Chapter 1 – Introduction

“Credit crises have always been painful and unpredictable. The current one is particularly hair-raising because it's occurring amid the first truly global bubble in asset pricing. It is also accompanied by a plethora of new and ingenious financial instruments. These are designed to spread risk around and to sell fee-bearing products that are in great demand ... Even if the credit crunch passes without a major catastrophe, the prices of stocks, bonds and real estate have a long way to fall…”

Jeremy Grantham

1.1 Background

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\(^7\) 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. Also see Archanapalli, et. al (2006).

1.2 Motivation for the study

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 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 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 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.

\(^7\)SMB is a size premium constructed by taking the simple average of the returns on all small portfolios minus the simple average of the returns on big portfolios. The portfolio returns are value weighted, the weights are assigned as per the market capitalization of the stocks in the portfolio. HML is the value premium constructed by taking the simple average of the returns on high book to market equity portfolios minus the simple average of the returns on low book to market equity portfolios.
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 capture distress risk. This study would be the first of its kind to present a model which incorporates factors which are highly relevant with appropriate economic explanation 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 risk which together are expected to enhance the explanatory power of the asset pricing model incorporating the Fama French factors and hence better explain the variations in 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 risk on the cross section of expected returns. When these variables are used jointly we expect the explanatory power (adjusted R-square) to increase significantly as we believe that these variables are highly relevant given the 2007 crisis.

This study is important in the light of today’s financial markets where investors try to build diverse 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 do not incorporate the effects of other variables like leverage and liquidity 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 risk, liquidity risk and the risk associated with idiosyncratic volatility have 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\(^8\) from the money market. Major 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.\(^9\) 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 analyze 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 report\(^10\), 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 of the conspicuously striking effects of the recent credit crisis is the unexpected surge in the stock market volatility. This has led to tremendous instability in the world wide economy. According to one of the reports, the implied volatility of S&P 100 has increased almost six fold since August 2007. It has been widely and unanimously accepted in the early literature that in the presence of systematic risk factors, idiosyncratic risk or the firm specific risk is not important. This has led to fallacious claims that an arbitrageur can diversify such idiosyncratic risk without any cost and this risk does not affect arbitrage activities. However in the last decade, there have been several evidences to prove that under equilibrium

conditions, market inefficiencies persist which makes the role of idiosyncratic risk critical and portrays idiosyncratic risk as a major contributor to arbitrage costs.

One can infer from the above evidences that leverage risk, liquidity risk and idiosyncratic risk factors have major relevance in explaining the expected stock returns.

1.3 The Fama French Model: A critical Review

Building on the Markowitz framework with the assumption that investors use the logic of Markowitz in forming portfolios, the Capital Asset Pricing Model was developed by Sharpe(1964), Lintner (1965) and Black (1971). This model paved the way for academicians to think about the relationship between the risk and returns of a security. The central prediction of this model led to the conclusions that (a) Expected returns on securities are positive linear functions of their market betas (b) The market betas suffice to describe the cross section of expected returns. However in the eighties several researchers brought forward various contradictions to the Sharpe-Lintner-Black model (SLB model) like the size effect, book to market equity effect and the leverage effect which were considered as the anomalies of CAPM. Fama and French (1992) evaluated the joint roles of market beta, size, E/P, leverage and book to market equity in the cross section of average returns on NYSE, AMEX and NASDAQ stocks.

Fama and French (1992) concluded that the combination of book to market equity and size described the cross section of average returns and absorbed the apparent roles of other variables like leverage and E/P. Fama and French (1993) extended the asset pricing tests in Fama and French (1992) by considering bond returns in addition to common stocks. Instead of using Fama – Macbeth regressions as in Fama and French (1992), they used the time series regression approach of Black, Jensen and Scholes (1972). They concluded that a market factor and returns on the portfolios constructed to proxy for the risk factors related to size and book to market equity presented a better explanatory power in explaining the cross section of average returns. In other words, they indicated that the expected return on a portfolio in excess of the risk free rate is explained by the sensitivity of its return to three factors (i) the excess return on a broad market portfolio (Rm - Rf); (ii) the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks (SMB, small minus big); and (iii) the difference between the return on a portfolio of high-book-to-market stocks
and the return on a portfolio of low-book-to-market stocks (HML, high minus low). Specifically, the expected excess return on portfolio $i$ is:

$$r_{it} - r_{ft} = \alpha + \beta_0 (r_{mt} - r_{ft}) + \beta_1 (R_{SMB})_t + \beta_2 (R_{HML})_t + \varepsilon_t$$  \hspace{1cm} (1)

where $r_{mt} - r_{ft}$, $R_{SMB}$, and $R_{HML}$ are expected premiums. $\beta_0$, $\beta_1$, $\beta_2$, are the slopes in the above time-series regression.

The mimicking portfolios SMB and HML captured common factors in stock returns related to size and book to market equity. Though the Fama French model was widely accepted across the globe, there has also been evidence that these factors didn't represent systematic risk. Lakonishok, Shleifer and Vishny (1994) indicated that investors get overly excited to stocks that have done well in the past and overbuy them as a result of which these “glamour” stocks become overpriced. Similarly investors dislike stocks which have performed poorly in the past, oversell them as a result of which these “value” stocks become underpriced. Contrarian investors take advantage of this arbitrage opportunity, they buy value stocks which are underpriced and sell growth stocks which are overpriced and earn a premium. Thus high returns on value stocks and low returns on growth stocks are due to mispricing in the market. Fama and French (1998) presented additional out of sample evidence on the value premium. They studied the value weighted returns on market, value and growth portfolios formed on book to market, E/P, C/P and D/P for the United States and twelve major countries, Europe, Australia and the Far East countries from the year 1975 through 1995. They concluded that the size factor was not strong in all the countries but the results showed a consistent value premium across all the thirteen markets indicating that value premium is pervasive.

However, Daniel and Titman (1997) held an opposite view and supported a characteristic model to explain the cross section of expected returns. According to this model, the risk premia due to size and book to market equity factors do not arise because of the co-movement of the stock returns with the systematic risk which these factors are expected to proxy for, but because of the firm specific characteristics which act as determinants of returns.
One of the major criticisms of the Fama French model was that the value premium was sample specific and was likely to be a “mere artifact of data mining” as indicated by Black (1993). Black (1993) argued that the existence of value premium is a mere chance unlikely to recur in future returns. MacKinlay (1995) also supported this argument. Kothari Shanken and Sloan (1995) indicated the problem of survivorship bias and postulated that the high explanatory power of the book to market ratio was only due to survivorship bias and mis-measurement of beta. Jagannathan and Wang (1996) supported the existence of a conditional CAPM after including the time varying component of the market betas. The paper also argued that the failure of CAPM to explain the cross section of expected returns was majorly because of an incorrect proxy for market returns. Inclusion of the human capital component in the market wide returns explained the variation in asset returns as much as the Fama and French model did.

At the same time, Penman et al (2007) conferred an argument that book to market ratio of a firm centrally demonstrated the accounting phenomenon and is in accordance with the method used by the accountants who measure “book value” of a firm rather than the risk exposure of the firm. The authors extend an interesting example of a pure investment fund where accountants employ “mark to market” accounting principles because of which the “net asset value” equals the market value. They explain that these methods used by accountants might result in a risky hedge fund and a money market fund having the same B/M ratio irrespective of their risk exposures. As a result the book to market factor does not capture precisely the distress risk of the firm and varies considerably in conjunction with the different accounting procedures and principles used by accountants.

1.4 The Role of leverage risk as a systematic risk factor – some evidences

A portfolio manager quotes, “Some companies take on leverage at the right time, for the right reasons. Others do it at the wrong time, or for the wrong reasons. Either of these situations can still result in investment opportunities. But each needs to be analyzed thoroughly.”\textsuperscript{11}

Why is leverage important? This question is crucial in the light of today’s financial crisis and the devastating effects which have occurred in the economy due to over issuance of debt. As it is rightly said, “Leverage is a double edged sword and a powerful ally during

\textsuperscript{11} As quoted by David Glancy, Portfolio manager, extracted from: http://www.putnam.com/spectrum/leveraged-companies.htm
boom times and at the same time can become our worst foe during the ensuing bust.”¹² In 2004, the US Securities and Exchange commission acclaimed a waiver of the international standards of maximum leverage ratio (which was about 12) for five major securities firms – Goldman Sachs, Merrill Lynch, Morgan Stanley, Lehman Brothers and Bear Sterns.¹³ Subsequently, it was noted that most of the investment banks boosted up their leverage ratios as high as 30 to 1 transacting with huge amounts as millions and billions of dollars. Mortgage giants Freddie and Fannie had leverage levels close to 100 to 1, which can be very lucrative if the asset prices rise, but has disaster written all over it if the asset prices fall. Many of the annotations of the recent financial crisis circle around two factors: the inefficient credit risk management and the extremely doomed housing market. A recent report¹⁴ deciphers the real cause of financial crisis as excessively high leverage ratios prevailing in the housing market and the underlying mortgage backed securities. As in the year 2009, the Western World was afflicted with the harsh reality of excessive indebtedness which had negative impact on the worldwide economy as a whole. To quote a few examples, a report in 2009 indicates that average household sector debt exploded as high as 141 per cent of disposable income in the United States and 177 percent in the United Kingdom.¹⁵ According to the above report, the best known banks in American and European countries had their balance sheets shooting up to forty, sixty or even hundred times the size of their capital with the British banks’ balance sheets wobbling around 440 per cent of the gross domestic product.

How does increased leverage affect the stock returns? According to the financial analysts¹⁶, under normal circumstances, in a situation where the stock prices deviate from their underlying fundamentals, they tend to bounce back to their intrinsic values thereby restoring the efficiency of the equity markets. However during a prolonged crisis like the recent U.S subprime crisis, this price discovery process takes a longer time and stocks remain out of their intrinsic values for quite a longer period of time. In addition to that, when the investor sentiments are dominated by fear and uncertainty about the financial markets, it may possibly lead to missing out on profitable arbitrage opportunities in the financial markets. As

analyzed by one of the reporters\textsuperscript{17}, due to the significant mispricing in the market, the US subprime crisis caused the share prices of various US and European banks to suffer and exerted immense pressure on these banks in the form of backsliding profit margins.

Considering the balance sheet perspective companies reduce their leverage ratios either by selling off their assets thereby restructuring their balance sheets or by boosting up their equity issues thereby increasing their retained earnings. Both these strategies have different implications on the expected returns from the investor perspective. A contemporary article by J.P.Morgan\textsuperscript{18} states that in spite of the efforts by the financial sector to augment their capital levels to as high as $300 billion; it has still not been possible to bring down the leverage to pre crisis levels. In response to this, the article opined that financial institutions can either wait till the maturity of the debt or accelerate the process of raising equity with greater speed than writing down their assets. Since 2008, various financial institutions and asset managers have been going through a backbreaking enterprise to restore the lower leverage levels which prevailed before the crisis. Now, this process of deleveraging which demands several years of efficacious financial restructuring might eventually diminish the ability of these institutions to produce appetizing returns, especially in case of those institutions which are unable to grow their balance sheets. In such circumstances, as financing gets costlier, firms focus on augmenting their capital level rather than investing it. In this process – “The big get bigger and the rest get smaller.”\textsuperscript{19} – this has a direct impact on the stock returns of these firms. In other words, higher leverage levels increases the risk exposure of the firms and presents higher growth opportunities which boosts up the stock returns. On the other hand, lower leverage levels contracts the balance sheet of the firm and also reduce their competitiveness having a negative impact on the shareholder value and stock returns. Notwithstanding this fact, it was observed that certain hedge funds made more at two times leverage than they did at four times leverage since decrease in leverage levels was accompanied by displacement of competitors from the market place.\textsuperscript{20}

On the darker side, this process of deleveraging has serious macroeconomic implications. Notwithstanding the consistent efforts by banks and financial institutions to

\begin{itemize}
  \item Source: http://sg.biz.yahoo.com/080625/67/4hbg2.html
  \item Source: http://www.financialweek.com/article/20080624/REG/705337846/-1/FWDAILYALERT01
  \item As stated in a research note by James Lee, vice chairman of J.P.Morgan Chase – extracted from http://www.financialweek.com/article/20080624/REG/705337846/-1/FWDAILYALERT01
  \item As observed by Mr. Cembalest, Chief Investment Officer of J.P.Morgan Private Bank – extracted from http://www.financialweek.com/article/20080624/REG/705337846/-1/FWDAILYALERT01
\end{itemize}
resort to deleveraging process, as on November 6, 2009, banks still exhibited 40 to 1 leveraged positions and could not pay off their debt obligations without going bankrupt. As part of activist control banking and policy making the U.S. government issued additional debt as high as $1.9 trillion during the past year. Governments worldwide have begun to raise interest rates and withdraw loans aiming to bring back financial normality and deter financial collapse. On the other hand analysts argue that increasing interest rates and withdrawing funds from the financial system may cause the economy to slide back into the quagmire from which they were hoping to ascend. It has also been forecasted that deliberate attempts of the governments of various nations to deleverage will lead to lower wages in the Western Economies and a permanent unemployment of 15% to 25% accompanies by high prosperity of the emerging markets offering higher growth opportunities. This commotion in the financial markets and the macro economy will discourage the investors investing in the stock and bond markets and would demand additional premium levels for investment which directly affects the expected returns on these stocks. In short, deleveraging would have negative effects on the macro economy as a whole and hence is expected to hold a negative relationship with the productivity levels of the economy. With the leverage having direct implications on the macro-economy one can possibly conclude that leverage affects the expected returns not as a firm specific variable but as a systematic risk factor influencing all the firms operating in the economy simultaneously.

1.5 The role of Liquidity risk as a systematic risk factor – some evidences

“Liquidity is like grease in the wheels; without it the wheels lock up, freeze up and the system breaks down.”

In common parlance, liquidity is a measure of immediacy with which stocks can be traded to generate cash. A liquidity crisis arises when these assets cannot be traded immediately resulting in a dearth of cash. Liquidity crisis can either be due to company specific factors or actuated by the external macroeconomic factors. Thus liquidity risk can

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24 In this section we predominantly focus on liquidity risk arising from the external macroeconomic factors which cannot be controlled by a finance manager. In other words, such risk cannot be eliminated through diversification by the investor and contributes to the systematic risk exposure of the firm.
be categorized into two different types: one is the “idiosyncratic liquidity risk” which is more company specific in nature and is not related to the macro economy as a whole; the other is the “aggregate market wide liquidity risk” which assumes a broader perspective and impacts the macro economy as a whole and simultaneously impacts all the entities operating in that economy. The former majorly reflects the company specific risk factor which leads to depletion of cash reserves of the company, while the latter reflects the macroeconomic factors which has system wide consequences. Company specific liquidity risk affects the cash flows of the company without triggering a major crisis in the financial markets; hence it can be eliminated through diversification. On the other hand “the aggregate market wide liquidity risk” results from inadequate market depth which deters the companies from disentangling their exposures or offsetting risky positions in the market without “moving the market” (or significantly impacting the market prices).  

The concept of liquidity has been of crucial importance in the context of financial markets and its effects were majorly felt at the time of a stock market crash (for example, the 1987 stock market crash and the U.S. Subprime crisis of 2007). In simple notations, the amount of liquidity being injected or drained out of the stock market has important implications for the stock market. When there is a gush of liquidity in the stock market it increases the buying capacity of the investors as well as boosts the confidence of the investors and the volume of stocks traded in the market increases. On the other hand when liquidity shrinks, it reduces the buying capacity of the investors as well as investor confidence which in turn dries up the stock market. The subsequent discussion deciphers the pivotal role of liquidity risk especially during the crisis periods.

The formidable onslaught of liquidity crisis was first witnessed during the 1987 stock market crash, the inefficient trading mechanisms of the financial markets failed to accommodate the cascading effect of out bursting sell orders. According to a report, a number of common stocks in NYSE had become quite illiquid because there was a dearth of buyers to buy such stocks which the sellers wanted to get rid of. This catastrophical event led to the termination of trade in several trading houses and caused the prices of these stocks to

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26 See http://www.marketoracle.co.uk/Article2214.html for further explanation.

27 See http://hnn.us/articles/895.html for further explanation.
dwindle in the downward direction. What impact did liquidity risk play during the recent credit crisis? Pete Kyle, an economist at the University of Maryland quotes,

“Money is like the tap water in the economy and normally you have two different pump houses that supply it. Traditional Banks is one pump house and the other one is the commercial paper market. Companies use commercial paper market to go straight to the investors and borrow money outside the banking system. Today, we are seeing that the commercial paper market, that extra source of liquidity is just not available. With this pump house down, banks are in a tough spot which is not good for the economy.”

To begin with, the first half of the year 2007 was characterized by the credit quality of adjustable rate subprime residential mortgages going downhill accompanied by the acute funding pressures on the mortgage companies. The effects of downgraded credit quality and rise in delinquency rates in the mortgage sector slowly proliferated across other sectors and the investors started showing aversion towards structured credit products resulting in a loss of confidence among the investors. This had detrimental effects on the leverages syndicated loan market, asset – backed commercial paper (ABCP) and other term bank funding markets and increased the spread on collateralized loan obligations (CLOs). This was a serious blow to the structured investment vehicles (SIVs) which had made substantial investment in the structured financial products and at the same time rung the bells in the interbank funding markets in the US, the European and the U.K banks. The reluctance on part of these financial institutions to provide liquidity (especially with longer maturities) to other banks significantly escalated the LIBOR spreads. The failure of the mortgage loan markets, the commercial paper markets and the syndicated loan markets created an apprehensive atmosphere among the financial markets and this paved the way to liquidity hoarding as a measure of protecting oneself from (excessively) anticipated liquidity needs. The U.S. stock markets collapsed followed by a steep decline in the European and Asian stock market activities. In spite of the herculean efforts made by the central banks to administer liquidity into the financial system there was an incredible fear among the investors which led to the significant widening of spread and pursuit towards “flight to quality”. This resulted in fuelling the demand for the “safe assets” which in turn had a dampening effect on the Treasury bill yields. To quote a

29 This section of the study has been adapted from Allen and Carletti (2008), “The Role of Liquidity in financial crisis” extracted from : http://www.kc.frb.org/publicat/sympos/2008/AllenandCarletti.08.04.08.pdf
few evidences, a report\textsuperscript{31} (as on August 10\textsuperscript{th}, 2007) indicates that the Dow Jones Industrial Average plummeted down by 81.62 points (0.62 percent), the Standard and Poor’s 500 index was down by 5.63 points (0.39 percent) and the Nasdaq Composite Index was down by 20.62 points (0.81 percent). Finally the sudden collapse of Bear Stearns in March 2008 aberrantly peaked up the counterparty risk and the spreads in the financial markets leading to an extended period of illiquidity which had system wide repercussions. According to the Basel Committee report\textsuperscript{32}, many banks deviated from the basic principles of liquidity risk management and were deficient of an adequate framework which adequately measured the liquidity risk exposure of individual products and business lines. The report further stated that major banks defaulted on the proper estimation of future liquidity needs required to satisfy their contingent obligations (contractual and non contractual); there was no proper calibration between the incentives at the business levels and the overall risk tolerance of these banks.

To quote a few examples, liquidity risk flaunted a major knockout on Long Term Capital Management\textsuperscript{33}(a hedge fund which owned $126 billion worth of assets) in 1998 which was bailed out by a consortium of 14 banks after being entangled in a cash flow crisis. The company based its investment strategies on volatility in foreign currencies and bonds\textsuperscript{34}. During this year there were significant economy wide shocks resulting from the devaluation of the Russian currency and a downswing of the US (around 20%) and the European markets (around 30%). This instigated the “flight to quality effects” and the apprehensive investors shifting their investments into the Treasury bonds caused a steep decline in the interest rates. This in turn significantly injured the highly leveraged investments of Long Term Capital Management (LTCM) and led to a pernicious loss of almost 50% of the value of its capital investments. The fund suffered from acute liquidity crisis in the sense that a high exposure of the balance sheet to liquidity risk resulted in an increase in price on its short positions relative to its long positions. Thus liquidity risk emerged as a massive, un-hedged single risk factor which had devastating effects on LTCM.

\textsuperscript{31} Source: “Fears of global liquidity crisis grip markets”, August 10\textsuperscript{th}, 2007, extracted from http://www.reuters.com/article/idUSHKG3454420070810
\textsuperscript{33} Major part of this discussion has been extracted from the website http://en.wikipedia.org/wiki/Liquidity_risk
\textsuperscript{34} Adapted from “What was the LTCM Hedge fund crisis?” extracted from http://useconomy.about.com/od/themarkets/f/LTCM.htm
Northern Rock, another prominent victim of liquidity risk was one of the top five mortgage lenders in the United Kingdom in terms of gross lending.\(^{35}\) Strongly affected by the subprime crisis, the Bank sought liquidity support facility from the Bank of England on 14 September, 2007 which propagated anxiety among the investors and led to huge withdrawals from the bank (leading to a bank run which drained out 8% of its total deposits worth 28 billion pounds in a week’s time\(^{36}\)) thereby exposing the bank to “high degree of liquidity risk”. In an attempt to face the cut throat competition with other banks in UK, US and other European nations, the bank narrowed down the spread between loans and deposits resulting in lending out a major chunk of money which the bank maintained as deposits from customers\(^{37}\). Thus liquidity mismatch (lending excessively over deposit levels) was one of the major factors which exposed the company to a major liquidity crisis. According to a recent report\(^{38}\),

“The key to making sense of the Northern Rock crisis is to understand that its business model was based on short-term funding of their lending book - it was cheaper to finance and increased its profit margins. This worked for a while but the fatal flaw was the assumption that limitless liquidity would be available in the markets, at cheap rates indefinitely. When this source of cheap finance was squeezed until its pips squeaked, it was only a matter of time before Northern Rock's liquidity dried up.”

The Marriott Hotel Company was a frequent borrower from the commercial paper market.\(^{39}\) The money was used for the operational activities of the company like paying employees as well as financing new investments like making payments to the contractors for building new hotels. To the companies’ fate failure of giants like Lehman Brothers and Bear Stearns curdled the blood of investors investing trillions of dollars into the money market funds which led to massive retraction of funds from the money markets (especially the commercial paper markets). The sudden seizure of the commercial paper markets took a heavy toll on Marriott’s business and led to the scrapping of major investment projects being barely able to pay its employees. Instances like this increased the reliance of companies like

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\(^{35}\) Referred from “Reflection on Modern Bank runs: A case study of Northern Rock” extracted from http://www.princeton.edu/~hsshin/www/nr.pdf


Marriott on banks which are already devoid of cash due to heavy losses in the subprime crisis and most of them have resorted to “hoarding liquidity”.

Apart from the above, managing liquidity risk has assumed prime importance in the light of the recent financial crisis with special focus to hedge funds. The devastating effects of liquidity crisis in many markets, especially the fixed income securities have adversely affected the performance of funds operating in these markets.40

Acharya, Schaefer and Zhang (2008) explained in detail the role of liquidity risk with respect to the General Motors and Ford downgrade in May 2005 and the consequences on the fixed income markets. GM and Ford had an enormous share in the corporate bond market and their downgrade to junk status posed serious challenges to portfolio managers and forced them to liquidate their positions in investment grade bonds and bond indices. A delay in this process left the market makers with high inventory levels in these bonds thereby increasing their risk exposure. This in turn had a contagion effect on other related segments like credit default swaps and collateralized debt obligations and thus had a macroeconomic impact.

In a pursuit to reinstate the degenerating economy and to save the economy from the severity of the liquidity crunch, the U.S. Federal Reserve, the European Central Bank and other central banks underwent a backbreaking exercise of enacting large fiscal stimulus packages41 and injecting liquidity into the market. The central banks’ purchase of government debt and troubled assets of banks especially during the last quarter of 2008 was an overwhelming amount of USD 2.5 trillion which has been recorded as the largest liquidity injection into the credit market and the largest monetary policy action till date.42

1.6 The role of idiosyncratic volatility43

Merton (1987) wrote, “…financial models based on frictionless markets and complete information are often inadequate to capture the complexity of rationality in action.” Paul Kupiec (1991)44 examines the volatility trends in the equity markets in major developed countries over the last 30 years. The study concludes that the past three decades have

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40 See a report by George Chacko, Managing Partner, 6S Capital, “The pricing of liquidity risk with an application to hedge funds”


43 Some parts of this section have been extracted from the PhD thesis of Dr. Vishwanathan Iyer, Assistant Professor, IBS Hyderabad.
witnessed unprecedented increase in aggregate volatility of stock returns, especially in the OECD markets. This is mainly due to the stupendous increase in idiosyncratic volatility of the stocks during crisis periods.

What leads to idiosyncratic volatility? In an efficient well functioning market, the prices reflect all the available information which includes the publicly available information as well as the firm specific private information. A certain class of informed investors who possess this exclusively private information profit by engaging in trades with the rest of the market and thereby releasing such information into the market. However such investors demand a premium for releasing the private information into the market. When the proportion of such informed traders in the market increases, less of firm specific information is being released into the market and the stocks operating in the economy respond only to the macroeconomic news or events.

Intuitively the R-square in a basic asset pricing framework suggests the proportion of variance in the stock returns which is explained by the systematic risk factors. These systematic risk factors are indicative of different kinds of macroeconomic and publicly available information which are reflected in the stock prices. A high R-square thus reflects that the stocks are more responsive to economy wide information than firm specific information. On the other hand a low R-square indicates that the stock prices are governed mostly by the firm specific information which is not explained by a traditional asset pricing model. In other words, high idiosyncratic volatility is characterized by a low value of R-square and is indicative of large amount of firm specific information which is not reflected in the stock prices and hence high levels of information asymmetry. On the other hand, low idiosyncratic volatility is characterized by a high R-square which indicates that the stock prices absorb most of the firm specific as well as economy wide information, which in turn indicates lower information asymmetry in the market. Excessive idiosyncratic volatility is an unfavorable situation to risk averse investors since it has adverse impacts on real economic activity and efficient functioning of the capital markets. Periods of extreme firm specific volatility leads to loss of investor confidence which may eventually lead to a major turmoil in the financial markets. Hence from the investment perspective, stocks with high idiosyncratic volatility entails higher risk as compared to stocks with low idiosyncratic volatility. Rationalizing on the above hypothesis, stocks with high idiosyncratic volatility are

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characterized by high levels of information asymmetry and hence are riskier and demand a premium over stocks with low idiosyncratic volatility.

The rest of the chapters are sequenced as follows. In chapter two we critically review the literature and enumerate the gaps in the literature. We list out our objectives and hypotheses in Chapter three, in chapter four we provide the empirical framework and the research methodology that will be adopted in our study. The description of data and detailed analysis and significance of the leverage, liquidity and idiosyncratic risk factors are explained in chapter five. In chapter six we present the final results and findings along with implications for finance managers. Chapter seven contains conclusions and the scope for future research.