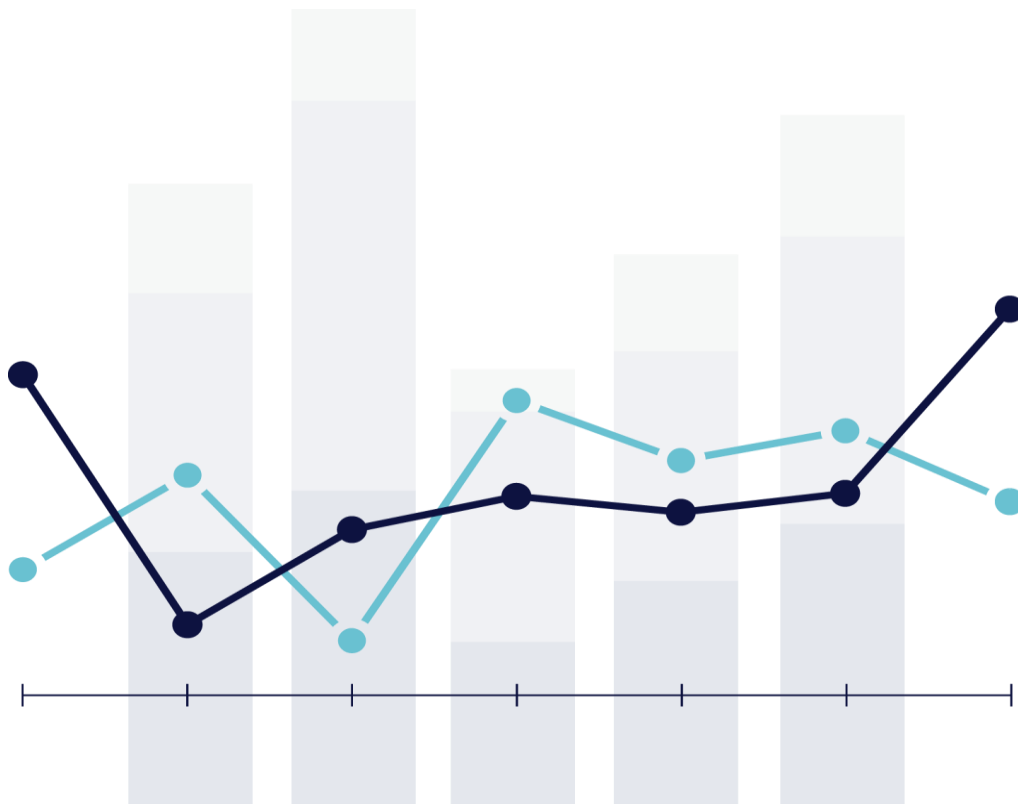


# Betting Against Beta



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# Betting Against Beta

## **Abstract**

The fundamental bet against the beta system is to discover assets with higher betas and take a short position in them. Simultaneously, a leveraged long position is taken in assets with lower betas. Beta is a measure of the risk that cannot be reduced by diversification. The thought is the higher beta assets are overpriced and the lower beta resources are undervalued. The hypothesis sets the costs of the stocks in the end return into line with one another. This is basically a statistical arbitrage strategy with the prices of the resources returning to the median price versus risk. This median is characterized as the Security Market Line. The SML is a straight line that shows the risk-return trade-off for an asset.

A main tenet of CAPM is all reasonable investors invest their money in a portfolio with the highest expected excess return per unit of risk. As a result, they have a tendency to overweight their portfolios toward higher beta assets to improve returns.

This tilting toward higher beta stocks indicates these assets require lower risk-adjusted returns versus lower beta assets. Several questions arise: How can an unconstrained arbitrageur exploit this effect, i.e., how do you bet against beta? What is the magnitude of this anomaly relative to the size, value, and momentum effects? Is betting against beta rewarded in other countries and asset classes? How does the return premium vary over time and in the cross-section? Who bets against beta?

## **Introduction**

AQR, a large hedge fund founded by famed investor Cliff Asness, uses a strategy of statistical arbitrage by taking a short position in stocks with high beta and a long position in stocks with a low beta. This strategy is known as a bet against beta. The theory is based on alleged inefficiencies with the capital asset pricing model, or CAPM, due to large funds being constrained in the type of leverage they can utilize and the risk they can take. Beta is a statistical measure of the risk of an individual stock or portfolio against the market as a whole. The phrase bet against beta was coined from a few economics' papers written by the creators of the strategy.

In our analysis, we have tried back testing for 99 companies and the NIFTY for two periods and tested this strategy in both periods. The companies we have considered have the highest market capitalization value in NSE. One period is the time before the pandemic and tested this strategy in normal times. The other period is the COVID Recovery months. We have considered a trading window of six months for each testing month in both the period. The months we have considered are December 2019, January 2020, February 2020, and March 2020 for the first period. For the next period, we have considered July, August, September, and October for the year 2020 as the testing months. The quarter with the lowest beta values has been considered low beta stocks and the quarter with the highest beta values have been considered high beta stocks. Finally, we have also tried to analyse the kind of companies in both High and low beta stocks for both timeframes and tried to segregate them into different sectors.

## **Background**

There is an assumption made in academic finance that investors are sufficiently diversified. Therefore, the only risk that matters is the systematic risk (applicable to the entire market e.g. inflation, currency depreciation). since idiosyncratic risks (risk related to a particular company e.g. CEO of a company dies) can be diversified away. The systemic risks affect the entire market but the way they affect each company is different. The sensitivity of a company (security or a portfolio) to the systematic risk is known as **Beta**.

By definition, the systematic risk of the market portfolio is 1. If the beta value is less than 1.0 means that the security is theoretically less volatile than the market and if it is greater than 1.0 indicates that the security's price is theoretically more volatile than the market. A beta value of 1 indicates a strong correlation of the stock with the market. Some stocks have negative betas. A beta of -1.0 means that the stock is inversely correlated to the market benchmark.

Companies that have high growth or high uncertainty or high exposure to systemic risk have a high beta. High Beta stocks are known as aggressive stocks or growth stocks. Companies which have low growth usually have low beta and they are known as defensives

In statistical terms, beta represents the slope of the line through a regression of an individual stock's returns against those of the market as a whole.

A security's beta is also calculated by dividing the product of the covariance of the security's returns and the market's returns by the variance of the market's returns over a specified period.

$$\beta_i = \frac{\text{Cov}(r_i, r_m)}{\text{Var}(r_m)}$$

$\beta$  = market beta of asset  $i$ ;

Cov = covariance;

Var = variance;

$r_m$  = average expected rate of return on the market;

$r_i$  = expected return on an asset  $i$

## **Advanced Trading Strategy: Betting Against Beta Strategy:**

The betting against beta strategy is to find assets with higher betas and take a short position in them. At the same time, a leveraged long position is taken in assets with lower betas to make money.

The basic idea behind this strategy is the higher beta assets are overpriced and the lower beta assets are under-priced. Constrained investors bid up high-beta assets, therefore high beta is associated with low alpha. Some agents cannot use leverage and therefore overweight high-beta assets, causing those assets to offer lower returns. Other agents can use leverage but face margin constraints. They underweight (or short-sell) high-beta assets and buy low-beta assets that they lever up.

### Implementation of the Betting Against Beta Strategy:

Once the beta value is calculated by running a regression of an individual stock's returns against those of the market as a whole. We rank the stocks based on Beta.

Find the median beta. Divide the stocks into the above-median and below-median based on their beta value. The stocks above median value are overvalued and stocks below-median are considered to be undervalued. So, our strategy is to go long on those low beta stocks and go short on high beta stocks. And hold it for a particular period and close the position.

But the problem is some high beta stocks may become low beta next month. To keep a check on that we need to calculate the new betas of each stock every month. We will be taking a 6 months estimation window for the calculation of the beta value of stocks for each month. The estimation window is nothing but a period over which parameters are estimated. In our setting, we are estimating the beta value of each stock over 6 months. It is not necessary to take the window of 6 months always. One is free to take a window of 3 months, 7 months, or even a year.

Now, suppose our trading period starts on 1st July and we plan to trade for the next 4 months. We pick up the January to June- 6 months period and calculate the beta for each company. This value can be calculated right on June 30th after the market hours. That is why this trading strategy can be implemented right on the 1st day of our holding period. Ideally, one should hold for a month. But one can try various combinations.

We will pick up the February to July- 6 months period for calculating the beta value of each company for trading in August. This concept of you applying the method or model repeatedly to the sub-datasets or sub-series in the data set or series is known as the Rolling window. After calculating beta for the trading month of August, we can again arrive at our long and shorts.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
Estimation Window						Trading			
	Estimation Window						Trading		
		Estimation Window						Trading	
			Estimation Window						Trading

### Limitations of using Beta for betting:

We arrive at the sensitivity of a stock or beta by taking some past returns of the market and past returns of the stock. But the future is never the same as the past. Many unforeseen things can happen, a lot of things can change in the market of this dynamic world. Since beta is calculated using historical data points, it becomes less meaningful for investors looking to

predict a stock's future movements. But we can use beta for categorizing stocks in various buckets.

Beta is also less useful for long-term investments since a stock's volatility can change significantly from year to year, depending upon the company's growth stage and other factors.

## **Methodology**

Our approach to the problem.

Estimating ex-Ante Betas:

We took the daily price data of 100 stocks listed on NSE over the past 2 years. On that data, we calculated daily returns on the t-th day as

$$\frac{c_t^p}{c_{t-1}^p} - 1$$

$c_t^p$  = Closing Price for time t;

$c_{t-1}^p$  = Closing Price for time (t - 1)

Similarly, for obtaining the Market Returns, we applied the same to NIFTY 50.

Having obtained these returns, we ran a Linear Regression over a course of 6 months with Nifty returns as the regressor and the Stock returns as the predicted variable

Formally,

$$R_i = \beta_i R_m + \epsilon$$

$R_i$  = Return on asset i

$R_m$  = Market Return

$\beta_i$  - Beta of i-th stock with respect to

We constructed simple portfolios that are long on low beta securities and short on high beta portfolios. Specifically, we sorted the 100 Betas obtained in increasing order and traded on the top and lower quartiles. Based on these 50 stocks, we set forth our long-short strategy and closed off the trade at the end of a month.

For the next month, we shifted the Beta calculation window by a month and followed suit. It so happens that the stocks don't maintain their positions over the several trading windows we tested. Some high beta stocks, over the course of our period, transitioned to moderate beta and slipped below the median value.

In our crude approach, we haven't calculated the Sharpe ratios for the portfolios under consideration. Rather, we tested the binary predictions of shorting the high beta stocks and taking a long position on the low beta stocks.

For our binary predictions, we referred to the monthly candlestick patterns and assigned a value of 1 if the candlestick pattern evolved according to the prediction of strategy and 0 else wise.

This approach gave us a success ratio metric = sum of cases where the strategy worked/No of cases. The findings are presented in the table below.

## **Findings:**

As we've done a comparative analysis on Beta Trends across the Top-100 NSE listed companies based on their market capitalization, we found that companies that lie **above the median of Beta prefer short call options**, and the companies having the **Beta below the median prefer long call options**.

We extended our analysis to check whether the strategy works well or not, we've analysed the stock price trends from December 2019 to October 2020 (excluding April, May & June; due to lockdown there is no significant change in the trends.)

For the companies under the **short-call**, our strategy holds good and it is following that if the companies are having a **higher beta** that is **overpriced and the price goes down** in the given trading window.

For the companies under the **long-call**, our strategy holds good and it is following that if the companies are having the **lower beta** that is **undervalued and the price goes up** in the given trading window.

The ratio of the companies holding the strategy to the total companies								
	Dec'19	Jan'20	Feb'20	Mar'20	Jul'20	Aug'20	Sep'20	Oct'20
Short-Call	0.40	0.64	0.92	1.00	0.16	0.24	0.84	0.36
Long-Call	0.44	0.52	0.28	0.16	0.63	0.58	0.50	0.46

The above table shows the trading windows in the first row and the ratio of companies following the strategy to the total companies.

After this, we've found the comparative statistics for the pre vs post lockdown period where we found that during the **pre-lockdown** period the **Average Ratio of the companies holding this strategy to the total companies in short call is quite high** whereas in the **long call** it is lower than 0.5.

But the results of the **post-lockdown** period are not having many differences and are inconclusive.

Average Ratio Pre v/s Post Lockdown		
	Dec-Mar	July-Oct
Short-Call	0.74	0.48
Long-Call	0.35	0.51

## **Sector Analysis:**

For the normal time period that is before the pandemic outbreak. The major sectors covered are IT, Pharma, and Healthcare in the low beta companies. Some companies are from the insurance sector like SBI Life, ICICI Prudential, and ICICI. We notice that for these four testing months the Beta of the Pharma companies is changing by a great decimal number each month. For High Beta stocks The major companies in this quarter belong to banks, the Automobile, and the manufacturing sector. Ambuja and UltraTech from the cement industry. The beta of most companies is changing a great deal each month for the time period

For the COVID recovery months, in the low beta quarter, most of the companies are pharmaceutical, household and HealthCare companies. There are some power transmission companies. For the test month of October, there were major changes in the list of the lowest quarter and many companies came into the lowest quarter. They are LTI, Godrej, Auropharma, ITC, Infratel, Berger Paints, IGL, and Kansar. The Beta values of these companies are mainly decreasing for four months. The High Beta companies in this quarter majorly comprise the banking sector, financial services, insurance, mutual funds, automobiles, and the manufacturing sector. In October there was a change in the list of the companies in the last quarter and Titan, Naukri, Hind Petro, and Eichermot came into the picture. The Beta values of these companies are mainly increasing for four months.

The Beta of the IT companies has changed considerably and shifted from the lowest quarter in pre-pandemic times and is distributed in the second and third quarters in corona recovery times. Insurance companies like SBI Life, ICICI, and ICICI Prudential traveled from the first quarter to even in the last quarter. ( From low Beta to High Beta) in the time span of before corona to the corona recovery period. "Naukri " also was a part of the first quarter in the pre-Corona times but with time it became a part of high Beta companies. Yes Bank due to its internal factors showed a peculiar movement different from the other banks.

## **Conclusion:**

Our Findings point out to a mixed review of the strategy. The case being that momentum factors play a higher influence on Indian markets than other emerging markets around the world. Additionally, with Indian Investing scene having a significant chunk of retail household investors who have, unfortunately, not much of a niche in investing. They produce knee jerk reactions to sentiments, which adds noise to the analysis.

The data points out to the central idea that High Beta stocks are overpriced and tend to a market correction in the near future. The shorting strategy, on average, works out better than the long strategy, confirming the same.

While it must be noted that in our set of the 100 companies, there is an inherent bias with the set comprising the highest market capitalization companies. A case may be made to compare companies amongst their sectors as that would wipe out the idiosyncrasies related to sectors but it suffers from the problem that companies tend to float along the beta spectrum when clubbed in a sector.

Overall, the strategy is to be combined with due diligence of stocks and Momentums strategies to time optimal results. Sole dependence on the BAB strategy is not recommended.