Synopsis

The Fama French Model which followed the CAPM has been widely debated by various researchers on issues like whether value and size premiums are caused by the underlying risk factors of firms falling within these categories or due to the incorrect extrapolation of past earnings growth by the market and subsequent correction of the mispricing errors. Several researchers have supported the ability of the Fama and French Factors to explain the cross section of expected returns across different stocks all around the world (Fama and French (1995), Fama and French (1998)), Liew and Vassalou (2000), Fama and French (2000)). However there is also evidence for rejecting the Fama French 3 factor model and accepting an alternative Characteristic Model to explain the cross section of expected returns (Daniel and Titman (1997)).

How well do the Fama-French factors predict stock returns during tranquil and chaotic periods? Suppose we have two stocks A and B which perform similarly during a given time period, but perform differently during good times and bad times. In such a case a stock which is more sensitive to the risk factors during periods of economic crisis demands a premium over stocks which are less sensitive. This is particularly important for a well diversified investor who wants to hedge the risks associated with bad times. In economic terms, during high consumption and output periods, the marginal utility for additional unit of consumption is lower as a result of which risk premium falls. During recessionary periods, when the consumption levels fall, investors anticipate a higher future consumption level which boosts up the risk premium levels. Black (1990), Abel (1988), Connor and Korajczyk (1989), Kandel and Stambaugh (1990) etc. provide strong evidences to this fact. Fama and French (1995) demonstrate that SMB and HML are “state variables proxy for the underlying economic risks”. To the extent that the Fama-French model has historically performed well, these factors generate returns which are inversely proportional to the marginal utility function of buying each additional asset (Cochrane (2001)). In simple terms, those assets which fail to perform well during periods of economic crisis have a higher cost of capital to remain competitive with those assets which perform well during those periods (Archanapalli, et. al (2006)). According to the authors, there is a value premium even during recessionary periods.

The recent credit crisis offers an excellent opportunity to examine the effectiveness of the Fama-French model to explain stock returns and suggest additional factors that may
perform better in capturing distress risk. This study would be the first of its kind to present a
model which incorporates factors which are more relevant than Fama French factors in the
light of the recent financial turmoil when the investor perception of risk has changed
significantly. We incorporate new factors based on leverage risk, liquidity risk and
idiosyncratic volatility which together are expected to add significant value to the traditional
Fama French model and provide a better explanatory power to explain the cross section of
expected returns. As per our knowledge there is no study till date which has tried to examine
the joint effects of leverage risk, liquidity risk and idiosyncratic volatility on the cross section
of expected returns.

One of the arguments supporting the necessity of a better and more comprehensive
model incorporating additional factors which better represent distress risk is that book to
market equity ratio is a very noisy proxy for the underlying distress factor of firms. For e.g.
when a company has lot of intangible assets like research and development capital, these are
not reflected in the accounting book value as they are treated as expenses which in turn
results in a low book to market equity ratio. When a company has a lot of growth
opportunities and invests in projects having positive NPV, the market price of such stocks is
boosted up (without being reflected in the book value of the stock) resulting in a lower book
to market equity ratio. Similarly a natural resource company or a company having huge oil
reserves will tend to have high temporary profits when the oil prices rise which will lower
down the book to market equity ratio. However the risk factor of such companies is very high
as they may not have good growth opportunities and this high risk is not reflected in the book
to market equity. Studies like Daniel and Titman (1997) and Lakonishok, Shleifer and Vishny
(1994) support the above argument. Dichev (1998) indicated that size and book to market
factors do not proxy for the default risk. Ghargori, Chan and Faff (2009) provide further
evidence to this fact. Hence one can infer that a better model incorporating the distress risk
factor would be appreciated.

In this study, we construct the factors based on leverage risk, liquidity risk and
idiosyncratic risk and test their significance in explaining the cross section of expected
returns. We consider the debt equity ratio of a company to construct the leverage risk factor.
We use a different measure to proxy liquidity risk. Instead of taking the absolute values like
market wide turnover or variability in liquidity, we try to arrive at the risk associated with the
sensitivity of the individual stock’s liquidity to the market wide liquidity as a whole; these
sensitivities represent liquidity risk. Using these sensitivities we sort the stocks following the
independent sorting procedure of Fama French (1993) and construct the liquidity risk factor. This factor is similar to the Fama French risk factors in the sense that it extracts the commonality of the firms sorted on the basis of their liquidity risk.

Next, we try to form the idiosyncratic risk factor using firm specific idiosyncratic volatility. Since idiosyncratic volatility\(^1\) is not directly observable, we estimate idiosyncratic volatility for each stock. To arrive at a robust estimate of idiosyncratic volatility we identified a core set of firm specific variables that have the explanatory power to predict synchronicity of stock price movements. Consistent with studies of Roll (1986), French and Roll (1988) and Morck et al. (2000), higher level of synchronicity suggests higher level of firm specific information being incorporated in the stock prices through informed trading and hence lower idiosyncratic volatility leading to lower idiosyncratic risk. Hence we identified a set of firm specific variables that have the information content to predict synchronicity. We include firm specific characteristics which contribute to idiosyncratic risk like size, market betas, book to market equity ratio, debt equity ratio, momentum, stock specific liquidity and coefficient of variance of liquidity (variability in liquidity) to arrive at a robust measure of idiosyncratic volatility. Finally, we sort the stocks based on idiosyncratic volatility and construct the idiosyncratic risk factor. This factor extracts the commonality of the stocks sorted on the basis of idiosyncratic risk. We finally test whether this conditional variance (idiosyncratic risk) factor in conjunction with the liquidity risk factor and leverage factor has an additional explanatory power to make significant contribution to the traditional Fama French 3 factor model.

Broadly speaking this study is different from the previous studies and contributes to the asset pricing literature in several ways. First, like the earlier studies, this study attempts to develop a comprehensive model which includes the systematic as well as unsystematic risk factors and explains the factors contributing to the cross section of expected returns. We suggest that financial leverage is a systematic risk factor. Consistent with Ferguson and Shockley (2003), we believe that leverage is a better proxy for the distress risk that significantly contributes to the systematic risk of a firm. In other words, we endeavor to establish that leverage risk is not a firm specific risk, but a systematic risk factor which has primary relevance in asset pricing theory. We also show that the leverage risk factor has direct linkages to important macro economic variables (which represent the macroeconomic

\(^1\) Some of the variables to measure of idiosyncratic volatility has been borrowed from the PhD thesis entitled “The information content of stock price synchronicity – An empirical analysis of stand alone and business group firms in India” of Dr. Vishwanathan Iyer, Assistant Professor, IBS Hyderabad.
environment in which the firm operates) like GDP growth rates, percentage changes in inflation rates, changes in the unemployment, percentage industrial production growth rate and short term interest rates.

Several studies incorporate liquidity levels of the stock as a factor which contribute to the systematic risk. We suggest that liquidity of the stock more closely represents the firm specific characteristic than being a part of the systematic risk component of the firm. In other words, it contributes to the idiosyncratic risk of the firm and does not form part of the systematic risk of the firm. This argument stems from the fact that there exists a significant negative relationship between idiosyncratic risk (firm specific risk) and liquidity levels of a firm and idiosyncratic risk tends to proxy the effects of liquidity on stock returns. (Spiegel and Wang (2006)).

Apart from this, though several studies have dealt with the evidence of liquidity risk as a priced factor, there has been no established literature which attests the reasons behind such liquidity risk in the context of the broader environment in which the firm operates. Most of the studies attribute this to the existence of correlated inventory costs and inventory risk of the specialists operating in a quote driven market like NYSE. Some studies characterize such commonality as an outcome of asymmetric information risk which might be common among the specialists (for e.g. prior knowledge about the introduction of a new technology into the market by informed traders may lead to correlated demand for such stocks\(^2\)). However exploring what external factors cause such inventory risk is important to ascertain that such liquidity risk is indeed a non diversifiable risk factor. We contribute to the existing strand of literature by analyzing the liquidity risk factor from the macroeconomic point of view. We prove that such liquidity risk has a direct significant relationship with the underlying macroeconomic fundamentals which provides a strong basis to believe that market wide liquidity is a priced factor and forms part of systemic risk of the firm which is non diversifiable.

The time span of most of the studies which explain the role of liquidity risk or commonality in liquidity has been restricted. We extend our contribution by using a longer sample period and investigating whether the effects of liquidity risk has been persistently significant especially in the periods of financial crisis. Moreover we did not find any major study till date which has empirically tested the effects of liquidity risk in the light of the recent credit crisis and we make an effort to efficiently articulate this aspect in our study.

\(^2\) See Chordia et al. (2000) for further explanation.
This is important because the impact of liquidity risk was a prime concern among the financial managers during this period.

Thirdly, it has been widely established in the literature that idiosyncratic risk plays a significant role in explaining the cross section of expected returns. However the estimation of idiosyncratic risk varies across different studies, as a result of which these studies yield contrasting results difficult to explain. In this study, we develop a better and a more comprehensive measure of idiosyncratic risk by incorporating the effects of firm specific characteristics to arrive at a comprehensive measure of idiosyncratic volatility. Our measure of idiosyncratic risk factor is derived from such measure of idiosyncratic volatility. Macroeconomic news has a major impact on the volatility of stock returns and the idiosyncratic risk factor is expected to be indicative of such macroeconomic effects in the economy. We test for the relationship between the idiosyncratic risk factor and macroeconomic variables to test the economic significance of idiosyncratic risk factor. This portrays idiosyncratic risk factor as a systematic risk factor which has significant importance in the context of a comprehensive asset pricing model which explains the expected stock returns.

This study is important in the light of today’s financial markets where investors try to build diversified portfolios with the objective of earning maximum returns and minimizing risk. Investors including financial institutions across the world widely use the Fama French model in estimating their premiums. This would be an inappropriate strategy if the Fama French factors are losing their explanatory power as compared to other variables like leverage, liquidity risk and idiosyncratic risk which have assumed prime importance in the financial markets. Financial managers need to note that especially during the recent financial turmoil, variables like economy wide leverage, liquidity risk and idiosyncratic volatility played a key role in exacerbating the risk exposure especially for the leveraged firms. With regard to leverage risk, many financial institutions like Lehman Brothers, Bear Stearns, Merrill Lynch, Goldman Sachs and Morgan Stanley issued large amounts of debt during 2004-2007 which drastically increased their debt market exposure. Initially companies like Northern Rock and Countrywide Financial, which were directly involved in construction business and mortgage lending, were affected because they could no longer obtain credit from the financial institutions. The crisis had major impact in September and October 2008 when there was a huge withdrawal of $144.5 billion\(^3\) from the money market. Major

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institutions like Lehman Brothers, Bear Stearns, Merrill Lynch, Fannie Mae, Freddie Mac and AIG had to bear the brunt of high debt market exposure. The TED spread (difference between the interest rates on interbank loans and short-term U.S. T-bill) which is an indicator of perceived credit risk in the economy spiked up in July 2007, then spiked even higher in September 2008, recording as high as 4.65% on October 10, 2008.⁴ Thus the credit storm in 2007-2008 had a contagion like effect, with leverage risk emerging as one of the major factors which financial managers need to acknowledge. An important study also indicated that idiosyncratic volatility in various developed markets is exhibiting an upward trend. This has a major implication for portfolio managers for determining the composition of investor portfolios and diversifying risks efficiently to generate optimum returns. Another pivotal aspect which has emerged from the recent financial crisis is that financial institutions and fund managers need to analyse the needs for liquidity at the enterprise level and be cautioned against the circumstances of market wide liquidity getting dried up eventually especially during turbulent periods. According to a recent report⁵, weak liquidity risk controls were a significant problem across several firms which contributed to the severity of the crisis and the stock market crash. The report illustrates that managers of individual business lines of the hard hit firms had little incentive to extend sufficient information to arrive at a measure of future expected liquidity needs of the firms or contingency funding plans. This led to inadequate preparation of the future funding needs of the firms and added to the funding pressures as well as pressures on capital ratios. On the brighter side, firms which were successful in sustaining the brunt of the financial meltdown devised strategies which included the consideration of liquidity risks and consolidated information from all business lines with special focus on structured investment vehicles thereby limiting their involvement in these activities. One can infer from the above evidences that leverage risk, idiosyncratic risk and liquidity risk have major relevance from the practical aspect in explaining the expected stock returns. In short, this study endeavors to build a road map which represents a better and a more comprehensive model incorporating all the above factors in addition to the widely acknowledged Fama French factors rather than adjure on the traditional altercation that the Fama French factors are bad proxies for distress risk.

We sequence our study in the following order. Firstly, we construct our additional risk factors in accordance with the independent sorting procedure as portrayed by Fama and French (1992). We use debt equity ratio, liquidity risk (estimated) and idiosyncratic volatility (estimated) to form additional risk factors i.e. leverage risk factor, liquidity risk factor and the idiosyncratic risk factor. Next, we attest that these additional risk factors have direct implications on the Macroeconomy. To summarize the findings, we find significant relationship between each of these additional risk factors with all the macroeconomic variables used in this study, viz. GDP growth rates, Industrial production growth rates, changes in unemployment rates, changes in inflation (CPI and WPI) and short term interest rates. This confirms that these additional risk factors are fundamentally systematic risk factors. Finally, we regressed excess stock returns against the market factor, traditional Fama French factors and the additional risk factors. Our analysis proceeds in the following order. First, we test for the significance of the Fama and French model and compare the results during tranquil and crisis periods. Specifically, we test the sensitivities of the asset returns to Fama-French factors during January 1992 –December 2012. We then split this period into two periods, January 1992– June 2007 which represents the tranquil period and July 2007 – December 2012 which represents the crisis period.

Each week from January 1992 to December 2012 we run cross sectional regressions of weekly excess stock returns on market factor, SMB, and HML factors. Next, we add the additional risk factors to test for their significance in addition to the market factor and the Fama-French factors using a GARCH specification with Generalized Error Distribution. For robustness check on the significance of the additional risk factors, we test for the significance of log likelihood ratio of redundant variables (leverage risk factor, liquidity risk factor and the idiosyncratic risk factor) to see whether these additional factors contribute significantly in explaining the cross section of expected returns. The regression results suggest that the additional risk factors made a pertinent contribution in explaining expected portfolio returns. To take care of the heterogeneity in the data we perform the regressions across three distinguished categories of stocks i.e. conventional globally traded stocks, Islamic stocks and the SRI stocks which are traded globally. The results also offer support to the earlier findings. We also perform the above regression on different categories of OECD market portfolios, Emerging market portfolios, U.S stock portfolios, Non U.S stocks portfolios and portfolios with financial and non financial stocks. The results also offer support to the earlier findings. The effects of the additional risk factors were consistently significant throughout the sample across the tranquil period and the crisis period. In a nutshell, the contribution of
additional risk factors (leverage risk, liquidity risk and idiosyncratic risk) has been quite remarkable and significant.