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## Article

# Mutual fund performance in changing economic conditions: Evidence from an emerging economy

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## FINANCIAL ECONOMICS | RESEARCH ARTICLE

# Mutual fund performance in changing economic conditions: Evidence from an emerging economy

Pankaj K Agarwal<sup>1\*</sup> and H. K. Pradhan<sup>2</sup>

**Abstract:** Traditional measures of assessment of mutual fund performance (alpha) are based mostly on Capital Assets Pricing Model which presupposes fixed sensitivity of risk exposure of a fund to its market proxy (beta). However, changing economic conditions will alter this relationship. In conditional performance evaluation, the betas as well as alphas are allowed to vary in response to changing economic conditions over time. We hypothesize that true skill in fund management goes beyond altering the portfolio in response to changes in macroeconomic indicators. Therefore, this study examines the existence of superior performance of open-ended equity mutual funds in India in a conditional setting. We use a survivorship-bias-free database including all schemes since inception (2006–2015). We find evidence of selectivity and timing skills by the Indian fund managers even after controlling for changing macroeconomic variables. The evidence is weaker on aggregate basis than at fund level.

**Subjects:** Economics; Finance; Business, Management and Accounting

**Keywords:** Mutual fund performance; asset pricing; selectivity; timing; conditional; Portfolio

**JEL Code:** G11; G12



Pankaj K Agarwal

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### PUBLIC INTEREST STATEMENT

Retail investors in India are increasingly choosing mutual funds. Since they will end up paying fees to the fund manager, it is important to be sure if their fund manager does what they cannot. In other words, is their fund manager skilled enough to generate better returns than a well-read lay investor? This paper probes this and finds that in India, fund manager appear to reasonably have ability to identify good stocks for their portfolio. In addition, fund managers should be able to anticipate changing market direction and accordingly change his portfolio suitably. The study finds that this ability of fund managers to time the market is weak.

Some other byproducts of this study are that fund returns have been driven by small stocks. Also, buying in March and selling in April seems to be profitable in Indian stock markets. But chasing winning stocks appears to be a losing proposition.

## 1. Introduction

One of the holy grails of finance is the measurement of true skill in mutual fund performance. Traditional methods of assessment of mutual fund performance (alpha) are based mostly on Capital Assets Pricing Model (CAPM) which presupposes fixed sensitivity of risk exposure of a fund to the market proxy (beta). The estimate of alpha from CAPM-based models is essentially computed as excess of average returns from an asset over average returns from a naïve beta-weighted portfolio of risk-free security and a market index. It is easy to see that positive alphas may result at times if beta and markets index returns have suitably undergone a natural variation over time. Such positive alphas, of course, cannot be interpreted as an evidence of stock selection skill. In a like manner, biased estimates of market timing ability may also be produced by CAPM-based models. Therefore, there is a clear possibility that common time-variation in risks and risk premia is confused with “performance” in evaluation of mutual funds. This problem of confounding variation in mutual fund risks and risk premia has been acknowledged in many early empirical studies (e.g. Jensen, 1972; Grant, 1977; Ferson and Schadt, 1996).

To overcome this issue, conditional performance evaluation (CPE) framework proposes that superior skill (stock selection and market timing) does not consist in creating a managed portfolio which can be replicated using publicly available information. After all, mutual fund managers of “active” schemes are supposed to possess information not available publicly and use it to deliver superior performance. Returns earned based on information available publicly, therefore, cannot be a true measure of skill, as this strategy can easily be replicated by the investor herself. In CPE framework, the presence of stock selection and market timing ability is examined only after variation in returns caused by public information has been controlled for. This is achieved by using instruments like pre-determined macro-economic variables in the right-hand side of the CAPM equation (Christopherson, Ferson, & Glassman, 1998; Gregoriou, 2003). This procedure decomposes total returns into one that could be earned from a strategy of creating managed portfolio based on publicly available information on macro-economic variables; and a remainder. A positive remainder indicates that the fund manager might have been acting on some information not available publicly. This superior information translates into stock selection and market timing ability and gives rise to superior performance. This procedure reduces the biases in inferences made out of CAPM-based measures of performance.

Specifically, the CPE framework offers two distinct improvements over traditional CAPM-based performance measurement approach. For one, traditional measures suffer from a number of biases due to their inability to accommodate dynamic behavior of returns. Second, it is quite possible that the managers’ trading behavior leads to even more complex dynamics of returns than those of stocks they trade (Ferson & Schadt, 1996). In addition, the CPE framework is consistent with semi-strong form of market efficiency (Fama, 1970). In CPE, the betas as well as alphas are allowed to vary in response to changing economic states or news over time (Ferson & Schadt, 1996).

In this study, we aim to identify and probe the sources and genesis of performance of open-ended equity mutual funds in India, allowing for changing economic conditions, using CPE framework of Ferson and Schadt (1996). We specifically examine the following:

- Fund managers of mutual funds in India exhibit stock selection skills. They display an ability to identify stocks that are not trading at correct valuations to their fair value. The mutual fund managers can therefore identify under-valued and over-valued stocks and invest/divest in them to earn superior returns for their funds.<sup>1</sup>
- Fund managers in India exhibit market timing ability. They anticipate changes in overall market movement correctly and take positions accordingly. They increase beta of their mutual fund portfolio when they foresee an upswing in the market and reduce beta when a downturn is around the corner.<sup>2</sup>

- The stock selection and market timing ability of the mutual funds co-exist, i.e., the presence of one does or doesn't mean the absence of another (Kon, 1983; Henriksson, 1984; Jagannathan & Korajczyk, 1986; Gregoriou, 2003).

These questions have been examined before in CPE framework in developed markets. However, the evidence is sparse in emerging markets context, particularly in India. To our knowledge, there have only been a few studies which have examined mutual fund performance in CPE framework in India (e.g. Deb, Banerjee, & Chakrabarti, 2007; Dhar & Mandal, 2014). However, these studies do not use the full conditional model where alphas as well as betas both are allowed time-variation. The estimation procedure adopted by the previous studies does not take care of the presence of heteroscedasticity and autocorrelation. In addition, the database used by the previous studies is not free of survivorship bias, as they consider the funds that exist only at the end of estimation period.

Our paper not only addresses the above issues, but contributes to the existing literature in a number of important ways with implications for investment management fees and the retail investors. First, we report the evidence of positive selection ability in a rigorous framework in line with the findings in the international studies. However, our findings on market timing contrast international evidence, except in full specification of the model including Fama–French–Carhart (FFC) factors. At fund level, we find evidence for positive market timing. We also contribute new evidence for the presence of anomalies like Size effect, Momentum effect, and April effect in Indian stock markets. Our findings are likely to be useful for the regulators, the asset management companies (AMCs) as well as the fund managers.

We also aim to bring forth evidence from an emerging market like India without losing the methodological rigor of developed market studies so that results can be compared and contrasted. Stock markets in emerging economies are characterized by many common denominators like lower level of institutional development and slower processing of economic information in markets (Morck, Yeung, & Yu, 2000). We expect the findings of the present study to be useful for other emerging economies as well.

The paper is structured as follows: Section 2 surveys the extant literature on theoretical and empirical dimensions. Section 3 describes creation of database for the study and provides the data sources. Section 4 describes models, estimation procedure and discusses results. Section 5 provides conclusions and implications of the study.

### **1.1. Indian mutual funds industry**

Started in 1963, the Indian mutual fund industry has come a long way. At the end of February 2018, there are 45 fund houses in India offering over 1,900 schemes.<sup>3</sup> The assets under management (AUM) was to the tune of INR 23.17<sup>4</sup> Trillion (USD 3,544 billion), growing at a CAGR in excess of 20% for last 15 years. As against global AUM/GDP ratio of over 50%, India lags behind at under 10%. In the wake of currency demonetization of 2016, leading to a structural shift in saving behavior, the mutual fund sector in India has witnessed sharp surge in individual investor participation.

The growth of mutual funds and the recent trend of increasing individual investor participation point towards increasing financialization of savings by the Indian investors. It is likely that this trend will persist in near to medium term. This growth has been aided by efforts of industry watchdog; the Securities and Exchanges Board of India (SEBI) and the industry self-regulatory organization; the Association of Mutual Funds of India (AMFI); who have been offering incentives to fund houses to reach smaller towns and are educating the hitherto uninitiated. Now the question arises whether this increasing interest and trust of individual investors in mutual funds; aided by structural nudges like demonetization; is misplaced? It merits examination whether the fund managers' have the ability to deliver superior returns over and above what could be earned by

**Table 1. AUM investor type-wise ownership trends in Indian mutual funds sector**

Year	AUM (INR trillion)	No. of folios (million)	% Ownership							
			Corporates		Banks/financial institutions		Foreign institutional investors		Individuals	
			AUM	Folios	AUM	Folios	AUM	Folios	AUM	Folios
2009–2010	6.15	47.96	50.99	0.79	2.95	0.01	0.83	0.00	45.23	99.21
2010–2011	5.97	47.23	44.18	0.83	4.39	0.03	0.50	0.00	50.92	99.15
2011–2012	5.88	46.45	43.10	0.92	2.26	0.01	0.69	0.00	53.95	99.08
2012–2013	7.02	42.83	46.24	1.13	2.40	0.01	0.74	0.00	50.62	98.26
2013–2014	8.25	39.55	48.71	0.93	1.91	0.01	0.88	0.00	48.49	99.07
2014–2015	10.83	41.74	45.95	0.87	1.15	0.01	1.39	0.00	51.51	99.12
2015–2016	12.33	47.66	46.95	0.97	1.21	0.01	0.85	0.00	50.99	99.03
2016–2017	17.55	55.40	48.04	1.03	1.50	0.01	0.72	0.00	49.74	98.97
2017–2018	21.36	71.35	43.44	0.57	1.06	0.01	0.63	0.00	54.88	99.43

Table 1 shows the changing ownership pattern in Indian MF sector in recent years as per type of investors on both AUM and number of accounts (folios).

Source: Economic Outlook Database, Centre for Monitoring Indian Economy.

investor herself by directly investing in equity markets, or index funds, for example. This is one of the important motivations for undertaking the present study.

## 2. Literature review

### 2.1. Theoretical framework

Performance evaluation of mutual funds has come a long way from the early CAPM-based single-factor approach by (Sharpe, 1964; Lintner, 1965; Mossin, 1966; Jensen, 1968), to Arbitrage Pricing Theory by Ross (1976); and to multi-factor approaches by (Connor & Korajczyk, 1986; Lehmann & Modest, 1987).

An issue with these models of performance evaluation is that they assume a constant non-changing state of the broad financial market or the general economy. They postulate that the only hurdle a portfolio has to surpass to exhibit superior performance is a premium for risk arising out of a chosen benchmark. The resultant alpha, therefore, is not a measure of superior performance but is also composed of risk premiums due to other economic risk factors (Ferson & Schadt, 1996). The true measure of superior performance or ability therefore can be obtained when adjustments for other economic risk factors are made. This reasoning is in accordance with semi-strong form of market efficiency proposed by Fama (1970) which postulates that stock returns reflect the publicly available information.

Accordingly, a conditional version of CAPM was mooted by Maddala (1977) and further extended by Shanken (1990) and Cochrane and Saa-Requejo (1996) and was later advocated by Chen and Knez (1996) and Ferson and Schadt (1996) who took into account changing economic conditions in their models. The asset pricing models based on conditional betas do a better job of explaining cross section of returns than their unconditional counterparts (Chan & Chen, 1988; Cochrane, 1992; Jagannathan & Wang, 1996). In CPE models, it is assumed that information on various economic factors affecting portfolio returns is available publicly. A fund manager can act upon anticipated changes in states of economy and alter the risk of portfolio to her advantage. Although portfolio turnover can lead to outperformance or underperformance of outcomes (Chou, Huang, & Lai, 2016), the only skill needed here will be macro-economic literacy which is not what fund managers get paid for as it can be replicated by investors too.

Controlling for public information on macro-economy, Ferson and Schadt (1996) provide the following mathematical expression of mutual fund performance. Their specification for unconditional CAPM can be written as:

$$R_{pt} = \alpha_p + \beta_p R_{mt} + u_{pt} \quad (1)$$

when betas are made conditional, then they can be written as:

$$\beta_p(Z_{t-1}) = \beta_{0p} + \beta'_p Z_{t-1} \quad (2)$$

where  $Z_{t-1}$  = a vector of lagged economic instruments

$z_{t-1}$  = a vector obtained from  $Z_{t-1} - E(Z)$

$E(Z)$  = unconditional average values of economic instruments

$\beta'_p$  = response of conditional betas to economic instruments

$\beta_{0p}$  = Average beta

when both the above equations are conjugated, we get:

$$R_{it} = \alpha_i + \beta_{0p}R_{mt} + \beta'_p(Z_{t-1}R_{mt}) + u_{pt} \quad (3)$$

$$E(u_{pt}|Z_{t-1}) = 0 \quad (4)$$

$$E(u_{pt}, r_{mt}|Z_{t-1}) = 0 \quad (5)$$

Christopherson et al. (1998) propose that even alphas can be made conditional on a set of lagged variables. If the fund manager does not possess superior information except the publicly available information on macroeconomic variables, then conditional alpha should be zero. The unconditional alpha can be decomposed to find out if there is evidence of superior returns, given  $Z_t$ .

$$A_p(Z_t) = \alpha_{p0} + \alpha_{p1}(Z_t) \quad (6)$$

So, a full conditional model will have both alphas and betas conditional upon information variables.

Here, the conditioning variables  $Z_t$  are defined and modified for India are:

$Z_1$  = one month T-bill yield lagged by one period.

$Z_2$  = dividend yield on value weighted S&P CNX Nifty on National Stock Exchange.

$Z_3$  = term structure of interest rate slope lagged by one period.

$Z_4$  = a dummy variable for beginning of the financial year, that is, month of April.

$Z_5$  = lagged quality spread (difference between BAA and AAA bond yields)

$Z_6$  = lagged foreign exchange yield

Based on the above definitions, the unconditional version of models of market timing can be modified into conditional ones as foregoing

Treynor and Mazuy (1966) (TM) propose that timing will induce curvature in the characteristic line drawn by plotting fund excess returns against market index excess return. Curvature will result because successful timer will increase the fund volatility if market is expected to move up and will decrease it if he expects market to go down. As a result, slope of the characteristic line will increase in up-market conditions and decrease in a bearish market. The presence of curvature can be captured by adding a squared excess market return term to the basic CAPM. This squared term shall magnify the returns both when market moves up or down. The model specification is given as under:

$$\text{Unconditional} \quad R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma R_{mt}^2 + e_{pt} \quad (7)$$

$$\text{Conditional} \quad R_{pt} = \alpha_0 + \alpha'_p Z_{t-1} + \beta_0 + \beta'_p Z_{t-1} R_{mt} + \gamma R_{mt}^2 + e_{pt} \quad (8)$$

With  $R_{mt} = R_{Mt} - R_{Ft}$ ,  $R_{pt} = R_{Pt} - R_{Ft}$  and  $\gamma$  = market timing

Henriksson & Merton (1981) (HM) formulate forecasts of market timing as forecasts whether the market return ( $R_M$ ) exceeds risk-free rate of return ( $R_F$ ). Accordingly, the timer will have two target betas for the possibilities  $R_M > R_F$ , and for  $R_M \leq R_F$ . So, the Henriksson–Merton (1981) model can be specified as:



$$\text{Unconditional} \quad R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma CR_{mt} + e_{pt} \quad (9)$$

$$\text{Conditional} \quad R_{pt} = \alpha_0 + \alpha'_p z_{t-1} + \beta_0 + \beta'_p z_{t-1} R_{mt} + \gamma(C) R_{mt} + e_{pt} \quad (10)$$

In this equation, C is a dummy variable that takes on two values.

$$\begin{cases} 1, & \text{if } R_{mt} > 0 \text{ (Up Market)} \\ 0 & \text{Otherwise (Down Market)} \end{cases}$$

TM and HM are commonly used return-based timing models (Agarwal, Jiang, Tang, & Yang, 2010). Further refinements to these specifications were proposed by Becker, Ferson, Myers, and Schill (1999) who use the models for benchmark investors. Chen et al (2009) also control for non-timing-related sources of non-linearity in these models. Effect of such refinements can be properly examined after inferences from a study like ours are available, therefore, we do not incorporate them here. Further, we have assumed a linear functional form for time-varying betas with information variables. This assumption of linearity requires further research to be conclusively established.

## 2.2. Previous empirical results

Models such as HM and TM are extensions of basic CAPM equation. The right-hand sides of Equations 7 and 9 above invariably contain a CAPM component and an additional one capturing market timing. However, it is well documented in research now that empirical testing of CAPM results in a “too-flat” security market line. On the other hand, the three-factor and four-factor models proposed by Fama & French (1992) and Carhart (1997) have been shown to explain common variation in asset returns better than CAPM. Since investment styles differ greatly across funds and schemes, using a single-factor CAPM model in the presence of variety of investment styles may lead to biased estimates. Further, the equity funds are exposed to varying degrees of stock-market capitalization, book-to-market ratio and momentum because their constituent stocks, which are well documented. FFC factors have been empirically found relevant in explaining cross-section of returns by controlling for size, book-to-market and momentum. If these factors are incorporated into estimation models, important insights into the type of stocks the funds are using are also likely to uncover while simultaneously identifying the appropriate return hurdle for them. Fama and French added two more factors to their three-factor model (Fama & French, 2015), namely Profitability and Investment. However, the fund management industry appears to be unsure about its usefulness yet.<sup>5</sup> Therefore, we propose to include both Fama–French three-factor model as well as Carhart four-factor model as regressors in the above models (Leite & Cortez, 2009; Busse, Jiang, & Tang, 2017).

The conditional versions of HM and TM models have been extensively tested in the developed markets.<sup>6</sup> Ferson and Schadt (1996) studied 67 US open-ended US equity mutual funds and find that risk exposures change with public information variables in an economically and statistically significant manner. They find that conditional alphas, unlike unconditional ones, are skewed to the right and clustered at zero. They attribute inferior performance of mutual fund managers shown by unconditional models to the covariance between mutual fund betas and conditional expected market return. Timing and selectivity performance improves once this covariance is controlled for the conditional models with public information variables. Improved alpha under conditional models is also reported by Kryzanowski, Lalancette, and To (1997) using data on Canadian funds. They propose a conditional version of APT and find evidence that the perverse timing ability shown by unconditional models is reduced in case of conditional models.

Why do the conditional measures show better performance? Ferson and Warther (1996) explain that new money flows into funds when higher returns are expected from the market. The increased cash brings down the performance as measured by unconditional models, but not by conditional ones.

Most of the unconditional measures of market timing have reported mixed and absent or perverse (negative) timing (Chang & Lewellen (1984), Chen and Stockum (1986), Lee and Rahman (1990), Kao, Cheng, and Chan (1998). Although most of the early studies report negative market timing, a few reporting positive market timing are Daniel et al. and Wermers (1997), Busse (1999) and Becker et al. (1999). The absence of market timing ability raises many questions. First, if market timing ability is non-existent, how do numerous Asset Allocation Funds exist? Also, the relationship between fund excess returns and benchmark excess returns should exhibit non-linearity (curvature) because of several reasons like the presence of derivatives in portfolio and trading due to public information. So, the conjecture is that market timing does exist but the unconditional models were unable to capture it. Also, if perverse timing ability prevails, it could very well be utilized by traders systematically. Ferson and Schadt (1996) show that unconditional models of market timings (HM and TM) are mis-specified and therefore indicate perverse timing ability, which is removed with conditional versions of these models. Gregoriou (2002) also reports similar findings.

Studies on CPE on emerging markets are sparse. Leite and Cortez (2009) use conditional multi-factor models to report the absence of timing ability in Portuguese funds. Rosero and Sedano (2012) examine Columbian mutual fund performance in conditional setting but find that results are hardly different from those from unconditional models. However, they do not study market timing. We do not find any other studies employing CPE in emerging markets.

Conditional CAPM was studied by Narasimhan and Pradhan (2003) for the first time on Indian equities. In case of Indian mutual funds, Roy and Deb (2003), Roy (2016) and Kumar (2016) report evidence for selectivity and weak evidence for market timing. Deb et al. (2007) test conditional models of market timing along with unconditional ones and report the presence of selectivity and negative market timing. However their study uses 96 funds existing throughout the study period and therefore suffers from survivorship bias which might have overestimated selection ability in their analysis. The study by Dhar and Mandal (2014) also suffers from survivorship bias. In addition, none of these studies seem to have employed the full conditional model where alphas have also been allowed to vary with time.

### 3. Data

#### 3.1. Sample data<sup>7</sup>

The present study uses Indian open-ended equity mutual funds with growth option for a total of nine-year period starting April 2006 till March 2015.<sup>8</sup> The funds considered here belonged to 44 mutual fund houses that are in existence in India during this period. The total number of open-ended diversified equity mutual fund schemes that existed ever during the sample period is 240. In order to control for survivorship bias, all the funds that existed during the sample period were included, irrespective of their survival. This resulted in 2,259 days of data of 240 funds, equivalent to 542,160 gross fund days of data, which to our knowledge is the largest dataset ever used in the Indian mutual fund evaluation studies. The funds' daily NAVs database, obtained from the AMFI, was converted into a monthly data of returns that produced 108 months of NAV data for 240 schemes, resulting in 25,920 funds-months data.

#### 3.2. Survivorship bias

An important aspect of recent literature on mutual fund performance in developed countries is concerned with the use of data free of survivorship bias. This bias crops up when researcher uses the funds existing only at the end of estimation period and leads to larger estimates (Brown, Goetzmann, & Ross, 1992). Agarwal and Pradhan (2018) were perhaps the first to use a survivorship-bias-free database on Indian mutual funds. We use the survivorship-bias-free database following the computations of Agarwal and Pradhan (2018) in this study (Table 2).

Although the extent of survivorship bias is about 1.3% per annum, the bias appears economically large enough to lead to incorrect inferences from the results of performance evaluation studies.

**Table 2. Survivorshipbias<sup>9</sup>**

	Number	Mean daily return	Mean monthly return
All funds	240	0.04%	0.95%
Surviving funds	172	0.05%	1.06%
Annualized survivorship bias		1.29%	1.31%
t-value		1.535	1.358

Table 2 shows the difference between mean return of total number of funds that ever existed during the study period and surviving funds. In total, 240 funds existed but due to net effect of disappearing funds and introduction of new funds, only 172 remained at the end of the study period.

The monthly NAV data for all active equity mutual funds for the nine-year period starting April 2006 to March 2015 has been obtained from AMFI website. These data have been used to compute monthly portfolio returns on the funds. Monthly value weighted market index return (CNX Nifty) data were obtained from website of NSE. The total return version of the index was used. Monthly data on risk-free rate and INR/USD exchange rates have been obtained from the Reserve Bank of India. The exchange rate data were used to compute monthly forex yields. The FFC factors have been obtained from IIM A data library. The data on BBB and AAA corporate bond yields have been obtained from Bloomberg.

The total number of funds year-wise and their descriptive statistics are provided in Tables 3 and 4.

Hereby, we had total 391,000 funds-days data, which to our knowledge, are the largest fund database ever used for studying mutual fund performance in India. On an average, each fund had 1,435 trading-days of data (approximately 5.74 years).

### 3.3. Choice of benchmarks

Any analysis of performance based on CAPM framework is sensitive to the choice of benchmarks (Ferson, Kandel, and Stambaugh, 1987; Bollerslev, Engle, and Wooldridge, 1988; Harvey, 1989; Roll, 1978). The Indian funds use a wide variety of benchmarks. There are 22 different benchmarks being used by open-ended equity mutual funds during 2014–2015 (Table 5).

The two modal benchmark indices are BSE 200 and S&P CNX Nifty. We could not use BSE 200 as the dividend yields for this benchmark are available only from 2011 onwards. Therefore, S&P CNX Nifty has been utilized throughout the study as the benchmark index. Since the returns on the mutual funds used in the study are that of growth option, we have taken S&P CNX Nifty Total Return Index as our benchmark. Nevertheless, testing the robustness of results with another widely used benchmark like BSE 200 would have been desirable.

**Table 3. Year-wise number of funds and returns**

Year	No. of funds	Mean	SD
2006–2007	129	0.04	1.63
2007–2008	153	0.06	1.87
2009–2010	184	0.21	1.49
2010–2011	194	0.05	0.99
2011–2012	188	0.01	1.09
2012–2013	181	0.02	0.8
2013–2014	179	0.05	0.97
2014–2015	190	0.17	0.92

Table 3 shows year-wise number of funds, their average returns and variability.

**Table 4. Aggregate fund descriptives**

	Obs.	Mean	SD	Skewness	Kurtosis	JB stat. average	JB stat. Pooled
Funds daily	353,820	0.04	1.36	−1	25.28	199,581	9,482,000
Funds monthly	17,421	0.95	7.23	−0.69	5.09	5.6	20,168

Table 4 shows the pooled average fund returns on daily and monthly basis along with variability statistics.

The descriptive statistics of the benchmark returns (total return on the market index) is as follows (Table 6):

### 3.4. Pre-determined information variables

These macroeconomic variables have been identified so as to see if they affect either the cash flows or the discount rates used in valuation of securities. If price of a financial asset is the discounted present value of its future cash flows, then both the discount rates and size of cash flows will affect current price (Chen and Stockum, 1986). Three variables that have been used most widely in empirical research included one-month T-bill yield, dividend yield on market index and the slope of term structure of interest rates (Ferson & Schadt, 1996; Christopherson et al., 1998; Cortez & Silva, 2002). The lagged credit quality spread represents default risk premium. The effect of discount rates is expected to partially capture in the default risk premium. Some studies have used treasury bill

**Table 5. Benchmarks being used by open-ended equity mutual funds<sup>10</sup>**

Benchmark	% of funds
S&P BSE 200	21.48
Nifty 50 Index	19.46
CNX Midcap	11.41
S&P BSE 100	11.41
Nifty 500 Index	10.07
S&P BSE SENSEX	6.04
S&P BSE Mid-Cap	3.36
CNX 100	2.68
CNX 200	2.01
S&P BSE 500	2.01
S&P BSE PSU	2.01
S&P BSE Small-Cap	1.34
CNX 500 Shariah index	0.67
CNX Commodities	0.67
CNX Dividend Opportunities Index	0.67
CNX PSE Index	0.67
CNX Smallcap	0.67
Crisil MIP Blended Index	0.67
MSCI Asia (ex-Japan) Standard Index	0.67
MSCI India	0.67
S&P India & China Weighted Index	0.67
UTI Transportation and Logistics	0.67

Table 5 shows the proportion of open-ended equity mutual funds using particular benchmarks in India in 2014–15.

Table 6. Descriptive statistics of the benchmark indices returns							
Monthly	Frequency	Observations	Mean, %	SD, %	Skewness	Kurtosis	JB stat.
Nifty 50	Daily	2232	0.044	1.61	0.01	8.76	7150
	Monthly	108	0.95	7.3	-0.72	3.21	59.44
CNX Nifty 500	Daily	2233	0.044	1.56	-0.22	8.32	6474
	Monthly	108	0.91	7.82	-0.64	3.58	69.20

Table 6 shows the mean return and variability statistics of Nifty 50 and CNX Nifty 500 benchmark indices returns and their variability statistics for daily and monthly frequencies.

Table 7. Choice of predetermined information variables						
Study	Term structure slope	Default risk premium	Treasury bill yield	Dividend yield	January effect	Others
Chen, Roll, and Ross (1986)	Y	Y				
Shanken (1990)			Y			T-bill Volatility
Cochrane and Saa-Requejo (1996)	Y			Y		
Ferson and Schadt (1996)	Y	Y	Y	Y	Y	
Becker et al. (1999)	Y		Y	Y	Y	
Ferson and Warther (1996)			Y	Y		
Christopherson et al. (1998)		Y	Y	Y	Y	
Christopherson et al. (1999)			Y	Y		
Narasimhan and Pradhan (2003)	Y			Y		Exchange Rate Fluctuation, Sensex Scaled by IIP
Gregoriou (2003)			Y	Y		
Roy and Deb (2003)	Y		Y	Y	Y	
Petkova and Zhang (2005)	Y	Y	Y	Y		Exchange Rate Fluctuation
Deb et al. (2007)			Y	Y		Exchange Rate Fluctuation, IIP, Gold Prices, PE Ratio
Dhar and Mandal (2014)			Y	Y		
Roy (2016)			Y	Y		Inflation, Exchange Rate Fluctuation, Mutual Fund Sales, AUM

Table 7 lists some of the major research studies using various macro-economic variables in performance evaluation of mutual funds across the world.

**Table 8. Regressions of equally weighted fund returns with economic variables**

Variable	Significance
Rf	*
LDIV	**
LTERM	***
LQUAL	Not significant
APRIL	**
FX	***

Table 8 shows significance of slope coefficients when benchmark returns are regressed individually on each of the variables.

volatility, exchange rate fluctuation, inflation and index of industrial production. Table 7 summarizes the choice of macroeconomic information variables used in conditional performance literature.

One of the econometric issues with the use of time series of predetermined information variables is the presence of persistence. Although not reported here, in our data, the first order autocorrelation is present in the variables chosen, which is likely to affect the results to that extent (Ferson, 2006).

We conduct individual regressions of an equally weighted portfolio of fund returns on each of the economic variables (Table 8). In order to have our results comparable with international studies, we begin with regressions using most frequently used lagged values of the following six variables, e.g.:

LRf = Lagged Treasury Bill Yield

LDIV = Lagged Dividend Yield

LTERM = Lagged Slope of Term Structure

LQUAL = Lagged Quality Spread

APRIL = Lagged Dummy for month of April

FX = Lagged Foreign Exchange Yield

The individual regressions suggest that the variable quality spread does not have any predictive power for returns, hence dropped. Further, there exists a very high degree of collinearity between the risk-free rate and term structure of slope (Table 9). Since, risk-free rate is already in the model for computation of excess return, we remove this variable as well. Thereby we are left with four variables of dividend yield, term structure slope, foreign exchange yield and April effect. These four variables are individually highly significant as well. To test their joint significance, we run the full Treynor–Mazuy model with these four variables and found that they are significant for a sizeable number of funds at 5%. Out of 189 funds, 37 have significant coefficients for term structure, 79 for April Effect, 24 for dividend yield and 5 for foreign exchange yield. It turns out that April effect is quite pervasive in Indian mutual funds. The removal of risk-free rate and quality spread also addresses the issues of collinearity and model parsimony.

#### 4. Models and estimation

We extend unconditional approach of Agarwal and Pradhan (2018) by testing conditional versions of Treynor–Mazuy and Henriksson–Merton models. We introduce FFC factors into these models based on our reasoning presented earlier. The models we test are as follows:

**Table 9. Correlation matrix of regressors**

	RmRf	Lrf	LQUAL	LDIV	APRILL	AFX	LTERM	SMB	HML	WML
RmRf	1									
Lrf	-0.19	1								
LQUAL	0.04	<b>-0.53</b>	1							
LDIV	-0.26	0.28	0.02	1						
APRILL	0.07	-0.04	0.06	-0.04	1					
AFX	-0.02	0.18	0.04	0.14	-0.1	1				
LTERM	0.2	<b>-0.95</b>	<b>0.53</b>	-0.41	0.06	-0.19	1			
SMB	0.03	-0.07	0	-0.26	-0.22	-0.11	0.14	1		
HML	0.31	-0.07	-0.14	-0.23	-0.1	0	0.07	0.36	1	
WML	-0.36	0.1	-0.1	0.04	-0.04	0.12	-0.12	-0.18	-0.27	1

Table 9 shows correlation matrix of macro-economic variables and Fama-French-Carhart Factors.



**Unconditional CAPM:**

$$R_{pt} = a_0 + b_0 * R_{mt} + e_{pt} \quad (11)$$

**Fama–French–Carhart (FFC):**

$$R_{pt} = a_0 + a_1 * SMB_t + a_2 * HML_t + a_3 * WML_t + b_0 * R_{mt} + e_{pt} \quad (12)$$

**Conditional CAPM:**

$$R_{pt} = a_0 + a_1 * DY_{t-1} + a_2 * TERM_{t-1} + a_3 * FX_{t-1} + a_4 * APRIL_{t-1} + b_0 * R_{mt} + b_1 * R_{mt} * DY_{t-1} + b_2 * R_{mt} * TERM_{t-1} + b_3 * R_{mt} * FX_{t-1} + b_4 * R_{mt} * APRIL_{t-1} + e_{pt} \quad (13)$$

**Conditional Treynor–Mazuy (TM):**

$$R_{pt} = a_0 + a_1 * DY_{t-1} + a_2 * TERM_{t-1} + a_3 * FX_{t-1} + a_4 * APRIL_{t-1} + b_0 * R_{mt} + b_1 * R_{mt} * DY_{t-1} + b_2 * R_{mt} * TERM_{t-1} + b_3 * R_{mt} * FX_{t-1} + b_4 * R_{mt} * APRIL_{t-1} + \gamma * R_{mt}^2 + e_{pt} \quad (14)$$

**Conditional Henriksson–Merton (HM):**

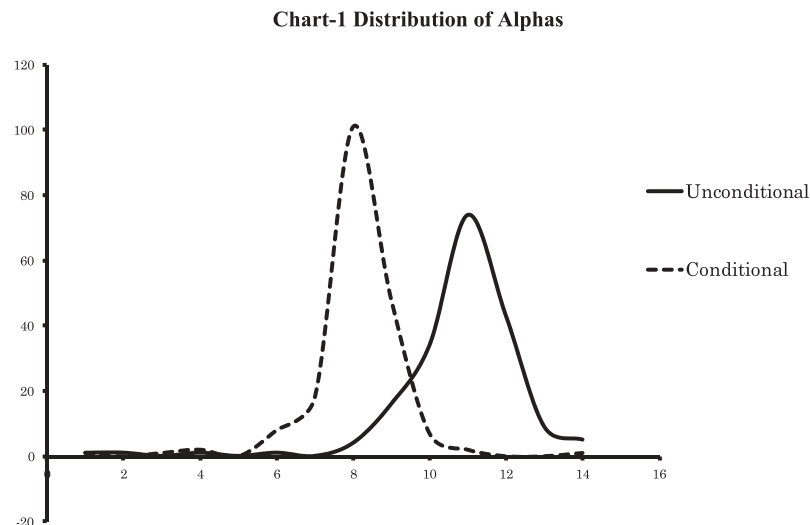
$$R_{pt} = a_0 + a_1 * DY_{t-1} + a_2 * TERM_{t-1} + a_3 * FX_{t-1} + a_4 * APRIL_{t-1} + b_0 * R_{mt} + b_1 * R_{mt} * DY_{t-1} + b_2 * R_{mt} * TERM_{t-1} + b_3 * R_{mt} * FX_{t-1} + b_4 * R_{mt} * APRIL_{t-1} + \gamma * C * R_{mt} + e_{pt} \quad (15)$$

In addition, we also test Conditional Treynor–Mazuy and Conditional Henriksson–Merton Model by incorporating FFC factors.

Here,  $a_0$ ,  $a_1$ ,  $a_2$ ,  $b_0$ ,  $b_1$ ,  $b_3$  and  $b_4$  are parameters of the model. DY is dividend yield, FX is the foreign exchange yield and TERM is a measure of slope of term structure. Here, C is the dummy variable defined earlier.

The models have been estimated by using OLS with Newey and West (1987) HAC standard errors, which gives identical results as GMM estimation in case of linear specification like ours (Zivot & Wang, 2007; Agarwal & Pradhan, 2018).

**Chart 1. Chart-1 shows comparison of distribution of all alphas of unconditional and conditional models.**



**Table 10. Equally weighted portfolio of funds**

Model	$\alpha$	$\beta$	$\delta_{\text{TERM}}$	$\delta_{\text{DIV}}$	$\delta_{\text{FX}}$	$\delta_{\text{APRIL}}$	$\beta_{\text{SMB}}$	$\beta_{\text{HML}}$	$\beta_{\text{WML}}$	$R^2$
Single factor	-0.013 (-0.07)	0.93 (41.23)								0.94
FFC factor	-0.062 (-0.40)	0.90 (50.22)					0.22 (6.55)	0.08 (2.55)	-0.020 (-1.04)	0.97
Conditional	0.10 (0.56)	0.91 (32.74)	0.34 (0.41)	0.03 (0.16)	0.00 (0.26)	0.15 (1.63)				0.94
Conditional-FFC	-0.04 (-0.25)	0.89 (53.73)	0.00 (0.35)	-0.17 (-0.31)	0.00 (0.20)	0.13 (2.00)	0.22 (6.22)	0.07 (2.92)	-0.02 (-1.02)	0.96

Table 10 shows intercept and slope coefficients in regression different model specifications (Column first) where dependent variable is return on equally weighted portfolio of all funds. The figures in parentheses are values of t-stats.

**Table 11. Individual funds**

Model	$\alpha > 0$	$ t_\alpha  > 2$	$\alpha < 0$	$ t_\alpha  > 2$	$\gamma > 0$	$ t_\gamma  > 2$	$\gamma < 0$	$ t_\gamma  > 2$	Funds
CAPM	106	10	83	7					189
FFC factors	92	12	97	18					189
Conditional	124	21	65	13					189
Conditional FFC	104	14	85	24					189

Table 11 shows number of funds with different positive/negative intercept and slope coefficients in regression different model specifications (Column first) where dependent variable is return on individual funds. The last column shows number of funds.

Our study contributes to the literature available on mutual fund performance from emerging economies in many important ways, particularly in data and estimation. The study uses a full conditional model allowing for varying alphas as well as betas for the first time in India. We use a survivorship-bias-free database to overcome backfill bias. We use data on all open-ended equity mutual funds to remove sampling errors. The benchmarks we used are the “total return” benchmarks rather than only price-appreciation benchmarks used in earlier studies. Further, we for the first time include FFC factors by extending the CAPM model and use rigorous HAC estimation.

**Selectivity:** The results on selectivity are summarized in Tables 10 and 11.

The equally weighted portfolio of funds shows negative alphas across all unconditional models. However, the inclusion of conditioning variables changes this and abnormal performance becomes positive. Also at fund level, the inclusion of conditioning variables results in positive alphas for 124 funds against 106 funds in unconditional model, out of 189 funds. The positive alphas are however significantly different from zero in only 17% of funds (21 out of 124). Similar results were also reported by Ferson and Schadt (1996) and Christopherson, Ferson, and Turner (1999). A possible explanation could be low power of statistical test owing to a modest sample size, as we have maximum 9 years of monthly data with 109 observations per fund.

When contrasted our results with the results of conditional models of performance globally, we find that except for Christopherson et al. (1998), the inclusion of conditioning variables were associated with more positive alphas (Ferson and Schadt, 1996; Kryzanowski et al., 1997; Zheng, 1999; Ferson & Qian, 2004, and others). We find over 65% of the overall alphas having positive coefficients, with 11% positive and statistically significant, and in general the distribution of alphas shifts rightwards with inclusion of conditioning variables. This is visibly discerned from Chart-1 when all alphas (statistically insignificant ones included) are overlayed on a plot of alphas from unconditional model. This evidence is in line with those of Indian studies on conditional performance (Deb et al., 2007; Roy & Deb, 2003) although a contrary result has recently been reported by Roy (2016).

What might account for this dramatically improved performance in the conditional models? Ferson and Warther (1996) suggest that unconditional models fail to capture the common variation in betas of funds through time, which, the interaction terms in conditional models are able to do. The interaction terms measure the covariance between betas and expected value of market return formed by lagged information variables. This shows that there is a negative relationship between betas and market returns. Another explanation for improvement in performance in conditional models is the flow of new money. New money flows into funds go up with expectation of higher returns. These new cash inflows will bring down the beta as the fund manager will tend to invest them with some lag. This would mean lower betas when market expected returns are high and higher betas when expected market return are low (due to withdrawals).

At individual fund level, the CAPM-based alphas are positive only for 10 funds and negative for 8 funds at 5%. In most of the studies, the selectivity performance in India has been reported to be

Table 12. Equally weighted Portfolio of funds											
Model	$\alpha$	$\beta$	$\gamma$	$\delta_{TERM}$	$\delta_{DIV}$	$\delta_{FX}$	$\delta_{APRIL}$	$\beta_{SMB}$	$\beta_{HML}$	$\beta_{WML}$	$R^2$
<b>Panel A: Treynor–Mazuy Models</b>											
Single factor	−0.008 (−0.045)	0.93 (37.91)	−0.00 (−0.06)								0.94
FFC factor	−0.11 (−0.78)	0.90 (54.30)	+0.00 (1.03)					0.22 (7.19)	0.08 (2.65)	−0.015 (−0.79)	0.97
Conditional	0.09 (0.47)	0.91 (28.59)	+0.00 (0.07)	0.028 (0.10)	0.39 (0.38)	0.00 (0.27)	0.15 (1.58)				0.94
Conditional-FFC	−0.08 (−0.57)	0.89 (57.77)	+0.00 (0.74)	−0.045 (−0.34)	0.15 (0.24)	0.00 (0.18)	0.13 (2.06)	0.22 (6.72)	0.07 (2.70)	−0.074 (−0.87)	0.96
<b>Panel B: Henriksson–Merton Models</b>											
Single factor	0.18 (0.56)	0.96 (31.11)	−0.06 (−0.80)								0.94
FFC factor	−0.09 (−0.39)	0.89 (26.48)	0.008 (0.16)					0.22 (6.24)	0.08 (2.58)	−0.019 (−0.98)	0.97
Conditional	0.31 (1.07)	0.95 (23.20)	−0.079 (−0.92)	0.11 (0.27)	0.01 (0.41)	0.00 (0.26)	0.15 (1.72)				0.94
Conditional-FFC	−0.00 (−0.00)	0.90 (26.64)	−0.01 (−0.25)	0.00 (0.03)	−0.25 (−0.43)	0.00 (0.20)	0.13 (2.10)	0.22 (5.91)	0.07 (2.56)	−0.025 (−1.30)	0.97

Table 12 shows slope coefficients of regression of returns of portfolio of equally weighted funds in different model specifications. Figures in parentheses are values of t-stats.

**Table 13. Individual funds**

Model	$\alpha > 0$	$ t_\alpha  > 2$	$\alpha < 0$	$ t_\alpha  > 2$	$\gamma > 0$	$ t_\gamma  > 2$	$\gamma < 0$	$ t_\gamma  > 2$	Funds
<i>Treynor-Mazuy models</i>									
Single factor	99	12	101	8	102	20	87	11	189
FFC factors	76	11	113	11	113	34	76	9	189
Conditional	114	23	75	14	103	17	86	9	189
Conditional FFC	87	16	102	22	116	27	73	8	189
<i>Henriksson-Merton models</i>									
Single factor	117	18	72	6	68	7	121	17	189
FFC factors	83	10	106	14	104	12	85	9	189
Conditional	129	35	60	8	58	7	131	20	189
Conditional FFC	96	13	93	15	99	9	90	7	189

Table 13 shows number of funds exhibiting positive intercepts and slope coefficients of regression of returns of individual funds in different model specifications.

far more positive. One important reason for our results showing fewer funds with positive selectivity is the absence of survivorship bias. None of the studies in India have considered and removed the effects of survivorship bias. This bias tends to result in positive alphas.

Another important insight into our study is that although both at aggregate level and fund level, in case of term structure slope, dividend yield and foreign exchange yields, coefficients of interaction terms of lagged information variables and market excess returns are not statistically significant, April effect is weakly significant. Funds seem to have earned positive returns in April consistently.

#### 4.1. Inclusion of Fama-French-Carhart factors

Although our sample consisted of diversified equity schemes which purportedly invest in large and mid-cap stocks (we excluded funds which had words “small-cap” in their names), surprisingly, we find that the loadings on SMB factor are positive and statistically significant. This loading is also consistently at about 0.22% per month across models (Tables 10 & 12). This is a strong evidence of fund returns being driven by the presence of small stocks in portfolios during 2006–2015. It raises important question on the presence of true selection skills. Further, the loadings are also significant statistically for book-to-market factor. But, we surprisingly find negative, although statistically insignificant, loadings for momentum factor. The value and momentum factors are estimated to have negatively correlated, in matured as well as emerging markets (Cakici, Fabozzi, & Tan, 2013). In our study, too this pattern can be discerned as the value factor is statistically significant and consistent across models. The correlation coefficient between SMB and WML is  $-0.18$  (Table 9). In

**Table 14. Correlation of alphas and timing coefficients**

Model	Correlation
Treynor-Mazuy	$-0.34$
Henriksson-Murton	$-0.72$
Conditional FFC-TM	$-0.49$
Conditional FFC-HM	$-0.62$
Conditional TM	$-0.39$
Conditional HM	$-0.59$
FFC-TM	$-0.42$
FFC-HM	$-0.71$

Table 14 lists correlation coefficients between selectivity (alphas) and timing coefficients obtained in various models.

addition, it appears that during the period 2006–2015, chasing winners has proved to be a counter-productive strategy for portfolio managers.

#### **4.2. Market timing**

Pooled regressions result in insignificant timing coefficients in all these cases. Both TM and HM models show different results for market timing. The presence of positive market timers is noted in both the models, more prominently in case of TM models. One interesting finding is that conditioning information does not seem to have any effect on the timing ability. Our findings contrast with that of Ferson and Schadt (1996), Ferson and Warther (1996) and Sawicki and Ong (2000) who found the presence of negative timing ability in unconditional models that disappeared in conditional models. In India, Deb et al. (2007) found no evidence of positive market timing. They report reduction in number of funds exhibiting market timing in case of conditioning models.

At the individual fund level, however, we find that a large number of funds (58–116) showing positive market timing ability. The evidence of timing improves with inclusion of FFC factors. Interestingly, the inclusion of conditioning variables does not seem to affect the evidence of market timing ability, both in conditional as well as unconditional settings. The number of funds showing negative timing also goes down considerably when FFC factors are included.

Our results are in contrast with the results of Ferson and Schadt (1996), Leite and Cortez (2009), etc. Almost all the studies have reported preponderance of negative timing ability that improves considerably when conditioning variables are included. One reason could be that all these studies have used partial conditional models allowing only for time-varying betas. Whereas, in our models, we have allowed for time-variation in alphas as well using full conditional models (Christopherson et al., 1998).

#### **4.3. Co-existence of selectivity and timing**

We also tackle the question of whether fund managers exclusively pursue stock selection strategy or market timing strategy. Brown, Harlow, and Starks (1996) suggest that fund managers change strategies over the calendar year depending on year-to-date performance to exploit incentive structures. Further, Bollen and Busse (2004) suggest that mutual fund performance studies focusing on either stock selection or market timing might suffer from a misspecification problem. Therefore, we also test our results for co-existence of stock selection and market timing abilities. Across all versions of models (Table 13), we find negative correlation between alpha and gamma (coefficients of timing), although the association is weaker in case of TM version of models. This is in line with the evidence as reported by Henriksson (1984) and Bollen and Busse (2004).

#### **5. Conclusion**

Traditional methods of assessment of mutual fund performance (alpha) are based mostly on CAPM which presupposes fixed sensitivity of risk exposure of fund to the market proxy (beta). However, changing economic conditions alter this relationship. In CPE, the betas as well as alphas are allowed to vary in response to changing economic states over time. We examine existence of superior performance of open-ended equity mutual funds in India in a conditional setting. We use a survivorship-bias-free database including all schemes since inception till recently. In addition, we adopt markedly improved in methodology by controlling for heteroscedasticity and autocorrelation. For the first time ever in India, we use full conditional models allowing for time-variation in alphas as well as betas.

Our results on selection ability of mutual fund managers are consistent with the international literature. In India, the results of performance studies suffer from survivorship bias and therefore overestimate selection ability. The evidence we find in a conditional setting assumes importance because in our model controls for returns due to portfolio decisions made based on “news” about movement of economic variables. The resultant alphas will likely arise only if the fund manager possessed superior information well beyond what is publicly known. Our findings will have

implications for investment management fees as CPE might result in new inferences about whether a fund manager has actually performed.

On market timing, however, except for four-factor conditional models, our results contrast findings of international as well as Indian studies, where timing ability is found to be non-existent at fund level too. We report non-existent timing ability at aggregate level and the presence of positive timers at fund level, as opposed to pervasive evidence of negative timing ability. Joint hypothesis of mutual fund performance and market efficiency is an important issue in performance literature. The evidence of positive conditional alphas points towards rejection of semi-strong form of efficient market hypothesis in Indian markets. Similarly, Size effect, Value effect, April Effect and Momentum effect are well-documented anomalies of stock markets calling in question the efficient market hypothesis. This study finds evidence for these anomalies.

These findings are likely to be useful for investors at large, regulators, the AMCs as well as the fund managers. The study also raises a number of interesting questions. First, the presence of positive conditional alphas in an emerging economy like India might be attributable to relatively weaker efficiency of markets, but what explains the presence of positive market timers when mostly the global evidence is contrary? Is evidence of successful market timing in a conditional setting really an evidence of ability or another pointer to market inefficiency? These issues can be taken up in future research. Also, globally mutual fund research is increasingly conducted with holdings data, which unfortunately is available for Indian markets only since 2012 onwards on a monthly basis, therefore, rendering itself insufficient for a longitudinal study. Holdings-based measures could throw new insights into mutual fund performance evaluation in future.

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#### Notes

1. Fama (1970), Kon and Jen (1979), Lee and Rahman (1990), Daniel et al. (1997), Kao et al. (1998), Avramov and Wermers (2006).
2. Ibid., Treynor and Mazuy (1966), Henriksson and Merton (1981).
3. [www.sebi.gov.in](http://www.sebi.gov.in).
4. <https://www.amfiindia.com/Themes/Theme1/downloads/home/industry-trends-feb-2018.pdf>.
5. For example, Blitz, Hanauer, Vidojevic, and Vliet (2018) find robustness and incompleteness issues with Five Factor model.

6. A partial list includes Ferson and Schadt (1996), Graham and Harvey (1996), Kryzanowski et al (1997), Christopherson et al. (1998), Sawicki and Ong (2000), Chen and Liang (2007) and Boguth, Carlson, Fisher, and Simutin (2011). Also see Ferson (2006) and Farnsworth (2015).
7. The authors acknowledge the contribution of M/s Accord Fintech for generously providing benchmark data used in the study.
8. Securities and Exchange Board of India (SEBI) classifies an equity scheme as having 65% and above investment in equity and equity-related instruments.
9. Agarwal, P. K., and Pradhan, H. K. (2018). Mutual Fund Performance Using Unconditional Multifactor Models: Evidence from India. *Journal of Emerging Market Finance*, 17(2).
10. The data on schemes-wise benchmarks was obtained from M/s Accord Fintech.

#### Declarations of interest

None.

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