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The "alpha squeeze" in Indian large caps

Passive investing has gained at the expense of active funds in the US with investors withdrawing $269 billion from active U.S. equity strategies in CY2016. The growing efficiency of equity markets which has led to a reduction in discovery and exploitation of 'pricing errors' is the major reason for this phenomenon. In this note we show how the active management of Indian large cap stocks too is susceptible to this paradigm shift as Indian equity markets become more efficient. Specifically, we show that in recent years there is a very significant reduction in alpha generated by the Indian large cap active funds. Going forward, alpha generation by Indian fund managers will come from two sources: a) increasing allocation to small/microcap stocks; and b) investing in structurally strong businesses for very long term horizons.

Passive funds have gained at the expense of active funds in the US

Passive funds in the US have grown larger at the expense of active funds. As per Morningstar, during CY2016, passive funds in the US took in a record $505 billion while active funds experienced outflows of $340 billion of which $269 billion came from active U.S. equity strategies, which is more than double the exodus seen in 2008. The growing skepticism around the ability of active funds to consistently beat the markets is related to both technological advancement and the increasing capability of market participants. This phenomenon has meant that firms are increasingly trading with other expert professionals, all having the same information, talent and drive thus reducing the pricing errors that have traditionally allowed active investors to outperform.

The rise of market efficiency in India

The fact that the Indian market too is becoming increasingly efficient is evident from the analysis of the performance of Indian large cap funds vis-à-vis the BSE100 index. While the performance since Jan'91 showcases that at an aggregate level, the MF returns were able to beat the index returns across all time horizons, it hides an important fact. As compared to the pre-2010 period (Jan'91-Dec'09), in the post-2010 period (Jan'10-Feb'17), there is a significant reduction in the alpha produced by large cap mutual funds. It has fallen from approximately 4% to just 1% (on avg. basis) for 5 to 10 year holding horizon.

Large cap funds lack consistency to keep outperforming peers

Even for the best performing funds, the consistency of performance is extremely low. We show that over the last decade, from the large cap funds that were in the top quartile almost 45% mean revert to end up in bottom two quartiles (over 2007-16). This in turn implies that it would be extremely tough for the average large cap fund to beat the benchmark significantly and even for the ones that do, the sustainability of this performance is doubtful.

Investment Implications

With the large cap universe in India becoming more efficient on the back of increasing analyst coverage, the case for passive large cap funds becomes stronger. The midcap and small cap universe on the other hand hasn't seen a similar increase in analyst coverage. These findings imply that Indian asset managers seeking to generate alpha will have to turn one of the two following approaches to generate significant alpha: a) Increase allocation to midcap, small cap & microcap funds; and b) Invest in funds with a focus on structurally strong plays and for a long term horizon.

Large cap funds' alpha has reduced materially in the recent years*

Holding period		Annualized returns		
		Avg.	Med.	St.dev.
Overall period (Jan'91-Feb'17)				
1 year	Equity MFs	20.1%	14.3%	40%
	BSE100	14.7%	8.7%	33%
3 year	Equity MFs	15.6%	13.5%	19%
	BSE100	12.6%	9.7%	16%
5 year	Equity MFs	15.1%	12.9%	12%
	BSE100	12.7%	9.8%	12%
10 year	Equity MFs	16.5%	16.7%	5%
	BSE100	14.7%	15.7%	4%
Pre -2010 (Jan'91-Dec'09)				
1 year	Equity MFs	21.8%	18.6%	46%
	BSE100	15.3%	8.2%	37%
3 year	Equity MFs	17.4%	17.3%	23%
	BSE100	14.2%	10.0%	19%
5 year	Equity MFs	17.4%	14.5%	14%
	BSE100	14.3%	9.8%	14%
10 year	Equity MFs	17.4%	15.8%	7%
	BSE100	13.3%	14.7%	5%
Post-2010 (Jan'10-Feb'17): The "Alpha Squeeze"				
1 year	Equity MFs	16.6%	10.9%	23%
	BSE100	13.4%	9.2%	23%
3 year	Equity MFs	12.3%	11.5%	7%
	BSE100	9.7%	9.3%	7%
5 year	Equity MFs	11.8%	12.2%	5%
	BSE100	10.3%	9.9%	6%
10 year	Equity MFs	15.8%	17.0%	3%
	BSE100	15.8%	16.5%	4%

*Source: www.mutualfundindia.com, Ambit Capital Research. * All returns are shown NET of fees*

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Section 1: Passive funds have gained at the expense of active funds in the US

"If a statue is ever erected to honor the person who has done the most for American investors, the hands down choice should be Jack Bogle. For decades, Jack has urged investors to invest in ultra-low-cost index funds. In his crusade, he amassed only a tiny percentage of the wealth that has typically flowed to managers who have promised their investors large rewards while delivering them nothing"

- Warren Buffet, 2016 letter to shareholders

This quote by Warren Buffet and similar ones by the proponents of low cost index investing has become all too well known owing to the significant outperformance of passive funds as compared to actively managed funds in developed markets. As he mentions in his 2016 shareholder letter, Buffet estimates that investors have wasted close to $100 billion in the last decade trying to beat the market. Hedge funds, for instance, traditionally take a fee structure of "2 and 20," which means a 2% fixed fee in good years or bad in addition to 20% of profits. Buffett estimates that nearly two thirds of the gains achieved by the five funds-of-funds were pocketed by management. "As Gordon Gekko might have put it: "Fees never sleep," writes Buffett.

Mutual fund data provider firm Morningstar has recently provided data on how passive funds in the US have grown larger at the expense of active funds (https://goo.gl/XmSaOI).

Exhibit 1: US passive funds saw inflows at the expense of active funds in CY16

Asset class	Estimated net flows (Active)			Estimated net flows (Passive)		
	Dec'16 ($mn)	One year ($mn)	Assets ($bn)	Dec'16 ($mn)	One year ($mn)	Assets ($bn)
U.S. Equity	(23,043)	(263,790)	3,545	50,811	236,667	2,981
Sector Equity	(3,402)	(31,819)	371	5,696	33,781	410
International Equity	(8,181)	(59,800)	1,387	14,707	66,644	915
Allocation	(3,927)	(53,531)	1,157	(4,445)	(48)	59
Taxable Bond	1,830	46,327	2,272	12,769	147,755	910
Municipal Bond	(15,879)	26,280	603	1,611	6,773	28
Alternative	(2,943)	(7,169)	164	(1,465)	2,458	45
Commodities	118	3,366	26	(3,241)	10,745	62
All Long Term	**(55,425)**	**(340,137)**	**9,525**	**76,444**	**504,776**	**5,409**

Source: Morningstar Inc.

Morningstar shows that during CY2016, passive funds in the United States took in a record $505 billion, far outpacing the previous high-water mark of $423 billion set in 2014 and 2015's tally of $419 billion. Last year's inflows for passive funds were double the quantum in in 2007. Meanwhile, active funds experienced outflows of $340 billion in 2016, exceeding the $231 billion net withdrawals seen in 2015, and even higher than during the financial crisis year of 2008 when active funds saw outflows of $208 billion. Last year, investors made net withdrawals of $269 billion from active U.S. equity strategies, up sharply from $174 billion in 2015 and more than double the exodus seen in 2008. In fact, active U.S. equity funds haven't seen a calendar year of inflows since 2005. But the preference for passively managed strategies was broader than just U.S. equity funds in 2016. Index-tracking international-stock funds took in $67 billion while their active competitors saw outflows of $60 billion last year.

The growing scepticism around the ability of active funds to consistently beat the markets is related to both technological advancement and the increasing capability of market participants seen over the last few decades. Over the last 50 years, investment research has increased substantially. Today's leading securities firms have analysts covering multiple aspects of economy - company analysts, industry analysts, market analysts, commodities and foreign exchange experts, economists, etc. Instant communication via Bloomberg terminals and the internet ensure that all investors worldwide have immediate and equal access to information, analysis and insight.

Further regulations around the world have restricted preferential access i.e. any investment information made available to any investor must be simultaneously made available to all investors. This eliminates what was once the key active of some active investors: getting "the first call". With each firm increasingly trading with other expert professionals, all having the same information at the same time with the same computers and teams of experts having much the same talent and drive, the pricing errors have reduced, traditionally, the only way for active investors to outperform the market.

A brilliant article by American wealth guru Charles Ellis in the Financial Times (https://goo.gl/tMC6lt) highlighted the four phases of evolution of active investing in the US (see table below) clearly pointing out how in an increasingly professionalized market, it has become tough to ignore the costs associated with management fees.

Exhibit 2: Four phases of active investment evolution in the US

Phases	Investment paradigm
Phase one (1960-1980)	Active managers compete principally against individuals and conservative mutual funds and trust institutions. Results: 200 to 300 basis points of superior performance. Index funds get no attention.
Phase two (1980-2000)	Active managers ride a strong bull market, which pleases clients greatly, but can only achieve enough incremental performance to offset their costs and fees. Index funds get some attention.
Phase three (2000-2010)	Active managers no longer earn back all their operating costs and fees. Index funds experience increasing interest and demand. Switching from active management to indexing increases from a low base level.
Phase four (2010-2017)	Increasing numbers of active managers — particularly larger firms that must invest mostly in large capitalisation, widely owned stocks covered by many analysts and mostly correctly priced — underperform an almost completely professionalised market, with returns averaging only 7 per cent. Objective observers conclude that fees and other costs can no longer be dismissed as "inconsequential". Demand for low-cost indexing accelerates steadily.

Source: Financial Times

The unsustainability of high costs especially in funds with low prospects of materially outperforming peers and the benchmark is clear from his statement: "*Historically, most products and services that have commanded prices that produce unusually high profit margins in free, competitive markets have been unable to sustain their exceptional profitability. So far, active investing has been remarkably successful — for the active managers. But, the remarkable success of the business — as distinct from the profession — continues to attract more and better competitors, information and technologies. This makes superior returns ever harder to achieve*".

In the next section we analyse how the Indian large cap funds are positioned amidst this global shift in investment management away from active to passive.

Section 2: The rise of market efficiency in India

In our 14 Feb'17 note, '*The rise and rise of market efficiency*', our colleagues had highlighted how in the Indian markets BSE100 stocks have become much more efficient in the noughties as compared to the nineties. This was evidenced by the fact that: (1) the volatility of returns fell in the noughties as compared to the nineties; and (2) the noughties were characterized by a distinctly stronger correlation between stock price returns and EPS growth. Furthermore, we also highlighted that the Indian market's return profile also improved in the noughties with median returns improving and with the distribution of returns developing a fatter right tail (implying a higher probability of earning above-average returns).

The alpha for large cap funds in India has reduced significantly post 2010

Given this market backdrop, we decided to analyze to analyze the performance of Indian large cap funds vis-à-vis the appropriate benchmarks by using the following approach:

- We selected a total of 19 funds for our analysis mainly on the basis of the fund's stated mandate (large cap focus) and the benchmark chosen by the fund (BSE100/Nifty/Sensex). The source for the list of funds is www.mutualfundindia.com. Notably the number of funds is extremely limited before 2003. Also, given the list of funds contains those in existence today, **the data suffers from survivorship bias which biases the returns in favor of actively managed mutual funds.**
- To compare the mutual fund returns vs. benchmark (BSE100), we first determine a fund's returns by using the daily NAV data (implying that the figures are NET of fees) and then calculate the **median return** across these 19 funds.
- We then analyzed the return profiles over 1, 3, 5 and 10 year holding horizons and constructed a probability distribution for mutual funds and the BSE100 by rolling the data on a daily basis i.e. we calculated average and median returns for different holding horizons by moving forward the sample data by one day over the entire period (since Jan'91) available.

As can be seen in the exhibit below, if we take the entire period since the availability of data into account (Jan'91) it looks as if the MFs returns were able to beat the index returns across horizons.

Further, the observations shown in the Appendix of this note on page 11 (exhibits 15-18) also highlight that if one was to take the entire period since Jan'91 into account, the conclusion would be that mutual funds have a higher probability of beating the risk free rate of 8% over all the holding horizons.

On a risk adjusted basis (i.e. adjusting for volatility) however, the ten year returns are much better for the benchmark index!

Exhibit 3: Large Cap MFs underperform BSE100 on a risk adjusted basis over long term (analysis based on data from Jan'91- Feb'17)

	Rolling One year		Rolling Three year		Rolling Five year		Rolling Ten year	
	Equity MFs	BSE 100	Equity MFs	BSE 100	Equity MFs	BSE 100	Equity MFs	BSE 100
Average returns	20.1%	14.7%	15.6%	12.6%	15.1%	12.7%	16.5%	14.7%
Median returns	14.3%	8.7%	13.5%	9.7%	12.9%	9.8%	16.7%	15.7%
Standard deviation	40%	33%	19%	16%	12%	12%	5%	4%
Sharpe ratio (average)	0.30	0.20	0.40	0.29	0.59	0.41	1.57	1.55
Sharpe ratio (median)	0.16	0.02	0.29	0.11	0.41	0.16	1.59	1.78

Source: www.mutualfundindia.com, Ambit Capital Research. Note: There are 5431, 4929, 4455 and 3201 data points used to calculate the return parameters for 1, 3, 5 and 10 year holding horizons above.

Interestingly however, if we were to divide the entire period into two parts – i.e. pre 2010 and post 2010 periods (basis the ending date of the holding period) to clearly demarcate the period when equities did extremely well (on the back of the global equity rally of 2003-08 and the stimulus driven rally of 2009), we get some interesting insights:

- **Both on average returns and on median returns, the alpha produced by large cap mutual funds has clearly diminished in the post-2010 era**.
- Secondly, actively managed funds have reduced their standard deviation significantly to move it closer to that of the index in the post-2010 period.
- Thirdly, as we highlight in exhibits 19-26 in the Appendix (page 13), the probability of beating the risk free rate of 8% for the mutual funds and the BSE100 converged significantly for the ten year holding horizon in the post-2010 period. In fact, the BSE100 has a higher probability of beating the risk free rate (at 99%) vs. the mutual funds (at 97%) in the post-2010 period. This implies that **the alpha generation of actively managed mutual funds in India has fallen sharply in the last seven years.**

It is worth noting that at present very little large cap money is actually managed passively in India. The AUM of index funds and ETFs benchmarked to Nifty50/Nifty NEXT50/Nifty100/Sensex/BSE100 as a proportion of the total equity AUM in India is only 6.2%.

Exhibit 4: Large cap MFs enjoyed significant alpha over BSE100 in pre-2010 era…(analysis based on data from Jan'91-Dec'09)

	Rolling One year		Rolling Three year		Rolling Five year		Rolling Ten year	
	Equity MFs	BSE 100	Equity MFs	BSE 100	Equity MFs	BSE 100	Equity MFs	BSE 100
Average returns	21.8%	15.3%	17.4%	14.2%	17.4%	14.3%	17.4%	13.3%
Median returns	18.6%	8.2%	17.3%	10.0%	14.5%	9.8%	15.8%	14.7%
Standard deviation	46%	37%	23%	19%	14%	14%	7%	5%
Sharpe ratio (average)	0.30	0.20	0.41	0.33	0.65	0.45	1.32	1.12
Sharpe ratio (median)	0.23	0.01	0.40	0.11	0.45	0.13	1.10	1.40

Source: www.mutualfundindia.com, Ambit Capital Research. There are 3635, 3133, 2659 and 1405 data points used to calculate the return parameters for 1,3,5 and 10 year holding horizons above

Exhibit 5: …but this alpha diminished significantly in the post-2010 period (analysis based on data from Jan'10-Feb'17)

	Rolling One year		Rolling Three year		Rolling Five year		Rolling Ten year	
	Equity MFs	BSE 100	Equity MFs	BSE 100	Equity MFs	BSE 100	Equity MFs	BSE 100
Average returns	16.6%	13.4%	12.3%	9.7%	11.8%	10.3%	15.8%	15.8%
Median returns	10.9%	9.2%	11.5%	9.3%	12.2%	9.9%	17.0%	16.5%
Standard deviation	23%	23%	7%	7%	5%	6%	3%	4%
Sharpe ratio (average)	0.38	0.24	0.60	0.25	0.69	0.39	2.25	2.16
Sharpe ratio (median)	0.13	0.05	0.48	0.19	0.76	0.31	2.57	2.34

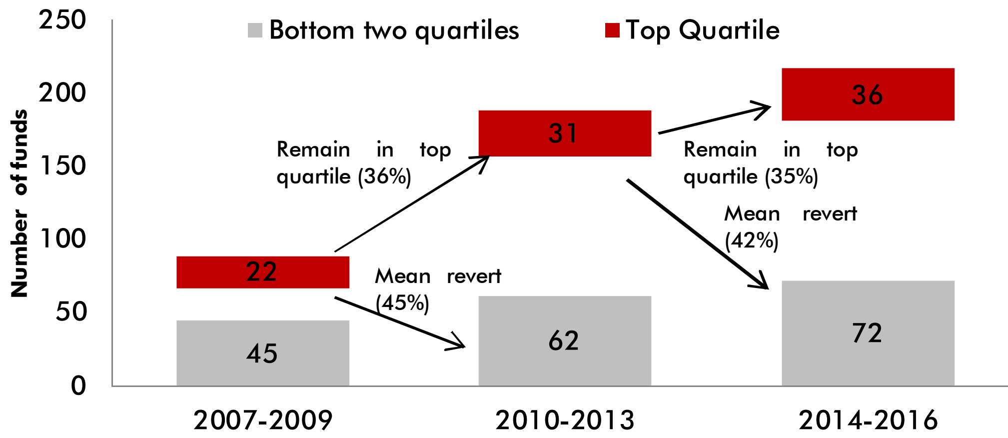
Source: www.mutualfundindia.com, Ambit Capital Research. There are 1796 data points used to calculate the return parameters for 1,3,5 and 10 year holding horizons above

The inability of the same mutual funds to consistently outperform

The problems for actively managed funds don't just end there. Even for the best performing funds, the consistency of performance is extremely low. As can be seen in the charts below, over the last decade, from the **large cap funds that were in the top quartile almost 45% mean revert to end up in bottom two quartiles** (over 2007-16).

In effect this means that it would be extremely tough for the average large cap fund to beat the benchmark significantly and even for the ones that do, the sustainability of this performance is doubtful.

Exhibit 6: Top performing Indian funds lack the consistency to keep outperforming peers

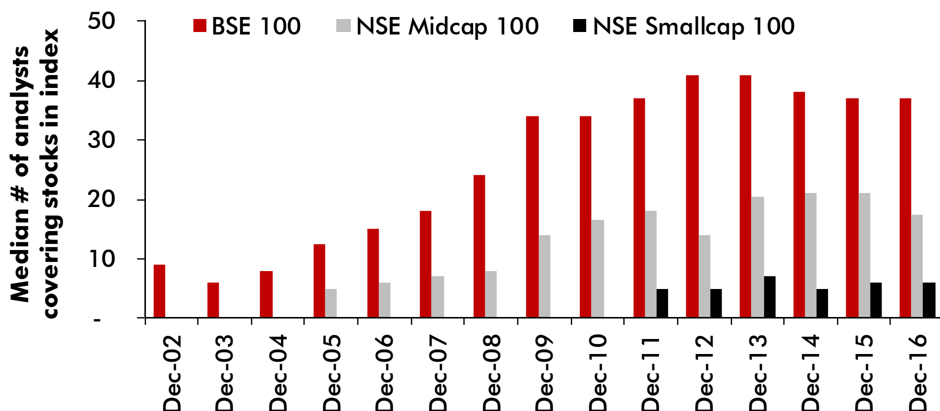


Source: *www.mutualfundindia.com, Ambit Capital*

Section 3: Investment implications

The results shown above and the insights from our 14 Feb'17 note suggest that with the Indian equity markets (comprising of large cap stocks in BSE100) becoming more efficient, the case for passive funds becomes stronger. The fact that our large cap stock prices have become more efficient limiting scope for exploiting pricing error is a direct consequence of a sharp increase in the analyst coverage for this universe (see chart below).

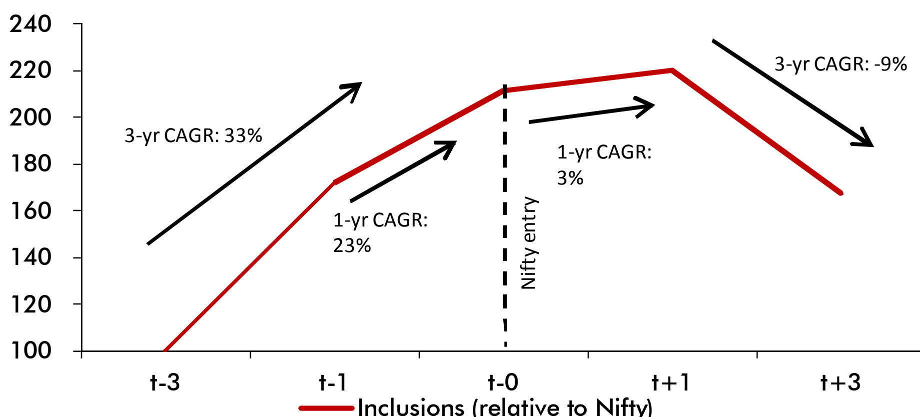
Exhibit 7: Analyst coverage increased significantly over last decade for large caps



Source: Bloomberg, Ambit Capital Research Note: The analyst coverage has been calculated for the index constituents as of 31 Dec of every year

The effect of a stock's discovery (proxied by inclusion in a benchmark index) on its returns cannot be better highlighted than in the chart below which calculates the returns for stocks (over 1 year and 3 years) before and after inclusion in the benchmark Nifty index.

Exhibit 8: Nifty stocks show lower returns post inclusion in the index

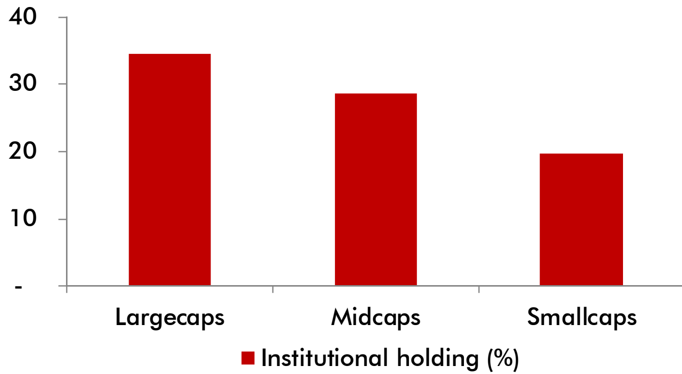


Source: Bloomberg, Ambit Capital Research Note: The data above calculates CAGR on a median basis for all Nifty inclusions since 1996

What the charts above essentially highlight is that **the potential for a stock to generate maximum alpha is before it becomes "discovered" by the Nifty**. As highlighted in the first section of this report, wide analyst coverage and wide institutional ownership is, ironically, a major negative for active managers seeking to beat benchmarks in the U.S. As the coverage for large cap stocks has increased, a similar phenomenon looks to be playing out for the Indian large cap funds as well.

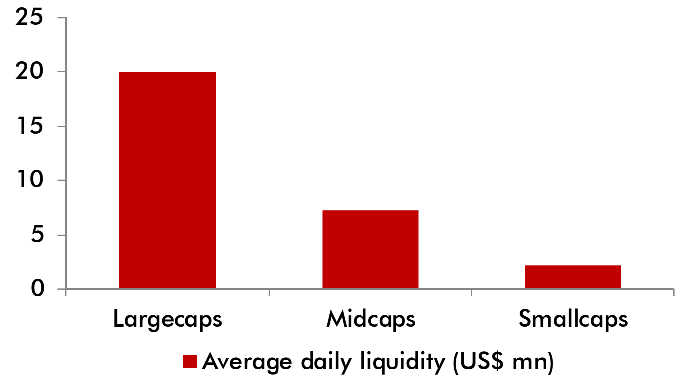
The midcap and small cap universe on the other hand hasn't really seen a similar increase in analyst coverage. For the small cap universe in fact, the coverage (on a median basis) has remained almost constant over the last six years. Further, these stocks also have lower institutional ownership thus making them relatively more liable to pricing errors.

Exhibit 9: Small caps have the lowest institutional holding...



Source: Capitaline, Ambit Capital Research Note: BSE100 index stocks classified as large caps, NSE midcap100 index stocks as midcap and NSE smallcap100 index stocks as small cap

Exhibit 10: ... and the lowest trading activity

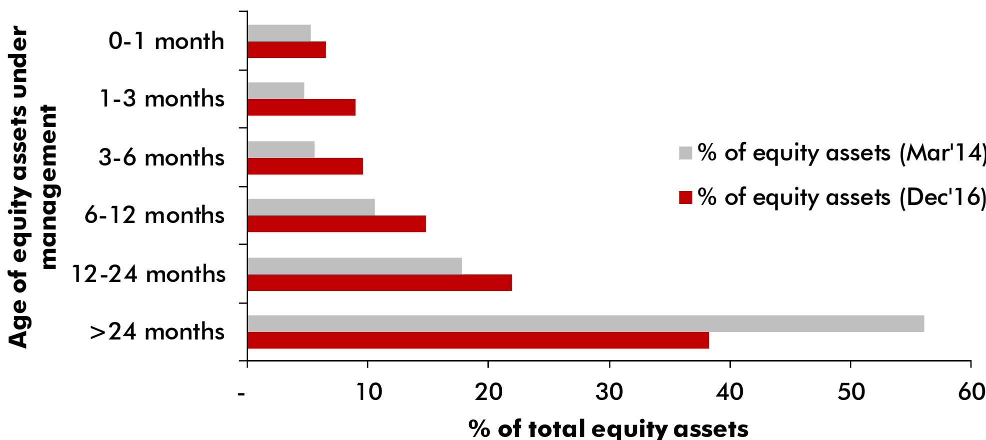


Source: Bloomberg, Ambit Capital Research. Note: BSE100 index stocks classified as large caps, NSE midcap100 index stocks as midcap and NSE smallcap100 index stocks as small cap

These findings imply that Indian asset managers seeking to generate alpha will have to turn one of the two following approaches to generate significant alpha:

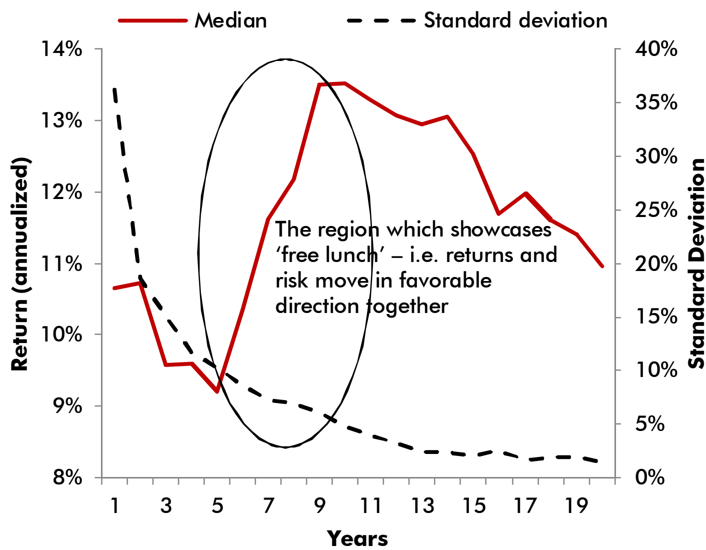
- Increase allocation to small cap & microcap funds to generate alpha. At present, only 36% of the equity AUM managed by Indian mutual funds is in small, mid & microcap funds.
- Invest in funds with a focus on fundamentally strong plays and for a long term horizon. As we showcased in our 25 Jan'17 dated note *'The Free lunch in Indian equities'*, the Sharpe ratio is maximized at around the 15 year holding horizon. Further, as can be seen in charts on the next page, between the 5-10 year horizons, the returns and standard deviation both move in favorable direction, thus enhancing risk adjusted returns. As per the data from the Association of Mutual Funds in India (AMFI), as compared to Mar'14 (last month available before 2014 general elections) when less than 44% of equity assets managed by Indian mutual funds were less than 2 years old, in Dec'16 the figure stood at 62%.

Exhibit 11: 62% of mutual funds equity assets are aged less than 2 years



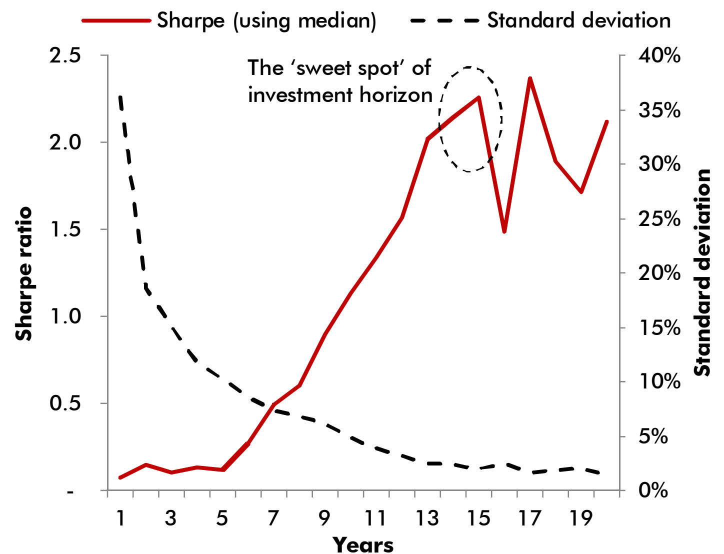
Source: AMFI

Exhibit 12: Risk decreases while returns increase between 5 and 10 year mark



Source: Bloomberg, Ambit Capital Research. Note: The returns have been computed on a daily rolling basis for the Nifty50 index since July 1990.In the computation, the returns were annualized before calculating the mean, median and standard deviation

Exhibit 13: Sweet spot of risk adjusted returns is reached around the fifteen year mark



Source: Bloomberg, Ambit Capital Research. Note: The returns have been computed on a daily rolling basis for the Nifty50 index since July 1990.In the computation, the returns were annualized before calculating the mean, median and standard deviation

The benefit of investing with a long term focus is also evident from the performance of our Coffee Can Portfolios which have consistently delivered alpha over the last 16 years.

Exhibit 14: Fifteen of the sixteen coffee can portfolios have generated alpha over the Sensex

Kick-off year*	CCP Value (start)	CCP Value (end)	CAGR return	Outperformance relative to Sensex
Completed portfolios				
2000	500	3,831	22.6%	6.6%
2001	600	9,802	32.2%	11.7%
2002	800	7,709	25.4%	5.1%
2003	900	10,175	27.4%	7.2%
2004	1,000	16,849	32.6%	12.7%
2005	900	6,643	22.1%	6.0%
2006	1,000	6,376	20.4%	9.0%
Incomplete portfolios#				
2007	1,500	7,765	18.5%	9.7%
2008	1,100	5,754	21.0%	10.1%
2009	1,100	5,052	21.9%	10.8%
2010	700	2,146	18.2%	9.0%
2011	1,400	2,616	11.6%	2.1%
2012	2,200	5,404	21.1%	8.0%
2013	1,800	4,972	31.7%	18.6%
2014	1,600	2,409	19.4%	16.6%
2015	2,000	2,410	14.8%	7.1%
2016	1,700	1,839	8.1%	-2.2%

Source: Ambit Capital Research, Bloomberg. Note: Returns have been computed on total returns basis implying dividends are reinvested on ex-dividend date, Returns for 10 year period for 2000-2006 (starting 30th June). CAGR returns for portfolios since 2007 until 07Mar'17 (except for 2016 which is our live portfolio launched in No'16 for which actual returns have been computed).

Appendix

As can be seen in the exhibits 15-18 below, the probability distribution constructed using the returns determined over the entire period since Jan'91 highlights that Mutual funds have higher instances of beating the risk free rate of 8% vs. the BSE100 index (calculate as 1- cum %).

Exhibit 15: Probability distribution of one year returns (analysis based on data from Jan'91 – Feb'17)

Return threshold	Return interval	Equity MFs - 1 Yr rolling returns (# obs)	BSE100 - 1 yr rolling returns (# obs)	Equity MFs - 1 Yr rolling returns (cum %)	BSE100 - 1 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-67%	<-0.67	24.0	-	0%	0%	100%	100%
-52%	-0.67 to -0.52	96	63	2%	1%	98%	99%
-37%	-0.52 to -0.37	130	107	5%	3%	95%	97%
-22%	-0.37 to -0.22	351	425	11%	11%	89%	89%
-7%	-0.22 to -0.07	634	750	23%	25%	77%	75%
8%	**-0.07 to 0.08**	**907**	**1,321**	**39%**	**49%**	**61%**	**51%**
23%	0.08 to 0.23	1,124	1,010	60%	67%	40%	33%
38%	0.23 to 0.38	710	585	73%	78%	27%	22%
53%	0.38 to 0.53	624	583	85%	89%	15%	11%
68%	0.53 to 0.68	300	223	90%	93%	10%	7%
83%	0.68 to 0.83	160	151	93%	95%	7%	5%
98%	0.83 to 0.98	178	153	96%	98%	4%	2%
113%	0.98 to 1.13	78	65	98%	99%	2%	1%
128%	1.13 to 1.28	32	18	98%	100%	2%	0%
143%	1.28 to 1.43	9	10	99%	100%	1%	0%
158%	1.43 to 1.58	4	5	99%	100%	1%	0%
173%	1.58 to 1.73	14	1	99%	100%	1%	0%
188%	1.73 to 1.88	21	1	99%	100%	1%	0%
203%	1.88 to 2.03	17	1	100%	100%	0%	0%
218%	2.03 to 2.18	15	1	100%	100%	0%	0%
233%	2.18 to 2.33	2	0	100%	100%	0%	0%
248%	2.33 to 2.48	1	1	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

Exhibit 16: Probability distribution of three year returns (analysis based on data from Jan'91 – feb'17)

Return threshold	Return interval	Equity MFs - 3 Yr rolling returns (# obs)	BSE100 - 3 yr rolling returns (# obs)	Equity MFs - 3 Yr rolling returns (cum % obs)	BSE100 - 3 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-22%	<-0.22	111.0	18.0	2%	0%	98%	100%
-7%	-0.22 to -0.07	327	322	9%	7%	91%	93%
8%	**-0.07 to 0.08**	**1,380**	**1,953**	**37%**	**46%**	**63%**	**54%**
23%	0.08 to 0.23	1,664	1,572	71%	78%	29%	22%
38%	0.23 to 0.38	743	576	86%	89%	14%	11%
53%	0.38 to 0.53	565	483	97%	99%	3%	1%
68%	0.53 to 0.68	114	44	99%	100%	1%	0%
83%	0.68 to 0.83	25	(0)	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

Exhibit 17: Probability distribution of five year returns (analysis based on data from Jan'91 – feb'17)

Return threshold	Return interval	Equity MFs - 5 Yr rolling returns (# obs)	BSE100 - 5 yr rolling returns (# obs)	Equity MFs - 5 Yr rolling returns (cum % obs)	BSE100 - 5 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-22%	<-0.22	-	-	0%	0%	100%	100%
-7%	-0.22 to -0.07	35	-	1%	0%	99%	100%
8%	**-0.07 to 0.08**	**1,327**	**1,899**	**31%**	**43%**	**69%**	**57%**
23%	0.08 to 0.23	2,236	1,823	81%	83%	19%	17%
38%	0.23 to 0.38	497	528	92%	95%	8%	5%
53%	0.38 to 0.53	360	214	100%	100%	0%	0%
68%	0.53 to 0.68	-	(0)	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

Exhibit 18: Probability distribution of ten year returns (analysis based on data from Jan'91 – feb'17)

Return threshold	Return interval	Equity MFs - 10 Yr rolling returns (# obs)	BSE100 - 10 yr rolling returns (# obs)	Equity MFs - 10 Yr rolling returns (cum % obs)	BSE100 - 10 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-17%	<-0.17	-	-	0%	0%	100%	100%
-12%	-0.17 to -0.12	-	-	0%	0%	100%	100%
-7%	-0.12 to -0.07	-	-	0%	0%	100%	100%
-2%	-0.07 to -0.02	22	-	1%	0%	99%	100%
3%	-0.02 to 0.03	20	19	1%	1%	99%	99%
8%	**0.03 to 0.08**	**89**	**276**	**4%**	**9%**	**96%**	**91%**
13%	0.08 to 0.13	634	653	24%	30%	76%	70%
18%	0.13 to 0.18	1,253	1,472	63%	75%	37%	25%
23%	0.18 to 0.23	835	785	89%	100%	11%	0%
28%	0.23 to 0.28	197	(1)	95%	100%	5%	0%
33%	0.28 to 0.33	151	(0)	100%	100%	0%	0%
38%	0.33 to 0.38	-	(0)	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

The results of pre-2010 period were a key reason for the high probability of mutual funds beating risks free rate vs. the BSE100 index as shown in exhibits below.

Exhibit 19: Probability distribution of one year returns (analysis based on data from Jan'91-Dec'09)

Return threshold	Return interval	Equity MFs - 1 Yr rolling returns (# obs)	BSE100 - 1 yr rolling returns (# obs)	Equity MFs - 1 Yr rolling returns (cum % obs)	BSE100 - 1 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-67%	<-0.67	24.0	-	1%	0%	99%	100%
-52%	-0.67 to -0.52	96	63	3%	2%	97%	98%
-37%	-0.52 to -0.37	130	107	7%	5%	93%	95%
-22%	-0.37 to -0.22	351	403	17%	16%	83%	84%
-7%	-0.22 to -0.07	468	510	29%	29%	71%	71%
8%	**-0.07 to 0.08**	**338**	**748**	**39%**	**50%**	**61%**	**50%**
23%	0.08 to 0.23	562	474	54%	63%	46%	37%
38%	0.23 to 0.38	476	345	67%	72%	33%	28%
53%	0.38 to 0.53	478	488	80%	85%	20%	15%
68%	0.53 to 0.68	263	208	88%	91%	12%	9%
83%	0.68 to 0.83	121	132	91%	95%	9%	5%
98%	0.83 to 0.98	147	117	95%	98%	5%	2%
113%	0.98 to 1.13	66	51	97%	99%	3%	1%
128%	1.13 to 1.28	32	12	98%	100%	2%	0%
143%	1.28 to 1.43	9	10	98%	100%	2%	0%
158%	1.43 to 1.58	4	5	98%	100%	2%	0%
173%	1.58 to 1.73	14	1	98%	100%	2%	0%
188%	1.73 to 1.88	21	1	99%	100%	1%	0%
203%	1.88 to 2.03	17	1	100%	100%	0%	0%
218%	2.03 to 2.18	15	1	100%	100%	0%	0%
233%	2.18 to 2.33	2	0	100%	100%	0%	0%
248%	2.33 to 2.48	1	1	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

Exhibit 20: Probability distribution of three year returns (analysis based on data from Jan'91-Dec'09)

Return threshold	Return interval	Equity MFs - 3 Yr rolling returns (# obs)	BSE100 - 3 yr rolling returns (# obs)	Equity MFs - 3 Yr rolling returns (cum % obs)	BSE100 - 3 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-22%	<-0.22	111.0	18.0	4%	1%	96%	99%
-7%	-0.22 to -0.07	327	321	14%	11%	86%	89%
8%	**-0.07 to 0.08**	**797**	**1,155**	**39%**	**47%**	**61%**	**53%**
23%	0.08 to 0.23	575	636	58%	67%	42%	33%
38%	0.23 to 0.38	619	516	78%	83%	22%	17%
53%	0.38 to 0.53	565	483	96%	99%	4%	1%
68%	0.53 to 0.68	114	44	99%	100%	1%	0%
83%	0.68 to 0.83	25	(0)	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

Exhibit 21: Probability distribution of five year returns (analysis based on data from Jan'91-Dec'09)

Return threshold	Return interval	Equity MFs - 5 Yr rolling returns(# obs)	BSE100 - 5 yr rolling returns(# obs)	Equity MFs - 5 Yr rolling returns (cum % obs)	BSE100 - 5 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-22%	<-0.22	-	-	0%	0%	100%	100%
-7%	-0.22 to -0.07	35	-	1%	0%	99%	100%
8%	**-0.07 to 0.08**	**830**	**1,197**	**33%**	**45%**	**67%**	**55%**
23%	0.08 to 0.23	945	734	68%	72%	32%	28%
38%	0.23 to 0.38	489	523	86%	92%	14%	8%
53%	0.38 to 0.53	360	214	100%	100%	0%	0%
68%	0.53 to 0.68	-	(0)	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

Exhibit 22: Probability distribution of ten year returns (analysis based on data from Jan'91-Dec'09)

Return threshold	Return interval	Equity MFs - 10 Yr rolling returns (# obs)	BSE100 - 10 yr rolling returns (# obs)	Equity MFs - 10 Yr rolling returns (cum % obs)	BSE100 - 10 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-17%	<-0.17	-	-	0%	0%	100%	100%
-12%	-0.17 to -0.12	-	-	0%	0%	100%	100%
-7%	-0.12 to -0.07	-	-	0%	0%	100%	100%
-2%	-0.07 to -0.02	21	-	1%	0%	99%	100%
3%	-0.02 to 0.03	9	19	2%	1%	98%	99%
8%	**0.03 to 0.08**	**43**	**254**	**5%**	**19%**	**95%**	**81%**
13%	0.08 to 0.13	322	256	28%	38%	72%	62%
18%	0.13 to 0.18	435	696	59%	87%	41%	13%
23%	0.18 to 0.23	230	184	75%	100%	25%	0%
28%	0.23 to 0.28	194	(0)	89%	100%	11%	0%
33%	0.28 to 0.33	151	(0)	100%	100%	0%	0%
38%	0.33 to 0.38	-	(0)	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

The post-2010 period however clearly showed convergence in the probabilities of mutual funds and BSE100 index beating the risk free rates as shown in exhibits below.

Exhibit 23: Probability distribution of one year returns (analysis based on data from Jan'10-Feb'17)

Return threshold	Return interval	Equity MFs - 1 Yr rolling returns (# obs)	BSE100 - 1 yr rolling returns (# obs)	Equity MFs - 1 Yr rolling returns (cum % obs)	BSE100 - 1 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-67%	<-0.67	-	-	0%	0%	100%	100%
-52%	-0.67 to -0.52	-	0	0%	0%	100%	100%
-37%	-0.52 to -0.37	-	0	0%	0%	100%	100%
-22%	-0.37 to -0.22	-	22	0%	1%	100%	99%
-7%	-0.22 to -0.07	166	240	9%	15%	91%	85%
8%	**-0.07 to 0.08**	**569**	**573**	**41%**	**47%**	**59%**	**53%**
23%	0.08 to 0.23	562	536	72%	76%	28%	24%
38%	0.23 to 0.38	234	240	85%	90%	15%	10%
53%	0.38 to 0.53	146	95	93%	95%	7%	5%
68%	0.53 to 0.68	37	15	95%	96%	5%	4%
83%	0.68 to 0.83	39	19	98%	97%	2%	3%
98%	0.83 to 0.98	31	36	99%	99%	1%	1%
113%	0.98 to 1.13	12	14	100%	100%	0%	0%
128%	1.13 to 1.28	-	6	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

Exhibit 24: Probability distribution of three year returns (analysis based on data from Jan'10-Feb'17)

Return threshold	Return interval	Equity MFs - 3 Yr rolling returns (# obs)	BSE100 - 3 yr rolling returns (# obs)	Equity MFs - 3 Yr rolling returns (cum % obs)	BSE100 - 3 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-22%	<-0.22	-	-	0%	0%	100%	100%
-7%	-0.22 to -0.07	-	1	0%	0%	100%	100%
8%	**-0.07 to 0.08**	**583**	**798**	**32%**	**44%**	**68%**	**56%**
23%	0.08 to 0.23	1,089	935	93%	97%	7%	3%
38%	0.23 to 0.38	124	60	100%	100%	0%	0%
53%	0.38 to 0.53	-	(0)	100%	100%	0%	0%
68%	0.53 to 0.68	-	0	100%	100%	0%	0%
83%	0.68 to 0.83	-	(0)	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

Exhibit 25: Probability distribution of five year returns (analysis based on data from Jan'10-Feb'17)

Return threshold	Return interval	Equity MFs - 5 Yr rolling returns (# obs)	BSE100 - 5 yr rolling returns (# obs)	Equity MFs - 5 Yr rolling returns (cum % obs)	BSE100 - 5 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-22%	<-0.22	-	-	0%	0%	100%	100%
-7%	-0.22 to -0.07	-	-	0%	0%	100%	100%
8%	**-0.07 to 0.08**	**497**	**702**	**28%**	**39%**	**72%**	**61%**
23%	0.08 to 0.23	1,291	1,088	100%	100%	0%	0%
38%	0.23 to 0.38	8	4	100%	100%	0%	0%
53%	0.38 to 0.53	-	(0)	100%	100%	0%	0%
68%	0.53 to 0.68	-	0	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

Exhibit 26: Probability distribution of ten year returns (analysis based on data from Jan'10-Feb'17)

Return threshold	Return interval	Equity MFs - 10 Yr rolling returns (# obs)	BSE100 - 10 yr rolling returns (# obs)	Equity MFs - 10 Yr rolling returns (cum % obs)	BSE100 - 10 yr rolling returns (cum % obs)	Equity MFs (prob of beating return threshold)	BSE100 - (prob of beating return threshold)
-17%	<-0.17	-	-	0%	0%	100%	100%
-12%	-0.17 to -0.12	-	-	0%	0%	100%	100%
-7%	-0.12 to -0.07	-	-	0%	0%	100%	100%
-2%	-0.07 to -0.02	1	-	0%	0%	100%	100%
3%	-0.02 to 0.03	11	(0)	1%	0%	99%	100%
8%	**0.03 to 0.08**	**46**	**22**	**3%**	**1%**	**97%**	**99%**
13%	0.08 to 0.13	312	397	21%	23%	79%	77%
18%	0.13 to 0.18	818	776	66%	67%	34%	33%
23%	0.18 to 0.23	605	600	100%	100%	0%	0%
28%	0.23 to 0.28	3	(1)	100%	100%	0%	0%
33%	0.28 to 0.33	-	(0)	100%	100%	0%	0%
38%	0.33 to 0.38	-	0	100%	100%	0%	0%

Source: www.mutualfundindia.com, Ambit Capital

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