

Asymmetric Beta in S&P 500 Stocks: A Pre-Registered Test of Two Hypotheses

Gyre Research · Working paper · 24 October 2026 · Contact: team@gyrerresearch.com

Abstract

A Gyre Research study of beta across benchmarks and time frames. This study set out to test two hypotheses about asymmetric beta in S&P 500 stocks: that a stock's asymmetry lasts long enough to exploit in a long/short equity portfolio, and that short-term asymmetry reverts in a way that can be traded. We tested both on S&P 500 history back to 1992, survivorship-free, with every test fixed before it ran, and published the results in full. Both hypotheses were rejected.

Only about 6% of a stock's own asymmetry carries into the next year; forecasting "no asymmetry" predicts next year better than this year's measured value; and asymmetry did not predict returns against SPY (+0.003% a month per standard deviation, t 0.0). Short-term aberrations do close quickly - 87% of a quarterly aberration is gone within one month - but trading that closing does not pay after costs, in the original design or in 36 refinements fixed before they ran. What held up is ordinary beta: in all 8 S&P 500 declines of 10% or more since 1999, the highest-beta stocks fell on average 24.9 percentage points more than the lowest-beta stocks, and down-beta added no measurable warning beyond it.

We count the study a success: the question was answered cleanly, by tests fixed in advance, on survivorship-free data, and the negative result is reported as plainly as a positive one would be. The daily calculation stays published as a research tool: each S&P 500 stock's beta against the benchmark that matches an investor's mandate, over time frames from 10 days to 2 years, with up- and down-beta and their 95% intervals alongside.

Keywords: downside beta, conditional beta, asymmetric beta, mean reversion, pre-registration, negative result, long/short equity **JEL:** G11, G12, G14

1. Introduction

A stock's beta is one number: how much the stock moves, on average, when the market moves. Splitting it in two - an **up-beta** measured on the days the market rose and a **down-beta** measured on the days it fell - gives a stock's **asymmetry**, up-beta minus down-beta. A positive asymmetry says the stock rose more with the market than it fell with it over the measurement window; a negative asymmetry says the reverse.

The idea is old and attractive (Bawa and Lindenberg, 1977; Harlow and Rao, 1989; Ang, Chen and Xing, 2006). For a long/short equity manager it suggests two trades:

1. If asymmetry is a **lasting trait** of a stock, hold the stocks with favourable asymmetry long and the others short.
2. If asymmetry is a **short-term aberration** that corrects itself, buy stocks whose asymmetry has fallen below their own norm and sell those above it, and collect the reversion.

From April to October 2026 Gyre Research ran asymmetric beta as an open research project. For four months (16 June to 24 October 2026, 92 daily publications) we published up-beta, down-beta and asymmetry for every

S&P 500 member. Alongside that, we tested both ideas against the S&P 500's own history back to 1992, using the members of each day (survivorship-free), with every test written down before it ran. This paper reports what we did, what we found, and why both hypotheses are rejected.

2. The two hypotheses

Hypothesis 1. Asymmetry lasts long enough to exploit in a long/short equity portfolio. A stock's asymmetry measured over one year is informative about its asymmetry in later years, and sorting stocks on it earns a return against SPY that a long/short equity portfolio could capture.

Hypothesis 2. Short-term aberrations revert in a way that can be traded. When a stock's asymmetry over the last quarter (or month) moves away from its own two-year norm, the gap closes, and a portfolio that buys negative aberrations and sells positive ones earns a return in excess of beta times SPY after realistic trading costs.

3. Data

- **Universe.** The S&P 500 members of each day, from published index component snapshots (quarter-end before 2005, month-end from 2005). A company is in the universe on a day only if it is a member that day and has a price that day; companies that later left the index, were acquired or failed are included while they were members. The study is therefore free of survivorship bias at snapshot granularity.
- **Prices.** A daily, split- and dividend-adjusted price history from 1990 that includes delisted companies, joined to the current daily price series. Where one company carries two price series (for example a bankruptcy and relisting), no return is taken across the switch. Coverage of index members by count is about 91% in 1999 and 100% from 2020.
- **Market.** For history from 1992, the cap-weighted return of each day's members, with the weights in force that day. For every comparison of returns, and as the robustness market, **SPY** (the fund that tracks the S&P 500), from November 1999.
- **Companies that leave.** A holding whose prices stop before the end of its holding period earns its return up to its last price, then 0% to the end.
- **Periods.** The full sample; the sub-periods 1992-2000, 2001-2008, 2009-2015 and 2016-2020; and **2021 to today held out**, reported separately.

4. Method

4.1 The estimator

The production estimator of the published page, used unchanged unless a test names a variant:

- **Up-beta** = $\text{Cov}(R_{\text{stock}}, R_{\text{market}} \mid R_{\text{market}} > 0) / \text{Var}(R_{\text{market}} \mid R_{\text{market}} > 0)$
- **Down-beta** = $\text{Cov}(R_{\text{stock}}, R_{\text{market}} \mid R_{\text{market}} \leq 0) / \text{Var}(R_{\text{market}} \mid R_{\text{market}} \leq 0)$
- **Asymmetry** = up-beta - down-beta

Each beta carries a 95% interval, $\text{beta} \pm t(n-2, 0.975) \times \text{SE}(\text{beta})$.

4.2 Pre-registration

Every test, metric and rule for calling a result "supported" was written into the study's methodology document and committed to version control before the test ran; the commit date is the proof. Statistics are computed per window across stocks, then over windows (Fama-MacBeth), with Newey-West standard errors; inside each family of tests the Benjamini-Hochberg correction at a 10% false-discovery rate decides significance. No random, shuffled or placebo portfolios are used: the control is SPY.

Two first-look runs of the persistence question were made before the methodology was written, and are stated there openly; the persistence verdict rules were written after those numbers were seen. Groups F and G were added after group E's results were seen, and are labelled as second looks with deliberately strict verdict rules.

4.3 The seven groups of tests

Group	Question	Tests
A	Can a single stock's asymmetry be measured?	A1 persistence over 1-10 years (rank correlation, Blume slope); A2 forecast accuracy against "sector average" and "zero"; A3 five better estimators (shrinkage, slope-winsorized returns after Welch 2022, 2-year windows, exponential weights, Dimson correction); A4 share of stocks with a real asymmetry, and interval coverage; A5 variance shares (stock, sector, window)
B	How long does it last, does it close, does it come back, is it cyclical?	B6' monthly curve of the top-minus-bottom quintile gap, months 1-36; B7 year-to-year quintile transitions; B8 regimes (market up, high volatility, recession) and periodograms; B9 sub-periods and held-out
C	Does it matter for an investor, compared with SPY?	C10 next-month return over SPY on asymmetry and on down-beta, controlling for beta, size, momentum and volatility; C11 the 8 SPY declines of 10% or more; C12 robustness (SPY as market, other up/down splits, 6-month and 2-year windows); C11b (follow-up) plain beta against the part of down-beta beta does not explain
D	Are today's published numbers right?	D13 full rebuild from stored inputs; recomputation from a second price source; published intervals against a bootstrap
E	Do short-term aberrations close, and can the closing be traded?	Aberration $z = (\text{asymmetry over the last 63 days minus the stock's 504-day norm}) / \text{its standard error}$; E1 how fast the gap closes; E2 long negative / short positive aberrations, excess over beta x SPY, net of 10 and 25 bp; E3 the aberration beyond short-term reversal
F	Refinements of the reversion trade	12 variants: quarterly and monthly signal x (only the clearest aberrations, outer tenths, outer fifths) x (long/short, long-only hedged with SPY); costs 5, 10, 25 bp; supported only if significant over 1999-now AND 2009-now, positive 2021-now, and surviving the correction across the 12
G	Weekly formation	The 12 group F variants formed every week, held 5 or 21 trading days: 24 variants, the same verdict rule

5. Results

Every figure below is taken from the study's result files; t-statistics are Newey-West.

5.1 Group A - the measurement

- **Persistence is statistically present but small.** The rank correlation of a stock's asymmetry in one calendar year with the next is 0.084 (t 4.7); five years later 0.048 (t 2.6); ten years later 0.009 (t 0.2). By the pre-registered rule this counts as "persistent"; by size it is close to nothing.

- **Forecasting zero beats the measurement.** As a forecast of next year's asymmetry, this year's measured value has a mean squared error of 0.341; forecasting "no asymmetry" has 0.198 (t -7.7 for the difference), and the sector average 0.210. Shrinking each stock toward its sector mean (0.179) is the best estimator tested.
- **Few stocks have a real asymmetry.** 7.9% of stocks in a window have an asymmetry different from zero at the 5% level, against 5% expected by chance (t 6.2); 6.6% in the held-out years.
- **It is mostly not a trait.** Of the variance of asymmetry, 85.4% is specific to the stock in the window, 12.5% is the sector and 1.2% is common to all stocks; of the stock part, only 5.9% repeats one window later. This is the "about 6%" of the conclusion.
- The published 95% interval for a window contains the next window's value 67.5% (up-beta) and 69.9% (down-beta) of the time: the interval describes the precision of this window's estimate, not a forecast of the next.

5.2 Group B - how long it lasts

- The asymmetry gap between the top and bottom quintile is no longer significant from the first month after formation (month 1: +0.066, t 1.6). Only in 2001-2008 did it persist, through month 14; in the held-out years it is not significant in any month.
- Stocks in an extreme quintile stay there next year slightly more often than chance (top 0.240, bottom 0.264, against 0.20; t 3.6 and 6.8). After leaving, the bottom quintile returns within a year slightly more often than chance (0.228 against 0.200, t 2.5); beyond one year neither quintile returns faster than chance would give.
- Average asymmetry and its spread across stocks do not differ between rising and falling markets, high and low volatility, or recession and other months (every |t| at most 1.0). Periodograms show 11 and 13 of 135 frequencies above the red-noise 95% level, at scattered periods from 3 to 24 months, with no dominant cycle.

5.3 Group C - does it matter for an investor

- **Asymmetry does not predict returns.** Controlling for beta, size, momentum and volatility, one standard deviation of asymmetry is worth +0.003% a month in return over SPY (t 0.0) from November 1999; -0.195% (t -1.9) in the held-out years. Down-beta: +0.009% (t 0.1). No robustness variant (SPY as market, splits at the mean or at one standard deviation, 6-month or 2-year windows) has a t above 0.6.
- **Sell-offs.** In all 8 SPY declines of 10% or more since 1999, the high down-beta quintile lost more than the low one, on average 22.3 points (t -4.2). The follow-up shows why: the highest-beta stocks lost on average **24.9 percentage points more** than the lowest-beta stocks (8 of 8 declines, t -4.3), while the part of down-beta that plain beta does not explain added **3.4 points** (5 of 8 declines, t -1.5): not significant.

5.4 Group D - the published numbers

- A full rebuild with the production code from the stored inputs reproduced **all 4,032 published values exactly**.
- Recomputed from a second price source, 28 of 49 sampled stocks agree within 0.01 in every beta. Every larger difference was traced: the stocks' own returns are identical in the two sources; the second source's benchmark series has one false day (1 September 2026), so the published betas are the correct ones.
- The published interval half-widths are close to a block bootstrap's (median ratio 0.93 for up-beta, 1.07 for down-beta).

5.5 Group E - short-term aberrations

- **They close quickly.** Of the gap between the top and bottom quintile of the quarterly aberration, 13% remains one month later (half-life one month): **87% is gone within one month.** A residue of about 10-12% remains through month 12, the small lasting part measured in group A.
- **The trade does not pay.** Buying negative and selling positive quarterly aberrations earned **-0.01% a month** before costs (t -0.1) over beta x SPY. On the monthly signal it earned +0.28% a month before costs (t 2.1) and **+0.12% after 10 basis points** (t 0.9, not significant); almost all of it came from 2001-2008 (+0.65% before costs, t 2.8), against -0.07% in 2009-2015 and +0.03% in 2016-2020.
- Beyond short-term return reversal, the quarterly aberration has a coefficient of -0.052% a month per standard deviation (t -1.2): not supported. The monthly aberration, reported beside it, has -0.115% (t -3.3), negative in the held-out years; the trade built on it is the one above that does not survive costs.

5.6 Groups F and G - the refinements

- **Group F (12 variants, monthly formation):** none passed. Several earned money in 2001-2008 - for example the monthly signal, outer fifths, long-only hedged with SPY: +0.69% a month net of 5 bp (t 2.8) - but none earned a significant return from 2009 on. The closest, the quarterly signal on the clearest aberrations ($|z| \geq 2$) long/short, made +0.68% a month net of 5 bp over 2009-now with t 1.7, and +2.39% a month over 2021-now on only 22 months; its corrected p-value is 0.511.
- **Group G (24 variants, weekly formation):** none passed; the smallest corrected p-value is 0.986. The same quarterly variant, held 5 days and re-formed weekly, made the equivalent of +0.62% a month net of 5 bp over 1999-now (t 1.3) and +0.20% a month over 2009-now (t 0.4).

Whatever edge existed in 2001-2008 has gone.

6. Why both hypotheses are rejected

Hypothesis 1 is rejected. Asymmetry is measurable and statistically non-zero, but it is not a stable trait of a stock: only about 6% of a stock's own asymmetry carries into the next year, a forecast of zero beats the measured value, and asymmetry did not predict returns against SPY (+0.003% a month per standard deviation, t 0.0), in any period or robustness variant. There is nothing for a long/short equity portfolio to hold.

Hypothesis 2 is rejected. The first half of it is true: aberrations close, and fast. The second half is not: the closing cannot be traded. The pre-registered trade earned -0.01% a month on the quarterly signal and +0.12% a month after 10 basis points on the monthly one (not significant), and that came almost entirely from 2001-2008. Twelve monthly refinements and twenty-four weekly ones, each with a strict rule fixed before it ran, did not produce one that passed.

7. What held up

Ordinary beta. In all 8 S&P 500 declines of 10% or more since 1999, the highest-beta stocks fell on average 24.9 percentage points more than the lowest-beta stocks. Down-beta added no measurable warning beyond beta: 3.4 points, not significant. For an investor asking how a holding is likely to behave in a sell-off, plain beta - measured against the right benchmark over the right time frame - carries the information; splitting it into up and down halves did not add to it.

8. Limitations

- Membership is known at snapshot granularity (quarter-end before 2005, month-end after), and price coverage of members is about 91% by count in 1999.
- Each company has one sector for its whole history.
- The persistence verdict rules (A1, A3) were written after two first-look runs; groups F and G were designed after group E's results. All are stated as such; none changes the verdicts, which are negative.
- The weekly formation of group G adds formation dates, not new history: it measures the same years more finely. Only a forward record is a clean test of a variant chosen after the data were seen.

9. Conclusion

We count the study a success. The question was answered cleanly, by tests fixed in advance, on survivorship-free data, and published in full, including the negative result. The two hypotheses were rejected, and we report that as plainly as we would a positive result: asymmetric beta in S&P 500 stocks is mostly a passing feature of the measurement window, its short-term swings correct within about a month, and neither the level nor the swings could be turned into a long/short equity return after costs.

10. Why the betas remain published

The study's daily calculation stays available as a research tool. For any S&P 500 stock an investor holds, the page shows its beta measured against the benchmark that matches the mandate - SPY, the equal-weight S&P 500, the cap-weighted S&P 500 rebuilt from each day's members, its own sector, or its own size tier - and over the time frame the investor cares about, from 10 days to 2 years. Up- and down-beta are shown alongside, with their 95% intervals. That is the use the study supports: beta, read against the right benchmark and time frame, is what held up in sell-offs, and the choice of benchmark and window changes the number a portfolio manager should look at.

Data availability

The daily calculation for every S&P 500 member, with the study's findings at the top, is published at <https://gyrersearch.com/asymmetric-beta/>, updated each trading day, with no registration. The method is documented at <https://gyrersearch.com/asymmetric-beta/methodology.html>. Questions: team@gyrersearch.com.

References

- Ang, A., Chen, J. and Xing, Y. (2006). "Downside Risk." *The Review of Financial Studies* 19(4). doi: 10.1093/rfs/hhj035
- Bawa, V. S. and Lindenberg, E. B. (1977). "Capital market equilibrium in a mean-lower partial moment framework." *Journal of Financial Economics* 5(2). doi:10.1016/0304-405X(77)90017-4
- Blume, M. E. (1971). "On the Assessment of Risk." *The Journal of Finance* 26(1). doi:10.1111/j.1540-6261.1971.tb00584.x
- Blume, M. E. (1975). "Betas and Their Regression Tendencies." *The Journal of Finance* 30(3). doi:10.1111/j.1540-6261.1975.tb01850.x

- Harlow, W. V. and Rao, R. K. S. (1989). "Asset Pricing in a Generalized Mean-Lower Partial Moment Framework." *The Journal of Financial and Quantitative Analysis* 24(3). doi:10.2307/2330813
 - Welch, I. (2022). "Simply Better Market Betas." *Critical Finance Review* 11(1). doi:10.1561/104.00000108
-

This document is published by Gyre Holdings LLC d/b/a Gyre Research for informational purposes only and does not constitute investment advice or a solicitation to buy or sell any security. Readers should consult a qualified financial professional before making any investment decision. It is licensed under CC BY 4.0: you may share and adapt it with attribution to Gyre Research.