Avantis Investors®

Post-Factor Investing

December 1, 2021

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Agenda

1. The Evolution of Financial Science
2. Post-Factor Investing – Going Back to Fundamentals with New Lenses
3. Implications for Asset Allocators
4. Summary & Questions

The Evolution of Financial Science:

From Markowitz to the Five Factor Model

Investing Before Data and Markowitz

"An investment operation is one which, upon thorough analysis, promises safety of principal and an adequate return. Operations not meeting these requirements are speculative."

-The Intelligent Investor, Benjamin Graham

Investing was an art.

There was no data, nor historical analysis.

Few great investors knew the power of understanding companies and their pricing to make good investments.

The art of fundamental analysis

The Evolution of Financial Science

Investing in only one security maximizes returns but does not consider the concept of risk and diversification.

Harry Markowitz introduced the concept of relating risk and expected return in portfolios.

"The basic concepts of portfolio theory came to me one afternoon in the library… if the investor were only interested in expected values of securities, he or she would only be interested in the expected value of the portfolio; and to maximize the expected value of a portfolio one need invest only in a single security.

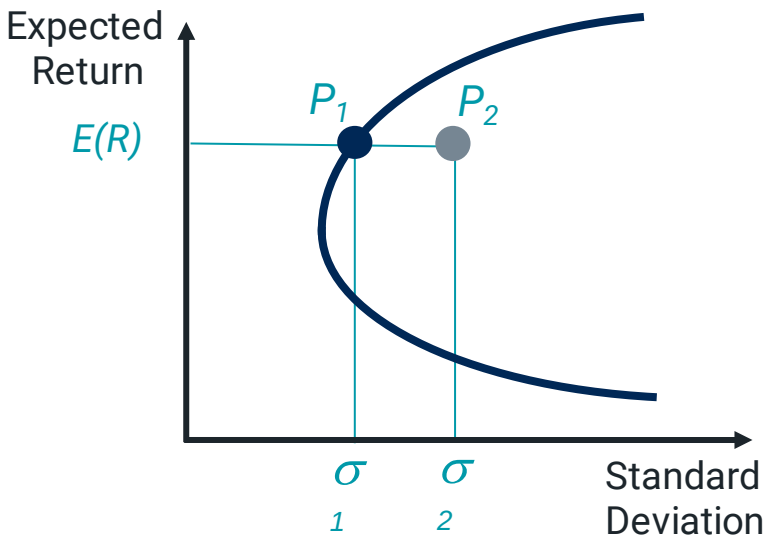
This, I knew, was not the way investors did or should act. ***Investors diversify because they are concerned with risk as well as return. Variance came to mind as a measure of risk.****"*

-"Portfolio Selection," Journal of Finance, 1952

Markowitz and the Efficient Frontier

Minimizes risk (measured as variance) for a level of expected returns

The Efficient Frontier is the set of portfolios that minimize variance for each level of expected returns



P_1 and P_2 have the same Expected Return, but P_1 has lower risk. P_1 is more efficient in getting the expected returns.

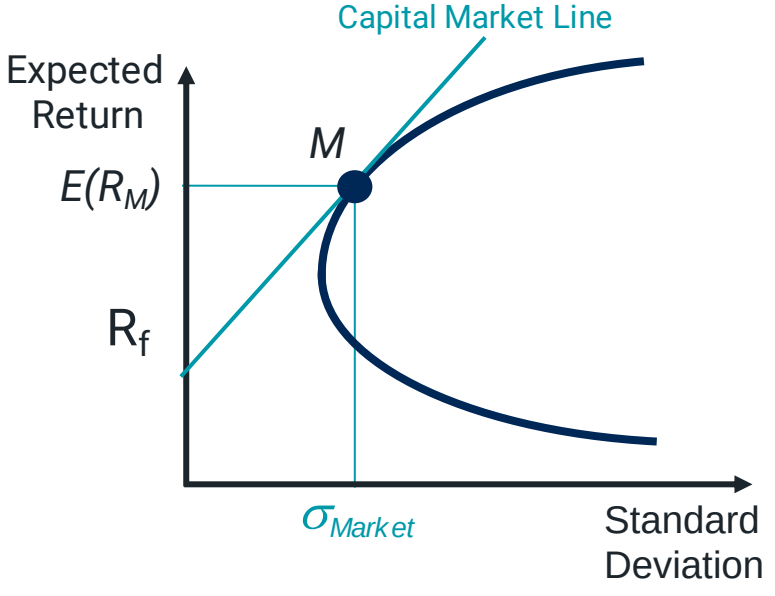
What matters to form portfolios

- Expected returns of securities
- Standard deviation of securities
- Correlation (co-movement) of securities

CAPM – Single Factor Model

Relates the expected excess return of securities over the risk-free rate to expected return of the market through a single parameter, β.

$$E(R_{sec}) = R_f + \beta_{sec} \underbrace{(E(R_M) - R_f)}_{\text{Market Factor}}$$



β_{sec} is a function of co-variance of the security with the market

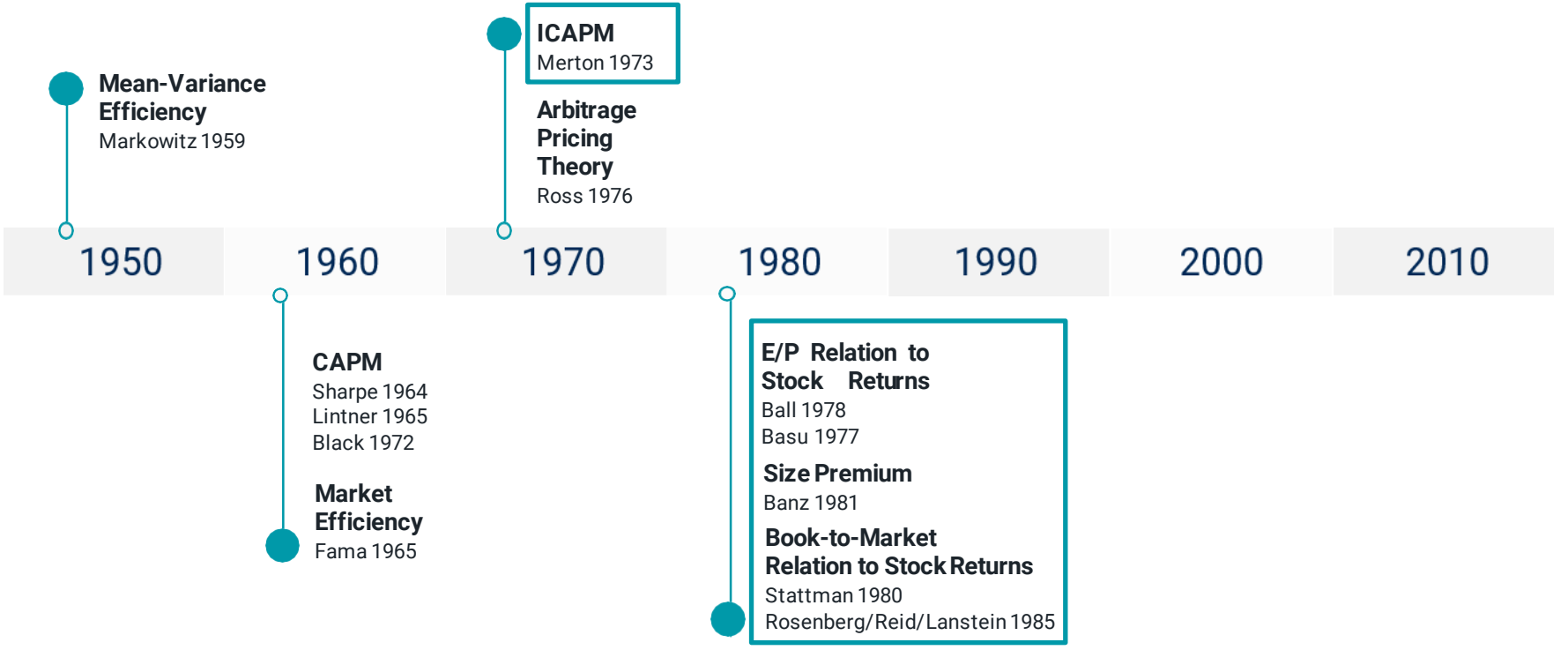
If risk can be diversified away up to the capital market line, E(R) of securities must be defined by their position on the capital market line.

Diversifiable risks are not compensated

The Evolution of Financial Science

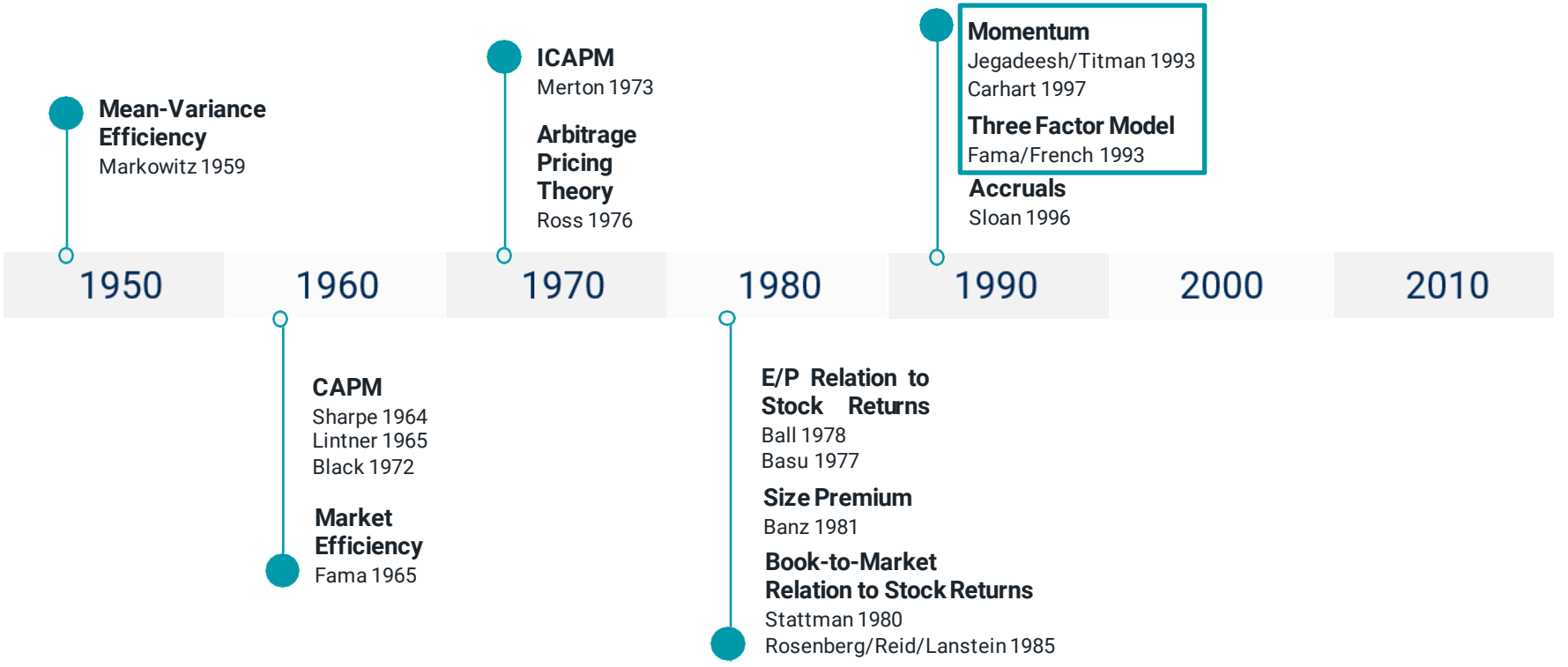
While the CAPM was elegant, reality is more complex.

Researchers embarked on historical data analysis to find out how the CAPM performed in real life.



The Evolution of Financial Science

The three- and four-factor models became another standard that new asset pricing models were judged against.



Fama/French Three Factor Model

Relates the expected excess return of equity securities over the risk-free rate to expected return of the market, a size factor and a book-to-price factor

$$E(R_{sec}) = R_f + b_{sec}\underbrace{(E(R_M) - R_f)}_{\text{Market Factor}} + s_{sec}\underbrace{E(SMB)}_{\text{(Small – Big) Factor}} + h_{sec}\underbrace{E(HML)}_{\text{(High B/M – Low B/M) Factor}}$$

- SMB: Long Small Cap /Short Big Cap Companies
- HML: Long High Book-to-Market /Short Low Book-to-Market Companies

This empirical model says that *smaller capitalization* and *higher book-to-market* companies have higher expected returns than the market. Premiums can be due to risk or tastes/preferences (model does not specify)

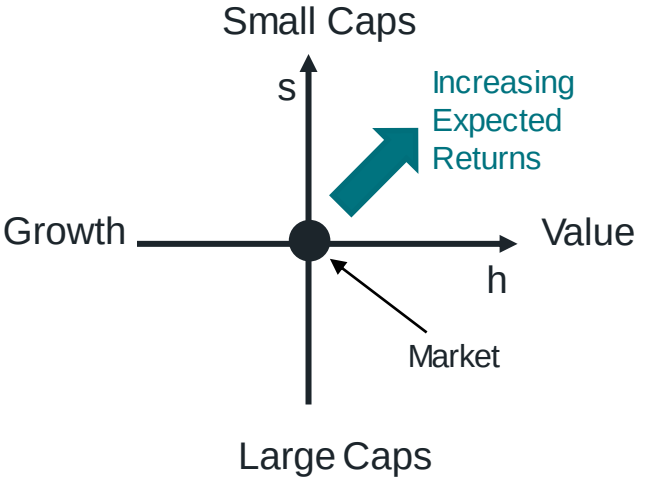
Fama/French (1992). Book-to-price can also be referred to as book-to-market.

Fama/French Three Factor Model

If we believe in a world described by the Three-Factor Model, how will we form portfolios?

Model:

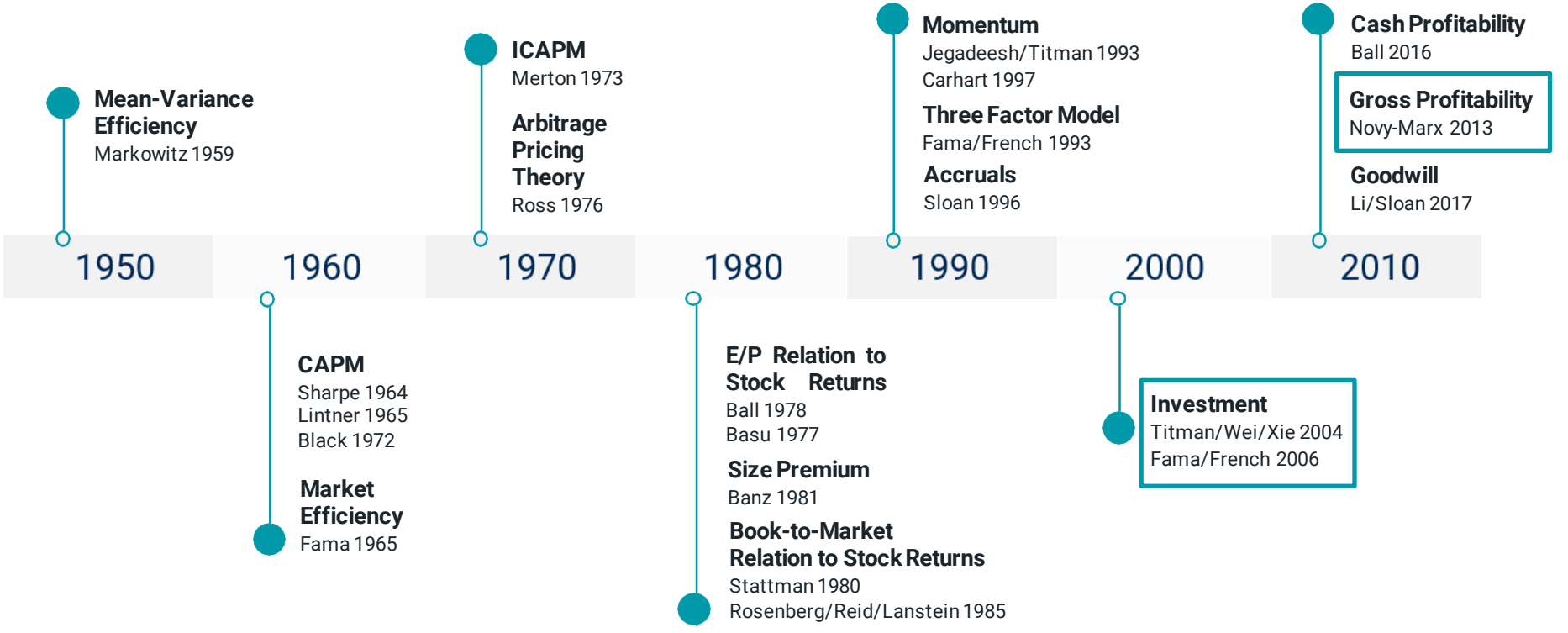
$$E(R_{sec}) = R_f + b_{sec}\,(E(R_M) - R_f) + s_{sec}\,E(SMB) + h_{sec}\,E(HML)$$



The b's tend to be close to 1 in this model so to increase expected returns investor needs to overweight/select *smaller capitalization companies* and *higher book-to-price* companies (value companies)

The Evolution of Financial Science

Since that time, research around the effects of profitability and investment have complemented the three- and four-factor models.



Fama/French Five Factor Model

Relates the expected excess return of equity securities over the risk-free rate to expected return of the market, size, book-to-market, profitability and investments factors

$$E(R_{sec}) = R_f + b_{sec}(E(R_M) - R_f) + s_{sec}\,E(SMB) + h_{sec}\,E(HML) + r_{sec}\,\underbrace{E(RMW)}_{\text{(High-Low) Profitability Factor}} + c_{sec}\,\underbrace{E(CMA)}_{\text{(Low-High) Investment Factor}}$$

- RMW: Long High Profitability/Short Low Profitability Companies
- CMA: Long Low Investments/Short High Investments Companies

Adds to the Three-Factor Model: *higher profitability* and *lower investment* companies have higher expected returns.

Robert Novy-Marx (2013), Aharoni/Grundy/Zeng (2013), Fama/French (2014), Wahal (2016)

From Five Factors to 400…and Counting

Data availability has allowed researchers and practitioners to "search" for patterns using historical data

- most of these patterns have no reason to exist – they happened randomly in the past
- Some factors provide benefits (but not increased expected returns), e.g., Low volatility
- Some factors may not be directly implementable but can enhance expected returns, e.g., momentum

What should investors do to cut through the factor noise?

See A Census of the Factor Zoo, Harvey/Liu (2019)

Post-Factor Investing

Going Back to Fundamentals With Our New Lenses

Interactions in a Multifactor Approach

Let's see the effects of a deviating from the market

Distribution of Companies in the U.S. Market

U.S. Companies Sorted by Profitability and Book-to-Market

		High Prof 0-20th	20-40th	40-60th	60-80th	Low Prof 80-100th	
High BtM	0-20th	0.2%	1.2%	2.9%	6.0%	9.6%	**20.0%**
	20-40th	1.0%	2.7%	6.5%	7.1%	2.8%	**20.1%**
	40-60th	5.2%	8.5%	2.2%	3.2%	3.5%	**22.6%**
	60-80th	7.8%	2.5%	2.8%	1.9%	2.2%	**17.2%**
Low BtM	80-100th	7.2%	3.6%	5.7%	1.7%	1.8%	**20.1%**
		21.5%	**18.5%**	**20.1%**	**19.8%**	**20.0%**	**100.0%**

Source: Avantis, Bloomberg, U.S. Securities, June 2020

But We Have Complications to Deal With

Shifting an allocation towards high (low) profitability produces a shift to companies with low (high) B/M.

Companies with High Profitability tend to have Low B/M

High BtM	1.0%
	4.6%
	24.4%
	36.5%
Low BtM	**33.6%**

U.S. Companies Sorted by Profitability and Book-to-Market

		High Prof 0-20th	20-40th	40-60th	60-80th	Low Prof 80-100th	
High BtM	0-20th	0.2%	1.2%	2.9%	6.0%	9.6%	**20.0%**
	20-40th	1.0%	2.7%	6.5%	7.1%	2.8%	**20.1%**
	40-60th	5.2%	8.5%	2.2%	3.2%	3.5%	**22.6%**
	60-80th	7.8%	2.5%	2.8%	1.9%	2.2%	**17.2%**
Low BtM	80-100th	7.2%	3.6%	5.7%	1.7%	1.8%	**20.1%**
		21.5%	**18.5%**	**20.1%**	**19.8%**	**20.0%**	**100.0%**

Searching for a profitability premium, as suggested by the factor, produces a negative B/M premium.

Source: Avantis, Bloomberg, U.S. Securities, June 2020

But We Have Complications to Deal With

Shifting an allocation towards high (low) B/M produces a shift to companies with low (high) profitability.

Companies with High B/M tend to have Low Profitability

High Prof				Low Prof
1.1%	6.1%	14.6%	**30.0%**	**48.2%**

U.S. Companies Sorted by Profitability and Book-to-Market

		High Prof 0-20th				Low Prof 80-100th	
High BtM	0-20th	0.2%	1.2%	2.9%	6.0%	9.6%	**20.0%**
	20-40th	1.0%	2.7%	6.5%	7.1%	2.8%	**20.1%**
	40-60th	5.2%	8.5%	2.2%	3.2%	3.5%	**22.6%**
	60-80th	7.8%	2.5%	2.8%	1.9%	2.2%	**17.2%**
Low BtM	80-100th	7.2%	3.6%	5.7%	1.7%	1.8%	**20.1%**
		21.5%	**18.5%**	**20.1%**	**19.8%**	**20.0%**	**100.0%**

Searching for a B/M premium, as suggested by the factor, produces a negative profitability premium.

Source: Avantis, Bloomberg, U.S. Securities, June 2020

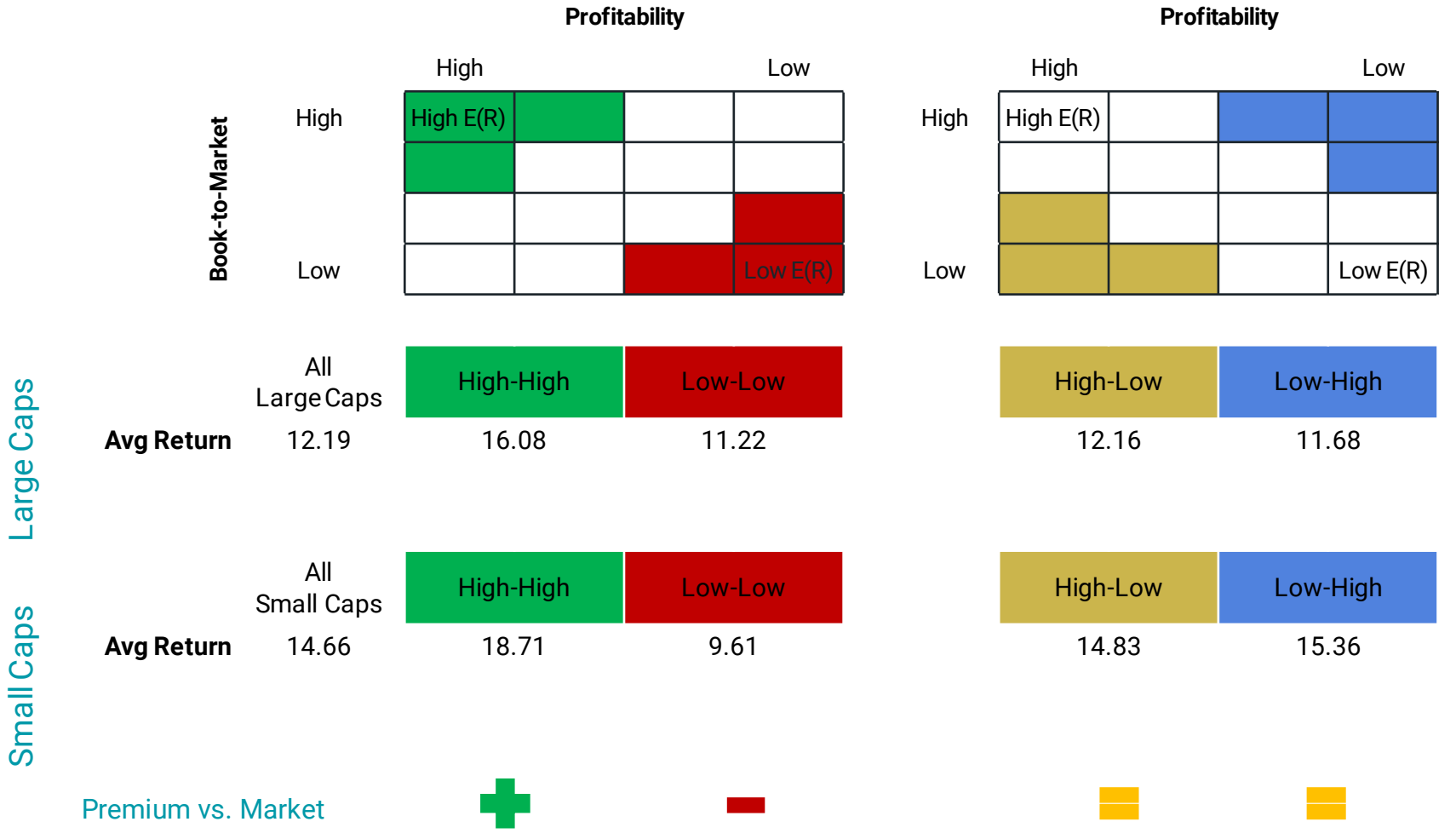
Valuation: A Powerful Framework

$\text{Price} = \text{Equity} + \frac{\text{Profits}}{\text{Discount Rate}}$	$\frac{\text{Equity}}{\text{Price}}$ AND $\frac{\text{Profits}}{\text{Equity}}$
Expected returns (discount rates) are a function of:	**Differences in expected returns across securities are captured in valuation ratios**
Prices	**Need to define**
Current equity	**Equity (modified B/M)**
Expected profits	**Profits (cash-based operating profitability)**

Use the learnings from asset pricing and factor research but within a valuation framework.

Goal is to find reliable proxies for equity and profits that incorporate enhancements to have a more robust approach.

Implications for Expected Returns



Source: Avantis and Sunil Wahal, CRSP/Compustat, US Securities, 1973-2020

Implications for Asset Allocators

Building Better Equity Allocations

Goal: Buy 25% of the market with highest expected return

Using B/M & Profitability Factors

Buy companies with highest B/M and Profitability to total 25% of the market

		High Prof 0-20th	20-40th	40-60th	60-80th	Low Prof 80-100th	
High BtM	0-20th	0.5%	1.5%	3.5%	15.3%	24.8%	45.6%
	20-40th	2.1%	0.0%	0.0%	0.0%	0.0%	2.1%
	40-60th	19.7%	0.0%	0.0%	0.0%	0.0%	19.7%
	60-80th	6.4%	0.0%	0.0%	0.0%	0.0%	6.4%
Low BtM	80-100th	26.1%	0.0%	0.0%	0.0%	0.0%	26.1%
		54.9%	1.5%	3.5%	15.3%	24.8%	100.0%

50.9% in Low-High/High Low Diagonal increasing TE, paying for higher fees for no E(R) benefit

Post-Factor Investing Approach

Buy companies with highest B/M and companies with highest Profitability to total 25% of the market

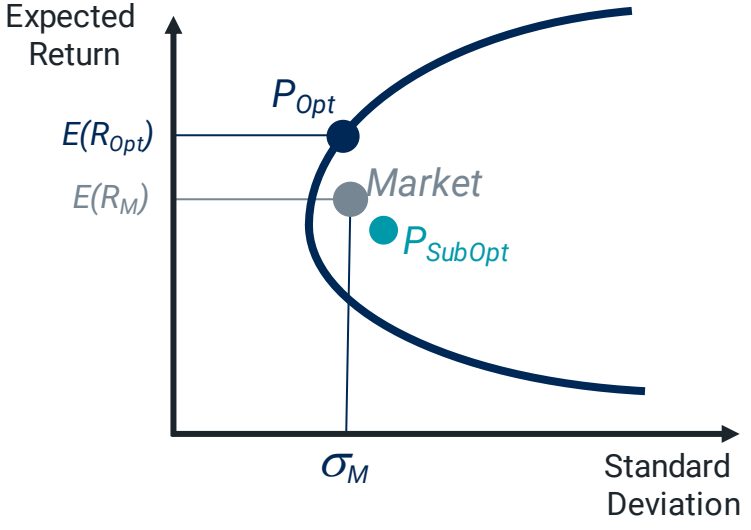
High Prof 0-20th	20-40th	40-60th	60-80th	Low Prof 80-100th	
0.9%	4.8%	11.4%	13.4%	0.0%	30.5%
3.9%	10.2%	18.5%	0.0%	0.0%	32.6%
20.5%	10.3%	0.0%	0.0%	0.0%	30.8%
6.1%	0.0%	0.0%	0.0%	0.0%	6.1%
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
31.4%	25.3%	29.9%	13.4%	0.0%	100.0%

100% above Low-High/High Low Diagonal Fully focused on securities with higher than market E(R)

Improving Upon the Market Portfolio

We know that many investors own suboptimal (non-efficient) portfolios due to single stocks, taste/preferences, taxes, restrictions, etc. The market portfolio is a combination of all investors:

Market = Suboptimal + Optimal



Optimal complementary portfolio should have higher expected returns for similar risk

Deviations from the market *not* for E(R) are part of the suboptimal portfolio

Complementary portfolio deviates from the market to increase E(R)

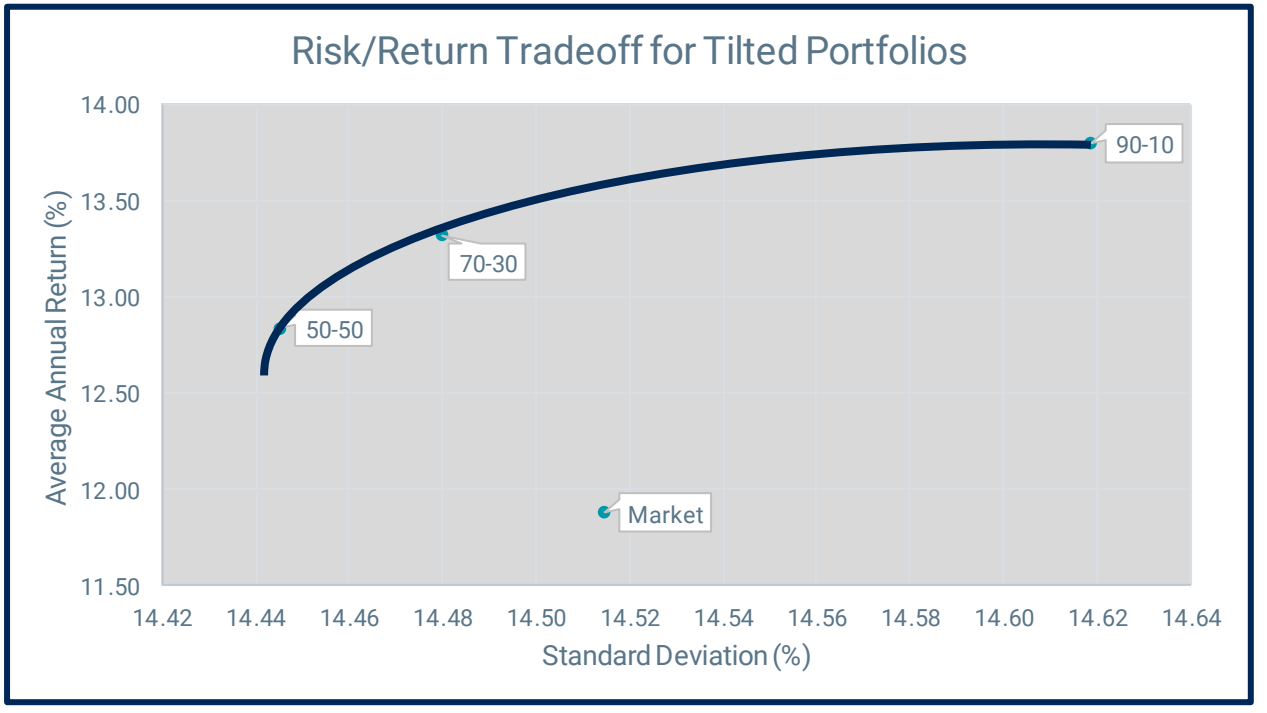
Post-Factor investing provides a roadmap for the complementary portfolio, deviations only for E(R)

Nagy/Obendberger (1994), Daniel/Titman (1997), Geczy et al. (2003), Cohen (2003), Fama/French (2007), Statman (2010), Luo/Subrahmanyam (2019)

Building Better Equity Allocations

Deviating from the Market by

- Overweighting companies with High Profitability & B/M
- Underweighting companies with Low Profitability & B/M



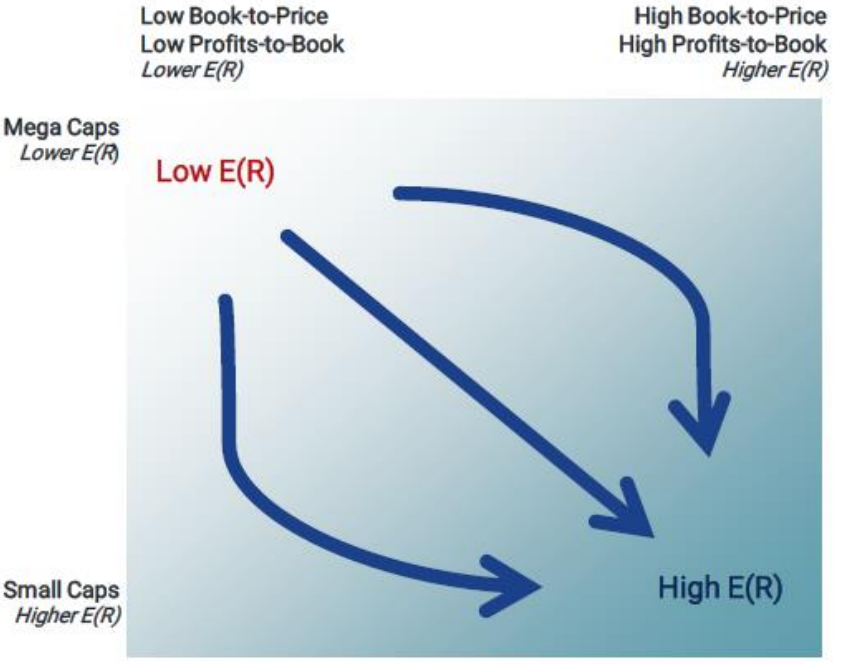
- Allocating more assets to companies with high profitability and B/M has produced a return benefit over the market without increasing volatility in any meaningful way
- The level of tilt can be customized based on the desired expected return profile

Source: Avantis Investors, Sunil Wahal. U.S. data from 1940-2019. Each tilted portfolio represents a given level of overweight toward high profitability/high B/M companies (50%, 70%, 90%). The market is represented by CRSP. The details of the methodology can be found in the paper, On the Conjoint Nature of Value and Profitability, Wahal/Repetto (2020). Electronic copy available at: https://ssrn.com/abstract=3635714. Past performance is no guarantee of future results.

Designing an Asset Allocation

If the goal is to increase E(R) while maintaining diversification and low turnover, we can:

- Underweight companies with low profitability trading at a high price relative to their equity
- Overweight companies with high profitability trading at a low price relative to their equity



If implemented correctly, this asset allocation will be diversified, have low turnover, emphasize companies with higher expected returns and deemphasize companies with lower expected returns

Summary & Questions

What Have We Learned?

Financial science and research on asset pricing and factors taught us:

Certain stock characteristics are associated with premiums

Premiums can be linked to valuations

To create better portfolios and asset allocations:

We do not need the factors

factors are just one possible implementation of a concept

We need the underlying concepts we learned from research and their interactions

Disclosures

Expected Returns: Valuation theory shows that the expected return of a stock is a function of its current price, its book equity (assets minus liabilities) and expected future profits, and that the expected return of a bond is a function of its current yield and its expected capital appreciation (depreciation). We use information in current market prices and company financials to identify differences in expected returns among securities, seeking to overweight securities with higher expected returns based on this current market information. Actual returns may be different than expected returns, and there is no guarantee that the strategy will be successful.

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