

# Does Return Horizon Matter? Implications for stock returns, mutual fund returns, and investment performance measurement

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10th Annual Emerging Markets Finance Conference  
October 23, 2019

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# Some little known investment research history

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- ✦ In the mid 1960s, staff at the University of Chicago developed the first comprehensive stock return database.
    - ✦ Now known as the Center for Research in Securities Prices (CRSP) database.
  - ✦ The question arose, at what frequency should we measure returns?
  - ✦ The leadership declared that we shall study **monthly** returns.
  - ✦ Upon observation that history contains many months, the leadership further declared that we should focus our studies upon the **arithmetic mean** of the monthly returns.
  - ✦ And so it has been done, for over fifty years.
  - ✦ Please be aware that this slide is a spoof, and there is no need to call Snopes.

# Does Return Horizon Matter?

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- ✦ Most studies of stock market performance are based on monthly returns: we know a lot about the parameters of monthly returns.
  - Means, variances, skewness, betas, alphas, Sharpe ratios, etc.
- ✦ But most investors' horizons are much longer.
- ✦ Most under-diversified investments in stocks underperform benchmarks in the long run.
  - True for individual stocks, and also for active mutual funds.
- ✦ Widely used measures of investment performance such as the Sharpe Ratio or (Jensen's) Alpha are different over long vs. short horizons.

# This discussion is based on:

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✦ “Do stocks outperform Treasury Bills?”

[https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2900447](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2900447)

✦ “Do global stocks outperform US Treasury Bills?”

[https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3415739](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3415739)

✦ “Why do so many mutual funds underperform?”

work in progress with Michael Cooper and Feng Zhang.

# Do Global Stocks Outperform US Treasury Bills?

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- ✦ We study compound returns to 61,981 common stocks issued by 61,100 firms, drawn from 42 countries, 1990 to 2018.
  - ✦ Including 3,731 stocks from India.
- ✦ Return data is from CRSP, Compustat Global, and Compustat North America.
- ✦ Returns are measured in US dollars to provide a common benchmark.

Figure 1: Percent of Stock/Months with Indicated Return

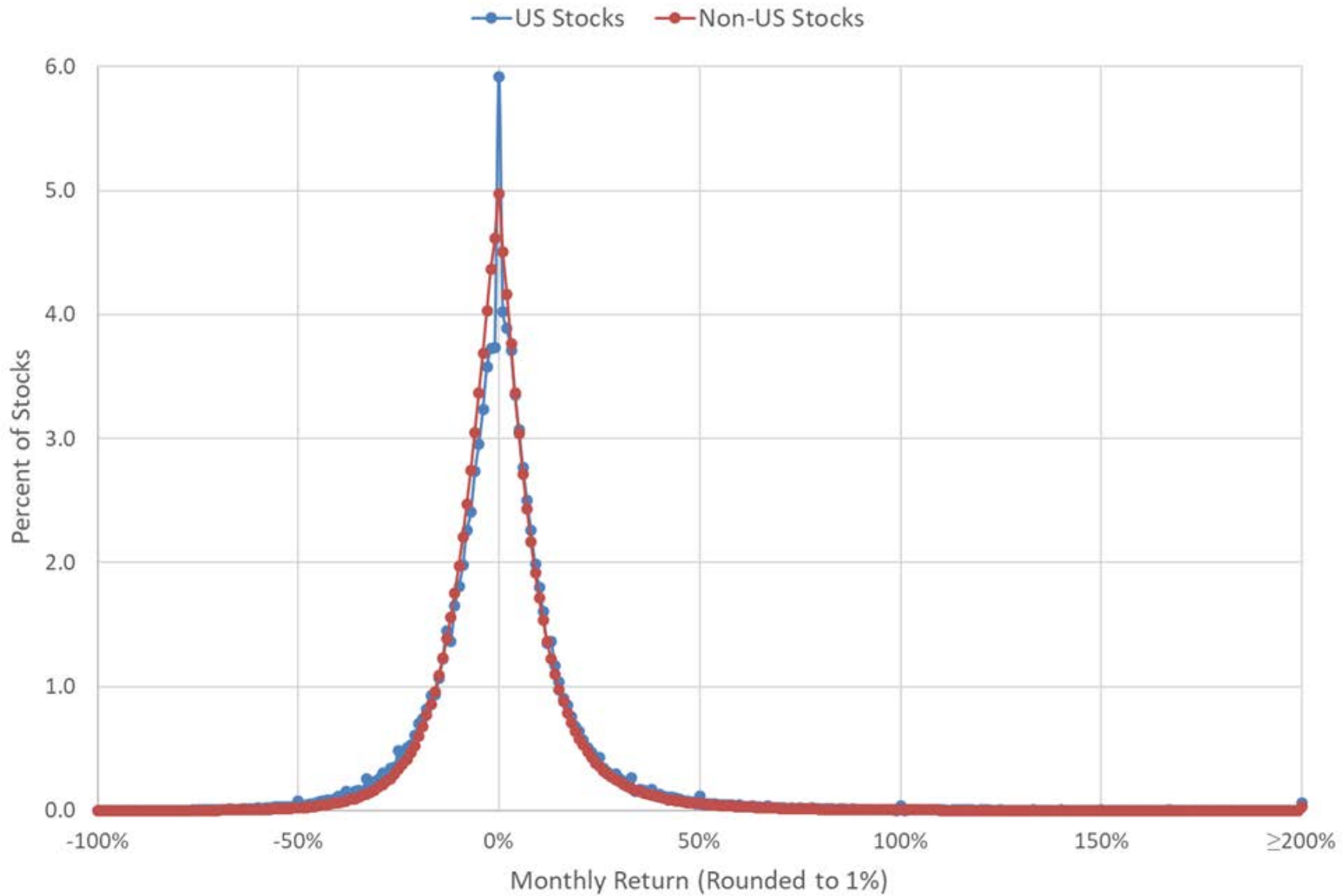


Figure 2: Percent of Stock-Years with Indicated Buy-and-Hold Return

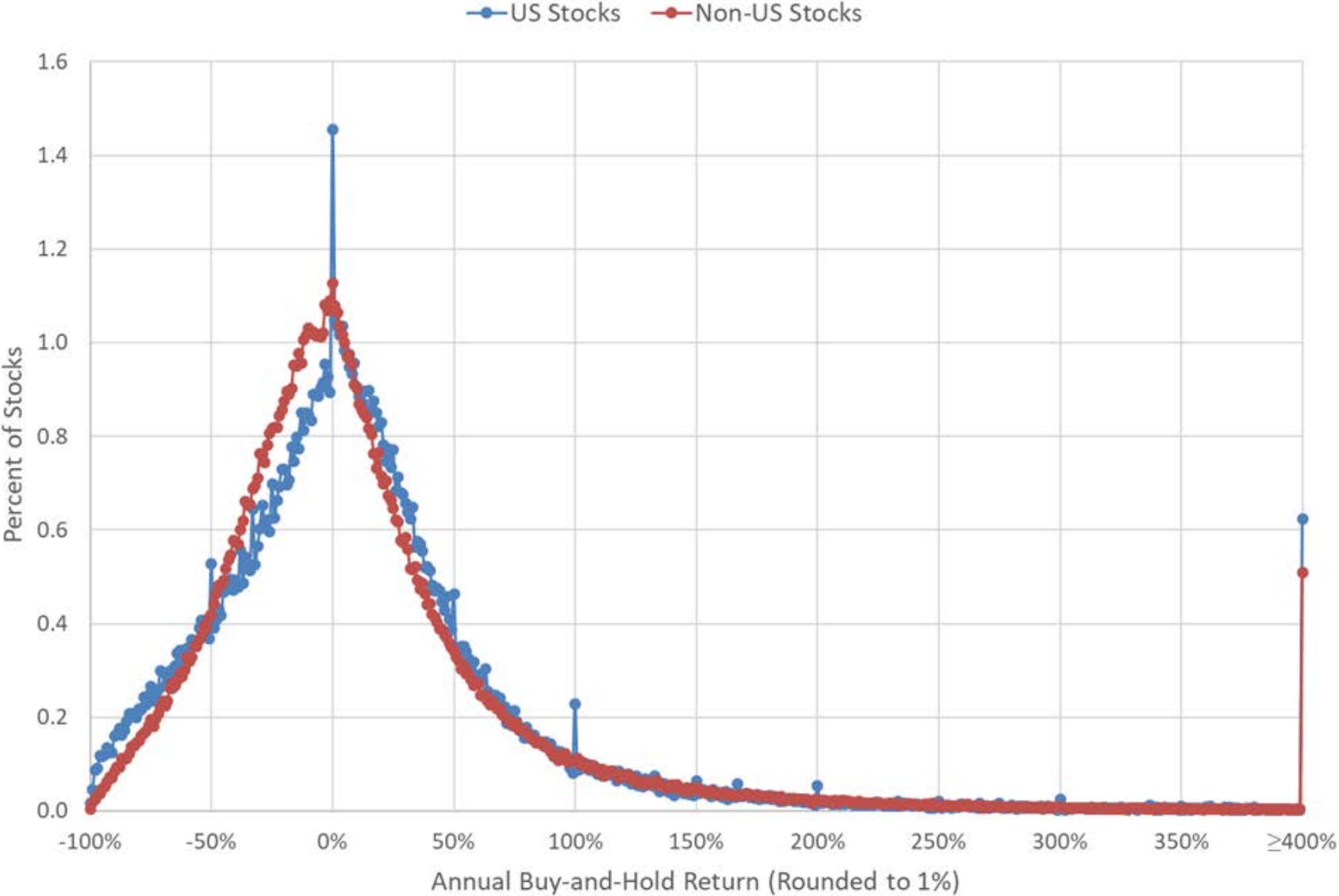


Figure 3: Percent of Stock-Decades with Indicated Buy-and-Hold Return

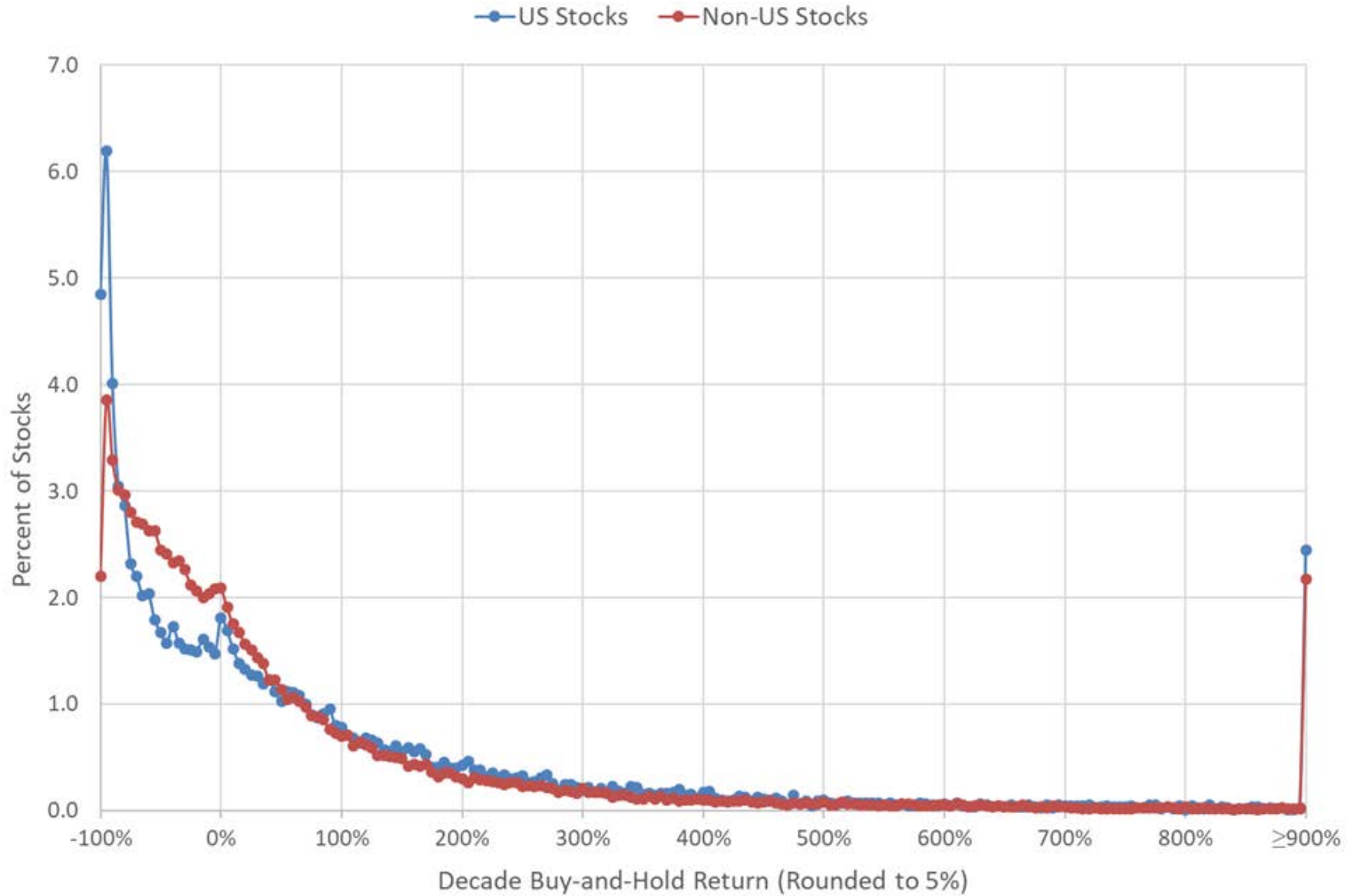
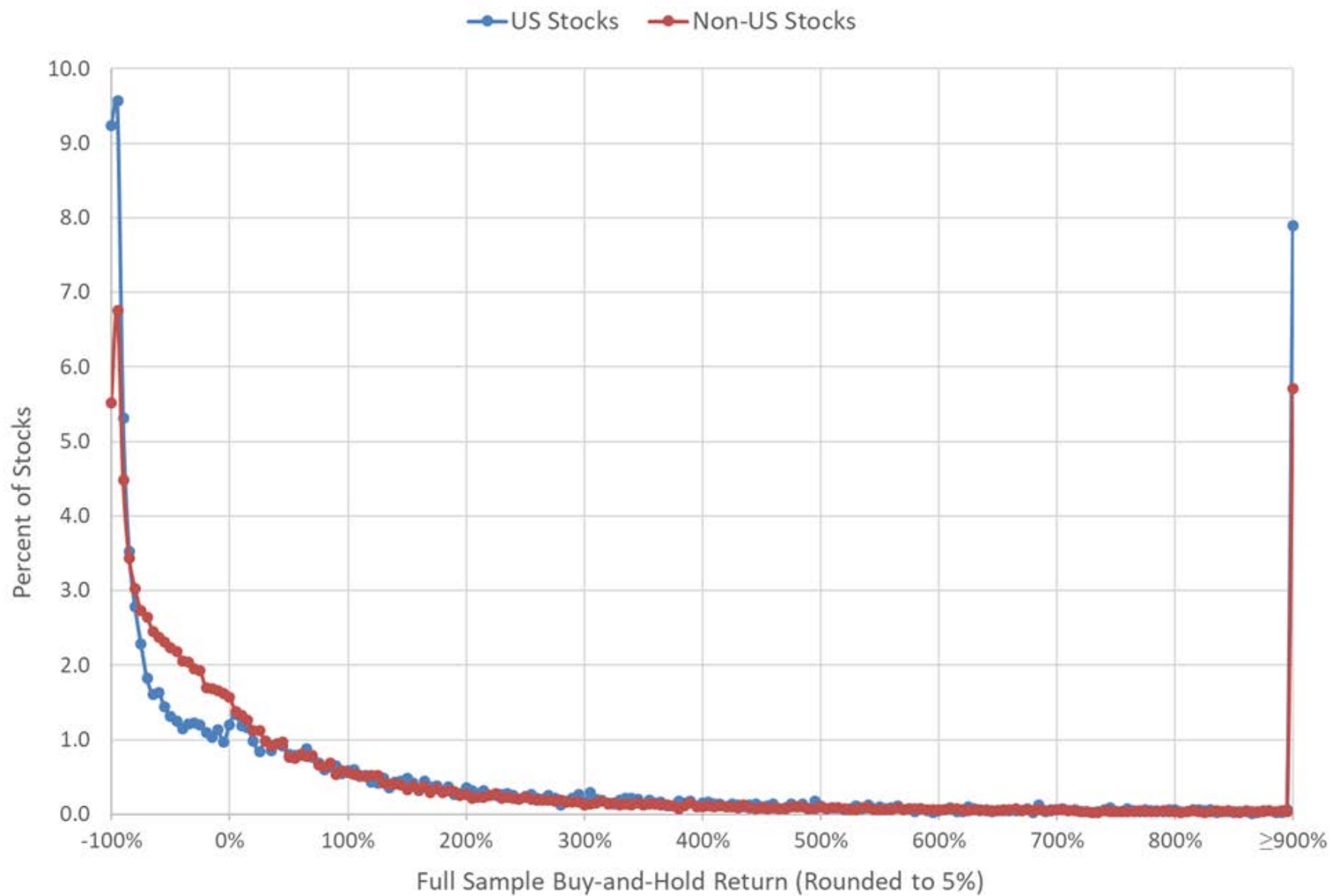




Figure 4: Percent of Stocks with Indicated Full Sample Period Buy-and-Hold Return



# Buy-and-Hold Returns, 1990-2018

Panel D: Full Sample Horizon

Sample	N	Mean	Median	SD	Skewness	% > 0	% > T-bill	% > VW Market
Global	61,981	2.6042	-0.1489	21.976	47.922	45.6%	40.5%	31.1%
Global (Excl. US)	44,476	2.2155	-0.1702	18.521	57.204	44.4%	39.3%	28.6%
<b>By Development</b>								
Developed	48,122	2.6499	-0.1145	22.386	50.132	46.8%	41.3%	32.6%
Developed (Excl. US)	30,617	2.1115	-0.1335	17.558	70.627	45.9%	40.0%	29.6%
Emerging	13,859	2.4453	-0.2280	20.489	37.414	41.3%	37.6%	26.2%
<b>By Region</b>								
North America	19,500	3.6368	-0.0598	27.863	36.524	48.7%	43.9%	37.8%
Europe	11,921	2.0603	-0.0926	9.086	10.336	47.2%	41.4%	32.3%
Asia Pacific	16,701	1.9184	-0.1722	21.835	66.393	44.4%	38.2%	26.6%

In India, 41.4% of stocks outperform US T-bills over the full sample.

# “Wealth Creation” by Stock Investing

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We measure, as of December 2018, the difference between the wealth of investors who held common stocks as compared to investing the same capital in one month Treasury Bills.

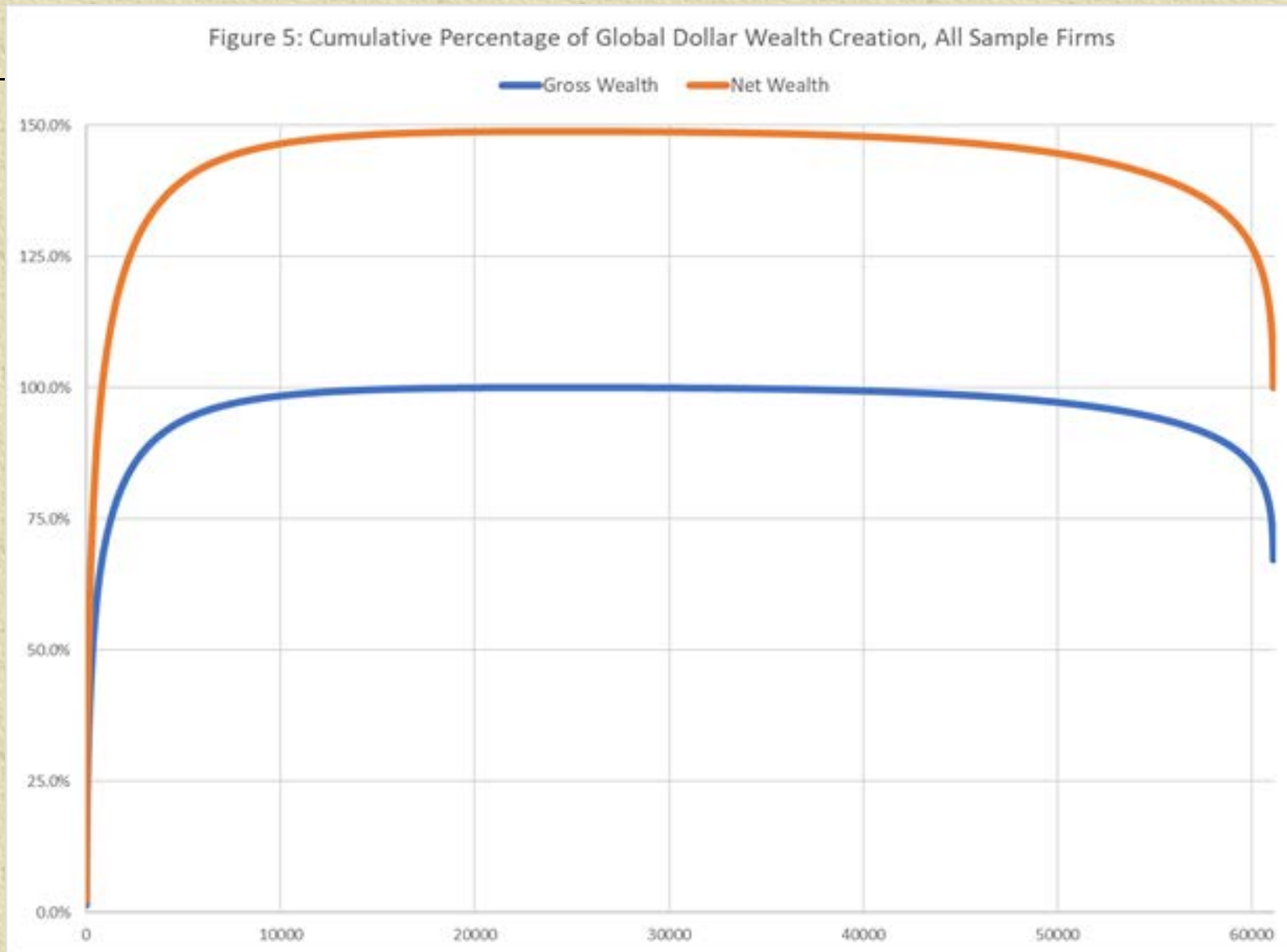
This is also the “Net Future Value” of the series of cash flows to investors in aggregate.

It is also the December 2018 Market Capitalization of the stock, minus the December 2018 equivalent of shareholder equity infusions, plus the December 2018 equivalent of dividends and share repurchases.

# Firms with Largest Wealth Creation, 1990-2018

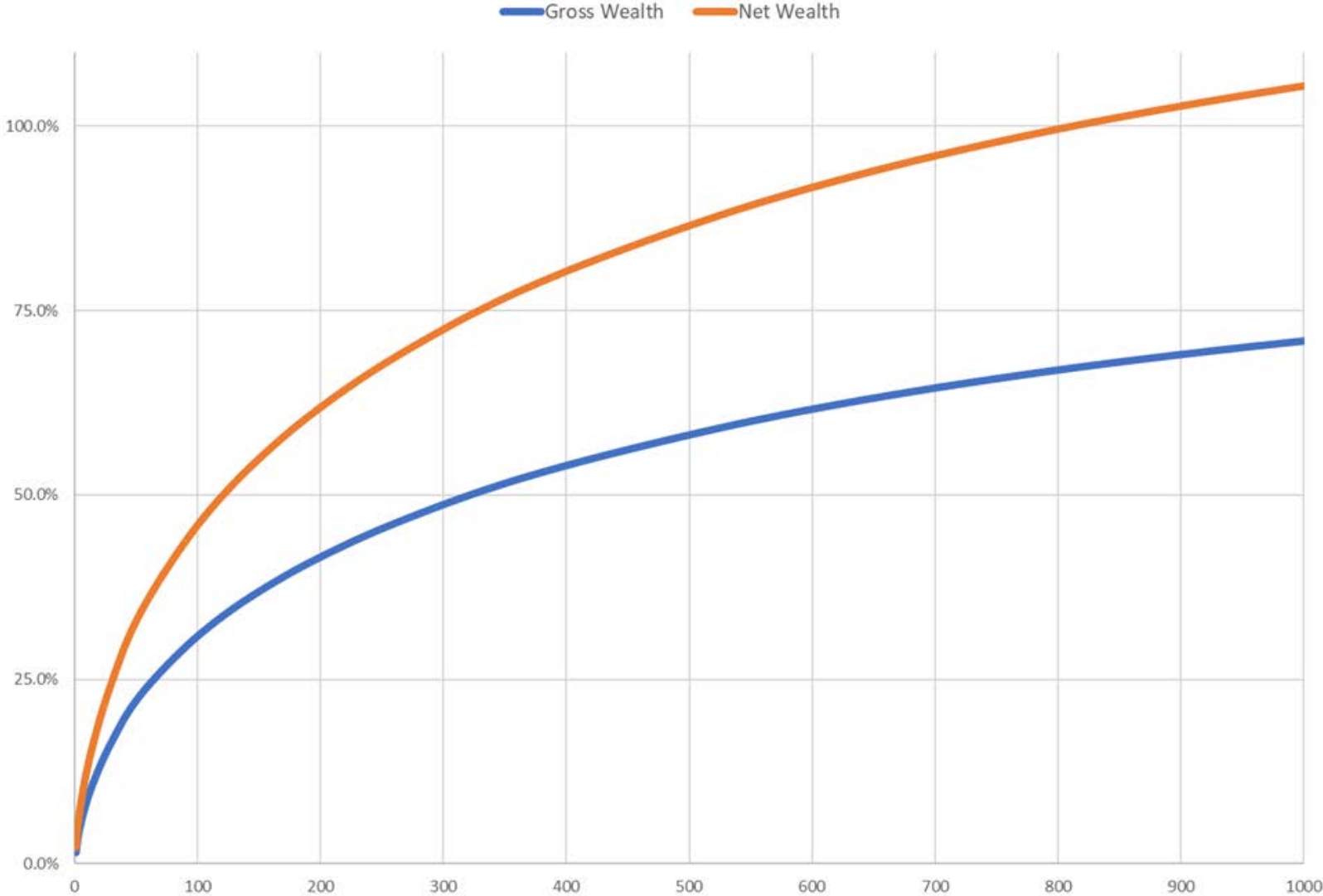
Firm Name	Country	PERMCO/GVKEY*	Wealth Created (\$US millions)	Accumulated % of Global Gross Wealth Creation	Accumulated % of Global Net Wealth Creation	Annualized Dollar Weighted Return
APPLE INC	U.S.	7	1,006,035	1.51%	2.25%	21.00%
MICROSOFT CORP	U.S.	8048	954,787	2.95%	4.38%	17.77%
AMAZON COM INC	U.S.	15473	696,738	3.99%	5.94%	29.35%
ALPHABET INC	U.S.	45483	528,536	4.79%	7.12%	17.62%
EXXON MOBIL CORP	U.S.	20678	515,827	5.56%	8.27%	11.26%
BERKSHIRE HATHAWAY INC DEL	U.S.	540	438,959	6.22%	9.26%	12.12%
JOHNSON & JOHNSON	U.S.	21018	437,430	6.88%	10.23%	13.87%
WALMART INC	U.S.	21880	407,376	7.49%	11.14%	13.13%
TENCENT HOLDINGS LTD	Hong Kong	270615*	377,356	8.06%	11.99%	50.10%
ALTRIA GROUP INC	U.S.	21398	360,711	8.60%	12.79%	17.12%
NESTLE SA/AG	Switzerland	016603*	354,068	9.13%	13.59%	12.88%
PROCTER & GAMBLE CO	U.S.	21446	315,778	9.60%	14.29%	12.59%
INTEL CORP	U.S.	2367	312,027	10.07%	14.99%	16.23%
JPMORGAN CHASE & CO	U.S.	20436	298,095	10.52%	15.65%	9.16%
SAMSUNG ELECTRONICS CO LTD	South Korea	104604*	284,884	10.95%	16.29%	18.61%
HOME DEPOT INC	U.S.	5085	282,676	11.37%	16.92%	16.17%
COCA COLA CO	U.S.	20468	281,365	11.80%	17.55%	12.99%
ROCHE HOLDING AG	Switzerland	025648*	276,330	12.21%	18.17%	13.80%
CHEVRON CORP NEW	U.S.	20440	270,235	12.62%	18.77%	11.05%
MERCK & CO INC NEW	U.S.	21188	266,496	13.02%	19.37%	11.96%
UNITEDHEALTH GROUP INC	U.S.	7267	264,762	13.42%	19.96%	21.28%
NOVARTIS AG	Switzerland	101310*	249,576	13.79%	20.52%	9.96%
ORACLE CORP	U.S.	8045	245,690	14.16%	21.07%	19.43%
PFIZER INC	U.S.	21394	231,589	14.51%	21.59%	7.04%
VISA INC	U.S.	52983	231,202	14.85%	22.10%	22.85%

# Concentration of Wealth Creation



# Concentration of Wealth Creation

Figure 6: Cumulative Percentage of Global Dollar Wealth Creation, Top 1000 Firms



# India

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- ✦ The best performing 1% of stocks account for 83% of net wealth creation, 1990 to 2018.
- ✦ Tata was the single largest wealth creator.

# Summary to here:

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- ✦ In the long run, most global stocks underperform US Treasury Bills.
- ✦ Actual wealth gains to investors are driven by a few very successful stocks.
- ✦ These results reflect that long horizon returns are strongly positively **skewed**, even if short horizon returns are not.



# Implications for Active vs. Passive

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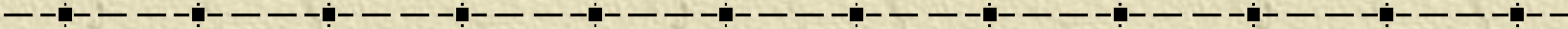
- ✦ For investors without comparative advantage in stock picking, and mean-variance preferences.
  - ◆ The results reinforce the importance of diversification.
  - ◆ But, from a different perspective – you don't want to take a chance on missing the four percent of stocks that generate all the wealth.
  - ◆ This is probably the key takeaway for many investors .
- ✦ For investors with skewness preference:
  - ◆ Skewness diversifies; you may want fewer stocks.
- ✦ For investors with comparative advantage in stock picking.
  - ◆ The potential gains are larger than may previously have been recognized.

# How about portfolios?

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- ✦ Some preliminary results regarding US equity mutual funds.
- ✦ Ongoing work with Feng Zhang and Mike Cooper.
- ✦ CRSP survivorship-bias free mutual fund database,
- ✦ January 1991 to December 2018.

# Lifetime (full sample) compound returns to active US equity funds, 1991 to 2018



Variable	N	Mean	Median	Skewness
Fund life (months)	8743	130.2	108.0	0.65
Outperform market	8743	23.9%	0.0%	1.23
Outperform SPY	8743	29.2%	0.0%	0.91
Outperform T-Bill	8743	74.5%	100.0%	-1.13
Fund compound return	8743	178.5%	66.8%	4.70
Market compound return	8743	213.4%	119.7%	2.51
SPY compound return	8743	195.4%	114.8%	2.43

# Fees and long term mutual fund performance

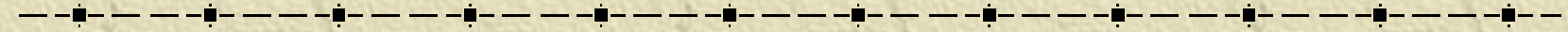
- ✦ We know that on average active mutual funds underperform, due to their fees and expenses.
- ✦ So, add back fees to mutual fund returns:

Variable	Mean	Median	Skewness
	Pre-Fee Returns		
Outperform market	38.40%	0.00%	0.486
Outperform SPY	44.60%	0.00%	0.497
Outperform T-Bill	79.30%	100.00%	0.405
Fund compound return	241.56%	83.43%	4.900
Market compound return	213.35%	119.68%	3.114
SPY compound return	195.39%	114.77%	2.824

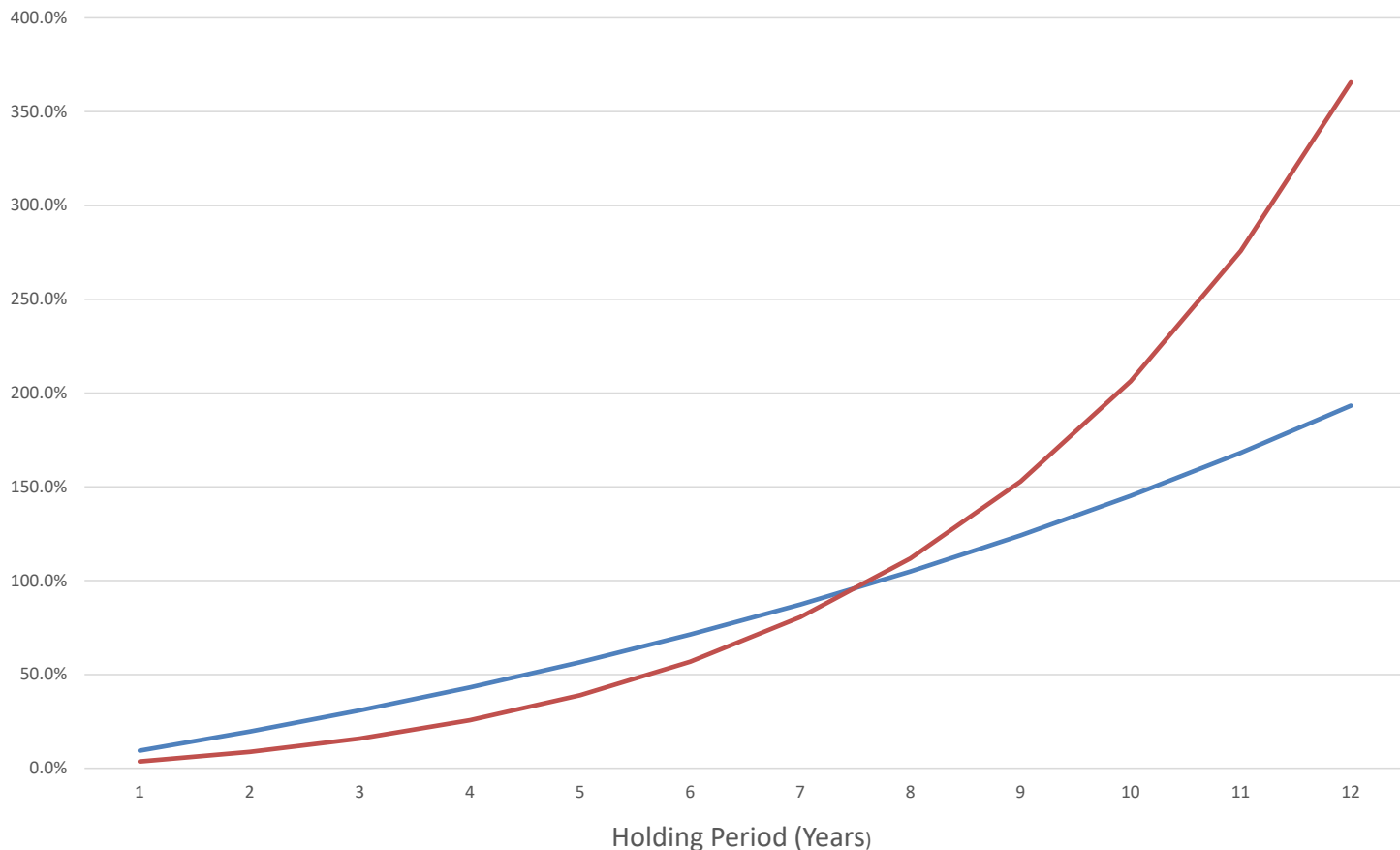
# Other Observations Regarding Return Horizon

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- ✦ Investment horizon, decision horizon, and return measurement horizon differ.
  - ✦ As horizon increases:
    - ◆ Expected return increases
    - ◆ Variance of returns increases
    - ◆ Covariances between return pairs tend to increase.
    - ◆ Skewness increases.
    - ◆ Not proportionate to time, or to each other.
  - ✦ The following slides contain some illustrations.
  - ✦ These assume returns are independent and identically distributed through time.
  - ✦ These focus on true, not estimated, parameters.

# Return volatility grows much faster than horizon, and also faster than expected return

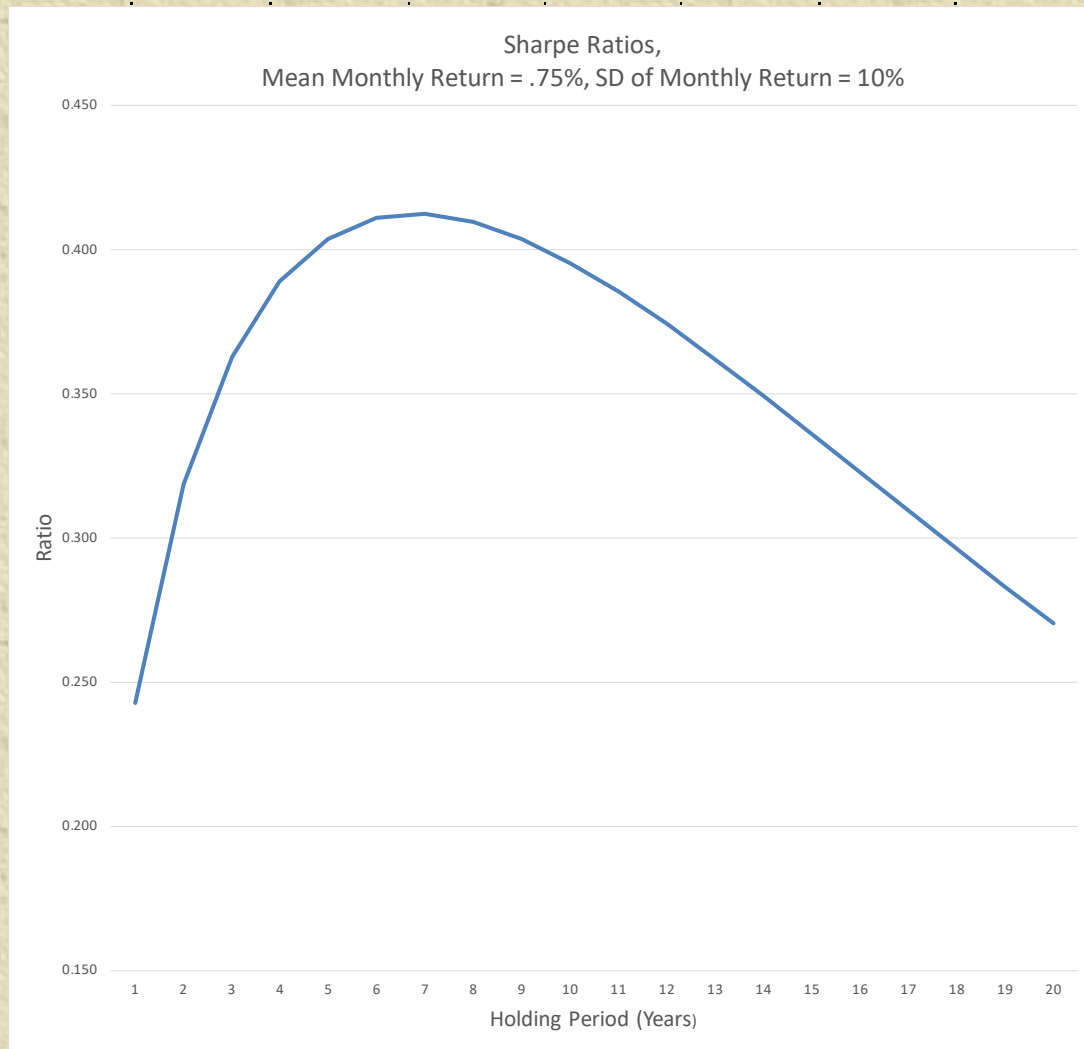


Mean and Variance of Long Horizon Returns,  
when monthly mean is 0.75% and monthly standard deviation is 5%



— Expected Long Return — Variance Long Return

# True Sharpe Ratio for various investment horizons, iid returns (illustration)



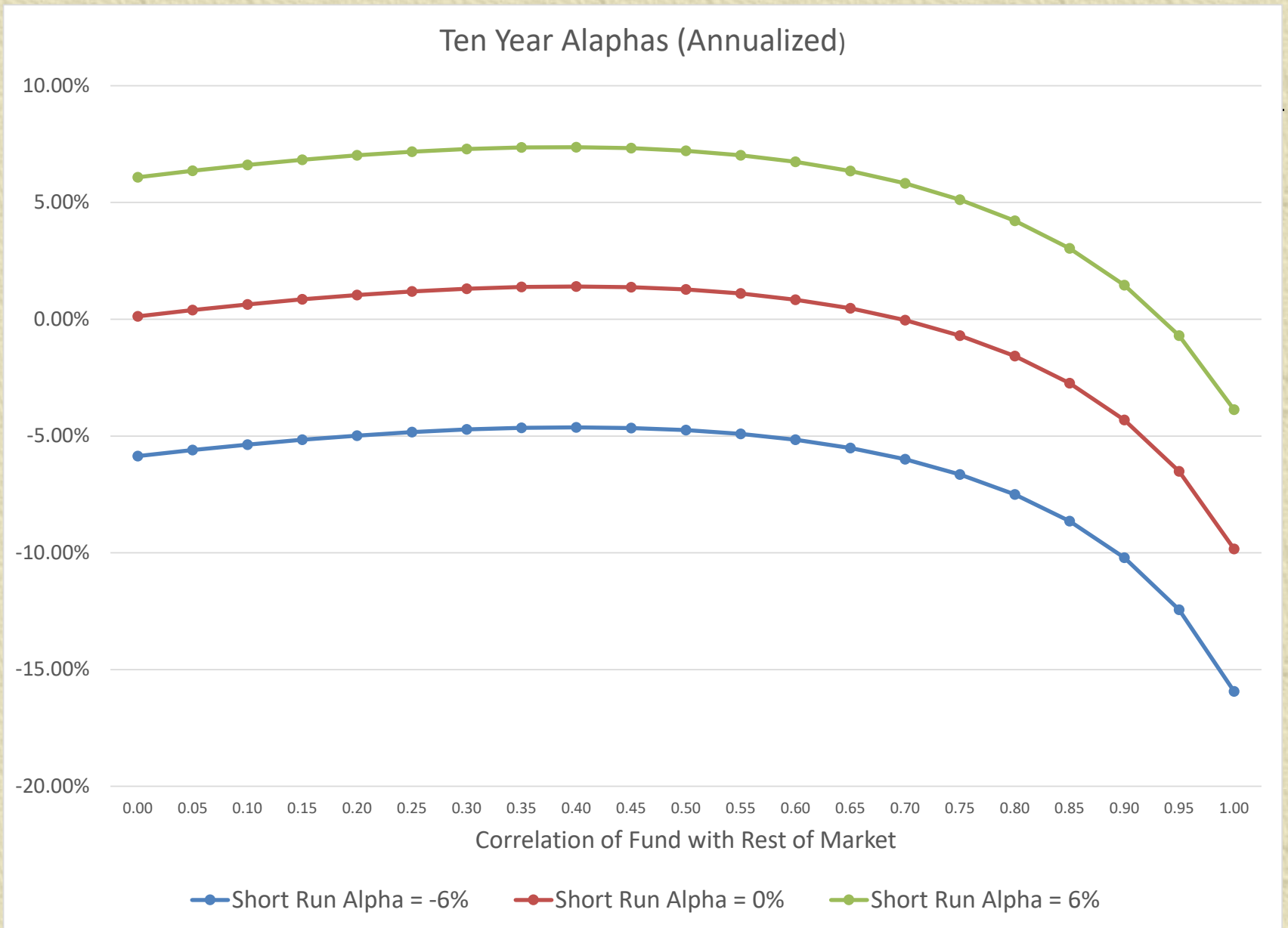
# Covariances

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- ✦ The Sharpe Ratio differs with horizon because expected return and variance grow with horizon, but non-linearly and at different rates.
- ✦ Covariances also depend on horizon, and the relation is complex.
- ✦ Implies that betas depend on horizon.
- ✦ Which implies that alphas depend on horizon.



# Illustrating of Horizon effects on Alpha



# What is the interpretation?

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- ✦ Zero short run alpha does not (except when  $\beta = 1$ ) imply zero long run alpha.
  - ✦ Is this an indictment of alpha as a measure of skill? As a statistic for testing an asset pricing model?
  - ✦ Jensen (1968) motivated alpha based on the CAPM, a single period model.
    - “The measure of portfolio performance summarized below is derived from a *direct application* of the theoretical results of the capital asset pricing models derived independently by Sharpe [20], Lintner [15] and Treynor [25].”
- ✦ The sign can even change, particularly for funds with positive short alpha and high short betas.

## Estimates from the Data: Short and Long Run Alpha for US Equity Mutual Funds, 1991-2018

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Variable	N	Mean	Median	Positive
Subsample where monthly beta > 1				
Monthly alpha	3426	-0.15%	-0.08%	36.54%
Long Run Alpha	3426	-0.52%	-0.32%	12.99%
Subsample where monthly beta < 1				
Monthly alpha	5317	-0.08%	-0.04%	43.45%
Long Run Alpha	5317	0.05%	0.03%	54.07%

# Summary:

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- ✦ Return horizon matters.
- ✦ We know a lot about the empirical distribution of short horizon returns.
- ✦ But investor horizons may be longer. All of the following depend on return measurement horizon, and not in simple ways:
  - ◆ Mean or expected return
  - ◆ Skewness of return
  - ◆ Variance of return.
  - ◆ Covariances of returns
  - ◆ Return betas
  - ◆ Return alphas
- ✦ We should be thinking more about long horizon returns.