

Factor Investing

NBER Conference on Long Term Asset Management

May 2019

Feifei Li, PhD

Partner, Head of Investment Strategy
Research Affiliates

Road Map

1. Factor Investing in practitioners' world
2. Caveats in Factor Investing
3. What do we do?

What Is Factor Investing?

Factor Investing in the Practitioners' World

Definition:

Factor investing is an investment approach that harvests persistent sources of excess returns and offers above market returns

Most popular applications:

- Equity: Style investing ; smart beta
- Multi-Asset classes

Factor investing/smart beta index funds have many benefits:

- Exposure to well-studied sources of return
- Typically low fees
- Transparency

The Promise

Influential 2009 paper

Evaluation of Active Management of the Norwegian Government Pension Fund – Global

December 14, 2009

Andrew Ang

Ann F. Kaplan Professor of Business, Columbia Business School

William N. Goetzmann

Edwin J. Beinecke Professor of Finance and Management Studies, Yale School of Management

Stephen M. Schaefer

Professor of Finance, London Business School

The Realization Disappointment

MAGAZINE ISSUES » APRIL 2019

Factor investing: Is factor investing broken?



Factor investing held out a promise to replicate the investment styles of the world's top active managers. So, why has this method let investors down? *George Mitton* reports.

Blame it on the Norwegians. It was an influential study of that nation's national oil fund that made factor investing the most fashionable investment method for institutions in the past decade.

Caveats in Factor Investing?

Reality of Factor Investing

Factor investing has failed to live up to many of its promises.
It's success is compromised by three risks often
underappreciated by investors:

1. Exaggerated expectation about factor performance due to
 - Data mining
 - Crowding and rising valuations
 - Ignorance of trading costs and implementability
2. Factors sometimes experience drawdowns that far exceed expectations
3. Diversification vanishes as correlations sometimes soar

Unrealistic Expectations

Factor Performance in the Long Run, United States, July 1963–June 2018

Factor	Average Year of Discovery	Average Return	Average Volatility	t-stat	CAPM Alpha	CAPM Alpha t-stat	CAPM Beta	CAPM Beta t-stat
Market	1964	4.20	10.00	3.11				
Value	1990	4.15	10.00	3.07	5.24	3.99	-0.26	-6.90
Size	1975	2.53	10.00	1.87	1.32	1.02	0.29	7.69
Operating profitability	2013	3.70	10.00	2.74	4.74	3.60	-0.25	-6.57
Investment	2003	4.32	10.00	3.20	5.80	4.56	-0.35	-9.69
Momentum	1989	5.48	10.00	4.06	6.06	4.50	-0.14	-3.57
Low beta	1966	0.16	10.00	0.12	3.18	3.36	-0.72	-26.46
Idiosyncratic volatility	2000	1.62	10.00	1.20	4.34	4.18	-0.65	-21.73
Short-term reversals	1987	5.34	10.00	3.96	4.13	3.17	0.29	7.70
Illiquidity	1997	3.01	10.00	2.23	3.96	2.99	-0.23	-5.99
Accruals	1991	4.31	10.00	3.20	4.93	3.67	-0.15	-3.81
Cash flow to price	1990	4.82	10.00	3.57	6.34	5.01	-0.36	-9.98
Earnings to price	1971	3.76	10.00	2.78	5.49	4.44	-0.41	-11.65
Long-term reversals	1982	3.43	10.00	2.55	3.50	2.57	-0.02	-0.39
Net share issues	2003	5.28	10.00	3.91	6.97	5.60	-0.40	-11.26
Average of factors 1–6	1989	3.39	10.00	2.51	4.39	3.50	-0.24	-7.58
Average of factors 7–14	1990	3.95	10.00	2.92	4.96	3.95	-0.24	-7.14
Average of other 33 factors	2000	3.58	10.00	2.64	4.44	3.48	-0.20	-5.89

Note: All factors are scaled to 10% volatility. Factor portfolios are equally weighted and also scaled to 10% volatility.

Source: Research Affiliates, LLC, using data from CRSP/Compustat.

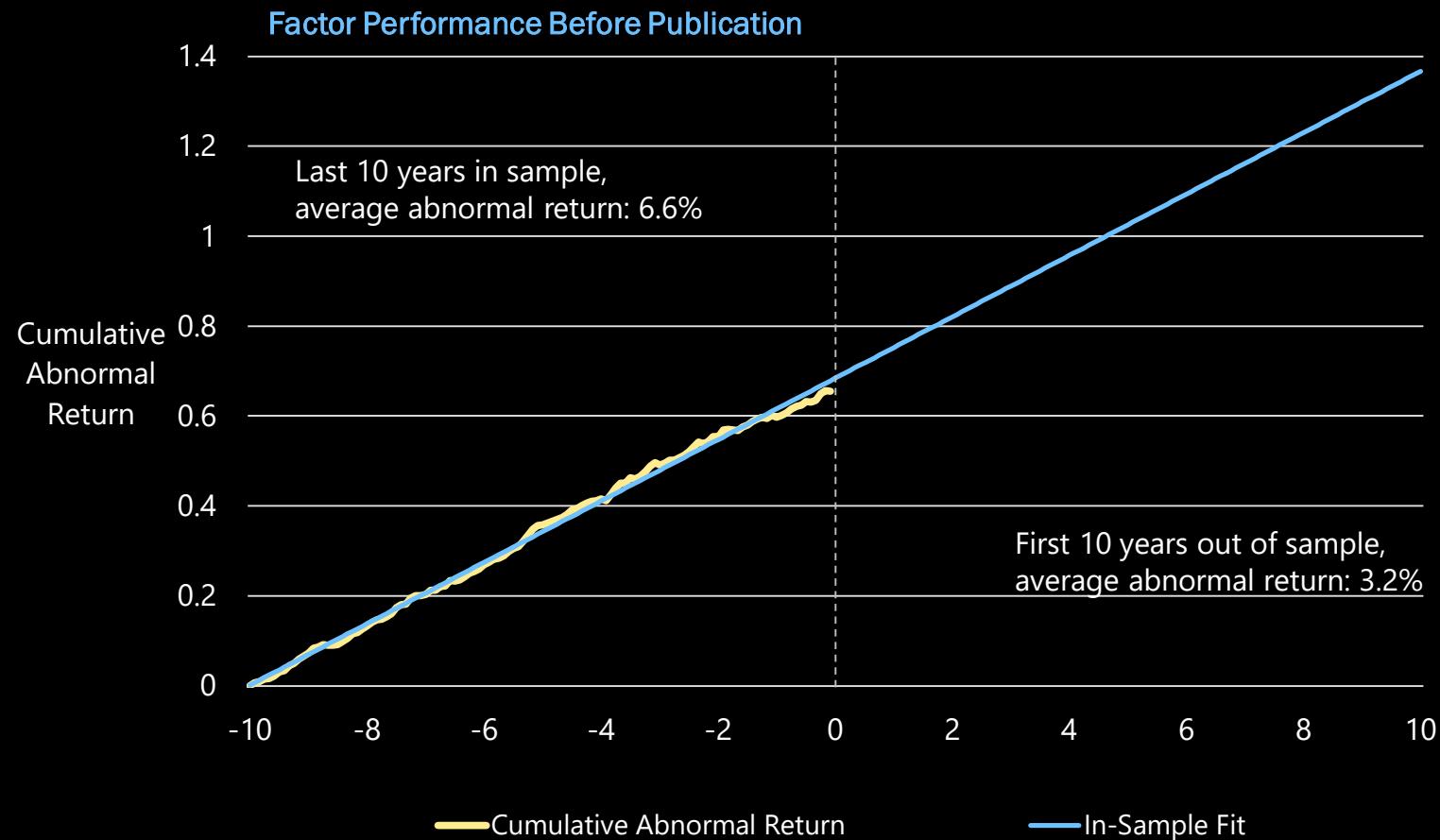
Factor Performance in the Long Run, United States, July 1963–June 2018

Factor			Average Year of Discovery	Average Return	Average Volatility	t-stat	CAPM Alpha	CAPM Alpha t-stat	CAPM Beta
Portfolios of factors	Average of factors 1–6		1989	3.39	10.00	2.51	4.39	3.50	-0.24
	Average of factors 7–14		1990	3.95	10.00	2.92	4.96	3.95	-0.24
	Average of other 33 factors		2000	3.58	10.00	2.64	4.44	3.48	-0.20
	No rebalancing, no vol. scaling	1–6	1989	3.61	5.17	5.18	4.44	6.82	-0.20
		7–14	1990	3.91	5.20	5.57	4.67	7.04	-0.18
		Other 33	2000	5.14	4.79	7.94	6.14	10.89	-0.24
	Monthly rebalancing, no vol. scaling	1–6	1989	3.39	4.60	5.47	4.39	8.22	-0.24
		7–14	1990	3.95	5.42	5.40	4.96	7.51	-0.24
		Other 33	2000	3.57	3.47	7.62	4.42	11.53	-0.20
	Monthly rebalancing, 10% vol. scaled	1–6	1989	7.38	10.00	5.47	9.55	8.22	-0.52
		7–14	1990	7.28	10.00	5.40	9.15	7.51	-0.44
		Other 33	2000	10.28	10.00	7.62	12.73	11.53	-0.58

Note: All factors are scaled to 10% volatility. Factor portfolios are equally weighted and also scaled to 10% volatility.

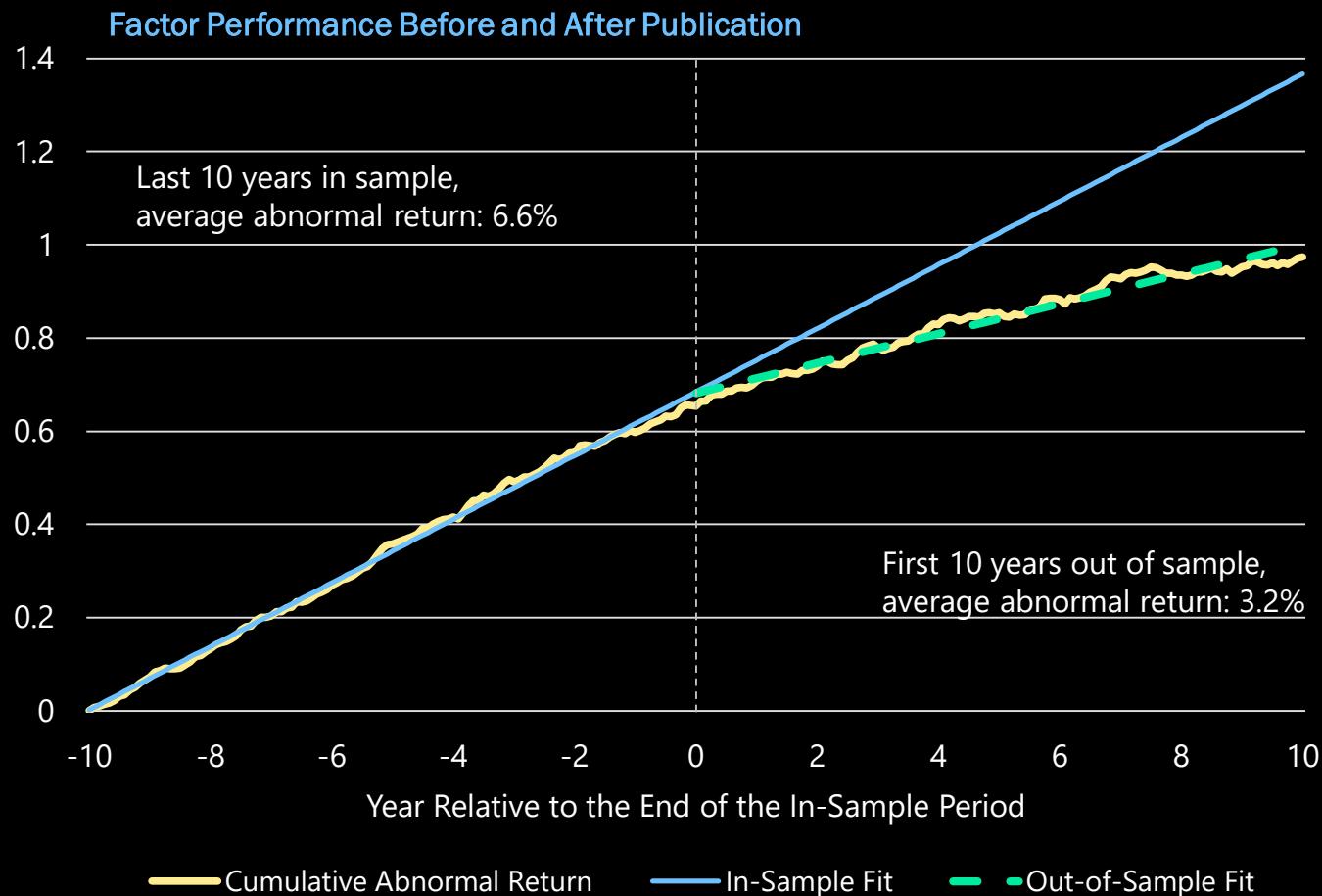
Source: Research Affiliates, LLC, using data from CRSP/Compustat.

Cumulative Factor Performance Before and After Publication



Source: Research Affiliates, LLC, using data from CRSP/Compustat from July 1963–June 2018.

Cumulative Factor Performance Before and After Publication



Source: Research Affiliates, LLC, using data from CRSP/Compustat from July 1963–June 2018.

Recent Average Annual Factor Returns, United States, July 2003–June 2018

Factor		Average Year of Discovery	Average Return	Average Volatility	t-stat	CAPM Alpha	CAPM Alpha t-stat	CAPM Beta
Average of factors 1–6		1989	1.20	10.00	0.46	2.12	0.96	-0.14
Average of factors 7–14		1990	1.17	10.00	0.45	1.64	0.69	-0.07
Average of other 33 factors		2000	1.64	10.00	0.63	2.86	1.23	-0.18
Portfolios of factors	No rebalancing, no vol. scaling	1–6	1989	1.12	3.97	1.09	1.98	1.99
		7–14	1990	1.04	4.31	0.93	1.49	1.32
		Other 33	2000	1.70	3.34	1.96	3.02	4.23
	Monthly rebalancing, no vol. scaling	1–6	1989	1.20	3.86	1.20	2.12	2.23
		7–14	1990	1.17	4.07	1.11	1.64	1.55
		Other 33	2000	1.64	3.11	2.04	2.86	4.27
	Monthly rebalancing, 10% vol. scaled	1–6	1989	3.10	10.00	1.20	5.50	2.23
		7–14	1990	2.89	10.00	1.11	4.03	1.55
		Other 33	2000	5.29	10.00	2.04	9.20	4.27

Note: All factors are scaled to 10% volatility. Factor portfolios are equally weighted and also scaled to 10% volatility.

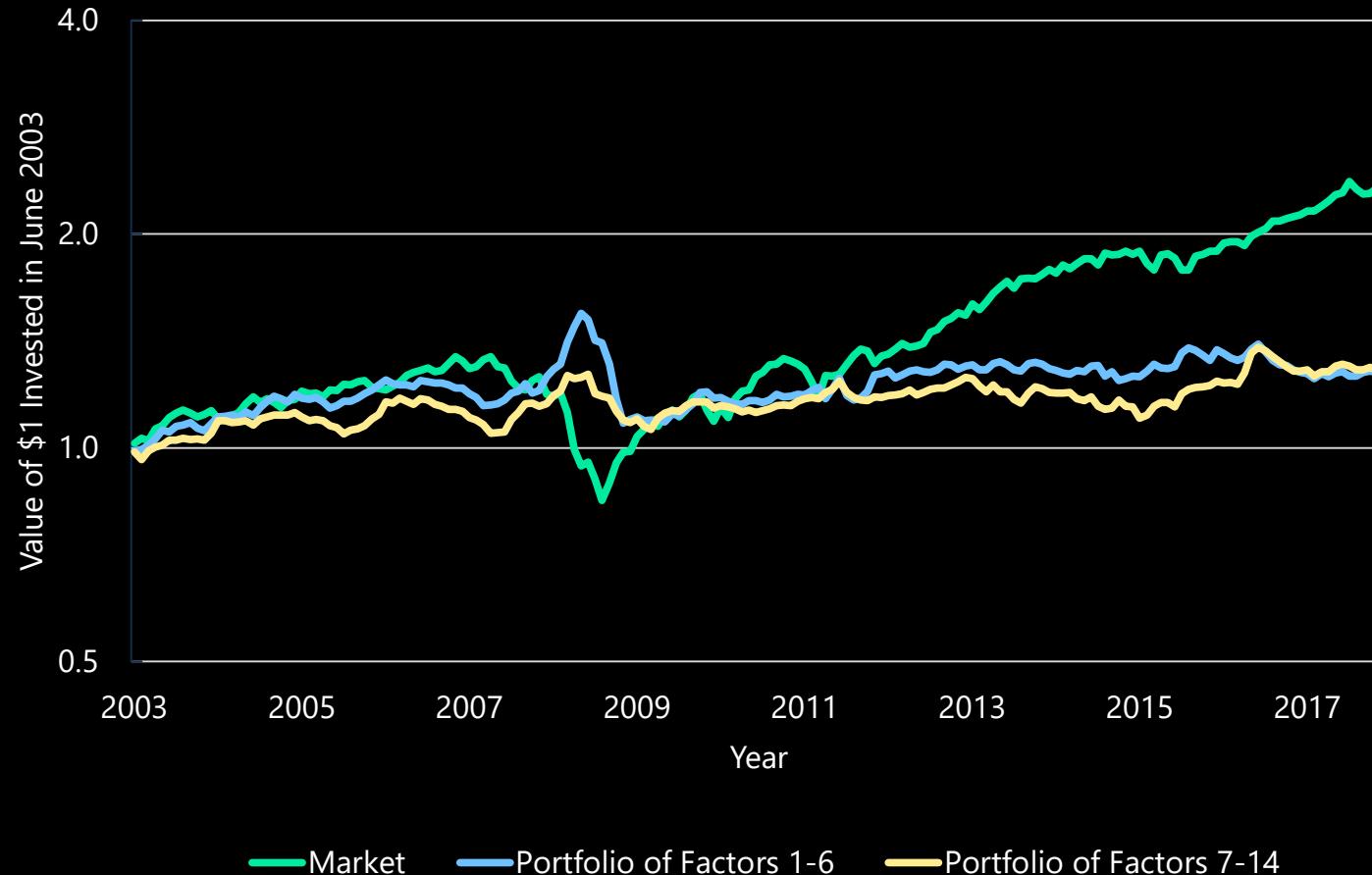
Source: Research Affiliates, LLC, using data from CRSP/Compustat.

Factor Performance in the Long Run, United States, July 1963–June 2018



Source: Research Affiliates, LLC, using data from CRSP/Compustat.

Recent Average Annual Factor Returns, United States, July 2003–June 2018

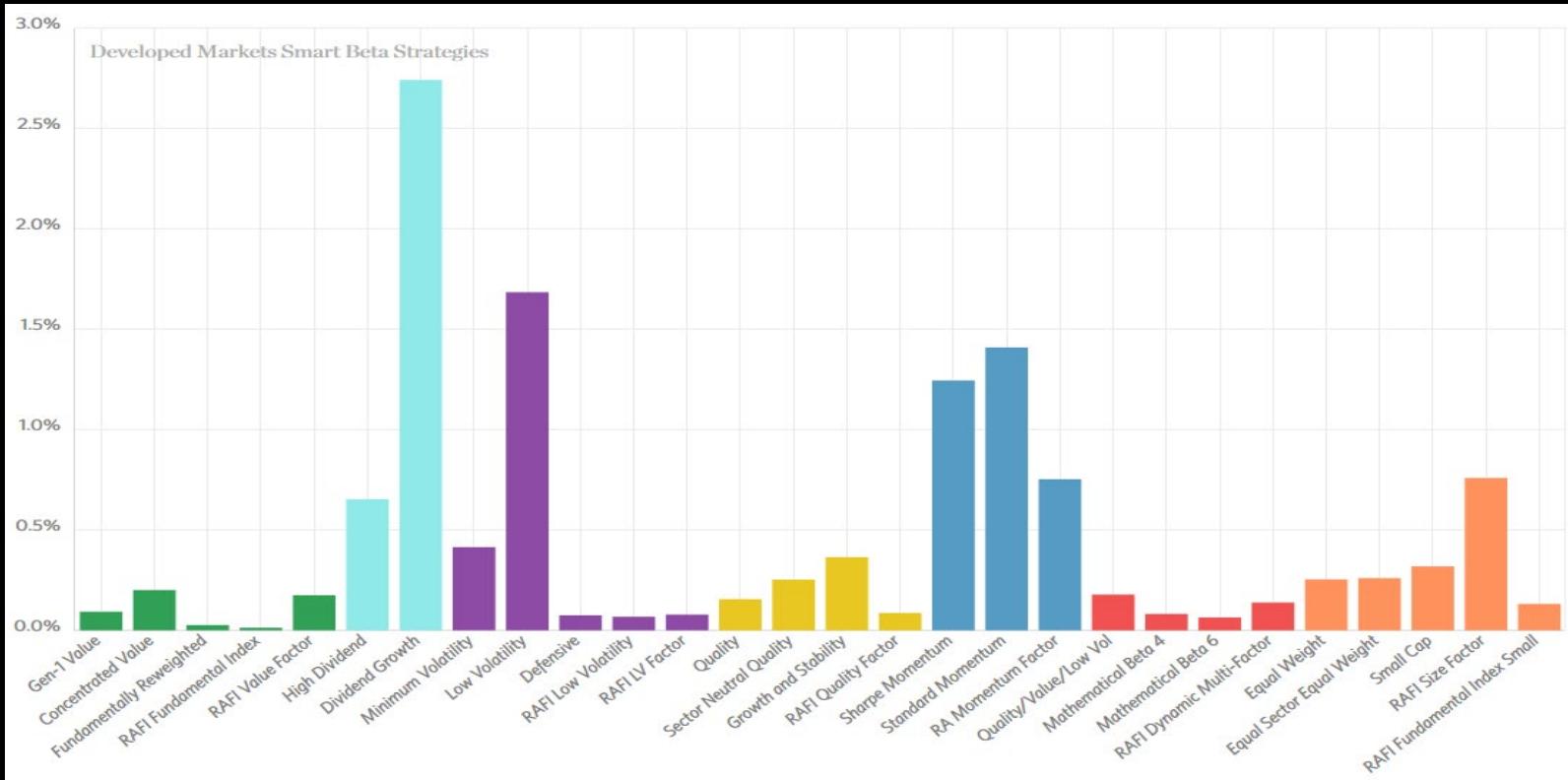


Source: Research Affiliates, LLC, using data from CRSP/Compustat.

Implementation Costs Make Things Worse

Poor Smart Beta Index Design Can Lead to High Costs

Trading Costs – Developed Markets



<https://interactive.researchaffiliates.com/smart-beta.html>

Source: Research Affiliates, LLC, using data from CRSP/Compustat and Datascope/Worldstream as of 12/31/2018.

Annualized trading costs are estimated as the market impact of transactions, assuming \$10B in AUM. For descriptions of the strategies shown, please see <https://interactive.researchaffiliates.com/smart-beta.html>. Strategy returns and characteristics are simulated. Please see important information at the end of this presentation regarding simulated data.

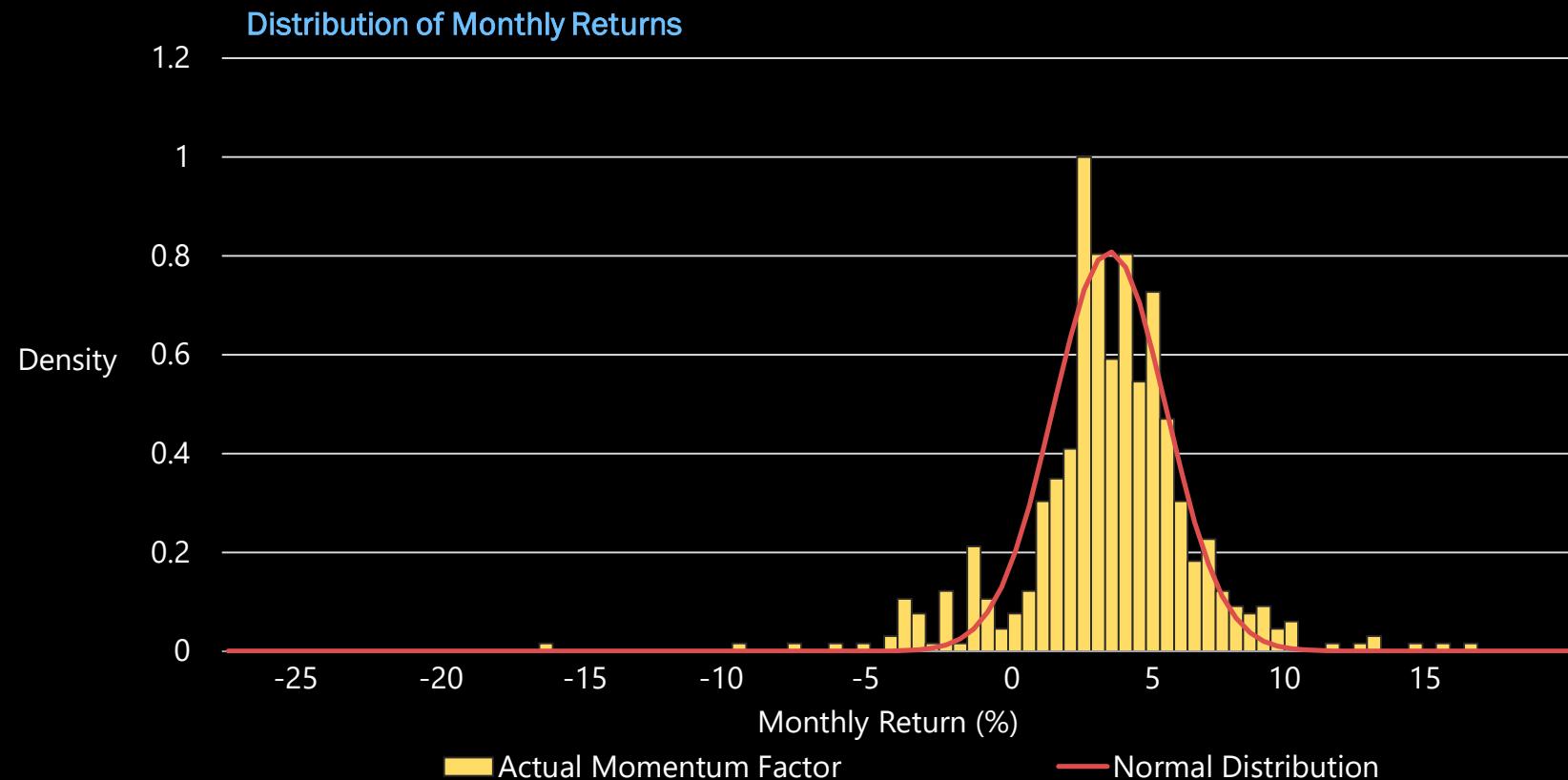


Difference in expense ratios
for smart beta strategies:
2 – 20 bps.

*Market Impact
by poorly
engineered funds:
200+ bps!*

Factors Are Prone to Crashes

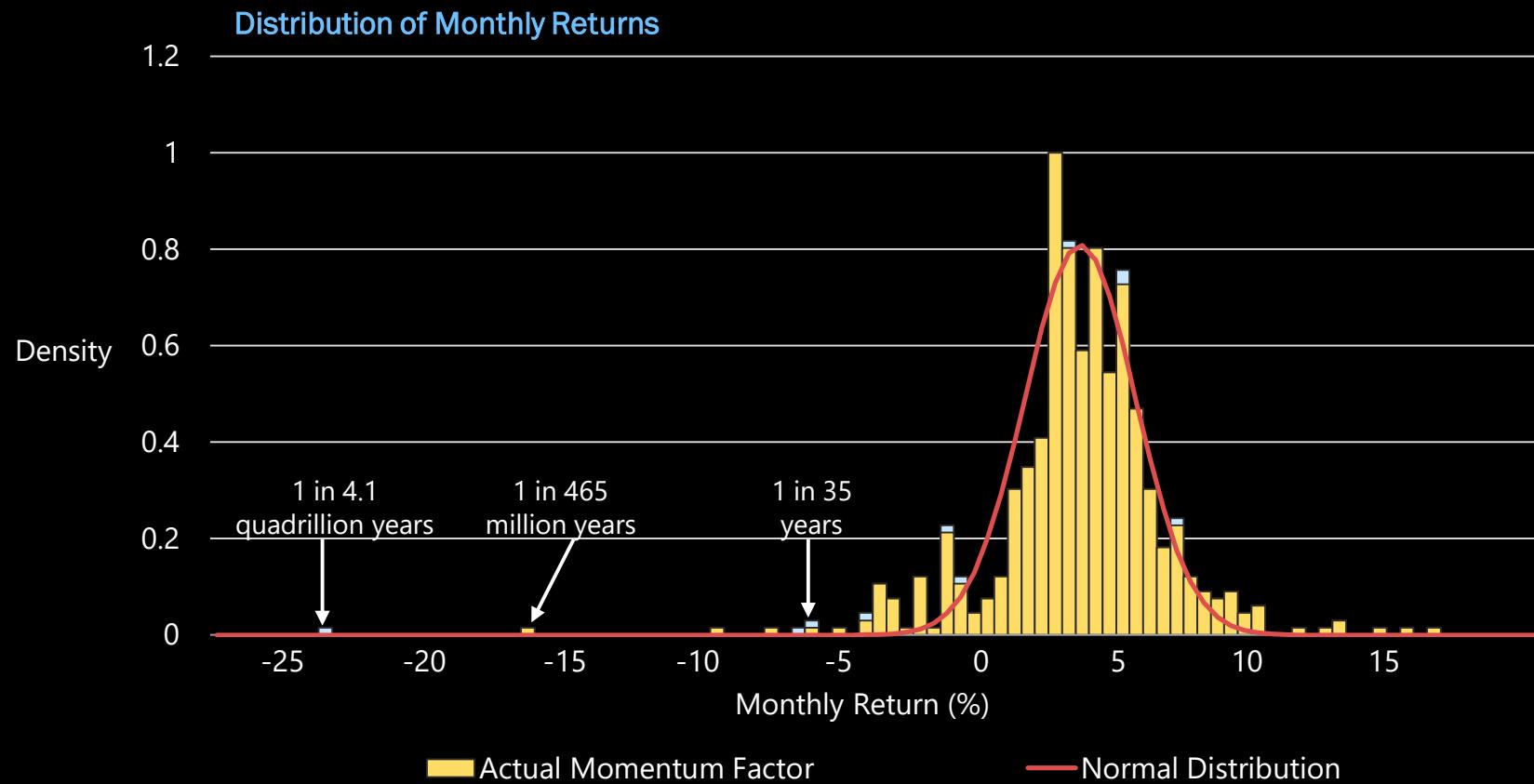
“Normally” Distributed Momentum



This is the monthly momentum return distribution from July 1963 through February 2009.

Source: Research Affiliates, LLC, using data from CRSP/Compustat.

“Normally” Distributed Momentum



The light blue bars denote the monthly momentum returns from March 2009 through December 2009.

Source: Research Affiliates, LLC, using data from CRSP/Compustat.

Momentum Crash: Actual vs. Hypothetical, United States, July 2003–June 2018



Source: Research Affiliates, LLC, using data from CRSP/Compustat.

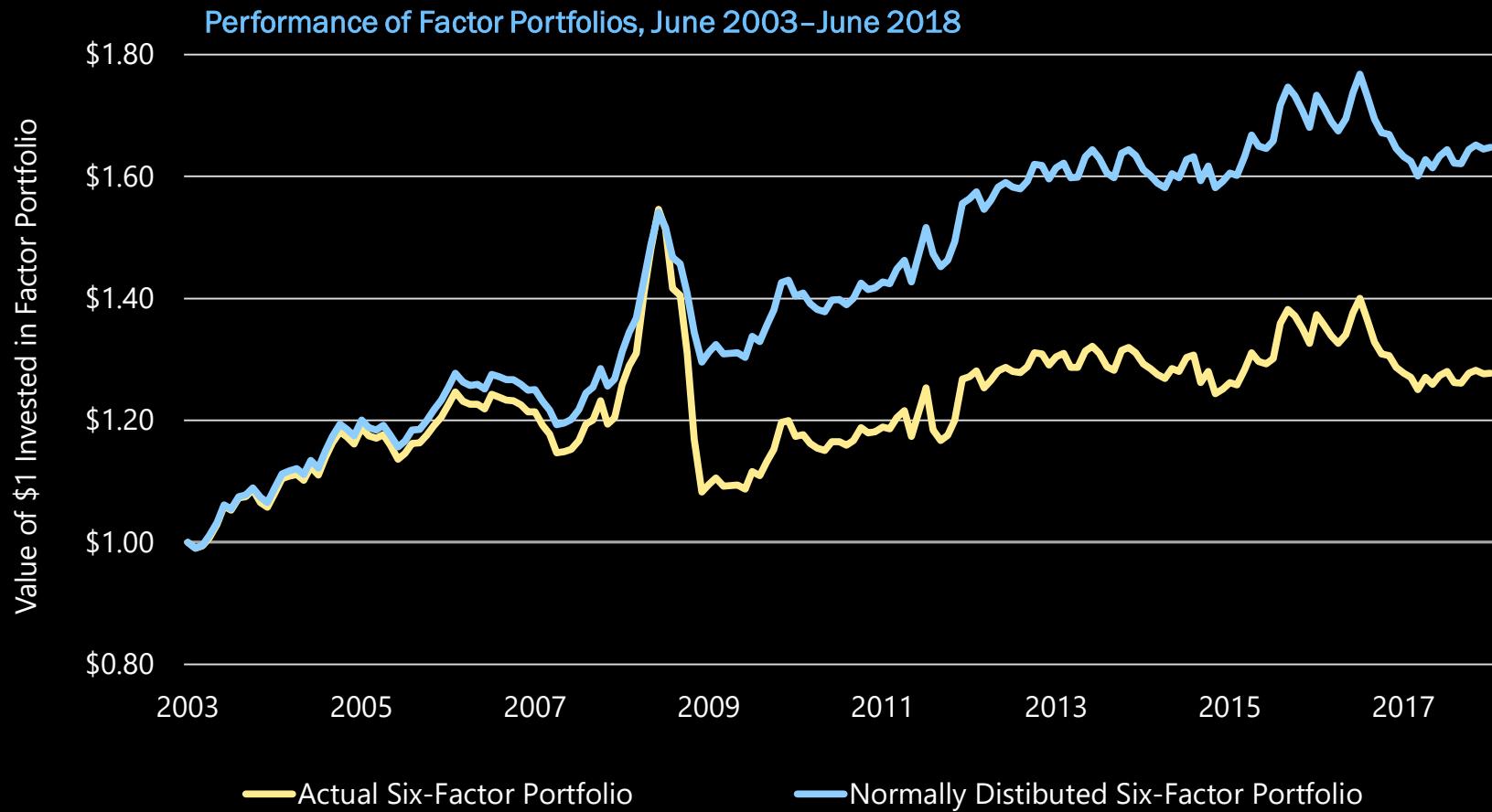
Non-Normality of Monthly Factor Returns, United States, July 1963–June 2018

Factor	Average Annualized Return	Skewness	Excess Kurtosis	Worst Monthly Return	Frequency (in Years) of Expected Worst Realized Monthly Return, Assuming Normal Return Distribution
Market	4.20%	-0.54	2.03	-15.30%	1 in 1.6 million
Value	4.15%	0.11	2.05	-11.50%	1 in 2,522
Size	2.53%	0.46	5.54	-16.20%	1 in 8.9 million
Operating profitability	3.70%	-0.25	12.64	-24.30%	1 in 4.7 quadrillion (10^{15})
Investment	4.32%	0.2	0.79	-9.20%	1 in 109
Momentum	5.48%	-1.41	11.38	-24.30%	1 in 4.1 quadrillion (10^{15})
Low beta	0.16%	-0.39	3.33	-17.10%	1 in 49.8 million
Idiosyncratic volatility	1.62%	-0.32	4.39	-16.40%	1 in 12.3 million
Short-term reversals	5.34%	0.37	5.82	-13.50%	1 in 58,097
Illiquidity	3.01%	-0.58	5.11	-17.10%	1 in 55.8 million
Accruals	4.31%	-0.11	0.97	-10.00%	1 in 320
Cash flow to price	4.82%	-0.35	5.81	-18.90%	1 in 2.5 billion (10^9)
Earnings to price	3.76%	-0.32	5.94	-19.50%	1 in 10.5 billion (10^9)
Long-term reversals	3.43%	0.65	2.62	-9.10%	1 in 106
Net share issues	5.28%	-0.4	9.85	-23.40%	1 in 357.5 trillion (10^{12})

Note: All factors are scaled to 10% volatility. Factor portfolios are equally weighted and also scaled to 10% volatility.
 Source: Research Affiliates, LLC, using data from CRSP/Compustat.

Diversification Falls Short of Expectations

Factor Portfolio Crash: Actual vs. Hypothetical, United States, July 2003–June 2018



Source: Research Affiliates, LLC, using data from CRSP/Compustat.

Non-Normality of Monthly Factor Returns, United States, July 1963–June 2018

Factor	Average Annualized Return	Skewness	Excess Kurtosis	Worst Monthly Return	Frequency (in Years) of Expected Worst Realized Monthly Return, Assuming Normal Return Distribution
Market	4.20%	-0.54	2.03	-15.30%	1 in 1.6 million
Portfolio of factors 1–6	7.38%	0.46	8.12	-16.10%	1 in 6.5 million
Portfolio of factors 7–14	7.28%	0.12	5.04	-17.60%	1 in 147.6 million
Portfolio of other 33 factors	10.28%	0.63	4.93	-13.30%	1 in 38,989

Note: All factors are scaled to 10% volatility. Factor portfolios are equally weighted and also scaled to 10% volatility.

Source: Research Affiliates, LLC, using data from CRSP/Compustat.

Worst Drawdowns in Portfolios of Factors, United States, July 1963–June 2018

Factors	Worst Realized Drawdown	Worst Simulated Drawdown and [% of samples worse than actual]				
		Bootstrap (Resampling Returns from Realized History)			12m Blocks, Preserving x-Factor and Time- Series Correlation	
Simulation Assuming Normality	Independent	x-Factor Correlation	1m Blocks, Preserving	x-Factor Correlation	12m Blocks, Preserving	
1–6	-33.4%	Return [p-value]	-21.5% [2.7%]	-21.9% [3.7%]	-25.8% [12.4%]	-30.4% [29.1%]
7–14	-42.9%	Return [p-value]	-13.3% [0.0%]	-13.5% [0.0%]	-26.4% [2.2%]	-32.5% [11.6%]
Other 33	-22.8%	Return [p-value]	-6.9% [0.0%]	-6.5% [0.0%]	-20.3% [26.1%]	-23.2% [44.3%]

Note: All factors are scaled to 10% volatility. Factor portfolios are equally weighted and also scaled to 10% volatility.
Source: Research Affiliates, LLC, using data from CRSP/Compustat.

Summary

Set up realistic expectations for factor investing

- Focus on real sources of economic risk premia
- Pay attention to implementation shortfall and crowding
- Diversification needs to be actively managed

What do we do?

Philosophy

Every investor should ask five questions before investing in a strategy:

1. Why does the strategy work?
2. Does the strategy produce similar results across different regions and show out-of-sample performance?
3. Does the strategy produce similar results across slightly different definitions (e.g., P/B vs. P/S)?
4. Does the strategy still work net of real-life transaction costs?
5. Does the majority of the strategy's excess return survive after controlling for changes in valuation?

DISCLOSURE

By accepting this document, you agree to keep its contents confidential. You also agree not to disclose the contents of this document to third parties (including potential co-investors) without the prior written permission of Research Affiliates, LLC (including its related entities).

The material contained in this document is for information purposes only. This material is not intended as an offer or solicitation for the purchase or sale of any security or financial instrument, nor is it advice or a recommendation to enter into any transaction. Any offer to sell or a solicitation of an offer to buy or sell shall be made solely by the legally permitted entity registered or licensed with the applicable regulator(s) and only to qualified investors through a regulatory registration statement or subject to an applicable exemption and disclosure document such as a private placement memorandum for pooled investment vehicles, or investment management agreement for separately managed accounts. The information contained herein may be opinions, which are subject to change, at any time, and should not be construed as financial or investment advice on any subject matter.

Certain performance information presented represents simulated performance. Hypothetical investor accounts depicted are not representative of actual client accounts. Certain performance information presented represents performance based on combined simulated index data (pre-index launch) and live index data (post-index launch). Indexes are unmanaged and cannot be invested in directly. Past simulated performance is no guarantee of future performance and does not represent actual performance of an investment product based on the index. No allowance has been made for trading costs, management fees, or other costs associated with asset management, as the information provided relates only to the index itself. Actual investment results may differ. As such, the simulated data may have under-or over-compensated for the impact, if any of certain market factors. Simulated returns may not reflect the impact that material economic and market factors might have had on the advisor's decision making if the advisor were actually managing clients' money. Simulated data is subject to the fact that it is designed with the benefit of hindsight. Simulated returns carry the risk that the performance depicted is not due to successful predictive modeling. Simulated returns cannot predict how an investment strategy will perform in the future. Simulated returns should not be considered indicative of the skill of the advisor. Investors may experience loss. Any information and data pertaining to an index contained in this document relate only to the index itself and not to any asset management product based on the index. With the exception of the data on Research Affiliates Fundamental Index, all other information and data are generally based on information and data from third party sources.

Research Affiliates, LLC, its affiliates, agents, and each of their respective officers, directors, employees, agents, representatives and licensors (collectively "RA") does not make any warranties, express or implied, to anyone regarding the information provided herein, including, without limitation, any warranties with respect to the timeliness, sequence, accuracy, completeness, currentness, merchantability, quality or fitness for a particular purpose or any

warranties as to the results to be obtained by any third-party in connection with the use of the information. Nothing contained in this material is intended to constitute legal, tax, securities or investment advice, nor an opinion regarding the appropriateness of any investment, nor a solicitation of any type. The general information contained in this material should not be acted upon without obtaining specific legal, tax and investment advice from a licensed professional. Investors should be aware of the risks associated with data sources and quantitative processes used to create the content contained herein or the investment management process. Errors may exist in data acquired from third party vendors, the construction or coding of indices or model portfolios, and the construction of the spreadsheets, results or information provided. RA takes reasonable steps to eliminate or mitigate errors, and to identify data and process errors so as to minimize the potential impact of such errors, however RA cannot guarantee that such errors will not occur. Use of this material is conditioned upon, and evidence of, the user's full release of Research Affiliates from any liability or responsibility for any third party for any loss or damage, direct, indirect or consequential, arising from or related to (i) any inaccuracy or incompleteness in, errors or omissions in the provided information or (ii) any decision made or action taken by any third party in reliance upon this information. RA shall not be liable to anyone for loss of business revenues, lost profits or any indirect, consequential, special or similar damages whatsoever, whether in contract, tort or otherwise, even if advised of the possibility of such damages.

Indices referenced herein (individually, the "Index") are the property of Research Affiliates, LLC, which has contracted with S&P Opco, LLC (a subsidiary of S&P Dow Jones Indices LLC) to calculate and maintain the Index. The Index and any products based on the Index are not sponsored, endorsed, sold or promoted by S&P Dow Jones Indices or its affiliates or its third party licensors (collectively, "S&P Dow Jones Indices"). "Calculated by S&P Dow Jones Indices" and the related stylized mark(s) are service marks of S&P Dow Jones Indices and have been licensed for use by Research Affiliates, LLC. S&P® is a registered trademark of Standard & Poor's Financial Services LLC ("SPFS"), and Dow Jones® is a registered trademark of Dow Jones Trademark Holdings LLC ("Dow Jones"). S&P Dow Jones Indices does not make any representation or warranty, express or implied, to the owners of any products or any member of the public regarding the advisability of investing in securities generally or in any products particularly or the ability of the Index to track general market performance. S&P Dow Jones Indices' only relationship to Research Affiliates with respect to the Index is the licensing of the underlying S&P indices, certain trademarks, service marks and trade names of S&P Dow Jones Indices, and the provision of the calculation services related to the Index. S&P Dow Jones

Indices is not responsible for and has not participated in the determination of the prices and amount of the products or the timing of the issuance or sale of the products or in the determination or calculation of the equation by which the products may be converted into cash or other redemption mechanics. S&P Dow Jones Indices has no obligation or liability in connection with the administration, marketing or trading of the products. S&P Dow Jones Indices LLC is not an investment advisor. Inclusion of a security within the Index is not a recommendation by S&P Dow Jones Indices to buy, sell, or hold such security, nor is it investment advice. S&P Dow Jones Indices does not guarantee the adequacy, accuracy,

timeliness and/or the completeness of the Index or any data related thereto or any communication with respect thereto, including oral, written, or electronic communications. S&P Dow Jones Indices shall not be subject to any damages or liability for any errors, omissions, or delays therein. S&P Dow Jones Indices makes no express or implied warranties, and expressly disclaims all warranties or merchantability or fitness for a particular purpose or use or as to results to be obtained by Research Affiliates LLC, owners of any of the products, or any other person or entity from the use of the Index or with respect to any data related thereto. Without limiting any of the foregoing, in no event whatsoever shall S&P Dow Jones Indices be liable for an indirect, special, incidental, punitive, or consequential damages, including but not limited to, loss of profits, trading losses, lost time, or goodwill, even if they have been advised of the possibility of such damages, whether in contract, tort, strict liability, or otherwise.

Frank Russell Company is the source and owner of the Russell index data contained or reflected in this material and copyrights related thereto. Frank Russell Company and Research Affiliates, LLC have entered into a strategic alliance with respect to the Russell RAFI Indexes. The Russell RAFI Indexes are calculated by Russell in conjunction with Research Affiliates LLC. All intellectual property rights in the Russell RAFI Indexes (the "Index") vest in Russell and RA. Neither Russell nor RA or their licensors accept any liability for any errors or omissions in the Index and / or Index ratings or underlying data. No further distribution of Russell Data is permitted without Russell's express written consent. Russell® is a trademark of Frank Russell Company. Research Affiliates, LLC is the owner of the trademarks, service marks, patents and copyrights related to the Fundamental Index and the Fundamental Index methodology. The presentation may contain confidential information and unauthorized use, disclosure, copying, dissemination, or redistribution is strictly prohibited. This is a presentation of Research Affiliates, LLC. Frank Russell Company is not responsible for the formatting or configuration of this material or for any inaccuracy in Research Affiliates' presentation thereof.

The FTSE Research Affiliates Fundamental Indexes are calculated by FTSE International Limited ("FTSE") in conjunction with Research Affiliates LLC ("RA"). All rights and interests in the FTSE Research Affiliates Fundamental Indexes vest in RA. All rights in and to the RA fundamental weighting methodology used in the calculation of the FTSE Research Affiliates Fundamental Indexes vest in RA. All rights in the FTSE indices and / or FTSE ratings (together the "FTSE Data") vest in FTSE and/or its licensors. Except to the extent disallowed by applicable law, neither FTSE nor RA nor their licensors shall be liable (including in negligence) for any loss arising out of use of the FTSE Research Affiliates Fundamental Indexes, the FTSE Data or underlying data by any person. "FTSE™" is a trademark of the London Stock Exchange Plc and is used by FTSE under license. FTSE is not an investment adviser and makes no representation regarding the advisability of investing in any security. Inclusion of a security in an index is not a recommendation to buy, sell or hold such security. No further distribution of FTSE Data is permitted without FTSE's express written consent.

Copyright MSCI. All Rights Reserved. Without prior written permission of MSCI, this information and any other MSCI intellectual property may only be used for your internal use, may not be reproduced or redistributed in any form and may not be used to create any financial instruments or products or any indices. This 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. Neither MSCI nor any third party involved in or related to the computing or compiling of the data makes any express or implied warranties, representations or guarantees concerning the MSCI index-related data, and in no event will MSCI or any third party have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits) relating to any use of this information. All MSCI returns information provided under license through MSCI. Any expected returns forecasted herein may be calculated by Research Affiliates LLC using data provided by MSCI Inc. No funds or securities relating to those expected returns forecasted herein are sponsored, endorsed or promoted by MSCI Inc., and MSCI bears no liability with respect to any such funds or securities.

DISCLOSURE

The RAFI™ Bonds US Investment Grade Index and RAFI™ Bonds US High Yield Index is calculated by ALM Research Solutions, LLC. in conjunction with Research Affiliates, LLC. All rights and interests in the RAFI™ Bonds US Investment Grade Index and the RAFI™ Bonds US High Yield Index vest in Research Affiliates, LLC. All rights in and to the Research Affiliates, LLC Fundamental Index™ concept used in the calculation of the RAFI™ Bonds US Investment Grade Index and the RAFI™ Bonds US High Yield Index vest in Research Affiliates, LLC. The RAFI™ Bonds US Investment Grade Index and the RAFI™ Bonds US High Yield Index are not sponsored, endorsed, sold or promoted by ALM Research Solutions, LLC., and ALM Research Solutions, LLC. makes no representation regarding the advisability of investing in such product(s). Neither ALM Research Solutions, LLC. nor Research Affiliates, LLC make any warranties, express or implied, to any of their customers nor anyone else regarding the accuracy or completeness of any data related to the RAFI™ Bonds US Investment Grade Index or the RAFI™ Bonds US High Yield Index. All information is provided for information purposes only. Neither ALM Research Solutions, LLC. nor Research Affiliates, LLC accept any liability for any errors or any loss arising from the use of information in this publication.

The trademarks Fundamental Index™, RAFI™, Research Affiliates Equity™, RAE™, and the Research Affiliates™ trademark and corporate name and all related logos are the exclusive intellectual property of Research Affiliates, LLC and in some cases are registered trademarks in the U.S. and other countries.

Various features of the Fundamental Index™ methodology, including an accounting data-based non-capitalization data processing system and method for creating and weighting an index of securities, are protected by various patents, and patent-pending intellectual property of Research Affiliates, LLC. (See all applicable US Patents, Patent Publications, Patent Pending intellectual property and protected trademarks located at https://www.researchaffiliates.com/en_us/about-us/legal.html, which are fully incorporated herein.) Any use of these trademarks, logos, patented or patent pending methodologies without

the prior written permission of Research Affiliates, LLC, is expressly prohibited. Research Affiliates, LLC, reserves the right to take any and all necessary action to preserve all of its rights, title, and interest in and to these marks, patents or pending patents.

Neither Research Affiliates, LLC nor its related entities provide investment advice outside of Australia, the United States, Canada and Ireland or offer or sell any securities, commodities or derivative instruments or products. Any such business may only be conducted through registered or licensed entities and individuals permitted to do so within the respective jurisdiction and only in conjunction with the legally required disclosure documents and subject to the all legally required regulatory filings.

Research Affiliates, LLC is an investment adviser registered under the Investment Advisers Act of 1940 (the "Advisers Act") with the U.S. Securities and Exchange Commission (SEC). Our registration as an Investment Adviser does not imply a certain level of skill or training. Additionally, Research Affiliates, LLC may engage in sales and marketing activities with your firm. This includes making available information, education, and guidance materials, herein and otherwise, regarding certain investment advisory services and/or indices that are constructed, published, and licensed.

It is not our intent to provide investment advice and accordingly, we will not receive any fees or other compensation directly from you for the provision of investment advice (as opposed to other services) in connection with any Transaction, unless contracted for or permissioned to do so. Without an express written objection from you, we will deem that these acknowledgments and representations apply.

Notice to wholesale clients in Australia:

Research Affiliates, LLC is exempt from the requirement to hold an Australian financial services license by operation of ASIC Class Order 03/1100: US SEC regulated financial service providers.

© 2019 Research Affiliates, LLC. All rights reserved. Duplication or dissemination prohibited without prior written permission.