

**STUDY OF HEDGE FUND INDUSTRY AND ITS RETURN
FROM 1990 TO 2006**

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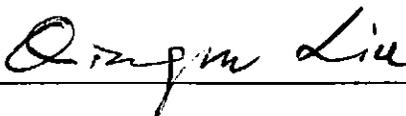
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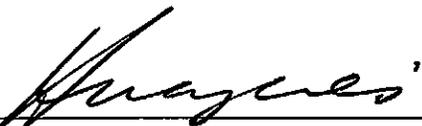
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ABSTRACT

Though the hedge funds are portrayed as risky investment instruments, the average is much higher and standard deviation of their returns is much lower than that of the SPX. The Sharpe ratio of different hedge fund strategies is much higher as well than that of SPX and the correlation between the SPX and different hedge fund strategies is low. Hedge fund strategies are able to produce significant amount of alpha when analyzed by single factor and multi factor model. Some of the disadvantages of hedge fund are that the correlation increases during the hour of crisis so that the hedge fund returns and market return move in tandem during such market turmoil and that their returns show non normality and are generally negatively skewed with high kurtosis.

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Study of Hedge Fund Industry and its Return from 1990 to 2006

I. Introduction:

Hedge funds are becoming increasingly popular nowadays. Ordinary people as well as wealthy people are equally fascinated by them and are subject of much discussion in both print and electronic media and most often portrayed wrongly as very risky investment instrument.

One of the main goals of hedge fund is to get absolute positive return with low volatility in all market condition and is thus they are also called absolute return strategies as these managers attempt to maximize long term returns independently of the traditional stock and bond index. The managers try to add value by using their skill in successfully identifying future price movements, rather than just because of movement of the market as a whole. One of the aims of hedge fund managers is capital preservation also.

Many people believe hedge fund to be excessive risky, however, it is important to note that not all hedge funds are aggressive and some are even more conservative than the traditional investment vehicles. Hedging is the practice of offsetting the risk inherent in any market position by taking an equal but opposite position. Contrary to the perception, not all hedge funds hedge their positions.

Hedge fund managers aim to identify inefficiencies in various financial markets and profit from these, before they are identified by others. Fundamental, quantitative and technical analyses are all important in hedge fund investment approach. Fundamental

analysis includes analysis of all relevant financial ratios, operating performance and capital structure as well as management of the entity. Technical analysis helps the hedge fund managers to determine the most opportunistic entry and exit points for specific trades. Hedge fund managers attempt to time the market by moving quickly across diverse assets categories.

II. Definition of Hedge Fund:

There is not any universally accepted definition of Hedge Fund. It has also remained undefined in the books of securities laws because there is no mention of hedge fund in Securities Act of 1933 or the Security Exchange Act of 1934. Neither is it defined by Investment Company Act of 1940, Investment Advisers Act of 1940, Commodity Exchange Act (Anson, 2002). One of the definition of hedge fund which is widely used by many writers is-“Hedge fund may be loosely defined as an investment vehicle, usually used by wealthy individuals and institutions, which is allowed to use aggressive strategies that are unavailable to traditional investment funds, including selling short, leverage, program trading, swaps, arbitrage and derivatives”.

Hedge funds today are reasonably heterogeneous group and they are better defined in terms their freedom from the constrained imposed by the security act of 1940, than they are by the particular style of investing. (Brown and Goetzmann, 2001).

III. History

Alfred Jones was the first to combine a leveraged long position with a portfolio of short position in an investment fund with an incentive fee structure. The other people of

the investment community knew about him when an article was published on "Fortune" magazine in 1966. People were surprised to find that he was able to get return of 325% in five years when the best performing Fidelity Trend only made 225%. In ten year period, he made 670% where as Dreyfuss Fund, the leader among the mutual funds during that period, only made 358%. Jones performance was 44% higher than Fidelity Trend and 87% than that of the Dreyfuss Fund. When other people knew about his strategy, many tried to copy his strategy but very few were able to survive the downturn of the stock market of the early 70's. George Soros and Michael Steinhardt are some of the survivors of that era (Niclolas, 1998).

The appeal for hedge funds increased tremendously in the 1990s but the hedge fund market was hit hard when Long Term Capital Management (L.T.C.M.) of Greenwich, Connecticut had to be rescued by a consortium of banks and brokerage firms (Anson 2002). The bear market of 2000-2002 witnessed unrelenting stock market decline for the longest period of time since the crash of 1929. This factor contributed to the increase in the number and assets under management under hedge fund (Tran, 2006).

IV. Structure:

Hedge funds are exempt from the Securities Act of 1933 if they obtain their investors through private placements rather than a public offering but only "accredited" investors are allowed to invest. Accredited investors are individuals who have incomes of at least \$200,000 in each of the two most recent years, who have a joint income with a spouse in excess of \$300,000 in each of those years (and who have a reasonable expectation of reaching the same income level in the current year), or who have a net worth, or joint net

worth with a spouse, that exceeds \$1 million at the time of purchase. Institutional investors with assets in excess of \$5 million, banks, savings and loan associations, broker/dealers, insurance companies, investment companies, and small business investment companies licensed by the U.S. Small Business Administration are also accredited investors. Hedge funds are typically exempt out of the 1934 Securities Act by limiting their investors to fewer than 500(Edwards,2006). Today hedge funds are generally organized as limited partnership in which the investors are limited partners and the managers are general partners and as general partners, the hedge fund managers usually invest a significant portion of their personal wealth into the partnership.

In December 2006, the SEC proposed a regulation that would raise the accredited investor threshold from \$1 million to \$2.5 million in assets. If adopted, the rule would significantly reduce the pool of potential hedge fund investors but would not be expected to have a strong impact on the largest funds, which rely more on institutional investors and qualified purchasers (Klunk, William, 2007).

The hedge fund may be registered in US or in some tax haven foreign land. Some of the popular offshore sites for hedge funds are Cayman Island, British Virgin Island, Bermuda, Channel Island, and Isle of Man. In order to cater the need of the foreign investors, most of the hedge funds nowadays have both on-shore and off-shore registered funds. The U.S. investors invest in the onshore fund and foreign investors invest in off shore funds so as to avoid double taxation. Both the funds are managed by the same management teams and such funds have a master account in tax free foreign lands.

IV. Different Strategies

There is no universal classification of different strategies and many writers and researchers have classified them differently but what most of the writers agree that all the strategies can be broadly can be classified into three groups-Relative value, Event Driven and Opportunistic. Convertible Arbitrage, Market Neutral and Fixed Income Arbitrage are relative value strategies and Distressed security and Merger Arbitrage are event driven strategies where as Macro, Emerging Market and Equity Long short are opportunistic strategies.

A. Convertible bond arbitrage:

The convertible bond offers a conversion option, which allows the investor to convert the bond to a pre-specified number of shares. The indenture of the bond describes the numbers of shares into which the hybrid bond can be converted. The most common trade in convertible arbitrage is to go long the bond and hedge the specific risk by shorting the underlying stock. Managers who apply this strategy seek to identify the undervalued securities which can be converted into ordinary shares. Equity risk can be hedged by selling the appropriate ratio of the stock underlying the convertible stock.

The price of the convertible bond depends upon three factors: investment, conversion and option value. The investment value is what the value of the bond would be without the convertibility feature, such as a straight bond. The conversion value represents the value of the common stock that the bond can be converted into. For example, if a convertible bond can be converted into 50 stocks of \$10 each stock, the conversion value of the stock will be \$500 and this value will change as the price of the underlying stock changes. If the stock price is low than the investment value, it does not make any economic sense for

the investor to convert the bond, rather she will hold the bond for the coupon payoff and hence investment value dominates. On the other hand, if the share price increases substantially, conversion becomes more attractive to the investor and the conversion value dominates. Only in rare circumstances will the convertible bond price be less than either the investment or conversion value. In the real world, most often the convertible bond price will be greater than the investment or conversion values due to the option of conversion granted to investors and this right to choose between the investment and conversion has value to the bondholder and is referred to as the 'time value' of an option. That's why a convertible bond will pay a lower yield than a regular bond because of the option to convert to common stock and collect a capital gain (Calamos, 2003).

A convertible arbitrage transaction consists of the purchase of a convertible bond and the simultaneous sale of the stock of the underlying bond issuer. The most important factors upon which the price of the call option of the convertible bond depend are implied volatility and the price of the stock upon which the options is based. As the implied volatility or stock price or both increases, the price of the options also increases. The basic concept of this strategy is to neutralize the delta, which is the sensitivity of the option price to the movement in the stock price and the managers neutralize it by selling certain amount of the stock and taking long positions on the bond. Once this exposure to the underlying stock's price is neutralized, the convertible bond's value will continue to be affected by the volatility level of the embedded option, the credit spread inherent in the bond resulting from the issuer's credit quality, and the level of interest rates in general.

The short selling of the underlying stock creates hedging and it may appear that large stock price increase of the stock can result in a negative outcome but in reality, the loss occurred by the price increase of the stock price is compensated by the increase in profit due to the rise in price of the bond. Conversely, if there is a large stock price decrease, the price of the bond will decrease to its investment value but there will be substantial gain due to the short positions of the stock (Simone). Another source of profit is if there is any compression in the credit spread, there will be capital appreciation of the bond. The interest proceeds from the sale of the stock are also another source of profit. As the industry is getting mature, newer ways of generating profit are being discovered.

Convertible managers also use volatility as a source of profits. These managers calculate the implied volatility of the embedded option of the convertible bond and sometime they may find the level of volatility implied in the option as inaccurate, which can provide them opportunities to take advantage of this anomaly. By finding the option on the same stock trading on an exchange that approximates the embedded option that is priced at a higher implied volatility level, the manager would then sell that option against the convertible bond to create an arbitrage. The another recent development in this strategy is by taking bet on directional volatility if the manager of a convertible arbitrage transaction believes the option embedded in the bond was priced inaccurately low and that volatility will increase. Since these managers own the option, they are long on volatility and any rise in the level of that stock's volatility should result in profits for the strategy (Calyx Financial).

B. Fixed Income Arbitrage:

Fixed-income arbitrageurs seek profit by exploiting pricing inefficiencies between related securities and their derivatives. It involves purchasing one fixed income security and simultaneous selling similar fixed income securities. They make bets on the relationship between two or more securities, rather than on market direction.

The fixed income instruments most often used in this strategy include:

- 1: Treasuries of all kind
- 2: Corporate bond
- 3: Municipal bonds (munis)
- 4: Mortgage based securities (MBS) and other assets backed securities
- 5: Interest rate swaps
- 6: Interest rate futures
- 7: Emerging market bonds
- 8: Collateralized debt obligation (CDO)
- 9: Credit defaults swaps (CDS)
- 10: Sovereign debt

Many of the fixed income securities are mathematically or historically interrelated and sometime these relationships are skewed due to various economical or other reasons and these managers are in search of those securities. The market for the fixed income arbitrage has changed very much and the complexity of these instruments and their derivatives is becoming greater each year. Many of the hedge funds have developed their own proprietary valuation model (Mayer).

C. Market Neutral:

Market neutral hedge fund managers generally hold equal positions of long and short stock positions and there is no net exposure to the either side of market. Market Neutral refers to a group of investment strategies that seek to neutralize certain market risk by taking offsetting long and short position in instruments with actual or theoretical relationship (Nicholas, 2000). Anson (2002) has mentioned that the Market Neutral generally follow a three step procedures in portfolio construction. First step involves of screening the stock so as to get a shortlist of stocks. Most often such stocks which are traded in the manager's exchange and have sufficient liquidity so that it will be easier to enter and exit the positions quickly are short listed. This may involves selection of stock from the manager's choice of market cap segment. The second step involves use of factor models similar to that of Equity Long and Short to identify the economic variables which impact the share price of the stock. These managers use mathematical multifactor model to review past company performance. These models are bottom-up models that concentrate solely on corporate financial information rather than on macroeconomic data. For example they may use their model to determine the impact of market price to book value on different market segment or economic sector or they may analyze changes in dividend yields on stock price performance. They generally do back testing of their model on past historical data to see if the model has any predictive power. If the model turns out to be successful, they conduct a 'out of sample' test of the model on the historical data which was not used in the building of the model. If that quantitative strategy ultimately turns out to be a successful one, it will be used to generate buy and sell order after close scrutiny by the manager. The last step is the portfolio construction and generally managers use optimizer computer software to construct a portfolio which is

neutral to market as well as across industries. This optimizer software are also called 'black box' which are often proprietary and lack transparency.

Equity Market Neutral managers shield their portfolio from market risks using four techniques such as by balancing the market value by taking equal long and short positions so that portfolio is cash neutral, minimizing sector risk by balancing the long and short positions in a given industry, by selecting the market cap in such a way that portfolio is not weighted in any particular cap range and finally, if investing in the foreign market, hedging the currency risk. Market Neutral risk are also involved in pair trading in which undervalued companies or those with accelerating earnings or the like are bought and then matched with companies that are viewed as overvalued, undergoing negative changes and so on and they are then sold short. Equity Market Neutral may also involves statistical arbitrage, which is quantitative trading techniques that identifies relative mispricing between pairs of stock based on the expected fair value of those equities. For example, if the prices of two securities move in tandem and if such historical price ratios are violated, the managers will put on a long short trade in the expectation that the stocks will return to their expected value. Equity Market Neutral managers will use both of these techniques to create a portfolio of long and short equity but unlike the Equity Long Short portfolios, the Market Neutral portfolios are beta neutral (Mayer et al. 2006).

D. Merger Arbitrage:

This Event driven strategy is also known as risk arbitrage and focuses on the share of the companies going through structural changes such as mergers, acquisitions and restructurings. The managers buy the common stock of a company being acquired or

merged with another company and sell short the stock of acquiring companies. Instead of stock, options may be traded.

The corporate acquisitions are generally made at a premium to the stock price of the target company prior to the announcement of the proposed mergers and there is always some risk inherent in the mergers and acquisitions due to the legal and economic factors, the target company's stock will typically trade at a discount. The spread-difference between the deal price and market price is due to the factors like financing difficulty, regulatory hurdles, market uncertainties and negative sentiment or complication in deal structure.

The business cycle and state of economy dictates many such events such as mergers, acquisitions, bankruptcies, restructuring, 13 D filing etc. Managers' experience and understanding of complex legal issues is one of the most important factors in event driven investing. Many scholars believe that basic principle of risk arbitrage is about 100 years old in America and during 5 years recessions of 1890's, 25% of railroad industry went bankrupt and they had to be restructured (Beverly).

The merger activities may involve cash mergers, stock swap mergers and stock swap mergers with a collar. The holders of stock of Target Company receive cash in cash mergers but they receive share of the acquiring company's stock. In stock swap mergers with a collar, the acquiring company can call off merger if the acquiring firm's stock price falls below a certain floor or collar. Merger arbitrage specialists estimate the probability of success or failure and failure of proposed deal and then translate the spread into annualized rate of return. If the return is high enough to take the risk, they take positions.

However, the merger arbitrage specialists do not try to anticipate possible merger activities.

E. Distressed security investing:

Oaktree Capital Management, a hedge fund, defines distressed debt as investing in securities that “deal with public debt securities (e.g. bonds and notes) and private indebtedness (e.g. bank loans, private placements and trade credit) of companies that are unable to service their debt and thus either have entered into default, bankruptcy or financial restructuring, or are likely to do so”. Many factors like poor management, law suits, industry weakness or excessive leverage used by company for operation or financing activities can cause a company to be in financial distress. Investing in distressed securities involves purchasing the claims of companies those have already filed for chapter 11 or chapter 7 bankruptcy protection or are trying to avoid chapter 11 through an out of court debt structuring with their creditors.

Altman (1993) has explained the four generic terms-failure, insolvency, default and bankruptcy that are commonly found in the literature. A business venture may be considered a failure if the realized rate of return on invested capital, with allowances for risks consideration, is significantly and continually lower than prevailing on similar investment. Insolvency is the condition when a firm can not meet its current obligation. It may be a temporary condition. It is also insolvency when a firm finds its total liability exceeds a fair valuation of its total assets. Default is a condition when the debtor violates a condition of the agreement with the creditor. The violation of the agreement may be anything from the failure to maintain required rate of quick ratio as stipulated by credit

agreement to inability to meet the obligation to pay the scheduled payments. All the condition mentioned above lead to formal declaration of bankruptcy in a federal court

Many institutional investors, like pension funds and mutual funds, are required by their charters or regulators to sell any holding if it degrades below some pre-specified investment grade irrespective of whether the company is viable one or not. They may have to dump their holdings at a highly discounted price which often further decrease the price. Since it may takes years to get the claims for debt by selling assets in case of bankruptcies, the banks also often get rid of their bad loans by selling in deep discounted to third party. Similarly, the suppliers, vendors etc who hold claim on trade also want to sell their claim because they are in different business and have neither expertise nor it is cost effective for them to go after legal system of full claim.

According to Barnhill, Maxwell and Shenkman (1999), there are four stages in the life cycle of the bankruptcy. The various stages will differ in not only in the length of the investment period but also in the issues to be addressed and due diligence required. The price level of the security purchased also depends upon the life cycle of the bankruptcy and the earlier the bankruptcy cycle, the cheaper the security because of the uncertainty of the future and time value of the money.

1: Pre-bankruptcy:

This stage is prior to bankruptcy filing and the duration of this stage may vary. Company in this stage acknowledges that it is in distress. The hedge fund mangers of this strategy start researching to find further information to evaluate whether it is worth investing or not.

2: Early bankruptcy:

This stage starts when the company files for bankruptcy and this stage may last from six months to more than one year. Legal advisors, creditor groups and consultants are very active here.

3: Middle bankruptcy:

This stage last from six months to two years after filing and during this period, usually cash flow difficulties begin to stabilize because the company is not paying interests to creditors. The picture of the future of the company becomes somewhat clarified.

4: Last stage of bankruptcy:

This stage can last from anywhere one year to several years. During this stage, creditor's disputes are resolved, enterprise value is established and claimholders' claims are settled.

These hedge fund managers who pursue this strategy consider many factors while analyzing a potential investment opportunity. According to Barnhill, Maxwell and Shenkman, some of the important factors which are necessary to consider before investment are:

A: The reason behind the condition of distress. Is it excessive leverage, industry weakness, poor management or lawsuits which have brought the company in distress?

B: What are the corporate or relevant industry characteristics like industry structure, industry trends or competitive forces?

C: What is the capital structure positioning of the company? How is debt in senior secured to junior subordinated, control or non-control?

D: Who are the other creditors like banks, debt holders, stock holders and those claiming damages etc and what are their interests?

E: Who is the bankruptcy judge and what is his record and how involved will he be in the reorganizing process?

G: How long the company will remain in bankruptcy?

H: What are the potential exit strategies?

These managers may invest in many types of investment instruments like bank loans, trade claims, investment debt, real estate mortgages etc. They generally attempt to profit on pricing inefficiencies associated with such securities. Most often there is general negative stigma associated with such claims because of which the assets are undervalued or sometimes there is an inability on the behalf of original investors to accurately value such claims or direct their legal interests during their restructuring process (Tremont). They may take active role by participating in the reorganization process. Some of the investors aim for a control position so that they may actively involve in the management process of formulating investment and operating policies. They may get the controlling position by purchasing the outstanding debt claims with the intent of transferring these claims into voting common stock upon emergence from the bankruptcy, by submitting their own reorganization plan to the claimholders, which gives detailed outline of how much each claimholder will receive and a new business plan to be implemented after the emergence of bankruptcy and by purchasing the new voting stock that is to be issued later. Some of the investors employ the different strategy of controlling the reorganization plan by increasing their share of outstanding debt so that once they own more than one third value of outstanding debt class; they can effectively block a reorganization plan (Tremont).

Distressed debt investing is cyclical and is fairly predictable. Historically, the most fertile periods for distressed opportunities follow the periods having recorded a large number of low quality issuance and there has been a significant relationship between the issuance of high yield bonds in a given year and the incidence of defaults a few years later (Chillemi, 2005). According to Barnhill, Maxwell and Shenkmen, the three key qualities essential for the successful distressed investing are superior ability to value a firm's assets, superior negotiating and bargaining skill and a thorough understanding of all investment risks.

F. Emerging Markets:

The managers invest in Emerging Markets. Emerging markets are the less mature markets. Difficulty in obtaining information, relative undeveloped legal system, unsophisticated local investors, unstable political and economic environment, lack of experience of the managers who are running local companies are the sources of opportunities for the hedge fund managers to exploit (Borla). Emerging Markets funds invest in securities of companies or the sovereign debt of developing or "emerging" countries. Investments are primarily long. According to Eichengreen et al. (1998), hedge fund managers are attracted to emerging markets because of the opportunity of identifying fundamentals that are far out of line. Also, in countries with a weak currency, foreign investors get more value for their dollars. Cheap funding allows hedge funds to take and hold a position in emerging markets even when they are uncertain about the timing.

Investing in emerging market poses different challenges than investing in developed market. These funds are the most volatile in comparison to other hedge funds. This is due to the reason that short selling is not often permitted in emerging markets (Maria Stromqvist, 2006). Market of any country is dynamic entity, thus with the passage of time, the emerging market may become mature and the entire investment opportunities vanishes once market become more efficient. Everest capital is a hedge fund which invests in emerging market. It initially used to invest in such countries as Greece and Portugal in 1990s; however, as the market of these countries become mature, they shifted their operation to other emerging market.

Before the fall of Long Term Capital Management in 1998, many Hedge funds used to take concentrated positions at the country level and diversified positions at the individual stocks or bond level, however, the default of Russia in 1998 has compelled many hedge funds to change their strategies.

One important issue associated with the emerging market is the illiquidity of the assets. Sometime the respective country government imposes a restriction on the amount of position a foreign investors may able to hold. So, the limited liquidity and the limited size of accepted deals can constrain the ability of hedge funds to build up positions. On the other hand, once they have entered large positions, they can be difficult to offload the positions and thus the desired profit may not be realized on time. In emerging market, high transaction costs also poses a problem to investors (Maria Stromqvist, 2006).

G. Equity Hedge

This strategy is also called Equity Long/Short and is the oldest hedge fund strategy and interest of the investors in this strategy has remained stronger over the years. Many people think Long/Short equity strategy as synonyms with hedge fund. The long short strategy consists of investing in a core holding of equities and hedging the long equity positions with short sales of other stocks and/or stock index derivatives. According to Anson (2002), Long Short equity hedge funds tend to be constructed with fewer securities than traditional portfolio. These portfolios are actively managed and managers shift their allocation of assets through various styles such as value, growth, large or small caps, sectors or geographical focus. Their net market exposure will vary depending upon the managers preference and market conditions. Compared with the traditional long only strategy, Long/Short strategies have significant flexibilities in taking short positions. As a rule of thumb, these managers will increase long positions in a bull market and decrease it or even take net short positions in bear market. Use of leverage is another characteristic that the Long/Short managers take advantages of.

Short positions have three different purposes:

1: To generate alpha:

Long/Short managers not only generate alpha from the long positions, they also generate from the short positions.

2: The short positions serve the purpose of hedging the market risks.

3: The managers earn interest generated by the account in which the proceeds from the sale of securities are kept.

In a bull market, the long positions will increase the value as fast as or as faster than the market and short positions will increase less than the long positions or will even

decline in value. In a bear market, the short positions will fall more rapidly than the market or they may even increase.

The ability to sell short creates unique profit opportunities. Most of the investors have regulatory barrier to sell the securities short, however, the freedom to sell short any equity which managers think as overpriced or under priced is an advantage for hedge fund. Underperforming short positions reduce returns in a rising market but it provides protections in a declining market. So, in bull market, equity long short managers achieve smaller return than if they were long only positions and in a bear market, their return can be negative but it is less if they were long only. This will result that the volatility of the equity long short will be less than the traditional long only.

The modern ELS managers uses strategies of short sales, the purchase and sale of options and the use of leverage which distinguish him from his traditional long only peers. One of the common strategies of the ELS managers is pair trading. They typically take a long position in a stock of one industry and then take a short position in a stock of the same industry which they believe as underperformer. Another strategy is to take long position in a small cap company and then take a short position on underperforming big cap companies. Since the stock of big cap companies are easier to borrow than the stocks of big cap companies, it is easier for the managers to take short position in big cap companies.

Buying and selling of option on stock and stock indices is another strategy employed by the ESL managers. Use of leverage is another characteristic of ESL managers.

A typical ELS portfolio might look like this: 35-40 long positions, equally weighted at cost, 25-30 short positions, equally weighted at cost, no long position will be allowed to exceed 5 percent at market, no short positions will be allowed to 3 percent of the market, gross long positions will be between 75-150 percent, gross short position will be between 30-50 percent, maximum sector exposure 25 percent, maximum industry group exposure 15 percent, maximum gross exposure not to exceed 200 percent (Anson,2002).

No two ELS hedge fund are similar and of course, the strategy of each hedge fund is different. One of the reasons why the ELS strategy has become popular among the investors is that it is easier for the investors to understand the strategy and risk associated with it.

H. Global Macro:

Global macro fund managers look into the big pictures, assessing opportunities and risks in the global market places. Events like shift in world economies, political development or changes of global supply and demand for physical and financial resources are particular interest to these managers. The ability to analyze the existing information more accurately than others and/or access to better information enable these managers to earn returns. These managers have broad market to invest. They can invest in any country, in any market sector or industry sector, financial market or segment. Some of them may even invest in commodity. Most often these managers have big fund to invest and they even apply leverage to increase the size of their macro bets (Anson, 2002).

These managers enjoy great deal of flexibility in terms of both investment philosophy and strategy (Borla). These types of Hedges funds are the ones who get most press coverage.

Global macro managers employ fundamental and/or systemic top down approach. They believe that the price will converge to a rational level as determined by fundamental economic factors in the long run but in the short run they can deviate substantially from their true economic equilibrium value. Since it takes time for the investors to absorb new information and this process of absorbing new information by the market is a gradual process rather than instantaneous process. Sometime trade restriction due to some political events can prohibit price moving to their real economic value. Sometimes price volatility also causes the investors to behave irrationally. The global managers thus seek to take advantage of the anomaly of the short term price and the real price to be determined by the long term macroeconomic trends.

According to Burstein (1999), the typical investment instruments used to implement this strategy are currencies, bond, and stock index futures, commodities and interest rate futures. The macroeconomic factors that these managers analyze are interest rates, inflation, Consumer price Index (CPI), Produces Price Index (PPI), Gross Domestic Product (GDP), exchange rate and money supply. Based on such macroeconomic indicator such as CPI, PPI, retail sales, GDP, employment, these managers calculate growth and inflation and make conclusion on the trend of interest rate. Their inference of interest rate help them to predict either a bullish and bearish direction and they , accordingly , take positions on currencies, stock indices and bonds.

Global Macro investment style is highly flexible and opportunistic and unlike other investment styles, it has the potential to do well in good as well as bad times.

According to Peter Ahl of Orthogonal Capital Management, the sources of return that macro funds can try to tap are based on: behavioral biases, models and/or asymmetric information. Macro hedge fund managers use three non distinct approaches: the feedback-based, the model-based and the information-based.

Feedback Approach:

The underlying philosophy is that markets are rational most of the time, but 5% of the time, the market does not behave in a rational manner. The assets price sometimes comes down below their intrinsic value and it seems that people are dumping their assets without any justifiable reason. The ability of the traders to understand the market, the fear and greed of the ordinary investors is very crucial and they try to profit from buying the undervalued assets at the lowest point of the curve of the crash and sell at the highest point of the curve.

Model and theoretical frameworks:

Economic concept of equilibrium may not be applicable in the short run so mechanical models based on economic equilibrium or fair value have little use if used in traditional way, however, they can be useful tools to extract the market expectation. For example, at Orthogonal Capital management, the manager run the Discounted Cash Flow (DCF) model in reverse to extract the information about the earning growth rates and Dynamic Equilibrium Exchange Rate model to expected productivity trends and so on.

Information Based:

The official macro statistics are released with significant time lag and information asymmetry persists till the information has become public and hence if it is possible to get a clear picture of the macro views before the official data are available by collecting and analyzing the available information of the micro level, considerable edge over competitors can be achieved. It is the strategy of the big macro players to analyze and access the macro level ahead of other and take trade positions accordingly.

According to Burstein, Global Macro initially started and developed as directional strategy. These early managers used to buy assets when several macroeconomic variables and indicators led to macroeconomic view favorable to those assets. However, today these managers not only employ directional strategy but also non directional one. The example of non directional strategy is of taking long and short positions on a related instrument. For example, most of the global macro managers sell a government bond of one country against a government bond of related country based on expected relative interest rate. Another feature of the global macro managers is to invest in a traditional investment tool by blending the traditional investment style with a global macro one. For example, they pick a stock, not just through the fundamental analysis, but also analyzing macro variable such as exchange rate and/or interest rate. How analyzing a macro economic factor can help to gain profit on another assets can be shown by the example of Italy. As the single currency was to be introduced in whole Europe through the European Monetary Union, the Global Macro Hedge fund managers took long positions on the Italian financial and interest rate sensitive stock or Italy Stock Index Future (MIB 30) because their expectation was that there would be Euro convergence of interest rate and hence, the Italian interest rate, which was higher than its peers, would fall and this fall in

interest rate would lead to rally in Italian stock market. Asian market crisis of 1997 turned out to be very good sources of return for some of the hedge funds. Some of them took positions on currencies but other took position on such assets which were exposed to Asia. For example, Carrefour and Promodes are two French retailer stocks and former is more internationally diversified with more Asian exposure where as the latter is more domestic market oriented. By correctly predicting the Asian financial crisis, many took short positions on Carrefour and long on Promodes.

Another similar example of how the analysis of global macro indicator can help to take positions in other investment instrument is that during the acute crisis Asian crisis of last quarter of 1997, though the Asian exposure of Swedish and Finnish market was similar, the Swedish market overacted by 12% and Global Macro hedge fund managers were quick to take advantage of arbitrage opportunities and they sold Finnish stock index futures and bought Swedish stock market futures for a 12% correction. Similar arbitrage opportunity was exploited by Global Hedge Fund managers when Italian market overacted to Asian crisis though the exposure of the German bank to the Asia due to bad loan was much higher than the Italian bank (Burstein ,1999).

V. Hedge Fund Fees:

The performance fee is one of the hallmarks of Hedge Fund and it creates a serious incentive for portfolio managers to generate better results. A hedge fund typically charges investors a management fee of 1.5% to 2%, and takes 15% to 20% of profits the fund generates. The partnership's net asset value is determined on the specified date and is charged to the partnership. However, if the hedge Fund fails to outperform the broader

market, such management fees and share in profit can be a source of complain (Rosenbush, 2007).

The fund of fund charge fees excess of as 4% of the product assets per annum. According to the study by van Eyk, high fee is the main reason why investors avoid fund of fund (Chan).

VI. High water marks:

Since there is no guarantee that a hedge fund will earn profit and in market downturn, hedge funds do lose their net asset value. Since it is unfair to charge such a high incentive fee when a fund has already lost money, many hedge funds have high water contract with investors. High water mark for each investor is the maximum share value since her investment in the fund. High water mark contracts have the appealing feature of paying the manager a bonus only when the investors make a profit, and they are eligible for the performance fee only when the lost money has been recovered. However, in reality, many of the hedge fund simply close down their funds when they lose significant amount of capital because it can take a long period of time to recover the lost capital and earn profit over pre set high water mark. So, even though many hedge funds claim to have high water marks, it is hardly a contractual binding because working only on the management fund can not be a strong motivating factor to run the fund. In their quest to gather assets, some smaller funds of hedge fund firms are offering deals on performance fees to plan sponsors.

VII. Hedge Fund Data

A. Hedge Fund Data Sources:

Hedge Fund data is provided by data vendors and are not easily accessible. Some of the data providers, who are still in the market, are: Hedge Fund Research Inc, index (HFRI), Lipper-TASS, and Morgan Stanley Capital International Hedge Fund Index.

B.HFRI

HFRI monthly indices are prepared by Hedge Fund Research, Inc. The Indices are equally weighted. The monthly performance is reported net of all fees. It reports assets in US dollar and only those funds with have at least \$50 Million under management or have been actively trading for at least twelve months are eligible for reporting their performance. Both domestic and offshore funds are included in the HFRI.

C. Data Biases:

Hedge Fund data are subject to various types of biases such as:

a: Selection Biases:

There are few private data collectors who gather data from different hedge funds. Hedge funds by law are prohibited from public solicitation, but are allowed to report their performance to data collectors. Since potential investors subscribe to the data vendors, the hedge fund managers have incentive to report to them. The main reason a hedge fund report to any data vendor is for their indirect advertisement and the poor performing hedge funds may not report to the data base and thus the database is not a representative sample of the universe of hedge fund. Moreover, hedge funds are not required to make

public disclosure of their performance. There is not any hedge fund association which can coerce its member hedge fund to report their performance to central data base.

b: Survivorship Biases:

Many funds, during their last period of life do not report to the data base. Surviving biases arises from analyzing surviving fund only. Since the performance of the disappearing fund is lower than the surviving funds and data providers can not access to their not reported low performance, the data of hedge funds have survivorship bias. Reaching maximum capacity and protecting a successful strategy are some other reasons why funds stop reporting.

c: Instant History Biases:

Many of the funds start reporting to the hedge fund only when their performance is attractive enough to allure new investors. As they enter to the data base their good old record is added which creates instant success bias. However, it is important to note that the funds do not bother to report their bad past performance and thus poor past performance is not included.

d: Short History:

Most of the hedge fund data providers started collecting their data only from the early 90's. The time period is too short to come to any concrete conclusion about hedge fund performance in different market condition.

e: Lack of transparency:

Hedge Funds are private investment instrument and we have to rely on the data they provide and assume that they are correct. It is not possible to come to conclusion about the content of the different assets and their allocation in portfolio.

f: Issues in the choice of index weight:

Many of the conventional indexes are equally weighted or assets under management weighted. One of the leading data providers HFR is equally weighted where as the TASS is an asset under management weighted.

Fewer than 25% of the all fund managers handle 75% of the industry's total capital, so equally weighted index may not give the true picture. There are some problems associated with using assets under management as weight because the exact amount of AUM is questionable and most of the large and successful funds stopped reporting to the data providers.

According to Fung and Hseish (2000), the historical return performance of the sample is biased upward and the historical risk is biased downward relative to the universe of all funds. They have distinguished between natural and spurious biases. According to them, natural biases arises due to the birth, growth and death process of hedge fund, while spurious biases arises from sampling data from unobservable universe of hedge fund and the way data are collected by vendor and provided by hedge fund. Brown et al. (1999) reported a bias of 3% and 20% drop out rate for offshore hedge fund. Fung and Hseish (2000) used the TASS data base and calculated the annualized survivorship bias to be 3% with a drop out rate of 15%. Liang (2000) found the survivorship bias exceeds 2% in TASS database and 0.6% in HFR.

Different researchers have calculated the back fill biases for hedge fund. Fung and Hseish (2000) calculated the backfill of Tass for 1994 to 1998 by eliminating the 12 months of return because they found median incubation period to be 343 days and found that mean performance was 1.4% lower. Using the same indirect method of eliminating

12 months of return from MaR database, Edward and Caglayan (2000) calculated the survivorship bias to be 1.17%.

D. Attrition Rate

The attrition rate varies among funds with different assets size and investment strategies, age and degree of use of leverage.

Amin et al. (2001) found that attrition rate is high among the funds with low (From \$0-\$4m) assets under management than fund with high assets under management. The funds with poor performance in the last twelve month have higher attrition than fund with good performance in last twelve month. They further found that whether the managers have invested in the fund or not does not make any difference in attrition rate. Their study also concluded that leveraged funds shows a somewhat higher attrition rate, however the difference in attrition rate with the non leveraged fund is relatively low and the attrition rate of young funds have been relatively low while that of the older funds has been relatively high. Type of the strategy that the funds are following do play a role in the attrition rate, however, one styles may have high attrition rate in one time period may have low attrition in other time period.

VIII. Leverage:

Leverage is one of the hallmarks of hedge fund. Leverage is the creation of exposure greater in magnitude than the initial dollar amounts of an investment. Hedge funds obtain economic leverage in various ways, such as through the use of repurchase agreements, short positions, and derivative contracts. Like banks and securities firms, but unlike most

mutual funds, hedge funds lever their capital bases to increase their total asset holdings by a multiple of the amount of capital invested in the funds. However it is very difficult to generalize about the amount of leverage hedge funds use and there are many hedge funds that do not use leverage.

Leverage itself is not something to be avoided. According to Schneeweis et al (2005), banks, for example, are levered about 20 to 1 (about 5% of assets are equity capital, 95% are loans and deposits). Residential Real estate is typically levered 5 to 1 (a 20% down payment is common, with 80% borrowed).

Leverage may be presented in various forms:

Gross Leverage= (Longs+Shorts)/Net Asset

Net Leverage= (Longs-Shorts)/Net Asset

Gross Longs= (Longs)/Net Asset Value

The leverage of Hedge Fund is of particular interest to the policy makers and regulators. Compared with other trading institutions, hedge funds' use of leverage becomes even more risky due to the fact that most often the investment assets of hedge funds are illiquid whose full value cannot be realized in a quick sale and hence it can potentially make them somewhat fragile institutions that are vulnerable to liquidity shocks. Estimates of Long Term Capital Management's leverage in its final pre-reorganization days suggest that the firm had less than \$1 billion in capital to offset positions in securities worth \$120 billion and derivatives with a notional value of \$1.3 trillion (Eichengreen and Park, 2001). While trading desks of banks and securities firms may take positions similar to hedge funds' investments, these organizations and their parent firms often have both liquidity sources and independent streams of income from

other activities that can offset the riskiness of their positions (Report of The President's Working Group on Financial Markets 1999).

In many strategy especially convertible arbitrage, the profit margin within a pair of trade are so small that unless leverage is used, it is difficult to realize a reasonable profit. The impact of leverage on return measurement is of particular concern for hedge fund investment analysis since two funds may differ solely by leverage such that they may differ in terms of absolute return but may be similar on a risk adjusted return basis. While leverage should theoretically not affect the level of risk-adjusted return within a strategy, it is possible that funds which attempt higher levels of leverage may in fact trade differently than lower leverage funds, such that the actual risk-adjusted performance may not be independent of leverage (Schneeweis et al, 2005).

According to Tran, use of leverage by different hedge fund strategies may be classified as :*Lowest Leverage*: Equity Market Neutral, Merger Arbitrage, Distressed Securities, Long/short security; *Moderate Leverage*: Event driven, Global Macro, *Highest leverage*; Fixed Income Arbitrage, Convertible Arbitrage.

Though the Federal Reserve Bank limits margin borrowing by investors to 50% of a stock's purchase price, that limit doesn't apply to "leveraging tools such as derivatives," which allow funds to add leverage without borrowing money (Wall Street Journal, April 30, 2007). However, since the hedge fund make greater use of leverage, the aggregate trading volume of hedge funds reportedly accounts for significant shares of total trading volumes in some segments of financial markets (Governor Kevin Warsh, 2007).

According to a survey conducted in 2002, the leverage used at the time by major hedge fund strategies was 20 to 30 times capital base by Fixed Income Arbitrage, 2 to 10

times by Convertible Arbitrage, 1 to 5 times by Market Neutral, 1 to 2 times by Equity Long/short and 1 to 2 times by Distressed Securities (Tran 2006).

IX. Growth

One reason that hedge funds have received so much attention is participation by more and more people. At the turn of the century, assets under management by the hedge funds grew exponentially as institutional investors increased their allocation to hedge fund due to the lack luster performance of global equity market and low nominal yields in fixed income markets (Fung/Hsieh, 2006). One reason that hedge funds have received so much attention is participation by more and more people because when the definition of accredited investors as those with substantial wealth or high incomes was written, a million dollars was a substantial amount. But a million dollars today is not what it used to be (Dwyer, 2006).

Since 1999, hedge funds asset under management has grown more than five folds and it is about \$1.6 trillion. The number of funds has grown to more than 9000 today. It is estimated that 1518 new funds were introduced and 717 liquidated in 2006 (Financial Stability Forum May 19, 2007). The total growth of hedge fund from 1990 to 2006 is more than 15 folds! But still, it is small comparison to US mutual fund industry, which included more than 8000 funds with about assets under management equal to \$10.5 trillion at the end of 2006 (Investment Factbook,2007). On September 29, 2003, the Securities and Exchange Commission (SEC, or the Commission) issued a report on the *Implications of the Growth of Hedge Funds* (SEC 2003) and one of the recommendation of the report was that most hedge managers (advisers) be required to register with the

SEC as investment advisers under the Investment Advisers Act (IAA) of 1940, as amended. On July 14, 2004, the SEC adopted a new rule requiring the registration of most hedge fund advisers by February 1, 2006 but in June 2006, however, an appeals court found that the rule was arbitrary and not compatible with the plain language of the Investment Advisers Act, and vacated it (Edward, 2006)

The growth of hedge fund and assets under management by them is given in table 1. In 1990, there were only 610 hedge Funds where as at the end of 2006, the number of Hedge Fund has increased to 9228 which is about 1400% percentage increase. The asset under management in Hedge Fund was only \$39 Billion and it has reached to \$1337 Billion till September 30, 2006. The growth of AUM from 1990 to 2006 September 30 is 3300%. During the same period, the growth in number of mutual fund was only 163% and that of the assets under management was 877%.

The figure 3 and 4 tells about the number of hedge funds and assets under management under then. The figure 5 and 6 give the comparisons of number of fund and assets under management under Hedge fund and mutual funds. The number of the mutual funds was highest on the year 2002 and from that year onwards, the number has decreased slightly. However, the AUM of the mutual fund is increasing every year.

The proportion of U.S. corporate defined benefit pension funds investing in hedge funds has increased to 24% in 2006, up from 19% in 2004 and 12% in 2000. These pension funds invest, on average, about 5.4% of their assets in hedge funds. Total pension assets allocated to hedge funds has grown from 1.3% in 2003 to 2.1% in 2006 (Klunk, 2007). It is interesting to note that in spite of the spectacular growth in the number and

assets under management, the hedge fund is a relatively small industry in comparisons to the assets under management of the mutual fund industry.

X. Analysis of Hedge Fund Returns Data:

The monthly closing data of S&P 500 is obtained from the Bloomberg and monthly rate of return is calculated from it. The monthly return of the different hedge fund strategy is obtained from HFRI website which is already in terms of monthly rate of return. The time period of data collected is 1990 to 2006 and Excel Stat Plus is used as a tool in statistical calculation.

A. Total Cumulative Compound Return:

Cumulative total return of SPX and all strategies was calculated by compounding monthly rate of return and the result is given in table 2. It was observed that total monthly compounding cumulative return of S&P 500 (SPX) from Jan 1990 to Dec 2006 was 301%. During the same period, the highest return was observed for Equity Hedge (EqH) which was 1308% or 4.3 times that of the SPX. The second highest performing hedge fund strategy during the same time period was Emerging Market (EMG) strategy and the return was 1180% or 3.9 times that of the SPX. Merger Arbitrage (MA) had 436% or 1.4 times that of SPX. Convertible Arbitrage (CA), Distressed Security (Dst), Global Macro (Mac) had 413%, 1003% and 1011% respectively. The lowest and second lowest performing strategies were Fixed Income Arbitrage (Fxl) and Market Neutral strategy (MN). The total returns of these strategies were 283% and 335% respectively and they were 0.9 and 1.1 times that of the SPX.

If \$100 had been invested in SPX in Jan 1990, it would have been grown to \$ 401.3 by the end of 2006 but it would have been grown to \$1408 had it been invested to a hedge fund employing Equity Hedge strategy. The table 1 shows the return characteristics of SPX and different hedge fund strategies. It is clear that the return of all the different Hedge Fund strategies except Fixed Income Arbitrage is superior to that of the SPX.

B. Mean Variance Analysis:

Any calculation of return without considering risk does not make any sense. The risk in investment is traditionally calculated by volatility and the standard deviation is one measure of volatility.

There are 204 monthly rates of return data from 1990 to 2006 and in order to get a better view of how risk has changed over time, the data is divided into three data sets. First set of data includes data from Jan 1990 to June 1998, second set of data includes data from July 1998 to December 2006 and the third set of data includes all the monthly return from January 190 to December 2006.

The summary statistics for the first set of data is given in table 3. It was observed that for the first set of data or from Jan 1990 to June 1998, the mean of the monthly rate of return for SPX was 1.21% Out of nine other hedge fund strategies, Convertible Arbitrage, Market Neutral, Fixed Income Arbitrage and Merger Arbitrage had lower average monthly rate of return where as the rest of the strategies had higher rate of return than SPX. The maximum monthly rate of return was observed for Global Macro strategy and it was 1.73% and lowest was observed for Convertible Arbitrage strategies. The standard deviation of SPX was observed as 3.53% and all the strategies except Emerging market

had lower standard deviation. The minimum monthly rate of return for SPX was -9.43% and the maximum was 11.16% and the range was 20.59% where as the range for Emerging Market was 24.34% with minimum and maximum results as -12.07% and 12.27% respectively. The lowest standard deviation was observed for Market Neutral which was only 0.22 times that of SPX.

The summary statistics for the second set of data of from July 1998 to December 2006 is given in table 4. It was observed that the average monthly rate of return for SPX during this period was 0.32% and all the strategies outperformed the SPX. The highest performing strategy was Emerging Market Strategy and the average monthly rate of return for this strategy was 1.2% or 1.53 times that of SPX. The standard deviation of SPX during this period was 4.42% and all the strategies had lower standard deviation during this period. The lowest standard deviation was observed for Market Neutral and it was only 0.21 times that of SPX. The minimum monthly rate of return of SPX during this period was -14.58% and highest rate of return was 9.67% where as for the Emerging Market strategy, the minimum was -21.02% and maximum was 14.80%.

If we consider the whole period from January 1990 to December 2006, the average monthly rate of return of SPX was 0.76% and all the strategies except the Fixed Income Arbitrage strategy outperformed the SPX (Table 5). The standard deviation of SPX during this period was 4.01% and it was highest than all the hedge fund strategies except than Emerging Market. The minimum monthly rate of return for SPX was -14.58% and maximum was 11.16% where as for the Emerging Market strategy, the minimum was -21.02% and maximum was 14.80%.

C. Analysis of yearly Return:

The yearly return of SPX and different Hedge Fund strategies is given in table 6. The average yearly return of SPX during this period was 9.81% and all the hedge fund strategies except Market neutral and Fixed Income Arbitrage had higher average return than that of SPX. The standard deviation of SPX was 16.94% which was higher than all the hedge fund strategies except Emerging Market. Market neutral had the lowest standard deviation. The Sharpe ratio of SPX was lowest among all the hedge fund strategies.

Brook and Kat (2002) studied the mean return and standard deviation of popular stock market benchmark and major hedge fund indices and they found that hedge fund had similar return to that of major indices but standard deviation was much lower. Bing Liang (1999) found that hedge fund returns were more volatile than that of S&P 500 during the January 1994– December 1996 period. He studied 385 funds, both dead and alive, and found that standard deviation of his hedge fund sample was 14% while that of S&P 500 was 11.7%. According to Ackermann et al. (1999), the hedge funds were more volatile than both mutual funds and market indices though hedge fund consistently outperformed mutual funds and beat market.

It is concluded that if the traditional measure of risk, which is standard deviation, is used as a criterion for the evaluation of the performance, we can say that hedge Fund strategies, other than Emerging market, are superior investment instruments.

D. Sharpe ratio Analysis:

Sharpe ratio is calculated by subtracting risk free rate from the return and then dividing by standard deviation and it tells whether the higher returns do not come with taking additional higher risk. The greater the Sharpe ration, the better the return is

considered. As given in Table 3, it was observed that SPX had the lowest Sharpe ratio than all the hedge fund strategies during the period Jan 1990 to June 1998. The highest Sharpe ratio was observed for Market Neutral during this period. For the second set of data or for data from July 1998 to December 2006, SPX had again the lowest Sharpe ratio (Table 4). The highest Sharpe ratio during this period was observed for Convertible Arbitrage. When the entire data set was considered, the SPX again had the lowest Sharpe Ratio and the highest Sharpe ratio during this entire period was observed for Distressed Securities strategy (Table 5). It can be concluded if Sharpe ratio is the criterion of evaluation of the performance, all the hedge fund has performed better than SPX.

E. Correlation analysis:

One of the advantages which is often cited as the benefit of the hedge fund is its low correlation with the market. To verify whether different hedge fund strategies have low correlation or whether the correlation changes with the time, correlation of different hedge fund strategies with SPX is calculated for each data set and the result is given in table 7,8 and 9.

For the first data set, the highest correlation with SPX was observed for Equity Hedge strategy. The Fixed Income Arbitrage was slightly negatively correlated with that of SPX (Table 7). It is found that the correlation between different hedge fund strategies and SPX was from low to moderate. For the second data set, the correlation between the different hedge fund strategies and SPX is again observed as moderate to low, though high correlation between SPX and the Equity Hedge was observed (Table 8). For the entire data set (from Jan 1990 to Dec 2006), the SPX and Equity Hedge had the highest

correlation and Emerging Market too had relatively high correlation though for other strategies, relatively low correlation was observed (Table 9).

F. Higher Moments Analysis:

The fundamental assumption behind the logic that standard deviation is a measure of risk and among any two investment instruments with same returns but different standard deviations, one with lower standard deviation is superior than that other is that the returns follow normal distribution pattern(Bodie et al,2006). In assessing risk, we are interested in the probability that a given fund has a large negative return in the next period and this probability is determined by the mean and standard deviation but this logic is valid only if the returns are normally distributed. Since the returns are not normally distributed in the hedge fund, the first two moments of mean and standard deviation are not sufficient to give an accurate probability. The situation becomes even more complex if we need to access the probability of large loss over multiple time periods (Fung and Hsieh, 1999b). When the past returns are calculated and if the risk is defined in the conventional way-that is as the variability of returns, it is safe to say that hedge funds provide expected returns similar to equity with a risk similar to bond. However, when investors give weight to the return distribution higher moment-skew ness and kurtosis, the returns of the hedge funds do not look very attractive. Negative skew ness means large negative result negative returns are more likely than would be the case under normal distribution and skewness is an indication of non normal tail risks. If an asset's or fund's return distribution follow non normal pattern, the chances of actual returns to be above or below the average are unequal. When it is negatively skewed, the chances of below average return are greater than above average return than another case where the return follows

normal distribution with zero skew but with same standard deviation. The lower the skew or the more the skew is negative, the greater the probability of below average or negative returns or vice versa. A significant positive skew means that the fund may have taken above normal risks and bets have paid off. The kurtosis of a normal distribution is 3 and the excess kurtosis means the average of the fund's returns may be pushed higher by the presence of a few large returns (David Anderson et al., 2002).

From January 1990 to June 1998, it is observed that SPX had a negative skewness and five out of nine strategies had negative skewness too (Table 3). Convertible Arbitrage, Emerging Market, Merger Arbitrage had lower or more negative skewness than that of SPX and though Market neutral was also negatively skewed, the skewness is less negative than that of SPX. The Convertible Arbitrage, Event Driven and Merger Arbitrage had a higher kurtosis and kurtosis of Merger Arbitrage was 15.83. For the second set of data or from July 1998 to December 2006, SPX as well as the all the strategies except Global Macro, Equity Hedge and Market Neutral were negatively skewed and Distressed Security, Emerging Market, Fixed Income Arbitrage and Merger Arbitrage showed excess kurtosis (Table 4). The kurtosis of Fixed Income was highest.

If we consider the whole data set from January 1990 to December 2006, SPX had negative skewness and all the hedge fund strategies except Global Macro, Equity Hedge and Market Neutral had negative skewness too and in fact, their skewness was more negative than that of SPX. During this same period, Distressed Security, Emerging Market, Event Driven, Fixed Income Arbitrage and Merger Arbitrage had higher kurtosis. The highest kurtosis was observed for Fixed Income Arbitrage and it was 11.57 (Table 5).

A fund can claim a perfectly respectable track record if it has a above average return and a standard deviation within some acceptable range, yet, it can be risky and dangerous to the to the people who do not possesses sufficient knowledge if fund's performance has been boosted by few instances of very large gain (Tran, 2006). Since most of the hedge funds show negative skewness and high kurtosis, the return of hedge funds possess some risks.

According HMK (2007), hedge funds were initially sold on the promise of superior performance, the story being fund managers' long experience and proven investment skills were virtual guarantee for superior return but the hedge funds' poor performance starting from late 90's changed the story so that the hedge funds were no longer sold o the promise of superior performance, but more and more on the basis of diversification argument, pointing at the hedge funds relatively low correlation with stocks and bonds and the beneficial effects on risk and return from including hedge fund in the traditional investment portfolio.

G. Single factor and multifactor analysis:

Every portfolio has systematic and unsystematic risks and though the unsystematic risk can be diversified away, the systematic risks can not be diversified away. The systematic is measured by the degree to which its return varies relative to those of the overall market and it is given by beta. The Capital Asset Pricing Model (CAPM) gives relationship between an assets and corresponding expected returned. The main concept of this theory is that assets is expected to earn the risk free rate plus a reward for taking risk associated with that assets as measured by its beta which is the ratio of expected excess

return of the assets and market's excess return. Since the CAPM says the risk of a stock should be measured relative to a comprehensible 'market portfolio', the fundamental questions that arises while applying CAPM is how to define market. Market in principle can include not just traded financial assets, but also consumer durables, real estates and human capital(Fama/French 2004). Since CAPM is used to evaluate the performance of hedge fund managers as well, many mangers claim that they were able to generate excess return (or were able to deliver alpha) than predicted by CAPM. Since excess return can be generated by increasing beta exposure also or by generating 'alpha', it is important to distinguish which one is the real cause of increase in return in order to correctly evaluate the performance of hedge fund managers.

Considering S&P as market, the alpha and beta was calculated by regressing the excess monthly return of different strategies on the excess monthly return of SPX from January 1990 to December 1994 and the result is tabulated in Table 15. It is observed that R square value is not very high and the highest one is about 0.36 for Equity Hedge strategy and lowest is observed for Fixed Income and Market Neutral strategy, which was only 0.02. The highest beta as measured by the coefficient of SPX is for Emerging Market and lowest is of Market Neutral. The highest alpha is observed for Emerging Market Strategy which is 1.6% and lowest is observed for Convertible Arbitrage which is 0.34%.

In order to analyze how the value of beta and alpha changed over time, the same regression process as mentioned above was done for the data of January 2002 to December 2006 and the statistical result was tabulated in table 16. It was observed that Equity Hedge had the highest value of R square where as Convertible Arbitrage had the

lowest one. Emerging Market had the highest beta or 0.46 followed by Equity Hedge which had .37 beta. The Emerging Market Strategy has the highest alpha, 1.32%, and Market Neutral has the lowest alpha or 0.15%. It is interesting to note that the overall alpha decreased.

The fundamental question in hedge fund is how to define the market. Does the S&P 500 or other such popular benchmark are the proxy of the market? Since the hedge funds faces additional risks like currency risks, bankruptcy risks, leverage risk etc than the traditional assets, many academicians believe that single risk factors assumed by the CAPM may not explain the expected return from hedge funds completely.

Fama and French have proposed that factors describing value and size to be the most significant factors outside of market risks. They have constructed two factors, one is SMB, which stands for small and minus big, to address size risk and another is HML, which stands high minus low, to address value risk. SMB is calculated as the average return for the small 30% of stocks minus the average return of the large 30% of stock in the given month. SMB measures the additional returns investors have historically received by investing in stocks of companies with relatively small market capitalization and this additional return is often called as 'size premium'. HML gives additional return that investors get by investing high book to market value and this additional return is also called 'value premium'. HML is computed as the average return for the 50% of stocks with the highest book to market ratio minus the average return of the 50% of stocks with the lowest book to market ratio each month. The positive HML for any month indicates value stocks outperformed growth stocks in that month.

The explanation given to justify that SMB as a risk factors is that small companies are generally more sensitive to many risk factors because of their relatively undiversified nature and their reduced ability to absorb negative financial events and HML as another risk factor is high book to market value indicates market value has decreased due to some financial trouble or poor financial future prospects and hence are more prone to bankruptcy or other financial troubles than their more highly valued counterparts.

The SMB, HML and excess market return from January 1990 to December 1994 was obtained from Kenneth French's website and excess return of every hedge fund strategy was regressed and the result is tabulated on table 17. It was observed that R square had improved drastically in 3 factors model. The highest R square was observed for Distressed Security strategy and it was 0.62 and the lowest R square was observed for Market Neutral and it is 0.03 only. The highest alpha was found for Global Macro and lowest alpha for Convertible Arbitrage. It is interesting to note that there was decrease in alpha in 3-factor model. The same process as mentioned above was repeated for the data set from January 2002 to December 2006 and the result is given in table 18. The highest R square during this period was observed for Equity Hedge, which was 0.79 and lowest for Fixed Income Arbitrage, which was 0.06. The highest alpha was observed for Emerging Market and lowest one was observed for Market Neutral and the values were 1.10% and 0.15% per month respectively.

Many scholar questions the validity of result from one factor model. According to Amin and Kat, (2002), hedge funds are complicated trading strategies and they often use complex derivatives and high leverage, so their risk and return characteristics is different from traditional stocks and bond investments. Due to special nature of the investment

strategies adopted, hedge fund returns may exhibit a high degree of non-normality as well as a non-linear relationship with the stock market. According to Fung and Hsieh (2001), hedge fund returns can be modeled focusing on 'trend following' strategy. The returns of trend following funds are uncorrelated with the standard equity, bond, currency and commodity indices and the relationship between trend followers and equity market is non-linear. Although the returns of trend following funds have a low beta against equity on average, the state-dependent beta estimates tend to be positive in up markets and negative in down markets. The presence of non-linearity gives beta from standard linear factor models which can overestimate or underestimate systematic risk. Since the trading rule of the trend followers is not available because the traders regard their trading systems to be proprietary, it is not possible to accurately calculate their total systematic risk exposure.

There is no consensus among academicians and researchers about how many factors should be used in the analysis of the hedge fund. Fung and Hsieh (2004) proposed a risk factor model using seven risk factors which include the excess return of S&P 500, small cap minus large cap, the return of the ten-year treasury bond above the risk-free rate of return, the return of Baa bonds above the return of the ten-year treasury bond, lookback portfolio on bonds, currencies and commodities. According to Lehman Brothers Report, nine financial and macro-economic factors can explain close to 60% of cross-sectional differences in average returns on different strategies. The nine factors of Lehman Brothers are: Slope of yield curve which is measured by the difference between the yield to maturity of the 30-year Treasury and 3-month T-Bill, long-term yield measured by the yield on the 30-year Treasury, T-Bill rate represented by the yield on the 3-month Treasury, credit risk premium measured by the difference between the yield on BAA

bond and yield on AAA bond, intra-month standard deviation of S&P 500 index, S&P total monthly return, small cap return as represented by Russell's 200 index, implied volatility index as given by CBOE's implied volatility Index for options on S&P 500 index and intra month volatility of bond return which is obtained by calculating the intra month standard deviation of the daily rate of Lehman Brother's Aggregate Bond Index. Unfortunately, there is no method which is accepted by every body in analyzing the results. According to Krail, Asness, and Liew (2001), many hedge funds hold, to various degrees and combinations, illiquid exchange-traded securities or difficult-to-price over-the-counter securities. Even small and medium capitalization stocks may fall into this category and the price of such securities is very hard to estimate and often these illiquid exchange-traded securities often do not trade at the end of every month. This can lead to non-synchronous price reactions and this gives the managers flexibility in how to mark their positions for month-end reporting. The writer argues that the presence of stale prices due to either illiquidity or managed pricing can artificially lower estimates of volatility and correlation to traditional indices.

H. Performance of Hedge fund during crisis:

It is claimed that Hedge Fund is absolute return investment instrument and it is able to generate positive return irrespective of the movement of the market. In order to verify the claim that hedge Fund can generate positive return even in market turmoil, return of the Hedge fund during the time of crisis was analyzed. The following market crisis periods were taken for the sake of analysis:

a. Bond Crisis

During the Bond crisis of Feb 1994 to Apr 1994, the performance of SPX was poor but so was the performance of other hedge fund strategies. The Sharpe ratio of all the hedge fund strategies except Market Neutral, Fixed Income Arbitrage was lower than that of SPX. The result is given in table 10. It is interesting to note that the correlation of between the SPX and different strategies increased drastically during the bond crisis (Table 14). The SPX and Market Neutral were perfectly correlated where as the correlation between the SPX and Distressed Securities was 0.82 or almost perfect correlation.

b. Asian Crisis

By analyzing the data of the Asian currency crisis of July 1997 to Dec 1997, it was observed that the Sharpe ratio of all the strategies was lower than that of SPX (Table 11). It was observed that most of the strategies were more correlated with the market during the time of crisis (Table 14).

c: Russian Crisis:

Interesting result was observed for Russian crisis of August 1998 to Oct 1998. The average return of all the strategy was lower than that of SPX and their performance in terms of Sharpe ratio was very disappointing in terms of Sharpe Ratio (Table 120. There was almost perfect correlation between SPX and different hedge fund strategies during Russian crisis (Table 14).

d. Dot Com Bubble

During the Dot Com bubble of April 2000 to September 2001, the average return of SPX was negative but that of Emerging market and Equity Hedge was negative too(

Table 13). The correlation between the SPX and Equity Hedge as well as Emerging Market increased during this period (Table 14).

I. Performance of SPX during Bull market:

In order to see how Hedge Fund performed during the best period of SPX, 1995 to 1998 was chosen as study period because it is considered as one of the best years of markets. During this Bull period, the total compounding cumulative return for SPX was 167.65% but the performance of other strategies was not as high as that of SPX. Equity Hedge, which was the best performers among the hedge fund strategies, performed only about 76% that of SPX. The worst performer was Emerging market and a total return was less than one percent in 4 years!

The table 19 gives yearly average returns, standard deviation and Sharpe ratio of SPX and other Hedge Fund strategies. It was observed that SPX had the highest average return and Sharpe ratio than that of any hedge fund strategies. The standard deviation was also very low compared to most of the hedge fund strategies and only Convertible Arbitrage, Market Neutral and Fixed income Arbitrage had lower standard deviation than that of the SPX. The result that I found was similar to Bing Liang (1998) who found that during the bull market of 1990s, many hedge funds did not perform well in comparison to that stock market. In a study from 1990 to July 1999, which included 1921 hedge funds, both dead and alive, and data maintained by TASS management, he found that the hedge fund have annual return of 14.2 % during this period as compared with 18.8 % of S&P 500 index. The difference was an underperformance of 41 % by hedge fund.

XI. Conclusion:

It is concluded that different Hedge Fund strategies have higher return and low standard deviation than that of the SPX. They have low correlation with the market and their Sharpe ratios are higher than that of SPX. The combination of attractive returns and lower risk, coupled with low correlation, is one of the main important marketing tools of hedge fund managers and it is found to be true.

All the strategies have very low beta as well. However, these traditional measures of risk do not give the true picture of the risks associated with Hedge Fund and they are not applicable to hedge fund because the return does not follow normal distribution. So, if the return of the Hedge Fund is analyzed in terms of the higher moments-skewness and kurtosis, the return statistics become less attractive. The returns are not only negatively skewed but also they have very high kurtosis. It is also observed that the returns of the hedge fund is lower than that of the market in the bull market period and though the hedge fund returns have low correlation with the market during the normal time, their correlation with the market during the hours of crisis. Though the performance of hedge fund is spectacular, it is still to be seen if such returns are sustainable over long run.

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Table 1 Number and Assets under Management (AUM) of Hedge fund and Mutual Fund

The table reports the number as well as the assets under management from 1990 to 2006. The first column is the year and second and third columns gives number of hedge funds and assets under management in Billion dollars. The forth and fifth columns gives the same information about mutual funds.

Year	HEDGE FUND		MUTUAL FUND	
	No of hedge Fund	AUM in Billion	No of Funds	AUM in Billion
1990	610	\$39	3,079	1,065.19
1991	821	\$58	3,403	1,393.19
1992	1105	\$96	3,824	1,642.54
1993	1514	\$168	4,534	2,069.96
1994	1945	\$167	5,325	2,155.32
1995	2383	\$186	5,725	2,811.29
1996	2781	\$257	6,248	3,525.80
1997	2990	\$368	6,684	4,468.20
1998	3325	\$375	7,314	5,525.21
1999	3616	\$456	7,791	6,846.34
2000	3873	\$491	8,155	6,964.63
2001	4454	\$539	8,305	6,974.91
2002	5379	\$626	8,244	6,390.36
2003	6297	\$820	8,126	7,414.40
2004	7436	\$973	8,041	8,106.94
2005	8664	\$1,105	7,975	8,904.82
2006	9228	\$1,337	8,120	10,413.62

Table 2 Total cumulative returns and growth of one hundred dollars.

This table reports total cumulative return and growth of \$100 from 1990 to 2006. The first column gives information about different strategies including SPX. The second column gives information about total cumulative compound returns. The third column gives information about relative return of each strategy in terms of returns of SPX. The fourth column gives information about how much one hundred dollars would have grown had it been invested in each strategy.

	Cumulative compound return		growth of \$100
SPX	301		401.3
Fxd Inc Arb	283	0.9 times return of SPX	383.0
Mark Neutral	335	1.1 times return of SPX	435.3
Merger Arb	436	1.4 times return of SPX	535.7
Convrt Arb	413	1.4 times return of SPX	512.9
Distressed	1003	3.3 times return of SPX	1102.5
Macro	1011	3.4 times return of SPX	1110.7
Emerging	1180	3.9 times return of SPX	1280.4
Equity Hedge	1308	4.3 times return of SPX	1408.1

Table 3 Summary statistics from Jan 1990 to June 1998

The first column gives information about different strategies. The second column gives about the average of the monthly rate of returns. The third, fourth and fifth columns give information about minimum, maximum and the range of the monthly rate of returns. The sixth column gives information about the standard deviation. The seventh and eighth columns give information about higher moments-skewness and kurtosis of the returns. The ninth column gives information the Sharpe ratio of the monthly rate of returns.

From Jan 1990 to June 1998

	Average	Minimum	Maximum	Range	Std Dev	Skewness	Kurtosis	Sharpe Ratio
SPX	1.21	-9.43	11.16	20.59	3.53	-0.18	0.49	0.23
CA	0.93	-2.79	2.32	5.11	0.93	-1.59	3.10	0.57
Mac	1.73	-6.40	7.88	14.28	2.70	0.06	0.16	0.49
Dst	1.49	-3.58	7.06	10.64	1.63	0.43	2.69	0.67
Emg	1.49	-12.07	12.27	24.34	4.08	-0.46	0.93	0.27
EqH	1.71	-3.34	7.22	10.56	2.15	0.05	-0.34	0.60
MN	0.96	-1.45	2.70	4.15	0.79	-0.07	0.14	0.70
FxI	0.95	-2.58	4.70	7.28	1.12	0.06	1.62	0.49
MA	1.03	-6.46	2.90	9.36	1.25	-3.25	15.83	0.50

Table 4 Summary statistics from July1998 to Dec 2006.

The first column gives information about different strategies. The second column gives about the average of the monthly rate of returns. The third, fourth and fifth columns give information about minimum, maximum and the range of the monthly rate of returns. The sixth column gives information about the standard deviation. The seventh and eighth columns give information about higher moments-skewness and kurtosis of the returns. The ninth column gives information the Sharpe ratio of the monthly rate of returns.

From July 1998 to Dec 2006

	Average	Minimum	Maximum	Range	Std Dev	Skewness	Kurtosis	Sharpe Ratio
SPX	0.32	-14.58	9.67	24.25	4.42	-0.52	0.73	0.01
CA	0.68	-3.19	3.33	6.52	1.05	-0.76	1.85	0.39
Mac	0.69	-3.70	6.82	10.52	1.77	0.39	1.29	0.24
Dst	0.90	-8.50	5.06	13.56	1.71	-1.61	8.37	0.37
Emg	1.20	-21.02	14.80	35.82	4.21	-1.24	7.41	0.22
EqH	0.96	-7.65	10.88	18.53	2.75	0.43	2.24	0.25
MN	0.50	-1.67	3.59	5.26	0.91	0.63	1.51	0.24
FxI	0.38	-6.45	3.04	9.49	1.17	-3.61	19.48	0.09
MA	0.64	-5.69	3.12	8.81	1.15	-1.99	8.80	0.32

Table 5. Summary statistics from Jan 1990 to Dec 2006.

The first column gives information about different strategies. The second column gives about the average of the monthly rate of returns. The third, fourth and fifth columns give information about minimum, maximum and the range of the monthly rate of returns. The sixth column gives information about the standard deviation. The seventh and eighth columns give information about higher moments-skewness and kurtosis of the returns. The ninth column gives information the Sharpe ratio of the monthly rate of returns.

From Jan 1990 to Dec 2006

	Average	Minimum	Maximum	Range	Std Dev	Skewness	Kurtosis	Sharpe Ratio
SPX	0.76	-14.58	11.16	25.74	4.01	-0.48	0.91	0.11
CA	0.81	-3.19	3.33	6.52	1.00	-1.12	2.15	0.47
Mac	1.21	-6.40	7.88	14.28	2.34	0.39	0.72	0.37
Dst	1.20	-8.50	7.06	15.56	1.69	-0.65	6.03	0.51
Emg	1.34	-21.02	14.80	35.82	4.14	-0.86	4.29	0.24
EqH	1.34	-7.65	10.88	18.53	2.49	0.19	1.50	0.40
MN	0.73	-1.67	3.59	5.26	0.88	0.21	0.52	0.44
FxI	0.67	-6.45	4.70	11.15	1.18	-1.76	11.57	0.28
MA	0.83	-6.46	3.12	9.58	1.21	-2.54	11.39	0.41

Table 6. Summary of the average, standard deviation and Sharpe ratio of the yearly rate of return.

Column 1 gives information about different years. Column 2 to 10 gives information about different strategies. The twentieth row gives information about the average of the yearly rate of returns and twenty-first and twenty-second rows gives information about standard deviation and Sharpe ratio of the different strategies.

Yearly return

Year	SPX	CA	Mac	Dst	Emg	EqH	MN	FxI	MA
1990	-6.56	2.16	12.56	6.44	-3.35	14.43	15.45	10.84	0.44
1991	26.31	17.60	46.66	35.66	45.40	40.15	15.65	12.89	17.86
1992	4.46	16.35	27.17	25.24	24.35	21.32	8.73	22.11	7.90
1993	7.06	15.22	53.31	32.54	79.22	27.94	11.11	16.64	20.24
1994	-1.54	-3.73	-4.30	3.84	3.38	2.61	2.65	11.94	8.88
1995	34.11	19.85	29.32	19.73	0.69	31.04	16.33	6.08	17.86
1996	20.26	14.56	9.32	20.77	27.14	21.75	14.20	11.89	16.61
1997	31.01	12.72	18.82	15.40	16.57	23.41	13.62	7.02	16.44
1998	26.67	7.77	6.19	-4.23	-32.96	15.98	8.30	-10.29	7.23
1999	19.53	14.41	17.62	16.94	55.86	44.22	7.09	7.38	14.34
2000	-10.14	14.50	1.97	2.78	-10.71	9.09	14.56	4.78	18.02
2001	-13.04	13.37	6.87	13.28	10.36	0.40	6.71	4.81	2.76
2002	-23.37	9.07	7.42	5.28	3.70	-4.71	0.98	8.77	-0.86
2003	26.38	9.93	21.44	29.58	39.37	20.53	2.46	9.36	7.48
2004	8.99	1.18	4.64	18.89	18.42	7.69	4.15	5.99	4.08
2005	3.00	-1.86	6.81	8.25	21.04	10.61	6.23	5.61	6.26
2006	13.62	12.17	8.17	15.95	24.25	11.71	7.32	7.28	14.24
Average	9.81	10.31	16.12	15.67	18.98	17.54	9.15	8.42	10.58
Std Dev	16.94	6.98	15.55	11.12	26.46	13.38	5.08	6.64	6.80
Sharpe	0.33	0.88	0.77	1.04	0.56	1.00	0.98	0.64	0.95

Table 7. Pearson Correlation from Jan 1990 to June 1998

This table reports the Pearson correlation between different strategies from Jan 1990 to June 1998.

	SPX	CA	Mac	Dst	Emg	EqH	MN	FxI	MA
SPX	1.000	0.351	0.488	0.310	0.476	0.573	0.162	-0.022	0.400
CA		1.000	0.447	0.514	0.391	0.499	0.091	-0.052	0.403
Mac			1.000	0.398	0.611	0.576	0.155	-0.021	0.278
Dst				1.000	0.515	0.533	0.135	0.302	0.493
Emg					1.000	0.499	0.013	0.338	0.346
EqH						1.000	0.339	0.053	0.383
MN							1.000	-0.064	0.010
FxI								1.000	-0.100
MA									1.000

Table 8. Pearson Correlation from July 1998 to Dec 2006

This table reports the Pearson correlation between SPX and different strategies from July 1998 to Dec 2006.

	SPX	CA	Mac	Dst	Emg	EqH	MN	FxI	MA
SPX	1.000	0.218	0.253	0.439	0.648	0.709	0.055	-0.143	0.522
CA		1.000	0.330	0.548	0.376	0.393	0.229	0.246	0.489
Mac			1.000	0.536	0.617	0.659	0.308	0.274	0.308
Dst				1.000	0.759	0.608	0.139	0.343	0.500
Emg					1.000	0.767	0.119	0.206	0.518
EqH						1.000	0.336	0.030	0.591
MN							1.000	0.080	0.382
FxI								1.000	-0.006
MA									1.000

Table 9. Pearson Correlation from Jan 1990 to Dec 2006

This table depicts the Pearson Correlation between SPX and different strategies from Jan 1990 to Dec 2006.

	SPX	CA	Mac	Dst	Emg	EqH	MN	FxI	MA
SPX	1.000	0.290	0.376	0.385	0.569	0.658	0.118	-0.061	0.461
CA		1.000	0.393	0.554	0.402	0.438	0.168	0.124	0.451
Mac			1.000	0.456	0.593	0.585	0.242	0.136	0.304
Dst				1.000	0.637	0.576	0.165	0.353	0.504
Emg					1.000	0.642	0.068	0.273	0.424
EqH						1.000	0.345	0.068	0.481
MN							1.000	0.070	0.214
FxI								1.000	-0.013
MA									1.000

Table 10. Performance during the Bond Crisis

This table reports the average, standard deviation and Sharpe ratio of monthly rate of returns of different strategies during Bond crisis which lasted from Feb. 1994 to April 1994.

Strategy	Average	STDEV	Sharpe
SPX	-2.14	2.96	-0.73
Convrt Arb	-1.55	1.59	-0.98
Macro	-3.68	2.61	-1.41
Distressed	-0.46	0.41	-1.12
Emerging	-2.43	1.91	-1.28
Equity Hedge	-0.95	0.98	-0.97
Mark Neutral	0.65	0.25	2.60
Fxd Inc Arb	1.18	0.39	3.01
Merger Arb	0.24	0.98	0.24

Table 11. Performance during the Asian Crisis.

This table reports the performance of SPX and different strategies during the Asian Crisis from July 1997 to Dec 1997

Strategy	Average	STDEV	Sharpe
SPX	1.66	5.29	0.31
Convrt Arb	0.93	0.56	1.64
Macro	1.46	2.97	0.49
Distressed	1.14	1.14	0.99
Emerging	-1.24	4.41	-0.28
Equity Hedge	2.16	2.63	0.82
Mark Neutral	1.19	0.85	1.39
Fxd Inc Arb	0.28	0.43	0.65
Merger Arb	1.59	0.54	2.96

Table 12. Performance during the Russian Crisis

This table reports the average, standard deviation and Sharpe ratio of monthly rate of returns of different strategies during Russian crisis which lasted from Aug 1998 to Oct 1998.

Strategy	Average	STDEV	Sharpe
SPX	-0.10	12.57	-0.01
Convrt Arb	-1.58	1.43	-1.11
Macro	-2.01	1.61	-1.25
Distressed	-4.27	3.92	-1.09
Emerging	-7.95	11.87	-0.67
Equity Hedge	-0.67	6.05	-0.11
Mark Neutral	-0.49	1.24	-0.40
Fxd Inc Arb	-4.57	2.94	-1.55
Merger Arb	-0.60	4.41	-0.14

Table 13. Performance during the Dot Com bubble.

This table reports the average, standard deviation and Sharpe ratio of monthly rate of returns of different strategies during the Dot Com bubble which lasted from April 2000 to Sept 2001.

Strategy	Average	STDEV	Sharpe
SPX	-1.89	4.86	-0.39
Convrt Arb	1.05	0.81	1.30
Macro	0.12	1.82	0.06
Distressed	0.45	1.56	0.29
Emerging	-1.17	3.84	-0.30
Equity Hedge	-0.41	2.99	-0.14
Mark Neutral	1.04	1.16	0.89
Fxd Inc Arb	0.48	1.12	0.42
Merger Arb	0.74	1.19	0.62

Table 14. Pearson Correlation of SPX and different strategies during different crisis.

This table gives information about the Pearson correlation between the SPX and different strategies during Bond crisis of Feb 1994 to April 1994, during the Russian crisis of Aug 1998 to Oct 1998, during Asian Crisis of July 1997 to Dec 1997, during the Dot Com bubble from April 2000 to September 2001.

Bond Crisis Feb 1994 to Apr 1994

	SPX	CA	Mac	Dst	Emg	EqH	MN	FxI	MA
SPX	1.000	-0.453	0.642	0.827	0.297	0.722	1.000	-0.190	-0.652

Russian Crisis Aug 1998 to Oct 1998

	SPX	CA	Mac	Dst	Emg	EqH	MN	FxI	MA
SPX	1.000	0.600	0.973	0.826	0.894	0.952	0.984	0.975	0.777

Asian Crisis July 1997 to Dec 1997

	SPX	CA	Mac	Dst	Emg	EqH	MN	FxI	MA
SPX	1.000	-0.023	0.814	0.604	0.649	0.533	0.631	0.340	0.784

Dot Com bubble Apr 2000 to Sept 2001

	SPX	CA	Mac	Dst	Emg	EqH	MN	FxI	MA
SPX	1.000	0.283	0.343	0.400	0.695	0.811	-0.229	0.393	0.328

Table 15. Regression result of single factor model from Jan 1990 to Dec 1994.

This table reports the R Square and Adjusted R square in the second and third column. Significance F at 95% confidence level is given in forth column. Intercept or α is given in fifth column and lat column gives the coefficient of excess return of SPX.

	R Square	Adjusted R Square	Significance F	Intercept	Excess SPX
CA	0.097758	0.082202	0.01500533	0.341839	0.096156
Mac	0.239152	0.226034	7.3456E-05	1.501961	0.401203
Dst	0.108767	0.093401	0.01007332	1.143211	0.187655
Emg	0.348766	0.337538	6.8051E-07	1.596267	0.685685
EqH	0.363828	0.35286	3.386E-07	1.16999	0.37471
MN	0.006105	-0.01103	0.55290018	0.45938	0.018544
Fxl	0.013935	-0.00307	0.36902894	0.773928	0.04144
MA	0.188645	0.174656	0.00052559	0.464491	0.186656

Table 16. Regression result of single factor model from Jan 2002 to Dec 2006.

This table reports the R Square and Adjusted R square in the second and third column. Significance F at 95% confidence level is given in forth column. Intercept or α is given in fifth column and lat column gives the coefficient of excess return of SPX.

	R Square	Adjusted R Square	Significance F	Intercept	Excess SPX
CA	0.014021	-0.00298	0.36753843	0.28868	0.031918
Mac	0.026857	0.010078	0.21086575	0.565399	0.068868
Dst	0.243679	0.230639	6.13E-05	0.968355	0.173173
Emg	0.430808	0.420994	1.24E-08	1.323295	0.46346
EqH	0.568365	0.560923	3.58E-12	0.449578	0.36924
MN	0.023087	0.006244	0.24648098	0.147999	0.021571
Fxl	0.058085	0.041845	0.06359295	0.411216	-0.02848
MA	0.348503	0.33727	6.89E-07	0.276244	0.143921

Table 17. Regression result of multifactor model from Jan 1990 to Dec 1994

This table reports the R Square and Adjusted R square in the second and third column. Significance F at 95% confidence level is given in forth column. Intercept or α is given in fifth column. The coefficient of excess return of market, small minus big and high minus low is given in sixth, seventh and eighth column respectively.

	R Square	Adjusted R Square	Significance F	Intercept	Rm-Rf	SMB	HML
CA	0.198073	0.155112	0.00593816	0.27571	0.096132	0.125726	0.062661
Mac	0.265401	0.226047	0.00057887	1.33488	0.416526	0.074736	0.126574
Dst	0.620905	0.600597	7.7221E-12	0.889357	0.216456	0.501347	0.415977
Emg	0.415931	0.384641	1.1547E-06	1.250722	0.709292	0.277028	0.365538
EqH	0.501572	0.47487	1.4862E-08	1.005365	0.350068	0.28936	0.03928
MN	0.033442	-0.01834	0.58883856	0.445041	0.019982	0.048507	-0.00452
Fxl	0.217049	0.175106	0.00315871	0.679271	0.058065	0.179604	0.189135
MA	0.286609	0.248392	0.00026374	0.346173	0.19878	0.138424	0.144856

Table 18. Regression result of multifactor models from Jan 2002 to Dec 2006

This table reports the R Square and Adjusted R square in the second and third column. Significance F at 95% confidence level is given in forth column. Intercept or α is given in fifth column. The coefficient of excess return of market, small minus big and high minus low is given in sixth, seventh and eighth column respectively.

	R Square	Adjusted R Square	Significance F	Intercept	Rm- Rf	SMB	HML
CA	0.108812	0.06107	0.08935519	0.382665	-0.0137	0.108971	0.074782
Mac	0.074749	0.025182	0.22241295	0.235539	-0.1016	0.090705	0.043861
Dst	0.39579	0.363422	2.9161E-06	0.235539	-0.1016	0.090705	0.043861
Emg	0.497692	0.470783	1.8399E-08	1.102276	0.402377	0.195234	0.072292
EqH	0.795562	0.78461	2.69E-19	0.254073	0.314879	0.285988	-0.01084
MN	0.209409	0.167056	0.00408212	0.150123	0.025381	0.066803	-0.06224
Fxl	0.062015	0.011766	0.30592765	0.406375	-0.03031	0.018137	0.002102
MA	0.53391	0.508941	2.3392E-09	0.207014	0.126151	0.127999	-0.02878

Table 19. Summary of the performance of SPX and different strategies during Bull market of 1995 to 1998.

This table reports the performance of the SPX and different strategies during the Bull market of 1995 to 1998. The average of the yearly rate of returns of SPX and different strategies is given in the sixth row. The standard deviation and Sharpe ratio of SPX and different strategies is given in seventh and eighth row.

Year	SPX	CA	Mac	Dst	Emg	EqH	MN	FxI	MA
1995	34.1	19.9	29.3	19.7	0.69	31	16.3	6.08	17.9
1996	20.3	14.6	9.32	20.8	27.1	21.8	14.2	11.9	16.6
1997	31	12.7	18.8	15.4	16.6	23.4	13.6	7.02	16.4
1998	26.7	7.77	6.19	-4.2	-33	16	8.3	-10	7.23
Average	28	13.7	15.9	12.9	2.86	23.1	13.1	3.68	14.5
Stdv	6	4.99	10.4	11.7	26.2	6.21	3.41	9.65	4.91
Sharpe	3.84	1.75	1.05	0.68	-0.1	2.91	2.38	-0.1	1.94
Total Compounding Cumulative Return	168	66.8	78.4	59.8	0.04	128	63.5	14	71.6

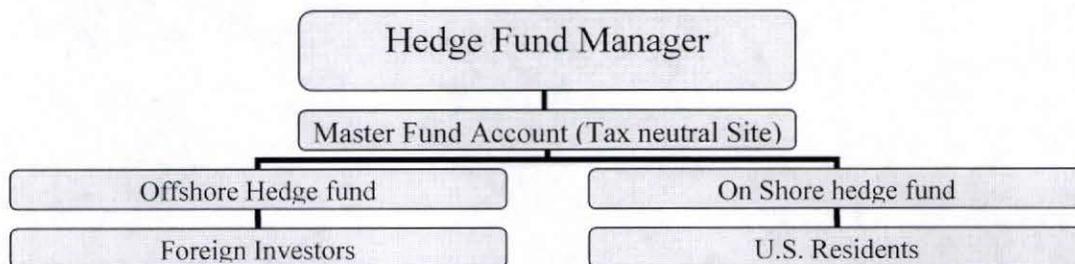


Figure 1. Structure of a typical hedge fund

This figure depicts the typical structure of a hedge fund, its master fund account and its two different on-shores and off shore hedge funds. The offshore funds are mainly for the foreign investors and onshore funds are mainly for the domestic investors.

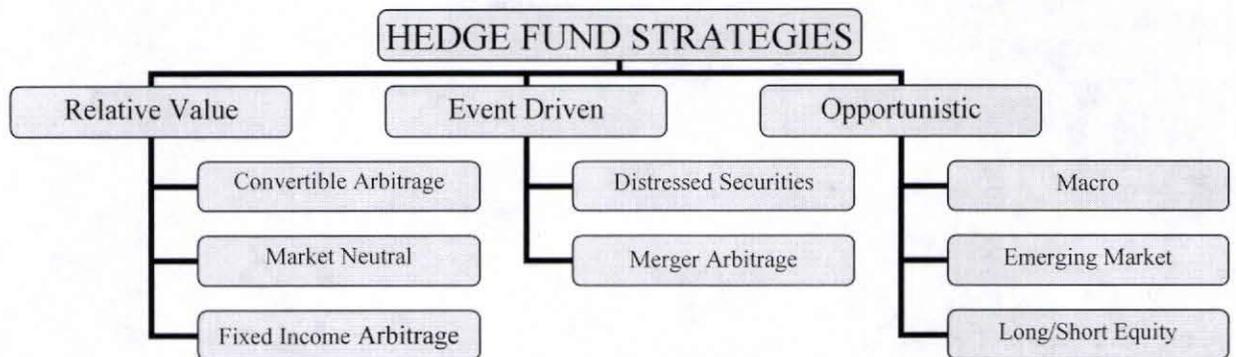


Figure 2. Different hedge fund strategies.

This figure depicts how hedge fund strategies can be divided into three different groups of strategies. The three groups are further divided into Convertible Arbitrage, Market Neutral and Fixed Income Arbitrage for Relative Value strategy, Distressed Securities and Merger Arbitrage for Event driven and Macro, Emerging Market and Long/Short equity or equity Hedge for Opportunistic strategy.

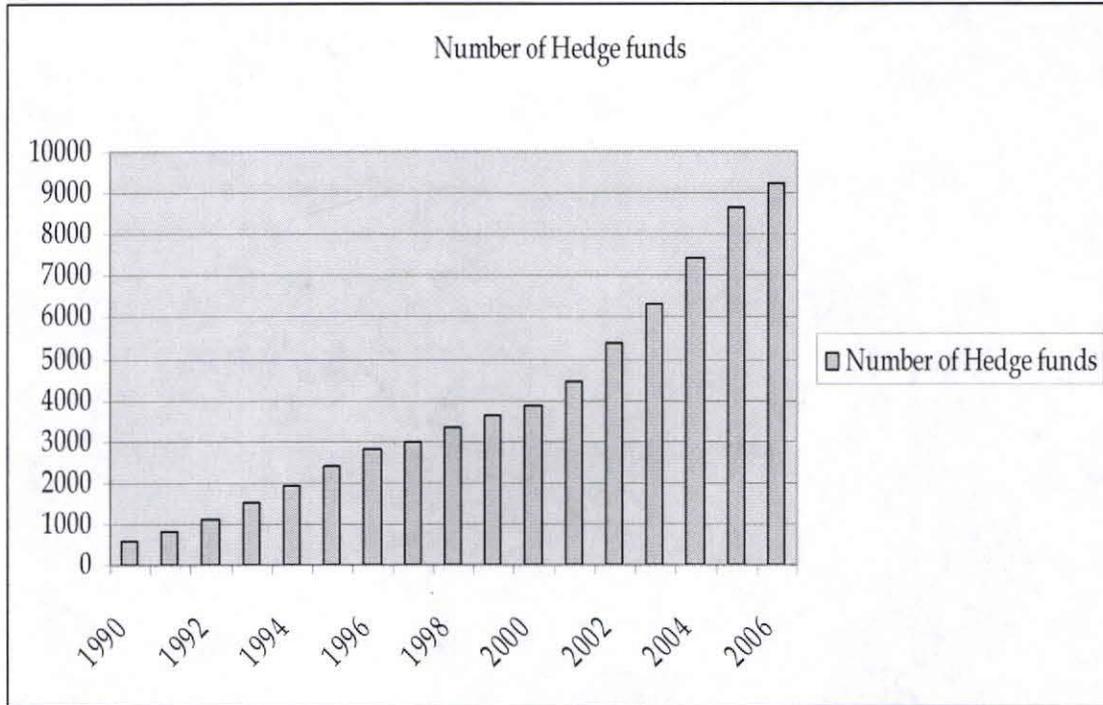


Figure 3. Number of hedge funds from 1990 to 2006.

This figure depicts the number of hedge funds from year 1990 to 2006.

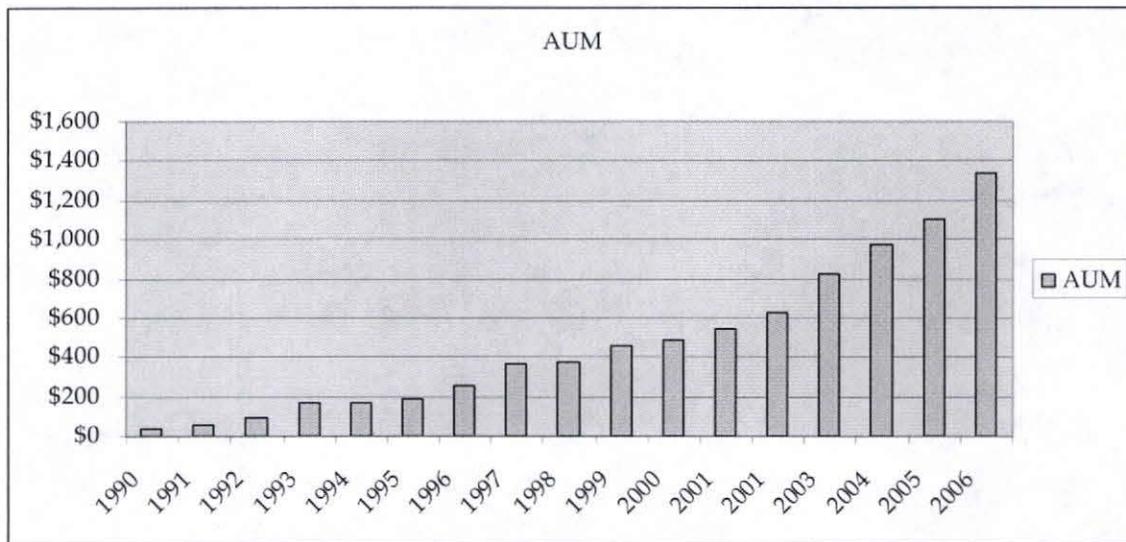


Figure 4. Total assets under management in hedge funds from 1990 to 2006.

This figure depicts total assets under management of hedge funds from 1990 to 2006.

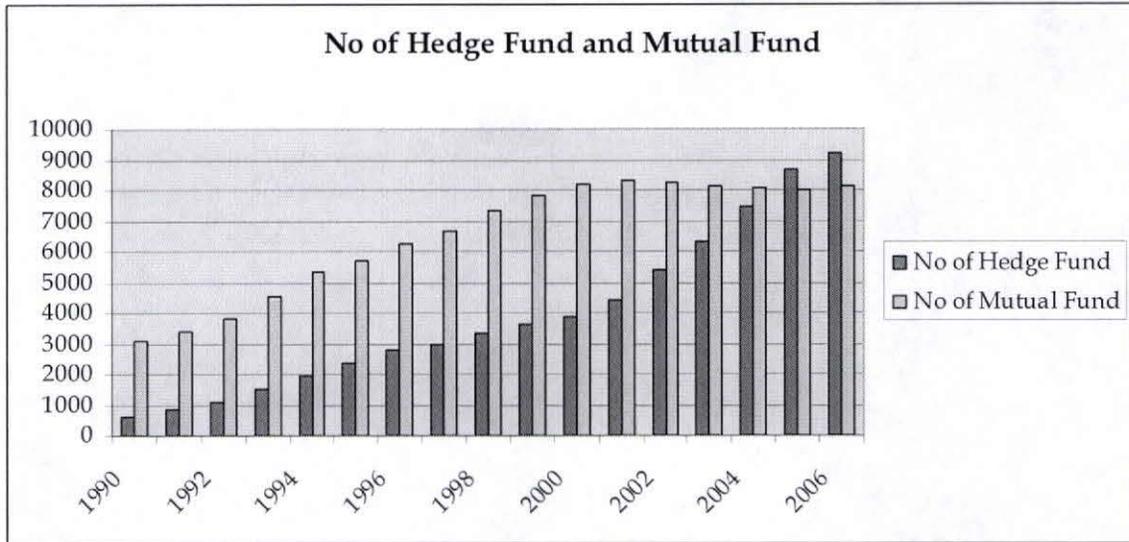


Figure 5. Comparison of number of hedge funds and mutual funds

This figure compares the number of hedge funds and mutual funds from 1990 to 2006.

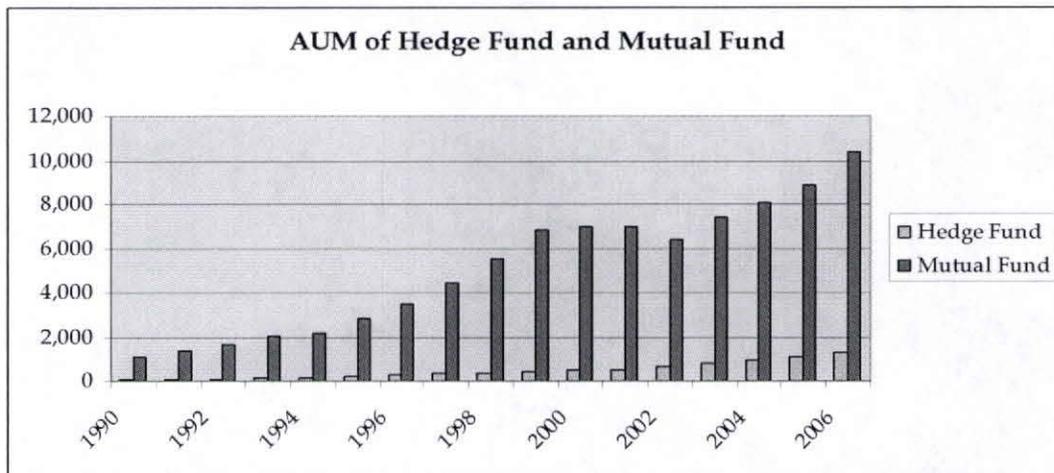


Figure 6. Comparison of assets under management between hedge funds and mutual funds.

This figure compares the assets under management between hedge funds and mutual funds from 1990 to 2006.