It has been very easy to beat the S&P500 in 2000-2018. Several examples

Pablo Fernández. Professor of Corporate Finance. e-mail: fernandezpa@iese.edu IESE Business School.
University of Navarra. Camino del Cerro del Aguila 3. 28023 Madrid. Spain.

Pablo Fernández Acín. Industrial Engineering. TECNUN. University of Navarra. San Sebastian. Spain[1].
e-mail: pablo.fernandez.14@retamar.es

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We document that unweighted indexes have outperformed weighted indexes and that the S&P400 and the S&P600 have outperformed the S&P500. $100 invested in the S&P500 in January 2000 became **$252.6** in April 2018, but invested in the S&P600 became $**577.2**, invested in the 30% smallest companies (equal weight) of Kenneth French became **$617.9** and invested in the portfolio of [smallest companies and highest Book to Market] (equal weight) of Kenneth French became **$1,640**. Then, we can conclude that it has been very easy to beat the S&P500. Kenneth French data show (exhibits 5 and 6) that it has been so since 1927.

When a rational investor invests for the long-term, he cares about how much money he will have at the end (retirement, endowment…) and he diversifies to avoid a concentration of risk in some of the individual investments. The rational investors (at least the ones we know) do not care about using "the best model", "the most popular model"… They do not care neither about maximizing some ratio (Sharpe…) nor about minimizing the volatility of his portfolio (most rational investors we know like volatility: volatility does not measure the risk they want to avoid).

The objectives of this paper are neither number crunching, neither to maximize anything nor to provide recipes on how to invest, but to provide with some data (facts) that help the reader to analyze his investments and, perhaps, to change his investment criteria.

We include a final advice: apply the logic principle *"Never buy a hair growth lotion from a man with no hair"* to your investment advisors.

Available at: https://ssrn.com/abstract=3184501

1. Rational Investors in equities

We know just a few things about rational investing in equities. Among them:

a) Diversification is a must
b) A portfolio of small (market-cap) companies has outperformed long-term a portfolio of big companies
c) Unweighted indexes have outperformed weighted indexes
d) Rational investors evaluate the managerial and ethical behavior of the companies in which they invest
e) Rational investors avoid investing in expensive (according to their judgement) companies

[1] The authors thank Vitaly Pershing, research assistant at IESE, for collecting all raw data.

In this paper we use only a), b) and c) and we show that, investing in the shares of some companies with extremely simple rules in the period 01/January/2000 – 01/April/2018, it was very easy getting higher returns than the S&P500.

Table 1 and Exhibit 1 contain evidence about b) [a portfolio of small (market-cap) companies has outperformed long-term a portfolio of big companies] with data of the XXI century about the indexes S&P500, S&P100, S&P400 MidCap, and S&P 600 SmallCap.

Exhibit 2 contains evidence about c) [Unweighted indexes have outperformed weighted indexes] with data of the XXI century about the index S&P500, S&P100, S&P400 MidCap, and S&P 600 SmallCap.

Fernandez et al. (2016) ("*The Market Portfolio is NOT Efficient: Evidences, Consequences and Easy to Avoid Errors*") document evidences about seven 'Equal weighted indexes' that have had higher returns than the corresponding 'market-value weighted index': S&P500, MSCI Emerging Markets, FTSE 100, MSCI World. MSCI, DAX 30 and IBEX 35.

Table 1. Return (01/01/2000 – 01/04/2018) of the S&P500, S&P100, S&P400 and S&P600 (Market Capitalization Weighted Indexes)

Index	**S&P 500**	S&P 100	S&P 400 Mid Cap	S&P 600 Small Cap
	Weighted	Weighted	Weighted	Weighted
01/01/2000	100	100	100	100
01/01/2005	89.2	78.4	157.4	172.9
01/01/2010	91.8	79.3	188.0	188.5
01/01/2015	188.3	157.0	404.2	418.0
01/04/2018	**252.6**	**210.4**	**538.0**	**577.2**
Total Return	*153%*	*110%*	*438%*	*477%*
Annualized return	*5.2%*	*4.2%*	*9.7%*	*10.1%*
*Annualized volatility**	*15.9%*	*15.9%*	*18.8%*	*20.6%*

** Calculated with monthly returns*

2. Four portfolios that have outperformed the S&P500

Given the evidence presented in section 1, we construct four equal weighted portfolios with the smallest 20, 40, 60 and 80 companies that were in the S&P1500 (see **table 2**). We also used two filters for size and Price-to-Book.

Column A tells us that $100 invested in the S&P500 in January 2000 became $252.6 in April 2018.

Column 1 tells us that $100 invested in "portfolio 1" ($5 in each of the 20 smallest companies of the S&P1500 with two filters) in January 2000 became $36,228 in April 2018: the portfolio was rebalanced each 24 months and the rebalance volume (amount of US$ bought and sold) was $117,885.

Table 2. Value of different portfolios. Initial investment (01/01/2000) = $100. Rebalanced each **24 months**. Companies of the S&P1500. Minimum Market Cap: $17 million. *Source of the raw data: Datastream.* *Total Investment Return: dividends reinvested

Column:	***A***	***1***	***2***	***3***	***4***	***B***	***C***
Number of companies	**S&P 500***	**20**	**40**	**60**	**80**	**20**	**40**
Criteria: **Market Cap**	ALL	Smallest	Smallest	Smallest	Smallest	Biggest	Biggest
	Weighted	Unweighted	Unweighted	Unweighted	Unweighted	Unweighted	Unweighted
01/01/2000	$100	$100	$100	$100	$100	$100	$100
01/01/2005	89.2	696	519	452	412	80.6	95.6
01/01/2010	91.8	3,086	1,885	1,397	1,119	81.1	105
01/01/2015	188.3	17,182	8,911	6,190	4,624	139.4	206.3
01/04/2018	**$252.6**	**$36,228**	**$17,985**	**$11,989**	**$8,631**	**$192.6**	**$273.1**
Total Return	*153%*	*36128%*	*17885%*	*11889%*	*8531%*	*93%*	*173%*
Annualized return	*5,2%*	*38.1%*	*32.9%*	*30.0%*	*27.7%*	*3.7%*	*5.7%*
Rebalance volume ($)		*117,885*	*53,634*	*33,336*	*22,313*	*416*	*555*

Table 2 also includes columns A, B and C to analyze and compare with portfolios 1 to 4, and the S&P500.

The objective of this paper is not to provide recipes on how to invest to the reader, but to provide with data (facts) of the last 18 years that help the reader to analyze his investments and, perhaps, to change his investment criteria.

We could construct thousands of portfolios with higher return than the S&P500, but we limit our analysis to these eight portfolios. As we have already mentioned, the objectives of this paper are not number crunching, neither to maximize anything nor to provide recipes on how to invest, but to provide with some data (facts) that helps the reader to analyze his investments and, perhaps, to change his investment criteria.

3. Similar results for portfolios of companies in Spain

F. Acin and Gaspar (2018) present a similar analysis for Spain (with many more than 8 portfolios) and show similar results. **Table 3** compares the evolution of the IBEX 35 (Float-Adjusted Market Capitalization Weighted Index) with three equal weighted portfolios with the smallest 10, 15, and 20 smallest companies that traded in the *Mercado Continuo* (Electronic Market)

Column A tells us that €100 invested in the IBEX 35 in January 2000 became €174.1 in March 2018.

Column 2 tells us that €100 invested in "portfolio 10" (€10 in each of the 10 smallest companies of the IBEX35) in January 2000 became €4,984 in March 2018: the portfolio was rebalanced each 12 months and the rebalance volume (amount of € bought and sold) was €15,760.

Table 3. Spain. Value of different portfolios. Initial investment (01/01/2000) = €100. Rebalanced each **12 months**. *Total Investment Return: dividends reinvested. *Source: F. Acin and Gaspar (2018)*

Number of companies	**IBEX 35***	**10**	**15**	**20**
Criteria: Market Cap	ALL	Smallest	Smallest	Smallest
	Weighted	Unweighted	Unweighted	Unweighted
01/01/2000	€ 100	€ 100	€ 100	€ 100
01/01/2005	88.5	259	221	228
01/01/2010	141.8	536	448	382
01/01/2015	162.4	1,016	759	493
01/03/2018	**€ 174.1**	**€ 4,948**	**€ 2,847**	**€ 1,449**
Total Return	*74%*	*4848%*	*2747%*	*1349%*
Annualized return	*3.1%*	*24.0%*	*20.2%*	*15.9%*
Rebalance volume (€)		*15,760*	*8,022*	*4,398*

4. "Academic literature" and "professional advisors" on investing: much confusion and not much rationality

Given the evidence, it is strange that many finance and investment books still recommend *"holding a diversified portfolio in which securities are held in the same relative proportions as in a broad market index such as the Standard & Poor's 500"* [see, for example, Bodie and Merton (2000)].

When a rational investor invests for the long-term, he cares about how much money he will have at the end (retirement, endowment…) and he diversifies to avoid a concentration of risk in some of the individual investments. The rational investors (at least the ones we know) do not care about using "the best model", "the most popular model"… They do not care neither about maximizing some ratio (Sharpe…) nor about minimizing the volatility of his portfolio (most rational investors we know like volatility: volatility does not measure the risk they want to avoid).

Volatility or beta are bad measures of risk. If risk is something bad for all investors, then volatility is not risk because many investors (including the author) like volatility. What most equity investors do not like is bankruptcy, default… in their investments.

A portfolio 'mean-variance efficient' is good for nothing because the variance (or volatility) is not an appropriate measure of investment risk.

About the unhelpfulness of the Sharpe ratio. As the volatility is not an appropriate measure of investment risk (in fact, many investors like volatility), the Sharpe ratio (return / volatility) cannot be a good measure for anything. I asked to 137 graduate students the following question: *"For the following 10 years, do you prefer an investment with an annual return of 16% and a Sharpe ratio of 0,4 or another investment with an annual return of 13% and a Sharpe ratio of 1,3?"* All of them (the 137 graduate students) preferred the first investment. And you?

Common errors and in portfolio management and wrong advises

1 Diversify the holding of risky assets according to the proportions of the market portfolio.
2 The only risk that matters is volatility.
3 The only risk that matters is beta.

4 Markets are efficient all the time.
5 The Sharpe ratio is useful.
6 Higher return means necessarily to assume higher risk.
7 Market indexes are difficult/impossible to beat.

Many papers on investments are written by economists whose main purpose is to elaborate "**models**" based on unrealistic assumptions. The conclusions and predictions of most "models" have very little to do with the real world: companies, financial markets, investors, managers… The most emblematic example is the CAPM. Fernandez (2015a) shows that it is an absurd model because its hypotheses and its conclusions / predictions are opposed to reality. The most extravagant hypothesis is that investors have **homogeneous expectations** for each of the stocks, bonds ... (all investors expect the same return and the same volatility for each of the stocks) and the prediction most contrary to the reality is that the Equity portfolio of all investors is identical in composition: shares of all traded companies ("the market portfolio"). Another absurd assumption is to define risk as volatility. Just talk to wise investors to realize that there are many who like volatility. What investors do not like is bankruptcy or suspension of payments (unless they have a "short" position). In addition, if all investors had identical expectations, why the trading volumes of many markets are huge?

Research in Finance and "generally accepted statements" illogical and false. We think that a good definition of Research (at least for Finance and Business) is the following: *"studies that a) contribute to better understand the reality in which we live; b) allow to identify aspects to improve or change; and c) are useful to students, managers and other teachers."* However, in the last 35 years many Universities (and most financial economists) have replaced it with "*research is only what is published in Journals of recognized prestige*".

Some "*generally accepted statements"* illogical and false:
"Utility depends on the mean and variance of wealth"
"Stocks are usually trading for what they're really worth"
"Beating the indexes is almost impossible"
"To obtain higher returns implies assuming more risk"
"The goal of all companies is to maximize their profits"
"Companies make their decisions to maximize their value in the stock market"
"All small companies have greater risk than large ones"
"Efficient portfolios are those that given an expected return have lower volatility"
"The efficient portfolio of all individuals must necessarily be the market portfolio."
"Any known risky financial asset can be replicated with a portfolio of the market and the risk-free asset."
"The model with multiple betas arises because the beta risk changes with the economic cycle"

The fundamental problem: forgetting what is a person. The following box contains a sentence from Ernesto Julia that we should not lose sight of, at least, those of us who dedicate ourselves to teaching and to businesses. And especially when we are tempted to make generalizations and hypotheses like *"homogeneous expectations", "all investors ...," all companies..."*

Juliá (2002, pg. 6): *"The variety of men and women is great and no classification will ever come to include them all ... Achieving a complete, definitive and adequate view of a human being is beyond the goals that another human being can achieve."*

"The Market thinks…" When you hear phrases that begin like this (*"The market thinks that ...", "the investors have reacted to ...", "the managers believe ...")* remember the previous **box**. It should also be remembered that:

A) A transaction in the market requires someone who sells and someone who buys
B) The databases usually provide us with only the price at which the last transaction of the day has produced.
C) In all the markets there are people who buy, others who sell, others who do both and many other people whom on a certain day neither buy nor sell.
D) There are large differences between companies due, among other things, to how their managers analyze the reality, their decision-making procedures, the criteria used to decide, the relationships between their employees and managers, ...
E) There are large differences between investors due to, among other things, if they have a clear horizon of investment, ability to withstand declines, propensity to invest when there are declines, if they understand what a short position is, if they apply common sense questions (an example: the author of the predictions or of the model that helps to predict the future, is he a billionaire?),...

Confusion between the expected rate of return and the required rate of return. We have never estimated an expected rate of return, but we have helped several companies and investors to estimate required returns. The document "*Expected and Required returns: very different concepts*" (http://ssrn.com/abstract=2591319) shows that they

are very different concepts for the majority of investors[2]. Confusing those leads to many mistakes and wrong decisions. It is obvious that, for an investor, the expected return for a share equals its required return only if the value obtained in the valuation is equal to the current market price.

*«**Experience** doesn´t consist of the number of things one has seen, but of the number of things on which one has reflected».* Pereda, José María. Santander.

The following Box of Yepes (professor of philosophy of the University of Navarra, who died in a mountain accident in 1996 being 43 years old) sheds more light on the topic "***models vs. logic, reality and common sense***"

Yepes (1993, pg. 17-18). *"Learning means being able to keep perceiving reality as it truly is: complex - and not trying to fit every new experience into a closed and pre-conceived notion or overall scheme.*
"Intellectually speaking, keeping young means never losing our capacity to learn. Old age comes when we no longer recognize novelty, reducing the richness of new events by trying to fit them through the lens of former experiences."

We all should try to explain *"the world as it is"*, not *"the world as we model it"*.

5. Conclusion

We document that unweighted indexes have outperformed weighted indexes and that the S&P400 and the S&P600 have outperformed the S&P500. Then, we can conclude that it has been very easy to beat the S&P500. Kenneth French data for the period 1927-2018 show (exhibit 5) that it has been so since 1927.

The objectives of this paper are neither number crunching, neither to maximize anything nor to provide recipes on how to invest, but to provide with some data (facts) that help the reader to analyze his investments and, perhaps, to change his investment criteria. We could have studied correlations, second moments,… formed thousands of portfolios that were more profitable than any S&P index (any portfolio has about 50% probability of being more profitable than any S&P index)…, but that is not the objective of this short paper. The reader interested in these numbers can calculate them easily.

We know just a few things about rational investing in equities. Among them:

a) Diversification is a must
b) A portfolio of small (market-cap) companies has outperformed long-term a portfolio of big companies
c) Unweighted indexes have outperformed weighted indexes
d) Rational investors evaluate the managerial and ethical behavior of the companies in which they invest
e) Rational investors avoid investing in expensive (according to their judgement) companies

In this paper, we have used only a), b) and c), although we think that d) and e) are much more important for long-term investing.

We add a final advice: apply the logic principle *"Never buy a hair growth lotion from a man with no hair"* to your investment advisors.

Exhibit 1. S&P100, S&P MidCap 400, S&P SmallCap 600, S&P500 and S&P1500

Source: http://us.spindices.com/indices/equity/sp-500-equal-weighted
https://us.spindices.com/indices/equity/sp-100-equal-weight-price-return-usd-index
https://us.spindices.com/indices/equity/sp-100
https://us.spindices.com/indices/equity/sp-400

The **S&P 500** is widely regarded as the best single gauge of large-cap U.S. equities. The index measures the performance of the large-cap segment of the market.

[2] *"There are many valuations that assume that the expected return is equal to the required return. Similarly, Expected Equity Premium (EEP) and Required Equity Premium (REP) are two very different concepts, although many books and financial literature do not distinguishing them. Both, the REP and the EEP differ for different investors. The topic of this short paper is "thinking about valuation": it is important to understand what we are doing."*

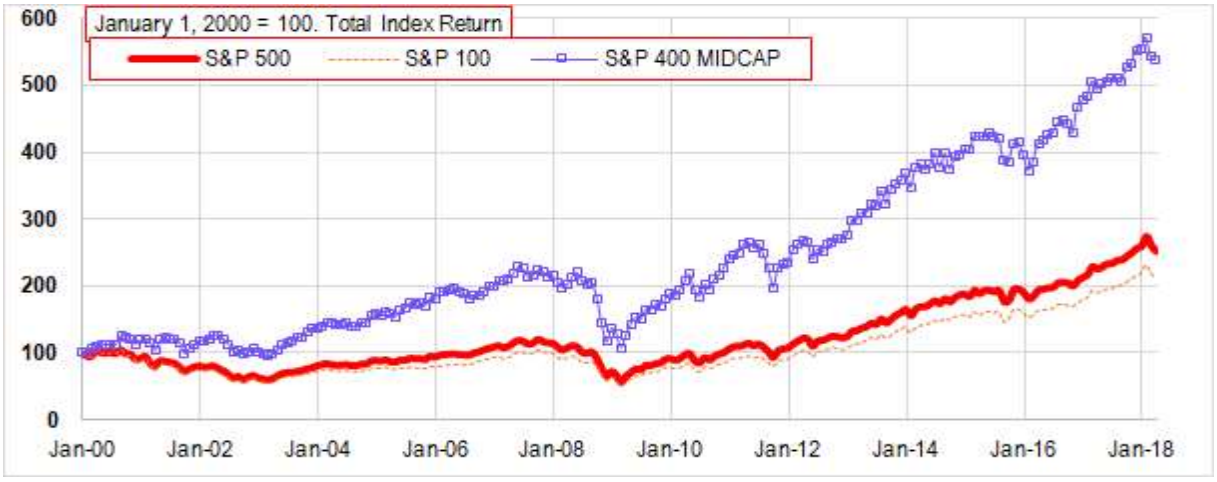
The **S&P 100** Index, a sub-set of the S&P 500, measures the performance of large cap companies in the United States. The Index comprises 100 major, blue chip companies across multiple industry groups. To be included, the companies should be among the larger and more stable companies in the S&P 500, and must have listed options. Sector balance is considered in the selection of companies for the S&P 100. This index is widely used for derivatives, and is the index underlying the OEX options.

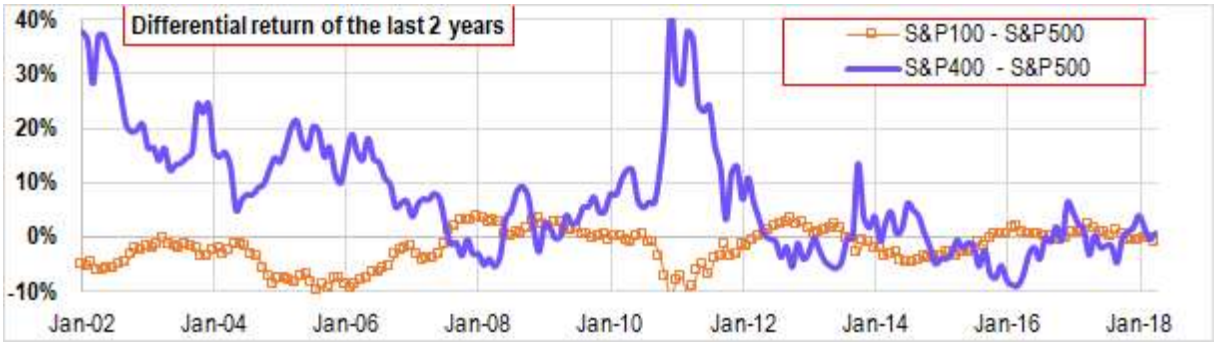
The **S&P MidCap 400** provides investors with a benchmark for mid-sized companies. The index measures the performance of mid-sized companies, reflecting the distinctive risk and return characteristics of this market segment.

The **S&P SmallCap 600 Index**, more commonly known as the S&P 600, is a stock market index from Standard & Poor's. It covers roughly the small-cap range of US stocks, using a capitalization-weighted index. As of 31 January 2017, the market capital of companies included in the S&P SmallCap 600 Index ranged from US$400 million to US$1.8 billion. The index's median market cap was almost $1.1 billion and covered roughly three percent of the total US stock market. These smallcap stocks cover a narrower range of capitalization than the companies covered by the Russell 2000 Smallcap index which range from $169 million to $4 billion. The market valuation for companies in the SmallCap Index and other indices change over times with inflation and the growth of publicly traded companies. The S&P 400 MidCap index combined with the SmallCap 600 compose the S&P 1000, and the S&P 1000 plus the S&P 500 comprise the S&P 1500. The index was launched on October 28, 1994.

The **S&P 1500**, or S&P Composite 1500 Index, is a stock market index of US stocks made by Standard & Poor's. It includes all stocks in the S&P 500, S&P 400, and S&P 600. This index covers 90% of the market capitalization of U.S. stocks. The index was launched on May 18, 1995.

All are *Float-Adjusted Market Capitalization Weighted Indices.*





Index	**S&P 500**	S&P 100	S&P 400 Mid Cap	S&P 600 Small Cap
	Weighted	Weighted	Weighted	Weighted
01/01/2000	100	100	100	100
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Total Return	*153%*	*110%*	*438%*	*477%*
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Total return		**S&P 500**	S&P 100	S&P 400 Mid Cap	S&P 600 Small Cap
between	and	Weighted	Weighted	Weighted	Weighted
01/01/2000	01/01/2005	-10,8%	-21,6%	57,4%	72,9%
01/01/2005	01/01/2010	2,9%	1,1%	19,5%	9,0%
01/01/2010	01/01/2015	105,1%	98,0%	115,0%	121,8%
01/01/2015	01/04/2018	34,2%	34,0%	33,1%	38,1%

Exhibit 2. S&P500 Equal Weighted Index

Source: http://us.spindices.com/indices/equity/sp-500-equal-weighted
https://us.spindices.com/indices/equity/sp-100-equal-weight-price-return-usd-index
https://us.spindices.com/indices/equity/sp-smallcap-600-equal-weighted-index

The S&P 500® Equal Weight Index (EWI) is the equal-weight version of the widely-used S&P 500. The index includes the same constituents as the capitalization weighted S&P 500, but each company in the S&P 500 EWI is allocated a fixed weight (0.2% of the index total) at each quarterly rebalance.

May 2008 - May 2018

	10 year annual Total return	
	Equal Weighted	Value Weighted
S&P 500	10.63%	9.32%
S&P MidCap 400	11.32%	10.24%
S&P 100	9.44%	9.03%
S&P SmallCap 600	12.42%	11.57%

100$ invested on May 2008, were on May 2018:	
Equal Weighted	Value Weighted
275	244
292	265
246	**237**
322	299

S&P500 Equal Weighted and S&P500 Value Weighted
All data until May 10, 2018 (10 years). Data have been re-based at 100

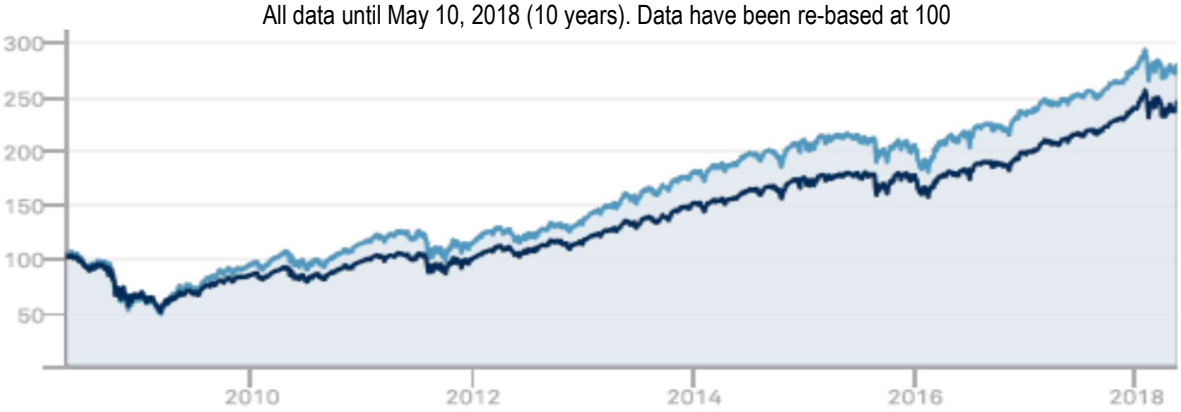
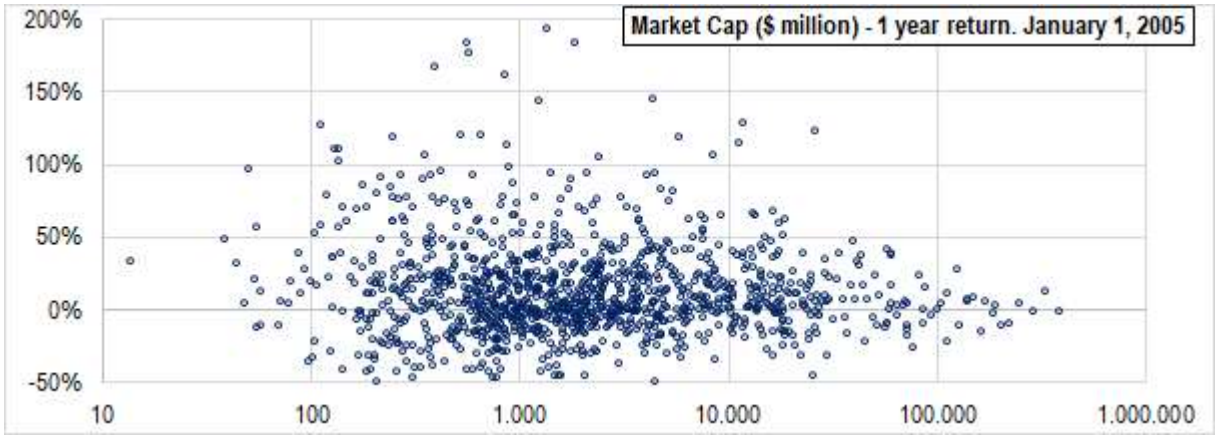
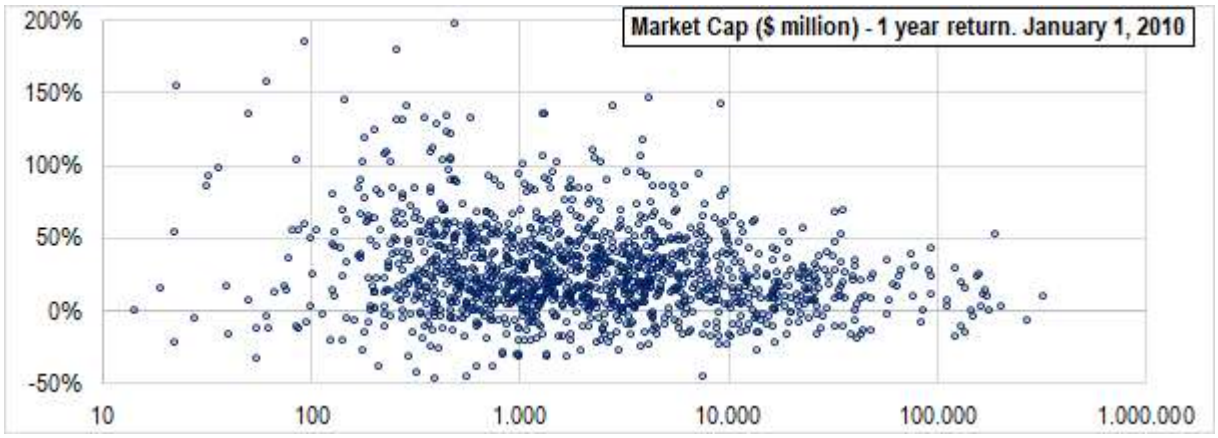


Exhibit 3. Charts that help to analyze the historical return of some traded US companies





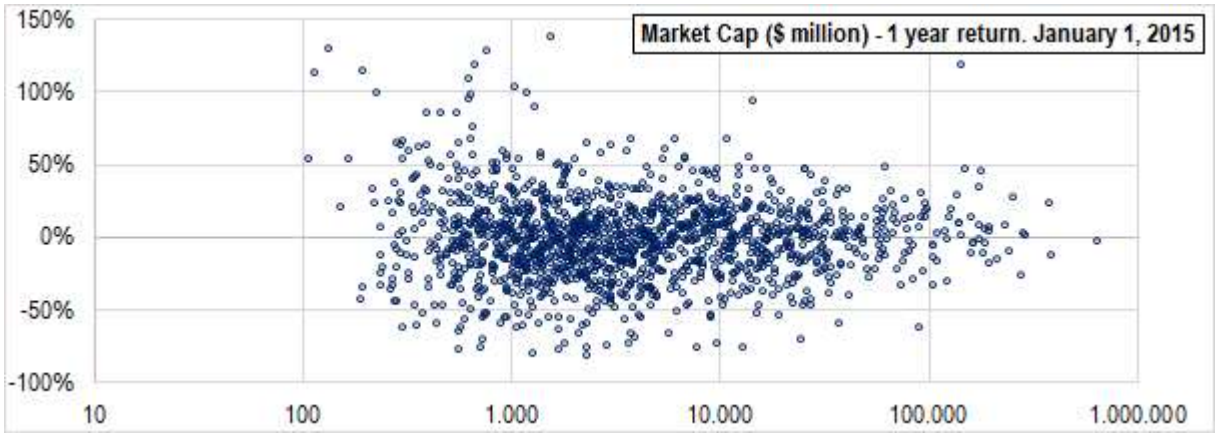


Exhibit 4. Definitions provided by Datastream

PRICE - Datatype (P) represents the official closing price. This is the default datatype for all equities. The prices taken at the close of market are stored each day. These stored prices are adjusted for subsequent capital actions, and this adjusted figure then becomes the default price offered on all Research programs. The actual historical prices can be accessed using the unadjusted price datatype (UP). Prices are generally based on 'last trade' or an official price fixing. For stocks which are listed on more than one exchange within a country, default prices are taken from the primary exchange of that country (note that this is not necessarily the 'home' exchange of the stock). For Japan and Germany, prices from the secondary markets can be obtained by qualifying the price datatype with an exchange code.

Market value on Datastream is the share price multiplied by the number of ordinary shares in issue.

EARNINGS PER SHARE represents the earnings for the 12 months ended the last calendar quarter of the year for U.S. corporations and the fiscal year for non-U.S. corporations It represents the fully diluted earnings per share (field 05290) for US companies and basic earnings per share (field 05210) for other companies.
It is as reported by the company. Preference stock has been included in the share base where it participates with the common/ordinary shares in the profits of the company. The following indicates the net earnings base used for earnings per share in each country.

The **DIVIDEND YIELD** expresses the dividend per share as a percentage of the share price. Dividend yield is calculated on gross dividends (including tax credits) where available. Note that dividend yield for UK, Irish and French stocks is calculated on gross dividends (including tax credits), although dividends per share for these countries are displayed net.

NUMBER OF SHARES: - number of ordinary shares that represent the capital of the company. For shares with more than one class of equity issue, (NOSH) is held separately for each issue.

PtoBV - This is the share price divided by the book value per share.

TOTAL RETURN INDEX - A return index (RI) is available for individual equities and unit trusts. This shows a theoretical growth in value of a share holding over a specified period, assuming that dividends are re-invested to purchase additional units of an equity or unit trust at the closing price applicable on the ex-dividend date. .
There are assumed to be 260 weekdays in a year, market holidays are ignored.
Method 1 (using annualised dividend yield)

$$RI_t = RI_{t-1} * \frac{PI_t}{PI_{t-1}} * \left(1 + \frac{DY_t}{100} * \frac{1}{N}\right)$$

RI on the basedate =100, then:

Where: RI_t = return index on day t RI_{t-1} = return index on previous day

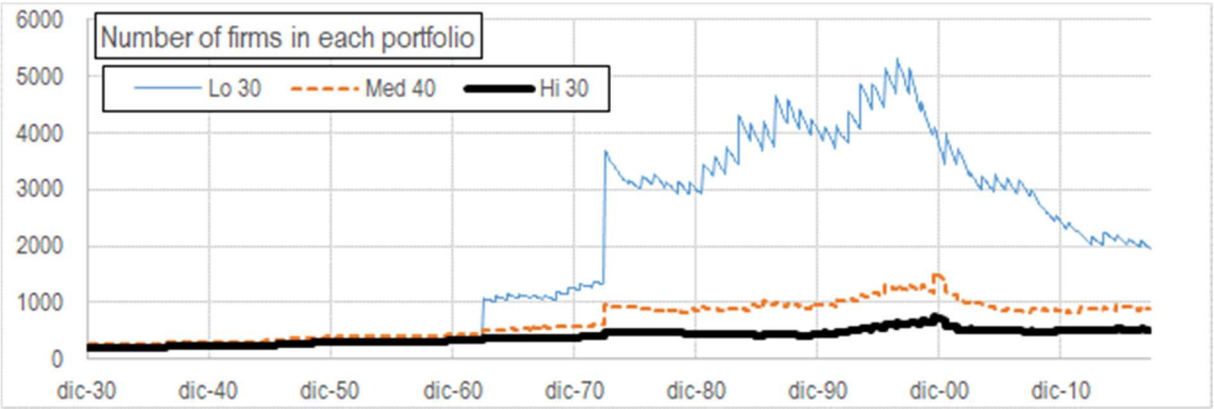
PI_t = price index on day t PI_{t-1} = price index on previous day

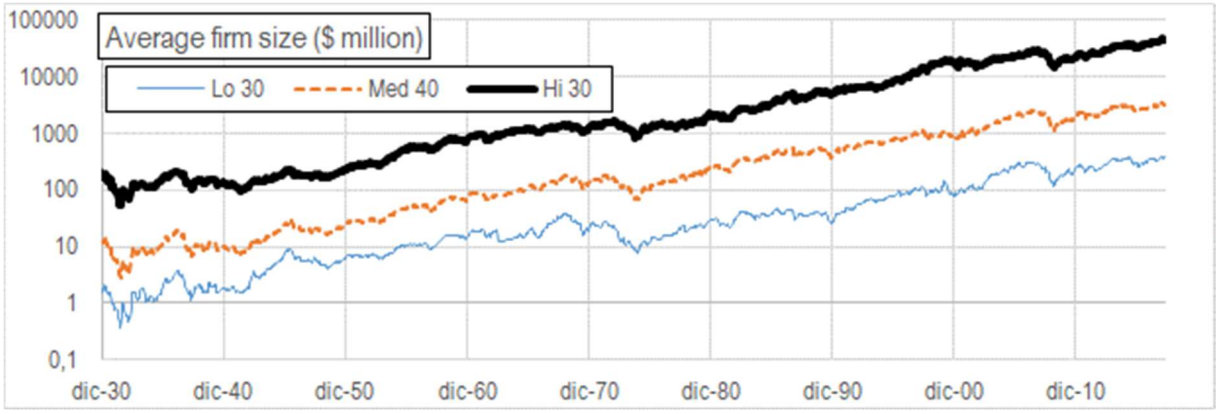
DY_t = dividend yield % on day t N = number of working days in the year (taken to be 260)

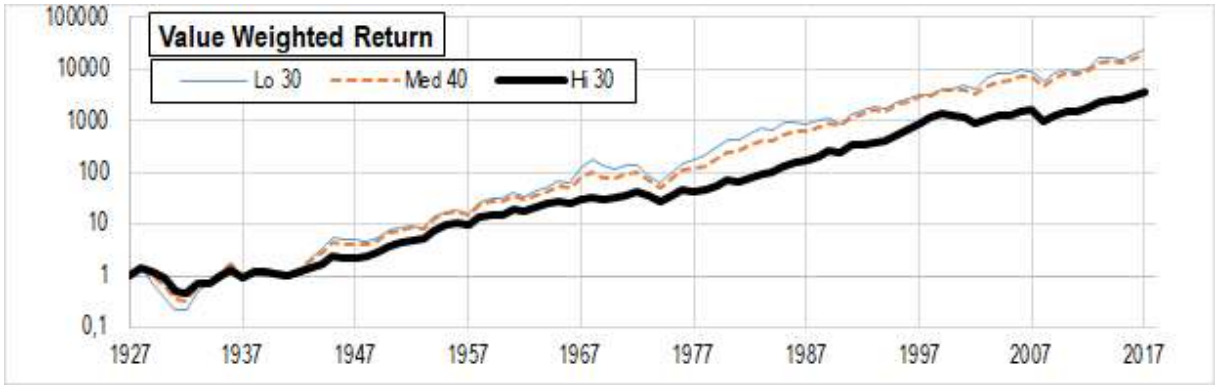
PER - This is the price divided by the earnings rate per share at the required date. For full details of the price and earnings figures used in any particular case, see the Price and Earnings per share topics.

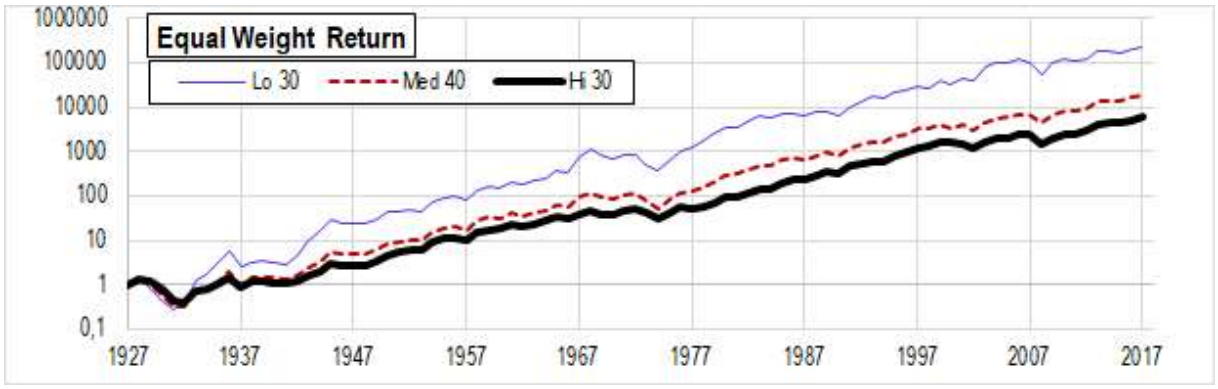
Exhibit 5. Size effect in Kenneth French data for the period 1927-2018

Source of the raw data: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html *"This file was created by CMPT_ME_RETS using the 201804 CRSP database. It contains value- and equal-weighted returns for size portfolios. Each record contains returns for: 30% 40% 30% 5 Quintiles 10 Deciles. The portfolios are constructed at the end of Jun."*









Value Weight Returns -- Total

	Lo 30	Med 40	Hi 30
1928 - 1950	694%	567%	260%
1951 - 1980	5411%	**3621%**	1848%
1981 - 1999	851%	**1495%**	**1903%**
2000 - 2017	439%	**386%**	159%

Equal Weight Returns -- Total

	Lo 30	Med 40	Hi 30
1928 - 1950	*4168%*	*701%*	*340%*
1951 - 1980	*8474%*	*3503%*	*2065%*
1981 - 1999	*940%*	*1284%*	*1651%*
2000 - 2017	*512%*	*370%*	*275%*

Value Weight Returns -- Annualized return

	Lo 30	Med 40	Hi 30
1928 - 1950	9.4%	8.6%	5.7%
1951 - 1980	14.3%	12.8%	10.4%
1981 - 1999	12.6%	15.7%	17.1%
2000 - 2017	9.8%	9.2%	5.4%

Equal Weight Returns -- Annualized return

	Lo 30	Med 40	Hi 30
1928 - 1950	*17.7%*	*9.5%*	*6.7%*
1951 - 1980	*16.0%*	*12.7%*	*10.8%*
1981 - 1999	*13.1%*	*14.8%*	*16.3%*
2000 - 2017	*10.6%*	*9.0%*	*7.6%*

Analysis of 5 Quintiles

Value Weight Returns – Total

	Lo 20	Qnt 2	Qnt 3	Qnt 4	Hi 20
1928 - 1950	878%	711%	654%	427%	251%
1951 - 1980	5340%	**4800%**	**3746%**	**2955%**	1757%
1981 - 1999	736%	**1157%**	**1480%**	**1597%**	**1944%**
2000 - 2017	399%	397%	395%	**401%**	145%

Equal Weight Returns -- Total

	Lo 20	Qnt 2	Qnt 3	Qnt 4	Hi 20
1928 - 1950	*7692%*	*1041%*	*719%*	*435%*	*286%*
1951 - 1980	*8847%*	*4470%*	*3410%*	*2706%*	*1800%*
1981 - 1999	*952%*	*953%*	*1383%*	*1568%*	*1735%*
2000 - 2017	*502%*	*416%*	*390%*	*365%*	*237%*

Number of companies (January)

	Lo 20	Qnt 2	Qnt 3	Qnt 4	Hi 20
1928	104	108	107	109	108
1960	207	207	207	207	209
1980	2688	578	414	326	292
2000	3663	951	586	502	416
2018	1675	589	440	379	336

Analysis of 10 Deciles

Value Weight Returns – Total

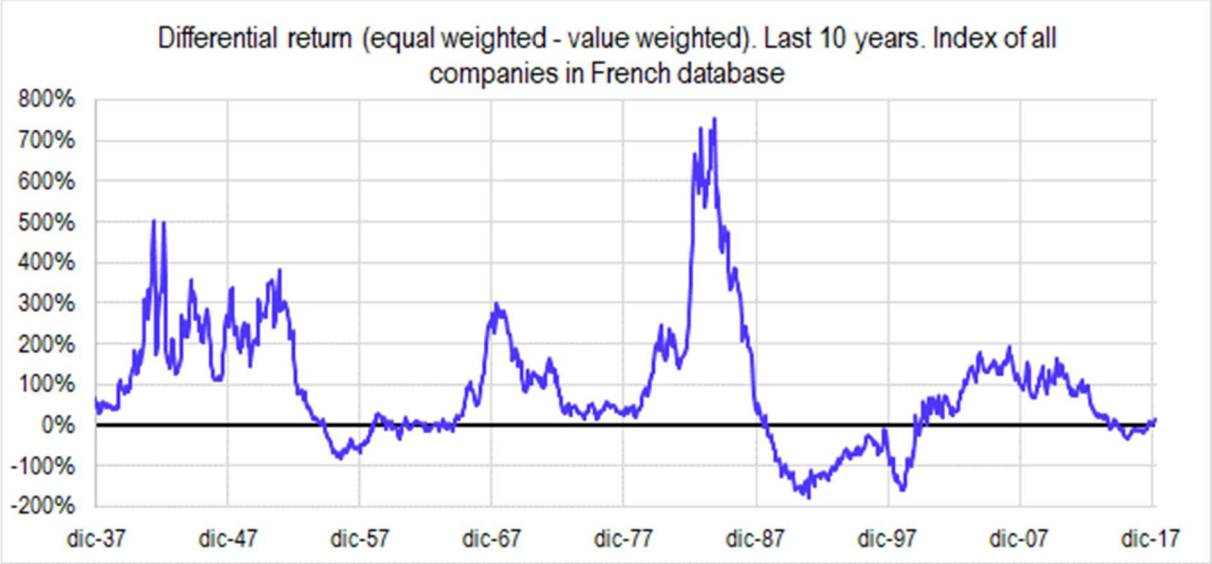
	Lo 10	Dec 2	Dec 3	Dec 4	Dec 5	Dec 6	Dec 7	Dec 8	Dec 9	Hi 10
1928 - 1950	1552%	671%	541%	816%	522%	751%	411%	427%	302%	242%
1951 - 1980	5626%	4398%	**5135%**	**4527%**	**4280%**	**3319%**	**3107%**	**2832%**	2365%	**1635%**
1981 - 1999	580%	963%	**1120%**	**1176%**	**1642%**	1364%	**1659%**	**1541%**	1575%	**2025%**
2000 - 2017	469%	343%	504%	**330%**	**336%**	443%	**394%**	**406%**	**343%**	119%

Equal Weight Returns -- Total

	Lo 10	Dec 2	Dec 3	Dec 4	Dec 5	Dec 6	Dec 7	Dec 8	Dec 9	Hi 10
1928 - 1950	*22218%*	*2282%*	*1002%*	*1037%*	*599%*	*841%*	*397%*	*459%*	*311%*	*253%*
1951 - 1980	*9309%*	*4697%*	*4764%*	*4144%*	*3909%*	*2859%*	*2783%*	*2604%*	*2381%*	*1331%*
1981 - 1999	*1041%*	*669%*	*909%*	*1003%*	*1398%*	*1370%*	*1611%*	*1508%*	*1578%*	*1904%*
2000 - 2017	*549%*	*318%*	*506%*	*326%*	*329%*	*463%*	*380%*	*348%*	*319%*	*163%*

Number of companies (January)

	Lo 10	Dec 2	Dec 3	Dec 4	Dec 5	Dec 6	Dec 7	Dec 8	Dec 9	Hi 10
1928	50	54	55	53	53	54	55	54	54	54
1960	104	103	105	102	104	103	105	102	105	104
1980	2223	465	328	250	233	181	160	166	147	145
2000	2833	830	551	400	310	276	257	245	219	197
2018	1230	445	327	262	230	210	189	190	167	169



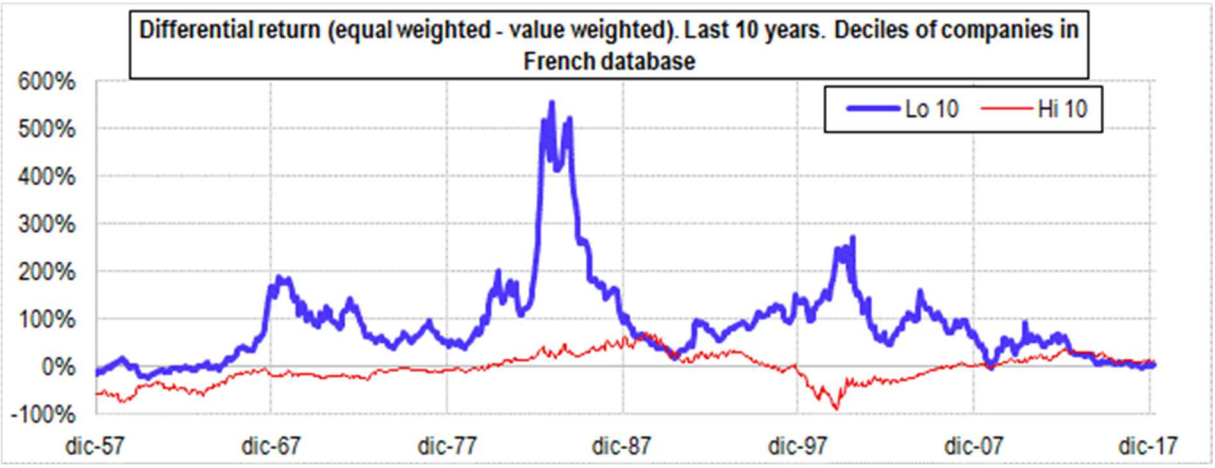


Exhibit 6. Size and Price-to-Book effects in Kenneth French data for the period 1990-2018

Source of the raw data: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html *"This file was created using the April 2018 Bloomberg database. It contains value- and equal-weighted returns for the intersections of 5 ME portfolios and 5 BE/ME portfolios in North America.The portfolios are constructed at the end of June. ME is market cap at the end of June. BE/ME is book equity at the last fiscal year end of the prior calendar year divided by ME as of 6 months before formation. Firms with negative BE are not included in any portfolio. The break points include utilities and include financials. The portfolios include utilities and include financials."* ME = Size. BE/ME = Book to Market

Value (US$) in April 2018 of 1$ invested in June 1990

Equal Weighted

		Book to Market				
		Low	2	3	4	High
Size	Small	*13,7*	*14,9*	*36,6*	*37,0*	***161,9***
	2	*2,6*	*9,9*	*19,3*	*21,4*	*21,9*
	3	*13,0*	*11,2*	*19,0*	*20,1*	*23,6*
	4	*12,6*	*14,2*	*19,1*	*21,0*	*25,8*
	Big	*9,4*	*14,7*	*15,0*	*16,8*	*12,5*

Value Weighted

Book to Market				
Low	2	3	4	High
3,2	7,0	22,9	22,6	59,5
3,2	8,2	17,4	18,6	21,8
13,2	11,1	17,5	17,8	25,9
16,2	13,7	20,5	18,0	24,0
12,8	13,5	12,0	12,8	8,5

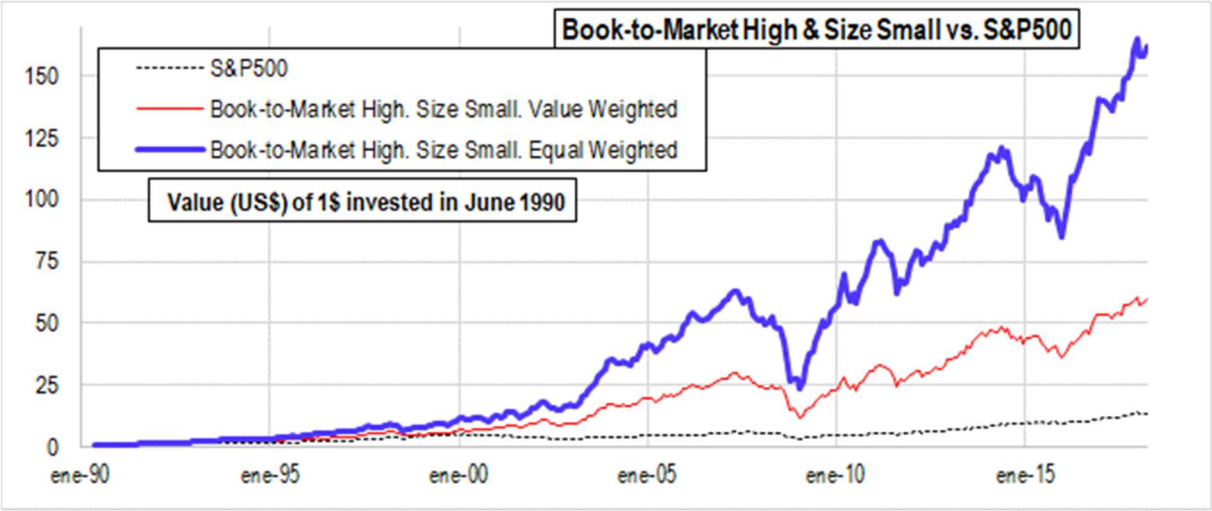
Value (US$) in April 2018 of 1$ invested in January 2000

Equal Weighted

		Book to Market				
		Low	2	3	4	High
Size	Small	*2,9*	*2,9*	*6,3*	*7,2*	***16,4***
	2	*1,1*	*3,3*	*5,4*	*6,2*	*5,9*
	3	*3,4*	*3,5*	*5,4*	*6,3*	*6,0*
	4	*2,6*	*4,4*	*6,1*	*5,6*	*6,4*
	Big	*1,9*	*3,5*	*4,2*	*4,5*	*2,8*

Value Weighted

Book to Market				
Low	2	3	4	High
1,0	1,9	4,9	5,2	9,6
1,1	2,5	4,9	5,4	5,8
3,0	3,2	5,2	6,3	6,2
2,8	4,4	6,3	5,1	5,5
2,1	2,6	2,8	3,5	1,9



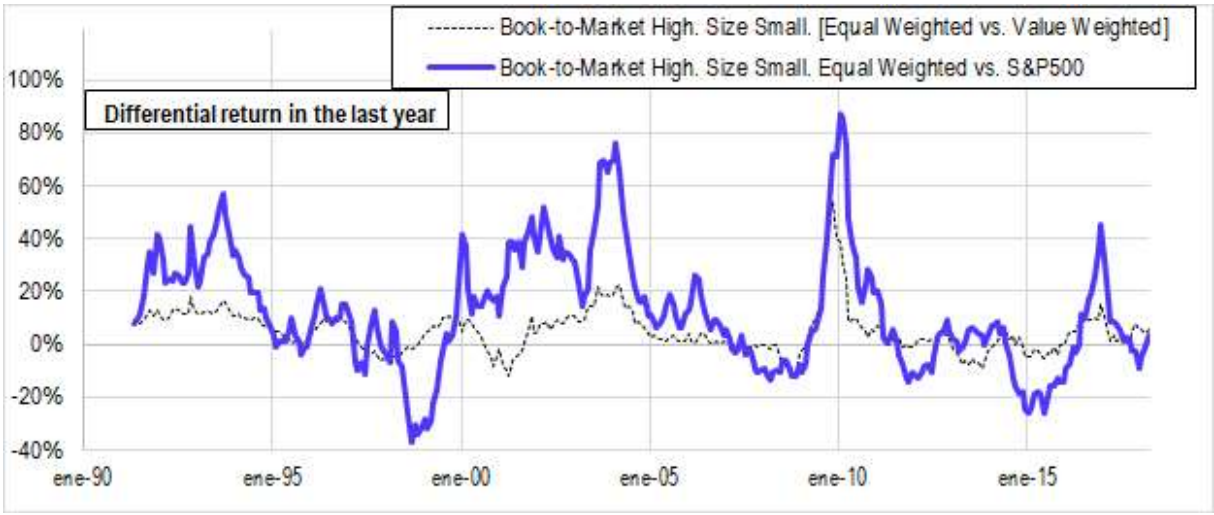


Exhibit 7. Some paragraphs of two recent academic papers: Fama and French (2017), and Harvey, Liu and Zhu (2015)

"Our goal is to develop insights about the max squared Sharpe ratio for model factors as a metric for ranking asset-pricing models.

Harvey, Liu, and Zhu (2015) catalogue 316 **anomalies** proposed as potential factors in asset-pricing models. The obvious path is to use theory to limit the set of competing models. In the ideal case, **theory provides fully specified models that lead to precise statements about the relation between an asset's measurable characteristics and its expected return.** The CAPM of Sharpe (1964) and Lintner (1965) is a prime example, and its fully specified predictions about risk and expected return explain its lasting attraction.

Stocks with high expected returns have low prices relative to future expected cashflows.

The dividend discount model is an umbrella: regardless of the process generating prices, there is a discount rate, which we call the long-run expected return that links a stock's price to its expected dividends. (Expected by whom?)

We worry, however, that opening the game to factors that seem empirically robust but lack theoretical motivation has a destructive downside – the end of discipline that produces parsimonious models and the beginning of a dark age of data dredging that produces a long list of factors with little hope of sifting through them in a statistically reliable way.

If the goal is to minimize the max squared Sharpe ratio for the intercepts for all assets, models should be ranked on the max squared Sharpe ratio for model factors, $Sh^2(f)$.

Factor models are a response to the empirical failures of the CAPM of Sharpe (1963) and Lintner (1964) and the consumption based CCAPM of Lucas (1978) and Breeden (1979). The attraction of the CAPM and CCAPM is that they specify the relevant measure of risk and the relation between expected returns and risk, which provides discipline for empirical tests. In contrast, factor models are motivated by observed patterns in average returns.

What discipline can we invoke to limit data dredging? We suggest that model comparisons in any paper should be limited by theory, even an umbrella theory like the dividend discount model, and by evidence on model robustness out-of-sample (different time periods and markets). For example, FF (2015, 2016) invoke the dividend discount model to motivate the five-factor model. Here, in our tests of nested models, we, in addition, invoke history to limit comparisons to the three-factor

model versus the CAPM, the five-factor model versus the three-factor model, and the six-factor model versus the five-factor model. Despite the absence of theoretical justification, we (somewhat reluctantly) add a momentum factor to the five-factor model. Thus, we limit both the total number of factors and the number of competing models. The spanning-test rejections of the CAPM, three-factor, and five-factor models are so strong that if we invoke Bonferroni's inequality to take account of the number of comparisons (three, or five if we count alternative profitability factors), all inferences survive.

Finally, statistical inference is always clouded by multiple comparisons issues. In asset pricing, we typically use data scoured by many before us, and the questions addressed are conditioned by previous work, typically on much the same data. In the absence of fresh data, inferences about reliability should reflect the union of all earlier tests (reported and unreported) – an impossible goal. Our point is that, if we limit the models considered in a study, we have a shot at ordering them in a statistically meaningful way, even though the overall level of p-values is necessarily clouded.

Over forty years ago, one of the first tests of the Capital Asset Pricing Model (CAPM) found that the market beta was a significant explanator of the cross-section of expected returns. The reported t-statistic of 2.57 in Fama and MacBeth (1973, Table III) comfortably exceeded the usual cutoff of 2.0."

The two cited papers do not have any example of returns of different portfolios between two dates.

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