MOMENTUM INVESTING: SIMPLE, BUT NOT EASY

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Overview

1. What is Momentum?
2. Do **transaction costs** destroy profits?
3. Is momentum **too crowded**?
4. Can an open secret **work in the future**?

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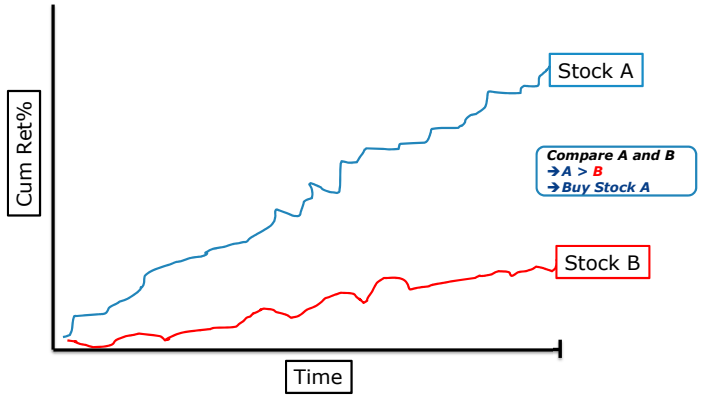
Stock Picking Momentum 101: Buy Past Winners



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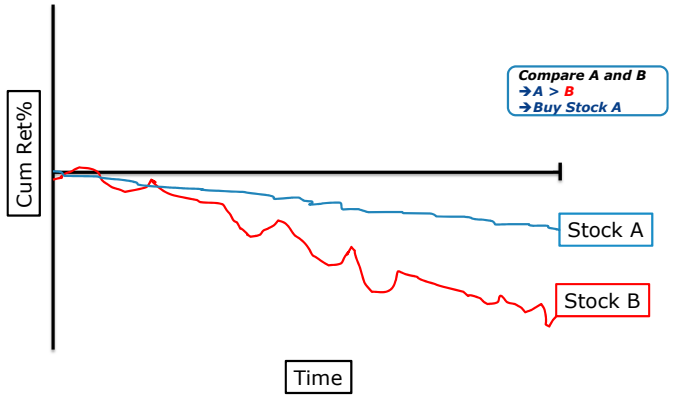
Stock Picking Momentum 101: Buy Past Winners



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Few Deny the Empirical Facts

"The premier anomaly is momentum..."

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Source: From "Dissecting Anomalies" by Kenneth French and Eugene Fama, 2008, *Journal of Finance.*

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Do Transaction Costs Destroy Momentum?

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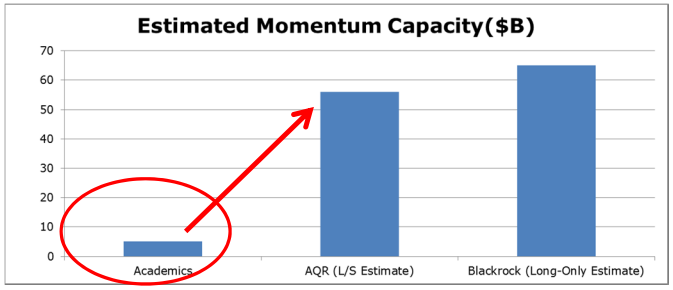
Papers Highlighting Momentum Has Capacity Constraints

1. "A Taxonomy of Anomalies and their Trading Costs" by Novy-Marx and Velikov (2015)
2. "The Illusory Nature of Momentum Profits" by Lesmond, Schill, and Zhou (2003)
3. "Are Momentum Profits Robust to Trading Costs?" by Korajczyk and Sadka (2003)
4. "Combining Value and Momentum" by Fisher, Shah, and Titman (2015)
5. "Capacity of Smart Beta Strategies: A Transaction Cost Perspective" by Ratcliffe, Miranda, and Ang (2017)
6. "Trading Costs of Asset Pricing Anomalies" by Frazzini, Israel, and Moskowitz (2015)



$5B or $50B+ Capacity?

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Who's Right?

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Source: https://www.askideas.com/27-most-funny-fights-pictures/

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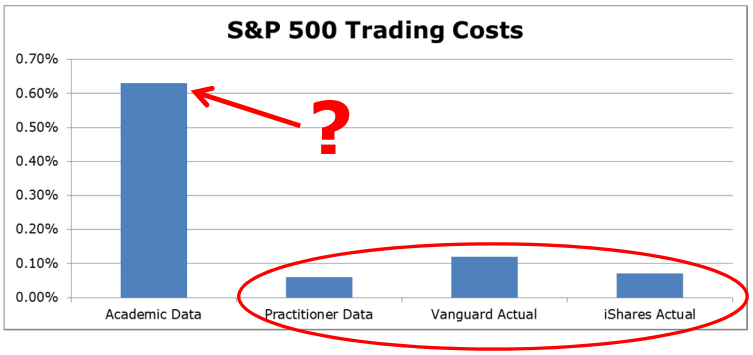
Reality Check: What Would It Cost to Trade The Market?



Practitioner Data is More Credible

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Source: "Trading Costs of Asset Pricing Anomalies" by Frazzini, Israel, and Moskowitz (2015) Performance figures contained herein are hypothetical, unaudited and prepared by Alpha Architect, LLC; hypothetical results are intended for illustrative purposes only. Past performance is not indicative of future results, which may vary.

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Momentum has capacity, but **it is not unlimited!**

Low <- rebal -> High	High <----- Concentration -----> Low							
	50	100	150	200	250	300	500	Universe
1	17.36%	15.85%	15.49%	14.01%	13.51%	12.95%	12.12%	10.27%
2	16.35%	15.41%	15.05%	13.92%	13.28%	12.83%	12.12%	10.27%
3	15.97%	14.68%	14.09%	13.35%	12.84%	12.53%	11.90%	10.27%
4	15.25%	13.86%	13.58%	12.94%	12.61%	12.30%	11.78%	10.27%
5	14.79%	13.53%	13.35%	12.71%	12.31%	12.15%	11.74%	10.27%
6	14.15%	13.07%	13.01%	12.55%	12.20%	11.96%	11.61%	10.27%
7	13.87%	12.86%	12.87%	12.41%	12.04%	11.81%	11.52%	10.27%
8	13.47%	12.72%	12.70%	12.25%	11.89%	11.67%	11.43%	10.27%
9	13.06%	12.37%	12.37%	11.97%	11.61%	11.45%	11.29%	10.27%
10	12.57%	12.11%	12.06%	11.74%	11.42%	11.26%	11.17%	10.27%
11	11.94%	11.73%	11.73%	11.42%	11.18%	11.05%	11.04%	10.27%
12	11.42%	11.35%	11.39%	11.12%	10.89%	10.82%	10.89%	10.27%

Long-only generic **momentum** portfolios: CAGR

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*The results are hypothetical results and are NOT an indicator of future results and do NOT represent returns that any investor actually attained. Additional information regarding the construction of these results is available upon request. Sample is from 1970 to 2016. Results are associated with a generic 2-12 momentum index strategy. Indexes are unmanaged, do not reflect management or trading fees, and one cannot invest directly in an index. All returns are gross total returns and include the reinvestment of distributions (e.g., dividends).

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Is Momentum Overcrowded?

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The data suggest that ETFs are not "crowding" factors

"…aggregate factor exposures **turn out to be close to zero**…

…[the evidence] **argues against** the concern that factor premiums are **being arbitrage away**…

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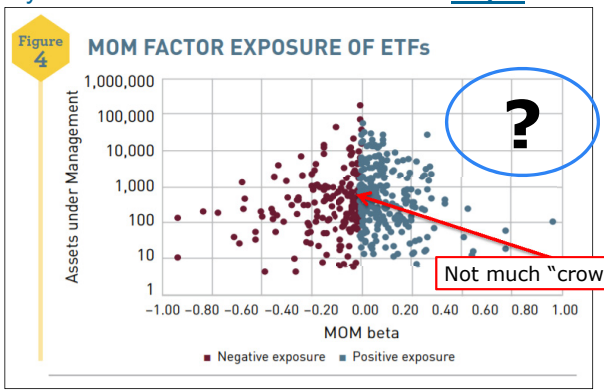
Is Everyone a Momentum Factor Investor? **Nope.**



Big Market with Many Buyers/Sellers

Source: Are Exchange-Traded Funds Harvesting Factor Premiums? by David Blitz. The results are hypothetical results and are NOT an indicator of future results and do NOT represent returns that any investor actually attained. Additional information regarding the construction of these results is available upon request. Sample is from 2011 to 2015. Indexes are unmanaged, do not reflect management or trading fees, and one cannot invest directly in an index. All returns are total returns and include the reinvestment of distributions (e.g., dividends).

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Who Are the Momentum Factor Investors? **Not the PhDs.**

(A) Ten Largest Positive Exposures			
ITB US	iShares US Home Construction	2,079	0.35
ICF US	iShares Cohen & Steers REIT	3,590	0.35
VNQ US	Vanguard REIT	26,986	0.33
RWR US	SPDR Dow Jones REIT	3,061	0.32
XHB US	SPDR S&P Homebuilders	1,935	0.32
SCHH US	Schwab US REIT	1,858	0.31
IYR US	iShares US Real Estate	4,737	0.28
XBI US	SPDR S&P Biotech	2,295	0.24
XLU US	SPDR Utilities Select	5,740	0.24
VPU US	Vanguard Utilities	1,657	0.24

(B) Ten Largest Negative Exposures			
VGT US	Vanguard Information Technology	8,340	-0.18
XLK US	SPDR Technology Select	13,659	-0.19
XLE US	SPDR Energy Select	12,290	-0.19
VDE US	[No Title]ard Energy	4,034	-0.23
IYW US	iShares US Technology	2,740	-0.23
XLB US	SPDR Materials Select	2,237	-0.25
IGE US	iShares North American Natural Resources	1,922	-0.30
AMLP US	Alerian MLP ETF	7,088	-0.30
AMJ US	JP Morgan Alerian MLP INDEX	3,726	-0.42
XOP US	SPDR S&P Oil & Gas Exploration and Production	1,796	-0.43

Momentum Factor Funds Aren't Driving Market

Source: Are Exchange-Traded Funds Harvesting Factor Premiums? by David Blitz. The results are hypothetical results and are NOT an indicator of future results and do NOT represent returns that any investor actually attained. Additional information regarding the construction of these results is available upon request. Sample is from 2011 to 2015. Indexes are unmanaged, do not reflect management or trading fees, and one cannot invest directly in an index. All returns are total returns and include the reinvestment of distributions (e.g., dividends).

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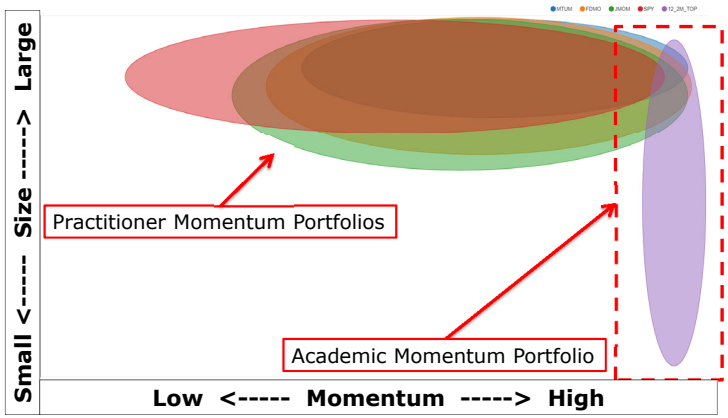
Are Momentum ETFs Even Trading Momentum? **Not Really.**



Mega-Cap Factor or Momentum Factor?

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Source: https://tools.alphaarchitect.com/

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Too Many CFAs…
Too Many Computers…
Too Many Quant PhDs…

"Momentum Investing is Dead."

Or is it?

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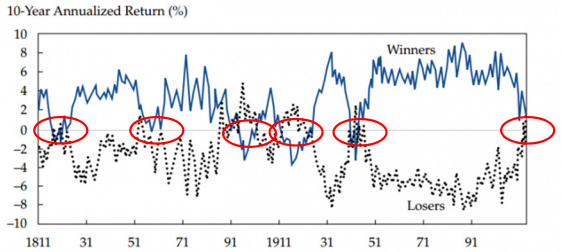
"Momentum is **DEAD:"** 10-year periods of underperformance!

Figure 2. Ten-Year Annualized Returns to Momentum Winner and Loser Portfolios, 1801–2012



Computers Blew Up the Trade?

*Source: Two Centuries of Price Return Momentum by Chris Geczy and Mikhail Samonov. The results are hypothetical results and are NOT an indicator of future results and do NOT represent returns that any investor actually attained. Additional information regarding the construction of these results is available upon request. Sample is from 1801 to 2012. Results are associated with a generic 2-12 momentum index strategy. Indexes are unmanaged, do not reflect management or trading fees, and one cannot invest directly in an index. All returns are total returns and include the reinvestment of distributions (e.g., dividends).

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Let's step back…

Why Do Strategies "Work" In the first place?

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Markets are efficient.

No they aren't!
People are insane.

Yes they are!
Why can nobody beat the market?

Because **people are insane**!

Nobody Seems to Know the Answer

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Why "Open Secrets" May Continue to Work…

Higher Risk + ***Tough to Exploit Mispricing*** = ***Expected Excess Return***

Secret Formula: No Pain, No Gain

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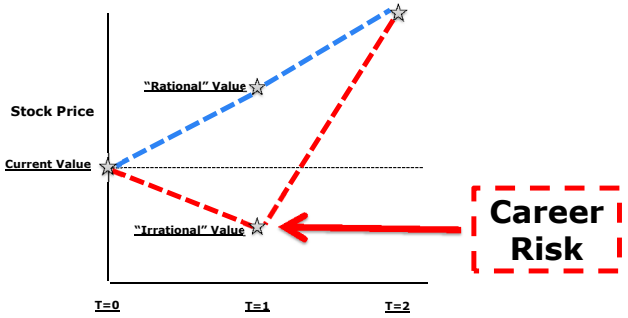
Risk is risk and "Mispricing" may not easy to exploit



	T=0	T=1	T=2
#1	$100	$150	$200
#2	$100	$50	$200

Relative Performance Destroys Careers

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Source: Shleifer A., R. Vishny, 1997, The Limits of Arbitrage, *Journal of Finance* 52, pg. 35-55.

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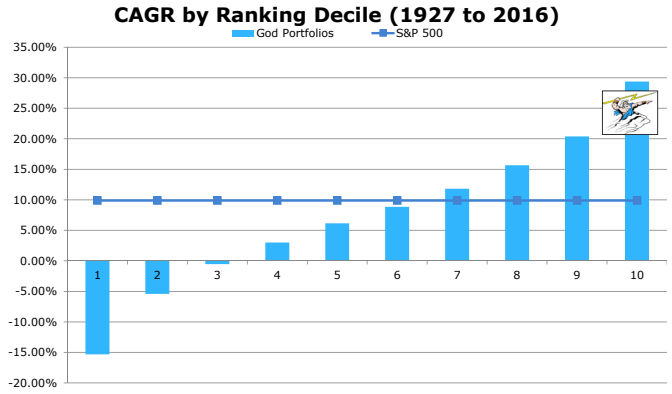
God can identify mispricing better than anyone…



Source: The results are hypothetical results and are NOT an indicator of future results and do NOT represent returns that any investor actually attained. In fact, these results are **IMPOSSIBLE to attain** because they have explicit look ahead bias. The deciles are based on 5-year look-ahead of total returns. All returns are total returns and include the reinvestment of distributions (e.g., dividends).

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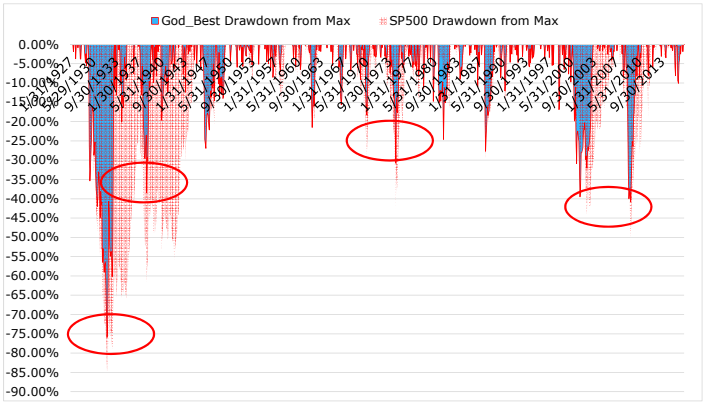
But Even God can't destroy risk…



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Looking for Excess Returns? Questions to Consider:

- Higher fundamental risk?
- Tough to exploit mispricing?
- Is my capital sustainable?

Higher Risk + ***Mispricing*** = ***Expected Excess Return***

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Overview

1. What is Momentum?
   - **Buying winners.**
2. Do **transaction costs** destroy profits?
   - **No, but capacity is limited.**
3. Is momentum **too crowded**?
   - **No, at least measured via ETF market.**
4. Can an open secret **work in the future**?
   - **Yes, via risk and costly arbitrage.**

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THE QUANTITATIVE MOMENTUM ALGORITHM

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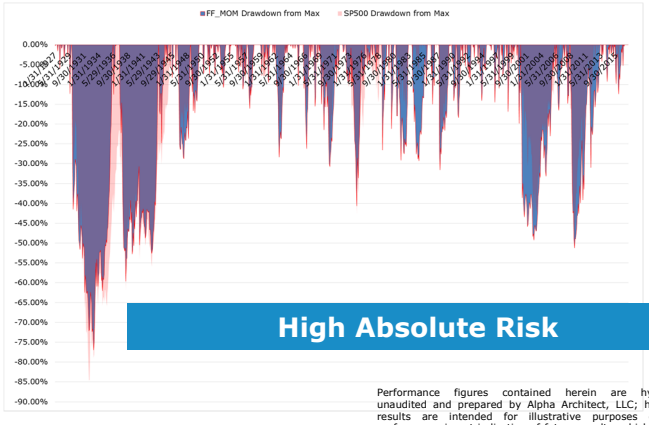
Risky: Long-only **momentum** portfolios can lose big!



High Absolute Risk

- **FF_MOM** = Top Decile Momentum
  - Ranked on cumulative 12 months, skip last month
  - Monthly rebalanced
- **SP500** = SP500 Total Return Index
- **Simulated Performance:** 1/1/1927 to 12/31/2016, Gross of fees, total returns, including dividends and distributions

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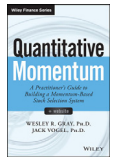
Our Best Effort: **Quantitative Momentum**

1. Identify **Universe**
2. **Core Momentum** Screen
3. **Momentum Quality** Screen
4. **Seasonality** Screen
5. Invest with ***Conviction*** (~50 stocks)

- ***Focused***
- ***High turnover***
- ***"Frog in the pan" momentum***
- ***Momentum seasonality***
- ***Massive tracking error***



Bottom line? High Expected Returns Have High Risk

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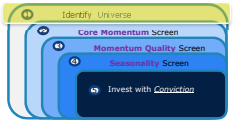
Step 1—Identify Universe: Mid- and Large-Cap

Liquidity restrictions

- ❑Mid- and large-caps

Universe rules

- ❑Operating Companies Only: Exclude from the data set specific securities, including ADRs, REITS, ETFs and CEFs.
- ❑No Sector Constraints



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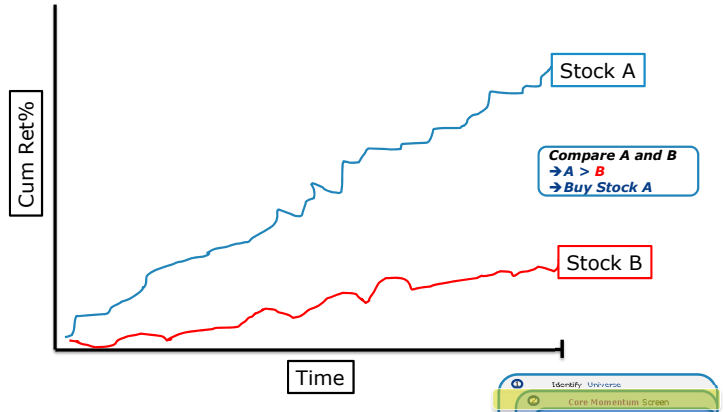
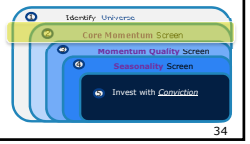
Step 2—Core Momentum Screen: Buy Past Winners





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Step 2—Core Momentum Screen: Crazy Idea?

"The premier anomaly is momentum..."

Even Fama and French Acknowledge the Historical Evidence

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From "Dissecting Anomalies" by Kenneth French and Eugene Fama, 2008, *Journal of Finance.*

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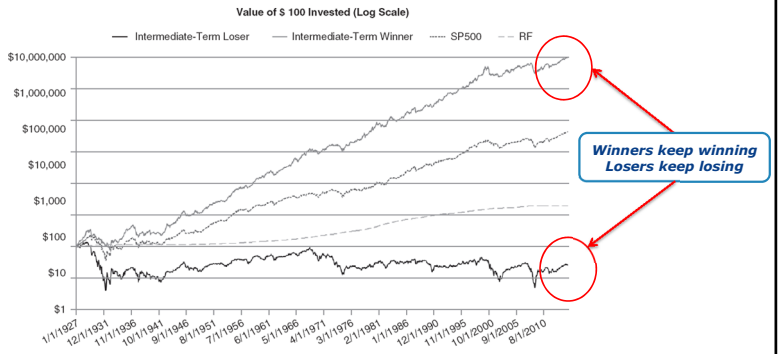
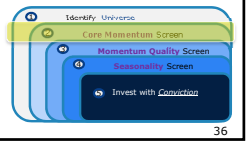
Step 2—Core Momentum Screen: 1-year look-back

Portfolios formed on momentum (1-year look-back) have strong historical performance





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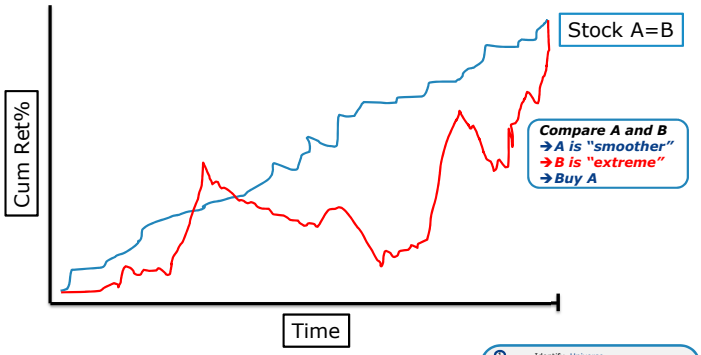
Step 3—Momentum Quality Screen: The Path Matters

"Lottery ticket" price paths attract more attention and are more likely to be efficient[1]



[1]Da, Gurun and Warachka, 2013, "Frog in the Pan: Continuous Information and Momentum," *Review of Financial Studies* 27, pg. 2171-2218. Charts presented are for illustrative purposes only.

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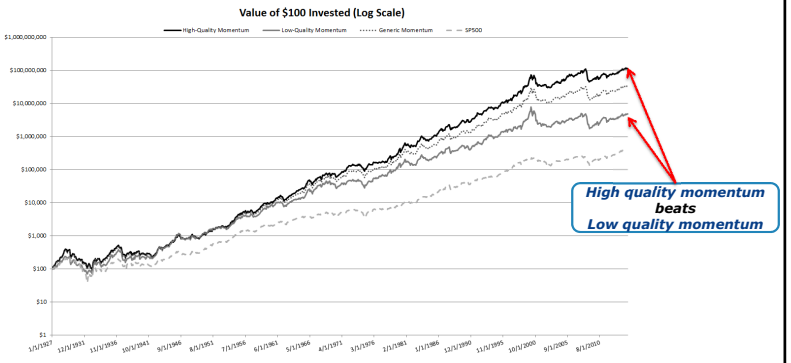
Step 3—Momentum Quality Screen: Frog-in-the-Pan

The "Frog-in-the-Pan" algorithm objectively identifies limited attention momentum paths



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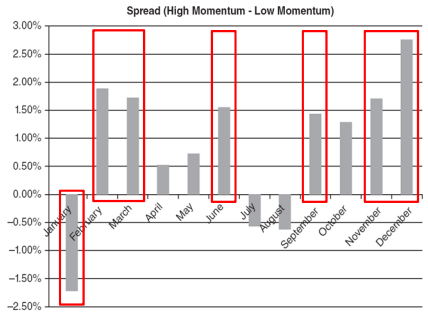
Step 4—Seasonality Screen: Premiums Vary Over Time

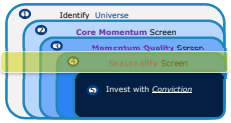
The momentum premium is highly seasonal. Window dressing and tax effects?



Performance Summary

Summary Statistics	Smart Rebalance	Dumb Rebalance
CAGR	15.97%	15.06%
Sharpe Ratio	0.60	0.57
Sortino Ratio	0.72	0.68

•**Smart** = Rebalance at the end of Feb., May, Aug, Nov.
•**Dumb** = Rebalance at the end of Dec., Mar., June, and Sept.



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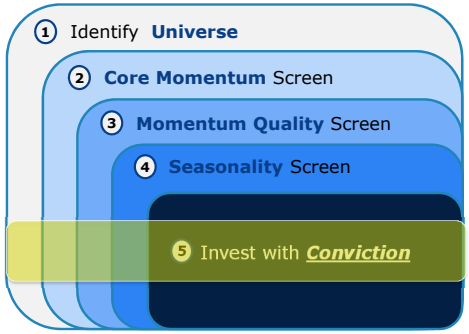
Step 5—Portfolio Construction



Portfolio Construction Parameters

- 50 stock portfolio (on average)
- Equal-weight construction
- Quarterly rebalance
- 25% sector/industry constraint
- Pre-trade liquidity model

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Focused Factors are a Double-Edged Sword

Long-only generic **momentum** portfolios: CAGR

Holding Period for each Stock	Number of Stocks Selected each month							
	50	100	150	200	250	300	500	Universe
1	17.36%	15.85%	15.49%	14.01%	13.51%	12.95%	12.12%	10.27%
2	16.35%	15.41%	15.05%	13.92%	13.28%	12.83%	12.12%	10.27%
3	15.97%	14.68%	14.09%	13.35%	12.84%	12.53%	11.90%	10.27%
4	15.25%	13.86%	13.58%	12.94%	12.61%	12.30%	11.78%	10.27%
5	14.79%	13.53%	13.35%	12.71%	12.31%	12.15%	11.74%	10.27%
6	14.15%	13.07%	13.01%	12.55%	12.20%	11.96%	11.61%	10.27%
7	13.87%	12.86%	12.87%	12.41%	12.04%	11.81%	11.52%	10.27%
8	13.47%	12.72%	12.70%	12.25%	11.89%	11.67%	11.43%	10.27%
9	13.06%	12.37%	12.37%	11.97%	11.61%	11.45%	11.29%	10.27%
10	12.57%	12.11%	12.06%	11.74%	11.42%	11.26%	11.17%	10.27%
11	11.94%	11.73%	11.73%	11.42%	11.18%	11.05%	11.04%	10.27%
12	11.42%	11.35%	11.39%	11.12%	10.89%	10.82%	10.89%	10.27%

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Alpha Seeking

+ Focused Factors **Increase** Expected Performance
- Focused Factors **Increase** Tracking Error & Volatility

*The results are hypothetical results and are NOT an indicator of future results and do NOT represent returns that any investor actually attained. Additional information regarding the construction of these results is available upon request. Sample is from 1970 to 2016. Results are associated with a generic 2-12 momentum index strategy. Indexes are unmanaged, do not reflect management or trading fees, and one cannot invest directly in an index. All returns are gross total returns and include the reinvestment of distributions (e.g., dividends).

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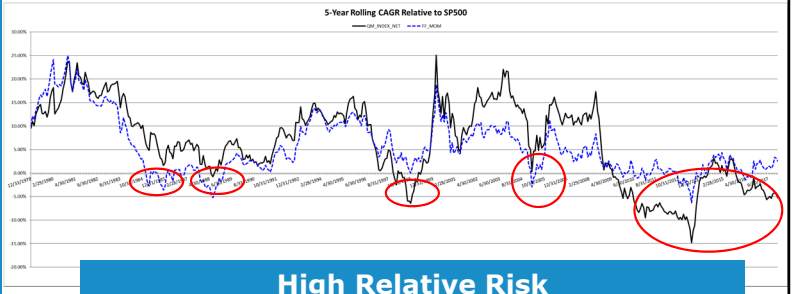
Risky: Long-only **momentum** portfolios can underperform!

5-Year Rolling CAGR Relative to S&P 500



High Relative Risk

- **QM_INDEX_NET** = Quantitative Momentum Index
- **FF_MOM** = Top Decile Momentum
  - Ranked on cumulative 12 months, skip last month
  - Monthly rebalanced
- **SP500** = SP500 Total Return Index
- **Simulated Performance:** 1/1/1974 to 12/31/2017, QM Index is net of 2% fees, total returns, including dividends and distributions.

Performance figures contained herein are hypothetical, unaudited and prepared by Alpha Architect, LLC; hypothetical results are intended for illustrative purposes only. Past performance is not indicative of future results, which may vary. Index returns are for illustrative purposes only and do not represent actual fund performance. Index performance returns do not reflect any management fees, transaction costs, or expenses, which would reduce returns. Indexes are unmanaged and one cannot invest directly in an index. Source: Ken French Data and Bloomberg.

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Our strategies are ***Not*** for everyone.

The investor must be **Patient** and **Disciplined**

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Looking for Excess Returns? Questions to Consider:

- Higher fundamental risk?
- Tough to exploit mispricing?
- Is my capital sustainable?

Higher Risk + ***Mispricing*** = ***Expected Excess Return***

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Why Trust Quant Geeks – They Can Read Your Mind!!!

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APPENDIX

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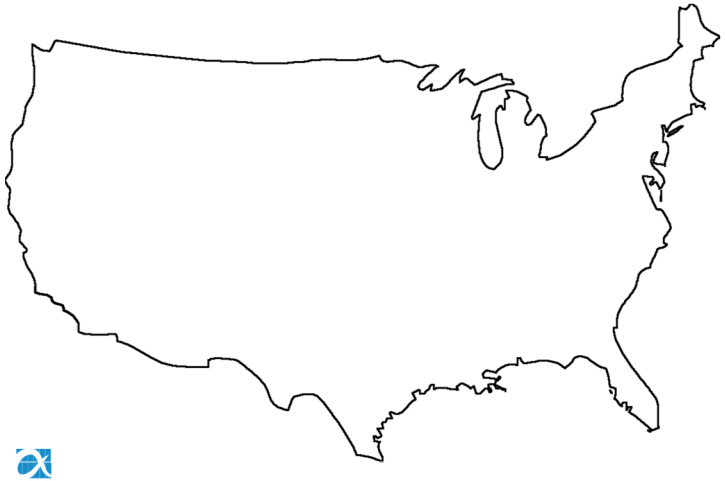
Knowledge is power, right?



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Our Firm Mission and *Passion*:

We Empower Investors Through Education

In order to

Develop *Sustainable* Investors

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There are risks involved with investing, including loss of principal. There is no assurance that the objectives of any strategy or fund will be achieved or will be successful. No investment strategy, including diversification, can protect against market risk or loss. Current and future portfolio holdings are subject to risk. Past performance does not guarantee future results.

There is a risk of substantial loss associated with trading commodities, futures, options and other financial instruments. Before trading, investors should carefully consider their financial position and risk tolerance to determine if the proposed trading style is appropriate. Investors should realize that when trading futures, commodities and/or granting/writing options one could lose the full balance of their account. It is also possible to lose more than the initial deposit when trading futures and/or granting/writing options. All funds committed to such a trading strategy should be purely risk capital.

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Indexes are unmanaged and one cannot invest directly in an index. There are no active components of indexes; therefore, using them as a proxy can be of limited value because there is no guarantee that the portfolio would have been managed to match the index. Realized returns and/or volatility may come in higher or lower than expected.

Annual performance is calculated based on monthly return streams, geometrically linked as of the end of the specified month end.

Results, unless cited otherwise, are shown gross of fees and do not reflect the effect of investment fees which would lower performance. Performance reflects the reinvestment of dividends and other earnings. The following hypothetical illustrates the compound effect fees have on investment return: For an account charged 1% with a stated annual return of 10%, the net total return before taxes would be reduced from 10% to 9%. A ten year investment of $100,000 at 10% would grow to $259,374, and at 9%, to $236,736 before taxes. For a complete description of all fees and expenses, please refer to Alpha Architect's Form ADV Part 2A.

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IMPORTANT INFORMATION - DEFINITIONS

- **CAGR:** Compound annual growth rate
- **Standard Deviation:** Sample standard deviation
- **Downside Deviation:** Sample standard deviation, but only monthly observations below 41.67bps (5%/12) are included in the calculation
- **Sharpe Ratio (annualized):** Average monthly return minus treasury bills divided by standard deviation
- **Sortino Ratio (annualized):** Average monthly return minus treasury bills divided by downside deviation
- **Appraisal Ratio (annualized):** CAPM regression intercept estimate divided by regression residual volatility
- **Worst Drawdown:** Worst peak to trough performance (measured based on monthly returns)
- **Rolling X-Year Win %:** Percentage of rolling X periods that a strategy outperforms
- **Sum (5-Year Rolling MaxDD):** Sum of all 5-Year rolling drawdowns
- **Down %**: The Down Number Ratio is a measure of the number of periods that the investment was down when the benchmark was down, divided by the number of periods that the benchmark was down. The smaller the ratio, the better
- **Up %**: The Up Number Ratio is a measure of the number of periods that the investment was up when the benchmark was up, divided by the number of periods that the benchmark was up. The larger the ratio, the better
- **Tracking Error:** Tracking Error is measured by taking the square root of the average of the squared deviations between the investment's returns and the benchmark's returns
- **Negative Correlation:** Correlation of returns relative to benchmark returns when the benchmark is negative
- **Positive Correlation:** Correlation of returns relative to benchmark returns when the benchmark is positive

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QUESTIONS?

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