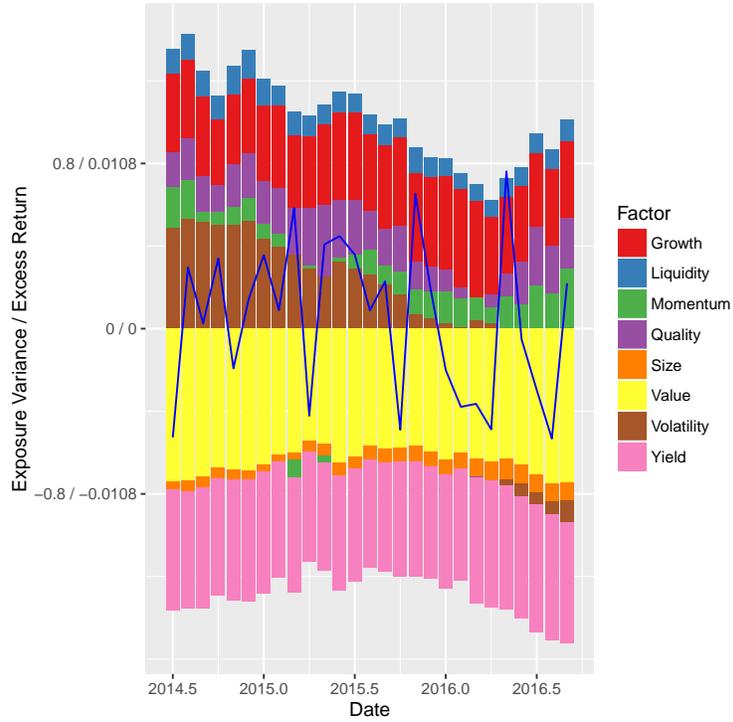
American Century Barra Factor Attribution



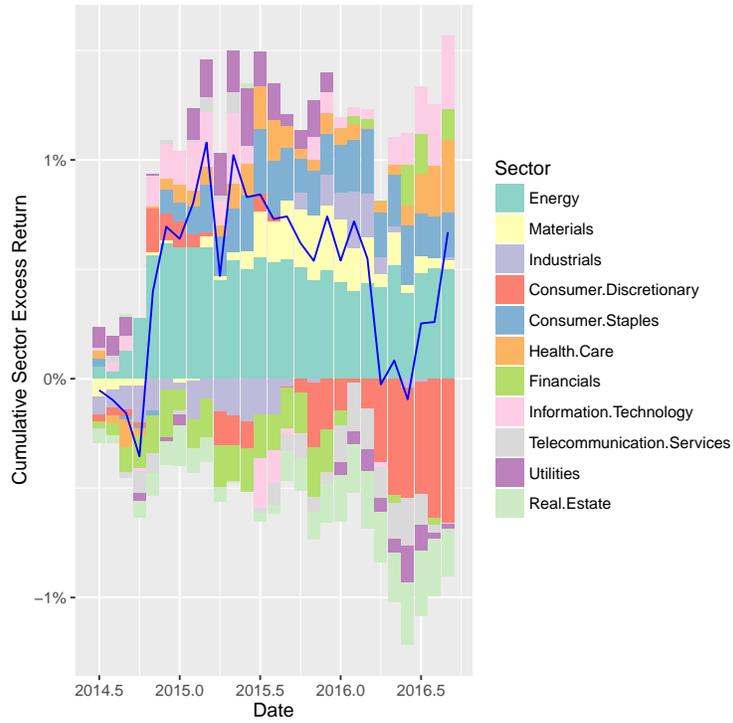
American Century Style Factor Breakout



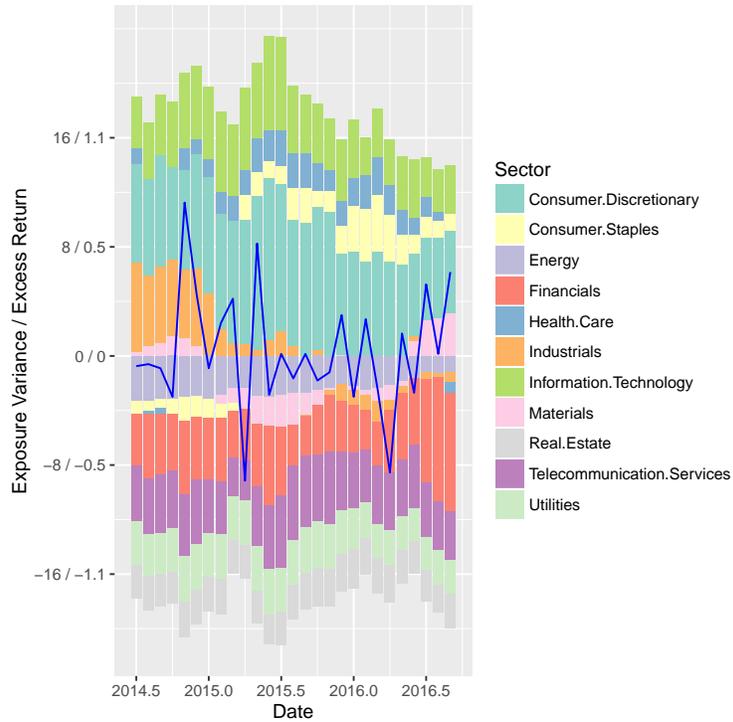
American Century Monthly Style Factors Active Exposure

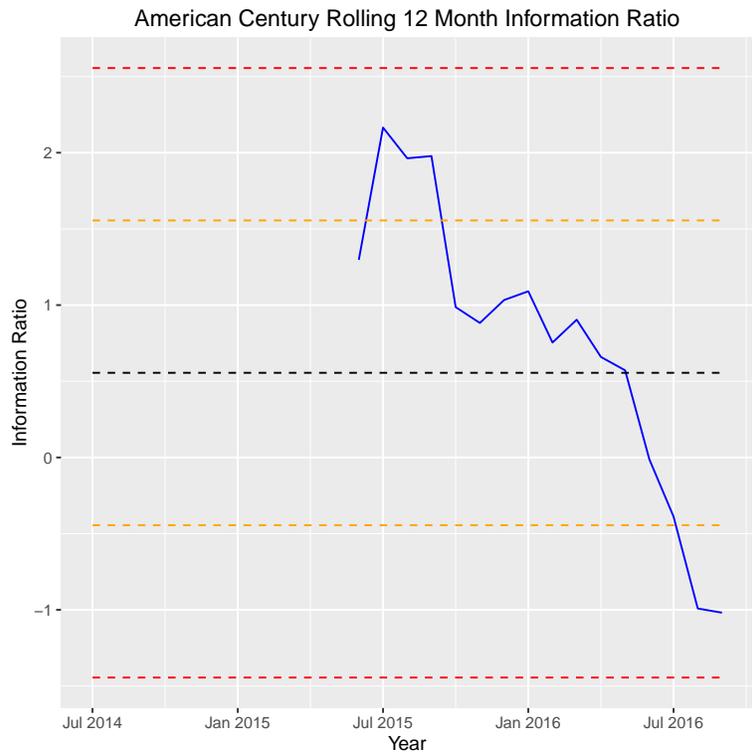
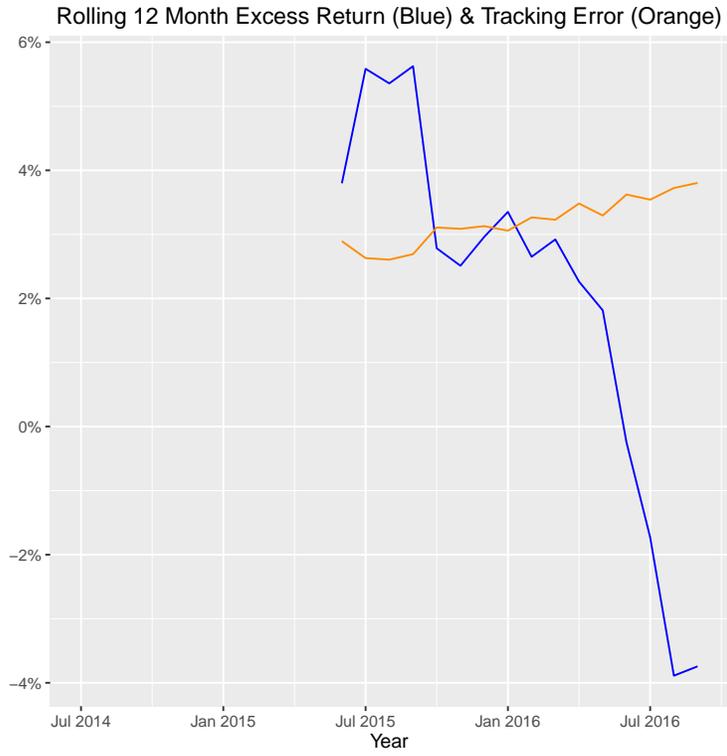


American Century Monthly GICS Sector Return

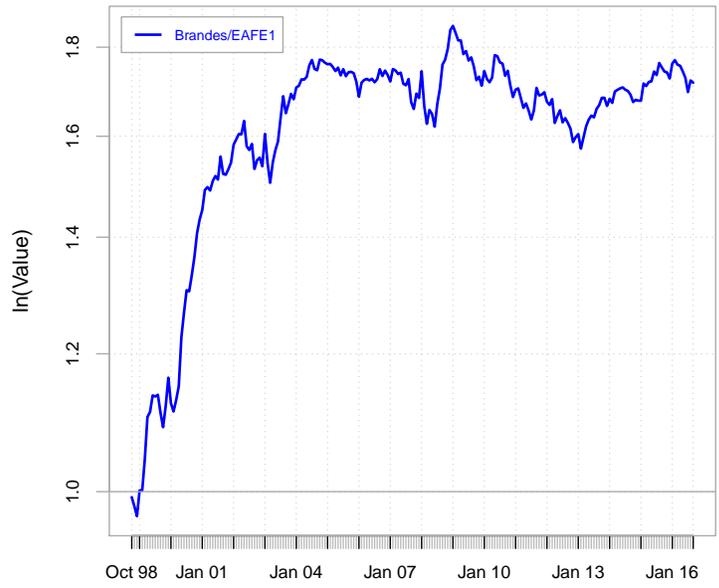


American Century GICS Sector Active Exposure

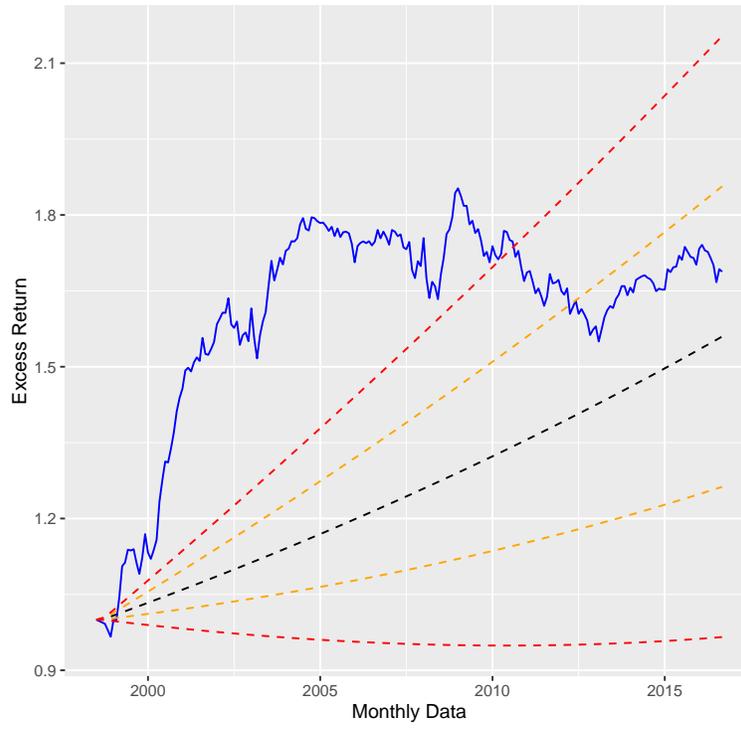




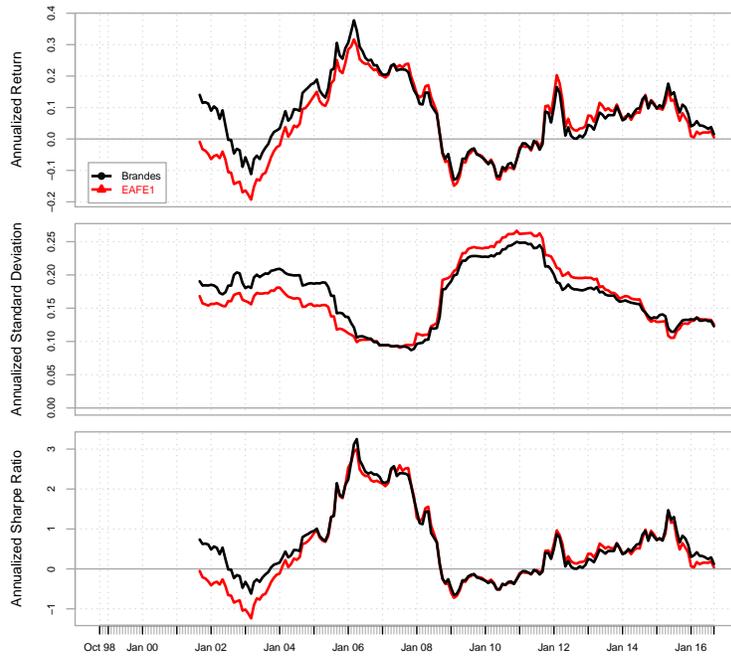
Brandes Cumulative Relative Performance



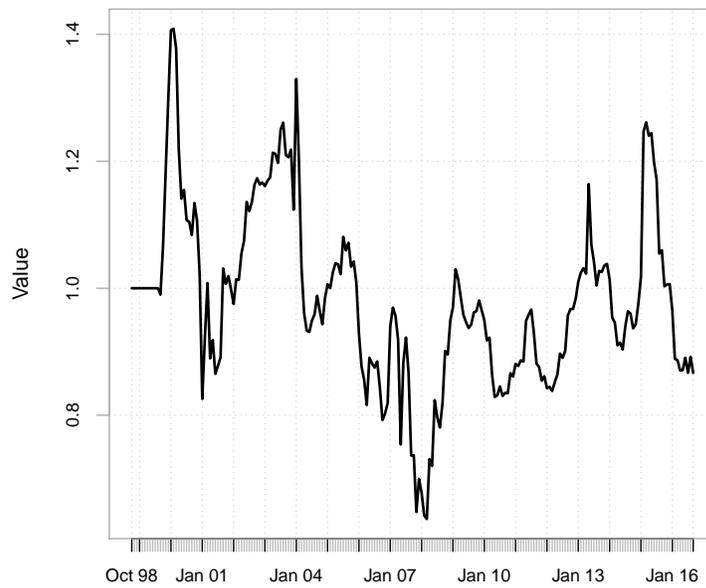
Brandes Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



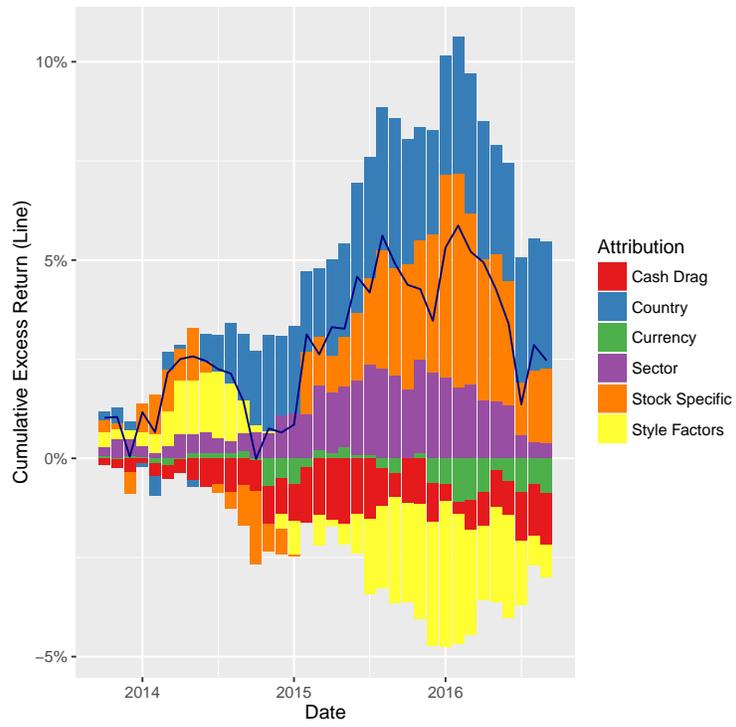
Brandes Rolling 3 year Performance



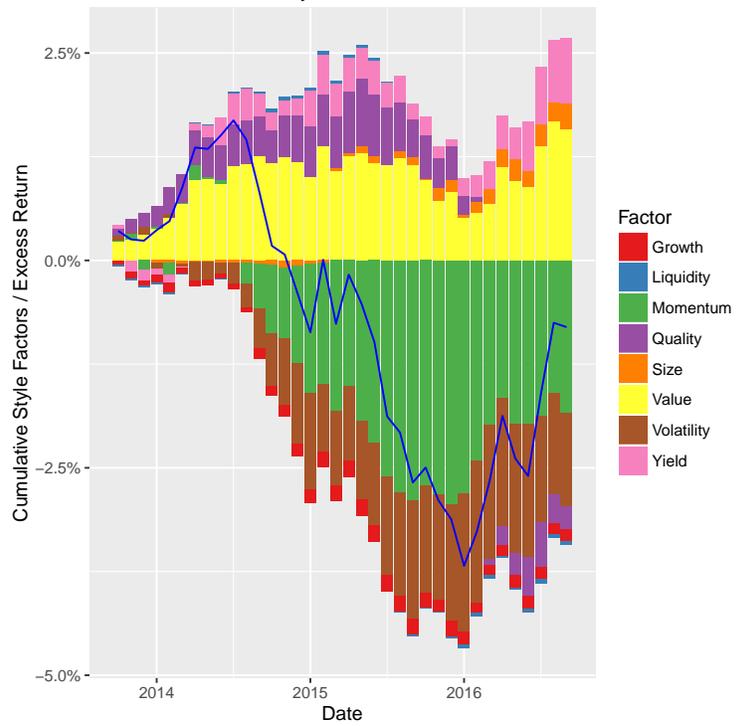
Brandes Rolling 12 Month Beta



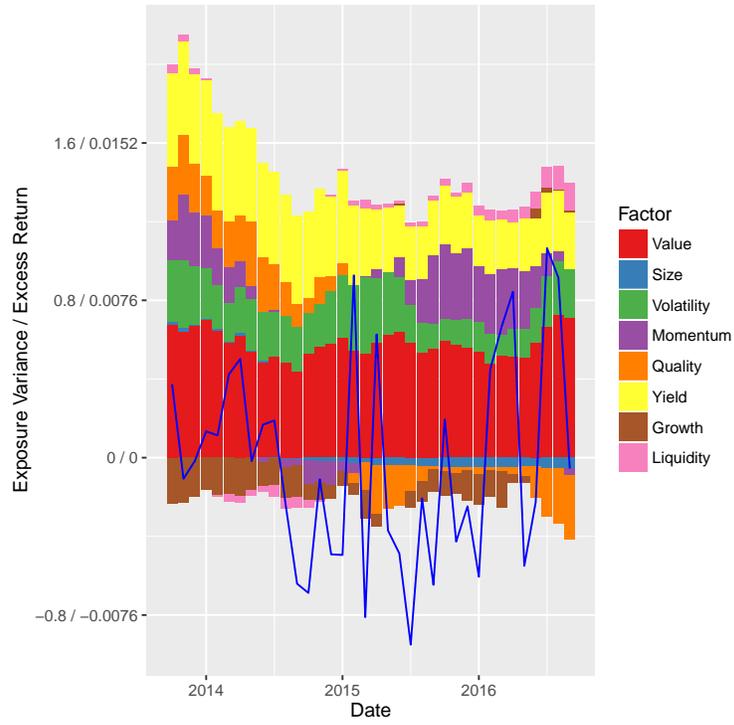
Brandes Barra Factor Attribution



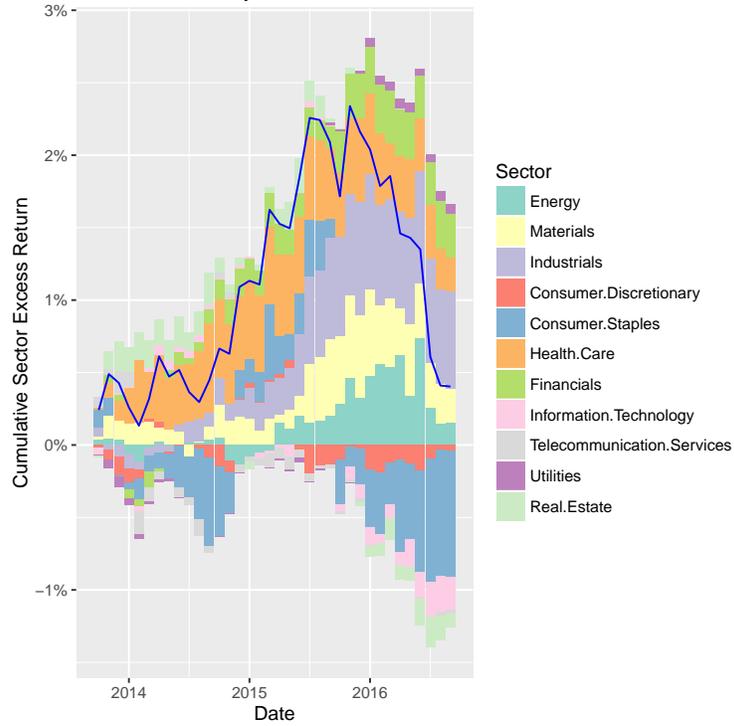
Brandes Style Factor Breakout



Brandes Monthly Style Factors Active Exposure



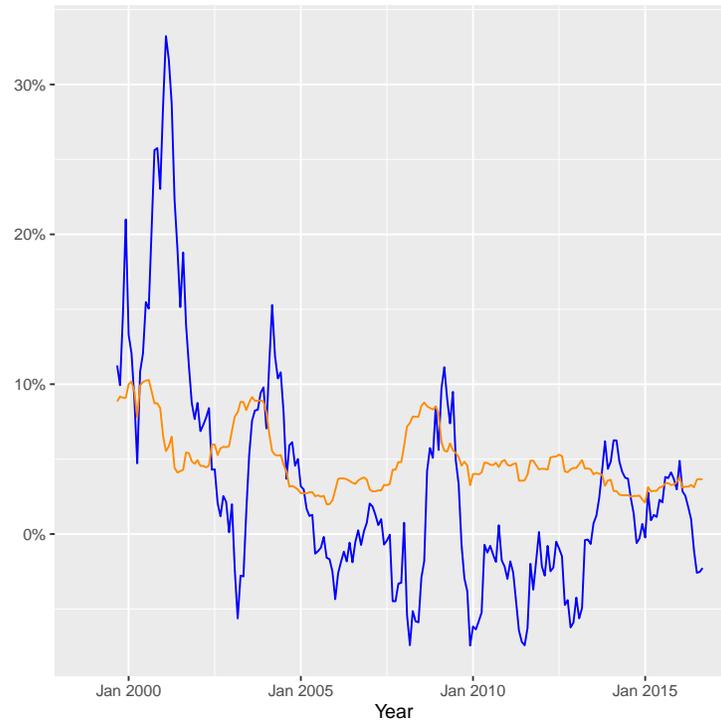
Brandes Monthly GICS Sector Return



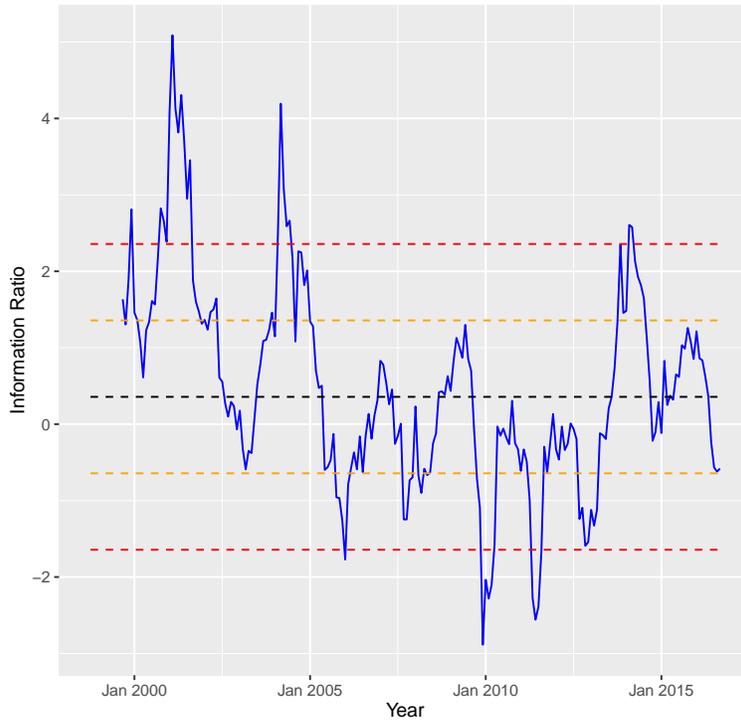
Brandes GICS Sector Active Exposure



Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



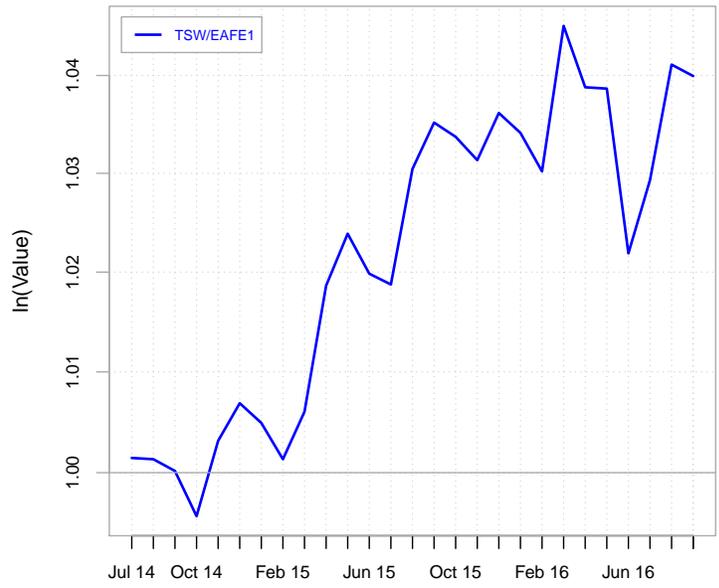
Brandes Rolling 12 Month Information Ratio



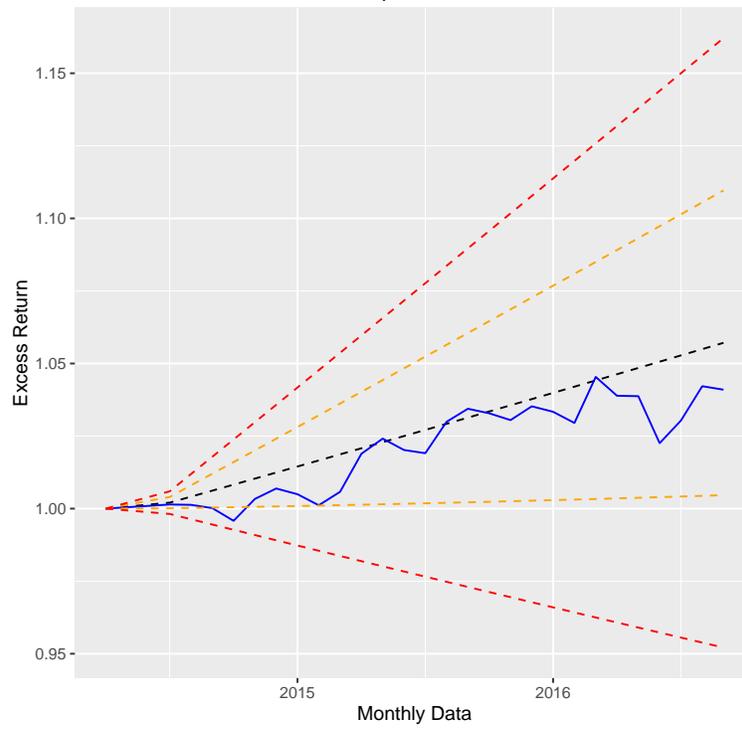
Brandes Rolling 36 Month Information Ratio



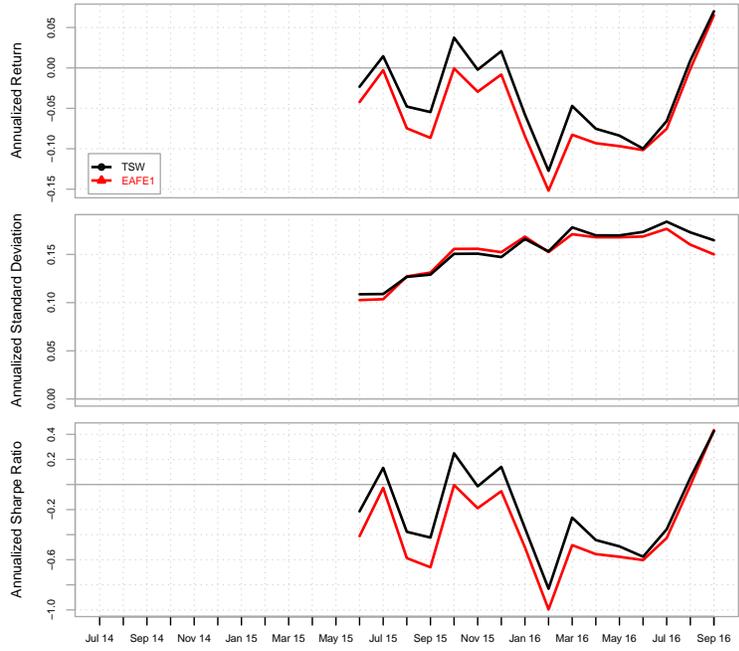
TSW Cumulative Relative Performance



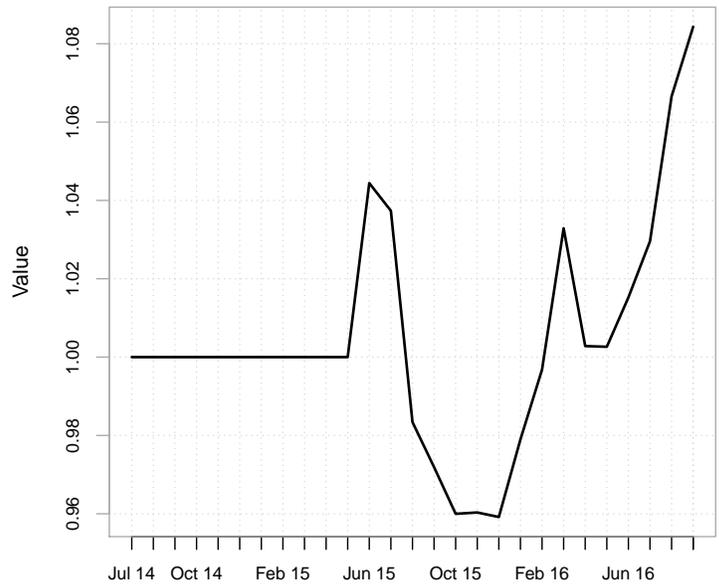
TSW Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



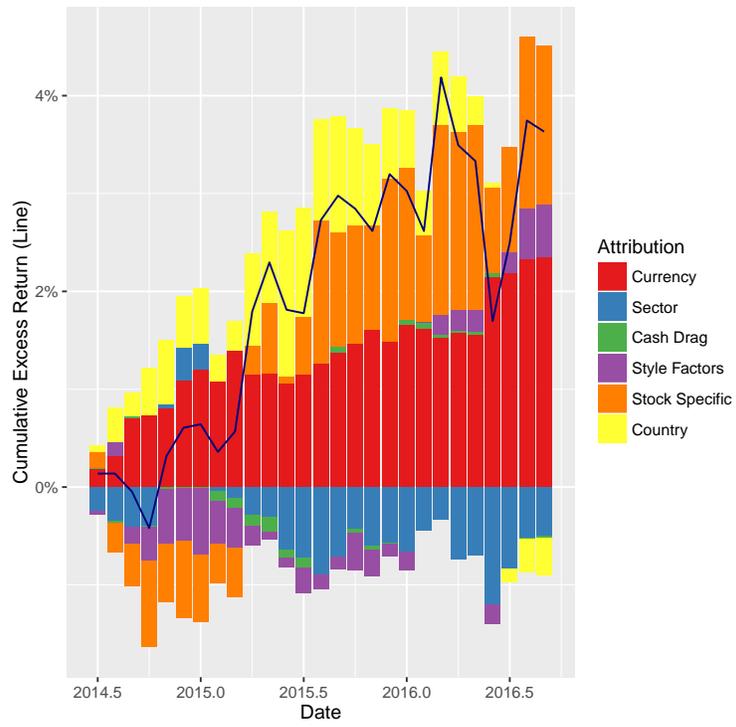
TSW Rolling 1 year Performance



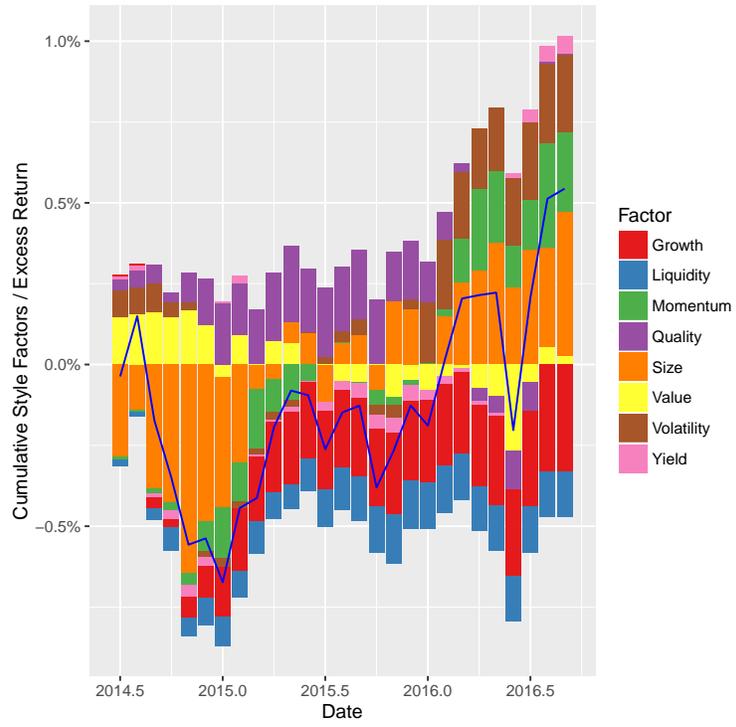
TSW Rolling 12 Month Beta



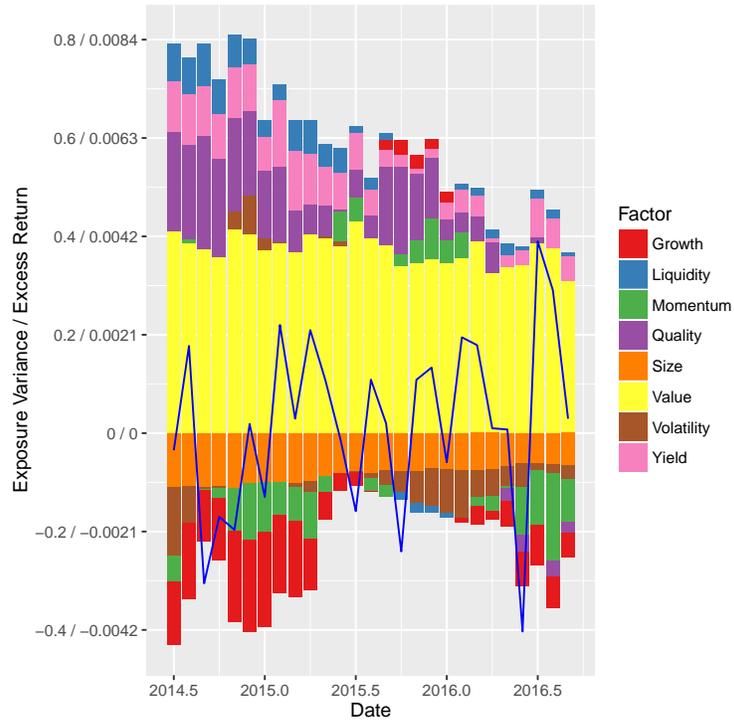
TSW Barra Factor Attribution



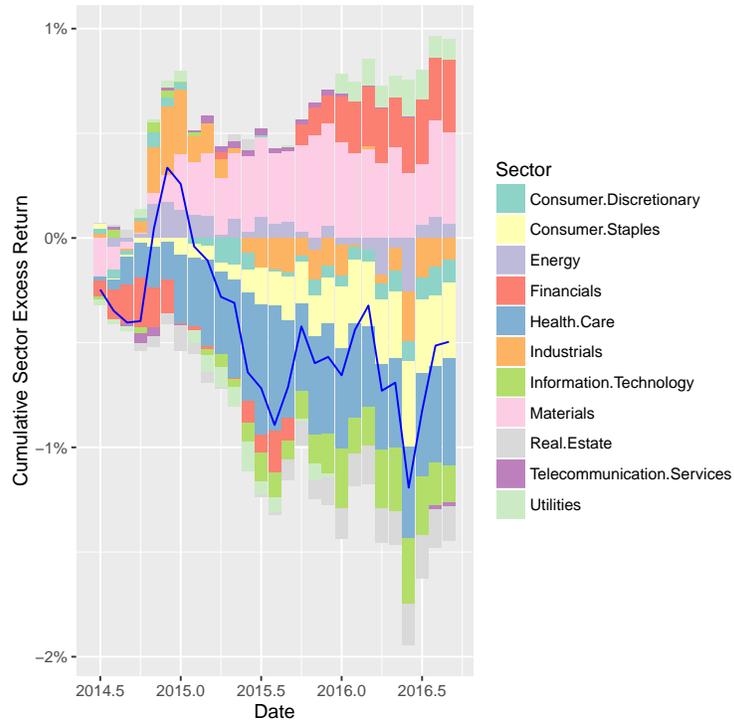
TSW Style Factor Breakout



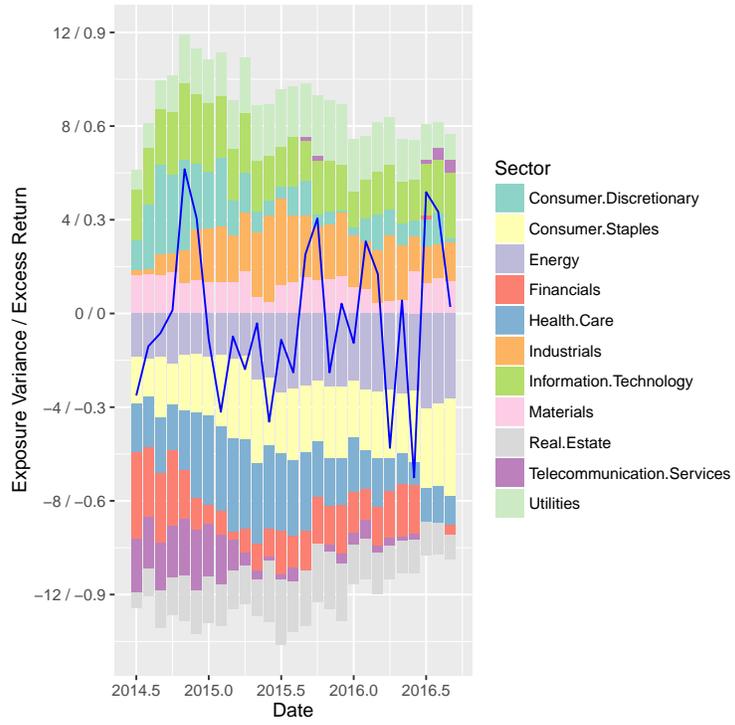
TSW Monthly Style Factors Active Exposure



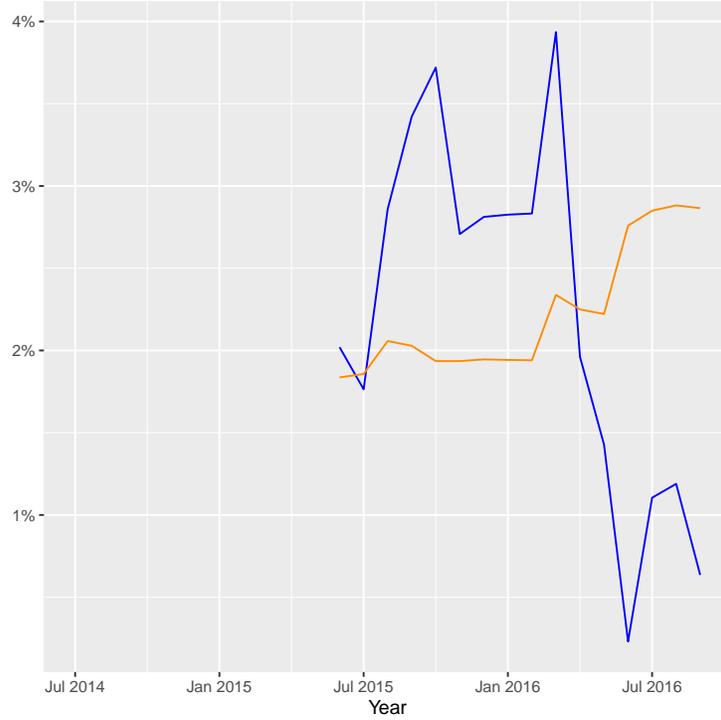
TSW Monthly GICS Sector Return



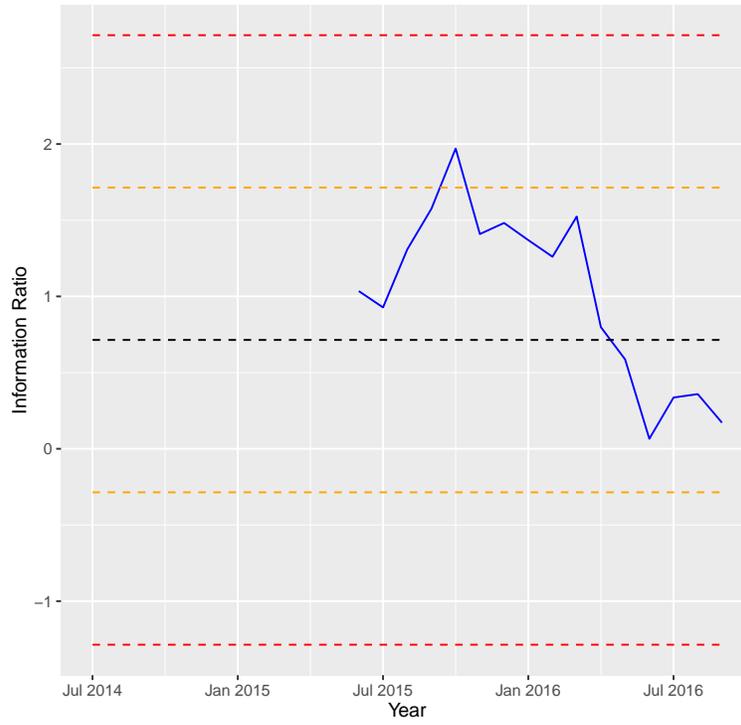
TSW GICS Sector Active Exposure



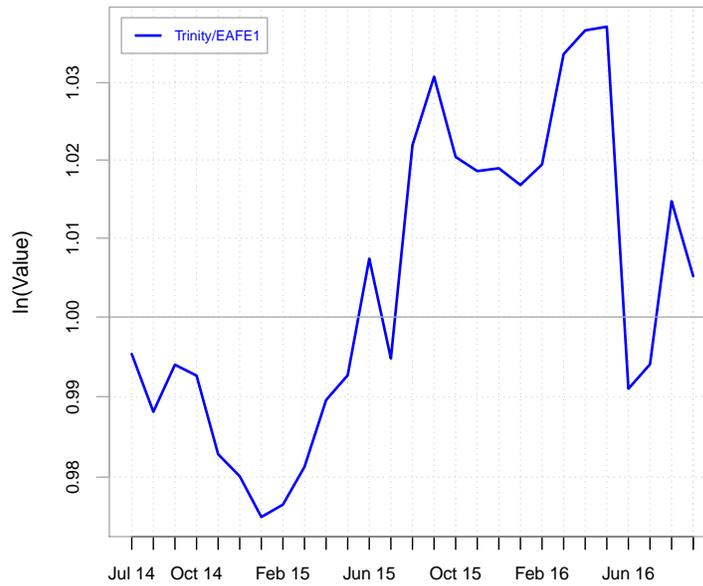
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



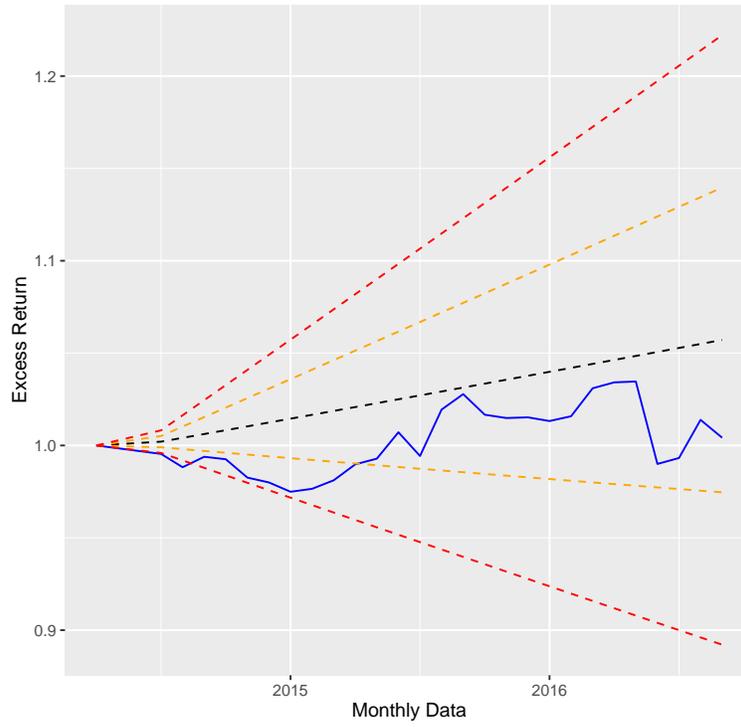
TSW Rolling 12 Month Information Ratio



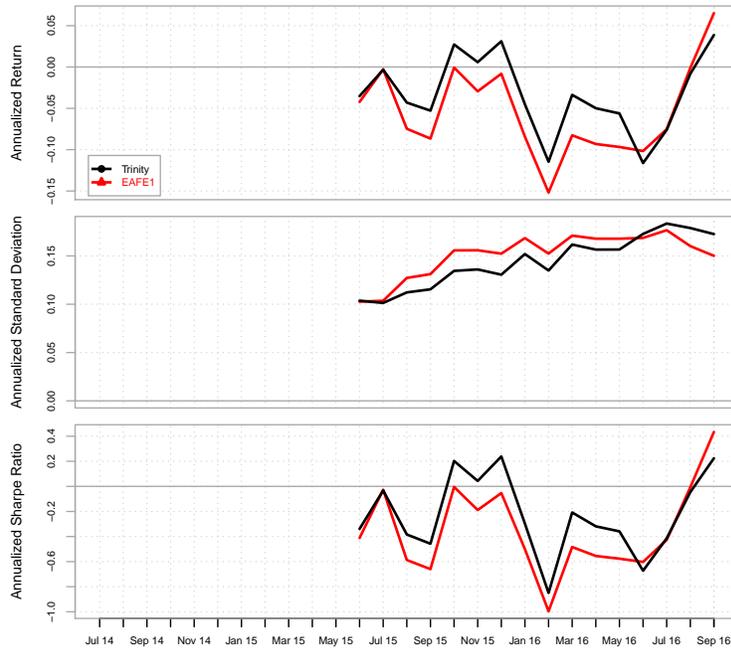
Trinity Cumulative Relative Performance



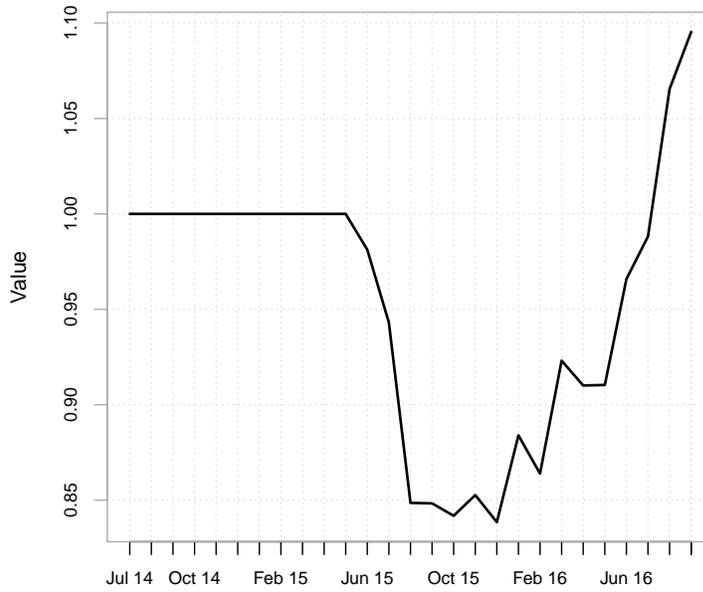
Trinity Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



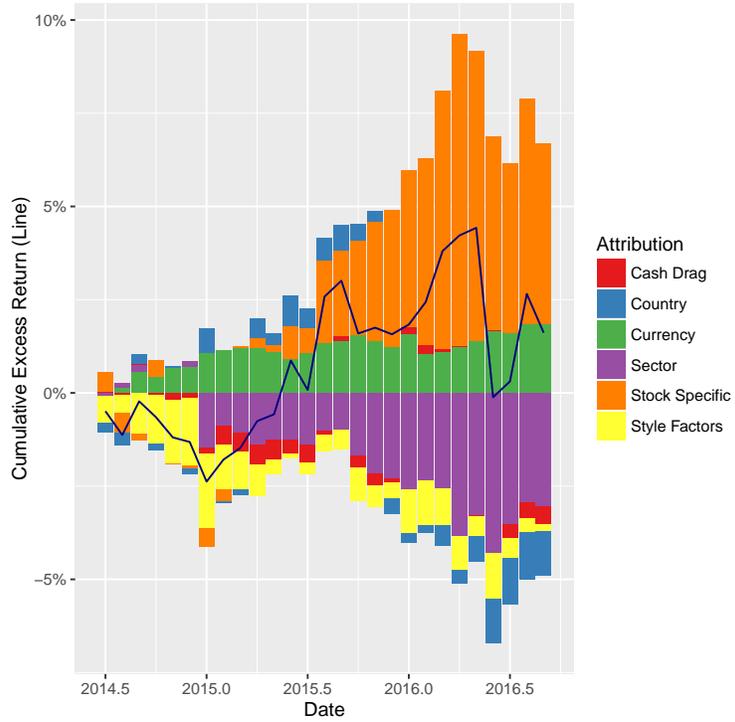
Trinity Rolling 1 year Performance



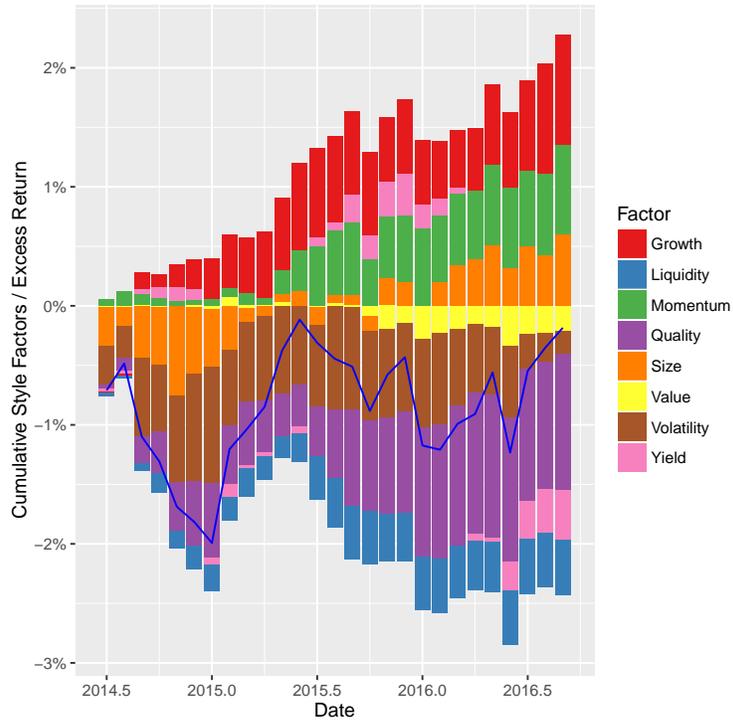
Trinity Rolling 12 Month Beta



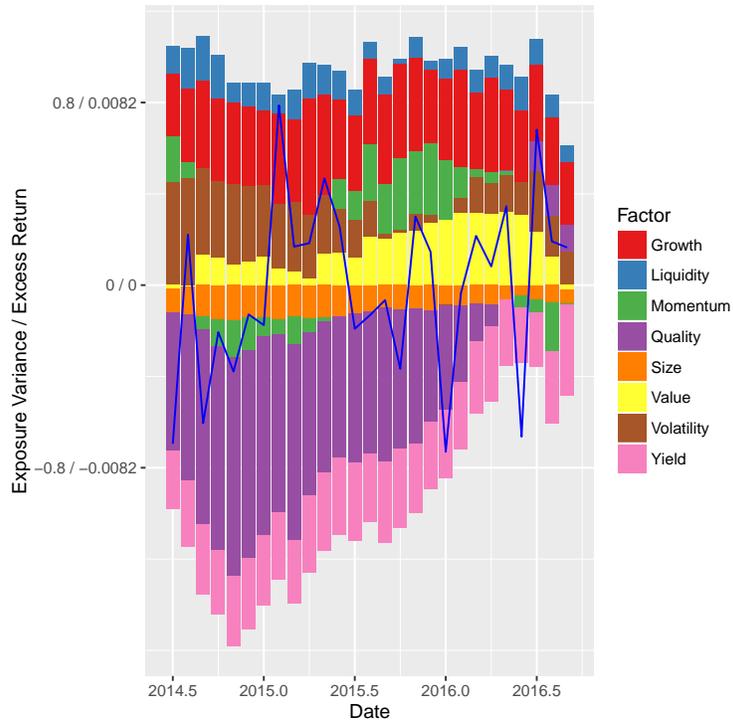
Trinity Barra Factor Attribution



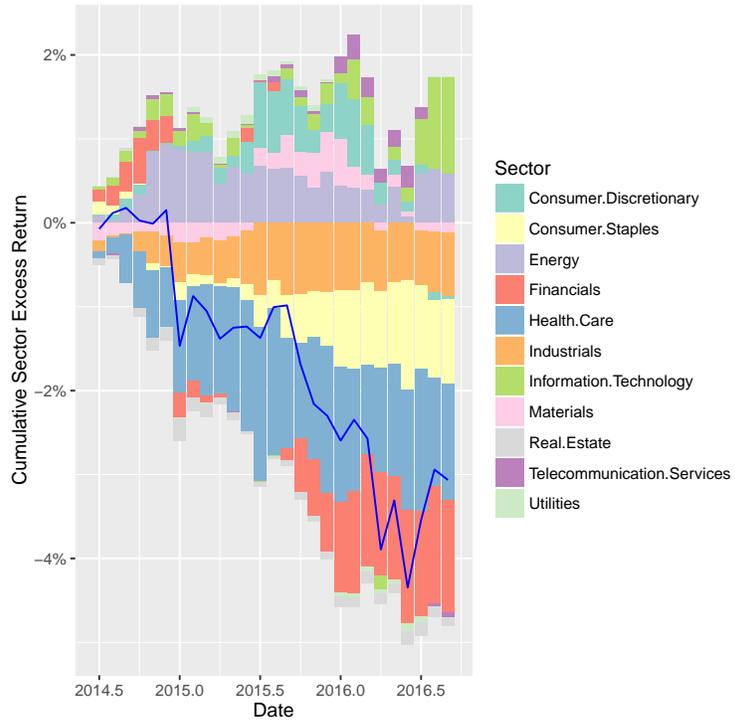
Trinity Style Factor Breakout



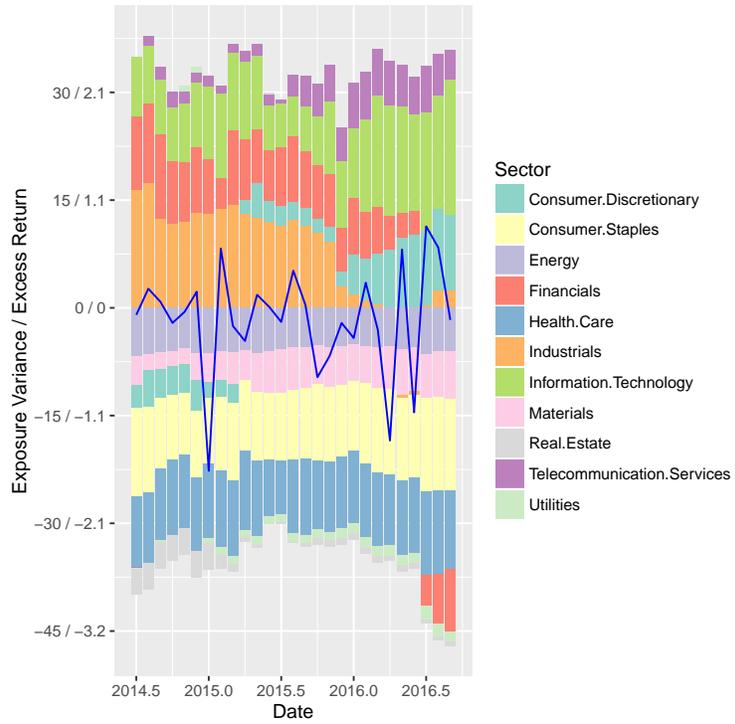
Trinity Monthly Style Factors Active Exposure

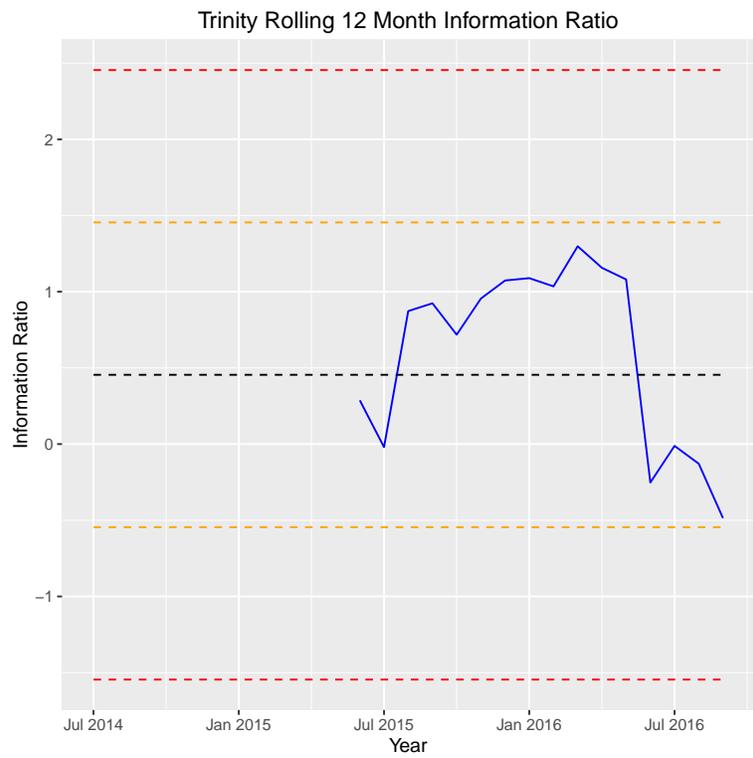
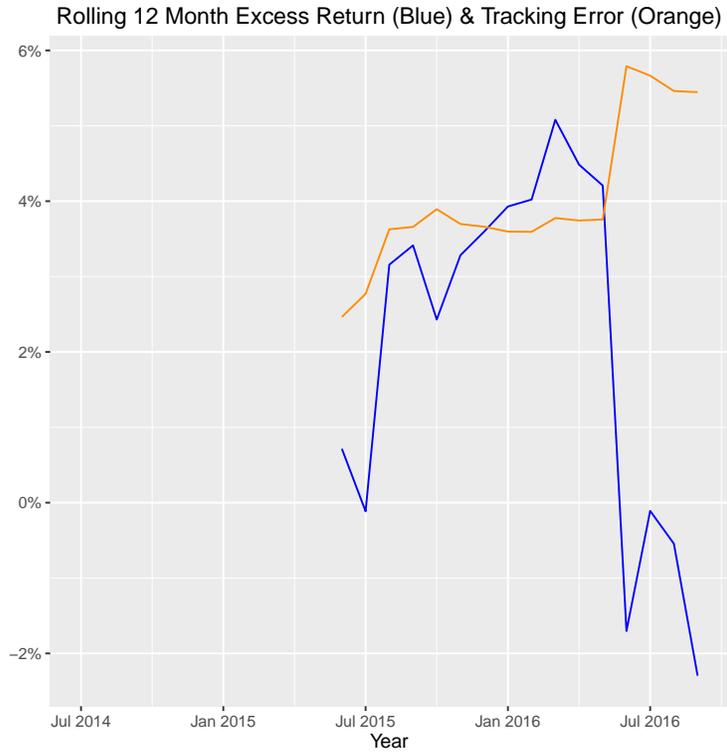


Trinity Monthly GICS Sector Return

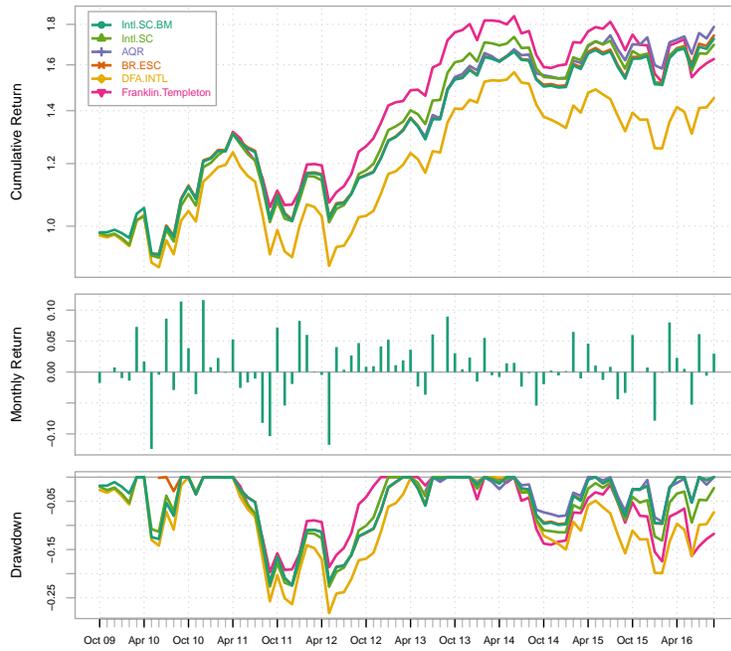


Trinity GICS Sector Active Exposure





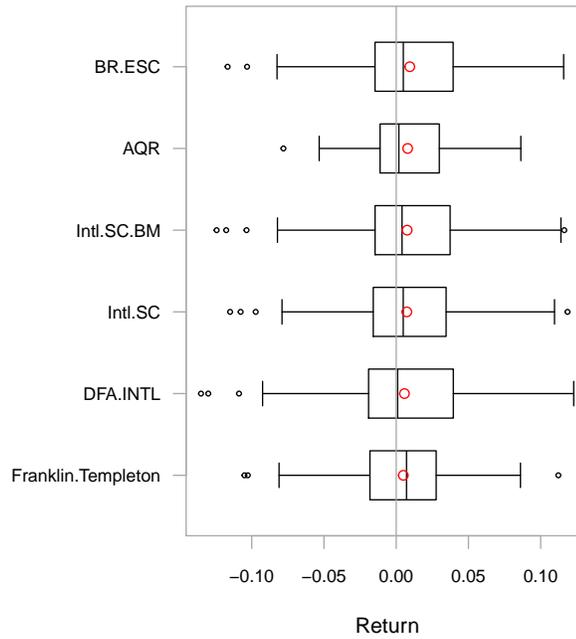
**Intl Developed Small Cap Performance Summary**



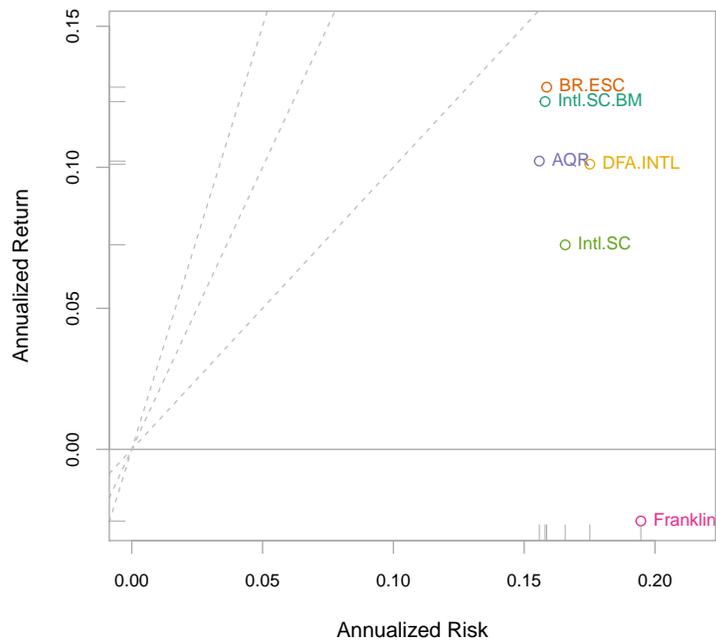
**Intl Developed Small Cap Cumulative Relative Performance**



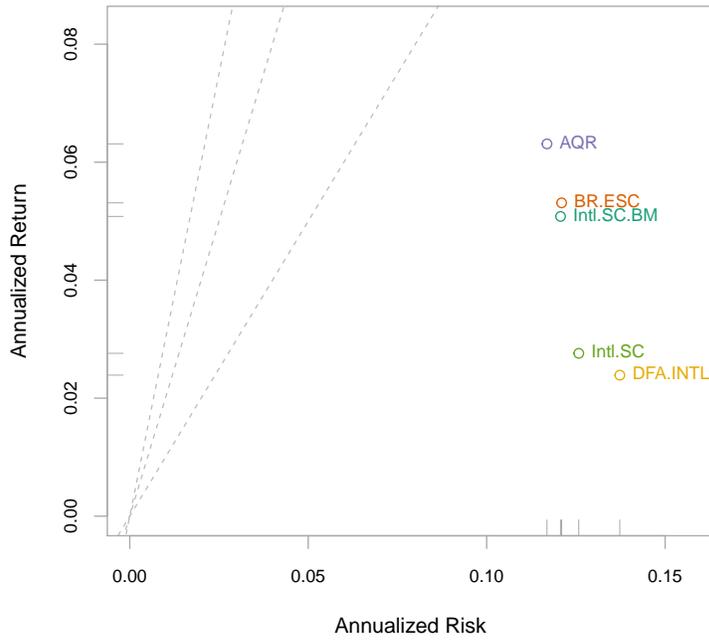
### Return Distribution Comparison



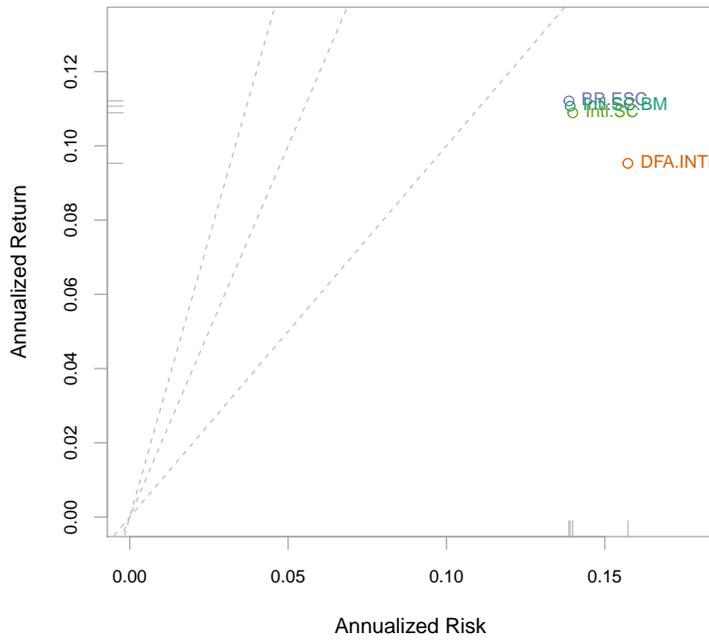
### Intl Developed Small Cap Trailing 1 Year Performance vs Sharpe Ratios (1,;



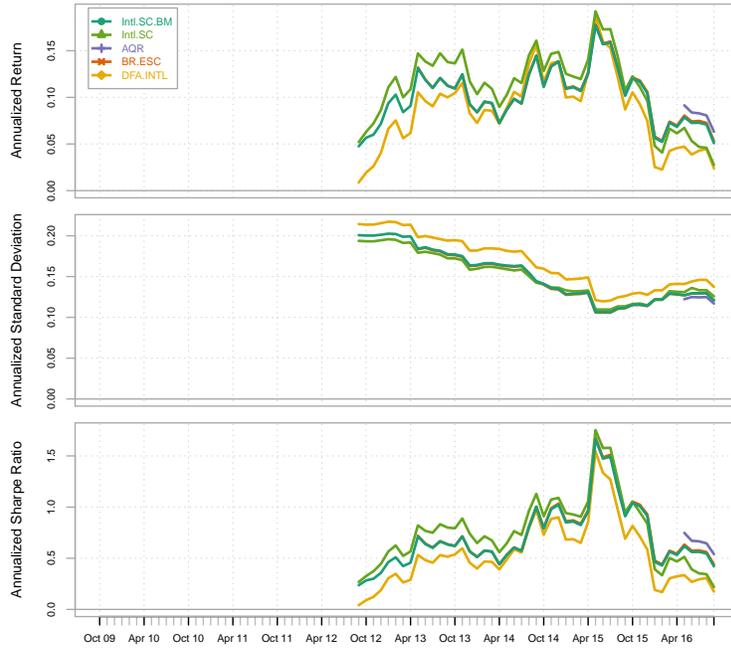
Trailing 3 Year Performance vs Sharpe Ratios (1,2,3)



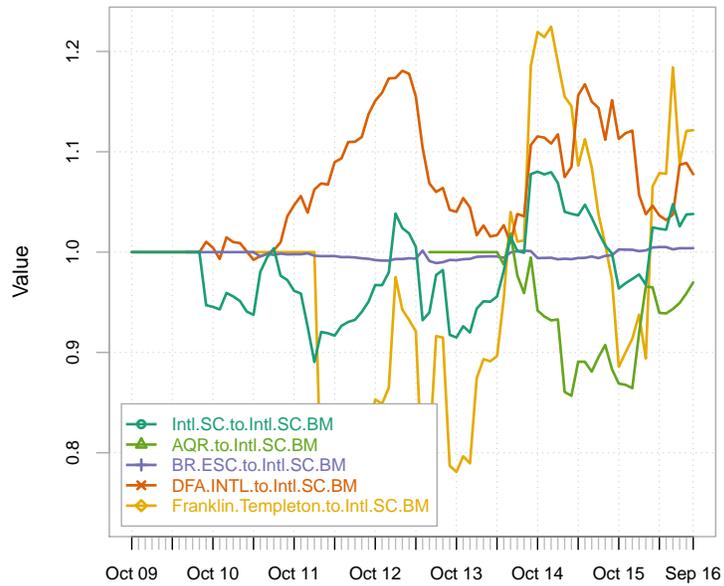
Trailing 5 Year Performance vs Sharpe Ratios (1,2,3)



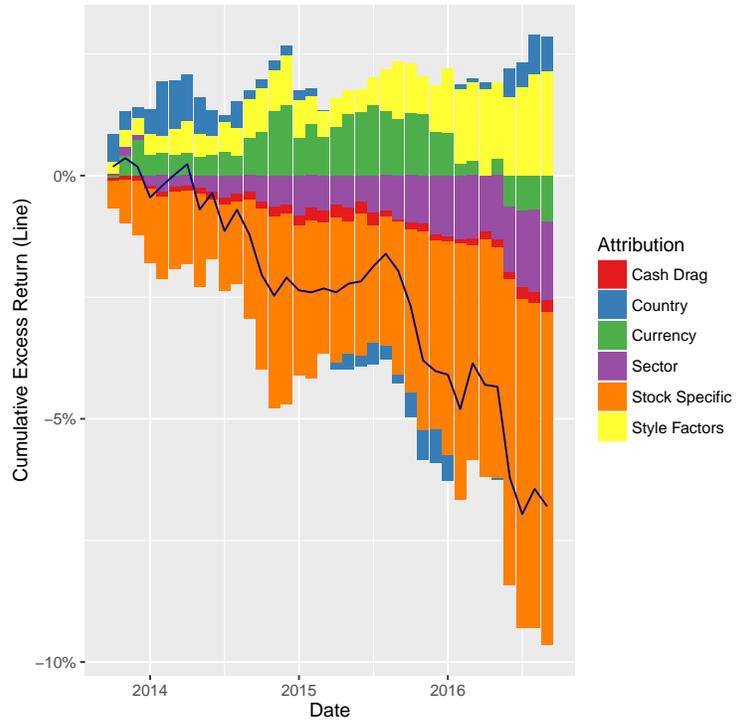
Intl Developed Small Cap Rolling 3 Year Performance



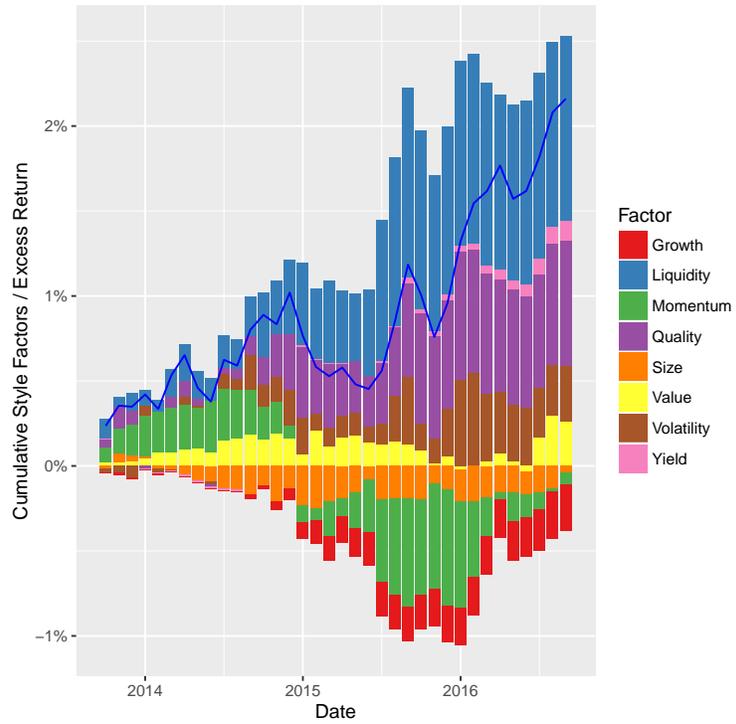
Intl Developed Small Cap Rolling 12 Month Beta



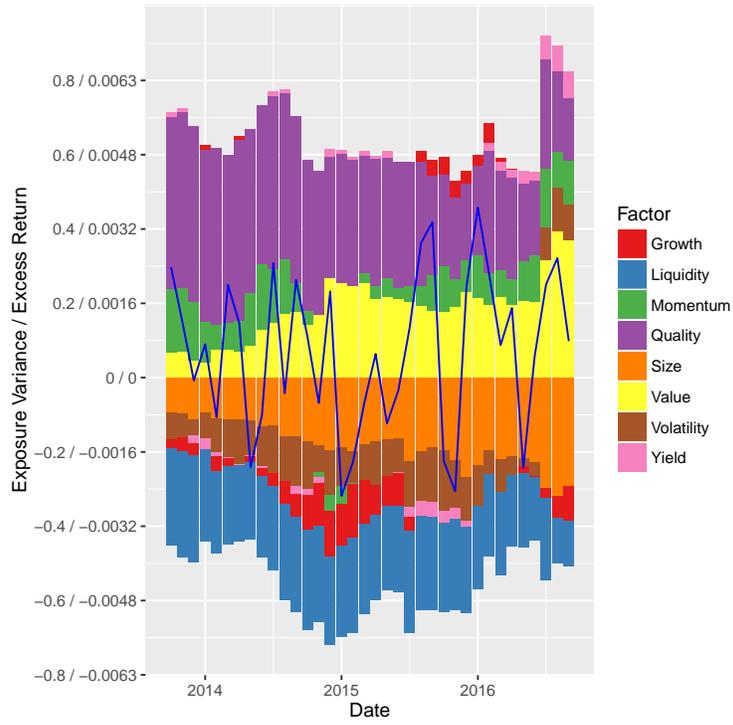
Intl Developed Small Cap Barra Factor Attribution



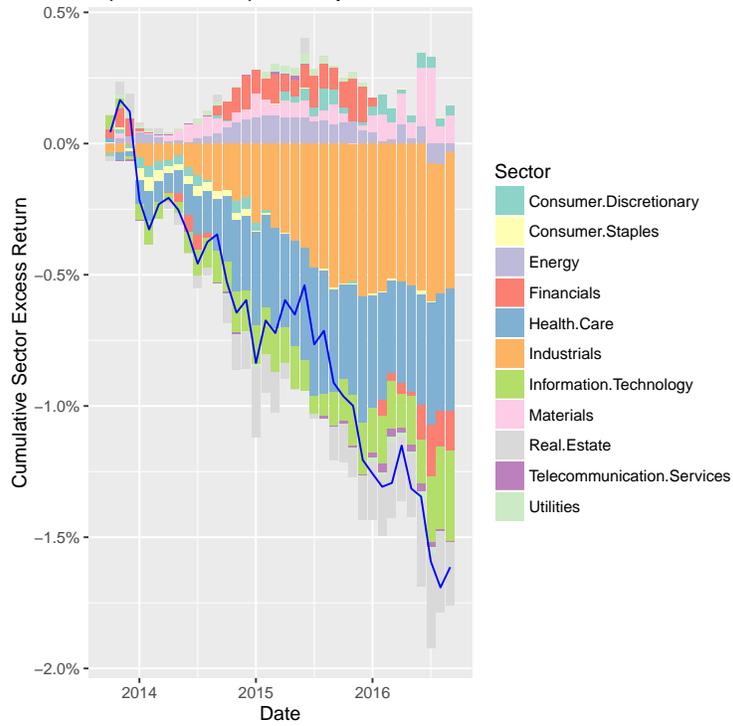
Intl Developed Small Cap Style Factor Breakout



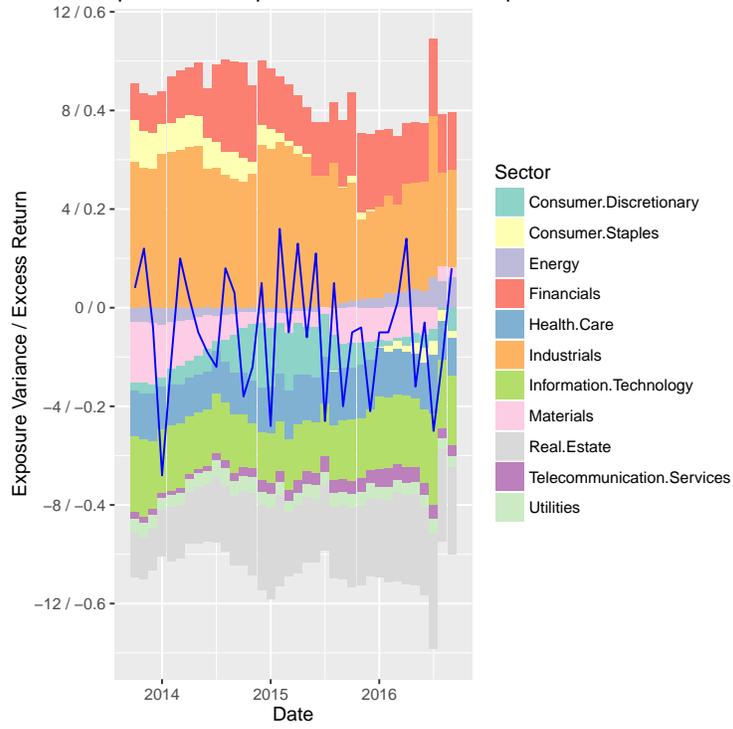
Intl Developed Small Cap Monthly Style Factors Active Exposure



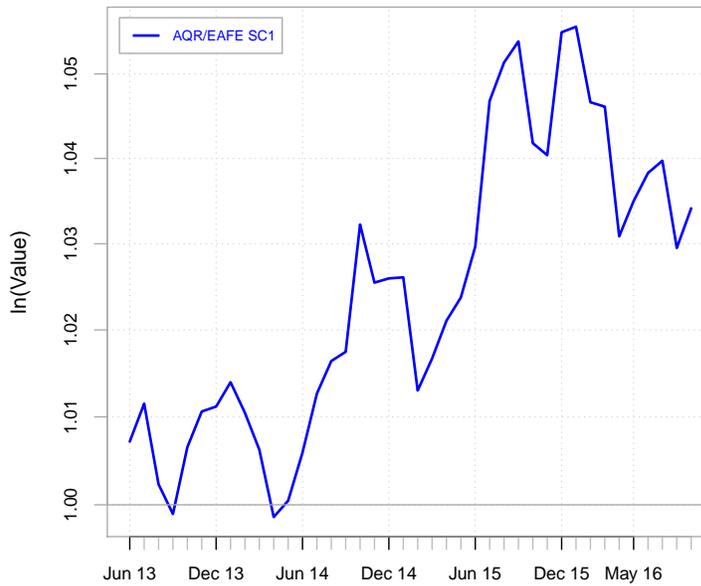
Intl Developed Small Cap Monthly GICS Sector Return



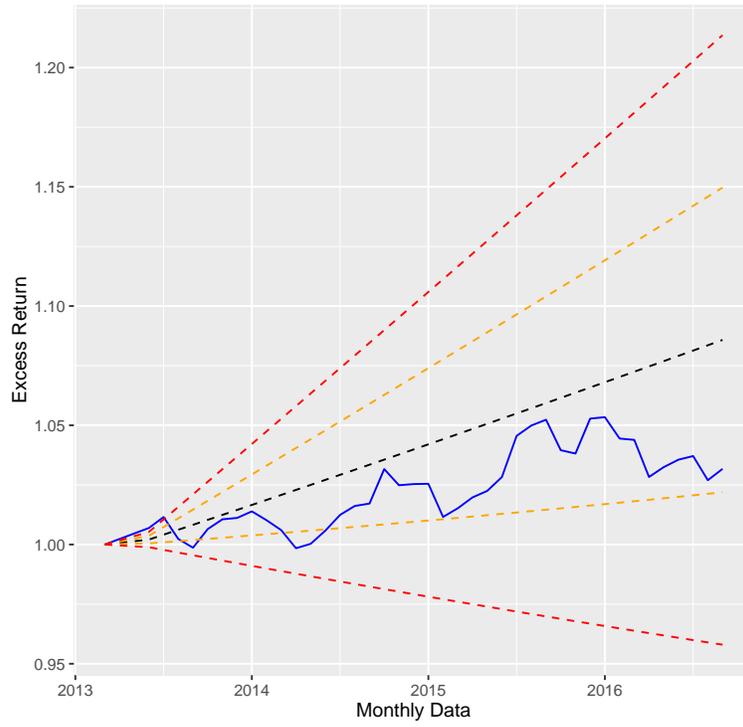
### Intl Developed Small Cap GICS Sector Active Exposure



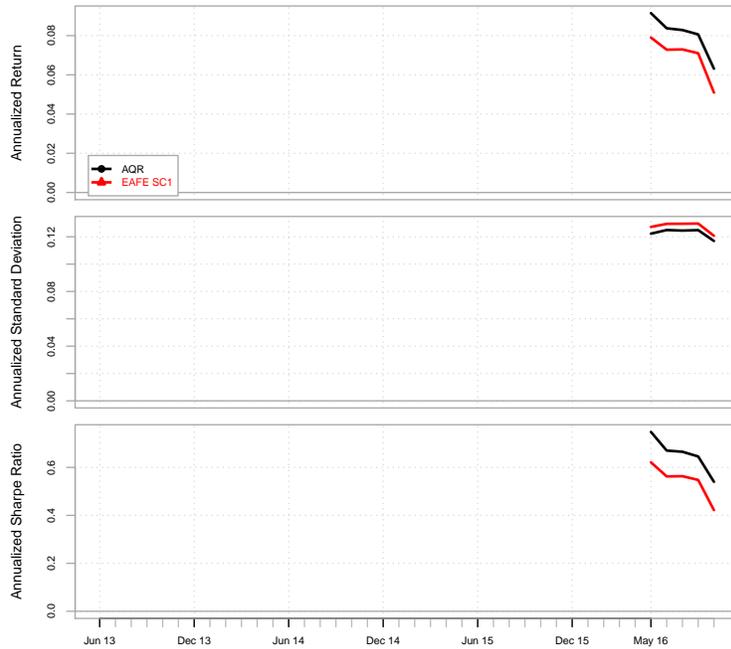
### AQR Cumulative Relative Performance



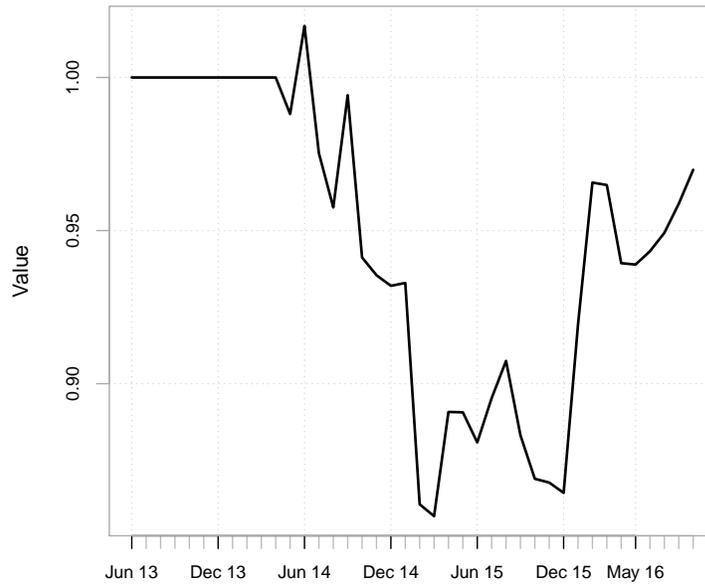
AQR Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



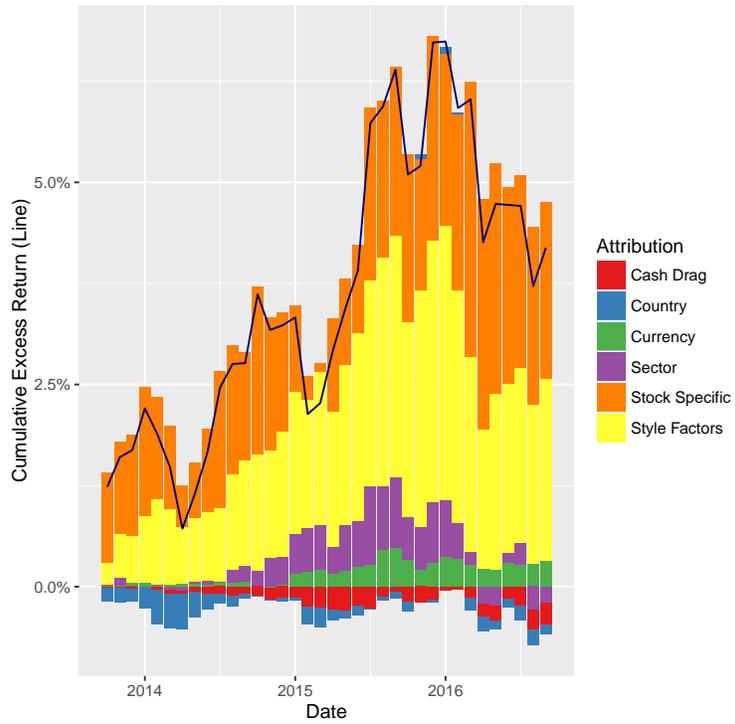
AQR Rolling 3 year Performance



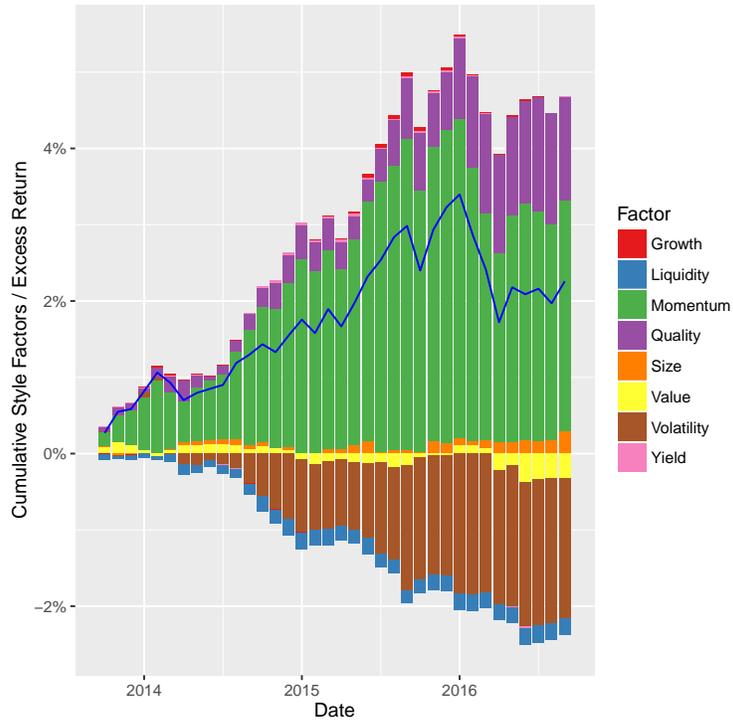
AQR Rolling 12 Month Beta



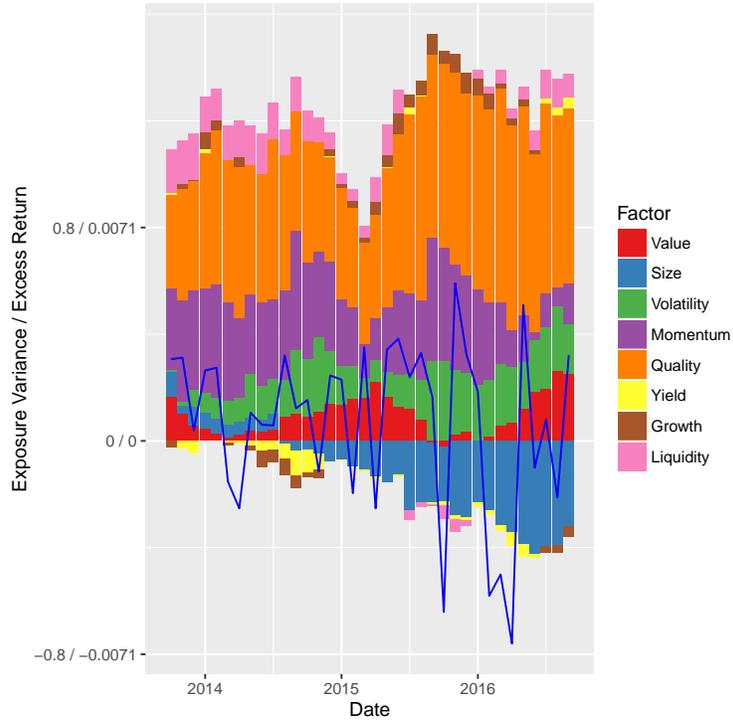
AQR Barra Factor Attribution



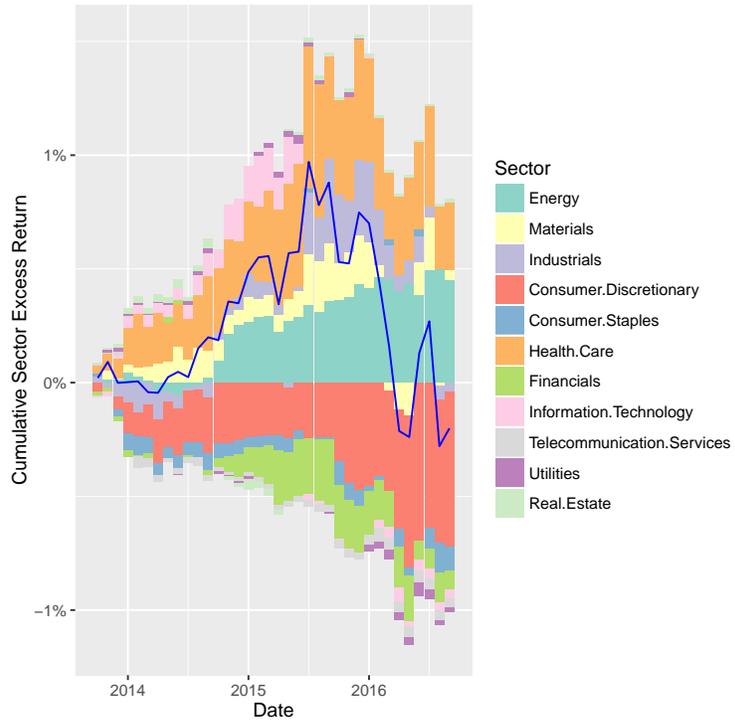
AQR Style Factor Breakout



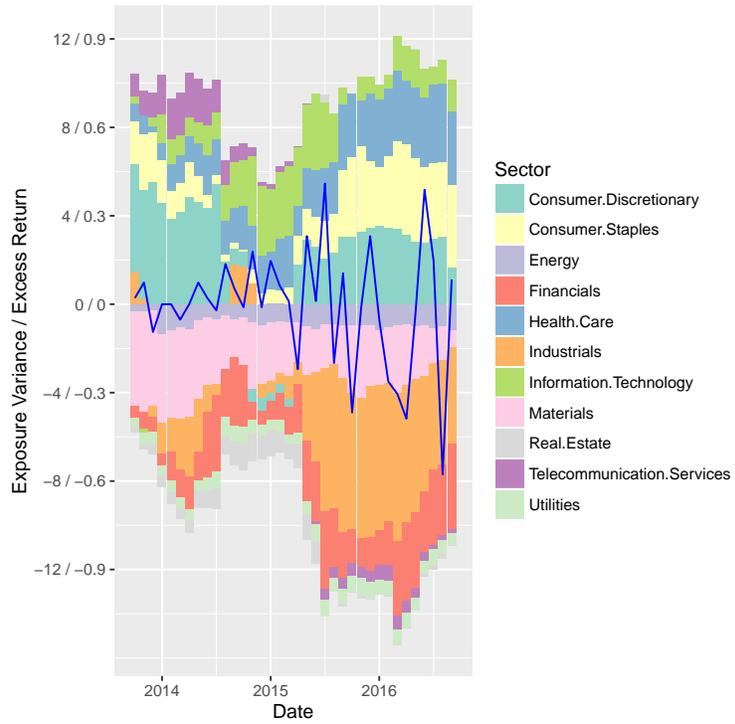
AQR Monthly Style Factors Active Exposure



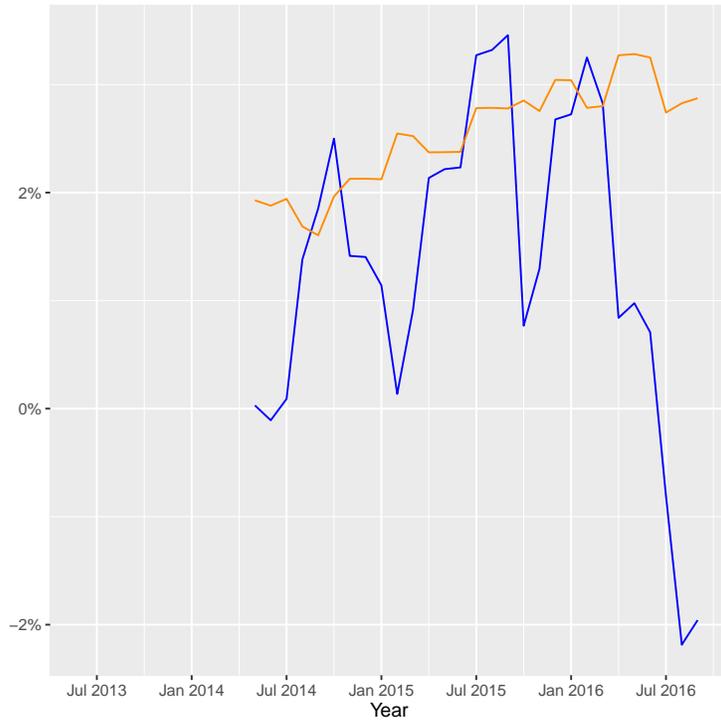
AQR Monthly GICS Sector Return



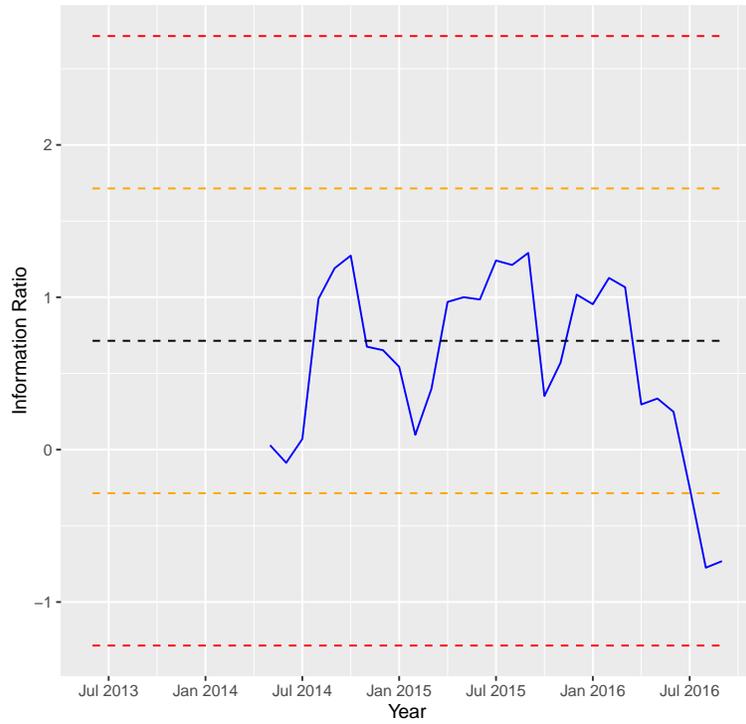
AQR GICS Sector Active Exposure



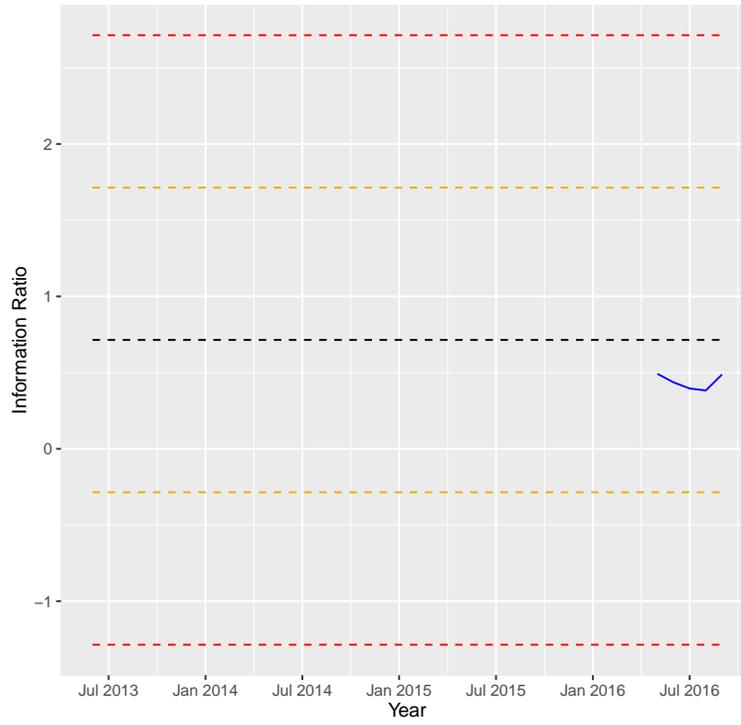
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



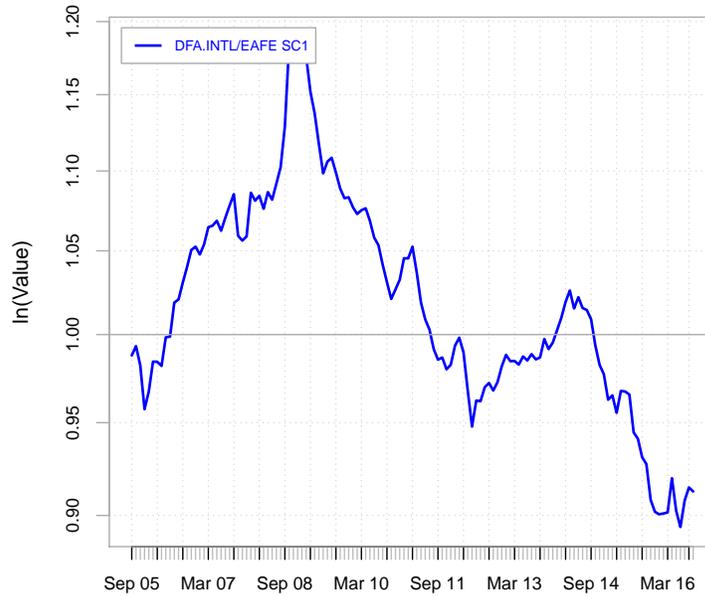
AQR Rolling 12 Month Information Ratio



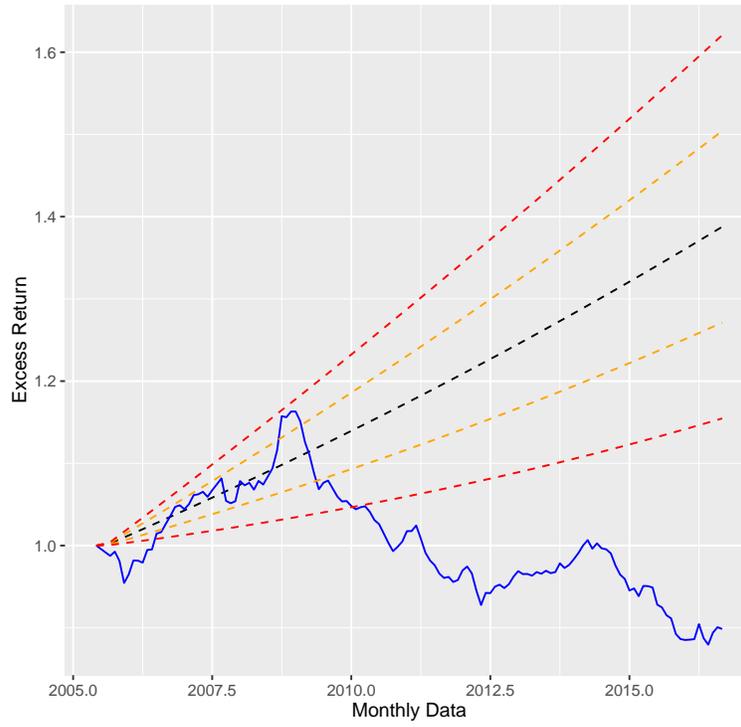
AQR Rolling 36 Month Information Ratio



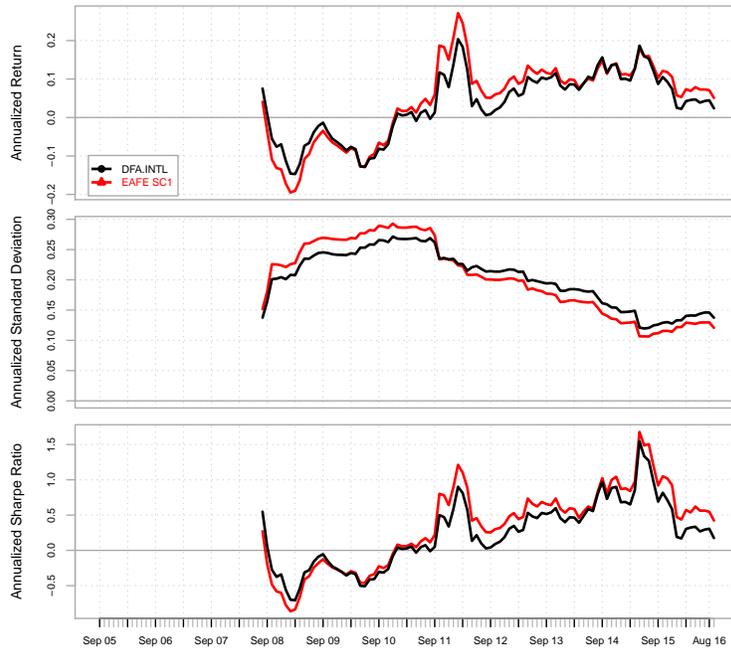
DFA.INTL Cumulative Relative Performance



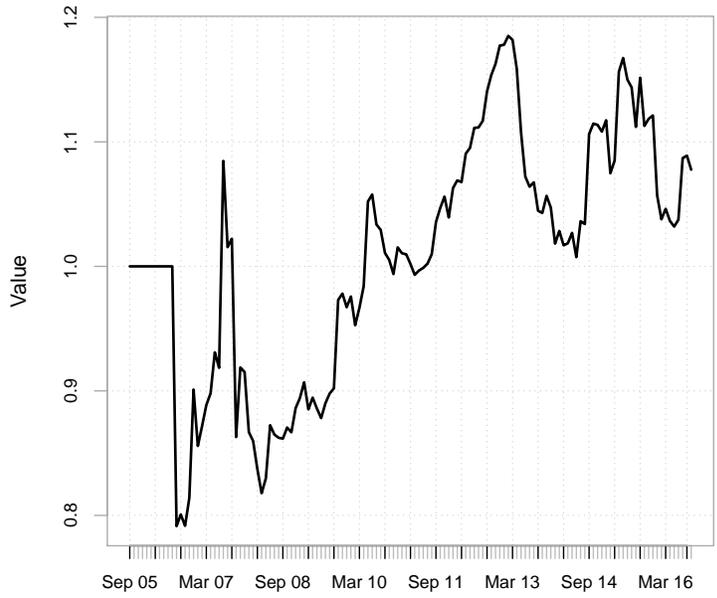
DFA.INTL Actual Excess vs Expected Excess +/- 2 Std Dev



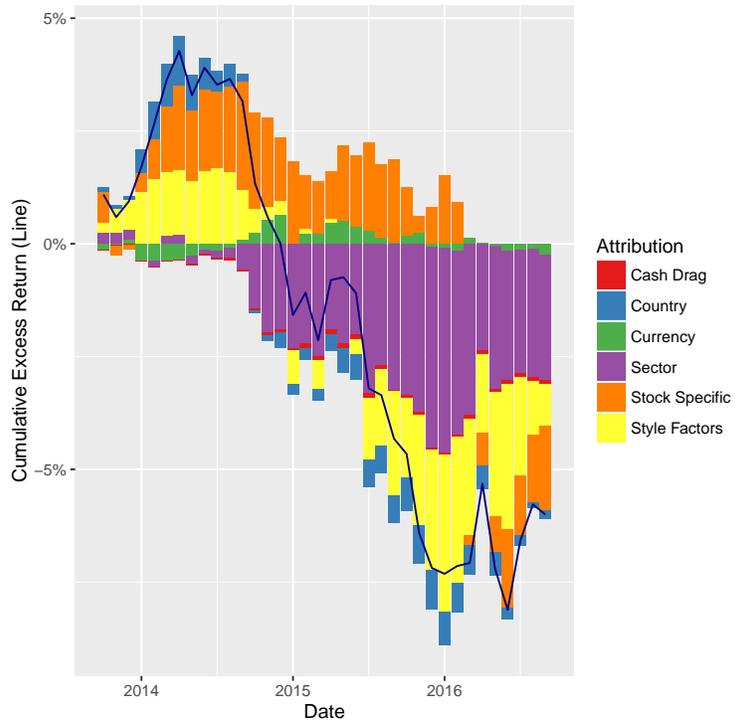
DFA.INTL Rolling 3 year Performance



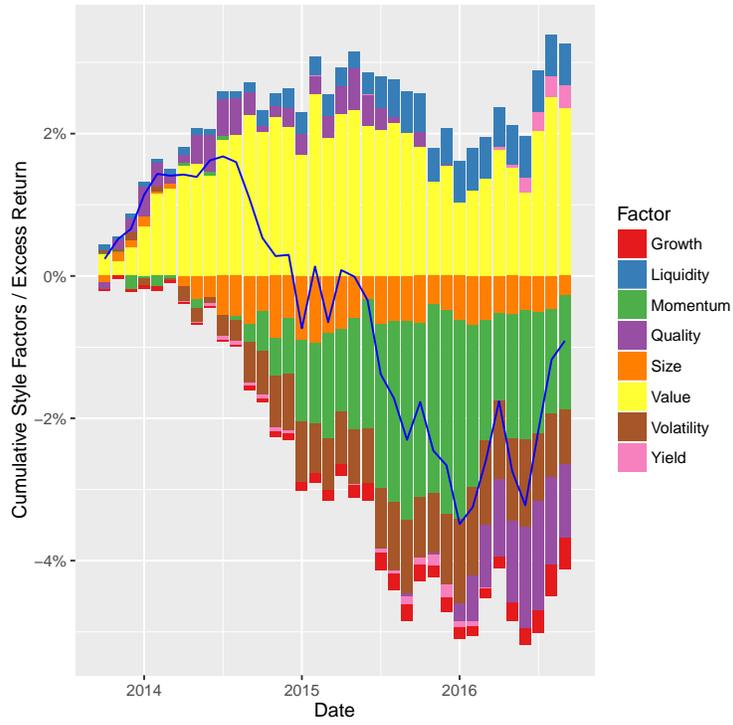
DFA.INTL Rolling 12 Month Beta



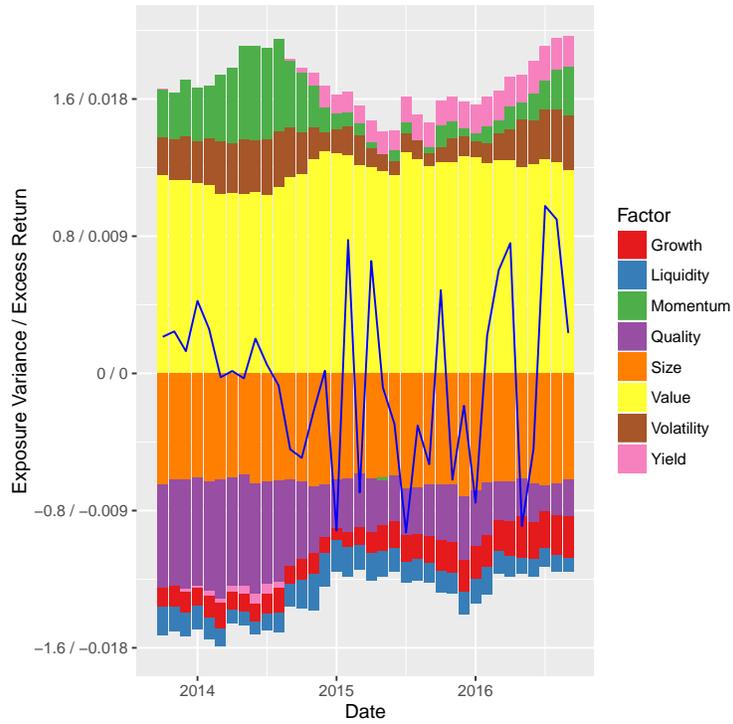
DFA.INTL Barra Factor Attribution



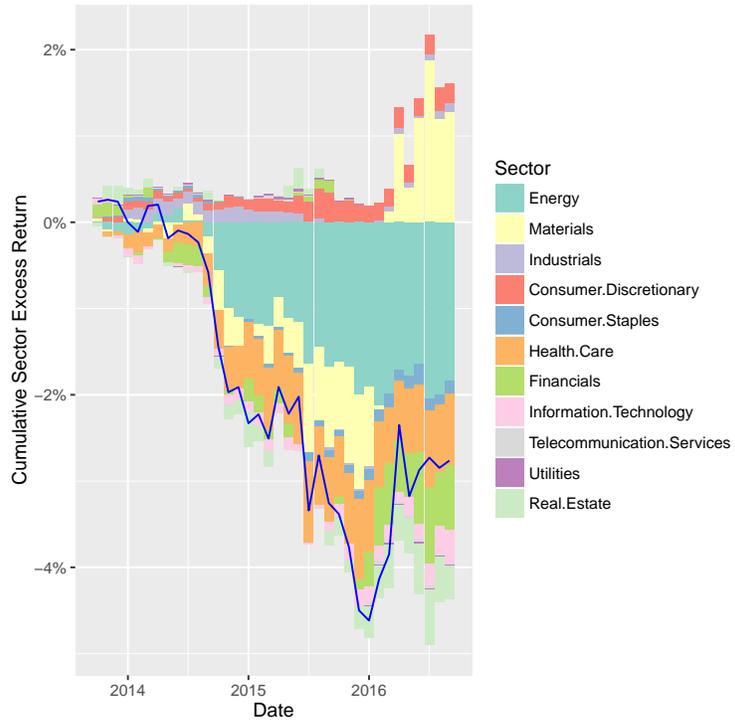
DFA.INTL Style Factor Breakout



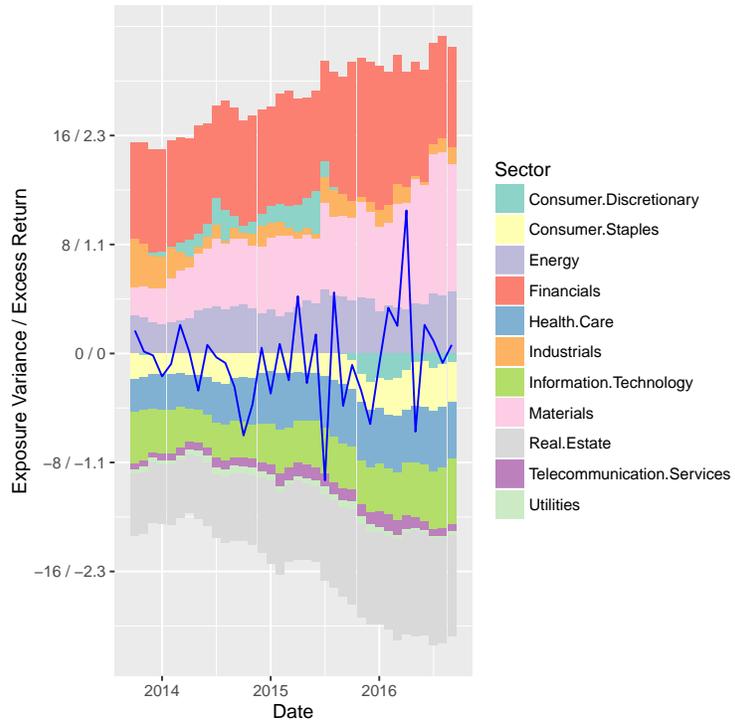
DFA.INTL Monthly Style Factors Active Exposure



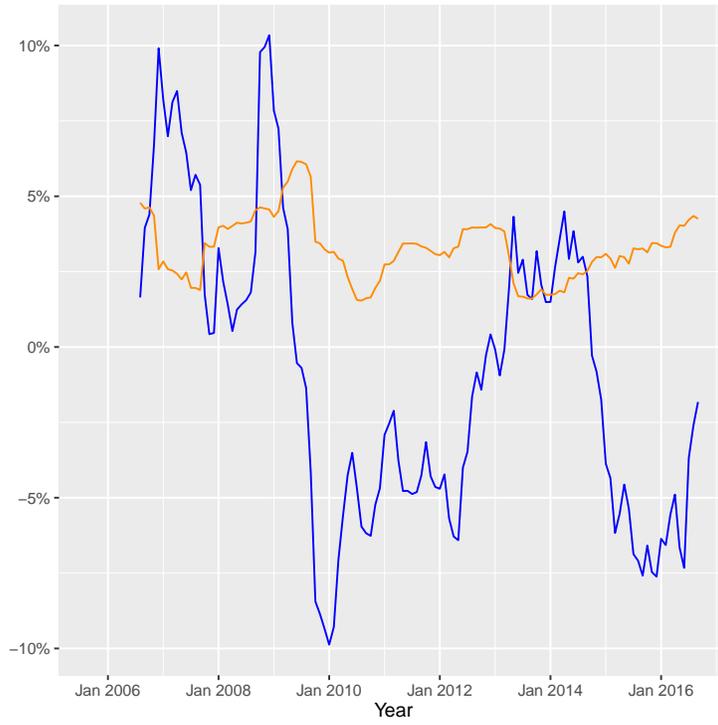
DFA.INTL Monthly GICS Sector Return



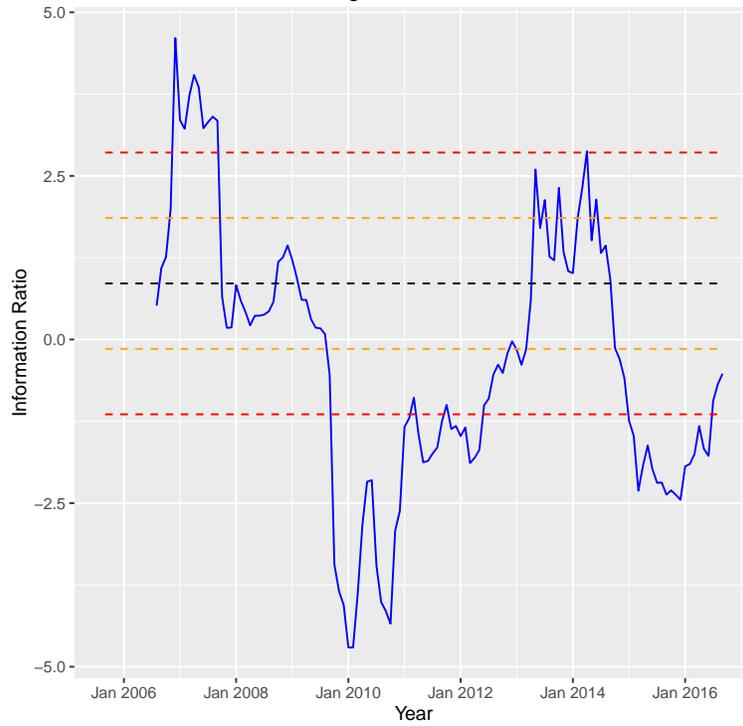
DFA.INTL GICS Sector Active Exposure



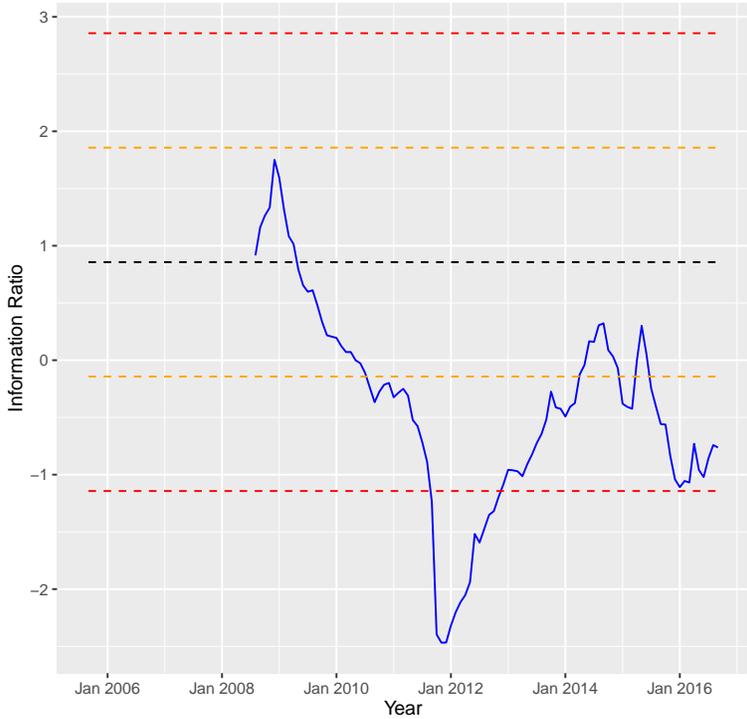
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



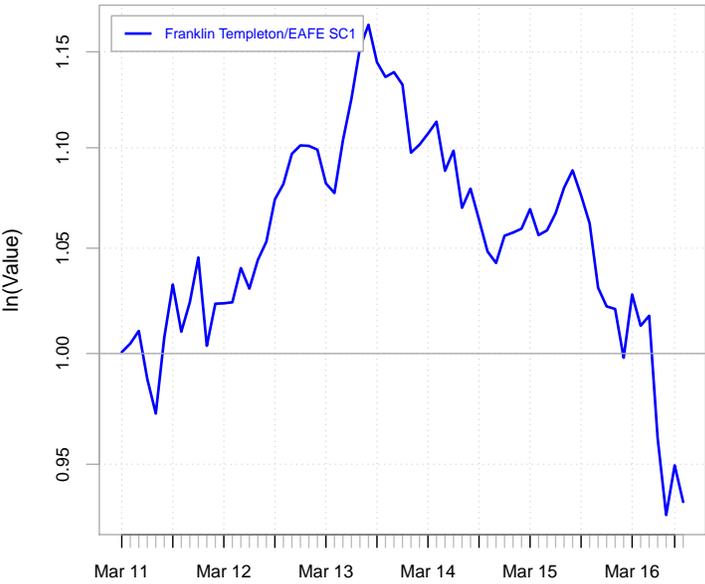
DFA.INTL Rolling 12 Month Information Ratio



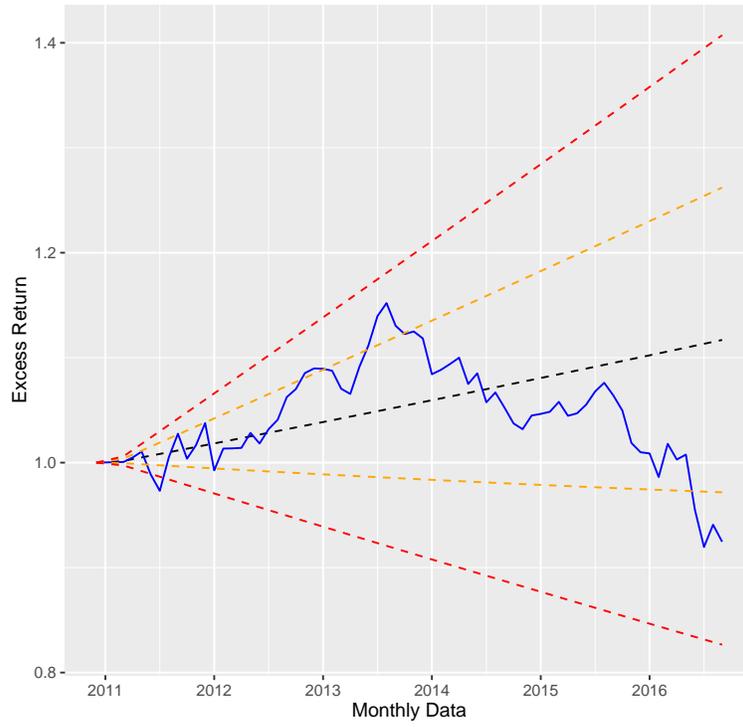
DFA.INTL Rolling 36 Month Information Ratio



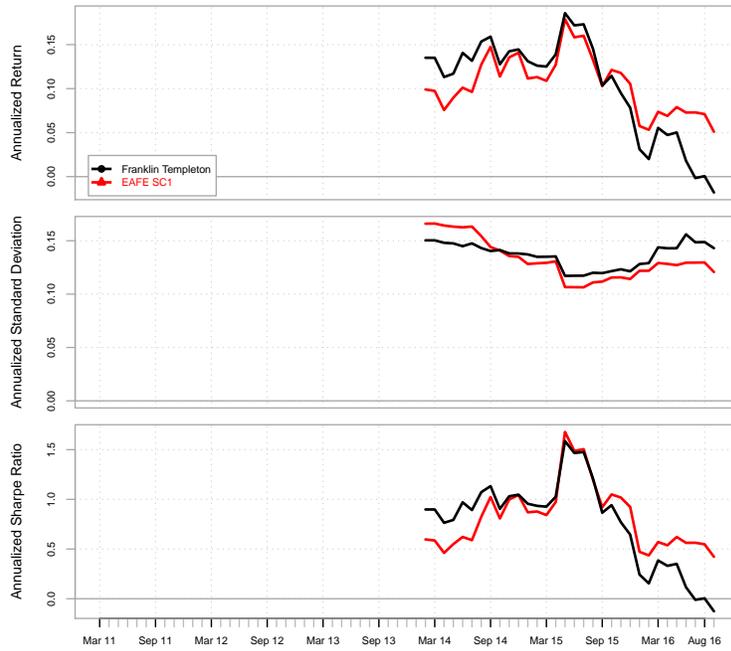
Franklin Templeton Cumulative Relative Performance



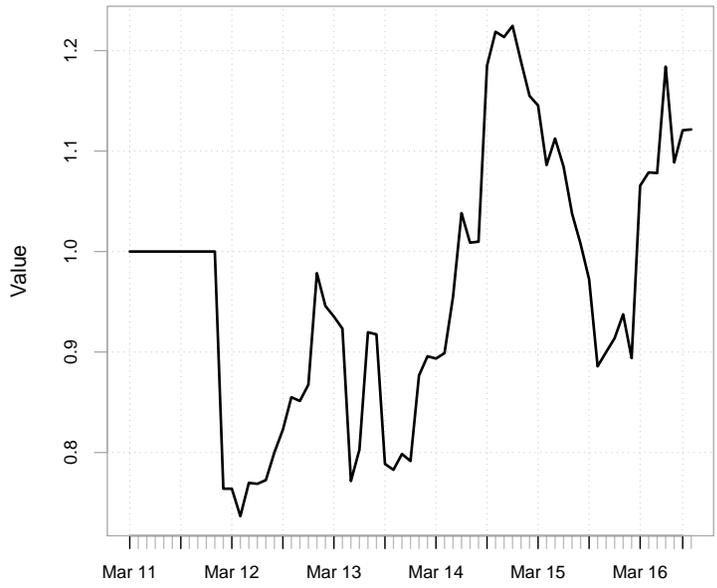
Franklin Templeton Actual Excess vs Expected Excess +/- 1 & 2 Std De



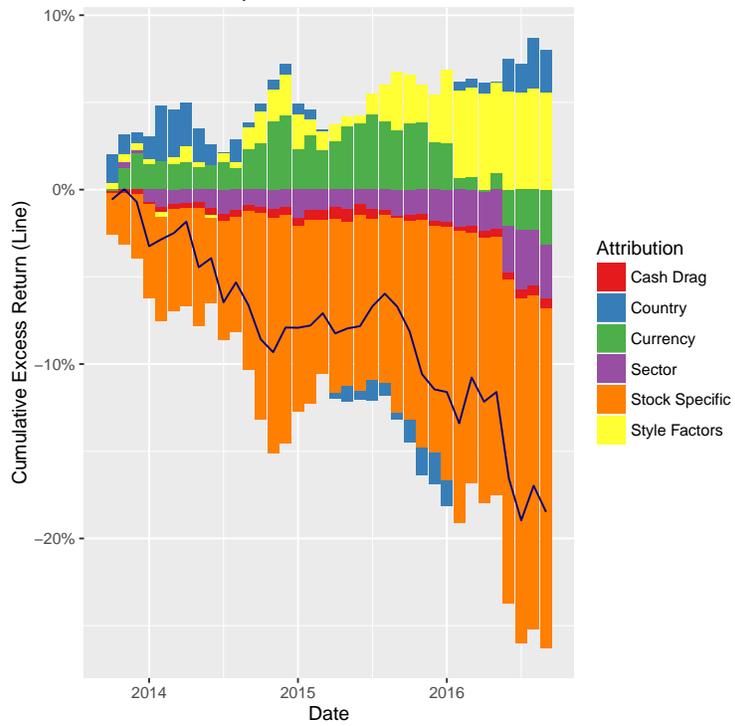
Franklin Templeton Rolling 3 year Performance



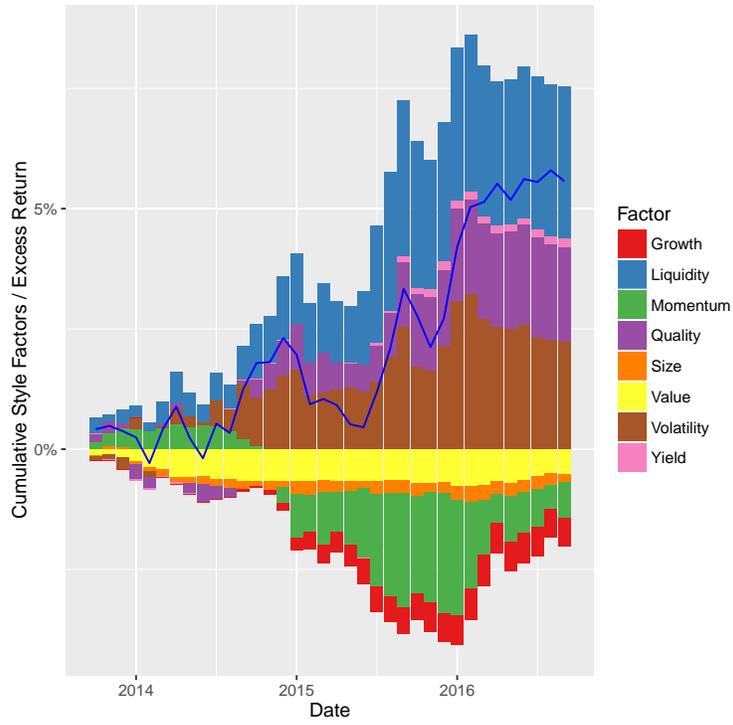
Franklin Templeton Rolling 12 Month Beta



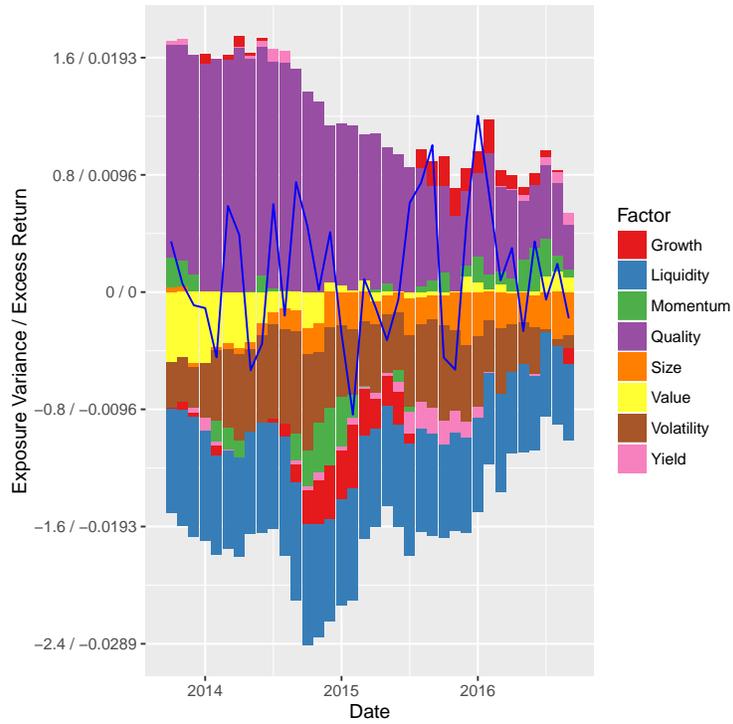
Franklin Templeton Barra Factor Attribution



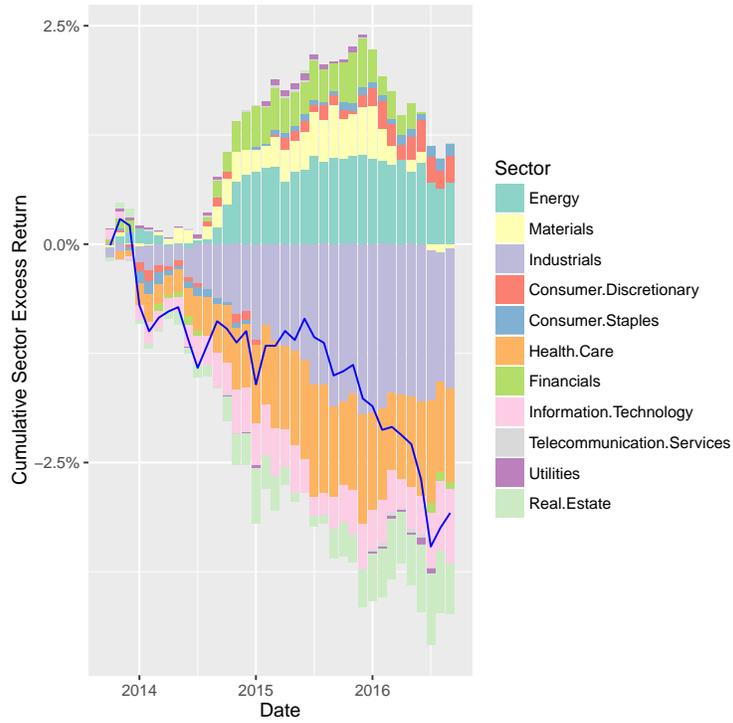
Franklin Templeton Style Factor Breakout



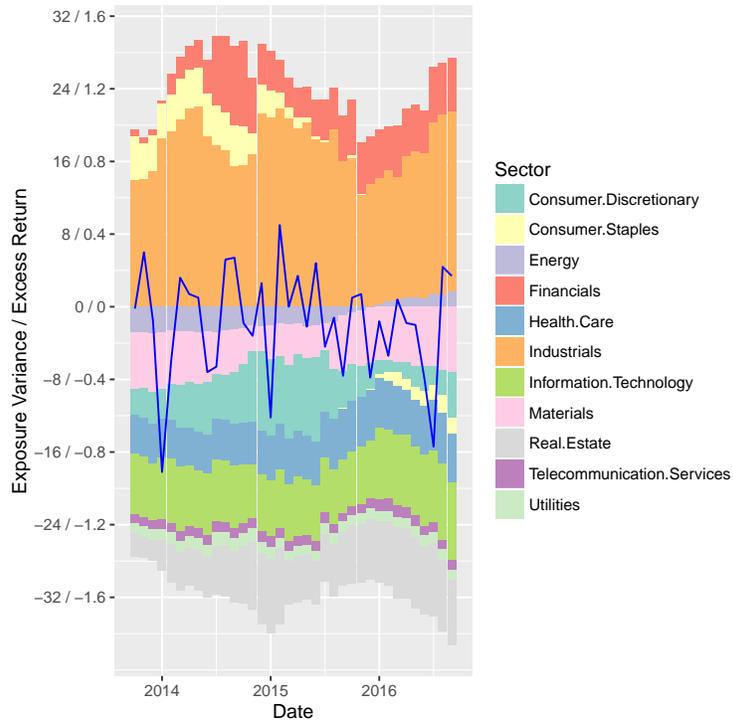
Franklin Templeton Monthly Style Factors Active Exposure



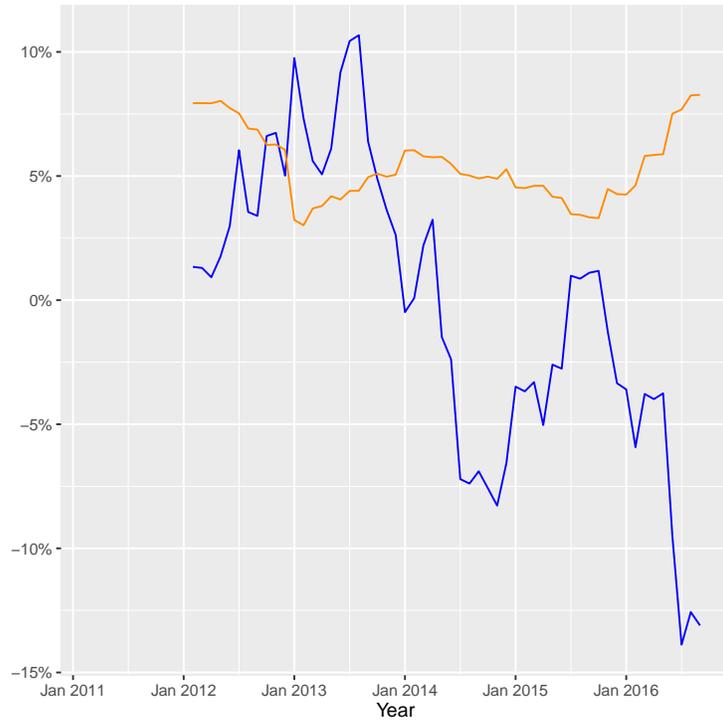
Franklin Templeton Monthly GICS Sector Return



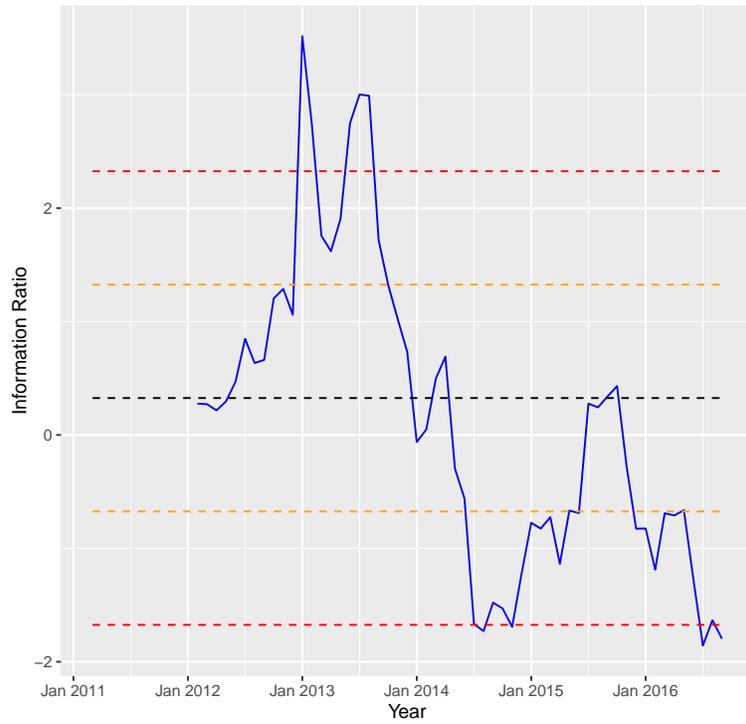
Franklin Templeton GICS Sector Active Exposure



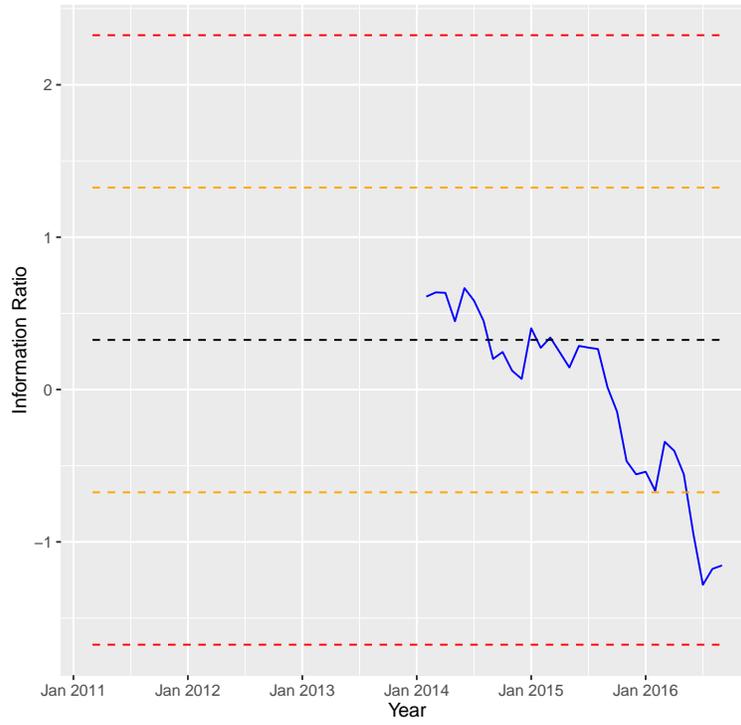
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



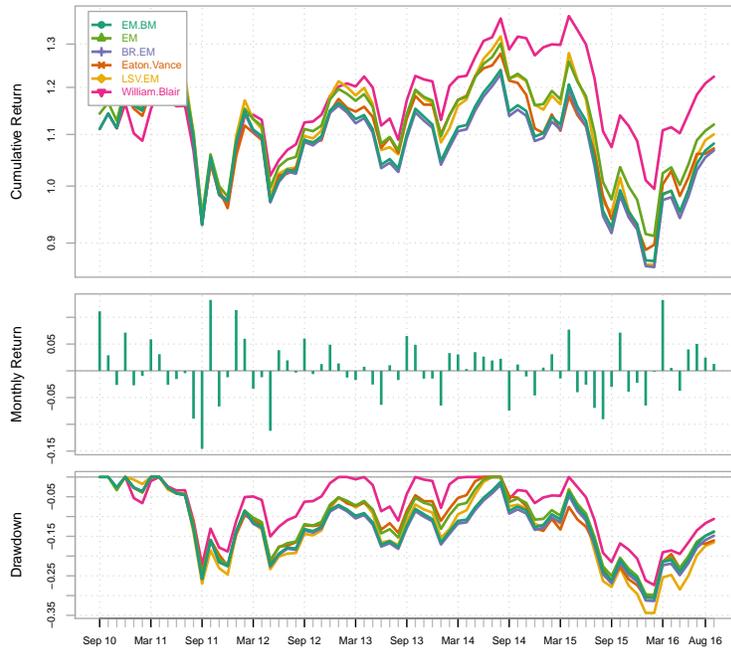
Franklin Templeton Rolling 12 Month Information Ratio



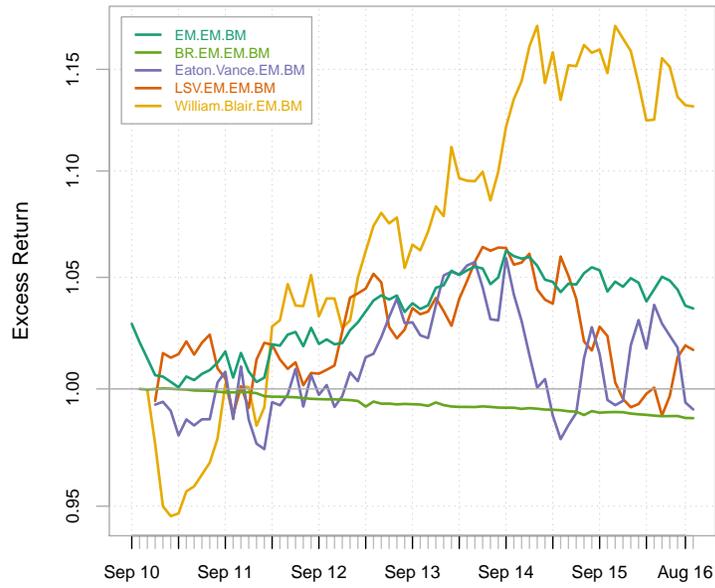
Franklin Templeton Rolling 36 Month Information Ratio



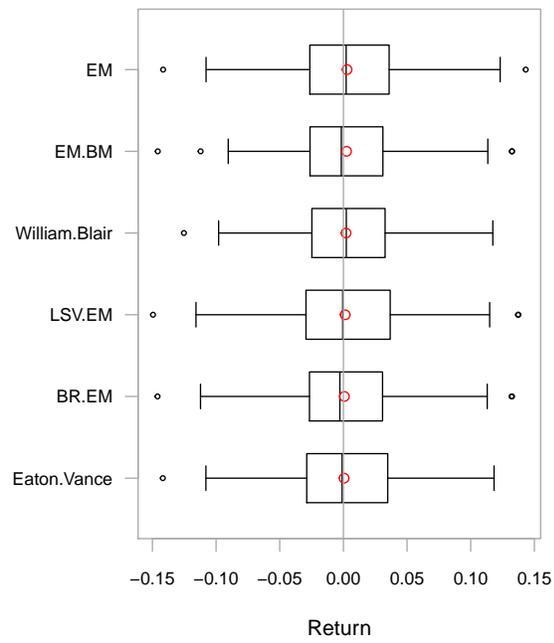
Emerging Markets Performance Summary



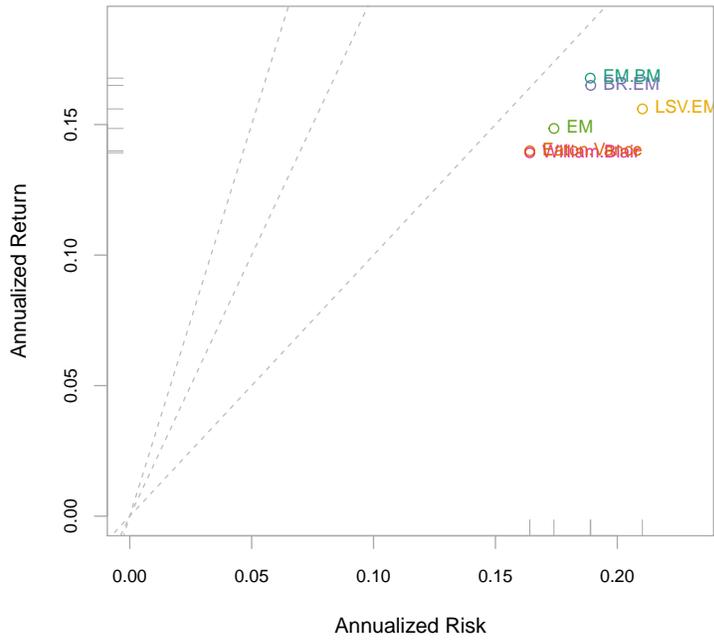
### Emerging Markets Cumulative Relative Performance



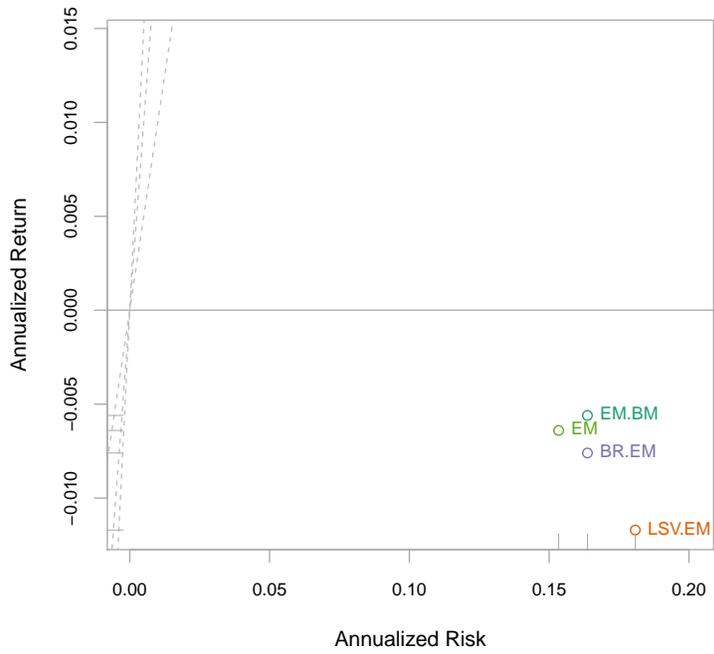
### Return Distribution Comparison



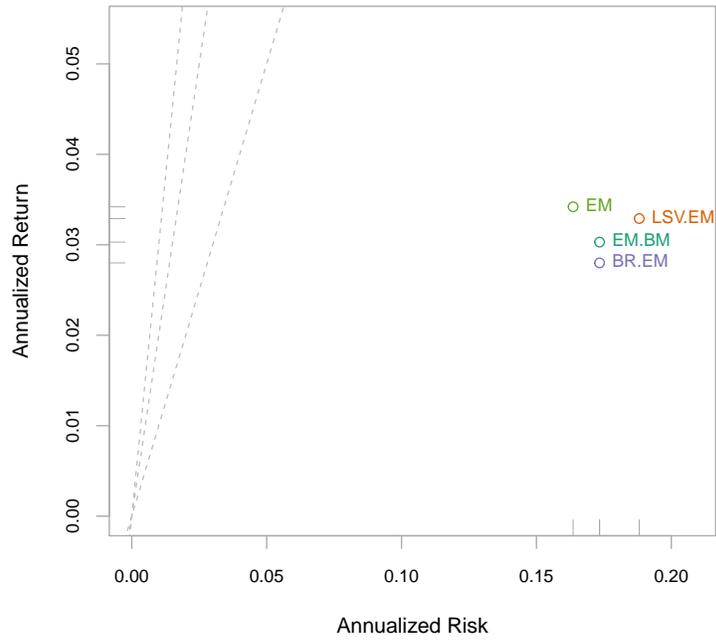
**Emerging Markets Trailing 1 Year Performance vs Sharpe Ratios (1,2,3)**



**Trailing 3 Year Performance vs Sharpe Ratios (1,2,3)**



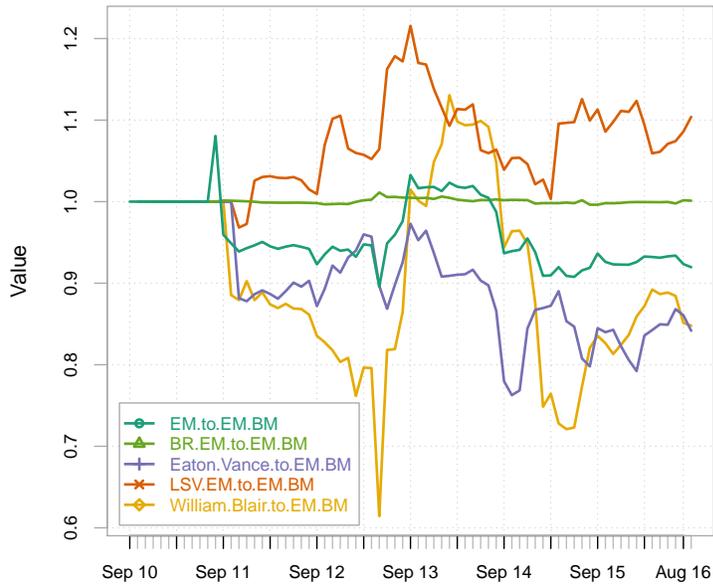
Trailing 5 Year Performance vs Sharpe Ratios (1,2,3)



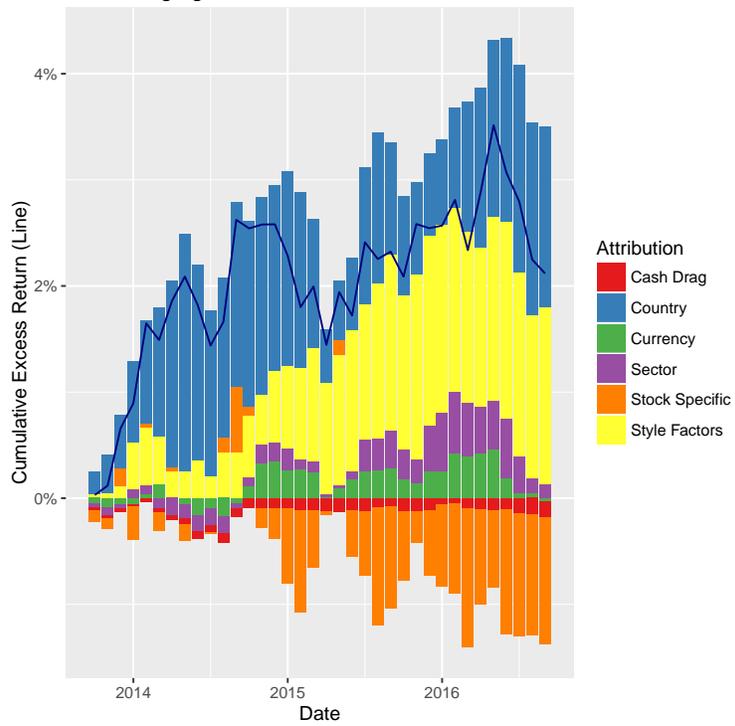
Emerging Markets Rolling 3 Year Performance



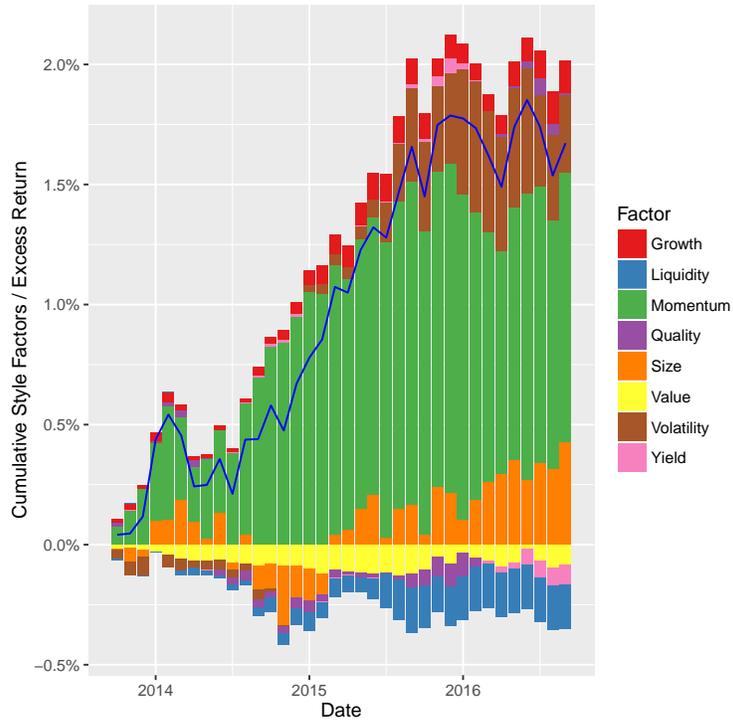
Emerging Markets Rolling 12 Month Beta



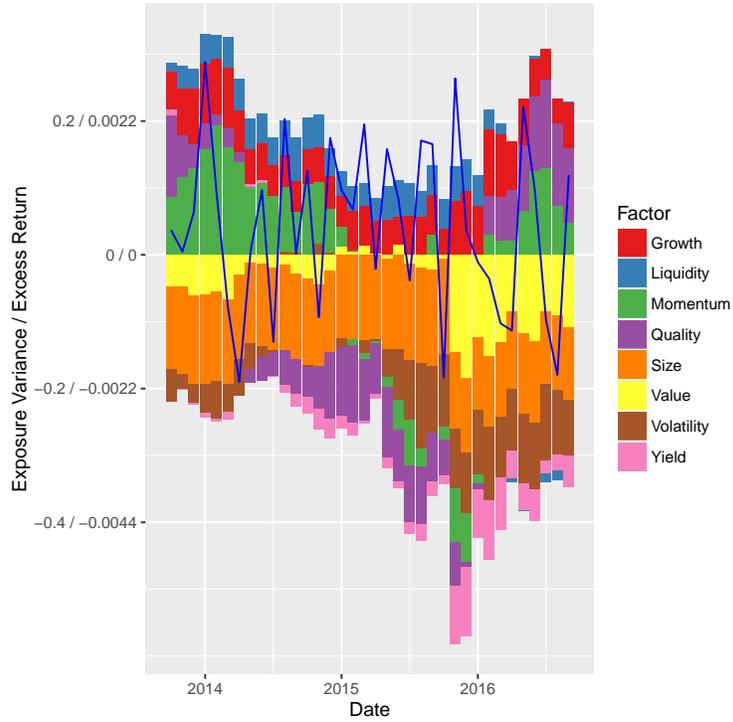
Emerging Markets Barra Factor Attribution



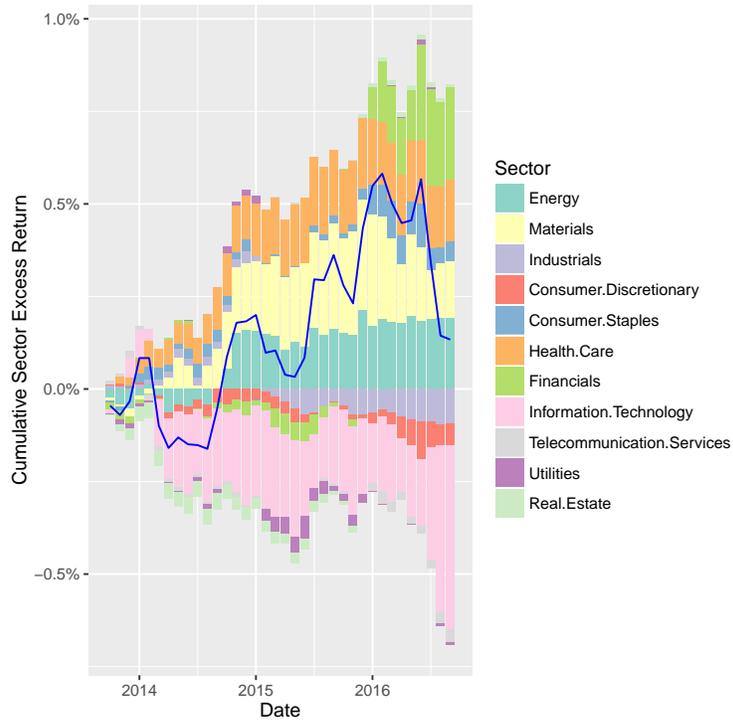
Emerging Markets Style Factor Breakout



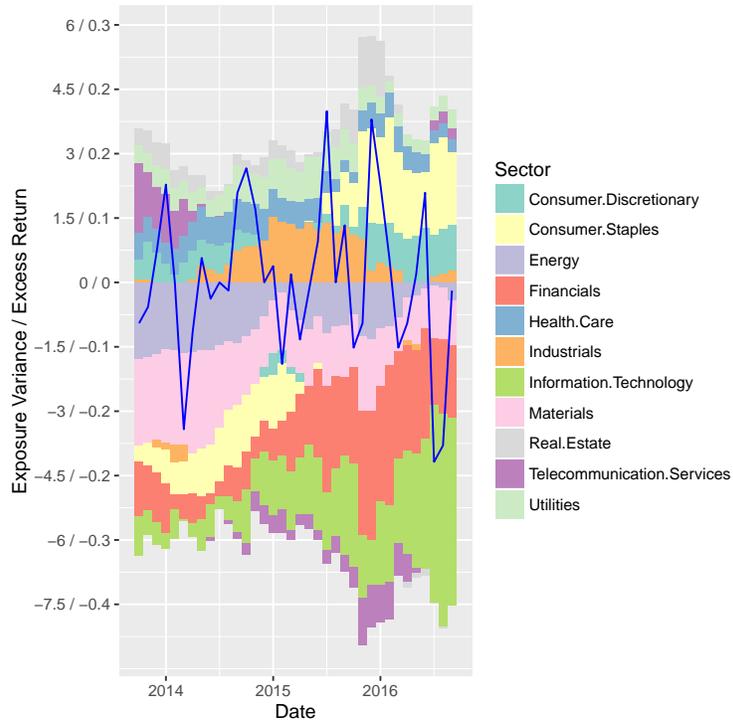
Emerging Markets Monthly Style Factors Active Exposure



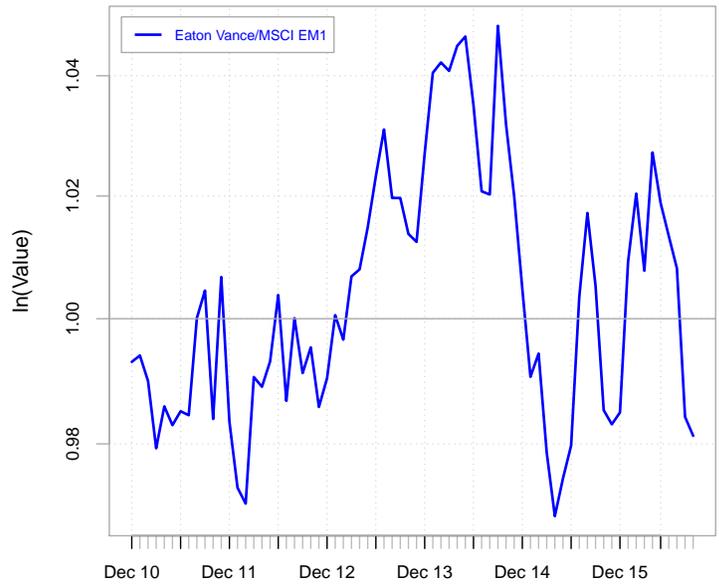
Emerging Markets Monthly GICS Sector Return



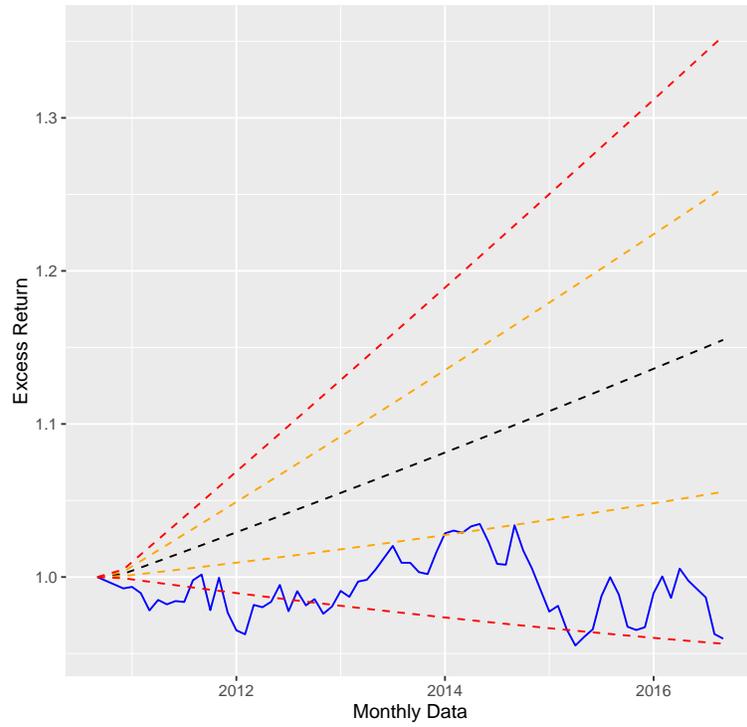
Emerging Markets GICS Sector Active Exposure



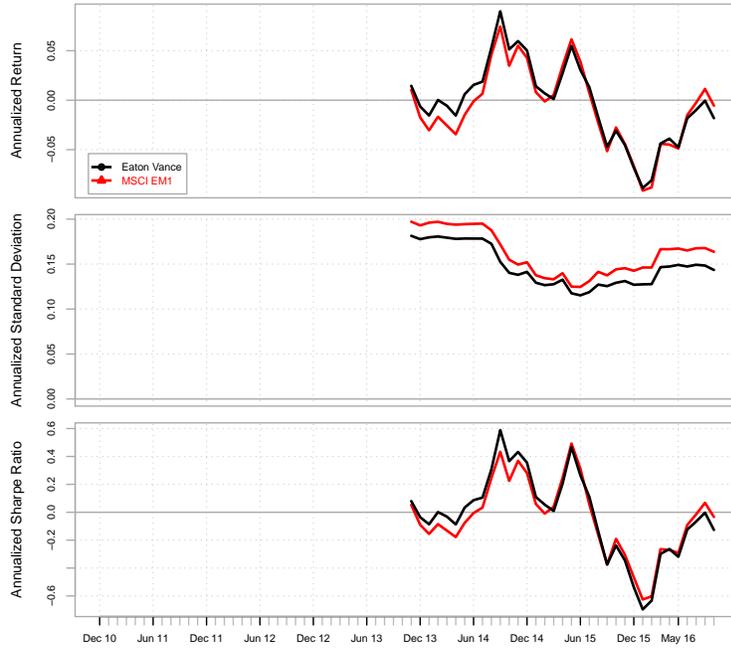
Eaton Vance Cumulative Relative Performance



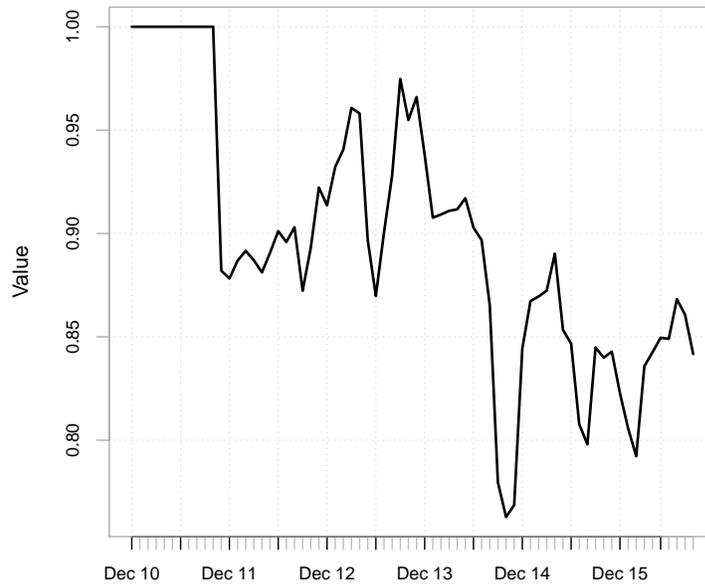
Eaton Vance Actual Excess vs Expected Excess +/- 2 Std Dev



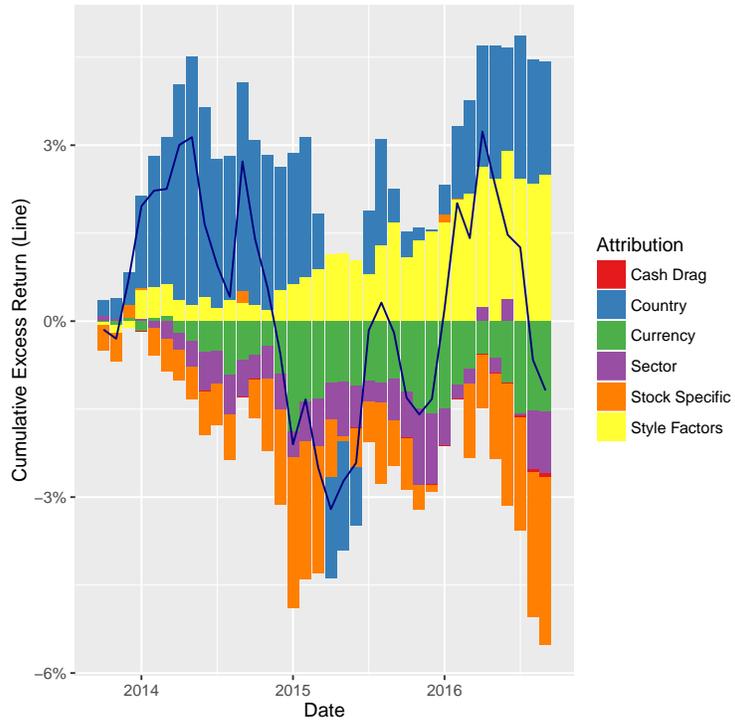
Eaton Vance Rolling 3 year Performance



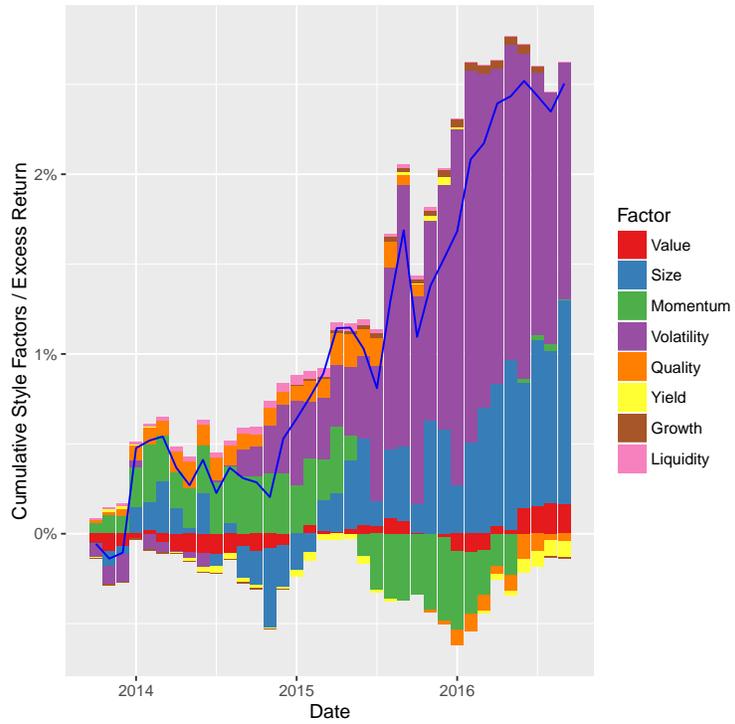
Eaton Vance Rolling 12 Month Beta



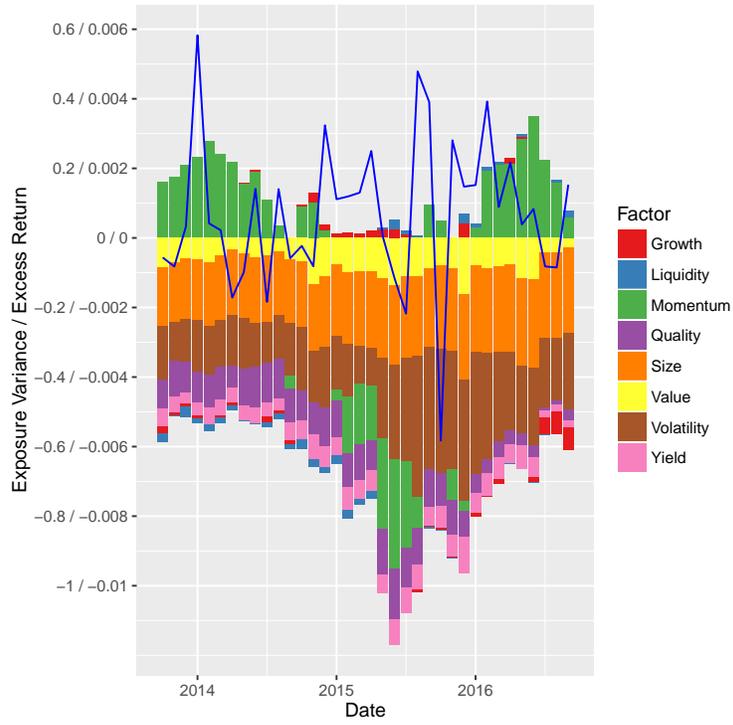
Eaton Vance Barra Factor Attribution



Eaton Vance Style Factor Breakout

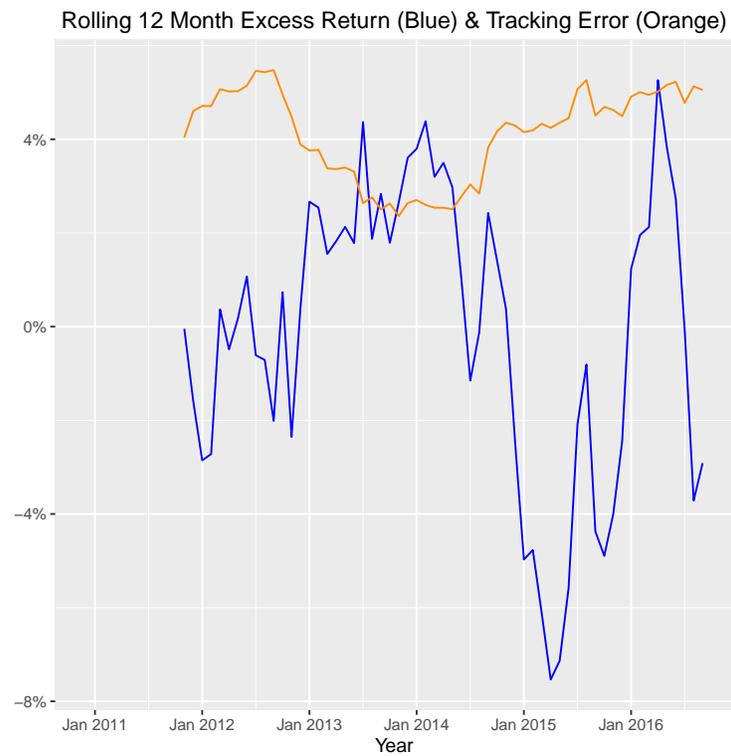
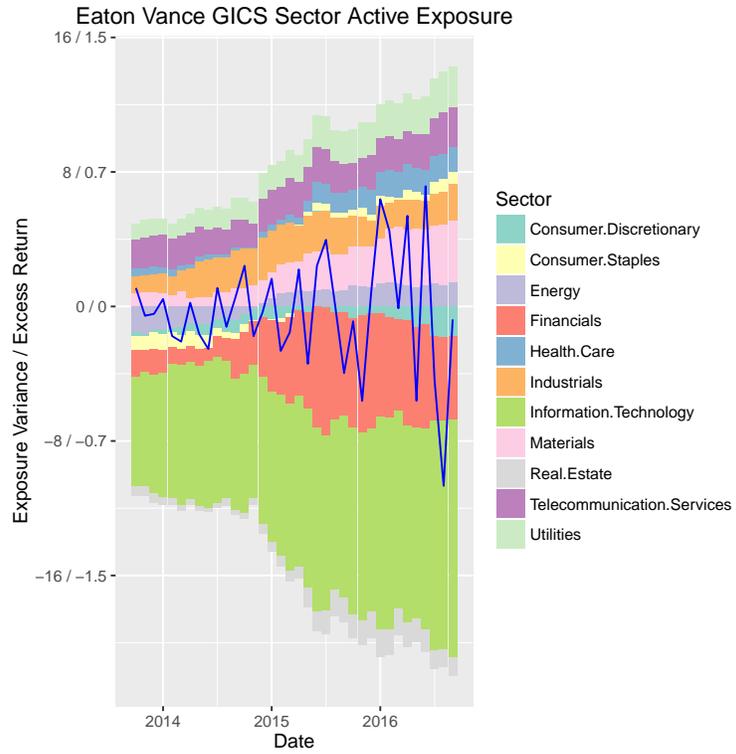


Eaton Vance Monthly Style Factors Active Exposure

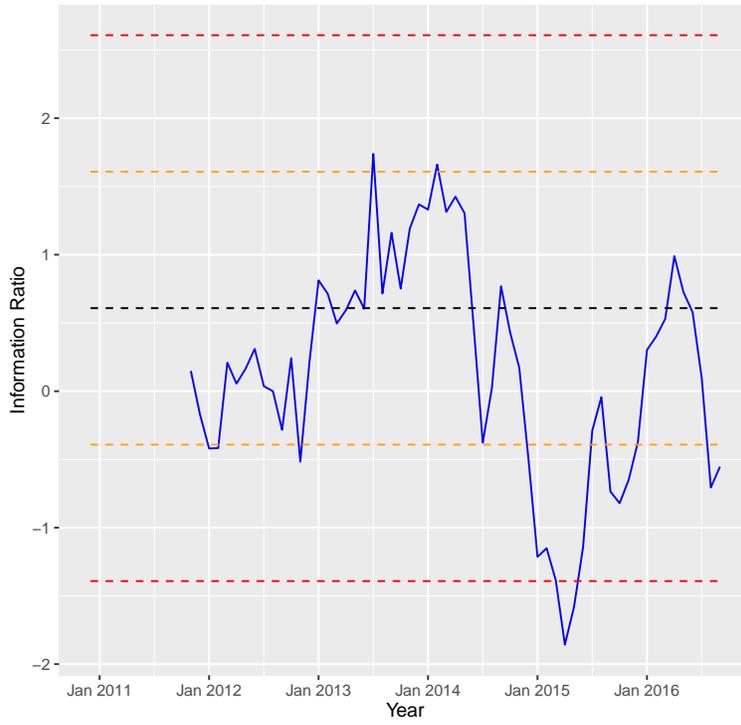


Eaton Vance Monthly GICS Sector Return

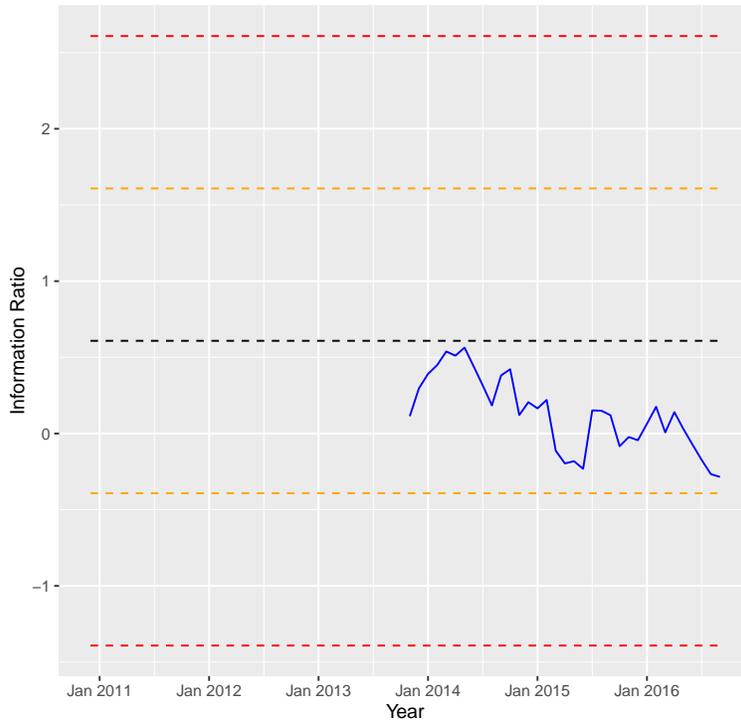




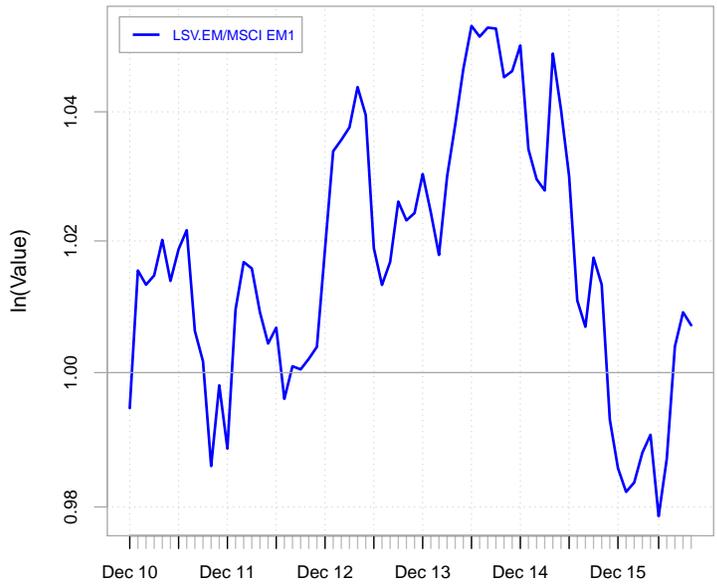
Eaton Vance Rolling 12 Month Information Ratio



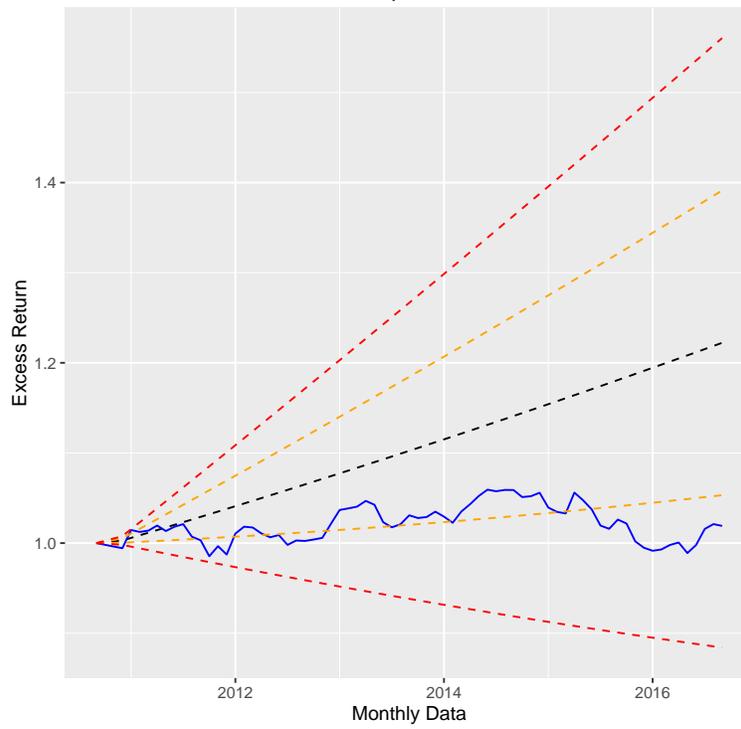
Eaton Vance Rolling 36 Month Information Ratio



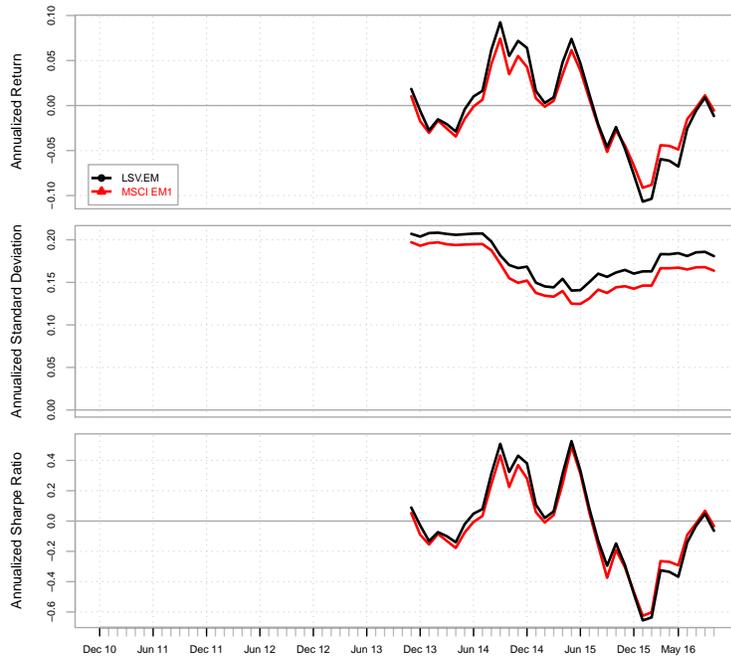
LSV.EM Cumulative Relative Performance



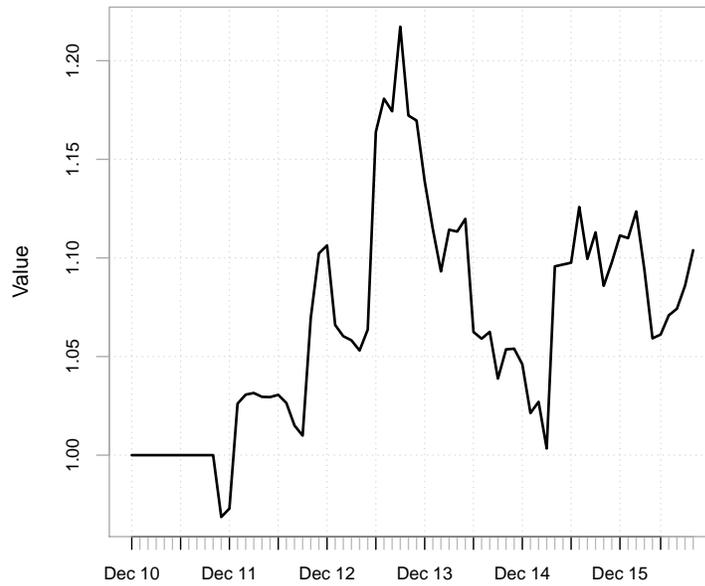
LSV.EM Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



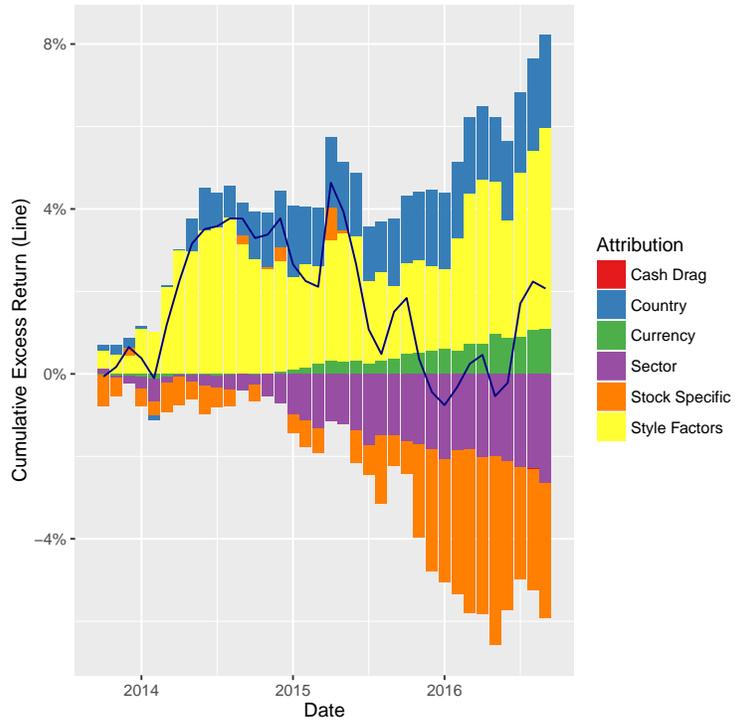
LSV.EM Rolling 3 year Performance



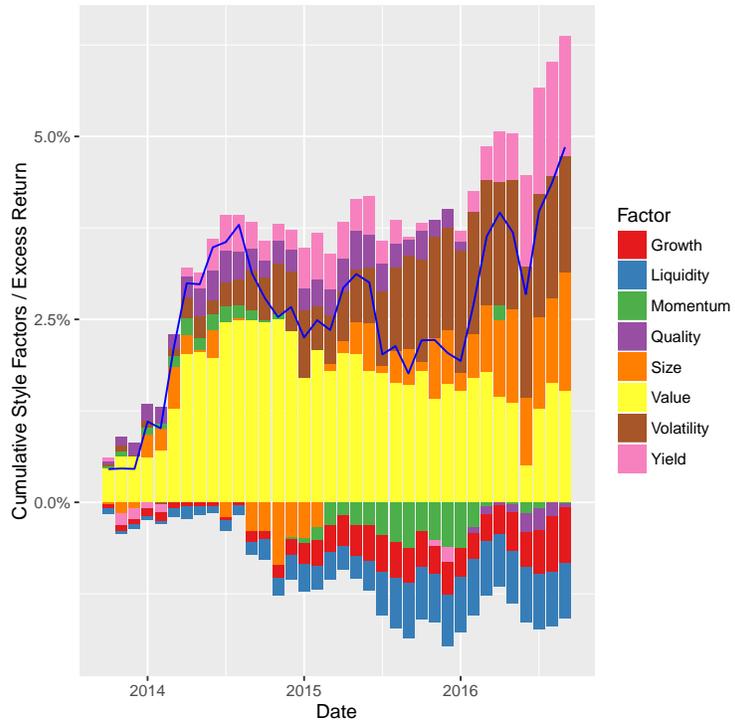
LSV.EM Rolling 12 Month Beta



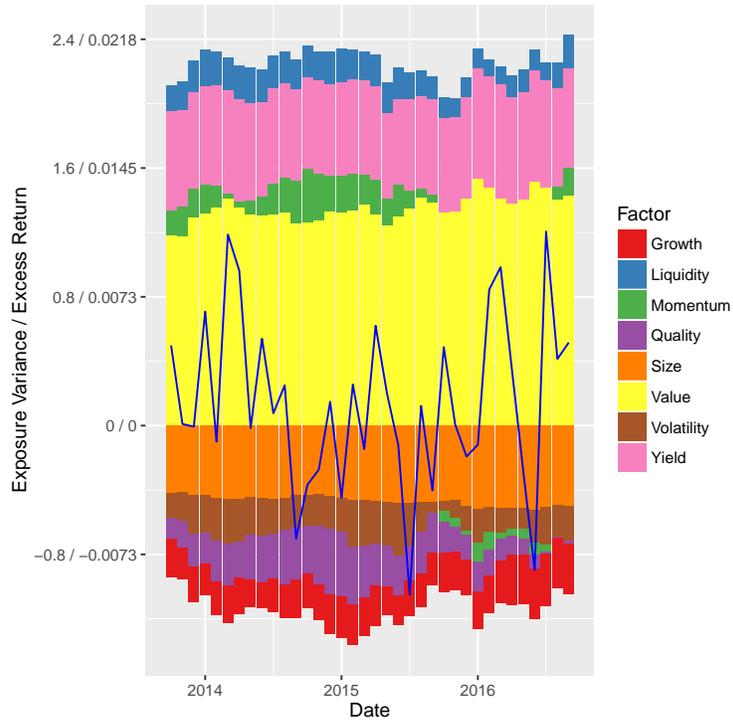
LSV.EM Barra Factor Attribution



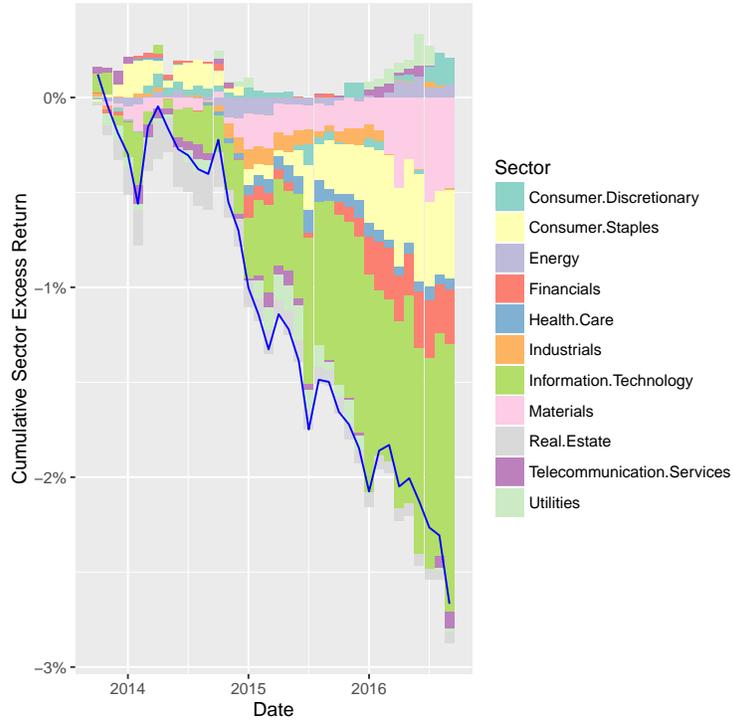
LSV.EM Style Factor Breakout



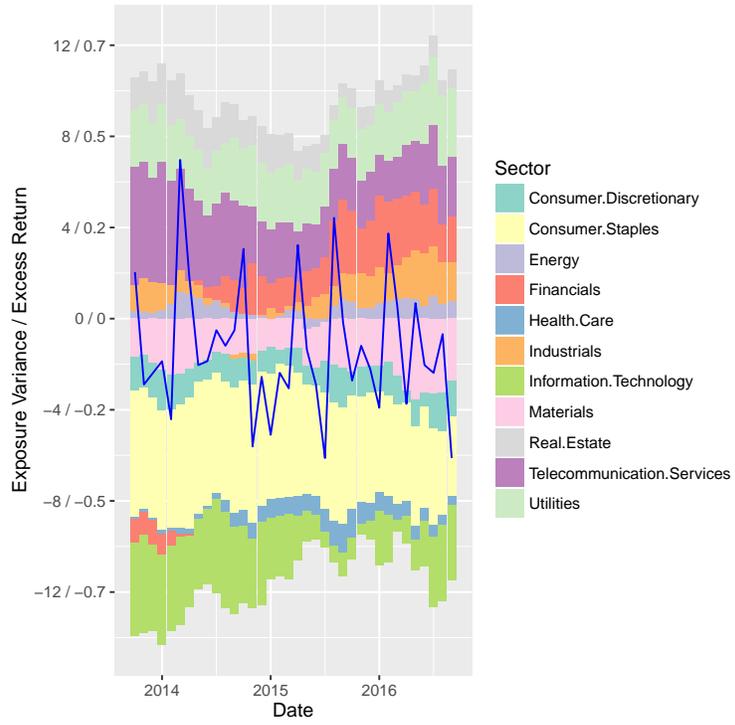
LSV.EM Monthly Style Factors Active Exposure



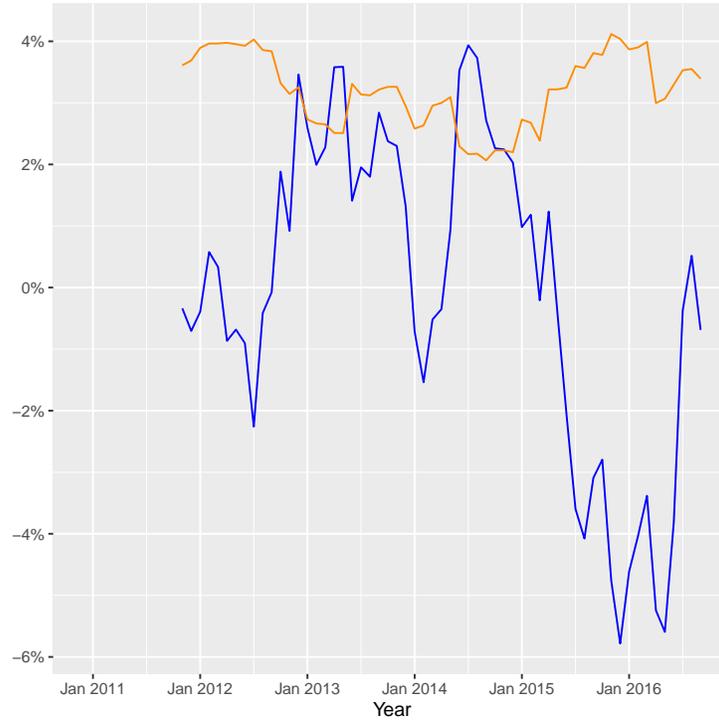
LSV.EM Monthly GICS Sector Return



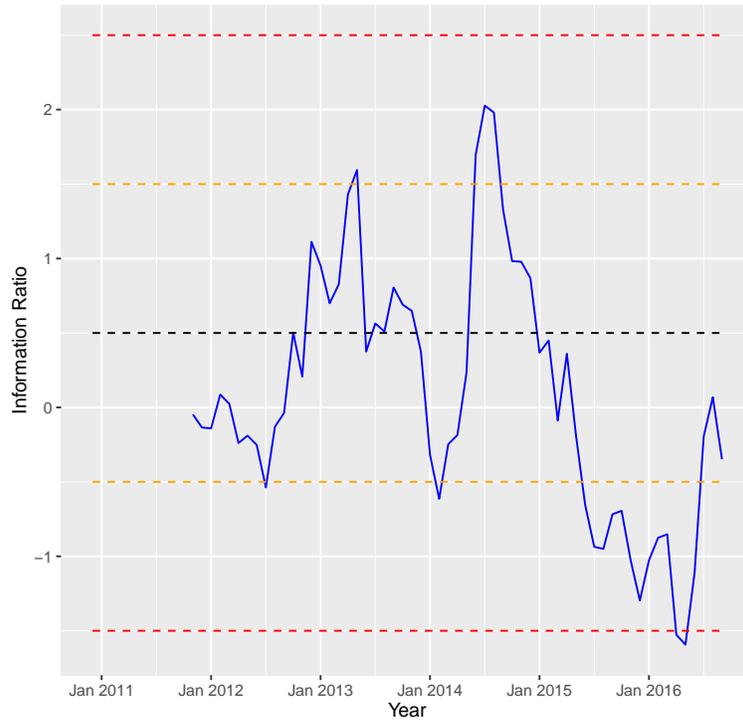
LSV.EM GICS Sector Active Exposure



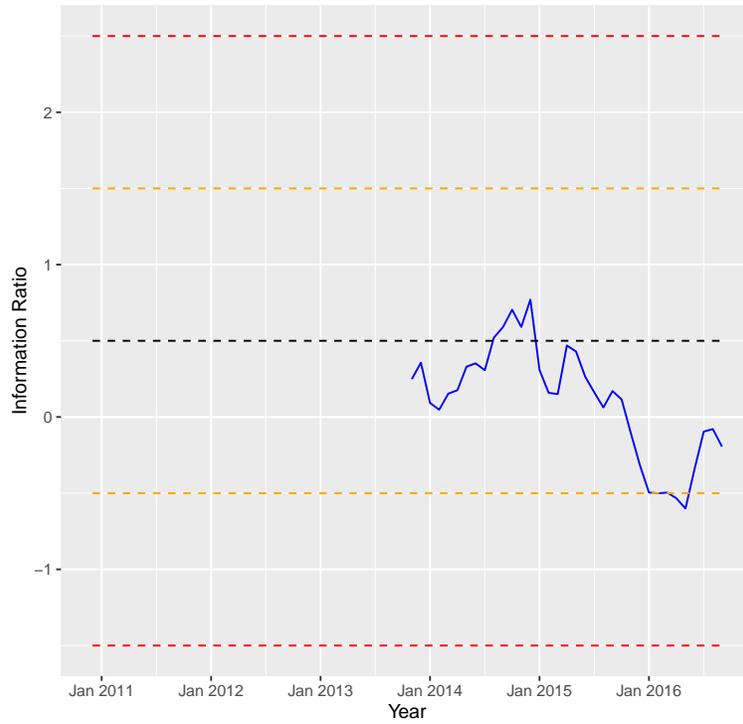
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



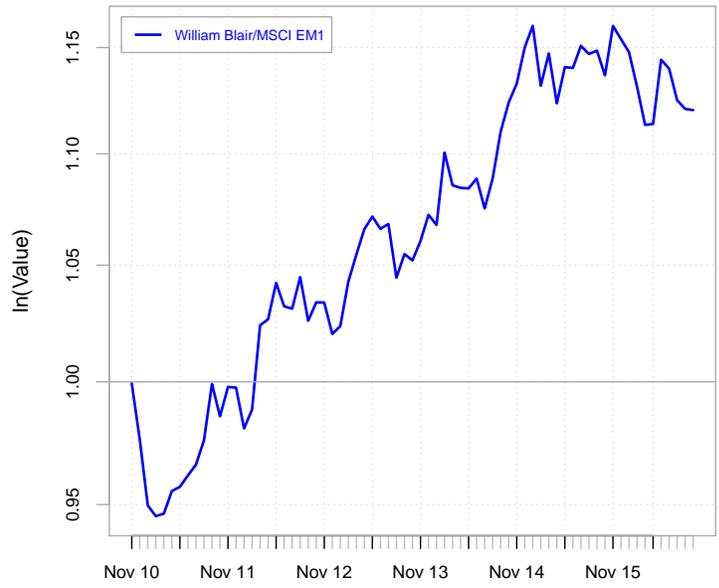
LSV.EM Rolling 12 Month Information Ratio



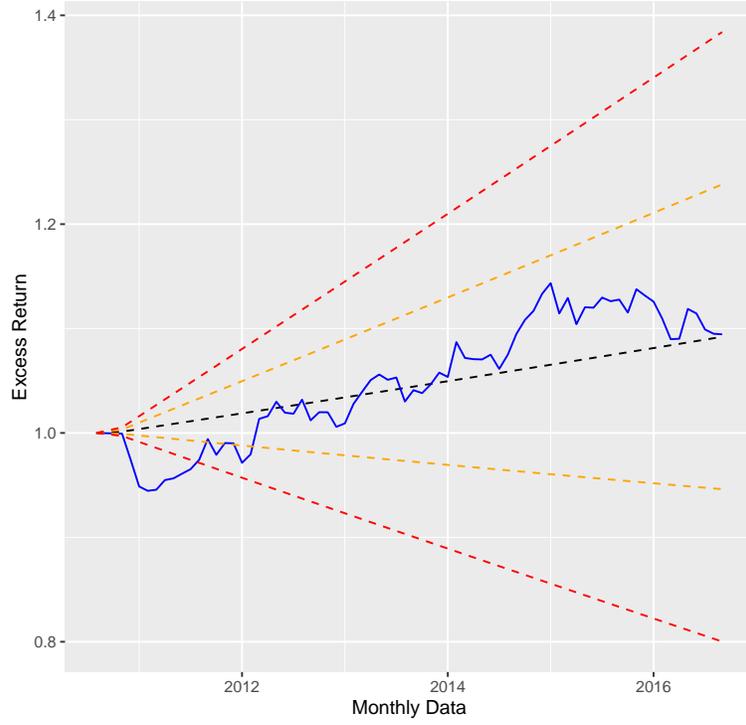
LSV.EM Rolling 36 Month Information Ratio



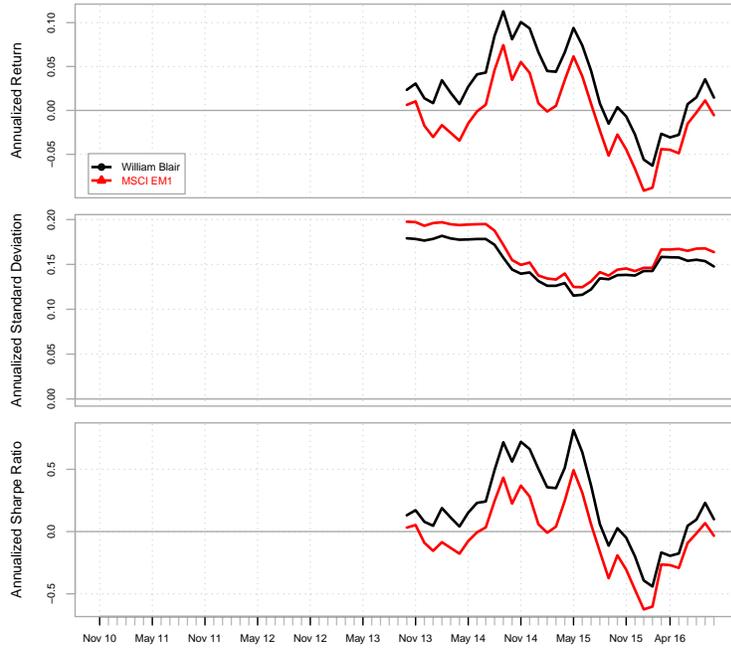
William Blair Cumulative Relative Performance



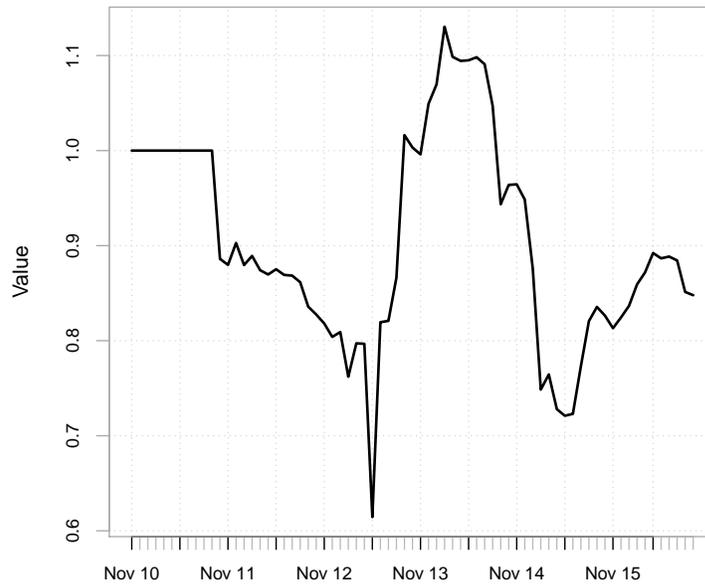
William Blair Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



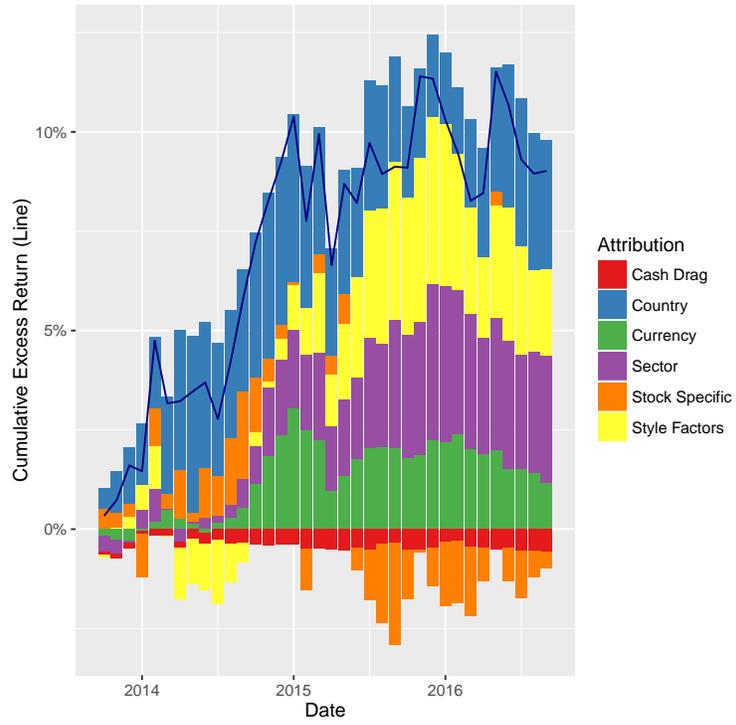
William Blair Rolling 3 year Performance



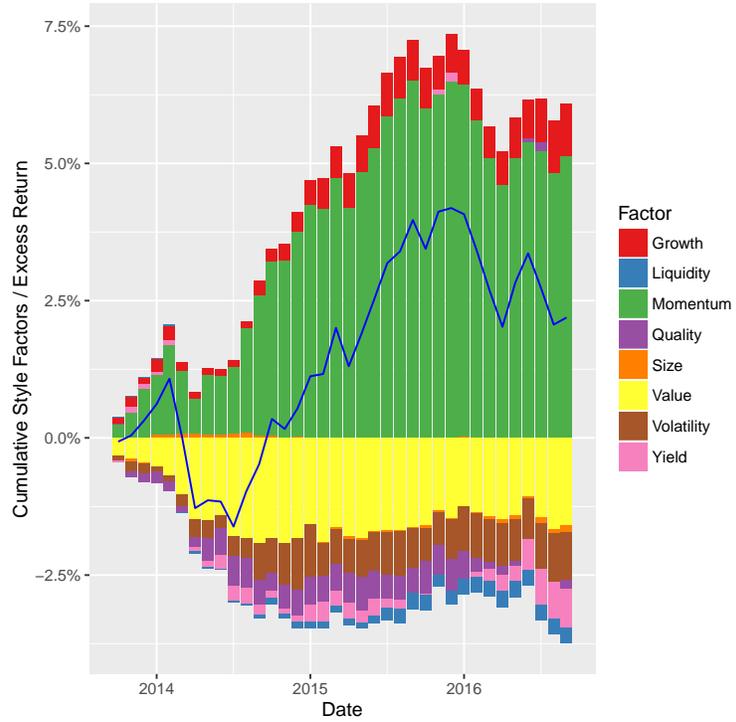
William Blair Rolling 12 Month Beta



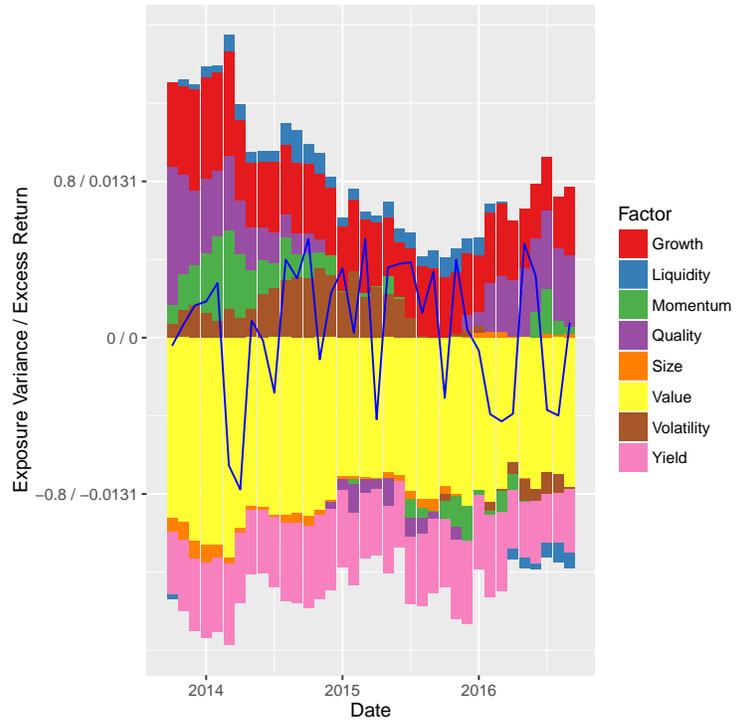
William Blair Barra Factor Attribution



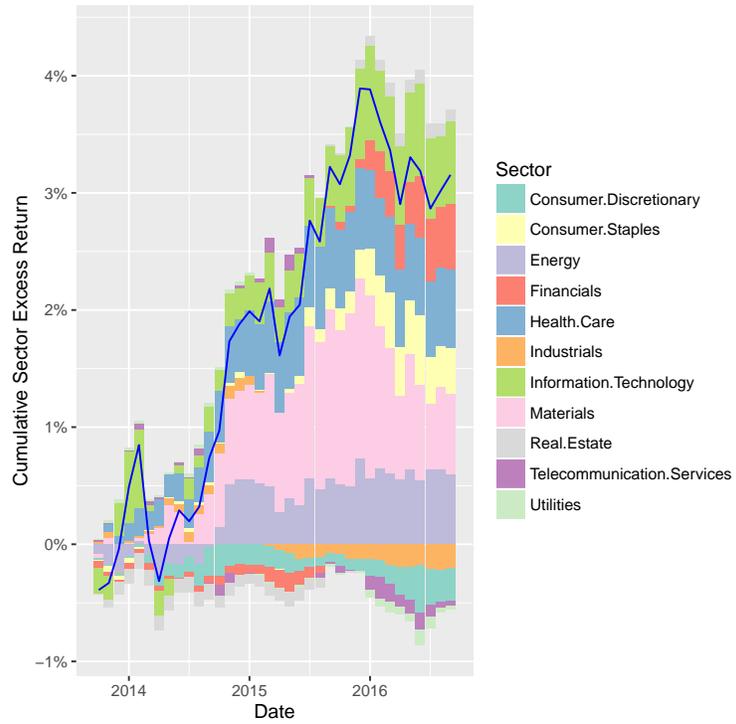
William Blair Style Factor Breakout



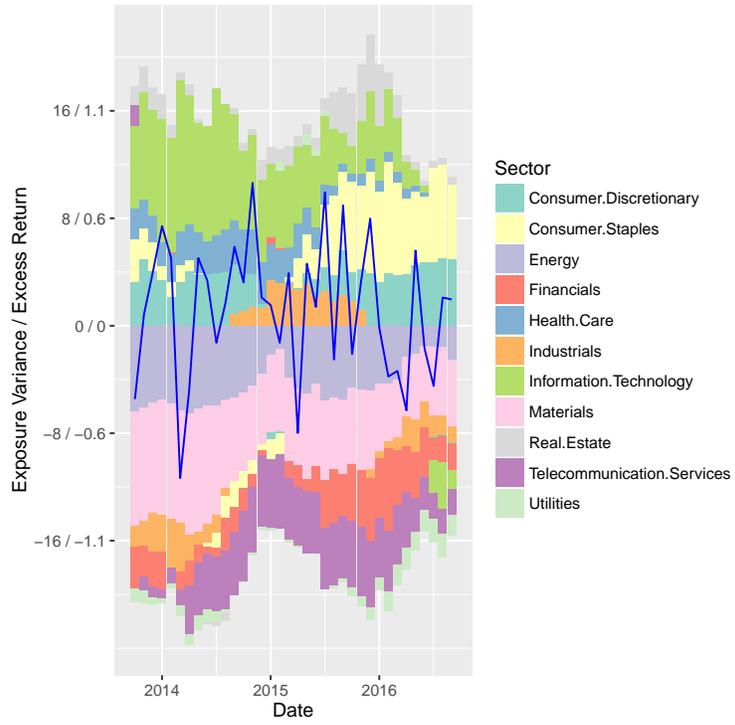
William Blair Monthly Style Factors Active Exposure



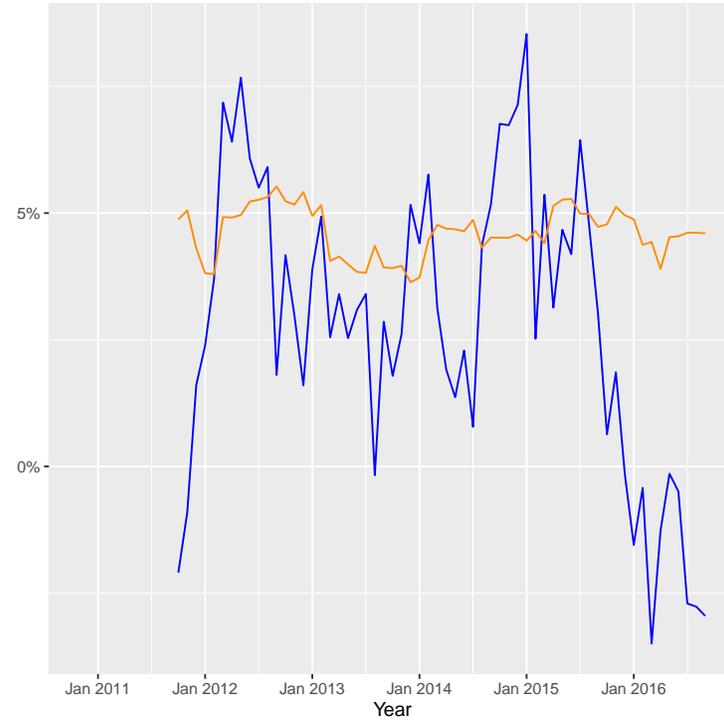
William Blair Monthly GICS Sector Return



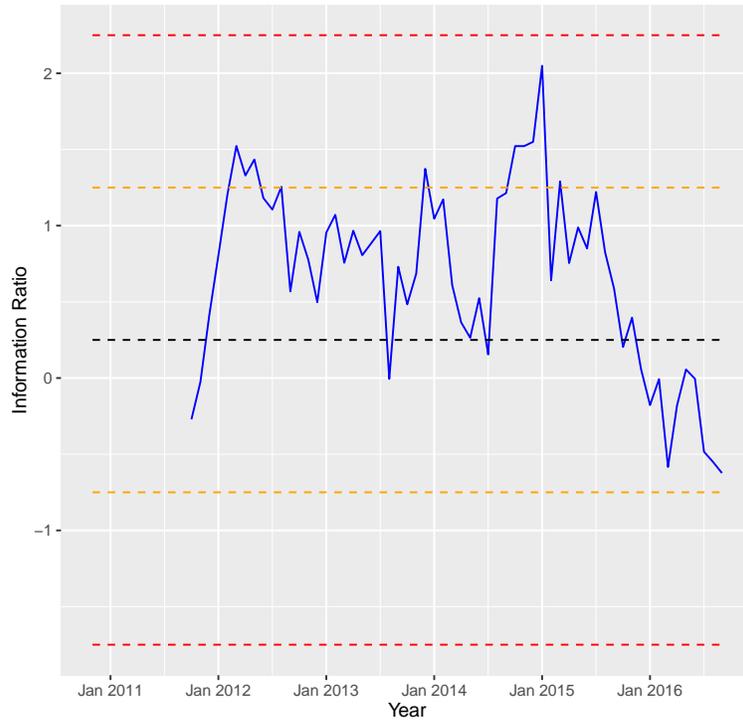
### William Blair GICS Sector Active Exposure



### Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



William Blair Rolling 12 Month Information Ratio



William Blair Rolling 36 Month Information Ratio



**Confidential  
Meeting  
Materials  
Removed**

**Confidential  
Meeting  
Materials  
Removed**

# Agenda Item #5

# **Executive Presentation**

**To: Arizona State Retirement System**

**truView Risk Report September 30, 2016**

**Produced by State Street Global Exchange, Risk Services**

## Monthly Reallocation Summary\*

Month Ending October 31, 2016

### Portfolio Reductions

- TOTAL DOMESTIC EQUITY
  - \$12.6M – E2 (Large Cap)
  - \$.2M – E3 (Mid Cap)
  - \$1.9M – E7 (Large Cap)
  - \$1.4M – E8 (Large Cap)
  - \$1.1M – E4 (Mid Cap)
  - \$4.7M – E6 (Small Cap)
  - \$10.9M – Timesquare Capital Mgt
  - <\$.1M – Wellington Management
  
- TOTAL REDUCTIONS\*\*
  - **\$32.8M**

### Portfolio Additions

- TOTAL INTERNATIONAL EQUITY
  - \$10.1M – Equity Transition
  
- TOTAL DOMESTIC EQUITY
  - <\$.1M – DFA Domestic Equity Small Cap
  
- TOTAL ADDITIONS\*\*
  - **\$10.1M**

\*Based on State Street accounting records for public markets and therefore exclude private market drawdowns.

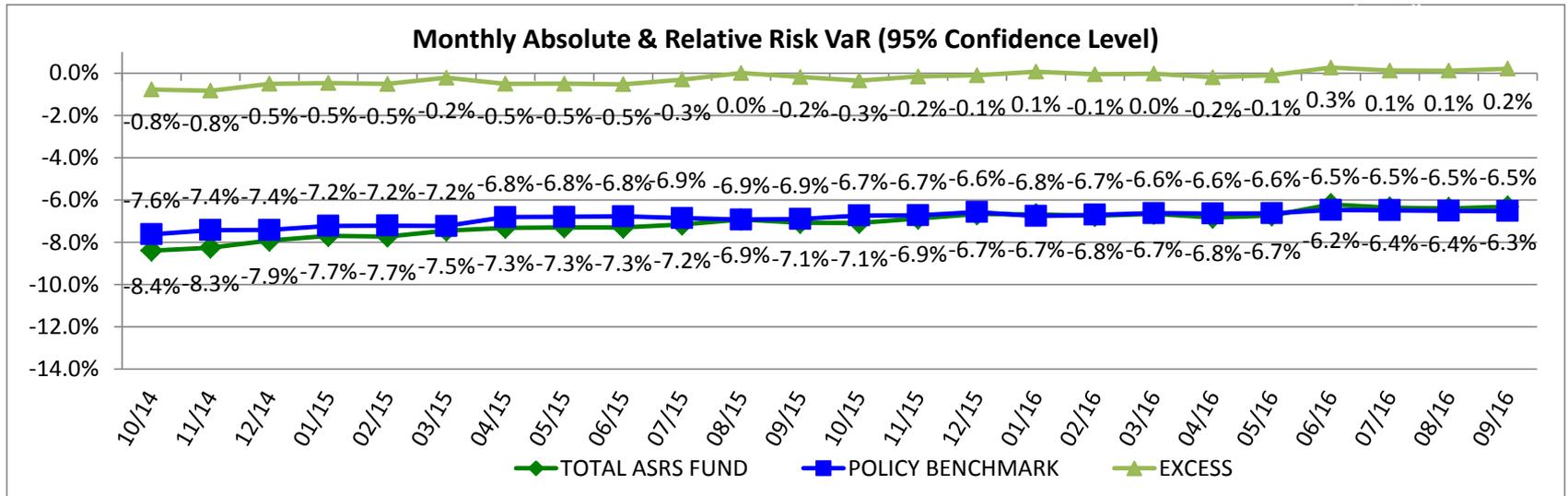
\*\*Reductions and additions do not include plan distributions.

## Monthly Risk Summary

Month Ending September 30, 2016

### Month-end Risk Profile

- Historical Risk (95% VaR) for all asset classes remain relatively constant from prior months. In aggregate, Total Plan risk fell 8 bps as the asset allocation remained largely the same over prior month. The Interim Policy Benchmark stayed constant in comparison during this time.
- Surplus risk under the Interim Policy Benchmark is now 21 bps.



ARIZONA STATE RETIREMENT SYSTEM  
As of September 30, 2016

## TOTAL PLAN EXPOSURE OVERVIEW

Sector (Public US Equity)	\$ Value	% Value	**Blended US BM	Difference
CONSUMER NON-CYCLICAL	\$ 1,983,355,527	22.6%	22.5%	0.2%
FINANCIAL	\$ 1,458,492,540	16.6%	18.6%	(1.9%)
TECHNOLOGY	\$ 1,022,119,409	11.7%	12.8%	(1.1%)
INDUSTRIAL	\$ 910,635,930	10.4%	11.5%	(1.1%)
COMMUNICATIONS	\$ 848,423,169	9.7%	11.5%	(1.8%)
CONSUMER CYCLICAL	\$ 820,410,763	9.4%	10.3%	(0.9%)
FUNDS	\$ 593,347,063	6.8%	0.0%	6.8%
ENERGY	\$ 535,617,680	6.1%	6.4%	(0.3%)
UTILITIES	\$ 313,025,128	3.6%	3.5%	0.0%
BASIC MATERIALS	\$ 220,130,710	2.5%	2.9%	(0.4%)
CASH	\$ 50,243,304	0.6%	0.0%	0.6%
GOVERNMENT	\$ 3,880,890	0.0%	0.0%	0.0%
DIVERSIFIED	\$ 1,521,448	0.0%	0.0%	(0.0%)
INDEX	\$ 1,067,888	0.0%	0.0%	0.0%
<b>GRAND TOTAL</b>	<b>\$ 8,762,271,451</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

Country Category (Public Equities)	\$ Value	% Value	*Blended TOTAL BM	Difference
NORTH AMERICA	\$ 9,201,790,454	55.2%	51.0%	4.2%
EUROPE DEVELOPED	\$ 4,057,734,161	24.4%	24.6%	(0.2%)
ASIA DEVELOPED	\$ 2,143,873,004	12.9%	14.8%	(1.9%)
ASIA EM	\$ 818,514,563	4.9%	7.0%	(2.1%)
LATIN AMERICA	\$ 212,656,685	1.3%	1.3%	(0.0%)
AFRICA	\$ 91,164,622	0.5%	0.7%	(0.2%)
MIDDLE EAST	\$ 90,002,602	0.5%	0.5%	0.1%
EUROPE EM	\$ 42,598,962	0.3%	0.2%	0.1%
<b>GRAND TOTAL</b>	<b>\$ 16,658,335,053</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

Market Cap^ (Public Equities)	\$ Value	% Value	*Blended TOTAL BM	Difference
1) 0 - 100M	\$ 1,757,748	0.0%	0.0%	0.0%
2) 100M - 500M	\$ 241,795,595	1.5%	0.5%	1.0%
3) 500M - 1B	\$ 356,451,309	2.2%	1.7%	0.5%
4) 1B - 5B	\$ 2,498,373,285	15.4%	13.6%	1.9%
5) 5B - 10B	\$ 1,842,039,773	11.4%	10.4%	1.0%
6) 10B - 50B	\$ 5,559,923,066	34.3%	33.6%	0.7%
7) >50B	\$ 5,701,831,963	35.2%	40.3%	(5.1%)
<b>GRAND TOTAL</b>	<b>\$ 16,202,172,738</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

^Excludes cash and non-traded securities

Top 20 Issuer (Total Plan)	\$ Value	% Value	Market Cap	Sector	Industry Group
1 US TREASURY N/B	\$ 1,477,871,610	4.3%		GOVERNMENT	SOVEREIGN
2 CASH***	\$ 1,351,585,405	3.9%		CASH	CASH
3 FANNIE MAE	\$ 730,382,637	2.1%		MORTGAGE SECURITIES	FNMA COLLATERAL
4 FREDDIE MAC	\$ 286,731,144	0.8%		MORTGAGE SECURITIES	FGLMC COLLATERAL
5 TREASURY BILL	\$ 218,734,450	0.6%		GOVERNMENT	SOVEREIGN
6 ISHARES EDGE MSCI USA QUALITY FAI	\$ 165,100,854	0.5%	4) 1B - 5B	FUNDS	EQUITY FUND
7 ISHARES EDGE MSCI USA SIZE FACTOI	\$ 158,182,421	0.5%	2) 100M - 500M	FUNDS	EQUITY FUND
8 ISHARES MSCI EMERGING MARKETS E	\$ 151,850,381	0.4%	6) 10B - 50B	FUNDS	EQUITY FUND
9 APPLE INC	\$ 150,422,634	0.4%	7) 50B+	TECHNOLOGY	COMPUTERS
10 GOVERNMENT NATIONAL MORTGAGE I	\$ 147,840,078	0.4%		MORTGAGE SECURITIES	GNMA2 COLLATERAL
11 ISHARES EDGE MSCI USA VALUE FACT	\$ 143,995,407	0.4%	3) 500M - 1B	FUNDS	EQUITY FUND
12 MICROSOFT CORP	\$ 137,193,523	0.4%	7) 50B+	TECHNOLOGY	SOFTWARE
13 EXXON MOBIL CORP	\$ 130,007,226	0.4%	7) 50B+	ENERGY	OIL&GAS
14 JOHNSON & JOHNSON	\$ 126,944,152	0.4%	7) 50B+	CONSUMER NON-CYCLICAL	PHARMACEUTICALS
15 ISHARES EDGE MSCI USA MOMENTUM	\$ 126,068,380	0.4%	4) 1B - 5B	FUNDS	EQUITY FUND
16 ALPHABET INC	\$ 117,557,696	0.3%	7) 50B+	COMMUNICATIONS	INTERNET
17 AT&T INC	\$ 106,680,358	0.3%	7) 50B+	COMMUNICATIONS	TELECOMMUNICATIONS
18 NESTLE SA	\$ 88,723,490	0.3%	7) 50B+	CONSUMER NON-CYCLICAL	FOOD
19 PROCTER & GAMBLE CO/THE	\$ 86,316,255	0.3%	7) 50B+	CONSUMER NON-CYCLICAL	COSMETICS/PERSONAL CARE
20 PFIZER INC	\$ 85,902,855	0.2%	7) 50B+	CONSUMER NON-CYCLICAL	PHARMACEUTICALS

\*Blended TOTAL BM: 21% SP500, 3% SP400, 3% SP600, 8% R2000, 18% MSCI EAFE, 5% MSCI EM, 2% MSCI Sml Cap, 15% BC US AGG, 4% BC US HY, 8% FTSE NAREIT GLOBAL, 2% DJ-UBS COMMODITY, 5% CUSTOM MULTI-ASSET CLASS, 6% S&amp;P/LSTA LEVERED LOAN.

\*\*Blended US BM: 78% SP500, 11% SP400, 11% SP600.

\*\*\*Cash does not represent an IMD tactical view; Cash includes the ASRS Cash balance, manager-level portfolio cash &amp; equivalents and cash collateralizing sundry portfolio-level futures contracts.

## ARIZONA STATE RETIREMENT SYSTEM

As of September 30, 2016

Sector (Public Intl Equity)	\$ Value	% Value	*Blended NON-US BM	Difference
CONSUMER NON-CYCLICAL	\$ 1,640,657,492	22.0%	22.2%	(0.2%)
FINANCIAL	\$ 1,618,048,204	21.7%	23.5%	(1.8%)
CONSUMER CYCLICAL	\$ 1,040,126,515	13.9%	12.0%	1.9%
INDUSTRIAL	\$ 911,073,210	12.2%	11.9%	0.3%
COMMUNICATIONS	\$ 680,558,175	9.1%	9.3%	(0.2%)
BASIC MATERIALS	\$ 417,663,167	5.6%	6.5%	(0.9%)
ENERGY	\$ 390,549,242	5.2%	5.2%	0.0%
TECHNOLOGY	\$ 349,400,642	4.7%	5.2%	(0.5%)
UTILITIES	\$ 243,086,270	3.3%	3.3%	(0.1%)
CASH	\$ 98,454,912	1.3%	0.0%	1.3%
DIVERSIFIED	\$ 55,152,547	0.7%	0.8%	(0.1%)
INDEX	\$ 16,921,861	0.2%	0.0%	0.2%
FX	\$ 52,070	0.0%	0.0%	0.0%
<b>GRAND TOTAL</b>	<b>\$ 7,461,744,308</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

## INTERNATIONAL EQUITY EXPOSURE OVERVIEW

Country Category (Public Intl Equity)	\$ Value	% Value	*Blended NON-US BM	Difference
EUROPE DEVELOPED	\$ 3,911,990,375	52.4%	49.2%	3.2%
ASIA DEVELOPED	\$ 2,123,338,132	28.5%	30.4%	(2.0%)
ASIA EM	\$ 817,678,054	11.0%	14.5%	(3.5%)
LATIN AMERICA	\$ 210,256,435	2.8%	2.6%	0.2%
AFRICA	\$ 91,164,622	1.2%	1.5%	(0.2%)
MIDDLE EAST	\$ 90,002,602	1.2%	1.0%	0.2%
NORTH AMERICA	\$ 175,010,327	2.3%	0.4%	1.9%
EUROPE EM	\$ 42,303,761	0.6%	0.4%	0.2%
<b>GRAND TOTAL</b>	<b>\$ 7,461,744,308</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

Top 20 Industry Groups (Public Intl Equity)	\$ Value	% Value	*Blended NON-US BM	Difference
1 BANKS	\$ 807,339,770	10.8%	11.7%	(0.9%)
2 PHARMACEUTICALS	\$ 541,168,902	7.3%	7.3%	(0.0%)
3 TELECOMMUNICATIONS	\$ 400,406,156	5.4%	5.3%	0.1%
4 FOOD	\$ 370,863,109	5.0%	4.6%	0.4%
5 OIL&GAS	\$ 355,804,832	4.8%	4.7%	0.0%
6 INSURANCE	\$ 353,309,637	4.7%	4.7%	0.1%
7 RETAIL	\$ 285,242,373	3.8%	2.8%	1.1%
8 AUTO MANUFACTURERS	\$ 238,817,760	3.2%	3.2%	0.0%
9 CHEMICALS	\$ 224,402,383	3.0%	3.5%	(0.5%)
10 DIVERSIFIED FINAN SERV	\$ 176,731,460	2.4%	2.5%	(0.1%)
11 BEVERAGES	\$ 167,695,044	2.2%	2.5%	(0.2%)
12 ELECTRIC	\$ 162,189,609	2.2%	2.2%	0.0%
13 SEMICONDUCTORS	\$ 161,589,492	2.2%	2.6%	(0.4%)
14 COMMERCIAL SERVICES	\$ 157,063,432	2.1%	2.1%	0.1%
15 INTERNET	\$ 143,747,284	1.9%	2.5%	(0.6%)
16 REAL ESTATE	\$ 143,239,407	1.9%	2.1%	(0.2%)
17 BUILDING MATERIALS	\$ 142,683,723	1.9%	1.4%	0.5%
18 MINING	\$ 128,786,171	1.7%	2.0%	(0.2%)
19 ENGINEERING&CONSTRUCTIC	\$ 122,213,891	1.6%	1.5%	0.2%
20 AUTO PARTS&EQUIPMENT	\$ 121,610,897	1.6%	1.4%	0.2%

Market Cap** (Public Intl Equity)	\$ Value	% Value	*Blended NON-US BM	Difference
1) 0 - 100M	\$ 1,478,156	0.0%	0.0%	0.0%
2) 100M - 500M	\$ 58,665,803	0.8%	0.4%	0.4%
3) 500M - 1B	\$ 106,121,995	1.4%	1.2%	0.2%
4) 1B - 5B	\$ 833,232,425	11.3%	12.0%	(0.6%)
5) 5B - 10B	\$ 1,057,682,977	14.4%	13.5%	0.9%
6) 10B - 50B	\$ 3,183,026,902	43.3%	40.9%	2.4%
7) >50B	\$ 2,103,386,612	28.6%	32.0%	(3.3%)
<b>GRAND TOTAL</b>	<b>\$ 7,343,594,872</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

\*\*Excludes cash and non-traded securities

\*Blended NON-US BM: 72% MSCI EAFE, 20% MSCI EM, 8% MSCI Sml Cap.

ARIZONA STATE RETIREMENT SYSTEM

As of September 30, 2016

TOTAL FIXED INCOME EXPOSURE OVERVIEW

Sector (Public Fixed Income)	\$ Value	% Value	*Blended FI BM	Difference
GOVERNMENT	\$ 1,812,712,847	32.5%	34.3%	(1.8%)
MORTGAGE SECURITIES	\$ 1,306,812,521	23.5%	22.7%	0.8%
FINANCIAL	\$ 469,660,516	8.4%	9.0%	(0.6%)
CONSUMER NON-CYCLICAL	\$ 394,873,278	7.1%	6.9%	0.1%
COMMUNICATIONS	\$ 385,581,988	6.9%	6.4%	0.5%
ENERGY	\$ 296,330,929	5.3%	5.1%	0.2%
CONSUMER CYCLICAL	\$ 243,517,352	4.4%	4.5%	(0.1%)
INDUSTRIAL	\$ 201,781,446	3.6%	3.4%	0.2%
TECHNOLOGY	\$ 151,795,955	2.7%	2.5%	0.2%
UTILITIES	\$ 119,878,845	2.2%	2.2%	(0.1%)
BASIC MATERIALS	\$ 85,212,739	1.5%	2.4%	(0.8%)
CASH	\$ 46,917,639	0.8%	0.0%	0.8%
BANK LOANS	\$ 26,394,428	0.5%	0.0%	0.5%
ASSET BACKED SECURITIES	\$ 21,883,636	0.4%	0.4%	0.0%
INDEX	\$ 8,365,150	0.2%	0.0%	0.2%
DIVERSIFIED	\$ 694,799	0.0%	0.1%	(0.1%)
<b>GRAND TOTAL</b>	<b>\$ 5,572,414,068</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

Top 20 Industry Groups (Public Fixed Income)	\$ Value	% Value	*Blended FI BM	Difference
1 SOVEREIGN	\$ 1,692,672,263	30.4%	32.0%	(1.7%)
2 FNMA COLLATERAL	\$ 733,394,289	13.2%	9.6%	3.6%
3 FGLMC COLLATERAL	\$ 288,632,619	5.2%	5.9%	(0.8%)
4 BANKS	\$ 263,641,904	4.7%	5.4%	(0.6%)
5 OIL&GAS	\$ 184,382,212	3.3%	3.2%	0.1%
6 TELECOMMUNICATIONS	\$ 180,132,146	3.2%	3.1%	0.1%
7 MEDIA	\$ 170,144,510	3.1%	2.9%	0.2%
8 GNMA2 COLLATERAL	\$ 157,360,805	2.8%	4.9%	(2.1%)
9 ELECTRIC	\$ 114,191,861	2.0%	2.1%	(0.0%)
10 PIPELINES	\$ 104,636,132	1.9%	1.5%	0.3%
11 DIVERSIFIED FINAN SERV	\$ 101,119,593	1.8%	1.6%	0.2%
12 HEALTHCARE-SERVICES	\$ 100,127,363	1.8%	1.6%	0.2%
13 PHARMACEUTICALS	\$ 98,939,885	1.8%	1.5%	0.3%
14 COMMERCIAL MBS	\$ 90,801,349	1.6%	1.3%	0.3%
15 RETAIL	\$ 87,836,165	1.6%	1.6%	(0.1%)
16 SOFTWARE	\$ 70,359,743	1.3%	1.1%	0.2%
17 MUNICIPAL	\$ 58,697,980	1.1%	0.7%	0.3%
18 CHEMICALS	\$ 52,402,699	0.9%	0.8%	0.1%
19 INSURANCE	\$ 51,519,457	0.9%	0.9%	0.0%
20 COMPUTERS	\$ 50,260,149	0.9%	0.9%	(0.0%)

Credit Rating Group** (Public Fixed Income)	\$ Value	% Value	*Blended FI BM	Difference
01) AAA	\$ 3,123,802,468	56.1%	55.4%	0.6%
02) AA	\$ 202,223,754	3.6%	3.5%	0.1%
03) A	\$ 507,855,209	9.1%	8.5%	0.6%
04) BBB	\$ 704,780,400	12.6%	11.9%	0.8%
05) BB	\$ 455,551,669	8.2%	10.5%	(2.3%)
06) B	\$ 469,549,857	8.4%	7.3%	1.1%
07) CCC	\$ 92,669,601	1.7%	2.2%	(0.5%)
08) CC	\$ 931,140	0.0%	0.1%	(0.1%)
09) C		0.0%	0.0%	(0.0%)
10) D	\$ 8,643,838	0.2%	0.0%	0.1%
11) Not Rated	\$ 6,406,132	0.1%	0.5%	(0.4%)
<b>GRAND TOTAL</b>	<b>\$ 5,572,414,068</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

Maturity Bucket (Public Fixed Income)	\$ Value	% Value	*Blended FI BM	Difference
0-1Y	\$ 183,428,134	3.3%	0.9%	2.4%
1Y-3Y	\$ 761,377,491	13.7%	18.6%	(4.9%)
3Y-5Y	\$ 906,336,980	16.3%	17.6%	(1.3%)
5Y-10Y	\$ 1,751,476,864	31.4%	27.5%	4.0%
10Y-15Y	\$ 237,699,310	4.3%	4.9%	(0.6%)
15Y+	\$ 1,731,179,839	31.1%	30.6%	0.5%
<b>GRAND TOTAL</b>	<b>\$ 5,571,498,618</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

\*Blended TOTAL BM: 79% BC US AGG, 21% BC US HY.

ARIZONA STATE RETIREMENT SYSTEM  
As of September 30, 2016

TOTAL PLAN RISK OVERVIEW

Strategy	\$ Value	% Value	Historical VaR 95%	HVaR Contri 95%	HVaR Contri % to Total	Parametric VaR 95%	PVaR Contri 95%	PVaR Contri % to Total	Exp Tail Loss 95%	Exp Tail Loss Contri 95%	Exp Tail Loss Contri % to Total	Max Loss	Std Dev	Downside Risk (8%)	Downside Risk Contri (8%)	Downside Risk Contri (8%) to Total
<b>MONTHLY RISK</b>																
CASH - UNASSETIZED	\$ 107,948,860	0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	(0.6%)	(0.0%)	(0.0%)
CASH - ASSETIZED	\$ 125,530,217	0%	(1.3%)	0.0%	0.0%	(1.5%)	0.0%	0.0%	(1.8%)	0.0%	0.1%	(2.9%)	0.9%	(1.0%)	0.0%	0.0%
INTEREST RATE SENSITIV	\$ 5,572,414,068	16%	(2.1%)	0.0%	0.2%	(1.9%)	(0.0%)	(0.4%)	(2.9%)	(0.0%)	(0.0%)	(4.8%)	1.2%	(1.2%)	(0.0%)	(0.8%)
US EQUITY	\$ 8,762,271,451	25%	(8.0%)	(2.0%)	(31.9%)	(7.9%)	(1.9%)	(30.5%)	(13.8%)	(3.5%)	(32.0%)	(29.6%)	5.5%	(4.0%)	(1.0%)	(30.6%)
INTERNATIONAL EQUITY	\$ 7,461,744,308	22%	(9.6%)	(1.9%)	(29.9%)	(9.2%)	(1.9%)	(29.8%)	(14.4%)	(2.9%)	(27.0%)	(35.4%)	6.1%	(4.4%)	(1.0%)	(29.1%)
REAL ESTATE	\$ 3,071,071,820	9%	(10.0%)	(0.9%)	(13.5%)	(10.7%)	(0.9%)	(13.9%)	(18.6%)	(1.5%)	(14.1%)	(39.9%)	7.0%	(5.3%)	(0.4%)	(13.7%)
FARMLAND & TIMBER	\$ 188,959,812	1%	(10.3%)	(0.1%)	(0.8%)	(11.0%)	(0.1%)	(0.9%)	(19.2%)	(0.1%)	(0.9%)	(40.8%)	7.2%	(5.4%)	(0.0%)	(0.9%)
PRIVATE EQUITY	\$ 2,802,588,395	8%	(10.5%)	(0.9%)	(13.5%)	(10.0%)	(0.8%)	(12.0%)	(17.0%)	(1.4%)	(12.6%)	(35.4%)	6.5%	(5.0%)	(0.4%)	(12.1%)
PRIVATE DEBT	\$ 3,075,535,189	9%	(2.2%)	(0.1%)	(1.9%)	(3.9%)	(0.2%)	(3.5%)	(7.4%)	(0.5%)	(4.3%)	(17.4%)	2.7%	(2.2%)	(0.1%)	(3.9%)
OPPORTUNISTIC EQUITY	\$ 434,319,294	1%	(10.0%)	(0.1%)	(1.6%)	(8.8%)	(0.1%)	(1.6%)	(15.3%)	(0.2%)	(1.7%)	(29.9%)	5.9%	(4.4%)	(0.2%)	(1.6%)
OPPORTUNISTIC DEBT	\$ 1,302,776,803	4%	(6.6%)	(0.2%)	(3.2%)	(8.0%)	(0.3%)	(3.9%)	(12.7%)	(0.4%)	(4.0%)	(27.2%)	5.1%	(3.8%)	(0.1%)	(3.9%)
GLOBAL INFLATION LINKED	\$ 224,365,861	1%	(8.0%)	(0.0%)	(0.5%)	(8.0%)	(0.0%)	(0.6%)	(11.8%)	(0.1%)	(0.6%)	(26.6%)	4.8%	(4.0%)	(0.0%)	(0.6%)
INFRASTRUCTURE	\$ 331,287,086	1%	(9.3%)	(0.1%)	(1.4%)	(8.9%)	(0.1%)	(1.3%)	(14.7%)	(0.1%)	(1.3%)	(35.1%)	5.6%	(4.5%)	(0.0%)	(1.3%)
MULTI-ASSET CLASS	\$ 1,041,373,377	3%	(5.8%)	(0.1%)	(2.0%)	(5.7%)	(0.1%)	(1.5%)	(8.2%)	(0.2%)	(1.6%)	(13.0%)	3.3%	(2.9%)	(0.1%)	(1.6%)
<b>GRAND TOTAL</b>	<b>\$ 34,502,186,541</b>	<b>100%</b>	<b>(6.3%)</b>	<b>(6.3%)</b>	<b>(100.0%)</b>	<b>(6.4%)</b>	<b>(6.4%)</b>	<b>(100.0%)</b>	<b>(10.9%)</b>	<b>(10.9%)</b>	<b>(100.0%)</b>	<b>(25.9%)</b>	<b>4.3%</b>	<b>(3.3%)</b>	<b>(3.3%)</b>	<b>(100.0%)</b>
<b>INTERIM POLICY BENCHMARK</b>			<b>(6.5%)</b>			<b>(6.5%)</b>			<b>(10.8%)</b>			<b>(26.1%)</b>	<b>4.4%</b>	<b>(3.3%)</b>		

<b>ANNUALIZED RISK</b>																
CASH - UNASSETIZED	\$ 107,948,860	0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N/A	0.0%	(2.2%)	(0.0%)	(0.0%)
CASH - ASSETIZED	\$ 125,530,217	0%	(4.6%)	0.0%	0.0%	(5.0%)	0.0%	0.0%	(6.4%)	0.0%	0.1%	N/A	3.2%	(3.4%)	0.0%	0.0%
INTEREST RATE SENSITIV	\$ 5,572,414,068	16%	(7.1%)	0.0%	0.2%	(6.8%)	(0.1%)	(0.4%)	(10.1%)	(0.0%)	(0.0%)	N/A	4.3%	(4.2%)	(0.1%)	(0.8%)
US EQUITY	\$ 8,762,271,451	25%	(27.7%)	(7.0%)	(31.9%)	(27.3%)	(6.7%)	(30.5%)	(47.6%)	(12.0%)	(32.0%)	N/A	19.0%	(13.9%)	(3.5%)	(30.6%)
INTERNATIONAL EQUITY	\$ 7,461,744,308	22%	(33.2%)	(6.6%)	(29.9%)	(31.8%)	(6.6%)	(29.8%)	(50.0%)	(10.2%)	(27.0%)	N/A	21.0%	(15.4%)	(3.3%)	(29.1%)
REAL ESTATE	\$ 3,071,071,820	9%	(34.7%)	(3.0%)	(13.5%)	(31.5%)	(3.1%)	(13.9%)	(64.5%)	(5.3%)	(14.1%)	N/A	24.1%	(18.3%)	(1.6%)	(13.7%)
FARMLAND & TIMBER	\$ 188,959,812	1%	(35.7%)	(0.2%)	(0.8%)	(38.1%)	(0.2%)	(0.9%)	(66.3%)	(0.3%)	(0.9%)	N/A	24.9%	(18.7%)	(0.1%)	(0.9%)
PRIVATE EQUITY	\$ 2,802,588,395	8%	(36.5%)	(3.0%)	(13.5%)	(34.8%)	(2.7%)	(12.0%)	(59.1%)	(4.7%)	(12.6%)	N/A	22.7%	(17.4%)	(1.4%)	(12.1%)
PRIVATE DEBT	\$ 3,075,535,189	9%	(7.6%)	(0.4%)	(1.9%)	(13.5%)	(0.8%)	(3.5%)	(25.6%)	(1.6%)	(4.3%)	N/A	9.2%	(7.5%)	(0.4%)	(3.9%)
OPPORTUNISTIC EQUITY	\$ 434,319,294	1%	(34.8%)	(0.4%)	(1.6%)	(30.3%)	(0.4%)	(1.6%)	(52.9%)	(0.6%)	(1.7%)	N/A	20.5%	(15.4%)	(0.2%)	(1.6%)
OPPORTUNISTIC DEBT	\$ 1,302,776,803	4%	(22.9%)	(0.7%)	(3.2%)	(27.7%)	(0.9%)	(3.9%)	(44.1%)	(1.5%)	(4.0%)	N/A	17.7%	(13.2%)	(0.4%)	(3.9%)
GLOBAL INFLATION LINKED	\$ 224,365,861	1%	(27.7%)	(0.1%)	(0.5%)	(27.7%)	(0.1%)	(0.6%)	(40.8%)	(0.2%)	(0.6%)	N/A	16.6%	(13.8%)	(0.1%)	(0.6%)
INFRASTRUCTURE	\$ 331,287,086	1%	(32.2%)	(0.3%)	(1.4%)	(30.7%)	(0.3%)	(1.3%)	(51.1%)	(0.5%)	(1.3%)	N/A	19.5%	(15.6%)	(0.2%)	(1.3%)
MULTI-ASSET CLASS	\$ 1,041,373,377	3%	(19.9%)	(0.4%)	(2.0%)	(19.6%)	(0.3%)	(1.5%)	(28.4%)	(0.6%)	(1.6%)	N/A	11.4%	(10.2%)	(0.2%)	(1.6%)
<b>GRAND TOTAL</b>	<b>\$ 34,502,186,541</b>	<b>100%</b>	<b>(22.0%)</b>	<b>(22.0%)</b>	<b>(100.0%)</b>	<b>(22.1%)</b>	<b>(22.1%)</b>	<b>(100.0%)</b>	<b>(37.6%)</b>	<b>(37.6%)</b>	<b>(100.0%)</b>	<b>N/A</b>	<b>14.9%</b>	<b>(11.4%)</b>	<b>(11.4%)</b>	<b>(100.0%)</b>
<b>INTERIM POLICY BENCHMARK</b>			<b>(22.6%)</b>			<b>(22.4%)</b>			<b>(37.5%)</b>			<b>N/A</b>	<b>15.3%</b>	<b>(11.4%)</b>		

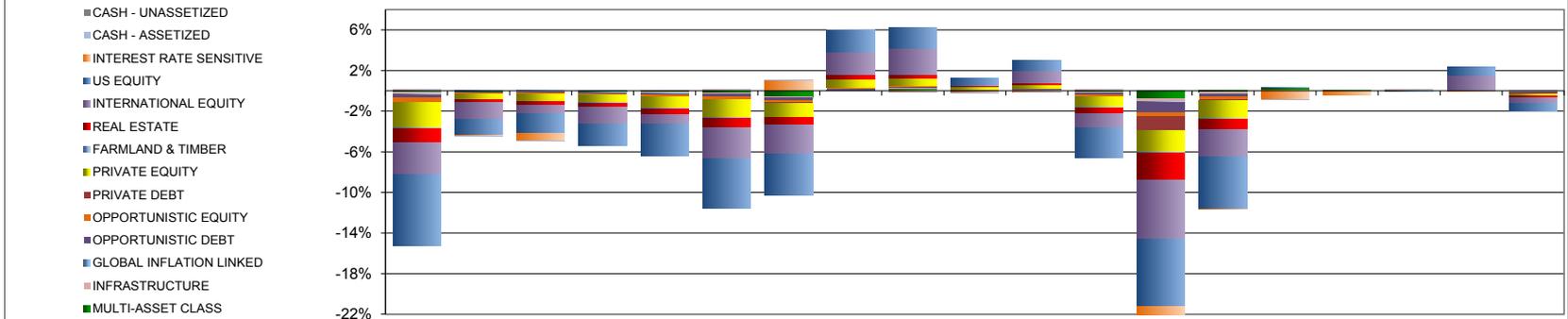
Strategy	\$ Value	% Value	Beta SP500	Corr SP500	Beta MSCI EAFE	Corr MSCI EAFE	Duration	Convexity	Notional Exposure	Gross Exposure	Gross Leverage
CASH - UNASSETIZED	\$ 107,948,860	0%	0.00		0.00				\$ 107,948,860	\$ 107,948,860	100.0%
CASH - ASSETIZED	\$ 125,530,217	0%	(0.02)	(0.42)	(0.01)	(0.35)			\$ 535,377,592	\$ 125,530,217	100.0%
INTEREST RATE SENSITIV	\$ 5,572,414,068	16%	0.01	0.03	0.02	0.11	5.24	0.121	\$ 5,183,765,690	\$ 5,572,414,068	100.0%
US EQUITY	\$ 8,762,271,451	25%	1.04	0.99	0.80	0.90	0.19	0.004	\$ 8,788,808,869	\$ 8,763,057,317	100.0%
INTERNATIONAL EQUITY	\$ 7,461,744,308	22%	1.05	0.90	0.98	0.99			\$ 7,461,760,854	\$ 7,474,751,500	100.2%
REAL ESTATE	\$ 3,071,071,820	9%	1.18	0.88	1.00	0.88			\$ 3,071,071,820	\$ 3,071,072,003	100.0%
FARMLAND & TIMBER	\$ 188,959,812	1%	1.19	0.87	1.02	0.87			\$ 188,959,812	\$ 188,959,812	100.0%
PRIVATE EQUITY	\$ 2,802,588,395	8%	1.19	0.95	0.91	0.86			\$ 2,802,588,395	\$ 2,802,588,395	100.0%
PRIVATE DEBT	\$ 3,075,535,189	9%	0.31	0.61	0.26	0.59	0.65	0.009	\$ 3,067,208,900	\$ 3,076,869,604	100.0%
OPPORTUNISTIC EQUITY	\$ 434,319,294	1%	1.05	0.93	0.81	0.84			\$ 434,319,294	\$ 434,319,294	100.0%
OPPORTUNISTIC DEBT	\$ 1,302,776,803	4%	0.74	0.75	0.62	0.75			\$ 1,302,776,803	\$ 1,302,776,907	100.0%
GLOBAL INFLATION LINKED	\$ 224,365,861	1%	0.29	0.62	0.26	0.66	0.20	0.001	\$ 447,386,065	\$ 224,365,861	100.0%
INFRASTRUCTURE	\$ 331,287,086	1%	1.05	0.97	0.90	0.98			\$ 331,287,086	\$ 331,287,086	100.0%
MULTI-ASSET CLASS	\$ 1,041,373,377	3%	0.04	0.58	0.03	0.51	19.29	3.832	\$ (9,381,421,757)	\$ 2,320,168,882	222.8%
<b>GRAND TOTAL</b>	<b>\$ 34,502,186,541</b>	<b>100%</b>	<b>1.11</b>	<b>0.97</b>	<b>0.93</b>	<b>0.95</b>	<b>4.93</b>	<b>0.122</b>	<b>\$ 24,341,838,283</b>	<b>\$ 35,796,109,806</b>	<b>103.8%</b>

ARIZONA STATE RETIREMENT SYSTEM  
As of September 30, 2016

TOTAL PLAN STRESS TESTS

Strategy	\$ Value	% Value	Historical Scenarios													Predictive Scenarios					
			Black Monday - 5 Day	Gulf War - 5 Day	Bond Crash: Feb 94 - May 94	Asian Crisis 97-98 - 5 day	Russian Crisis - 5 Day	Nasdaq Correction: July 99 - Aug 99	Russian Debt Crisis Aug-Oct	IR Sleepening: Sept 99 - Nov 99	Emerging Markets Rally: Jan 99 - May 99	Fed Tightening: April - June 99	Nasdaq Rally: Nov 99 - Jan 00	9/11 Attack - 5 Day	09-10-2008	S&P 500 -20%	IR Parallel Shift +100bps	Spread Up 100bps	Inflation +1%	Gold Shock -20%	Oil Shock -20%
<b>Stress Test Stand Alone</b>																					
CASH - UNASSETIZED	\$ 107,948,860	0.3%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CASH - ASSETIZED	\$ 125,530,217	0.4%	0.4	(0.2)	(2.6)	0.3	0.2	0.4	7.3	0.0	(0.3)	(0.3)	(0.5)	0.5	3.7	0.0	(5.6)	0.0	0.5	0.0	
INTEREST RATE SENSITIV	\$ 5,572,413,667	16.2%	0.7	(0.4)	(4.5)	0.4	0.4	0.7	6.7	0.0	(0.6)	(0.5)	(0.8)	0.9	(16.0)	(0.0)	(5.6)	(2.5)	0.6	(0.0)	
US EQUITY	\$ 8,762,271,451	25.4%	(27.6)	(6.1)	(7.8)	(8.4)	(12.2)	(19.3)	(15.7)	8.7	8.0	2.8	4.2	(11.8)	(26.0)	(20.3)	0.0	0.0	(0.0)	3.4	
INTERNATIONAL EQUITY	\$ 7,461,744,308	21.6%	(14.5)	(7.6)	(3.6)	(7.8)	(4.2)	(13.9)	(13.3)	10.3	11.7	(0.7)	5.2	(6.4)	(27.2)	(12.5)	(0.0)	0.0	0.0	6.6	
REAL ESTATE	\$ 3,071,071,820	8.9%	(15.1)	(3.3)	(4.3)	(4.6)	(6.7)	(10.6)	(8.5)	4.8	4.4	1.6	2.3	(6.4)	(28.9)	(11.1)	0.0	0.0	0.0	(1.2)	
FARMLAND & TIMBER	\$ 188,959,812	0.5%	(14.0)	(3.1)	(4.0)	(4.2)	(6.2)	(9.9)	(8.0)	4.4	4.0	1.4	2.1	(6.0)	(29.0)	(10.3)	0.0	0.0	0.0	(1.1)	
PRIVATE EQUITY	\$ 2,802,588,395	8.1%	(30.6)	(6.7)	(8.5)	(9.2)	(13.4)	(21.5)	(16.9)	9.7	8.5	3.1	4.6	(13.0)	(26.0)	(22.6)	0.0	0.0	0.0	(3.3)	
PRIVATE DEBT	\$ 3,075,535,189	8.9%	(0.6)	(0.1)	(0.2)	(0.2)	(0.3)	(0.4)	(0.3)	0.2	0.2	0.1	0.1	(0.3)	(15.8)	(0.5)	(0.0)	(0.1)	0.0	(0.2)	
OPPORTUNISTIC EQUITY	\$ 434,319,294	1.3%	(35.6)	(7.8)	(10.2)	(10.8)	(15.7)	(25.1)	(20.2)	11.3	10.2	3.7	5.4	(15.2)	(28.8)	(26.2)	0.0	0.0	0.0	(5.7)	
OPPORTUNISTIC DEBT	\$ 1,302,776,803	3.8%	(9.0)	(2.0)	(2.6)	(2.7)	(4.0)	(6.3)	(5.1)	2.9	2.6	0.9	1.4	(3.8)	(25.8)	(6.6)	0.0	0.0	0.0	(1.5)	
GLOBAL INFLATION LINKED	\$ 224,365,861	0.7%	(0.0)	0.0	0.1	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	0.0	0.0	0.0	(0.0)	(16.5)	0.0	0.1	0.0	(0.0)	(2.2)	
INFRASTRUCTURE	\$ 331,287,086	1.0%	(22.7)	(5.0)	(6.5)	(6.9)	(10.1)	(16.0)	(12.9)	7.2	6.5	2.4	3.5	(9.7)	(28.3)	(16.7)	0.0	0.0	0.0	(2.7)	
MULTI-ASSET CLASS	\$ 1,041,373,377	3.0%	(3.9)	(2.8)	(1.3)	(3.8)	(5.4)	(5.0)	(19.9)	0.5	7.8	1.6	2.6	(4.7)	(26.0)	(4.5)	9.2	(0.2)	(0.5)	1.3	
<b>GRAND TOTAL</b>	<b>\$ 34,502,186,139</b>	<b>100.0%</b>	<b>(15.1)</b>	<b>(4.4)</b>	<b>(4.9)</b>	<b>(5.3)</b>	<b>(6.3)</b>	<b>(11.4)</b>	<b>(9.1)</b>	<b>6.0</b>	<b>6.1</b>	<b>1.0</b>	<b>2.9</b>	<b>(6.5)</b>	<b>(23.8)</b>	<b>(11.7)</b>	<b>(0.6)</b>	<b>(0.4)</b>	<b>0.1</b>	<b>2.4</b>	
<b>INTERIM POLICY BENCHMARK</b>			<b>(15.6)</b>	<b>(4.9)</b>	<b>(5.3)</b>	<b>(6.0)</b>	<b>(6.2)</b>	<b>(12.2)</b>	<b>(8.8)</b>	<b>7.1</b>	<b>7.2</b>	<b>1.0</b>	<b>3.4</b>	<b>(6.6)</b>	<b>(21.3)</b>	<b>(12.1)</b>	<b>(1.1)</b>	<b>(0.5)</b>	<b>0.1</b>	<b>3.0</b>	

<b>Stress Test Contribution</b>																				
CASH - UNASSETIZED	\$ 107,948,860	0.3%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CASH - ASSETIZED	\$ 125,530,217	0.4%	0.0	(0.0)	(0.0)	0.0	0.0	0.0	0.0	0.0	(0.0)	(0.0)	(0.0)	0.0	0.0	0.0	(0.0)	0.0	0.0	0.0
INTEREST RATE SENSITIV	\$ 5,572,413,667	16.2%	0.1	(0.1)	(0.7)	0.1	0.1	0.1	1.1	0.0	(0.1)	(0.1)	(0.1)	0.1	(2.6)	(0.0)	(0.9)	(0.4)	0.1	(0.0)
US EQUITY	\$ 8,762,271,451	25.4%	(7.0)	(1.5)	(2.0)	(2.1)	(3.1)	(4.9)	(4.0)	2.2	2.0	0.7	1.1	(3.0)	(6.6)	(5.2)	0.0	0.0	(0.0)	0.9
INTERNATIONAL EQUITY	\$ 7,461,744,308	21.6%	(3.1)	(1.6)	(0.8)	(1.7)	(0.9)	(3.0)	(2.9)	2.2	2.5	(0.1)	1.1	(1.4)	(5.9)	(2.7)	(0.0)	0.0	0.0	1.4
REAL ESTATE	\$ 3,071,071,820	8.9%	(1.3)	(0.3)	(0.4)	(0.4)	(0.6)	(0.9)	(0.8)	0.4	0.4	0.1	0.2	(0.6)	(2.6)	(1.0)	0.0	0.0	0.0	(0.1)
FARMLAND & TIMBER	\$ 188,959,812	0.5%	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)	0.0	0.0	0.0	0.0	(0.0)	(0.2)	(0.1)	0.0	0.0	0.0	(0.0)
PRIVATE EQUITY	\$ 2,802,588,395	8.1%	(2.5)	(0.5)	(0.7)	(0.7)	(1.1)	(1.7)	(1.4)	0.8	0.7	0.2	0.4	(1.1)	(2.1)	(1.8)	0.0	0.0	0.0	(0.3)
PRIVATE DEBT	\$ 3,075,535,189	8.9%	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	0.0	0.0	0.0	0.0	(0.0)	(1.4)	(0.0)	(0.0)	(0.0)	0.0	(0.0)
OPPORTUNISTIC EQUITY	\$ 434,319,294	1.3%	(0.4)	(0.1)	(0.1)	(0.1)	(0.2)	(0.3)	(0.3)	0.1	0.1	0.0	0.1	(0.2)	(0.4)	(0.3)	0.0	0.0	0.0	(0.1)
OPPORTUNISTIC DEBT	\$ 1,302,776,803	3.8%	(0.3)	(0.1)	(0.1)	(0.1)	(0.2)	(0.2)	(0.2)	0.1	0.1	0.0	0.1	(0.1)	(1.0)	(0.3)	0.0	0.0	0.0	(0.1)
GLOBAL INFLATION LINKED	\$ 224,365,861	0.7%	(0.0)	0.0	0.0	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	0.0	0.0	0.0	(0.0)	(0.1)	0.0	0.0	0.0	(0.0)	(0.0)
INFRASTRUCTURE	\$ 331,287,086	1.0%	(0.2)	(0.0)	(0.1)	(0.1)	(0.1)	(0.2)	(0.1)	0.1	0.1	0.0	0.0	(0.1)	(0.3)	(0.2)	0.0	0.0	0.0	(0.0)
MULTI-ASSET CLASS	\$ 1,041,373,377	3.0%	(0.1)	(0.1)	(0.0)	(0.1)	(0.2)	(0.2)	(0.6)	0.0	0.2	0.0	0.1	(0.1)	(0.8)	(0.1)	0.3	(0.0)	(0.0)	(0.1)
<b>GRAND TOTAL</b>	<b>\$ 34,502,186,139</b>	<b>100.0%</b>	<b>(15.1)</b>	<b>(4.4)</b>	<b>(4.9)</b>	<b>(5.3)</b>	<b>(6.3)</b>	<b>(11.4)</b>	<b>(9.1)</b>	<b>6.0</b>	<b>6.1</b>	<b>1.0</b>	<b>2.9</b>	<b>(6.5)</b>	<b>(23.8)</b>	<b>(11.7)</b>	<b>(0.6)</b>	<b>(0.4)</b>	<b>0.1</b>	<b>2.4</b>
<b>INTERIM POLICY BENCHMARK</b>			<b>(15.6)</b>	<b>(4.9)</b>	<b>(5.3)</b>	<b>(6.0)</b>	<b>(6.2)</b>	<b>(12.2)</b>	<b>(8.8)</b>	<b>7.1</b>	<b>7.2</b>	<b>1.0</b>	<b>3.4</b>	<b>(6.6)</b>	<b>(21.3)</b>	<b>(12.1)</b>	<b>(1.1)</b>	<b>(0.5)</b>	<b>0.1</b>	<b>3.0</b>



GLOSSARY	DEFINITION	INTERPRETATION
Historical VaR 95%	A risk metric that is derived from a full revaluation historical simulation of the risk factors impacting a portfolio, <u>making no assumption of the tail distribution</u> , and reporting the largest loss likely to be suffered over a holding period (1Month for ASRS) 5 times out of 100, or 1 month out of 20	Value at Risk is a number, measured in price units or as percentage of portfolio value, which tells you that in a defined large percentage of cases (usually 95% or 99%) your portfolio is likely to not lose more than that amount of money. Or said the other way around, in a defined small percentage of cases (5% or 1%) your loss is expected to be greater than that number.
HVaR Contri 95%	This is the decomposition of the VaR, making it an additive measure, showing positive values where risk is decreased and correlations are negative.	
HVaR Contri % to Total	This is the VaR contribution displayed in percent.	
Parametric VaR 95%	A risk metric that is derived from a full revaluation historical simulation of the risk factors impacting a portfolio, <u>making a Normal distribution assumption of the tail distribution</u> , and reporting the largest loss likely to be suffered over a holding period (1Month for ASRS) 5 times out of 100, or 1 month out of 20.	Value at Risk is a number, measured in price units or as percentage of portfolio value, which tells you that in a defined large percentage of cases (usually 95% or 99%) your portfolio is likely to not lose more than that amount of money. Or said the other way around, in a defined small percentage of cases (5% or 1%) your loss is expected to be greater than that number.
PVaR Contri 95%	This is the decomposition of the VaR, making it an additive measure, showing positive values where risk is decreased and correlations are negative.	
PVaR Contri % to Total	This is the VaR contribution displayed in percent.	
Exp Tail Loss 95%	Also known as Conditional VaR or ETL, it is derived by taking a weighted average between the VaR and losses exceeding the VaR. If VaR is reported at 95.0%, then ETL will average the losses between 95.1% to 99.9%. It is a risk measure that assesses the risk beyond VaR and into the tail end of the distribution of loss.	A measure that produces better incentives for traders than VaR is expected shortfall. This is also sometimes referred to as Conditional VaR, or tail loss. <u>Where VaR asks the question 'how bad can things get?', expected shortfall asks 'if things do get bad, what is our expected loss?'</u>
Exp Tail Loss Contri 95%	This is the decomposition of the ETL making it an additive measure, showing positive values where risk is decreased and correlations are negative.	
Exp Tail Loss Contri % to Total	This is the ETL contribution displayed in percent.	
Max Loss	The maximum projected loss.	
Downside Risk (8.7%)	A risk metric that distinguishes between "good" and "bad" returns by assigning risk only to those returns below a return specified by an investor. Downside risk is considered a more effective risk measure than standard deviation (volatility) for two important reasons: 1) it is investor specific, and 2) it identifies return distributions that have higher probabilities for negative ("left tail") market events. Downside risk is also referred to as downside deviation or target semi-deviation.	A 5% downside risk with an 8.7% MAR means that the conditional average underperformance (below 8.7% annual) is 5%, adjusted for a positive skew (greater than the MAR). Effectively, downside risk amplifies a big loss (by squaring the distance of that loss to the target) and smoothes out the risk measure by taking into account the gains setting them up to be equal to the target MAR.
Downside Risk Contri (8.7%)	This is the decomposition of the downside risk, making it an additive measure, showing positive values where risk is decreased and correlations are negative.	
Downside Risk Contri (8.7%) to Total	This is the downside risk contribution displayed in percent.	

State Street Global Exchange® and truView® are trademarks of State Street Corporation (incorporated in Massachusetts) and are registered or have registrations pending in multiple jurisdictions.

This document and information herein (together, the "Content") is subject to change without notice based on market and other conditions and in any event may not reflect the views of State Street Corporation and its subsidiaries and affiliates ("State Street"). The Content provided is for informational, illustrative and/or marketing purposes only; it does not constitute investment research or investment advice. The Content provided was prepared and obtained from sources believed to be reliable at the time of preparation, however it is provided "as-is" and State Street makes no guarantee, representation, or warranty of any kind including, without limitation, as to its accuracy, suitability, timeliness, merchantability, fitness for a particular purpose or otherwise. State Street disclaims all liability, whether arising in contract, tort or otherwise, for any claims, losses, liabilities, damages (including direct, indirect, special or consequential), expenses or costs arising from or connected with the Content. The Content provided does not constitute any binding contractual arrangement or commitment for State Street of any kind. The Content provided is not intended for retail clients, nor is intended to be relied upon by any person or entity, and is not intended for distribution to or use by any person or entity in any jurisdiction where such distribution or use would be contrary to applicable law or regulation.

The Content provided may contain certain statements that could be deemed forward-looking statements; any such statements or forecasted information are not guarantees or reliable indicators for future performance and actual results or developments may differ materially from those depicted or projected. Past performance is no guarantee of future results. No permission is granted to reprint, sell, copy, distribute, or modify the Content in any form or by any means without the prior written consent of State Street.

# Agenda Item #6

# State Street Global Services: Investment Compliance Review

Arizona State  
Retirement  
System

# Arizona State Overview

For background purposes, following is a brief description of the compliance services provided for the ASRS investment portfolios:

## **Service Overview:**

State Street works closely with the Plan to interpret investment guidelines and advise on different monitoring approaches. The compliance specialists will maintain the existing tests and add new tests as requested by the customers. Testing for the ASRS's portfolios is provided on a daily and monthly basis in a post-trade, pre-settlement environment. This includes:

- Clarification of rules
- Set up and ongoing modification of rules
- Validation and exception research
- Reporting provided daily or monthly.
- Comments and research posted within the Compliance Dashboard (MySS.com)

## **Additional Services:**

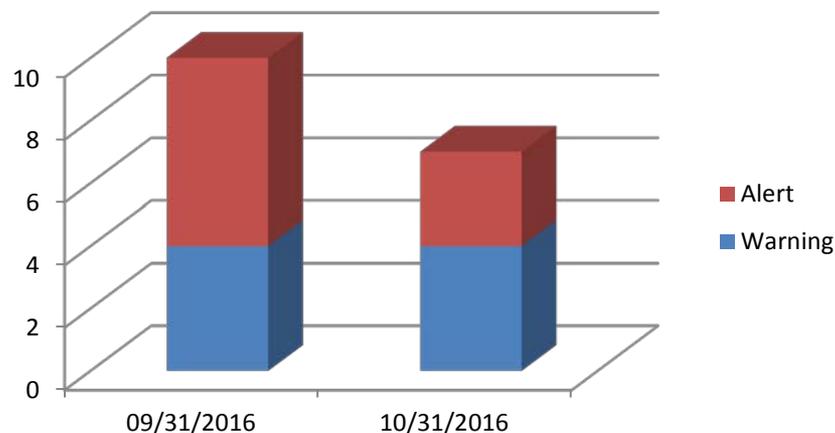
To satisfy the needs of more sophisticated customers, like Arizona, State Street provides additional assistance with the below:

- Alert validation with Investment Managers
- Quarterly governance meetings

# Report Card: Summary & Projects

## Alerts & Warnings

### September – October 2016



**Alert:** includes compliance rules which are hard limits and /or prohibition according to the Letters of Direction

**Warning:** includes compliance rules which have been designed as soft notification or flags (informational flag)

**Note:** Alerts and Warnings do not necessarily mean a violation has occurred. They could be a result of any of the following:

1. A data error/omission
2. A future action needs to occur to prevent a violation from taking place (i.e. future benchmark inclusion)
3. A violation has occurred

## Breakdown

- September: 6 Alerts – 3 Recurring / 4 Warnings – 4 Recurring
- October: 3 Alerts – 3 Recurring / 4 Warnings – 4 Recurring

## New Alerts/Warnings\*\*

- September: 3 New Alerts
  - Allowed securities and Securities contained on Index only
    - The fund previously held EMC Corp which merged with Dell Inc. The combined company, Dell Technologies Inc. was not on the index. Shares were subsequently sold.
  - Allowed securities and Securities contained on Index only
    - Cooper Companies Inc. was removed from the S&P MidCap 400 and added to the S&P 500 on September 22. Shares were subsequently sold.
  - Allowed securities and Securities contained on Index only
    - RR Donnelley & Sons was removed from the S&P MidCap 400 and added to the S&P Small Cap 600 on September 27. Shares were subsequently sold.
- October: No New Alerts or Warnings

**\*\* All alerts/warnings were researched and resolved to both State Street & Arizona's satisfaction. Alerts/warnings have valid responses/actions.**

# Report Card: Summary & Projects (cont'd)

## Arizona Statutes on Investment Limits

### Max 80% equity test (Law 38-718 H) –

All Passes

#### September

58.60% of Market Value

55.69% of Cost

#### October

N/A\*\* of Market Value

N/A\*\* of Cost

### Max 40% foreign investments test (Law 38-718 I) –

All Passes

#### September

32.22% of Market Value

36.30% of Cost

#### October

N/A\*\* of Market Value

N/A\*\* of Cost

## Additional Items

- Additional compliance testing and reporting:
  - Downgrades reporting
  - Non-Testable Rules Summary & Testing Coverage
- Explore Additional Applicable Regulatory Testing
- Report Alerts & Warnings by Asset Classes

### Max 60% internally managed assets test (Law 38-718 J) –

All Passes

#### September

26.48% of Market Value

21.45% of Cost

#### October

N/A\*\* of Market Value

N/A\*\* of Cost

### Max 5% Issuer test (Law 38-718 K)

Test Results:

September: Largest holding – **Apple Inc. 0.458% - Pass**

October: Largest holding – **N/A\*\***

### Max 10% Debt of Multinational Development Banks (Law 38-718 L)

Test Results:

September: **0.020% - Pass**

October: **N/A\*\***

### Arizona Restricted Country List

As of September 30<sup>th</sup>, 2016 the Arizona funds were not invested in countries that support terrorism.

**\*\* October Statute results are unavailable at this time. Will be available on October 23.**

STATE STREET.

# Agenda Item #7

# Arizona State Retirement System

## Independent ASRS Investment Program Oversight for the Period Ending September 30, 2016

November 28, 2016

Allan Martin, Partner, NEPC  
Don Stracke, Sr. Consultant, NEPC  
Michael Malchenko, Sr. Analyst, NEPC



- ASRS Investment Objectives/Performance
- Independent Oversight/Compliance
  - SAA Policy Compliance
  - Total Fund and Asset Class Analysis
  - Asset Class Committee Monitoring
- Market Environment Update and Outlook
- Appendix: SAA Policy History

# ASRS Investment Objectives/Performance

**Note: All of the data shown on the following pages is as of September 30, 2016 and reflects the deduction of investment manager fees, unless otherwise noted.**



Macro

- Objective #1: Achieve a twenty-year rolling annual total fund net rate of return equal to or greater than the actuarial assumed interest rate.
- Objective #2: Achieve one- and three-year rolling annual total fund net rates of return equal to or greater than the return of the ASRS Strategic Asset Allocation Policy (SAAP) Benchmark.
- Objective #3: Achieve one- and three-year rolling annual net rates of return for ASRS strategic asset classes that are equal to or greater than their respective strategic asset class benchmarks.
- Objective #4: Ensure sufficient monies are available to meet pension benefits, health insurance, member refunds, administrative payments, and other cash flow requirements.

Micro

*Source: ASRS Strategic Plan, March 2013*

- Objective #1: Achieve a twenty-year rolling annual total fund net rate of return equal to or greater than the actuarial assumed interest rate.

	<u>20 Year Annualized Return</u>
Total Fund	7.4%
Constant 8%	<u>8.0%</u>
Excess Return	<b>(0.6)%</b>

**Goal Met:  
No**

- Objective #2: Achieve one- and three-year rolling annual total fund net rates of return equal to or greater than the return of the ASRS Strategic Asset Allocation Policy (SAAP) Benchmark.

	Quarter	1 Year	3 Years	5 Years	10 Years	Since Inception (6/30/75)
<b>Total Fund</b>	3.4%	9.0%	6.4%	10.1%	5.9%	9.7%
<b>Interim SAA Policy<sup>1</sup></b>	3.8%	8.5%	5.4%	9.4%	5.5%	9.4%
<b>Excess Return</b>	-0.4%	0.5%	1.0%	0.7%	0.4%	0.3%

**1 Year Goal Met: Yes**  
**3 Year Goal Met: Yes**

<sup>1</sup>Composition of SAA Policy can be found in the appendix.

Arizona State Retirement System  
**Total Fund Attribution Analysis**

<b>Total Plan</b>	<b>1 Year</b>	<b>3 Years</b>	<b>5 Years</b>
Allocation Effect <sup>1</sup>	-0.18%	0.64%	0.44%
Manager Selection Effect <sup>2</sup>	0.76%	0.67%	0.29%
Residual <sup>3</sup>	-0.05%	0.01%	-0.03%
<b>Excess Return</b>	<b>0.53%</b>	<b>1.02%</b>	<b>0.70%</b>

*The Brinson-Fachler Attribution model explains excess return by identifying the size of contributors or detractors from excess return based on the three effects defined below:*

**1. Allocation Effect:** Measures the impact of the decision to over/under weight asset classes relative to Interim SAAP benchmark weights. (Return Asset Class Index – Total Interim Policy Index Return) × (Weight Asset Class Portfolio – Weight Asset Class Interim Policy Index).

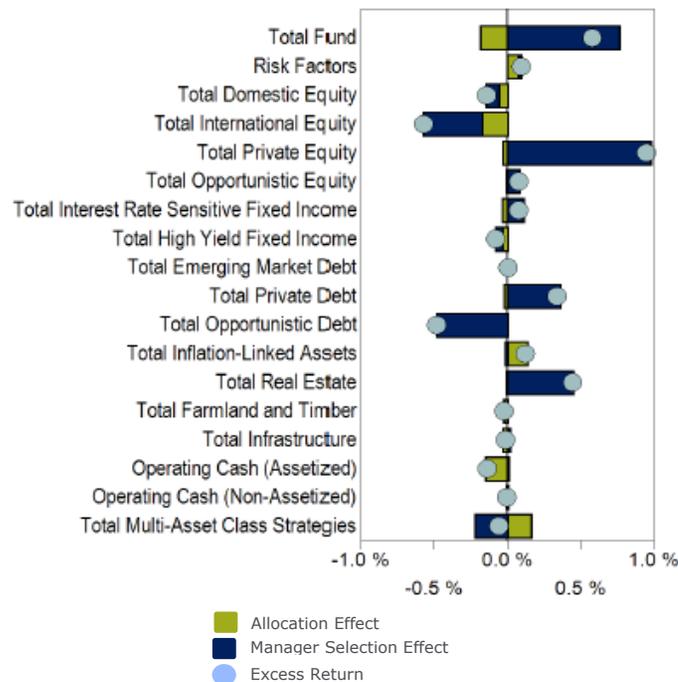
**2. Manager Selection Effect:** Measures the impact of over/under performance of asset classes in the portfolio relative to the asset class benchmarks in the Interim SAAP benchmark. [Weight Asset Class Benchmark × (Return Portfolio Asset Class – Return Asset Class in Interim Policy Index)] + **Interaction Effect:** Measures the impact of over/under weighting decisions and over/under performance. (Return Asset Class Portfolio (Weight Asset Class Portfolio – Weight Asset Class Policy Index)) – (Return Asset Class Index (Weight Asset Class Portfolio – Weight Asset Class Index)).

**3. Residual:** Contribution to excess return not captured in Allocation Effect and Manager Selection Effect.

# Arizona State Retirement System

## Total Fund Attribution Detail

### Attribution Effects 1 Year Ending September 30, 2016



### 1 Year Excess Return: +0.53%

- Allocation Effect: -0.18%
  - International Equity tactical overweight (-0.17%)
  - Assetized Cash tactical overweight (-0.15%)
  - Multi-Asset Class Strategies underweight (+0.16%)
- Manager Selection Effect: +0.76%
  - Private Equity outperformed due to various managers (+0.98%)
  - Real Estate outperformed due to various managers (+0.45%)
  - Opportunistic Equity outperformed (+0.08%)
  - Opportunistic Debt underperformed (-0.48%)
  - International Equity underperformed (-0.40%)
  - Multi-Asset Class Strategies underperformed (-0.22%)
- Residual: -0.05%

**The Brinson-Fachler Attribution model explains excess return by identifying the size of contributors or detractors from excess return based on the three effects defined below:**

**Allocation Effect:** Measures the impact of the decision to over/under weight asset classes relative to Interim SAAP benchmark weights.  $(\text{Return Asset Class Index} - \text{Total Interim Policy Index Return}) \times (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Interim Policy Index})$ .

**Manager Selection Effect:** Measures the impact of over/under performance of asset classes in the portfolio relative to the asset class benchmarks in the Interim SAAP benchmark.  $[\text{Weight Asset Class Benchmark} \times (\text{Return Portfolio Asset Class} - \text{Return Asset Class in Interim Policy Index})]$  + **Interaction Effect:** Measures the impact of over/under weighting decisions and over/under performance.  $(\text{Return Asset Class Portfolio} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Policy Index})) - (\text{Return Asset Class Index} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Index}))$ .

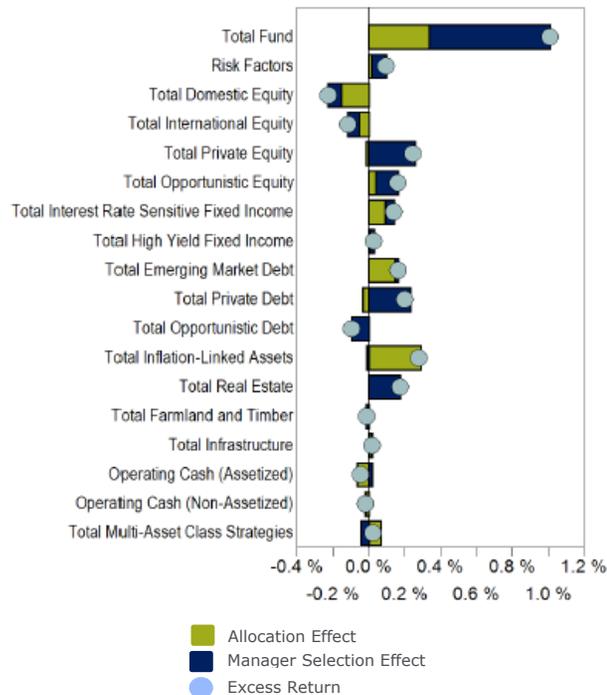
**Residual:** Contribution to excess return not captured in Allocation Effect and Manager Selection Effect.



# Arizona State Retirement System

## Total Fund Attribution Detail

**Attribution Effects**  
3 Years Ending September 30, 2016



### 3 Year Excess Return: +1.02%

- Allocation Effect: +0.34%
  - Inflation-Linked Assets tactical underweight (+0.29%)
  - Public Markets Fixed Income tactical underweight (+0.25%)
  - Domestic Equity tactical underweight (-0.15%)
  - International Equity tactical overweight (-0.05%)
- Manager Selection Effect: +0.67%
  - Private Equity outperformed due to various managers (+0.26%)
  - Private Debt outperformed due to various managers (+0.23%)
  - Real Estate outperformed due to various managers (+0.17%)
- Residual: +0.01%

**The Brinson-Fachler Attribution model explains excess return by identifying the size of contributors or detractors from excess return based on the three effects defined below:**

**Allocation Effect:** Measures the impact of the decision to over/under weight asset classes relative to Interim SAAP benchmark weights.  $(\text{Return Asset Class Index} - \text{Total Interim Policy Index Return}) \times (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Interim Policy Index})$ .

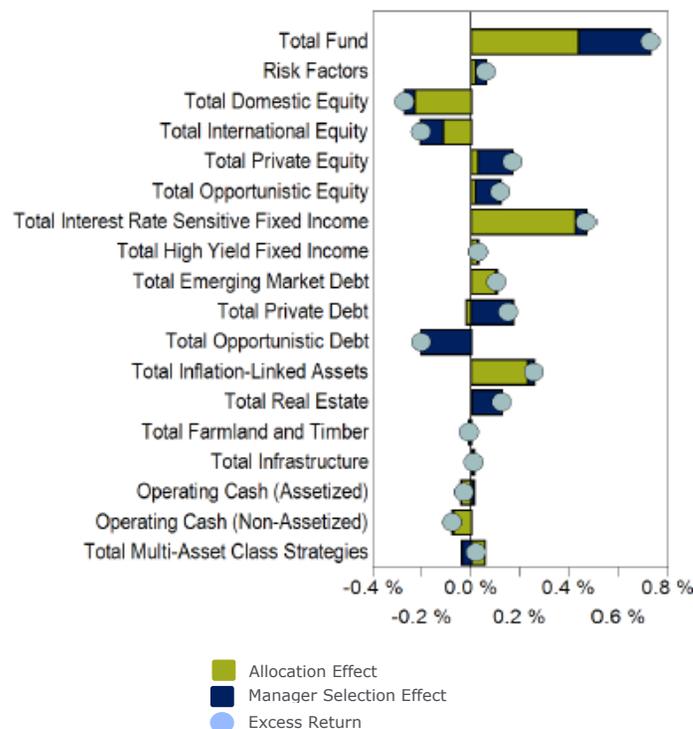
**Manager Selection Effect:** Measures the impact of over/under performance of asset classes in the portfolio relative to the asset class benchmarks in the Interim SAAP benchmark.  $[\text{Weight Asset Class Benchmark} \times (\text{Return Portfolio Asset Class} - \text{Return Asset Class in Interim Policy Index})]$  + **Interaction Effect:** Measures the impact of over/under weighting decisions and over/under performance.  $(\text{Return Asset Class Portfolio} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Policy Index})) - (\text{Return Asset Class Index} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Index}))$ .

**Residual:** Contribution to excess return not captured in Allocation Effect and Manager Selection Effect.

# Arizona State Retirement System

## Total Fund Attribution Detail

### Attribution Effects 5 Years Ending September 30, 2016



### 5 Year Excess Return: +0.70%

- Allocation Effect: +0.44%
  - Public Markets Fixed Income tactical underweight (+0.56%)
  - Inflation-Linked Assets tactical underweight (+0.23%)
  - Domestic Equity tactical underweight (-0.23%)
  - International Equity tactical overweight (-0.12%)
- Manager Selection Effect: +0.29%
  - Private Debt outperformed due to various managers (+0.17%)
  - Private Equity outperformed due to various managers (+0.14%)
  - Real Estate outperformed due to various managers (+0.12%)
  - Opportunistic Equity outperformed (+0.10%)
  - Opportunistic Debt underperformed (-0.20%)
  - International Equity underperformed (-0.06%)
- Residual: -0.03%

**The Brinson-Fachler Attribution model explains excess return by identifying the size of contributors or detractors from excess return based on the three effects defined below:**

**Allocation Effect:** Measures the impact of the decision to over/under weight asset classes relative to Interim SAAP benchmark weights.  $(\text{Return Asset Class Index} - \text{Total Interim Policy Index Return}) \times (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Interim Policy Index})$ .

**Manager Selection Effect:** Measures the impact of over/under performance of asset classes in the portfolio relative to the asset class benchmarks in the Interim SAAP benchmark.  $[\text{Weight Asset Class Benchmark} \times (\text{Return Portfolio Asset Class} - \text{Return Asset Class in Interim Policy Index})]$  + **Interaction Effect:** Measures the impact of over/under weighting decisions and over/under performance.  $(\text{Return Asset Class Portfolio} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Policy Index})) - (\text{Return Asset Class Index} (\text{Weight Asset Class Portfolio} - \text{Weight Asset Class Index}))$ .

**Residual:** Contribution to excess return not captured in Allocation Effect and Manager Selection Effect.



Asset Class Performance vs. Benchmark – Public Markets

- Objective #3: Achieve one- and three-year rolling annual net rates of return for ASRS strategic asset classes that are equal to or greater than their respective strategic asset class benchmarks.

	1 Year Return	3 Year Return
ASRS Total Domestic and Int'l Equity <sup>1</sup>	11.7%	6.2%
ASRS Custom Total Equity Benchmark	12.6%	6.3%
Excess Return	<b>-0.9%</b>	<b>-0.1%</b>
ASRS Domestic Equity	15.5%	10.5%
ASRS Custom Domestic Equity Benchmark	15.8%	10.7%
Excess Return	<b>-0.3%</b>	<b>-0.2%</b>
ASRS International Equity	7.4%	0.4%
ASRS Custom Int'l Equity Benchmark	9.2%	0.7%
Excess Return	<b>-1.8%</b>	<b>-0.3%</b>
ASRS Public Markets Fixed Income	7.1%	4.0%
ASRS Custom Fixed Income Benchmark	7.2%	3.3%
Excess Return	<b>-0.1%</b>	0.7%
ASRS Inflation-Linked	<b>-4.6%</b>	<b>-13.4%</b>
ASRS Custom Inflation-Linked Benchmark	<b>-2.6%</b>	<b>-12.3%</b>
Excess Return	<b>-2.0%</b>	<b>-1.1%</b>
ASRS Multi-Asset Class Strategies	<b>-5.9%</b>	1.0%
ASRS Multi-Asset Class Strategies Benchmark	0.2%	3.9%
Excess Return	<b>-6.1%</b>	<b>-2.9%</b>

<sup>1</sup>Performance of ASRS Total Domestic and Int'l Equity includes the performance of the ASRS Domestic Equity and ASRS International Equity asset classes and the Equity Risk Factor Portfolio with an inception date of 6/1/2013.

Note: Composition of ASRS Custom Asset Class Benchmarks can be found in the appendix.

**Goal Met:  
Partially**

Asset Class Performance vs. Benchmark – Private Markets<sup>1</sup>

- Objective #3: Achieve one- and three-year rolling annual net rates of return for ASRS strategic asset classes that are equal to or greater than their respective strategic asset class benchmarks.

	1 Year Return	3 Year Return	IRR Since Inception	Inception Date
ASRS Private Equity	5.8%	10.6%	11.0%	Oct-07
Russell 2000	-7.8%	4.9%	9.1%	
Excess Return	13.6%	5.7%	1.9%	
ASRS Opportunistic Equity <sup>2</sup>	14.9%	21.9%	23.1%	Apr-11
ASRS Private Debt	9.0%	10.1%	10.7%	Jul-12
S&P/LSTA Leveraged Loan Index + 250 bps	4.3%	5.2%	5.4%	
Excess Return	4.7%	4.9%	5.3%	
ASRS Opportunistic Debt <sup>2</sup>	-4.2%	3.4%	8.9%	Jan-08
ASRS Real Estate	13.0%	13.2%	8.0%	Oct-05
NFI - ODCE Index	12.3%	12.5%	7.3%	
Excess Return	0.7%	0.7%	0.7%	
ASRS Farmland and Timber	4.5%	--	3.8%	Jul-13
CPI ex-Food and Energy + 350 bps	5.8%	--	5.7%	
Excess Return	-1.3%		-1.9%	
ASRS Total Infrastructure	7.4%	--	6.5%	Dec-14
CPI ex-Food and Energy + 350 bps	5.8%	--	5.6%	
Excess Return	1.6%		0.9%	

<sup>1</sup>Performance of private markets portfolios and corresponding benchmarks is reported on a one quarter lag. Performance shown as of March 31, 2016.

<sup>2</sup>Net absolute rate of return expectations range from 10-14% per annum.

Note: Due to the drawdown nature of private markets portfolios in which the investment managers call capital over time, dollar-weighted performance, or internal rate of return (IRR), is a more appropriate measure of the performance of ASRS private markets portfolios.

**Goal Met:  
Partially**



Cash Management

- Objective #4: Ensure sufficient monies are available to meet pension benefits, health insurance, member refunds, administrative payments, and other cash flow requirements.

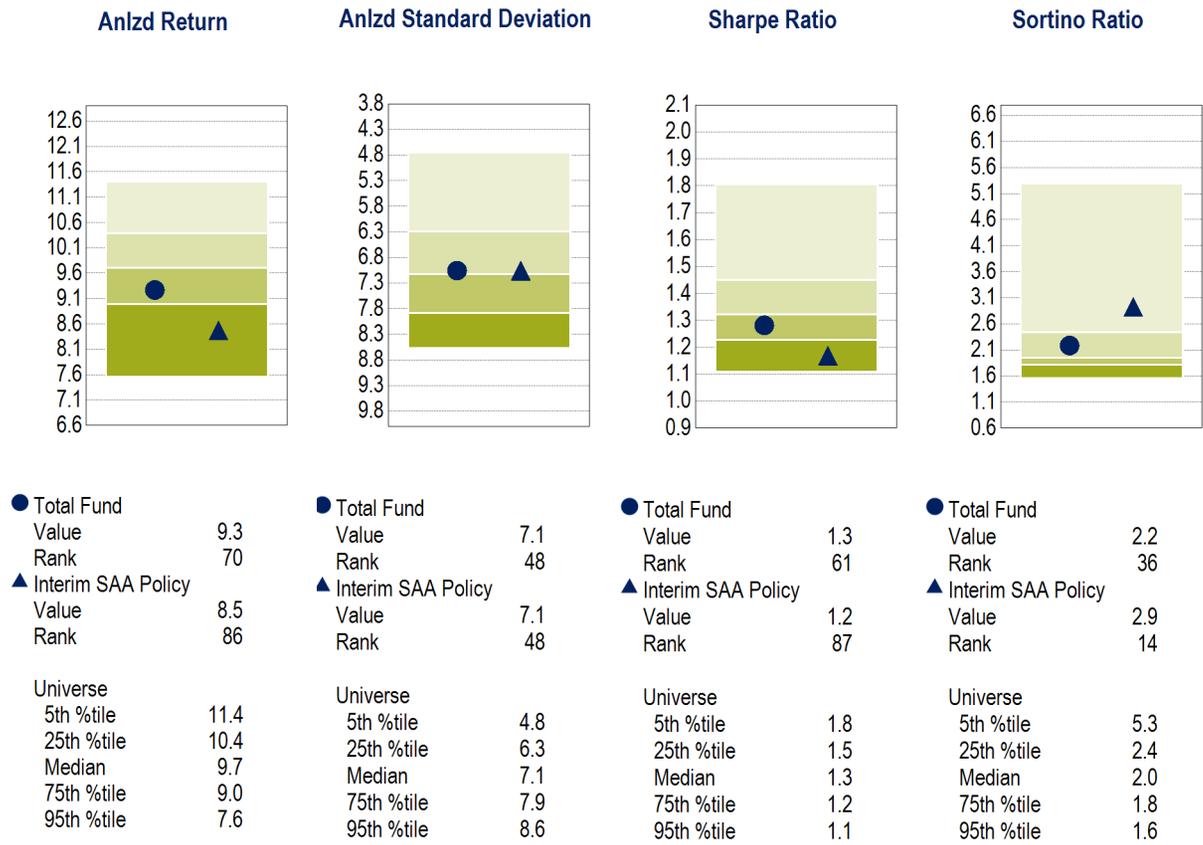
Month	External CFs	Last day of the Month Ending Balance*
Sep – 15	(\$103.3)	\$392.0
Oct – 15	(\$73.0)	\$394.5
Nov – 15	(\$107.8)	\$705.5
Dec – 15	(\$65.4)	\$966.1
Jan – 16	(\$108.6)	\$788.9
Feb – 16	(\$109.2)	\$545.2
Mar - 16	(\$94.4)	\$517.3
Apr – 16	(\$77.5)	\$394.7
May - 16	(\$91.4)	\$425.5
Jun - 16	(\$62.9)	\$274.6
Jul – 16	(\$150.5)	\$512.3
Aug – 16	(\$147.7)	\$467.9
Sep - 16	(\$73.2)	\$209.5

**\*Includes assetized & unassetized cash balances (Inception of 1/26/15); represents monies to be used for funding needs that occur in subsequent month(s). Generally, monthly pension payments occur on the first day of month.**

**Goal Met:  
Yes**

Total Fund Risk Statistics vs. Peer Universe

Total Fund vs. IFx Public DB > \$1B Gross(USD)(peer)  
1 Year



Note: The information contained herein is for comparison purposes only and is not a Total Fund benchmark. Peer universe comparisons are subject to several limitations, including: peer groups are not comprehensive; several funds are included in multiple peer groups; peer groups are constructed using gross of fee returns; and survivorship bias in that poorly performing funds may no longer report results.

Universes are constructed using gross of fee returns; therefore, ASRS rank is based on gross of fee returns.

Rankings are from highest (1) to lowest (100) in the InvestorForce Public Funds > \$1 Billion Gross Universe.

The InvestorForce Public Funds > \$1 Billion Gross Universe contains 105 observations for the period ending September 30, 2016, with total assets of \$1.8 trillion.

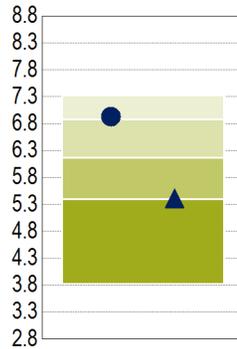
Composition of Interim SAA Policy can be found in the appendix.

Total Fund Risk Statistics vs. Peer Universe

Total Fund vs. IFx Public DB > \$1B Gross(USD)(peer)

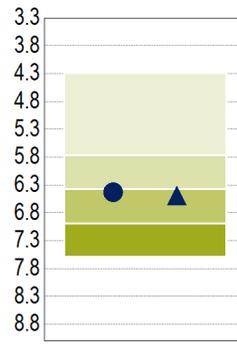
3 Year

Anlzd Return



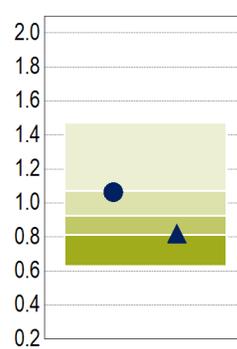
● Total Fund	
Value	6.9
Rank	25
▲ Interim SAA Policy	
Value	5.4
Rank	75
Universe	
5th %tile	7.3
25th %tile	6.9
Median	6.2
75th %tile	5.4
95th %tile	3.8

Anlzd Standard Deviation



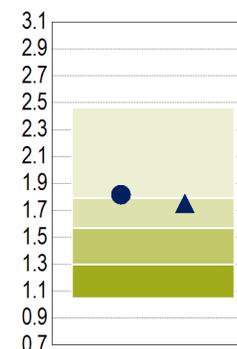
● Total Fund	
Value	6.4
Rank	53
▲ Interim SAA Policy	
Value	6.5
Rank	58
Universe	
5th %tile	4.3
25th %tile	5.8
Median	6.4
75th %tile	7.0
95th %tile	7.6

Sharpe Ratio



● Total Fund	
Value	1.1
Rank	27
▲ Interim SAA Policy	
Value	0.8
Rank	75
Universe	
5th %tile	1.5
25th %tile	1.1
Median	0.9
75th %tile	0.8
95th %tile	0.6

Sortino Ratio



● Total Fund	
Value	1.8
Rank	23
▲ Interim SAA Policy	
Value	1.8
Rank	30
Universe	
5th %tile	2.5
25th %tile	1.8
Median	1.6
75th %tile	1.3
95th %tile	1.1

Note: The information contained herein is for comparison purposes only and is not a Total Fund benchmark. Peer universe comparisons are subject to several limitations, including: peer groups are not comprehensive; several funds are included in multiple peer groups; peer groups are constructed using gross of fee returns; and survivorship bias in that poorly performing funds may no longer report results.

Universes are constructed using gross of fee returns; therefore, ASRS rank is based on gross of fee returns.

Rankings are from highest (1) to lowest (100) in the InvestorForce Public Funds > \$1 Billion Gross Universe.

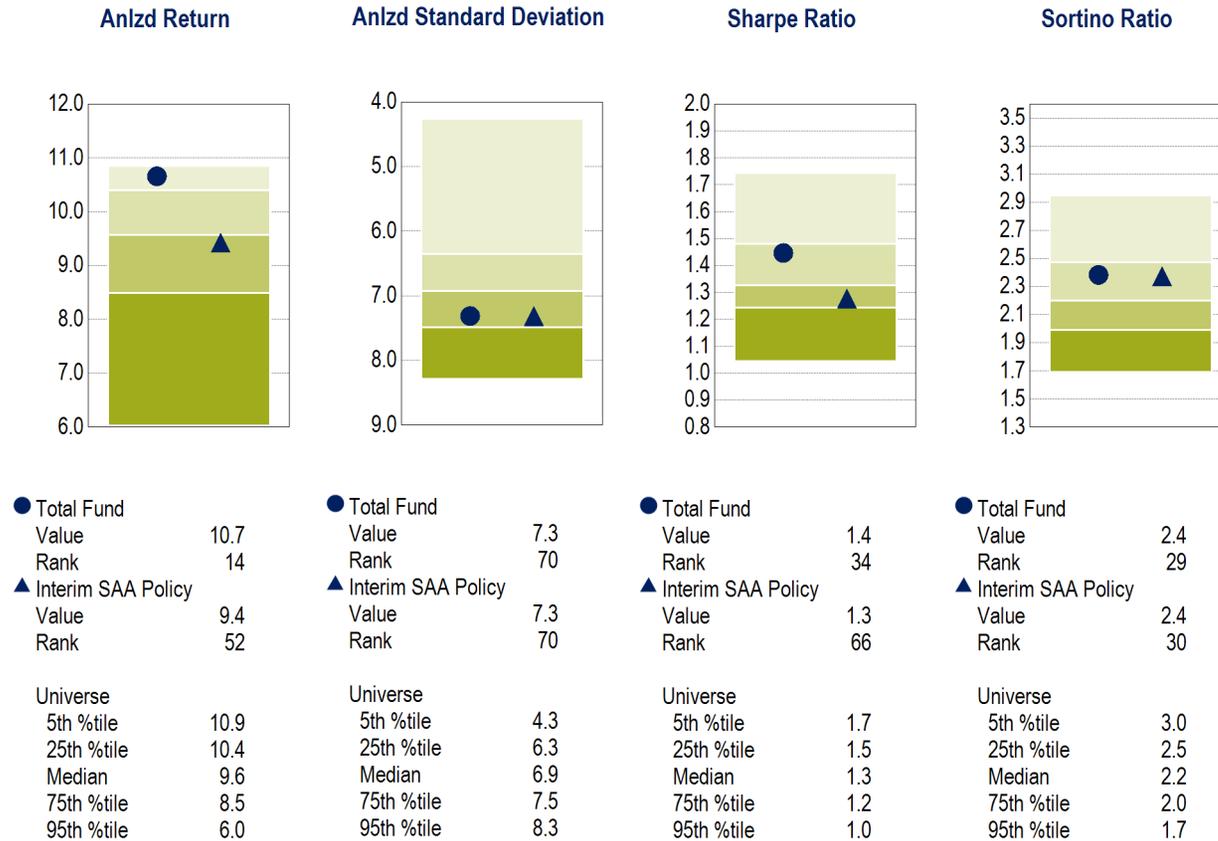
The InvestorForce Public Funds > \$1 Billion Gross Universe contains 105 observations for the period ending September 30, 2016, with total assets of \$1.8 trillion.

Composition of Interim SAA Policy can be found in the appendix.

Total Fund Risk Statistics vs. Peer Universe

Total Fund vs. IFx Public DB > \$1B Gross(USD)(peer)

5 Year



Note: The information contained herein is for comparison purposes only and is not a Total Fund benchmark. Peer universe comparisons are subject to several limitations, including: peer groups are not comprehensive; several funds are included in multiple peer groups; peer groups are constructed using gross of fee returns; and survivorship bias in that poorly performing funds may no longer report results.

Universes are constructed using gross of fee returns; therefore, ASRS rank is based on gross of fee returns.

Rankings are from highest (1) to lowest (100) in the InvestorForce Public Funds > \$1 Billion Gross Universe.

The InvestorForce Public Funds > \$1 Billion Gross Universe contains 105 observations for the period ending September 30, 2016, with total assets of \$1.8 trillion.

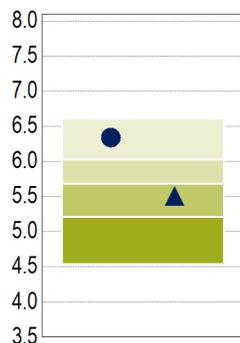
Composition of Interim SAA Policy can be found in the appendix.

Total Fund Risk Statistics vs. Peer Universe

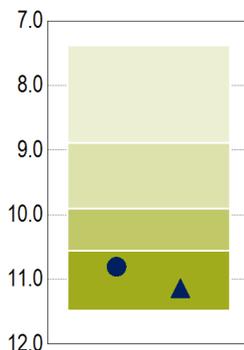
Total Fund vs. IFx Public DB > \$1B Gross(USD)(peer)

10 Year

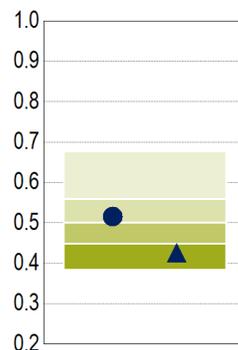
Anlzd Return



Anlzd Standard Deviation



Sharpe Ratio



Sortino Ratio



● Total Fund

Value 6.3  
Rank 11

▲ Interim SAA Policy

Value 5.5  
Rank 68

Universe

5th %tile 6.6  
25th %tile 6.0  
Median 5.7  
75th %tile 5.2  
95th %tile 4.5

● Total Fund

Value 10.8  
Rank 86

▲ Interim SAA Policy

Value 11.1  
Rank 90

Universe

5th %tile 7.4  
25th %tile 8.9  
Median 9.9  
75th %tile 10.5  
95th %tile 11.5

● Total Fund

Value 0.5  
Rank 42

▲ Interim SAA Policy

Value 0.4  
Rank 88

Universe

5th %tile 0.7  
25th %tile 0.6  
Median 0.5  
75th %tile 0.5  
95th %tile 0.4

● Total Fund

Value 0.7  
Rank 34

▲ Interim SAA Policy

Value 0.6  
Rank 85

Universe

5th %tile 0.9  
25th %tile 0.8  
Median 0.7  
75th %tile 0.6  
95th %tile 0.5

Note: The information contained herein is for comparison purposes only and is not a Total Fund benchmark. Peer universe comparisons are subject to several limitations, including: peer groups are not comprehensive; several funds are included in multiple peer groups; peer groups are constructed using gross of fee returns; and survivorship bias in that poorly performing funds may no longer report results.

Universes are constructed using gross of fee returns; therefore, ASRS rank is based on gross of fee returns.

Rankings are from highest (1) to lowest (100) in the InvestorForce Public Funds > \$1 Billion Gross Universe.

The InvestorForce Public Funds > \$1 Billion Gross Universe contains 105 observations for the period ending September 30, 2016, with total assets of \$1.8 trillion.

Composition of Interim SAA Policy can be found in the appendix.

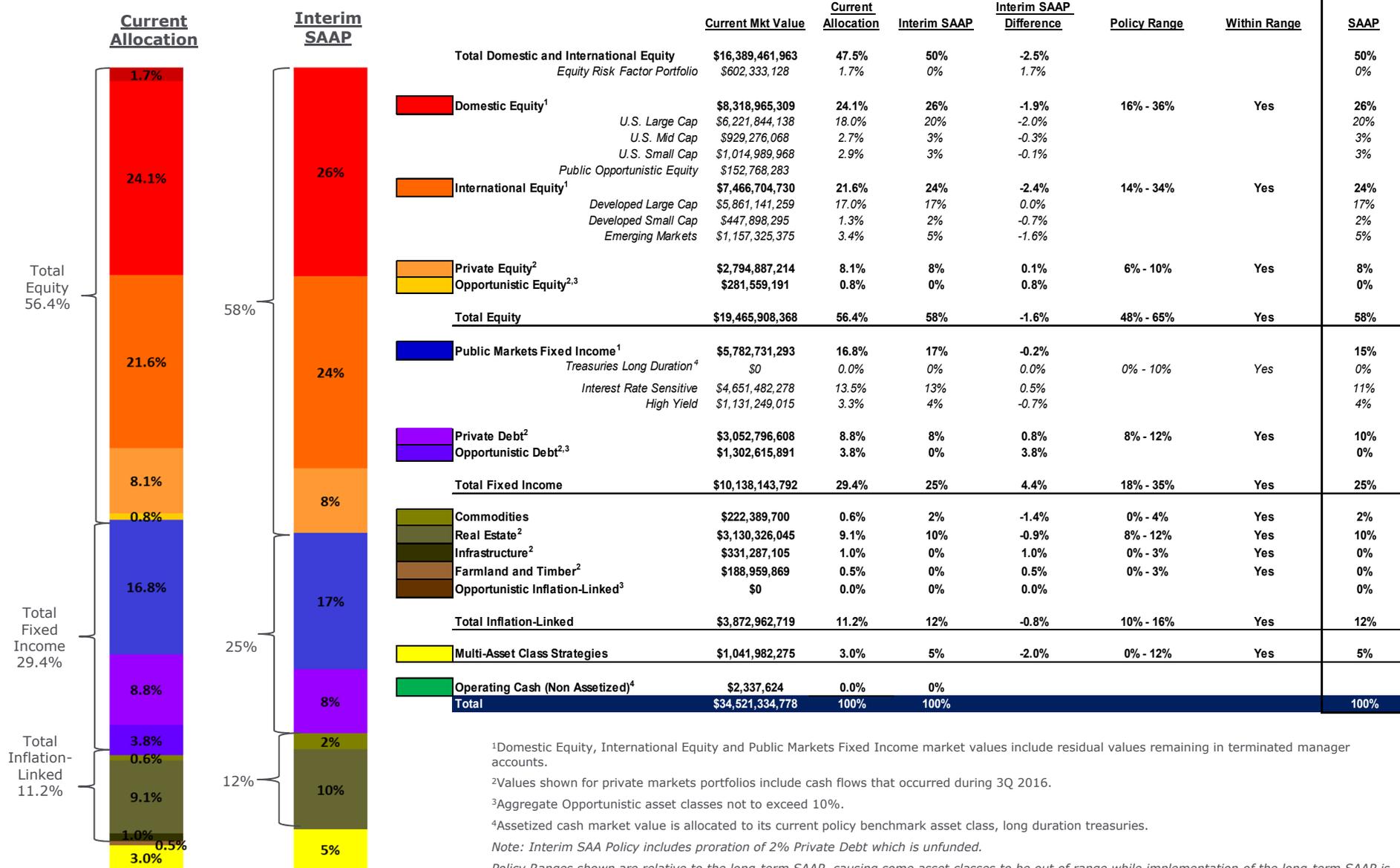
# Independent Oversight/Compliance

**Note: All of the data shown on the following pages is as of September 30, 2016 and reflects the deduction of investment manager fees, unless otherwise noted.**



# Arizona State Retirement System

## SAA Policy Compliance



	Current Mkt Value	Current Allocation	Interim SAAP	Interim SAAP Difference	Policy Range	Within Range	SAAP
<b>Total Domestic and International Equity</b>	<b>\$16,389,461,963</b>	<b>47.5%</b>	<b>50%</b>	<b>-2.5%</b>			<b>50%</b>
Equity Risk Factor Portfolio	\$602,333,128	1.7%	0%	1.7%			0%
<b>Domestic Equity<sup>1</sup></b>	<b>\$8,318,965,309</b>	<b>24.1%</b>	<b>26%</b>	<b>-1.9%</b>	<b>16% - 36%</b>	<b>Yes</b>	<b>26%</b>
U.S. Large Cap	\$6,221,844,138	18.0%	20%	-2.0%			20%
U.S. Mid Cap	\$929,276,068	2.7%	3%	-0.3%			3%
U.S. Small Cap	\$1,014,989,968	2.9%	3%	-0.1%			3%
Public Opportunistic Equity	\$152,768,283						
<b>International Equity<sup>1</sup></b>	<b>\$7,466,704,730</b>	<b>21.6%</b>	<b>24%</b>	<b>-2.4%</b>	<b>14% - 34%</b>	<b>Yes</b>	<b>24%</b>
Developed Large Cap	\$5,861,141,259	17.0%	17%	0.0%			17%
Developed Small Cap	\$447,898,295	1.3%	2%	-0.7%			2%
Emerging Markets	\$1,157,325,375	3.4%	5%	-1.6%			5%
<b>Private Equity<sup>2</sup></b>	<b>\$2,794,887,214</b>	<b>8.1%</b>	<b>8%</b>	<b>0.1%</b>	<b>6% - 10%</b>	<b>Yes</b>	<b>8%</b>
<b>Opportunistic Equity<sup>2,3</sup></b>	<b>\$281,559,191</b>	<b>0.8%</b>	<b>0%</b>	<b>0.8%</b>			<b>0%</b>
<b>Total Equity</b>	<b>\$19,465,908,368</b>	<b>56.4%</b>	<b>58%</b>	<b>-1.6%</b>	<b>48% - 65%</b>	<b>Yes</b>	<b>58%</b>
<b>Public Markets Fixed Income<sup>1</sup></b>	<b>\$5,782,731,293</b>	<b>16.8%</b>	<b>17%</b>	<b>-0.2%</b>			<b>15%</b>
Treasuries Long Duration <sup>4</sup>	\$0	0.0%	0%	0.0%	0% - 10%	Yes	0%
Interest Rate Sensitive	\$4,651,482,278	13.5%	13%	0.5%			11%
High Yield	\$1,131,249,015	3.3%	4%	-0.7%			4%
<b>Private Debt<sup>2</sup></b>	<b>\$3,052,796,608</b>	<b>8.8%</b>	<b>8%</b>	<b>0.8%</b>	<b>8% - 12%</b>	<b>Yes</b>	<b>10%</b>
<b>Opportunistic Debt<sup>2,3</sup></b>	<b>\$1,302,615,891</b>	<b>3.8%</b>	<b>0%</b>	<b>3.8%</b>			<b>0%</b>
<b>Total Fixed Income</b>	<b>\$10,138,143,792</b>	<b>29.4%</b>	<b>25%</b>	<b>4.4%</b>	<b>18% - 35%</b>	<b>Yes</b>	<b>25%</b>
<b>Commodities</b>	<b>\$222,389,700</b>	<b>0.6%</b>	<b>2%</b>	<b>-1.4%</b>	<b>0% - 4%</b>	<b>Yes</b>	<b>2%</b>
<b>Real Estate<sup>2</sup></b>	<b>\$3,130,326,045</b>	<b>9.1%</b>	<b>10%</b>	<b>-0.9%</b>	<b>8% - 12%</b>	<b>Yes</b>	<b>10%</b>
<b>Infrastructure<sup>2</sup></b>	<b>\$331,287,105</b>	<b>1.0%</b>	<b>0%</b>	<b>1.0%</b>	<b>0% - 3%</b>	<b>Yes</b>	<b>0%</b>
<b>Farmland and Timber<sup>2</sup></b>	<b>\$188,959,869</b>	<b>0.5%</b>	<b>0%</b>	<b>0.5%</b>	<b>0% - 3%</b>	<b>Yes</b>	<b>0%</b>
<b>Opportunistic Inflation-Linked<sup>3</sup></b>	<b>\$0</b>	<b>0.0%</b>	<b>0%</b>	<b>0.0%</b>			<b>0%</b>
<b>Total Inflation-Linked</b>	<b>\$3,872,962,719</b>	<b>11.2%</b>	<b>12%</b>	<b>-0.8%</b>	<b>10% - 16%</b>	<b>Yes</b>	<b>12%</b>
<b>Multi-Asset Class Strategies</b>	<b>\$1,041,982,275</b>	<b>3.0%</b>	<b>5%</b>	<b>-2.0%</b>	<b>0% - 12%</b>	<b>Yes</b>	<b>5%</b>
<b>Operating Cash (Non Assetized)<sup>4</sup></b>	<b>\$2,337,624</b>	<b>0.0%</b>	<b>0%</b>				
<b>Total</b>	<b>\$34,521,334,778</b>	<b>100%</b>	<b>100%</b>				<b>100%</b>

<sup>1</sup>Domestic Equity, International Equity and Public Markets Fixed Income market values include residual values remaining in terminated manager accounts.  
<sup>2</sup>Values shown for private markets portfolios include cash flows that occurred during 3Q 2016.  
<sup>3</sup>Aggregate Opportunistic asset classes not to exceed 10%.  
<sup>4</sup>Assetized cash market value is allocated to its current policy benchmark asset class, long duration treasuries.  
 Note: Interim SAA Policy includes proration of 2% Private Debt which is unfunded.  
 Policy Ranges shown are relative to the long-term SAAP, causing some asset classes to be out of range while implementation of the long-term SAAP is in process.  
 Market values include manager held cash.

# Arizona State Retirement System

## Asset Class Performance Summary - Public Markets

	Market Value (\$)	% of Portfolio	3 Mo (%)	Rank	YTD (%)	Rank	1 Yr (%)	Rank	3 Yrs (%)	Rank	5 Yrs (%)	Rank	10 Yrs (%)	Rank	Inception (%)	Since
<b>Total Fund</b>	<b>34,521,334,778</b>	<b>100.0</b>	<b>3.4</b>	<b>--</b>	<b>6.2</b>	<b>--</b>	<b>9.0</b>	<b>--</b>	<b>6.4</b>	<b>--</b>	<b>10.1</b>	<b>--</b>	<b>5.9</b>	<b>--</b>	<b>9.7</b>	<b>Jul-75</b>
<i>Interim SAA Policy</i>			<u>3.8</u>	--	<u>6.8</u>	--	<u>8.5</u>	--	<u>5.4</u>	--	<u>9.4</u>	--	<u>5.5</u>	--	<u>9.4</u>	<i>Jul-75</i>
Over/Under			-0.4		-0.6		0.5		1.0		0.7		0.4		0.3	
<i>Actual Benchmark</i>			3.5	--	6.5	--	8.3	--	5.8	--	9.7	--	5.5	--	--	<i>Jul-75</i>
<b>Total Domestic and International Equity<sup>1</sup></b>	<b>16,389,461,963</b>	<b>47.5</b>	<b>5.1</b>	<b>80</b>	<b>6.4</b>	<b>91</b>	<b>11.7</b>	<b>71</b>	<b>6.2</b>	<b>23</b>	<b>12.6</b>	<b>24</b>	<b>5.7</b>	<b>19</b>	<b>6.4</b>	<b>Jan-98</b>
<i>ASRS Custom Total Equity Benchmark</i>			<u>5.7</u>	63	<u>7.1</u>	51	<u>12.6</u>	37	<u>6.3</u>	21	<u>12.7</u>	18	<u>5.8</u>	15	<u>5.9</u>	<i>Jan-98</i>
Over/Under			-0.6		-0.7		-0.9		-0.1		-0.1		-0.1		0.5	
<i>InvestorForce Public DB &gt; \$1 Billion Total Equity Net Median</i>			5.8		7.1		12.0		5.3		11.9		5.3		5.9	
<b>Total Domestic Equity</b>	<b>8,318,965,309</b>	<b>24.1</b>	<b>3.8</b>	<b>93</b>	<b>9.0</b>	<b>17</b>	<b>15.5</b>	<b>10</b>	<b>10.5</b>	<b>12</b>	<b>16.5</b>	<b>11</b>	<b>7.9</b>	<b>7</b>	<b>11.1</b>	<b>Jul-75</b>
<i>ASRS Custom Domestic Equity Benchmark</i>			<u>4.3</u>	85	<u>9.0</u>	16	<u>15.8</u>	8	<u>10.7</u>	4	<u>16.7</u>	5	<u>7.7</u>	9	<u>11.2</u>	<i>Jul-75</i>
Over/Under			-0.5		0.0		-0.3		-0.2		-0.2		0.2		-0.1	
<i>InvestorForce Public DB &gt; \$1 Billion US Equity Net Median</i>			4.8		7.7		13.6		9.3		15.9		7.1		11.1	<i>Jul-75</i>
<b>Total International Equity</b>	<b>7,466,704,730</b>	<b>21.6</b>	<b>6.7</b>	<b>49</b>	<b>3.4</b>	<b>87</b>	<b>7.4</b>	<b>92</b>	<b>0.4</b>	<b>90</b>	<b>6.4</b>	<b>78</b>	<b>2.0</b>	<b>72</b>	<b>5.8</b>	<b>Apr-87</b>
<i>ASRS Custom Int'l Equity Benchmark</i>			<u>7.2</u>	32	<u>5.0</u>	77	<u>9.2</u>	73	<u>0.7</u>	76	<u>6.8</u>	60	<u>2.9</u>	26	<u>5.5</u>	<i>Apr-87</i>
Over/Under			-0.5		-1.6		-1.8		-0.3		-0.4		-0.9		0.3	
<i>InvestorForce Public DB &gt; \$1 Billion Global ex-US Equity Net Median</i>			6.7		6.5		10.6		1.3		7.0		2.3		5.8	<i>Apr-87</i>
<b>Total Public Markets Fixed Income</b>	<b>5,551,306,564</b>	<b>16.1</b>	<b>1.4</b>	<b>71</b>	<b>7.8</b>	<b>38</b>	<b>7.1</b>	<b>52</b>	<b>4.0</b>	<b>38</b>	<b>3.4</b>	<b>88</b>	<b>5.1</b>	<b>67</b>	<b>8.2</b>	<b>Jan-00</b>
<i>ASRS Custom Public Markets Fixed Income Benchmark</i>			<u>1.8</u>	68	<u>8.3</u>	24	<u>7.2</u>	41	<u>3.3</u>	81	<u>2.9</u>	99	<u>4.6</u>	88	--	<i>Jul-75</i>
Over/Under			-0.4		-0.5		-0.1		0.7		0.5		0.5			
<i>InvestorForce Public DB &gt; \$1 Billion Fixed Income Net Median</i>			2.2		7.5		7.1		3.9		4.3		5.5		8.2	<i>Jul-75</i>
<b>Total Inflation-Linked Assets</b>	<b>222,389,700</b>	<b>0.6</b>	<b>-4.0</b>	<b>99</b>	<b>7.0</b>	<b>62</b>	<b>-4.6</b>	<b>95</b>	<b>-13.4</b>	<b>89</b>	<b>-9.0</b>	<b>99</b>	<b>--</b>	<b>--</b>	<b>-5.7</b>	<b>Feb-10</b>
<i>ASRS Custom Inflation-Linked Benchmark</i>			<u>-3.9</u>	99	<u>8.9</u>	48	<u>-2.6</u>	88	<u>-12.3</u>	85	<u>-9.4</u>	99	--	--	<u>-6.6</u>	<i>Feb-10</i>
Over/Under			-0.1		-1.9		-2.0		-1.1		0.4				0.9	
<i>InvestorForce Public DB &gt; \$1 Billion Real Assets/Commodities Net Median</i>			1.3		8.2		4.9		-1.8		2.7		--		5.2	<i>Feb-10</i>
<b>Total Multi-Asset Class Strategies</b>	<b>1,041,982,275</b>	<b>3.0</b>	<b>1.2</b>	<b>95</b>	<b>-6.5</b>	<b>99</b>	<b>-5.9</b>	<b>99</b>	<b>1.0</b>	<b>99</b>	<b>6.7</b>	<b>11</b>	<b>5.5</b>	<b>1</b>	<b>6.1</b>	<b>Jan-04</b>
<i>Multi-Asset Class Strategies Custom Benchmark</i>			<u>0.1</u>	99	<u>0.2</u>	92	<u>0.2</u>	93	<u>3.9</u>	27	<u>8.6</u>	1	<u>4.8</u>	70	<u>5.6</u>	<i>Jan-04</i>
Over/Under			1.1		-6.7		-6.1		-2.9		-1.9		0.7		0.5	
<i>InvestorForce Public DB &gt; \$1 Billion Global Tactical Net Median</i>			2.8		8.9		9.4		3.3		5.8		5.1		6.1	<i>Jan-04</i>
<b>Operating Cash (Assetized)</b>	<b>233,758,781</b>	<b>0.7</b>	<b>-1.6</b>	<b>--</b>	<b>0.5</b>	<b>--</b>	<b>-1.3</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>-1.3</b>	<b>Feb-15</b>
<i>ASRS Cash Assetization Custom Benchmark</i>			<u>-0.9</u>	--	<u>1.1</u>	--	<u>-2.3</u>	--	--	--	--	--	--	--	<u>-4.5</u>	<i>Feb-15</i>
Over/Under			-0.7		-0.6		1.0		--		--		--		3.2	

<sup>1</sup>Performance of ASRS Total Domestic and International Equity includes the performance of the ASRS Domestic and International Equity asset classes and the Equity Risk Factor Portfolio with an inception date of 6/1/2013. NEPC began calculating Total Domestic and International Equity performance in January 2009. Monthly performance data from January 1998 - December 2008 was provided by State Street. Note: Performance, ranks and medians are based on net of fee performance data. Rankings are from highest (1) to lowest (100) in the eVestment Universe. Universe shown for Total Public Markets Fixed Income includes all U.S. fixed income strategies and does not accurately represent the exposures of the ASRS Public Markets Fixed Income allocation, which has included allocations ranging from 10% - 25% to emerging markets debt historically. Composition of Interim SAA Policy and ASRS Custom Asset Class Benchmarks can be found in the appendix.

# Arizona State Retirement System

## Asset Class Performance Summary - Private Markets

	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	Inception (%)	Since
<b>Total Fund</b>	<b>34,521,334,778</b>	<b>100.0</b>	<b>3.4</b>	<b>9.0</b>	<b>6.4</b>	<b>10.1</b>	<b>9.7</b>	<b>Jul-75</b>
<i>Interim SAA Policy</i>			<u>3.8</u>	<u>8.5</u>	<u>5.4</u>	<u>9.4</u>	<u>9.4</u>	<i>Jul-75</i>
Over/Under			-0.4	0.5	1.0	0.7	0.3	
<i>Actual Benchmark</i>			3.5	8.3	5.8	9.7	--	<i>Jul-75</i>
<b>Total Private Equity</b>	<b>2,830,301,121</b>	<b>8.2</b>	<b>3.7</b>	<b>5.8</b>	<b>10.6</b>	<b>11.5</b>	<b>11.0</b>	<b>Oct-07</b>
<i>Russell 2000 1 QTR Lagged</i>			<u>3.4</u>	<u>-7.8</u>	<u>4.9</u>	<u>7.4</u>	<u>9.1</u>	<i>Oct-07</i>
Over/Under			0.3	13.6	5.7	4.1	1.9	
<b>Total Opportunistic Equity<sup>1</sup></b>	<b>317,087,387</b>	<b>0.9</b>	<b>3.6</b>	<b>14.9</b>	<b>21.9</b>	<b>--</b>	<b>23.1</b>	<b>Apr-11</b>
<b>Total Private Debt</b>	<b>2,867,198,636</b>	<b>8.3</b>	<b>2.7</b>	<b>9.0</b>	<b>10.1</b>	<b>--</b>	<b>10.7</b>	<b>Jul-12</b>
<i>S&amp;P/LSTA Leveraged Loan Index + 250 bps 1 QTR Lagged</i>			<u>3.5</u>	<u>4.3</u>	<u>5.2</u>	<u>--</u>	<u>5.4</u>	<i>Jul-12</i>
Over/Under			-0.8	4.7	4.9	--	5.3	
<b>Total Opportunistic Debt<sup>1</sup></b>	<b>1,172,649,946</b>	<b>3.4</b>	<b>2.1</b>	<b>-4.2</b>	<b>3.4</b>	<b>4.9</b>	<b>8.9</b>	<b>Jan-08</b>
<b>Total Real Estate</b>	<b>3,364,067,063</b>	<b>9.7</b>	<b>1.8</b>	<b>13.0</b>	<b>13.2</b>	<b>12.7</b>	<b>8.0</b>	<b>Oct-05</b>
<i>NCREIF ODCE 1 QTR Lagged (net)</i>			<u>2.0</u>	<u>12.3</u>	<u>12.5</u>	<u>12.0</u>	<u>7.3</u>	<i>Oct-05</i>
Over/Under			-0.2	0.7	0.7	0.7	0.7	
<b>Total Farmland and Timber</b>	<b>188,959,869</b>	<b>0.5</b>	<b>0.5</b>	<b>4.5</b>	<b>--</b>	<b>--</b>	<b>3.8</b>	<b>Jul-13</b>
<i>CPI ex-Food and Energy + 350 bps 1 QTR Lagged</i>			<u>1.4</u>	<u>5.8</u>	<u>--</u>	<u>--</u>	<u>5.7</u>	<i>Jul-13</i>
Over/Under			-0.9	-1.3	--	--	-1.9	
<b>Total Infrastructure</b>	<b>331,287,105</b>	<b>1.0</b>	<b>1.8</b>	<b>7.4</b>	<b>--</b>	<b>--</b>	<b>6.5</b>	<b>Dec-14</b>
<i>CPI ex-Food and Energy + 350 bps 1 QTR Lagged</i>			<u>1.4</u>	<u>5.8</u>	<u>--</u>	<u>--</u>	<u>5.6</u>	<i>Dec-14</i>
Over/Under			0.4	1.6	--	--	0.9	

<sup>1</sup>Net absolute rate of return expectations range from 10-14% per annum.

Note: Performance in private markets asset classes is based on net of fee dollar-weighted performance data.

Due to the drawdown nature of private markets portfolios in which the investment managers call capital over time, dollar-weighted performance, or internal rate of return (IRR), is a more appropriate measure of the performance of ASRS private markets portfolios.

Performance of private markets portfolios and corresponding benchmarks is reported on a one quarter lag. Performance shown as of June 30, 2016. Performance data and market values provided by State Street.

Prior to 3Q 2012, performance of the Total Private Debt and Total Opportunistic Debt asset classes was reported in aggregate. Effective 6/30/2012, the Fund's allocations to Private Debt and Opportunistic Debt were separated and will be reported separately going forward.

Composition of Interim SAA Policy can be found in the appendix.

# Arizona State Retirement System

## Public Market Asset Class Analysis

3 Years Ending September 30, 2016

	% of Tot	Anlzd Ret	Rank	Anlzd Std Dev	Rank	Tracking Error	Rank	Info Ratio	Rank	Anlzd AJ	Rank	Beta	Sharpe Ratio
Total Fund	100.0%	6.4%	21	6.4%	57	1.4%	73	0.7	5	1.2%	11	1.0	1.0
Interim SAA Policy	--	5.4%	57	6.5%	58	--	--	--	--	--	36	--	0.8
Total Domestic and International Equity	47.5%	6.2%	23	11.0%	40	0.6%	1	-0.2	69	0.1%	57	1.0	0.6
ASRS Custom Total Equity Benchmark	--	6.3%	21	11.3%	92	--	--	--	--	--	59	--	0.5
Total Domestic Equity	24.1%	10.5%	12	10.7%	15	0.5%	6	-0.4	25	0.0%	13	1.0	1.0
ASRS Custom Domestic Equity Benchmark	--	10.7%	4	10.9%	28	--	--	--	--	--	13	--	1.0
Total International Equity	21.6%	0.4%	90	12.3%	82	0.9%	3	-0.3	98	-0.3%	98	1.0	0.0
ASRS Custom Int'l Equity Benchmark	--	0.7%	76	12.6%	89	--	--	--	--	--	87	--	0.0
Total Public Markets Fixed Income	16.1%	4.0%	38	3.0%	59	0.9%	20	0.9	1	1.1%	35	0.9	1.3
ASRS Custom Public Markets Fixed Income Benchmark	--	3.3%	81	3.2%	62	--	--	--	--	--	82	--	1.0
Total Inflation-Linked Assets	0.6%	-13.4%	89	14.2%	89	2.3%	15	-0.4	72	-1.2%	86	1.0	-0.9
ASRS Custom Inflation-Linked Benchmark	--	-12.3%	85	14.2%	89	--	--	--	--	--	62	--	-0.9
Total Multi-Asset Class Strategies	3.0%	1.0%	99	7.4%	75	4.7%	56	-0.6	78	-3.8%	89	1.2	0.1
Multi-Asset Class Strategies Custom Benchmark	--	3.9%	27	4.7%	6	--	--	--	--	--	22	--	0.8

Note: Performance is reported net of fees.

Underlying composites do not add up to 100% because the chart excludes private market composites.

Ranks for statistics shown above are based on the respective universe against which the portfolio is ranked on the asset class performance summary that precedes this section of the analysis.

Rankings are from highest (1) to lowest (100) in the eVestment Universe.

Composition of Interim SAA Policy and ASRS Custom Benchmarks can be found in the appendix.

# Arizona State Retirement System

## Public Market Asset Class Analysis

5 Years Ending September 30, 2016

	% of Tot	Anlzd Ret	Rank	Anlzd Std Dev	Rank	Tracking Error	Rank	Info Ratio	Rank	Anlzd AJ	Rank	Beta	Sharpe Ratio
Total Fund	100.0%	10.1%	14	7.3%	67	1.3%	69	0.5	9	0.8%	15	1.0	1.4
Interim SAA Policy	--	9.4%	35	7.3%	67	--	--	--	--	--	51	--	1.3
Total Domestic and International Equity	47.5%	12.6%	24	11.8%	41	0.6%	1	-0.2	72	0.1%	86	1.0	1.1
ASRS Custom Total Equity Benchmark	--	12.7%	18	12.0%	59	--	--	--	--	--	88	--	1.1
Total Domestic Equity	24.1%	16.5%	11	11.4%	20	0.5%	6	-0.3	41	0.0%	17	1.0	1.4
ASRS Custom Domestic Equity Benchmark	--	16.7%	5	11.5%	24	--	--	--	--	--	17	--	1.4
Total International Equity	21.6%	6.4%	78	13.9%	73	0.8%	3	-0.5	99	-0.2%	89	1.0	0.5
ASRS Custom Int'l Equity Benchmark	--	6.8%	60	14.2%	91	--	--	--	--	--	87	--	0.5
Total Public Markets Fixed Income	16.1%	3.4%	88	3.3%	63	0.7%	13	0.6	42	0.5%	75	1.0	1.0
ASRS Custom Public Markets Fixed Income Benchmark	--	2.9%	99	3.3%	51	--	--	--	--	--	96	--	0.9
Total Inflation-Linked Assets	0.6%	-9.0%	99	13.9%	99	2.4%	21	0.2	65	0.3%	61	1.0	-0.7
ASRS Custom Inflation-Linked Benchmark	--	-9.4%	99	13.8%	99	--	--	--	--	--	71	--	-0.7
Total Multi-Asset Class Strategies	3.0%	6.7%	11	8.3%	99	3.7%	40	-0.5	71	-2.8%	99	1.1	0.8
Multi-Asset Class Strategies Custom Benchmark	--	8.6%	1	6.8%	9	--	--	--	--	--	27	--	1.3

Note: Performance is reported net of fees.

Underlying composites do not add up to 100% because the chart excludes private market composites.

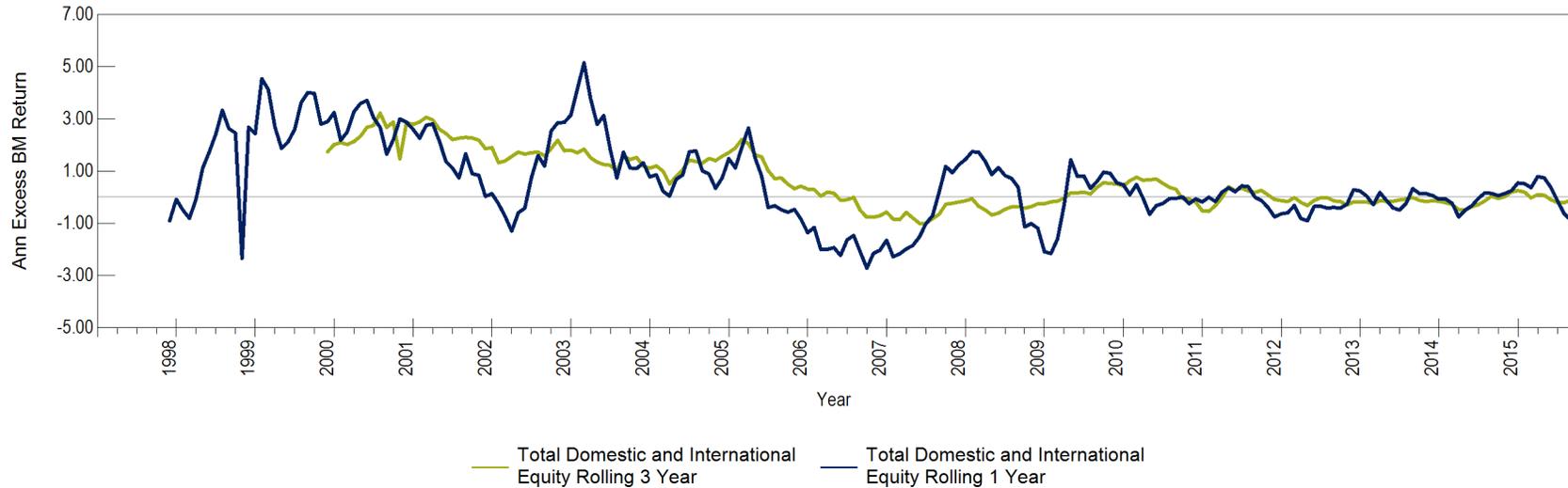
Ranks for statistics shown above are based on the respective universe against which the portfolio is ranked on the asset class performance summary that precedes this section of the analysis.

Rankings are from highest (1) to lowest (100) in the eVestment Universe.

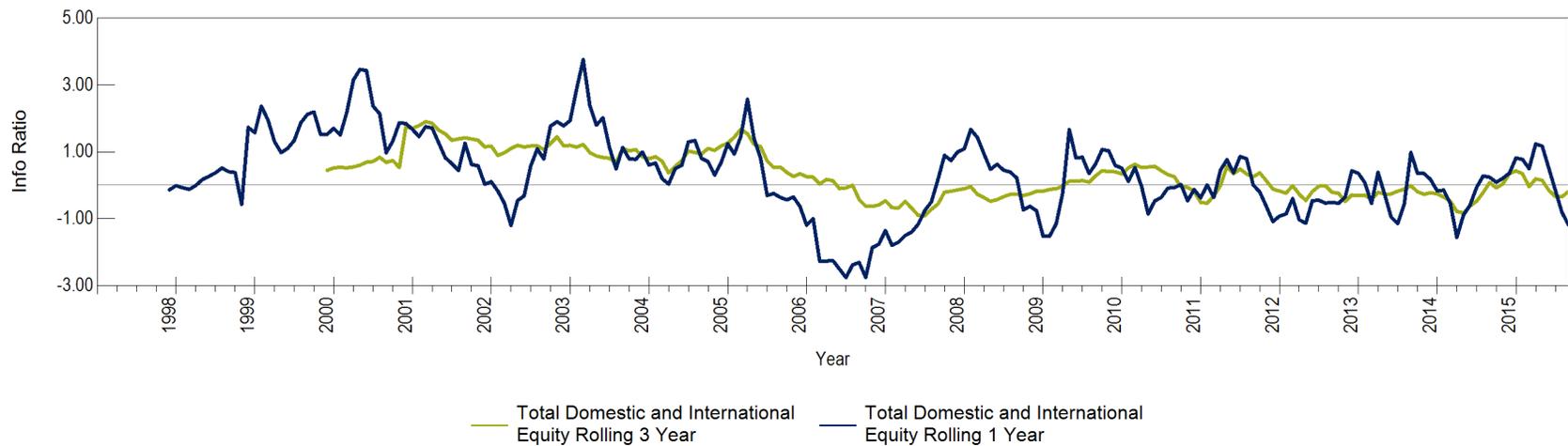
Composition of Interim SAA Policy and ASRS Custom Benchmarks can be found in the appendix.

# Asset Class Analysis - Total Domestic and International Equity

Rolling Annual Excess Benchmark Return

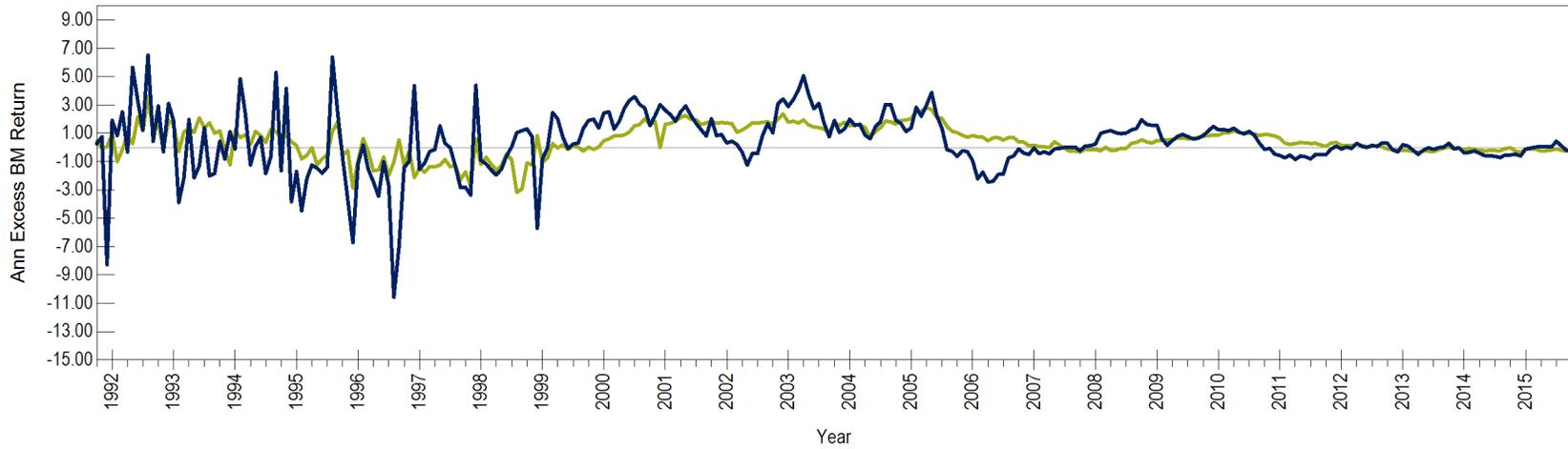


Rolling Information Ratio



Asset Class Analysis - Total Domestic Equity

Rolling Annual Excess Benchmark Return



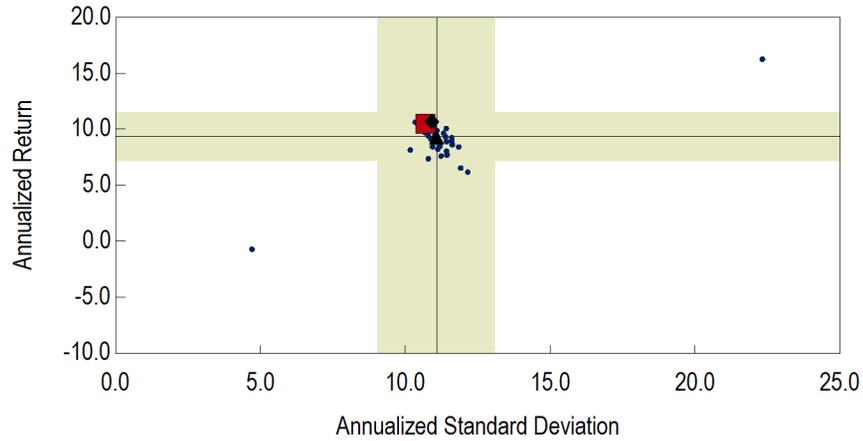
— Total Domestic Equity Rolling 3 Year      — Total Domestic Equity Rolling 1 Year

InvestorForce Public DB > \$1 Billion US Equity Net Accounts



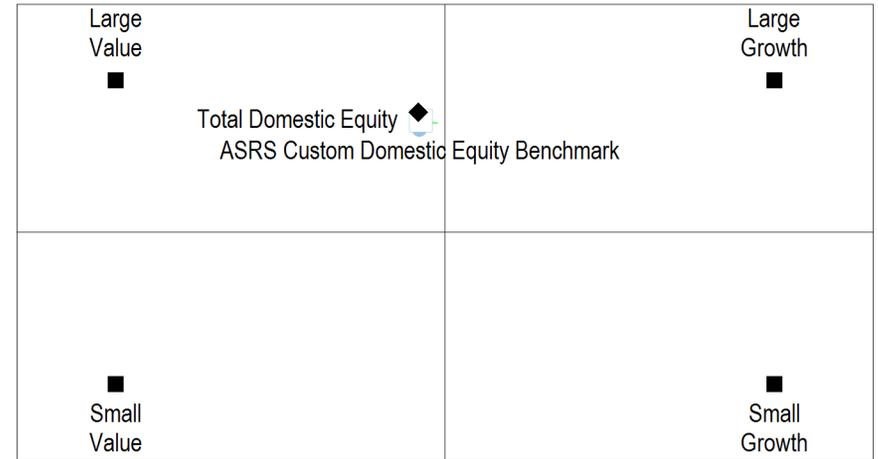
Asset Class Analysis - Total Domestic Equity

3 Year Risk Return

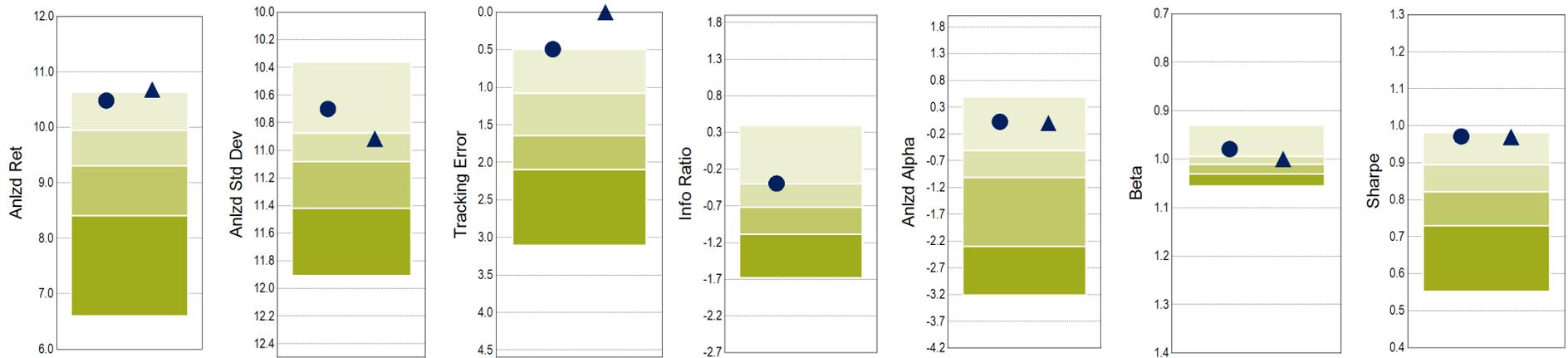


- Total Domestic Equity
- ◆ ASRS Custom Domestic Equity Benchmark
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB > \$1 Billion US Equity Net

3 Year Style Map

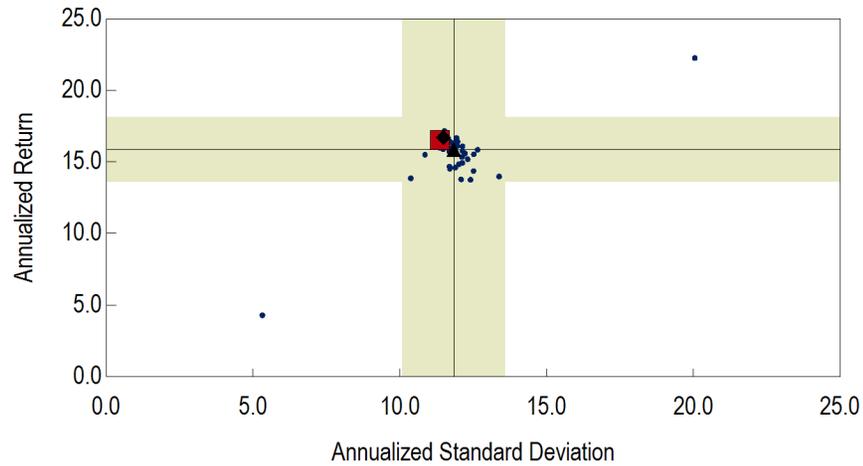


- First Rolling Period
- ◆ Last Rolling Period



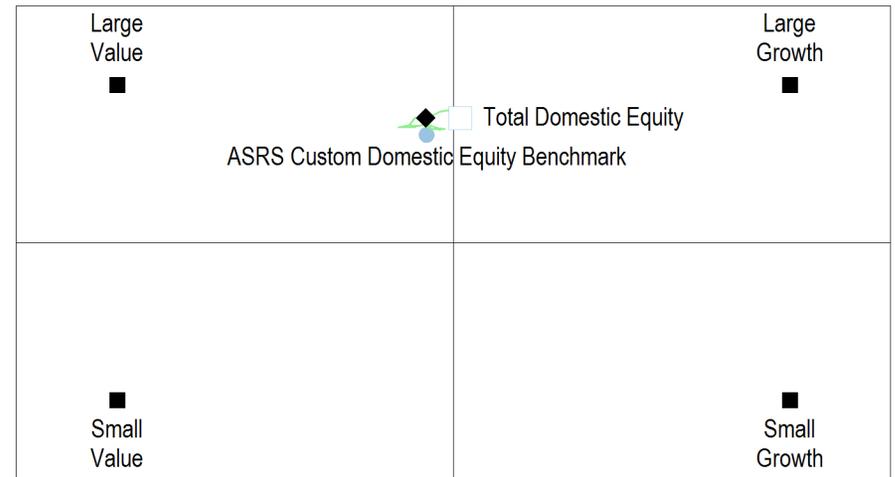
- Total Domestic Equity
- ▲ ASRS Custom Domestic Equity Benchmark
- 5th to 25th Percentile
- 25th to Median
- Median to 75th Percentile
- 75th to 95th Percentile

5 Year Risk Return

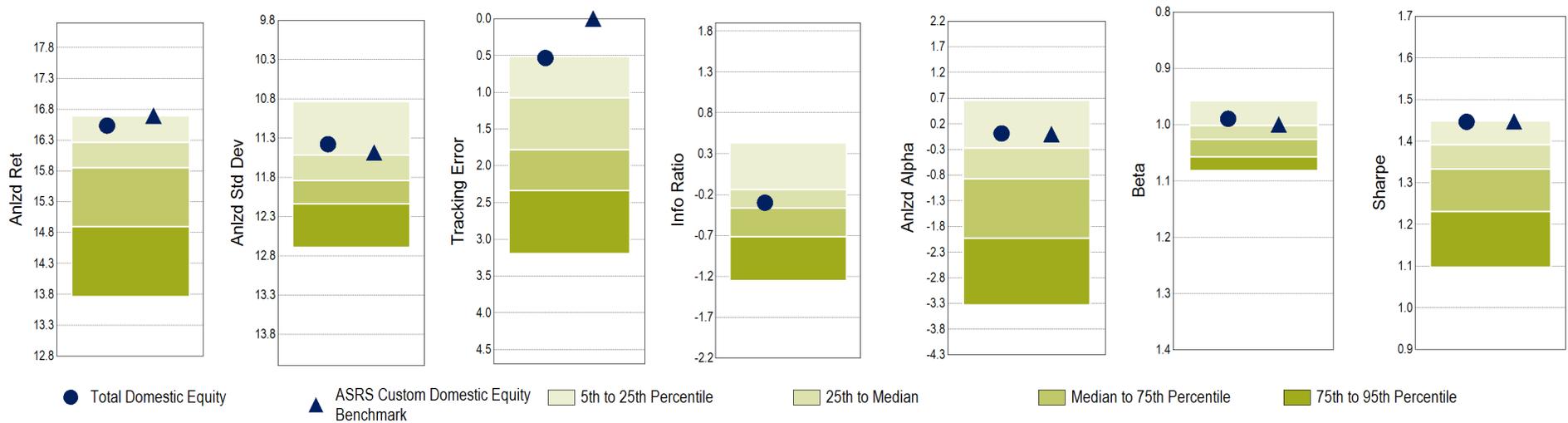


- Total Domestic Equity
- ◆ ASRS Custom Domestic Equity Benchmark
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB > \$1 Billion US Equity Net

5 Year Style Map



- First Rolling Period
- ◆ Last Rolling Period



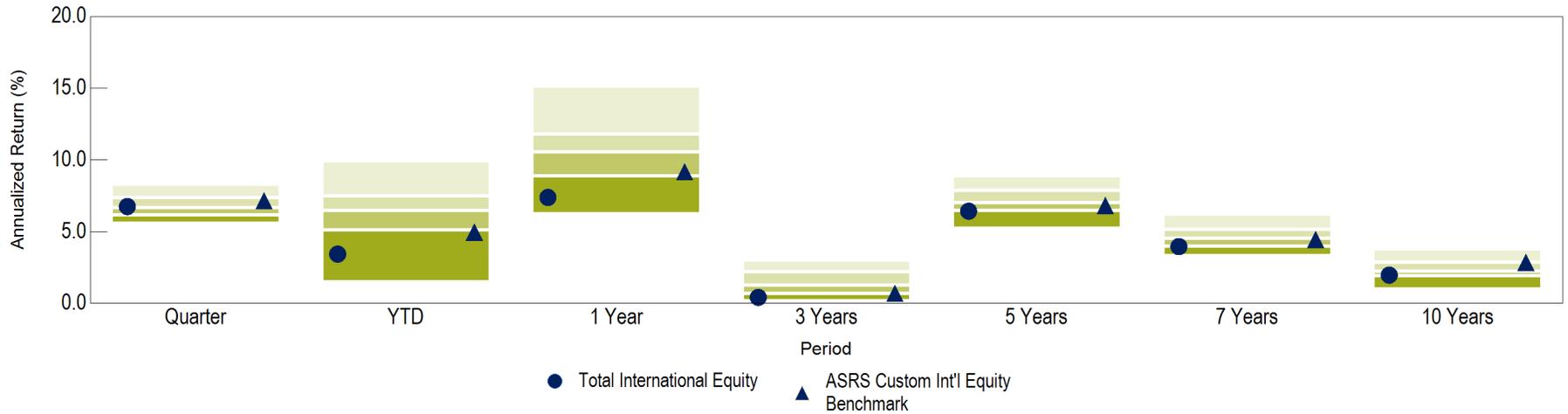
- Total Domestic Equity
- ▲ ASRS Custom Domestic Equity Benchmark
- 5th to 25th Percentile
- 25th to Median
- Median to 75th Percentile
- 75th to 95th Percentile

Asset Class Analysis - Total International Equity

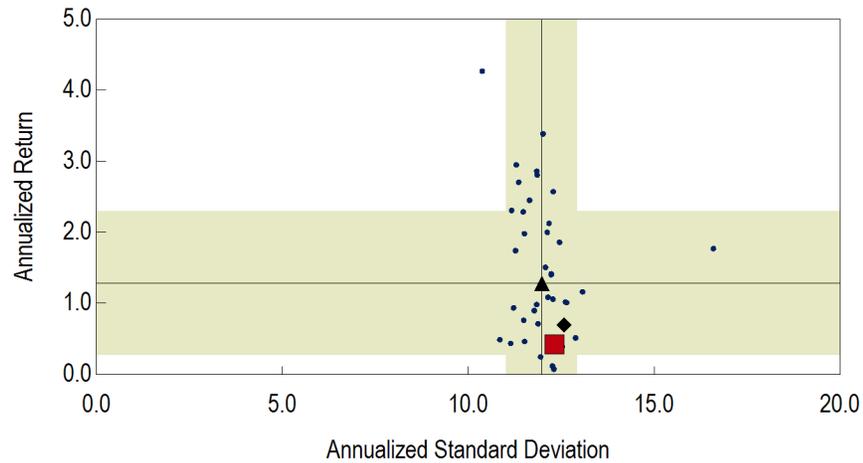
Rolling Annual Excess Benchmark Return



InvestorForce Public DB > \$1 Billion Global ex-US Equity Net Accounts

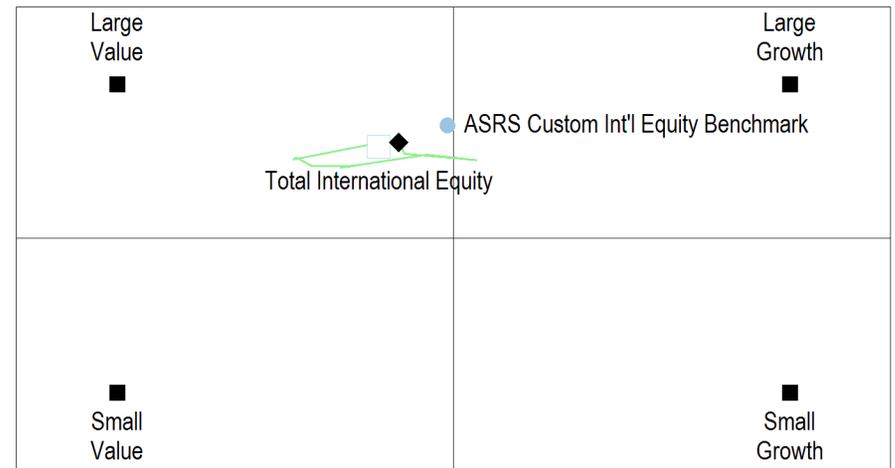


3 Year Risk Return

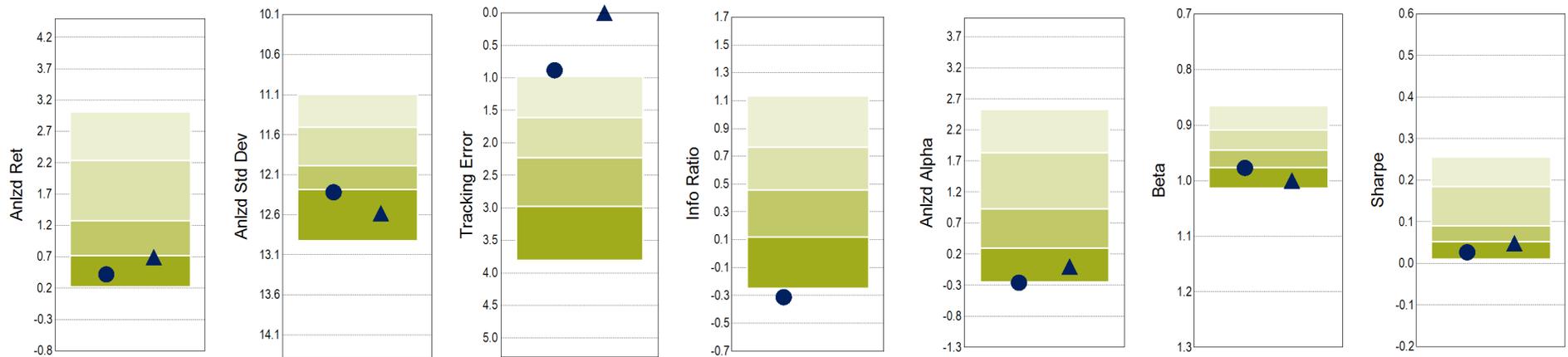


- Total International Equity
- ◆ ASRS Custom Int'l Equity Benchmark
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB > \$1 Billion Global ex-US Equity Net

3 Year Style Map

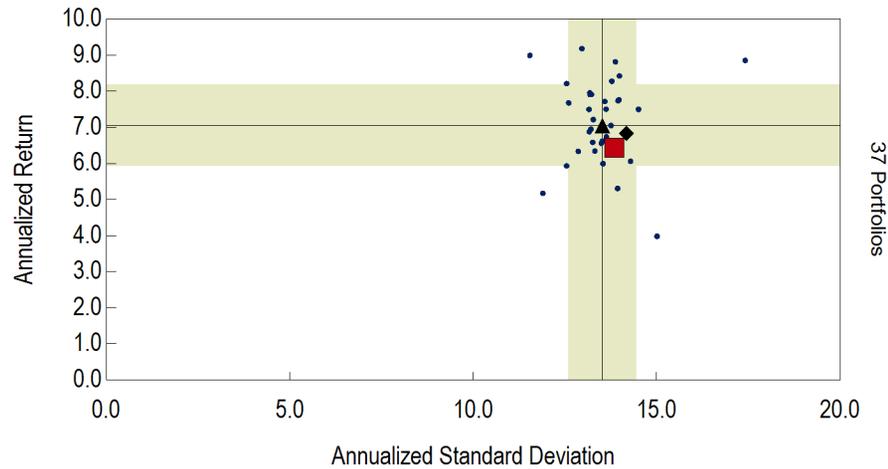


- First Rolling Period
- ◆ Last Rolling Period



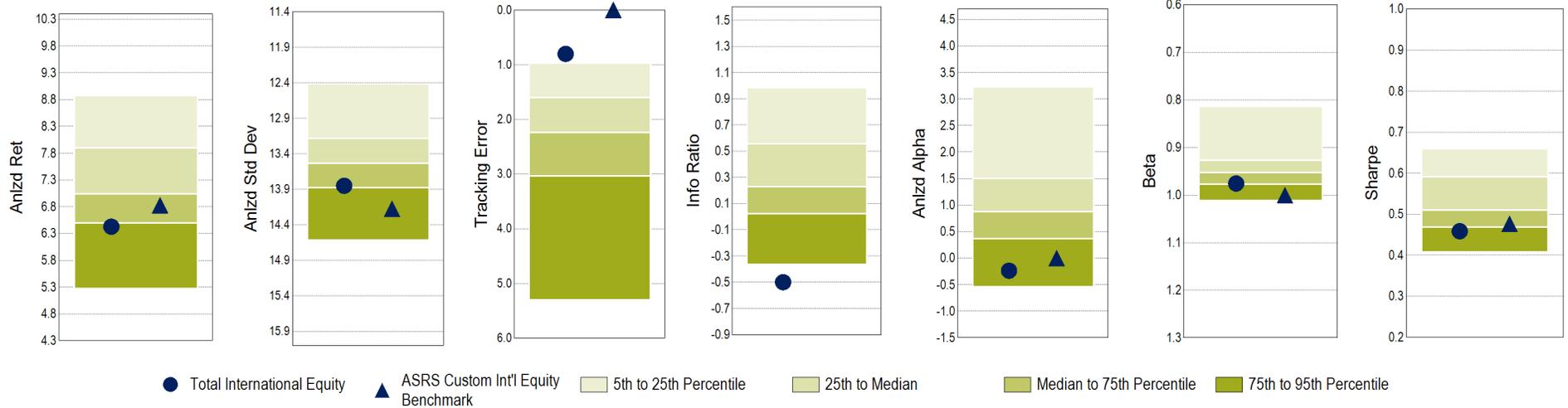
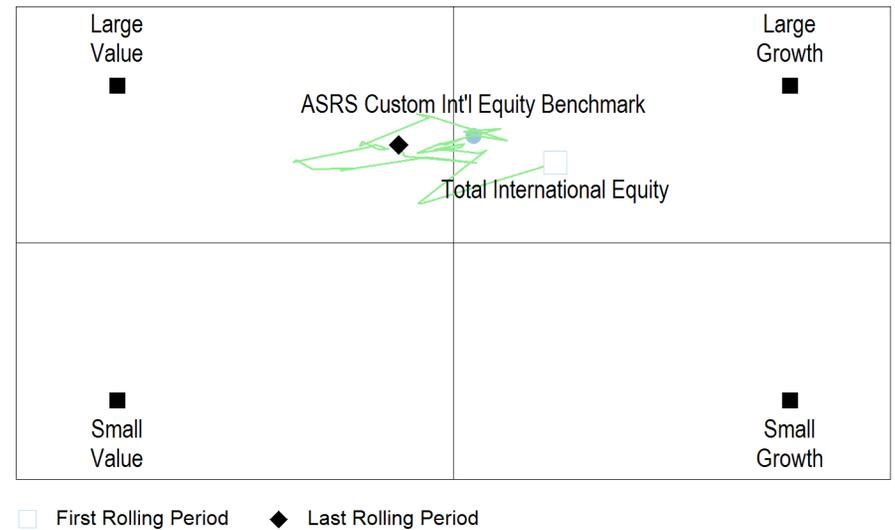
- Total International Equity
- ▲ ASRS Custom Int'l Equity Benchmark
- 5th to 25th Percentile
- 25th to Median
- Median to 75th Percentile
- 75th to 95th Percentile

5 Year Risk Return



- Total International Equity
- ◆ ASRS Custom Int'l Equity Benchmark
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB > \$1 Billion Global ex-US Equity Net

5 Year Style Map

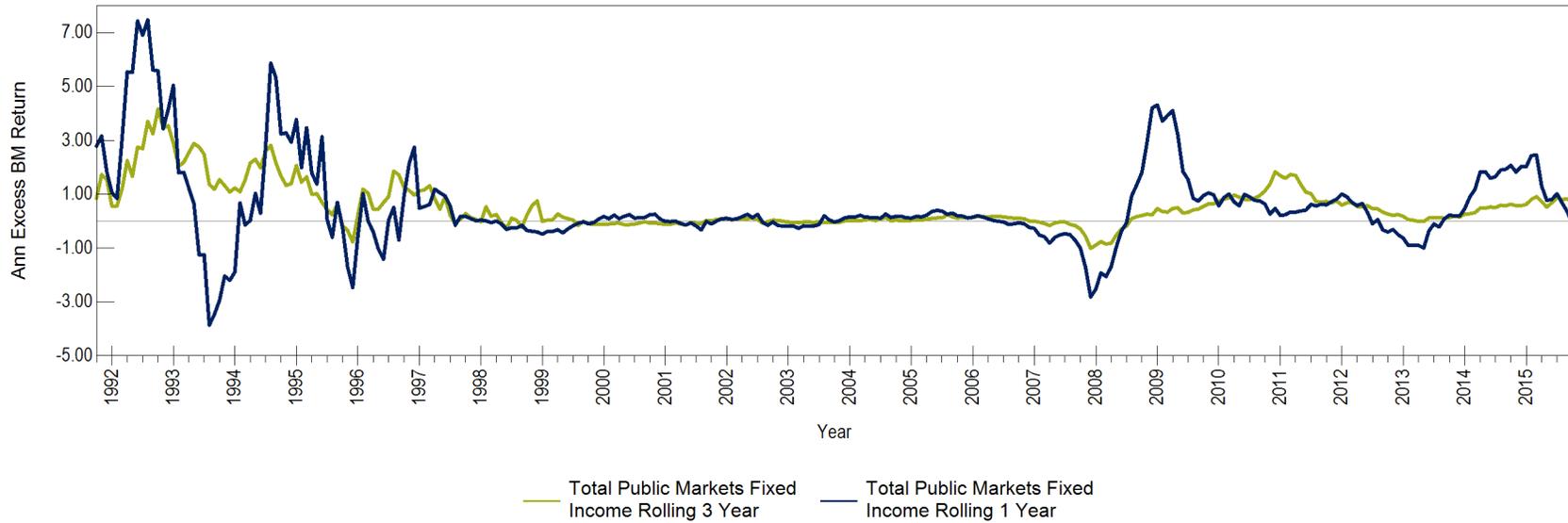


- Total International Equity
- ▲ ASRS Custom Int'l Equity Benchmark
- 5th to 25th Percentile
- 25th to Median
- Median to 75th Percentile
- 75th to 95th Percentile

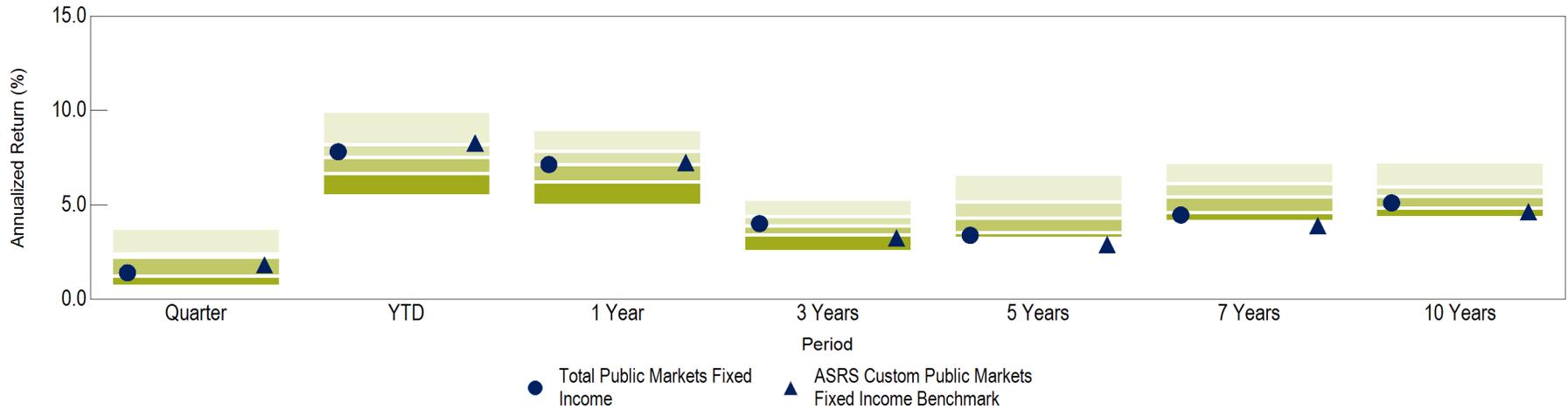


Asset Class Analysis - Total Public Markets Fixed Income

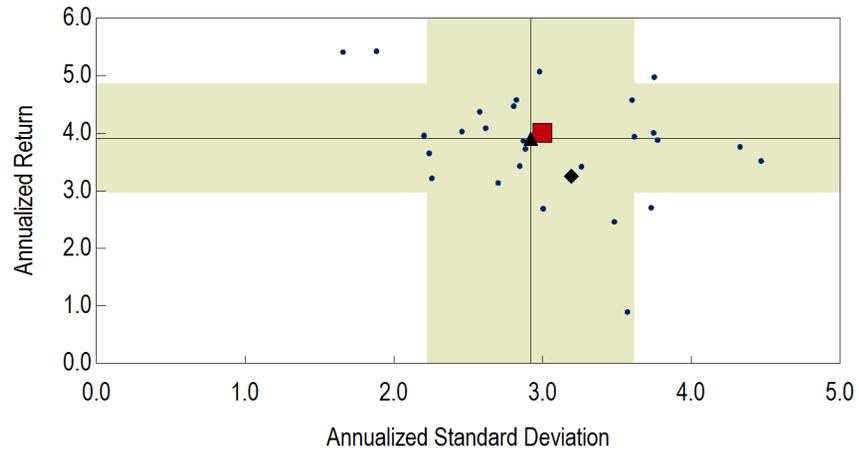
Rolling Annual Excess Benchmark Return



InvestorForce Public DB > \$1 Billion Fixed Income Net Accounts

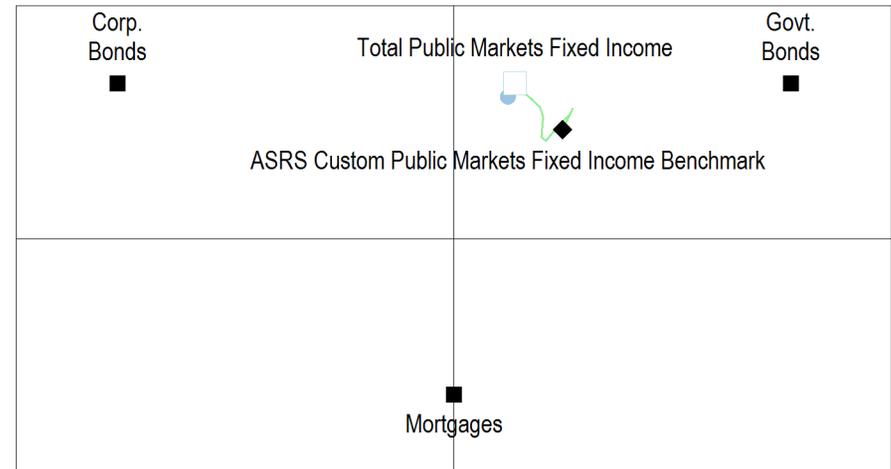


3 Year Risk Return

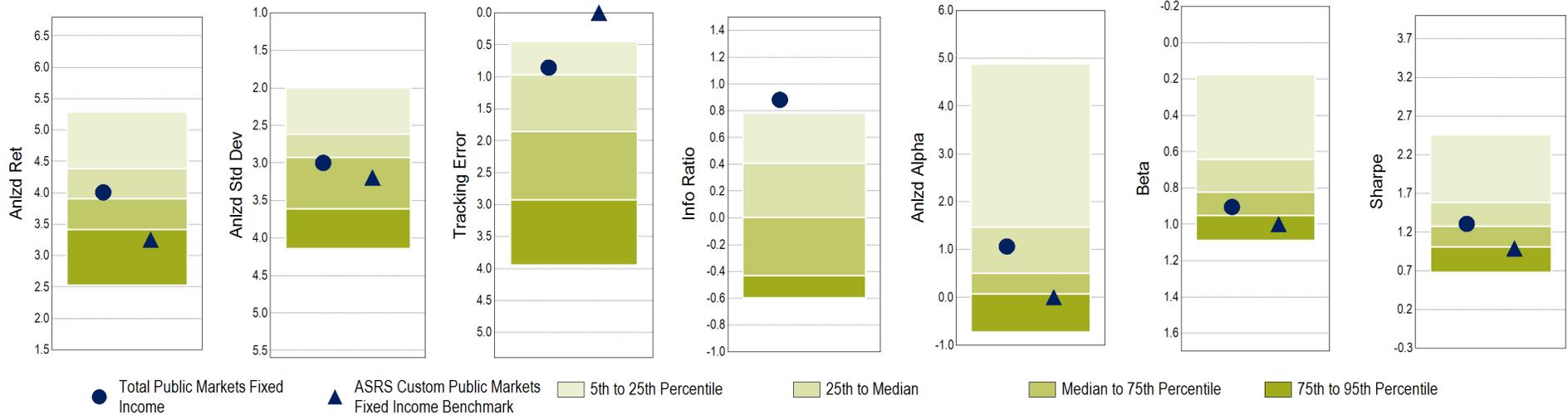


- Total Public Markets Fixed Income
- ◆ ASRS Custom Public Markets Fixed Income Benchmark
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB > \$1 Billion Fixed Income Net

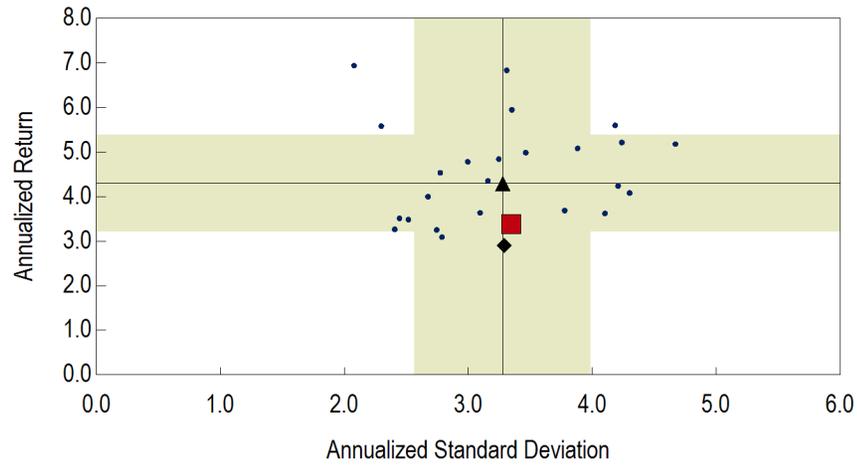
3 Year Style Map



- First Rolling Period
- ◆ Last Rolling Period

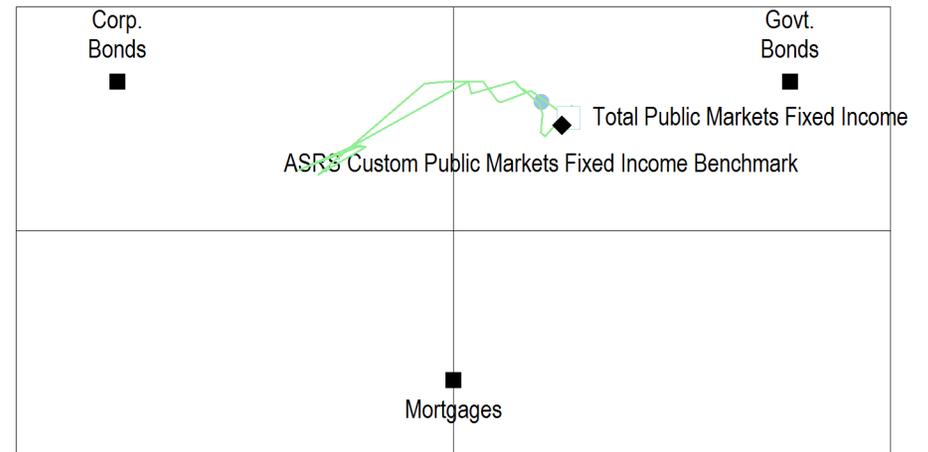


5 Year Risk Return

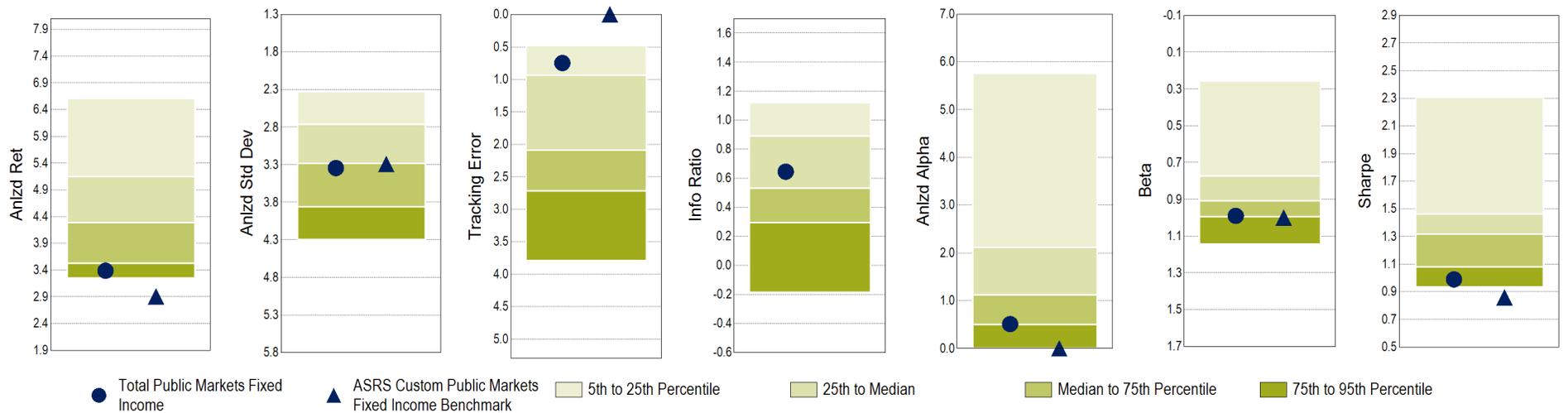


- Total Public Markets Fixed Income
- ◆ ASRS Custom Public Markets Fixed Income Benchmark
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB > \$1 Billion Fixed Income Net

5 Year Style Map

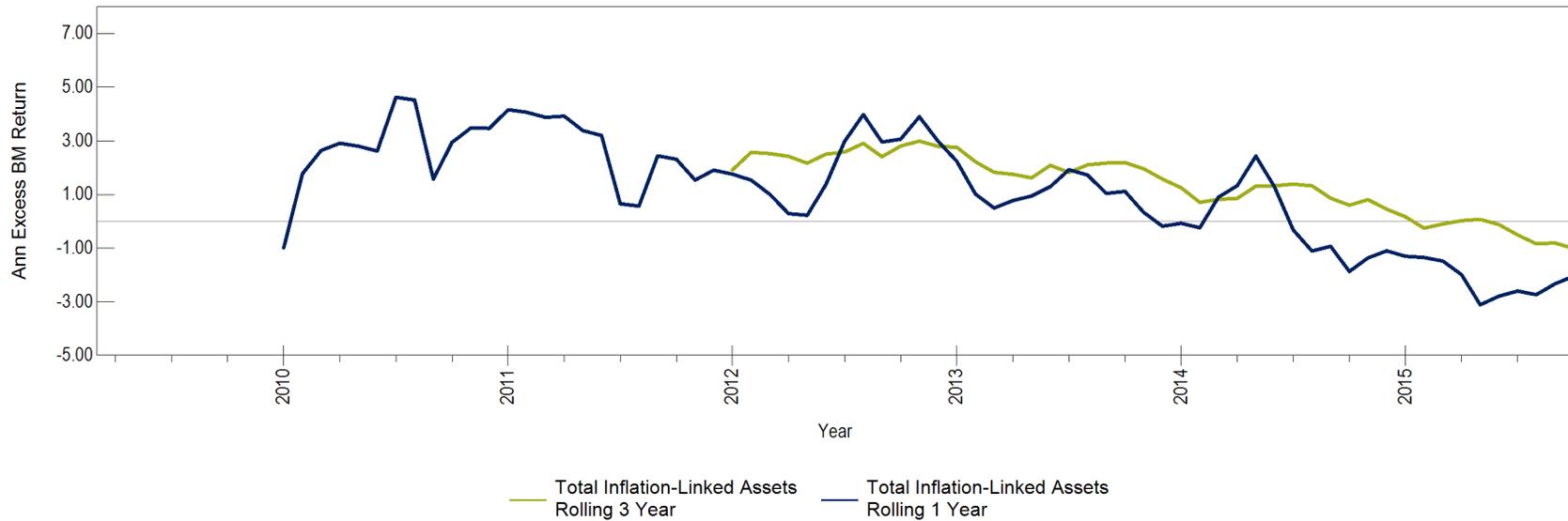


- First Rolling Period
- ◆ Last Rolling Period

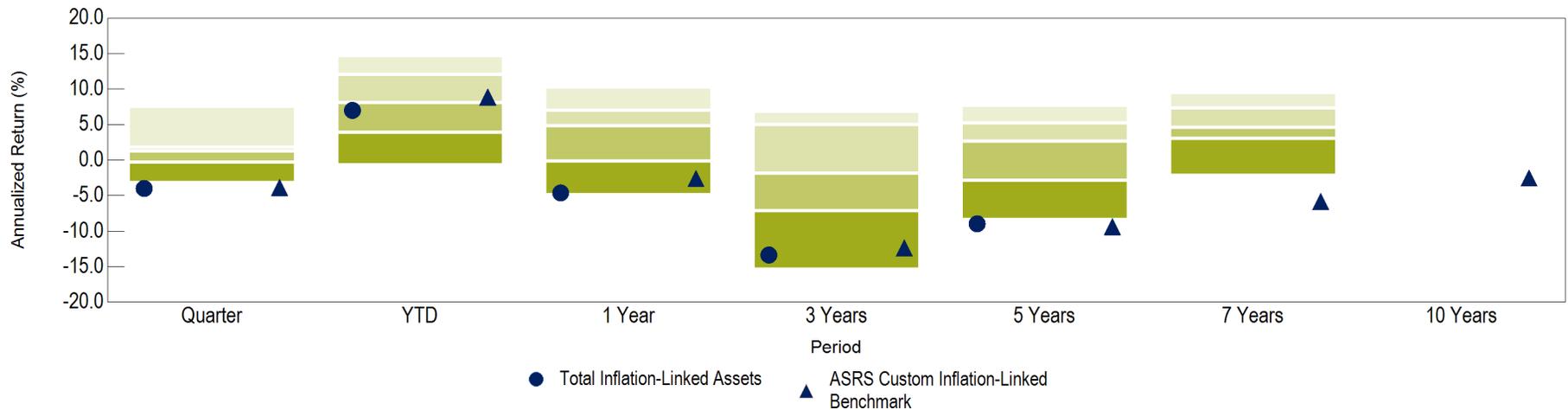


Asset Class Analysis - Total Inflation-Linked Assets

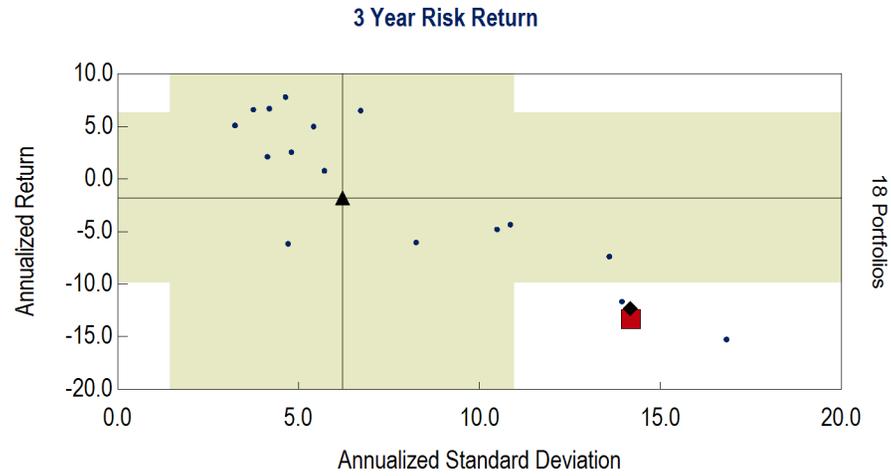
Rolling Annual Excess Benchmark Return



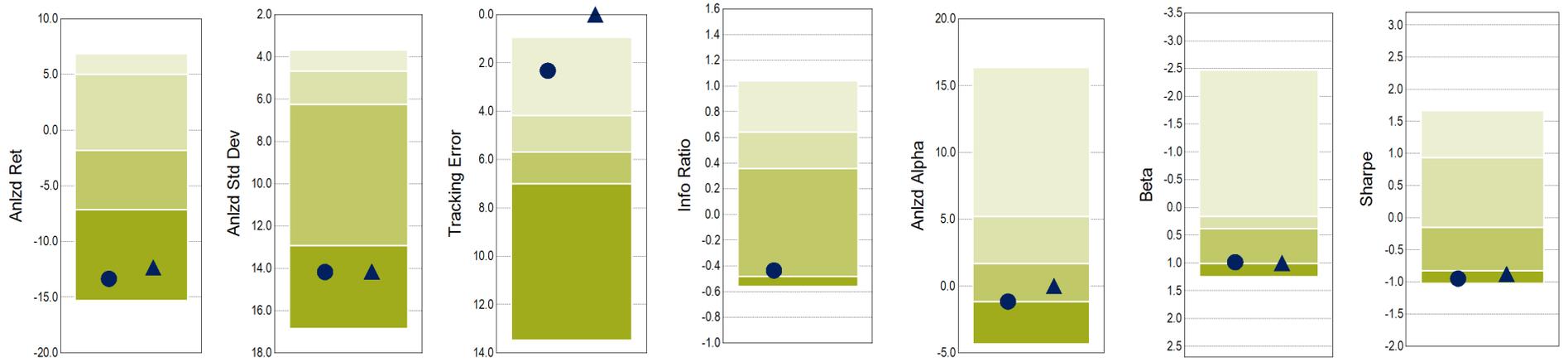
InvestorForce Public DB > \$1 Billion Real Assets/Commodities Net Accounts



Asset Class Analysis - Total Inflation-Linked Assets

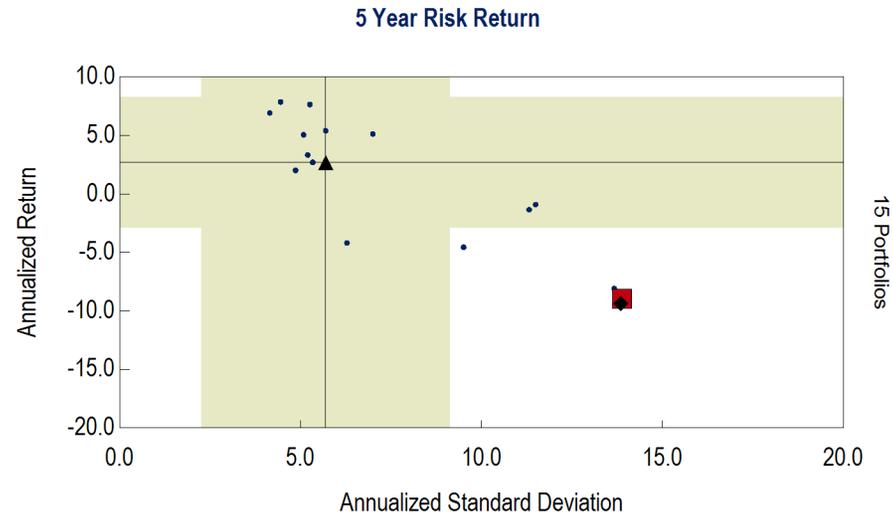


- Total Inflation-Linked Assets
- ◆ ASRS Custom Inflation-Linked Benchmark
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB > \$1 Billion Real Assets/Commodities Net

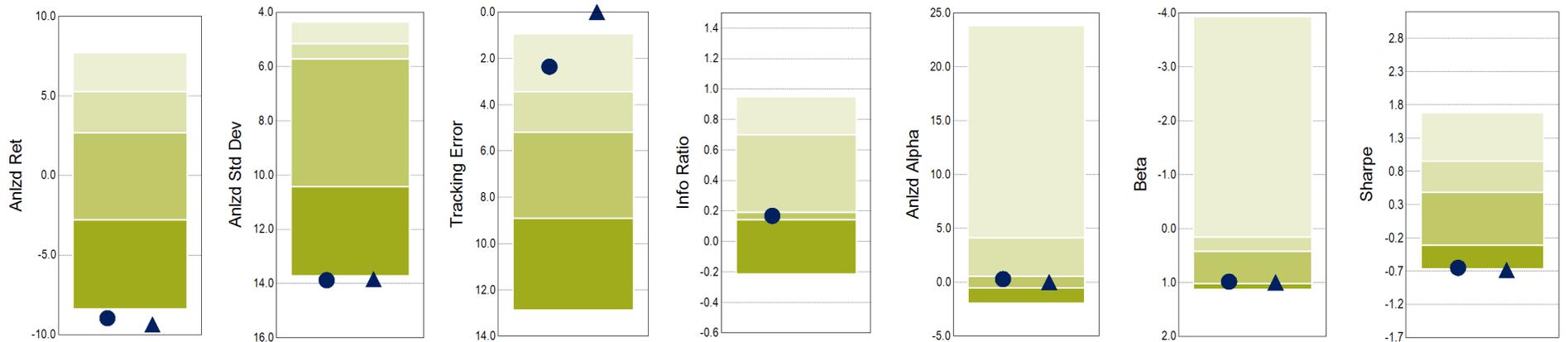


- Total Inflation-Linked Assets
- ▲ ASRS Custom Inflation-Linked Benchmark
- 5th to 25th Percentile
- 25th to Median
- Median to 75th Percentile
- 75th to 95th Percentile

Asset Class Analysis - Total Inflation-Linked Assets



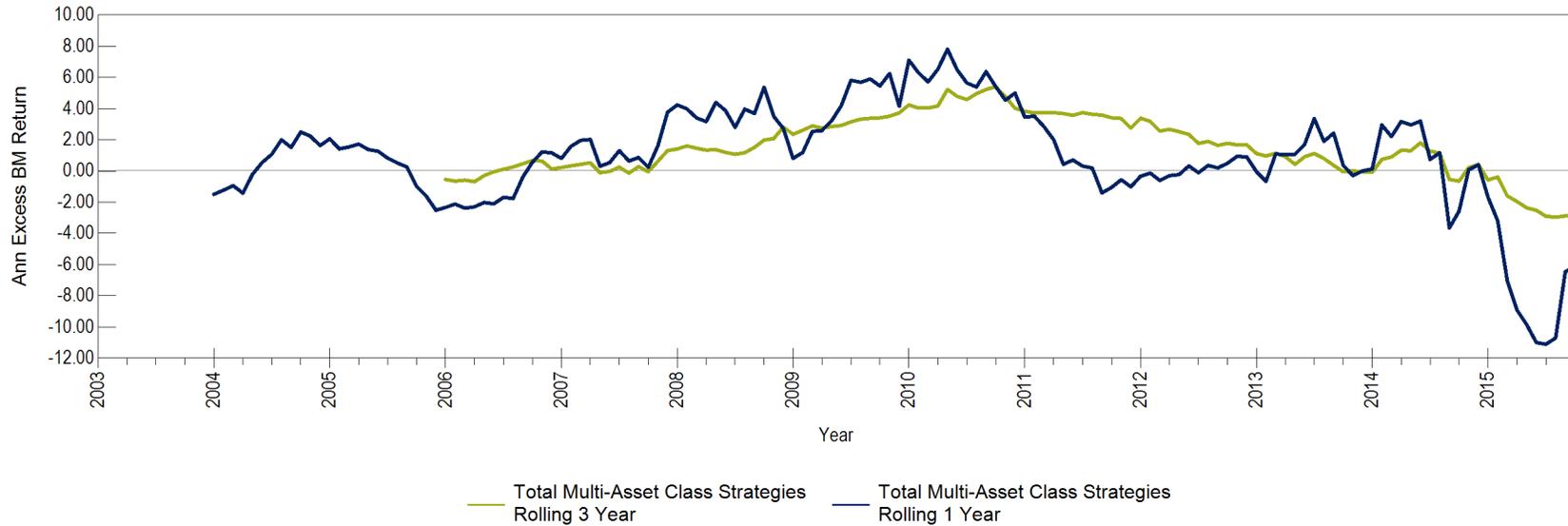
- Total Inflation-Linked Assets
- ◆ ASRS Custom Inflation-Linked Benchmark
- ▲ Universe Median
- 68% Confidence Interval
- InvestorForce Public DB > \$1 Billion Real Assets/Commodities Net



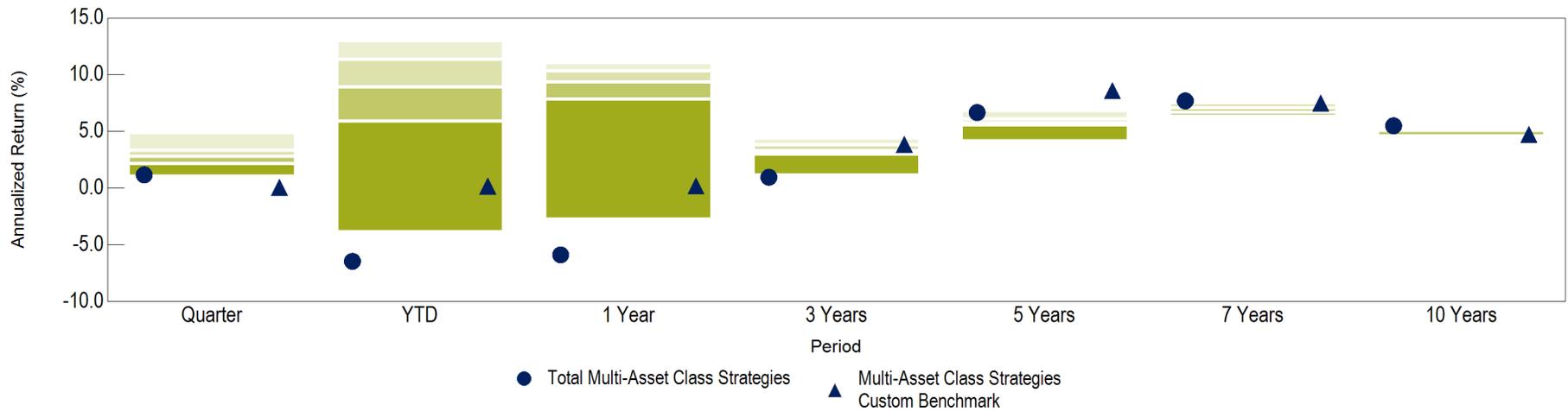
- Total Inflation-Linked Assets
- ▲ ASRS Custom Inflation-Linked Benchmark
- 5th to 25th Percentile
- 25th to Median
- Median to 75th Percentile
- 75th to 95th Percentile

Asset Class Analysis - Total Multi-Asset Class Strategies

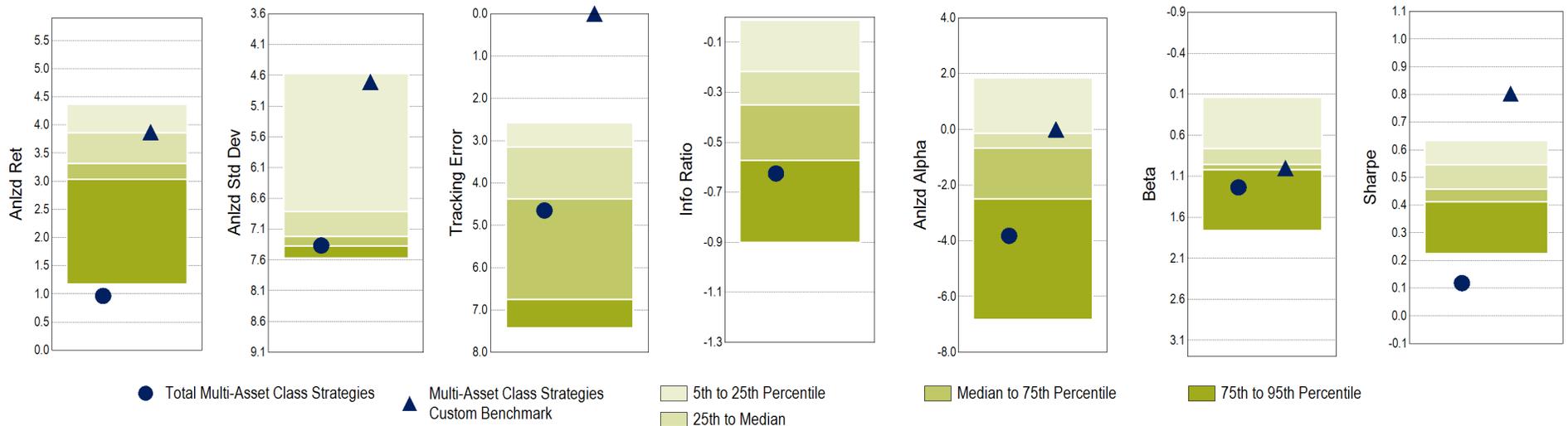
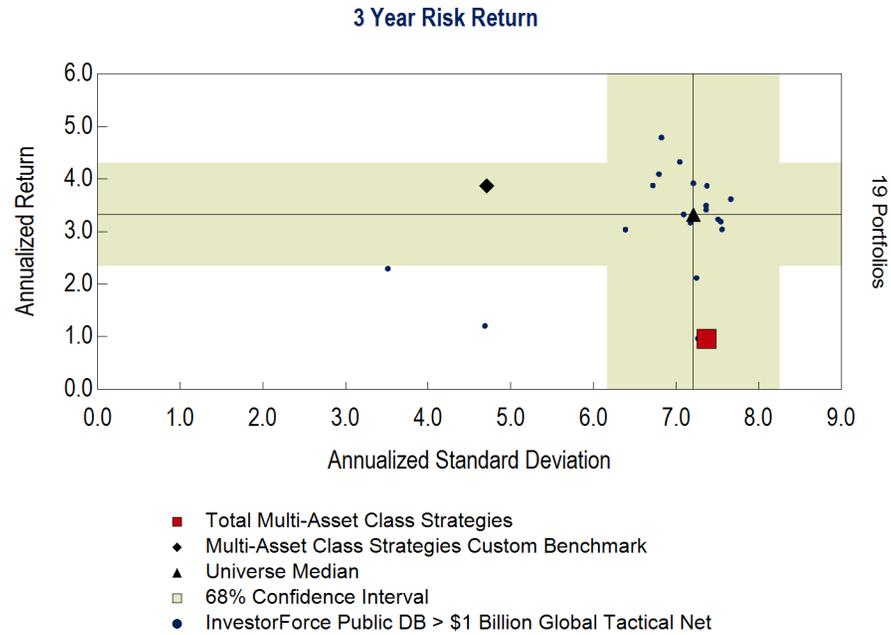
Rolling Annual Excess Benchmark Return



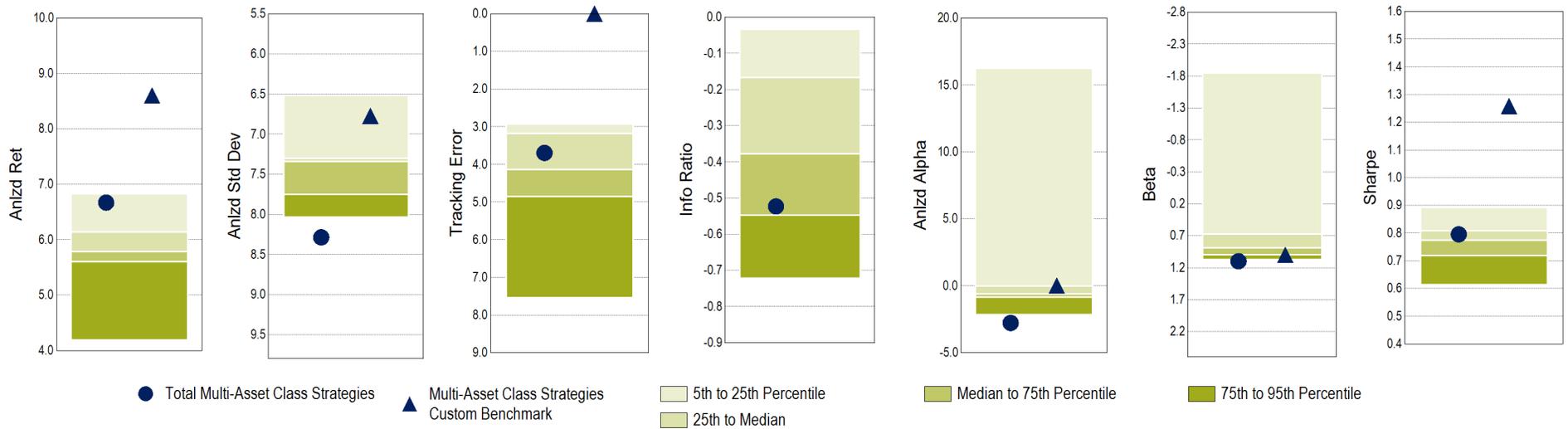
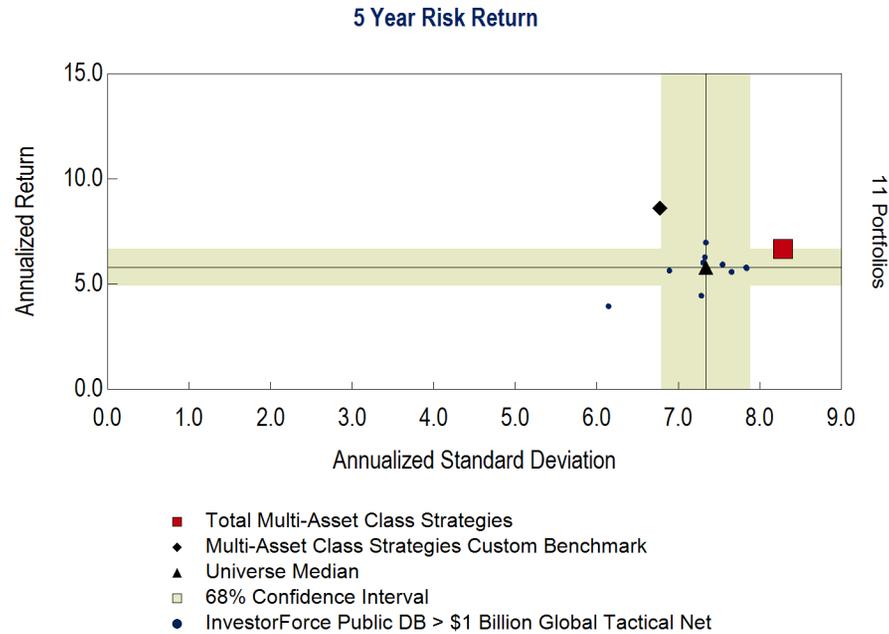
InvestorForce Public DB > \$1 Billion Global Tactical Net Accounts



Asset Class Analysis - Total Multi-Asset Class Strategies



Asset Class Analysis - Total Multi-Asset Class Strategies



## Asset Class Committee Monitoring

- **Two Asset Class Committee meetings have been held since the last time we provided an update on the ASRS Asset Class Committee Meetings.**
- **October 17, 2016 – Combined Public and Private Markets Committee**
  - Public and private markets monthly report review and deal flow discussion
  - Real Estate SMA compliance review
  - Private Equity manager recommendation (\$50mm)
    - Consistent with strategic plan at the Total Fund level (SAAP Target is 8%)
    - Due diligence process was followed in accordance with SIP 006 – Investment Manager, Partner, and Co-Investment Selection and Oversight
    - Committee approved the recommendation
  - Private Equity manager recommendation (\$100mm)
    - Consistent with strategic plan at the Total Fund level (SAAP Target is 8%)
    - Due diligence process was followed in accordance with SIP 006 – Investment Manager, Partner, and Co-Investment Selection and Oversight
    - Committee approved the recommendation
  - Real Estate manager guidelines variance recommendations
    - RCLCo recommended changes to two investment criteria around construction risk and equity exposure to an individual project
    - Due diligence process was followed in accordance with SIP 006 – Investment Manager, Partner, and Co-Investment Selection and Oversight
    - Committee approved the recommendation
- **October 24, 2016 – Private Markets Committee**
  - Private Equity manager recommendation (\$50 mm)
    - Consistent with strategic plan at the Total Fund level (SAAP Target is 8%)
    - Due diligence process was followed in accordance with SIP 006 – Investment Manager, Partner, and Co-Investment Selection and Oversight
    - Committee approved the recommendation

## General Observations

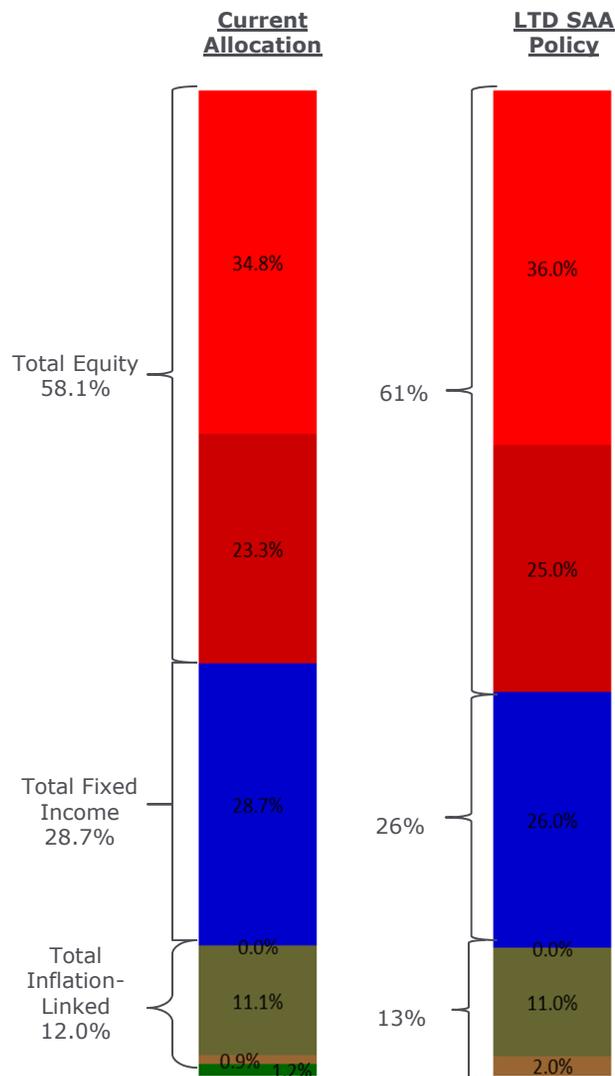
- **The Fund continues to make significant progress moving the portfolio from the Interim SAAP toward the long-term SAAP.**
  - Current Interim SAAP includes proration of approximately 2% unfunded Private Debt.
  - Interim SAAP has achieved SAAP weight in Real Estate and Public Equity as of Q3 2016.
  - Continued build out of private markets asset classes provides opportunity to take advantage of illiquidity premium to produce expected returns in excess of what we believe can be achieved in the public markets.
- **The Equity program has contributed negatively to performance over the past five years.**
  - Public US Equity and Public International Equity have contributed -0.47% to the Fund's return over the past five years. Approximately 75% of the negative contribution to Total Fund was due to positioning between US and International Equity.
  - Private Equity and Opportunistic Equity have contributed positively to the Fund (+0.27%) over the past five years. Approximately 85% of the positive contribution was due to manager outperformance.
- **The Fixed Income program has contributed positively to performance over the past five years.**
  - Opportunistic debt allocation is contributing primarily to an overweight in Total Fixed Income and has contributed negatively (-0.20%) over the past five years
  - Public Markets Fixed Income and Private Debt has contributed positively (+0.75%) over the past five years.
  - \$5 billion in commitments to private debt strategies equates to approximately 14.5% of Total Fund assets vs. the SAAP target of 10%.
- **Manager selection within Private Markets asset classes (Private Equity, Private Debt, and Real Estate) has been the largest contributor to the Fund's outperformance vs. the Interim SAAP over the past one-, three- and five-year periods.**
- **Current tactical positioning is consistent with IMD House Views.**

# Independent Oversight/Compliance: LTD

**Note: All of the data shown on the following pages is as of September 30, 2016 and reflects the deduction of investment manager fees, unless otherwise noted.**



Long Term Disability SAAP Policy Compliance



	Current Mkt Value	Current Allocation	LTD SAAP	Difference
<b>U.S. Equity</b>	<b>\$68,475,563</b>	<b>34.8%</b>	<b>36.0%</b>	<b>-1.2%</b>
U.S. Large Cap	\$41,129,680	20.9%	24.0%	-3.1%
U.S. Small Cap	\$27,345,883	13.9%	12.0%	1.9%
<b>International Equity</b>	<b>\$45,796,083</b>	<b>23.3%</b>	<b>25.0%</b>	<b>-1.7%</b>
Developed Large Cap	\$32,568,852	16.6%	18.0%	-1.4%
Developed Small Cap	\$4,252,586	2.2%	2.0%	0.2%
Emerging Markets	\$8,974,646	4.6%	5.0%	-0.4%
<b>Total Equity</b>	<b>\$114,271,646</b>	<b>58.1%</b>	<b>61.0%</b>	<b>-2.9%</b>
<b>U.S. Fixed Income</b>	<b>\$56,473,860</b>	<b>28.7%</b>	<b>26.0%</b>	<b>2.7%</b>
Core	\$41,461,769	21.1%	19.0%	2.1%
High Yield	\$15,012,092	7.6%	7.0%	0.6%
<b>Emerging Market Debt</b>	<b>\$125</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>
<b>Total Fixed Income</b>	<b>\$56,473,985</b>	<b>28.7%</b>	<b>26.0%</b>	<b>2.7%</b>
<b>Real Estate</b>	<b>\$21,923,966</b>	<b>11.1%</b>	<b>11.0%</b>	<b>0.1%</b>
<b>Commodities</b>	<b>\$1,708,699</b>	<b>0.9%</b>	<b>2.0%</b>	<b>-1.1%</b>
<b>Total Inflation-Linked</b>	<b>\$23,632,665</b>	<b>12.0%</b>	<b>13.0%</b>	<b>-1.0%</b>
<b>Cash<sup>1</sup></b>	<b>\$2,339,886</b>	<b>1.2%</b>	<b>0.0%</b>	<b>1.2%</b>
<b>Total</b>	<b>\$196,718,182</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>

<sup>1</sup>Cash includes money for the upcoming monthly pension distribution.

Note: Market values include manager held cash.

ASRS LTD rebalanced to the new SAA Policy in February 2016, with an effective date of 2/18/2016.

**Long Term Disability Performance Summary**

	<b>Quarter</b>	<b>1 Year</b>	<b>3 Years</b>	<b>5 Years</b>	<b>10 Years</b>	<b>Since Inception (July-02)</b>
Long Term Disability	4.0%	11.9%	6.0%	10.1%	4.8%	6.3%
LTD SAA Policy <sup>1</sup>	4.1%	12.1%	5.9%	9.9%	5.3%	6.6%
Excess Return	<b>-0.1%</b>	<b>-0.2%</b>	0.1%	0.2%	<b>-0.5%</b>	<b>-0.3%</b>

<sup>1</sup>LTD SAA Policy composition can be found in the appendix.

# Market Environment Update and Outlook

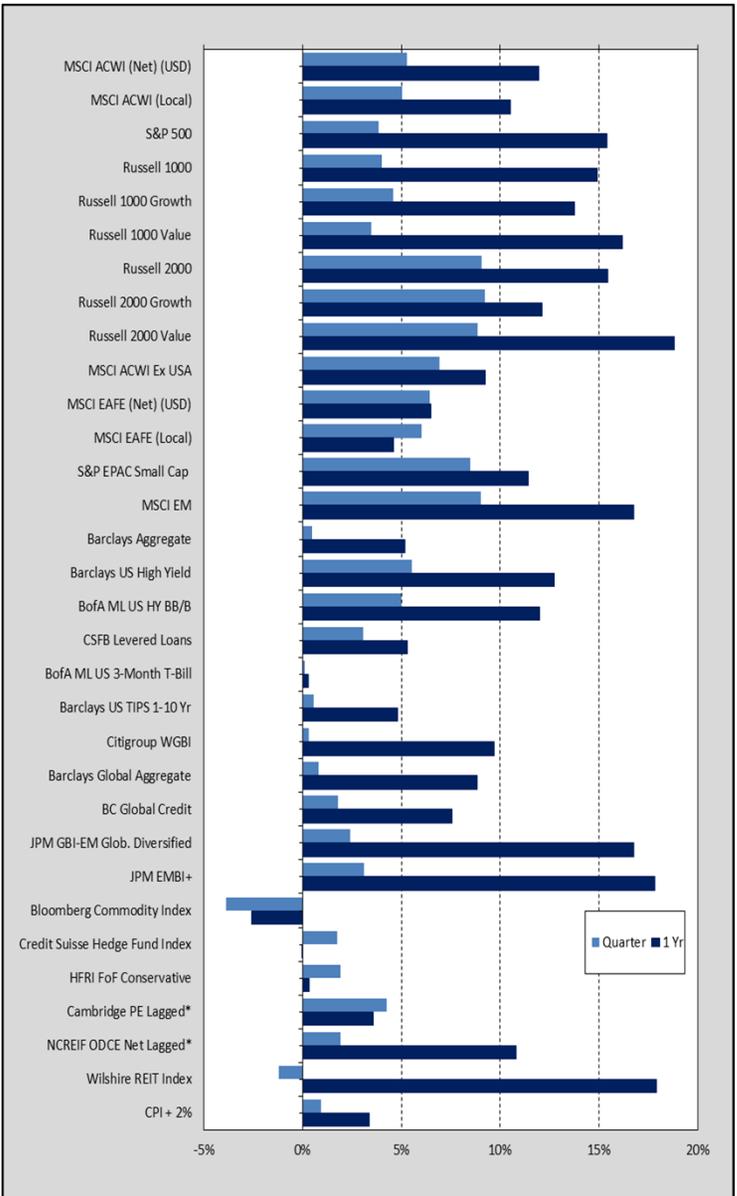


- **Third quarter GDP growth rate (first estimate) printed at 2.9%.**
  - Retail sales ended August at +1.6% on a year-over-year basis. In the same period last year the YoY growth rate was 1.3%.
  - The inventory-to-sales ratio ended August flat at 1.4 and has remained relatively flat since early 2010.
  - Corporate profits (ended April) as a percent of GDP increased to 8.8% from 8.5% (in January) and remain elevated relative to historical levels.
  - The U.S. trade deficit widened ending August as the rate of change in imports increased to a level not seen since last September.
- **The unemployment rate increased 0.1% to 5.0% in Q3; U-6, a broader measure of unemployment, increased to 9.7% during the third quarter from 9.6%.**
- **The Case-Shiller Home Price Index (ended July) increased to 183.6 from 180.7 in July and is at levels higher than that of pre-financial crisis levels of 150.9.**
- **Rolling 12-month seasonally adjusted CPI saw an uptick to 1.36% at the end of September; Capacity Utilization was flat at 75.4% ended Q3.**
- **Fed Funds rate was unchanged at 0.50%. The 10-year Treasury Yield (constant maturity) finished Q3 unchanged at 1.6% vs Q2.**
- **The Fed balance sheet decreased slightly during Q3 2016, while the European Central Bank balance sheet continues to increase.**
  - ECB held its benchmark refinancing rate at 0%, deposit rates -0.4% and asset purchases at €80 billion per month of corporate and public securities.
- **S&P valuations increased slightly in Q3 remaining above the 10-year and long-term averages.**
  - Cyclically adjusted Shiller PE ratio (26.71x) is above the long-term average of 16.68x and above the 10-year average of 22.92x.

# Arizona State Retirement System

## Market Environment – Q3 2016 Overview

		Qtr.	1 Yr.	3 Yr.	5 Yr.	10 Yr.
<b>World Equity Benchmarks</b>						
MSCI ACWI (Net) (USD)	World	5.3%	12.0%	5.2%	10.6%	4.3%
MSCI ACWI (Local)	World (Local Currency)	5.1%	10.5%	7.7%	12.6%	4.6%
<b>Domestic Equity Benchmarks</b>						
S&P 500	Large Core	3.9%	15.4%	11.2%	16.4%	7.2%
Russell 1000	Large Core	4.0%	14.9%	10.8%	16.4%	7.4%
Russell 1000 Growth	Large Growth	4.6%	13.8%	11.8%	16.6%	8.8%
Russell 1000 Value	Large Value	3.5%	16.2%	9.7%	16.2%	5.9%
Russell 2000	Small Core	9.0%	15.5%	6.7%	15.8%	7.1%
Russell 2000 Growth	Small Growth	9.2%	12.1%	6.6%	16.1%	8.3%
Russell 2000 Value	Small Value	8.9%	18.8%	6.8%	15.4%	5.8%
<b>International Equity Benchmarks</b>						
MSCI ACWI Ex USA	World ex-US	6.9%	9.3%	0.2%	6.0%	2.2%
MSCI EAFE (Net) (USD)	Int'l Developed	6.4%	6.5%	0.5%	7.4%	1.8%
MSCI EAFE (Local)	Int'l Developed (Local Currency)	6.0%	4.6%	5.3%	11.2%	2.2%
S&P EPAC Small Cap	Small Cap Int'l	8.5%	11.4%	5.6%	11.5%	4.8%
MSCI EM	Emerging Equity	9.0%	16.8%	-0.6%	3.0%	3.9%
<b>Domestic Fixed Income Benchmarks</b>						
Barclays Aggregate	Core Bonds	0.5%	5.2%	4.0%	3.1%	4.8%
Barclays US High Yield	High Yield	5.6%	12.7%	5.3%	8.3%	7.7%
BofA ML US HY BB/B	High Yield	5.0%	12.0%	5.6%	8.0%	7.1%
CSFB Levered Loans	Bank Loans	3.1%	5.3%	3.6%	5.4%	4.3%
BofA ML US 3-Month T-Bill	Cash	0.1%	0.3%	0.1%	0.1%	0.9%
Barclays US TIPS 1-10 Yr	Inflation	0.6%	4.8%	1.5%	1.3%	3.8%
<b>Global Fixed Income Benchmarks</b>						
Citigroup WGBI	World Gov. Bonds	0.3%	9.7%	1.8%	0.8%	4.1%
Barclays Global Aggregate	Global Core Bonds	0.8%	8.8%	2.1%	1.7%	4.3%
BC Global Credit	Global Bonds	1.8%	7.6%	2.9%	3.7%	4.6%
JPM GBI-EM Glob. Diversified	Em. Mkt. Bonds (Local Currency)	2.4%	16.8%	-2.7%	0.0%	5.5%
JPM EMBI+	Em. Mkt. Bonds	3.1%	17.8%	8.0%	7.3%	7.6%
<b>Alternative Benchmarks</b>						
Bloomberg Commodity Index	Commodity	-3.9%	-2.6%	-12.3%	-9.4%	-5.3%
Credit Suisse Hedge Fund Index	Hedge Fund	1.8%	-0.0%	2.6%	4.3%	4.2%
HFRI FoF Conservative	Fund of Hedge Funds	1.9%	0.3%	2.2%	3.1%	1.5%
Cambridge PE Lagged*	Private Equity	4.2%	3.6%	11.3%	11.3%	10.8%
NCREIF ODCE Net Lagged*	Real Estate	1.9%	10.8%	12.0%	11.7%	5.2%
Wilshire REIT Index	REIT	-1.2%	17.9%	14.3%	15.8%	5.9%
CPI + 2%	Inflation/Real Assets	0.9%	3.4%	3.0%	3.2%	3.8%



\* As of 6/30/2016

### Global Equity

- **U.S. equities posted modest gains in the third quarter (+3.9%) according to the S&P 500. Volatility related to political change and economic uncertainty continued in the quarter.**
- **Small cap stocks outperformed large cap stocks during the quarter, with the Russell 2000 Index returning 9.0% and the Russell 1000 Index returning 4.0%.**
- **International equities outperformed U.S. markets during the quarter, returning +6.9%, as measured by the MSCI ACWI ex-U.S. Index. Emerging markets returned +9.0 as measured by the MSCI Emerging Markets Index in U.S. dollar terms.**
  - Developed international markets returned +6.4% as measured by the MSCI EAFE Index.

### Private Equity

- **Private equity fundraising totaled \$71.7 billion in Q3 2016.**
- **Buyout and Special Situations fundraising totaled \$38 billion in Q3 2016.**
- **Venture capital fundraising totaled \$11.7 billion.**
  - VC fundraising as a percent of total new PE funds is in line with historical post-dot com levels.
- **Fund of fund and multi-manager co-investment fundraising totaled \$3 billion.**
- **Growth equity fundraising totaled \$7.2 billion.**

### Fixed Income

- **The nominal yield curve flattened in the Q3. Intermediate yields increased 13 –to- 17 basis points and long duration yields increased 2 basis points.**
- **The spread between two and 10-year rates decreased to 83 basis points in Q3 from 91 basis points in Q2. Treasury Inflation-Protected Securities, or TIPS, returned +0.6% during the quarter, as measured by the Barclays US TIPS 1-10 Yr Index.**
- **The Barclays Long Duration Credit Index gained +2.26% as the long end of the curve ended the quarter 2 basis points higher.**
- **Long Treasuries lost -0.36% and investment-grade US corporate debt gained +0.5%.**
- **The Barclays 1-3 year Government/ Credit Index returned +0.02%. US high yield bonds gained +5.6% driven by lower quality and Energy names.**
- **Emerging markets debt continued its broad rally.**
  - US dollar-denominated debt, as measured by the JP Morgan EMBI Index, gained +3.1%; local currency debt gained +2.4%, according to the JP Morgan GBI-EM Index.
  - 90% of flows have been into EM Hard Currency
  - Despite a spectacular +17% YTD, EM Local 3-year return is still -3.17%

### Real Assets/Inflation-Linked Assets

- **Massive energy market dislocation.**
  - Seek inflation sensitive asset classes that offer positive yield
  - Oil prices stabilizing and remain low.
  - Private equity and private debt opportunities may be relatively attractive.
  - Potential for public stressed/distressed credit, equity and commodity plays.
- **Select infrastructure opportunities showing signs of being attractive.**
  - Target opportunistic strategies in niche sub-sectors to take advantage of market dislocations.
  - Secular opportunities may exist within the shipping industry as traditional financing sources (both debt and equity) are less abundant
- **Timber opportunities remain elusive.**
  - Income yields (net) are low as assets are predominantly traded between like-minded institutions
  - Private strategies are illiquid and constrain quick entrance/exit (i.e. long-term lock-up)
  - Liquid strategies have limited pure timber exposure (and limited active-play options)
- **Metals & Mining; weakened commodity prices may be the new norm as China growth shifts.**
- **Agriculture; outlook supported by strong demographic trends.**

### Commodities

- **Commodities ended quarter down -3.9% as measured by the Bloomberg Commodity Index.**
  - Gold lost -0.5% in the third quarter though rallying YTD approximately 24%.
  - Agricultural commodities were lower during the quarter.

### Real Estate

- **NEPC continues to be neutral on core real estate in the US and remains positive on non-core real estate, that is, value-add and opportunistic strategies.**
- **Within U.S. core real estate, strong fundamentals continue to be the story along with attractive income spreads relative to interest rates.**
  - Real estate fundamentals and debt terms are attractive, however valuations are high and the possibility of rising interest rates and the impact on cap rates causes concern.
- **Overall, the non-core real estate investment environment in the U.S. is normalizing; however, select areas remain attractive.**
- **US REITs recorded negative returns -1.2% as measured by the Wilshire REIT Index. The sector is trading at a slight premium to NAV ending Q3.**
- **Europe is viewed as the best place for a marginal dollar of non-core real estate investment.**
  - Current US-dollar denominated investors with currency exposure will feel near-term impact of Brexit, but new investors may benefit from a strong US-dollar. Long-term Brexit implications, however, are unclear.

# Highlights of Third Quarter Happenings at NEPC

September 30, 2016

## NEPC Insights

### Recent White Papers

- “DC Governance: Slaying the Hydra” (August)
- “Nonprofit Annual Audit Survival Guide” (August)
- “Class is in Session: Lawsuits Against Higher Education Retirement Plans” (September)
- Market Chatter: “NEPC’s Summer Travel: Perspectives on China” (September)
- NEPC’s 11<sup>th</sup> Annual Defined Contribution Plan & Fee Survey

### Webinar

- “2016 Defined Contribution Plan & Fee Survey Webinar” (September); Panel reviewed key findings from our 11th annual NEPC 2016 Defined Contribution Plan & Fee Survey.

### Video Series

- “Five Questions with Jeff Roberts on Healthcare Strategic Private Equity Investing” (July)
- “Five Questions with Richard M. Charlton” (July)
- “Discussing Pension Risk Transfers with Chris Levell and Craig Svendsen” (August)

## NEPC Recognitions

We are pleased to announce that *Chief Investment Officer* published their fifth annual list of the world’s most influential investment consultants featuring NEPC’s **Tim McCusker, FSA, CFA, CAIA, CIO, Partner**, and **Scott Perry, CAIA, Partner**.



## Upcoming Events

The 8<sup>th</sup> Annual NEPC, LLC Public Fund Workshop will be held January 23-24, 2017 in Tempe, Arizona at the Tempe Mission Palms.

NEPC’s 22<sup>nd</sup> Annual Investment Conference will be held on May 9-10, 2017 at the InterContinental Hotel in Boston, MA.

## ESG – Clearing Up The Confusion Webinar (Coming in December)

NEPC is hosting a webinar to continue the conversation around Environmental, Social and Governance integration (ESG). We aim to help clear up the confusion around what ESG represents and why it has become a growing topic of interest. NEPC will be joined by investment managers from different asset classes who will offer their insights into how they are implementing ESG into their investment portfolios.

## NEPC Gives Back

- NEPC employees went “sock-less” and participated in the *Sox for Socks* drive to support the Boston Health Care for the Homeless Program, which provides socks for the homeless men and women of Boston.
- Eighteen NEPC employees volunteered to work with Habitat for Humanity Greater Boston, stepping up to help build new homes for low-income families in need of decent and affordable housing.

## Appendix: SAA Policy History



## Strategic Asset Allocation Policy (SAAP) History

- 7/1/75 – 12/31/79 – 40% S&P 500/60% Barclays Capital Aggregate
- 1/1/80 – 12/31/83 – 50% S&P 500/50% Barclays Capital Aggregate
- 1/1/84 – 12/31/91 – 60% S&P 500/40% Barclays Capital Aggregate
- 1/1/92 – 12/31/94 – 50% S&P 500/10% MSCI EAFE/40% Barclays Capital Aggregate
- 1/1/95 – 6/30/97 – 45% S&P 500/15% MSCI EAFE/40% Barclays Capital Aggregate
- 7/1/97 – 12/31/99 – 50% S&P 500/15% MSCI EAFE/35% Barclays Capital Aggregate
- 1/1/00 – 9/30/03 – 53% S&P 500/17% MSCI EAFE/30% Barclays Capital Aggregate
- 10/1/03 – 12/31/06 – 53% S&P 500/15% MSCI EAFE/ACWI ex-U.S.<sup>1</sup>/26% Barclays Capital Aggregate/6% NCREIF ODCE (lagged one quarter)
- 1/1/07 – 10/31/2009 – 31% S&P 500/7% S&P 400/7% S&P 600/18% MSCI ACWI ex-U.S./5% Russell 2000 (lagged one quarter)/26% Barclays Capital Aggregate/6% NCREIF ODCE (lagged one quarter)
- 11/1/2009 – 6/30/2012 – 28% S&P 500/6% S&P 400/6% S&P 600/13% MSCI EAFE/2% MSCI EAFE Small Cap/3% MSCI Emerging Markets/7% Russell 2000 (lagged one quarter)/24% Barclays Capital Aggregate/2% Barclays Capital High Yield/6% NCREIF ODCE (lagged one quarter)/3% Dow Jones/UBS Commodities Index
- 7/1/2012 – 3/31/2015 – 23% S&P 500/5% S&P 400/5% S&P 600/14% MSCI EAFE/3% MSCI EAFE Small Cap/6% MSCI Emerging Markets/7% Russell 2000 (lagged one quarter)/13% Barclays Capital Aggregate/5% Barclays Capital High Yield/4% JP Morgan GBI-EM Global Diversified/3% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/8% NCREIF ODCE (lagged one quarter)/4% Dow Jones/UBS Commodities Index
- **4/1/2015 - present – 20% S&P 500/3% S&P 400/3% S&P 600/17% MSCI EAFE/2% MSCI EAFE Small Cap/5% MSCI Emerging Markets/8% Russell 2000 (lagged one quarter)/11% Barclays Capital Aggregate/4% Barclays Capital High Yield/10% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/10% NCREIF ODCE (lagged one quarter)/2% Bloomberg Commodities Index TR/5% Multi-Asset Class Custom Index**
- **\*Interim SAA Policy:** 20% S&P 500/3% S&P 400/3% S&P 600/17% MSCI EAFE/2% MSCI EAFE Small Cap/5% MSCI Emerging Markets/8% Russell 2000 (lagged one quarter)/13% Barclays Capital Aggregate/4% Barclays Capital High Yield/8% S&P/LSTA Levered Loan Index + 250 basis points (lagged one quarter)/2% Bloomberg Commodity Index/5% Multi-Asset Class Custom Index/10% NCREIF ODCE (lagged one quarter)
- Note: Interim SAA Policy includes proration of 2% Private Debt which is unfunded. Recently approved Strategic Asset Allocation Policy effective April 1, 2015.

<sup>1</sup>MSCI EAFE/ACWI ex-U.S. Benchmark is the MSCI EAFE Index prior to 10/1/2005 and the MSCI ACWI ex-U.S. thereafter.

Note: All MSCI indices changed from Gross to Net dividend withholding taxes effective 1/1/2014.



## ASRS Custom Asset Class Benchmark History

- **ASRS Custom Total Equity Benchmark** was 77% S&P 500, 23% MSCI EAFE through 12/31/1999; 76% S&P 500, 24% MSCI EAFE through 9/30/2003; 78% S&P 500, 22% MSCI EAFE/ACWI ex-U.S.<sup>1</sup> through 12/31/2006; 49% S&P 500, 11% S&P 400, 11% S&P 600, 29% MSCI ACWI ex-U.S. through 10/31/2009; 48% S&P 500, 10% S&P 400, 10% S&P 600, 23% MSCI EAFE, 4% MSCI EAFE Small Cap, 5% MSCI Emerging Markets through 6/30/2012; 41% S&P 500, 9% S&P 400, 9% S&P 600, 25% MSCI EAFE, 5% MSCI EAFE Small Cap, 11% MSCI Emerging Markets through 3/31/2015; 40% S&P 500, 6% S&P 400, 6% S&P 600, 34% MSCI EAFE, 4% MSCI EAFE Small Cap, 10% MSCI Emerging Markets thereafter.
- **ASRS Custom Domestic Equity Benchmark** was S&P 500 through 12/31/2006; 74% S&P 500, 13% S&P 400, 13% S&P 600 through 12/31/2010; 70% S&P 500, 15% S&P 400, 15% S&P 600 through 3/31/2015.; 77% S&P 500, 11.5% S&P 400, 11.5% S&P 600 thereafter.
- **ASRS Custom International Equity Benchmark** was MSCI EAFE through 9/30/2005; MSCI ACWI ex-U.S. through 12/31/2010; 72% MSCI EAFE, 11% MSCI EAFE Small Cap and 17% MSCI Emerging Markets through 6/30/2012; 61% MSCI EAFE, 13% MSCI EAFE Small Cap and 26% MSCI Emerging Markets through 3/31/2015; 71% MSCI EAFE, 8% MSCI EAFE Small Cap and 21% MSCI Emerging Markets thereafter.
- **ASRS Custom Public Markets Fixed Income Benchmark** was Barclays Capital U.S. Aggregate Index through 12/31/2010; 93% Barclays Capital U.S. Aggregate Index, 7% Barclays Capital U.S. High Yield Bond Index through 12/31/2012; 59% Barclays Capital U.S. Aggregate Index, 23% Barclays Capital U.S. High Yield Bond Index, 18% JP Morgan GBI-EM Global Diversified through 3/31/2015; 73% Barclays Capital U.S. Aggregate Index, 27% Barclays Capital U.S. High Yield Bond Index thereafter.
- **ASRS Custom Inflation-Linked Benchmark** was 100% Barclays Capital U.S. TIPS through 7/31/2010; 50% Barclays Capital U.S. TIPS, 50% Bloomberg Commodity Index through 8/31/2010; 30% Barclays Capital U.S. TIPS, 70% Bloomberg Commodity Index through 5/31/2011; 100% Bloomberg Commodity Index thereafter.
- **Multi-Asset Class Strategies Custom Benchmark** was 56% S&P 500, 16% MSCI EAFE, 28% Barclays Capital Aggregate through 9/30/2011; 50% S&P 500, 19% MSCI EAFE, 28% Barclays Capital Aggregate, and 3% Bloomberg Commodity Index through 06/30/2012; 43% S&P 500, 25% MSCI EAFE, 28% Barclays Capital Aggregate, and 4% Bloomberg Commodity Index through 3/31/2015; market value weighted average of the benchmarks for Bridgewater (91 Day T-Bill) and Windham (52% MSCI ACWI net, 30% Citi WGBI, 9% DJ US REIT, and 9% Bloomberg Commodities Index) thereafter.

<sup>1</sup>MSCI EAFE/ACWI ex-U.S. Benchmark is the MSCI EAFE Index prior to 10/1/2005 and the MSCI ACWI ex-U.S. thereafter.

Note: All MSCI indices changed from Gross to Net of dividend withholding taxes effective 1/1/2014.

## ASRS Custom Asset Class Benchmark History

- **ASRS Custom Small Cap Equity Blended Benchmark** was the Russell 2000 Index through 12/31/2006; S&P 600 Index thereafter.
- **DFA Blended Benchmark** was the Russell 2000 Value Index through 12/31/2006; S&P/Citigroup 600 Value Index thereafter.
- **ASRS Custom Int'l Developed Markets Equity Index** was MSCI EAFE through 9/30/2005; MSCI ACWI ex-U.S. through 12/31/2010; 87% MSCI EAFE and 13% MSCI EAFE Small Cap through 6/30/2012; 82% MSCI EAFE and 18% MSCI EAFE Small Cap through 3/31/2015; 89% MSCI EAFE and 11% MSCI EAFE Small Cap thereafter.
- **Brandes Custom Benchmark** was MSCI EAFE through 9/30/2005; MSCI ACWI ex-U.S. through 2/28/2011; MSCI EAFE thereafter.
- **ASRS Cash Assetization Custom Benchmark** is 33% S&P 500, 14% Russell 2000, 25% MSCI EAFE, 28% Barclays Treasury Index through 8/24/2015; 100% Barclays US Long Treasury Index through 11/13/2015; 15% S&P 500, 15% Russell 2000, 16% MSCI EAFE, 4% MSCI Emerging Markets Index, 50% Barclays US Treasury Index through 4/29/2016; 52% S&P 500, 18% Russell 2000, 30% Barclays US Long Treasury Index through 6/28/2016; 100% Barclays US Long Treasury Index through 9/15/2016; NYSE US 2 Year Treasury Futures Index thereafter.
- **ASRS Bridgewater Custom Benchmark** was 56% S&P 500, 16% MSCI EAFE, 28% Barclays Capital Aggregate through 9/30/2011; 50% S&P 500, 19% MSCI EAFE, 28% Barclays Capital Aggregate, and 3% Bloomberg Commodity Index through 06/30/2012; 43% S&P 500, 25% MSCI EAFE, 28% Barclays Capital Aggregate, and 4% Bloomberg Commodity Index through 3/31/2015; Citigroup 3-Month Treasury Bill Index thereafter.
- **Times Square Custom Benchmark** was Russell 2500 Growth through 3/31/2015; Russell 2000 Growth thereafter.

<sup>1</sup>MSCI EAFE/ACWI ex-U.S. Benchmark is the MSCI EAFE Index prior to 10/1/2005 and the MSCI ACWI ex-U.S. thereafter.

Note: All MSCI indices changed from Gross to Net of dividend withholding taxes effective 1/1/2014.

## Long Term Disability Strategic Asset Allocation Policy (SAAP) History

- 7/1/2002 – 12/31/2004 - 53% S&P 500/17% MSCI EAFE/30% Barclays Capital Aggregate Bond Index
- 1/1/2005 – 2/28/2007 - 53% Russell 3000/15% MSCI EAFE/26% Barclays Capital Aggregate Bond Index/6% DJ Wilshire Real Estate Securities Index
- 3/1/2007 – 12/31/2010 - 50% Russell 3000/18% MSCI EAFE/26% Barclays Capital Aggregate Bond Index/6% DJ Wilshire Real Estate Securities Index
- 1/1/2011 – 12/31/2012 - 40% Russell 1000/7% Russell 2000/13% MSCI EAFE/2% MSCI EAFE Small Cap/3% MSCI Emerging Markets/24% Barclays Capital Aggregate/2% Barclays Capital High Yield/6% DJ Wilshire Real Estate Securities Index/3% Bloomberg Commodity Index
- 1/1/2013 – 2/28/2016 - 34% Russell 1000/6% Russell 2000/14% MSCI EAFE/3% MSCI EAFE Small Cap/6% MSCI Emerging Markets/13% Barclays Capital Aggregate/8% Barclays Capital High Yield/4% JP Morgan GBI-EM Global Diversified/8% DJ Wilshire Real Estate Securities Index/4% Bloomberg Commodity Index
- **2/29/2016 – Present - 24% Russell 1000/12% Russell 2000/18% MSCI EAFE/2% MSCI EAFE Small Cap/5% MSCI Emerging Markets/19% Barclays Capital Aggregate/7% Barclays Capital High Yield/11% DJ Wilshire Real Estate Securities Index/2% Bloomberg Commodity Index**

Note: All MSCI indices changed from Gross to Net of dividend withholding taxes effective 1/1/2014.

- **The client's custodian bank is NEPC's preferred data source unless otherwise directed. NEPC reconciles custodian data to manager data. If the custodian cannot provide accurate data, manager data may be used.**
- **Trailing time period returns are determined by geometrically linking the holding period returns, from the first full month after inception to the report date. Rates of Return are annualized when the time period is longer than a year. Performance is presented gross and/or net of fees as indicated.**
- **For managers funded in the middle of a month, the 'since inception' return will start with the first full month, although actual inception dates and cash flows are included in all respective Composite calculations.**
- **This report may contain forward-looking statements that are based on NEPC's estimates, opinions and beliefs, but NEPC cannot guarantee that any plan will achieve its targeted return or meet other goals.**

- **Past performance is no guarantee of future results.**
- **All investments carry some level of risk. Diversification and other asset allocation techniques are not guaranteed to ensure profit or protect against losses.**
- **Some index returns displayed in this report or used in calculation of a policy, allocation or custom benchmark may not be available from the source or may be preliminary and subject to change.**
- **NEPC's source for portfolio pricing, calculation of accruals, and transaction information is the Plan's custodian bank. Information on market indices and security characteristics is received from other sources external to NEPC. While NEPC has exercised reasonable professional care in preparing this report, we cannot guarantee the accuracy of all source information contained herein.**
- **This report is provided as a management aid for the client's internal use only. Performance in this report does not constitute a recommendation by NEPC.**
- **This report may contain confidential or proprietary information and may not be copied or redistributed to any party not legally entitled to receive it.**

# Agenda Item #8

# IMD Activities

Arizona State Retirement System

November 28, 2016

# Asset Class Committee Schedule

- The asset class committees met on the following days during 2016:
  - January 19 (private markets)
  - February 25 (private markets)
  - March 22 (private markets)
  - April 26 (private markets)
  - May 2 (public markets)
  - May 26 (private markets)
  - June 24 (combined public and private)
  - July 18 (combined public and private)
  - August 11 (private markets)
  - September 22 (combined public and private)
  - October 17 (combined public and private)
  - October 24 (private markets)
  - November 16 (combined public and private)
- Combined meetings of the public and private markets committee are scheduled for:
  - December 15
  - Future meetings anticipated monthly thereafter, or more frequently as needed

# Combined Public and Private Markets Committee – September 22, 2016

- Discussed two managers in the opportunistic fixed income portfolio and approved ending the investment period for both
- Discussed various periodic reports for the public and private markets portfolios

# Combined Public and Private Markets Committee – October 17, 2016

- Approved two private equity managers with a total commitment of \$150 million
- Approved a variance related to account level concentration for a real estate project in west Los Angeles

## Private Markets Committee – October 24, 2016

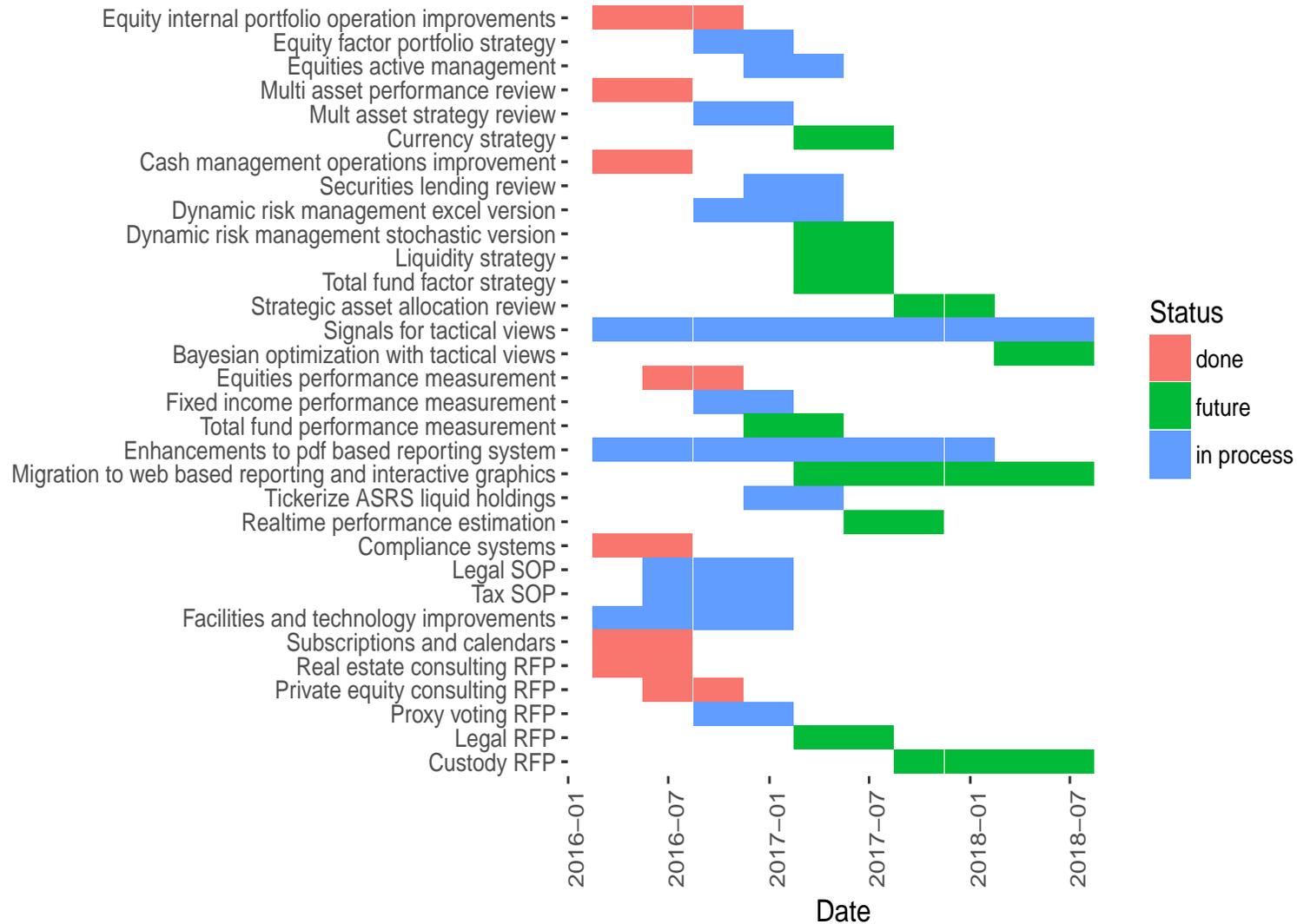
- Approved a no fee, no carry co-investment in a restructuring transaction for an energy related investment

# Combined Public and Private Markets Committee – November 16, 2016

- Reviewed the private equity pacing and implementation plan for 2017

# Summary of IMD Working Group Projects

## ASRS Investment Management Division Projects



# Agenda Item #9

# Arizona State Retirement System Investment Committee

## Proposed Interim Changes to Strategic Asset Allocation Policy Schematic

November 28, 2016



# Executive Summary

- We are requesting approval of following interim changes to the ASRS Strategic Asset Allocation Policy Schematic:
  - Increase the policy target for Private Debt to 12% from 10% (recent weighting approximately 9.3%)
  - Expand the range for Private Debt to 8-16% from 8-12%
  - Reduce the policy target for US High Yield to 2% from 4% (recent weighting approximately 3.3%)
  - Establish a range for US High Yield of 0-6%.
- We believe the shift to a higher policy target for Private Debt and a lower policy target for US High Yield will provide the following benefits to ASRS:
  - Higher expected returns
  - Reduced volatility.
- We believe Private Debt offers the most attractive opportunity in the fixed income markets with high expected net returns available for investors willing to accept illiquidity and a delayed deployment of capital. The market opportunity for Private Debt is principally driven by regulatory constraints that make it unattractive for banks to hold illiquid loans or other debt of below investment-grade credit quality.
- Since its inception in July 2012 through June 2016, the ASRS Private Debt asset class had a return of 10.7%, which exceeded the return of its benchmark by 5.3%. Furthermore, for the three fiscal year period ended June 30, 2016, the return of the ASRS Private Debt asset class was 10.1%, which exceeded the return of the Total Fund by 3.0% and the Barclays High Yield Index by 5.9%.

<b>CURRENT</b>				<b>PROPOSED</b>			
<b>ASRS Strategic Asset Allocation Policy Schematic</b>				<b>ASRS Strategic Asset Allocation Policy Schematic</b>			
<b>Asset Class</b>	<b>Policy</b>	<b>Range</b>	<b>Benchmark</b>	<b>Asset Class</b>	<b>Policy</b>	<b>Range</b>	<b>Benchmark</b>
Tactical Cash (Unassetized)	0%	(0-3%)		Tactical Cash (Unassetized)	0%	(0-3%)	
Operating Cash (Unassetized)	0%			Operating Cash (Unassetized)	0%		
Operating Cash (Assetized)	0%			Operating Cash (Assetized)	0%		
<b>Total Cash</b>	<b>0%</b>			<b>Total Cash</b>	<b>0%</b>		
Treasuries (Long Duration)	0%	(0-10%)	<b>Barclays LT Treasuries</b>	Treasuries (Long Duration)	0%	(0-10%)	<b>Barclays LT Treasuries</b>
Core Bonds	11%		<b>Barclays Aggregate</b>	Core Bonds	11%		<b>Barclays Aggregate</b>
<b>Interest Rate Sensitive</b>	11%			<b>Interest Rate Sensitive</b>	11%		
US High Yield	4%		<b>Barclays High Yield</b>	US High Yield	2%	(0-6%)	<b>Barclays High Yield</b>
Private Debt	10%	(8-12%)	<b>S&amp;P/LSTA Leveraged Loan Index + 2.5%</b>	Private Debt	12%	(8-16%)	<b>S&amp;P/LSTA Leveraged Loan Index + 2.5%</b>
Opportunistic Debt	0%		<b>Investment Specific</b>	Opportunistic Debt	0%		<b>Investment Specific</b>
<b>Total Fixed Income</b>	<b>25%</b>	<b>(18-35%)</b>		<b>Total Fixed Income</b>	<b>25%</b>	<b>(18-35%)</b>	
Large Cap	20%		<b>S&amp;P 500</b>	Large Cap	20%		<b>S&amp;P 500</b>
Mid Cap	3%		<b>S&amp;P 400</b>	Mid Cap	3%		<b>S&amp;P 400</b>
Small Cap	3%		<b>S&amp;P 600</b>	Small Cap	3%		<b>S&amp;P 600</b>
<b>U.S. Equity</b>	<b>26%</b>	<b>(16-36%)</b>		<b>U.S. Equity</b>	<b>26%</b>	<b>(16-36%)</b>	
Developed Large Cap	17%		<b>MSCI EAFE</b>	Developed Large Cap	17%		<b>MSCI EAFE</b>
Developed Small Cap	2%		<b>MSCI EAFE Small Cap</b>	Developed Small Cap	2%		<b>MSCI EAFE Small Cap</b>
Emerging Markets	5%		<b>MSCI EM</b>	Emerging Markets	5%		<b>MSCI EM</b>
<b>Non-U.S. Equity</b>	<b>24%</b>	<b>(14-34%)</b>		<b>Non-U.S. Equity</b>	<b>24%</b>	<b>(14-34%)</b>	
Private Equity	8%	(6-10%)	<b>Russell 2000</b>	Private Equity	8%	(6-10%)	<b>Russell 2000</b>
Opportunistic Equity	0%		<b>Investment Specific</b>	Opportunistic Equity	0%		<b>Investment Specific</b>
<b>Total Equity</b>	<b>58%</b>	<b>(48-65%)</b>		<b>Total Equity</b>	<b>58%</b>	<b>(48-65%)</b>	
Commodities	2%	(0-4%)	<b>Bloomberg Total Return</b>	Commodities	2%	(0-4%)	<b>Bloomberg Total Return</b>
Real Estate	10%	(8-12%)	<b>NCREIF ODCE</b>	Real Estate	10%	(8-12%)	<b>NCREIF ODCE</b>
Infrastructure	0%	(0-3%)	<b>Investment Specific</b>	Infrastructure	0%	(0-3%)	<b>Investment Specific</b>
Farmland & Timber	0%	(0-3%)	<b>Investment Specific</b>	Farmland & Timber	0%	(0-3%)	<b>Investment Specific</b>
Opportunistic Inflation Linked	0%		<b>Investment Specific</b>	Opportunistic Inflation Linked	0%		<b>Investment Specific</b>
<b>Total Inflation Linked</b>	<b>12%</b>	<b>(10-16%)</b>		<b>Total Inflation Linked</b>	<b>12%</b>	<b>(10-16%)</b>	
<b>Multi-Asset Class Strategies</b>	<b>5%</b>	<b>(0-12%)</b>	<b>Investment Specific</b>	<b>Multi-Asset Class Strategies</b>	<b>5%</b>	<b>(0-12%)</b>	<b>Investment Specific</b>
<b>Total</b>	<b>100%</b>			<b>Total</b>	<b>100%</b>		

Approved by ASRS Board on 3/27/2015

# Private Debt

- Private Debt is comprised of illiquid loans and bonds that typically fund highly leveraged companies and real estate properties that are typically too small in size to meet the requirements of the tradable leveraged loan, high yield bond, commercial mortgage-backed, and asset-backed securities markets.
  - For example, Private Debt may consist of secured loans funding leveraged buyouts of small to mid-size companies or mezzanine financing for real estate properties.
- We believe that the Private Debt asset class has the following advantages:
  - High expected net returns (10-11% on average)
  - Low loss history and volatility in underlying portfolios
  - Primarily floating rate
  - Full due diligence by investment managers
  - Customized covenants and credit monitoring

# ASRS Private Debt Program

## Lending Strategies Diversified Across 10 Managers

- US Corporate
  - Five managers targeting unique areas of the middle market
  - One manager targeting larger companies
- European Corporate
  - One manager targeting middle market lending
- Real Estate Finance
  - Two managers targeting three market segments
- Asset Backed
  - One manager targeting specialty finance companies

# Private Debt Managers

Portfolio	ASRS Commitment (\$MM)	Market Value (\$MM) 11/11/16	Target Net Return	%	IMD Commentary
Sonoran Private Credit Opportunities Fund, LLC (Managed by Cerberus)	\$1,100	1,005	13%	32	Separate account that invests in floating-rate secured loans primarily to fund private-equity sponsored middle market leveraged transactions. The LLC can leverage ASRS's investment by up to 1.25x to boost returns.
RFM Cactus Holding Company, LLC (Partnership with Related)	\$600	523	10%	16	Fund-of-one partnership that invests in: 1) "Freddie B" securities (first loss tranches of multi-family property securitizations that have been pooled and sponsored by Freddie Mac;) and 2) mezzanine debt to finance real estate properties.
Cactus Direct Lending Fund, LP (Partnership with HPS)	\$600	238	12%	7	Fund-of-one partnership that invests in floating-rate secured loans primarily to fund middle market leveraged transactions (ex. buyouts, recapitalizations) often without a private equity sponsor. The partnership can leverage ASRS's equity investment by up to 1.25x to boost returns.
AP Mezzanine Partners III , LP (Partnership with HPS)	\$500	26	11%	1	Fund-of-one partnership that invests primarily in mezzanine debt to fund highly leveraged transactions for larger capitalization companies.
ICG Arizona Senior Direct Lending Credit Fund	\$401	205	11%	7	Fund-of-one partnership that invests in floating-rate secured loans primarily to fund private-equity sponsored middle market leveraged transactions in Europe. The partnership can leverage ASRS's equity investment by up to 1.0x.
H/2 Core Real Estate Debt Fund	\$400	291	6%	9	Open-ended fund that invests in floating-rate senior mortgage loans and other conservatively underwritten real estate finance investments. The fund will utilize leverage of up to 60%.
Sonoran Cactus Private Asset Backed Fund, LLC (Managed by Ares)	\$500	140	10%	4	Separate account that invests in loans backed by consumer and commercial receivables.
Monroe Private Credit Fund A	\$450	298	11%	9	Fund-of-one partnership that invests in floating-rate secured loans primarily to fund smaller middle market leveraged transactions . The partnership can leverage ASRS's equity investment by up to 1.25x to boost returns.
Arizona – White Oak Investor LLC	\$210	210	12%	7	Separate account that invests in floating-rate secured loans for small- to mid-size companies typically lacking a deal sponsor.
AP Mezzanine Partners II, LP (Partnership with HPS, in liquidation)	\$182	182	11%	6	Fund-of-one partnership that invests primarily in mezzanine debt to fund highly leveraged transactions for larger capitalization companies. Investment period expired 6/30/16.
Blackstone/GSO Capital Solutions Fund (in liquidation)	\$67	67	13%	2	Commingled fund which provided rescue financing to companies seeking to avoid a bankruptcy or restructuring. Investment period ended in 2013 and portfolio is now running off.
Total	\$5,010	\$3,185		100	6

## Private Debt Performance Summary as of June 30, 2016

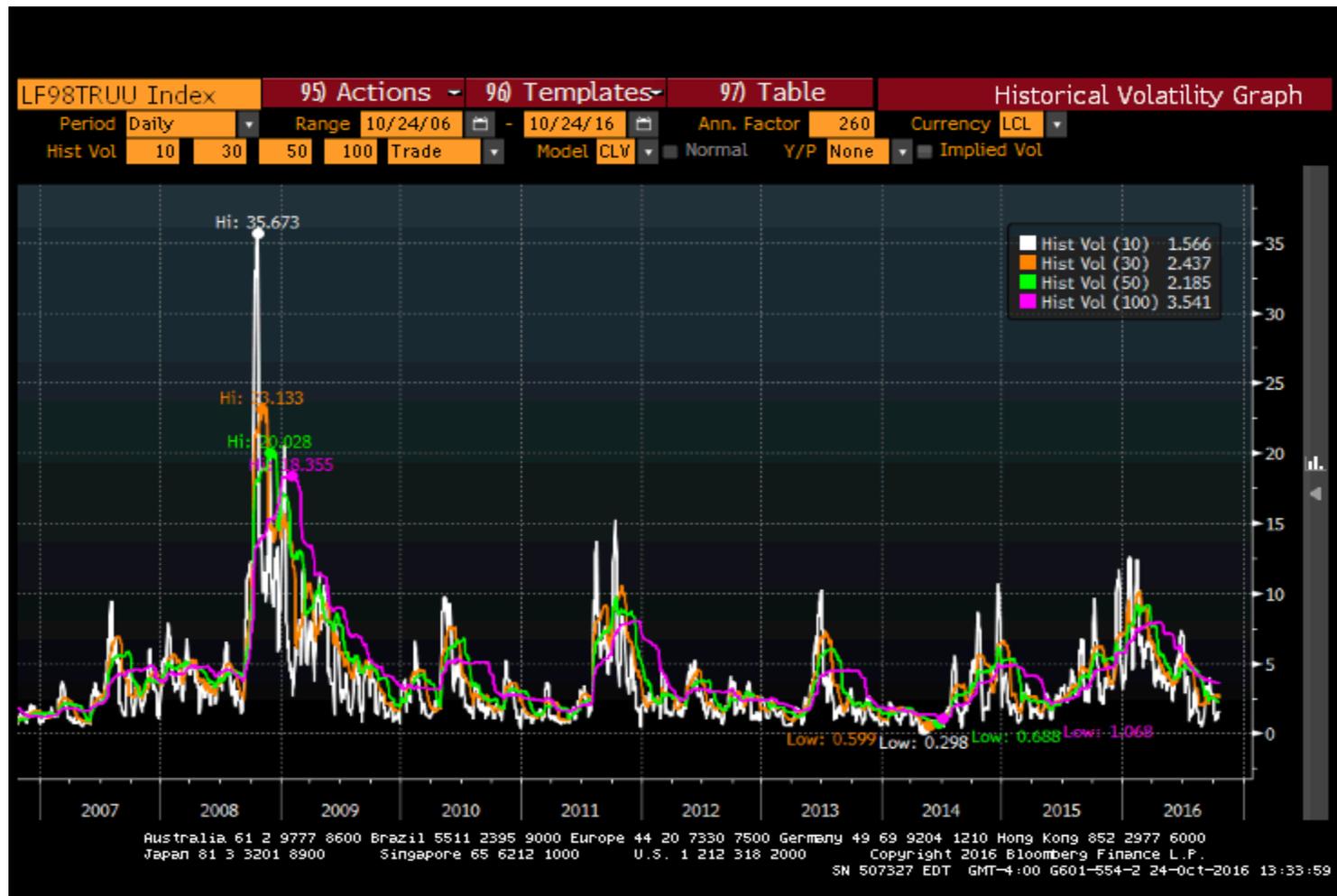
	Market Value (\$)	% of Portfolio	3 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	Inception (%)	Since
<b>Total Private Debt</b>	<b>2,867,198,636</b>	<b>8.3</b>	<b>2.7</b>	<b>9.0</b>	<b>10.1</b>		<b>10.7</b>	<b>Jul-12</b>
<i>S&amp;P/LSTA Leveraged Loan Index + 250 bps 1 QTR Lagged</i>			<u>3.5</u>	<u>4.3</u>	<u>5.2</u>		<u>5.4</u>	<i>Jul-12</i>
Over/Under			-0.8	4.7	4.9		5.3	
<b>Total Corporate Private Debt</b>	<b>1,964,389,933</b>	<b>5.7</b>	<b>3.0</b>	<b>10.0</b>	<b>11.8</b>		<b>12.5</b>	
AP Mezzanine Partners II, L.P.	191,765,017	0.6	4.3	11.4	12.7		12.9	Jan-13
AP Mezzanine Partners III, L.P.	14,500,000	0.0						Jul-16
Arizona White Oak Investor LLC	196,107,313	0.6	4.0	13.4	13.5		15.5	Jan-13
Blackstone/GSO Capital Solutions Fund, L.P.	63,622,390	0.2	-0.1	-16.6	6.3		10.3	Jul-12
Cactus Direct lending Fund, L.P.	194,590,559	0.6	6.7	16.3			16.4	Jul-15
ICG Arizona Senior Direct Lending Credit Fund	108,762,460	0.3	1.4	7.1			6.5	Jul-15
Monroe Private Credit Fund A	297,933,311	0.9	3.2	12.5			12.3	Jul-15
Sonoran Private Credit Opps, LLC	897,108,883	2.6	2.3	11.4	12.5		12.7	Jan-13
<b>Total Real Estate Private Debt</b>	<b>788,875,356</b>	<b>2.3</b>	<b>2.0</b>	<b>6.3</b>	<b>6.5</b>		<b>6.5</b>	
H/2 Core Real Estate Debt Fund, LP	288,146,822	0.8	2.1	5.7	5.5		5.5	Jan-13
RFM Cactus Holding Company, LLC	500,728,534	1.5	1.9	6.8	7.6		7.6	Apr-13
<b>Total Asset Backed Private Debt</b>	<b>113,933,348</b>	<b>0.3</b>	<b>3.2</b>	<b>14.8</b>			<b>13.9</b>	
Ares Cactus Private Asset Backed Fund	113,933,348	0.3	3.2	14.8			13.9	Jul-15

Source: State Street

# US High Yield

- After a weak 2015, the high yield market has had a strong rally in 2016 with a return of approximately 15%. The rally is due to a number of factors including a recovery in oil prices and other commodities off their lows, strong global demand for higher yielding assets, and continued low default rates outside of the energy sector.
- Yields and credit spreads in the high yield bond market have compressed significantly in 2016. As a result, the market is no longer cheap and, more likely, fairly valued.
- While we continue to believe that we are likely in the later stages of credit cycle (that began with an upturn in 2009), the opening of the credit markets which has accompanied the strong high yield rally this year has most likely elongated the credit cycle and pushed out a substantial uptick in defaults outside of energy. With sovereign rates low, a strong global demand for yield will likely continue to buoy the market.

# Barclays US Corporate High Yield Index Historic Volatility 2006 – 2016



# Barclays US Corporate High Yield Index Option Adjusted Spread (OAS) 2006 – 2016



# Barclays US Corporate High Yield Index Yield-to-Worst 2006 – 2016



# Agenda Item #10

# Public Fixed Income Performance Chart Pack

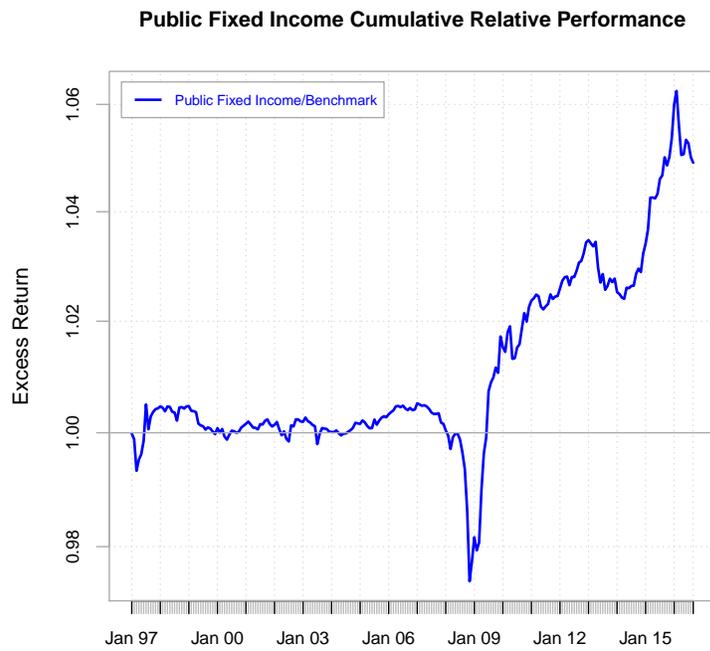
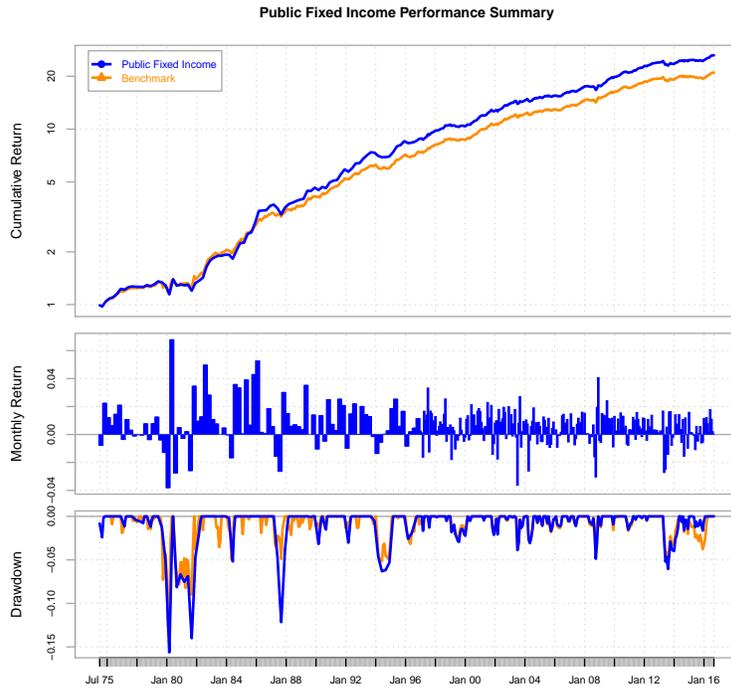
*Investment Management Division*

*Performance through September 30, 2016*

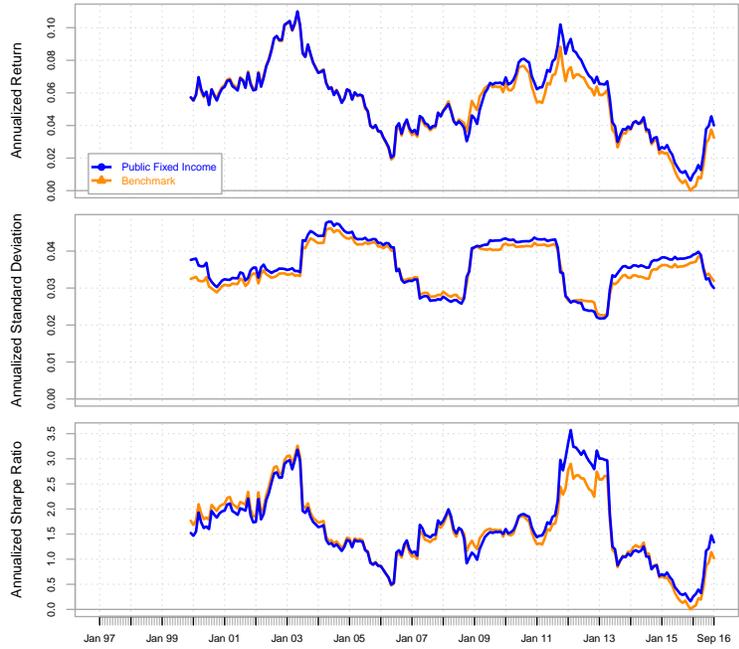
Table 1: Table of Contents

Contents	Manager	Page
Total Public Fixed Income		2
Interest Rate Sensitive		6
	F2	8
High Yield		11
	Columbia	13
	JP Morgan	16

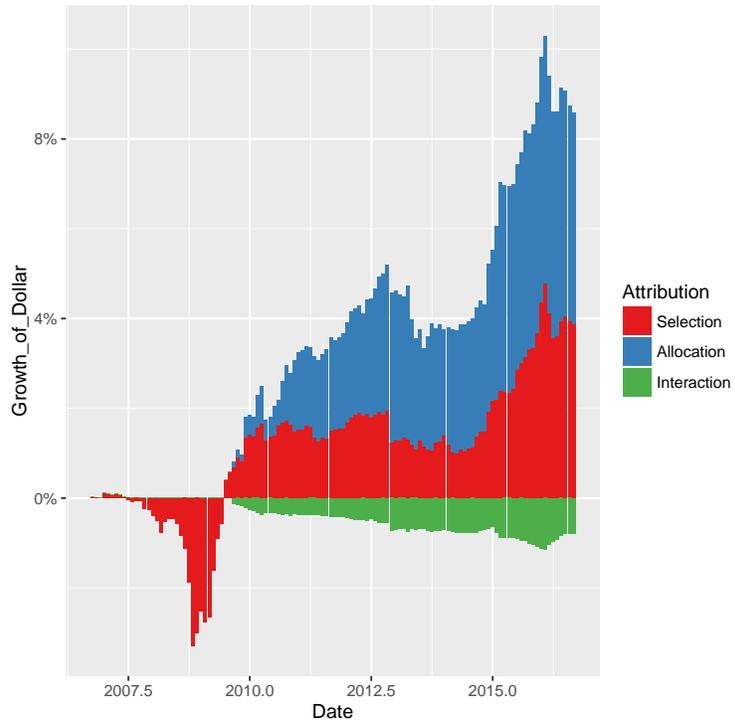
# Total Public Fixed Income



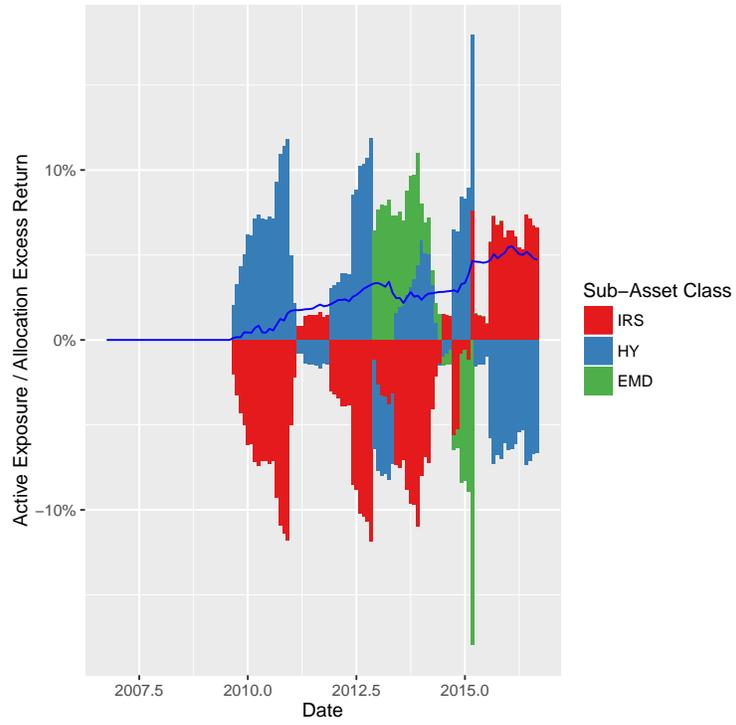
Public Fixed Income Rolling 3 Year Performance



Brinson Return Attribution

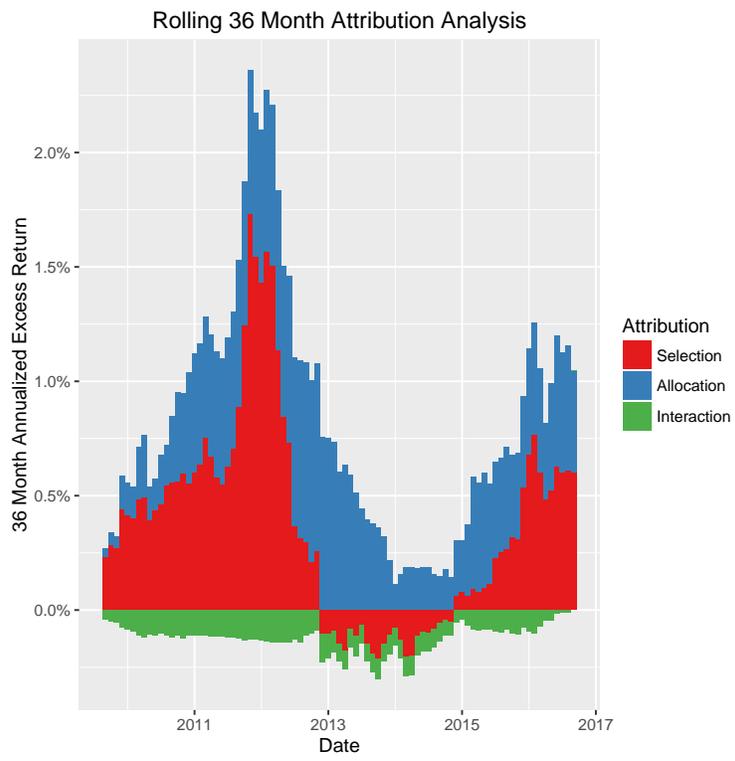
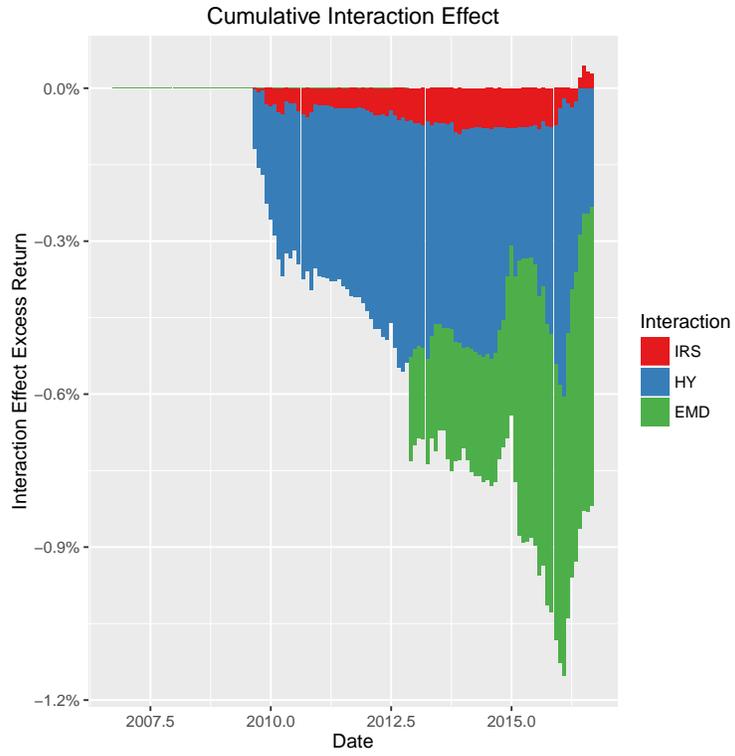


Over/Under Weights & Cumulative Allocation Effect (Line)

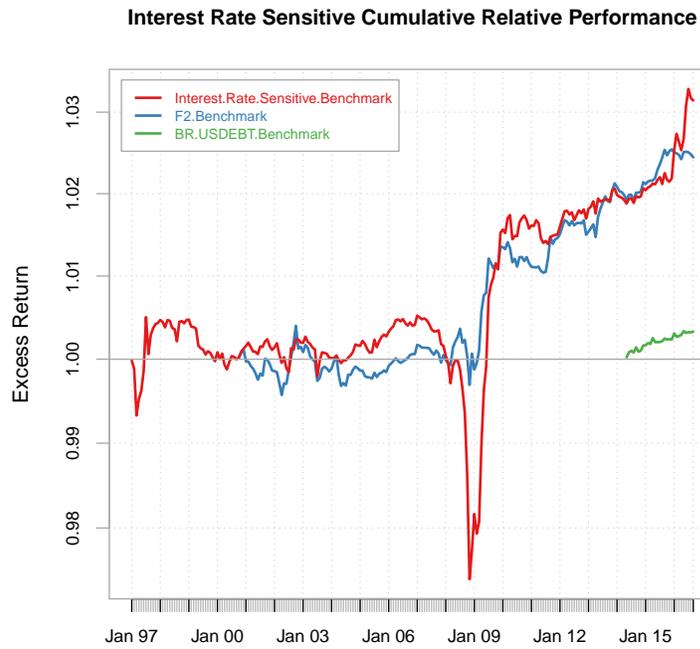
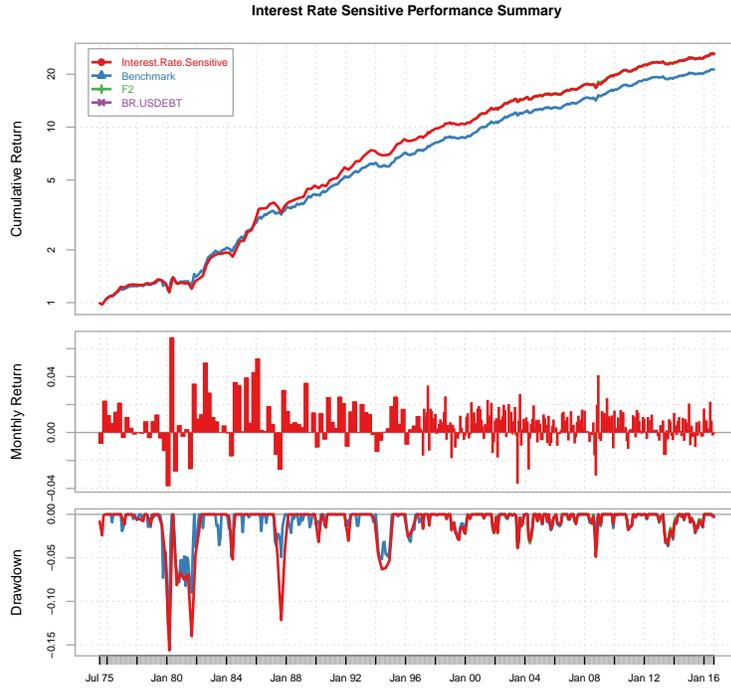


Cumulative Selection Effect

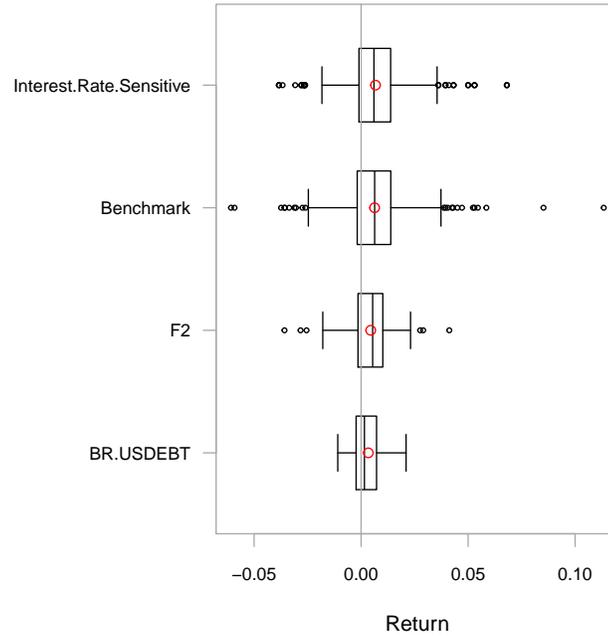




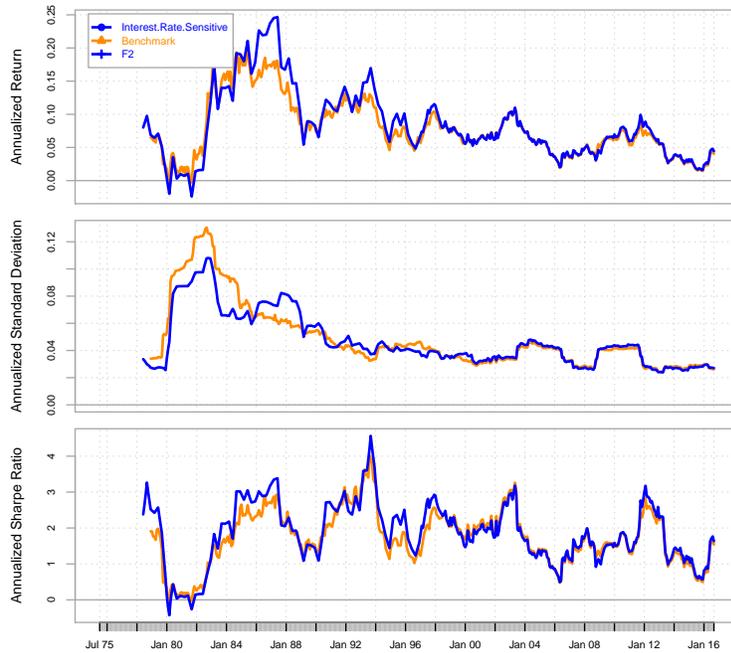
# Interest Rate Sensitive



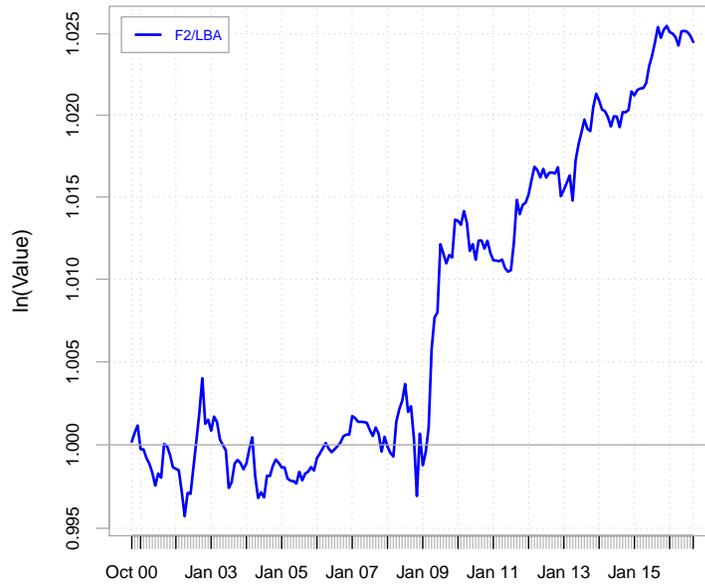
### Return Distribution Comparison



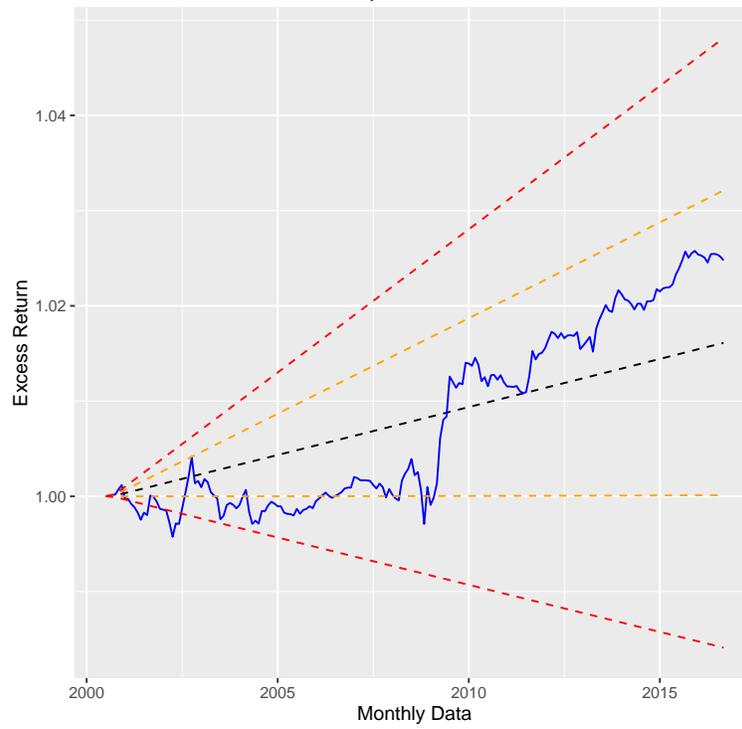
### Interest Rate Sensitive Rolling 3 Year Performance

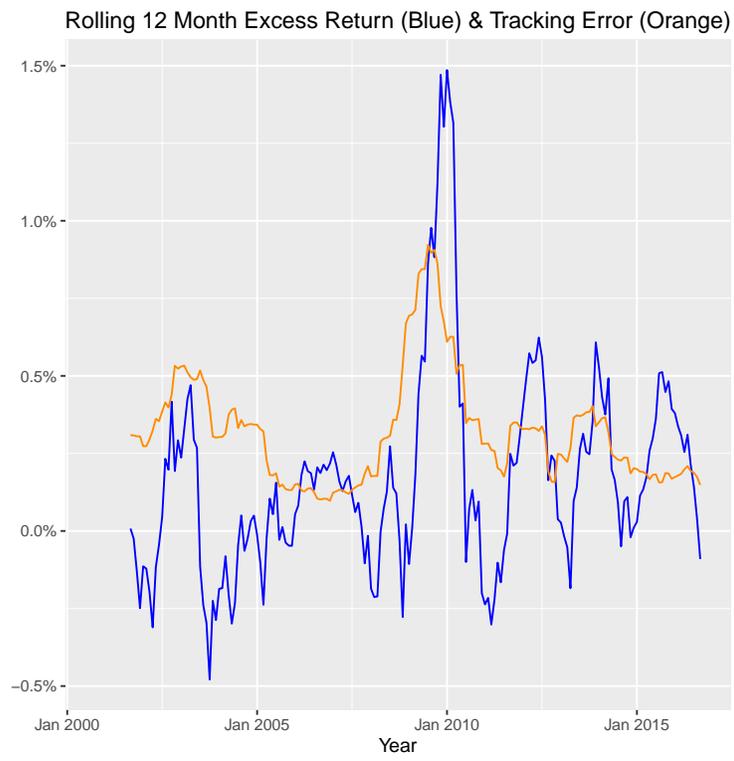
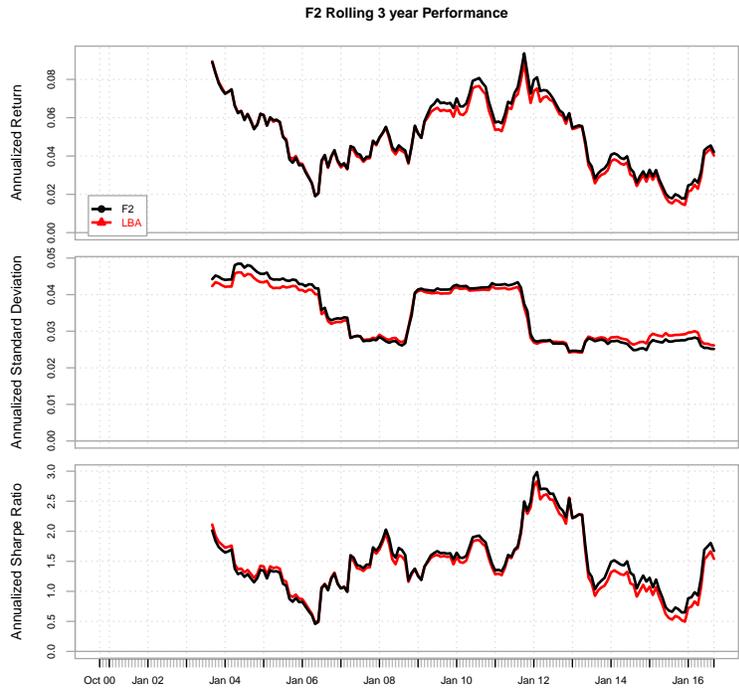


F2 Cumulative Relative Performance

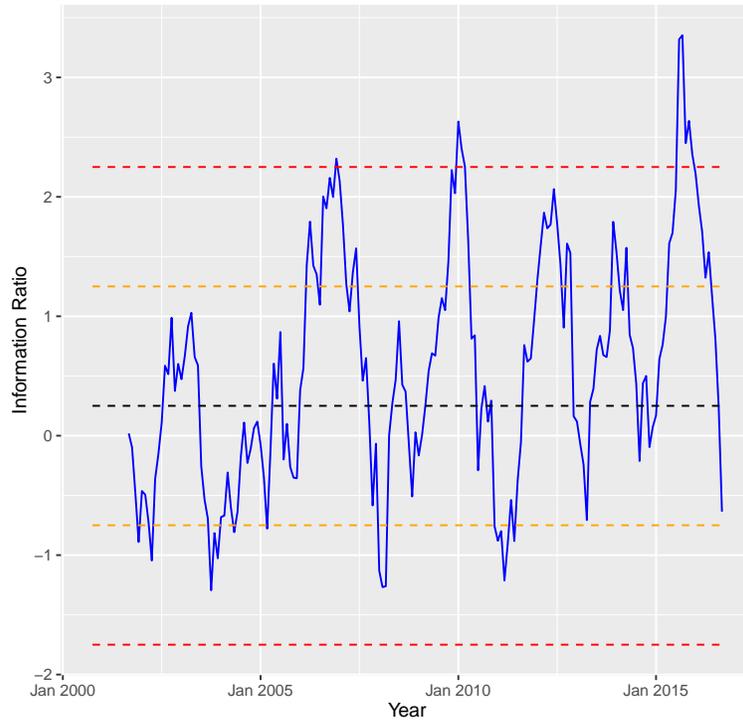


F2 Actual Excess vs Expected Excess  $\pm 1$  & 2 Std Dev





F2 Rolling 12 Month Information Ratio

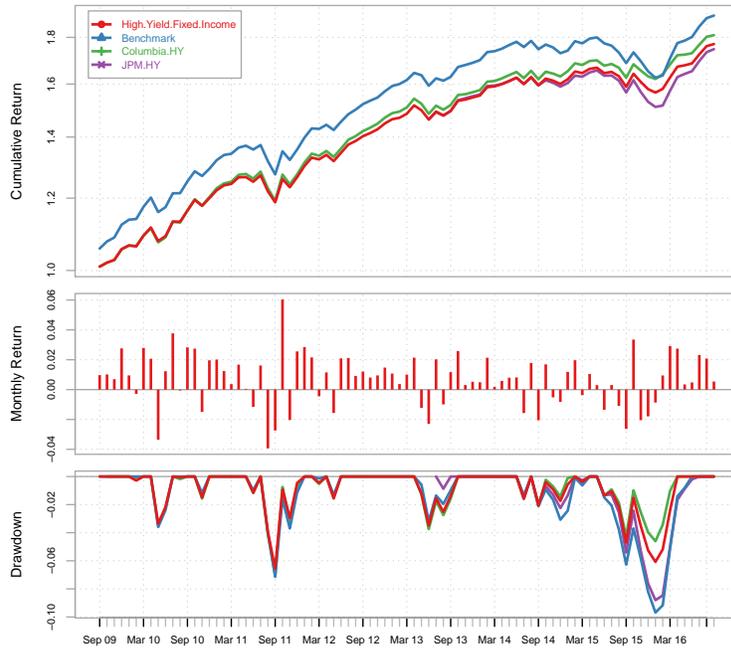


F2 Rolling 36 Month Information Ratio

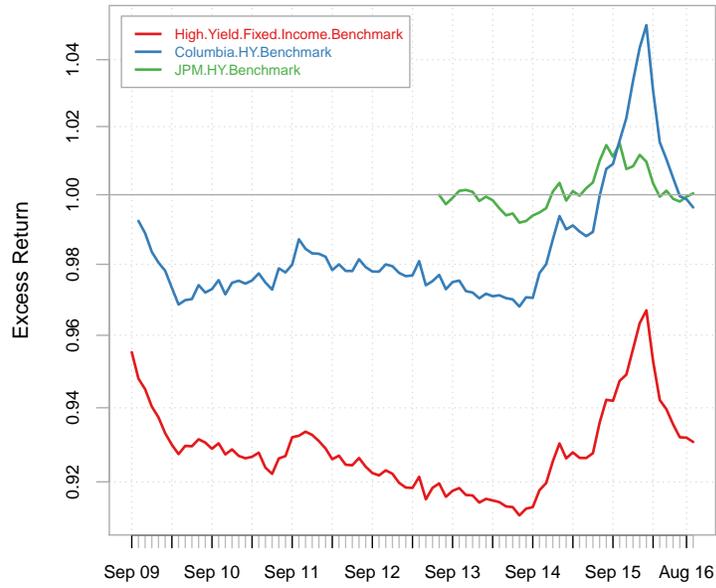


# High Yield

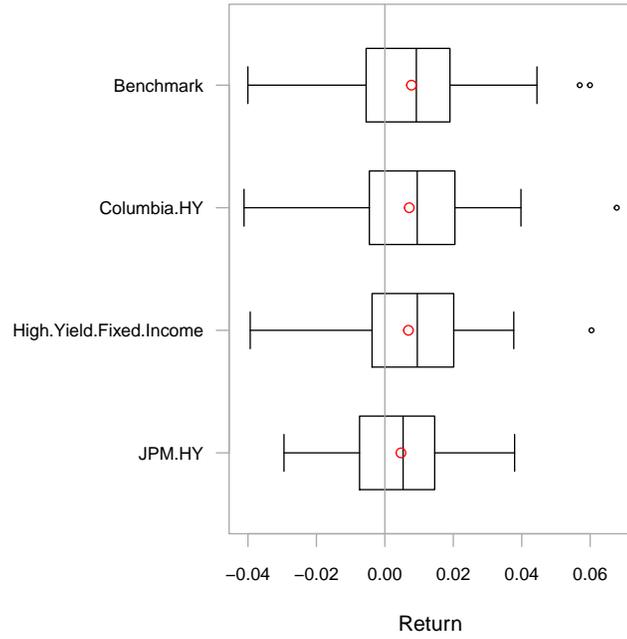
High Yield Fixed Income Performance Summary



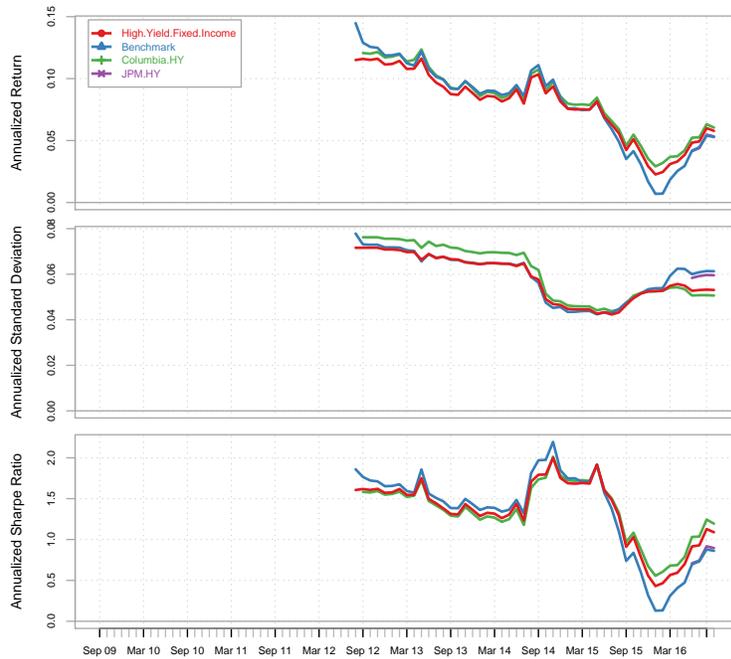
High Yield Fixed Income Cumulative Relative Performance



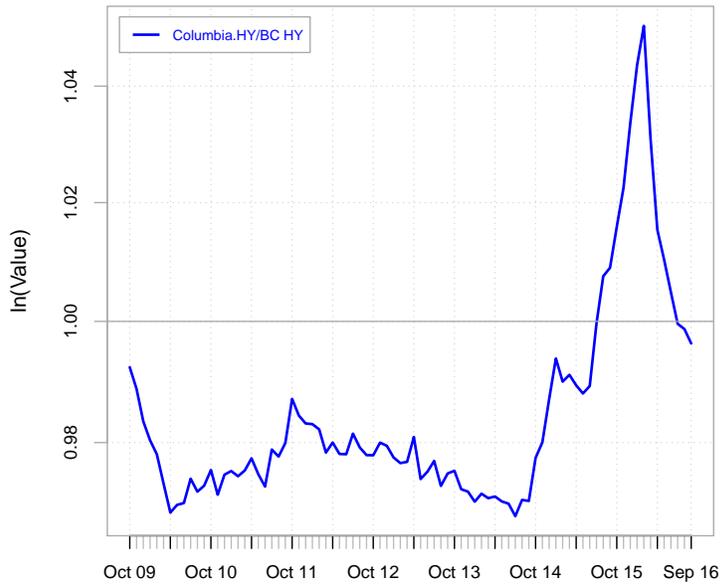
### Return Distribution Comparison



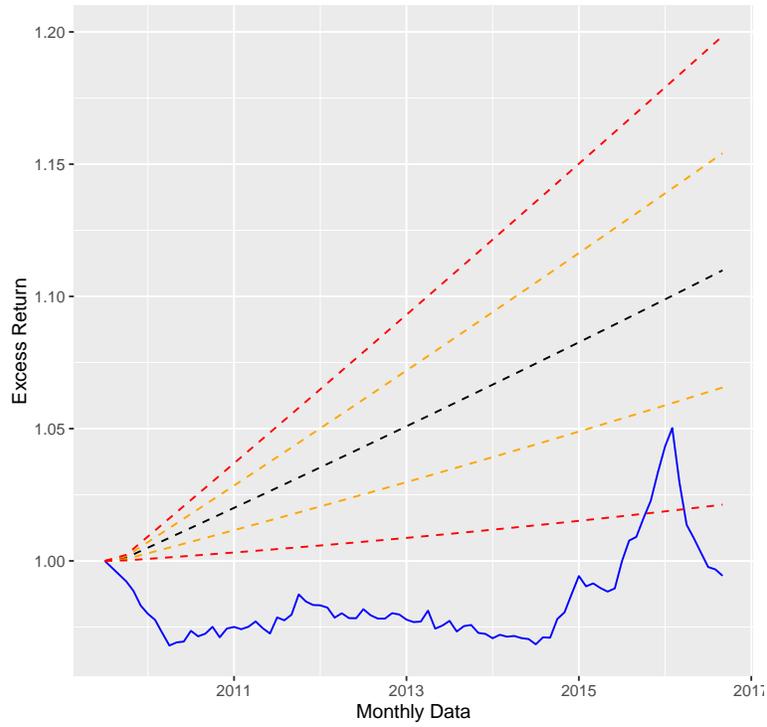
### High Yield Fixed Income Rolling 3 Year Performance



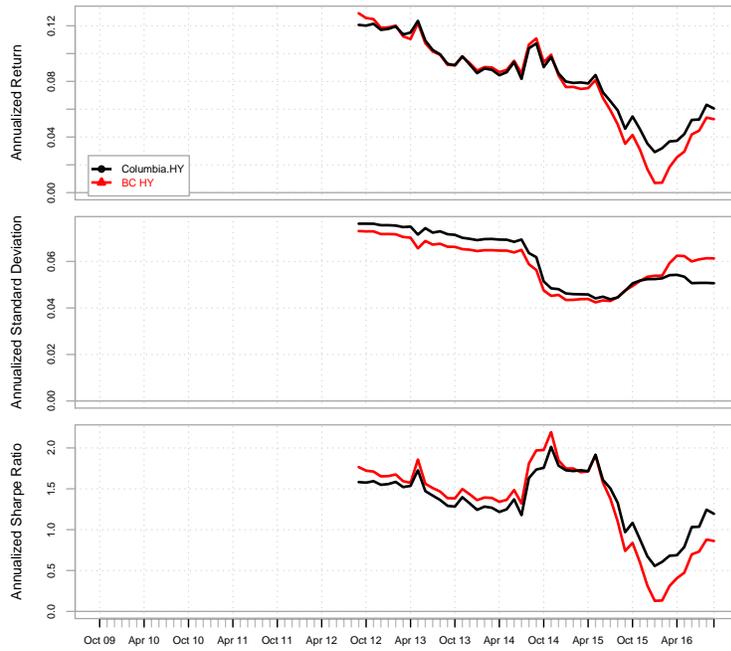
Columbia.HY Cumulative Relative Performance



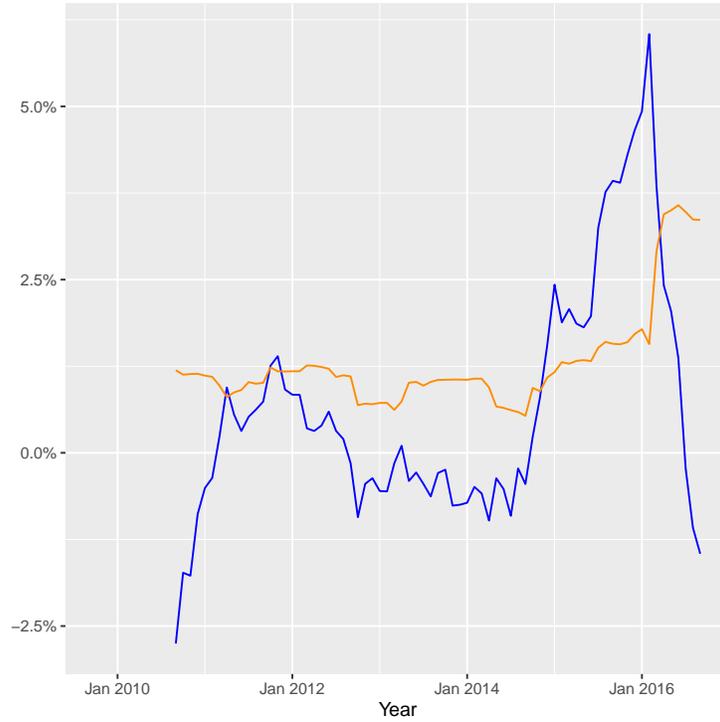
Columbia.HY Actual Excess vs Expected Excess +/- 1 & 2 Std Dev



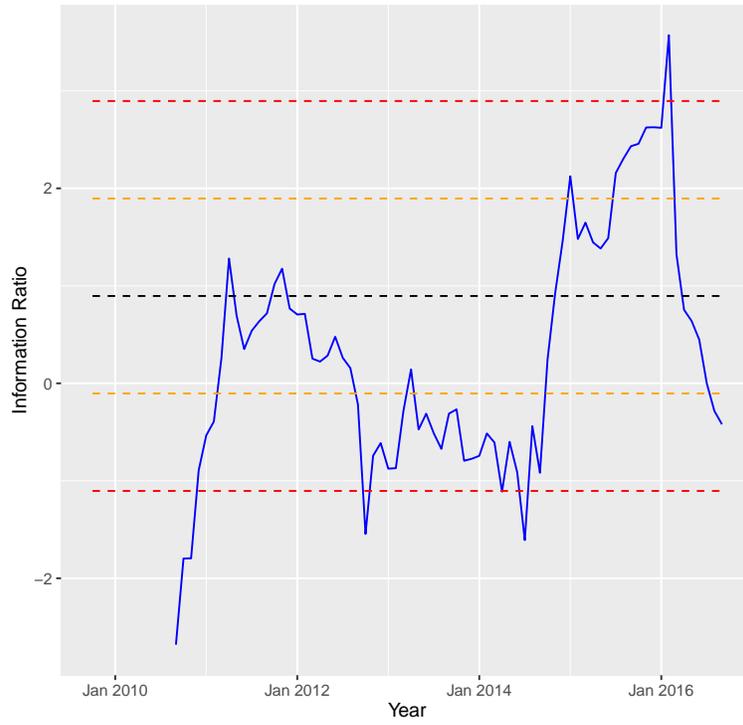
Columbia.HY Rolling 3 year Performance



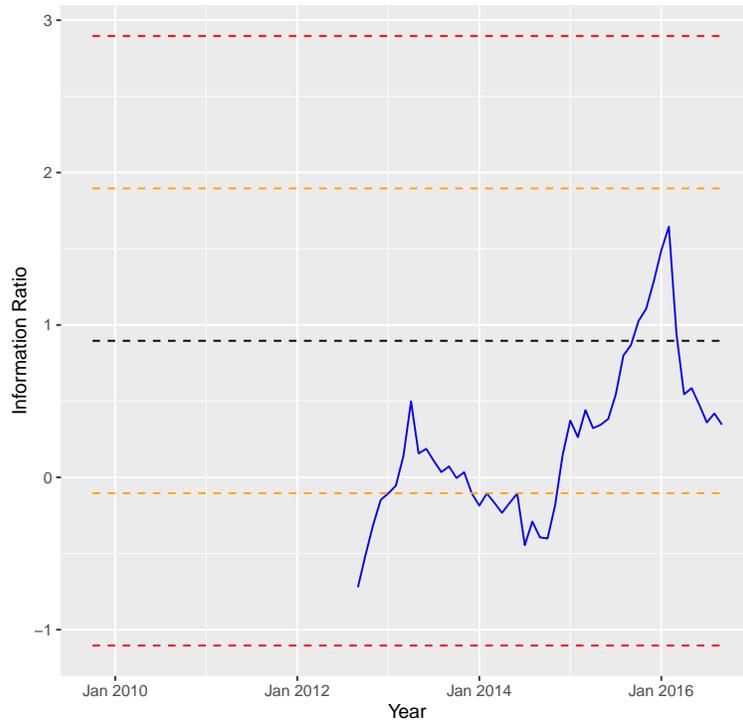
Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)



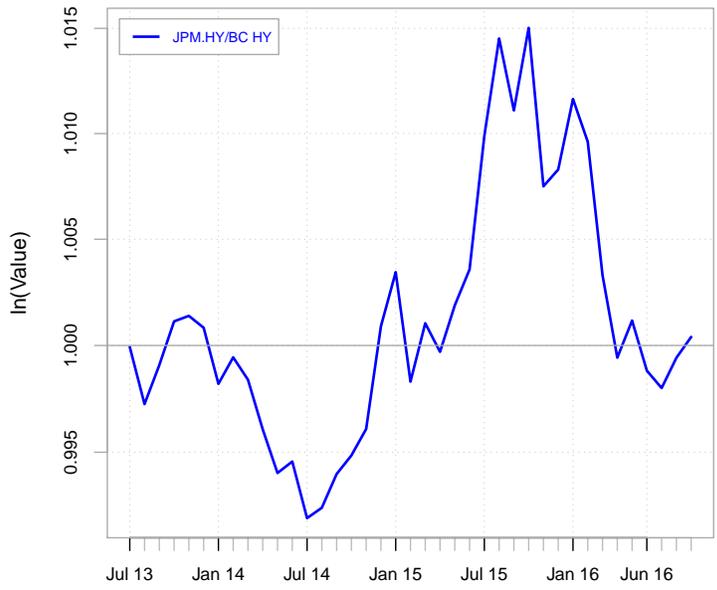
Columbia.HY Rolling 12 Month Information Ratio



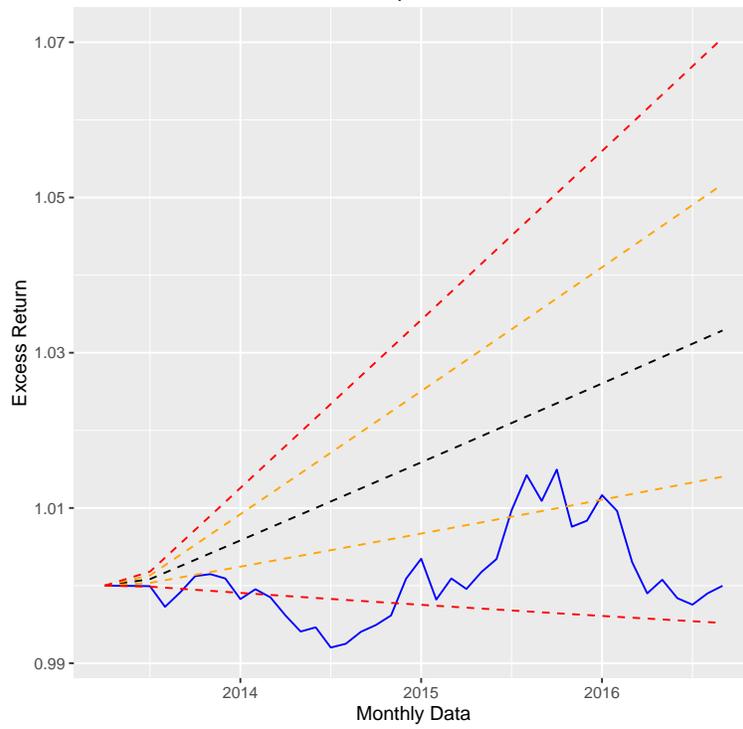
Columbia.HY Rolling 36 Month Information Ratio

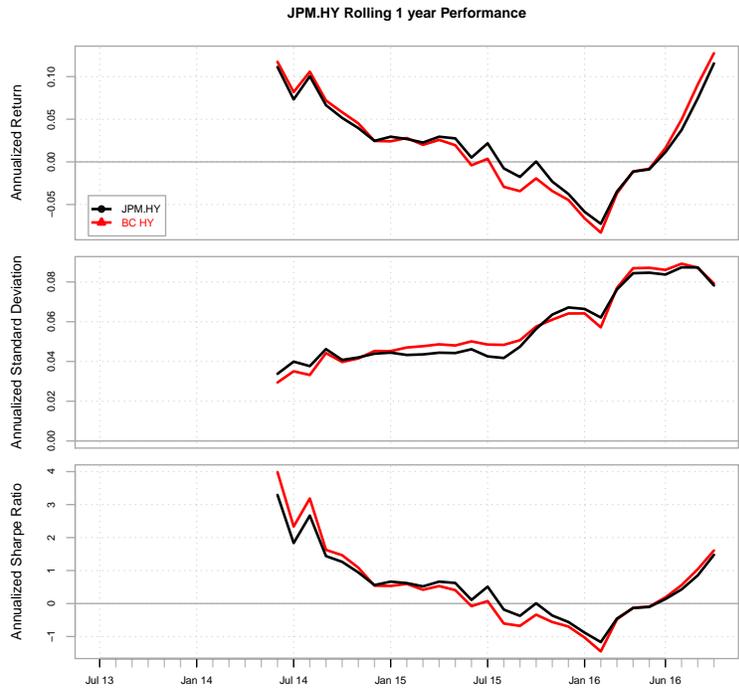


JPM.HY Cumulative Relative Performance

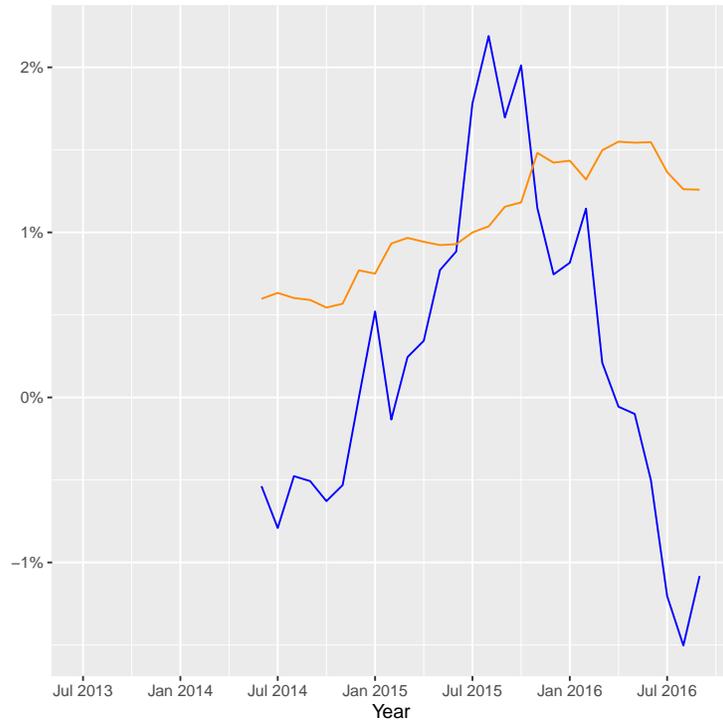


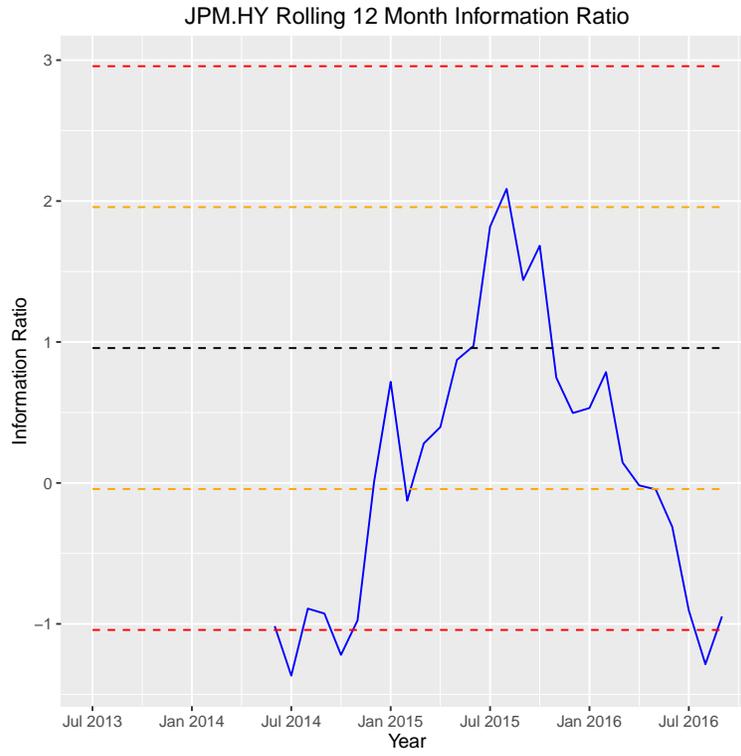
JPM.HY Actual Excess vs Expected Excess +/- 1 & 2 Std Dev





Rolling 12 Month Excess Return (Blue) & Tracking Error (Orange)





# Agenda Item #11

# Inflation Linked Assets

## Asset Class Review

Eric Glass & Micheal Copeland

Arizona State Retirement System

November 28, 2016

# Outline

- 1 Background
  - Evolution of the ASRS Inflation-linked program
  
- 2 Private Markets
  - Real Estate
  - Agriculture
  - Infrastructure
  - Timber
  
- 3 Public Markets
  - Commodities

# Inflation Linked Assets

- Inflation linked assets are positively linked to inflation through their value and income streams
- Inflation linked assets are one of three major asset classes (along with equities and fixed income) as defined in the ASRS strategic asset allocation
- Inflation linked assets are implemented in both private and public markets
- Private market inflation linked assets are
  - Real estate
  - Farm land
  - Infrastructure
  - Timber
- Investments in commodities are generally implemented through highly liquid derivatives markets

# The 2009 Asset Allocation Study

- The 2009 Strategic Asset Allocation Study established Inflation-linked as an asset class
  - Commodities & TIPS
    - Positive short and medium-term correlation to inflation
    - Diversification benefits from low correlation to traditional asset classes & low correlation among one another
- During 2009-2011 used TIPS opportunistically
  - Blackrock US TIPS passive
- In Q3 2010 ASRS hired two commodities managers
  - Gresham & Cargill

## 2009 Inflation Linked Allocations

Asset Class	Target	Range	Benchmark
Commodities	3%	0-5%	DJ UBS Total Return
TIPS	0%	0-5%	Barclay's TIPS
Total IL	3%	0-10%	

# The 2012 Asset Allocation Study

- The 2012 Strategic Asset Allocation Study further built out the Inflation-linked program
  - Real Estate: Increased target allocation to 8% from 6%
  - Commodities: Increased target allocation from 3% to 4%
  - Farmland & Timber, Infrastructure, and Opportunistic Inflation-linked each established as asset classes, with 0% target allocation and 0-3% range

## 2012 Inflation Linked Allocations

Asset Class	Target	Range	Benchmark
Commodities	4%	1-7%	DJ UBS Total Return
Real Estate	8%	6-10%	NCREIF ODCE
Infrastructure	0%	0-3%	Core CPI plus 3.5%
Farmland & Timber	0%	0-3%	Core CPI plus 3.5%
Opportunistic	0%	0-3%	Investment Specific
Total IL	12%	8-16%	

# The 2015 Asset Allocation Study

- The 2015 Strategic Asset Allocation Study modified the Inflation-linked program
  - Real Estate: Increased target allocation to 10% from 8%
  - Commodities: Reduced target allocation to 2% from 4%
  - Farmland & Timber, Infrastructure, and Opportunistic Inflation-linked retained as asset classes, with no change to target allocation

## 2015 Inflation Linked Allocations

Asset Class	Target	Range	Benchmark
Commodities	2%	0-4%	DJ UBS Total Return
Real Estate	10%	8-12%	NCREIF ODCE
Infrastructure	0%	0-3%	Core CPI plus 3.5%
Farmland & Timber	0%	0-3%	Core CPI plus 3.5%
Opportunistic	0%	0-3%	Investment Specific
Total IL	12%	8-16%	

# Real Estate Strategy

- ASRS Implements its real estate program pursuant to a strategic plan
- ASRS updated this plan in September, 2015
- The ASRS Real Estate Strategic Plan can be found at the following link  
[www.azasrs.gov/content/key-investment-documents](http://www.azasrs.gov/content/key-investment-documents)

# Real Estate Objectives

- Generate attractive risk adjusted returns at or above the actuarial target return of 8%
- Enhance the overall diversification of the ASRS investment program
- Generate regular cash flow from stabilized properties
- The program is benchmarked against the NCREIF ODCE index. The real estate strategic plan provides the following guidance regarding the target return and selection of the benchmark:

*“By selecting the NFI-ODCE as benchmark, the ASRS considers this benchmark as an opportunity cost, not a model portfolio. The ASRS expects that its portfolio will vary significantly from the ODCE index. The ASRS will manage its investments actively and dynamically in the real estate asset class in order to target a net return expectation of 8%. The 8% net objective represents a significant premium over the 6.5% net long term expectation for passive, stable, equity real estate positions.”*

# Real Estate Portfolio Structure

- 75% of the portfolio is planned for implementation in separate account structures
  - In these structures, ASRS will be a majority owner with significant control rights including control over liquidity events and the right to utilize a consultant to validate each property meets the investment criteria and return hurdles applicable to the investment
  - ASRS favors separate account structures because of the ability to negotiate custom investment criteria, enhanced controls and enhanced liquidity
- 25% of the portfolio is planned for implementation in commingled structures
  - Commingled structures will be used for differentiated strategies that are only available in a commingled structure or not feasible to implement in a separate account
- ASRS commenced building the separate account portfolio in 2013 and this portfolio now constitutes approximately one half of the real estate portfolio. We anticipate the target portfolio structure will be achieved within three years as we continue to build out the separate accounts and the legacy commingled funds run off.

## Risk Management – Property Markets

- Real estate performance is strongly influenced by observable and durable demographic and economic trends
- Rental increases occur in situations with high demand and constraints on supply
- Some important trends are:
  - The demographics of baby boomers and their children profoundly affect real estate demand
  - E-commerce affects utilization of industrial and retail space
  - The structure of employment away from goods producing to service occupations affects the geographic dispersion of economic activity
  - Urbanization is a continuing trend with a pattern of globally significant cities emerging
  - Office utilization is becoming much more efficient with a strong downward trend of space utilization per employee

## Risk Management – Demand Driven Investing

- In order to capitalize on these trends, we are creating a customized investment strategy that we like to call “demand driven investing”.
  - We believe the risk of real estate is not having tenants
  - We search for opportunities with strong demand fundamentals driven by age and income demographics, education levels, concentrations of high quality jobs and other relevant location criteria
- We identify sectors that have favorable demand dynamics with demographic or other economic tail wind and search for markets with supply barriers
  - Apartments, industrial, self-storage, medical office, senior housing, student housing are overweight sectors for us
- We have implemented a robust search and recruitment process to find the most qualified parties to be our partners in this program
  - Identify first tier operators in each of these sectors to implement through custom separate account arrangement

## Risk Management – Property Level Underwriting

- All of our separate account agreements require consultant confirmation that each property acquired meets investment criteria and meets applicable return hurdles
  - While there are national real estate estate statistics, property markets are inherently local
  - We underwrite every property in the context of its competitiveness in the supply/demand dynamic of its neighborhood
- We are supported in this process by a consultant with deep expertise in this type of property level underwriting and with extensive contacts in the real estate industry

## Risk Management – Diversification and Leverage

- As required by the strategic plan, the portfolio will be well diversified across
  - Property types
  - Geography
  - Life Cycle Stage
  - Vintage Year
- The portfolio will levered at 50% to 60% loan to value
  - Leverage is measured at the portfolio level, allowing latitude at the property level
  - Higher leverage is permitted on stable properties with access to fixed rate financing but offset by lower leverage on properties in the process of implementing a value creation business plan
  - Given the uncertainty on future interest rates, leverage of up to 65% may be utilized on an asset level basis for fixed interest rate debt

## Risk Management – Capital Markets

- Like other asset classes, real estate faces challenges as we approach what may be the end of an extended period of very low interest rates
  - While real estate cap rates are low, spreads to treasuries are higher than historic norms indicating some degree of interest rate increase is already priced into values
- Our strategy in this context is:
  - Focus on diversification, especially by vintage year
  - Highly disciplined underwriting at the property level anticipating future increases in interest rates and cap rates
  - Avoid the most expensive core properties which in the current market are “priced to perfection”
  - Focus on niche property types such as medical office priced wide of traditional property categories
  - Focus on properties with value creation potential through operational improvement investing directly with expert operators

# Current Portfolio

## Real Estate Portfolio as of June 30, 2016

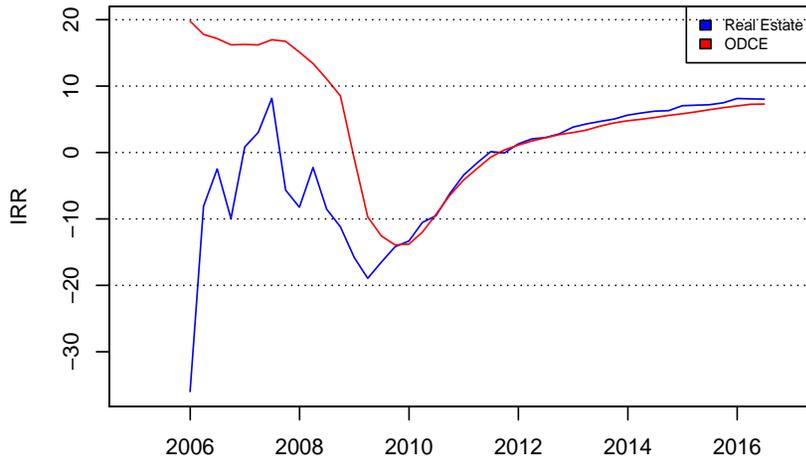
	\$ millions	Percent of ASRS Total Fund
Net Asset Value	3364.07	9.65%

- Current Portfolio is \$122 million below the target funding of 10%
- We update a pacing study and implementation plan each year to determine the amount of new investment commitments to achieve the target funding

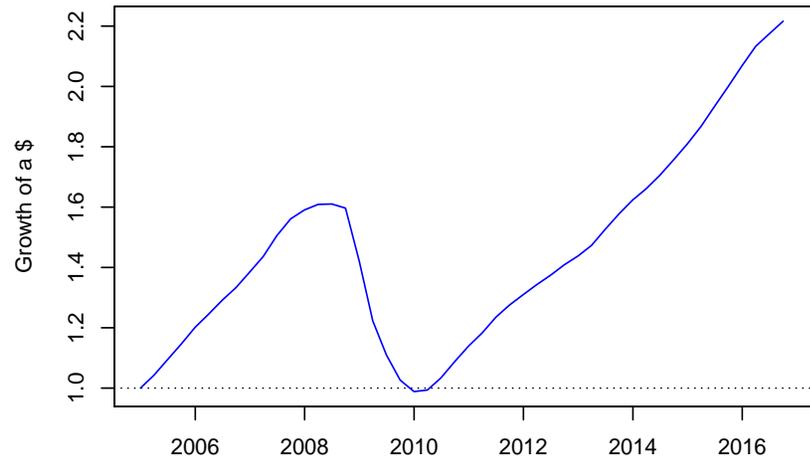
# Performance

- The charts and tables on the following pages illustrate the performance of the real estate portfolio
- The real estate portfolio underperformed its benchmark in its early years, but recent out-performance has brought the inception to date performance above benchmark levels
- As noted above a majority of assets are invested in commingled opportunity funds which have, as would be expected, underperformed during down markets but outperformed in up markets

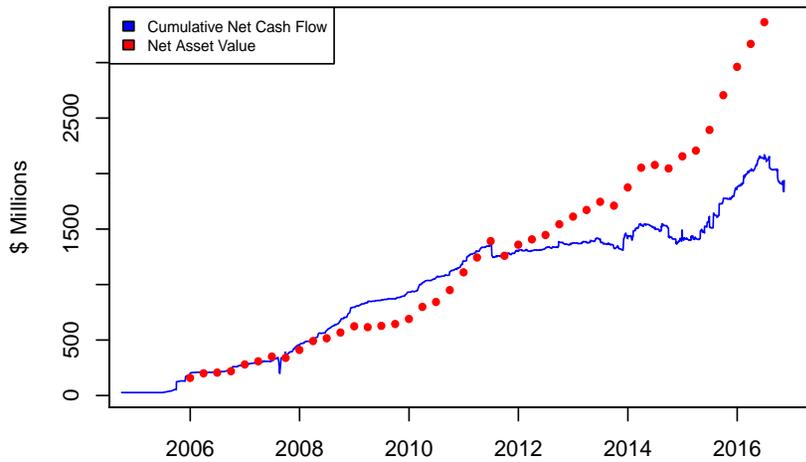
**Real Estate IRRs compared to ODCE**  
 Inception through indicated date



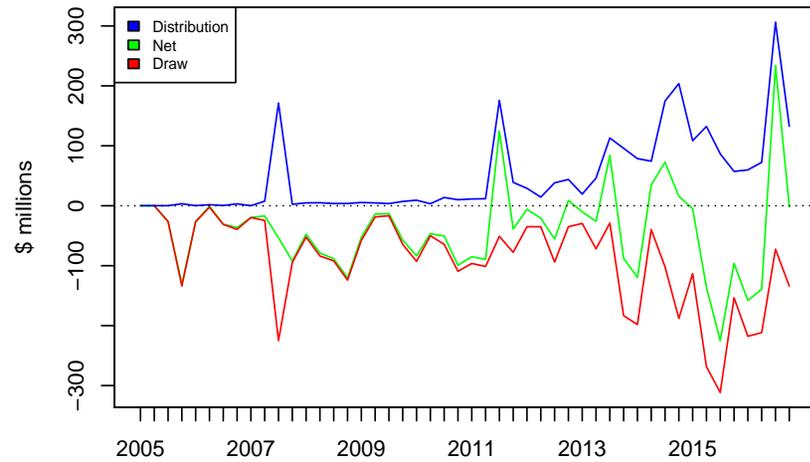
**ODCE**



**Real Estate Cumulative Net Capital Contributed**  
 Compared to Value



**Real Estate**  
 Quarterly Draws and Distributions



## Returns for Periods Ended June 30, 2016

### Time Weighted Returns

	One Quarter	One Year	Three Years	Five Years	Inception
Real Estate TWR	1.77%	13.00%	13.24%	12.66%	8.04%
ODCE TWR	3.10%	12.00%	12.00%	13.00%	6.00%

### IRRs

	One Quarter	One Year	Three Years	Five Years	Inception
Real Estate IRR	1.75%	13.00%	13.23%	12.67%	8.04%
ODCE IRR	1.95%	12.29%	12.45%	11.98%	7.30%

# Opportunistic Investments

## Real Estate Related Opportunistic Investments

	Commitment	Net Amount Invested	NAV	Inception IRR
56th and Park (NY) Holdings, LLC	50	19.37	74.53	36.70%
OCM STR Co-Invest 1, L.P.	0	-125.81	0.43	22.74%
Saguaro Land Investor, LLC.	140	58.25	71.49	14.66%

- OCM Store is a REIT based in Scottsdale investing in single tenant net lease properties. ASRS was a founding investor in this company which has recently gone public (NYSE:STOR).
- 56th and Park is a condominium at 432 Park in Manhattan
- Saguaro Land Investor provides subdivision financing to homebuilders
- Tunbridge is a platform that purchases private markets' GP interests, particularly Real Estate managers

# Performance Accountability

The following table shows performance for legacy real estate investments and those by the current management team.

## Portfolio Returns

	Portfolio IRR	ODCE IRR	Outperformance
Total RE Legacy Portfolio	6.12	6.03	0.09
Total RE Current Portfolio	15.29	12.28	3.01
Real Estate Opportunistic	24.40	12.44	11.96
Combined Current Real Estate	17.01	12.32	4.69

The following table shows performance of the current consulting team.

## Consultant Returns

	Portfolio IRR	ODCE IRR	Outperformance
RCLCO Real Estate	15.82	12.40	3.42
RCLCO Opportunistic	29.23	12.53	16.70
RCLCO Combined	17.21	12.43	4.78

# Farm Land Investing

- ASRS invests in farm land for its long-term inflation protection linked to the value of land and its income generation
- ASRS invested \$175 million International Farming Corp (IFC)
  - IFC is a multi-generational U.S. farming corporation with deep operational expertise
  - They pursue a diversified and value add approach to agricultural investing
    - Diverse crop mix and geography with high crop optionality
    - Prefer properties with natural resource optionality (water and mineral rights)
    - Avoids the expensive Midwest 'I' states (Iowa, Illinois, and Indiana)
  - ASRS negotiated custom structure with right-of-first-offer (ROFO) rights to buy assets upon sale from the fund
  - Inception IRR through June 30, 2016 is 3.82% which has underperformed the benchmark return of CPI+350 by 1.8%
    - The portfolio is still young with average hold of less than 3 years
    - Value add business plans are still in course of implementation with productivity improvements being realized in the current crop year
    - Recent distressed investments in citrus and organic farming seem very promising
    - Commodity grain investments have been impacted by prices

# Infrastructure

- ASRS invests in infrastructure for long-term inflation protected income streams from assets and systems that support transportation, energy, shipping, and communications
  - Global needs exist to support rising populations and antiquated operations
- ASRS invested \$300 million with Industry Funds Management (IFM), an Australian-based infrastructure manager that invests globally using a core strategy in an open-end fund structure
  - Fund structure provides diversity of exposure across strategies and geography
  - Long term vehicle structure is aligned with long term character of assets
  - Focused on OECD countries; current portfolio invests across US, UK, and Europe
  - Investments include airports, toll roads, a petroleum pipeline, power generation & transmission facilities, a regulated water & wastewater treatment company, and broadcast and wireless communication infrastructure
    - Projects are heavily regulated and have predictable revenue patterns
- The \$300 million commitment was called in December 2014
- Inception IRR through June 30, 2016 is 6.48%, which has outperformed the benchmark return of CPI+350 by 0.8%
  - The portfolio has performed well (albeit over a short measurement period) but with gains largely offset by currency impacts

# Timber

- Timber is a permitted asset in the inflation linked group because it can provide long-term inflation protection income derived from the rising utilization of timber and shrinking forest sizes
- Timber has a low correlation with other asset classes combined with low volatility
- ASRS has made no investments in timber but monitors the space
- Should ASRS pursue this strategy, it will seek alignment of asset and vehicle life similar to other private markets inflation-linked assets

# Background of ASRS Commodities Program

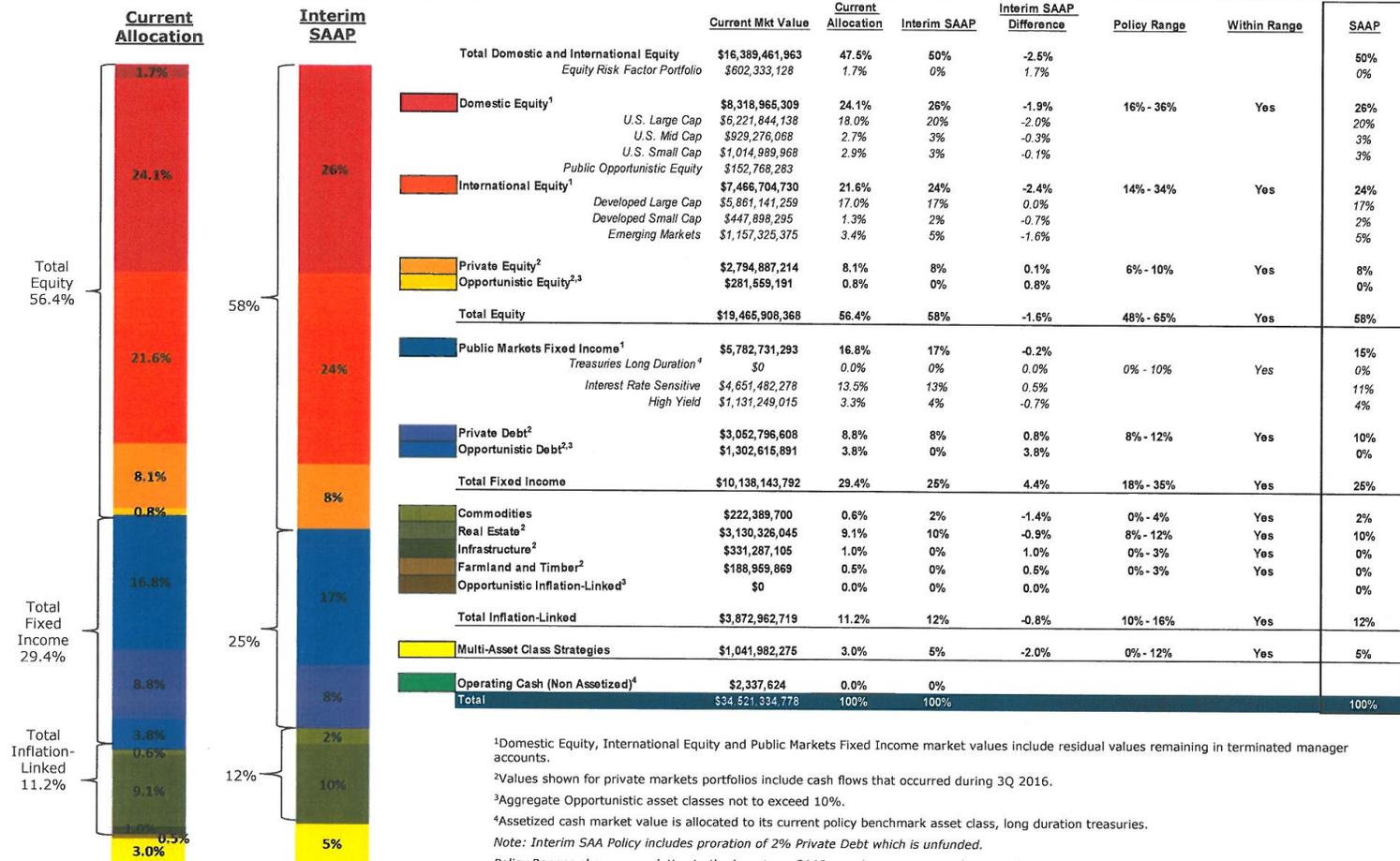
- ASRS approved a 3% (0%-5%) strategic allocation to commodities in October 2009. After an in-depth search, ASRS invested just over half of the allocation with two long-only commodities investment managers
  - Gresham - \$200M on 8/30/2010
    - Systematic rules-based approach is used to construct and rebalance the portfolio. A discretionary, market-driven approach is used to implement and roll commodity futures.
  - Cargill - \$200M on 9/30/2010
    - Fundamental, bottom up approach using trading desks to construct a regional and global supply/demand balance sheet for each commodity market in which Cargill participates
- ASRS legged into its allocation to avoid chasing returns and because of valuation concerns.
- ASRS GTAA managers' benchmark also included a 3% allocation to commodities.

## Background of ASRS Commodities Program (2)

- The 2012 Strategic Asset Allocation Study increased target allocation from 3% to 4%, with a range of 1% - 7%
- The 2015 Strategic Asset Allocation Study reduced the target allocation from 4% to 2%, with a range of 0% - 4%
  - Over the past 2 years, ASRS maintained a tactical underweight to commodities and reduced its exposure:
    - \$100M redemption in December 2014
    - \$50M redemption in July 2015
    - \$200M redemption in August 2015
  - These moves were consistent with the ASRS House View of maintaining an underweight position and also to provide liquidity for the Total Fund
  - ASRS has reduced its tactical underweight as certain commodities markets begin to rebalance and a new administration that has indicated a desire for less regulation and more fiscal stimulus
    - \$200M contribution in November 2016 to reduce underweight from -1.4% to -0.8%
  - ASRS maintains its single manager relationship in commodities with Gresham. ASRS is comfortable with Greshams' role due to inception-to-date outperformance, exceptional client service, and low fees

# ASRS Commodities Asset Class Overview as of 9/30/2016

## Arizona State Retirement System SAA Policy Compliance



<sup>1</sup>Domestic Equity, International Equity and Public Markets Fixed Income market values include residual values remaining in terminated manager accounts.

<sup>2</sup>Values shown for private markets portfolios include cash flows that occurred during 3Q 2016.

<sup>3</sup>Aggregate Opportunistic asset classes not to exceed 10%.

<sup>4</sup>Assetized cash market value is allocated to its current policy benchmark asset class, long duration treasuries.

Note: Interim SAA Policy includes proration of 2% Private Debt which is unfunded.

Policy Ranges shown are relative to the long-term SAAP, causing some asset classes to be out of range while implementation of the long-term SAAP is in process.

Market values include manager held cash.

# Commodities Performance

as of 9/30/16

Arizona State Retirement System

## Asset Class Performance Summary - Public Markets

	% of (\$) Portfolio	3 Mo (%)	Rank	YTD (%)	Rank	1 Yr (%)	Rank	3 Yrs (%)	Rank	5 Yrs (%)	Rank	10 Yrs (%)	Rank	Inception (%)	Since	
<b>Total Inflation-Linked Assets</b>	222,389,700	0.6	-4.0	99	7.0	62	-4.6	95	-13.4	89	-9.0	99	-	-	-5.7	Feb-10
<i>ASRS Custom Inflation-Linked Benchmark</i>			-3.9	99	8.9	48	-2.6	88	-12.3	85	-9.4	99	-	-	-6.6	Feb-10
<i>Over/Under</i>			-0.1		-1.9		-2.0		-1.1		0.4				0.9	
<i>InvestorForce Public DB &gt; \$1 Billion Real Assets/Commodities Net Median</i>			1.3		8.2		4.9		-1.8		2.7		-		5.2	Feb-10

as of 10/31/16

ARIZONA STATE RETIREMENT SYSTEM  
Investment Management Division  
Oct-31-2016  
Net Returns  
Preliminary

ASRS Pension and HBS Assets  
Public Securities Markets  
Investment Managers Performance Summary



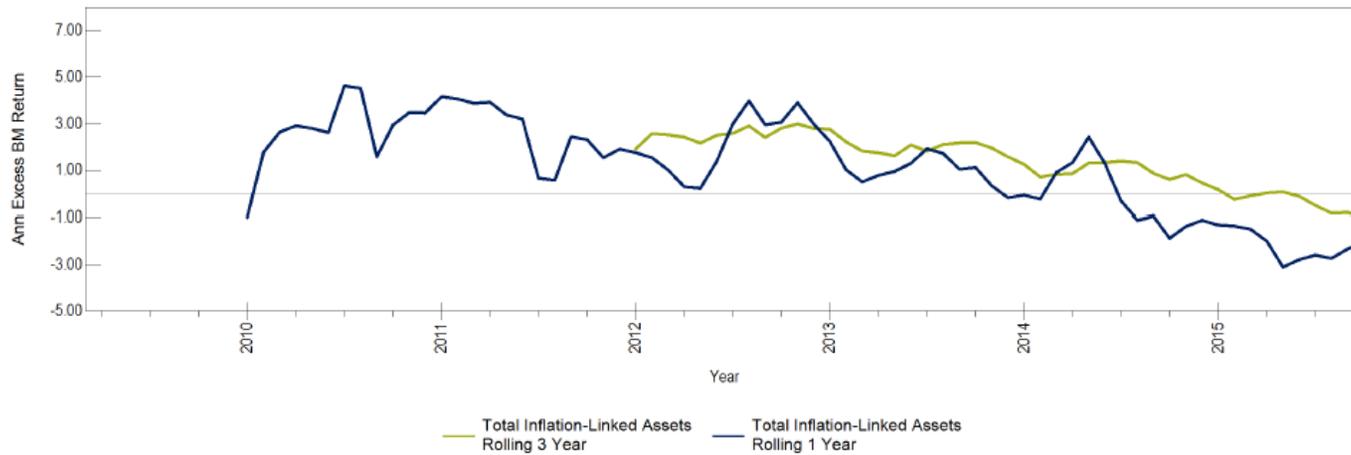
	Benchmark	Market Value (\$mil.)	1 Mth	3 Mth	FYTD	1 Year	3 Year	5 Year	10 Year	ITD	Inception Date
<b>GLOBAL INFLATION LINKED</b>											
GRESHAM	Bloomberg Commodity Index Total Return	224	0.83	2.24	-3.21	-3.82	-12.85	-10.04		-5.37	09-01-2010
Excess			1.31	1.42	1.13	-1.20	-0.80	0.57		1.31	

# Commodities Excess Return

## Arizona State Retirement System

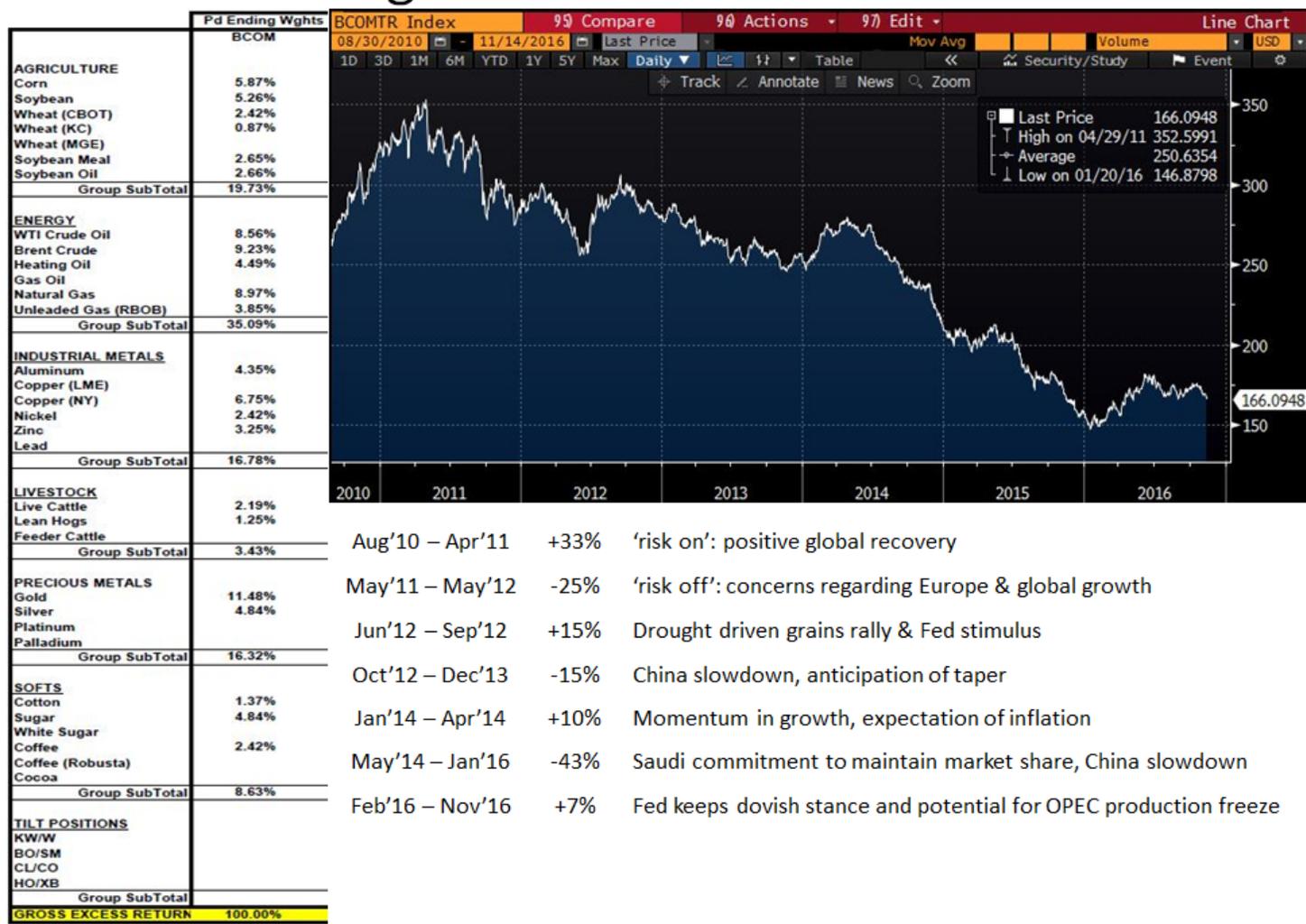
### Asset Class Analysis - Total Inflation-Linked Assets

Rolling Annual Excess Benchmark Return



# Commodities Profile

## Bloomberg Commodities Total Return Index



Aug'10 – Apr'11 +33% 'risk on': positive global recovery  
 May'11 – May'12 -25% 'risk off': concerns regarding Europe & global growth  
 Jun'12 – Sep'12 +15% Drought driven grains rally & Fed stimulus  
 Oct'12 – Dec'13 -15% China slowdown, anticipation of taper  
 Jan'14 – Apr'14 +10% Momentum in growth, expectation of inflation  
 May'14 – Jan'16 -43% Saudi commitment to maintain market share, China slowdown  
 Feb'16 – Nov'16 +7% Fed keeps dovish stance and potential for OPEC production freeze

9/30/2016 Index weights

# Commodities Index: Energy

- Performance <sup>1</sup>
  - YTD WTI (+16%) and Brent (+19%) have been strong; rebound from \$26 in February to \$50 in October
    - OPEC is working to enact a production freeze
    - US rig count is up 40% since the trough in May, the majority in the Permian
  - YTD Natural gas (+19%) has also rebounded materially
- Market Commentary and Outlook
  - Uncertain demand picture given policy implications of new administration
  - November meeting forthcoming by OPEC members to formulate supply strategy
  - Market expected to rebalance in 2017 >\$50

---

<sup>1</sup>as of 11/14/16

# Commodities Index: Precious and Industrial Metals

- Performance YTD <sup>2</sup>
  - Gold (+15%) and silver (+23%) have been strong as the USD weakened until August but rebounded recently
  - Copper (+18%) has performed well since the end of October on incremental positive news from China & anticipation of fiscal stimulus in the US
- Market Commentary and Outlook
  - US inflation has picked up & a rate hike is priced in for December; the rest of the world is emphasizing fiscal levers with minimal success
    - Likely to result in currency volatility as data comes in & policies sort out
  - Base metals have rallied ahead of fundamentals, which have shown modest improvement

---

<sup>2</sup>as of 11/14/15

# Commodities Index: Ags, Livestock, and Softs

- Performance YTD <sup>3</sup>
  - Corn (-5%) and wheat (-15%) have been weak due to good weather and increases in global stocks
  - Cattle (-15%) and hogs (-18%) have been weak on the back of surging herds and tepid demand growth
  - Coffee and Sugar (+~20%) has experienced the largest gains among the softs as a result of supply issues
- Market Commentary and Outlook
  - The weather largely cooperated for a strong growing season in row crops

---

<sup>3</sup>as of 11/14/16

# Commodities House Views: Bottoms up model

1-3 month horizon										
as of:	Index	Current	60 day							
11/15/2016	DJUBS	price	volatility	-1 st dev	+1 st dev	prob +	prob -	prob price	% ret	wght'd ret
<b>AGRICULTURE</b>										
Corn	8.0%	349.25	9%	317	381	50%	50%	349	0%	0.0%
Soybeans	5.7%	989.50	7%	918	1,061	50%	50%	990	0%	0.0%
Wheat	4.4%	418.75	9%	381	456	50%	50%	419	0%	0.0%
Soybean Meal	2.5%	312.30	8%	286	338	50%	50%	312	0%	0.0%
Soybean Oil	3.2%	34.21	9%	31	37	50%	50%	34	-1%	0.0%
Group SubTotal	23.7%									
<b>ENERGY</b>										
Crude Oil WTI	7.4%	45.82	15%	39	53	50%	50%	46	-1%	-0.1%
Crude Oil Brent	6.3%	46.97	14%	40	54	50%	50%	47	-2%	-0.1%
Heating Oil	3.1%	144.57	13%	126	163	50%	50%	145	-1%	0.0%
Natural Gas	8.8%	2.71	14%	2.33	3.09	50%	50%	2.71	-6%	-0.6%
Unleaded Gas (RB)	4.2%	133.58	14%	115	152	50%	50%	134	0%	0.0%
Group SubTotal	29.8%									
<b>INDUSTRIAL METALS</b>										
Aluminum	4.7%	1731.00	6%	1,628	1,834	32%	68%	1,694	-2%	-0.1%
Copper (NY)	7.1%	250.60	8%	232	269	32%	68%	244	-3%	-0.2%
Nickel	1.5%	11230.50	12%	9,939	12,522	50%	50%	11,231	0%	0.0%
Zinc	2.2%	2599.75	10%	2,347	2,852	32%	68%	2,509	-4%	-0.1%
Group SubTotal	15.5%									
<b>LIVESTOCK</b>										
Live Cattle	3.3%	106.53	9%	97	116	50%	50%	107	0%	0.0%
Lean Hogs	1.8%	52.90	13%	46	60	50%	50%	53	0%	0.0%
Group SubTotal	5.1%									
<b>PRECIOUS METALS</b>										
Gold	12.7%	1227.50	6%	1,154	1,301	68%	32%	1,254	2%	0.3%
Silver	4.3%	17.07	12%	15	19	50%	50%	17	0%	0.0%
Group SubTotal	17.0%									
<b>FOODS &amp; FIBERS</b>										
Cotton	1.9%	70.48	9%	64	77	50%	50%	70	0%	0.0%
Sugar	5.0%	21.15	11%	19	23	50%	50%	21	3%	0.1%
Coffee (ICE)	2.0%	165.30	11%	147	184	32%	68%	159	-4%	-0.1%
Group SubTotal	8.9%									
	100.0%									
									Total	-0.9%
										total weighted expected return: bottoms up

# Commodities House Views: Top down model

$$\Delta p = -16.8 + 5.3 * \Delta \text{WorldGDP} - 0.9 * \Delta \text{Dollar}$$

4

2.9%	World GDP
-2.3%	USD
0.6%	expected price change

<sup>4</sup> <http://libertystreeteconomics.newyorkfed.org/2016/03/what-tracks-commodity-prices.html>



# Arizona State Retirement System

## *Investment Beliefs*

---

### **FRAME OF REFERENCE**

The following *Investment Beliefs* have been established to ensure the development of congruent and synergistic investment strategies, and to ensure the effective and efficient allocation of resources. These *Investment Beliefs* determine the general paradigm within which investment strategies are developed, investment ideas are reviewed, and investment decisions are implemented.

Modifications to these *Investment Beliefs* will occur if experiential, academic, conceptual, and/or practical perspectives suggest that a superior belief system exists.

### **INVESTMENT BELIEFS**

#### **1. Asset Class Decisions are Key**

In general, decisions with respect to which asset classes and sub-asset classes to invest in, and the allocations to these asset classes and sub-asset classes, have a greater impact on total fund investment returns than decisions in which specific securities to invest.

#### **2. Theories and Concepts Must be Sound**

Over longer periods of time, investment outcomes (e.g. rates of return, volatility) conform to logical theories and concepts. Significant deviations (e.g. internet bubble, pre-subprime erosion of risk premiums) from theoretically and conceptually sound investment constructs are usually not sustainable and are typically self-reverting.

#### **3. House Capital Market Views Are Imperative**

The development and articulation of sound *House Views* (e.g. views on interest rates, corporate spreads, asset valuations) will ensure consistency among investment decisions, clarity of investment direction, baselines for debates, and conformity of understanding.

#### **4. Investment Strategies Must be Forward Looking**

Investment strategies will be developed based on forward-looking insights, rather than simply on successful strategies of the past.

Asset class valuations and security valuations are significantly affected by endogenous outcomes (e.g. earnings, GDP growth rates, competitive barriers) that are probabilistic, and these outcomes are typically well analyzed by the investment industry.

Asset class valuations and security valuations are also significantly affected by random outcomes (e.g. natural disasters, certain supply & demand shocks) that are virtually unpredictable, and these outcomes are typically not analyzed directly by the investment industry.

Asset class valuations and security valuations are also significantly affected by exogenous outcomes (e.g. foreign policies, global cultural interactions) that can possibly be modeled, and these outcomes are typically not analyzed by the investment industry.

#### **5. Public Markets are Generally Informationally Efficient**

##### **Asset Class Valuations**

Asset class valuations (e.g. stock market levels versus interest rate levels) are often in equilibrium with one another, but anomalous situations do occur which result in disequilibria between asset class valuations. These disequilibria offer valuable investment opportunities which we will pro-actively seek and capitalize on.

## Security Valuations

Security valuations (e.g. IBM versus Cisco) are often in equilibrium with one another, but private markets and anomalous public market situations do occur which result in disequilibria between security valuations. These disequilibria offer valuable investment opportunities which we will pro-actively seek and capitalize on.

The extent of informational efficiency varies across asset classes.

Private markets offer significant opportunities for asset mispricing and manager excellence which we will pro-actively seek and capitalize on.

## 6. Market Frictions are Highly Relevant

Market frictions (e.g. management fees, carried interest, revenue sharing, expenses, costs, transaction spreads, market impacts, taxes, commissions) can be significantly detrimental to investment performance and as a result transactions will be initiated only to the extent there is a strong level of conviction that they will result in increased investment returns or decreased risks net of all market frictions.

## 7. Internal Investment Professionals are the Foundation of a Successful Investment Program

In-house investment management capability engaged in direct portfolio management results in superior investment decision-making.

In-house investment management pro-actively monitors capital markets in order to determine mispricing opportunities & allocate capital and will successfully increase risk adjusted returns.

In-house investment professionals are more closely aligned with, and have a better understanding of, the purpose and risk & reward tolerance of the ASRS than external parties.

In-house investment professionals will impact direct investment negotiations, better align economic interests, and influence investment industry conditions (e.g. private deal structures, fee levels, introduction of innovative products & strategies).

## 8. External Investment Management is Beneficial

External investment organizations can often offer greater expertise, resources, and/or flexibility than internal personnel for various investment strategies.

## 9. Investment Consultants

Investment consultants will be effectively utilized in the following four general categories, and utilization of consultants will be focused on situations where there is a demonstrable need in at least one of the four areas:

- Independence: When oversight or controls should be enhanced
- Perspective: When internal perspectives are not broad enough
- Special Skills: When internal skills are not deep enough
- Resource Allocation: When internal resources are not broad enough

## 10. Trustee Expertise

Trustees often have expertise in various areas of investment management, and this expertise should be utilized while ensuring separation between Board oversight and staff management.