



## Investment Advisory Committee (IAC) Meeting

Wednesday, 4/14/2021  
10:00 AM - 12:30 PM ET

Virtual Meeting  
GoToWebinar

- I. Welcome & Introductions
- II. Public Comment
- III. Approve Meeting Minutes from November 10, 2020 Meeting  
*IAC Mtg Minutes Nov 2020 For Approval - Page 2*
- IV. Election of IAC Vice-Chairperson
- V. CIO Report  
*CIO Report - IAC Meeting 4-14-21 - Page 6*
- VI. Equity Manager Perspectives - Guest Speakers  
*Guest speaker presentation materials are included in the consolidated "Presentation Deck."*
  - Spencer Adair, CFA, Global Alpha Investment Manager; Baillie Gifford
  - Josef Lakonishok, Founding Partner, CEO & CIO; LSV
- VII. Discounted Cash Flow Modeling - Guest Speaker  
*Guest speaker presentation materials are included in the consolidated "Presentation Deck."*
  - Sean Burns, Vice President; HOLT Investment Strategy Team
- VIII. Break
- IX. Asset Class Reviews - Public Markets  
*IAC Presentation Deck 4-14-21 - Page 11*  
*IAC Reading Deck 4-14-21 - Page 131*
  - Overview
  - Internal Equity
  - Public Equity
  - Fixed Income
- X. Function Review - Portfolio Solutions Group  
*Materials for this section included are included in the consolidated "Presentation Deck."*
  - Overview
  - Risk Management
  - Research
- XI. Review of Defined Benefit Plan Investment Beliefs Statements  
*VRS DBP Inv Beliefs Statement for IAC Review - Page 199*
- XII. Adjournment

---

## Minutes

An electronic meeting, held in accordance with § 2.2-3700 et seq. of the *Code of Virginia* and Chapter 1289 of the 2020 Acts of Assembly, of the Investment Advisory Committee of the Virginia Retirement System was held on November 10, 2020 with the following members present:

Larry Kochard, Chairperson  
Hance West  
Michael Beasley  
Theodore Economou  
Deborah Allen Hewitt  
Nan Leake  
Bryan Lewis  
Rod Smyth

The following Board members were present:

O'Kelly E. McWilliams, III  
Joseph Montgomery  
Brandon Bell  
Michael Disharoon  
Susan Gooden  
Wallace Harris  
Brett Hayes  
Troilen Seward

The following staff members were in attendance:

Trish Bishop, Ron Schmitz, Jennifer Schreck, Stephen Adelaar, John Alouf, Rory Badura, Parham Behrooz, Erica Billingslea, Warren Chang, Jeanne Chenault, Tom Coleman, Sara Denson, Valerie Disanto, Laurie Fennell, Josh Fox, Katherine Grawe, JT Grier, Dane Honrado, K.C. Howell, Ross Kasarda, Kristina Koutrakos, Matt Lacy, Chung Ma, Curt Mattson, Jennifer MacKnight, Steve McClelland, Irina Moore, Tom Mulvin, Walker Noland, Greg Oliff, Steven Peterson, Dan Schlusser, Kristy Scott, Jillian Sherman, Lisa Turner, Grace Wheaton, Dan Whitlock, Cindy Wilkinson, Steve Woodall, and Nick Zizzo.

Also in attendance was Jamie Blitz of the Joint Legislative Audit Review Commission; Steff Chavez of Mandate Wire; Rachel Furash of Goldman Sachs; Latosha Johnson of the Virginia Department of Planning and Budget; Adam Rees of Pageant Media; James Rosatelli of the Virginia

---

Senate Finance & Appropriations Committee; and John Zilko of PineBridge Investments.

Ms. Turner served as host and walked participants through the logistics of an electronic meeting. Ms. Turner turned the meeting over to Mr. Kochard to call the meeting to order.

Mr. Kochard called the meeting to order at 10:07 a.m. Mr. Kochard noted that given the current circumstances related to COVID-19, the IAC was unable to meet in person. However, utilizing electronic means, the IAC could hold this meeting in accordance with § 2.2-3700 et seq. of the *Code of Virginia* and Chapter 1289 of the 2020 Acts of Assembly as it relates to conducting business during the pandemic.

Mr. Kochard took a roll call of each IAC member for attendance purposes:

Mr. Beasley – present  
Mr. Economou – present  
Dr. Hewitt – present  
Ms. Leake – present  
Mr. Lewis – present  
Mr. Smyth – present  
Mr. West – present  
Mr. Kochard – present

Mr. Kochard noted that Mr. Gayner could not be in attendance due to a schedule conflict.

**Public Comment**

Mr. Kochard noted that the meeting is open to public comment, however, there are no public comments to be entered into the record.

**Minutes**

A motion was made by Mr. Kochard and seconded by Mr. Beasley to approve the minutes for the August 12, 2020 Committee meeting. The motion was unanimously approved via roll call:

Mr. Beasley – approve  
Mr. Economou – approve  
Dr. Hewitt – approve  
Ms. Leake – approve  
Mr. Lewis – approve  
Mr. Smyth – approve  
Mr. West - approve  
Mr. Kochard - approve

**CIO Report**

Mr. Schmitz gave a brief overview of economic and market conditions. Mr. Schmitz presented the Performance Summary, Asset Allocation Report, and Total Fund Tracking Error as of September 30, 2020. Last, Mr. Schmitz reviewed the New Investments and Terminations Report.

**Private Market Program  
Reviews**

Mr. Howell provided a brief overview of Private Assets, provided a preview of agenda items that each Program Director will be covering, and introduced the following Program reviews: Private Equity, Real Assets, Credit Strategies, and Private Investment Partnership.

Mr. Alouf provided an annual review of the Private Equity program. Annual review topics included: an overview of team members, markets, exposures, results, and co-investments.

Mr. Noland provided an annual review of the Real Assets program. Annual review topics included: an overview of program objectives and team members, markets, exposures, results, manager investment commitments, and looking forward at program objectives.

Mr. McClelland provided an annual review of the Credit Strategies program. Annual review topics included: an overview of program objectives and team members, markets, exposures, results, co-investments, managers including Women & Minority managers, looking back, and looking forward at program objectives.

Mr. McClelland also provided an annual review of the Private Investment Partnership (PIP) program. Annual review topics included: an overview of program objectives and team members, exposures, asset allocation, commitments, portfolio growth, results, and looking forward at program objectives.

Mr. West exited the meeting at 11:58 a.m.

**Forward Returns &  
Scenario Analysis**

Mr. Schmitz led a robust discussion on forward returns and scenario analyses. Based on the scenario discussions in June and August, the IAC and staff explored numerous topics for prioritization and additional discussion in 2021.

Mr. Lewis stepped away from meeting at 1:01 p.m.

As a follow-on to the August IAC meeting, a Board member had asked staff to look at a Depression scenario in order for the Board to be fully aware of the portfolio impacts should a 1930s type economic meltdown occur. Dr. Peterson and Mr. Badura devised a scenario that mimicked the



---

Great Depression from 1929-1948. Dr. Peterson discussed the impact that scenario would have on Fund level returns, funded status, contribution rates and liquidity over the next 20 years.

The Committee members engaged in general discussion throughout all the reviews provided.

**Adjournment**

Mr. Beasley made a motion to adjourn the meeting. Mr. Economou seconded the motion. Mr. Kochard asked for each Committee member to vote on the motion:

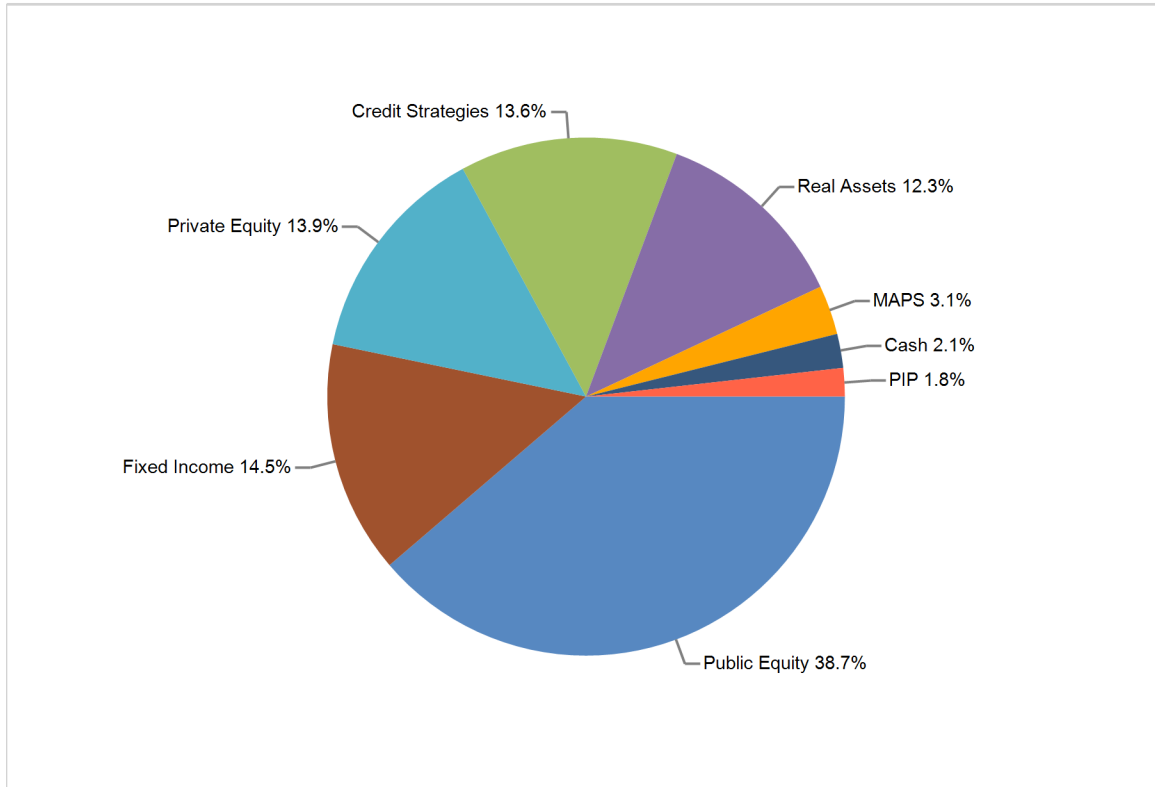
Mr. Beasley – aye  
Mr. Economou – aye  
Dr. Hewitt – aye  
Ms. Leake – aye  
Mr. Smyth - aye  
Mr. Kochard – aye

The motion to adjourn the meeting passed.

The meeting was adjourned at 1:21 p.m.

---

Larry Kochard, Chairperson



	<u>Current \$Bil</u>	<u>Current Weight</u>	<u>Policy Weight</u>	<u>Variance</u>	<u>Allowable Range</u>		<u>Internal %</u>
<b>Total Fund</b>	<b>93.6</b>						<b>30.7%</b>
<b>Public Equity</b>	<b>36.2</b>	<b>38.7%</b>	<b>37.0%</b>	<b>1.7%</b>	<b>-5%</b>	<b>+5%</b>	<b>40.7%</b>
<b>Fixed Income</b>	<b>13.6</b>	<b>14.5%</b>	<b>16.0%</b>	<b>-1.5%</b>	<b>-3%</b>	<b>+5%</b>	<b>93.1%</b>
<b>Credit Strategies</b>	<b>12.7</b>	<b>13.6%</b>	<b>14.0%</b>	<b>-0.4%</b>	<b>-5%</b>	<b>+5%</b>	
RS Credit	5.2	5.5%	5.6%	-0.1%			
NRS Credit	7.6	8.1%	8.4%	-0.3%			
<b>Real Assets</b>	<b>11.5</b>	<b>12.3%</b>	<b>14.0%</b>	<b>-1.7%</b>	<b>-5%</b>	<b>+5%</b>	<b>10.9%</b>
Public RE	1.3	1.3%					99.9%
Private RE	6.7	7.2%					
Other RA	3.6	3.8%					
<b>Private Equity</b>	<b>13.0</b>	<b>13.9%</b>	<b>13.0%</b>	<b>0.9%</b>	<b>-5%</b>	<b>+5%</b>	
<b>MAPS</b>	<b>2.9</b>	<b>3.1%</b>	<b>3.0%</b>	<b>0.1%</b>	<b>-1%</b>	<b>+1%</b>	
DSTRAT	1.5	1.6%					
RBI	1.4	1.5%					5.2%
<b>PIP</b>	<b>1.7</b>	<b>1.8%</b>	<b>2.0%</b>	<b>-0.2%</b>	<b>-1%</b>	<b>+2%</b>	
<b>Cash</b>	<b>2.0</b>	<b>2.1%</b>	<b>1.0%</b>	<b>1.1%</b>	<b>-1%</b>	<b>+4%</b>	

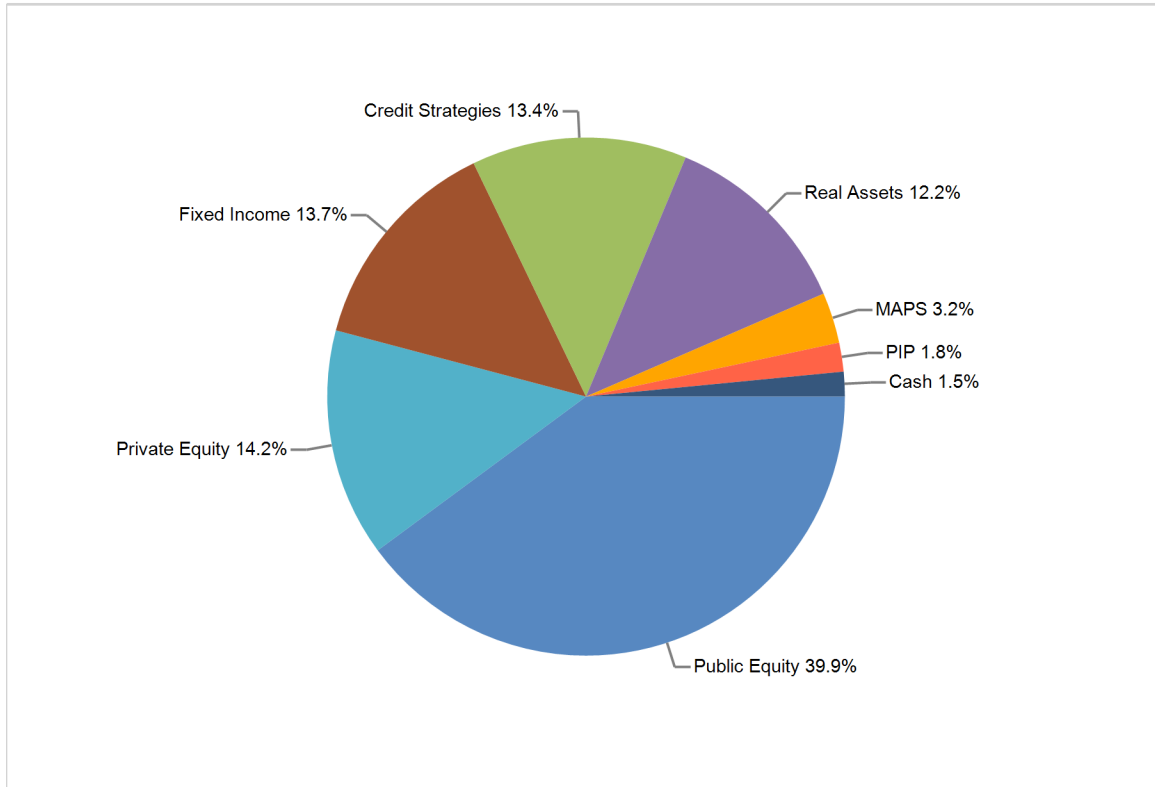
	<u>Current \$Bil</u>	<u>Current Weight</u>	<u>Policy Limit</u>
<b>Hedge Funds</b>	<b>10.2</b>	<b>10.9%</b>	<b>15.0%</b>

<b>3 Year Tracking Error</b>
Total Fund: <b>2.62%</b>
Total Public: <b>0.94%</b>

\*Total Fund includes the following amt held by the Treasurer of VA: \$ 348 million

• The values shown for each asset class on this report may differ from the VRS Monthly Performance Report due to adjustments related to derivative positions in the Rebalance Account, pending transactions, and certain accruals. The values on this report are a more descriptive representation of the Virginia Retirement System's true economic exposure to each asset class. ( 9 adjustments applied )

\*Total Fund and Total Public tracking error are calculated using monthly returns, then annualized



	Current \$Bil	Current Weight	Policy Weight	Variance	Allowable Range		Internal %
<b>Total Fund</b>	<b>96.6</b>						<b>28.6%</b>
<b>Public Equity</b>	<b>38.5</b>	<b>39.9%</b>	<b>37.0%</b>	<b>2.9%</b>	<b>-5%</b>	<b>+5%</b>	<b>35.5%</b>
<b>Fixed Income</b>	<b>13.3</b>	<b>13.7%</b>	<b>16.0%</b>	<b>-2.3%</b>	<b>-3%</b>	<b>+5%</b>	<b>94.7%</b>
<b>Credit Strategies</b>	<b>13.0</b>	<b>13.4%</b>	<b>14.0%</b>	<b>-0.6%</b>	<b>-5%</b>	<b>+5%</b>	
RS Credit	5.1	5.3%	5.6%	-0.3%			
NRS Credit	7.9	8.2%	8.4%	-0.2%			
<b>Real Assets</b>	<b>11.8</b>	<b>12.2%</b>	<b>14.0%</b>	<b>-1.8%</b>	<b>-5%</b>	<b>+5%</b>	<b>11.2%</b>
Public RE	1.3	1.4%					99.9%
Private RE	6.8	7.0%					
Other RA	3.7	3.8%					
<b>Private Equity</b>	<b>13.8</b>	<b>14.2%</b>	<b>13.0%</b>	<b>1.2%</b>	<b>-5%</b>	<b>+5%</b>	
<b>MAPS</b>	<b>3.1</b>	<b>3.2%</b>	<b>3.0%</b>	<b>0.2%</b>	<b>-1%</b>	<b>+1%</b>	
DSTRAT	1.6	1.7%					
RBI	1.4	1.5%					5.0%
<b>PIP</b>	<b>1.7</b>	<b>1.8%</b>	<b>2.0%</b>	<b>-0.2%</b>	<b>-1%</b>	<b>+2%</b>	
<b>Cash</b>	<b>1.5</b>	<b>1.5%</b>	<b>1.0%</b>	<b>0.5%</b>	<b>-1%</b>	<b>+4%</b>	

	Current \$Bil	Current Weight	Policy Limit
<b>Hedge Funds</b>	<b>11.0</b>	<b>11.3%</b>	<b>15.0%</b>

<b>3 Year Tracking Error</b>
Total Fund: <b>2.65%</b>
Total Public: <b>1.03%</b>

\*Total Fund includes the following amt held by the Treasurer of VA: \$ 108 million

• The values shown for each asset class on this report may reflect adjustments related to derivative positions in the Rebalance Account, pending transactions and certain accruals, in order to provide a more descriptive representation of the true economic exposure to each asset class ( 9 adjustments applied )

\*Total Fund and Total Public tracking error are calculated using monthly returns, then annualized

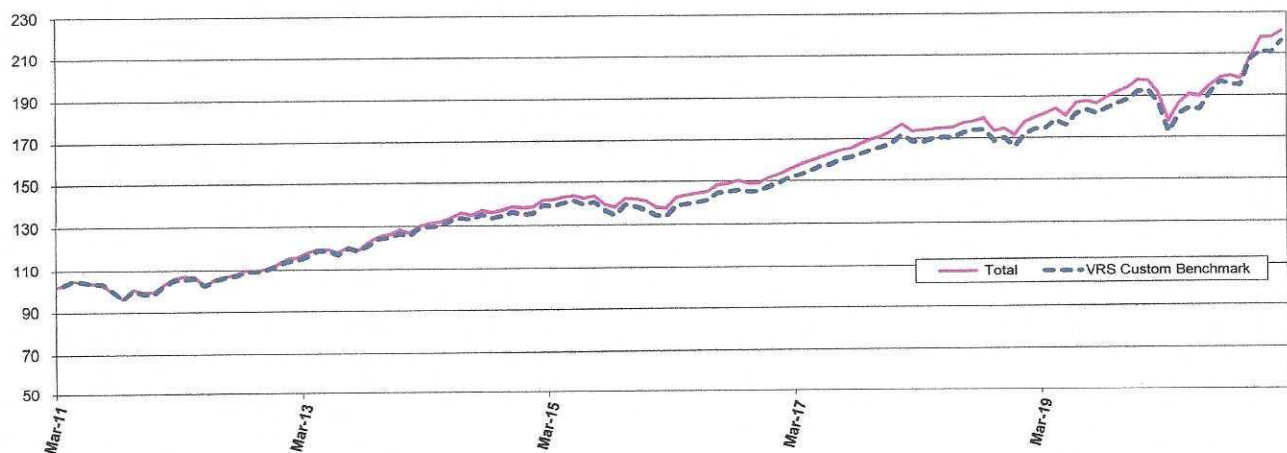
**PERFORMANCE SUMMARY**  
**Rolling Periods Ending**  
**February 28, 2021**



**TOTAL FUND PERFORMANCE**

	10 Yr	5 Yr	3 Yr	1 Yr	Qtr	Month	Fiscal YTD	Cal YTD	Market Value (\$MM)
<b>Total Public Equity Strategies</b>	<b>9.2</b>	<b>12.6</b>	<b>9.2</b>	<b>29.0</b>	<b>8.9</b>	<b>3.7</b>	<b>27.9</b>	<b>3.5</b>	<b>36,669</b>
<i>Benchmark</i>	9.2	13.7	10.8	32.0	7.7	2.7	28.5	2.5	
<b>Total Fixed Income</b>	<b>4.3</b>	<b>4.8</b>	<b>6.7</b>	<b>5.1</b>	<b>-1.2</b>	<b>-1.3</b>	<b>1.9</b>	<b>-1.8</b>	<b>12,031</b>
<i>Benchmark</i>	3.6	3.6	5.3	1.8	-1.8	-1.4	-0.1	-2.1	
<b>Total Credit Strategies</b>	<b>6.1</b>	<b>8.2</b>	<b>6.6</b>	<b>9.1</b>	<b>4.6</b>	<b>0.8</b>	<b>12.4</b>	<b>1.6</b>	<b>12,733</b>
<i>Benchmark</i>	5.6	7.7	6.2	6.8	2.4	0.3	9.3	1.0	
<b>Total Real Assets</b>	<b>10.1</b>	<b>8.1</b>	<b>6.5</b>	<b>3.1</b>	<b>2.4</b>	<b>0.7</b>	<b>4.6</b>	<b>0.6</b>	<b>11,539</b>
<i>Benchmark</i>	8.6	6.2	5.2	2.4	1.6	0.7	2.7	0.9	
<b>Total Private Equity</b>	<b>14.6</b>	<b>15.5</b>	<b>15.4</b>	<b>16.8</b>	<b>11.7</b>	<b>0.0</b>	<b>24.6</b>	<b>-0.1</b>	<b>12,965</b>
<i>Benchmark</i>	14.3	14.5	13.1	17.7	7.2	12.3	42.0	10.0	
<b>Total Private Investment Partnerships</b>	<b>n/a</b>	<b>6.9</b>	<b>5.4</b>	<b>1.8</b>	<b>5.4</b>	<b>0.0</b>	<b>12.6</b>	<b>0.0</b>	<b>1,658</b>
<i>Benchmark</i>	n/a	9.0	8.9	9.7	3.8	5.3	18.4	4.7	
<b>Total Multi-Asset Public Strategies</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>12.1</b>	<b>5.0</b>	<b>0.9</b>	<b>14.9</b>	<b>1.5</b>	<b>2,879</b>
<i>Benchmark</i>	n/a	n/a	n/a	13.5	3.0	0.7	11.3	0.7	
<b>Total Fund</b>	<b>8.1</b>	<b>10.0</b>	<b>8.4</b>	<b>15.8</b>	<b>6.0</b>	<b>1.5</b>	<b>16.6</b>	<b>1.5</b>	<b>93,581</b>
<i>VRS Custom Benchmark</i>	7.8	10.0	8.6	15.9	4.2	2.6	17.9	2.3	

**10-Year Performance**  
**Indexed to 100**



Effective July 2013, the VRS Custom Benchmark is a blend of the Asset Class Benchmarks at policy weights.

The VRS Cash Account, the Treasurer Short-Term Investment Account, the VRS Rebalancing Account, transition activity and accounts with market values of less than \$1 million are included in the Total Fund's market value. Differences in market value totals are due to rounding.



# Total Fund Tracking Error

Figure 1: Policy Tracking Error Rolling Three Year - Plan (as of 12/31/2020)

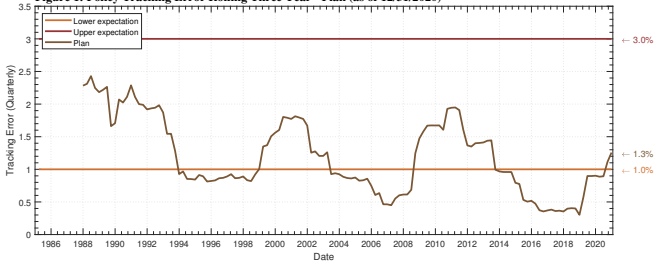
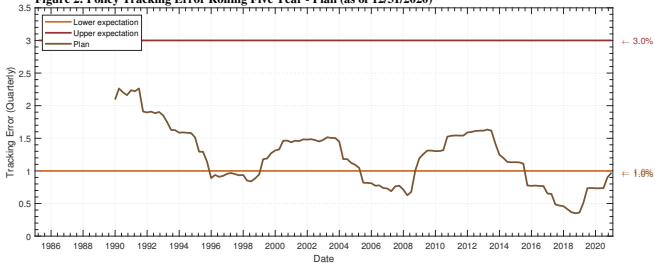


Figure 2: Policy Tracking Error Rolling Five Year - Plan (as of 12/31/2020)



Program	Action	Effective Date	Commitment/ Current Value	Funding/ Defunding Period	Description
Public Equity	Hired	01/04/2021	\$400 Million	2 Years	<b>Coatue</b> – A long/short equity fund.
Credit Strategies	Terminated	10/21/2020	\$42 Million	Immediate	<b>Anchorage Capital Partners</b> – An event-driven credit hedge fund.
Credit Strategies	Hired	11/25/2020	\$300 Million	4 Years	<b>Ares Private Credit Solutions II</b> – An upper middle market junior capital lending strategy.
Credit Strategies	Hired	03/10/2021	\$400 Million	3 Years	<b>Whitehorse Liquidity Partners IV</b> – A portfolio finance strategy.
Real Assets	Hired	11/17/2020	\$100 Million	4 Years	<b>Digital Colony Partners II</b> – An infrastructure fund that targets digital infrastructure on a global basis.
Real Assets	Hired	02/12/2021	\$125 Million	3 Years	<b>Penwood Select Industrial Partners VI LP</b> - A closed-end enhanced core fund investing in U.S. industrial properties.
Real Assets	Hired	04/02/2021	\$125 Million	3 Years	<b>Harrison Street Real Estate Partners Fund VIII</b> - A closed-end opportunistic fund investing in U.S./Canada alternative property types (life sciences, medical office, senior housing, student housing, etc).
Private Equity	Hired	11/20/2020	\$100 Million	6 Years	<b>Charlesbank X</b> – A buyout fund that looks for relative value opportunities: companies that are misunderstood by the market or simply mispriced in the market.
Dynamic Strategies	Opened	12/01/2020	\$100 Million	Immediate	<b>Shenandoah</b> – An internally directed global asset allocation strategy.



Virginia  
Retirement  
System

# Investment Advisory Committee Meeting

April 14, 2021







Virginia Retirement System

# Equity Manager Perspectives: Growth & Value Investing





## Spencer Adair, CFA ● Global Alpha Investment Manager

### Baillie Gifford



Adair graduated from the University of St Andrews with a Bachelor of Science degree in Medicine in 1997, followed by two years of clinical training in Edinburgh.

He joined Baillie Gifford in 2000. Initially he worked on the Fixed Income Team and then worked in equities on the Japanese Team, the European Team, and the U.K. Team. Adair has been involved in the Global Alpha portfolio since inception in 2005 and has focused exclusively on this portfolio management responsibility since early 2007.

He has earned the rights to use the CFA designation. Adair became a partner in 2013 and currently chairs the firm's Investment Risk Committee.

# Virginia Retirement System

Spencer Adair and John Carnegie. April 2021



*Global Alpha*

Where Baillie Gifford pooled funds are held, please note the fund portfolio information contained within this report is confidential, proprietary information and should be maintained as such and not disseminated. The content is intended for information purposes only and should not be disclosed to other third parties or used for the purposes of market timing or seeking to gain an unfair advantage.

# Bio's

---



**Spencer Adair**

## **Global Alpha Investment Manager**

Spencer joined Baillie Gifford in 2000 and is an Investment Manager in the Global Alpha Team. He became a Partner in 2013 and has also spent time working in the Fixed Income, Japanese, European and UK Equity Teams. Spencer managed the Investment Grade Long Bond Fund whilst being a Fixed Income Investment Manager and the European portion of wider Global portfolios whilst in the European Team. He has also spent time with our Emerging Markets Team. Spencer has been involved in the Global Alpha portfolio since inception in 2005 and has focused exclusively on this portfolio management responsibility since early 2007. He graduated BSc in Medicine from the University of St Andrews in 1997, followed by two years of clinical training in Edinburgh.



**John Carnegie**

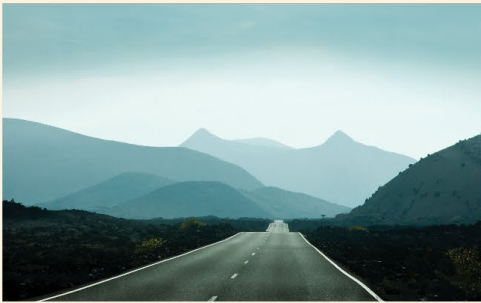
## **Client Service Director**

John joined Baillie Gifford in 2006 and is a Director in the Clients Department with particular responsibility for Global Alpha clients. He is a member of the CFA Institute and the CFA Society of the UK. John became a Partner in 2017. Prior to joining Baillie Gifford, he spent ten years working as a Sell Side Equity Analyst for Credit Suisse, Citigroup and ABN Amro. John graduated BA in Sociology from the University of Durham in 1994 and MLitt in Management, Economics and Politics from the University of St Andrews in 1995.

# Baillie Gifford – A Trusted Partner

---

## PARTNERSHIP



Independence:  
owned by 46 partners

Stability

Long term

## EXPERIENCE



Active investment  
management since 1908

Alignment of interest

## ALIGNMENT



Clients' interests  
ahead of our own



# The Global Alpha Growth Philosophy

## BELIEF

**Sustainable compound growth drives long-term wealth creation**

## FOCUS

**Few companies meet our standards**

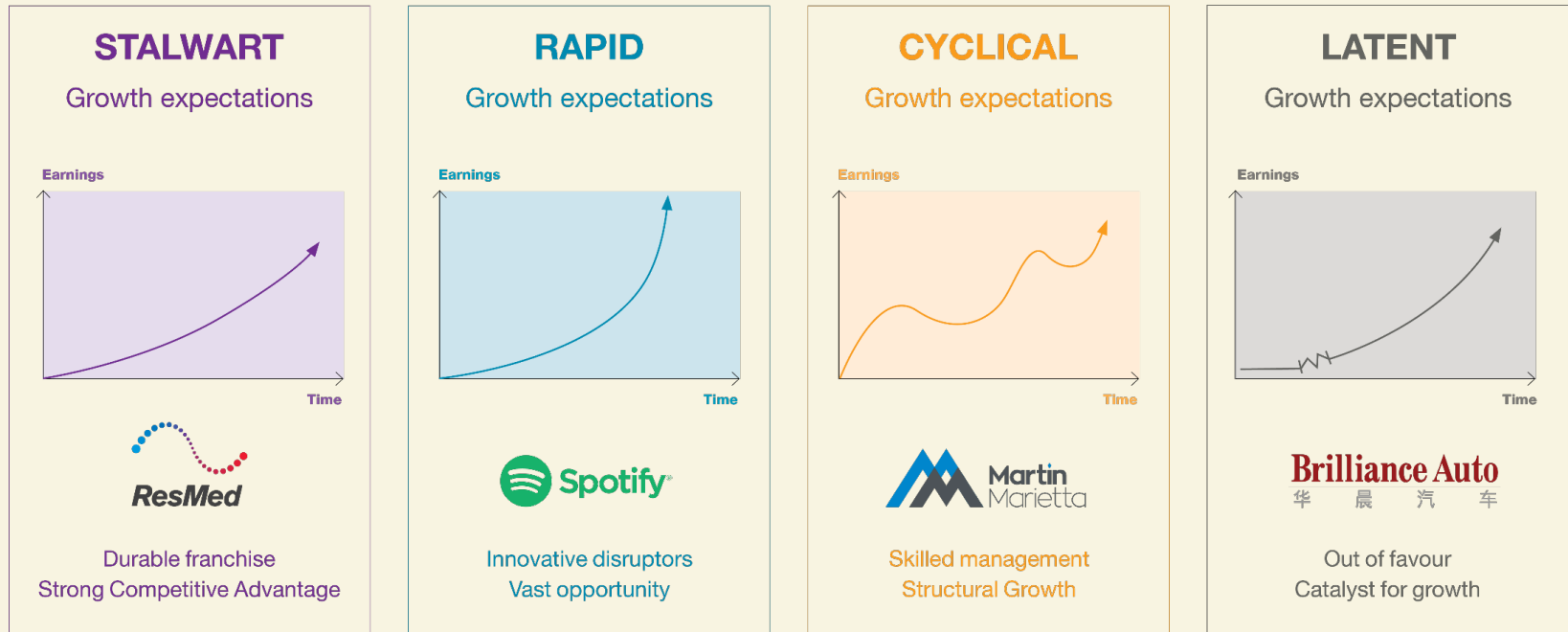
## TASK

**Identification, patient ownership and growth-focused stewardship**

Number of Holdings	70-120*
Investment Time Horizon	5 Years
Investment Opportunity	Global
Style	Growth, Unconstrained

\*Typical range, guideline only.

# Global Alpha Growth Profiles



Logos courtesy of companies.

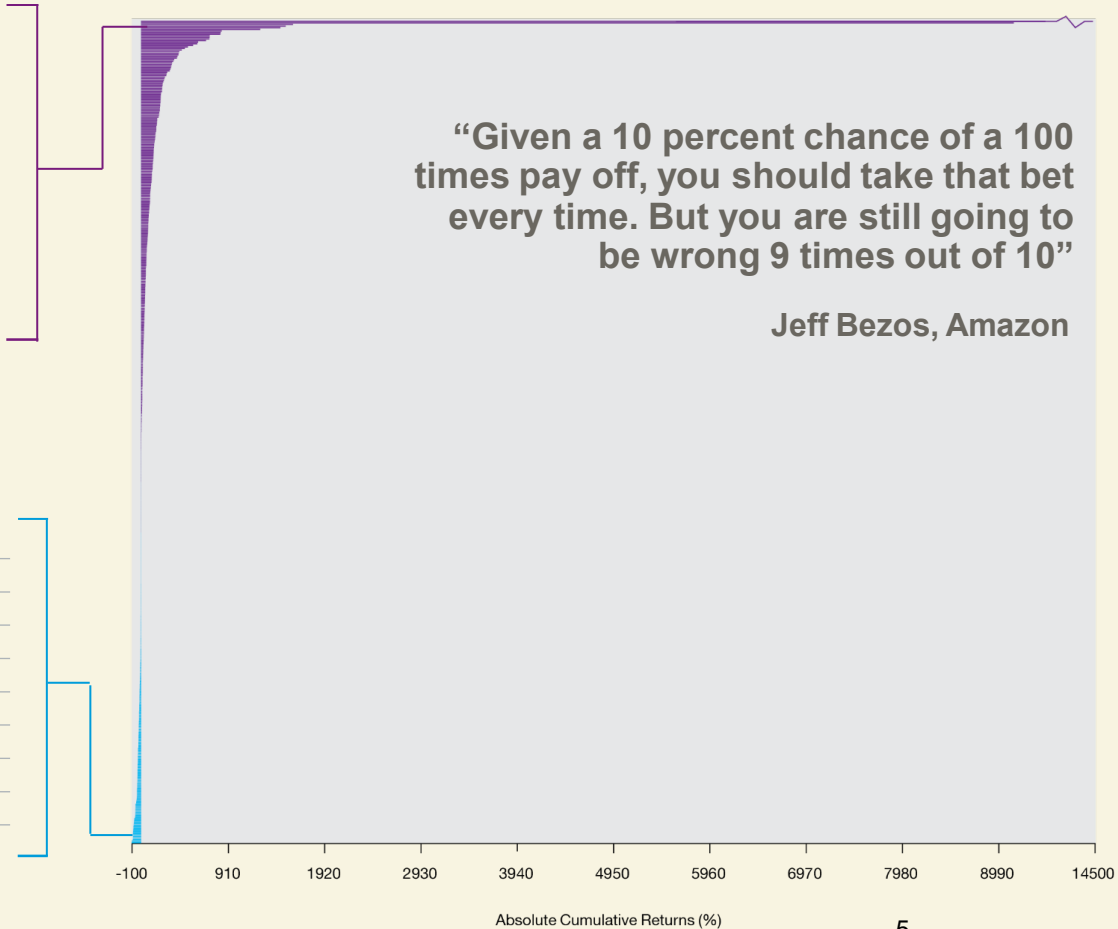
**Our Growth hurdle: >30% chance of doubling over 5 years**

# Time, Not Timing, Drives Long-term Wealth Creation

Amazon.com	144x
Tesla Inc	92x
TSMC	16x
Naspers	15x
Atlas Copco	15x
Mastercard	13x
Facebook	8x
Samsung Electronics*	8x
Teradyne	8x
NVIDIA*	7x

Key: **Stalwarts** **Rapid** **Cyclical** **Latent**  
 \*Stocks not currently held

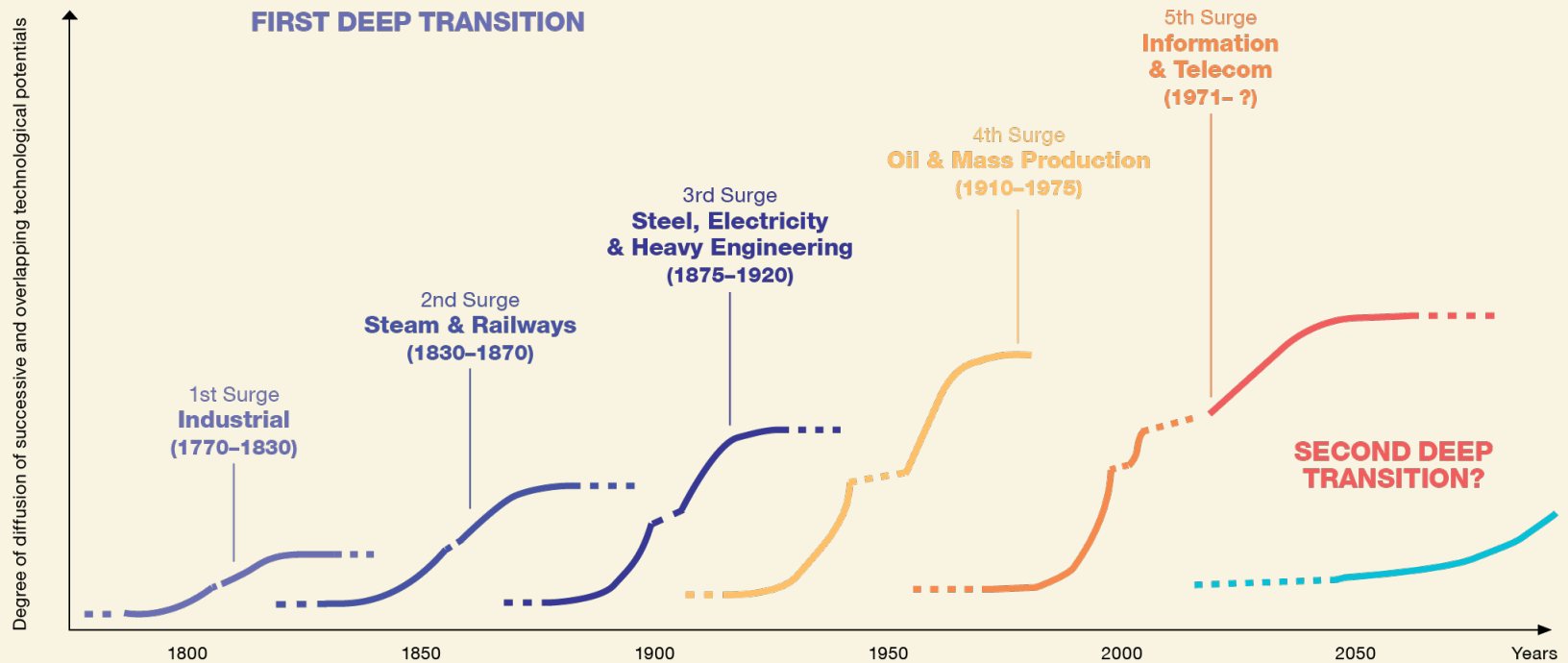
DIA*	-80.2%
Arcos Dorados*	-80.3%
Evrax*	-82.6%
Bank of Ireland*	-84.5%
Now Inc*	-85.5%
Kowloon Development*	-86.0%
Opti Canada*	-86.5%
Apache*	-86.7%
Q-Cells*	-87.0%
Ultra Petroleum*	-99.2%



Source: StatPro. Absolute stock returns of Global Alpha composite since inception (May 31, 2005) to December 31, 2020. US dollars. Some stocks were only held for part of the period.

Virginia Retirement System  
 April 2021

# Change is Perpetual



Source: Johan Schot & Laur Kanger, Deep transitions: Emergence, acceleration, stabilization and directionality, 2018.



# Global Alpha Portfolio

Holding Size	Growth Stalwarts 24.2%	Rapid Growth 44.9%	Cyclical Growth 18.0%	Latent Growth 12.0%	Total	
~2.0%	Moody's Microsoft Prudential Mastercard AIA Anthem	Naspers Alphabet Amazon.com Shopify SEA Limited Meituan Dianping Alibaba Tesla Inc	TSMC Martin Marietta Materials	SoftBank Group Ryanair BHP Group Rio Tinto	41.7%	
~1.0%	Olympus Pernod Ricard AJ Gallagher Estee Lauder Facebook Sysmex adidas Thermo Fisher Scientific ResMed Broadridge Financial Solutions	Ping An Insurance Zillow The Trade Desk Farfetch Prosus Telado c HDFC Reliance Industries Moderna Anylam Pharmaceuticals Axon Enterprise Cloudflare Illumina	Advantest Teradyne CRH Booking Holdings Albemarle Atlas Copco SMC SiteOne Landscape Supply	CBRE Group Inc	33.5%	
~0.5%	Service Corporation International CoStar S&P Global Inc Hoshizaki Corp	Novocure Tencent Music Schibsted Twilio Chegg CyberAgent Netflix ICICI Bank Adyen Abiomed Spotify Wayfair Genmab B3	Datadog Autohome Ping An H&T Seagen Inc. Interactive Brokers UbiSoft Just Eat LendingTree Mail.ru Group Adevinta KE Holdings Snowflake DoorDash	Richmont Epiroc EOG Resources Schwab, Charles Corp Markel Deutsche Boerse Lyft Wizz Air Wabtec Hays Orica Sands China	IAC Fairfax Financial Sberbank Stericycle Howard Hughes Brilliance China Automotive MS&AD Insurance	23.9%

# APPENDICES

# Investment Capabilities



As of December 31, 2020.

\*Average based on 5 year annual turnover. As of December 31, 2020.

**Investment is a profession, not a short-term business. Create a supportive environment for investment professionals**

## Retention



81% investment staff start at Baillie Gifford

4.2% investor turnover annually\*

Investors remunerated on 5-year rolling performance

## Diversity



c.58 degree disciplines 27 nationalities

## Experience

**22**

of years

Average investment experience of Head

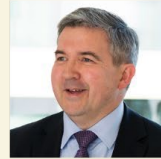
Teams

# The Emerging Markets Team

## EM ALL CAP PCG



**Mike Gush\***  
 MEng in Mechanical Engineering  
 17 (17) years' experience  
 Taiwan, China



**Andrew Stobart**  
 MA in Economics  
 29 (29) years' experience  
 China, LatEMEA



**Ewan Markson-Brown**  
 MA in Philosophy, Politics and Economics  
 20 (7) years' experience  
 India/ASEAN, Korea

## REST OF EM TEAM



**Will Sutcliffe\***  
 MA in History  
 21 (21) years' experience  
 LatEMEA, India



**Sophie Earnshaw**  
 MA in English Literature, MPhil in Eighteenth Century and Romantic Literature  
 10 (10) years' experience  
 China, Taiwan



**Roderick Snell**  
 BSc (Hons) in Biological Sciences  
 14 (14) years' experience  
 Korea, China



**Abhishek Parajuli**  
 MPhil in Politics  
 1 (1) year's experience  
 GEM



**Joanna Abudar**  
 MA in English Literature and Classics  
 Joined in 2020  
 GEM

**BG SHANGHAI RESEARCH PLATFORM**

**THIRD PARTY ADDITIONAL PERSPECTIVES**

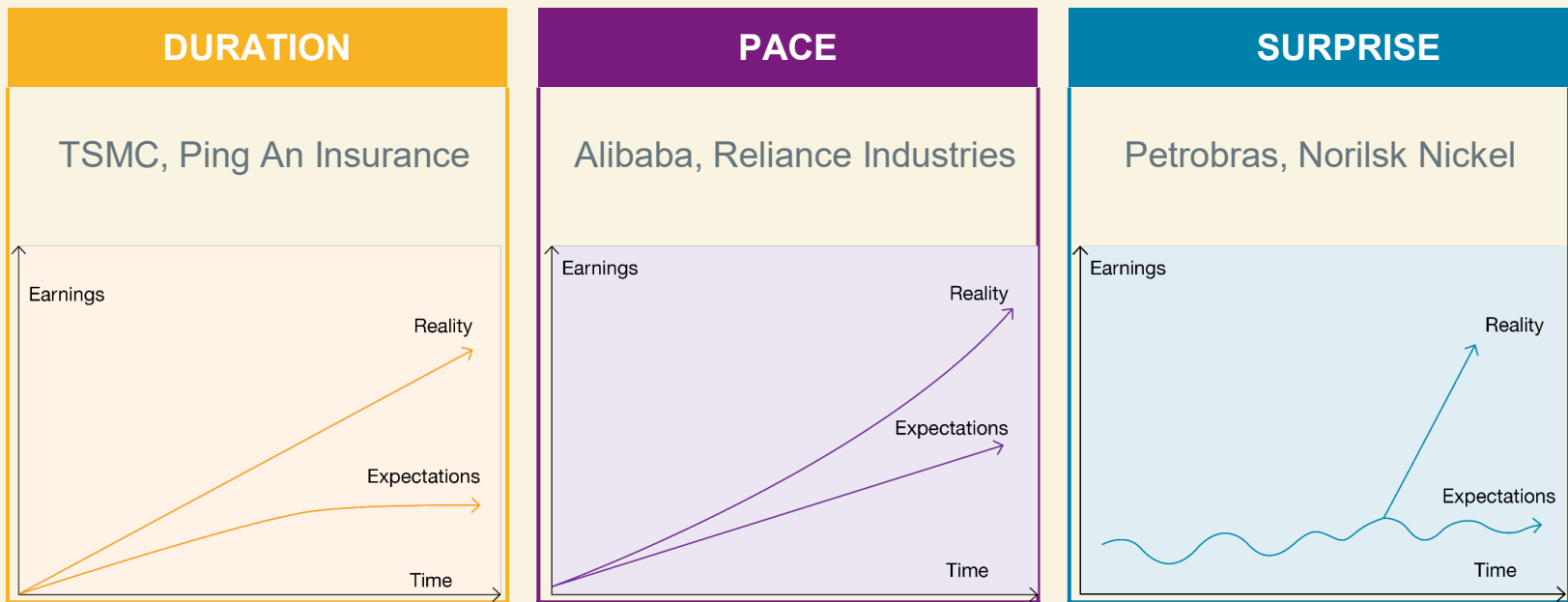
**20 OTHER BAILLIE GIFFORD INVESTMENT TEAMS**

\*Partner  
 (Years with Baillie Gifford)

**Diversity of character and alignment with clients**

# Emerging Markets: How Do We Think About Growth?



We are long-term growth investors, focused on three under-appreciated growth opportunities



We believe that in the long-run, dollar equity returns follow dollar earnings growth

Many market participants suffer from short-termism, failure of imagination and an aversion to risk/volatility

# Emerging Markets: Portfolio Listing

Holding	Portfo	Holding	Portfo	Holding	Portfo	Holding	Portfo
lio %		lio %		lio %		lio %	
CHINA	40.2	Yatsen Holding Limited	0.4	MercadoLibre	2.4	THAILAND	0.5
Tencent	7.5	Burning Rock Biotech	0.2	Vale	2.0	Siam Commercial Bank	0.5
Alibaba	6.3	SOUTH KOREA	12.8	B3	1.1	KAZAKHSTAN	0.3
Meituan Dianping	3.3	Samsung Electronics	6.0	Banco Bradesco	0.7	Kaspi.Kz JSC	0.3
Ping An Insurance	3.0	LG Chemical	1.8	RUSSIA	6.9	PERU	0.0
China Merchants Bank	2.1	Samsung SDI	1.7	Sberbank	2.7	Credicorp	0.0
Kingsoft Cloud	1.6	SK Hynix	1.6	Norilsk Nickel	2.7	<b>72 Holdings</b>	
Kuaihou Technology	1.4	NAVER Corp	0.8	Ozon Holdings	0.6		
Zai Lab	1.2	Hyundai Motor Company	0.5	Moscow Exchange	0.5	Source: Baillie Gifford & Co, MSCI. As of February 28, 2021. Cash 0.5%. Based on the Virginia Retirement System Emerging Markets Portfolio. Totals may not sum due to rounding.	
CATL	1.2	Doosan Bobcat	0.4	Magnit	0.4		
Geely Automobile	1.1	TAIWAN	11.2	OTHER EMERGING MARKETS	1.7	 Geographical Location overweight relative to MSCI Emerging Markets IMI.	
JD.com	1.1	TSMC	8.6	First Quantum Minerals	1.7		
Ping An Bank	0.9	Mediatek	2.6	MEXICO	1.7	 Geographical Location underweight relative to MSCI Emerging Markets IMI.	
Tencent Music Entertainment	0.9	INDIA	9.9	Cemex	0.7		
Lufax Holding	0.9	Reliance Industries	3.0	Grupo Financiero Banorte	0.5		
Haier Smart Home	0.8	HDFC	2.3	Walmex	0.4		
Shenzhou International	0.7	Tata Consultancy Services	1.0	POLAND	1.5		
KE Holdings	0.7	Tech Mahindra	0.8	Allegro	0.9		
Midea	0.6	HDFC Life Insurance	0.6	KGHM Polska Miedz	0.6		
BeiGene	0.6	Mahindra & Mahindra	0.5	CHILE	1.4		
Dada Nexus	0.6	Maruti Suzuki	0.5	Lundin Mining	1.4		
Li Ning	0.5	UltraTech Cement	0.5	SINGAPORE	1.1		
Kingdee International Software	0.5	ICICI Lombard	0.4	SEA Limited	1.1		
Brilliance China Automotive	0.5	ICICI Prudential Life Insurance	0.3	INDONESIA	0.9		
Jiangsu Hengrui Medicine	0.5	Indraprastha Gas	0.2	Bank Rakyat Indonesia	0.9		
Zijin Mining	0.5	BRAZIL	8.6	PANAMA	0.8		
HUYA	0.5	Petrobras	2.4	Copa Holdings	0.8		
Minth Group	0.4						

# Legal Notices

---

All information is current and sourced from Baillie Gifford & Co unless otherwise stated.

## **Contracting Entity**

Baillie Gifford Overseas Limited

## **MSCI**

Source: MSCI. The MSCI information may only be used for your internal use, may not be reproduced or disseminated in any form and may not be used as a basis for or a component of any financial instruments or products or indices. None of the MSCI information is intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such. Historical data and analysis should not be taken as an indication or guarantee of any future performance analysis, forecast or prediction. The MSCI information is provided on an "as is" basis and the user of this information assumes the entire risk of any use made of this information. MSCI, each of its affiliates and each other person involved in or related to compiling, computing or creating any MSCI information (collectively, the "MSCI Parties") expressly disclaims all warranties (including, without limitation, any warranties of originality, accuracy, completeness, timeliness, non-infringement, merchantability and fitness for a particular purpose) with respect to this information. Without limiting any of the foregoing, in no event shall any MSCI Party have any liability for any direct, indirect, special, incidental, punitive, consequential (including, without limitation, lost profits) or any other damages. ([www.msci.com](http://www.msci.com))

---

## Josef Lakonishok ● Founding Partner, CEO & CIO

---

### LSV Asset Management



Josef Lakonishok is a Founding Partner, CEO and CIO of LSV Asset Management. Dr. Lakonishok has more than 40 years of investment and research experience.

Prior to founding LSV Asset Management, Dr. Lakonishok had a distinguished academic career, most recently as a Professor of Finance at the College of Commerce & Business Administration at the University of Illinois at Urbana-Champaign. Before that, he held staff and visiting professorships at Tel Aviv University, Cornell University, the University of North Carolina at Chapel Hill, and the University of British Columbia.

Dr. Lakonishok was one of the top contributors to major financial journals and has published more than 100 articles. His research covered such diverse areas as analyst forecasts, execution cost measurement, performance evaluation, value and growth investing, share repurchases and insider activity.

Dr. Lakonishok received a B.A. in Economics and Statistics from Tel Aviv University in 1970 and an M.B.A. from that university in 1972. He earned an M.S. in Business Administration in 1974 and a Ph.D. in Business Administration in 1976 from Cornell University.





# Virginia Retirement System

## *Current Market Conditions*

April 14, 2021

**Josef Lakonishok**

Founding Partner, CEO & CIO

P: (312) 460-2326 | W: [lsvasset.com](http://lsvasset.com)

## Market Update: U.S.

	Periods Ending 3/31/21					
	1Q21	1 Yr	2 Yrs	3 Yrs	5 Yrs	10 Yrs
S&P 500	6.2%	56.4%	20.6%	16.8%	16.3%	13.9%
Large Cap Value (R1000V)	11.3%	56.1%	13.7%	11.0%	11.7%	11.0%
Large Cap Growth (R1000G)	0.9%	62.7%	28.2%	22.8%	21.0%	16.6%
<b>Value vs Growth Spread:</b>	<b>10.3%</b>	<b>-6.7%</b>	<b>-14.4%</b>	<b>-11.8%</b>	<b>-9.3%</b>	<b>-5.6%</b>
Mid Cap Core (RMC)	8.1%	73.6%	19.1%	14.7%	14.7%	12.5%
Mid Cap Value (RMCV)	13.1%	73.8%	14.8%	10.7%	11.6%	11.1%
Mid Cap Growth (RMCG)	-0.6%	68.6%	23.6%	19.4%	18.4%	14.1%
<b>Value vs Growth Spread:</b>	<b>13.6%</b>	<b>5.2%</b>	<b>-8.7%</b>	<b>-8.7%</b>	<b>-6.8%</b>	<b>-3.1%</b>
Small Cap Core (R2000)	12.7%	94.8%	21.7%	14.8%	16.4%	11.7%
Small Cap Value (R2000V)	21.2%	97.1%	17.7%	11.6%	13.6%	10.1%
Small Cap Growth (R2000G)	4.9%	90.2%	24.4%	17.2%	18.6%	13.0%
<b>Value vs Growth Spread:</b>	<b>16.3%</b>	<b>6.9%</b>	<b>-6.7%</b>	<b>-5.6%</b>	<b>-5.0%</b>	<b>-3.0%</b>
Russell 1000 Defensive	4.0%	42.8%	16.8%	16.2%	14.6%	13.9%
Russell 2000 Defensive	13.5%	64.3%	14.1%	10.5%	12.9%	11.8%
MSCI USA Minimum Volatility	2.2%	29.8%	10.1%	11.7%	11.2%	12.3%

*Periods longer than one year are annualized.*

# Raw Factor Performance

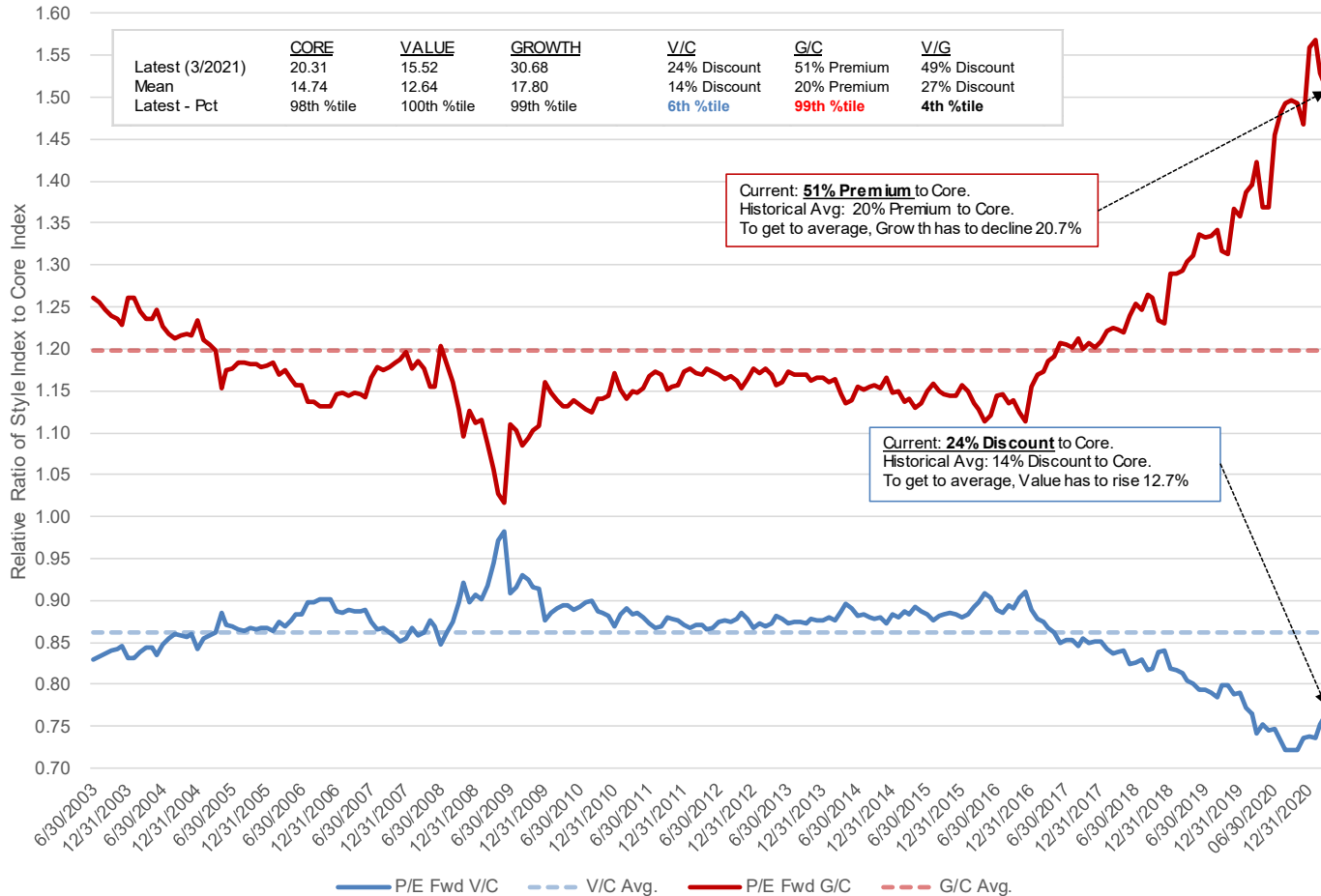
## Raw Factor Portfolios

Performance Spread Between High (Top 20%) and Low (Bottom 20%)

	Q1 2021					Trailing 3-Years (ending 3/31/21)				
	EAFE	U.S.	Europe	Japan	Emerging Markets	EAFE	U.S.	Europe	Japan	Emerging Markets
<b>Valuation</b>	18.9%	23.9%	17.1%	25.9%	14.3%	-25.4%	-31.7%	-35.5%	-22.8%	-27.6%
Earnings Yield - 12 month forward	18.5%	18.4%	16.5%	23.9%	12.4%	-18.5%	-34.6%	-28.8%	-14.3%	-24.0%
Cash Flow To Price	16.7%	20.5%	11.9%	25.0%	17.7%	-14.6%	-29.9%	-15.0%	-22.0%	-25.2%
Dividend Yield	10.0%	11.5%	3.4%	20.2%	9.6%	-19.1%	-13.4%	-30.9%	-15.8%	-1.1%
Book to Price Ratio	16.1%	17.7%	13.3%	28.5%	13.4%	-23.6%	-23.9%	-30.7%	-17.7%	-25.1%
Sales to Price Ratio	17.3%	22.4%	13.4%	24.6%	18.1%	-15.7%	-19.8%	-21.1%	-15.0%	-20.6%
EBITDA/ EV	13.1%	16.6%	12.3%	16.5%	14.1%	-13.5%	-39.1%	-19.3%	-19.9%	-27.0%
<b>Growth</b>	-7.7%	-12.5%	-8.2%	-10.7%	-6.6%	-1.6%	-5.8%	-3.6%	-1.5%	12.9%
<b>Low Risk</b>	-12.1%	-15.9%	-10.0%	-11.9%	-5.4%	-13.6%	-22.1%	-1.9%	-14.4%	-12.8%
<b>Size (Market Cap)</b>	-2.1%	-4.5%	-0.2%	-8.8%	-5.5%	-2.2%	-1.9%	-11.6%	3.5%	10.8%
<b>Quality</b>	-5.6%	-3.5%	-2.8%	-8.2%	-2.4%	2.8%	-13.1%	3.7%	2.3%	-6.8%
<b>Price Momentum</b>	-6.6%	-6.5%	-2.0%	-12.5%	0.2%	1.2%	-10.2%	5.2%	-0.9%	25.3%
<b>Estimates Momentum</b>	3.1%	7.0%	5.8%	1.4%	3.4%	11.0%	10.5%	22.8%	9.3%	51.9%
<b>Universe Returns</b>										
Market Cap Weighted	3.5%	5.5%	4.1%	1.6%	2.6%	20.7%	62.1%	20.0%	20.2%	22.0%
Equally Weighted	4.3%	8.6%	4.6%	4.0%	1.8%	18.5%	51.7%	20.5%	14.9%	16.4%

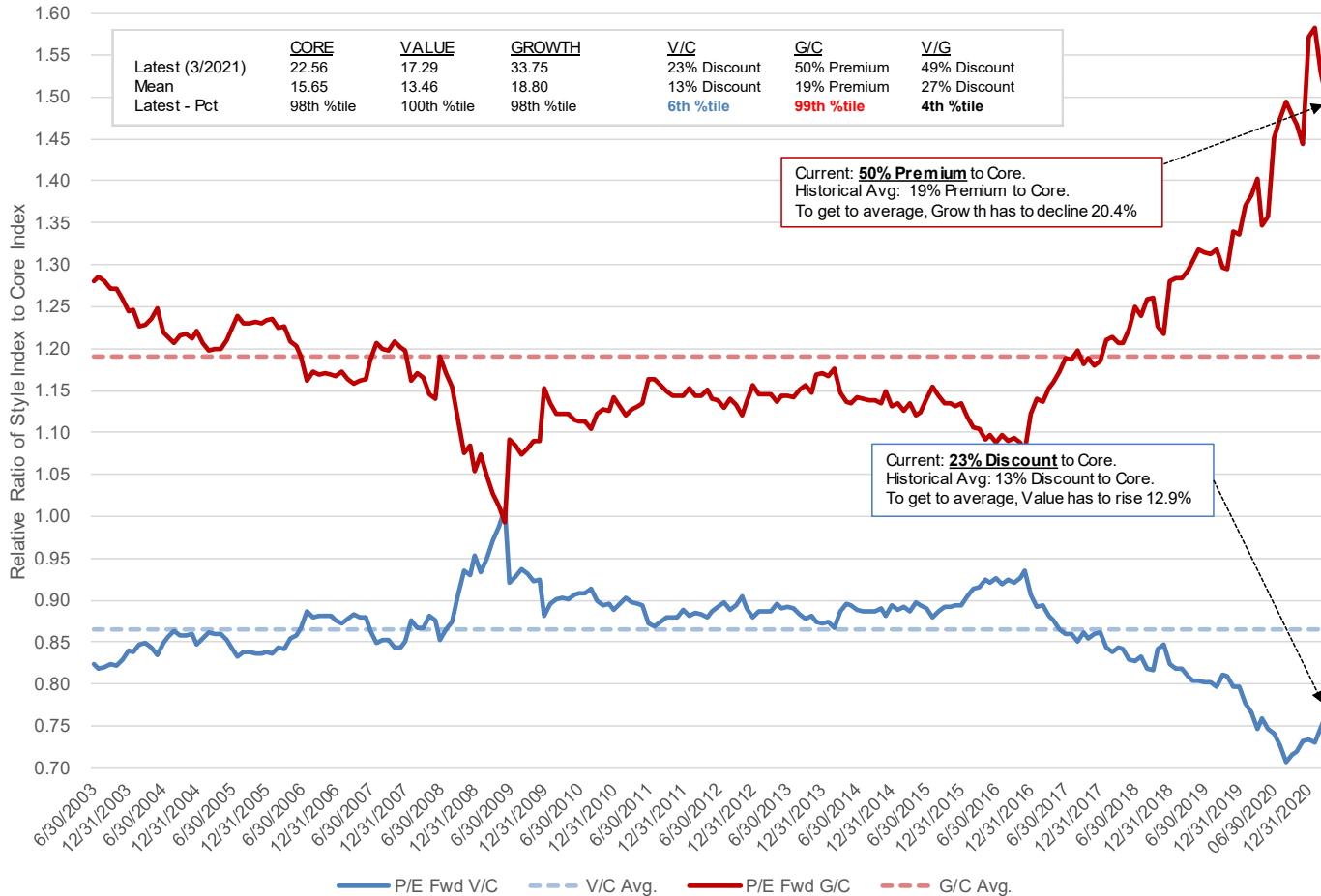
# Relative Valuations of Value vs. Growth at Extreme Levels

Forward PE Ratio for MSCI World Value and Growth Index Relative to MSCI World Core (Mar-2021)



# Relative Valuations of Value vs. Growth at Extreme Levels

Forward PE Ratio for MSCI USA Value and Growth Index Relative to MSCI USA Core (Mar-2021)



## Current vs. Historical Valuations by Size and Valuation

### Largest 2,000 U.S. Companies: Top 500, Mid 500, Small 1000 by Market Value

30-40-30 Market cap portfolios sorted by Comprehensive Valuation Measure

As of March 31, 2021

Size:	Small1000			Mid500			Top500		
	Expensive P1	Middle P2	Cheap P3	Expensive P1	Middle P2	Cheap P3	Expensive P1	Middle P2	Cheap P3
30-40-30:									
Number of Firms	309	382	309	154	194	152	139	192	169
Total Market Cap (in millions)	\$638,814	\$850,218	\$633,119	\$1,110,916	\$1,482,575	\$1,107,249	\$11,153,624	\$14,864,251	\$11,127,133
Rank on Valuation	0.242	0.542	0.858	0.236	0.515	0.837	0.248	0.450	0.784
Market to book ratio	7.07	2.33	1.66	8.69	3.41	1.77	13.69	6.30	2.22
P/E FY2	56.8	18.7	11.3	50.4	18.3	11.9	41.5	22.7	13.0
P/E FY1	93.9	24.1	12.3	69.2	22.2	12.9	53.7	26.6	14.3
<b>P/E FY2</b>									
2021-03-31 Level	<b>56.8</b>	<b>18.7</b>	<b>11.3</b>	<b>50.4</b>	<b>18.3</b>	<b>11.9</b>	<b>41.5</b>	<b>22.7</b>	<b>13.0</b>
2003-2019 Median	34.0	16.6	11.3	26.9	16.0	11.1	21.3	15.3	10.9
Premium to Median %	<b>67.4</b>	<b>12.8</b>	<b>-0.3</b>	<b>87.8</b>	<b>14.3</b>	<b>7.6</b>	<b>95.1</b>	<b>48.0</b>	<b>19.4</b>
Rank(2003-2019)	0.925	0.908	0.497	0.987	0.962	0.740	1.000	1.000	0.992
<b>P/E FY1</b>									
2021-03-31 Level	<b>93.9</b>	<b>24.1</b>	<b>12.3</b>	<b>69.2</b>	<b>22.2</b>	<b>12.9</b>	<b>53.7</b>	<b>26.6</b>	<b>14.3</b>
2003-2019 Median	59.6	21.0	12.5	41.3	18.7	12.0	25.6	17.2	11.8
Premium to Median %	<b>57.7</b>	<b>14.6</b>	<b>-1.0</b>	<b>67.3</b>	<b>18.4</b>	<b>7.1</b>	<b>109.5</b>	<b>54.3</b>	<b>21.8</b>
Rank(2003-2019)	0.932	0.882	0.496	1.000	0.973	0.735	1.000	1.000	1.000
<b>M/B</b>									
2021-03-31 Level	<b>7.1</b>	<b>2.3</b>	<b>1.7</b>	<b>8.7</b>	<b>3.4</b>	<b>1.8</b>	<b>13.7</b>	<b>6.3</b>	<b>2.2</b>
2003-2019 Median	3.8	2.1	1.4	3.9	2.6	1.5	4.8	3.0	1.8
Premium to Median %	<b>85.8</b>	<b>10.8</b>	<b>21.8</b>	<b>120.3</b>	<b>32.9</b>	<b>18.7</b>	<b>185.1</b>	<b>106.8</b>	<b>24.3</b>
Rank(2003-2019)	1.000	0.799	0.916	1.000	1.000	0.942	1.000	1.000	1.000

## Current vs. Historical Valuations by Size and Valuation

### Largest 2,000 Developed EAFE + Canadian Companies: Top 500, Mid 500, Small 1000 by Market Value

30-40-30 Market cap portfolios sorted by Comprehensive Valuation Measure

As of March 31, 2021

Size:	Wt Mean								
	Small1000			Mid500			Top500		
30-40-30:	Expensive P1	Middle P2	Cheap P3	Expensive P1	Middle P2	Cheap P3	Expensive P1	Middle P2	Cheap P3
Number of Firms	304	387	309	149	203	148	144	214	142
Total Market Cap (in millions)	\$840,480	\$1,117,977	\$836,192	\$1,179,623	\$1,550,260	\$1,161,464	\$6,104,905	\$8,074,693	\$6,011,448
Rank on Valuation	0.159	0.515	0.843	0.156	0.473	0.827	0.143	0.502	0.882
Market to book ratio	4.15	1.52	1.00	4.72	1.84	1.13	6.24	2.17	1.15
P/E FY2	36.07	17.02	10.86	34.97	18.16	10.95	34.38	16.68	10.12
P/E FY1	58.44	22.46	12.39	57.01	26.14	12.81	42.96	18.55	11.11
<b>P/E FY2</b>									
2021-03-31 Level	<b>36.1</b>	<b>17.0</b>	<b>10.9</b>	<b>35.0</b>	<b>18.2</b>	<b>11.0</b>	<b>34.4</b>	<b>16.7</b>	<b>10.1</b>
2003-2019 Median	21.9	14.6	11.2	20.9	15.1	12.0	19.3	14.2	11.2
Premium to Median %	<b>64.5</b>	<b>16.4</b>	<b>-3.3</b>	<b>67.2</b>	<b>20.6</b>	<b>-8.6</b>	<b>78.1</b>	<b>17.1</b>	<b>-9.5</b>
Rank(2003-2019)	1.000	1.000	0.452	1.000	1.000	0.323	1.000	0.905	0.335
<b>P/E FY1</b>									
2021-03-31 Level	<b>58.4</b>	<b>22.5</b>	<b>12.4</b>	<b>57.0</b>	<b>26.1</b>	<b>12.8</b>	<b>43.0</b>	<b>18.6</b>	<b>11.1</b>
2003-2019 Median	31.5	17.6	12.6	27.5	17.7	13.0	21.8	16.4	11.9
Premium to Median %	<b>85.3</b>	<b>27.4</b>	<b>-1.9</b>	<b>107.0</b>	<b>47.4</b>	<b>-1.4</b>	<b>96.8</b>	<b>13.3</b>	<b>-6.9</b>
Rank(2003-2019)	1.000	1.000	0.447	1.000	1.000	0.481	1.000	0.888	0.361
<b>M/B</b>									
2021-03-31 Level	<b>4.2</b>	<b>1.5</b>	<b>1.0</b>	<b>4.7</b>	<b>1.8</b>	<b>1.1</b>	<b>6.2</b>	<b>2.2</b>	<b>1.1</b>
2003-2019 Median	2.4	1.5	1.2	2.8	1.7	1.4	3.4	2.1	1.5
Premium to Median %	<b>71.3</b>	<b>4.0</b>	<b>-16.2</b>	<b>68.4</b>	<b>6.0</b>	<b>-21.7</b>	<b>83.7</b>	<b>2.7</b>	<b>-21.4</b>
Rank(2003-2019)	1.000	0.590	0.197	1.000	0.729	0.175	1.000	0.671	0.078

## Value Strategies Mean Revert Strongly After Valuation Spreads Are Wide

### Value Reversals in the U.S. After Large Valuation Spreads (1967 – 2020)

Value/Growth Spread	Trailing E/P				Forward 1yr Returns (Equal Weighted)					Forward 1yr Returns (Value Weighted)				
	Expens. 30%	Middle 40%	Cheap 30%	Ratio: Cheap / Expens.	Expens. 30%	Middle 40%	Cheap 30%	Cheap – Expens.	Hit Rate: Cheap Wins	Expens. 30%	Middle 40%	Cheap 30%	Cheap – Expens.	Hit Rate: Cheap Wins
Value Expensive	5.3%	8.1%	11.1%	2.13	20.0%	16.5%	17.3%	<b>-2.7%</b>	44.8%	17.4%	14.9%	15.5%	<b>-1.9%</b>	40.8%
Quintile 2	4.3%	6.9%	10.1%	2.33	15.6%	15.3%	16.2%	<b>0.7%</b>	50.4%	16.2%	14.2%	14.5%	<b>-1.8%</b>	39.2%
Quintile 3	3.8%	6.3%	9.3%	2.48	12.2%	13.2%	15.2%	<b>3.1%</b>	68.0%	11.8%	12.5%	14.5%	<b>2.7%</b>	64.0%
Quintile 4	3.6%	6.4%	9.7%	2.67	9.3%	12.8%	15.6%	<b>6.3%</b>	77.6%	8.8%	10.5%	14.2%	<b>5.5%</b>	76.0%
Value Cheap	3.3%	7.0%	11.0%	3.44	-0.1%	4.2%	8.5%	<b>8.6%</b>	72.8%	0.3%	4.5%	8.9%	<b>8.6%</b>	69.6%

After periods in which the spread in relative valuations of Cheap versus Expensive stocks are wide, Value strategies outperform significantly and approximately ~70% of the times over the next 1-year



## Value Strategies Mean Revert Strongly After Valuation Spreads Are Wide

### Value Reversals in Developed International Markets After Large Valuation Spreads (1989 – 2019)

Value/Growth Spread	Trailing E/P				Forward 1yr Returns (Equal Weighted)					Forward 1yr Returns (Value Weighted)				
	Expens. 30%	Middle 40%	Cheap 30%	Ratio: Cheap / Expens.	Expens. 30%	Middle 40%	Cheap 30%	Cheap – Expens.	Hit Rate: Cheap Wins	Expens. 30%	Middle 40%	Cheap 30%	Cheap – Expens.	Hit Rate: Cheap Wins
Value Expensive	2.7%	4.9%	7.9%	2.93	8.3%	7.4%	6.7%	<b>-1.6%</b>	31.9%	10.0%	11.3%	11.0%	<b>1.0%</b>	58.3%
Quintile 2	2.7%	5.2%	8.8%	3.25	10.3%	10.1%	10.1%	<b>-0.2%</b>	45.2%	11.1%	12.0%	11.6%	<b>0.5%</b>	53.4%
Quintile 3	2.5%	5.2%	9.0%	3.65	9.3%	10.4%	12.6%	<b>3.3%</b>	69.9%	8.6%	9.1%	10.7%	<b>2.0%</b>	57.5%
Quintile 4	2.4%	5.6%	9.7%	4.04	13.2%	13.9%	15.7%	<b>2.5%</b>	65.8%	11.0%	10.8%	12.6%	<b>1.6%</b>	60.3%
Value Cheap	2.0%	5.2%	9.9%	5.10	2.5%	7.9%	12.5%	<b>10.1%</b>	83.3%	-1.5%	2.3%	7.9%	<b>9.4%</b>	62.5%

After periods in which the spread in relative valuations of Cheap versus Expensive stocks are wide, Value strategies outperform significantly over the next 1-year in International Markets as well

## Performance of the Largest U.S. Companies

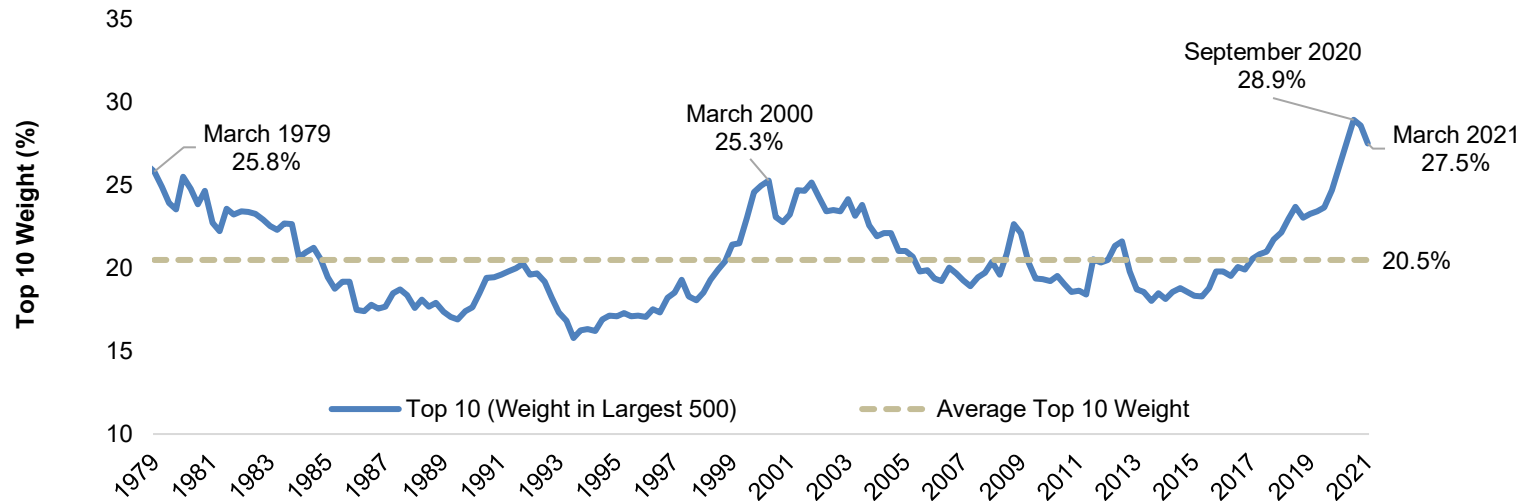
### The Top 10 Stocks Over Time

	December 1980	December 1990	December 2000	December 2010	December 2020
1	IBM	IBM	General Electric	Exxon Mobil	Apple
2	AT&T	Exxon	Exxon Mobil	Apple	Microsoft
3	Exxon	General Electric	Pfizer	Microsoft	Amazon
4	Standard Oil of Indiana	Phillip Morris	Citigroup	Berkshire Hathaway	Alphabet
5	Schlumberger	Royal Dutch Shell	Cisco Systems	General Electric	Facebook
6	Shell Oil	Bristol-Myers Squibb	Wal-Mart Stores	Wal-Mart	Berkshire Hathaway
7	Mobil	Merck	Microsoft	Google	Johnson & Johnson
8	Standard Oil of California	Wal-Mart Stores	AIG	Chevron	JP Morgan Chase & Co
9	Atlantic Richfield	AT&T	Merck	IBM	Visa
10	General Electric	Coca-Cola	Intel	Procter & Gamble	Procter & Gamble

- The “top 10” generally make up about 20% of the Index and the list is always changing
  - As of March 31, 2021 the top 10 represents 27.5% of the largest 500 U.S. companies
- When a concentration occurs in one sector or in high valuation companies, the next 5 years tend to be good for ‘active’ money managers
- In 1980, there were 7 oil companies in the top 10

# Performance of the Largest U.S. Companies

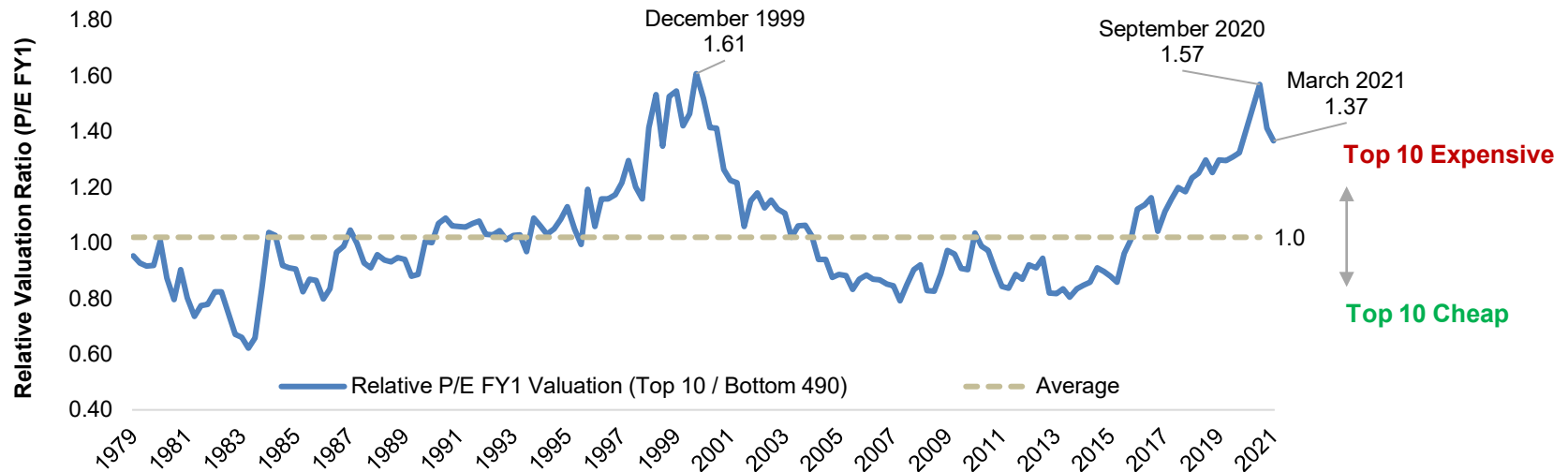
## Weight of Top 10 Stocks in the U.S. Over Time



- **As of March 2021, the Top 10 stocks in the U.S. represent 27.5% of the market cap of the largest 500 companies, the highest on record dating back to the 1970's**
  - The historical average weight of the top 10 names is 20.5%

## Performance of the Largest U.S. Companies

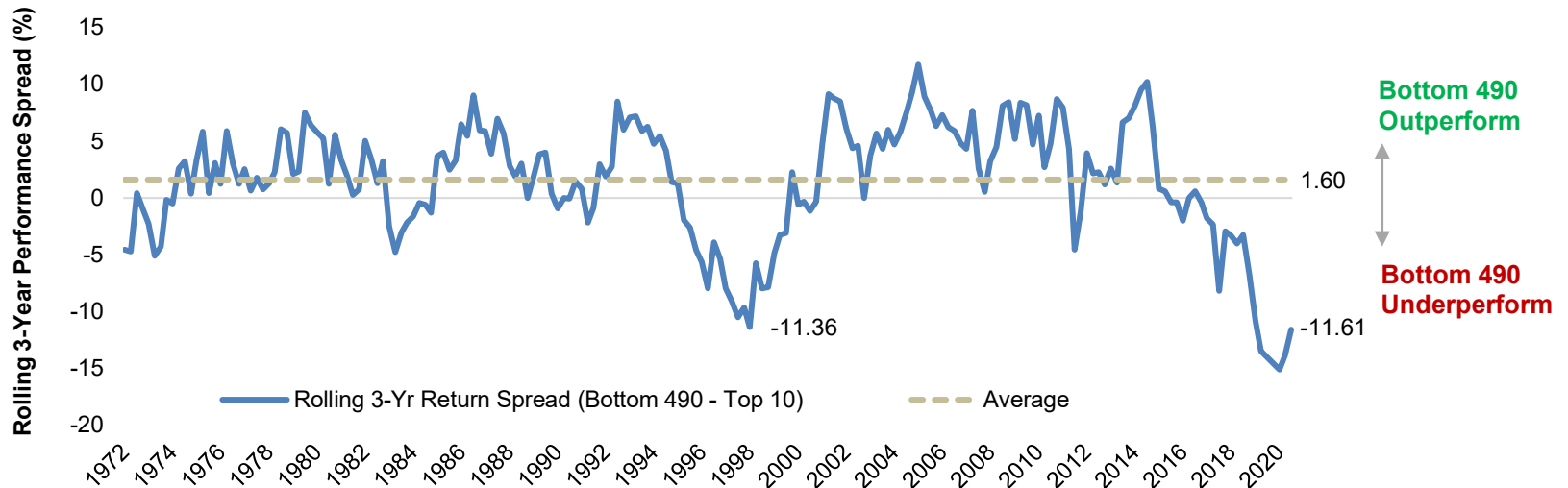
### Relative Valuation of Top 10 Stocks vs. Bottom 490 in the U.S. Over Time



- **The Top 10 stocks in the U.S. are also incredibly expensive today relative to the Bottom 490 companies**
  - Historically, the Top 10 stocks and Bottom 490 trade on par with one another
  - As of March 2021, the relative valuation ratio stands at 1.37; down from 1.57 in September 2020
  - The only period higher was at the height of the tech bubble at 1.61

# Performance of the Largest U.S. Companies

## Performance of Top 10 Stocks in the U.S. Over Time



- **Historically, the Top 10 stocks in the U.S. have underperformed the Bottom 490 by 1.60% annualized over rolling 3-year periods**
  - Over the past 3 years, the Top 10 stocks outperformed the Bottom 490 by 11.61% annualized; the worst relative performance of the Bottom 490 for the past half century
- **It is extremely rare to find periods in which the Top 10 stocks are 1) highly concentrated 2) expensive and 3) have outperformed significantly over the past 3 years. History would suggest that now is a good time to be contrarian.**

## Multiple Expansion & Contraction by Valuation 1970-2019

	Expensive						Cheap
Portfolio	P1	P2	P5	P6	P9	P10	
E/P FY1	3.4	4.8	6.7	7.3	9.6	11.6	
B/M	17.5	25.6	46.7	51.1	65.5	80.8	
Return -4 to 0	249.8	130.8	66.5	62.0	50.5	45.9	
Sales Growth -5 to 0	125.2	80.6	50.0	46.3	42.2	43.7	
EW Return T+1	8.6	9.4	11.9	12.2	15.2	16.3	
CW Return T+1	8.7	9.4	11.0	11.8	14.2	15.6	
VW Return T+1	9.5	8.8	10.9	11.7	13.3	15.5	
Value Weighted	P1	P2	P5	P6	P9	P10	
P/S Base	4.04	2.33	1.17	1.07	0.75	0.54	
P/S After 3 Years	2.95	2.07	1.18	1.07	0.85	0.63	
P/S After 5 Years	2.63	2.01	1.22	1.10	0.91	0.70	
P/S After 10 Years	2.23	1.98	1.30	1.18	1.03	0.84	
P/EBITDA Per Share Base	21.5	12.6	7.3	6.4	4.3	3.5	
P/EBITDA After 3 Years	15.6	10.9	7.2	6.6	5.0	4.4	
P/EBITDA After 5 Years	14.3	10.6	7.3	6.6	5.5	4.9	
P/EBITDA After 10 Years	12.8	10.5	7.6	7.0	6.1	5.6	
P/FY1 Base	33.9	23.0	16.2	14.8	11.1	9.1	
P/FY1 After 3 Years	27.1	21.3	16.5	15.8	13.8	12.8	
P/FY1 After 5 Years	25.8	21.3	16.9	16.1	14.7	13.9	
P/FY1 After 10 Years	22.8	20.4	17.4	16.7	15.6	15.3	

## Expected Return Comparison

### Assumptions for a Growth Stock and a Value Stock

GROWTH STOCK		VALUE STOCK	
SalesForce.Com Inc		Bristol-Myers Squibb	
Market Cap (in MM)	\$206,516	Market Cap (in MM)	\$138,839
Price	\$220.79	Price	\$62.06
Est. EPS 2021	3.41	Est. EPS 2021	7.47
Est. P/E 2021	64.75	Est. P/E 2021	8.31
Time (in Years)	10	Time (in Years)	10
<b>Assume :</b>		<b>Assume :</b>	
Annual Growth in Earnings	12.0%	Annual Growth in Earnings	3.0%
Future P/E	22.0	Future P/E	15.0
Realized EPS in Year 10	10.59	Realized EPS in Year 10	10.03
Div Yield	0.00%	Div Yield	3.16%
<b>Realized Stock Return over 10 Y</b>	<b>0.54%</b>	<b>Realized Stock Return over 10 Y</b>	<b>12.71%</b>

Even if SalesForce grows at 14.8%, which is the top 5<sup>th</sup> percentile for portfolios of large expensive companies, it will still only yield a modest 3.05% return over 10 years



# Discounted Cash Flow Modeling



---

## Sean Burns ● Vice President

---

### Credit Suisse; HOLT Investment Strategy Team



Sean Burns is a Vice President at Credit Suisse and a member of the HOLT Investment Strategy Team in New York. He is responsible for conducting research focused on market themes, quantitative strategies, sector and geographic allocations, portfolio positioning, and the benefits of HOLT data. Prior to joining Credit Suisse in 2019, he was a Vice President at Advisory Research, Inc. serving as a research analyst and member of the Investment Committee for a Global Equity strategy. He began his career in 2014 at Credit Suisse as an analyst with HOLT. Sean holds a BSBA in Finance from the D'Amore-McKim School of Business at Northeastern University.

# HOLT Investment Strategy

Prepared for VRS – April 2021



**Sean Burns**  
**HOLT Investment Strategy**  
+1 212 538 9914  
[sean.burns@credit-suisse.com](mailto:sean.burns@credit-suisse.com)



# Introduction to HOLT

# What are “Economic Adjustments”?

*Most analysts make some of these adjustments...*

- Inflation
- Depreciation
- Asset Life
- Asset Mix
- Deferred Taxes
- Research & Development
- In-process R&D
- Non-recurring Items
- Off Balance Sheet Items
- LIFO & FIFO Accounting
- Asset Write-Offs
- Monetary Holding Gains or Losses
- Acquisition Accounting (Purchase vs. Pooling)
- Investments
- Pension Gains/Losses
- Pro-forma earnings adjustment

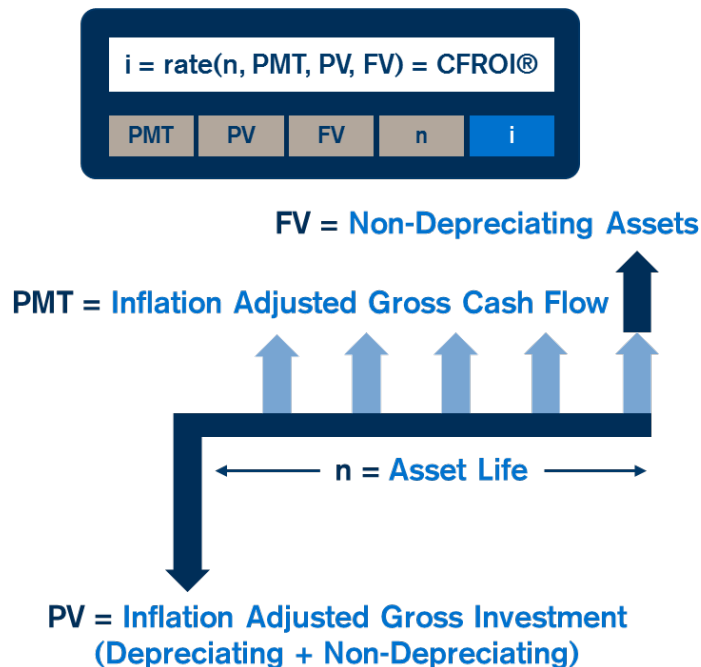
*...HOLT makes all of them (and then some)*

*systematically for over 19,000 stocks in 65 countries.*

# Introduction to CFROI®

## What is CFROI?

The HOLT **Cash Flow Return on Investment** is an approximation of the economic returns earned by a firm on the portfolio of projects that constitute its operating assets. It is an estimate of the **average real internal rate of return (IRR) of a firm**, recognizing the finite economic life of depreciating assets and the residual value of non-depreciating assets.



### Benefits of using CFROI

- Adjusted for accounting distortions and inflation
- Considers economic life of depreciating assets
- Captures off-balance sheet liabilities (rent) and capitalizes R&D expense for comparability

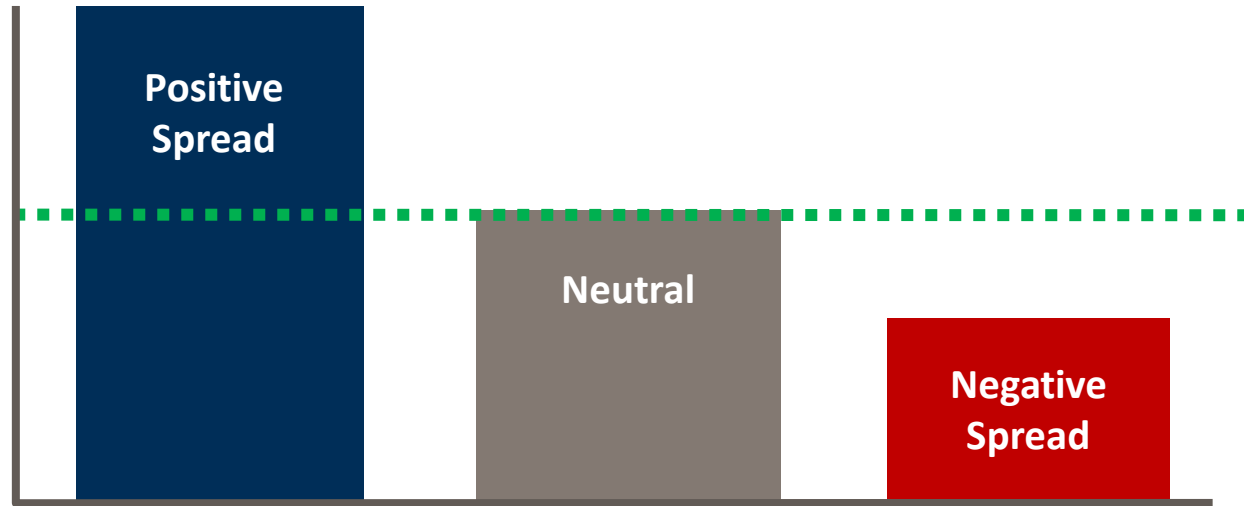
- Comparable across time, sector, and countries
- Provides a robust basis for systematic cash flow projection and valuation

# CFROI can be used to assess whether a firm is creating or destructing value and where the strategic focus should be

Economic Returns (CFROI)



Discount Rate  
(Cost of Capital)



**Business Priority**

**Expanding Profitable Business**

**Improving Profitability**

**Avoiding Further Value Destruction**

**Strategic Options**

Further Increase CFROI  
Hold CFROI and Grow  
Trade CFROI for Growth

Increase CFROI First  
Then Grow

Increase CFROI  
Reduce Reinvestment  
Divest or Liquidate

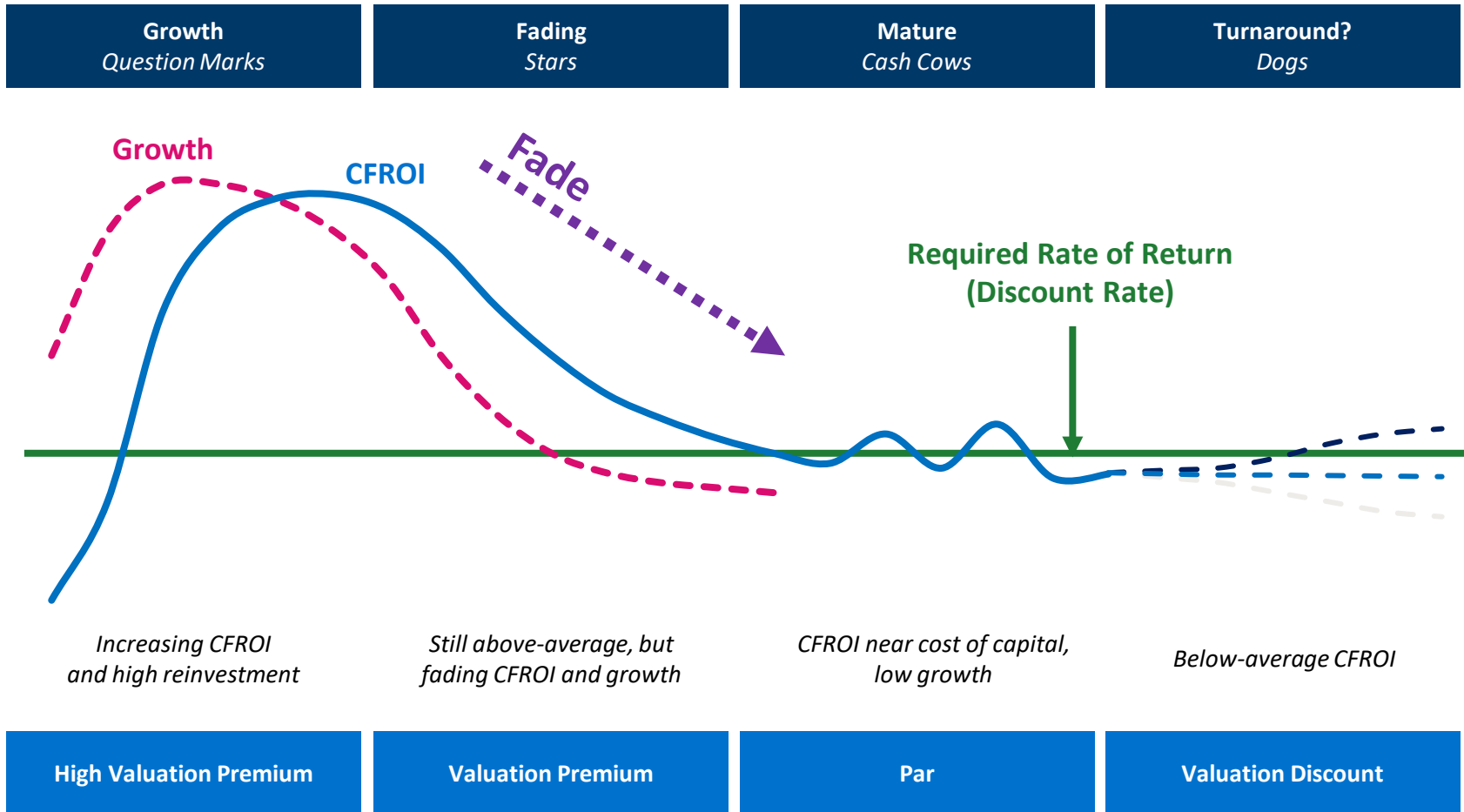
**Key Value Drivers**

**Sales Growth**

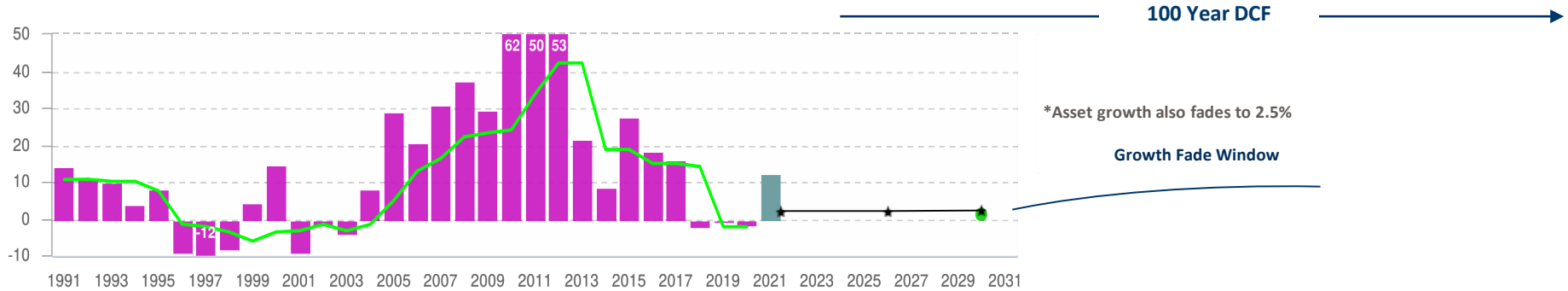
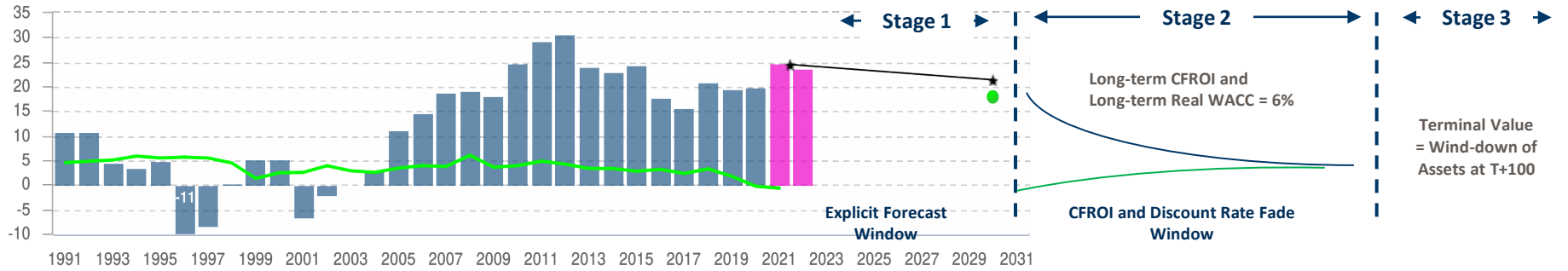
**Margins or Asset Utilization**



# Mean-reversion of returns and growth (“Fade”) happens in an average corporate/industry life-cycle



# HOLT DCF Company Example

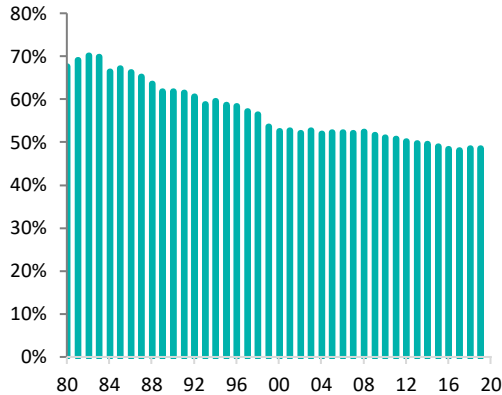


# Changing Balance Sheet Impact on Valuation

# The Composition of Corporate Balance Sheets is Changing

GAAP Balance Sheet captures PP&E and Inventory, but companies are becoming less capital intensive.

**Inflation Adjusted Gross Plant % of IAGI**

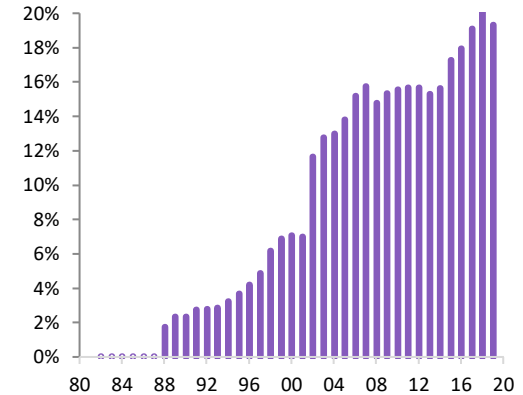


**Adj Inventories % of IAGI**



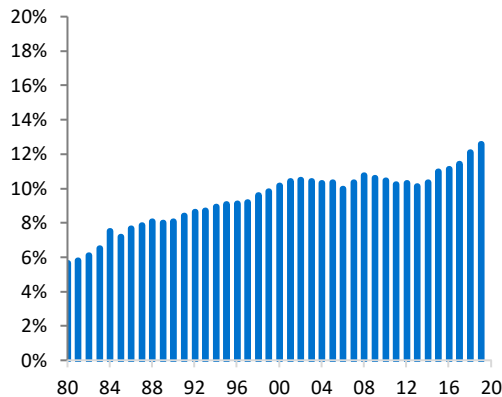
Goodwill, a non-operating asset, is becoming more significant on corporate balance sheets.

**Goodwill as % of IAGI**

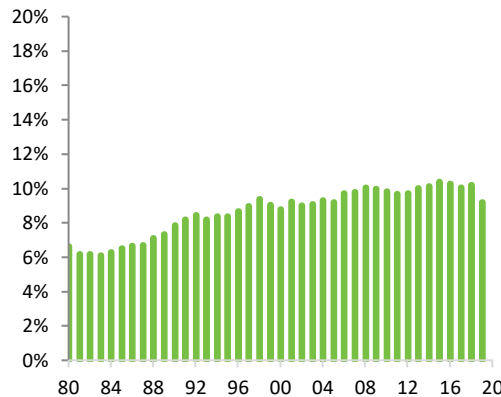


HOLT capitalizes off balance sheet investments into its capital base, including R&D and Operating Leases.

**Capitalized R&D as % of IAGI**

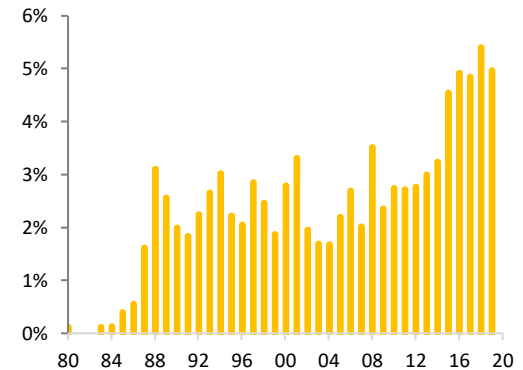


**Capitalized Leases as % of IAGI**



Many companies now have negative book equity, including non distressed firms like MCD.

**% of Companies with Negative Book Equity**

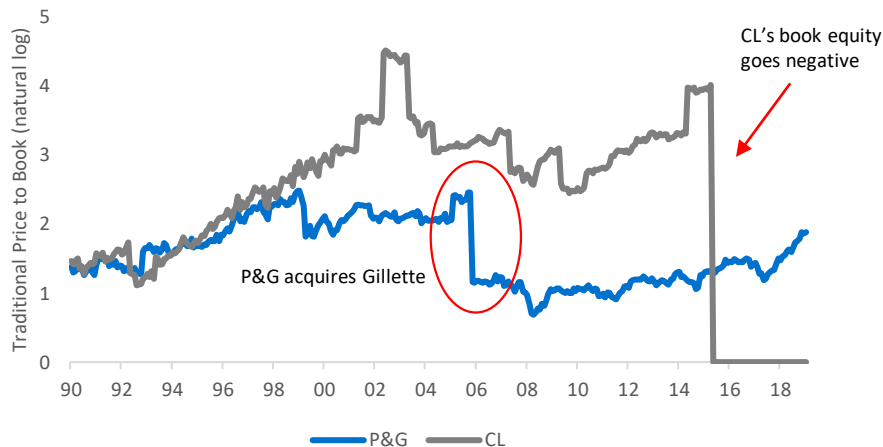


IAGI = HOLT's Inflation Adjusted Gross Investment

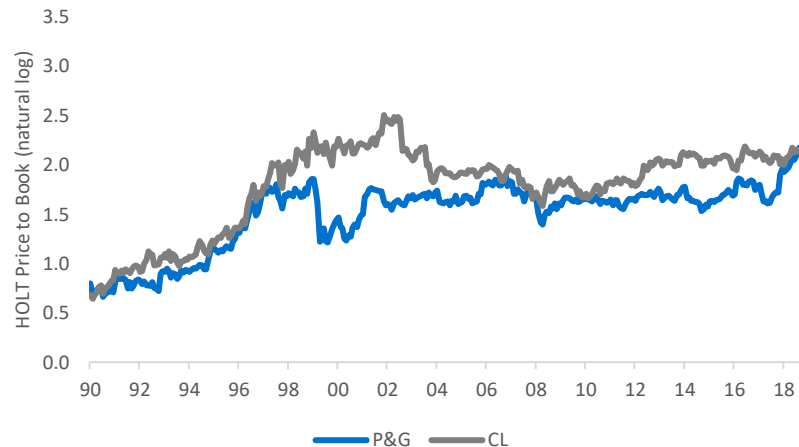
# Downfalls of comparing companies with P/B

## Procter and Gamble vs. Colgate-Palmolive

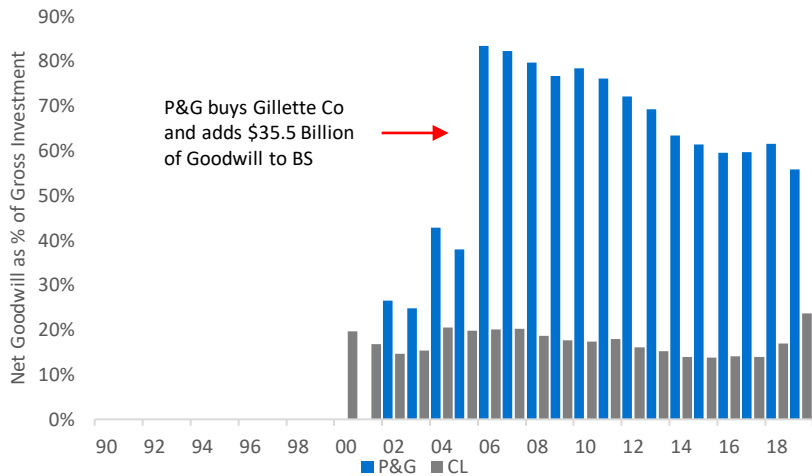
Traditional Price-to-Book measures can be distorted by different accounting treatments



HOLT Price-to-Book is a multiple on the inflation-adjusted operating assets according to the HOLT Model



Goodwill on the balance sheet can distort traditional price-to-book metrics

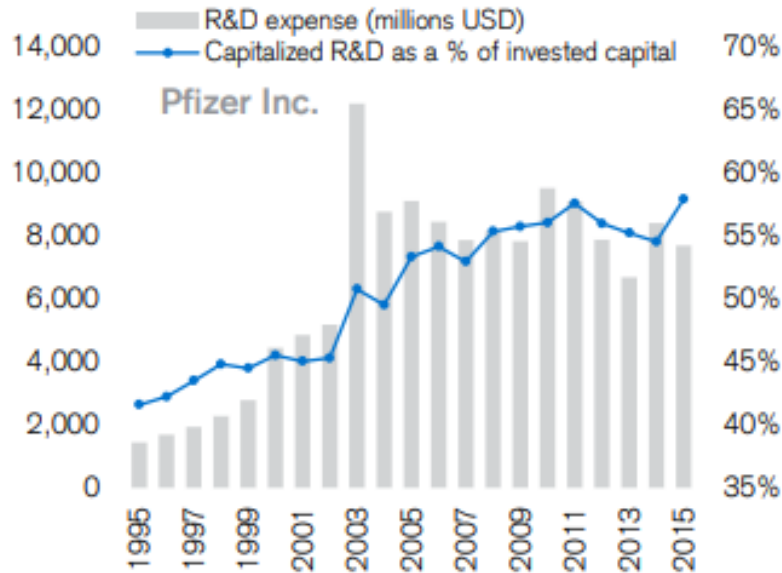


HOLT CFROI ensures comparability of operating profitability and valuations



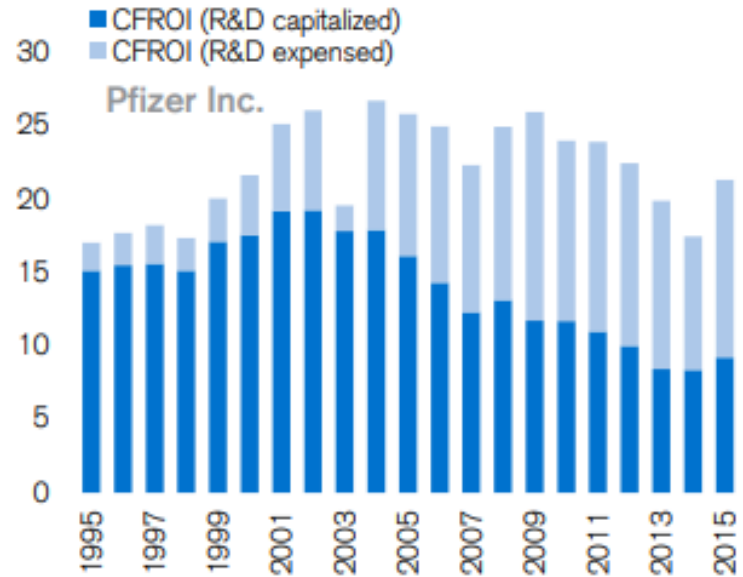
# The HOLT Approach: R&D is an Investment not an Expense

Figure 5: As more capital is devoted to R&D...



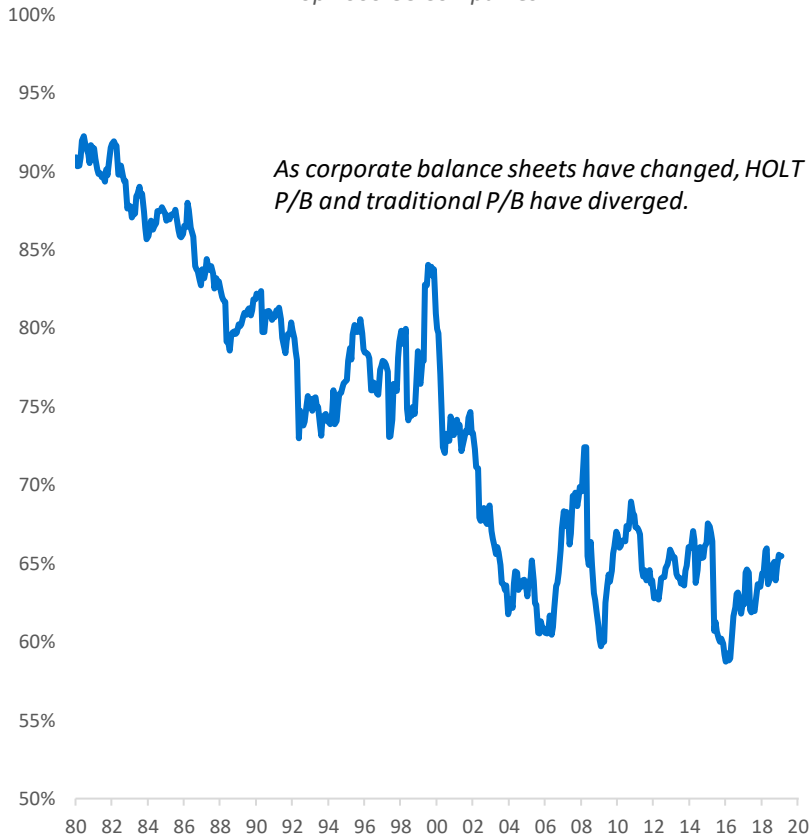
Source: Credit Suisse HOLT

Figure 6: ...expensing it could overstate return on capital

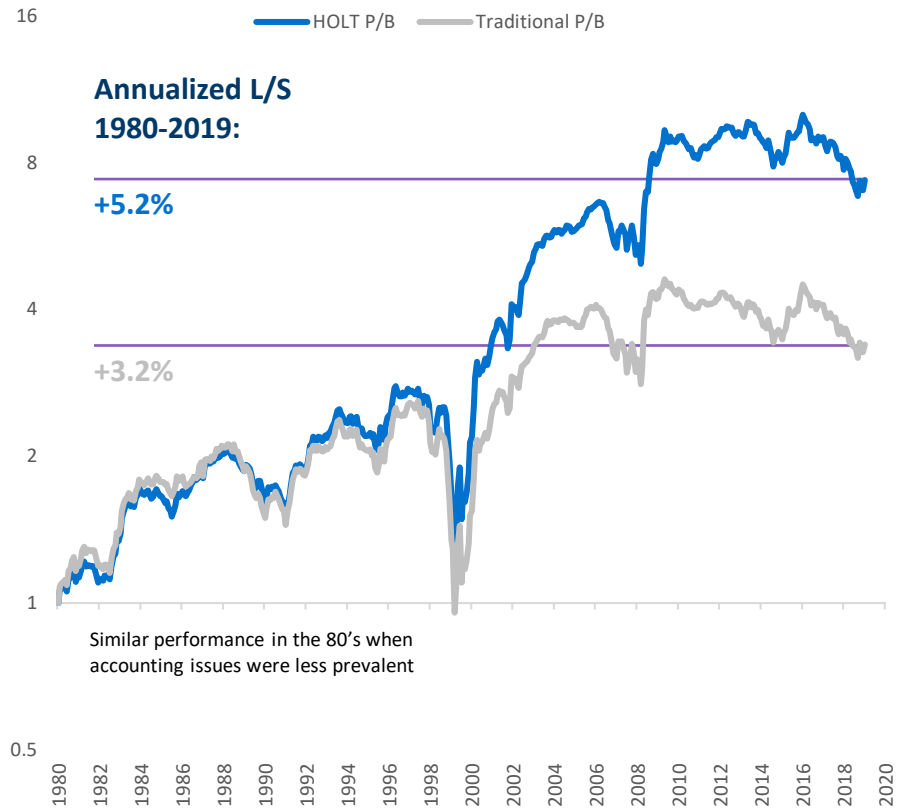


# Better Classification leads to Superior Performance

**Rank Correlation: HOLT vs Traditional Price to Book**  
Top 1000 US Companies



**Cumulative L/S Return (Top vs Bottom 3rd)**  
Top 3000 US Companies by TTM Mkt Cap



Universe: Largest 3000 US stocks by TTM market cap. Source: Credit Suisse HOLT  
Date range: 1980 to 2019. Groups formed into equal terciles by 1/ HOLT P/B and 1/ P/B

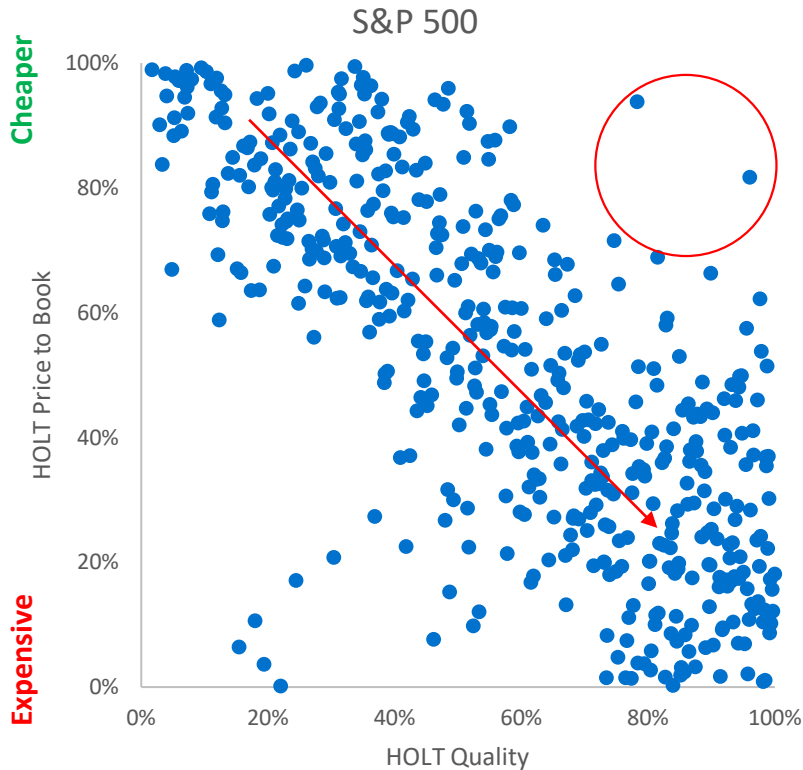


## Comparison of Valuation Metrics

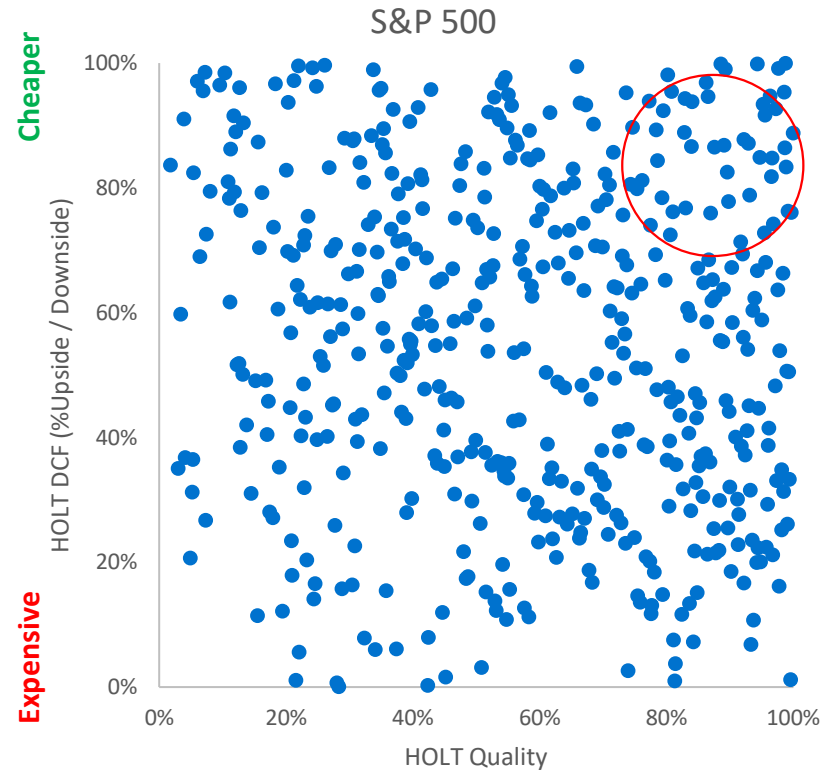
Traditional Analog	HOLT Metric	Benefits	Notes
Price / Book	HOLT Price / Book (Value to Cost)	Simple, assesses the market value of the firm relative to its inflation-adjusted net assets (including off-balance sheet items).	HOLT Valuation metric that is most closely associated with the Value risk premium.
Price / Earnings EV / NOPAT	Economic P/E (Economic Yield)	Improves on HOLT Price / Book by normalizing multiple by profitability	Best evaluated in yield form, 1/Economic P/E, when used in a factor model.
PE / Growth (PEG)	Market Implied Discount Rate (MIDR)	MIDR explicitly incorporates forecasted company-specific fade and growth rates.	Measures the expected return for each firm implied by the current price, given HOLT's assumptions of fade in profitability and growth.
DCF / Dividend Discount Model (DDM)	Warranted % Upside/Downside	Estimate of equity Valuation using a market-derived discount rate that accounts for non-diversifiable risks.	Provides upside relative to peers within their business model: Industrials, spread-earning Financials, REITs, and Regulated Utilities.

# HOLT's DCF valuation factor has much different correlation to Quality

*No free lunch on traditional Value metrics... must pay premium to own highest Quality businesses*



*If you model intrinsic value using profitability, Growth, and Risk you can find stocks with attractive Valuations along the entire Quality spectrum*



Source: Credit Suisse HOLT, Bloomberg, as of 6/30/2020

# The DCF provides a differentiated measure of “cheapness” by accounting for Profitability, Fade, Growth, and Risk.

Cheapest on...

## HOLT Price to Book

BERKSHIRE HATHAWAY	BRK.B
EXXON MOBIL CORP	XOM
VERIZON COMMUNICATIONS INC	VZ
AT&T INC	T
CHEVRON CORP	CVX
WELLS FARGO & CO	WFC
T-MOBILE US INC	TMUS
CITIGROUP INC	C
GOLDMAN SACHS GROUP INC	GS
GENERAL MOTORS CO	GM
DUKE ENERGY CORP	DUK
FEDEX CORP	FDX
SOUTHERN CO	SO
CONOCOPHILLIPS	COP
CAPITAL ONE FINANCIAL CORP	COF
DOMINION ENERGY INC	D
METLIFE INC	MET
FREEPORT-MCMORAN INC	FCX
FORD MOTOR CO	F
NEWMONT CORP	NEM

Cheapest on...

## Economic PE Ratio

JPMORGAN CHASE & CO	JPM
INTEL CORP	INTC
VERIZON COMMUNICATIONS INC	VZ
AT&T INC	T
PFIZER INC	PFE
BROADCOM INC	AVGO
MERCK & CO	MRK
ABBVIE INC	ABBV
CITIGROUP INC	C
BRISTOL-MYERS SQUIBB CO	BMJ
GOLDMAN SACHS GROUP INC	GS
INTL BUSINESS MACHINES CORP	IBM
BLACKROCK INC	BLK
MICRON TECHNOLOGY INC	MU
LOCKHEED MARTIN CORP	LMT
CVS HEALTH CORP	CVS
ALTRIA GROUP INC	MO
CIGNA CORP	CI
ANTHEM INC	ANTM
GILEAD SCIENCES INC	GILD

Cheapest on...

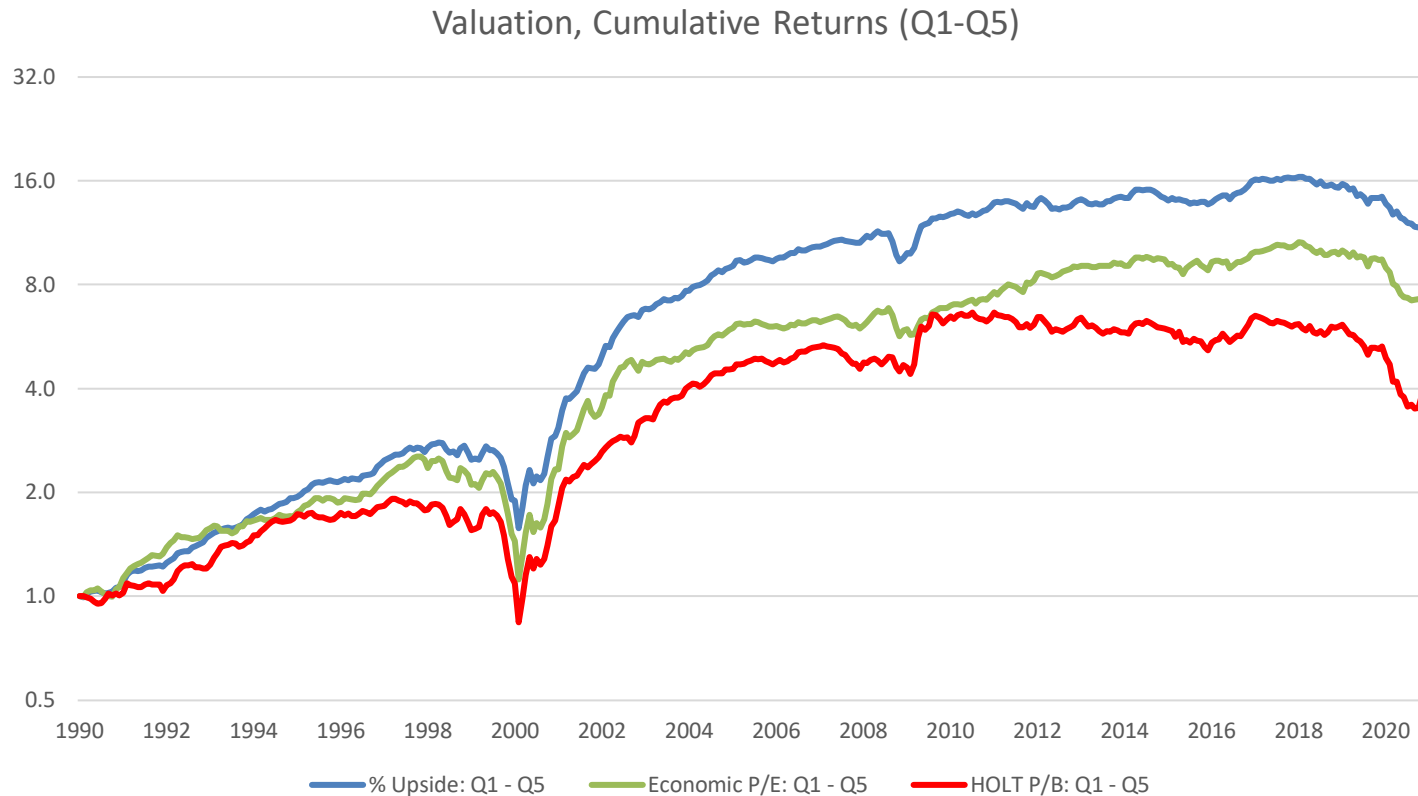
## The HOLT DCF

MICROSOFT CORP	MSFT
ALPHABET INC	GOOGL
FACEBOOK INC	FB
BERKSHIRE HATHAWAY	BRK.B
JOHNSON & JOHNSON	JNJ
UNITEDHEALTH GROUP INC	UNH
NVIDIA CORP	NVDA
INTEL CORP	INTC
EXXON MOBIL CORP	XOM
VERIZON COMMUNICATIONS INC	VZ
ABBOTT LABORATORIES	ABT
CHEVRON CORP	CVX
PFIZER INC	PFE
MERCK & CO	MRK
ABBVIE INC	ABBV
THERMO FISHER SCIENTIFIC INC	TMO
CITIGROUP INC	C
QUALCOMM INC	QCOM
BRISTOL-MYERS SQUIBB CO	BMJ
LOWE'S COS INC	LOW

Name screens in cheapest 20% of 2 valuation metrics

Name screens in cheapest 20% of 3 valuation metrics

# Valuation Factors Performance



	% Upside: Q1 - Q5	Economic P/E: Q1 - Q5	HOLT P/B: Q1 - Q5
Return	8.3%	6.7%	4.5%
Risk	10.1%	12.4%	13.1%
Return / Risk	0.82	0.54	0.34

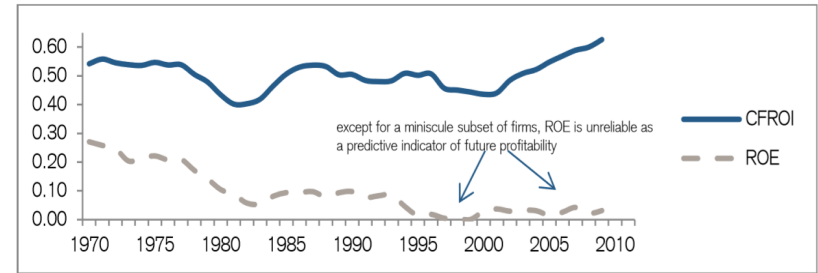
# HOLT Quality / eCAPs

# Deep Dive: HOLT Quality

## CFROI® as a Return Factor

- The CFROI level of a company approximates the **average Internal Rate of Return of all existing projects of a firm**
- **CFROI is adjusted for inflation and accounting distortions**, enhancing the comparability of corporate performance of firms across time, geography and sector
- **High serial autocorrelation of CFROI** enables us to build meaningful DCF forecasts

## Average 5 Year Autocorrelation in CFROI and ROE



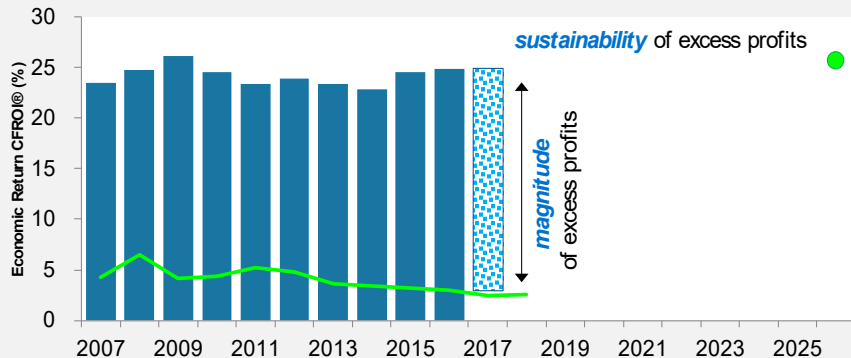
Source: Credit Suisse HOLT. US Industrial/Service firms. Correlation between CFROI(t) and CFROI(t+5) and ROE(t) and ROE(t+5), 1970-2010.

## Relative Wealth Chart

Household Products  
Market Cap: 64.781 USD

## COLGATE-PALMOLIVE CO

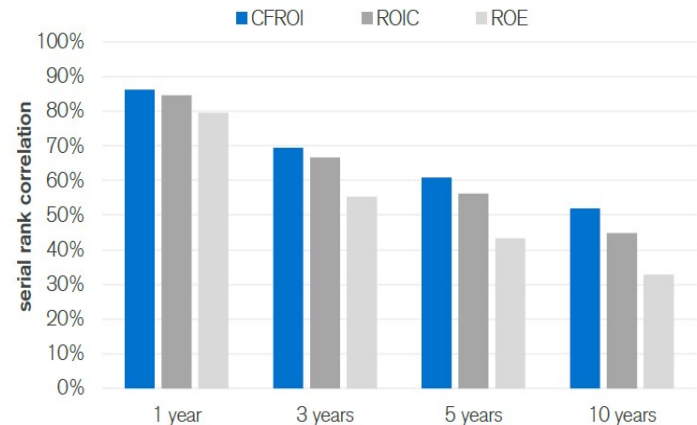
Price: 73.34 (Aug 14, 2017)  
Warranted Price: 58.25 USD (-21%)



Source: Credit Suisse, HOLT. For Illustrative Purposes Only.

## Cross-sectional rank correlation of CFROI, ROIC & ROE

Rank today vs. 1,3,5 & 10-year forward rank, displayed as median since 1990



Source: Credit Suisse HOLT as of 12/31/2017. Date range: December 1989 – December 2017.  
Universe: Largest 2000 Global stocks by market cap.  
Notes: ROIC = NOPAT / Avg. Invested Capital ROE = Adjusted Net Income / Avg. Book Equity  
ROIC is not calculated for Financial firms, ROE is used instead.

# Empirical Competitive Advantage Period: eCAPs

eCAP firms are the most profitable, least variable, and most persistent firms in the investable universe.

## Filter:

## CFROI<sup>®</sup> attributes:

**1 Persistently high levels of profitability**  
Maintain 8%+ CFROI<sup>®</sup> for 5 consecutive years

Level

**2 Favorable trend in profitability**  
Decay of CFROI levels between -0.1 and +0.75

Trend

**3 Low variability in profitability**  
CFROI coefficient of variation < 0.3

Variability

**4 Sustainable levels of growth**  
5-year average real asset growth rate < 30%

Asset growth

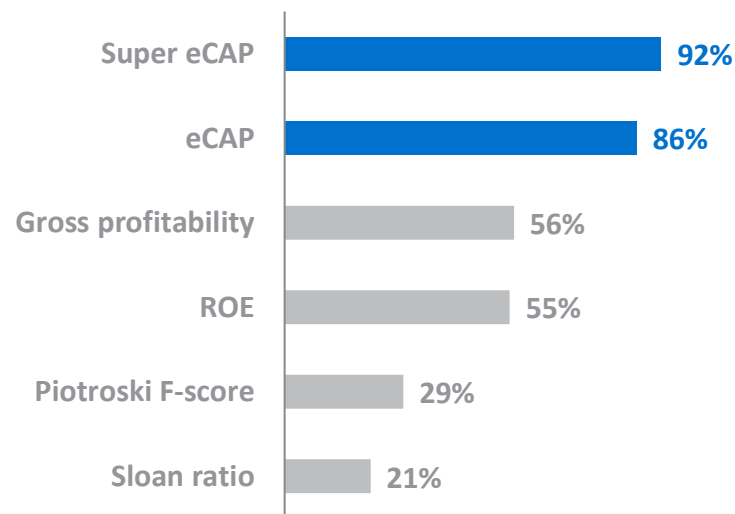


# The eCAP methodology identifies quality *ex-ante*

Precision: the ratio of true positive predictions to all predictions.

		Actual	
		positives	negatives
Predicted	positives	<b>true positives</b> high quality firm classified as high quality	<b>false positives</b> low quality firm classified as high quality
	negatives		

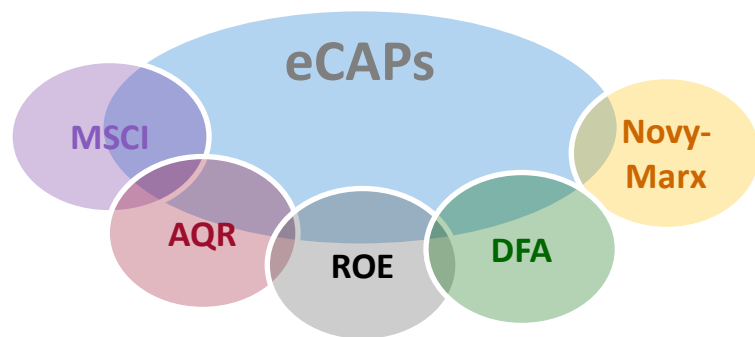
$$\text{precision} = \frac{TP}{TP + FP}$$



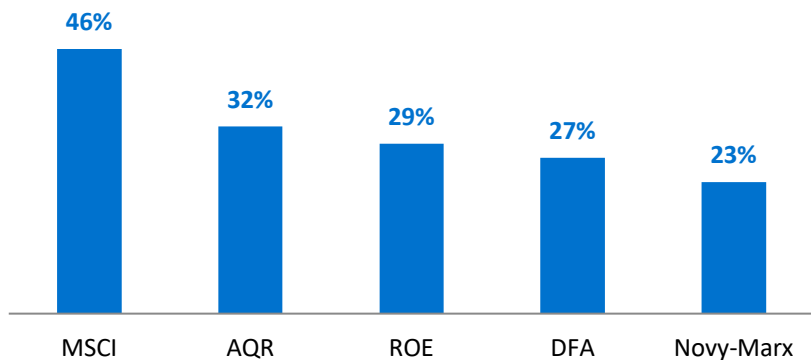
An astounding 86% of eCAPs maintained above-average CFROI levels in 4 of the next 5 years!

# eCAPs are a differentiated approach to quality

Because HOLT's eCAP methodology is proprietary and differentiated, there is limited overlap with other "high quality" definitions.



% of high quality portfolio that are HOLT eCAPs

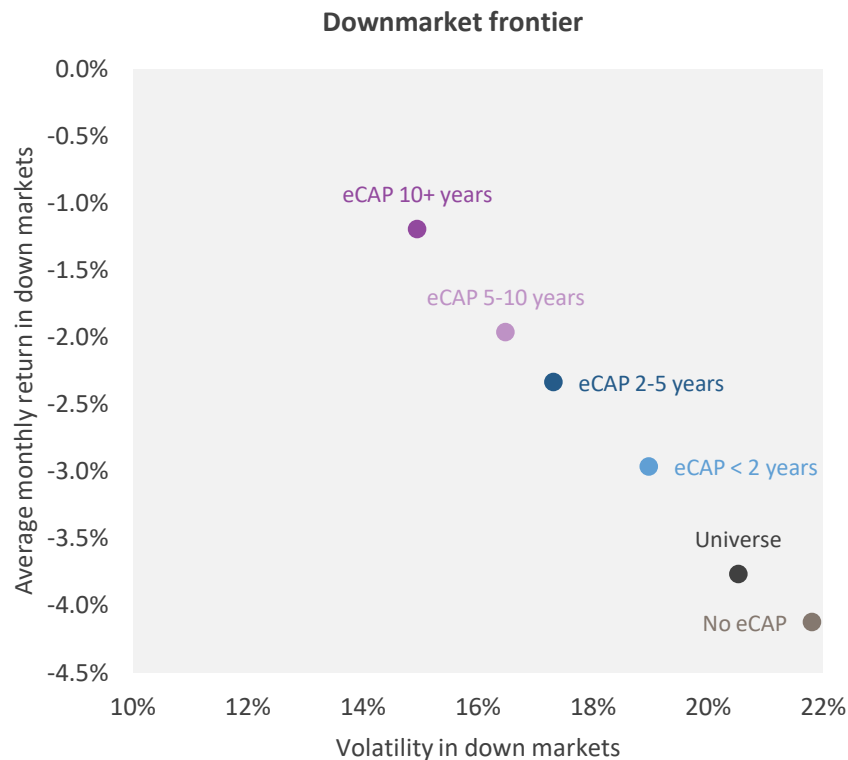
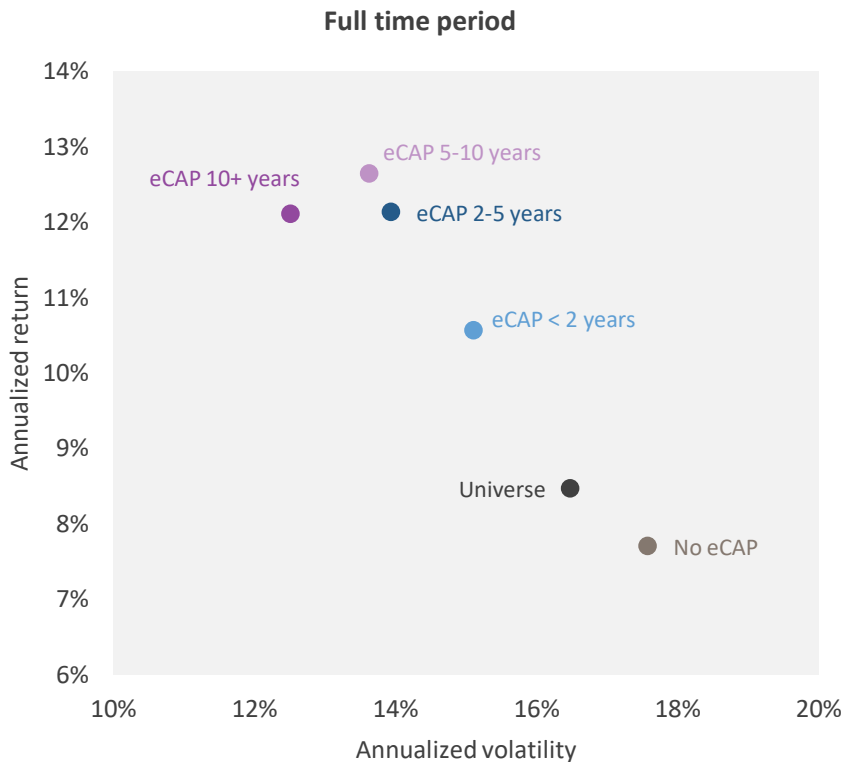


Method	Name	Definition
AQR Capital Management	AQR	<ul style="list-style-type: none"> <li>Total profits/assets</li> <li>Gross margins</li> <li>Free cash flow/assets</li> </ul>
Dimensional Fund Advisors Direct Profitability	DFA	<ul style="list-style-type: none"> <li>(EBITDA – interest)/book value</li> </ul>
MSCI Quality Factor	MSCI	<ul style="list-style-type: none"> <li>Return on Equity</li> <li>Debt to Equity</li> <li>Earnings variability</li> </ul>
Novy-Marx Gross Profitability	Novy-Marx	<ul style="list-style-type: none"> <li>Gross profit/assets</li> </ul>
Return on equity	ROE	<ul style="list-style-type: none"> <li>Return on Equity</li> </ul>
HOLT Empirical Competitive Advantage Period	eCAP	<ul style="list-style-type: none"> <li>High economic returns on capital</li> <li>Operational persistence</li> </ul>

# eCAP Frontier Analysis

*eCAPs outperform with less volatility over time*

*Quality matters when the market sells off*



Source: Credit Suisse HOLT as of 1/31/2021  
 Universe: Global \$8Bn+ Stocks

# U.S. Large Cap Companies that earn eCAPs

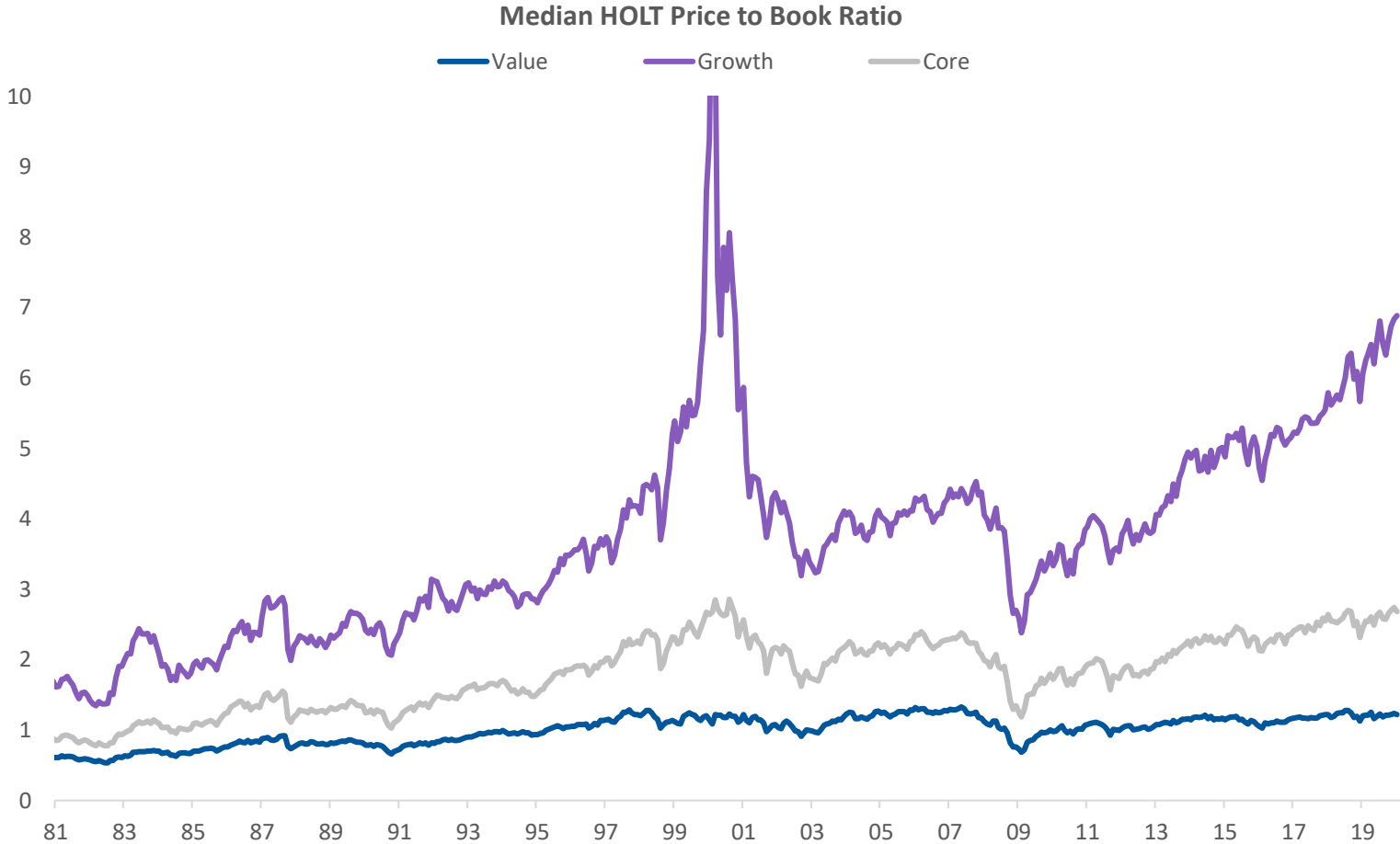
*Showing largest firms by market cap \$USD*

Name	Name	Name	Name
APPLE INC	HOME DEPOT INC	ACCENTURE PLC	UNITED PARCEL SERVICE INC
MICROSOFT CORP	PAYPAL HOLDINGS INC	MCDONALD'S CORP	LOWE'S COS INC
ALPHABET INC	INTEL CORP	TEXAS INSTRUMENTS INC	STARBUCKS CORP
VISA INC	COMCAST CORP	MEDTRONIC PLC	RAYTHEON TECHNOLOGIES CORP
JOHNSON & JOHNSON	NIKE INC -CL B	DANAHER CORP	INTL BUSINESS MACHINES CORP
MASTERCARD INC	COCA-COLA CO	QUALCOMM INC	BLACKROCK INC
WALMART INC	ABBOTT LABORATORIES	HONEYWELL INTERNATIONAL INC	3M CO
DISNEY (WALT) CO	PFIZER INC	COSTCO WHOLESALE CORP	LAUDER (ESTEE) COS INC -CL A
UNITEDHEALTH GROUP INC	BROADCOM INC	AMGEN INC	INTUIT INC
PROCTER & GAMBLE CO	ORACLE CORP	PHILIP MORRIS INTERNATIONAL	AMERICAN TOWER CORP

*Representation from every sector except Energy if screening for eCAPs within U.S. firms with market caps above \$10Bn*

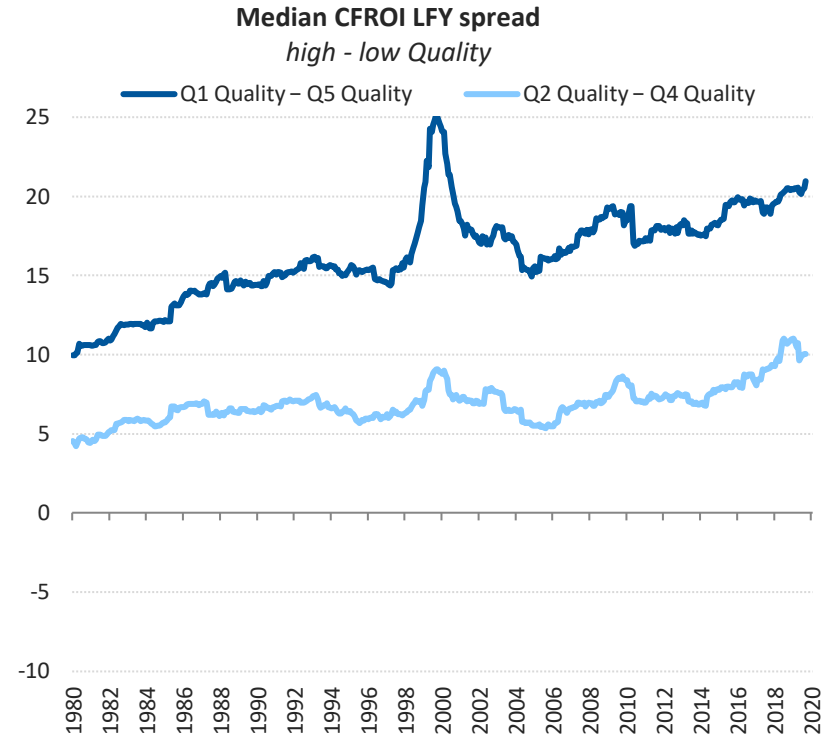
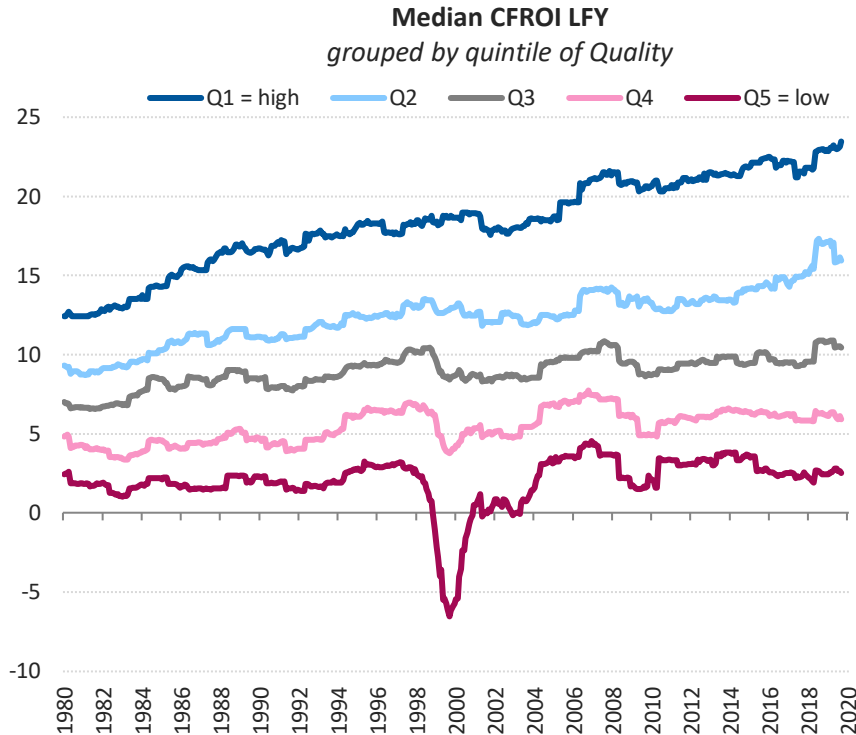
# APPENDIX: MARKET VIEWS

# The Valuation gap between Value and Growth (measured by HOLT P/B) is wide relative to history...



Universe: Largest 1000 US stocks by TTM market cap. Source: Credit Suisse HOLT  
Date range: 1980 to 2019

... but improvements in profitability have continued to accrue disproportionately to the highest Quality firms.

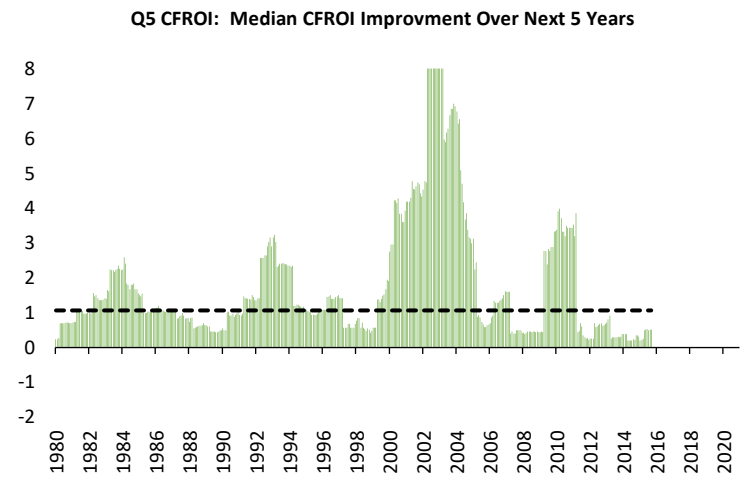
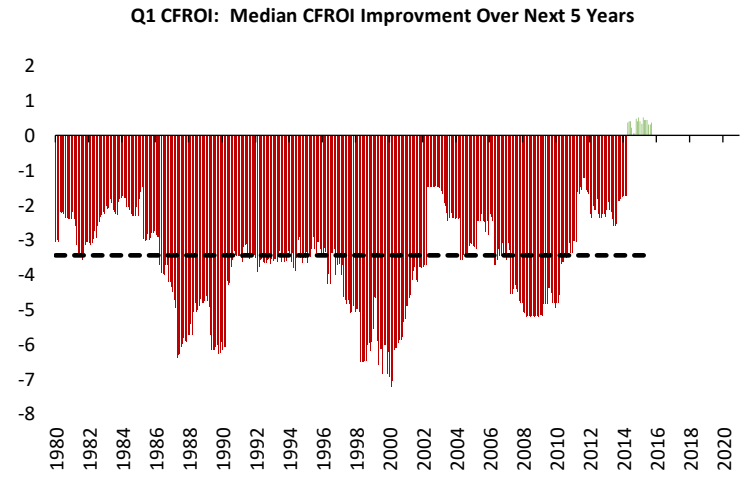
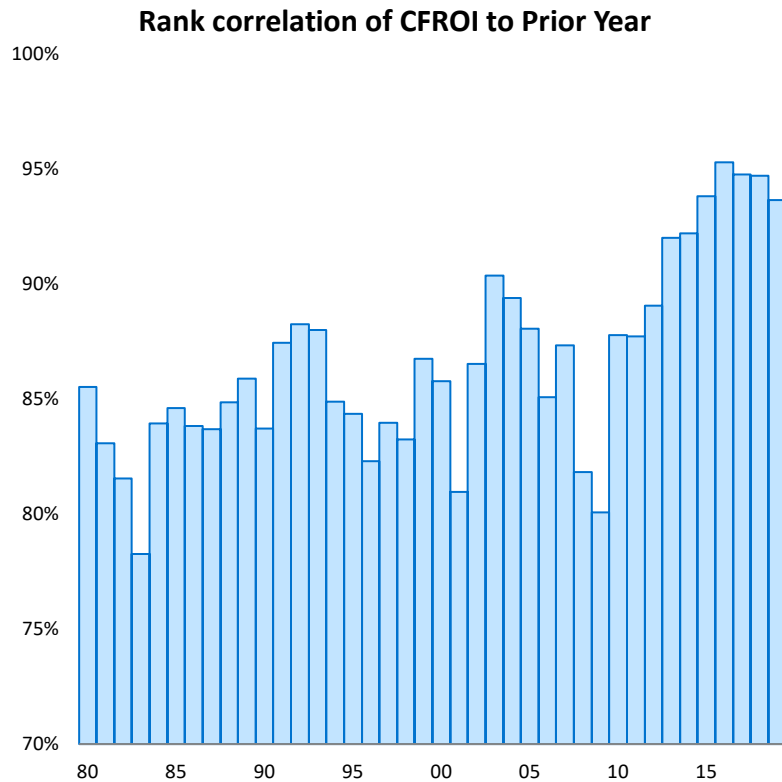


*In fact, the profitability gap between the most and least profitable firms has doubled in the last 40 years.*

Universe: Largest 1000 US companies by TTM market cap, Source: Credit Suisse HOLT

Date range: January 1980 – August 2020, CFROI LFY values are trimmed by 150bps for CFROE Financials (Banks & Insurance) for comparability purposes.

# In the US, the *persistence* of profitability has been unusually high.



*This dynamic has been a multi-year positive for Quality investors who experience fewer false positives, and a drag for Value investors betting on mean-reversion.*



In 2020 we introduced a new way to classify stocks based on common attributes to better understand risk and returns.

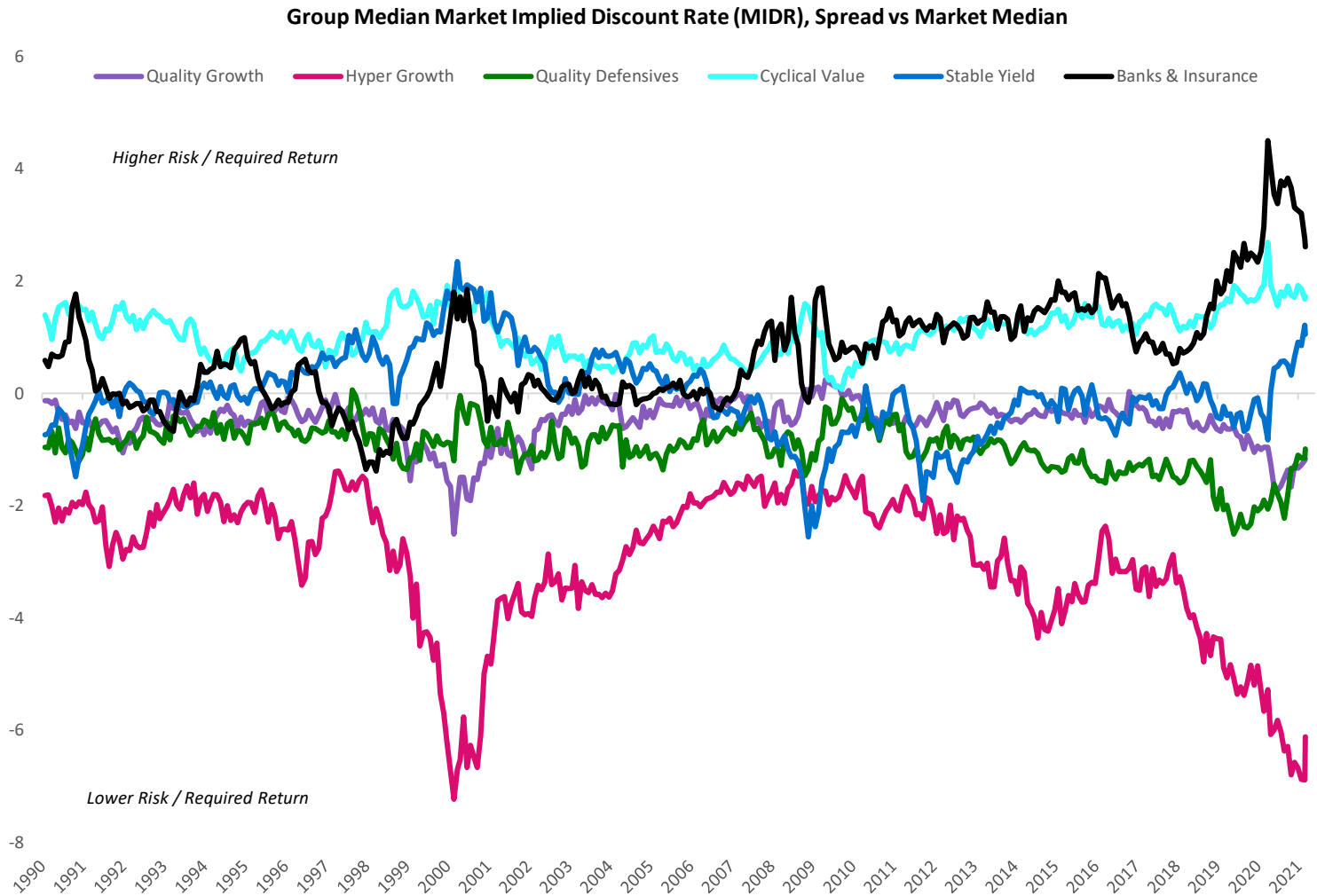


Performance dispersion across groups has been wide in 2020-21. The year-to-date outperformance of Hyper Growth and recent outperformance of Cyclical Value are particularly notable.

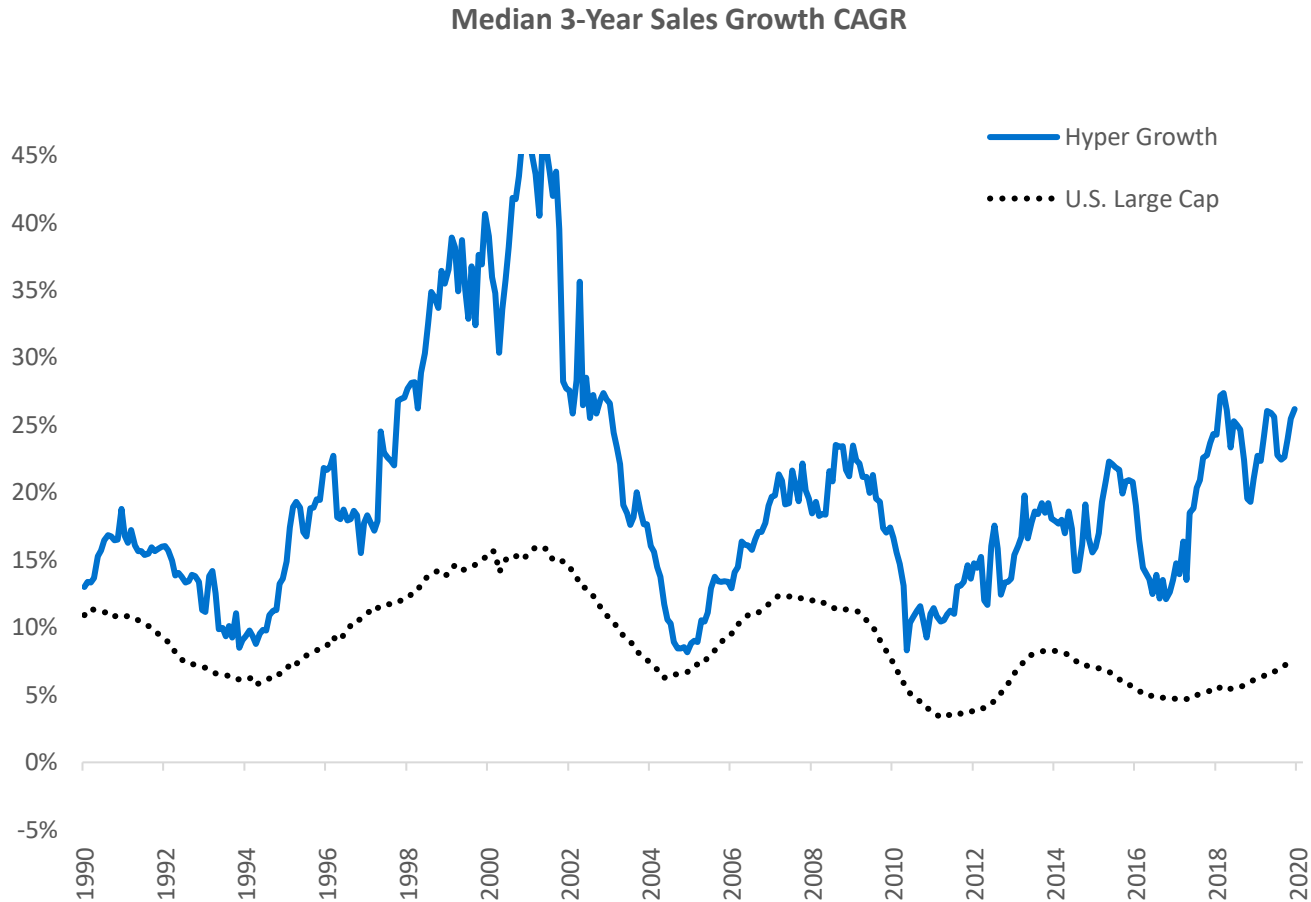
### Annual Total Returns - Equally Weighted in \$USD

Annual Total Returns														
2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Hyper Growth 23.7%	Stable Yield -23.2%	Cyclical Value 93.2%	Hyper Growth 33.7%	Stable Yield 14.9%	Cyclical Value 22.9%	Hyper Growth 49.2%	Stable Yield 28.2%	Quality Defensive 7.3%	Cyclical Value 32.1%	Hyper Growth 33.4%	Quality Defensive 2.0%	Hyper Growth 33.9%	Hyper Growth 98.5%	Cyclical Value 24.2%
Quality Growth 14.1%	Quality Defensive -23.9%	Quality Growth 51.7%	Cyclical Value 33.1%	Quality Defensive 9.7%	Banks & Insurance 21.5%	Cyclical Value 47.0%	Quality Defensive 14.1%	Banks & Insurance 1.7%	Banks & Insurance 24.9%	Quality Growth 24.7%	Stable Yield 1.8%	Quality Growth 32.8%	Quality Growth 28.5%	Banks & Insurance 19.1%
Stable Yield 13.5%	Market -40.6%	Market 49.5%	Quality Growth 27.2%	Quality Growth 0.2%	Hyper Growth 18.7%	Banks & Insurance 40.8%	Quality Growth 11.4%	Quality Growth 1.6%	Stable Yield 16.3%	Quality Defensive 20.9%	Hyper Growth -1.3%	Banks & Insurance 31.0%	Market 17.1%	Market 9.4%
Quality Defensive 8.0%	Banks & Insurance -43.6%	Hyper Growth 41.1%	Market 25.0%	Market -1.2%	Quality Growth 18.2%	Quality Growth 37.1%	Market 11.3%	Stable Yield 1.5%	Market 14.2%	Market 19.4%	Quality Growth -4.2%	Market 30.3%	Quality Defensive 9.8%	Stable Yield 5.8%
Market 4.1%	Quality Growth -45.1%	Banks & Insurance 26.5%	Banks & Insurance 19.1%	Cyclical Value -7.4%	Market 17.9%	Market 37.0%	Hyper Growth 8.4%	Market -2.8%	Quality Defensive 13.8%	Cyclical Value 13.3%	Market -8.9%	Quality Defensive 25.3%	Cyclical Value 6.4%	Quality Defensive 5.3%
Cyclical Value -3.7%	Cyclical Value -47.4%	Quality Defensive 21.0%	Quality Defensive 18.9%	Hyper Growth -10.0%	Quality Defensive 17.5%	Quality Defensive 37.0%	Banks & Insurance 5.9%	Hyper Growth -3.2%	Quality Growth 6.9%	Banks & Insurance 12.8%	Banks & Insurance -14.7%	Stable Yield 24.8%	Banks & Insurance -7.4%	Quality Growth 4.2%
Banks & Insurance -21.7%	Hyper Growth -52.5%	Stable Yield 15.0%	Stable Yield 15.7%	Banks & Insurance -12.0%	Stable Yield 9.0%	Stable Yield 15.3%	Cyclical Value 4.7%	Cyclical Value -14.9%	Hyper Growth -5.0%	Stable Yield 9.2%	Cyclical Value -17.8%	Cyclical Value 21.9%	Stable Yield -14.8%	Hyper Growth -4.3%

# The range of risk/return expectations priced by the market remains extremely wide by historical standards.

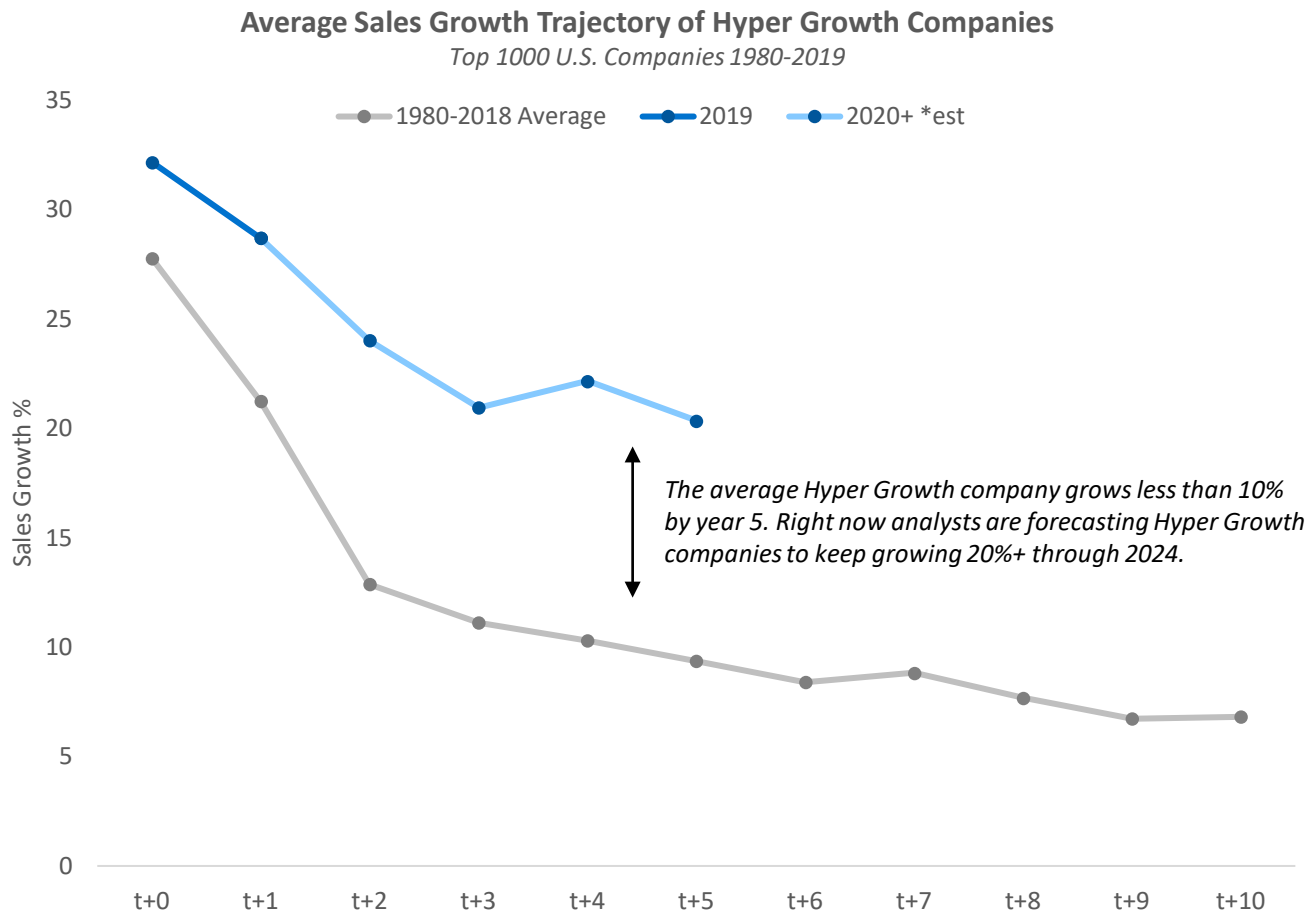


Strong performance from Hyper Growth has been driven by impressive top line growth, which has been scarce in every region. The median U.S. Hyper Growth stock has been growing sales at more than 20% p.a. and growth accelerated in 2020.



Source: Credit Suisse HOLT, Groups sorted as of 12/31/2020

Consensus forecasts are for growth rates of 20%+ to persist through 2024. Historically, growth fades to 10% over this period of time.



Source: Credit Suisse HOLT, Bloomberg, Data Date: 01/06/2021. 2020-2024 Sales Growth is based on consensus estimate from Bloomberg.  
[Prepared for Chance: Forecasting Corporate Growth](#)

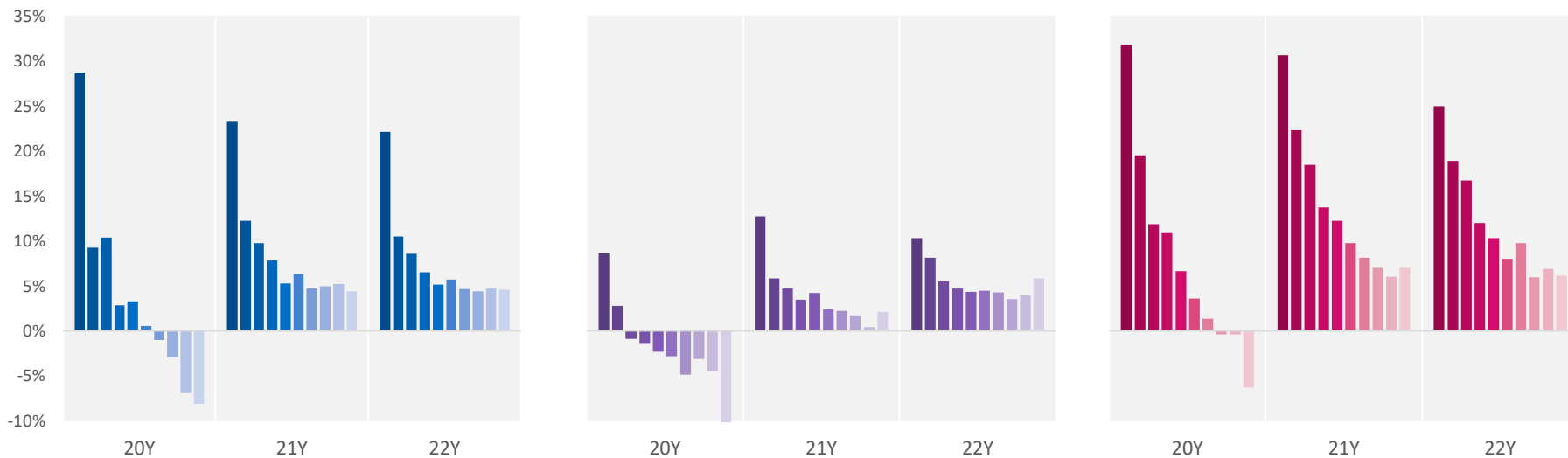
# Growth will be more evenly distributed in 2021 and 2022.

## Forecasted Sales Growth by Decile

### U.S. Large Cap

### EAFE

### Emerging Markets



Each bar represents a decile on HOLT Growth Factor (from left to right = high to low)

Source: Credit Suisse HOLT, Bloomberg, Data Date: 1/13/2021. 2020 Sales Growth is based on consensus estimate from Bloomberg.

# HOLT Education and Training Disclaimer

This document is intended for institutional customers of Credit Suisse only, is provided for informational and educational purposes, is intended for your use only, does not constitute an invitation or offer to subscribe for or purchase any of the products or services mentioned, and must not be forwarded or shared with retail customers or the public. Nothing in this document constitutes investment, legal, accounting or tax advice or a representation that any investment strategy or service is suitable or appropriate to your individual circumstances.

The information provided in this document, including any tools, services, strategies, methodologies and opinions, is expressed as of the date hereof and is subject to change. Credit Suisse Securities (USA) LLC and its affiliates ("Credit Suisse") assumes no obligation to update or otherwise revise these materials. The information has been obtained from or based upon sources believed by Credit Suisse to be reliable, but Credit Suisse does not represent or warrant its accuracy or completeness and is not responsible for losses or damages arising out of errors, omissions or changes or from the use of information presented in this document.

The HOLT methodology does not assign ratings or a target price to a security. It is an analytical tool that involves use of a set of proprietary quantitative algorithms and warranted value calculations, collectively called the HOLT valuation model, that are consistently applied to all the companies included in its database. The HOLT valuation model is a discounted cash flow model. Third-party data (including consensus earnings estimates) are systematically translated into a number of default variables and incorporated into the algorithms available in the HOLT valuation model. The source financial statement, pricing, and earnings data provided by outside data vendors are subject to quality control and may also be adjusted to more closely measure the underlying economics of firm performance. These adjustments provide consistency when analyzing a single company across time, or analyzing multiple companies across industries or national borders.

The default scenario that is produced by the HOLT valuation model establishes a warranted price that represents the expected mean value for a security based upon empirically derived fade algorithms that forecast a firm's future return on capital and growth rates over an extended period of time. As the third-party data are updated, the warranted price updates automatically. A company's future achieved return on capital or growth rate may differ from HOLT default forecast. Additional information about the HOLT methodology is available upon request.

CFROI, CFROE, HOLT, HOLT Lens, HOLTfolio, "Clarity is Confidence" and "Powered by HOLT" are trademarks or registered trademarks of Credit Suisse Group AG or its affiliates in the United States and other countries.

HOLT is a corporate performance and valuation advisory service of Credit Suisse.

© 2019 Credit Suisse Group AG and its subsidiaries and affiliates. All rights reserved.

**Global Market Commentary Disclaimer**

References to Credit Suisse include all of the subsidiaries and affiliates of Credit Suisse AG operating under its Global Markets division. For more information on our structure, please follow the attached link: <https://www.credit-suisse.com/us/en/about-us/our-company.html>.

This material has been prepared by individual traders or sales personnel of Credit Suisse identified in this material as “Authors” and not by Credit Suisse’s research department. The information contained in this document has been provided as general market commentary only and does not constitute any form of regulated financial advice, legal, tax or other regulated financial service. It is intended only to provide observations and views of these traders or sales personnel, which may be different from, or inconsistent with, the observations and views of Credit Suisse research department analysts, other Credit Suisse traders or sales personnel, or the proprietary positions of Credit Suisse. Observations and views expressed herein may be changed by the trader or sales personnel at any time without notice. Credit Suisse accepts no liability for losses arising from the use of this material.

This material does not purport to contain all of the information that an interested party may desire and, in fact, provides only a limited view of a particular market. It is not investment research, or a research recommendation for regulatory purposes, as it does not constitute substantive research or analysis. The information provided is not intended to provide a sufficient basis on which to make an investment decision and is not a personal recommendation or investment advice. While it has been obtained from or based upon sources believed by the trader or sales personnel to be reliable, each of the trader or sales personnel and Credit Suisse does not represent or warrant its accuracy or completeness and is not responsible for losses or damages arising from the use of this material.

This material is provided for informational purposes and does not constitute an invitation or offer to subscribe for or purchase any of the products or services mentioned. It is directed exclusively at Credit Suisse’s market professional and institutional investor clients (e.g. QIBs) as defined by the rules of the relevant regulatory authority, and must not be forwarded or shared with retail customers or the public. It is not intended for private customers and such persons should not rely on this material.

Moreover, any investment or service to which this material may relate will not be made available by Credit Suisse to such private customers.

This material may have previously been communicated to the Credit Suisse trading desk or other Credit Suisse clients. You should assume that the trading desk makes markets and/or currently maintains positions in any of the securities mentioned above.

Credit Suisse may, from time to time, participate or invest in transactions with issuers of securities that participate in the markets referred to herein, perform services for or solicit business from such issuers, and/or have a position or effect transactions in the securities or derivatives thereof. Information provided on any trades executed with Credit Suisse will not constitute an official confirmation of the trade details, and all preliminary trade report information is subject to our formal written confirmation.

**FOR IMPORTANT DISCLOSURES** on companies covered in Credit Suisse Global Markets Division research reports, please see [www.credit-suisse.com/researchdisclosures](http://www.credit-suisse.com/researchdisclosures). To obtain a copy of the most recent Credit Suisse research on any company mentioned please contact your sales representative or go to <http://www.credit-suisse.com/researchandanalytics>.

Past performance should not be taken as an indication or guarantee of future performance, and no representation or warranty, expressed or implied is made regarding future performance. Backtested, hypothetical or simulated performance results have inherent limitations. Simulated results are achieved by the retroactive application of a backtested model itself designed with the benefit of hindsight. The backtesting of performance differs from the actual account performance because the investment strategy may be adjusted at any time, for any reason and can continue to be changed until desired or better performance results are achieved. Alternative modeling techniques or assumptions might produce significantly different results and prove to be more appropriate. Past hypothetical backtest results are neither an indicator nor a guarantee of future returns. Actual results will vary from the analysis.

Investment principal on securities can be eroded depending on sale price or market price. In addition, there are securities on which investment principal may be eroded due to changes in redemption amounts. Care is required when investing in such instruments.

**HOLT Disclaimer**

The HOLT methodology does not assign ratings or a target price to a security. It is an analytical tool that involves use of a set of proprietary quantitative algorithms and warranted value calculations, collectively called the HOLT valuation model, that are consistently applied to all the companies included in its database. The HOLT valuation model is a discounted cash flow model. Third-party data (including consensus earnings estimates) are systematically translated into a number of default variables and incorporated into the algorithms available in the HOLT valuation model. The source financial statement, pricing, and earnings data provided by outside data vendors are subject to quality control and may also be adjusted to more closely measure the underlying economics of firm performance. These adjustments provide consistency when analyzing a single company across time, or analyzing multiple companies across industries or national borders.

The default scenario that is produced by the HOLT valuation model establishes a warranted price that represents the expected mean value for a security based upon empirically derived fade algorithms that forecast a firm’s future return on capital and growth rates over an extended period of time. As the third-party data are updated, the warranted price updates automatically. A company’s future achieved return on capital or growth rate may differ from HOLT default forecast. Additional information about the HOLT methodology is available upon request.

CFROI, CFROE, HOLT, HOLT Lens, HOLTfolio, “Clarity is Confidence” and “Powered by HOLT” are trademarks or registered trademarks of Credit Suisse Group AG or its affiliates in the United States and other countries.

HOLT is a corporate performance and valuation advisory service of Credit Suisse.

© 2019 Credit Suisse Group AG and its subsidiaries and affiliates. All rights reserved.

**European Market Abuse Regulation (Securities Traded on EU-Regulated Markets)**

The date and time published on the title page of this material (the “Published Date and Time”) are the date and time of completion of production of this material and the date and time of its first dissemination.

The European Market Abuse Regulation (596/2014) and associated rules (“MAR”) define “investment recommendations” as information recommending or suggesting an investment strategy, explicitly or implicitly, concerning one or several financial instruments or the issuers, including any opinion as to the present or future value or price of such instruments, intended for distribution channels or for the public. To the extent this material contains any “investment recommendation” as defined under MAR for a security traded on an EU-regulated market, the Published Date and Time are also the date and time of completion of production, and the date and time of first dissemination, of any such “investment recommendation” (unless otherwise expressly specified in this material).

This material is produced and distributed by Credit Suisse and its subsidiaries and affiliates. Such subsidiaries and affiliates may include: Credit Suisse International; Credit Suisse Securities (Europe) Limited; Credit Suisse Securities (USA) LLC; Credit Suisse Management (Australia) Pty; Credit Suisse Securities (Japan) Limited; Credit Suisse Securities (Europe) Limited, Seoul Branch; Credit Suisse AG, Singapore Branch; and/or Credit Suisse (Hong Kong) Limited.

Please follow the attached hyperlink for important further information regarding conflicts of interest, disclosures, and a history of our “investment recommendations” as defined by MAR: <https://rave.credit-suisse.com/disclosures/view/nr>

For region specific disclosures, including information about applicable registrations and certain regulatory disclosures, please follow the links below:

Americas: [https://www.credit-suisse.com/legal/en/ib/market\\_commentary.jsp](https://www.credit-suisse.com/legal/en/ib/market_commentary.jsp)

Europe: <https://www.credit-suisse.com/legal/en/ib/europe.jsp> (Credit Suisse Securities (Europe) Limited is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority in the United Kingdom)

Asia: [https://www.credit-suisse.com/legal/en/ib/market\\_commentary\\_disclaimer\\_asia.jsp](https://www.credit-suisse.com/legal/en/ib/market_commentary_disclaimer_asia.jsp)

General investors in Japan should open the following link and read it:

<https://www.credit-suisse.com/jp/ja/investment-banking-apac/disclaimer.html>



# Public Markets: Asset Class Reviews

J.T. Grier  
Managing Director



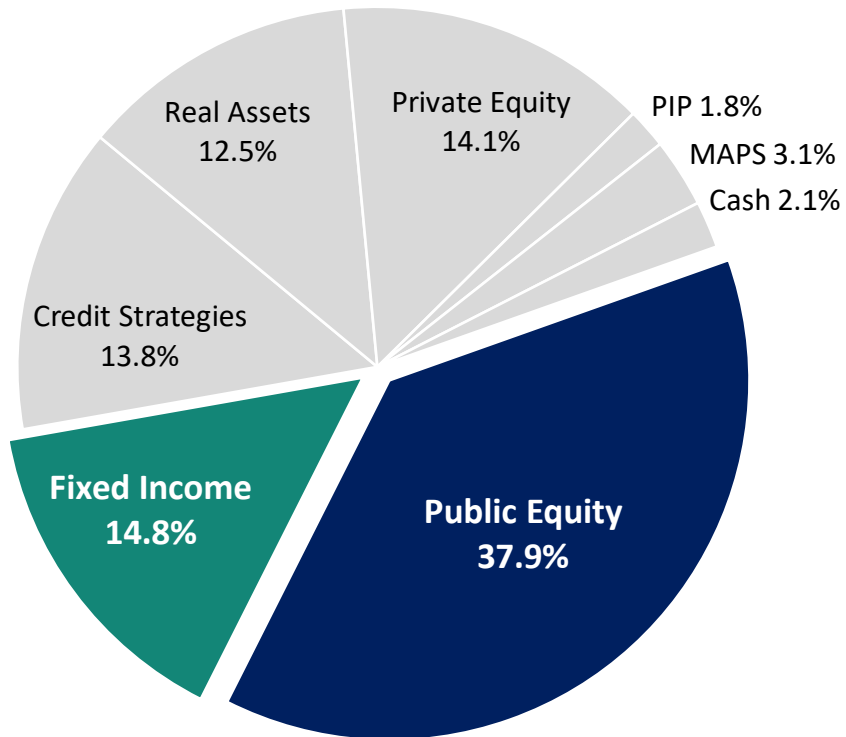
## Overview

(J.T. Grier, Managing Director)

## Program Reviews

- **Internal Equity Management**  
(Dan Schlussler, Program Director)
- **Public Equity**  
(Dan Whitlock, Program Director)
- **Fixed Income**  
(Parham Behrooz & Greg Oliff, Co-Directors)

# Overview: Public Market Assets



## Public Equity

- 23 Developed Mkts
- 27 Emerging Mkts

## Internal Equity Management

- ≈40% of Public Equity
- Invested in 50 Global Mkts

## Fixed Income

- U.S. Core Focus
- USD EMD
- High Yield

**Public Market Assets: 52.7%**

Market values as of 12/31/2020; source: BNY Mellon data

# Overview: Preview Of Agenda Items



# Internal Equity Management (IEM)

Dan Schlussler  
Program Director



# Overview: Factor Selection & Alpha Score

**Valuation**  
Discounted Cash Flow  
Relative Valuations



**Quality**  
Prudent Accounting  
Return on Equity



**Market Sentiment**  
Momentum  
Analysts' Revisions



**Composite  
Score**

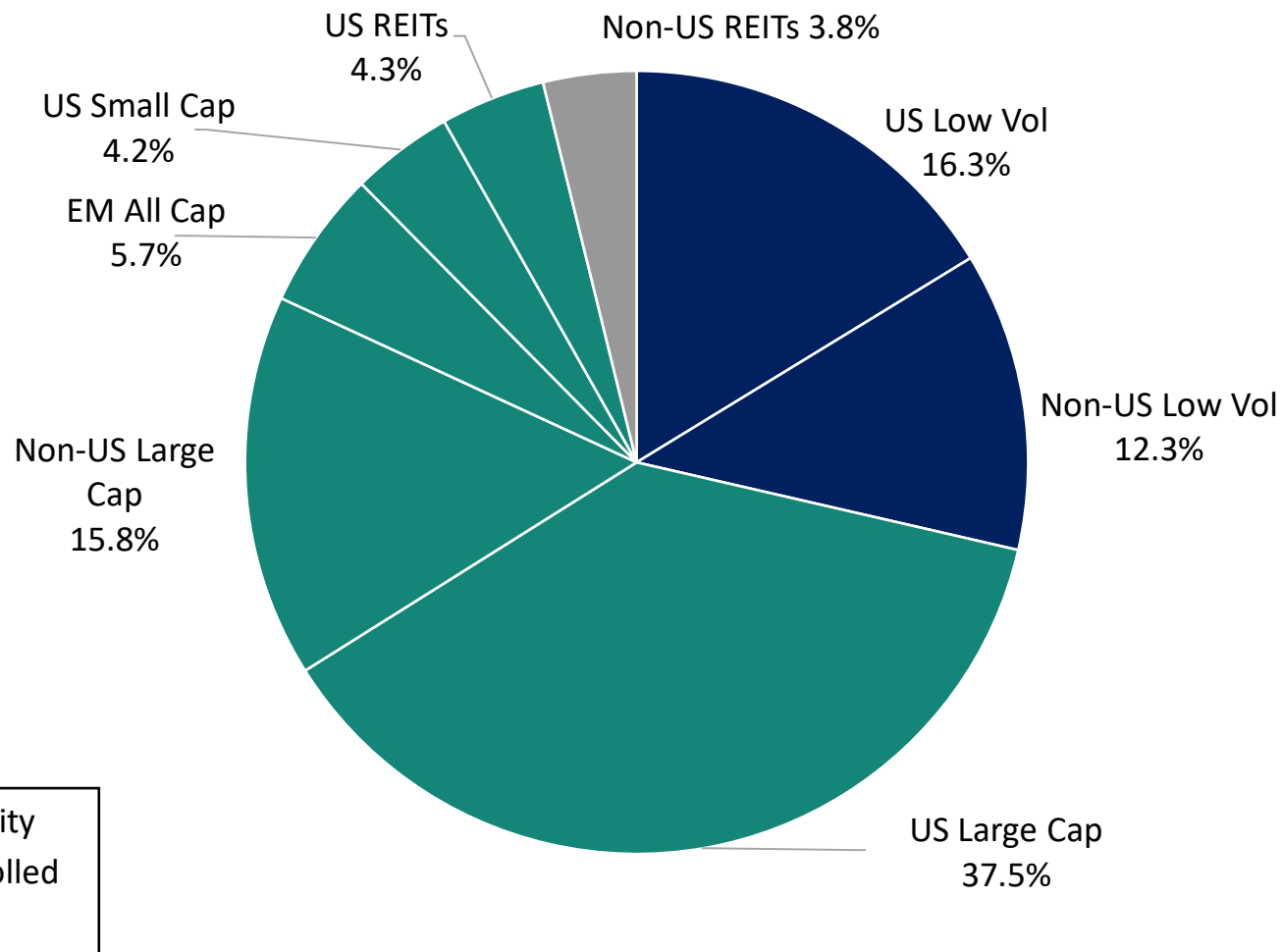
- DCF models provide robust estimates of intrinsic value
- RV models compare stocks within cohorts using accounting metrics
- Valuation models identify stocks trading at a discount or premium

- Cash based earnings are preferred to accrual-based earnings
- High & stable ROEs help to avoid value traps
- Quality captures accounting strength & management efficiency

- Stock price movements show persistence in the intermediate term
- Analysts revisions have a predictable impact on stock prices
- Market sentiment indicates potential investment opportunities

**Composite score identifies stocks that are trading at a discount, have superior management, & positive market recognition**

# Overview: Asset Allocation



# Program Performance Summary

## As of 2/28/21

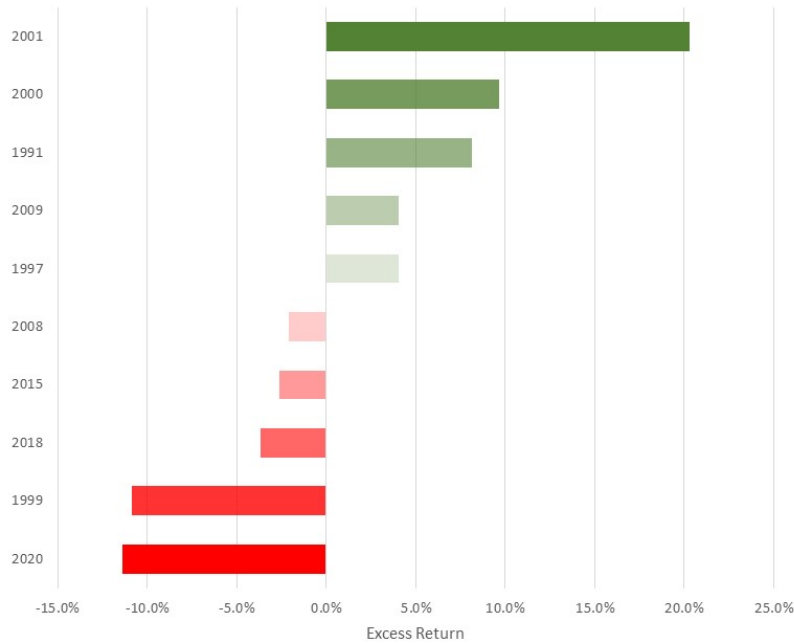


	IEM Active				IEM Low Volatility				IEM Enhanced Index			
	1 Yr	3 Yr	5 Yr	Incep	1 Yr	3 Yr	5 Yr	Incep	1 Yr	3 Yr	5 Yr	Incep
Total Active Internal Equity	22.27	8.70	12.55	7.64	11.36	5.57	9.42	11.99	27.38	10.06	13.76	7.31
IEM Benchmark	25.43	10.91	13.76	7.21	16.31	9.16	11.53	10.25	29.59	11.71	14.62	7.18
<i>Excess Returns</i>	-3.16	-2.21	-1.21	0.44	-4.96	-3.59	-2.11	1.75	-2.21	-1.66	-0.86	0.13
<i>Realized Tracking Error</i>	1.16	0.89	0.89	1.03	1.55	1.55	1.61	2.80	1.11	0.82	0.78	0.78
<i>Realized Information Ratio</i>	-2.74	-2.48	-1.37	0.42	-3.19	-2.32	-1.31	0.62	-1.99	-2.02	-1.11	0.16

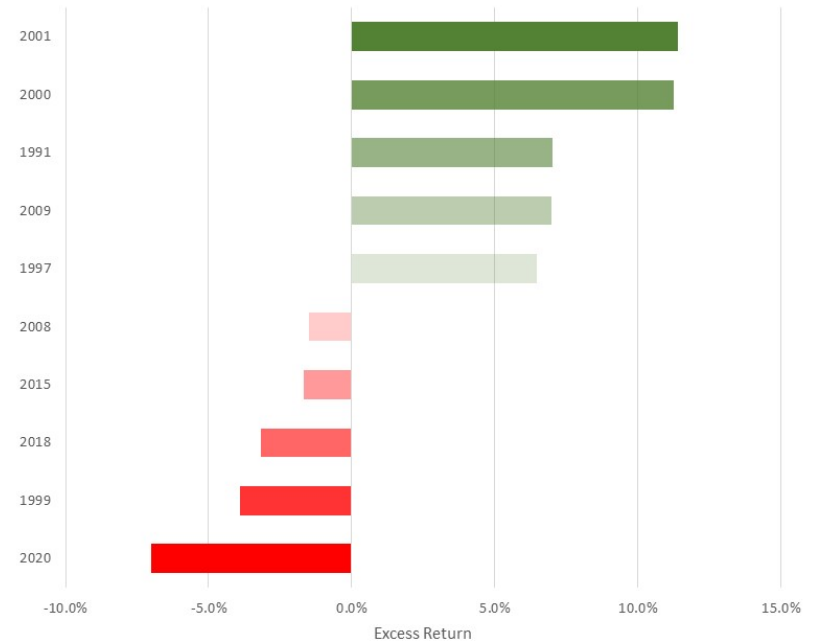


# Markets: Headwinds for Value

**Value Excess Annual Returns (US)**  
Top & Bottom 5 Years: 1990 - 2020



**Value Excess Annual Returns (Global)**  
Top & Bottom 5 Years: 1990 - 2020



Source: Credit Suisse HOLT, Virginia Retirement System Research

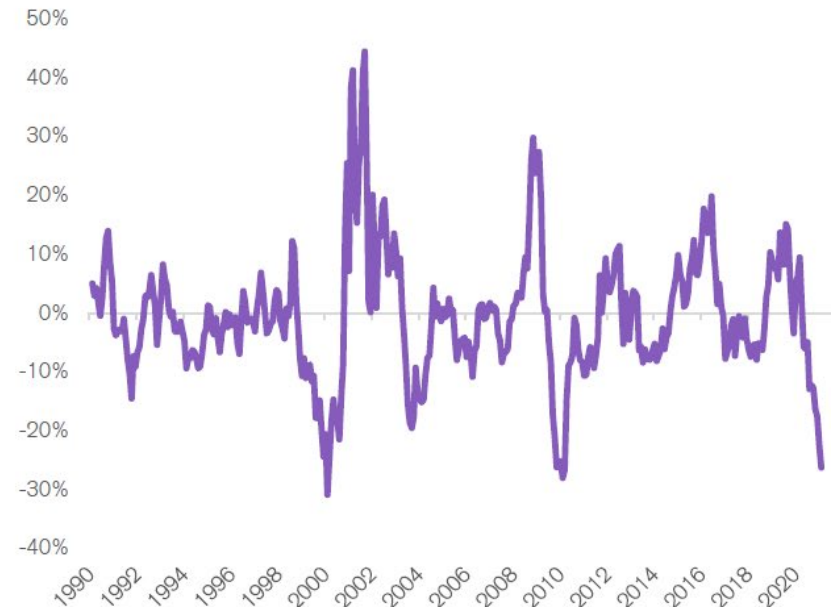
# Markets: Quality & Low Risk Have Suffered



Rolling 1-Year Return of Q1 Quality vs Market  
Top 1000 US Companies by mkt cap

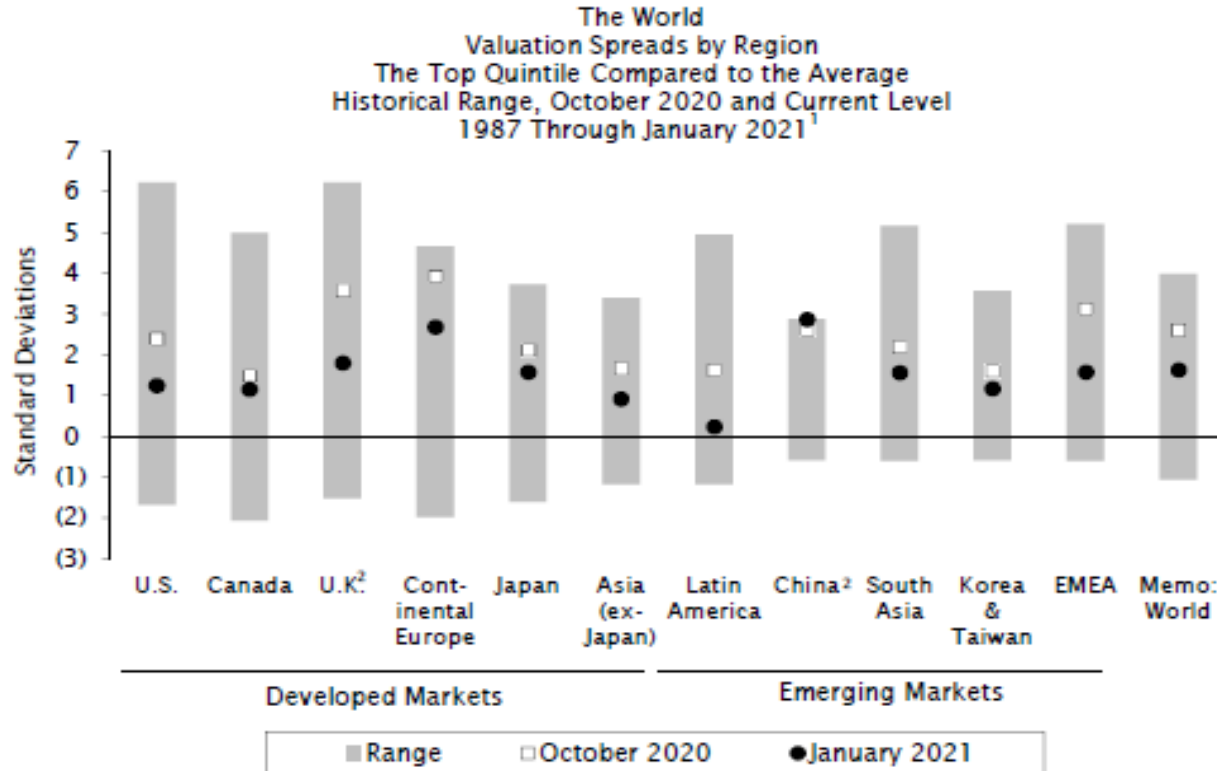


Rolling 1-Year Return of Q1 (Low) Risk vs Market  
Top 1000 US Companies by mkt cap



Source: Credit Suisse HOLT, Bloomberg, Data Date: 2/28/2021

# Markets: Valuation Spreads Remaining Elevated



Source: Empirical Research Partners Analysis.

<sup>1</sup> U.S. data since 1926. Japan and emerging markets regional data since 1997.

<sup>2</sup> U.K. data based on the largest 350 companies. China is H-shares only.

# Strategies As of 2/28/2021



	Inception Date	Mkt Value (\$MM)	1-Year Return	1-Year Excess	Since Inc. Excess	Since Inc. Tracking
<b>Risk Controlled Strategies</b>		<b>10,413</b>	<b>27.38</b>	<b>-2.21</b>	<b>0.13</b>	<b>0.78</b>
U.S. Large Cap (Potomac)	Apr-01	5,739	33.33	-0.75	0.21	0.95
Non-U.S. Large (Matoaka)	Sep-10	2,409	18.56	-4.11	-0.20	1.09
EM Large Cap (Tuckahoe)	Sep-15	888	31.35	-5.70	-1.24	1.60
U.S. Small Cap (Afton)	Jun-05	700	41.57	-6.32	-0.09	1.83
U.S. REIT (Monroe)	Dec-05	678	2.45	0.23	1.08	1.14
<b>Less Constrained (Low Vol) Strategies</b>		<b>4,233</b>	<b>11.36</b>	<b>-4.96</b>	<b>1.75</b>	<b>2.80</b>
U.S. Large Cap (Mobjack)	Jun-10	2,401	13.44	-5.11	1.70	3.25
Non-U.S. Large (Piedmont)	Dec-12	1,832	8.89	-4.62	0.62	2.54
<b>Passive Strategies</b>		<b>578</b>	<b>19.00</b>	<b>0.33</b>	<b>0.11</b>	<b>0.18</b>
Non-U.S. Developed REIT	Jul-20	578	n.a.	n.a.	-0.50	0.13
<b>Other Mandates</b>						
Rebalancing & Liquidity Mgmt	Jul-07	104	n.a.	n.a.	n.a.	n.a.
Currency Hedging	Apr-09	2,989	n.a.	n.a.	n.a.	n.a.

# Overview: Team Members



Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
Dan Schlussler	Program Director, Non-U.S. Dev Low Vol	MBA	CFA	25	8
Joe Kennebeck	Head Trader	BA		28	14
Ryan Carlson	U.S. REIT	BS	CFA	18	1
Aaron Lazar	Rebalance, Currency Hedge	MA	Passed CFA Level 1	7	7
Vu Le	U.S. Small Cap	PhD	CFA	10	9
Alex Muniz	U.S. Low Volatility	MA	CFA	20	20
Garret Rhodes	Non-U.S. REIT Passive, Currency Hedge	MS	Passed CFA Level 3	2	2
Larry Tentor	Non-U.S. Large Cap	PhD	FRM	19	13
Weldon Wirick	Emerging Markets, Currency Hedge	MA	CFA	19	15
Matthew Lacy	U.S. Large Cap	MA	CFA	22	22
Additional Resources	Investment Operations Department Portfolio Solutions Group Investment Decision Support				

# Looking Forward: Focus on Process and Projects

- 
- Difficult Year Of Performance
  - We Maintain Conviction In Our Strategies
  - Continue To Enhance The Overall Investment Process
  - Continue Research On Global Long And Long/Short Strategies
  - Major Project To Enhance Our Research Infrastructure

# Public Equity

Dan Whitlock  
Program Director



# Overview: Team Members



Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
Dan Whitlock	Director	MBA	CFA, CAIA	19	19
Stephen Adelaar	Portfolio Manager	MS	CFA	21	14
Holly Glass	Portfolio Manager	MA	CFA	20	20
Olga Zozulya	Investment Officer	BS	CFA	8	8
Korey Turner	Investment Analyst	BA		1	1
Kelly Baker	Portfolio Assistant	AAS		11	6
Additional Resources	The entire Internal Equity Team, Portfolio Solutions Group, Management Committee, Operations Team, Compliance Team, and Legal/Regulatory Team.				



# Markets: Unusual Times

**Goldman Sachs** Record concentration of market cap in 5 largest stocks  
5 stocks account for 22% of S&P 500 equity cap: AAPL, MSFT, AMZN, GOOGL, FB



Source: Compustat, Goldman Sachs Global Investment Research. As of January 4, 2021.

Global Investment Research 23

## U.S. GROWTH PRICE/SALES

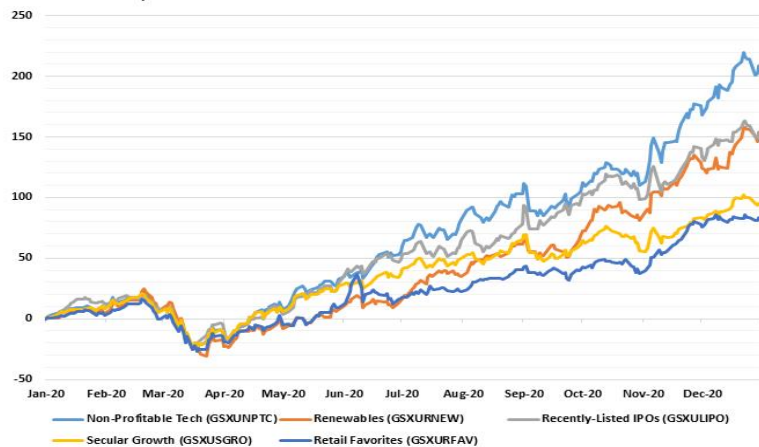


As of 1/31/21 | Sources: GMO, Worldscope, Compustat, MSCI  
Note: Valuation ratios calculated using a weighted median

\*Regulatory information not for distribution. For informational use only. Copyright © 2021 by GMO LLC. All rights reserved.

GMO | 1

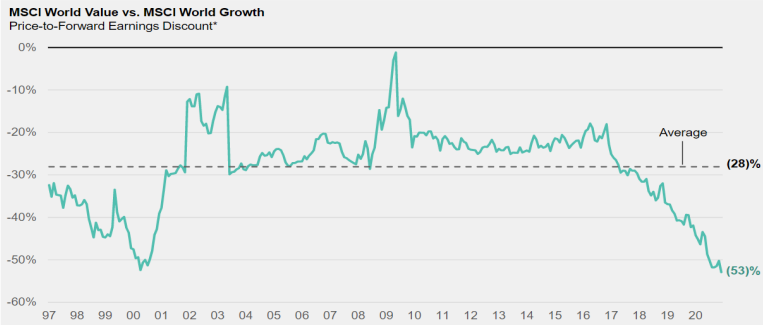
### Performance of top 5 GS Custom Baskets of 2020:



Source: AQR. For illustrative purposes only. Hypothetical data has inherent limitations, some of which are described in the disclosures. See detailed explanation in the body of this article, and additional disclosures at the end of this article. This hypothetical performance does not reflect the deduction of any management fees, which as mentioned, would further reduce the actual return. It should not be assumed that the inversion of these charts is illustrative of actual portfolio performance.

# Markets: Opportunity In Value

## ...Leaving Value Priced at a Near-Record Discount to Growth Stocks



Past performance and current analysis do not guarantee future results.  
 \*Price-to-forward earnings (next 12-months) since January 1997.  
 As of December 31, 2020.  
 Source: FactSet, MSCI, IBES and AB

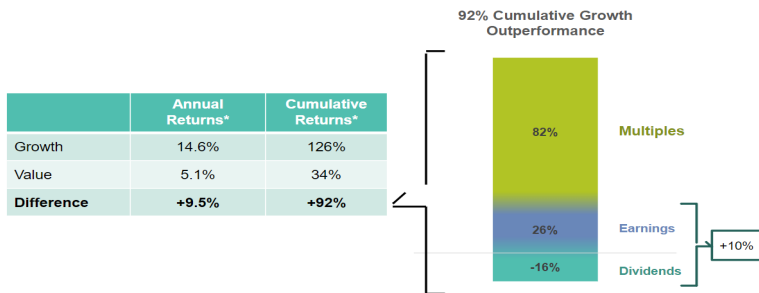
**AB** For investment professional use only.  
 Not for inspection by, distribution or quotation to, the general public.

Value Investing | 3



Source: AQR. For illustrative purposes only.

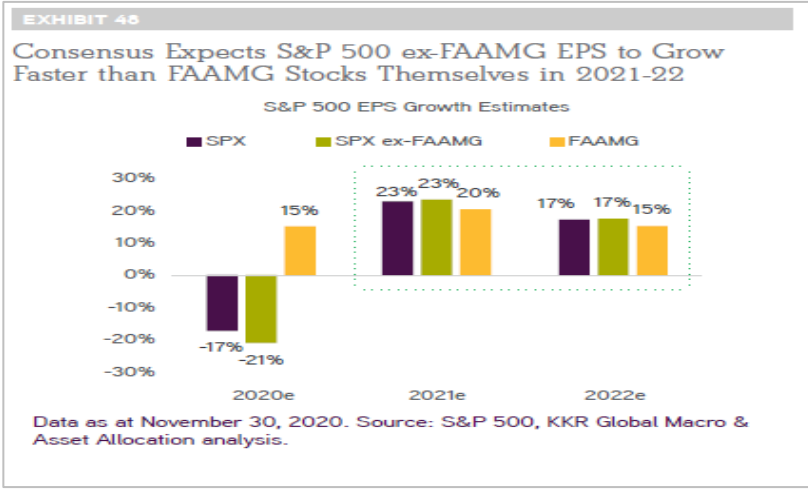
## Growth Outperformance Dominated by Multiple Expansion



Past performance and current analysis do not guarantee future results.  
 \*Based on the MSCI World Value index and MSCI World Growth index returns from January 2015 to December 2020. All index returns shown in US dollars terms. Numbers may not sum due to rounding.  
 As of December 31, 2020. Source: FactSet, MSCI, Compustat, WorldScope and AB

**AB** For investment professional use only.  
 Not for inspection by, distribution or quotation to, the general public.

Value Investing | 6



Data as at November 30, 2020. Source: S&P 500, KKR Global Macro & Asset Allocation analysis.

# Exposures: Portfolio Positioning as of 12/31/20

**\$35.6 Billion**  
**38.6% of Plan Assets**

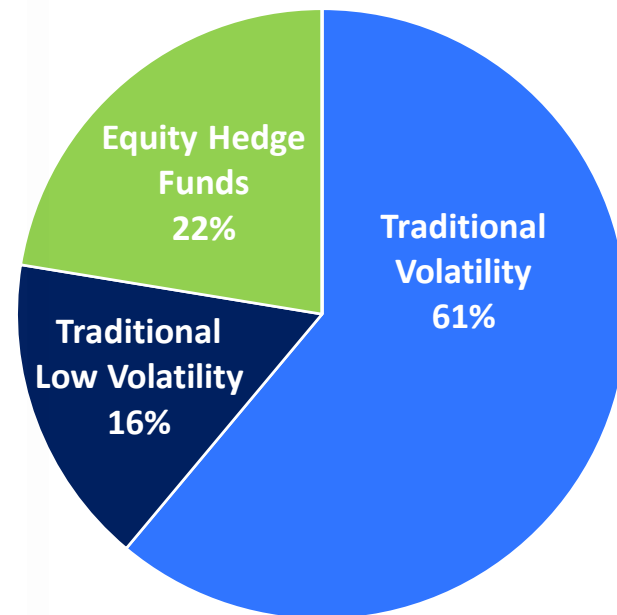
- 55% Traditional Domestic (-1.4% vs. bmk)
- 31% Traditional Non-US Developed (+0.6% vs. bmk)
- 14% Traditional Emerging Markets (+0.7% vs. bmk)

100% Active  
0% Passive

39% Internal  
61% External

61% Traditional Volatility  
16% Traditional Low Volatility  
22% Equity Hedge Funds  
0% Passive

21.66% Forecasted Portfolio Risk (Barra)  
22.09% Forecasted Beta-1 Benchmark Risk (Barra)  
1.29% Forecasted Active Risk (Barra)



27 External Mandates (14 Traditional & 13 HFs)  
21 External Managers (9 Traditional & 12 HFs)

# Results: As of 12/31/20



	10 Year	5 Year	3 Year	1 Year
<b>Total Public Equity</b>	<b>9.19</b>	<b>10.50</b>	<b>8.25</b>	<b>13.36</b>
Strategic Benchmark	9.33	11.64	10.21	17.01
Excess Return	-0.14	-1.14	-1.95	-3.65
Beta vs. Strategic Benchmark*	0.98	0.97	0.97	
Beta vs. Respective Beta 1 Market Cap Benchmarks*	0.92	0.93	0.94	
Active Risk vs. Strategic Benchmark**	1.01	1.08	1.28	
Information Ratio vs. Strategic Benchmark***	-0.14	-1.05	-1.53	

\*Measure of volatility, or systematic risk, of a portfolio in comparison to a benchmark

\*\*Otherwise known as tracking error, this is the standard deviation of returns relative to a benchmark

\*\*\* $(\text{Portfolio Returns} - \text{Benchmark Returns}) / \text{Active Risk}$

**VRS Public Equity has outperformed in seven of the last ten calendar years, underperforming in only 2018 - 2020**

# Results: CY 2020 Attribution Deeper Dive



## 2020 Performance Factor Attribution

Note: Attribution an estimate and does not contain fees, intra-month trading, t-costs, etc.; some categories that are not material were left off.

### Factor Impacts:

- U.S. Value detracted -66 bps
- U.S. Size detracted -44 bps
- U.S. underweight detracted -32 bps
- Lower volatility detracted -23 bps

**Top 3 Stock Detractors: -2.6%**

**Top 3 Stock Contributors: +1.3%**

Attribution	Value (%)
Portfolio Base Return	14.6
Benchmark Base Return	17.1
Active Base Return	-2.6
Currency	0.3
Active Local Excess Return	-2.8
Market Timing	-0.2
Active Local Residual Return	-2.6
Allocation	0.8
Selection	-3.4
Industry	-0.6
Style	-1.9
Stock Specific Return	-0.8

# Results: 2021 Update: Rebounding Amid Stabilization



## 2020/2021 Performance Factor Attribution\*

### Factor Impacts:

- Detractors of U.S. Value and Size in 2020 are largest contributors in 2021

### Stock Contributors:

- Largest stock-specific detractors in 2020 are the largest contributors in 2021

### Actual Performance (2021 CYD)

- 3.5% vs. 2.5%
- March was also strong

Attribution	2020	2021 (through Feb)
Portfolio Base Return	14.6	3.7
Benchmark Base Return	17.1	2.6
Active Base Return	-2.6	1.1
Currency	0.3	0.0
Active Local Excess Return	-2.8	1.1
Market Timing	-0.2	-0.1
Active Local Residual Return	-2.6	1.2
Allocation	0.8	-0.1
Selection	-3.4	1.3
Industry	-0.6	0.2
Style	-1.9	0.6
Stock Specific Return	-0.8	0.6

\*Attribution is an estimate and does not contain fees, intra-month trading, t-costs, etc.; some categories that are not material were left off.

# Managers: Hires & Terminations – 1 Year



Action	Effective Date	Commitment/ Current Value	Funding/ Defunding Period	Description
Hired	1/1/2020	\$200 Million	Immediate	<b>Advent Global Balanced Convertibles</b> A global convertibles strategy <sup>1, 2</sup>
Terminated	7/1/2020	\$300 Million	Immediate	<b>Highline Capital Partners</b> A long/short equity hedge fund
Terminated	9/30/2020	\$150 Million	Immediate	<b>New Mountain Vantage</b> A long/short equity hedge fund
Hired	1/4/2021	\$400 Million	2 Years	<b>Coatue</b> A long/short equity hedge fund

<sup>1</sup>Minority Owned Business

<sup>2</sup>Manager was previously in the Credit Strategies Program

# Fixed Income

Parham Behrooz & Greg Oliff  
Co-Directors



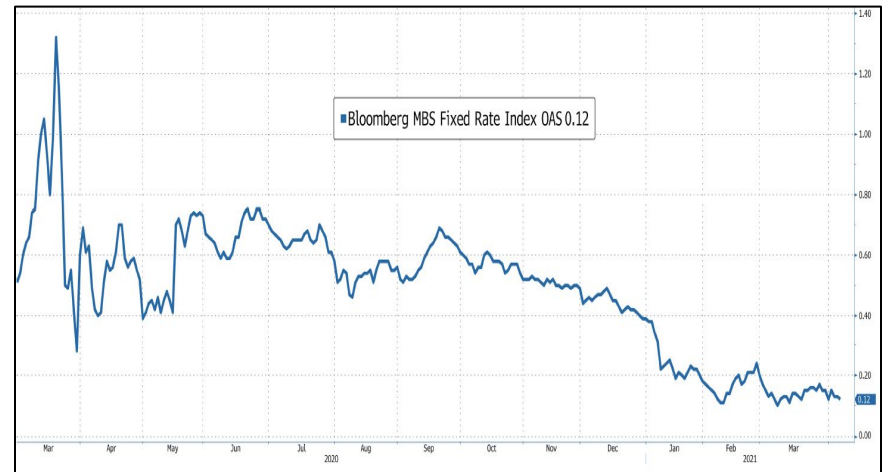
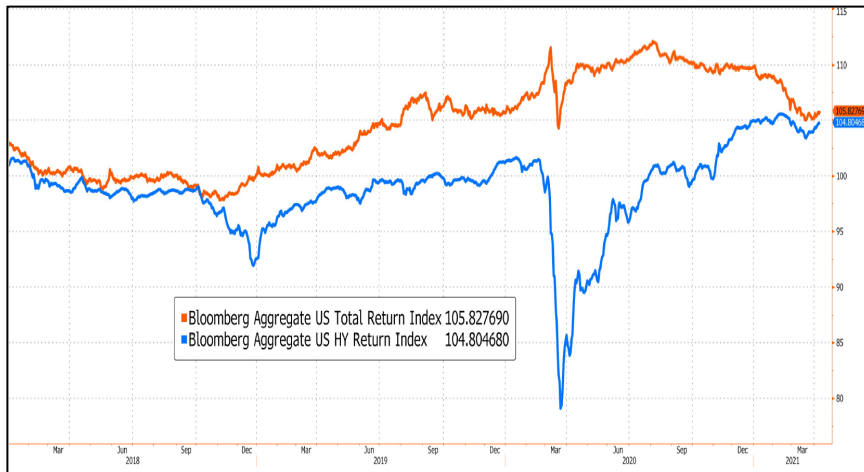
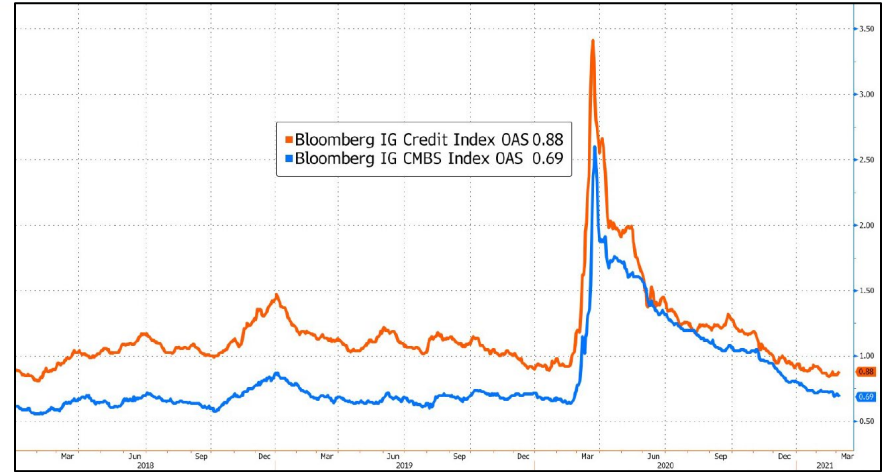
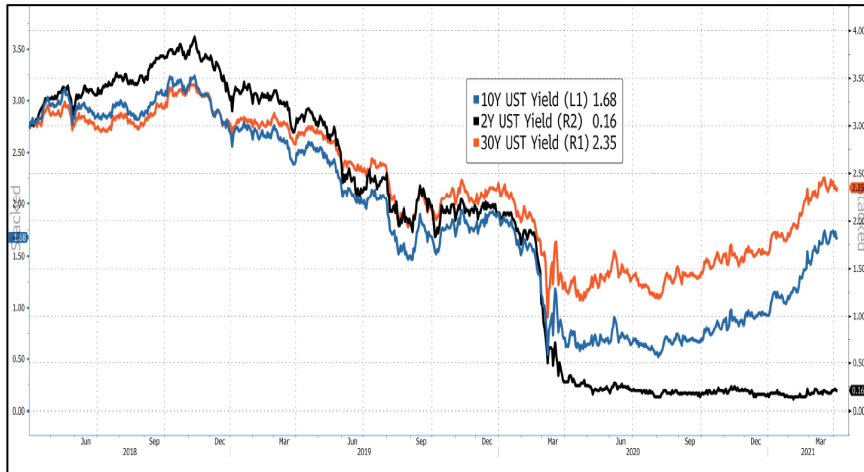


# Overview: Team Members

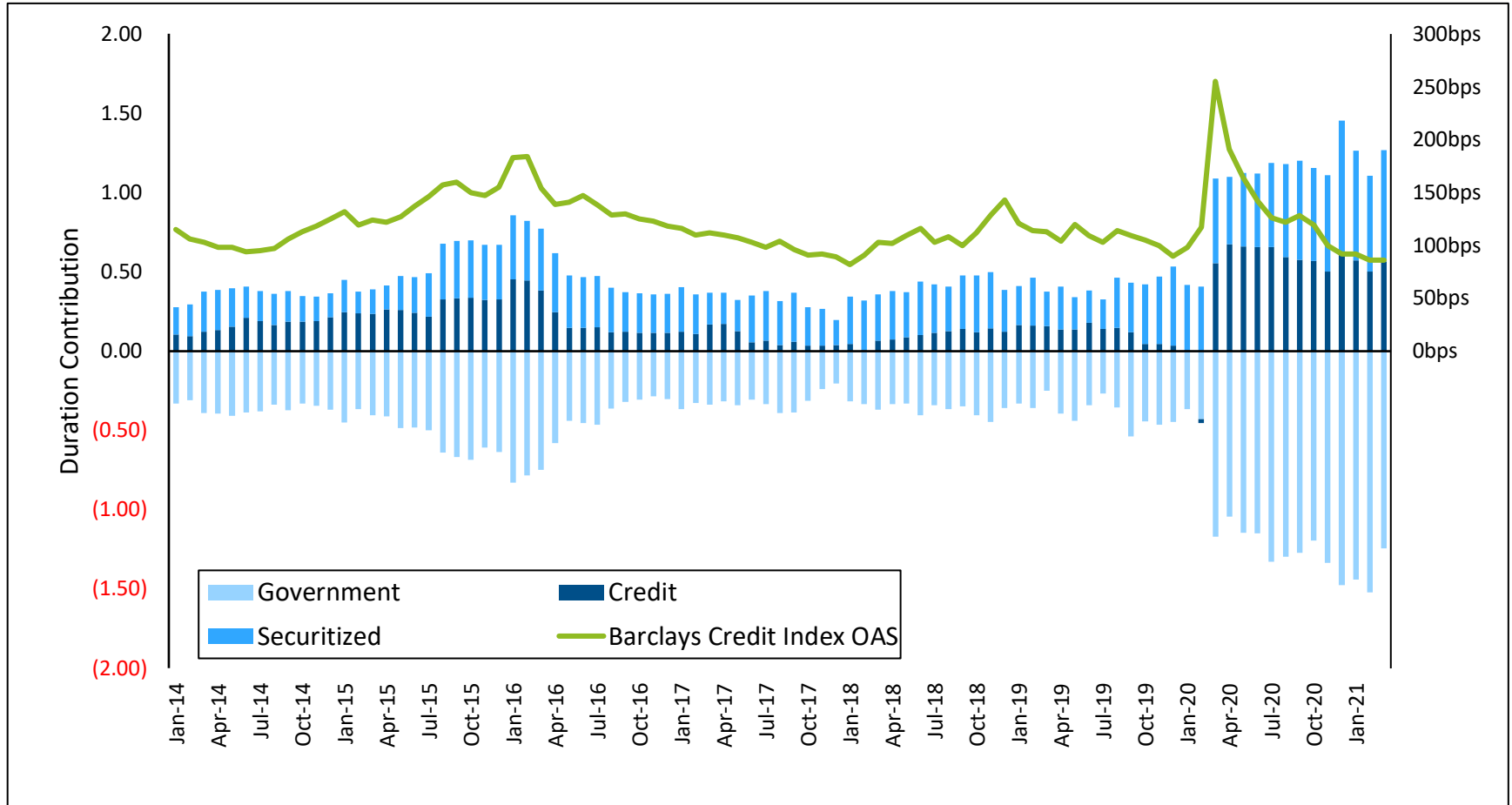


Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
Parham Behrooz	Co-Director	BS	CFA	24	8
Greg Oliff	Co-Director	MBA	CFA	13	10
Mehtab Haleem	Sr. Investment Officer	MS		12	<1
Teresa Nguyen	Sr. Investment Officer	BA	CFA	19	4
Edward Norfleet	Sr. Investment Officer	MBA	CFA	10	7
Nick Toporkov	Investment Officer	PhD		2	2
Delaney Brown	Sr. Investment Analyst	BS	CFA	4	1
Michael Desai	Sr. Investment Analyst	MS		4	<1
Additional Resources	Investment Operations Department & Portfolio Intelligence Team				

# Markets: Data: Jan 2018 - Mar 2021



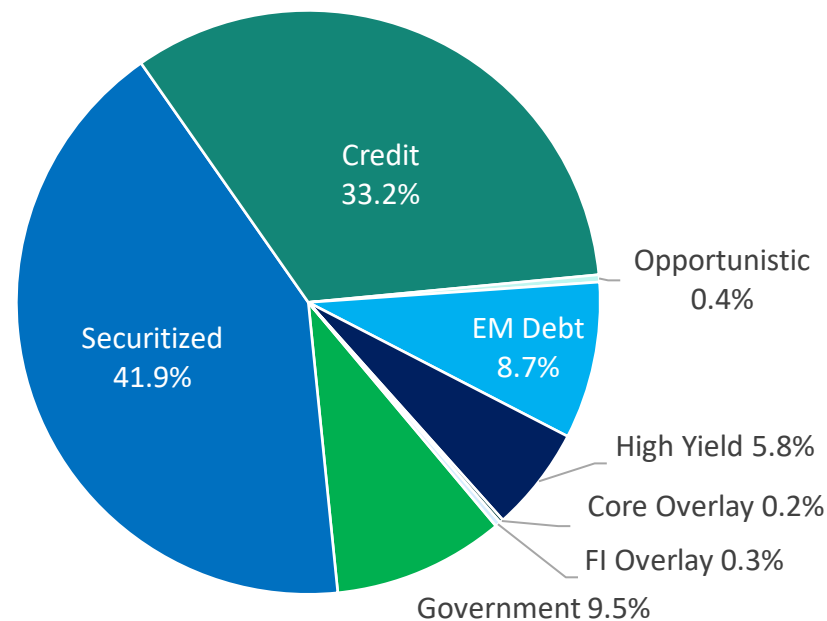
# Markets: History of Core Sector Tilts



Source: Aladdin, Bloomberg

# Exposures: Fixed Income Snapshot as of 03/31/2021

VRS Internal Fixed Income Portfolios		
Strategy	Market Value (\$MM)	Market Value (%)
Government	1,078.1	9.5
Securitized	4,761.2	41.9
Credit	3,770.1	33.2
Opportunistic	48.7	0.4
EM Debt	986.9	8.7
High Yield	664.1	5.7
Core Overlay	19.0	0.2
FI Overlay	33.4	0.3
<b>Total</b>	<b>11,361.5</b>	<b>100.0</b>



## Highlights From Past Year

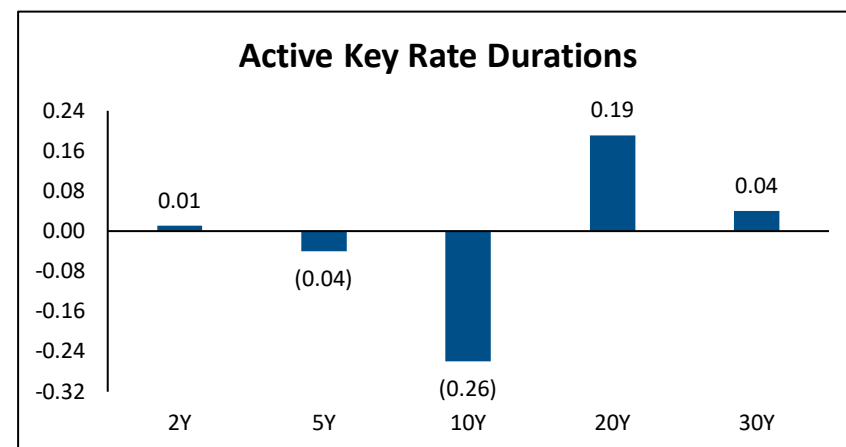
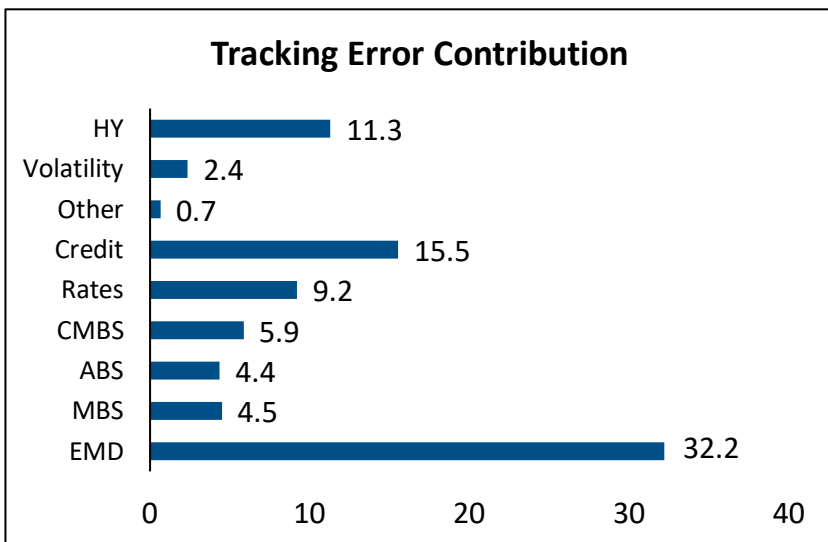
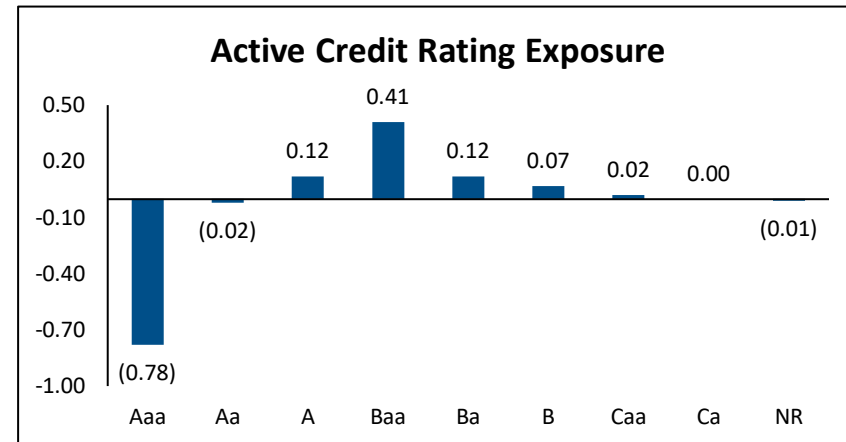
- Capitalized on opportunities from March COVID related market dislocation
- Robust processes and market knowledge helped team realize strong outperformance
- Furthered long-term plan of deeper sector specialization coupled with cross training
- Onboarded two new team members virtually

# Exposures: Portfolio Characteristics as of 3/31/2021



**Total Fixed Income Program Market Value: \$11,361,535,320**

Portfolio Characteristics			
	Port	Bench	Diff
Effective Duration	6.37	6.44	(0.07)
Yield to Maturity	2.47	1.88	0.60
Option Adj. Spread	99	53	46



# Results: Risk/Return Characteristics as of 2/28/2021



## Program Excess Return and Statistics

	Since July 2012*	5 Year	3 Year	1 Year
<b>Core FI Program</b>	<b>0.41</b>	<b>1.12</b>	<b>1.29</b>	<b>3.00</b>
Tracking Error	0.42	0.51	0.63	0.90
Information Ratio	0.98	2.19	2.05	3.34
<b>Total FI Program</b>	<b>0.55</b>	<b>1.21</b>	<b>1.34</b>	<b>3.22</b>
Tracking Error	0.95	0.56	0.68	0.96
Information Ratio	0.58	2.17	1.98	3.36

## Batting Average

### Monthly Excess Returns\*

Core FI Program	79/104	76%
-----------------	--------	-----

\*Beginning July 2012, FI transitioned all assets internally and implemented our enhanced investment approach.

# Results: Portfolio as of 2/28/2021



## Portfolio Excess Return and Statistics

	Since July 2012*	5 Year	3 Year	1 Year
<b>Government</b>	<b>0.31</b>	<b>0.37</b>	<b>0.35</b>	<b>0.56</b>
Tracking Error	0.16	0.18	0.23	0.38
Information Ratio	1.96	2.04	1.55	1.48
<b>Securitized</b>	<b>0.60</b>	<b>0.72</b>	<b>0.83</b>	<b>2.11</b>
Tracking Error	0.47	0.54	0.69	1.09
Information Ratio	1.28	1.33	1.20	1.94
<b>Credit</b>	<b>0.72</b>	<b>1.08</b>	<b>1.01</b>	<b>1.63</b>
Tracking Error	0.35	0.29	0.28	0.31
Information Ratio	2.08	3.72	3.59	5.28
<b>Opportunistic*</b>	<b>–</b>	<b>0.97</b>	<b>1.02</b>	<b>2.11</b>
Tracking Error	–	0.79	0.95	1.10
Information Ratio	–	1.24	1.07	1.91

\*Beginning July 2012, FI transitioned all assets internally and implemented our enhanced investment approach.

# Results: Portfolio as of 2/28/2021



Portfolio Excess Return and Statistics				
	Since Inception*	1 Year	Fiscal YTD	3 Months
<b>Internal EMD</b>	<b>0.33</b>	<b>0.41</b>	<b>0.85</b>	<b>0.20</b>
Tracking Error	0.74	0.75	–	–
Information Ratio	0.44	0.55	–	–
<b>Payden &amp; Rygel EMD</b>	<b>1.97</b>	<b>2.70</b>	<b>2.93</b>	<b>1.32</b>
<b>PIMCO EMD</b>	<b>1.38</b>	<b>1.40</b>	<b>2.40</b>	<b>0.88</b>
<b>Internal High Yield</b>	<b>(0.52)</b>	<b>(1.78)</b>	<b>(0.15)</b>	<b>(0.12)</b>
<b>AQR High Yield</b>	<b>(4.87)</b>	<b>(4.20)</b>	<b>(0.21)</b>	<b>(0.64)</b>
<b>Man Numeric High Yield</b>	<b>1.41</b>	<b>–</b>	<b>1.41</b>	<b>0.52</b>

\*Inception dates: Internal EMD Portfolio 11/2018, Internal HY Portfolio 7/2019, External EMD & AQR HY Portfolios 1/2020, Man Numeric HY 7/2020



# Portfolio Solutions Group: Function Review Chung Ma Managing Director



# Overview: Team Members Portfolio Solutions Group



Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
<b>Chung Ma</b>	<b>Managing Director</b>	<b>MA</b>	<b>CFA</b>	<b>25</b>	<b>7</b>
<b>Matt Lacy</b>	<b>Program Director, Port. Integration</b>	<b>MA</b>	<b>CFA</b>	<b>22</b>	<b>22</b>
<b>Kristina Koutrakos</b>	<b>Director, Portfolio Strategy</b>	<b>MBA</b>	<b>CAIA</b>	<b>22</b>	<b>5</b>
Katie Grawe	Sr. Investment Officer	MBA		22	3
<b>Steven Peterson</b>	<b>Program Director, Research</b>	<b>PhD</b>		<b>40</b>	<b>13</b>
Dane Honrado	Research Director, IDS	MS/MBA	FRM	18	5
Advait Apte	Investment Officer	PhD	CFA	3	4
Lisa Davis	Decisions Systems Analyst II	BS	PMP, CSM	5	5
Quynh Phuong	Decision Systems Principal	BS		2	1
Andrew Simpson	Decisions Systems Analyst II	BA		5	5
Jeff Halun	Decision Data Analyst	MBA		2	2
<b>Ross Kasarda</b>	<b>Director, Risk Management</b>	<b>MA</b>	<b>CFA</b>	<b>16</b>	<b>16</b>
Moses Maxfield	Investment Officer	MBA	CFA, CAIA	15	15
Greg Hines	Investment Officer	MA	CFA	10	7

# Risk Team Overview

Ross Kasarda

Director, Risk Management

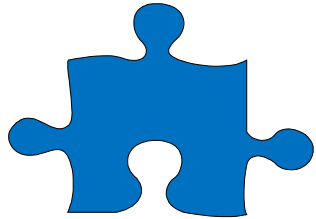




# Team Members

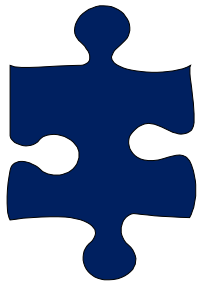
Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
<b>Ross Kasarda</b>	<b>Director</b>	<b>MA</b>	<b>CFA</b>	<b>16</b>	<b>16</b>
Moses Maxfield	Investment Officer	MBA	CFA, CAIA	15	15
Greg Hines	Investment Officer	MA	CFA	10	7

Other Resources
Director of Portfolio Integration
Executive Committee
Investment Operations Department
Investment Advisory Committee
Portfolio Assistant



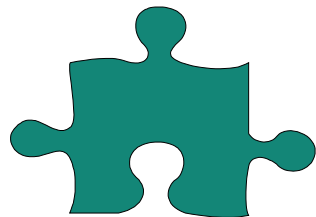
## Total Plan Risk Monitoring System

BarraOne position level reporting and tools



## Market Intelligence and Collaboration

Work with teams to help supplement their programs

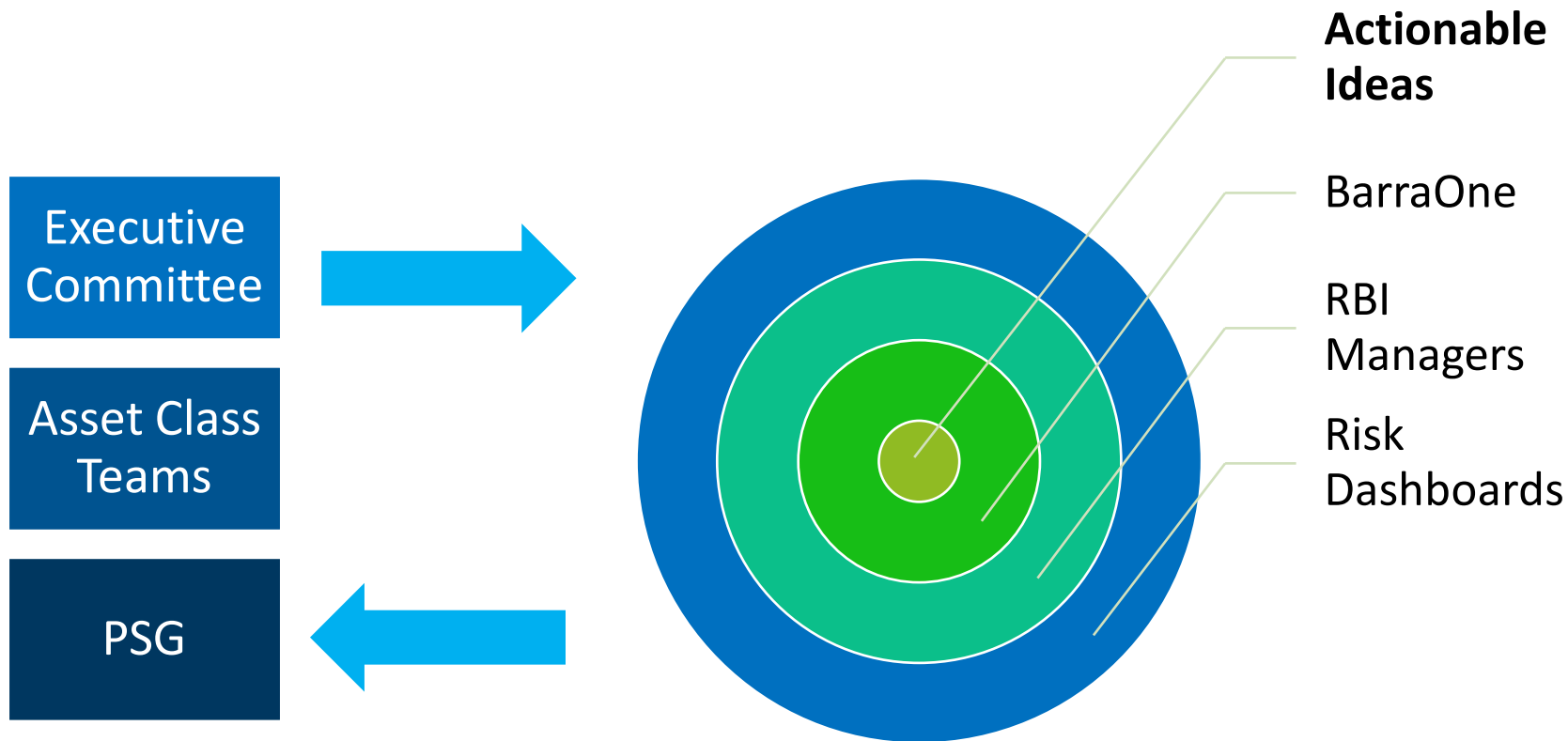


## Leverage RBI Relationships to Improve Plan

Identify and evaluate hedging and opportunistic ideas

**Serve as a Resource for the Plan**

# Risk Team Synergies



# Example: High Yield Options Monitor

Date (T+1) 3/5/2021 CurrentYield<sup>5</sup>

Day of ExpD.	StrikeBktPct / StrikeBkt / ImpliedYieldBkt									
	80	85	90	95	100	105	110	115	120	
	69.30	73.63	77.96	82.29	86.62	90.95	95.28	99.61	103.94	
	6.25	5.88	5.56	5.26	5.00	4.76	4.55	4.35	4.17	
04/16/21	40.37 0.17%	28.37 0.08%	22.82 0.15%	16.58 0.27%	10.20 0.68%	6.31 0.19%	13.95 0.10%	20.06 0.09%	23.58 0.07%	
05/21/21	31.37 0.13%	24.24 0.23%	19.85 0.34%	14.60 0.59%	9.30 1.17%	6.29 0.23%	11.14 0.12%	16.72 0.15%	19.41 0.10%	
06/18/21	26.87 0.25%	22.26 0.37%	18.72 0.51%	14.22 0.86%	9.65 1.77%	6.35 0.35%	8.65 0.07%	14.91 0.18%	18.24 0.19%	
09/17/21	22.80 0.60%	19.10 0.80%	16.19 1.17%	12.79 1.87%	9.19 2.95%	6.62 0.52%	8.36 0.16%	13.66 0.33%	13.75 0.18%	
01/21/22	20.59 1.19%	17.72 1.56%	15.01 2.16%	12.36 3.11%	9.48 4.78%	7.31 0.83%	8.39 0.27%	11.38 0.30%	11.94 0.22%	
06/17/22	20.71 1.86%	17.49 2.35%	13.55 3.23%	11.49 4.88%	9.69 6.72%	8.41 1.17%	9.75 0.51%	11.91 0.58%	13.44 0.58%	
01/20/23	17.87 2.57%	13.76 3.29%	12.74 4.67%	10.93 6.56%	9.54 9.45%	7.98 1.24%	8.81 0.60%	10.97 0.58%	12.00 0.58%	

More Detail

Currently Highlighted: All% Strike Bucket - January 21, 2022 Expiry

Historical Implied Volatility



Historical Open Interest





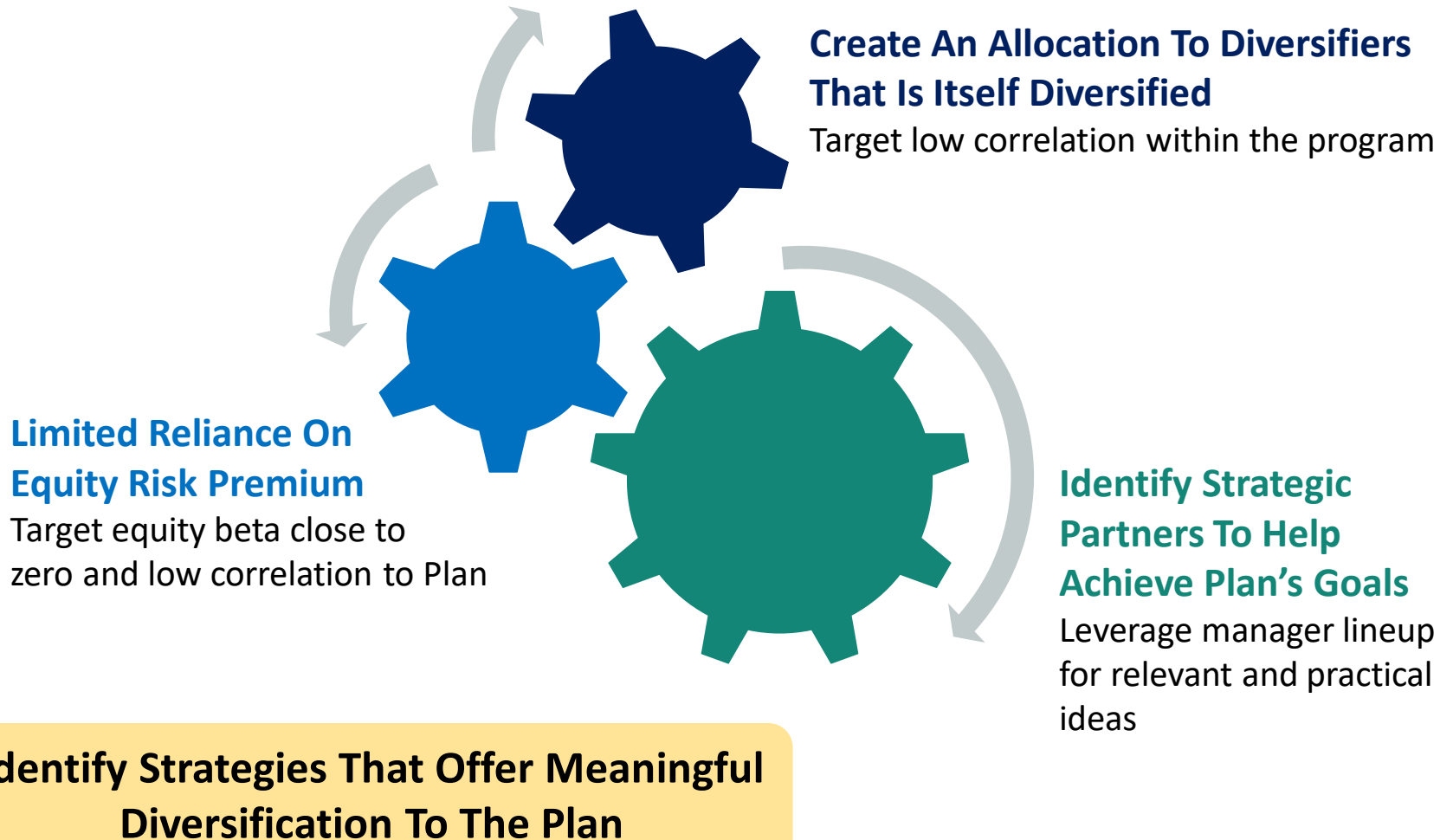


Continue PSG Collaboration On Actionable Ideas

Continue Being A Resource For Asset Class Teams

Increase Mindshare With Current And Prospective RBI Managers

# Risk Overview Appendix



# Mindshare Examples – Beyond Returns

- Frequent dialog and color regarding volatility and options markets
- Bespoke options advice for Total Fund trade ideas (worked closely on implementation of an equity risk reversal trade)
- Energy hedging discussions with real assets team

Capstone



- High yield factor research – Internal Fixed Income
- Counterparty risk dashboard –Internal Equity team
- Stock selection research – Public Equity and Plan level Value discussions
- Risk parity research

AQR Capital



- Plan level FX factor models and inputs to hedging decisions
- Research and insight into Natural Language Processing and Flows based metrics

First Quadrant  
(Active Currency)



**Identify Managers That Offer Actionable Knowledge Transfer**

# Research Update

Steven Peterson  
Program Director, Research



# Environmental, Social & Corporate Governance (ESG)



- Two primary goals: Integrate ESG data into portfolio construction process AND monitor VRS's portfolio exposure to ESG related issues.
- Research in this area is mixed prompting us to start our own in-house effort.
- Data definitions, quality, and coverage is inconsistent across vendors and therefore it is important to evaluate which dataset(s) will be most useful.
- Primarily, two types of data available: I. Historical, backward looking, slow moving series such as ESG ratings/scores/rankings/carbon emissions which are useful in the construction of factor portfolios, systematic strategies, and monitoring. II. Forward looking, faster moving measures such as ESG sentiment and carbon transition, which is useful in developing trading signal, asset rotation strategies, and TAA.
- We are testing two strategies and their variations: I. Integrate ESG as a factor in existing factor models AND II. Construct low carbon/net zero/Paris aligned portfolios.

# Natural Language Processing (NLP)



- We use NLP techniques to extract text data from 13F, 10-K, 10-Q, and 8-K corporate filings from the SEC Edgar database.
- We use the information extracted from 13F filings to examine the holdings composition of a subset of hedge funds and changes in these holdings through time, cross-sectionally as well as at the individual fund level.
- We also collect 10-K, 10-Q, and 8-K filings using all the companies currently listed on the S&P 500 index and use this information to create multiple sentiment signals that can be used to assess these signals' potential as performance indicators.
- **EXAMPLE:** We extracted 10-K annual filings from the SEC for all the current constituents in the S&P 500 going back as far as 2002. Those annual reports were then parsed and sorted into the categories identified by Loughran and McDonald as {positive, negative, uncertain, litigious, constraining, superfluous, and interesting}.
- We constructed a sentiment signal as ***(number of negative words – number of positive words)/(total word count in the filing)***. We repeat this for every filing and construct a longitudinal-cross section of sentiment signals by company. We then joined this set with a panel of monthly returns to each company in the index, also going back to 2002.

# Natural Language Processing (NLP) *continued*



- Company 10-K filings are not all filed in the same month and so we mark the month that the 10-K was filed and then measure the subsequent 3-month return following the release of the 10-K. We then regress the forward 3-month return on the sentiment signal to test whether negative sentiment (positive sentiment) anticipates falling (rising) forward returns. We used a fixed effects panel estimator (controlling for sector differences) for the following result:

$$R_{i,t} = \alpha + \beta \textit{sentiment}_{i,t-1} + \varepsilon_{i,t}$$

- $\beta < 0$  and statistically significant at a 1% level of confidence. The negative sign on sentiment indicates that should negative sentiment rise by 1 percent (as a ratio to total word count in the 10-K), one quarter-ahead returns will fall on average by 11 bps.
- Dividing the sample into deciles, we estimate the mean return for firms in decile 1 (most positive sentiment) to be 18.74% while the mean return for firms in decile 10 is a negative -0.102%.



- We follow Diebold-Li and Stock-Watson using Machine Learning methods to construct the Diebold-Li three factor yield curve model and supplement this with a fourth “business cycle” factor from Stock and Watson.
- We create a four-factor monthly time series dating back to 1977 and, using a Self-Organizing Map, create and test an 8-state model of the economy which is a projection on these four factors (level, slope, curve, cycle). For example, a “state” can be an expansionary (cycle), high rate regime (level) with inverted yield curve (slope).
- Using the MXUS sector returns, we identify potentially outperforming sectors by their returns rankings within and across each state. We then create a Monte Carlo experiment that projects states and sector returns over a twelve-month forward horizon, rotating exposures to outperforming sectors, conditional on state.
- Preliminary findings suggest that the rotation strategy outperforms the passive MXUS index by approximately 2 percent per year (across 10,000 trials) which is statistically significant at the 1% level.

# Scenario Analyses & Stress Tests

## Liquidity Model



### Scenario Analysis and Stress Tests

- We built an ALM simulator which incorporates the VRS CMA, liabilities, contributions and amortization assumptions to test how various macro shocks impact Fund performance over time along with response paths for Funded Status, Contribution rates and net outflows/inflows to the fund over the amortization period.

### Liquidity Model

- Using the same platform, we incorporate specific assumptions about the private asset classes regarding annual capital commitments, quarterly draw down and distribution speeds and then track (among other things) liquidity at the fund level over the amortization horizon and across all asset classes to capture the dynamics in liquidity availability and stress points.

# Investment Advisory Committee

## Public Market Assets

### Program Reviews

### Reading Deck

April 14, 2021



## Overview

(J.T. Grier, Managing Director)

## Program Reviews

- **Internal Equity Management**

(Dan Schlussler, Program Director)

- **Public Equity**

(Dan Whitlock, Program Director)

- **Fixed Income**

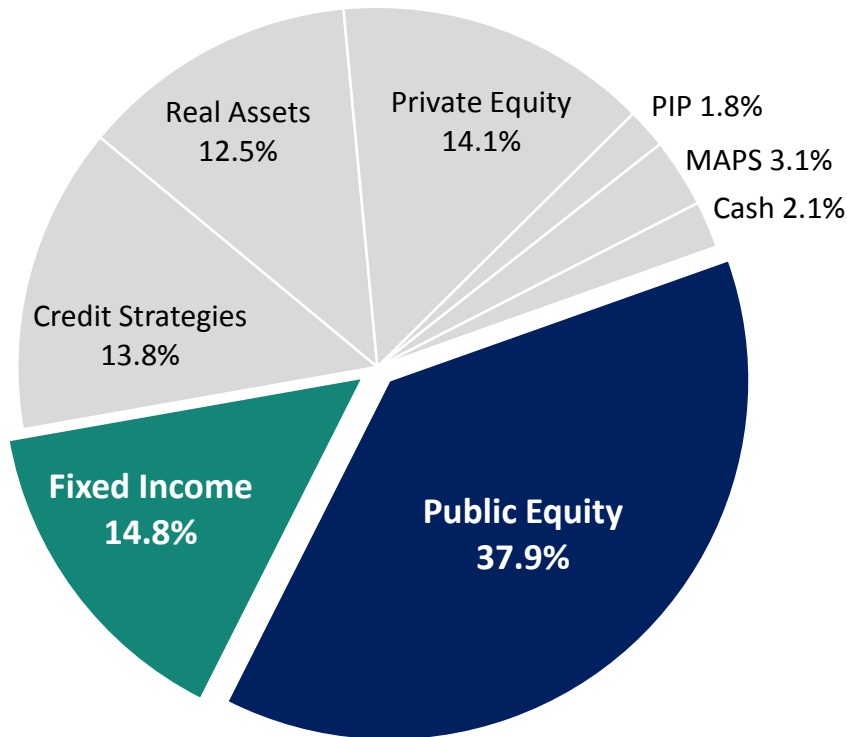
(Parham Behrooz & Greg Oliff, Co-Directors)

# Public Market Program Overview

J.T. Grier  
Managing Director, Public Markets



# Overview: Public Market Assets



## Public Equity

- 23 Developed Mkts
- 27 Emerging Mkts

## Internal Equity Management

- ≈40% of Public Equity
- Invested in 50 Global Mkts

## Fixed Income

- U.S. Core Focus
- USD EMD
- High Yield

**Public Market Assets: 52.7%**

Market values as of 12/31/2020; source: BNY Mellon data

# Overview: Preview Of Agenda Items





# Internal Equity Management (IEM)

Dan Schlusser  
Program Director





# Agenda: IEM Annual Review Topics

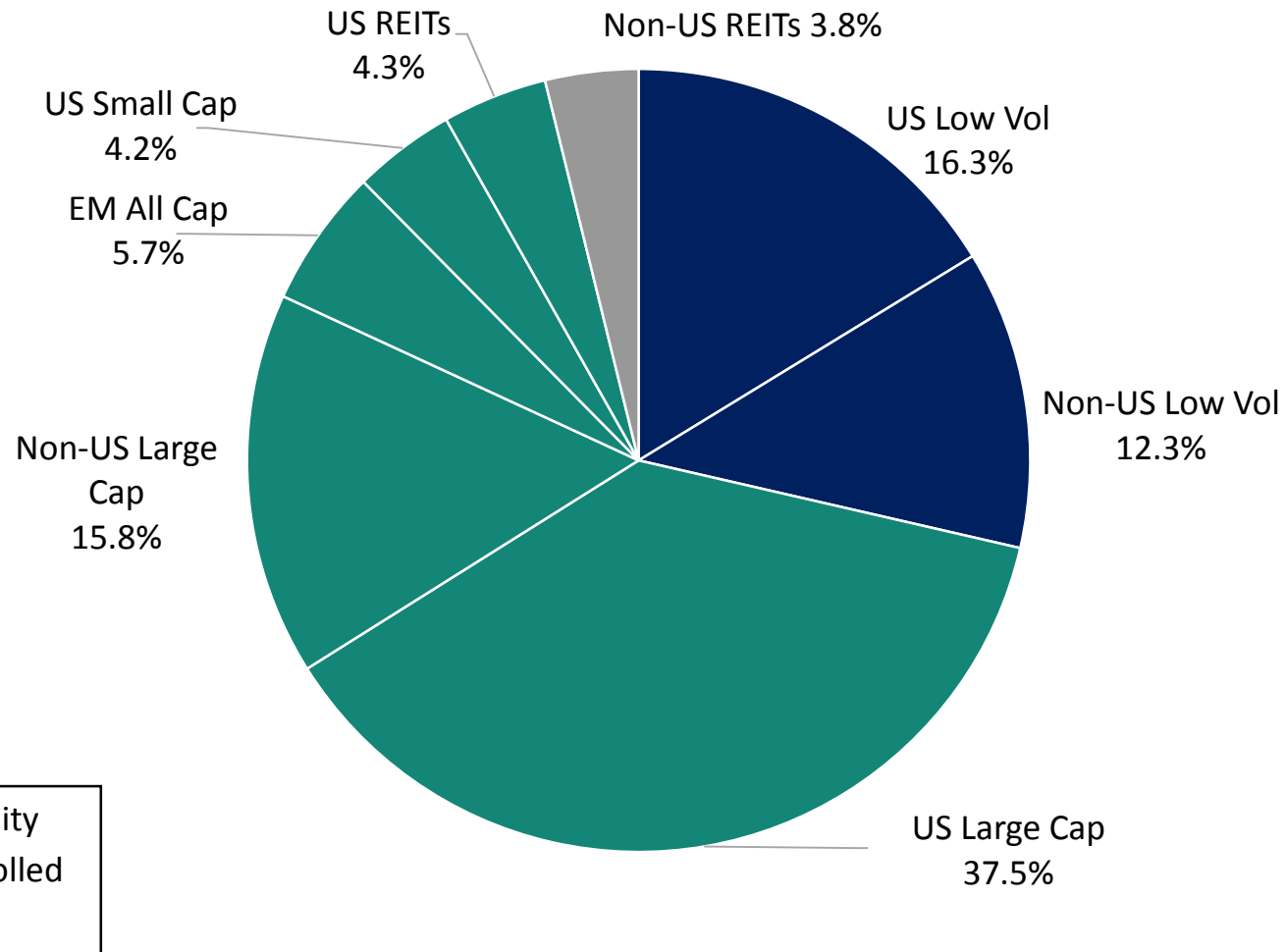


# Overview: Team Members



Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
Dan Schlussler	Program Director, Non-U.S. Dev Low Vol	MBA	CFA	25	8
Joe Kennebeck	Head Trader	BA		28	14
Ryan Carlson	U.S. REIT	BS	CFA	18	1
Aaron Lazar	Rebalance, Currency Hedge	MA	Passed CFA Level 1	7	7
Vu Le	U.S. Small Cap	PhD	CFA	10	9
Alex Muniz	U.S. Low Volatility	MA	CFA	20	20
Garret Rhodes	Non-U.S. REIT Passive, Currency Hedge	MS	Passed CFA Level 3	2	2
Larry Tentor	Non-U.S. Large Cap	PhD	FRM	19	13
Weldon Wirick	Emerging Markets, Currency Hedge	MA	CFA	19	15
Matthew Lacy	U.S. Large Cap	MA	CFA	22	22
Additional Resources	Investment Operations Department Portfolio Solutions Group Investment Decision Support				

# Overview: Asset Allocation



# Overview: Philosophy

Provide Cost Effective Access To The Equity Risk Premium



Provide Risk-controlled Value Added



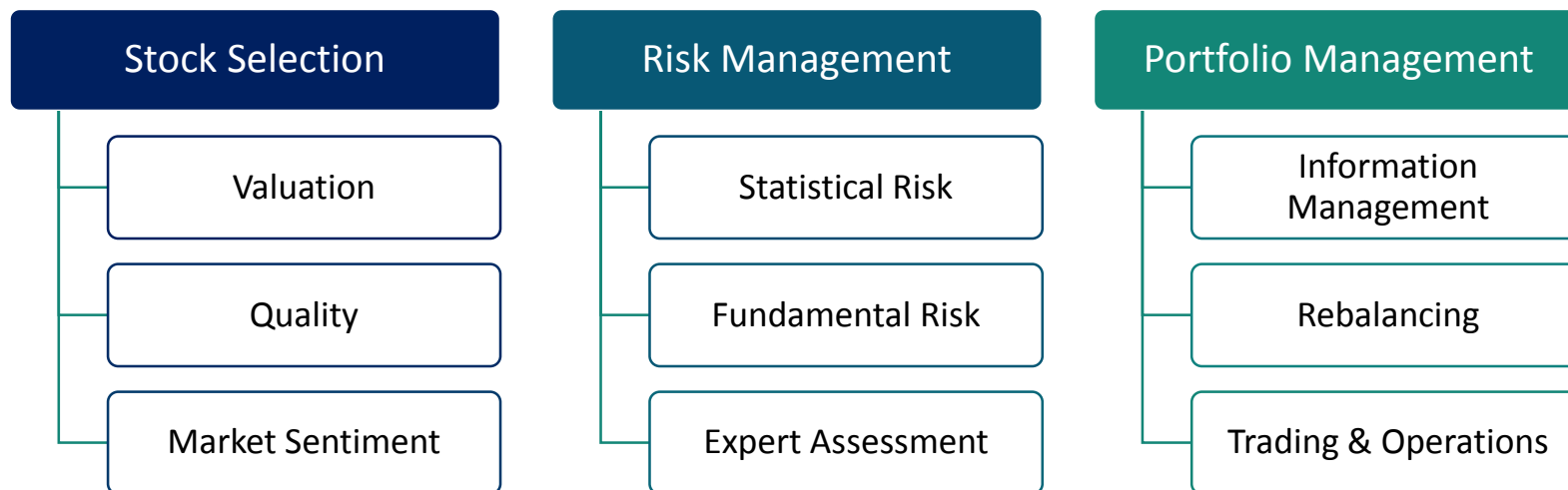
Provide Insights Into The Capital Markets



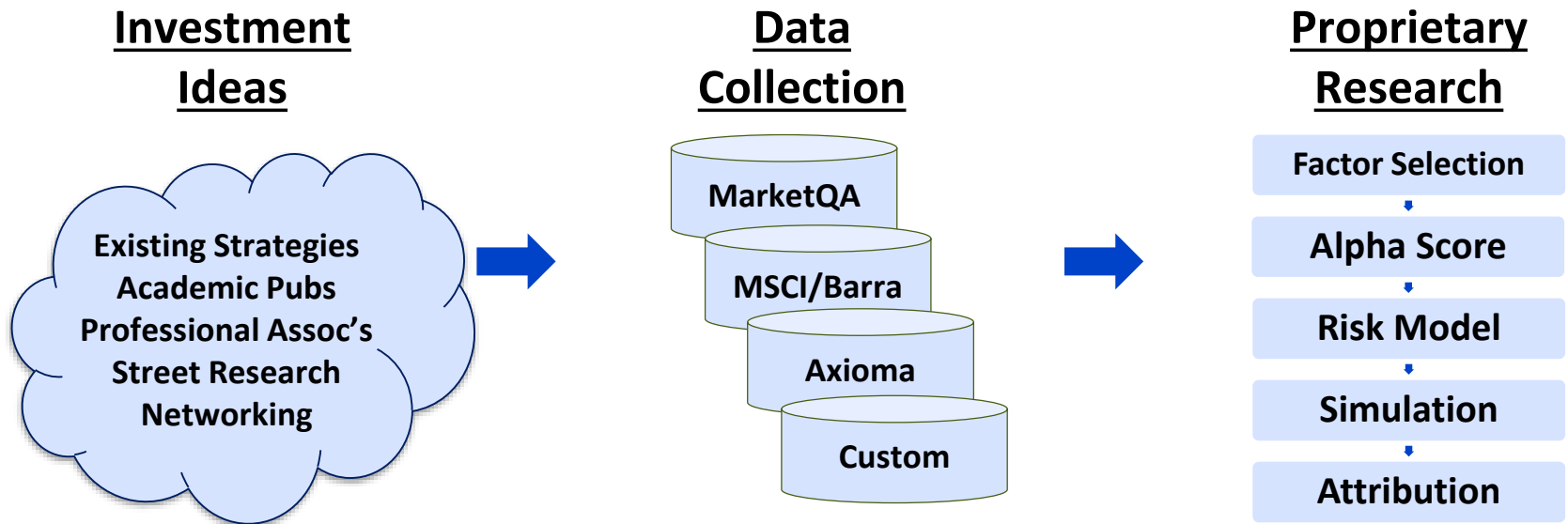
Complement The Total Public Equity Program

## Philosophy – Risk Controlled Relative Value

- Markets are relatively efficient
- Behavioral biases create exploitable opportunities
- Systematic strategies are effective at capitalizing on these opportunities



# Overview: Research Process



# Overview: Factor Selection & Alpha Score

**Valuation**  
Discounted Cash Flow  
Relative Valuations



**Quality**  
Prudent Accounting  
Return on Equity



**Market Sentiment**  
Momentum  
Analysts' Revisions



**Composite  
Score**

- DCF models provide robust estimates of intrinsic value
- RV models compare stocks within cohorts using accounting metrics
- Valuation models identify stocks trading at a discount or premium

- Cash based earnings are preferred to accrual-based earnings
- High & stable ROEs help to avoid value traps
- Quality captures accounting strength & management efficiency

- Stock price movements show persistence in the intermediate term
- Analysts revisions have a predictable impact on stock prices
- Market sentiment indicates potential investment opportunities

**Composite score identifies stocks that are trading at a discount, have superior management, & positive market recognition**

# Overview: Portfolio & Risk Management



## Quantitative

### Statistical Risk

- Fundamental Multifactor Risk Models
- PCA Risk Models

### Factor Constraints

- Relative or Total Risk
- Return & Risk Factors
- Industries, Sectors, Countries, Regions, etc.

## Qualitative

### Fundamental & Non-Modeled Risks

- Forensic Accounting, Refinancing Risk, etc.
- Individual Stock Modeling Tools

### Expert Assessment

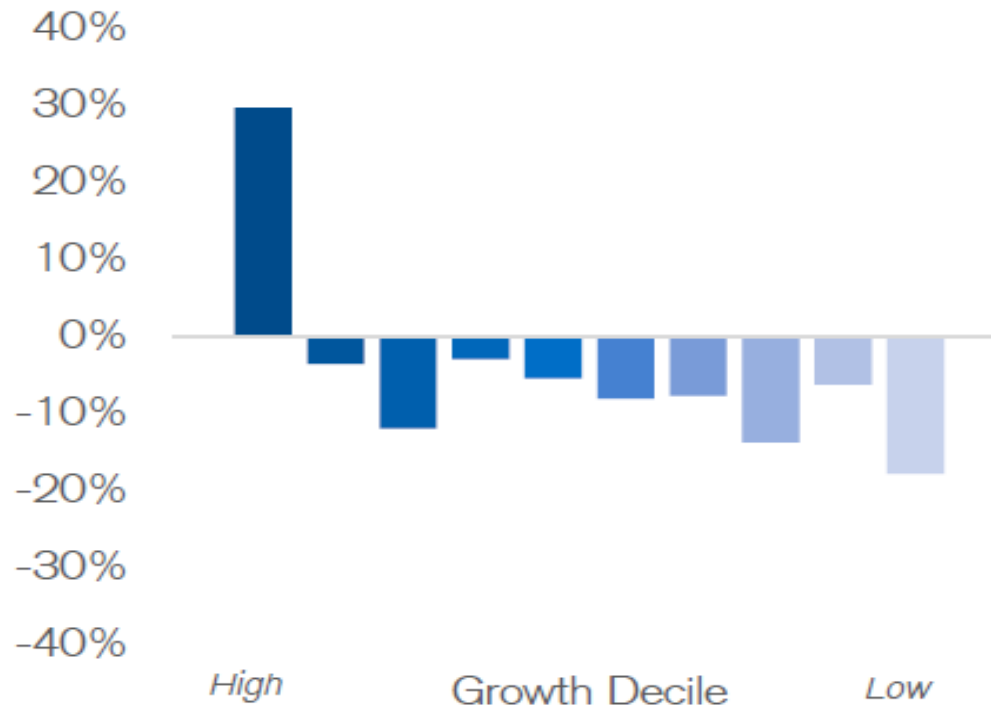
- Continuous Monitoring
- Thematic Trend Analysis
- Proprietary Research



# Markets: Narrow Growth Leadership for Most of 2020...



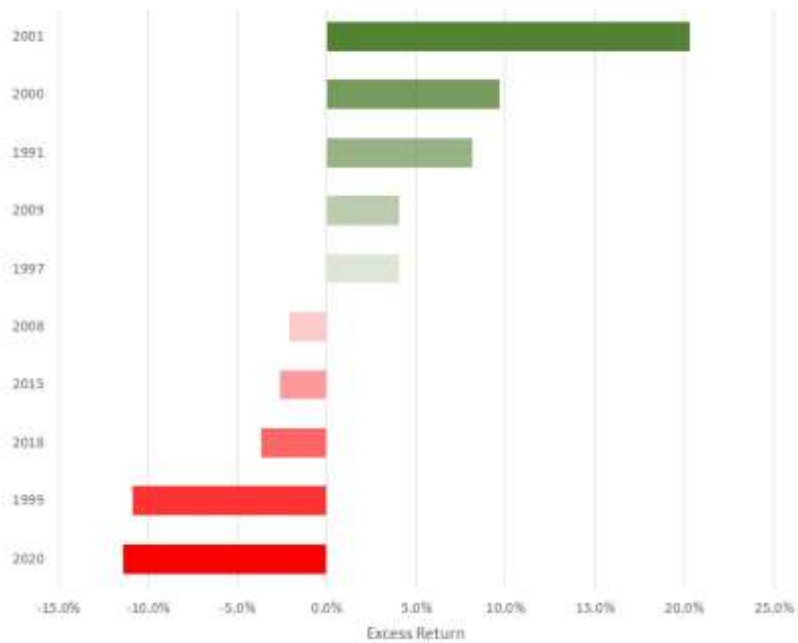
**Absolute Performance**  
*January 2020 – October 2020*



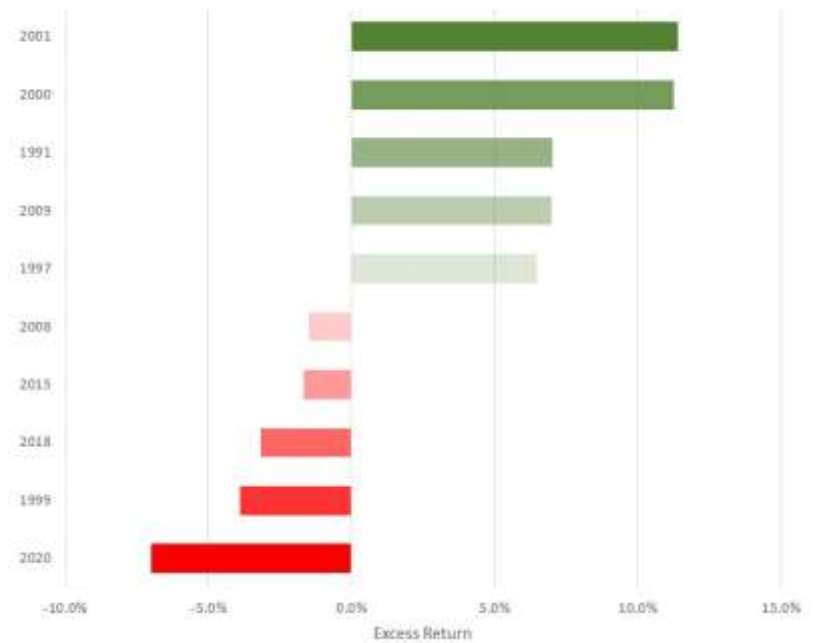
Source: Credit Suisse HOLT, Bloomberg, as of 3/16/2021.  
Stocks ranked as of 12/31/2019 for top chart, and 10/31/2020 for bottom chart and held static for measurement period.

# Markets: ...and Headwinds for Value

Value Excess Annual Returns (US)  
Top & Bottom 5 Years: 1990 - 2020



Value Excess Annual Returns (Global)  
Top & Bottom 5 Years: 1990 - 2020

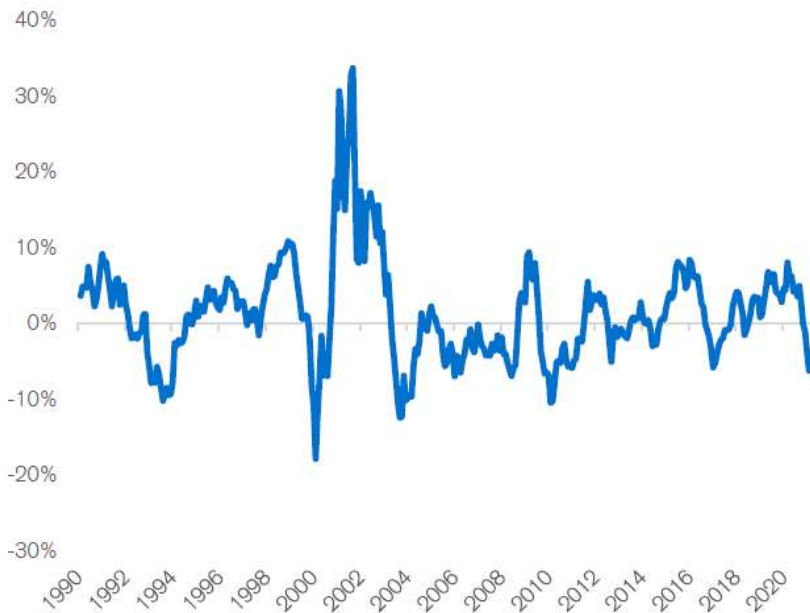


Source: Credit Suisse HOLT, Virginia Retirement System Research

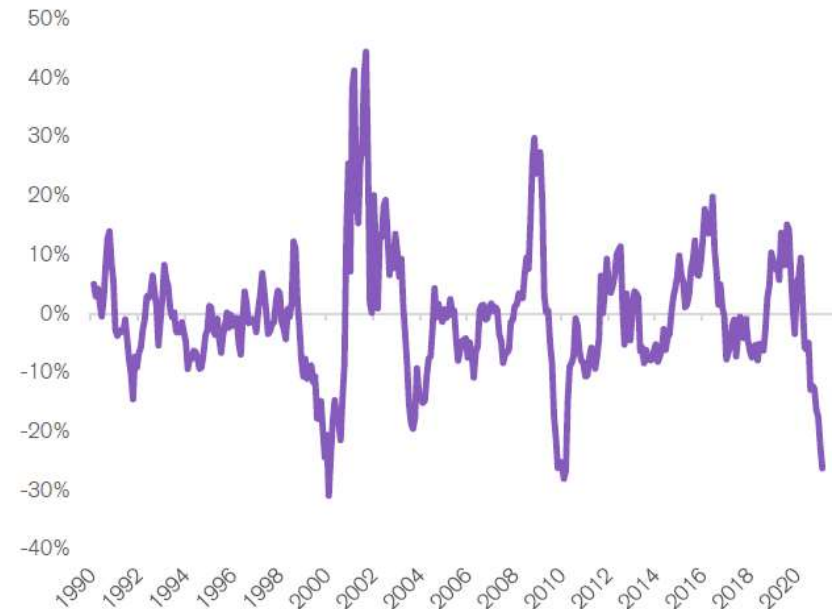
# Markets: Quality & Low Risk Have Suffered



Rolling 1-Year Return of Q1 Quality vs Market  
Top 1000 US Companies by mkt cap



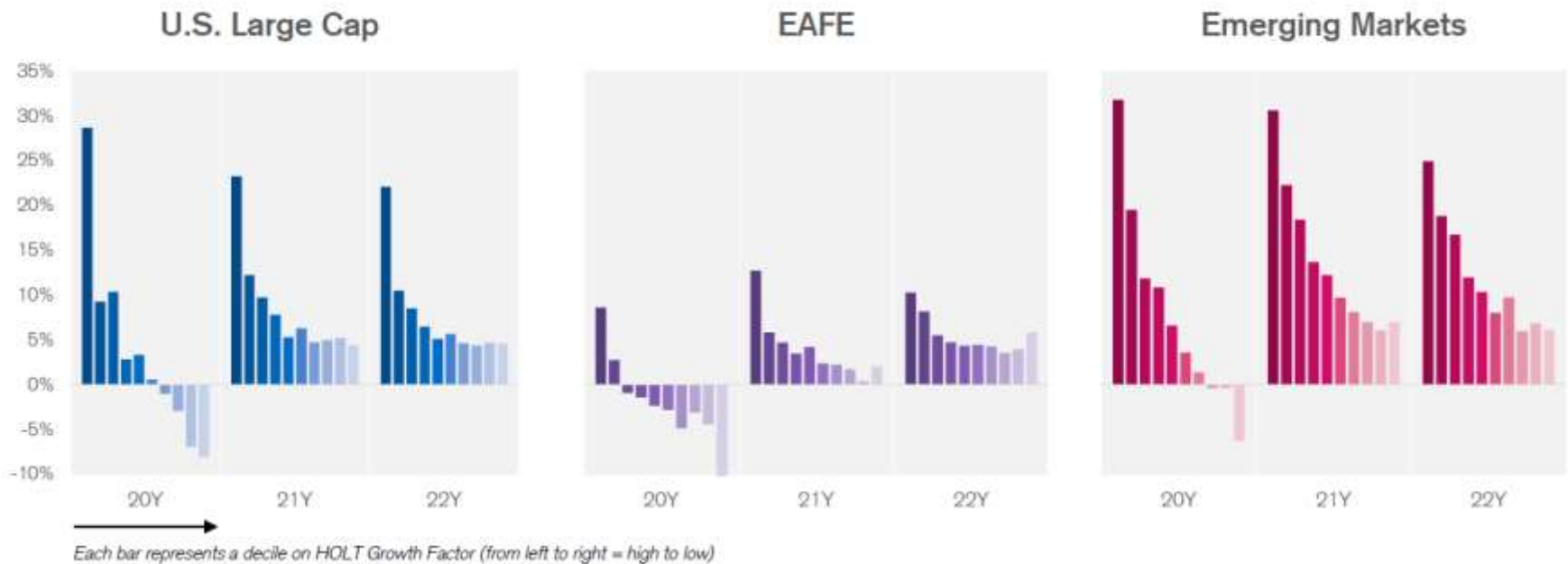
Rolling 1-Year Return of Q1 (Low) Risk vs Market  
Top 1000 US Companies by mkt cap



Source: Credit Suisse HOLT, Bloomberg, Data Date: 2/28/2021

# Markets: Growth Prospects Broadening Out

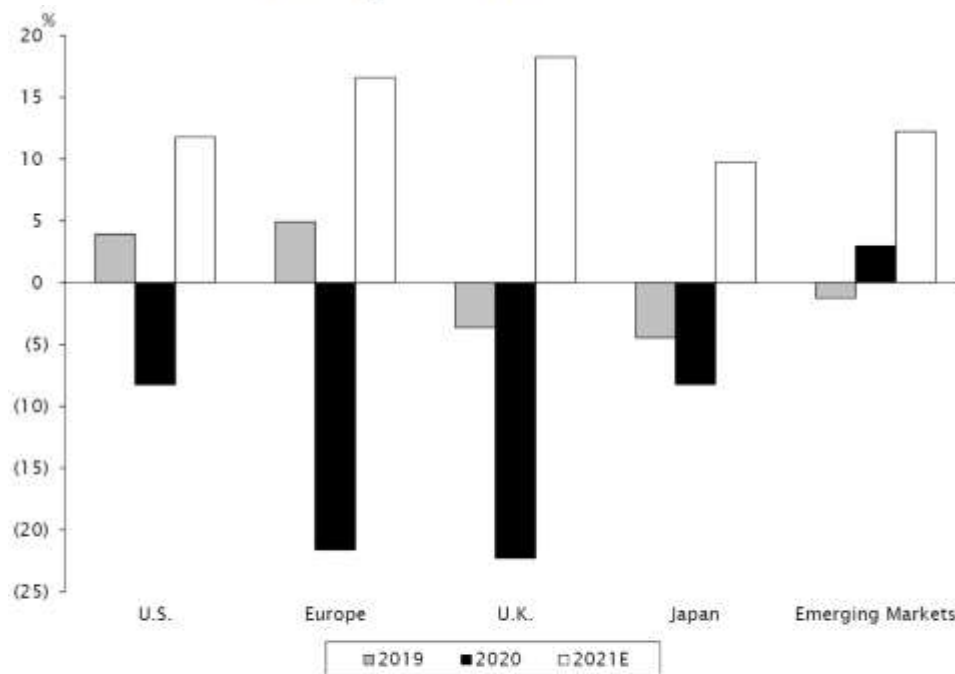
Forecasted Sales Growth by Decile



Source: Credit Suisse HOLT, Bloomberg, Data Date: 1/13/2021. 2020 Sales Growth is based on consensus estimate from Bloomberg.

# Markets: ...Expanding to Value Stocks Globally...

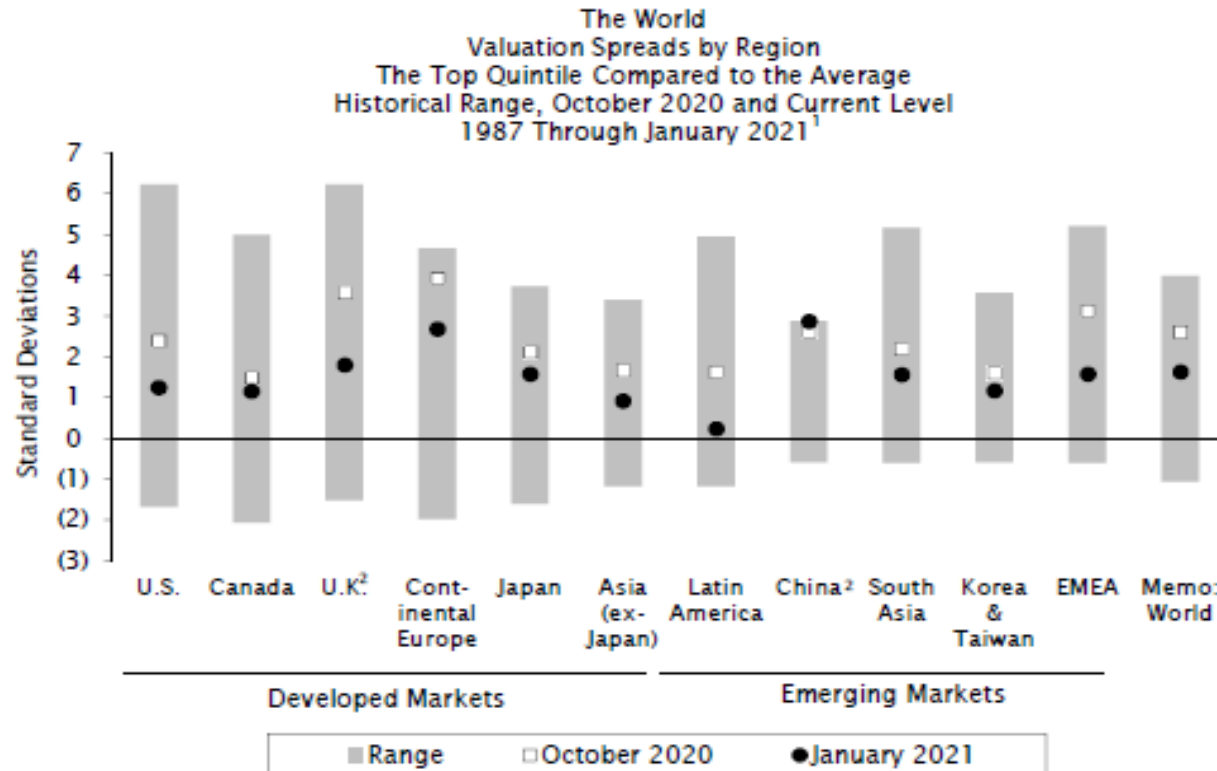
**The World: Value Stocks<sup>1</sup>  
Median Earnings Growth Rate by Year  
2019 Through 2021E**



Source: Empirical Research Partners Analysis.

<sup>1</sup> Drawn from the lowest quintile of the valuation super factor in each region. Stocks ranked relative to the region. Excludes real estate.

# Markets: ...with Valuation Spreads Remaining Elevated



Source: Empirical Research Partners Analysis.

<sup>1</sup> U.S. data since 1926. Japan and emerging markets regional data since 1997.

<sup>2</sup> U.K. data based on the largest 350 companies. China is H-shares only.

# Exposures: Risk & Positions



Risk Summary*	Strategy	Mkt Val (\$MM)	Weight	Tracking	CF Risk	Specific	Risk Attrib	% of TE
<b>Program</b>	<b>Composite</b>	<b>14,331</b>	<b>100.0</b>	<b>1.02</b>	<b>0.62</b>	<b>0.38</b>	<b>1.02</b>	<b>100.0</b>
Potomac	US Large Cap	5,585	39.0	0.95	0.25	0.75	0.20	19.7
Afton	US Small Cap	629	4.4	1.25	0.19	0.81	0.01	1.1
Monroe	US REIT	646	4.5	0.94	0.16	0.84	0.00	-0.2
Mobjack	US Low Vol	2,423	16.9	2.66	0.40	0.60	0.30	29.3
Matoaka	Non-US Dev. Large Cap	2,357	16.4	1.86	0.69	0.31	0.21	21.0
Tuckahoe	Emerging Markets	852	5.9	2.20	0.74	0.26	0.03	2.7
Piedmont	Non-US Dev. Low Vol	1,838	12.8	2.88	0.70	0.30	0.27	26.3

Top 10 Industry	Act Wgt
Utility	1.79
Pharmac	1.09
Software	0.73
Oilgas	0.46
Divmetal	0.44
Retail	-0.58
Conssvcs	-0.63
Commsvcs	-0.63
Media	-0.71
Chemical	-0.78

Top 10 Country	Act Wgt
Australia	0.87
Spain	0.41
Netherlands	0.40
Italy	0.36
Singapore	0.26
Hong Kong	-0.29
Germany	-0.37
France	-0.39
Switzerland	-0.74
Japan	-1.17

Sectors	Act Wgt
Utilities	1.45
Consumer Staples	0.81
Health Care	0.61
Information Technology	0.44
Communication Services	0.16
Energy	-0.20
Materials	-0.28
Consumer Discretionary	-0.77
Industrials	-1.08
Financials	-1.15

Factor	Act Wgt
Earnings Yield	0.20
Dividend Yield	0.11
Book Yield	0.09
Liquidity	0.03
Size (Non-Lin)	0.01
Growth	0.01
Beta	-0.03
Momentum	-0.04
Size	-0.05
Leverage	-0.06
Residual Vol	-0.07

\* Market Value Data as of 12/31/2020. All other risk Data as of 1/15/2021.

# Results: Program Performance (as of 12/31/20)



	IEM Active				IEM Low Volatility				IEM Enhanced Index			
	1 Yr	3 Yr	5 Yr	Incep	1 Yr	3 Yr	5 Yr	Incep	1 Yr	3 Yr	5 Yr	Incep
Total Active Internal Equity	8.91	7.84	10.74	7.59	3.35	5.39	8.79	12.27	11.49	8.85	11.48	7.19
IEM Benchmark	13.17	10.36	12.08	7.19	8.76	9.34	10.92	10.53	15.15	10.82	12.53	7.11
<i>Excess Returns</i>	-4.26	-2.52	-1.35	0.40	-5.41	-3.95	-2.14	1.73	-3.66	-1.97	-1.04	0.08
<i>Realized Tracking Error</i>	0.68	0.77	0.90	1.03	1.27	1.50	1.70	2.82	0.65	0.68	0.75	0.77
<i>Realized Information Ratio</i>	-6.30	-3.25	-1.50	0.39	-4.26	-2.64	-1.26	0.61	-5.64	-2.88	-1.39	0.11



# Results: Strategy Performance (as of 12/31/20)



	Inception Date	Mkt Value (\$MM)	1-Year Return	1-Year Excess	Since Inc. Excess	Since Inc. Tracking
<b>Risk Controlled Strategies</b>		<b>10,069</b>	<b>11.49</b>	<b>-3.66</b>	<b>0.08</b>	<b>0.77</b>
U.S. Large Cap (Potomac)	Apr-01	5,585	18.68	-2.69	0.16	0.93
Non-U.S. Large Cap (Matoaka)	Sep-10	2,357	3.19	-5.46	-0.27	1.08
EM All Cap (Tuckahoe)	Sep-15	852	13.01	-5.89	-1.30	1.62
U.S. Small Cap (Afton)	Jun-05	629	12.23	-6.66	-0.14	1.83
U.S. REITs (Monroe)	Dec-05	646	-9.44	0.15	1.09	1.14
<b>Less Constrained (Low Vol) Strategies</b>		<b>4,262</b>	<b>3.35</b>	<b>-5.41</b>	<b>1.73</b>	<b>2.82</b>
U.S. Large Cap (Mobjack)	Jun-10	2,423	6.37	-5.47	1.71	3.27
Non-U.S. Large (Piedmont)	Dec-12	1,838	-0.20	-5.21	0.55	2.56
<b>Passive Strategies</b>		<b>573</b>	<b>5.12</b>	<b>0.14</b>	<b>0.11</b>	<b>0.18</b>
Non-U.S. Developed REIT	Jul-20	573	n.a.	n.a.	-0.40	0.15
<b>Other Mandates</b>						
Rebalancing & Liquidity Mgmt	Jul-07	104	n.a.	n.a.	n.a.	n.a.
Currency Hedging	Apr-09	2,989	n.a.	n.a.	n.a.	n.a.

# Results: Performance Factors



## Potomac\*: US Enhanced Index

- Potomac had its most challenging year since inception which goes back to 2001.
- Nearly the entirety of its 2.7% under-performance can be attributed to our value exposure, a common theme across our portfolios.

\*Largest strategy by assets

## Afton: US Small Cap Enhanced Index

- In addition to value's detraction, the portfolio's exposure to higher quality stocks was a further drag.
- Overweights to technology and health care stocks was additive.

## Piedmont: Non-US Low Volatility Strategies

- In addition to value exposure defensive positioning had been a drag on performance.
- Overweights to financials and technology stocks within the Asia-Pacific region meaningfully contributed to performance.

## Monroe: US REITs Enhanced Index Strategy

- While Value underperformed within the REITs universe, the headwind was less severe and offset by some of our other return factors.
- Our pre-COVID underweight to the Retail sector was a contributor.

# Looking Forward: Focus on Process and Projects

- Difficult Year Of Performance
- We Maintain Conviction In Our Strategies
- Continue To Enhance The Overall Investment Process
- Continue Research On Global Long And Long/Short Strategies
- Major Project To Enhance Our Research Infrastructure

# Public Equity

Dan Whitlock  
Program Director



# Agenda: Public Equity Annual Review Topics



# Overview: Team Members



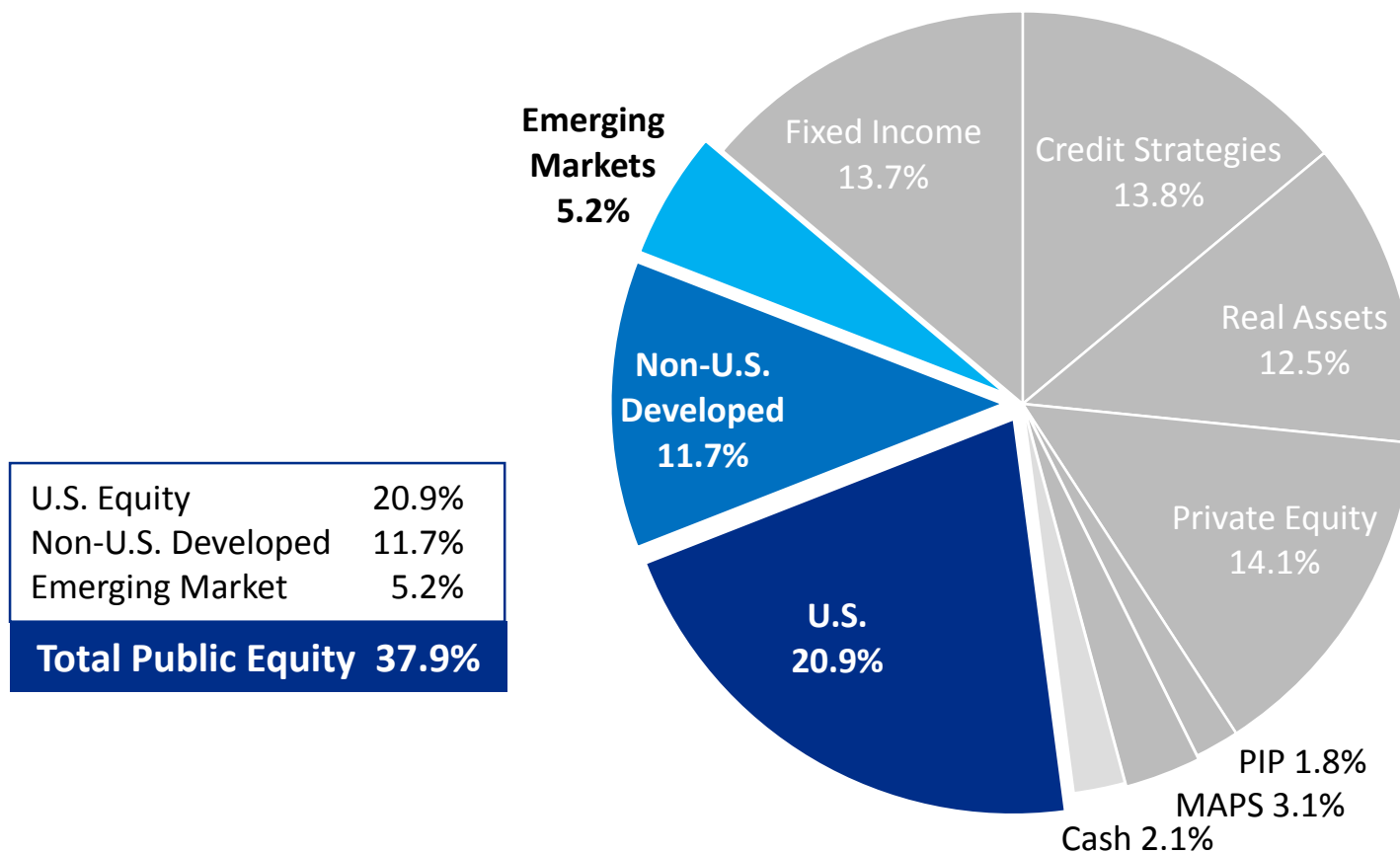
Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
<b>Dan Whitlock</b>	<b>Director</b>	<b>MBA</b>	<b>CFA, CAIA</b>	<b>19</b>	<b>19</b>
Stephen Adelaar	Portfolio Manager	MS	CFA	21	14
Holly Glass	Portfolio Manager	MA	CFA	20	20
Olga Zozulya	Investment Officer	BS	CFA	8	8
Korey Turner	Investment Analyst	BA		1	1
Kelly Baker	Portfolio Assistant	AAS		11	6
Additional Resources	The entire Internal Equity Team, Portfolio Solutions Group, Management Committee, Operations Team, Compliance Team, and Legal/Regulatory Team.				

# Overview: Team & Process



	<u>Stephen Adelaar</u>	<u>Holly Glass</u>	<u>Olga Zozulya</u>	<u>Daniel Whitlock</u>
<b>Strategy Lead</b>	Defined Contribution Emerging Markets Hedge Funds	<i>IEM Group (Italics)</i> Risk Management Transition Management United States	Global Equity International Developed Tilt Monitoring	Total Public Equity
<b>Analyst</b>	Afton ( <i>IEM</i> ) Baillie Gifford Global Baillie Gifford EM Coatue Kylin LSV Global LSV Non-U.S. Small Cap LSV U.S. SC Matoaka ( <i>IEM</i> ) Select – SEG Select - Cooper Square	Acadian EM Acadian Small Cap Arrowstreet Global Cevian Eminence <i>Hedge Fund Overlay</i> <i>Mobjack (IEM)</i> <i>Piedmont (IEM)</i> Taiyo	Ariel Global <i>Internal EM (IEM)</i> J.P. Morgan LS Jackson Square Lansdowne Global Maverick Nitorum Theleme	Advent Convertibles Advent Converts EMP Arisaig Global EM Cons Farallon Nordea EM Nordea Global <i>Potomac (IEM)</i> ValueAct Capital

# Overview: Asset Allocation as of 12/31/20





# Overview: Philosophy



# Overview: Manager Evaluation Framework



## Sustainable Risk-Adjusted Returns

- Long history, repeatable process, consistent philosophy
- Sustainable team and firm
- Outperformed in a consistently diversified manner
- Outperformed when considering risk profile
- Sizeable allocations will not impact performance

## Doing Things Differently

- Low correlations to existing book (quantitative & qualitative)
- Something VRS cannot produce internally
- Something one of VRS' existing external managers cannot provide
- Employ a different way of thinking or different strategies

## Terms & Back Office

- Favorable fees, liquidity, etc.
- Robust back office
- Partnership mentality
- Resources to manage sizeable allocations

# Markets: 1 Year Ending 12/31/20



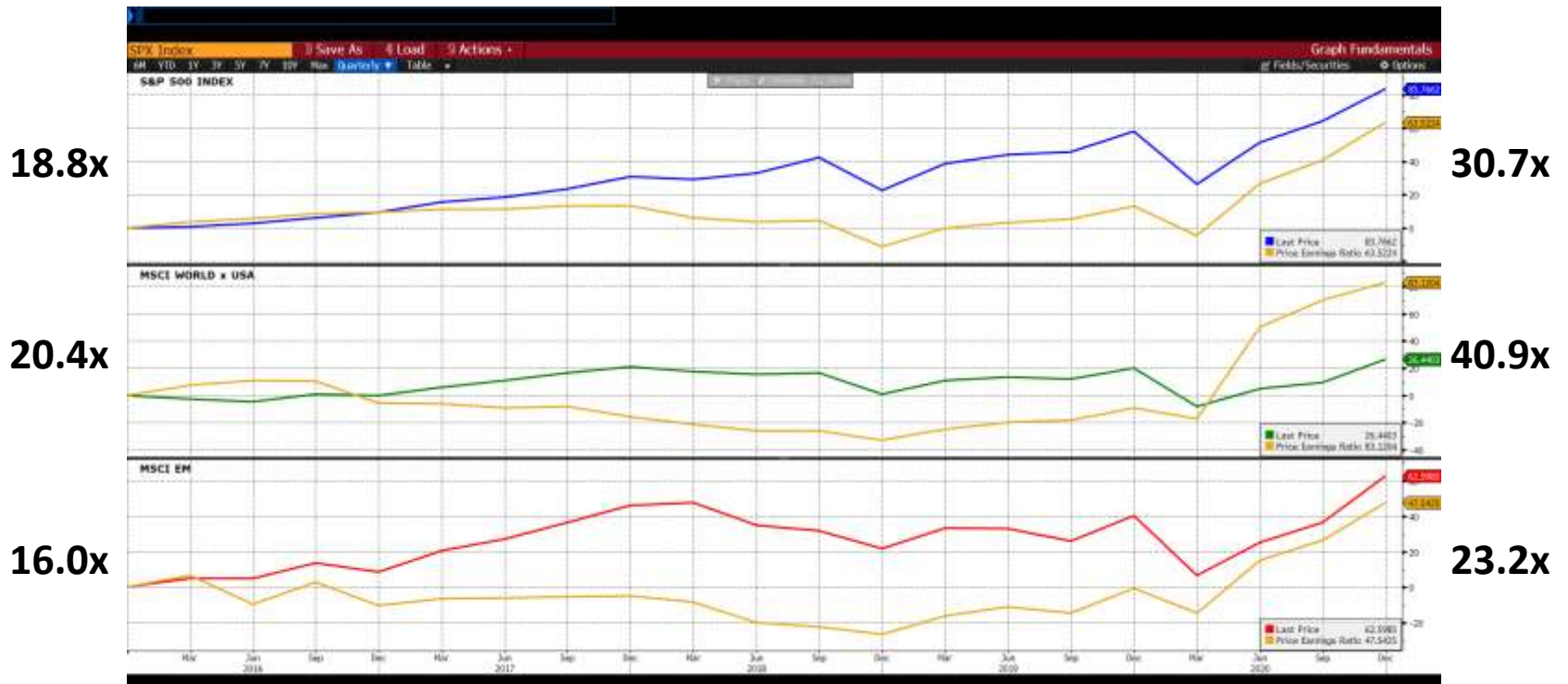
	Global	Developed	Dev ex US	US	EMEA	Pacific	Emerging	EM ASIA	EM LatAm	EM EMEA
All Sectors	16.3%	15.9%	7.6%	20.7%	5.5%	11.9%	18.3%	28.4%	-13.8%	-6.9%
Information Technology	45.6%	43.8%	33.1%	45.6%	26.4%	50.9%	60.1%	60.3%	36.3%	n/a
Consumer Discretionary	36.7%	36.6%	15.8%	49.9%	16.1%	29.6%	36.7%	42.4%	-19.4%	15.1%
Communication Services	23.7%	23.0%	11.7%	26.2%	-5.7%	34.3%	27.5%	34.1%	-15.4%	-1.1%
Materials	20.9%	19.9%	19.9%	20.0%	19.2%	25.5%	24.8%	29.3%	30.5%	14.2%
Health Care	14.9%	13.5%	11.1%	14.6%	6.9%	33.0%	52.8%	62.2%	-12.7%	-7.3%
Industrials	11.3%	11.7%	11.6%	11.8%	13.0%	8.1%	5.0%	8.3%	-10.2%	-2.4%
Consumer Staples	8.1%	7.8%	5.7%	9.7%	5.2%	13.8%	10.7%	22.4%	-16.4%	8.6%
Utilities	3.8%	4.8%	13.3%	-0.8%	21.8%	-5.0%	-5.2%	-1.2%	-18.6%	4.7%
Financials	-3.8%	-2.8%	-2.9%	-2.8%	-8.2%	1.0%	-8.2%	-1.8%	-24.6%	-14.4%
Real Estate	-6.4%	-5.0%	-7.3%	-3.7%	-3.8%	-10.1%	-16.9%	-14.4%	-39.3%	-19.9%
Energy	-28.6%	-31.5%	-27.3%	-35.1%	-28.0%	-19.6%	-15.4%	-3.8%	-26.6%	-24.4%

Unhedged Total Returns

Sources: MSCI and Bloomberg

# Markets: 5 Years Ending 12/31/20

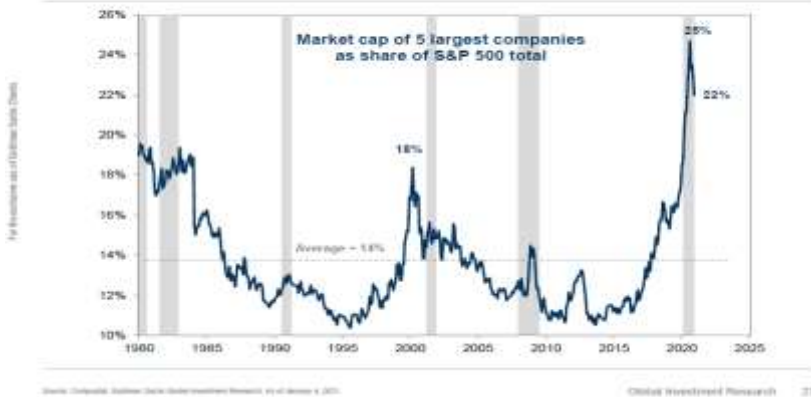
## Percentage Appreciation of Price/Earnings



Source: Bloomberg

# Markets: Unusual Times

**Goldman Sachs** Record concentration of market cap in 5 largest stocks  
5 stocks account for 22% of S&P 500 equity cap: AAPL, MSFT, AMZN, GOOGL, FB



U.S. GROWTH PRICE/SALES

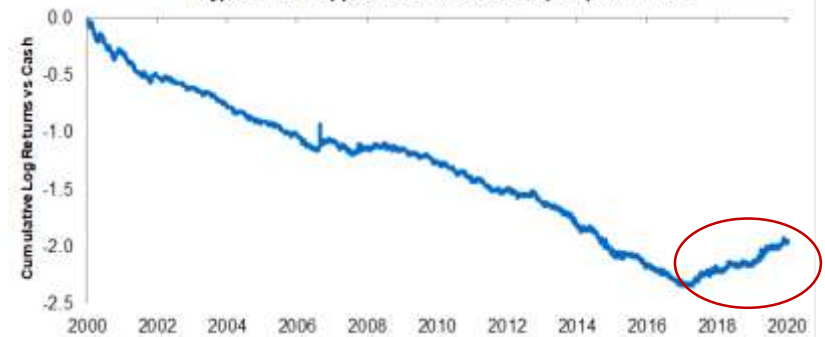


As of 1/1/21 (Source: I/B/E/S, Worldscope, Compustat, IBIS)  
Note: Calculated using annualized log-weighted index.  
Source: I/B/E/S and IBISWorld. Permission to Reproduce: © 2014, I/B/E/S. All rights reserved. (CIBC) 1

Performance of top 5 GS Custom Baskets of 2020:



Hypothetical Opposite Stock Selection (SSP) Illustration

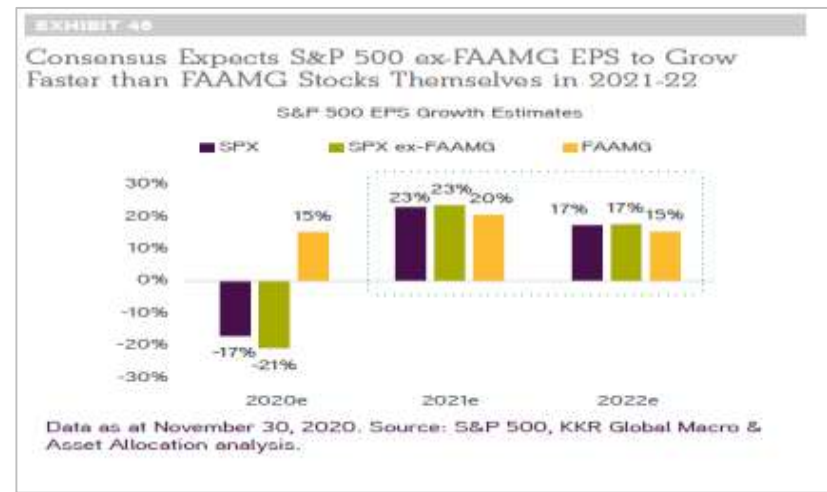
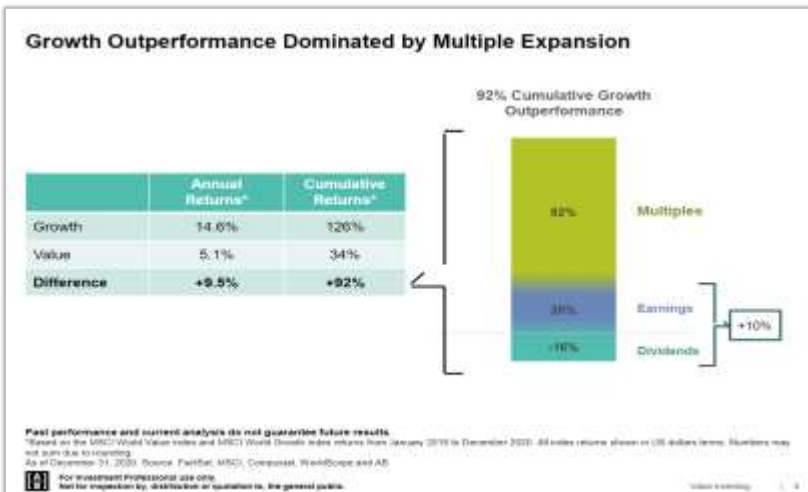


Source: AQR. For illustrative purposes only. Hypothetical data has inherent limitations, some of which are described in the disclosures. See detailed explanation in the body of this article, and additional disclosures at the end of this article. This hypothetical performance does not reflect the deduction of any management fees, which as mentioned, would further reduce the actual return. It should not be assumed that the inversion of these charts is illustrative of actual portfolio performance.

# Markets: Opportunity In Value



Source: AQR. For illustrative purposes only.

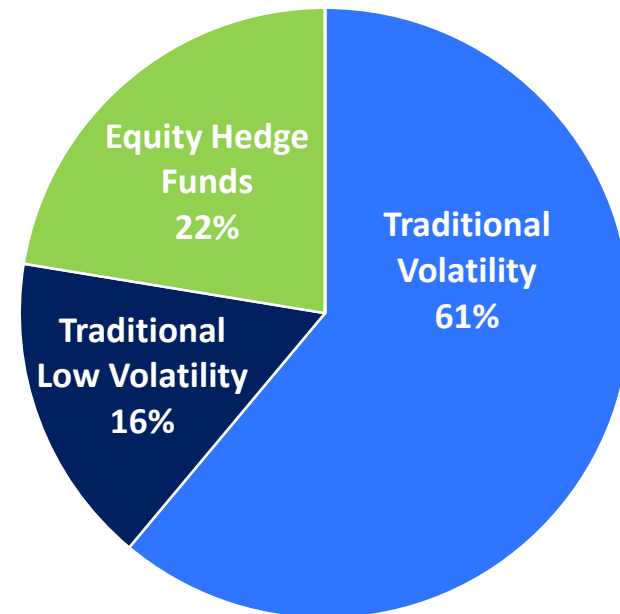


# Exposures: Portfolio Positioning as of 12/31/20



**\$35.6 Billion**  
**38.6% of Plan Assets**

- 55% Traditional Domestic (-1.4% vs. bmk)
- 31% Traditional Non-US Developed (+0.6% vs. bmk)
- 14% Traditional Emerging Markets (+0.7% vs. bmk)
- 100% Active
- 0% Passive
- 39% Internal
- 61% External
- 61% Traditional Volatility
- 16% Traditional Low Volatility
- 22% Equity Hedge Funds
- 0% Passive
- 21.66% Forecasted Portfolio Risk (Barra)
- 22.09% Forecasted Beta-1 Benchmark Risk (Barra)
- 1.29% Forecasted Active Risk (Barra)



- 27 External Mandates (14 Traditional & 13 HFs)
- 21 External Managers (9 Traditional & 12 HFs)



# Exposures: Portfolio Characteristics as of 12/31/20



Portfolio Characteristics	Program	Benchmark	
Dividend Yield	1.9%	1.8%	●
Price to Book	2.3	2.6	●
Price to Earnings (F12)	17.3	20.1	●
Price to Earnings (T12)	28.5	34.3	●
Return on Equity	8.8%	6.5%	●
Debt to Assets	23.1%	23.9%	●
Sales Growth	(3.1)%	(4.8)	●
Profit Margin	5.7%	4.8%	●

**Great Value, Better Quality, and Attractive Growth Profiles**



# Results: As of 12/31/20



	10 Year	5 Year	3 Year	1 Year
<b>Total Public Equity</b>	<b>9.19</b>	<b>10.50</b>	<b>8.25</b>	<b>13.36</b>
Strategic Benchmark	9.33	11.64	10.21	17.01
Excess Return	-0.14	-1.14	-1.95	-3.65
Beta vs. Strategic Benchmark*	0.98	0.97	0.97	
Beta vs. Respective Beta 1 Market Cap Benchmarks*	0.92	0.93	0.94	
Active Risk vs. Strategic Benchmark**	1.01	1.08	1.28	
Information Ratio vs. Strategic Benchmark***	-0.14	-1.05	-1.53	

\*Measure of volatility, or systematic risk, of a portfolio in comparison to a benchmark

\*\*Otherwise known as tracking error, this is the standard deviation of returns relative to a benchmark

\*\*\* $(\text{Portfolio Returns} - \text{Benchmark Returns}) / \text{Active Risk}$

**VRS Public Equity has outperformed in seven of the last ten calendar years, underperforming in only 2018 - 2020**

Please see endnotes on page 51

# Results: As of 12/31/20



	10 Year	5 Year	3 Year	1 Year	MV (\$M)
<b>Total Public Equity</b>	<b>9.19</b>	<b>10.50</b>	<b>8.25</b>	<b>13.36</b>	<b>35,570</b>
Strategic Benchmark <sup>1</sup>	9.33	11.64	10.21	17.01	
Excess Return	-0.14	-1.14	-1.95	-3.65	
<b>U.S. Program</b>	<b>13.49</b>	<b>14.12</b>	<b>12.50</b>	<b>17.11</b>	<b>10,902</b>
U.S. Benchmark <sup>2</sup>	13.66	15.48	14.45	20.95	
Excess Return	-0.17	-1.35	-1.95	-3.84	
<b>Non-U.S. Developed Program</b>	<b>7.19</b>	<b>7.30</b>	<b>2.68</b>	<b>3.16</b>	<b>5,514</b>
Non-U.S. Developed Benchmark <sup>3</sup>	7.28	9.05	6.30	9.39	
Excess Return	-0.09	-1.75	-3.62	-6.22	
<b>Emerging Market Program</b>	<b>2.78</b>	<b>9.97</b>	<b>2.59</b>	<b>11.72</b>	<b>2,438</b>
Emerging Market Benchmark <sup>4</sup>	3.51	12.29	5.84	18.44	
Excess Return	-0.72	-2.32	-3.25	-6.72	
<b>Global Program</b>	<b>10.22</b>	<b>11.92</b>	<b>9.01</b>	<b>13.15</b>	<b>8,766</b>
Global Benchmark <sup>5</sup>	10.24	13.03	11.12	16.98	
Excess Return	-0.01	-1.11	2.11	-3.83	
<b>Equity Hedge Fund Program</b>	<b>7.31</b>	<b>6.48</b>	<b>8.28</b>	<b>17.17</b>	<b>7,951</b>
Equity Hedge Fund Program Benchmark <sup>6</sup>	6.10	6.54	7.82	17.17	
Excess Return	1.21	-0.07	0.45	0.00	

# Results: As of 12/31/20



	1 Year
<b>Total Public Equity</b>	<b>13.36</b>
Strategic Benchmark <sup>1</sup>	17.01
Excess Return	-3.65

## Largest One Year Absolute Return Contributors:

**Positive:** U.S. program was up 17.1% with a 31% weight

**Negative:** Non-U.S. Program was up 5.6% with a 22% weight

## Largest One Year Relative Return Contributors:

**Positive:** Growth exposure, HF Managers, and Qualitatively implemented managers

**Negative:** Value exposure, Low-Vol exposure, and Quantitatively implemented managers

Please see endnotes on page 51

# Results: CY 2020 Attribution Deeper Dive



## 2020 Performance Factor Attribution

Note: Attribution an estimate and does not contain fees, intra-month trading, t-costs, etc.; some categories that are not material were left off.

### Factor Impacts:

- U.S. Value detracted -66 bps
- U.S. Size detracted -44 bps
- U.S. underweight detracted -32 bps
- Lower volatility detracted -23 bps

**Top 3 Stock Detractors: -2.6%**

**Top 3 Stock Contributors: +1.3%**

Attribution	Value (%)
Portfolio Base Return	14.6
Benchmark Base Return	17.1
Active Base Return	-2.6
Currency	0.3
Active Local Excess Return	-2.8
Market Timing	-0.2
Active Local Residual Return	-2.6
Allocation	0.8
Selection	-3.4
Industry	-0.6
Style	-1.9
Stock Specific Return	-0.8

# Results: 2021 Update: Rebounding Amid Stabilization



## 2020/2021 Performance Factor Attribution\*

### Factor Impacts:

- Detractors of U.S. Value and Size in 2020 are largest contributors in 2021

### Stock Contributors:

- Largest stock-specific detractors in 2020 are the largest contributors in 2021

### Actual Performance (2021 CYD)

- 3.5% vs. 2.5%
- March was also strong

Attribution	2020	2021 (through Feb)
Portfolio Base Return	14.6	3.7
Benchmark Base Return	17.1	2.6
Active Base Return	-2.6	1.1
Currency	0.3	0.0
Active Local Excess Return	-2.8	1.1
Market Timing	-0.2	-0.1
Active Local Residual Return	-2.6	1.2
Allocation	0.8	-0.1
Selection	-3.4	1.3
Industry	-0.6	0.2
Style	-1.9	0.6
Stock Specific Return	-0.8	0.6

\*Attribution is an estimate and does not contain fees, intra-month trading, t-costs, etc.; some categories that are not material were left off.

# Managers: Top 5



Name	Mandates	# of Mandates	% of Program
VRS Internal Equity	U.S., Non-U.S., Emerging	6	38%
LSV	Global, Non-U.S. Small, U.S. Small	3	9%
Arrowstreet	Global	1	6%
Nordea	Global, Emerging	2	6%
Baillie Gifford	Global, Emerging	2	5%
<b>Total</b>			<b>64%</b>

# Managers: Hires & Terminations – 1 Year



Action	Effective Date	Commitment/ Current Value	Funding/ Defunding Period	Description
Hired	1/1/2020	\$200 Million	Immediate	<b>Advent Global Balanced Convertibles</b> A global convertibles strategy <sup>1, 2</sup>
Terminated	7/1/2020	\$300 Million	Immediate	<b>Highline Capital Partners</b> A long/short equity hedge fund
Terminated	9/30/2020	\$150 Million	Immediate	<b>New Mountain Vantage</b> A long/short equity hedge fund
Hired	1/4/2021	\$400 Million	2 Years	<b>Coatue</b> A long/short equity hedge fund

<sup>1</sup>Minority Owned Business

<sup>2</sup>Manager was previously in the Credit Strategies Program

# Managers: Diverse Investment Management Engagement (DIME)



## Women & Minority Owned Management Firms Currently In The Lineup

- Ariel managing VRS assets since 2014  
*African-American, Asian-American & women-owned global equity manager*
- Kylin managing VRS assets since 2014  
*Asian-American owned hedge fund*
- Advent managing VRS assets since 2011, Public Equity assets since 2020  
*African-American owned convertible manager*

## Continue To Meet With New Prospects & Consider New Investments

- 94 meetings with minority managers or consultants in last 5 years
- 193 meetings since we started tracking this in late 2009



# Looking Forward: Remain Opportunistic



# Appendix

# Due Diligence: Constant Re-Underwriting

## Existing Portfolio

- **Qualitative:** long-term relationships, frequent communication, monitor organizations & personnel
- **Quantitative:** monitor exposures & performance & risk, risk budget drives allocation, identify new strategic & tactical tilts

## Assess Opportunity

- **Qualitative:** identify attractive investments, identify talented managers, utilize network of contacts
- **Quantitative:** multiple data sources/screen universe, identify potential manager, evaluate performance & risk of prospects

## Manager Due Diligence

- **Qualitative:** face to face manager meetings, review firm strategy & process, detailed portfolio reviews, reference checks
- **Quantitative:** due diligence of existing managers, attribution, verify performance, assess risk

## Portfolio Construction & Risk Management

- **Qualitative:** bottom-up portfolio construction, look for organizational “cracks” & process changes
- **Quantitative:** review targeted policy allocation & portfolio tilts, determine benchmark & manager allocations, perform risk analysis, monitor exposures



<sup>1</sup>Effective February 2020, this is the MSCI ACWI IMI (net VRS tax rates) index; prior periods included several other representative benchmarks.

<sup>2</sup>Effective March 2017, this is a weighted average of MSCI U.S. Standard and MSCI U.S. Small Cap indices; prior periods are other representative benchmarks

<sup>3</sup>Effective February 2020, this is a weighted average of MSCI World ex U.S. Standard (net VRS tax rates) and MSCI World ex U.S. Small Cap (net of VRS tax rates) indices; prior periods are other representative benchmarks

<sup>4</sup>Effective April 2009, this is the MSCI Emerging IMI (net of VRS tax rates); prior periods are other representative benchmarks

<sup>5</sup>Effective February 2020, this is the MSCI ACWI Standard (net of VRS tax rates) index; prior periods are other representative benchmarks

<sup>6</sup>Effective February 2020, this is the MSCI ACWI IMI (net of VRS tax rates) index; prior periods are other representative benchmarks

# Fixed Income

Parham Behrooz & Greg Oliff  
Co-Directors



# Agenda: Fixed Income Annual Review Topics

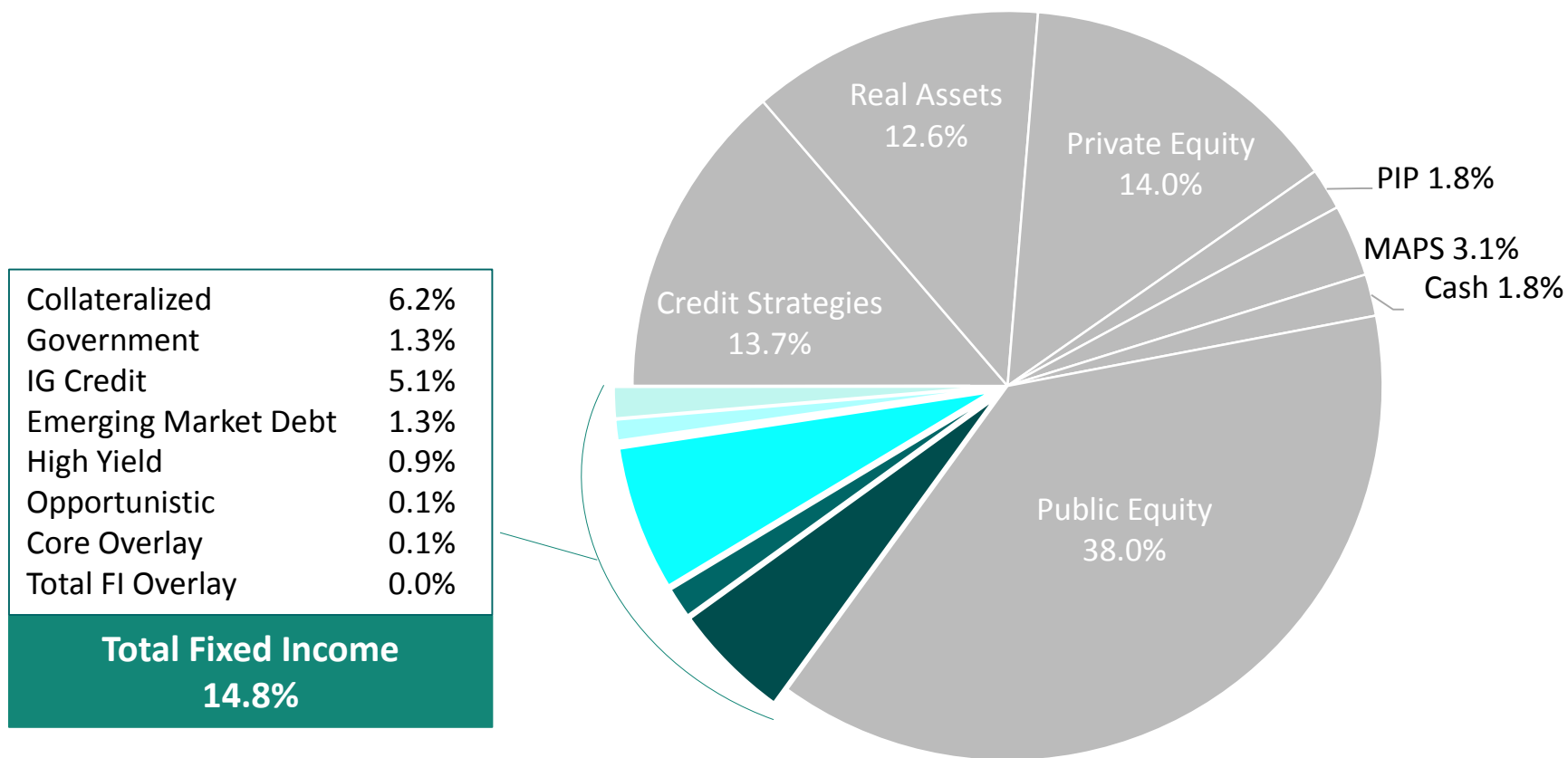


# Overview: Team Members



Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
<b>Parham Behrooz</b>	<b>Co-Director</b>	<b>BS</b>	<b>CFA</b>	<b>24</b>	<b>8</b>
<b>Greg Oliff</b>	<b>Co-Director</b>	<b>MBA</b>	<b>CFA</b>	<b>13</b>	<b>10</b>
Mehtab Haleem	Sr. Investment Officer	MS		12	<1
Teresa Nguyen	Sr. Investment Officer	BA	CFA	19	4
Edward Norfleet	Sr. Investment Officer	MBA	CFA	10	7
Nick Toporkov	Investment Officer	PhD		2	2
Delaney Brown	Sr. Investment Analyst	BS	CFA	4	1
Michael Desai	Sr. Investment Analyst	MS		4	<1
Additional Resources	Investment Operations Department & Portfolio Intelligence Team				

# Overview: Asset Allocation as of 12/31/20



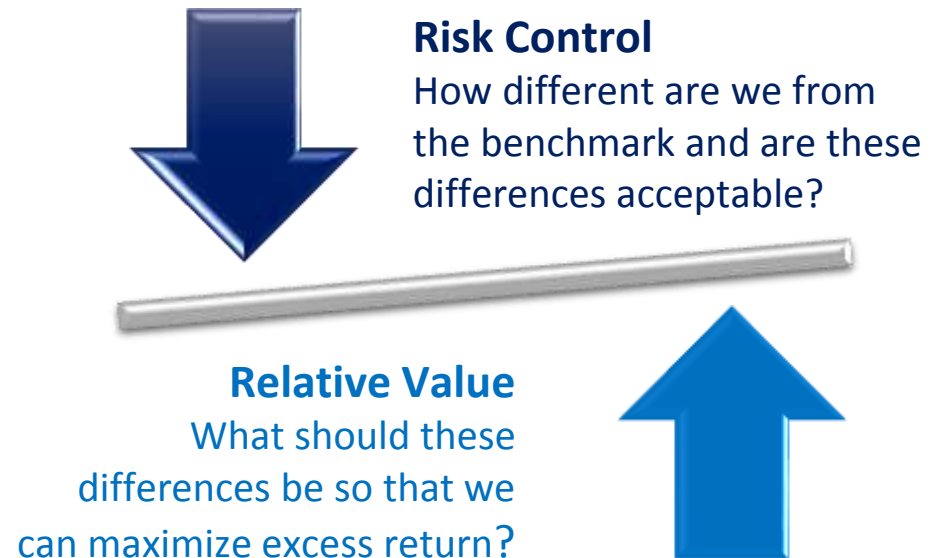
Market values as of 12/31/2020; Source: BNY Mellon data



# Overview: Philosophy

## Risk Controlled Relative Value

Market factors provide opportunities to add value through optimal sector allocation and security selection, while managing risk exposures to the benchmark within controlled parameters

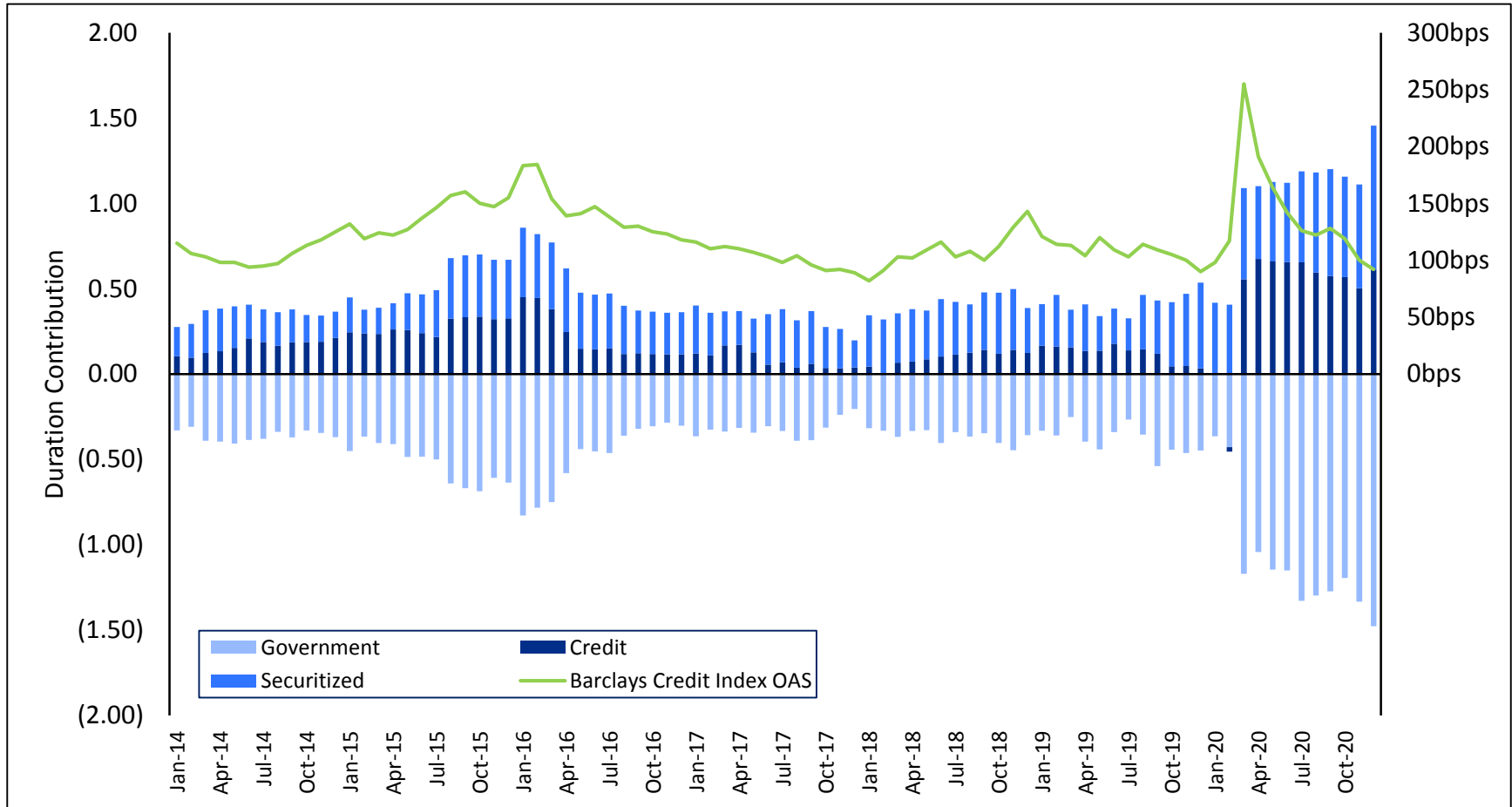


**The Fixed Income Program serves as a diversifying asset class, historically providing a hedge against a deflationary economic environment.**

# Markets: Data: Jan 2018 - Mar 2021

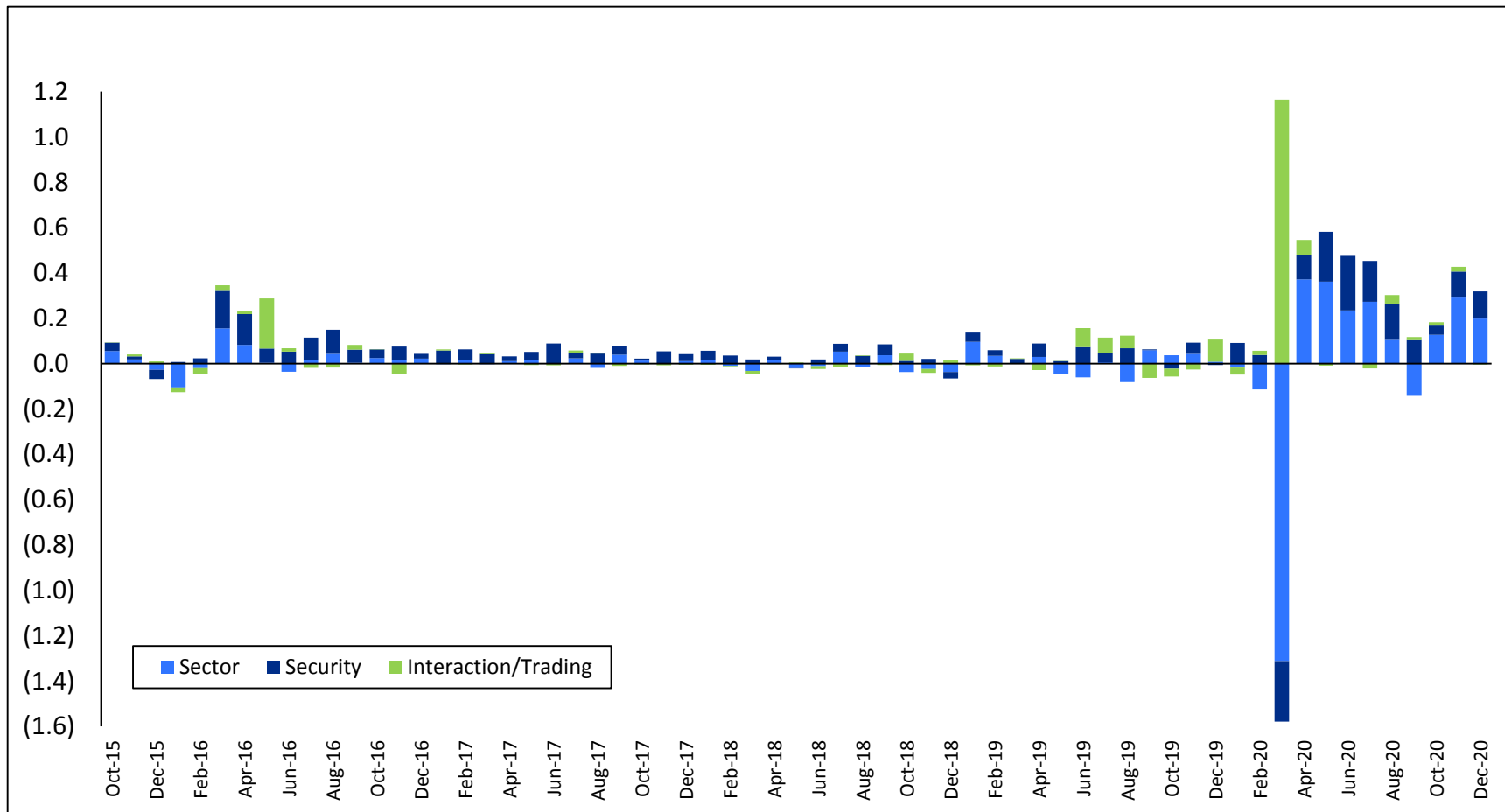


# Markets: History of Core Sector Tilts



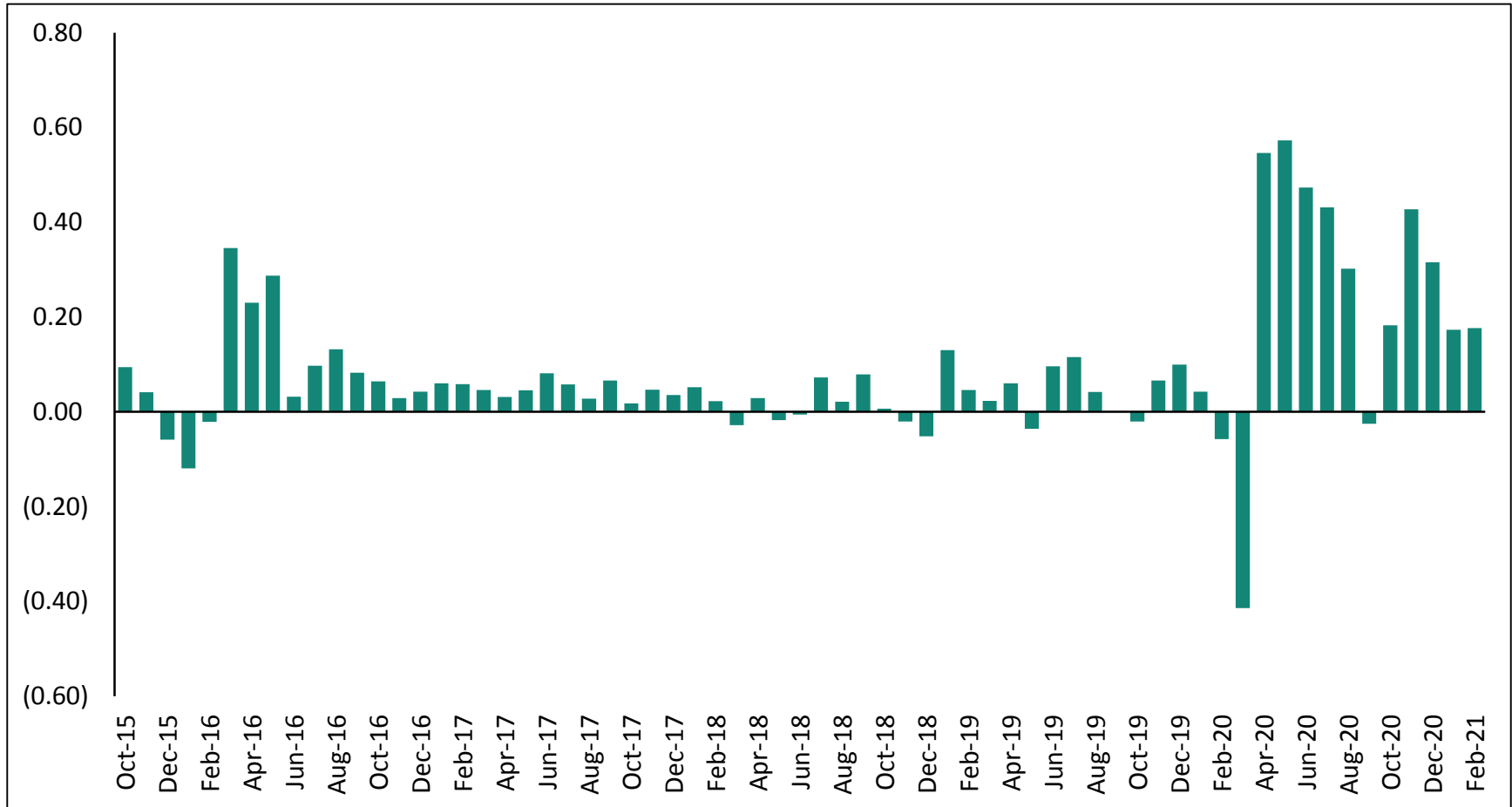
Source: Aladdin, Bloomberg

# Markets: Excess Return Attribution



Source: Aladdin, Bloomberg

# Markets: Program Monthly Excess Returns

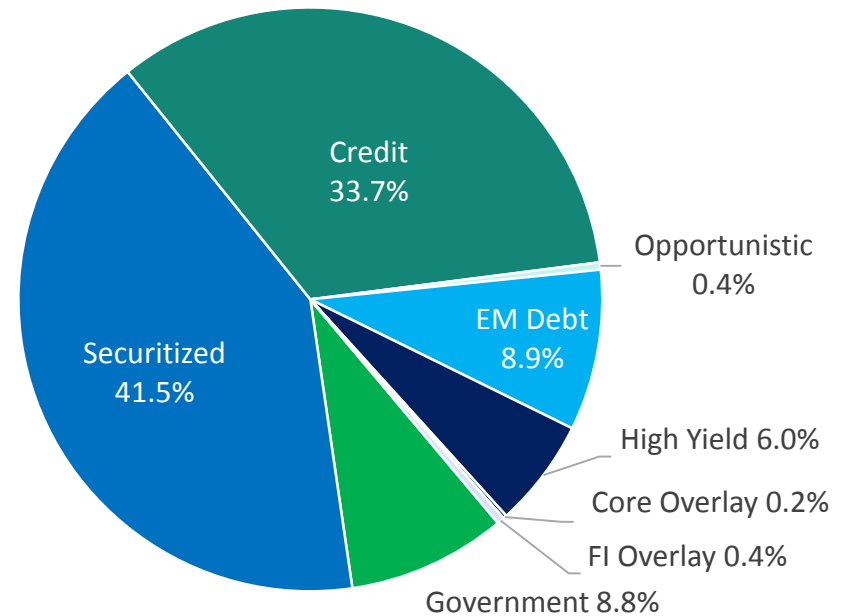


Source: BNY Mellon, VRS

# Exposures: Fixed Income Snapshot as of 12/31/20



VRS Internal Fixed Income Portfolios		
Strategy	Market Value (\$MM)	Market Value (%)
Government	1,075.4	8.8
Securitized	5,083.1	41.5
Credit	4,134.4	33.7
Opportunistic	50.5	0.4
EM Debt	1,091.5	8.9
High Yield	730.4	6.0
Core Overlay	29.9	0.2
FI Overlay	55.0	0.4
<b>Total</b>	<b>12,250.2</b>	<b>100.0</b>



## Highlights From Past Year

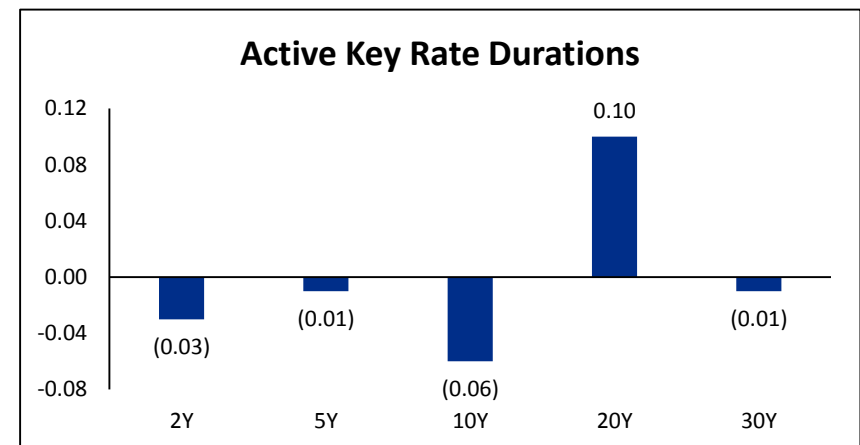
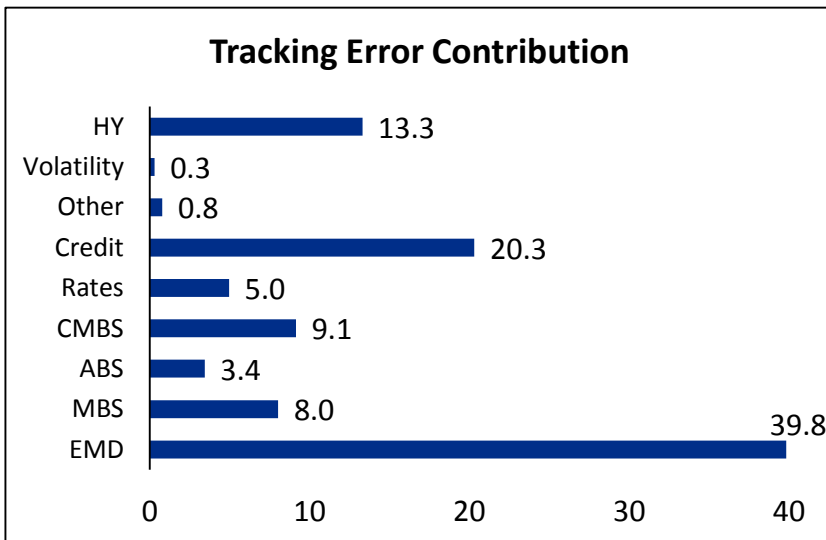
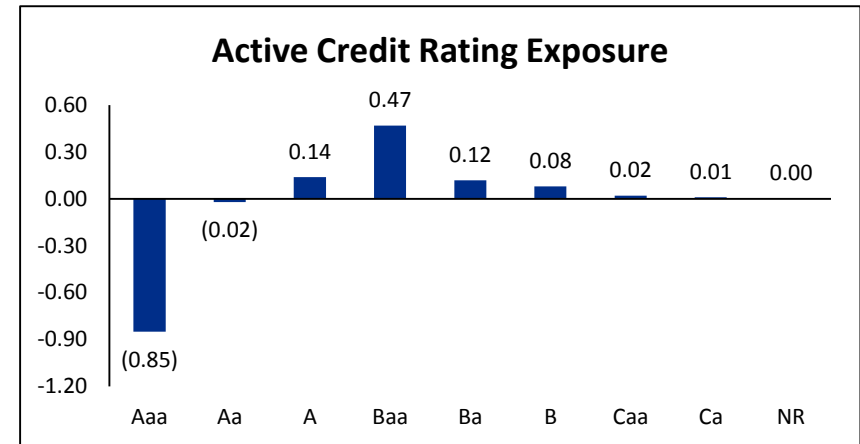
- Capitalized on opportunities from March COVID related market dislocation
- Robust processes and market knowledge helped team realize strong outperformance
- Furthered long-term plan of deeper sector specialization coupled with cross training
- Onboarded two new team members virtually

# Exposures: Portfolio Characteristics as of 12/31/20



**Total Fixed Income Program Market Value: \$13,325,456,888**

Portfolio Characteristics			
	Port	Bench	Diff
Effective Duration	6.24	6.27	(0.03)
Yield to Maturity	2.03	1.42	0.61
Option Adj. Spread	118	68	50



# Results: Attribution Factors For CY'20



## Program Level

- COVID-19 created a significant market dislocation in early 2020
- Substantial monetary and fiscal stimulus programs buoyed capital markets
- Sector allocation decisions added 38 basis points to excess return

## Portfolio Level

- Fixed income portfolio realized substantial outperformance in fiscal year
- Team took advantage of robust processes and capitalized on opportunities to add risk during market turmoil, in which sector specialization was key
- Security selection added 115 basis points to the Program's excess return
- The remaining excess return during CY'20 came from interaction/trading



# Results: Risk/Return Characteristics as of 12/31/20



## Program Excess Return and Statistics

	Since July 2012*	5 Year	3 Year	1 Year
<b>Core FI Program</b>	<b>0.40</b>	<b>1.02</b>	<b>1.18</b>	<b>2.84</b>
Tracking Error	0.42	0.52	0.63	0.94
Information Ratio	0.95	1.97	1.89	3.03
<b>Total FI Program</b>	<b>0.54</b>	<b>1.11</b>	<b>1.25</b>	<b>3.00</b>
Tracking Error	0.95	0.56	0.68	1.03
Information Ratio	0.57	1.97	1.83	2.92

## Batting Average

### Monthly Excess Returns\*

Core FI Program	77/102	75%
-----------------	--------	-----

\*Beginning July 2012, FI transitioned all assets internally and implemented our enhanced investment approach.

# Results: Portfolio as of 12/31/20



## Portfolio Excess Return and Statistics

	Since July 2012*	5 Year	3 Year	1 Year
<b>Government</b>	<b>0.32</b>	<b>0.38</b>	<b>0.35</b>	<b>0.67</b>
Tracking Error	0.15	0.17	0.21	0.35
Information Ratio	2.08	2.20	1.68	1.90
<b>Securitized</b>	<b>0.56</b>	<b>0.61</b>	<b>0.67</b>	<b>1.91</b>
Tracking Error	0.47	0.53	0.67	1.08
Information Ratio	1.20	1.16	0.99	1.77
<b>Credit</b>	<b>0.72</b>	<b>1.09</b>	<b>1.03</b>	<b>1.72</b>
Tracking Error	0.35	0.29	0.28	0.31
Information Ratio	2.07	3.72	3.63	5.50
<b>Opportunistic*</b>	<b>–</b>	<b>0.94</b>	<b>1.12</b>	<b>3.27</b>
Tracking Error	–	0.79	3.86	0.98
Information Ratio	–	1.19	3.40	3.35

\*Beginning July 2012, FI transitioned all assets internally and implemented our enhanced investment approach.

# Results: Portfolio as of 12/31/20



## Portfolio Excess Return and Statistics

	Since Inception*	1 Year	Fiscal YTD	3 Months
<b>Internal EMD</b>	<b>0.25</b>	<b>0.58</b>	<b>0.66</b>	<b>0.30</b>
Tracking Error	0.76	0.77	–	–
Information Ratio	0.32	0.96	–	–
<b>Payden &amp; Rygel EMD</b>	<b>1.68</b>	<b>1.68</b>	<b>2.31</b>	<b>1.47</b>
<b>PIMCO EMD</b>	<b>1.05</b>	<b>1.05</b>	<b>1.84</b>	<b>1.19</b>
<b>Internal High Yield</b>	<b>(0.50)</b>	<b>(1.64)</b>	<b>(0.03)</b>	<b>(0.34)</b>
<b>AQR High Yield</b>	<b>(5.33)</b>	<b>(5.33)</b>	<b>0.20</b>	<b>(0.21)</b>
<b>Man Numeric High Yield</b>	<b>0.99</b>	<b>–</b>	<b>0.99</b>	<b>0.73</b>

\*Inception dates: Internal EMD Portfolio 11/2018, Internal HY Portfolio 7/2019, External EMD & AQR HY Portfolios 1/2020, Man Numeric HY 7/2020

# Looking Forward: Where Are We focusing?



**Continue To Implement Long Term Vision For The Program**

**Continue to Find Ways To Collaborate in Efforts To Add Value To VRS**

## **On The Radar**

- Enhancements to portfolio processes and program cross training
- Explore quantitative closed-end fund strategy
- Expand into more value-adding ideas in the Opportunistic Portfolio
- Cross-asset class working groups to enhance expertise

# People: Collaboration Across Programs



## Portfolios

---

- IEM: Systematic High Yield & Total Fund Rebalance Portfolio
- RBI: RBI Risk Hedging Portfolio
- Operations: Collateral Management Portfolio
- CS: CS Overlay Portfolio

## People

---

- Intentional Touch Points Across Programs
- External Manager Partnership Sessions
- Factor Based Investing Work
- Individual Team Member Collaboration

# Investment Advisory Committee

April 14, 2021

# Virginia Retirement System (VRS) Defined Benefit Plan Investment Beliefs Statements

Approved by the Board of Trustees: \_\_\_\_\_, 2021

---

## I. Introduction

The VRS Board of Trustees (Board) developed Investment Beliefs to guide the strategic management of the VRS investment portfolio. These Investment Beliefs represent a high-level framework for making decisions that require balancing multiple and competing factors. In addition, the Investment Beliefs provide context for VRS actions and reflect VRS values, with a focus on maintaining the long-term commitment to provide benefits to participants.

## II. VRS Investment Beliefs Statements

The Board developed the following Investment Beliefs Statements to guide its decisions and provide an anchor to the stated goals and objectives.

### Goals and Objectives

- 1) The primary objective of the VRS investment portfolio is to achieve the highest level of return for a given level of risk over the long term.
- 2) With respect to VRS' investments, the VRS Board has two key roles:
  - a. Establish the overall level of investment risk for the Fund:
    - i. Total Risk (range of outcomes that the VRS total portfolio is likely to experience). Total risk is determined largely by the Strategic Allocation Policy as set by the Board. Total risk is the larger of the two risks.
    - ii. Relative Risk (range of outcomes in relation to Strategic Allocation Policy benchmark). Once the Board establishes this range, staff is expected to add value over the investment performance policy benchmark by an amount commensurate with that amount of relative risk allowed. While material, relative risk is typically a fraction of total risk.

- b. Establish and monitor investment guidelines that are then delegated to staff to implement consistent with the risks above.
- 3) As VRS conducts its investment activities, it seeks to strike a balance among three competing objectives:
- a. Achieving Long-Term Funding Progress – In order to achieve long-term funding goals, VRS must allocate to asset classes and strategies that take advantage of equity and illiquidity risk factors. Such allocations introduce volatility into the Fund.
  - b. Avoiding Short-Term Drawdown Risk – Higher exposures to equity and liquidity risk increase the probability of large short-term mark-to-market declines in the Fund’s value. However, investment strategies to avoid shortfall risk may lead to a reduced long-term investment return, increasing the likelihood of falling short of long-term funding goals.
  - c. Avoiding Contribution Volatility – Short-term mark-to-market declines in the Fund’s value can cause intermediate term increases in required contribution rates. However, investment strategies that seek to reduce volatility may lead to a reduced long-term investment return, thus requiring higher overall contribution rates and raising long-term costs for employers.

#### **VRS Access and Structural Advantages**

- 4) In order to achieve the necessary long-term returns, VRS focuses on two premiums that typically reward long-term investors: the equity risk premium and the illiquidity risk premium. Both risk premiums vary over short to intermediate periods; however, over longer horizons, both risk premiums have historically produced positive returns.
- 5) VRS has the size and capabilities to pursue global opportunities, which offer a vast array of investments across a wide spectrum of domestic and international markets.
- 6) Diversification can take the form of exposure or time:
  - a) Multiple asset classes/risk premiums enhance the return-risk tradeoff of VRS’ investment portfolio, particularly over short-to-intermediate horizons.
  - b) Vintage year diversification, as well as dollar-cost averaging, in and out of investments helps mitigate the impact of market volatility.



- 7) Portfolio management is an active and dynamic process. Market inefficiencies exist in varying degrees across and within all asset classes in which VRS invests. Using both internal and external management capabilities, VRS can add value exploiting these inefficiencies.

### **Staff Implementation Parameters**

- 8) VRS has the governance structure, staffing and resources to leverage the cost savings associated with managing assets in-house. Given these attributes, staff should continue to explore further expansion of internal capabilities in areas that leverage staff's expertise in a cost-effective manner.
- 9) VRS has a long history of investment innovation and the Board encourages staff to continue to explore, access and implement creative investment approaches and strategies. Staff is expected to monitor new initiatives closely, and the Board recognizes that not all may develop into permanent strategies.
- 10) Costs (management fees, commissions, transaction costs, etc.) related to managing the VRS investment program are significant and have a material impact upon long-term performance. As an experienced, large-scale investor, VRS will seek to maximize its negotiating leverage to manage its assets in a cost-effective manner.
- 11) VRS believes it is difficult to successfully add value by making frequent, large scale shifts between major asset classes; however, smaller-scale shifts and tilts across asset class segments can add incremental value when based on sound relative value judgments.
- 12) Leverage is a financial tool that can be utilized in a prudent and thoughtful manner to help balance risk exposures, and in turn, enhance the risk/return profile of a portfolio.
- 13) VRS' Investment Staff develops, strengthens and retains its intellectual capital, so that it can remain successful through industry leadership and innovation. This is primarily advanced by collaboration among asset class and functional area teams. Secondly, external relationships with like-minded global partners are identified and cultivated to broaden investment reach. With both internal and external personnel, success is based on cooperation, trust and transparency.