

Smart Beta, Monkeys and Upside Down Strategies

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Capturing Market Premium Passively

Traditional Indices

- » Cap-weighted to measure market performance
- » Captures market risk premium effectively
- » Contains one source of equity return

Smart Beta

Non-price-weighted indices

Non-traditional equity premiums

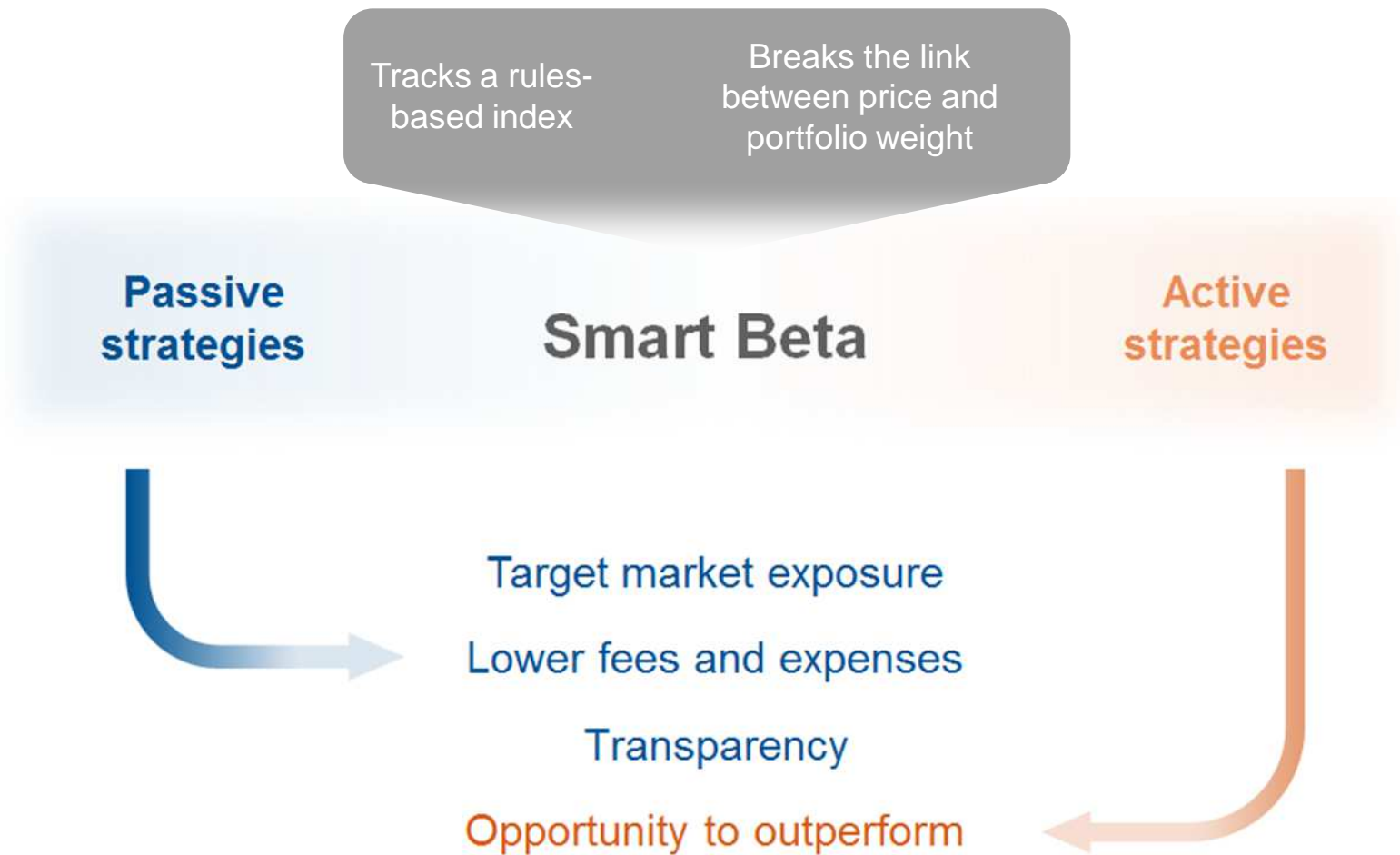
- » EW indices capture small premium
- » Fundamental indices capture value premium, dynamic as opposed to static exposure
- » Low volatility indices capture Low vol premium

Smart Beta is Cap-weighting Evolved

CAPM evolves into APT

- » One factor → Multi-factor
- » Market Premium → Market + Value + Size + Low Volatility + Momentum Premiums
- » Cap-weighted traditional index → Smart Betas

Smart Beta - A New Paradigm



Equity Smart Beta Strategies

Many offerings, many marketing claims, so...

- » How much better are these strategies than market cap?
- » What similarities can we identify?
- » What are critical differences?
- » How do we use Smart Beta strategies?



The Surprising Alpha from Malkiel's Monkey & Upside-Down Strategies

Logic of Our Studies

- » Make a claim
- » Show the strategy based on the claim outperforms cap-weighted index
- » Construct a counter-intuitive strategy based on the claim turned upside-down:

If the claim is right, the counter-intuitive strategy should underperform the cap-weighted index

Popular Smart Beta Strategies Global, 1991-2012

Strategy	Return	Standard Deviation	Sharpe Ratio	Information Ratio
Volatility Wt ¹	7.9%	16.9%	0.28	0.19
Fundamentals Wt ⁷	11.0%	15.3%	0.49	0.72
Minimum Variance ⁹	8.4%	9.9%	0.53	0.13
Maximum Diversification ¹⁰	7.1%	11.3%	0.35	0.00
Risk-Efficient ($\lambda=2$) ¹¹	9.0%	14.8%	0.40	0.53
Risk Cluster Equal Weight ¹²	9.5%	15.9%	0.40	0.36
Diversity Weighting ¹³	7.4%	15.3%	0.28	0.22
Global Cap Wt ⁴	7.1%	15.1%	0.26	0.00

See notes slide for disclosures regarding individual strategies.

Source: Research Affiliates, LLC, based on Arnott, Hsu, Kalesnik and Tindall (2013)

Popular Smart Beta Strategies Global, 1991-2012

Upside-down strategies also outperform!

Strategy	Return	Standard Deviation	Sharpe Ratio	Information Ratio
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Risk Cluster Equal Weight ¹²	9.5%	15.9%	0.40	0.36
Diversity Weighting ¹³	7.4%	15.3%	0.28	0.22
Inverse of Volatility Wt ¹	9.3%	13.9%	0.44	0.53
Inverse of Fundamental Wt ⁷	12.5%	15.7%	0.58	0.80
Inverse of Minimum Variance ⁹	8.7%	16.2%	0.34	0.45
Inverse of Maximum Diversification ¹⁰	8.9%	15.9%	0.36	0.48
Inverse of Risk-Efficient ($\lambda=2$) ¹¹	8.5%	15.5%	0.35	0.40
Inverse of Risk Cluster Equal Weight ¹²	9.4%	16.7%	0.38	0.35
Inverse of Diversity Weighting ¹³	8.7%	15.5%	0.36	0.45
Global Cap Wt ⁴	7.1%	15.1%	0.26	0.00

See notes slide for disclosures regarding individual strategies.
Source: Research Affiliates, LLC, based on Arnott, Hsu, Kalesnik and Tindall (2013)

Malkiel's Monkey Global, 1991-2012

Strategy	Return	Standard Deviation	Sharpe Ratio	Information Ratio
Average of 100 Malkiel's Monkey Portfolios ¹⁴	8.1%	16.4%	0.31	0.16
Global Cap Wt ⁴	7.1%	15.1%	0.26	0.00

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Source: Research Affiliates, LLC, based on Arnott, Hsu, Kalesnik and Tindall (2013)



Value and Size Factors

Four-Factor Model Decomposition (Global, 1991-2012)

All non-cap-weighted strategies have value and small size tilt

Strategy	Annual FFC Alpha	Alpha t-stat	Market Exposure	Size Exposure	Value Exposure	Momentum Exposure
Volatility Wt ¹	0.12%	0.20	1.10	0.31	0.13	-0.06
Fundamentals Wt ⁷	1.93%	2.98	0.98	0.09	0.43	-0.11
Minimum Variance ⁹	1.73%	1.33	0.55	0.02	0.30	-0.06
Maximum Diversification ¹⁰	0.12%	0.08	0.65	0.11	0.24	0.01
Risk-Efficient ($\lambda=2$) ¹¹	0.53%	0.93	0.98	0.19	0.28	-0.03
Risk Cluster Equal Weight ¹²	0.97%	0.66	1.00	0.25	0.21	0.08
Diversity Weighting ¹³	-0.09%	-0.33	1.01	0.07	0.04	0.00
Inverse of Volatility Wt ¹	0.77%	1.28	0.92	0.13	0.34	-0.04
Inverse of Fundamental Wt ⁷	2.81%	3.44	0.99	0.35	0.51	-0.15
Inverse of Minimum Variance ⁹	0.42%	0.76	1.07	0.24	0.23	-0.05
Inverse of Max Diversification ¹⁰	0.50%	0.88	1.04	0.21	0.29	-0.07
Inverse of Risk-Efficient ($\lambda=2$) ¹¹	0.44%	0.75	1.01	0.22	0.25	-0.06
Inverse of Risk Cluster EW ¹²	0.63%	0.42	1.05	0.14	0.28	0.02
Inverse of Diversity Weighting ¹³	0.47%	0.84	1.02	0.34	0.19	-0.03
Global Cap Wt ⁴	0.00%	0.00	1.00	0.00	0.00	0.00

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Source: Research Affiliates, LLC, based on Arnott, Hsu, Kalesnik and Tindall (2013)

Malkiel's Monkey

All non-cap-weighted strategies have value and small size tilt

Four-Factor Model Decomposition (Global 1991–2012)

Strategy	Annual FFC Alpha	Alpha t-stat	Market Exposure	Size Exposure	Value Exposure	Momentum Exposure
Average of 100 Malkiel's Monkey Portfolios ¹⁴	0.15%	0.10	1.02	0.23	0.18	-0.03
Global Cap Wt ⁴	0.00%	0.00	1.00	0.00	0.00	0.00

See notes slide for disclosures regarding individual strategies.

Source: Research Affiliates, LLC, based on Arnott, Hsu, Kalesnik and Tindall (2013)

Value and Size Factors

All smart beta strategies are largely similar

- » Any portfolio return can be decomposed:

$$\begin{aligned}R_p &= n \cdot E[r_i w_i] = n \cdot E[r_i] E[w_i] + n \cdot \text{cov}[r_i, w_i] \\ &= EW + n \cdot \text{cov}[r_i, w_i]\end{aligned}$$

- » *EW*—"Return of equally weighted portfolio—no skill!"
- » $n \cdot \text{cov}[r_i, w_i]$ —"skill from security selection."

Jonathan Berk: Value and size factors generate returns because they sort stock based on prices!

- » Weighting on price is negatively related to future return
- » Smart Beta weights unrelated to price—no skill
- » *Cap-weighted is the only strategy in the study with negative skill!*



Choosing a Smart Beta Strategy

Implementation Is the Primary Differentiator

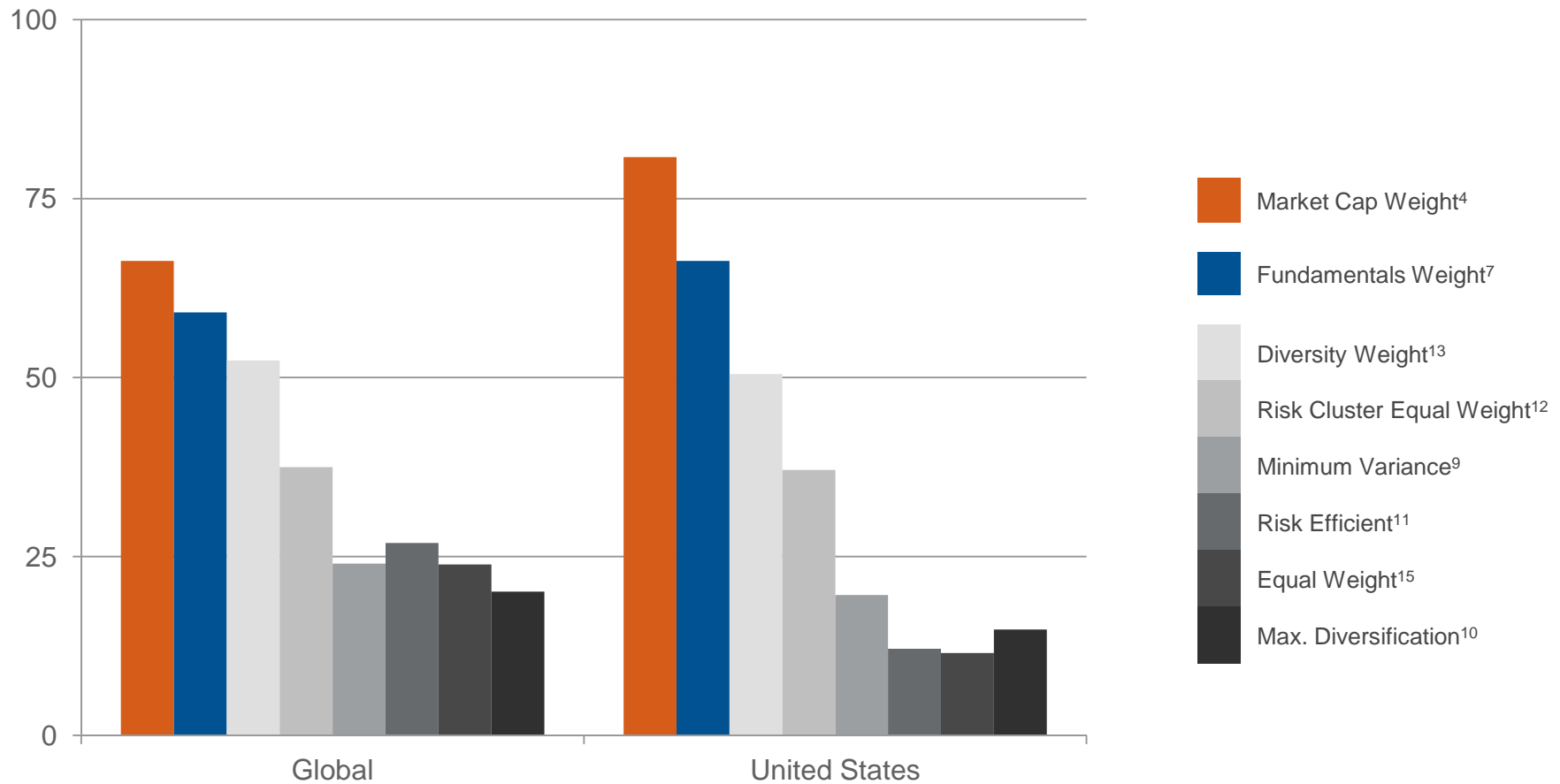
Many smart beta strategies suffer from high implementation costs.

» Investors should seek to:

Maximize	Minimize
Capacity/Liquidity	Turnover
Economic Representation	Trading Costs

Fundamentals Weight Has the Greatest Liquidity

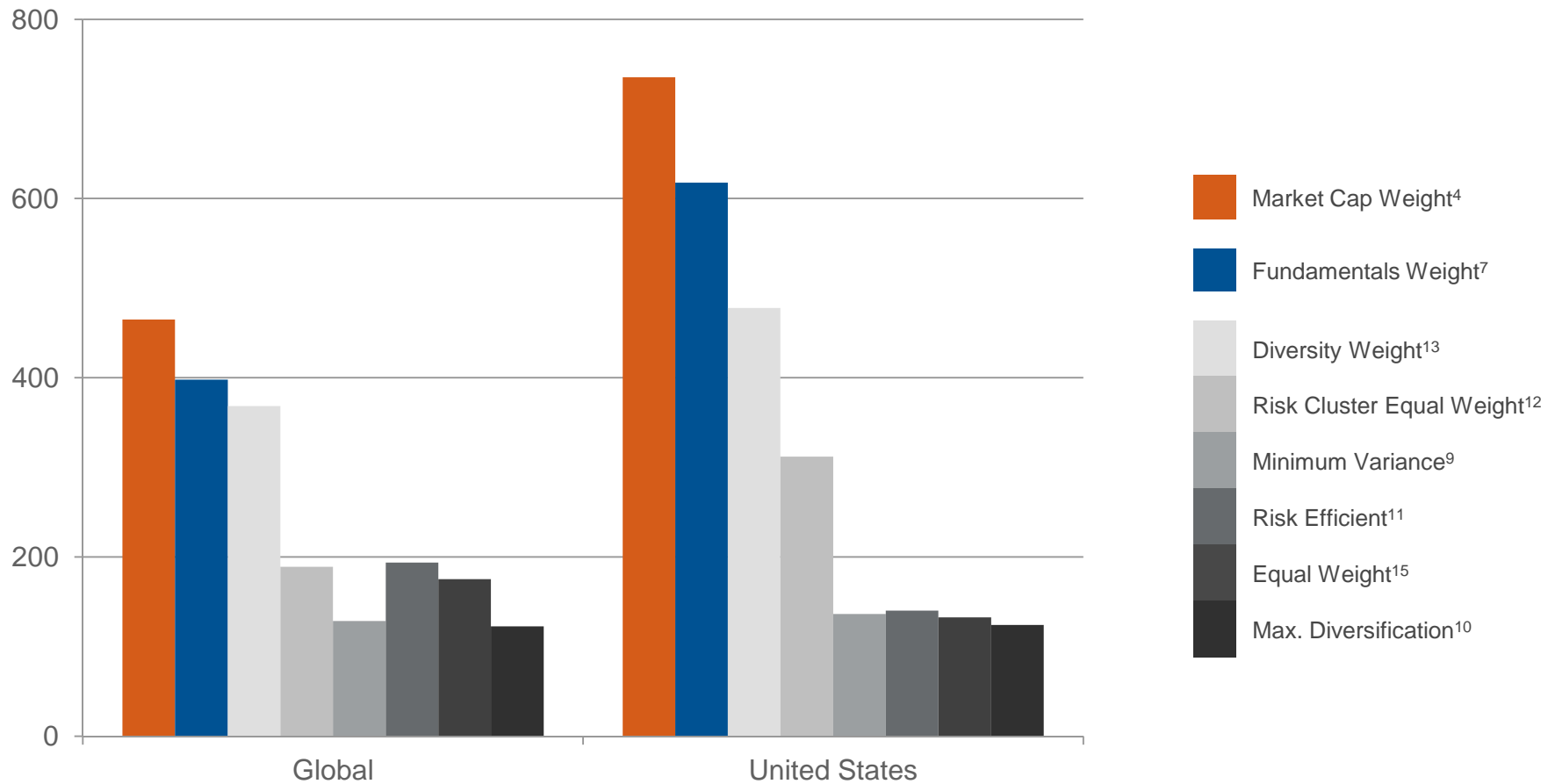
Market Cap in USD Billions – Jan 2010



Above figures all represent weighted averages.
 See notes slide for disclosures regarding individual strategies.
 Source: Research Affiliates, LLC.

Fundamentals Weight Leads in Daily Volume

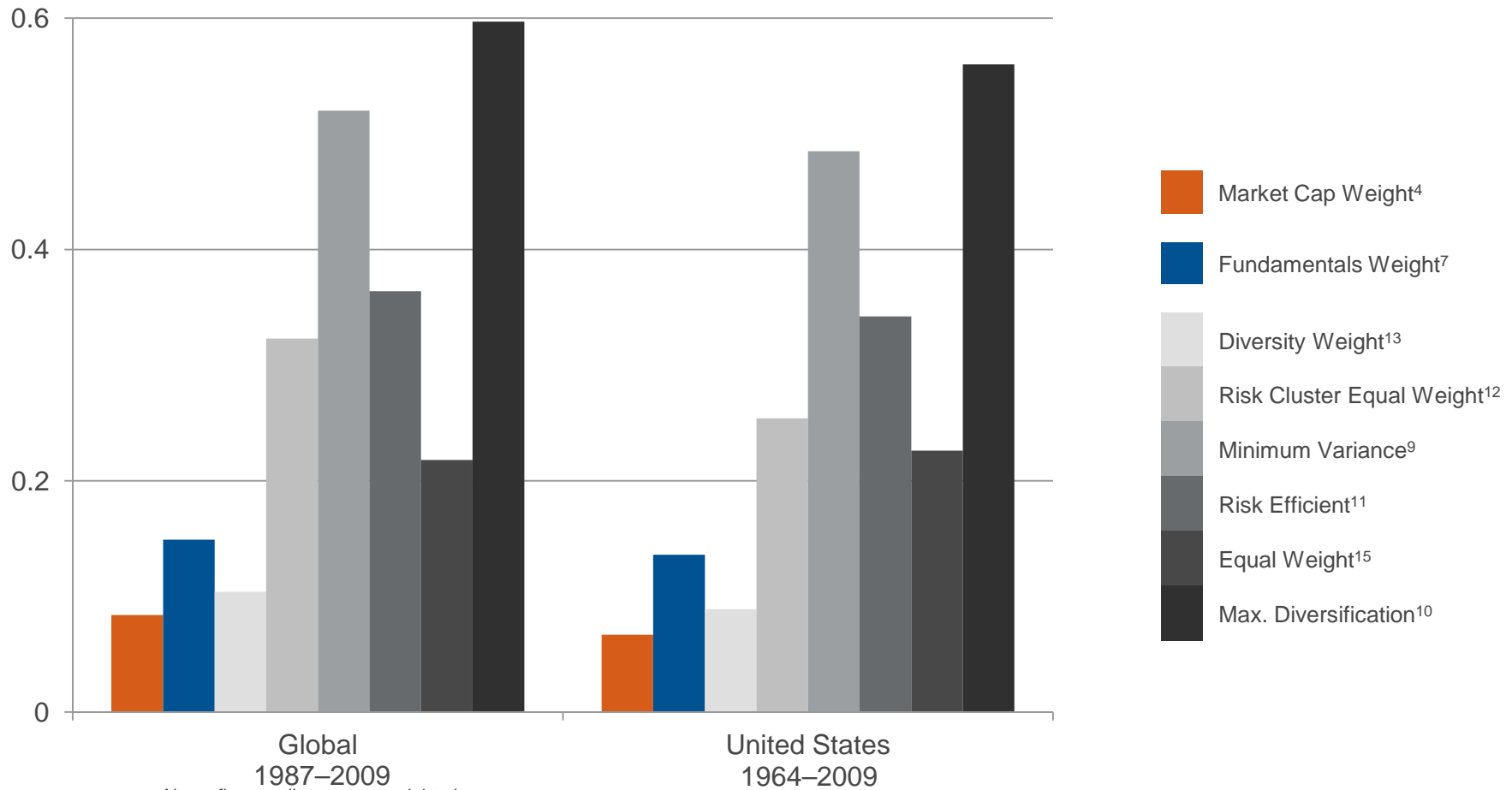
Adjusted Daily Volume in USD Millions – Jan 2010



Above figures all represent weighted averages.
 See notes slide for disclosures regarding individual strategies.
 Source: Research Affiliates, LLC.

Fundamentals Weight Has Low Trading Costs

Average Annual Turnover

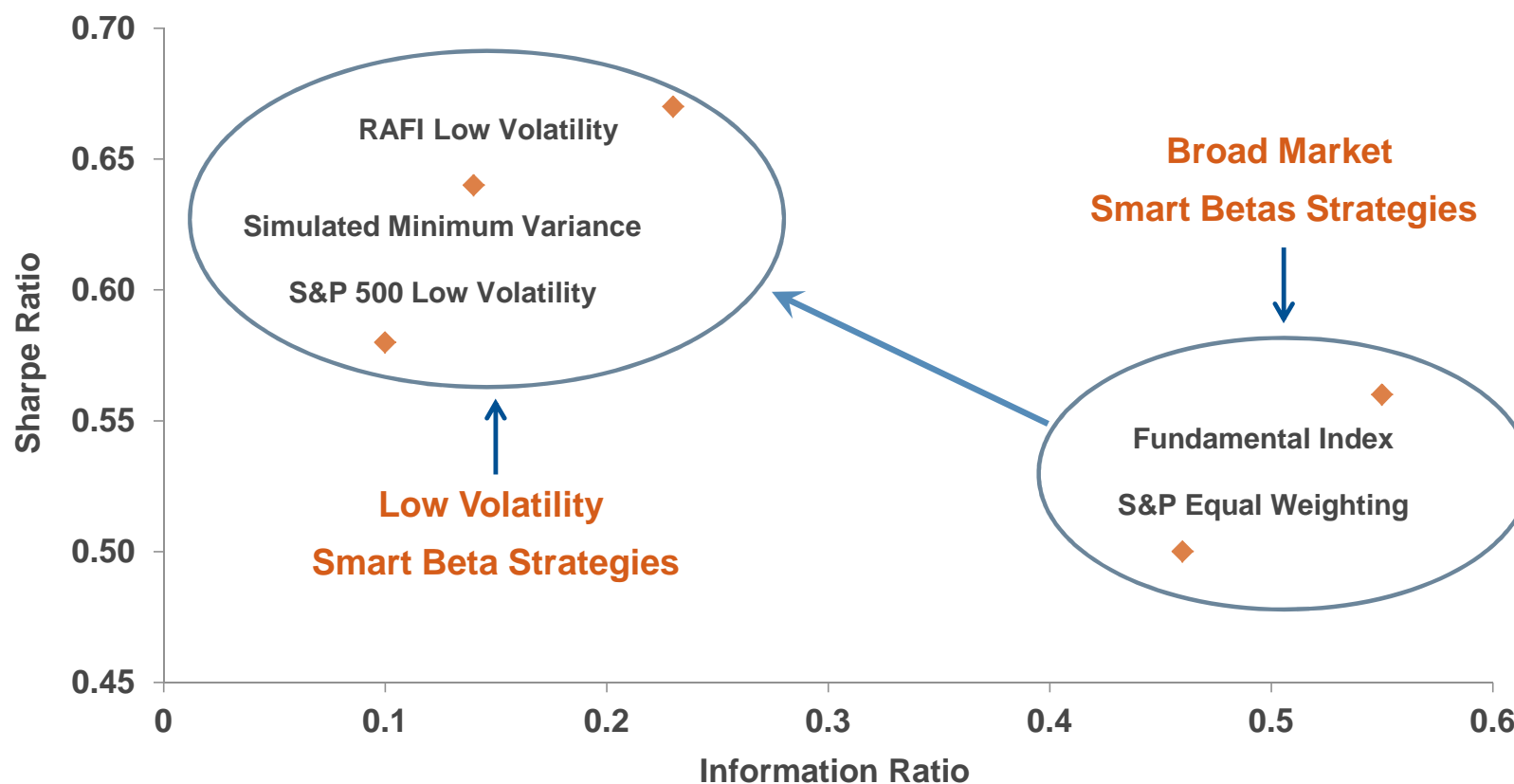


Above figures all represent weighted averages.
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 Source: Research Affiliates, LLC.

Information Ratio vs. Sharpe Ratio Investors

From information ratio to Sharpe ratio

» Is your risk Tracking Error or Volatility?



Source: Research Affiliates, LLC, based on data from CRSP/Compustat and Standard & Pools. Turnover average from 1991-2010. Weighted average market cap as of December 31, 2010.



FTSE RAFI Index Series

If Not Price Weighting, Then What?

Weighting metrics

- » Not correlated with price
- » Widely acceptable measures of company size
- » Co-integrated with liquidity and capacity
 - » Turnover
 - » Trading costs
 - » Capacity
 - » Economic representation

The solution: Fundamental measures of firm size

- » Sales, cash flow, dividends, and book value

Selection Matters

Selecting AND weighting adds approximately 25% over weighting alone

Region	RAFI Return (%)	Fundamentally Reweighted Return (%)	RAFI Minus Reweighted Return (%)	Start Year
Developed 1000	12.2	11.8	0.46	1984
Dev ex US Large	12.5	11.8	0.68	1984
US Large	11.9	11.2	0.76	1962
All World 3000	10.2	9.1	1.13	1996
Emerging Markets	16.1	11.4	4.76	1996

End Date: June 30, 2013

Return figures are annualized.

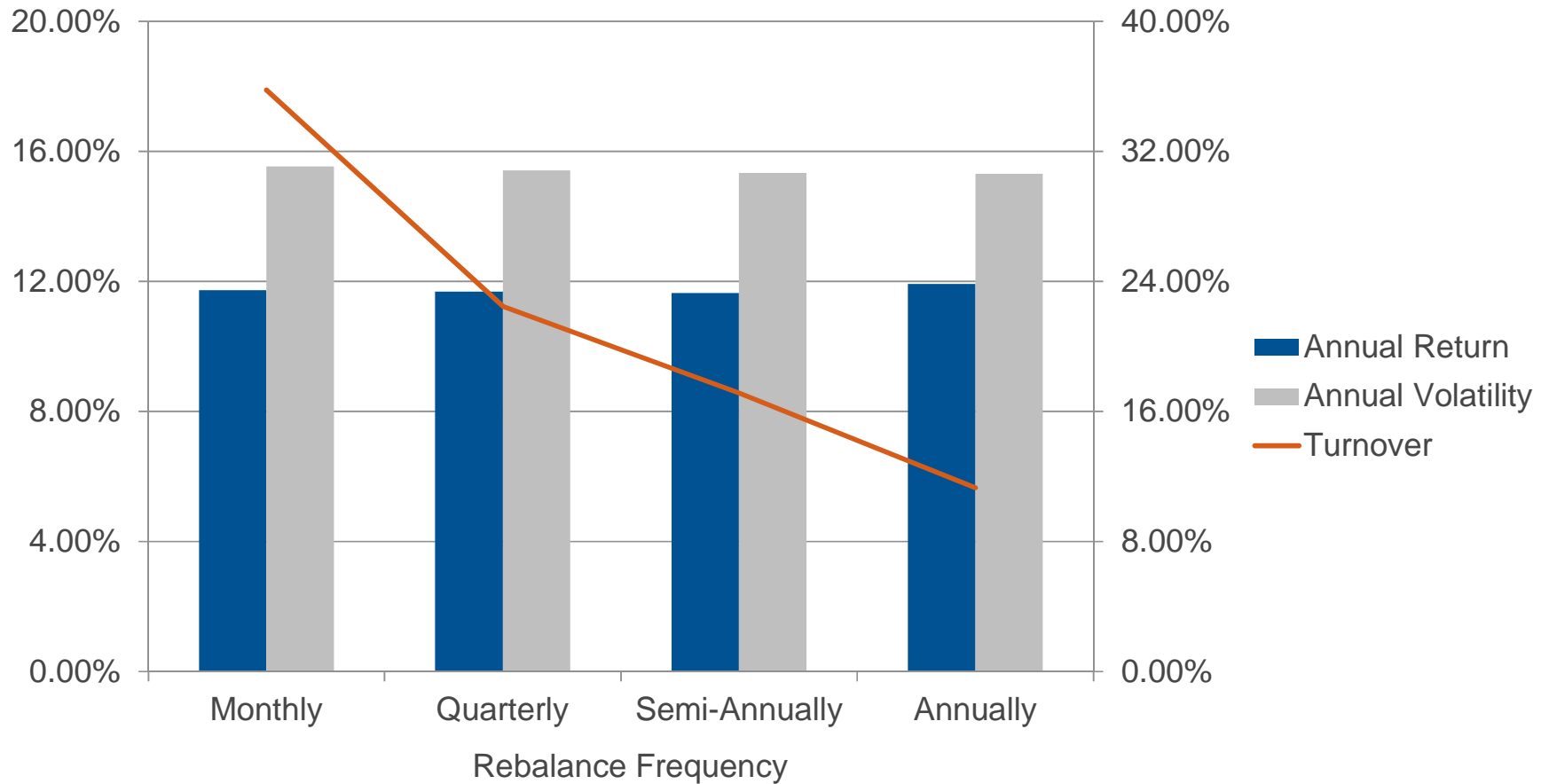
Simulated using 5-year average fundamental-weighted approach with annual rebalancing to identify the pure effect of selection. Reweighted indices based on simulated cap-weighted indices.

Source: Research Affiliates, LLC. based on data from Worldscope, Datastream, CRSP, and Compustat.

Note: The index data published herein is simulated. Please see important disclosure information at end.

Frequent Rebalancing Increases Turnover

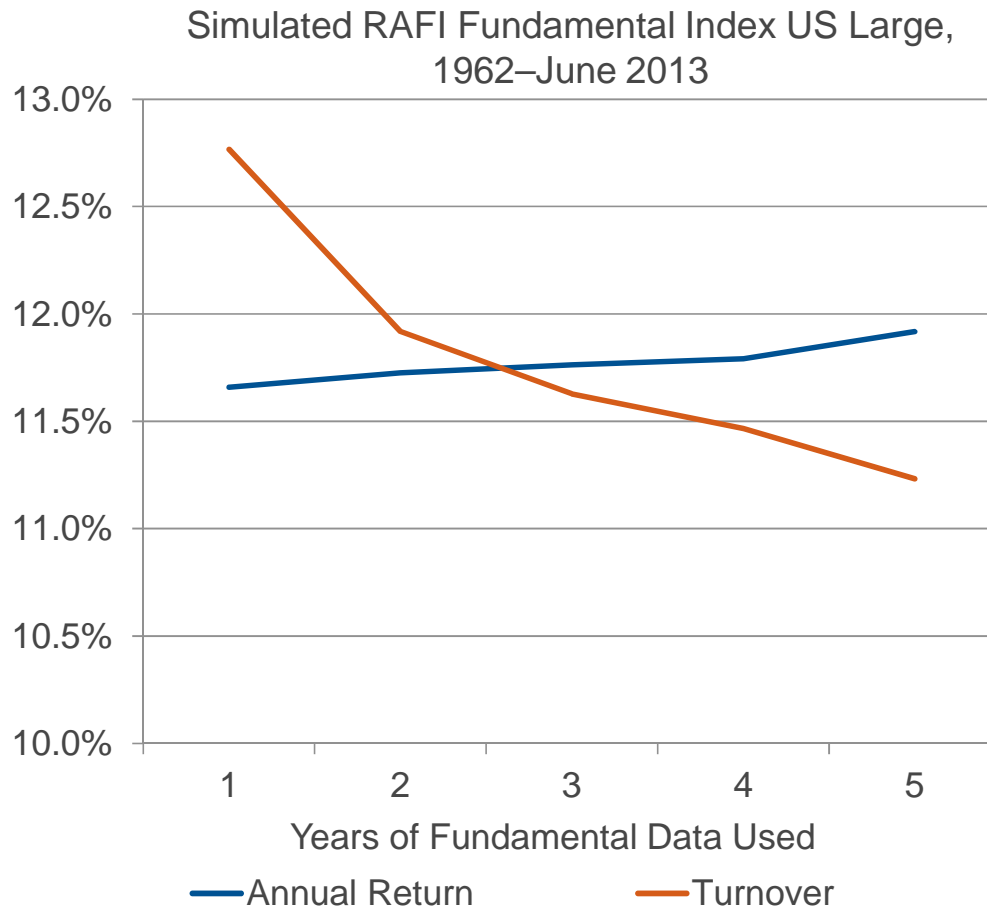
Simulated RAFI Fundamental Index
US Large, 1962–June 2013



Return and Volatility figures are annualized. Turnover figures are one-way.
Source: research affiliates, LLC based on data from CRSP and compustat.
Note: The index data published herein is simulated. Please see important disclosure information at end.

Older Data Is Better!

Longer Averaging Periods Increase Returns and Decrease Turnover

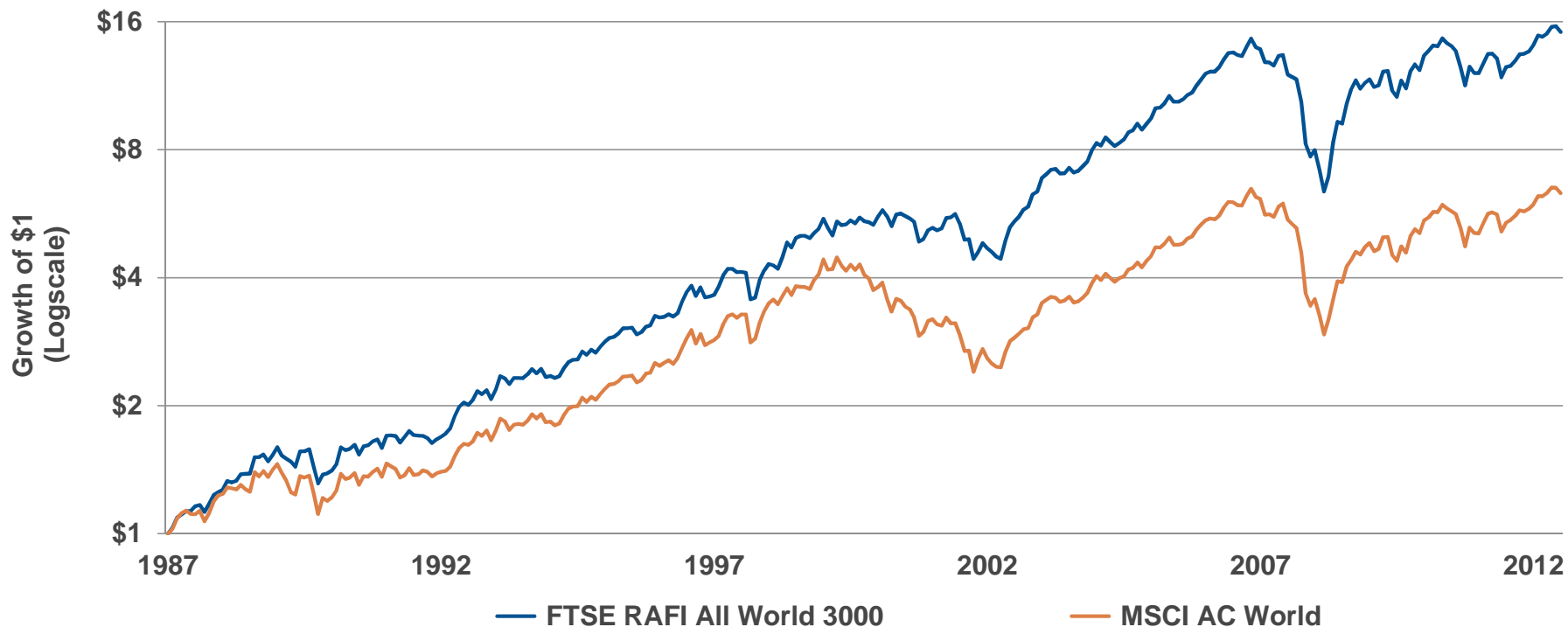


- » Helps smooth peaks and valleys in financial data
- » Less susceptible to aggressive accounting
- » Recent financial data more highly correlated with recent price moves
- » Breaks the link with price

Return figures are annualized. Turnover figures are one-way.
Source: Research Affiliates, LLC based on data from CRSP and compustat.
Note: The index data published herein is simulated. Please see important disclosure information at end.

FTSE RAFI All World 3000 1988–June 2013

FTSE RAFI All World 3000 vs. MSCI All Country World

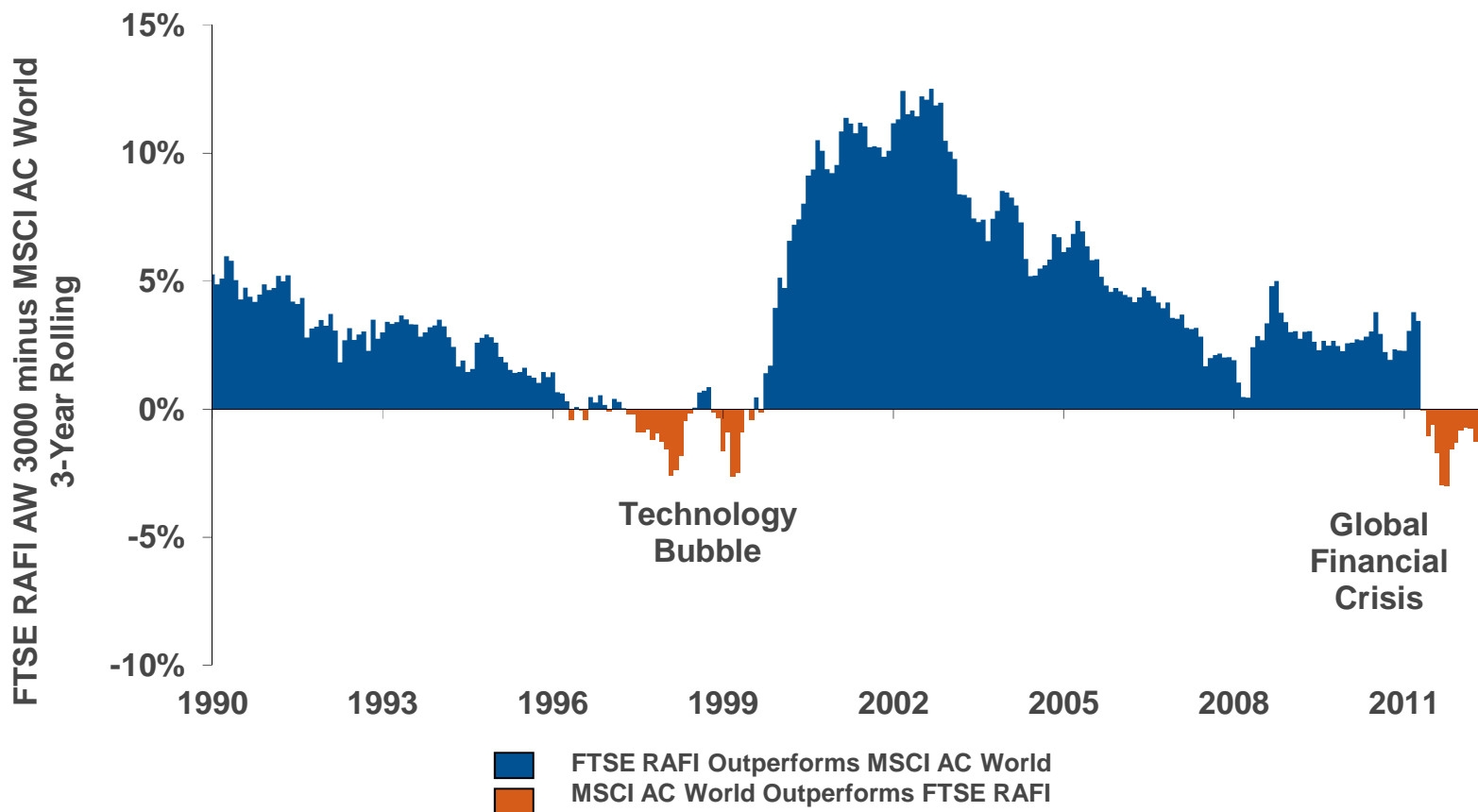


Index	Return	Volatility	Value Added	Tracking Error	Beta	Correl	R2
FTSE RAFI All World 3000	11.24%	15.63%	3.75%	4.57%	0.96	0.96	0.92
MSCI All Country World	7.50%	15.54%	--	--	--	--	--

Source: Research Affiliates, based on data from Bloomberg. The FTSE RAFI AW 3000 Index launched on 10/06/2008. Index returns prior to launch are simulated. MSCI returns information provided under license through MSCI. All returns based calculations are calculated by Research Affiliates, LLC.

Wins and Losses: FTSE RAFI AW 3000 Ann. Rolling Three-Year Returns, 1988–June 2013

FTSE RAFI AW 3000 vs. MSCI All Country World
RAFI Underperforms in Irrational Bubbles



Source: Research Affiliates, based on data from Bloomberg. The FTSE RAFI AW 3000 Index launched on 10/06/2008. Index returns prior to launch are simulated. MSCI returns information provided under license through MSCI. All returns based calculations are calculated by Research Affiliates, LLC.

Performance Across Markets

More value-add in less efficient markets

	Return (%)	Volatility (%)	Value Add (%)	Start Date
FTSE RAFI 1000	11.6	15.3	2.0	1962
S&P 500	9.6	15.1		
FTSE RAFI - 23 Country Average	12.4	16.2	2.0	1984
MSCI - 23 Country Average	10.4	15.7		
FTSE RAFI Dev ex US M/S 1500	11.4	18.2	3.2	2001
MSCI EAFE Small Cap	8.3	19.8		
FTSE RAFI All World 3000	11.2	15.6	3.7	1988
MSCI AC World	7.5	15.5		
FTSE RAFI US 1500	15.5	19.5	3.8	1979
Russell 2000	11.7	19.8		
FTSE RAFI EM	12.8	25.3	7.4	1994
MSCI EM	5.4	24.0		

End Date: June 30, 2013

Return and Volatility figures are annualized.

Source: research affiliates, LLC. Based on data from bloomberg.

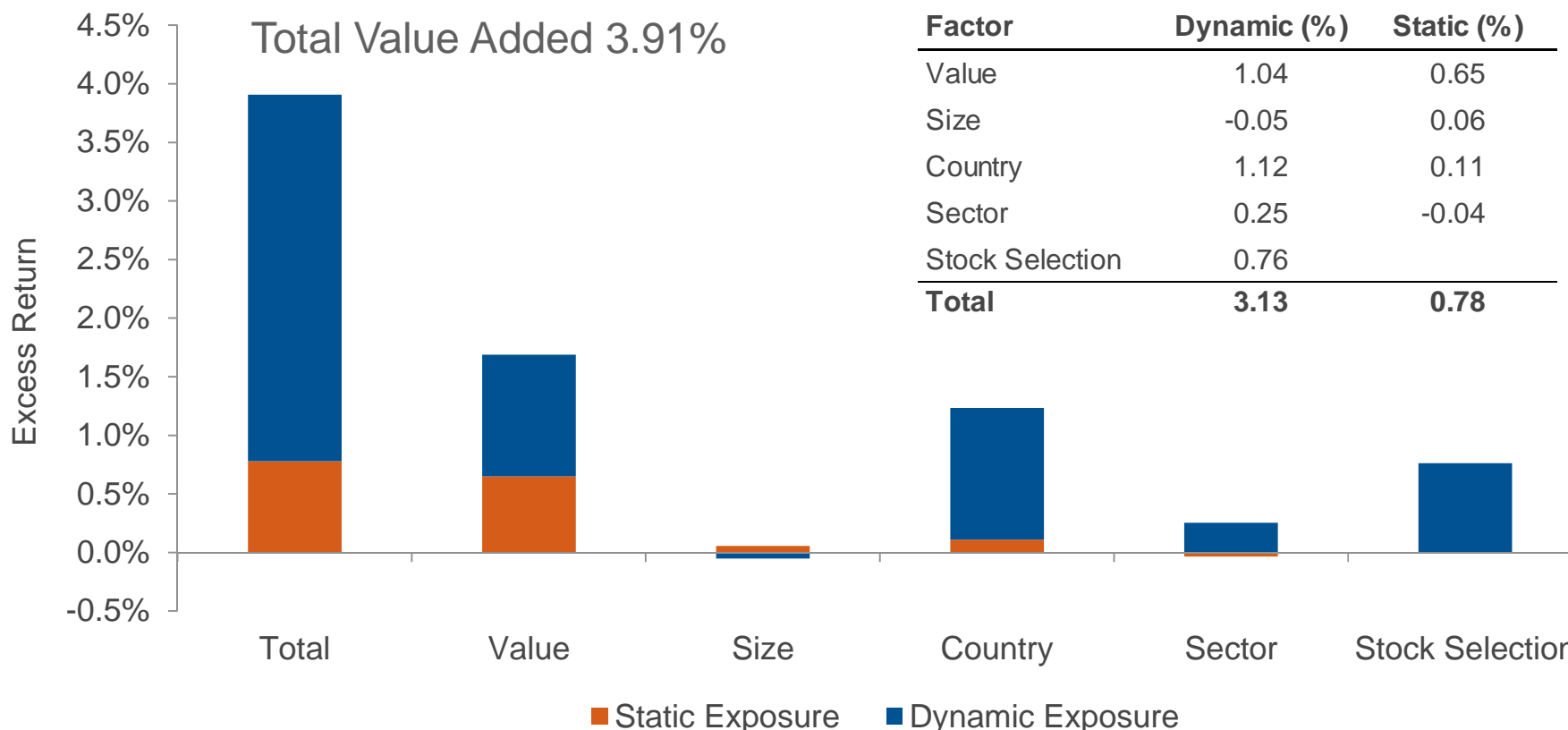
Note: The 23-developed countries correspond to the country study conducted by Research Affiliates. Index data prior to launch date are simulated. Launch date: FTSE RAFI US 1000 (11/28/2005), FTSE RAFI country indexes (11/28/2005), FTSE RAFI US MS 1500 (5/4/2006), FTSE RAFI AW 3000 (10/06/2008), FTSE RAFI EM (7/9/2007).

Please see important disclosure information at end.

MSCI returns information provided under license through MSCI. All returns based calculations are calculated by Research Affiliates, LLC.

Exposure to Return Factors is Dynamic

Simulated RAFI Fundamental Index All World 3000 (1984–June 2013)



Return figures are annualized.

Source: Research Affiliates, LLC, based on data from CRSP, Compustat, Datastream and Worldscope.

Note: The analysis displays value added attribution of simulated RAFI AW 3000 against a simulated Cap-Weight All World 3000 Index and simulated RAFI US Large vs S&P 500 Index. Returns are in USD. The Attribution Analysis used is described in our November/December 2010 *Financial Analysts Journal* article, which is available on www.researchaffiliates.com.

Fundamental Index Performance

	8/31/2013	3 Month	1 Year	3 Year	5 Year	Since Launch*	Launch Date
FTSE RAFI All World 3000		0.2%	20.8%	12.0%	6.0%	14.2%	10/6/2008
MSCI All World		-0.3%	16.1%	12.3%	4.4%	12.5%	
Value Added		0.5%	4.7%	-0.3%	1.6%	1.7%	
FTSE RAFI UK 300		1.7%	19.1%	13.0%	6.1%	13.1%	3/16/2012
MSCI UK		0.6%	13.5%	11.4%	3.2%	9.7%	
Value Added		1.1%	5.6%	1.6%	2.9%	3.4%	
FTSE RAFI US 1000		0.9%	25.6%	19.4%	10.6%	7.6%	11/28/2005
Russell 1000		1.0%	19.8%	18.7%	7.6%	6.0%	
Value Added		-0.2%	5.8%	0.7%	3.0%	1.6%	
FTSE RAFI Europe		1.9%	22.5%	8.3%	1.3%	2.5%	5/4/2006
MSCI Europe		0.9%	20.0%	10.7%	1.9%	2.8%	
Value Added		0.9%	2.5%	-2.4%	-0.5%	-0.2%	
FTSE RAFI Developed ex-US 1000		0.8%	21.0%	8.4%	2.6%	4.9%	11/28/2005
MSCI EAFE		0.2%	19.2%	9.8%	2.1%	4.1%	
Value Added		0.6%	1.8%	-1.4%	0.5%	0.8%	
FTSE RAFI Emerging Markets		-7.7%	-3.9%	-0.7%	2.0%	0.4%	7/9/2007
MSCI Emerging Markets		-6.9%	0.9%	1.4%	2.2%	-0.3%	
Value Added		-0.9%	-4.7%	-2.2%	-0.2%	0.6%	

*Launch date returns are calculated using the first full month of returns following index inception.

Note: The index version of the RAFI methodology, or the FTSE RAFI Indexes, is licensed globally by our partner the FTSE Group. All returns are Total Returns in USD with the exception of the FTSE RAFI Developed Europe Mid Small and MSCI Small Cap Europe Index which are price returns.

This material relates only to a hypothetical model of past performance of the Fundamental Index® strategy itself, and not to any asset management products based on this index. No allowance has been made for trading costs or management fees which would reduce investment performance. Actual results may differ. Indexes are not managed investment products, and, as such cannot be invested in directly. Returns represent performance based on rules used in the creation of the index, are not a guarantee of future performance and are not indicative of any specific investment. Returns listed prior to the individual indexes launch dates are simulated.

MSCI returns information provided under license through MSCI. All returns based calculations are calculated by Research Affiliates, LLC.

Source: Research Affiliates, LLC., based on data from Bloomberg and Factset.

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Notes: Strategy Simulation Descriptions

¹Volatility weighted: Weighted based on the standard deviation of monthly returns over the five year window prior to index construction.

²Market Beta Weighted: Weighted based on CAPM betas using market factor kindly provided by Kenneth French on his website.

The market beta loading is estimated using monthly returns data over five years window prior to index construction.

³Downside Semi-Deviation Weighted: Weighted based on downside semi-deviation of the monthly returns over five year period prior to index construction.

⁴Cap-Weighted: Weighted based on market capitalization. The market capitalization is computed using December close of the year prior to index construction.

⁵Book Weighted: Weighted based on the book value of equity. We use the book value from the fiscal year two years prior to index construction. We introduce delay to avoid forward-looking bias.

⁶Five-year Average Earnings Weighted: Weighted based on the average of the five-year earnings. The averaging period covers the five fiscal years ending with the fiscal year two years prior to index construction. We introduce delay to avoid forward-looking bias.

⁷Fundamentals Weighted: Weighted based on the five year averages of cash flows, dividends, sales and the most recent book value of equity. We introduce two year delay to avoid forward-looking bias. Following the original method, we select top stocks with the largest fundamental weight. For details see Arnott, Hsu, and Moore (2005).

⁸Earnings Growth Weighted based on five-year average dollar change in earnings divided by the average absolute dollar value of earnings over the five-year period. The last fiscal years of the measuring window is taken two years prior to index construction. We introduce delay to avoid forward-looking bias.

⁹Minimum Variance: To construct the minimum variance strategy we use the method of Clarke, de Silva, and Thorley (2006).

¹⁰Maximum Diversification Portfolio optimized to maximize expected diversification ratio, which is defined as the ratio of weighted average risk to the expected portfolio risk. For details see Choueifaty and Coignard (2008).

¹¹Risk-Efficient ($\lambda=2$) Mean-variance optimized portfolio assuming that expected excess returns are proportional to the stocks' downside semi-deviation, and with stringent constraint to limit portfolio concentration. For details see Amenc et al (2010).

¹²Risk Cluster Equal Weight Applying statistical methods to identify major market risk factors, assumed to be driven by industries and geographies, and then equally weight these uncorrelated risk clusters.

¹³Diversity Weighting: Weighted based on the market capitalization weight raised to the power of a constant that is between zero and one to tilt the portfolio towards small cap stocks while limiting tracking error. We used the value of 0.76 in our simulation.

¹⁴Malkiel's Monkey: Average of 100 portfolios, where each of the individual portfolios is rebalanced annually by randomly selecting 30 stocks out of the universe of the largest 1000 stocks by market capitalization.

¹⁵Equal Weighting: Equally weighted portfolio of 1000 largest stocks by market capitalization

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