

Medium and Long Term Trading Strategy by Absolute Momentum

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Abstract

Momentum is one of the strongest returns generating factors and with this research we try to analyse application of momentum in size/sector/style rotation in Indian Equity Markets. We also analyse effective time frame for use of momentum in allocation to enhance risk adjusted returns in both medium & long term trading models. We optimise factors such as look back period, holding time and number of assets in the portfolio to obtain maximum profits. We also analyse optimal portfolio allocation based on momentum by including non-equity asset class in models including fixed income and gold for higher risk adjusted returns as compared to only equity focused portfolio. We then evaluate our strategies numerically and visually using comparative returns, standard deviations, profit consistency, alphas, Sharpe ratios, box plots, and maximum drawdowns under different scenarios.

Keywords: Momentum investing, sector asset allocation, price momentum, asset allocation, momentum trading, style factors

1. Introduction

Momentum is one the counter intuitive factor yet the most popular factor driving equity market returns. Momentum is defined as power of past returns to influencing future returns. In its basic form it involves analysing the past returns of a security influencing future returns.

Absolute momentum is different from relative momentum and is positive only when there is excess return from an asset over a lookback period, regardless of relative performance with other assets. There may be a case where momentum to be relatively negative but absolutely positive.

Momentum investing has more hard data backing its persistence as a strategy for outperformance than any other school of investing thought, including value. Absolute momentum is equally strong and universal as relative momentum. It has shown to perform well during extreme market conditions and across asset classes

We analyse momentum in index constituents in portfolio selection to outperform index with higher risk adjusted returns. We analyse portfolio returns based on number of index constituents for medium and long term holding period variations with portfolio selection and weights driven momentum factor based on lookback period.

2. Literature Review

The idea of Momentum investing has existed in the mainstream since the '90s. It is built on the logic that stocks that have gone up will continue to go up and that the returns from such a portfolio must be better than the broader markets. This simple premise has been shown to work on US stocks (Jegadeesh and Titman (1993))[1],

industries, currencies, government and corporate bonds (Asness, Moskowitz and Pedersen (2012))[2].

The effect of absolute momentum risk, returns, and correlation of diverse markets have been extensively studied and compared to buy and hold approach (Antonacci (2012))[3]. It was seen that Absolute momentum improved the Sharpe ratio with respect to relative momentum.

Determining trend using absolute momentum also benefits to track regime changes and mitigate and mitigate the downside risk. In addition, absolute momentum gave substantially lower maximum drawdown than relative momentum also lowering the cross module correlations.

In the Indian market context, Sehgal and Balakrishnan (2002) obtained significant evidence of long-term return-reversal tendency and short-term momentum effect in Indian equities. Ansari and Khan (2012)[2] found a strong presence of momentum profit in the Indian context and pointed out the significance of behavioural factors as sources of momentum profit.

It is well documented that momentum as a strategy works in developed markets like US and Europe. But does a strategy that buys winners purely based on price returns work in the Indian markets? Since there aren't many concrete published studies, we plan to analyse this strategy in the Indian Markets. We will back test the momentum strategy using a basket of stocks/assets with an intention to find the optimal number of assets, holding period, look back period.

3. Methodology

For acquiring the data from National Stock Exchange(NSE), we have used an open source python library, NSEpy. This will be the basic building block for extraction of historical data for back testing. We can fetch the daily price history of stocks/indices/derivatives using NSEpy into a Pandas data frame, providing us with a dataset with minimum daily time period data, which can be modified to larger time periods. We plan to use NSEpy data and NSE website data for relevant indices and stocks from 2010 to present date.

Once the data frame is ready with a mix of stocks, indices, fixed income indices and exchange traded funds(ETFs), we find the absolute momentum of each of the assets using a certain lookback period, where absolute momentum would be return in the lookback period and perform back test and analyse returns of portfolio in relevant holding period.

Absolute momentum strategy compares a security's returns against its own historical performance. In long only version, strategy buys positive returning securities, where historical return is calculated for lookback period.

Our strategy is to leverage absolute momentum to enhance this portfolio by optimising look back period, holding time and number of assets in the portfolio to obtain risk adjusted maximum returns.

We create 3 types of implementation of Momentum Strategy

1. Index Constituent Selection based Optimization

- 1.1 Momentum strategy is applied to portfolio of n index constituents [Basket Elements] for various lookback period [L] where only positive returning

securities are considered in portfolio and are rebalanced after a particular holding period [HP] of portfolio.

1.2 Lookback period , Holding Period varies according to Trading Strategy Period

1.3 In the medium term strategy, we look at a holding period of 5 days to 1 month, whereas for a long term strategy we will consider a period of 1 month to 1 year.

Type	Strategy/Rebalance frequency	Lookback period(days)	Holding Period(days)
Medium term	Weekly	5,10,20,60,120	5
	Biweekly	5,10,20,60,120	10
	Monthly	10,20,60,120,240	20
Long term	Quarterly	20,60,120,240	60
	Half-yearly	60,120,240	120
	Yearly	120,240	240

1.4 Basket Elements are number of assets in that portfolio and strategy is implemented for [5,10,15,20,30] elements in basket and only top n performing assets in lookback period are selected in portfolio. We apply 5 bps cost for transaction cost on rebalance.

1.5 We keep equal weight portfolio with maximum weight to a constituent being 1/Number of Basket Elements.

1.6 We also optimize weights for best performing lookback period , holding period and number of elements

2 Market Cap Allocation Optimization [Equity Asset Class]

2.1 Momentum Strategy is applied to Indices of Nifty 50 [Large Cap Index], Nifty Midcap 100 [Mid Cap Index] and Nifty Smallcap 100 [Small Cap Index]

2.2 Strategy looks to selects only the best performing index with only positive returns based on lookback period variations and rebalances based on lookback periods. We apply 5 bps cost for transaction cost on rebalance.

2.3 In the medium term strategy, we look at a holding period of 5 days to 1 month, whereas for a long term strategy we will consider a period of 1 month to 1 year.

Type	Strategy/Rebalance frequency	Lookback period(days)	Holding Period(days)
Medium term	Weekly	5,10,20,60,120	5
	Biweekly	5,10,20,60,120	10
	Monthly	10,20,60,120,240	20
Long term	Quarterly	20,60,120,240	60
	Half-yearly	60,120,240	120
	Yearly	120,240	240

3. Asset Class Allocation Optimization

- 3.1. Momentum Strategy is applied to Indices of Nifty 50 [Large Cap Index], Nifty Midcap 100 [Mid Cap Index] and Nifty Smallcap 100 [Small Cap Index], Fixed Income and GoldBees
- 3.2. Strategy looks to select only the best performing index with only positive returns based on lookback period variations and rebalances based on lookback periods. We apply 5 bps cost for transaction cost on rebalance.
- 3.3. In the medium term strategy, we look at a holding period of 5 days to 1 month, whereas for a long term strategy we will consider a period of 1 month to 1 year.

Type	Strategy/Rebalance frequency	Lookback period(days)	Holding Period(days)
Medium term	Weekly	5,10,20,60,120	5
	Biweekly	5,10,20,60,120	10
	Monthly	10,20,60,120,240	20
Long term	Quarterly	20,60,120,240	60
	Half-yearly	60,120,240	120
	Yearly	120,240	240

4. Results

1. Index Constituent Selection based Optimization

1.1. Medium Term Nifty50 Analysis

Table 1. Nifty 50 with 10 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	8.69	11.44	-0.085
10 Days / 5 Days	12.03	10.72	0.027
20 Days / 5 Days	16.36	10.63	0.140
60 Days / 5 Days	17.35	10.05	0.170
120 Days / 5 Days	17.54	9.80	0.178
5 Days / 10 Days	12.24	15.69	0.045
10 Days / 10 Days	13.39	15.52	0.088
20 Days / 10 Days	13.85	15.29	0.106
60 Days / 10 Days	17.49	14.52	0.232
120 Days / 10 Days	20.14	15.40	0.289
10 Days / 20 Days	15.09	25.41	0.227
20 Days / 20 Days	10.99	20.44	-0.020
60 Days / 20 Days	15.55	23.95	0.263
120 Days / 20 Days	17.40	21.46	0.390
240 Days / 20 Days	16.11	11.26	0.593
Nifty 50 Index	20.74	12.21	0.378

Table 2. Nifty 50 with 20 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	9.68	8.71	-0.067
10 Days / 5 Days	11.94	8.47	0.027
20 Days / 5 Days	14.39	8.32	0.115
60 Days / 5 Days	17.40	8.30	0.204
120 Days / 5 Days	15.31	7.66	0.155
5 Days / 10 Days	12.69	10.90	0.081
10 Days / 10 Days	15.61	10.89	0.224
20 Days / 10 Days	16.10	11.49	0.234
60 Days / 10 Days	17.35	10.81	0.299
120 Days / 10 Days	17.52	10.63	0.311
10 Days / 20 Days	14.72	17.17	0.295
20 Days / 20 Days	13.40	17.86	0.184
60 Days / 20 Days	14.43	17.34	0.270
120 Days / 20 Days	15.72	14.86	0.422
240 Days / 20 Days	15.48	10.27	0.574
Nifty 50 Index	20.74	12.21	0.378

Table 3. Nifty 50 with 25 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	10.87	7.59	-0.019
10 Days / 5 Days	12.23	7.46	0.042
20 Days / 5 Days	13.65	7.53	0.098
60 Days / 5 Days	16.35	7.37	0.196
120 Days / 5 Days	15.24	6.66	0.174
5 Days / 10 Days	13.69	9.82	0.147
10 Days / 10 Days	15.32	9.69	0.236
20 Days / 10 Days	15.34	9.96	0.231
60 Days / 10 Days	16.21	9.41	0.288
120 Days / 10 Days	17.15	8.52	0.366
10 Days / 20 Days	14.01	15.45	0.264
20 Days / 20 Days	12.72	14.35	0.154
60 Days / 20 Days	14.06	15.94	0.260
120 Days / 20 Days	14.84	12.56	0.407
240 Days / 20 Days	14.31	8.35	0.523
Nifty 50 Index	20.74	12.21	0.378

Table 4. Nifty 50 with 30 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	11.26	6.56	-0.003
10 Days / 5 Days	12.64	6.78	0.064
20 Days / 5 Days	13.60	6.54	0.110
60 Days / 5 Days	15.85	6.59	0.200
120 Days / 5 Days	14.24	5.75	0.155
5 Days / 10 Days	13.82	9.44	0.159
10 Days / 10 Days	15.20	8.94	0.248
20 Days / 10 Days	14.96	8.80	0.238
60 Days / 10 Days	16.18	7.92	0.338
120 Days / 10 Days	15.77	6.97	0.355
10 Days / 20 Days	13.30	13.21	0.231
20 Days / 20 Days	12.56	13.04	0.150
60 Days / 20 Days	13.73	15.40	0.239
120 Days / 20 Days	14.33	11.25	0.394
240 Days / 20 Days	13.85	7.21	0.517
Nifty 50 Index	20.74	12.21	0.378

Nifty 50 Performance Images -> [Link Here](#)

For Nifty 50 Index constituents we observe that Momentum strategy underperforms index returns and is not able to outperform in any combinations. We also find that best combinations with maximum Sharpe Ratio is for 240 days Lookback Period with 20 days Holding Period and 10 Number of Constituents. We observe that concentrated portfolio in Nifty Large Cap Index (Nifty 50) gives better risk adjusted returns.

1.2. Medium Term Nifty Midcap 100 Analysis

Table 1. Midcap 100 with 10 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	14.78	16.51	0.073
10 Days / 5 Days	20.36	15.43	0.157
20 Days / 5 Days	16.85	15.32	0.110
60 Days / 5 Days	22.94	15.86	0.183
120 Days / 5 Days	37.49	12.97	0.368
5 Days / 10 Days	18.26	24.84	0.160
10 Days / 10 Days	16.71	21.31	0.149
20 Days / 10 Days	21.54	22.27	0.230
60 Days / 10 Days	30.84	22.87	0.344

120 Days / 10 Days	36.24	20.18	0.447
10 Days / 20 Days	13.56	33.12	0.122
20 Days / 20 Days	17.08	35.26	0.242
60 Days / 20 Days	30.28	31.13	0.623
120 Days / 20 Days	23.46	28.72	0.500
240 Days / 20 Days	20.86	20.56	0.576
Midcap 100 Index	26.67	17.47	0.379

Table 2. Midcap 100 with 20 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	13.59	12.74	0.062
10 Days / 5 Days	17.95	12.67	0.149
20 Days / 5 Days	19.07	11.65	0.180
60 Days / 5 Days	23.41	12.08	0.241
120 Days / 5 Days	25.02	11.14	0.283
5 Days / 10 Days	15.23	18.42	0.131
10 Days / 10 Days	21.51	16.89	0.295
20 Days / 10 Days	21.25	17.93	0.274
60 Days / 10 Days	24.64	17.05	0.353
120 Days / 10 Days	27.13	18.23	0.371
10 Days / 20 Days	19.29	24.60	0.424
20 Days / 20 Days	16.89	25.69	0.309
60 Days / 20 Days	24.67	23.09	0.656
120 Days / 20 Days	23.43	25.24	0.563
240 Days / 20 Days	18.55	21.28	0.451
Midcap 100 Index	26.67	17.47	0.379

Table 3. Midcap 100 with 25 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	14.23	11.38	0.084
10 Days / 5 Days	17.53	11.78	0.151
20 Days / 5 Days	19.52	11.01	0.198
60 Days / 5 Days	21.69	11.04	0.235
120 Days / 5 Days	22.75	9.92	0.279
5 Days / 10 Days	17.91	16.30	0.220
10 Days / 10 Days	19.23	16.34	0.252
20 Days / 10 Days	21.61	16.78	0.299
60 Days / 10 Days	23.74	15.88	0.359

120 Days / 10 Days	25.72	16.00	0.394
10 Days / 20 Days	18.63	24.41	0.400
20 Days / 20 Days	17.41	23.29	0.362
60 Days / 20 Days	23.16	21.09	0.658
120 Days / 20 Days	23.41	21.42	0.657
240 Days / 20 Days	17.61	18.80	0.453
Midcap 100 Index	26.67	17.47	0.379

Table 4. Midcap 100 with 30 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	13.82	10.76	0.077
10 Days / 5 Days	17.90	10.93	0.169
20 Days / 5 Days	20.37	10.62	0.221
60 Days / 5 Days	21.43	10.44	0.243
120 Days / 5 Days	22.22	9.23	0.289
5 Days / 10 Days	18.61	15.26	0.252
10 Days / 10 Days	21.03	15.70	0.304
20 Days / 10 Days	23.02	15.41	0.354
60 Days / 10 Days	21.92	15.60	0.326
120 Days / 10 Days	24.28	15.28	0.383
10 Days / 20 Days	19.05	22.24	0.455
20 Days / 20 Days	18.11	23.42	0.393
60 Days / 20 Days	20.67	21.08	0.554
120 Days / 20 Days	20.53	20.66	0.558
240 Days / 20 Days	17.60	19.10	0.446
Midcap 100 Index	26.67	17.47	0.379

Midcap 100 Performance Images -> [Link Here](#)

For Midcap 100 Index constituents we observe that Momentum strategy can outperform index returns in certain combinations. We also find that best combinations with maximum Returns is for 120 days Lookback Period with 10 days Holding Period and 10 Number of Constituents. We observe that concentrated portfolio in Nifty Midcap Cap Index (Nifty 50) gives better risk adjusted returns and with diversification by increasing index constituents decreases absolute returns.

1.3. Medium Term Nifty Smallcap 100 Analysis

Table 1. Smallcap 100 with 10 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	36.40	19.52	0.246

10 Days / 5 Days	45.07	19.73	0.286
20 Days / 5 Days	68.19	17.79	0.406
60 Days / 5 Days	51.31	19.86	0.310
120 Days / 5 Days	44.18	17.22	0.320
5 Days / 10 Days	63.51	29.24	0.465
10 Days / 10 Days	39.64	27.85	0.357
20 Days / 10 Days	74.47	27.38	0.538
60 Days / 10 Days	72.89	26.00	0.559
120 Days / 10 Days	81.02	22.87	0.666
10 Days / 20 Days	36.52	38.53	0.607
20 Days / 20 Days	39.91	36.00	0.694
60 Days / 20 Days	42.86	41.00	0.650
120 Days / 20 Days	25.84	28.86	0.562
240 Days / 20 Days	53.30	42.34	0.732
Midcap 100 Index	21.80	10.52	0.248

Table 2. Smallcap 100 with 20 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	25.22	15.13	0.215
10 Days / 5 Days	26.33	15.77	0.218
20 Days / 5 Days	36.29	14.60	0.320
60 Days / 5 Days	44.61	15.22	0.361
120 Days / 5 Days	34.50	14.01	0.319
5 Days / 10 Days	38.58	22.15	0.431
10 Days / 10 Days	30.98	21.54	0.365
20 Days / 10 Days	42.13	23.22	0.441
60 Days / 10 Days	55.65	22.22	0.555
120 Days / 10 Days	46.15	19.77	0.548
10 Days / 20 Days	25.62	31.67	0.511
20 Days / 20 Days	27.43	30.85	0.566
60 Days / 20 Days	40.92	33.17	0.765
120 Days / 20 Days	31.60	29.23	0.690
240 Days / 20 Days	22.60	24.96	0.541
Midcap 100 Index	21.80	10.52	0.248

Table 3. Smallcap 100 with 25 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	26.62	13.94	0.247

10 Days / 5 Days	27.57	14.89	0.242
20 Days / 5 Days	34.30	13.57	0.327
60 Days / 5 Days	37.72	13.53	0.355
120 Days / 5 Days	33.26	13.23	0.325
5 Days / 10 Days	37.34	20.74	0.446
10 Days / 10 Days	34.00	20.89	0.409
20 Days / 10 Days	37.97	21.33	0.441
60 Days / 10 Days	41.72	19.83	0.508
120 Days / 10 Days	41.79	18.70	0.538
10 Days / 20 Days	26.18	31.81	0.522
20 Days / 20 Days	27.48	31.22	0.562
60 Days / 20 Days	34.11	29.61	0.732
120 Days / 20 Days	28.95	29.60	0.624
240 Days / 20 Days	25.24	26.31	0.596
Midcap 100 Index	21.80	10.52	0.248

Table 4. Smallcap 100 with 30 elements

Lookback / Holding Period	Annualised return (%)	Ann Risk (%)	Sharpe Ratio
5 Days / 5 Days	24.50	12.97	0.239
10 Days / 5 Days	26.90	13.88	0.251
20 Days / 5 Days	30.08	12.75	0.306
60 Days / 5 Days	32.17	12.28	0.339
120 Days / 5 Days	28.00	11.98	0.301
5 Days / 10 Days	33.99	19.71	0.432
10 Days / 10 Days	32.28	19.92	0.408
20 Days / 10 Days	34.34	20.06	0.429
60 Days / 10 Days	38.86	19.48	0.489
120 Days / 10 Days	36.99	17.60	0.517
10 Days / 20 Days	24.64	29.94	0.513
20 Days / 20 Days	25.97	28.25	0.577
60 Days / 20 Days	34.79	30.12	0.733
120 Days / 20 Days	26.72	25.41	0.660
240 Days / 20 Days	22.26	23.99	0.550
Midcap 100 Index	21.80	10.52	0.248

Smallcap 100 Performance Images -> [Link Here](#)

For Smallcap 100 Index constituents we observe that Momentum strategy can outperform index returns in various combinations. We also find that best combinations with maximum Returns is for 120 days Lookback Period with 10 days Holding Period and 10 Number of Constituents. We observe that concentrated portfolio in Nifty Small Cap Index (Nifty 50) gives better risk

adjusted returns and with diversification by increasing index constituents decreases absolute returns.

53.1. Long term Nifty 50

Table 1. Nifty 50 with 10 elements

Lookback / Holding Period	Annualized return (%)	Ann Risk (%)	Sharpe Ratio
20 Days / 60 Days	6.63	15.80	-0.104
60 Days / 60 Days	12.73	11.01	0.071
120 Days / 60 Days	13.49	12.45	0.092
240 Days / 60 Days	12.01	10.75	0.049
60 Days / 120 Days	11.40	14.17	0.050
120 Days / 120 Days	15.53	13.92	0.336
240 Days / 120 Days	13.73	14.14	0.217
120 Days / 240 Days	16.45	15.60	0.544
240 Days / 240 Days	14.50	7.40	0.694
Nifty 50 Index	20.74	12.21	0.378

Table 1. Nifty 50 with 20 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	8.64	14.60	-0.040
60 Days / 60 Days	10.94	9.90	0.008
120 Days / 60 Days	10.07	9.79	-0.029
240 Days / 60 Days	13.01	8.72	0.088
60 Days / 120 Days	9.47	13.35	-0.129
120 Days / 120 Days	10.68	11.43	-0.032
240 Days / 120 Days	12.81	10.20	0.182
120 Days / 240 Days	12.50	12.05	0.200
240 Days / 240 Days	15.93	10.70	0.685
Nifty 50 Index	20.74	12.21	0.378

Table 1. Nifty 50 with 25 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	8.86	11.99	-0.057
60 Days / 60 Days	9.77	9.94	-0.041
120 Days / 60 Days	9.42	9.05	-0.067
240 Days / 60 Days	12.24	8.67	0.059
60 Days / 120 Days	8.63	12.81	-0.229
120 Days / 120 Days	10.44	9.62	-0.083
240 Days / 120 Days	12.44	9.58	0.149
120 Days / 240 Days	13.10	8.67	0.358
240 Days / 240 Days	15.09	8.72	0.695
Nifty 50 Index	20.74	12.21	0.378

Table 1. Nifty 50 with 30 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	8.70	11.19	-0.072
60 Days / 60 Days	9.78	8.00	-0.062
120 Days / 60 Days	9.05	9.20	-0.083
240 Days / 60 Days	11.52	8.25	0.028
60 Days / 120 Days	8.56	13.07	-0.229
120 Days / 120 Days	11.14	7.32	-0.016
240 Days / 120 Days	12.84	9.04	0.199
120 Days / 240 Days	12.79	7.43	0.340
240 Days / 240 Days	15.00	9.81	0.611
Nifty 50 Index	20.74	12.21	0.378

Nifty 50 Performance Images -> [Link Here](#)

For Nifty 50 Index constituents we observe that Momentum strategy underperforms index returns and is not able to outperform in any combinations. We also find that best combinations with maximum Annual returns is for 120 days Lookback Period with 240 days Holding Period and 10 Number of Constituents. We observe that concentrated portfolio in Nifty Large Cap Index (Nifty 50) gives better risk adjusted returns.

53.2. Long term Nifty Midcap 100

Table 1. Nifty Midcap 100 with 10 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	10.32	18.07	0.022
60 Days / 60 Days	17.90	14.64	0.170
120 Days / 60 Days	20.63	14.33	0.217
240 Days / 60 Days	20.25	13.69	0.217
60 Days / 120 Days	15.81	19.73	0.278
120 Days / 120 Days	22.80	19.19	0.534
240 Days / 120 Days	22.73	22.76	0.468
120 Days / 240 Days	20.97	22.79	0.652
240 Days / 240 Days	19.21	25.76	0.514
Midcap 100 Index	26.67	17.47	0.379

Table 1. Nifty Midcap 100 with 20 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	10.11	17.51	0.017
60 Days / 60 Days	12.97	12.37	0.077
120 Days / 60 Days	19.94	14.63	0.202
240 Days / 60 Days	20.60	12.59	0.236
60 Days / 120 Days	11.97	11.27	0.091
120 Days / 120 Days	19.91	20.15	0.422
240 Days / 120 Days	20.05	22.28	0.397
120 Days / 240 Days	17.15	17.62	0.546

240 Days / 240 Days	17.12	26.31	0.413
Midcap 100 Index	26.67	17.47	0.379

Table 1. Nifty Midcap 100 with 25 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	11.20	16.29	0.037
60 Days / 60 Days	13.45	12.42	0.090
120 Days / 60 Days	16.97	14.07	0.159
240 Days / 60 Days	20.39	12.58	0.232
60 Days / 120 Days	12.12	9.51	0.114
120 Days / 120 Days	17.66	18.07	0.370
240 Days / 120 Days	19.18	22.20	0.371
120 Days / 240 Days	18.70	20.62	0.578
240 Days / 240 Days	16.15	25.37	0.371
Midcap 100 Index	26.67	17.47	0.379

Table 1. Nifty Midcap 100 with 30 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	11.59	15.67	0.045
60 Days / 60 Days	11.89	12.43	0.048
120 Days / 60 Days	13.72	12.89	0.095
240 Days / 60 Days	17.93	12.23	0.192
60 Days / 120 Days	11.32	9.84	0.022
120 Days / 120 Days	15.20	14.55	0.301
240 Days / 120 Days	16.83	19.03	0.323
120 Days / 240 Days	18.25	17.65	0.625
240 Days / 240 Days	15.08	20.95	0.351
Midcap 100 Index	26.67	17.47	0.379

Midcap 100 Performance Images -> [Link Here](#)

For Midcap 100 Index constituents we observe that Momentum strategy can outperform index returns in certain combinations. We also find that best combinations with maximum Returns is for 120 days Lookback Period with 120 days Holding Period and 10 Number of Constituents. We observe that concentrated portfolio in Nifty Midcap Cap Index (Nifty 50) gives better risk adjusted returns and with diversification by increasing index constituents decreases absolute returns.

53.1. Long term Nifty Smallcap 100

Table 1. Nifty Smallcap 100 with 10 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	19.06	22.41	0.151
60 Days / 60 Days	28.06	26.94	0.204
120 Days / 60 Days	32.10	24.45	0.237
240 Days / 60 Days	31.16	24.70	0.229
60 Days / 120 Days	29.94	20.78	0.683

120 Days / 120 Days	25.40	35.82	0.392
240 Days / 120 Days	25.32	33.63	0.408
120 Days / 240 Days	32.04	41.20	0.678
240 Days / 240 Days	22.32	48.88	0.438
SmallCap 100 Index	21.80	10.52	0.248

Table 1. Nifty Smallcap 100 with 20 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	17.07	20.36	0.135
60 Days / 60 Days	31.95	19.83	0.273
120 Days / 60 Days	29.64	21.43	0.241
240 Days / 60 Days	23.28	20.66	0.198
60 Days / 120 Days	20.58	19.46	0.460
120 Days / 120 Days	30.25	34.11	0.470
240 Days / 120 Days	23.09	31.71	0.382
120 Days / 240 Days	28.51	35.59	0.674
240 Days / 240 Days	22.44	37.40	0.501
SmallCap 100 Index	21.80	10.52	0.248

Table 1. Nifty Smallcap 100 with 25 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	17.16	18.62	0.141
60 Days / 60 Days	23.52	17.08	0.226
120 Days / 60 Days	28.44	21.01	0.237
240 Days / 60 Days	25.80	19.36	0.229
60 Days / 120 Days	16.39	19.95	0.299
120 Days / 120 Days	28.49	35.37	0.436
240 Days / 120 Days	25.51	35.58	0.395
120 Days / 240 Days	27.19	35.05	0.649
240 Days / 240 Days	22.39	37.62	0.498
SmallCap 100 Index	21.80	10.52	0.248

Table 1. Nifty Smallcap 100 with 30 Elements

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
20 Days / 60 Days	16.63	18.39	0.135
60 Days / 60 Days	24.42	16.83	0.239
120 Days / 60 Days	25.12	18.96	0.226
240 Days / 60 Days	21.46	17.12	0.202
60 Days / 120 Days	20.15	22.64	0.397
120 Days / 120 Days	25.03	32.09	0.409
240 Days / 120 Days	20.60	31.33	0.336
120 Days / 240 Days	25.82	36.74	0.596
240 Days / 240 Days	22.05	36.58	0.497
SmallCap 100 Index	21.80	10.52	0.248

SmallCap 100 Performance Images -> [Link Here](#)

For Smallcap 100 Index constituents we observe that Momentum strategy can outperform index returns in various combinations. We also find that best combinations with maximum Returns is for 120 days Lookback Period with 10 days Holding Period and 10 Number of Constituents. We observe that concentrated portfolio in Nifty Small Cap Index (Nifty 50) gives better risk adjusted returns and with diversification by increasing index constituents decreases absolute returns.

54. Market Cap Allocation Optimization [Equity Asset Class]

Table 1. Marketcap Allocation

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
120 Days/240 Days	15.51	17.77	0.425
240 Days/240 Days	13.77	17.76	0.282
120 Days/120 Days	12.73	14.13	0.149
240 Days/120 Days	11.61	14.31	0.064
60 Days/120 Days	12.44	11.54	0.135
120 Days/60 Days	11.75	10.50	0.041
20 Days/60 Days	9.90	12.74	-0.014
240 Days/60 Days	12.48	10.66	0.065
60 Days/60 Days	13.07	11.98	0.081
10 Days/20 Days	25.97	11.98	0.394
120 Days/20 Days	19.22	10.23	0.294
20 Days/20 Days	21.54	12.58	0.295
240 Days/20 Days	18.89	9.96	0.291
60 Days/20 Days	26.34	10.74	0.443
10 Days/10 Days	20.63	10.42	0.239
120 Days/10 Days	16.85	9.43	0.176
20 Days/10 Days	20.40	11.41	0.216
5 Days/10 Days	17.36	10.67	0.169
60 Days/10 Days	22.73	9.77	0.294
10 Days/5 Days	18.23	13.55	0.093
120 Days/5 Days	12.00	13.54	0.019
20 Days/5 Days	16.56	14.15	0.074
5 Days/5 Days	16.18	12.86	0.075
60 Days/5 Days	15.03	14.30	0.057
SmallCap 100 Index	21.80	10.52	0.248
Midcap 100 Index	26.67	17.47	0.379
Nifty 50 Index	20.74	12.21	0.378

Market Cap Allocation Performance Images -> [Link Here](#)

For Equity Market cap Allocation optimization Momentum strategy underperforms index returns and is not able to outperform in any combinations. We also find that best combinations with maximum returns is for 60 days Lookback Period with 20 days Holding Period.

3. Asset Class Allocation Optimization

Table 1. Asset Class Allocation

Lookback / Holding Period	Annualized return (%)	Ann Risk	Sharpe Ratio
120 Days/240 Days	18.30	22.58	0.638
240 Days/240 Days	15.32	22.03	0.426
120 Days/120 Days	17.68	12.69	0.538
240 Days/120 Days	16.68	11.90	0.496
60 Days/120 Days	15.95	8.36	0.603
120 Days/60 Days	11.24	11.43	0.025
20 Days/60 Days	11.06	13.38	0.026
240 Days/60 Days	12.06	10.58	0.051
60 Days/60 Days	13.69	12.62	0.096
10 Days/20 Days	22.67	14.99	0.248
120 Days/20 Days	11.55	21.90	0.034
20 Days/20 Days	15.08	15.80	0.109
240 Days/20 Days	16.22	17.10	0.125
60 Days/20 Days	11.72	19.11	0.036
10 Days/10 Days	17.48	10.21	0.193
120 Days/10 Days	12.72	10.48	0.055
20 Days/10 Days	16.63	11.14	0.159
5 Days/10 Days	15.31	10.02	0.138
60 Days/10 Days	18.36	10.97	0.200
10 Days/5 Days	18.20	11.80	0.120
120 Days/5 Days	14.66	11.63	0.069
20 Days/5 Days	15.05	12.63	0.071
5 Days/5 Days	10.42	11.84	-0.013
60 Days/5 Days	16.33	12.16	0.092
SmallCap 100 Index	21.80	10.52	0.248
Midcap 100 Index	26.67	17.47	0.379
Nifty 50 Index	20.74	12.21	0.378

Asset Class Allocation Performance Images -> [Link Here](#)

For Asset Class Allocation Optimization we observe that Momentum strategy underperforms index returns and is not able to outperform in any combinations. We also find that best combinations with maximum Sharpe Ratio is for 10 days Lookback Period with 20 days Holding Period.

5. Results

We analyse the momentum factor on the daily data based momentum strategies on the themes of index constituent optimization and relative asset calls momentum on the liquid equity indices for the Indian markets.

As for the momentum factor based on daily data for index constituents are concerned we conclude that higher concentration (lower number index constituents) increases returns of basket. We also observe that for large cap index momentum factor is not able to outperform by index constituent selection. Momentum factor works for midcap and smallcap indices constituents where they are able to outperform respective index and are able to generate better risk

adjusted returns and higher sharpe ratios. This indicates that size factor enhances momentum factors performance..

We analysed market cap optimization and asset class allocation for momentum factor and Momentum strategy underperformed individual indices in terms of performance. This indicates that market cap optimization needs to be enhanced with inclusion of only midcap and small indices with other asset class.

6. Further work

There are established equity momentum strategies research across international markets, the implementation of our strategies on the Indian markets would help to provide insight to Indian market factor research. We find that momentum outperforms with small cap and mid cap index constituents, we can further research on baskets based on growth, value and quality factors to analyse performance for momentum and these factors.

We have used very basic implementation of momentum factor which is absolute return in lookback period, we can implement momentum factor with additional factor including other momentum indicators eg moving averages, relative strength etc. Efficacy of these individual factors can be analysed further

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