Does Sentiment Risk Persist as Priced Risk Factor? A Multi Factor Approach for Stock Return

Abstract

Much of the academic debate has gone in to exploring the better asset pricing model that can explain the quantification of the trade-off between risk and expected return for the cross section of stock return. Nevertheless this intimidating task becomes more pragmatic given the market structure of emerging markets, liquidity effects, market inefficiency, and more significantly the presence of inherent imperfect rationality or sentiment. The basic objective of this paper is to evaluate the pricing implication of unconditional five factor model to explain the cross sectional stock return behaviour in the context of Indian stock market. Our analysis also aims to examine the pricing nature of aggregate market wide sentiment risk in the presence of other risk factors. We employ Fama and French time series regression approach to examine the impact of market risk premium, size, book-to-market equity, momentum and liquidity as risk factors on stock return. Our empirical results show that given the multidimensional nature of risk the choice of a five factor model is apparently persuasive for consideration in investment decisions. However, inconsistent with prior literature book-to-market equity fails to explain the average return in case of large stocks, and pricing evidence of momentum profits fades in case of winner stocks and momentum strategy retains its value only for the sell side transactions i.e., loser portfolios. With the presence of liquidity factor in the five factor model specification, the results suggest that liquidity is priced and explains a cross sectional variation in stock returns. Our results also suggest that it is naïve to argue for the universal pricing implication of sentiment risk in a multifactor model framework, and market wide risk factors resume their importance as rational source of priced risk.

Keywords: Risk factor, multi factor model, liquidity risk, momentum strategy, stock return, sentiment risk

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1. Introduction

The concept of Portfolio theory (Markowitz, 1952) followed by the development of asset pricing models for the risk measurement of cross section of stock returns had a major contribution towards the theory and practice of investment management. Founded on various assumptions like markets are highly efficient, rational and risk averse investor behaviour to exploit arbitrage opportunities, asset pricing models attempt to answer certain fundamental questions: (i) what type of risks are rewarded, (ii) what is the premium for such priced risk factors, and (iii) why some assets pay higher average returns than others. Mainstream asset pricing literature like Capital Asset Pricing Model (CAPM) advocated by Sharpe (1964) and Lintner (1965) suggests that the expected return on an asset above the risk-free rate is proportional to non-diversifiable or systematic risk, measured by the covariance of asset return with the market portfolio. Intertemporal Capital Asset Pricing Model (ICAPM) developed by Merton (1973) suggests that an asset's risk premium depends on the prospects of investing for the future with an adverse change in the future investment opportunity set. Similar to the multifactor argument of ICAPM, Arbitrage Pricing Theory (APT) given by Ross (1976) stipulates that under no arbitrage the expected returns of assets are expressed as a linear function of certain common factors, though the theory does not specify the factors themselves. The Consumption-based Capital Asset Pricing Model (CCAPM) advocated by Breedin (1979) suggests that expected return of stock is determined by the consumption beta or covariance of a securities return with the consumption growth risk, in stead of market beta as argued by CAPM.

Given the theoretical argument of multifactor model specification like ICAPM or APT and the apparent violations of traditional models with inconsistent empirical validation, the multifactor models proposed by Fama and French (1993) and Carhart (1997) had been widely debated and acclaimed in recent asset pricing literature to explain the pricing implication for stock returns (see, for an excellent review of literature, Campbell 2000; Fama and French 2004; Subrahmanyam 2010). While Fama and French (1993) three factor model consisting of a market factor and trade portfolios on size (SMB i.e., small-minus-big) and book to market equity (HML, high-minus-low) factors performs well on explaining average cross section of stock return, Charhat (1997) advocates towards a four factor model or an augmented three factor model with a momentum factor to explain stock return behaviour in different test asset portfolios. Quantification of the trade-off between risk and expected return using the multifactor approach validates the fact that, since intercepts of the traditional asset pricing models deviate statistically from zero the missing risk factors are the potential reason for concern. In this regard the basic objective of multi factor model proponents is to introduce additional factors in the form of excess returns on the trade portfolios and to re-examine the hypothesis of intercepts indistinguishable from zero.

However, the key assumptions of several asset pricing models including the recent multifactor models fail to explain time and again the unconventional market behaviour which limits the investor's ability to quantify risk premium, and to diversify portfolio risk in a state of noise trading, persistent idiosyncratic risk and market anomalies, market frictions and liquidity effects, risk to arbitrage, and more significantly the inherent imperfect rationality or sentiment (Barberis et al., 1998). Nevertheless apart from the critiques of testing asset pricing models in U.S. markets because of the inherent sample selection bias and data-snooping bias (MacKinlay, 1995), literature from the emerging markets also accepts the fact that because of the special nature of emerging markets it will be premature to validate the multifactor model specifications as the universal benchmark for equity pricing (Bekaert and Harvey, 2003). More often it is evident that the wide disparity of performance among several asset pricing models in emerging economies is pertinent to low liquidity, thin trading, information asymmetry, low worldwide market integration, and volatile market and macroeconomic conditions (Bekaert and Harvey, 2003; Iqbal et al., 2010). Moreover since the market structure in terms of the category of investor participations in an emerging market is completely different as compared to developed market it is also naïve to assume the universal pricing implication of sentiment risk as an indication of the presence of irrational behavior by market participants (Barberis et al., 1998).

Given these caveats, the primary motivation of this paper is to analyse the controversy over whether or not the multifactor models can better explain the cross sectional regularities in an the context of an emerging market like India. Following the argument of irrational market wide sentiment risk induced by several behavioural biasness this paper also aims to make a comprehensive reassessment of multifactor model explanations of stock return in the presence of sentiment risk.

The rest of the paper is organised as follows. Section 2 describes the review of literature. Section 3 explains the models specification and methodology. Section 4 presents the data and describes our test assets. Section 5 discusses the main empirical results. Section 6 represents the summary and conclusion.

2. Review of literature

Beyond as a source of elegant theoretical contribution the mainstream asset pricing models and more specifically CAPM have never been favoured as universal explanation for the cross sectional behaviour of stock returns (Campbell, 2000; Fama and French, 2004; Subrahmanyam, 2010). Similar to their international counterpart in Indian stock market several literature during their respective study periods also found CAPM as an unsuitable descriptor of stock return (Ansari, 2000; Basu and Chawla, 2010; Sehgal, 1997). In the sideline of empirical evidences towards the failure of the conventional asset pricing models, literature also debate on the anomalous returns associated with several fundamental characteristics that have shown cross sectional regularities with a predictable pattern. More prominently known as CAPM anomalies in asset pricing literature these firm specific characteristics cause to undermine the fact that risk factors defined by mainstream asset pricing literature can never be the only relevant measure of risk. More prominently the benchmark asset pricing models do not explain why there is a risk premium associated with size (SZ), book-to-market equity (BME) (Banz, 1981, Fama and French, 1992, Rosenberg et al., 1985), momentum (MOM) (Jegadeesh and Titman, 1993) and liquidity (LIQ) (Amihud, 2002).

Evidently literatures also argue that the premiums earned by these fundamental risk characteristics are indeed pervasive across developed and emerging markets (Fama and French, 1992; Chan and Faff, 2003; Groot and Verschoor, 2002; Lam, 2002; Rouwenhorst, 1999; Sehgal and Jain, 2011). Most arguably the source of deviation from the zero intercept hypothesis in case of mainstream asset pricing models and subsequent identification of characteristic based risk pricing have given rise to the advancement of multifactor explanations for cross section of stock return. Motivated by the model misspecification stories inherited from the conventional asset pricing literature, and presence of risk premium for several fundamental risk characteristics such as SZ, BME, MOM and LIQ the basic objective of multi factor model proponents is twofold. First is to introduce additional factors in the form of excess returns on the trade portfolios and to re-examine the hypothesis of intercepts indistinguishable from zero. Second is to examine whether the earlier identified fundamental characteristics proxy for underlying risk factors, or whether they simply priced because of the mispricing arising from an inefficient market.

In recent years, since the publication of seminal paper by Fama and French (1993) and Carhart (1997) there has been increased debate on the performance of multifactor asset pricing models to describe the cross section of average stock returns. Fama and French (1993) advocated a three factor pricing model (hereafter FFTFM) consisting of a market factor and trade portfolios of SZ and BME factors found suitable for explaining average cross section of stock return in U.S. stock market. Following the empirical failure of Fama and French (1996) to capture the MOM effect in their three factor model specification, Charhat (1997) advocated a four factor model (hereafter CFFM) or an augmented FFTFM with a MOM factor. With the similar paradigm Her et al. (2004) for Canada, Sehgal and Jain (2011) for India, Keene and Peterson (2007) for U.S. also supported the momentum augmented three factor model performance in their respective stock markets. Given the argument of liquidity as a priced source of risk, Liu (2006) and Keene and Peterson (2007) in U.S. stock market, Chan and Faff (2003) and Marshall and Young (2003) in Australian stock market, and recently Lam and Tam (2011) in Hong Kong stock market found that liquidity remains an important risk factor even after controlling for the other market wide risk factors in a four or five factor model specification. In common research on the applicability of multifactor models has been encouraging in a wide spectrum of sample periods and in several different markets (Shum and Tang, 2005).

However, there are at least four issues that cast doubt on the general ability of multifactor models to explain stock returns. First, the result of these models may be biased in the sense that, the model tests depend heavily on the characteristics of underlying test assets (Lewellen et al., 2006). Therefore, it is apparent to argue that the literature that supports the validity of a three factor model in a particular market may be limited by its approach towards the choice of test assets. Second argument follows from the inconclusive evidences towards the validity of the priced risk characteristics in other markets apart from U.S. market (Chui and Wei, 1998; Claessens et al., 1995 and 1998). It can be therefore argued that, as there is no consistent universal pricing implication for fundamental characteristics there could have been ample scope for the pricing implications of market wide risk factors constructed from these risk characteristics. Third apparent violation is following from the literature which argue towards the wide disparity of performance among several benchmark asset pricing models along with the multifactor models in the context of emerging capital markets (Bekaert and Harvey, 2003; Iqbal et al., 2010).

The fourth major argument is supported by the gamut of behavioural asset pricing literature which advocates the role of imperfect rationality or sentiment in financial markets, and tries to explain various market anomalies by using multifactor models in which investors are not fully rational (Barberis and Thaler, 2003). Alternative to the efficient markets paradigm, and assumption of complete arbitrage, behavioural finance is build upon two fundamental arguments towards mispricing in financial markets i.e., the role of investor psychology and limited arbitrage in determining stock prices (Brown and Cliff, 2004; Shleifer and Vishny, 1997). Empirical evidences following the top-down approach (Baker and Wurgler, 2006), have advocated investor sentiment as an explanatory variable in cross section of stock returns (Baker and Wurgler, 2006, 2007; Brown and Cliff, 2004). It is therefore apparent to ask that whether the risk factors in the multifactor model specification are the sole determinant of risk or is there any scope to revalidate the implication of market wide sentiment risk.

Given these arguments, the primary motivation of this paper and contribution to the asset pricing literature in this regard is three fold. First we attempt to resolve the debate that argues the limited potential of FFTFM on a larger and diversified asset class. To our knowledge it is perhaps the first attempt from an emerging market prospective to test FFTFM with an asset class consisting with several well debated priced idiosyncratic characteristics. Second, as an order driven and emerging stock market[1], liquidity as a priced risk factor in Indian stock market has never been given a considerable importance. To be more specific, as far as our knowledge is concerned this is perhaps the first attempt to test the performance of unconditional five factor asset pricing model on the Indian stock market with a larger sample period and test assets. We know from prior research that emerging market returns are characterized by low correlation with returns on other emerging markets and with developed markets (Bekaert and Harvey, 2003). Consequently, evidence from an emerging market like India on the applicability of multifactor models is particularly interesting as it provides a robustness validation test and out of sample evidence on a sample that is not highly correlated with data used in previous research. Given the importance of emerging markets with higher return predictable potential, and international portfolio diversification demand with substantial exposer to emerging markets it is also evident to understand the factors that can affect expected return in a promising stock market like India. Our approach to measure the sentiment risk is having its several intuitive advantages. The measure of market wide irrational sentiment with the sentiment index is more comprehensive as it considers several proxies which are not used in prior literature for constructing their respective sentiment index. Although for the Indian market Sehgal et al (2009, 2010) have tried to develop a sentiment index, but their index is

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[1] Based on the dynamic process of price formation and the market clearing process trading mechanism in a market can be order driven or quote driven. In an order driven market various participants of the market submit buy/sell orders relating to listed financial instruments to a central location where they are matched and the prices on the screen represent orders submitted by all participants. The market price is derived from a continuous process of matching demand with supply. In a quote driven market prices are determined from quotations made by designated market makers or dealers. Market makers supply liquidity to the market by continuously quoting the bid-and-ask prices at which they are willing to trade (Marshall and Young, 2003). Narayan and Zheng (2010) suggest that an order driven market structure generates liquidity demand and supply schedules that are consistent with equilibrium under perfect competition.

limited to capture the market wide irrational component as they have considered some of the macroeconomic indicators and more specifically, it is not orthogonal to fundamental factors. Furthermore, over the last few decades in spite of the rapid growth of the Indian stock market in terms of market capitalisation and its increasing importance in the international financial arena, there is also conspicuous gap in the literature that can support towards the assessment of a multifactor asset pricing model in the context of India.

3. Model specification and methodology

For the present analysis we consider the five factor asset-pricing models (FFM) that augments the Carhart's (1997) four-factor model with a liquidity factor. Our approach to consider unconditional multifactor model can be viewed as an augmented version of the single-beta CAPM expressed in a multifactor ICAPM or APT setting. Following the APT and ICAPM multifactor specification suppose that returns of our test assets are generated by a k-factor linear asset-pricing model:

$$\mu_{p\,t} = \alpha_p + \sum_{j=1}^{k} \beta_{p\,j}\left(F_{jt}\right) + \varepsilon_{pt}, \;\; t = 1,....T,\; p = 1...N, \;\; .... \;(1)$$

Where, μ_P is the excess return on portfolio over the risk free rate ($r_{pt} - r_{ft}$), F_j is the excess return
on the j_{th} factor portfolio, β_{Pj} is portfolio P's loading on factor j. Following the similar specification FFM can be expressed as:

$$\mu_{pt} = \alpha_p + \sum_{k=1}^{3} \beta_{p\,k} FFTFM_{k\,\mathrm{t}} + \beta_{WML_P}\left(r_{WML_t}\right) + \beta_{LFP_P}\left(r_{LFP_t}\right) + \varepsilon_t,\; t = 1,...,T,\; p = 1,...,N, ...(2)$$

$$\mu_{pt} = \alpha_p + \sum_{k=1}^{4} \beta_{p\,k} CFFM_{k\,\mathrm{t}} + \beta_{LFP_P}\left(r_{LFP_t}\right) + \varepsilon_t, \;\; t = 1,...,T,\; p = 1,...,N, ...(3)$$

Where, in equation two, *FFTFM* is a vector containing Fama and French's three-factors r_{MKT_t} (market excess return i.e., $r_{mt} - r_{ft}$), r_{SMBt} (returns on an SMB portfolio), $r_{HML\mathrm{t}}$ (returns on an HML portfolio). $r_{WML\;\mathrm{t}}$ and $\beta_{WML\;p}$ respectively represent the returns and factor sensitivities of test asset p to the WML portfolio. Similarly $r_{LFP\;t}$ and $\beta_{LFP\;\mathrm{p}}$ respectively represent the returns and factor sensitivities of test asset p to the LFP portfolio. In third equation *CFFM* is a vector containing the Carhart's (1997) four-factors namely, r_{MKT_t}, r_{SMBt} , $r_{HML\mathrm{t}}$ and $r_{WML\;t}$. In our reported result we will follow specifications of the third equation.

Given our objective of validating the risk factors which are priced in Indian stock market we restrict ourselves up to the first stage time series regression. Unlike the popular practice of asset pricing literature to follow the Fama and Mcbeth (1973) two step regressions, our restriction to the first step only is due to our objective of identification and validation of factors that are implicitly assumed to be priced as a rational source of risk factor. Whether such factors earn a premium in the market or they are result of mispricing in the market is left over for our future research.

After conducting the time series asset pricing tests using the FFM we then examine the alphas (intercepts) of these regressions which are a measure of abnormal return. The proposition is that if the spread in the average returns of these portfolios is indeed a compensation for risk (at least as measured by standard risk factors), then the alpha of these portfolios should be jointly zero. In addition to individual t-test we also test this prediction by the Gibbons, Ross and Shanken (1989) GRS test of the hypothesis that the alphas are jointly zero. In other words the GRS test statistic (Gibbons et al., 1989) tests the null hypothesis: $H_0 : \alpha_P = 0, \forall P$ which should not be rejected if the factors completely explain excess returns. The GRS test statistic has better small sample properties than the Wald, Lagrange Multiplier, and Likelihood ratio tests (Gibbons et al., 1989). Specifically, GRS test is less likely to falsely reject the null of intercepts are all zero (Campbell et al., 1997).

After examining the pricing behaviour of our five market wide risk factors we made a modest attempt to see whether there is any market wide sentiment risk factor. In order to examine the pricing implication of market wide sentiment as a risk factor we specified the following three equations for time series regression analysis, which includes our market wide aggregate sentiment index (ASI) as one of the explanatory variable along with FFTFM, CFFM and FFM specifications:

$$\mu_{p\,t} = \alpha_p + \beta_{ASI_P} ASI_{t-1} + \sum_{k=1}^{3} \beta_{p\,k} FFTFM_{k\,t} + \varepsilon_t \quad (4)$$

$$\mu_{p\,t} = \alpha_p + \beta_{ASI_P} ASI_{t-1} + \sum_{k=1}^{4} \beta_{p\,k} CFFM_{k\,t} + \varepsilon_t \quad (5)$$

$$\mu_{p\,t} = \alpha_p + \beta_{ASI_P} ASI_{t-1} + \sum_{k=1}^{4} \beta_{p\,k} CFFM_{k\,t} + \beta_{LFP_P}\left(r_{LFP_t}\right) + \varepsilon_t \quad (6)$$

Where, β_{ASI_P} indicates the loading on the aggregate sentiment index (ASI), *FFTFM* is a vector containing Fama and French's three-factors and *CFFM* is a vector containing the Carhart's (1997) four-factors. $r_{LFP\,t}$ and $\beta_{LFP\,\mathrm{p}}$ respectively represent the returns and factor sensitivities of test asset p to the LFP portfolio. Under the null hypothesis that stock returns are not influenced by behavioural forces, sentiment should not enter the regression significantly. Against this null under the alternative hypothesis we argue that since optimism or a bullish sentiment drives stock prices above the fundamental values and thus sentiment will have a negative impact on stock return i.e., the coefficient of should be negative and statistically significant. In other words positive sentiment results in over valuation of stocks, so future returns over the time period would be lower as market valuation of a stock returns to its intrinsic value.

4. Data and variables

We have used monthly returns of nonfinancial firms listed in the National Stock Exchange (NSE) of India starting from September 1995 to March 2011(187 months). Following Fama and French (1992, 1993) and several other asset pricing literatures financial firms are excluded from the sample. The S&P CNX NIFTY has been taken as the market proxy. In choosing an Indian stock index as the market portfolio, we assume implicitly that the Indian stock market is segmented, and an absence of international integration (Misra and Mahakud, 2009), and the market risk premium is priced because of local macroeconomic, and firm specific factors (Bekaert and Harvey, 2003). For the risk-free rate, we use 91-days Treasury bill rate. We begin portfolio formation on September 1 every year since around 80% of the listed firms in the NSE have their fiscal year end in March. Therefore, the accounting data for the year ending March of year *Y* have been compared with stock return from September of year *Y* to August of year *Y+1* i.e., giving a period of five months lag for the disclosure of available accounting information to market participants and to minimise the look-ahead bias. The required stock return data has been collected from Centre for Monitoring Indian Economy (CMIE) PROWESS database, risk free rate data has been collected from Reserve Bank of India (RBI) website, and other relevant market wide data has been collected from NSE websites. Encompassing all the selection measures advocated in related literature there are between 392 (September 1995) and 1,156 (September 2010) companies available for our analysis.

4.1. Construction of test assets

The 36 SZ-BME-LIQ-MOM portfolios as our test assets are formed in accordance with Fama and French (1993), using the momentum factor from Jegadeesh and Titman (1993) and Carhart (1997), and a liquidity factor (Keene and Peterson, 2007). In the SZ and in the BME groups SZ is measured at the end of August of the year *Y*. The book value of common equity in the BME ratio is measured at the fiscal year-end in the calendar year *Y*. The MOM groups are formed at the end of August of year *Y*, when the returns are calculated over 11-month period beginning in August *Y-1* and ending in June of year *Y*. LIQ is measured by the annual average of monthly turnover ratio i.e., number of shares traded (NST) to the number of shares outstanding (NSO). In September of each year the liquidity groups are formed, by using annual average for liquidity based on monthly measures from September *Y-1* to August *Y*. We use the above mentioned measures to sort all stocks into three SZ trisects (based on the breakpoints for the bottom 30% as large, middle 40% as medium and top 30% as small), two LIQ and two BME bisects (50 percent breakpoint), three MOM trisects (30 percent and 70 percent breakpoints), yielding 36 portfolios from the matrix of the SZ-LIQ-BME-MOM groups. Value-weighted monthly returns are calculated for the 36 portfolios for the following year from the beginning of September through August of the next year. In September of each year we reform the portfolios and calculate returns for the following year. We repeated this process to form portfolios from September 1995 through September 2010. Our test assets used as the dependent variables in the regressions are the excess monthly returns for the 36 portfolios, over the risk-free rate.

For the purpose of brevity we report the portfolio groups of SZ/LIQ/BME as Pi/j/k. The first subscript in the portfolio notation Pi/j/k represents the three SZ trisects, for e.g., small (1), medium (2), large (3). The second subscript denotes the two LIQ bisects, for e.g., low (1), high (2). Similarly the third subscript represents the two BME bisects for e.g., low (1), high (2). For instance portfolio group P3/1/2 indicates a portfolio consisting with large SZ/ low LIQ/ high BME stocks and portfolio group P1/1/2 indicates a portfolio consisting with small SZ/low LIQ/ high BME stock. In subsequent tables for the purpose of brevity instead of detail description we will report the portfolio groups of SZ/LIQ/BME as Pi/j/k.

In Table 1 we report the annual average number of stocks for each portfolio (figures in the curly bracket) and descriptive statistics of the test assets with their raw return. Table 1 shows the apparent relation between SZ and LIQ. As we move from the large to small SZ groups (keeping BME and MOM constant), with the decrease in liquidity the number of stocks in the portfolio also increases. The opposite pattern can be observed in the large SZ group. This evident the presence of large numbers of small and low liquid stocks in the market. In terms of MOM pattern the small (large) size group shows a high concentration of looser (winner) stocks with the decrease (increase) in liquidity. This also suggests that, on average big firms are more liquid than small firms. The averages of the annual number of stocks in the portfolios show that big, low liquid portfolios and small high liquid portfolios have fewer firms than big high liquid portfolios, and small low liquid portfolios. Descriptive statistics of Table 1 also suggest that the winners outperform the losers across all the 36 portfolios with a spread between winner and loser portfolio return of 0.67 percent per month (t = -2.48). The standard deviation proxied for volatility of the entire portfolio remains same with a spread between winner and loser is minimal 0.21 percent per month (t = -0.29). The overall result shows that winner and looser trading strategy gives higher return. While making a comparison for mean excess return in our unreported results we found that although momentum profit persists in Indian market but it fails give super normal profit or to bit the market even in the periods of up-market. The high level of skewness and kurtosis in our data is consistent with literature on emerging markets, which commonly characterises these markets with higher level of kurtosis in return data (Claessens et al., 1995,1998; Iqbal et al., 2010).

4.2 Construction of the five factors

Following FFTFM (1993), Carhart (1997), and Keene and Peterson (2007) we have constructed five factors designed to mimic risk variables related to MKT (market excess return), SMB (small minus big), HML (high minus low), LFP (low liquid minus high liquid), and WML (winners minus losers).

We define the MKT as the value-weighted market excess return over the risk free rate. For the cconstruction of SMB and HML factors, for each month from September of year *Y* to August *Y+1*, we rank the stocks based on their SZ (50 percent breakpoint) and BME (30 percent and 70 percent breakpoints) value of September *Y*. Based on the above break point rankings we form six value-weighted portfolios, *S/L* (small-low), *S/M* (small-medium), *S/H* (small-high), *B/L* (big-low), *B/M* (big-medium) and *B/H* (big-high) from the intersection of two ME and three BME groups. Our second and third risk factors namely SMB and HML are measured each month as the equal-weight average of the returns on the small stock portfolios minus the returns on the big stock portfolios, and the returns on the high BME (value stock) portfolios minus the returns on the low BME (growth stock) portfolios respectively. LFP has been constructed by forming four portfolios from the intersection of two SZ-based and two LIQ-based portfolios i.e., *S/HL* (small high liquid), *S/LL* (small-low liquid), *B/HL* (big-high liquid), *B/LL* (big-low liquid). For this purpose each month from September of year *Y* to August *Y+1*, we rank the stocks based on their SZ and LIQ value of September *Y* (annual average of monthly turnover ratio from September of year *Y-1* to August *Y*) with 50 percent breakpoint for SZ and LIQ. Here we have favoured towards the SZ to make LFP factor to be BME neutral following the argument of apparent relationship between market equity and liquidity (Amihud, 2002; Keene and Peterson, 2007). Our fourth factor LFP is the difference between the simple

Table 1 Descriptive Statistics of Raw Return for 36 Portfolios Formed on Size, Liquidity, Book-to-Market Equity, and Momentum.

Portfolio	Momentum (MOM)																	
	L	N	W	L	N	W	L	N	W	L	N	W	L	N	W	L	N	W
	Mean Return			Standard Deviation			Skewness			Kurtosis			Maximum			Minimum		
P1/1/1	1.56 {24}	1.62 {22}	2.54 {19}	12.54	11.42	13.94	0.52	0.52	0.79	4.03	4.39	4.46	45.21	43.51	61.69	-34.34	-32.35	-30.53
P1/1/2	2.73 {24}	2.8 {21}	3.74 {19}	13.86	13.16	14.52	0.6	1	0.81	3.61	4.69	3.86	47.44	52.28	51.26	-35.16	-30.14	-33.48
P1/2/1	0.72 {22}	1.85 {20}	2.05 {17}	13.76	13.01	13.96	0.71	0.88	0.7	4.24	5.23	4.62	53.46	56.2	54.17	-31.87	-30.39	-36.94
P1/2/2	1.39 {22}	1.48 {19}	1.82 {18}	15.38	14.39	13.51	0.94	1.06	0.6	5.12	5.8	3.74	62.61	68.28	52.19	-36.59	-33.69	-33.49
P2/1/1	1.15 {20}	1.63 {18}	1.94 {20}	10.26	9.96	11.62	0.38	0.65	0.65	4.39	6.47	5.38	45.1	49.66	56.05	-28.02	-34.22	-33.12
P2/1/2	2.21 {18}	2.18 {18}	2.47 {21}	12.21	11.31	10.64	0.59	0.76	0.33	4.68	5.94	3.95	53.56	51.83	42.02	-31.89	-32.58	-30.68
P2/2/1	1.11 {21}	1.67 {18}	1.51 {19}	12.24	12.16	13.41	0.46	0.42	0.48	4.55	4.58	4.76	52.77	54.12	55.85	-32.49	-32.21	-38.58
P2/2/2	2.25 {20}	2.1 {18}	2.97 {18}	13.55	12.5	13.1	0.59	0.5	1.06	4.89	5.07	8.64	63.27	58.67	78.92	-36.45	-33.38	-33.81
P3/1/1	0.85 {18}	1.41 {19}	1.45 {17}	8.66	7.93	9.74	0.29	0.01	0.15	4.08	4.25	4.62	36.41	30.92	41.32	-23.53	-28.22	-31.21
P3/1/2	1.71 {16}	1.62 {19}	2.09 {15}	10.84	9.79	10.34	0.52	0.24	0.48	5.69	4.53	6.02	51.48	42.93	50.8	-36.33	-29.7	-37.13
P3/2/1	0.89 {18}	1.2 {14}	1.39 {17}	10.66	10.38	12.15	0.26	0.09	0.07	3.38	4.47	4.83	53.69	46.92	50.33	-38.76	-31.08	-39.25
P3/2/2	1.88 {18}	2.16 {18}	2.56 {19}	11.81	10.03	11.32	0.54	0.12	0.17	6.06	4.84	5.39	61.85	45.71	55.22	-33.53	-30.45	-36.39

Notes: The 36 SZ-LIQ-BME-MOM portfolios are formed using three size, two liquidity, two book-to-market equity and three momentum groups. Sample period is of 187 months (September 1995-March 2011). For the purpose of brevity we report the portfolio groups of SZ/LIQ/BME as Pi/j/k. The first subscript in the portfolio notation Pi/j/k represents the three SZ trisects, for e.g., small (1), medium (2), large (3). The second subscript denotes the two LIQ bisects, for e.g., low (1), high (2). Similarly the third subscript represents the two BME bisects for e.g., low (1), high (2). Size is calculated using the market value of equity at the end of August of the year *t* (reported Rs. in crores). The book value of common equity in the BME ratio is measured at the fiscal year-end in the calendar year *Y*. Liquidity is proxied by turnover, which is calculated as the ratio of the monthly shares traded to the number of shares outstanding. In September of each year the liquidity groups are formed, by using annual average for liquidity based on monthly measures from September *Y-1* to August *Y*. Momentum is calculated as the 11-month returns lagged two month. Figures in the curly brackets represent the average number of firms for 36 portfolios formed on size, liquidity, book-to-market equity, and momentum: September1995- March 2011.

average of returns from the two low liquid portfolios and the simple average of returns from the two high liquid portfolios.

To construct our fifth factor WML, for each month from September of year *Y* to August *Y+1*, we rank the stocks based on their market equity value of September *Y* and their prior performance or return momentum of 11-month lagged two month. Similar to the SMB and HML we calculate a 50 percent breakpoint for SZ, and 30 percent and 70 percent breakpoints for return momentum for constructing six value-weight portfolios namely *S/W* (small-winner), *S/N* (small-neutral), *S/L* (small-looser), *B/W* (big-winner), *B/N* (big-neutral) and *B/L* (big-looser), as the intersection of two size and three return momentum groups. We define WML as the equal-weight average of the returns on the winner stock portfolios minus the returns on the loser stock portfolios. While constructing our SMB, HML, LFP and WML factors we hold the respective portfolio positions from September of year *Y* to August *Y+1*, and portfolios were formed and updated at the beginning of September every year.

Table 2 Descriptive Statistics of Five Risk Factors.

Panel A: Construction of five risk factors									
MKT	(Rm – Rf)								
SMB	[(S/L + S/N + S/H) – (B/L + B/N + B/H)] / 3								
HML	[(S/H + B/H) – (S/L + B/L)] / 2								
LFP	[(S/LL + B/LL) – (S/HL + B/HL)] / 2								
WML	[(S/W+ B/W) – (S/L+ B/L)] / 2								
Panel B: Summary statistics and correlation matrix of market wide risk factors									
	Summary statistics				Correlation matrix				
	Mean Return	St. Deviation	Skewness	Kurtosis	MKT	SMB	HML	LFP	WML
MKT	-8.12	7.48	-0.23	0.33	1.00				
SMB	0.30	9.97	-1.37	8.00	0.26#	1.00			
HML	1.55	11.12	1.80	4.40	-0.25#	-0.69#	1.00		
LFP	0.48	3.50	0.22	1.54	-0.13^	0.06	0.05	1.00	
WML	1.09	10.35	-0.24	3.56	-0.02	0.02	-0.10	0.04	1.00

Notes: Panel A of this table reports construction of six market wide risk factors. Panel-B shows summary statistics and correlation matrix of the market wide risk factors(see for detail discussion in section 4.2) for the full sample period (187 months). # and ^ represent statistical significance at 5% and 10% level respectively.

In Table 2 we report the construction and summary statistics of five factors. In panel B of Table 3 we found a significant positive correlation between SMB and MKT, while a negative correlation has been observed with HML and MKT. The positive but small correlation between LFP and other factors (SMB, HML, and WML) indicate that liquidity factor in addition to the well documented four factors captures another dimension of systematic risk. Consistent with the finding of Liu (2006) our liquidity factor is negatively correlated with market. The proposition here is that when the economy performs badly, causing liquidity to be low, investors require a high liquidity premium as a compensation for liquidity risk. The lack of high positive correlation between size and liquidity may indicate that size presents some underlying factors besides liquidity.

4.3 Construction of investor sentiment index

Investor sentiment refers to the expectations and beliefs of investors about the future developments of the market risks that is not justified by the facts at hand (Baker and Wurgler, 2007). Existing literatures support two different approaches to measure investor sentiment. First, the aggregate investor sentiment as an explicit sentiment proxy calculated directly from survey data of individual investors. Second, implicit sentiment proxy derived from indirect measures of sentiment from selected market statistics and market parameters with theoretical argument towards investor behaviour (Baker and Wurgler, 2006). Our sample period in this case includes 98 monthly observations (January 2003 to March 2011). The choice of sample period is conditioned up on the data availability. We follow the top-down approach of Baker and Wurgler (2006) to construct investor sentiment Index from market related proxy. The choice of our market related sentiment proxies (MRSP) for constructing a sentiment index has been supported by prior literature, turnover volatility ratio (TVR), buy-Sell imbalance ratio (BSIR), put-call ratio (PCR), advance decline ratio (ADR), share turnover velocity (STV), number of IPOs (NIPO), equity issue in total issue (EITI), dividend Premium (Div.P), change in margin borrowing (CMB), fund flow (FF), cash to total assets (CTA) (Baker and Wurgler, 2006,2007; Brown and Cliff, 2004; Finter and Ruenzi, 2011; Jun et al, 2003; Kumar and Lee,2006; Neal and Wheatley,1998).

In contrast to prior literatures (see for e.g., Baker and Wurgler, 2006,2007; Brown and Cliff, 2004) which empirically validated sentiment index from a wide range of market related proxies, we have included three new measures of market wide sentiment index namely, TVR, BSIR, STV that has been supported by related literatures. Since we aim to test the impact of sentiment risk in the presence of liquidity factor, we have included TVR and STV as discussed by Jun et al (2003) and World Federation of Exchanges respectively as proxies of market liquidity. The direction of the relation between sentiment and these variables is supported from the theoretical arguments given in the related literature. Retaining their theoretical sign our aggregate sentiment index (ASI) with respect to the above mentioned MRSP can be represented as:

$$ASI = BSIR - PCR + ADR + STV + NIPO + EITI - Div.P + CMB + FF - CTA - TVR$$

However, when an investor is bullish or bearish, then this could be a rational reflection of future period's expectation or irrational enthusiasm or a combination of both (Brown and Cliff, 2004). Therefore, it is likely that each MRP for sentiment may include a sentiment component as well as idiosyncratic, non-sentiment related component. To exclude the fundamental and business cycle component from each of the proxies prior to Principal Component Analysis (PCA). We tried to orthogonalise these proxies with macroeconomic factors. Accordingly we formulate Eq. (1) to isolate irrational sentiment component of our sentiment measures from the k fundamental components (FUNDA):

$$MRSP_t = \alpha_j + \gamma_k \sum_{k=1}^{11} FUNDA_{kt} + \varepsilon_t \quad \ldots\ldots(7)$$

Where, α_j indicates the constant, γ_k is the parameter to be estimated, ε_t is the random error term. $FUNDA_{kt}$ is the above mentioned fundamental factors. The fitted values of equation (7) capture the rational component of market wide sentiment proxies (i.e., $M\hat{R}SP_t$). On the other hand the residual of equation (1) capture the irrational component of the sentiment. We then use principal components analysis for measuring the common variation and to isolate the common components from the orthogonal market related sentiment proxies. Then again, there is also ample possibility that some of the MRSP may exhibit lead-lag relationships with the aggregate market wide sentiment and some variables may reflect a shift in sentiment earlier than others (Baker and Wurgler, 2006). Therefore it is important to accommodate the orthogonal $MRSP_t$ ($MRSP_t^{\perp}$) with their relative timing. To overcome this problem before validating our final sentiment index, we first tried to construct a raw sentiment index (ASI'_t) by estimating the first principal component of the 11 $MRSP_t^{\perp}$ and their lags. Thus, our first stage raw sentiment index is composed of 22 loadings indicating one for each of the current and lagged values of $MRSP_t^{\perp}$. After having the ASI'_t we then compute the correlation between the first-stage index and the current and lagged values of each of the $MRSP_t^{\perp}$. Finally, we construct ASI_t with the first principal component of $MRSP_t^{\perp}$ with their respective lead or lag, whichever has higher correlation with the ASI'_t. Since the first principal component explains 42% of the sample variance, we restrict our selves at the first principal level for extracting the common variation of $MRSP^{\perp}$. We found the correlation between ASI_t and ASI'_t is 0.82, which suggest that we are not running the risk of losing substantial information in dropping the 11 proxies with other time subscripts. The resulting final sentiment index can be expressed as:

$$\begin{aligned} ASI_t = &(-0.060*BSIR_t^{\perp}) - (-0.164*PCR_{t-1}^{\perp}) + (-0.194*ADR_{t-1}^{\perp}) + (0.394*STV_{t-1}^{\perp}) + (0.209*NIPO_t^{\perp}) \\ &+ (0.213*EITI_t^{\perp}) - (-0.053*Div.P_t^{\perp}) + (0.273*CMB_{t-1}^{\perp}) + (0.025*FF_{t-1}^{\perp}) - (0.308*CTA_{t-1}^{\perp}) \\ &- (0.328*TVR_{t-1}^{\perp}) \end{aligned}$$

Except for *DivP* we found similar results as that of Baker and Wurgler (2006) for incorporating the relative timing of the $MRSP_t^{\perp}$ in our ASI_t i.e., proxies that involve firm supply responses (*NIPO* and *EITI*) expected to lag behind proxies that are based directly on investor demand or investor behaviour (*PCR*, *ADR*,*STV*,*CMB*, *FF*, *CTA*,*TVR*). While Baker and Wurgler (2006) found that *DivP* should enter in to the index with a lag, we found that in the context of India the impact of dividend premium cannot be accounted as investor demand side influence, rather it shows a contemporaneous effect. This is also consistent with recent literature which suggests in India over the years the percentage of companies paying dividends have declined and only a few companies pay regular dividends (Pandey and Bhat, 2007). Table 3 gives the correlation matrix of the ASI with other market wide risk factors which gives an indication that our constructed proxy for sentiment risk is insignificantly related to market wide risk factors.

Table 3 Correlation Matrix of Aggregate Sentiment Index with Market Risk Factors.

	MKT	SMB	HML	LFP	WML	ASI
MKT	1.00					
SMB	0.15	1.00				
HML	-0.08	-0.06	1.00			
WML	-0.26#	0.04	0.01	1.00		
LFP	0.24#	0.01	0.21#	0.05	1.00	
ASI	0.02	0.05	-0.13	-0.06	0.02	1.00

Notes: This table gives the correlation matrix of our constructed Aggregate Sentiment Index (ASI) with the other market wide risk factors as explained in section 4.2. # represents statistical significance at 5% level.

5. Regression results

5.1 Five factor model

Table 4 presents the results of multivariate time series regression results of equation (3). The adjusted R^2 values have been reasonably high supporting the fact that to some extent our five factor model is capable to capture the common variation in stock returns. The reported GRS statistics which tests the null that the alphas are jointly zero can not be rejected. The results in Table 4 indicate that the market factor has been priced significantly, irrespective of SZ-LIQ-BME-MOM group. Our result supports the pervasive and significant market risk factor even in the presence of liquidity and other factors. It is also evident that coefficient of SMB factor decreases as SZ increases, and the coefficient on the HML factor increases as BME increases. Consistent with the results of Fama and French (1993) and Keene and Peterson (2007) our results also validates that undoubtedly SMB and HML are systematically related to SZ and BME characteristics and represent the shared variation in stock returns related to SZ and BME characteristics and represent the shared variation in stock returns related to SZ and BME

Table 4 Regression of Excess Portfolio Returns on Five Factor Model or Liquidity Augmented Unconditional Carhart (1997) Four Factor Model.

$$\mu_{pt} = \alpha_p + \sum_{k=1}^{4} \beta_{p\,k} CFFM_{k\,t} + \beta_{LFP_p}\left(r_{LFP_t}\right) + \varepsilon_t$$

Portfolio Groups	Momentum (MOM)																				
	L	N	W	L	N	W	L	N	W	L	N	W	L	N	W	L	N	W	L	N	W
	α_P			$\beta_{m\,P}$			$\beta_{SMB\,P}$			$\beta_{HML\,P}$			$\beta_{WML\,P}$			$\beta_{LFP\,P}$			$Adj.\ R^2$		
P1/1/1	-1.51#	-1.59#	0.15	0.83*	0.77*	0.96*	0.98*	0.85*	0.98*	0.49*	0.37*	0.52*	-0.02	-0.02	0.01	-0.17	-0.15	-0.22			
	(-1.95)	(-2.15)	(0.16)	(9.68)	(9.42)	(9.27)	(11.57)	(10.49)	(9.54)	(6.39)	(5.08)	(5.65)	(-1.43)	(-1.48)	(-1.36)	(-0.98)	(-0.92)	(-1.05)	0.62	0.59	0.54
P1/1/2	-0.02	-0.54	0.16	0.89*	0.82*	0.80*	1.08*	1.03*	1.23*	0.52*	0.55*	0.67*	-0.03#	0.01	-0.02	-0.28	-0.08	-0.22			
	(0.00)	(-0.60)	(0.17)	(9.43)	(8.23)	(7.72)	(11.62)	(10.46)	(11.96)	(6.19)	(6.22)	(7.28)	(-2.27)	(-0.10)	(-1.26)	(-1.44)	-0.40)	(-0.06)	0.62	0.54	0.57
P1/2/1	-1.73^	-0.90	0.44	0.88*	0.84*	1.01*	0.92*	0.93*	0.86*	0.41*	0.47*	0.41*	-0.03#	-0.01	0.00	-0.57*	-0.66*	-0.82*			
	(-1.89)	(-1.04)	(0.48)	(8.67)	(8.75)	(9.97)	(9.23)	(9.74)	(8.59)	(4.51)	(5.52)	(4.52)	(-2.01)	(-0.46)	(-0.20)	(-2.76)	(-3.96)	(-4.00)	0.55	0.55	0.57
P1/2/2	-1.44	-1.89#	-1.01	0.85*	0.77*	0.82*	1.19*	1.16*	0.91*	0.60*	0.62*	0.42*	-0.02	-0.03#	-0.02	-0.92*	-0.71*	-0.52*			
	(-1.47)	(-2.05)	(-1.08)	(7.85)	(7.58)	(7.90)	(11.11)	(11.54)	(8.88)	(6.21)	(6.80)	(4.51)	(-1.24)	(-1.97)	(-1.22)	(-4.18)	(-3.40)	(-2.46)	0.57	0.58	0.51
P2/1/1	-1.66#	-1.05	-0.20	0.79*	0.81*	0.91*	0.57*	0.50*	0.61*	0.23*	0.23*	0.31*	-0.02	-0.02#	-0.01	-0.15	-0.12	-0.36^			
	(-2.31)	(0.12)	(0.81)	(9.90)	(10.80)	(9.88)	(7.21)	(6.71)	(6.67)	(3.28)	(3.53)	(3.74)	(-1.40)	(-2.10)	(-2.10)	(-0.90)	(-0.82)	(-1.93)	0.53	0.54	0.50
P2/1/2	-0.36	-0.68	0.10	0.87*	0.81*	0.89*	0.80*	0.68*	0.58*	0.39*	0.34*	0.29*	-0.04*	-0.03#	-0.01	-0.15	-0.19	-0.05			
	(0.65)	(0.39)	(0.89)	(9.83)	(9.17)	(10.87)	(9.07)	(7.80)	(7.14)	(4.98)	(4.40)	(3.98)	(-3.09)	(-2.13)	(-0.63)	(-0.86)	(-1.07)	(-0.42)	0.58	0.51	0.54
P2/2/1	-0.76	-1.04	-0.33	0.87*	0.80*	0.91*	0.58*	0.67*	0.70*	0.23*	0.35*	0.27*	-0.03#	-0.03#	-0.01	-1.01*	-0.52*	-0.97*			
	(0.36)	(0.24)	(0.72)	(9.56)	(8.23)	(8.98)	(6.41)	(6.94)	(6.96)	(2.80)	(3.97)	(3.04)	(-2.38)	(-2.12)	(-0.36)	(-5.45)	(-2.64)	(-4.71)	0.55	0.47	0.52
P2/2/2	-0.07	0.44	0.94	0.86*	0.96*	0.90*	0.71*	0.55*	0.63*	0.39*	0.24	0.32*	-0.04	-0.02	-0.02	-0.72*	-0.45#	-0.71*			
	(0.95)	(0.49)	(0.98)	(8.09)	(9.60)	(8.52)	(6.76)	(5.51)	(6.05)	(4.09)	(2.74)	(3.38)	(-0.36)	(-1.62)	(-1.43)	(-3.33)	(-2.23)	(-3.31)	0.47	0.48	0.46
P3/1/1	-2.11*	-1.55*	-0.27	0.70*	0.70*	0.88*	0.29*	0.21*	0.16#	0.07	0.08	0.03	-0.04*	-0.03*	-0.01	-0.12	-0.10	-0.46*			
	(-3.29)	(-2.64)	(-0.38)	(9.91)	(10.86)	(11.11)	(4.17)	(3.34)	(2.02)	1.17)	(1.41)	(0.49)	(-3.53)	(-2.94)	(-0.91)	(-0.87)	(-0.76)	(-2.86)	0.50	0.50	0.49
P3/1/2	-0.04	-0.84	0.55	0.87*	0.80*	0.99*	0.30*	0.36*	0.25*	0.04	0.13^	0.15#	-0.04*	-0.03*	-0.01	-0.42#	-0.14	0.03			
	(-0.05)	(-1.18)	(0.73)	(10.56)	(10.21)	(11.86)	(3.60)	(4.67)	(3.08)	(0.57)	(1.80)	(2.05)	(-3.12)	(-2.61)	(-0.55)	(-2.51)	(-0.89)	(0.20)	0.52	0.50	0.49
P3/2/1	-0.41	-0.39	0.96	0.91*	0.88*	1.02*	0.11	0.19#	0.08	0.04	0.01	0.05	-0.03*	-0.02#	-0.01	-0.75*	-0.51*	-1.12*			
	(-0.56)	(-0.53)	(1.18)	(11.23)	(10.76)	(11.33)	(1.32)	(2.27)	(0.92)	(0.52)	(0.12)	(0.58)	(-2.84)	(-2.05)	(-0.51)	(-4.55)	(-3.06)	(-6.09)	0.52	0.50	0.54
P3/2/2	-0.03	0.05	1.15	0.85*	0.82*	0.94*	0.37*	0.25*	0.29*	0.14	0.10	0.16#	-0.04*	-0.02	-0.02	-0.74*	-0.55*	-0.82*			
	(0.98)	(0.94)	(0.15)	(8.98)	(10.15)	(10.67)	(3.97)	(3.08)	(3.26)	(1.62)	(1.45)	(2.04)	(-3.30)	(-1.51)	(-1.51)	(-3.86)	(-3.32)	(-4.54)	0.48	0.47	0.50
GRS	5.38 (p-val. 2.01)																				

Notes: This table represents coefficients of time series regression of excess stock returns on five factor model (equation, 4). Sample period consists of 187 monthly observations (September 1995 to March 2011). The 36 SZ-LIQ-BME-MOM portfolios are formed using three size, two liquidity, two book-to-market equity and three momentum groups. For the purpose of brevity we report the portfolio groups of SZ/LIQ/BME as Pi/j/k. The first subscript in the portfolio notation Pi/j/k represents the three SZ trisects, for e.g., small (1), medium (2), large (3). The second subscript denotes the two LIQ bisects, for e.g., low (1), high (2). Similarly the third subscript represents the two BME bisects for e.g., low (1), high (2). MKT is the market factor, SMB is the size factor, HML is the book-to-market factor, WML is the short run momentum factors, LFP is the liquid factor (difference between the return on a portfolio of low liquid stocks and the return on a portfolio of high liquid stocks). The t-statistics (reported in parentheses) have been corrected for the effects of hetroskedasticity and autocorrelation using the method of Newey and West (1987). *, # and ^ represent statistical significance at 1%, 5% and 10% level respectively.

respectively. However, in contrast to Fama and French (1993) we found a significant positive HML slope for small and medium SZ groups but positive insignificant in case of large SZ group. This is inconsistent with the relative distress effect argument of high BME stocks (Fama and French, 1992). Our results suggest that although BME is priced in the Indian stock market but the argument of relative distress as a priced source of risk is abysmal for Indian large SZ companies.

Overall picture of WML as a priced risk factor never looks good to favour the pricing of winner stocks portfolio. In Table 4 the FFM leaves an average momentum spread of 1.11 percent per month between winner and loser intercepts for small stock group, 0.84 percent for stocks mid size group, and a momentum spread of 1.23 percent for large stock group. Overall picture of WML as a priced risk factor never looks good to favour the pricing of winner stocks portfolio. In Table 4 the FFM leaves an average momentum spread of 1.11 percent per month between winner and loser intercepts for small stock group, 0.84 percent for stocks mid size group, and a momentum spread of 1.23 percent for large stock group. Given these results, one might conclude that the local FFM is reasonable but may not be absolute solution for applications to portfolios.

The pricing of $r_{WML\ t}$ results negative coefficients across the portfolios and the significant pricing evidence of momentum profits fades in case of winner portfolio. The momentum strategy retains its value only for the sell side transactions (losers). This is quite contradicting with Jegadeesh and Titman (1993, 2001) findings that debate on the significance of pervasive momentum profits in both buy and sell strategies. However, our results suggest that momentum profits come from the short side of the transaction and not from the long side of the transaction. One possible reason for the presence of such under reaction hypothesis in case of looser stocks may be attributed to their low analyst coverage and their presence as small stocks as evident from the Table 1.

More evidently, we found that liquidity is priced and explains shared variation in returns but our LFP factor priced negatively across all the portfolio characteristics which indicate that there is a positive liquidity premium in case of Indian stock market. However, the frequency of statistical significance is considerably greater for the large stocks and for high BME groups. This is also consistent with our subsequent analysis (not reported here) which shows that the average of annual average value of liquidity value increases as we move from small to large size groups. Being more liquid the loading of slope coefficients for LFP found to be significant in the large stocks. Although direct comparison is not possible, but our results are contradictory to that of Amihud (2002), Keene and Peterson (2007) and Liu (2006) for U.S.

and Lam and Tam (2011) for Hong Kong market as we do not find any variation in terms of positive or negative pricing pattern of liquidity across size groups. The negative relationship between liquidity and excess return supports the fact that due to less liquidity investors can reasonably expect to be compensated with larger returns for the risk that they will not be able to sell a stock in a timely fashion without undue loss (Marshall and Young, 2003). Another plausible explanation is that because of the high concentration of promoter holding the large size stocks may not have the same amount of market liquidity as it is expected to be.

5.2 Sentiment augmented unconditional multifactor models

Table 5 represents the results of sentiment augmented multifactor models as specified in equation no. 4, 5 and 6 respectively. For the purpose of brevity we have only reported the slope coefficient of the sentiment factor (ASI) and the respective intercepts. The results for the other market wide risk factors are consistent with our prior analysis. Table 5 gives the first impression on how the portfolio returns are related to sentiment, with the loadings on our macro adjusted ASI, which remains insignificant across the portfolio sorting criteria. This indicates that the argument of existing literature on behavioural finance towards the pervasiveness of sentiment risk factor is not applicable to the Indian stock market. However, consistent with prior literature which suggests that small stocks and stocks those are hard to value and riskier to arbitrage are more profoundly expected to be influenced by sentiment factor (Baker and Wurgler, 2006, 2007) we found that stocks with characteristics such as small size, low LIQ, low BME and losers are affected with the sentiment risk. This result is also robust to the three factor, four factor and five factor model specifications. Although in case of three factor model specification large size, low LIQ, low BME across all the momentum portfolios have shown significant pricing of sentiment risk, but as we add more market risk factors in the four and five factor model specifications the sentiment pricing gradually looses its importance. This gives an impression that the FFTFM may be validated with caution in Indian stock market as it fails to capture the impact of sentiment risk to some extent. Our results also suggest that the magnitude of pricing implication for the market wide risk factors as reported in Table 5 gives an impression of the rational sources of priced risk.

The minimal pricing implication of market wide sentiment risk in the context of Indian stock market can be explained with the following arguments. This may be because of the some special characteristics of Indian stock mark. With the low level of retail investor participation, high promoter holding and large portion of institutional investors' contribution towards the entire market turnover might lead to a different reaction of stock returns to investor sentiment. More arguably the dominance of institutional investors' participation and insignificance of

Table 5 Regression of Excess Portfolio Returns on Sentiment Augmented Unconditional Multifactor Models.

Portfolio Groups	Momentum (MOM)																	
	L	N	W	L	N	W	L	N	W	L	N	W	L	N	W	L	N	W
	(1)						(2)						(3)					
	$\mu_{p\,t} = \alpha_p + \beta_{ASI_p} ASI_{t-1} + \sum_{k=1}^{3} \beta_{p\,k} FFTFM_{k\,t} + \varepsilon_t$						$\mu_{p\,t} = \alpha_p + \beta_{ASI_p} ASI_{t-1} + \sum_{k=1}^{4} \beta_{p\,k} CFFM_{k\,t} + \varepsilon_t$						$\mu_{p\,t} = \alpha_p + \beta_{ASI_p} ASI_{t-1} + \sum_{k=1}^{4} \beta_{p\,k} CFFM_{k\,t} + \beta_{LFP_p}\left(r_{LFP_t}\right) + \varepsilon_t$					
	α_P			$\beta_{ASI\ P}$			α_P			$\beta_{ASI\ P}$			α_P			$\beta_{ASI\ P}$		
P1/1/1	-0.77	-0.49	-0.03	-0.25#	-0.12	-0.12	-0.04	0.21	0.21	-0.21#	-0.08	-0.17	-0.03	0.22	0.21	-0.22#	-0.09	-0.17
	(-0.84)	(-0.64)	(-0.04)	(-2.32)	(-1.33)	(-1.33)	(-0.04)	(0.27)	(0.22)	(-2.01)	(-0.96)	(-1.59)	(-0.04)	(0.28)	(0.23)	(-2.02)	(0.32)	(-1.60)
P1/1/2	0.37	0.25	0.99	-0.27	-0.18	-0.18	1.52	1.09	1.32	-0.21	-0.14	-0.16	1.53	1.09	1.35	-0.21	-0.14	-0.17
	(0.37)	(0.26)	(1.05)	(-2.27)	(-1.57)	(-1.57)	(1.53)	(1.08)	(1.33)	(-1.87)	(-1.23)	(-1.42)	(1.53)	(1.08)	(1.38)	(-1.88)	(-1.23)	(-1.57)
P1/2/1	-1.29	-0.78	0.20	-0.21	-0.15	-0.15	-0.11	-0.29	0.99	-0.15	-0.13	-0.08	-0.08	-0.25	1.06	-0.16	-0.15	-0.12
	(-1.13)	(-0.78)	(0.18)	(-1.53)	(-1.31)	(-1.31)	(-0.09)	(-0.28)	(0.82)	(-1.13)	(-1.09)	(-0.60)	(-0.07)	(-0.24)	(0.93)	(-1.24)	(-1.28)	(-0.89)
P1/2/2	-2.04	-1.29	-0.59	-0.14	-0.14	-0.14	-0.50	-0.35	-0.35	-0.06	-0.09	-0.12	-0.46	-0.31	-0.32	-0.08	-0.11	-0.14
	(-1.67)	(-1.15)	(-0.55)	(-0.99)	(-1.03)	(-1.03)	(-0.43)	(-0.30)	(-0.31)	(-0.48)	(-0.68)	(-0.96)	(-0.40)	(-0.27)	(-0.28)	(-0.64)	(-0.86)	(-1.10)
P2/1/1	-0.55	-0.30	1.11	-0.15	-0.12	-0.12	0.27	0.24	1.31	-0.11	-0.09	-0.11	0.28	0.25	1.32	-0.12	-0.10	-0.11
	(-0.66)	(-0.36)	(1.18)	(-1.56)	(-1.19)	(-1.19)	(0.31)	(0.27)	(1.32)	(-1.17)	(-0.91)	(-0.94)	(0.33)	(0.29)	(1.36)	(-1.04)	(-1.24)	(-1.00)
P2/1/2	0.15	0.59	0.99	-0.19^	-0.18#	-0.18#	1.16	1.18	1.28	-0.14	-0.15	-0.20^	1.17	1.18	1.29	-0.15	-0.15	-0.20^
	(0.16)	(0.64)	(1.12)	(-1.72)	(-2.08)	(-2.08)	(1.22)	(1.24)	(1.39)	(-1.32)	(-1.36)	(-1.91)	(1.22)	(1.23)	(1.39)	(-0.96)	(-1.34)	(-1.94)
P2/2/1	-0.38	0.02	-0.06	-0.19	-0.14	-0.14	0.43	0.18	0.21	-0.15	-0.13	-0.14	0.48	0.21	0.26	-0.18	-0.14	-0.17
	(-0.37)	(0.02)	(-0.06)	(-1.12)	(-1.34)	(-1.34)	(0.41)	(0.16)	(0.20)	(-1.30)	(-1.03)	(-1.21)	(0.47)	(0.19)	(0.24)	(-1.54)	(-1.15)	(-1.49)
P2/2/2	-0.05	0.22	1.48	-0.11	-0.18	-0.18	1.12	1.09	1.84	-0.05	-0.13	-0.12	1.17	1.13	1.88	-0.07	-0.15	-0.14
	(-0.04)	(0.20)	(1.13)	(-0.73)	(-1.39)	(-1.39)	(0.90)	(0.97)	(1.33)	(-0.33)	(-1.06	(-0.78)	(0.96)	(1.02)	(1.37)	(-0.52)	(-1.22)	(-0.91)
P3/1/1	-0.96	-0.60	0.72	-0.18#	-0.17#	-0.17#	-0.45	-0.25	0.81	-0.15^	-0.15^	-0.16^	-0.44	-0.26	0.82	-0.16^	-0.15^	-0.17^
	(-1.34)	(-0.88)	(0.88)	(-2.10)	(-2.29)	(-2.29)	(-0.62)	(-0.35)	(0.94)	(-1.81)	(-1.91)	(-1.67)	(-0.60)	(-0.36)	(0.95)	(-1.87)	(-1.87)	(-1.73)
P3/1/2	0.43	0.63	0.97	-0.15#	-0.15^	-0.15^	1.14	1.20	1.16	-0.12	-0.12	-0.13	1.16	1.21	1.16	-0.13^	-0.12	-0.13
	(0.47)	(0.72)	(1.08)	(-2.13)	(-1.75)	(-1.75)	(1.20)	(1.34)	(1.21)	(-1.10)	(-1.15)	(-1.19)	(1.24)	(1.35)	(1.21)	(-1.73)	(-1.23)	(-1.19)
P3/2/1	0.35	0.17	0.70	-0.15	-0.18	-0.18	1.21	0.24	0.95	-0.11	-0.18	-0.16	1.24	0.27	0.99	-0.13	-0.19	-0.18^
	(0.37)	(0.19)	(0.70)	(-1.32)	(-1.78)	(-1.78)	(1.23)	(0.26)	(0.91)	(-0.96)	(-1.72)	(-1.35)	(1.30)	(0.29)	(0.68)	(-1.21)	(-1.15)	(-1.85)
P3/2/2	0.52	0.33	1.14	-0.25#	-0.18	-0.18	1.40	0.69	1.73	-0.20^	-0.16	-0.10	1.43	0.71	1.77^	-0.22^	-0.17^	-0.12
	(0.50)	(0.33)	(1.13)	(-2.01)	(-1.53)	(-1.53)	(1.31)	(0.66)	(1.64)	(-1.68)	(-1.36)	(-0.82)	(1.36)	(0.69)	(1.73)	(-1.60)	(-1.86)	(-1.46)

Notes: This table represents slope and intercept of regression results of portfolio returns on sentiment augmented unconditional multifactor models (Fama and French three factor model, Carhart four factor model and five factor model). (1), (2) and (3) represents the regression results of equation no. 4, 5 and 6 respectively. Sample period consists of 98 monthly observations (January 2003 to March 2011). The 36 SZ-LIQ-BME-MOM portfolios are formed using three size, two liquidity, two book-to-market equity and three momentum groups. For the purpose of brevity we report the portfolio groups of SZ/LIQ/BME as Pi/j/k. The first subscript in the portfolio notation Pi/j/k represents the three SZ trisects, for e.g., small (1), medium (2), large (3). The second subscript denotes the two LIQ bisects, for e.g., low (1), high (2). Similarly the third subscript represents the two BME bisects for e.g., low (1), high (2). ASI indicates the aggregate sentiment index as described in section 4.3. The t-statistics (reported in parentheses) have been corrected for the effects of hetroskedasticity and autocorrelation using the method of Newey and West (1987). # and ^ represent statistical significance at 5% and 10% level respectively.

sentiment risk pricing in Indian stock market is also consistent with the recent literature which supports the fact that institutional investors are more rational as compared to the individual investors (Verma and Verma, 2009). Another possible reason for our deviation from existing behavioural asset pricing literature may be because of our value weighted portfolio characterisation and one year holding period restriction.

5. Summary and conclusions

Our findings support that the applicability of unconditional five factor pricing model as reasonable but may not be absolute solution for applications to portfolios in Indian stock market. It may not be absolute because of the resulted non zero intercept across all the portfolios. In contrast to Fama and French (1996) we found that Fama and French factors retains their importance while explaining the return on momentum portfolios as long as the test assets are not tilted towards the large size stocks. Our results suggest that a liquidity risk factor plays a relevant role in explaining the cross section of average return in India. However, in contrast to several literatures our results do not so any such variation of its pricing nature across the size groups. Apart from the special nature of an order driven market another possible explanation in this regard can be attributed to the lack of sufficient liquidity among many stocks and therefore to warrant a liquidity premium.

Our results also contradicts to the distress risk argument of high-minus low book-to-market equity factor as in Fama and French (1993, 1996 p.77). Several authors like Lakonishok et al. (1995) and MacKinlay (1995) advocated towards the behavioural biasness of investor which amounts to book-to-market equity factor as a priced risk.

The resulted minimal pricing implication of momentum factors for the explaining return associated with winner stock portfolios the under-reaction hypothesis of stock prices to information contained in past stock returns and past company earnings cannot be hold good for Indian stock return. This also casts doubt on the behavioural models of investor behaviour (Barberis et al., 1998 and Daniel et al., 1998). This may imply that with the concentration of institutional investors and sparse and minimal concentration of the individual investors the behavioural biasness argument of earlier literature may not be much significant. Following the argument of behavioural asset pricing literature towards the pricing of market wide sentiment risk we have examined the pricing of sentiment risk in the presence of other market wide risk factors. We found market wide risk factors resume their importance as rational source of priced risk. Our results also suggest that it is naïve to argue for the universal pricing implication of sentiment risk in a multifactor model framework given the special nature of Indian stock market with high promoter holding and marginal retail investor participation.

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