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Research Article

Indian Pharmaceutical Stocks

Low Beta Is Not Low Risk: Evidence and Investor Implications from Five Indian Pharmaceutical Stocks, 2021–2025

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Pharmaceutical stocks are often called defensive, but "low risk" can mean a modest response to market swings, low volatility, or protection of capital when markets fall – three different claims. This study separates them for five Indian pharmaceutical companies (Sun Pharma, Cipla, Dr. Reddy's, Zydus and Lupin) over four fiscal years, April 2021–March 2025. Before analysis, the price data was audited against official exchange records, which uncovered a two-year benchmark-duplication error in the Sun Pharma series, an unadjusted Dr. Reddy's stock split, and an unbridged Zydus ticker change – all corrected using official NSE and BSE sources. Using ordinary least-squares regression, correlation and descriptive statistics, all five stocks show a market beta below one against BSE SENSEX 50 (0.31–0.67), yet every stock is more volatile (20.8%–28.1% a year) than the index (13.8%), and four of five lost more than a quarter of their value at some point. An equal-weight portfolio has a beta of 0.54, but its maximum drawdown (26.0%) exceeds the index's (17.1%) and stays negative on 88% of the market's fifty worst days despite losing less than the index on average. An 80/20 index–pharma blend lowers historical variance by about 12%, stable across sub-periods, though its own drawdown is marginally deeper than the index's. Repeating the analysis on the uncorrected data reverses the headline beta finding, showing that data verification mattered more than any statistical technique here. Beyond this sample, the paper documents a reproducible data-integrity case and translates its findings into guidance for retail investors, advisers, fund managers and investor-education policy on what a "defensive" label can and cannot support.

Keywords: Indian Pharmaceutical Stocks, SENSEX 50, Market Beta, Portfolio Diversification, Drawdown Risk, Data Verification, Investor Protection, Riskometer Disclosure

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1. Introduction

Calling a stock "defensive" can mean three quite different things in practice. It can mean that the stock moves less than the overall market on an average day (low market beta). It can mean that the stock's own price simply does not move around much (low volatility). Or it can mean that the stock protects an investor's capital when markets fall sharply (limited drawdown and positive returns in a crisis). A stock can satisfy the first definition while badly failing the other two, and the difference matters a great deal to how the label "defensive" is used in practice, including in discussions of Indian pharmaceutical equities.

Existing Indian research gives good reasons to examine these distinctions rather than assume the whole sector behaves in one uniform way. Studies of the pharmaceutical sector around COVID-19-related news and interventions report mixed, firm-specific responses rather than a single sector-wide pattern (Behera & Rath, 2021; Kumari, Rai, & Pandey, 2023; Lamba, Aggarwal, Gupta, & Joshipura, 2024). These studies examine short windows around specific announcements; on their own they say little about how a pharmaceutical holding behaves over a longer, multi-year investment horizon, or whether it improves several dimensions of portfolio risk at the same time.

This study examines five companies – Sun Pharmaceutical Industries Limited, Cipla Limited, Dr. Reddy's Laboratories Limited, Zydus Lifesciences Limited and Lupin Limited – over 1 April 2021 to 31 March 2025. The sample is fixed by that brief rather than drawn at random from the sector, and the paper does not claim the five firms represent the wider industry. The paper asks three plain questions: (i) does each stock move less than one-for-one with the market; (ii) does its sensitivity to falling markets differ from its sensitivity to rising markets; and (iii) does adding a pharmaceutical allocation to a market-index holding actually reduce realized portfolio risk, on more than one measure of risk.

Before addressing those questions, the price data itself required attention and was checked, line by line, against official exchange sources. I found that, from April 2022 onward, the Sun Pharma price series had been overwritten with the benchmark index's own values for roughly two-thirds of the study window – an error that, left uncorrected, would have produced an impossible one-day return of about 1,924% at the point the series reverted to genuine prices. It also found that Dr. Reddy's five-for-one stock split (effective 28 October 2024) had not been reflected in the pre-split prices, and that Zydus's original ticker, CADILAHC, needed to be linked to its renamed successor, ZYDUSLIFE, to form one continuous history. Each of these was corrected using official NSE price histories, NSE corporate-action records and Dr. Reddy's own corporate filing before any return, correlation or regression was computed.

The contribution of this paper is therefore deliberately modest in scope but is aimed at three distinct audiences. First, for the research literature on Indian equity data, it demonstrates that verifying the input data can change a study's conclusion more than any subsequent choice of statistical method: repeating the whole exercise on the uncorrected series flips the portfolio's estimated market beta from below one to above one, a documented, reproducible warning for anyone building on retail-accessible price data without first auditing it. Second, having established a clean dataset, the paper uses only widely taught, easily replicated tools – descriptive statistics, correlation and simple linear regression – to show that low market beta, higher standalone volatility, deep drawdowns and a genuine (if partial) diversification benefit can all be true of the same five stocks at the same time, a distinction that matters directly to retail investors, financial advisers and fund managers who encounter the word "defensive" in relation to this sector. Third, it connects that distinction to a concrete, low-cost suggestion for investor-education and disclosure practice, discussed in Section 7. It is not a causal study of the pandemic, an industry-wide survey, or an argument for any particular portfolio weight; it is a source-verified, transparently computed comparison within a clearly bounded five-stock sample.

2. Related Literature

Portfolio theory has long distinguished a security's own volatility from its contribution to a diversified portfolio's risk. Markowitz (1952) shows that a volatile asset can still reduce a portfolio's overall variance, provided its co-movement with the existing holding is sufficiently low.

This is the reason the present paper reports standalone volatility, market beta and portfolio-level variance as three separate results rather than assuming that a high ranking on one measure implies a similar ranking on the others; a change in maximum drawdown, in particular, depends on the sequence of returns and does not follow automatically from a lower variance.

A related literature separates ordinary co-movement from co-movement specifically during market stress. Ang, Chen, and Xing (2006) find that US stocks with greater sensitivity to market declines earn a return premium, defining "downside" relative to the market's own average return. Baur and Lucey (2010) distinguish an asset that is broadly uncorrelated with the market (a diversifier) from one that specifically holds its value during a crisis (a safe haven), using gold as their setting; the distinction between the two is conceptual and does not, by itself, imply anything about Indian pharmaceutical shares. Working with Indian data, Janani Sri, Kayal, and Balasubramanian (2022) examine whether individual NIFTY 50 constituents behave as safe havens using formal dependence models. That work is a reminder that a "safe haven" claim requires its own dedicated test; the present paper's more limited stress-day comparison, described below, does not attempt to replicate that test and does not claim safe-haven status for any of the five stocks.

A second strand looks specifically at Indian pharmaceutical shares around COVID-19-related news. Behera and Rath (2021) report generally positive average pharmaceutical returns during the pandemic period alongside considerable firm-level variation. Kumari et al. (2023), covering 74 Indian pharmaceutical stocks, find that announcements were, on average, associated with negative abnormal returns and that smaller firms were more exposed. Lamba et al. (2024) study 77 intervention announcements by 46 listed firms and report a positive abnormal return in the days before an announcement. These are event studies of short, announcement-specific windows; they speak to firm-level news reactions rather than to a stock's ordinary sensitivity to the broad market over a multi-year period, which is the question this paper asks.

Two further studies are closer descriptive comparators. Dua and Meena (2024) examine daily returns for 17 Indian pharmaceutical firms over 2013–2023 against the NIFTY Pharma sector index, using conventional risk and return measures; a beta measured against a sector index answers a different question from one measured against a broad market index such as SENSEX 50, and the two are not directly comparable. Kaur and Chavali (2025) apply a more technical volatility model (GARCH-M) to ten pharmaceutical firms over 2012–2023 and report a statistically significant risk–return relationship only before the pandemic period, underlining that even sophisticated models do not produce one uniform verdict for the sector. Saraf and Kayal (2023) study a broader volatility–return anomaly across Indian equities generally; that cross-sectional question is distinct from asking whether a fixed pharmaceutical allocation improves the risk of an existing market holding, which is the applied question addressed here.

Taken together, this literature motivates explicit, separately reported comparisons rather than a single label for the sector. Announcement-day effects, sector-index betas, volatility models and realized portfolio outcomes are different empirical quantities, measured over different periods and against different benchmarks; their results cannot be pooled into one verdict that pharmaceutical shares are, in general, safe or risky. Building on this reasoning, and on the data-quality issues described in Section 1, this paper poses three specific research questions: (RQ1) is each stock's market beta against SENSEX 50 below one; (RQ2) does each stock's sensitivity to falling markets differ materially from its sensitivity to rising markets; and (RQ3) does a fixed 20% allocation to an equal-weight pharmaceutical portfolio reduce a market-index holding's realized variance, and does that benefit extend to maximum drawdown. Because the analysis is retrospective, uses one specified sample, and was not preregistered, results are treated as descriptive evidence about this sample and period rather than as a general test of sector-wide asset-pricing theory.

3. Data and Verification

3.1 Sources and Coverage

Daily closing prices for all five stocks were sourced from the National Stock Exchange of India's official EQ-series security price-volume records -

(NSE, n.d.-a), and the market benchmark is the BSE SENSEX 50 price index (BSE Indices, n.d.). After adding the 31 March 2021 closing observation needed to compute the first return, the study window yields 993 aligned trading dates and 992 daily returns, split across four fiscal years: 248 in FY2021/22, 249 in FY2022/23, 246 in FY2023/24 and 249 in FY2024/25. The final trading observation is 28 March 2025, since 31 March 2025 fell on an exchange holiday (NSE, 2024); no return is invented for that date, and official special weekend trading sessions are retained rather than discarded. Both stock and index prices exclude cash dividends, so the reported growth rates describe price performance rather than an investor's total, dividend-inclusive return.

3.2 Data Checks and Corrections

Before any statistic was computed, the daily closing price was checked against the official sources above. Three material issues were found and corrected, summarized in Table 1. The Sun Pharma correction relies on the same official NSE price history already cited above (NSE, n.d.-a); the Dr. Reddy's split is confirmed independently by the company's own regulatory filing (Dr. Reddy's Laboratories Limited, 2025) and by NSE's corporate-action record (NSE, n.d.-b); and the Zydus ticker change is confirmed by NSE's own circular announcing the renaming (NSE, 2022). Every affected series was replaced or adjusted using these official sources.

The importance of this step is not merely procedural. Section 5.7 shows that repeating the full analysis on the original, uncorrected data reverses the paper's central conclusion about the portfolio's market beta. In this application, careful source verification mattered more to the result than any subsequent choice of statistical technique – a point worth stating plainly, since it is easy for a more sophisticated model to be applied to data that was never checked.

Issue found	What the check showed	How it was corrected
Sun Pharma price series	From 1 April 2022, all four Sun Pharma daily price fields were identical to the benchmark index's own fields on 744 of the 992 study dates – an evident copy-paste error that would otherwise imply a one-day return of about +1,924% at the reversion point.	The entire Sun Pharma series was replaced with official NSE closing prices for the full study window.
Dr. Reddy's stock split	Dr. Reddy's Laboratories completed a five-for-one stock split effective 28 October 2024, confirmed in the company's own regulatory filing and in NSE's corporate-action record. The supplied data had not adjusted pre-split prices.	All pre-split closing prices were multiplied by 0.2 so that the full series sits on one comparable-share basis.
Zydus ticker change	Zydus Lifesciences traded as CADILAHC until 7 March 2022 and as ZYDUSLIFE thereafter. The two segments needed to be joined into one continuous history.	Official NSE records for both tickers were linked into a single, continuous price series.
Benchmark identity	The values derived matched the BSE SENSEX 50 index rather than the widely quoted 30-stock SENSEX.	All results are labelled "SENSEX 50" throughout, and no substitution for the 30-stock index is implied.

Table 1: Data checks performed against official exchange sources and the corrections applied before any calculation.

Aside from these three issues, the remaining stock prices differed only slightly from official NSE closes (a mean absolute difference of between roughly INR 0.31 and INR 1.91 per share across the four unaffected stocks), most plausibly reflecting minor differences between data vendors rather than a specific error; these small differences are not classified as errors and no further adjustment was made to them. No value was interpolated, capped, or discarded, and every corrected series was checked to have plausible, positive prices with no missing or duplicated dates.

3.3 Returns and the Two Portfolios Used

Each asset's daily return is the ordinary percentage change in its closing price from the previous trading day (dividends and trading costs excluded); Dr. Reddy's pre-split prices use the 0.2 comparable-share adjustment described above. Two combinations are studied throughout.

The "equal-weight pharma portfolio" holds all five stocks at a fixed 20% weight each, rebalanced daily; its daily return is simply the average of the five stocks' returns. The "80/20 blend" combines an 80% holding in SENSEX 50 with a 20% holding in the equal-weight pharma portfolio. Both are frictionless, paper calculations – chosen to illustrate a diversification question, not to describe an actual tradable fund or an optimized weight – and this limitation is returned to in Section 8.

Cumulative wealth is tracked by compounding daily returns from a starting value of one on 31 March 2021. Total return is the resulting terminal wealth minus one, and the compound annual growth rate (CAGR) restates that total return as an equivalent constant annual rate over the four fiscal years in the window. Annualized volatility is the standard deviation of daily returns multiplied by the square root of 252 (the approximate number of trading days in a year); downside deviation applies the same annualizing step to only the negative daily returns. Maximum drawdown is the largest percentage decline from any prior peak in the cumulative wealth series, capturing the worst peak-to-trough loss an investor holding the position would have experienced within the window.

4. Method

The methods used here are deliberately restricted to tools taught in an introductory finance or statistics course: descriptive statistics, Pearson correlation and ordinary least-squares (OLS) regression. This choice is made because the underlying research questions – is beta below one, does it differ across up and down markets, and does a blended allocation reduce realized risk – do not require a more elaborate econometric apparatus to answer meaningfully once the input data has been verified. Where a simplification carries a genuine limitation (for example, the possibility that daily returns are not independent of one another, or that their variance changes over time), that limitation is stated plainly in Section 8 rather than addressed with an additional layer of technical machinery.

4.1 Market Beta

For each stock and for the equal-weight portfolio, market beta is estimated by regressing the asset's daily return on a constant and the contemporaneous SENSEX 50 daily return, using ordinary least squares. The slope coefficient (beta) measures the asset's average linear sensitivity to the market: a beta of 0.5, for instance, means the stock has historically moved about half as much, on average, as the index on a given day. R^2 measures the share of the asset's day-to-day variation that this one-factor comparison explains; a low R^2 signals that most of the asset's daily movement comes from something other than the broad market. A standard 95% confidence interval and a one-sided t-test (of the null hypothesis that beta is at least one, against the alternative that it is below one) are reported for each stock, based on ordinary OLS standard errors. No adjustment for testing multiple stocks at once is applied; because five closely related tests are reported together, the individual p-values in Table 3 should be read as indicative rather than as guaranteeing an overall 5% error rate across the whole family of tests, a point returned to in Section 8.

4.2 Sensitivity to Rising and Falling Markets

To ask whether a stock responds differently when the market is falling, the regression above is extended with an indicator variable that equals one on days when the market return is negative and zero otherwise, allowing the slope (and intercept) to differ across the two regimes. This is still an ordinary least-squares regression with one extra explanatory variable; it requires no specialized software beyond what estimates the plain regression in Section 4.1. The reported "down-market beta" and "up-market beta" are the two implied slopes, and a standard two-sided t-test checks whether the difference between them is distinguishable from zero. Of the 992 trading days, 452 had a negative SENSEX 50 return.

4.3 Performance on the Market's Worst Days

A simple stress-day comparison identifies the 50 trading days (the worst 5%) on which SENSEX 50 recorded its lowest returns, and reports each asset's own average return and the share of positive returns on precisely those same dates. This is a descriptive comparison conditioned on the market's own worst days, not a forecast of future crisis performance, and it does not by itself establish that any stock is a safe haven in the formal sense used in the literature discussed in Section 2.

4.4 The Diversification Comparison and its Robustness

The diversification question is addressed by comparing the sample variance of the 80/20 blend's daily returns with the sample variance of SENSEX

50's own daily returns, expressed as a percentage change (variance of the blend divided by variance of the index, minus one); a negative number means the blend's realized daily variance was lower than the index's alone. Because a single full-period number could be an artefact of one unusual period, this comparison is repeated on two sub-samples – the first two fiscal years against the last two, and separately, each of the four fiscal years on its own – rather than relying on a single simulated resampling procedure. Consistency of the sign and rough magnitude of the variance reduction across these independent sub-periods is treated as the robustness check, in place of a bootstrap confidence interval; both approaches ask the same underlying question, but splitting the actual, observed sample into independent sub-periods is more directly interpretable and easier to reproduce by hand.

4.5 Sensitivity to the Data Correction

Finally, to quantify how much the Section 3 data corrections mattered, the entire analysis is repeated once more on the original, uncorrected price series (that is, without removing the Sun Pharma duplication and without adjusting for Dr. Reddy's split), using the same starting baseline. This is a plain sensitivity comparison – the same simple calculations applied to two different input datasets – rather than a new technique in its own right.

5. Results

5.1 Returns, Volatility and Drawdowns

Table 2 and Figure 1 show wide differences in outcomes across the five stocks. Sun Pharma has the highest price CAGR (30.52%), while Dr. Reddy's has the lowest (6.09%), below SENSEX 50's own 12.40%. The equal-weight pharma portfolio grows at 19.30% a year on this price basis – a favourable outcome, but one that is not, by itself, evidence of lower risk, and one that Section 5.6 shows is concentrated in a single strong fiscal year rather than spread evenly across the period.

Every individual stock is more volatile than SENSEX 50: annualized volatility ranges from 20.84% (Sun Pharma) to 28.06% (Lupin), compared with 13.81% for the index. The equal-weight portfolio's volatility (17.62%) is lower than any single constituent, consistent with ordinary diversification across five imperfectly correlated stocks, but it still exceeds the index's own volatility. Its downside deviation (11.51%) is likewise higher the index's (9.85%).

Figure 1: Cumulative price wealth for each stock, SENSEX 50 and the equal-weight pharma portfolio, indexed to 100 at 31 March 2021. Dividends excluded.

The drawdown comparison is more severe still. Sun Pharma's maximum drawdown is 19.61%, Cipla's 26.51%, and Dr. Reddy's 33.30%. Zydus and Lupin both experienced drawdowns exceeding 50% at some point in the window, despite finishing the period with positive cumulative returns – a reminder that a positive full-period return can still conceal a very large interim loss. The equal-weight portfolio's own maximum drawdown, 26.01%, is well above the index's 17.12%. Terminal wealth and market beta alone would miss this pattern entirely; only an explicit drawdown measure captures it.

Asset	Total return	CAGR	Ann. volatility	Downside dev.	Max drawdown
SENSEX 50	59.60%	12.40%	13.81%	9.85%	−17.12%
Sun Pharma	190.18%	30.52%	20.84%	12.80%	−19.61%
Cipla	76.94%	15.33%	23.50%	15.09%	−26.51%
Dr. Reddy's	26.68%	6.09%	21.68%	15.55%	−33.30%
Zydus	101.04%	19.08%	26.42%	17.16%	−50.36%
Lupin	98.73%	18.73%	28.06%	18.89%	−52.68%
Equal-weight pharma	102.56%	19.30%	17.62%	11.51%	−26.01%
80/20 blend	68.96%	14.01%	12.93%	9.17%	−17.39%

Table 2: Full-period price performance and risk, 1 April 2021–31 March 2025 (N=992 daily returns). CAGR is annualized over four fiscal years; volatility uses 252 trading sessions; drawdowns are the largest peak-to-trough decline. Dividends and trading costs are excluded throughout; the portfolio and blend rebalance daily.

5.2 Market Beta

Table 3 reports beta estimates from 0.308 (Cipla) to 0.669 (Zydus); all five confidence intervals sit entirely below one, and the one-sided test rejects a beta of at least one for every stock ($p<0.001$ in each case). The equal-weight portfolio's beta is 0.538, with a 95% confidence interval of 0.465–0.610. On this evidence, all five stocks and the resulting portfolio moved less than one-for-one with SENSEX 50 over the study window.

At the same time, the explanatory power of this one-factor comparison is limited: R^2 ranges from just 0.033 (Cipla) to 0.150 (Sun Pharma), and 0.177 for the portfolio. In plain terms, the great majority of each stock's day-to-day movement is unrelated to the broad market's own movement on that day – which is exactly why a low beta does not translate into low overall volatility, as Table 2 already shows.

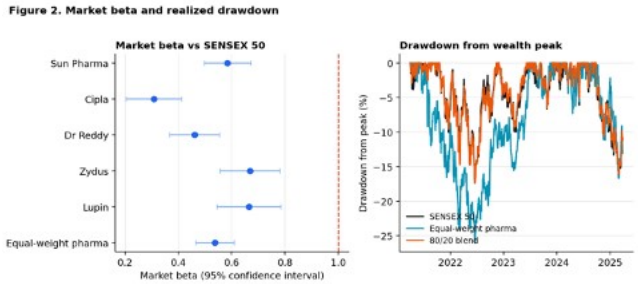

Figure 2: Left: estimated market beta and 95% confidence interval for each stock and the portfolio, with the beta = 1 reference line. Right: drawdown from each series' own preceding wealth peak, for SENSEX 50, the equal-weight pharma portfolio and the 80/20 blend.

Asset	Correlation	Beta	95% CI	R^2	p (beta < 1)
Sun Pharma	0.387	0.584	0.498–0.671	0.150	<0.001
Cipla	0.181	0.308	0.204–0.413	0.033	<0.001
Dr. Reddy's	0.294	0.461	0.368–0.555	0.086	<0.001
Zydus	0.350	0.669	0.557–0.781	0.122	<0.001
Lupin	0.327	0.665	0.545–0.785	0.107	<0.001
Equal-weight pharma	0.421	0.538	0.465–0.610	0.177	<0.001

Table 3: Correlation with, and OLS market beta against, SENSEX 50. The 95% confidence interval and the p-value for the one-sided test of beta ≥ 1 use ordinary (non-adjusted) OLS standard errors; see Section 4.1 and Section 8 for the corresponding limitation.

5.3 Rising versus Falling Markets

Table 4 compares each stock's sensitivity on days when SENSEX 50 fell with its sensitivity on days when SENSEX 50 rose. Point estimates differ across stocks – Zydus's estimated down-market beta (0.864) is materially higher than its up-market beta (0.553), for instance – but none of the five differences is statistically distinguishable from zero at conventional levels, and the portfolio's own up- and down-market betas (0.526 and 0.545) are close to each other. The evidence here is accordingly more supportive of a straightforward, single below-one beta than of a meaningfully different response to falling versus rising markets; a genuine asymmetry, if one exists, may simply require more data or a more targeted test to detect with confidence.

Asset	Beta (rising days)	Beta (falling days)	Difference	p-value
Sun Pharma	0.620	0.622	+0.003	0.985
Cipla	0.303	0.166	−0.137	0.384
Dr. Reddy's	0.541	0.347	−0.194	0.168
Zydus	0.553	0.864	+0.312	0.064
Lupin	0.614	0.728	+0.114	0.527
Equal-weight pharma	0.526	0.545	+0.019	0.858

Table 4: Beta on days when SENSEX 50 rose versus days when it fell, from one OLS regression per asset with a negative-market indicator variable (452 of 992 days had a negative market return). The p-value is a plain two-sided test of no difference; none is significant at the 5% level.

5.4 Performance on the Market's Worst Days

On the 50 worst SENSEX 50 trading days in the sample (a decline of roughly −1.39% or worse), the index itself lost 2.03% on average. The equal-weight pharma portfolio lost less, 0.94% on average, but still posted a positive return on only 12% of those days (Table 5); it did not turn the market's worst days into good days, only into somewhat less bad ones. Every individual stock's average return on these same 50 dates is likewise negative, ranging from −0.25% (Cipla) to −1.52% (Lupin). The 80/20 blend, unsurprisingly given its 80% index weight, tracks the index closely on these dates and loses 1.81% on average.

Asset	Mean return on 50 worst market days	Share of positive days
SENSEX 50	−2.03%	0%
Sun Pharma	−0.94%	14%
Cipla	−0.25%	34%
Dr. Reddy's	−0.56%	26%
Zydus	−1.41%	16%
Lupin	−1.52%	22%
Equal-weight pharma	−0.94%	12%
80/20 blend	−1.81%	0%

Table 5: Average return and share of positive daily returns for each asset on the same 50 trading dates on which SENSEX 50 recorded its lowest returns (the empirical worst 5%).

5.5 The Diversification Comparison and its Stability

The 80/20 blend's own annualized volatility (12.93%) is below the index's (13.81%), and its variance is about 12.3% lower than the index's variance over the full period. This is not an isolated full-period artefact: splitting the sample into a first half (April 2021 to March 2023) and a second half (March 2023 to March 2025) gives variance reductions of 12.8% and 11.5% respectively, and repeating the comparison separately within each of the four fiscal years gives reductions ranging narrowly from 11.1% to 13.6% (Table 6). The equal-weight pharma portfolio held on its own, by contrast, has a variance roughly 63% above the index's – so it is specifically the blending of an imperfectly correlated pharmaceutical component (correlation of 0.421 with SENSEX 50) into a larger market holding, and not any property of the pharmaceutical portfolio in isolation, that produces the variance reduction.

Sub-period	80/20 blend variance vs. index	Equal-weight portfolio variance vs. index
First half (Apr 2021–Mar 2023)	−12.8%	+49.1%
Second half (Mar 2023–Mar 2025)	−11.5%	+83.2%
FY2021/22	−13.6%	—
FY2022/23	−12.0%	—
FY2023/24	−12.7%	—
FY2024/25	−11.1%	—
Full period (Table 2 basis)	−12.3%	+62.9%

Table 6: Variance of the 80/20 blend (and, where shown, the equal-weight pharma portfolio) relative to SENSEX 50's own variance, computed independently within each sub-period rather than through simulation. A negative value indicates lower realized variance than the index.

The benefit does not, however, extend cleanly to drawdown. The blend's maximum drawdown over the full period is 17.39%, marginally deeper than the index's 17.12% (Figure 2, right panel), and its mean return on the market's 50 worst days (−1.81%) is close to, though a little better than, the index's own −2.03%. A reduction in average variance is therefore a real but limited benefit: it did not, in this sample, also produce a shallower worst-case loss.

5.6 Fiscal-year Variation

The full-period return advantage of the pharmaceutical portfolio is concentrated in time rather than steady. Table 7 shows the equal-weight portfolio returning 81.59% in FY2023/24 alone – far above the index's 28.40% that year – while underperforming the index in FY2021/22 and FY2024/25. The blend's volatility is lower than the index's in all four fiscal years, consistent with the sub-period stability already noted in Table 6, even though the strength of the full-period return advantage should not be projected forward mechanically.

Asset	FY2021/22	FY2022/23	FY2023/24	FY2024/25
SENSEX 50	19.04% (15.75%)	−0.23% (14.69%)	28.40% (9.81%)	4.67% (14.21%)
Equal-weight pharma	2.68% (20.32%)	6.00% (16.62%)	81.59% (15.33%)	2.49% (17.66%)
80/20 blend	15.95% (14.64%)	1.17% (13.78%)	37.88% (9.17%)	4.46% (13.40%)

Table 7: Fiscal-year return, with annualized volatility for that fiscal year shown in parentheses. Returns compound only that fiscal year's daily returns; the portfolio and blend rebalance daily.

5.7 Why the Data Correction Mattered

Repeating the full calculation on the original, uncorrected price data – with the Sun Pharma duplication and the unadjusted Dr. Reddy's split both left in place – produces starkly different, and clearly implausible, results (Table 8). Uncorrected Sun Pharma volatility comes out at roughly 970% a year, and the uncorrected equal-weight portfolio's volatility at roughly 195% a year, both many multiples of any plausible equity volatility and an unmistakable sign of a data error rather than a genuine market outcome.

More importantly for this paper's central claim, the uncorrected portfolio's estimated market beta is 1.16 – above one, the opposite of this paper's finding.

The reversal happens because the corrupted Sun Pharma segment briefly tracked the benchmark almost exactly, mechanically inflating both that stock's apparent market sensitivity and its measured volatility. This single comparison illustrates the paper's central methodological point directly: no amount of statistical sophistication applied to the uncorrected series would have produced a reliable answer to this study's research questions, whereas even the simple tools used throughout this paper give a stable, plausible answer once the data itself is verified.

Measure	Using uncorrected original data	Using verified data (this paper)
Sun Pharma annualized volatility	≈970%	20.84%
Equal-weight portfolio annualized volatility	≈195%	17.62%
Equal-weight portfolio market beta	1.16	0.538

Table 8: The same calculations applied to the uncorrected original price series versus the source-verified series used throughout this paper.

6. Discussion

The results support one specific, narrow meaning of "defensive": lower average linear sensitivity to SENSEX 50. They do not support the broader claim that these pharmaceutical stocks are, in general, low-risk holdings. The two claims are logically distinct – beta compares an asset's co-movement with the market to the market's own variance, and says nothing directly about the asset's total volatility or its exposure to company- or sector-specific events. In this sample, correlations with the market are modest and R^2 values are low, which is exactly the condition under which a below-one beta can coexist comfortably with high total volatility and deep individual drawdowns, as it clearly does here.

The stress-day results sharpen this same distinction. The pharmaceutical portfolio loses less than the index, on average, on the market's worst days, yet it still loses money on the great majority of them, and its own maximum drawdown across the full period is considerably larger than the index's.

An investor who looked only at the estimated beta would miss both of these facts; the wealth and drawdown series in Figures 1 and 2 make them directly visible.

The diversification result has a narrower but genuinely constructive interpretation. Because the pharmaceutical portfolio's correlation with SENSEX 50 (0.421) is comfortably below one, a modest 20% allocation lowers the blend's realized variance relative to holding the index alone, and this reduction is not a one-off artefact – it holds up, at broadly similar magnitude, when the sample is split into halves or into individual fiscal years (Table 6). At the same time, a roughly 12% reduction in variance corresponds to a much smaller reduction in annualized volatility (from 13.81% to 12.93%, under one percentage point), and it did not, in this sample, translate into a shallower maximum drawdown or a better return specifically on the market's worst days. Whether this trade-off is worthwhile depends on an investor's own objectives and, in practice, on transaction costs that this frictionless, illustrative calculation does not include.

These results also help place the announcement-focused literature discussed in Section 2 in context. Studies of specific COVID-19-related news events examine a different, much shorter-horizon question – how a stock reacts to a particular piece of information – than the one asked here, which concerns ordinary day-to-day sensitivity to the broad market over four fiscal years. A favourable multi-year return, as this portfolio delivered, is fully compatible with weak everyday market linkage and with substantial sector-specific losses along the way; the two literatures answer complementary rather than competing questions.

Finally, the comparison in Table 8 carries a methodological lesson that extends beyond this particular sample: checking data provenance, corporate actions and date alignment before estimating any model is not a preliminary formality but can be decisive for the substantive conclusion. Here, an uncorrected data error was large enough to flip the sign of the paper's central beta-related finding; no increase in modelling sophistication applied to the flawed series would have recovered the correct answer.

7. Implications for Investors, Advisers and Policy

The distinction this paper draws between market beta, standalone volatility and drawdown is not only an academic one. India's retail equity investor base has grown rapidly in recent years: SEBI reported roughly 194 million demat accounts by mid-2025, and a substantial share of new accounts continues to open through direct-trading apps and thematic or sector-focused mutual fund schemes, among which pharmaceutical funds are commonly marketed using language such as "defensive" or "stable" (Business Standard, 2025). The results in Sections 5 and 6 speak directly to what such a label can, and cannot, support, and this section restates the findings for four audiences who are unlikely to read a regression table but who make decisions based on exactly this kind of evidence.

7.1 Retail investors and their Financial Advisers

A retail investor choosing a pharmaceutical stock or fund because it is described as defensive should understand precisely what that word is likely to mean here: a tendency to move less than the broad market on an average day (an estimated beta of 0.31 to 0.67 across the five stocks in this sample). It does not mean the investment has low volatility in absolute terms – every stock's own annualized volatility (20.8% to 28.1%) is well above the market index's (13.8%) – and it does not mean the investor is protected from large losses: four of the five stocks experienced a peak-to-trough decline of more than 25% within this four-year window, and two exceeded 50%. A financial adviser using the word "defensive" to describe a pharmaceutical holding could reasonably be asked, and should be able to answer, which of these three distinct things is meant, ideally with a specific number attached to each rather than a single descriptive label.

7.2 Mutual Fund and Portfolio Managers

For a fund or portfolio manager weighing a modest pharmaceutical allocation alongside an index-tracking core holding, this study offers a concrete, if narrow, benefit: a 20% allocation reduced realized portfolio variance by roughly a tenth to an eighth of the index's own variance, and this reduction held up consistently across both halves of the sample and every individual fiscal year (Table 6). At the same time, the same allocation left maximum drawdown essentially unimproved and underperformed the index outright in two of the four fiscal years examined (Table 7). A product or mandate that markets a pharmaceutical sleeve as a general "risk reducer" should be specific about which risk is reduced – here, realized variance – and which is not – here, drawdown and performance on the market's worst days.

7.3 Investor Education and Disclosure Policy

India's principal retail risk-disclosure tool for mutual fund schemes, SEBI's mandatory riskometer, communicates a single composite risk category, ranging from "Low" to "Very High," for each scheme (Securities and Exchange Board of India, 2021). This is a reasonable simplification for a fast, comparable, at-a-glance label, but the results in this paper illustrate a specific gap it leaves open: two portfolios can carry a similar composite risk rating, or a similar market beta, while having very different volatility and drawdown histories, and an investor relying only on the single composite figure has no direct way to see that difference. Investor-education material issued alongside the riskometer – by SEBI, by the Association of Mutual Funds in India, or by individual fund houses in scheme documents – could usefully be accompanied by the same two additional, easily computed numbers used throughout this paper: annualized volatility and maximum historical drawdown. Neither requires a sophisticated risk model, and both would let an investor see, in the pharmaceutical sector or elsewhere, exactly where a below-one beta does and does not protect them.

7.4 Researchers and Data Practice

The corrected error in the Sun Pharma series (Section 3.2) is a reminder that Indian retail-accessible equity data – whether obtained through a paid vendor, a free download, or a workbook compiled by a research assistant or an automated tool – can carry material errors that persist unless someone specifically checks for them. This paper's contribution to the literature is therefore partly methodological: it offers a documented, reproducible demonstration of how much a single unverified data point can change a published finding (Section 5.7 and Table 8), and it argues that a routine check against an official exchange source is a necessary first step in any Indian equity study, prior to any choice between a simple and a more sophisticated statistical technique.

8. Limitations and Future Research

The five-stock sample is inherited from an existing research brief rather than drawn using an explicit selection rule, so it cannot support claims about prevalence across the wider Indian pharmaceutical sector, and the possibility of survivorship or selection effects in how the five firms came to be chosen cannot be ruled out. The four-fiscal-year window is also finite: FY2023/24's unusually strong pharmaceutical returns and the subsequent drawdowns shown in Table 7 indicate that results vary meaningfully over time, and the sub-period checks in Table 6 describe that variation without constituting a genuine out-of-sample forecast test.

All reported price returns exclude cash dividends. Matching the stocks to a price index (rather than a total-return index) avoids one obvious mismatch, but dividend omission still limits any conclusion about an investor's actual realized wealth, particularly around ex-dividend dates. A useful extension would reconstruct dividend-inclusive returns and compare them with a matching total-return benchmark, and would also compare results against a pharmaceutical sector index (such as NIFTY Pharma) alongside the broad-market index used here, to separate general market exposure from sector-specific exposure.

On the statistical side, this paper deliberately uses ordinary least-squares standard errors and does not adjust for the possibility that daily stock returns are not fully independent of one another or that their volatility changes over time (both plausible features of daily equity data). Where these features are present, ordinary standard errors can understate true uncertainty to some degree; the paper's headline finding – a below-one beta for every stock, with confidence intervals well clear of one – is unlikely to be overturned by a more technical correction given how far the point estimates sit from the boundary, but a reader should treat the exact reported p-values and interval widths as approximate rather than exact. Because five closely related beta-below-one tests are reported side by side without a formal adjustment for testing several stocks at once, individual p-values in Table 3 should likewise be read as indicative evidence for each stock rather than as controlling one combined error rate across the whole set of five.

The paper's robustness check for the diversification result (splitting the sample into halves and fiscal years, Section 5.5) is a transparent alternative to a simulated resampling procedure, but it draws on the same 992 trading days and so cannot fully substitute for genuinely new, out-of-sample data.

The literature review in Section 2 relies in places on publicly available abstracts rather than complete access to every cited study's full text and underlying data; where this is the case, comparisons are restricted to the broad findings and research designs that are explicitly reported, and no claim of exhaustive novelty is made. The stress-day comparison in Table 5 uses one specific threshold (the empirical worst 5% of market days); a different threshold, or a different definition of a stressed market, could give a somewhat different picture and would be a natural robustness extension. Finally, the 80/20 blend is an illustrative, frictionless, retrospective construction: it does not identify an optimal pharmaceutical weight, does not model transaction costs or taxes, and should not be read as an executable investment recommendation.

9. Conclusion

For five Indian pharmaceutical stocks over 1 April 2021 to 31 March 2025, source-verified price data show a market beta below one for every stock and for an equal-weight portfolio of all five, using nothing more elaborate than descriptive statistics and ordinary least-squares regression. That same evidence shows every stock to be more volatile than the market index, four of the five stocks experiencing drawdowns of 25% or more, and the resulting portfolio's own maximum drawdown well above the index's. A fixed 20% allocation to this portfolio does lower a broad-market holding's realized variance, consistently across sub-periods, but it leaves maximum drawdown essentially unimproved and does not turn the market's worst days into profitable ones. Perhaps the most transferable finding is methodological rather than financial: verifying the underlying price data – catching a duplicated series, an unadjusted stock split and a ticker change before they enter any calculation – mattered more to getting a trustworthy answer here than the choice between a simple and a sophisticated statistical technique. Within this bounded five-stock sample, the evidence supports low average market exposure and a genuine, if partial and cost-free, diversification benefit; it does not support treating these stocks,

individually or as a portfolio, as low-risk or capital-protective holdings.

The paper's contribution beyond this specific sample sits in three places. For the literature on Indian equity data practice, it offers a documented, reproducible case of how an unverified pricing error can reverse a headline finding, and a corresponding argument for treating source verification as a mandatory first step in any Indian equity study. For retail investors, financial advisers and fund managers, it translates that evidence into a concrete, numeric account of what a "defensive" pharmaceutical holding can and cannot be expected to do. And for investor-education and disclosure policy, it points to a specific, low-cost step – reporting volatility and maximum drawdown alongside the existing composite risk label – that could be adopted without new regulation or new data infrastructure, and that would let an investor see precisely where a low market beta does, and does not, protect them.

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