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**“Smart Beta” Factor Investing: Mapping Factor
Exposures into Asset Allocations** 04.07.2019



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“Smart Beta” Factor Investing: Mapping Factor Exposures into Asset Allocations

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Portfolio Management

EMFI Angola’s Sovereign Fund 2019

Outline and objectives

- What is smart beta? Is it smart?
- Kahn and Lemmon's passive/active/smart beta decomposition
- The smart beta illusion: do not pay active ptf. management prices for smart beta exposures
- Smart beta as a disruptive innovation in asset management
- Smart beta in the long run and as a worldwide phenomenon

What is smart beta?

- A smart beta strategy is a portfolio strategy aimed at gaining non-zero (often, substantial and persistent) exposure to one or more **“priced” risk factors** that differ from the plain-vanilla, market portfolio
 - Priced == characterized by a non-zero risk premium, i.e., by a non-zero average excess return
 - Generally, positive exposures are acquired vs. **factor-mimicking ptf.** that pay positive risk premia
 - The factors are represented by dynamic portfolios of assets (usually but not only, stocks) that maximize the exposure to a factor
 - Therefore the strategy buys into a dynamically rebalanced factor portfolio and as such it takes a dynamic position that implies that systematic buying and selling should take place
 - The factors differ from the classical market portfolio
- This smart beta is dynamic and implies (often considerable) trading
- Because the CAPM implies that the market ptf. is a value-weighted ptf. all assets/stocks, also static portfolios that deviate from weighted-value schemes are considered smart beta

What is smart beta?

- What are the most popular SMS?
- Fama and French (1993, 2012, 2015) identify four factors in addition to the market: **size, value, profitability, and investment**
- Black (1972) and Frazzini and Pedersen (2014) identify **low risk**
- Jegadeesh and Titman (1993) and Carhart (1997) identify **momentum**
- Some other factors noted as of recent times and occasionally commented in the asset management literature are quality (good accounting health ratios), dividend payouts, receivables, and ESG
- In all, researchers have identified **at least 316 factors**, of which Harvey, Liu, and Zhu (2016) point out that nearly all are unlikely to be robust in independent testing
- Novy-Marx and Velikov (2015) express doubts on the prospective profits from exploiting SMS that appear promising on in-sample basis
- Harvey (2017) notes the impracticality of waiting for additional data in order to test a model's OOS reliability—not to mention the understandable impatience of practitioners.

What is smart beta?

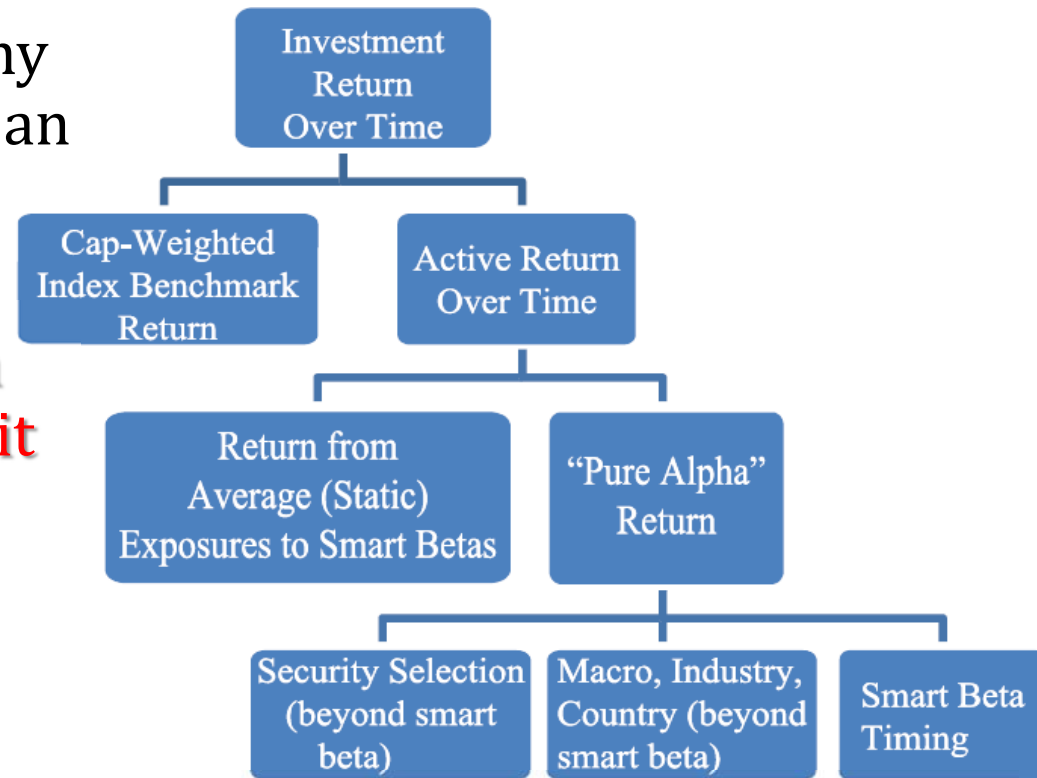
- Let's consider the case of **value stocks**, i.e., stock with high book-to-market, low price-earnings, etc. ratio
 - Value is conceptually defined as “cheap stocks”
 - It has been found to give positive average returns in the long run
 - Practically the factors is formed by going **long** in the top quintile of stocks sorted on the basis of their BM ratio and going **short** in the bottom quintile of the same sort
 - Such measures change every quarter (at least, given that the price changes every day) and as such the sorting is performed afresh so that stocks leave and enter the traded quintiles
 - Therefore the factor-mimicking ptf. implies considerable trading
- A smart beta strategy (**SBS**) may consist of investing 50% of a portfolio in the market ptf. (an index ETF) and 50% in a long-short portfolio tilted towards (away from) high (low) BTM ratio stocks
 - In this case one is buying value beta
 - The strategy is both static and dynamic because it implies a deviation from the value-weighted CAPM ptf. but also dynamic because the value smart beta requires active trading

Kahn and Lemmon (2015, JPM)

- SBS are active strategies, in that they attempt to enhance risk-adjusted returns through exposure to desirable characteristics, or factors
- They have some of the benefits of passive strategies, in that portfolio construction is simple, rules-based, and transparent, which tends to lead to high capacity and low fees and costs
- **Most product development to date has occurred in equities**, and these products typically provide exposure to combinations of value, momentum, size (with small caps outperforming large caps), quality, and volatility (with low-beta or low-volatility stocks outperforming high-beta or high-volatility stocks)
- These factors may be driven by associated risk premia or result from a behavioral anomaly or market structural impediment
 - There are never guarantees, i.e., these equity factors have historically exhibited significant underperformance over specific 3- to 5-year periods
- Kahn and Lemmon propose a **decomposition** of any ptf. into a combination capitalization-weighted benchmark returns and active returns (SMS returns and active return above and beyond SMS factors)

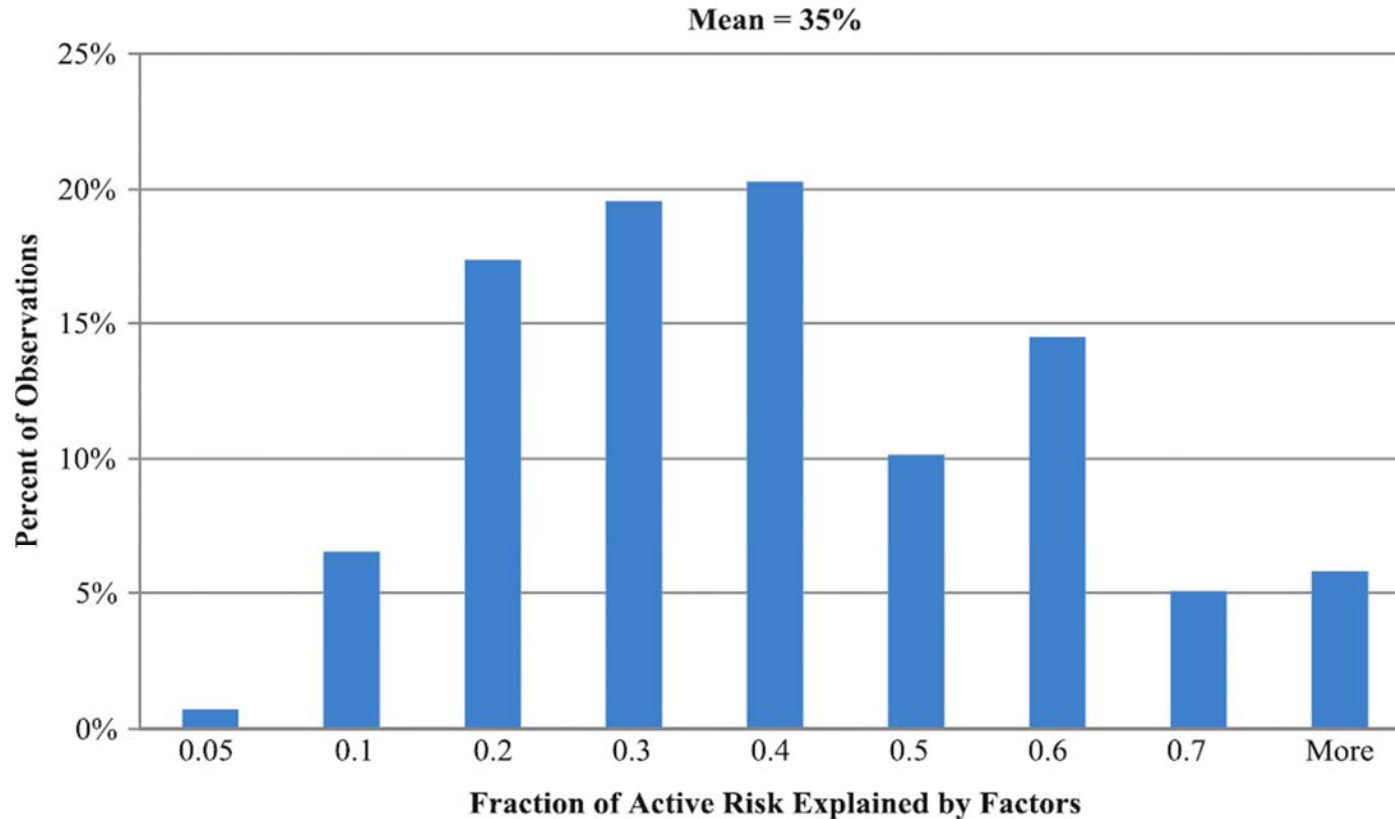
Kahn and Lemmon (2015, JPM)

- Over time, the active return for any investment product is the sum of an average smart-beta term and pure alpha return
- Therefore **smart beta is not alpha and should not be confused with it**
- Pure alphas arises from:
 - The average **security selection** (beyond SMS)
 - The avg. macro, industry, and country returns (beyond SMS), the **strategic sectoral/country allocation**
 - The return due to **smart-beta timing**, when SMS exposures vary over time and exposures are higher when the SMS factor return exceeds its expectation and lower when the SMS factor return falls short of its expectation
- The goal of active management is to deliver active returns above and beyond that available via static exposures to SMS factors
- Static exposures to SMS factors are now available at low cost



Kahn and Lemmon (2015, JPM)

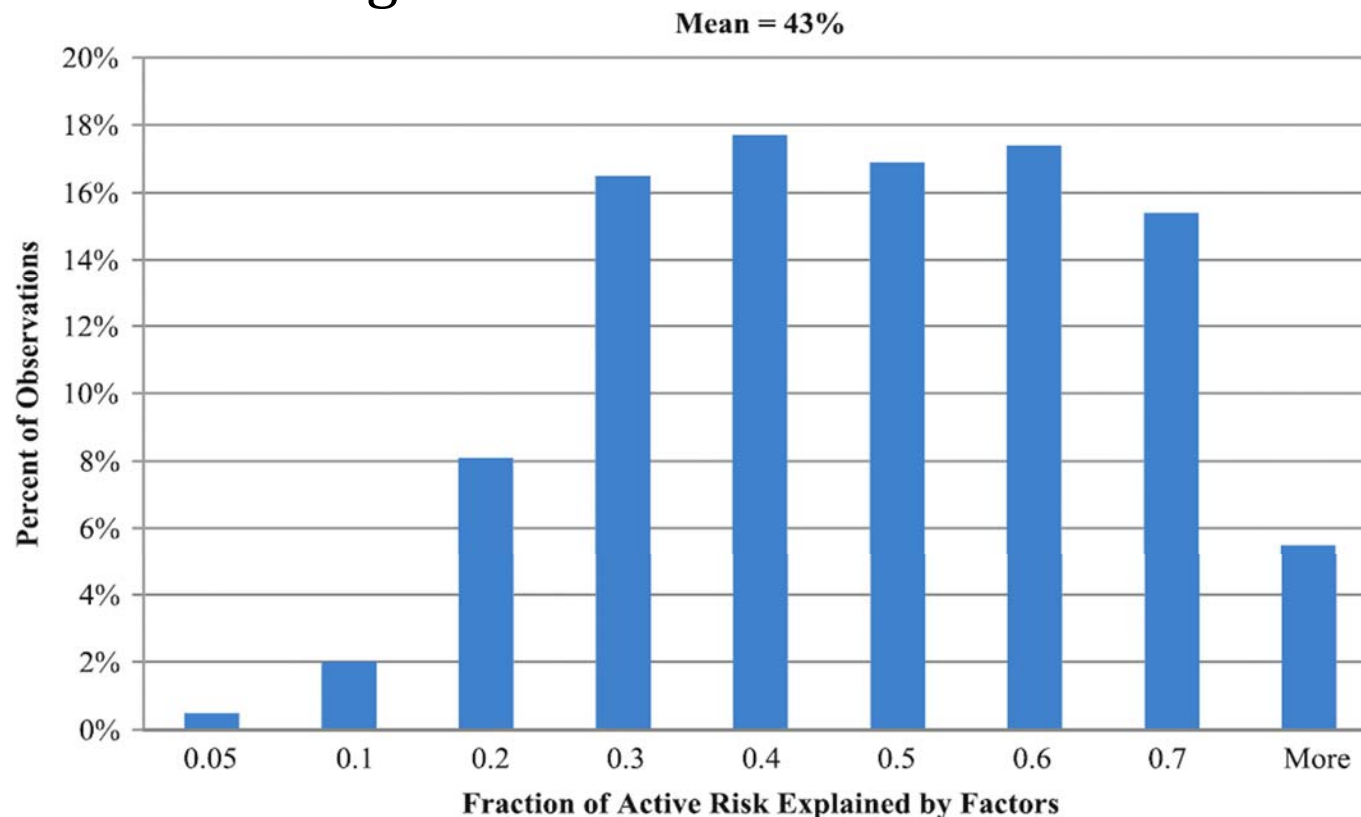
- This plot shows the fraction of active risk explained by four smart-beta factors (market, size, value, and momentum) for 138 global active-equity managers in the eVestment database (April 2011-March 2014)



- Many of these active managers are not focused on delivering what only active managers can deliver: returns beyond static exposures to SMS!
- **This situation becomes more pronounced when an investor hires multiple managers**

Kahn and Lemmon (2015, JPM)

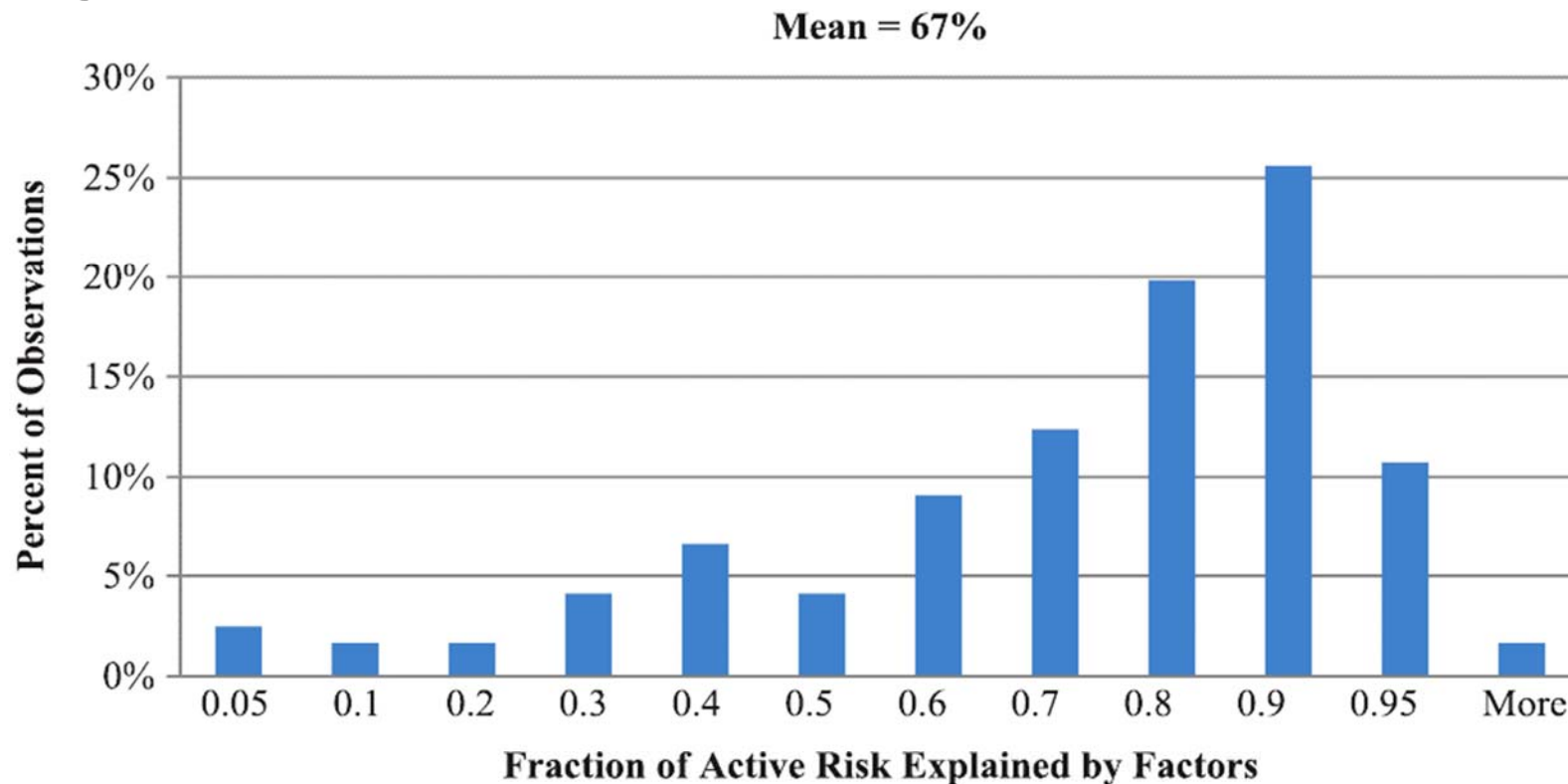
- Even if each individual manager takes mainly stock-specific risk, the aggregate portfolio can have a higher fraction of active risk in SMS
 - There is a mathematical reason for it (see details in the paper)
- Same picture for 1,000 simulations, each building an equally weighted portfolio of 10 managers chosen at random



- You can be happier with your active managers in isolation and less happy with them in aggregate

Kahn and Lemmon (2015, JPM)

- The issue of SMS factor exposures being magnified in multi-manager portfolios is **even more dramatic in fixed income**
- The histogram concerns the fraction of active risk explained by two SMS (duration and credit) for the 121 U.S. Core Plus fixed income managers in the eVestment database (April 2011 - March 2014)



- However, SMS and active management are not in contrast: **SMS products should expand the after-cost efficient frontier provided by active products**

Kahn and Lemmon (2015, JPM)

- At this point, assuming the optimal, fairly priced, blend of active management and SMS has been found, investors must consider several practical issues
- Do they want a **long-only** implementation of SMS factors (e.g., through ETFs), or are they open to **long-short implementations** (e.g., ETNs)?
 - Do their guidelines allow shorting? Is shorting allowed but limited and possibly more valuable when used for alternative investments?
 - The advantage of long-short implementations is that they better capture the true factor and so presumably have a higher ratio of return to risk.
 - The disadvantage include the additional costs of shorting, the additional complexity of implementation, the scarcity of long-short SMS offerings
- **Capacity**, whether SMS can be accessed without impacting prices and hence expected returns, is another practical issue
 - For example, the size factor overweights small-cap stocks to capture their outperformance relative to large-cap stocks; but there is limited capacity available for investing in small-cap stocks
- What **tracking error** can be accepted by the investors?

Kahn and Lemmon (2016, FAJ)

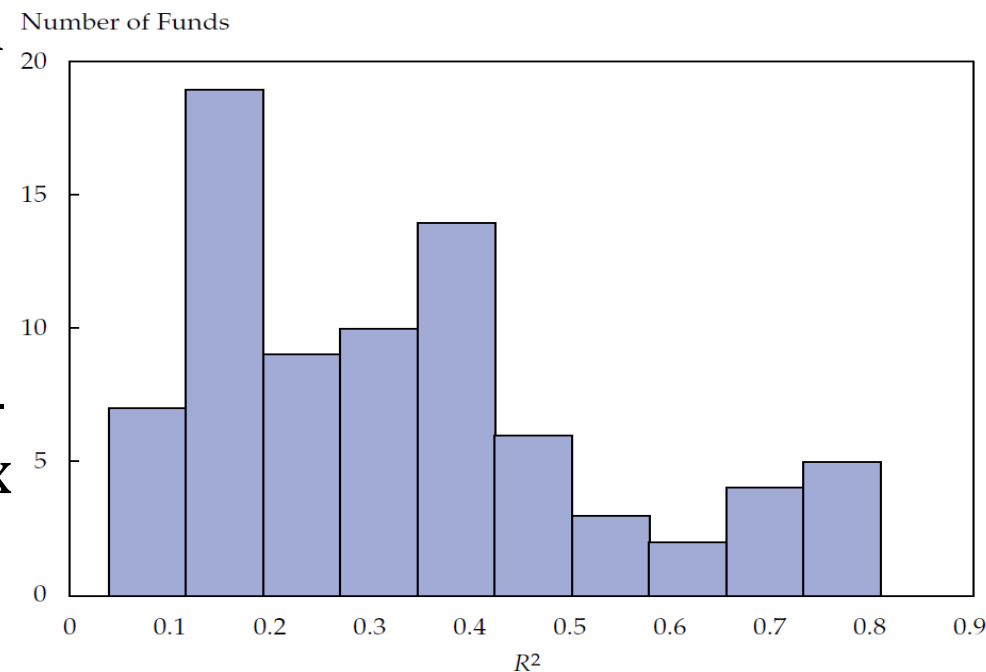
- Kahn and Lemmon (2016) claim that although smart beta products are a disruptive financial innovation with the potential to significantly affect the business of traditional active management...
 - See <https://www.economist.com/briefing/2014/05/01/will-invest-for-food>
 - In management lingo on innovation, this is not a revolutionary innovation but a disruptive one, that creates new markets
- They provide an important component of active management via simple, transparent, rules-based portfolios delivered at lower fees
- They emphasize what investors need from their active managers is pure alpha—returns beyond those from static exposures to smart beta
- Most of the disruptive innovations in asset management have arisen despite seemingly little, if any, appetite for them in the marketplace



Kahn and Lemmon (2016, FAJ)

- SMS are active strategies with some characteristics of passive ones
 - They use **simple, rules-based, transparent approaches** to building ptf's that deliver static exposures (relative to cap-weighted benchmarks) to characteristics historically associated with excess risk-adjusted returns
 - They are active strategies because **they require periodic rebalancing** in order to maintain the desired exposures, and like any active strategy, they can underperform their cap-weighted benchmark
- **SMS are a disruptive innovation** because currently many traditional active managers deliver a significant fraction of their active returns via static exposures to smart beta factors while charging active fees
- In the plot, Kahn and Lemmon estimate time-series regressions on six SMS factors (market, size, value, quality, momentum, and low vol)
- R^2 measures the fraction of managers' active return variance explained by SMS

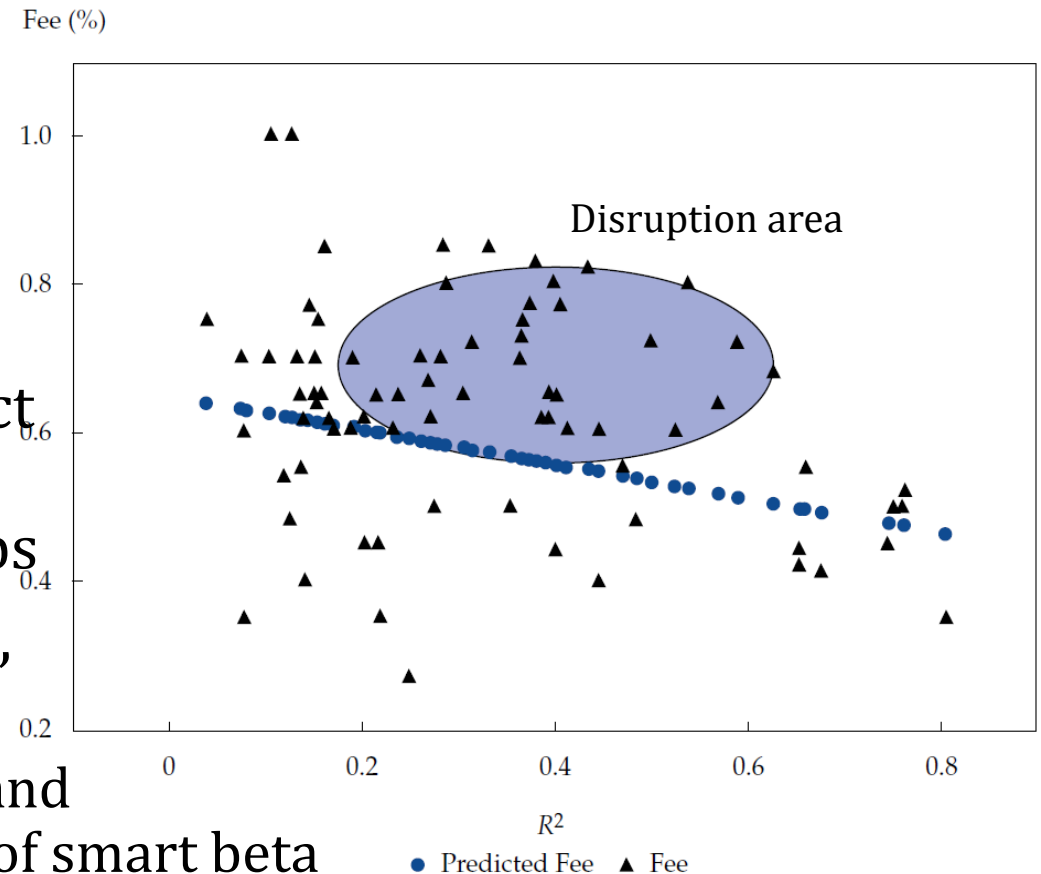
Fraction of Managers' Active Variance (R^2) Explained by Six Smart Beta Factors, January 2010–December 2014



Kahn and Lemmon (2016, FAJ)

- SMS exposures are a significant part of active management
 - What this finding means for investors in active products depends on how much smart beta they receive relative to the fees they pay
- If an active global equity product delivers 100% pure alpha ($R^2 = 0$), its fee should be about 65 bps
- If it delivers 100% SMS ($R^2 = 1$), its fee should be about 42 bps.
 - The funds near the far right-hand side, with a very high fraction of smart beta risk, appear to have fees more in line with their factor exposures
 - This set are dominated by low-volatility and defensive funds
- SMS are likely to be successful: take ideas already in use— as components of active strategies—and deliver them cheaply and transparently

Actual Fees and Predicted Fees vs. the Fraction of Managers' Active Variance (R^2) Explained by Six Smart Beta Factors, January 2010–December 2014



Kahn and Lemmon (2016, FAJ)

- However, SMS face risks in its development:
 - ① Because investors may hear more about the benefits of smart beta than about the risks, there is a danger that negative smart beta investment performance will impede the evolution from traditional active
 - Even without significant underperformance, we could see a wide dispersion of returns for different definitions of smart beta (e.g., book-to-price versus earnings-to price for value)
 - This result could dampen enthusiasm among investors who do not understand that smart beta factors are not uniquely defined
 - ② The schism of traditional active management into two distinct product types will require a significant effort to educate investors
 - ③ The asset management business is fragmented; the proliferation of smart beta products and indexes has confused investors, even if many of those products share similar smart beta exposures
- Consider the managers who deliver a mix of smart beta and pure alpha at fees roughly consistent with that mix: the dilemma is to choose whether to go with smart beta or pure alpha

Dimson, Marsh, and Staunton (2017, JPM)

- To identify SMS, researchers typically construct long–short ptf s that are **long the preferred exposure and short the unwanted exposure**
- As it is far easier to buy stocks you do not own than to sell stocks you do not own, long–short strategies are expensive— on occasion impossible—to construct, and they can certainly be difficult to scale up
- “Pure play” long–short strategies are often called “**style strategies**”
- It should be no surprise that the growth in smart beta ETFs and ETPs is in long-only portfolios that are tilted (sometimes rather modestly) toward or away from particular factor exposures
- Dimson, Marsh, and Staunton (2017) examine the out-of-sample (OOS) evidence on SMS over a long, 117-year sample for the US and the UK

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2008–2016
Panel A: U.S.										
Highest	Low vol 90.3	Size 28.5	Size 13.6	Low vol 40.5	Value 11.5	Size 5.3	Low vol 11.3	Momentum 42.3	Value 17.2	Low vol 6.0
	Income 20.7	Value –8.0	Momentum 8.5	Income 29.5	Size 7.8	Value 4.7	Income 1.6	Low vol 13.9	Income 14.8	Size 4.0
	Momentum –2.4	Income –17.2	Income 7.1	Momentum 1.4	Momentum –0.9	Momentum 4.5	Value –2.2	Income 2.4	Size 9.6	Income 3.8
	Size –4.3	Low vol –33.0	Value –4.5	Size –3.7	Low vol –1.5	Income –8.2	Momentum –5.3	Size –9.3	Low vol –1.8	Value –1.8
Lowest	Value –6.0	Momentum –50.6	Low vol –15.2	Value –12.8	Income –7.6	Low vol –9.3	Size –6.7	Value –12.0	Momentum –22.4	Momentum –6.0

Dimson, Marsh, and Staunton (2017, JPM)

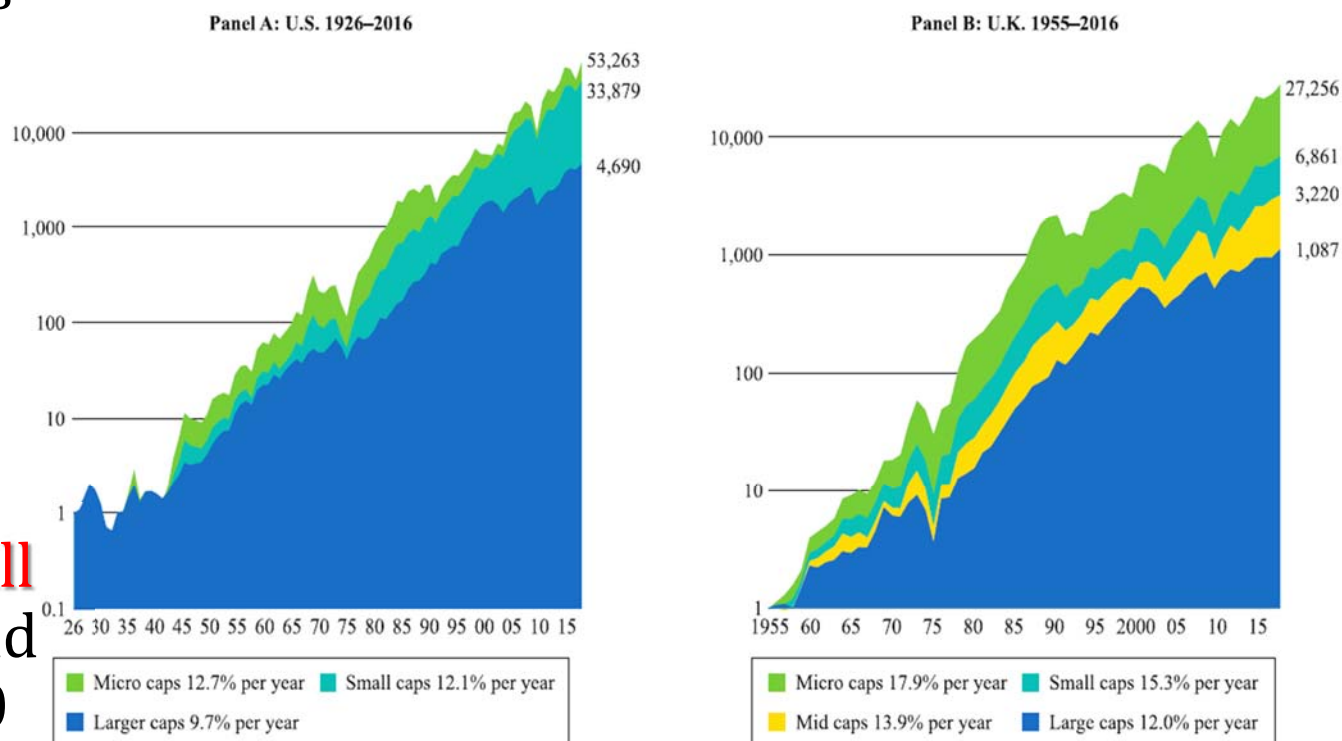
Panel B: U.K.

Highest	Low vol 127.0	Size 24.9	Size 12.4	Low vol 35.0	Size 17.0	Momentum 32.4	Momentum 42.8	Low vol 23.7	Value 20.2	Momentum 12.8
	Momentum 78.8	Income 1.1	Value 3.2	Income 28.3	Value 14.8	Size 15.5	Size 12.1	Momentum 20.1	Income 15.3	Size 6.5
	Income 15.7	Value -6.9	Momentum 0.7	Momentum 20.6	Momentum -1.7	Low vol 11.5	Income -1.3	Size 11.1	Size -4.9	Low vol 5.5
	Value -11.8	Low vol -20.1	Income -13.7	Size -4.9	Income -8.1	Income 0.0	Low vol -6.2	Income -11.2	Momentum -18.3	Income 2.1
Lowest	Size -17.5	Momentum -25.4	Low vol -22.9	Value -10.7	Low vol -15.7	Value 0.0	Value -10.0	Value -20.9	Low vol -21.2	Value -3.2

- A frustrating feature of factor risk premiums is that they may simply be transient anomalies in stock market behavior and no sooner have they been identified than they cease to work

- Large caps are the constituents of CRSP NYSE deciles 1–5, **small caps** as deciles 6–8, and **micro** are deciles 9–10

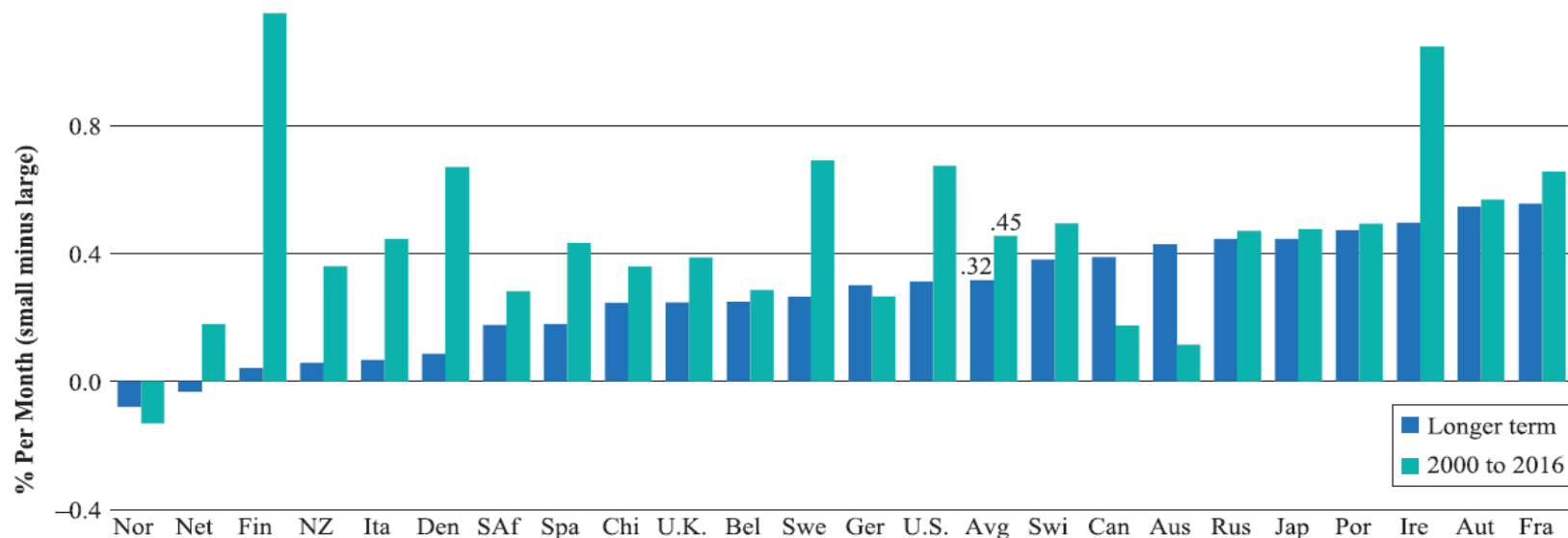
Performance of Micro-, Small- and Large-Cap Stocks: U.S. 1926–2016 and U.K. 1955–2016



Dimson, Marsh, and Staunton (2017, JPM)

- The returns on large-cap stocks were an annualized 9.7%, while small- and micro-cap stocks achieved 12.1% and 12.7%, respectively
- For the UK, the numbers are 12.0% and 17.9%.
- The relative progress of small caps, however, was not consistent and steady, and there were prolonged intervals of underperformance
- The size premium is/was not restricted to the U.S. and the U.K., but had been present in almost every country studied; in most countries, the size premium could not be explained away by risk

Small-Firm Premium in 23 Countries, Period to End of 2016, % Per Month

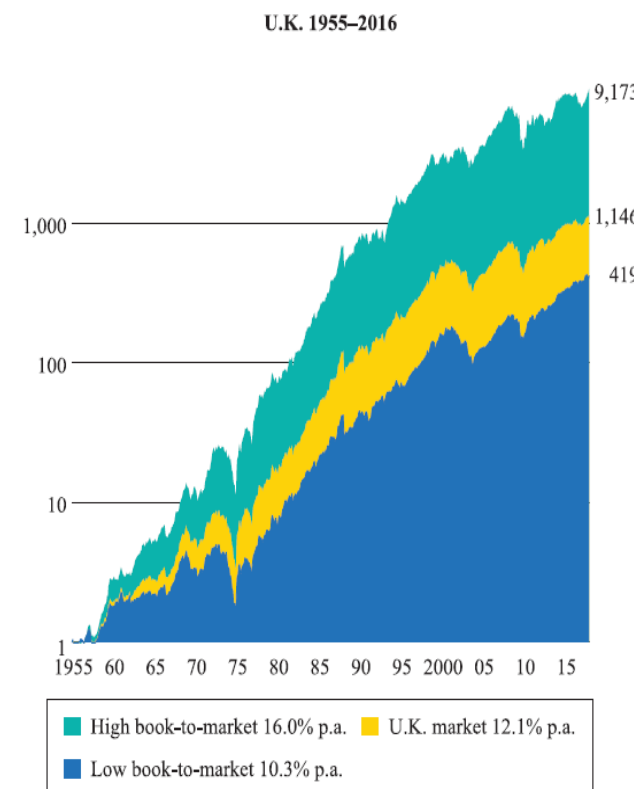
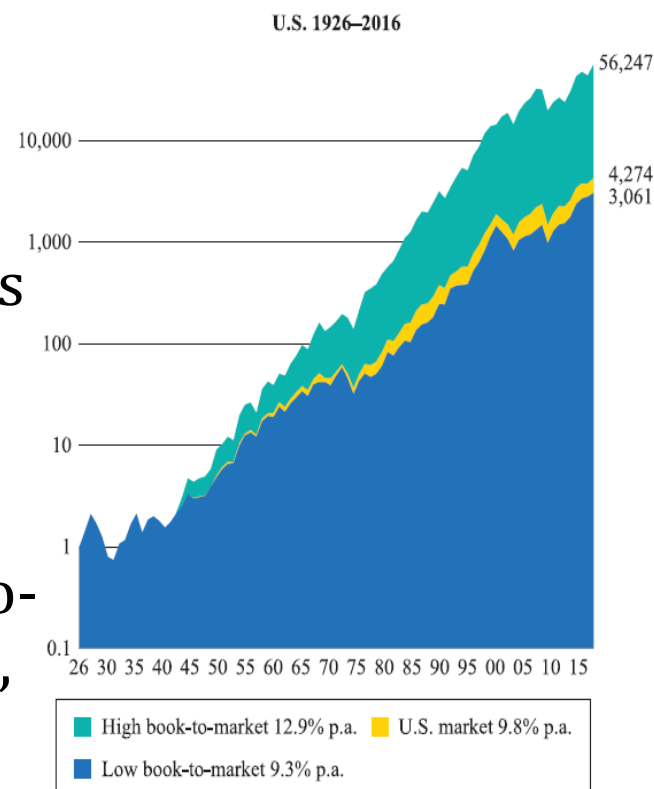


- Yet, the premium has been increasing recently – size is not dead!

Dimson, Marsh, and Staunton (2017, JPM)

- Nevertheless, small caps continue to perform differently from large caps, and it is clear that the small-cap effect lives on, even if the small-cap premium has proved lower in practice than in initial discovery
- There has historically been a relationship between the value or growth orientation of an investment strategy and its long-run performance
- **Value** stocks sell for low multiples of earnings, book value, dividends
- They may be mature businesses with an unexciting future, or they may have a depressed share price that reflects or anticipates setbacks
- **Growth** stocks sell for high valuation ratios, reflecting favorable prospects for the business, and expected to grow

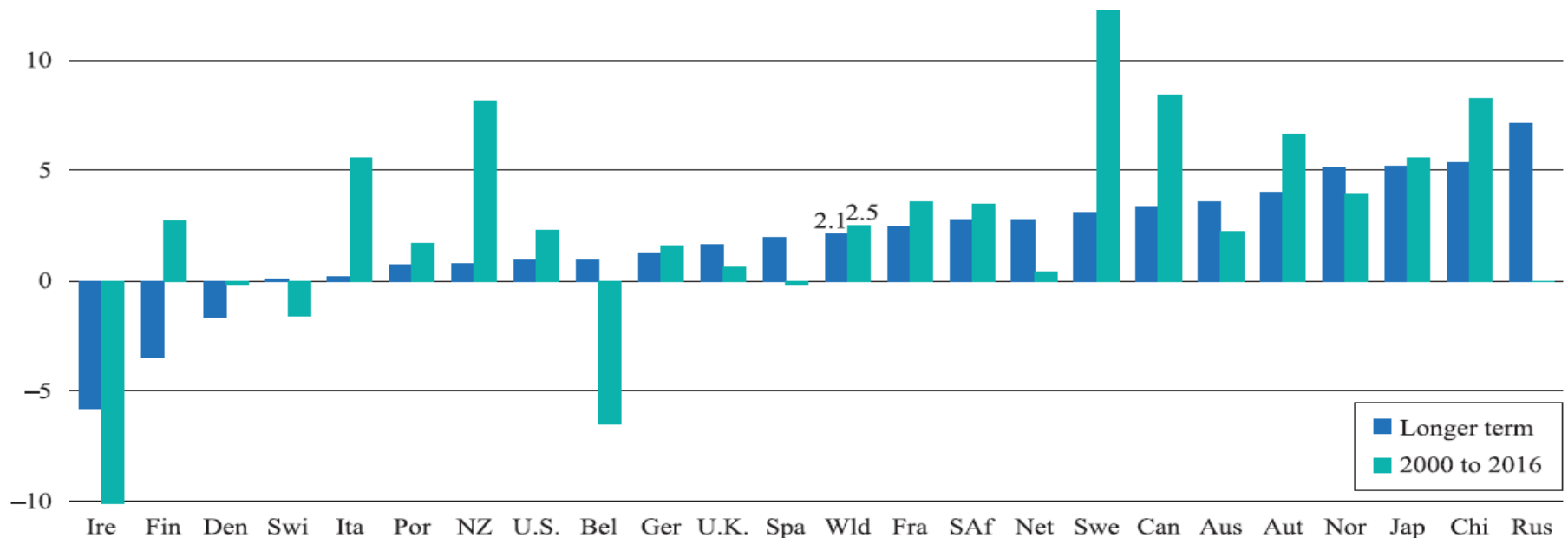
Performance of High and Low Book-to-Market Stocks: U.S. 1926–2016 and U.K. 1955–2016



Dimson, Marsh, and Staunton (2017, JPM)

- The (geometric) difference between the annualized returns on the Fama-French value and growth indexes is 3.3% for the US and 4.7% for the UK
- Value investing was a winning strategy in the period covered by the major research studies, but as in other areas of investing, the subsequent outcome was for several years the opposite
 - The 1990s was the era of growth stocks, and value strategies fared poorly
- After March 2000, value investing came back into its own

Annualized Value Premium in 23 Countries, 1975–2016, % Per Year

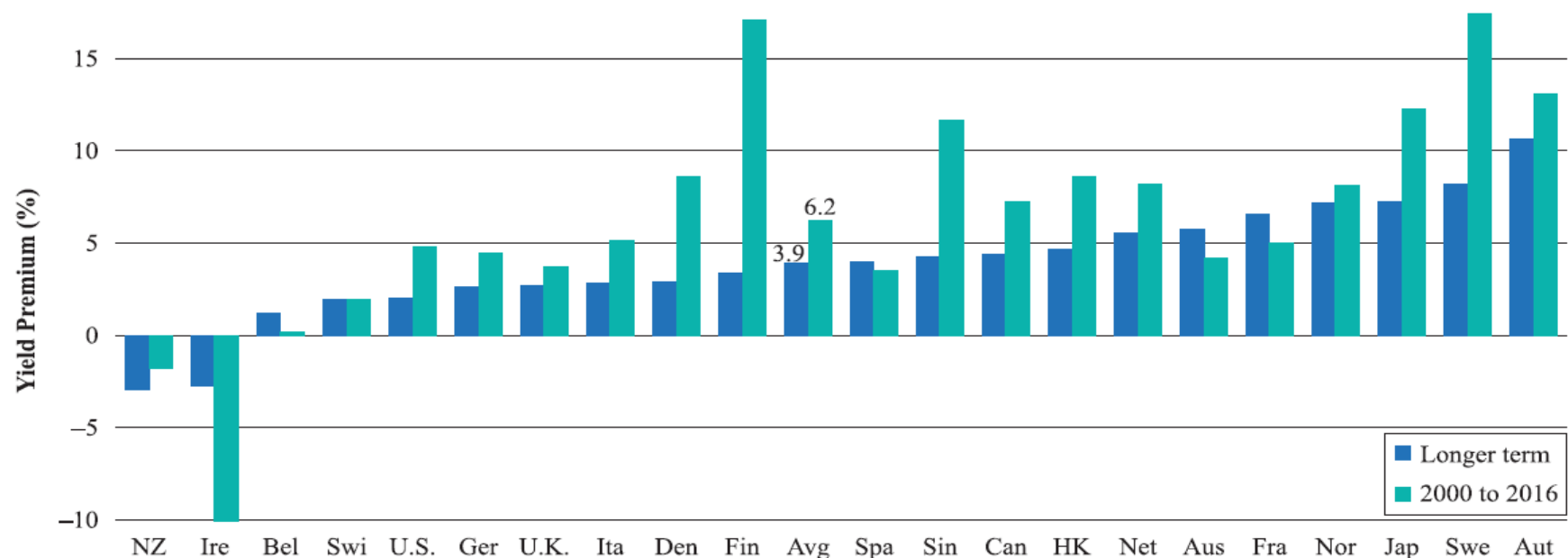


- Taking a global and long-term perspective, value mostly beat growth investing

Dimson, Marsh, and Staunton (2017, JPM)

- Since the 1970s, a number of researchers have documented a return premium from stocks with an above-average **dividend yield**
 - For the US, the return from the nondividend-paying stocks was 8.5%, while low-yield stocks returned 9.0%, and high yielders gave 11.3%
 - In the UK, the low-yield strategy would have given an annualized return of 7.8% vs. 10.8% per year for high-yield stocks

The Yield Premium around the World, 1975–2016, % Per Year



- The yield premium is now viewed as a manifestation of the value effect, since high yielders are stocks that sell for low multiples of a fundamental variable, namely dividends

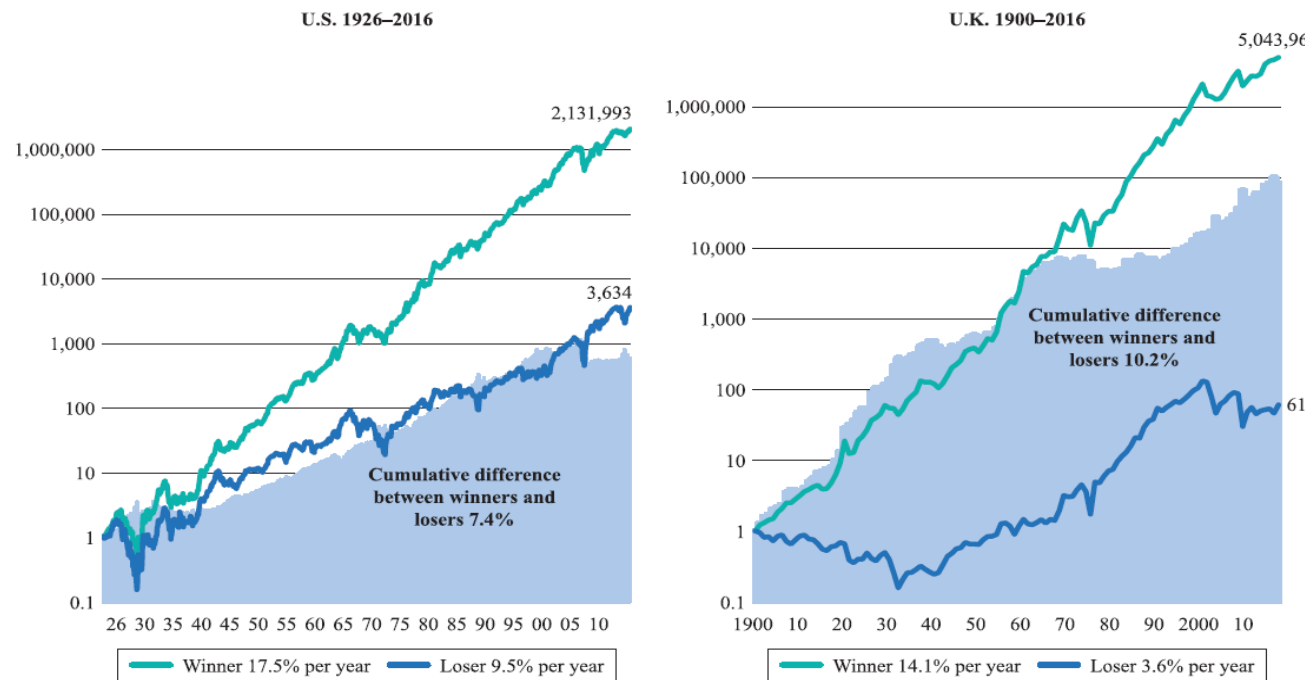
Dimson, Marsh, and Staunton (2017, JPM)

- In well-functioning mkts, it should not be possible to earn superior returns from a naïve strategy of buying past winners and selling losers
- In a seminal study of U.S. stock returns, Jegadeesh and Titman (1993) found that, over an intermediate horizon (up to 12 months), past winners tend to achieve superior performance and past losers suffer inferior performance, while short-term returns were unpredictable
- A strategy buying stocks that did well over the prior year (winners) and selling losers generated monthly profits of 1%
 - These profits were significant within small, medium, and large firms, and across beta subsamples, and were attainable because performance was attributed mainly to the long, rather than the short side of the portfolio
 - Researchers use different definitions of winners and losers, but typically they are taken to be the top and bottom 10%, 20%, or 30% of stocks
 - The strategy is to hold this position for (say) 1, 3, 6, or 12 months
 - To allow time for implementation, and to avoid contamination from the bid-ask bounce, there is usually a “wait period” btw. ranking and holding
 - A 6/1/6 strategy involves ranking stocks by their returns over six months, waiting for one month, and then investing over the next six months

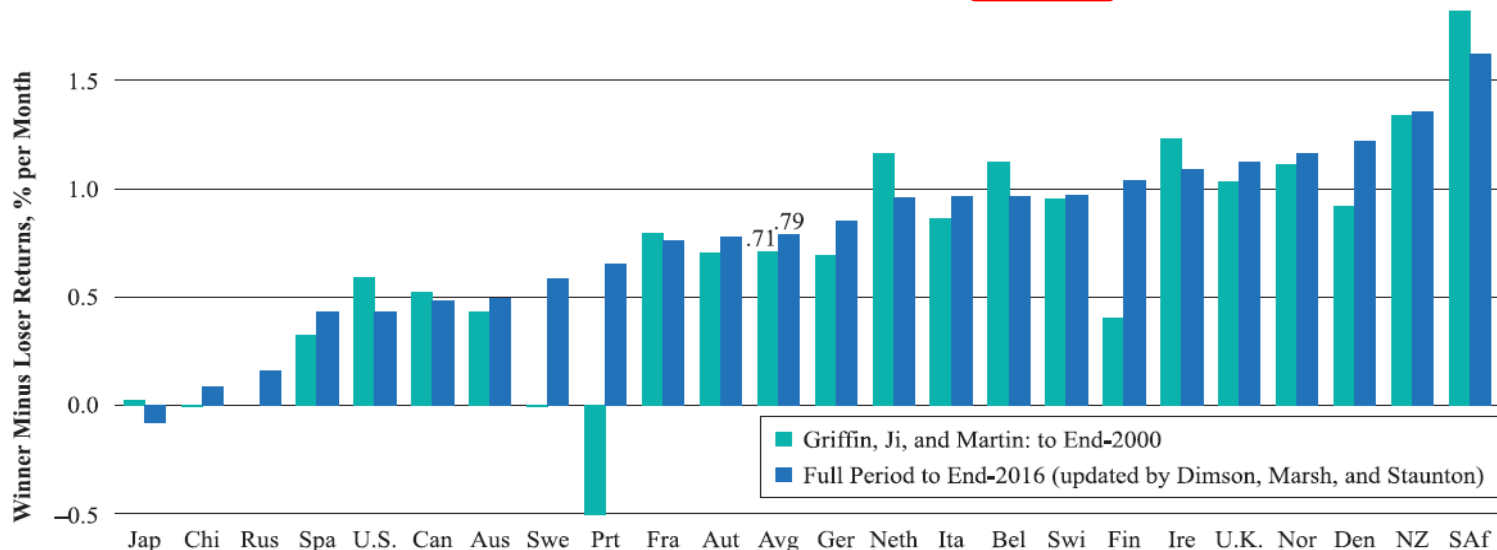
Dimson, Marsh, and Staunton (2017, JPM)

- A 6/1/6 **momentum** strategy in the US would have given a nominal return of 9.5% per year
- Results are similar for 1
- However strategies may be costly
- The returns from a WM strategy are volatile, with the occasional very bad year when markets sharply reverse direction

Performance of Momentum Strategy Based Portfolios: U.S. 1926–2016 and U.K. 1900–2016



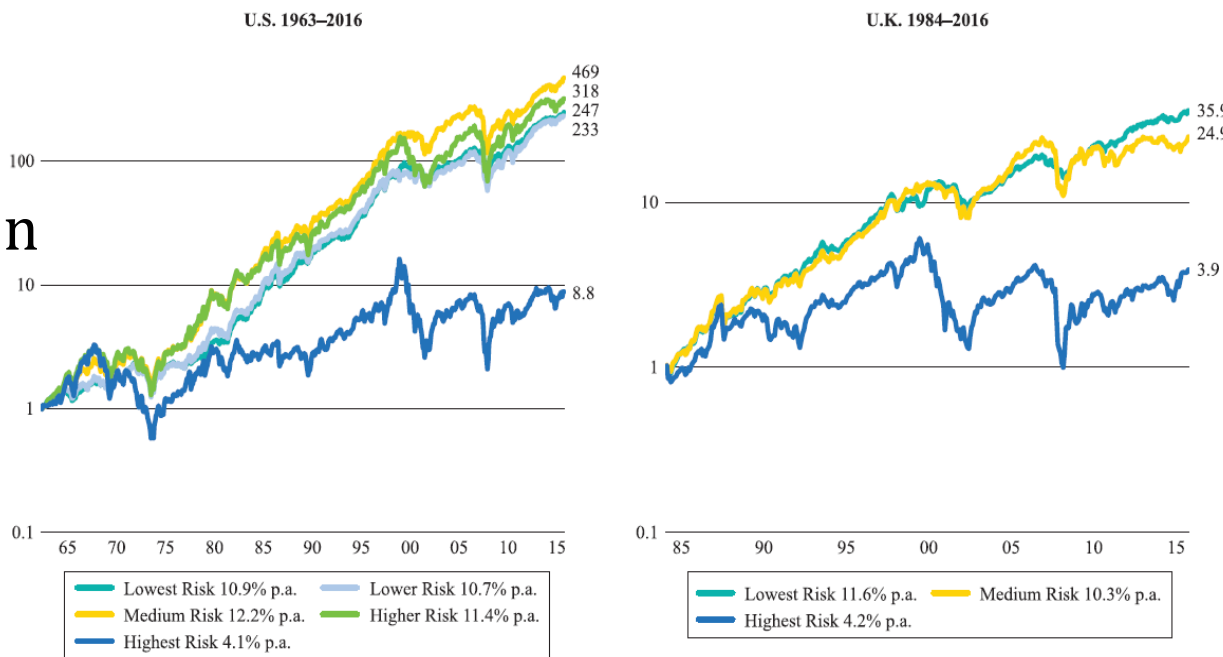
Returns from a 6/1/6 Momentum Strategy in 23 Countries, 1975–2016, % **per Month**



Dimson, Marsh, and Staunton (2017, JPM)

- From the earliest studies of risk and return, it was apparent that the return from low- β securities was higher than the CAPM implied, and that the return from high- β ones was not as high as the CAPM predicts
- The beta anomaly has been persistent—Frazzini and Pedersen (2014) estimate a **betting-against-beta (BAB) factor** that involves taking a long position in a portfolio of low-beta assets, leveraged to a beta of 1; plus a short portfolio of high-beta assets, unleveraged to a beta of 1
- They find support for the profitability of a BAB strategy in the U.S. and other countries
- Even more remarkable is the **low-volatility anomaly**, a significant inverse relation btw volatility or residual risk and mean return
- In both countries, the strategy reveals substantial underperformance by high risk stocks

Performance of Stocks Ranked by Short-Term Residual Risk: U.S. 1963–2016 and U.K. 1984–2016



Dimson, Marsh, and Staunton (2017, JPM)

- The results reported for the U.S. and U.K. are confirmed in studies of other countries, although there is no agreement on the causes
- However, volatile stocks tend to have a relatively low market capitalization: this presents an implementation challenge in that a long-short strategy aiming to take advantage of the underperformance of risky stocks would be shorting
 - For the US and UK, low risk companies represent an avg. 40% and 54% of the value of the equity market, respectively, whereas high-risk companies represent an average of just 8% of the market in both countries
 - Bali and Cakici (2008) argue that the significant negative relation reported by Ang et al. (2006) is driven by small-cap stocks and that, if these securities are omitted, the results become statistically insignificant
 - Furthermore, short-term risk measures are estimated with considerable error, and the true underlying risk of a stock is also time varying
 - Consequently, portfolio turnover for these risk-based strategies can be expected to be high
- There surely are other factors, **Cochrane's (2011) "zoo" of new factors** that are related to investment returns

Dimson, Marsh, and Staunton (2017, JPM)

- Fama and French (2015) present a five-factor asset-pricing model that outperforms their earlier three-factor model of stock returns
- Surprisingly, when the two additional factors of **profitability and investment** are added to the original three-factor model, the value factor becomes superfluous in U.S. tests
 - Consequently, profitability and investment entered the language of academic finance as factors in the return-generating process, and the new five-factor model was referred to by some as a four-factor model
- We recount five criteria that a potential factor should meet if it is to be useful in practice:
 - ① A factor must be persistent over time,
 - ② pervasive across markets,
 - ③ robust to different definitions,
 - ④ intuitive to common sense, and
 - ⑤ investable at reasonable cost

Dimson, Marsh, and Staunton (2017, JPM)

- Moreover, once a SMS premium has been identified and the research disseminated, the rewards to factor exposure may change. Just like predictions of the equity risk premium, it can be dangerous to extrapolate past performance into the future
- After disappointing performance, amplified by transaction costs and management charges, investors seeking to exit from a SMS run the danger of being involved in **crowded trades**, with price pressure
- E.g., commentators have argued that rapid growth in low-risk investing may have caused these assets to be bid up to an excessive price
- Also, a difference may exist between mean returns and mean risk-adjusted ones, e.g., the low-risk factor does not offer a superior return to investors—it offers a superior risk-adjusted return
- Dimson et al. have noted that all SMS returns, including five-factor risk premiums, are higher in periods of easing interest rates and lower when rates are tightening
- This statistically significant difference in asset returns persists in the UK as well as the US



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