DIPARTIMENTO DI ECONOMIA & FINANZA

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HEDGE FUNDS: HOW THE FINANCIAL CRISIS INFLUENCED THEIR PERFORMANCE

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Introduction

The main aim of this thesis is to document how the hedge fund world work and how their performance was influenced by the financial crisis and by the unconventional monetary policies.

The first paragraphs start giving the main point that an hedge fund has to present in order to be considered such way, so, we start giving its characteristics and the objectives they want to achieve. We continue highlighting the differences and the similarities between the hedge fund and a more common mutual fund. The first part ends explaining how hedge funds are structured, both under an organizational and a remuneration point of view.

The second part of the first chapter gives us an overview on hedge funds history focusing on the events that shocked the world economy, such as the 1969-1970 crisis and the Black Monday.

The first chapter continues explaining the different regulations hedge funds have to follow mainly focusing on Italy and United States.

The end of the first chapter focuses on the different strategies that hedge funds can decide to follow, giving representations of the volatility, the time horizon and the returns that each strategy entails.

It also gives an idea on which parameters investors and managers can use in order to compare hedge funds between them or a hedge fund and the market and evaluate it in order to decide whether the strategy they are following is satisfactory or not.

The second chapter starts explaining what a monetary policy is and which types of instruments central banks can use, focusing on the Federal Reserve and on the European Central Bank.

The second chapter continues speaking about the financial crisis and the different steps that both the Federal Reserve and the European Central Bank did to fight it, it also gives us an idea on how these monetary policies influenced and changed their balance sheets.

The Second chapter ends showing and then explaining how different indexes performed right after the financial crisis and the monetary policies, we mainly focus on five indexes: the *HFRX Global Hedge Fund Index* which gives an idea of how hedge funds performed without distinctions of strategy, the *HFRX Event*

Drive Index which summarize the performance of hedge funds using a event driven strategy, the *HFRX Equity Hedge Index* which summarize performance of hedge funds investing according to a long/short equity strategy. The last two indexes we considered are the *HFRX Emerging Market Index* and the *HFRX Market Directional Index* which take into account funds which use emerging market and market directional strategies respectively.

CH. 1: HEDGE FUNDS

1.1 Introduction to Hedge funds

Lately, and even more after the recent financial crises, we often hear many people talking about hedge funds and how bad they are for the economy, but what are really the hedge funds and are they really that bad for the economy?

First, it would be wise to start from their name, the term *hedge* comes from the fact that initially they were meant to hold both long and short positions on stocks so that investors could have made money regardless of whether their prices went up or down, when this strategy is used stocks are said to be "*hedged"*, so that is where the name came from.

A hedge fund is a *pooled investment structure* set up by a money manager or by an investment advisor and can be set up as a limited partnership or as a limited liability company. They are managed portfolios, this means that the manager will pick several securities that he/she thinks will perform well and he/she will group them into a single portfolio.

Hedge fund's managers raise money from outsider investors and they invest those money according to the different strategies they have promised to use, these strategies go from buying common stock and never sell short to investing in limited fields as energy or technology.

In order to reach positive payoff a hedge funds can use several sophisticated strategies (which cannot be used by mutual funds) such as derivatives, short selling, hedging and derivatives.

Hedge funds aim to reach an absolute and positive payoff independent from the movements of the market and so to outperform the market benchmark.

The main difference between a mutual and a hedge fund is that If a manager of a mutual fund finds a stock which he believes is going to go down in value then the only thing he can do is to sell that stock, if he owns it, and he cannot reach any other profit. Instead if the money manager of a mutual fund thinks that a stock will perform negatively he can gain profit through short selling operations.

Differently from mutual funds hedge funds are managed more aggressively, they use speculative positions such as options and future contracts and they can

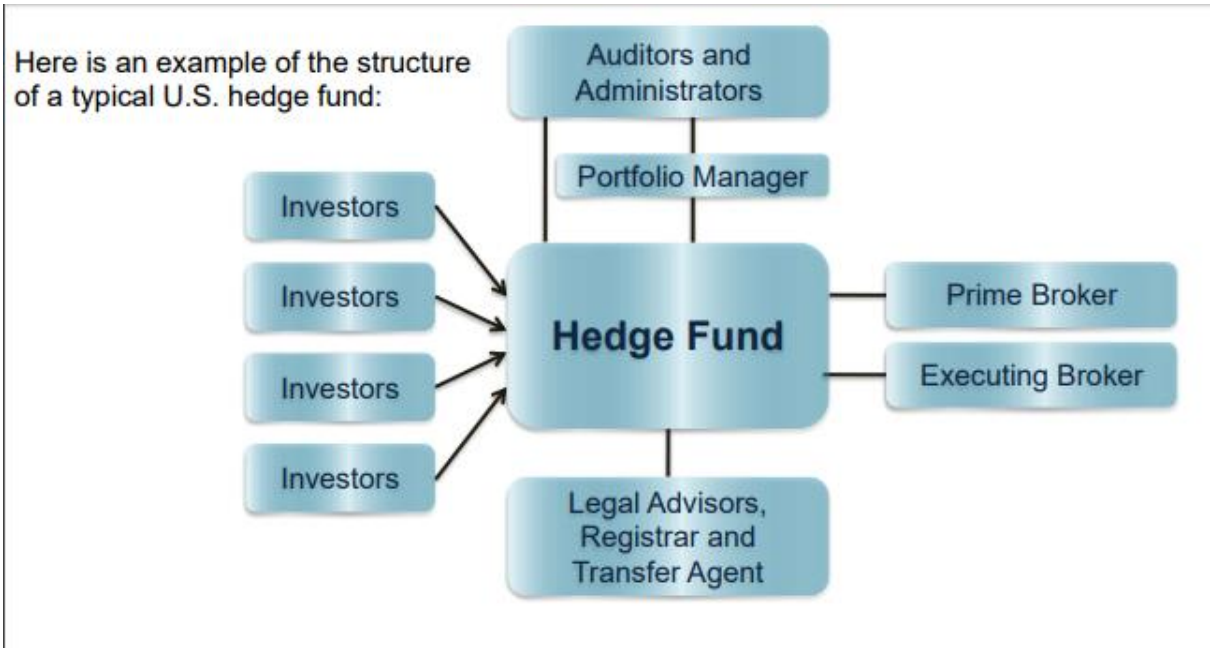
short sell stocks in order to achieve a constant return uncorrelated with market performance.

Another difference we find between mutual and hedge funds is about the fields where a fund can invest, mutual fund managers can invest only in certain fields (Bonds, equity etc.) while hedge fund managers have a larger freedom in deciding the composition of their portfolio in order to invest in the best performing asset class. The fact that hedge fund manager can almost completely change the portfolio makes hedge funds less clear under the composition point of view and under the strategies point of view.

Organizational Structure

When an investor decides to put his money into an hedge fund he becomes a limited partner of the hedge funds, in facts he is considered liable only up to the amount he contributed with but he has to share partnership's income and expenses.

Graph 1 - Hedge Funds Structure



(www.hedgefundamentals.org)

The website www.managedfunds.org explain that every Hedge Fund needs three main key players:

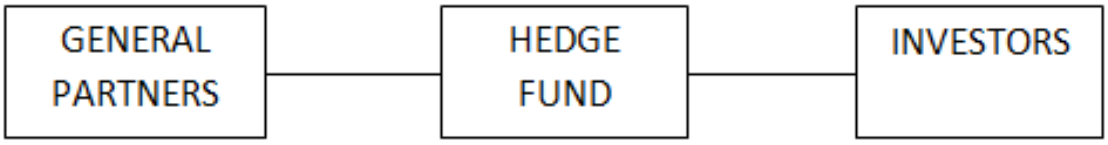
- *Investment Manager*: He decides which strategy the fund should use, he takes the investment decisions and he manages risk. He is compensated via management and performance fee.

- *Prime Broker*: To gain margin and execute trades funds must secure their loans with collateral. Each broker decides how much to lend to each client through a risk matrix. (e.g. Morgan Stanley, Credit Suisse and UBS)

-*Auditors*: Verify financial statements

Legally speaking the structure of a hedge fund created using a limited partnership model is a two-tiered organization. General partner is unlimitedly responsible for the decision concerning who is managing the hedge fund, while limited partners are liable only for the amount they invested.

Graph 2 - Structure Hedge Fund Established as LP



(www.hedgefundamentals.org)

Fee Structure

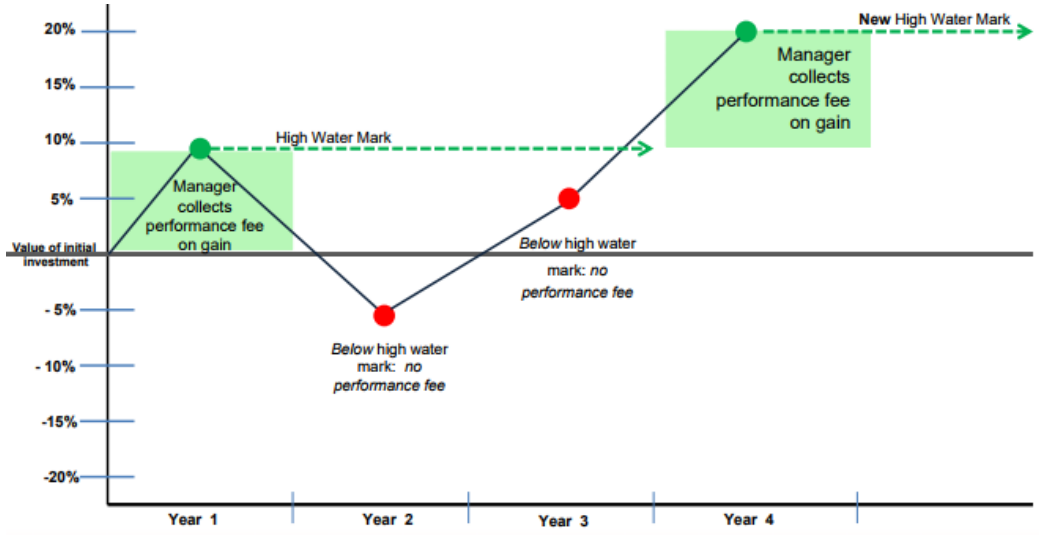
Usually investors are charged by hedge funds a *management* (or 'operating') *fee* which usually is a percentage of the asset managed. Most of the time this fee is equal or higher than 2%, a higher value may be due to high demand because of very good track record. (www.invstopedia.com)

Management fee is usually intended to cover the costs of running the hedge fund.

Almost every hedge fund also charges *a performance fee* of anywhere between 10-20 percent of fund profit, this fee is collected only if the fund is profitable, exceeding the fund previous *high-water mark* which represents the level at which the performance fee begins to accrue. A performance fee can be useful to align the incentive of the manager to those of the investors.

As shown in the graph below, if the fund loses 5 percent from its previous high, the manager will not collect an incentive fee until he/she has first made up the 5 percent loss (www.hedgefundamentals.org).

Graph 3 - Graphical Illustration of Typical Fee Structure



(www.hedgefundamentals.org)

The most common compensation structure for the hedge fund is the "*Two And Twenty*", it means that they charge a flat 2% of total asset value as a management fee (so it is paid regardless of the fund's performance) and a 20% as a performance fee (for profit earned).

1.2 History of Hedge Funds

As written in the "*Handbook of Hedge Funds*" by François-Serge Lhabitant (2006), we could see hedge funds or funds like them from the beginning of 1930s

Early Years: The 1930s

The oldest source about hedge funds was a book entitled *Scientific Forecasting* written by Karl Karsten and published by Greenberg in 1931.

Karsten at first was not interested in finance, he used the stock market in order to test his statistical studies. In his laboratory Karsten "developed what he called "barometers", which were forecasts of future business conditions,

including barometers of volume of trade, of building activity, of interest rates etc. "(F. Lhabitant).

They created a fund in order to invest in order exploit his forecasts and after six months the value of the fund was up 78%. In his book Karsten summarized the key principles of running a hedge fund and stated, "Suppose that motor stocks be the group, and that the prediction for the time is that the average of these stocks will rise out of line from the average of the entire market... we should theoretically sell short an equally great (in dollar value) holding of all the stocks in the market".

Formative Years (1949-1968)

The first hedge fund created in order really gain profit from the market was Alfred Winslow Jones in 1949 and it was called A.W. Jones & Co. A. Jones started his career studying the methods for market analysis. "Jones' investment model rested on two assumptions: First, Jones was convinced that he had superior stock selection ability. Second, he believed that he had no market-timing skills, so that he was unable to predict market directions. His strategy consisted in combining long positions in undervalued stocks and short positions in overvalued ones", he also used leverage in order to amplify his returns.

As previously said, the term *hedge* came from the fact that they could both long and short positions on stocks so that investors could have made money regardless of whether their prices went up or down, when this strategy is used stocks are said to be "*hedged".*

Jones was the first to use these types of strategies in everyday investments, in fact at that time they were only used in specific contexts.

Another innovative part in Jones' fund was that he was using *velocity* which measures the "speed at which a stock's price would change in relation to changes in the market, it can be considered the ancestor of beta".

Graph 4 - Evolution of the US stock market (S&P 500) from 1950 to 1968 scaled to a value of 100 on 1 January 1950

(Lhabitant, 2006)

Graph 4 shows us the evolution of the US stock market between 1950 and 1968 with the relevant events which happened in this period in order to give us a comparison to the hedge funds performance.

Between the 1950s and the 1960s A.W. Jones & Co outperformed the market (we can estimate a 670% between 1955 and 1965) (Lhabitant, 2006)

The term hedge fund was used for the first time in this period by Carol J. Loomis in an article where she wrote about the strategies used by Jones. After this period investors started creating hedge funds all over the United States. Between these investors who created their fund in this period we can find Warren Buffett who is considered one of the first hedge fund managers and maybe the best fund manager ever.

Dark Ages (1969-1974)

After Jones' fund's outstanding performance many new hedge funds managers tried to imitate him by selling short, unfortunately after the bull market of the 1960s short selling became unprofitable.

Graph 5 - Evolution of US stock market (S&P 500) from 1969 to 1975, scaled to a value of 100 on 1 January 1969

(Lhabitant, 2006)

Similarly to Graph 4, Graph 5 shows us the evolution of the US stock market but for a different period, namely from 1969 to 1975.

Hedge funds suffered many losses between 1969 and 1970 but the worst broke out only in the 1973-1974 recession when even Dow Jones and S&P 500 halved their value.

Renaissance (1975-1997)

Graph 6 - Evolution of US stock market (S&P 500) from 1975 to 1982, scaled to a value of 100 on 1 January 1975

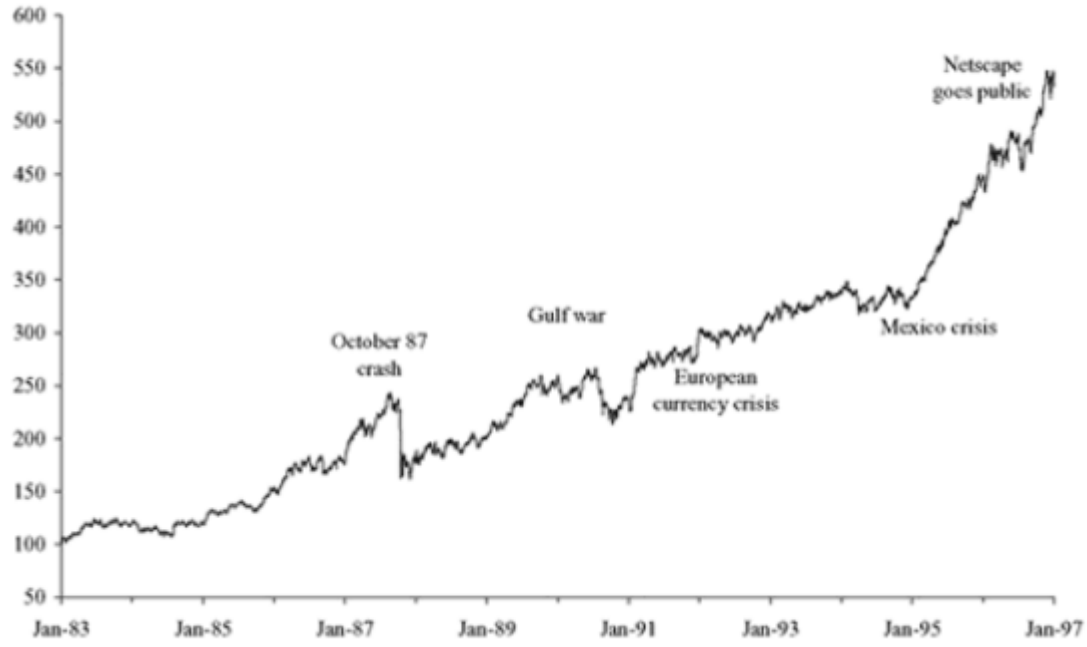
(Lhabitant, 2006)

In the years after the 1973-1974 recession the economy struggled to recover, one of the feature of this period was that the Dow Jones Industrial Average was never able to climb much over 1000. By this time the number of hedge funds was really low and most of them were limited partnership with high minimum investment requirements but they managed to get high returns taking advantage of the rising-falling markets.

Robertson's Tiger Fund was one of these wee-performing funds, it managed to get a compound annual return of 43% compared to the 18.7% of the S&P 500 for the same period (Lhabitant). In his investments Julian Robertson focused on macroeconomic analysis.

The new rise ended suddenly on 19 October 1987, also known as "Black Monday", every market suffered heavy losses, Dow Jones dropped by 22.6%, S&P 500 dropped by 20.5% and NYSE dropped by 19.2%. Luckily markets recovered quickly and by the end of 1987 S&P 500 was again up 5.2%.

Graph 7 - Evolution of US stock market (S&P 500) from 1983 to 1996, scaled to a value of 100 on 1 January 1983



(Lhabitant, 2006)

From 1989 global macro funds emerged as major players in financial markets, "George Soros' Quantum Fund, for example, in 1992 gained a billion dollar when he forced The British pound to exit from the European Monetary System. It is not still sure if he was entirely responsible for the pound's collapse, but the size of the gains raised concerns that hedge funds could contribute to financial instability". (Lhabitant)

Many Hedge funds had problem when Federal Reserve raised interest rates in 1994, in fact they had large long positions funded with margin but they recovered quickly.

Equity Bubble Years

After the reduction of interest rates due to the Asian and Russian crises of 1997-1998 conditions in the stock market in 1999 were very good for any type of asset and in this environment a bubble, affecting especially the information technology sector, rose.

Many hedge funds decided to ride the bubble rather than burst it.

The NASDAQ plunged on March 2000 and it was followed by a slowdown in economic growth.

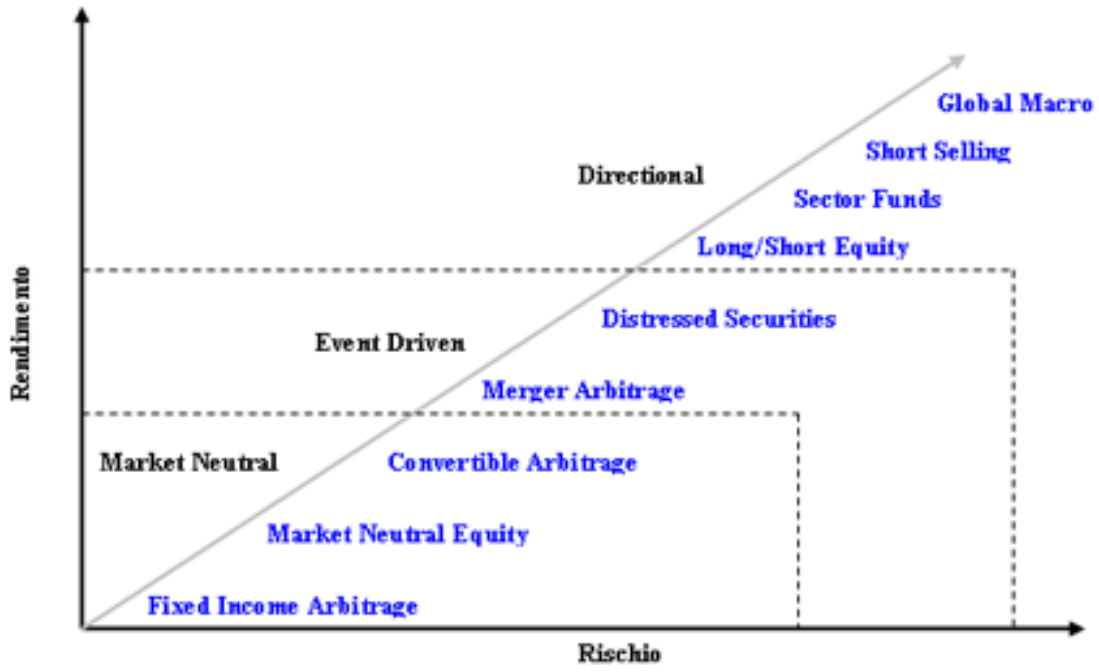
In these years and in the following ones characterized by the uncertainty after the 11 September 2001 terroristic attacks hedge funds performed unexpectedly well, proving the fact that their performance was not correlated to the market and they could have gotten a positive payoff anyway if well managed.

1.3 Strategies

Fung and Hsieh (1997) classify a hedge fund's strategy according to *style*, type of positions the manager takes, and *location*, asset class the fund invest in.

Hedge fund's strategies can be divided into three macro-groups: *Market Neutral*, *Event Driven* and *Directional*. We can divide these three macro-groups into smaller sub-strategies according to the style and/or the location of the investment.

Graph 8 - Hedge Fund's Strategies Risk-Return



(http://www.ansa.it/sito/notizie/economia/finanza_personale/static/hedgefund8.html)

Market Neutral

When a hedge fund's manager uses a Market Neutral strategy he uses his own ability in selecting stocks to create the portfolio, so the results are independent from the market performance. The manager does so by taking long and short positions on different but correlated activities in order to be protected from market risk. A Market Neutral strategy tend to have a beta and a duration close to zero.

With the money, a manager makes short selling an instrument he can take new long positions on a new instrument so that the fund buys position for an higher value (**leverage**)

We can distinguish the Market Neutral into three different sub-categories:

- *Equity Market Neutral*: The manager has to forecast the market performance and to identify a possible inefficiency between the stock price and the price of its derivatives.

- *Convertible Arbitrage*: Profit is gained through the relation between the price of the convertible bond and the price of the share it pays, the manager try to exploit a possible arbitrage if existing.

- *Fixed Income Arbitrage*: it consists in taking long and short positions of stocks linked to a fixed interest rate but with different prices.

Table 1 - Characteristics Market Neutral Strategies

	Convertible Arbitrage	Fixed Income Arbitrage	Equity Market Neutral
Return	Medium	Low	Medium
Volatility	Low	Low	Low
Downside Risk	Low	Medium	Low
Sharpe Ratio	Medium	Low	High
Correlation Stock	Medium	Low	Low
Leverage	Medium	High	Medium
Time Horizon	Medium	Medium	Medium

(Visconti, Gentilini, 2005)

Event Driven

Managers focus on the fundamental changes in companies such as mergers, acquisitions and recapitalization. We can see this type of strategy as a bet on a specific event.

Managers have to meticulously study the companies and forecast how the event is going to influence the value of the company.

The Event Driven strategy is divided into 2 sub-categories:

- *Merger Arbitrage*: Profit is gained through arbitrage operations on companies in the vicinity of mergers and/or acquisitions (M&A), it starts once the proposal of acquisition is already public and its positive payoff depends on the ability of the manager in forecasting if the acquisition is actually going to take place or not.

- *Distressed Securities*: Managers are interested in profit coming from distressed companies, hedge funds can buy stocks of temporarily distressed firm for cheap and then sell them when the company is performing better.

Table 2 - Characteristics Event Driven Strategies

	Merger Arbitrage	Distressed Securities
Return	High	Medium
Volatility	Medium	Medium
Downside Risk	Medium	Medium
Sharpe Ratio	High	Medium
Correlation Stock	Medium	Medium
Leverage	Medium	Low
Time Horizon	Medium	High

(Visconti, Gentilini, 2005)

Directional

The directional strategy includes many different sub-categories. Generally speaking, managers look for the best way and the best moment to invest through highly diversified portfolios, these strategies are more volatile than the ones we just saw.

Similarly, to the event driven and the market neutral strategies we can divide the directional strategy in few sub-groups.

- *Macro*: Managers bet on the directions of the market after macroeconomics changes, profit depends on the timing at which capital is invested.

- *Emerging Markets*: Managers who follow this strategy invest capital in emerging markets where volatility is higher and the number of instruments is limited

- *Short Sellers*: Profit is created by the difference between the price at which stocks are bought and the price at which the same stock was previously sold by the manager who borrowed them.

- *Long/Short Equity*: The manager creates his portfolio with long and short positions, market risk is partially covered, in fact the positions are not equally balanced.

Table 3 - Characteristics Directional Strategies

	Macro	Short Sellers	Long/Short Equity	Emerging Markets
Return	High	Medium	High	High
Volatility	High	High	High	High
Downside Risk	Medium	High	High	High
Sharpe Ratio	Medium	Low	Low	Low
Correlation Stock	Medium	Negative	High	High
Leverage	Medium	Low	Low	Low
Time Horizon	Short	Medium	Low	Medium

(Visconti, Gentilini, 2005)

1.4 Performance Valuation

In order to analyze the performance of every fund, and, more specifically in our case, hedge funds, managers and investors have several instruments. Since hedge funds are an alternative investment, some of these instruments do not perfectly work but they can give us a good idea about their performance.

Most of these instruments are based on the *Capital Asset Pricing Model* (CAPM) which is a "mathematical relation between the return of a stock and his

volatility measured through only one risk factor, *beta*" (www.borsaitaliana.it , 2009).

Sharpe Ratio

It was developed by William Sharpe and nowadays it is the most widely used method for calculating risk-adjusted return (www.investopedia.com).

"It measures the *average return* earned in excess of the *risk-free rate* per unit of volatility or total risk, anything above 1 tends to be an attractive return" (www.investopedia.com).

$$Sharpe\ Ratio = \frac{\overline{r_p} - r_f}{\delta_p} \quad (1)$$

Where:

$\overline{r_p}$ = Expected portfolio return

r_f = Risk-Free rate

δ_p = Portfolio standard deviation

In order to have a good estimation of the performance of an hedge fund we need to identify a market index to make comparisons, it could be a difficult choice since it often happens that an hedge fund decides to invest following different strategies which could be totally different from each other.

The *ex-ante* Sharpe Ratio formula uses expected return while the *ex-post* Sharpe Ratio uses realized returns (www.investopedia.it).

Sortino Ratio

As the website "www.investopedia.it" explains: "The Sortino ration is a variation of the Sharpe Ratio that differentiates harmful volatility from total overall volatility by using the asset's standard deviation of negative asset returns, called *downside deviation*. It is a good estimator of investment's return for a given level of bad risk".

Sortino Ratio is used to compare the risk-adjusted performance of programs with differing risk and return policies.

Since it penalizes only for returns falling below a user-specified target while the Sharpe Ratio penalizes both upside and downside risk, it is frequent the fact that they show different results (www.wikipedia.it).

Similarly, to the Sharpe Ratio, anything above 1 tends to be an attractive return.

$$Sortino\ Ratio = \frac{< R > - R_f}{\delta_d} \quad (2)$$

Where:

$< R >$ = Expected Return

R_f = Risk-Free Rate of Return

δ_d = Standard Deviation of Negative Asset Returns

Treynor Index

Also know as *Reward to Volatility Ratio* was introduced in 9165 by Jack Traynor, similarly to the Sortino Ratio it is a transformation of the Sharpe Ratio.

It differentiates from the Sharpe Ratio by using *Beta* (β) as a measure of risk instead of the standard deviation.

Beta indicates the sensitivity of a portfolio to movements in the market.

$$Treynor\ Ratio = \frac{\overline{r_p} - r_f}{\beta_p} \quad (3)$$

Where:

$\overline{r_p}$ = Expected portfolio return

r_f = Risk-Free rate

β_p = Portfolio Beta

When the value of the Treynor Ratio is high, it is an indication that an investor has generated high returns on each of the market risks he has taken (www.investopedia.com)

Jensen's Alpha

"Jensen's Alpha represents the average return on a portfolio or investment above or below that predicted by the Capital Asset Pricing Model (CAPM) given the portfolio's or investment's beta and the average market return" (www.investopedia.com).

"Jensen's Alpha for fund *p* is the intercept $\boldsymbol{\alpha_p}$ in the linear regression of the *fund excess return*, $\tilde{r}_{p,t} - r_{f,t}$, over the *market portfolio excess return* $\tilde{r}_{m,t} - r_{f,t}$" (Essentials of investments, Bodie, Kane and Marcus (2013)).

$$Alpha = \left(\bar{r}_p - \bar{r}_f\right) - \hat{\beta}_p * (\bar{r}_m - \bar{r}_f) \quad (4)$$

Where:

$\hat{\beta}_p$ = Fund's beta

$\bar{r}_p$ = Realized return (on the portfolio)

$\bar{r}_m$ = Market return

$\bar{r}_f$ = Risk-Free rate

Jensen's Alpha measures if returns earned by the fund are on average higher or smaller (if α is negative) than return they would have made by only replicating the market index, and so, if they are larger than the equilibrium value consistent with their amount of systematic risk.

"A positive value for Jensen's Alpha means a fund manager has "beat the market" with his stock picking skills" (www.invstopedia.com)

Modigliani Index

"Modigliani Index (or Modigliani Risk-adjusted Performance index) aims to measure the performance of two hedge funds with similar benchmark and therefore similar risk" (www.bankopedia.org).

It is similar to the Sharpe Ratio but it has the advantage that it expresses the results in percentage, so that is more intuitive to understand which one is better.

"The greater the value of the index, the better the fund will perform in comparison to others using the same benchmark" (www.bankopedia.org).

$$Modigliani = r_f + \frac{r_p + r_f}{\delta_p} * \delta_m \quad (5)$$

Where:

r_f = Risk-free rate

r_p = Portfolio return

δ_p = Portfolio Standard Deviation

δ_m = Market Standard Deviation

Information Ratio

As stated in the website "www.investopedia.com": "The Information Ratio (IR) is a ratio of portfolio return above the returns of a benchmark, usually an index, to the volatility of those returns. It measures a portfolio manager's ability to generate excess return relative to a benchmark but also attempts to identify the consistency of the investor"

$$IR = \frac{(R_p - R_i)}{S_{p-i}} \quad (6)$$

Where:

R_p = Return of the portfolio

R_i = Return of the index (or benchmark)

S_{p-i} = Tracking error (Standard deviation of the difference between portfolio and the index returns)

Appraisal Ratio

The Appraisal Ratio tells us the quality of the manager's investment picking ability. It is given by the ratio between the estimator alpha, which measure the systematic risk, and the non-systematic risk.

$$AR = \frac{\propto}{\delta_p} \tag{7}$$

Where:

$\propto =$ Systematic risk

$\delta_p =$ Non-systematic risk (or residual standard deviation)

It is useful in order to evaluate whether it is convenient or not to invest in a portfolio.

Appraisal ratio of portfolio X let us quantify the variation in the Sharpe Index of the total portfolio resulting from the investment in this portfolio.

1.5 Regulation

Since Hedge Funds often use riskier financial instruments than mutual funds, legislations have tried from the beginning to regulate them more carefully.

United States

As explained by Phoebus Athananassiou in his book '*Research handbook on hedge funds, private equity and alternative investments':* "Typical hedge fund is set up with three objectives in mind: avoid SEC registration, benefit from 'pass-through' taxation and assume limited liability" even though many hedge funds voluntarily decide to register with the SEC.

As previously said, hedge funds in the United States are created as limited partnerships or as limited liability companies, it happens so that hedge funds have more freedom in investing.

American Hedge Funds incorporated under the limited liability can have a maximum of 100 investors 65% of which have to be *accreditor investors*, it means that they need a net personal patrimony of 1,000,000$ or net personal earnings in the previous year of at least 200,000$ (300,000$ if a couple). The manager of the hedge fund is unlimitedly liable while investors are only liable for the amount they invested.

A limited liability company hedge fund usually is incorporated in off-shore countries so that they have even more freedom of investing and they have more convenient tax laws (www.borsaitaliana.it).

If a hedge fund manager wants to incorporate and to manage his hedge fund in the United States and he wants to have a more convenient tax breaks he can use a 'pass-through' taxation, it entails that only investors pay taxes when profits are distributed rather than the fund itself.

Italy

As an article from the Italian Press Agency "ANSA" explain, In Italy the first hedge fund was created in 1999 after "Decreto 24 maggio n. 228", it gave to the funds more freedom concerning the management of the fund but it also imposed some limitations regarding the number of the participants of the fund, the minimum amount to invest and the publicity of the books.

Italian Hedge funds cannot have more than 200 participants and the minimum investment a participant must do in order to enter the hedge fund is 500,000€ (ANSA).

Since the manager needs a secure capital in order to follow his investment strategies, usually the possibility to disinvest is limited and the only way an investor can get rid of his share is by selling it to third parties, but, since it is a really sophisticated instrument it is not easy.

In order to overcome the problems of high initial investment and of difficulty in transfer the share "*funds of hedge funds*" were created, they collect capital from small investor and buy shares in different hedge funds, this way they can also diversify they investments (www.borsaitaliana.it).

CH. 2: HEDGE FUNDS AND THE FINANCIAL CRISIS

2.1 Monetary Policy

We can define monetary policy as: "the regulation of monetary and financial conditions in view o achieving specific macroeconomic goals" (De Haan, Oosterloo, Schoenmaker, 2012).

Usually these macroeconomic roles that monetary policy aim to reach are *Financial Stability*, *Price Stability* and *Full Employment*.

As suggested by both the European Central Bank and the Federal Reserve in order to guarantee price stability the level of inflation should be below but close to 2% in the medium term. (https://www.ecb.europa.eu)

In order to reach these results a Central Bank can use many instruments, we can divide them into two big groups: *Conventional* and *Non-Conventional*.

Conventional Instruments

Conventional monetary policy include: *Open Market Operations*, *Marginal Lending* (*Discount*), *Marginal Deposit, Main Refinancing Operation* and *Required Reserve Coefficient.*

- *Marginal Lending*: A bank borrows money overnight from a central bank against the presentation of sufficient eligible assets, rates are higher than the corresponding money market rates because bank should use it in absence of other alternatives.

-*Marginal Deposits*: A bank deposits overnight its money in the central bank.

-*Required Reserve Coefficient*: Central bank requires credit institutions to hold deposits on account, it is imposed so that banks would always have a cash reserves.

-*Open Market Operations*: we can find two main types of OMOs, An Open market operation can be *Expansionary*, if money supply increase, interest rate goes down and prices go up, or *Restrictive*, if money supply decrease, interest rate goes up and prices go down (Expansionary is often used in order to fight deflation while the Restrictive is used in order to fight high inflation).

Expansionary $$M\uparrow \Rightarrow P^e\uparrow \Rightarrow \pi^e\uparrow \Rightarrow i_r\downarrow \Rightarrow I\uparrow \Rightarrow Y\uparrow \quad (8)$$

Restrictive $$i\uparrow_{\text{off}} \Rightarrow i\uparrow_{\text{MM}} \Rightarrow i\uparrow_{\text{bank loan, bond}} \Rightarrow i_r\uparrow \Rightarrow I\downarrow \Rightarrow Y \quad (9)$$

-*Main Refinancing Operation (MRO)*: it is a regular open market operation with the purpose of providing the banking system with the amount of liquidity that the former deems to be appropriate. They are conducted on a weekly standard tender with a maturity of one week.

Since many of the parameters we can use in order to evaluate a hedge fund performance are based on the risk-free rate, the monetary policies which pushed them down (we will see later that after the 2008 financial crisis central banks adopted expansionary monetary policies) influenced these ratios.

In the case of the Sharpe Ratio of the Sortino Ratio, a lower risk-free rate for a given rate of return would make the hedge fund more attractive while if we follow the Modigliani Index, a lower risk-free rate would make the hedge fund less attractive.

Non-Conventional Instruments

"Unconventional measures can be defined as those policies that directly target the cost and availability of external finance to banks, households and non-financial companies" (www.ecb.europa.eu)

-*Long Term Refinancing Operations (LTRO)*: It is similar to MRO but with maturity up to 3 years.

-*Targeting Long Term Refinancing Operations (TLTRO)*: It is similar to LTRO but the Central Bank decided to lend more money to the banks who lent more money to the private sector

-*Quantitative Easing (QE)*: It was a specific Monetary Policy instrument the European Central Bank used in order to fight the financial crises which started in the United States in 2007. The ECB decided to buy up to €60 billion of public and private sector securities every month. (de Hann, Oosterloo, Schoenmaker)

2.2 Financial Crisis and Monetary Policies

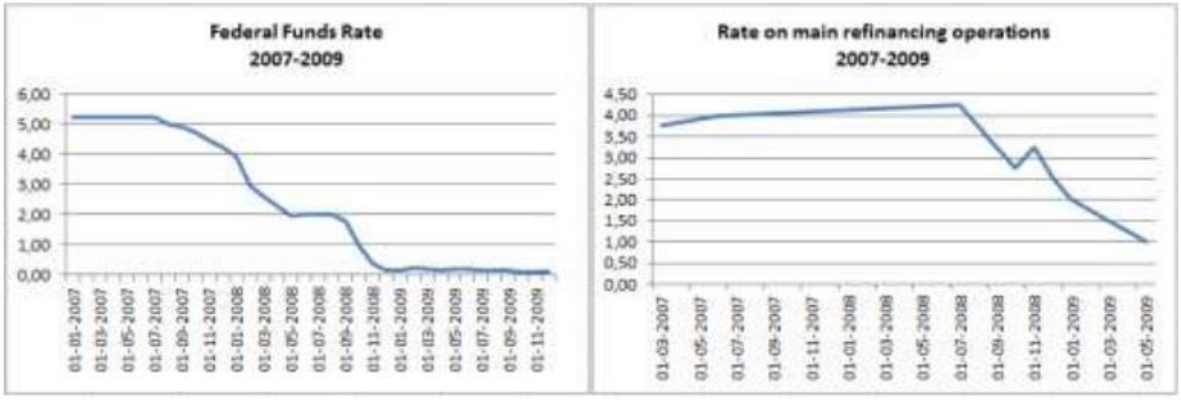
Reaction of the Fed and the ECB to the crisis

"The global financial crisis arose in August of 2007, because of the burst of the housing bubble in the United States, and then spread to the euro area where it took the form of a sovereign debt crisis after 2010." (C. Tuckwell, A. Mendonça, 2016)

In order to fight this crisis, central bank such as Federal Reserve and European Central Bank, decided to start unconventional monetary policies.

Right after the collapse of Lehman Brothers on the 15th September 2008, the FED and after the ECB decided to cut interest rates. By the end of 2008, the federal fund rate (FFR) had reached zero.

Graph 9 - The FFR (Fed) and the RMRO (ECB), 2007-2009, in %

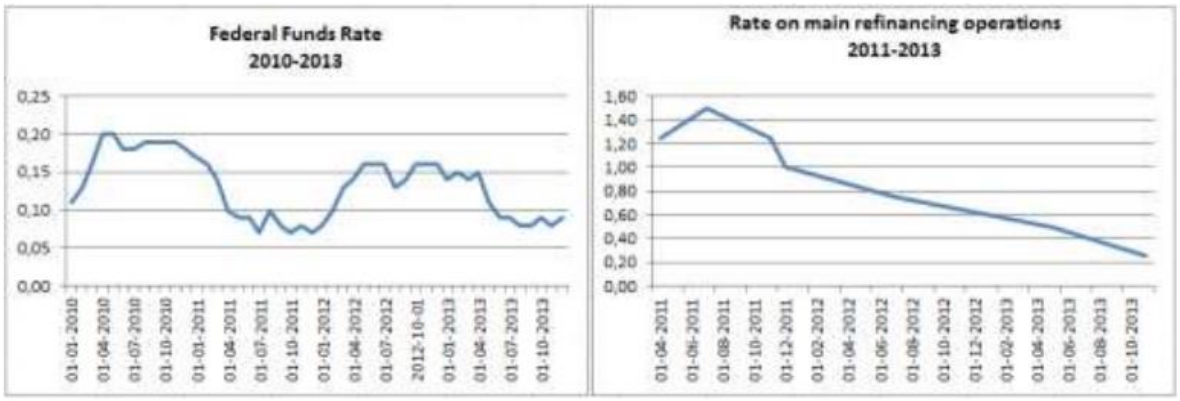


(C. Tuckwell, A. Mendonça, 2016)

"Later the FED decided to introduce the Large-Scale Asset Purchases (LSAPs), which consist of purchases, directly in the private market, of long-term securities issued by the government. It leads to a reduction of the yields if various long-term securities". (C. Tuckwell, A. Mendoça, 2016)

In 2010 the ECB did a similar, but sterilized, thing called *Securities Markets*

Graph 10 - The FFR (Fed) and the RMRO (ECB), 2010-2013, in %



(C. Tuckwell, A. Mendonça, 2016)

Program (SMP) but it also included private bond.

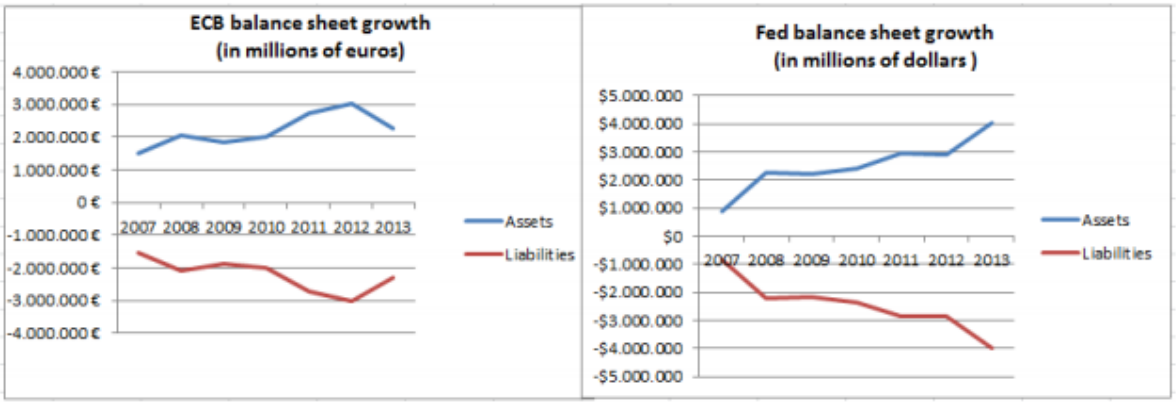
SMP lasted until the 2nd of August 2012 when the Governing Council announced the *Outright Monetary Transactions* (OMT), which pointed sovereign bonds in the euro area.

In 2012 the ECB reduced its key interest rates again reaching 0.25%.

Of course, the non-conventional policies adopted by the Federal Reserve and by the European Central Bank had an impact on the size and on the composition on their balance sheets.

"Observing Graph 11, in both cases, we can see how a general tendency for growth at least until 2012, with the widening of the gap between assets and liabilities. After 2012 the ECB's balance sheet declines until 2013 as the Fed's balance sheet continues to grow". (C. Tuckwell, A. Mendoça, 2016)

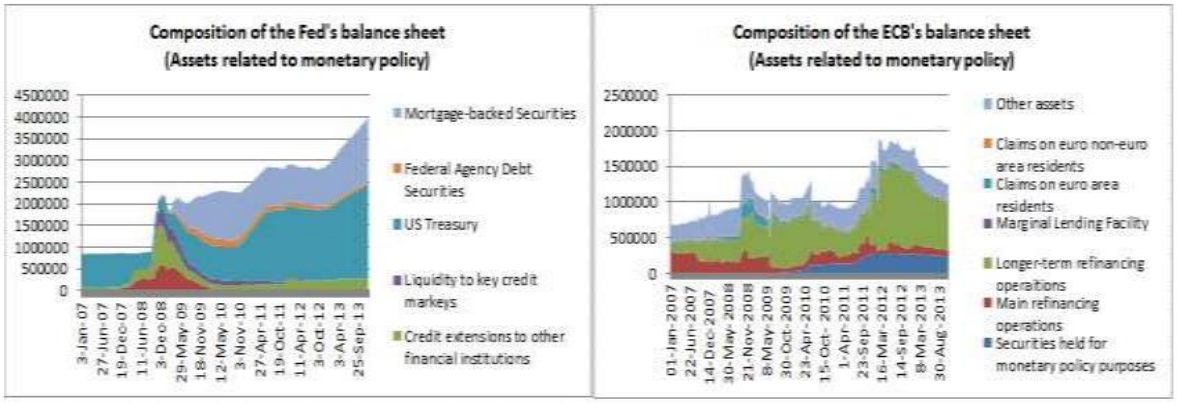
Graph 11 - Size of the Fed and the ECB's balance sheet (2007-2013)



(C. Tuckwell, A. Mendonça, 2016)

"Observing Graph 12, the LSAPs (the purchase of US Treasuries, agency debt and mortgaged-backed securities) have the biggest impact on Fed's balance sheet.". (C. Tuckwell, A. Mendoça, 2016)

Graph 12 - Composition of the Fed and the ECB's balance sheets (2007-2013)



(C. Tuckwell, A. Mendonça, 2016)

Another important, if not the most, instruments used by the ECB was the *Quantitative Easing*. By Quantitative easing we mean the process for which: (As explained by the official site of the ECB: https://www.ecb.europa.eu)

1. European Central Bank buys bonds from banks
2. This increase the price of these bonds and creates money in the banking system
3. As a consequence, a wide range of interest rates fall and loans become cheaper

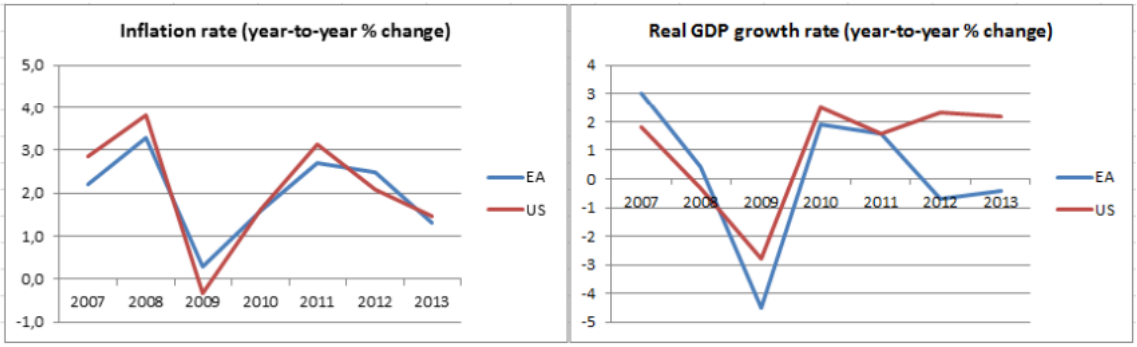
4. Businesses and people can borrow more and spend less to repay their debts
5. As a result, consumption and investment receive boost
6. Higher consumption and more investment support economic growth and job creation
7. As price rise, the ECB achieves an inflation rate below, but close to 2% over the medium term

The ECB decided to purchase assets on the secondary market for and amount of €60 billion every month until at least September 2016.

Effects of Monetary Policies on the Economy

Asset purchases performed by the principals central banks after the financial crisis had powerful impact on output growth, inflation and of course on the hedge funds business.

Graph 13 - Inflation rate and real GDP growth rate (year to year % change) in the EA and the US



(C. Tuckwell, A. Mendonça, 2016)

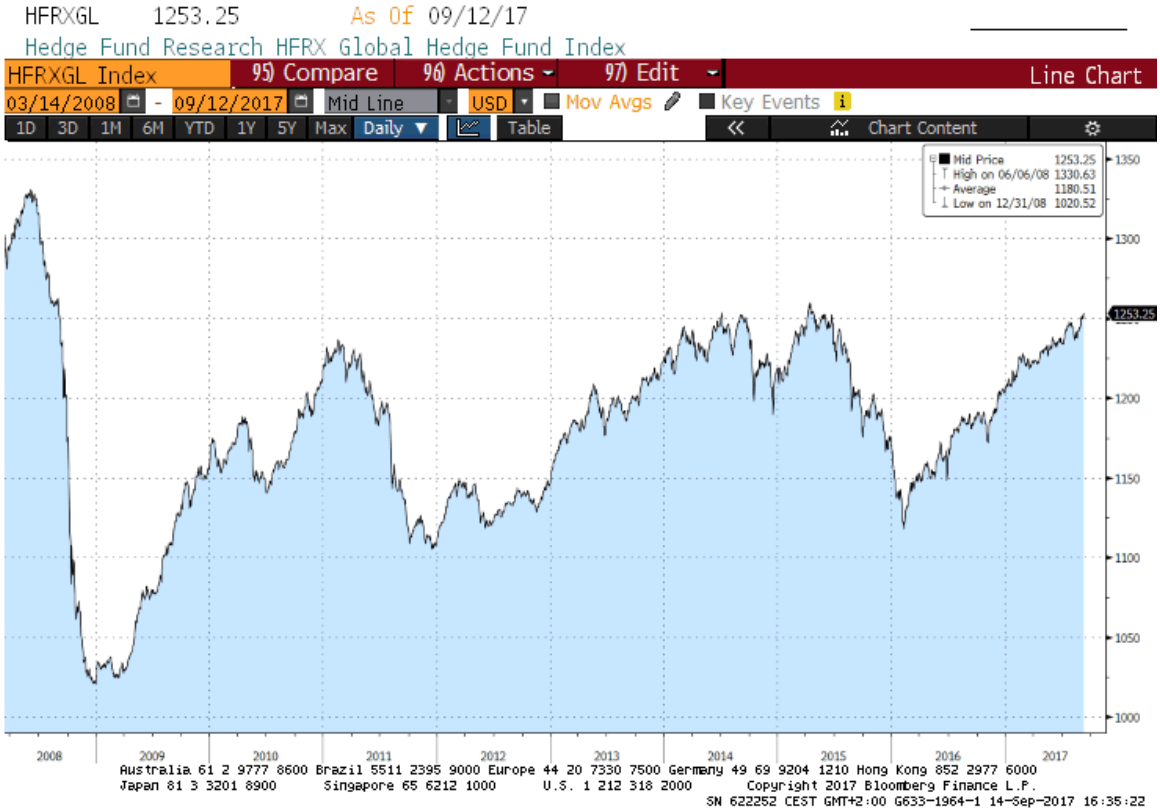
After the financial crisis and all the policies used both by the Fed and by the ECB we can find a world economy which is trying to reach the financial stability represented by an inflation of 2% in the medium term, a world economy in which interest rates are really close to 0% (sometimes even lower), an unemployment rate which is decreasing but it is still far from its natural level.

How did this situation, due to the financial crisis and to the following monetary policies thought in order to fight the crisis, influenced the hedge fund market?

2.3 Hedge Funds Performance

"The HFRX Global Hedge Fund index is designated to be representative of the overall composition of the hedge fund universe. It comprises all eligible hedge fund strategies; The strategies are asset weighted based on the distribution of assets in the hedge funds industry".
(https://www.hedgefundresearch.com/hfrx-indices-index-descriptions)

Graph 14 - HFRX Global Hedge Fund Index performance (2008-2017)



(Bloomberg)

As we can see from the previous graph, even hedge funds collapsed in 2007 when the financial crises began but, differently from the rest of the market they rose again faster even though we can see many little crashes.

Taking into account numbers, after the first ten years (1998-2007) which were really prosperous for the hedge funds industry, hedge funds performance collapsed from a value of 1,327.02 in May 2008 to an index value of 1,020.52 in December 2008. In the following nine years, they almost completely recovered reaching a value of the same index of 1,249.34 on August 2017.

In Table 4 are shown the monthly rate of return and the Year to Date (YTD) of the HFRX Global Hedge Fund index in the last nineteen years. We can clearly see how profitable were the hedge funds before the 2007 financial crisis, after the crisis, in 2008, they registered a rate of return of -23.25%, which, anyways, was not as bad as the negative returns the markets suffered.

Table 4 - Rate of Return of the HFRX Global Hedge Fund Index (1998-2017)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YTD
2017	0.50%	1.12%	0.03%	0.42%	0.24%	0.21%	0.93%	0.29%					3.81%
2016	-2.76%	-0.32%	1.24%	0.41%	0.46%	0.20%	1.45%	0.16%	0.55%	-0.57%	0.87%	0.86%	2.50%
2015	-0.29%	2.02%	0.33%	0.21%	0.26%	-1.24%	-0.03%	-2.21%	-2.07%	1.46%	-0.72%	-1.33%	-3.64%
2014	-0.24%	1.59%	-0.23%	-0.73%	0.45%	0.93%	-0.88%	1.09%	-0.77%	-1.32%	0.33%	-0.75%	-0.58%
2013	1.96%	0.43%	0.72%	0.62%	0.75%	-1.33%	1.01%	-0.86%	0.96%	1.20%	0.55%	0.56%	6.72%
2012	1.72%	1.42%	-0.02%	0.12%	-1.69%	-0.30%	0.54%	0.51%	0.39%	-0.52%	0.41%	0.92%	3.51%
2011	0.56%	0.73%	-0.88%	0.47%	-1.39%	-1.59%	-0.11%	-3.47%	-2.99%	0.81%	-0.87%	-0.42%	-8.87%
2010	-0.02%	0.26%	1.38%	0.80%	-2.64%	-0.94%	1.23%	0.17%	1.72%	1.12%	-0.27%	2.36%	5.19%
2009	1.10%	-0.38%	-0.03%	1.61%	3.15%	0.04%	1.59%	1.25%	2.22%	-0.06%	1.66%	0.55%	13.40%
2008	-2.06%	1.77%	-2.46%	1.20%	1.44%	-0.83%	-2.82%	-1.28%	-6.90%	-9.35%	-3.04%	-1.22%	-23.25%
2007	1.50%	-0.21%	0.28%	2.21%	2.55%	-0.07%	-0.93%	-2.55%	1.28%	2.82%	-2.41%	-0.14%	4.23%
2006	2.45%	0.17%	1.15%	1.15%	-1.31%	-0.49%	-0.57%	0.76%	0.50%	2.02%	1.54%	1.58%	9.26%
2005	-0.95%	0.88%	-0.97%	-1.76%	0.14%	0.91%	1.67%	0.43%	1.11%	-1.85%	1.69%	1.48%	2.72%
2004	1.13%	0.44%	0.25%	-1.23%	-0.62%	-0.17%	-0.92%	-0.25%	0.75%	0.16%	1.92%	1.24%	2.69%
2003	1.27%	0.67%	0.47%	1.83%	2.72%	0.86%	0.37%	0.79%	0.71%	1.06%	0.13%	1.79%	13.39%
2002	0.12%	0.19%	2.08%	0.65%	0.41%	-0.27%	-1.45%	0.74%	-0.02%	0.09%	1.34%	0.80%	4.72%
2001	2.14%	0.09%	2.20%	0.05%	-0.01%	0.38%	0.68%	1.47%	0.27%	1.42%	-0.66%	0.36%	8.67%
2000	0.95%	5.95%	1.55%	-3.85%	-0.07%	0.52%	-0.44%	3.58%	-0.22%	-0.95%	1.78%	5.03%	14.29%
1999	5.49%	-2.57%	2.89%	4.99%	-1.28%	2.39%	-0.60%	0.14%	0.47%	1.20%	5.36%	5.84%	26.66%
1998	-0.96%	1.49%	4.20%	-1.86%	-0.52%	1.60%	2.00%	-1.76%	-0.57%	1.54%	2.92%	3.88%	12.94%

(https://www.hedgefundresearch.com/indices/hfrx-global-hedge-fund-index)

Table 5 – Statistics HFRX Global Hedge Fund Index

TYPE	HFRXGHF
Std. Deviation	1.74

Annualized Return	4.51
Risk Free Rate	1.94
% of Winning Mo.	64.83
Sharpe Ratio	0.44
Monthly Alpha	0.07
Monthly Beta	0.91
Correlation	0.84
Statistics calculated since inception of index	

(https://www.hedgefundresearch.com/indices/hfrx-global-hedge-fund-index)

We can also differentiate hedge funds and so having different for their performance according to the strategies each fund decides to invest with.

Event Driven

In order to get an idea about the performance of hedge funds which decided to invest using the *Event Driven* strategy we can use the HFRX Event Driven Index.

"HFRX Event Driven index include funds which maintain positions in companies currently or prospectively involved in corporate transactions of a wide variety. Securities types can range from most senior in the capital structure to most juniors or subordinated, and frequently involve additional derivative securities". (https://www.hedgefundresearch.com/indices/hfrx-event-driven-index)

Graph 15 - HFRX Event Driven Index Performance (2006-2017)

(https://www.hedgefundresearch.com/indices/hfrx-event-driven-index)

Table 6 – Rate of Return of the HFRX Event Driven Index (2007-2017)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YTD
2017	1.05%	1.55%	0.33%	0.70%	0.93%	-0.03%	1.00%	0.08%					5.75%
2016	-3.81%	0.06%	2.63%	0.43%	2.67%	1.37%	2.37%	1.34%	0.05%	-0.13%	1.82%	1.92%	11.08%
2015	-1.56%	2.69%	0.35%	0.52%	0.48%	-1.00%	-1.73%	-2.92%	-3.24%	2.23%	-1.85%	-0.93%	-6.94%
2014	0.39%	2.55%	-0.13%	-0.68%	0.67%	1.57%	-0.96%	1.31%	-3.15%	-5.01%	0.00%	-0.47%	-4.06%
2013	3.38%	0.45%	1.42%	0.95%	2.16%	-1.14%	1.68%	-0.54%	2.10%	1.80%	0.60%	0.28%	13.87%
2012	2.80%	2.36%	0.56%	-0.10%	-2.01%	-0.57%	0.25%	0.92%	0.67%	-0.86%	0.58%	1.29%	5.96%
2011	0.86%	1.35%	0.18%	0.99%	-0.62%	-1.31%	-0.66%	-4.05%	-2.20%	2.11%	-0.96%	-0.56%	-4.90%
2010	0.65%	-0.12%	1.75%	0.82%	-3.23%	-0.53%	0.90%	-0.43%	2.30%	-0.59%	-0.55%	1.11%	1.98%
2009	1.47%	-0.01%	0.82%	2.03%	2.39%	2.05%	1.53%	1.17%	2.16%	-0.03%	0.88%	1.03%	16.59%
2008	-3.39%	1.68%	-1.50%	1.16%	1.47%	-3.35%	-0.83%	-1.00%	-7.37%	-7.53%	-2.74%	-0.79%	-22.11%
2007	2.11%	0.60%	1.24%	2.63%	3.15%	-0.94%	-0.74%	-1.98%	1.08%	1.51%	-2.97%	-0.71%	4.88%

(https://www.hedgefundresearch.com/indices/hfrx-event-driven-index)

The index using the funds which were investing according to the event driven strategy dropped from an index value of 1,474.2 on May 2008 to a value of 1,156.16 on December 2008.

It suffered a loss of -22.11% in 2008 which is less than the HFRX Global Hedge Fund Index.

The main difference between funds using the event driven strategy and the global hedge funds index is how they recovered after the crisis, in fact differently from the global index, which is struggling to reach the past values, on August 2017 the HFRX Event Driven Index reached 1,654.32, with really high returns especially in 2013 and in 2016, which is a value higher than the one before the financial crisis.

Table 7 - Statistics HFRX Event Driven Index

TYPE	HFRXED
Std. Deviation	1.90
Annualized Return	4.70
Risk Free Rate	1.94
% of Winning Mo.	66.10

Sharpe Ratio	0.44
Monthly Alpha	0.28
Monthly Beta	0.30
Correlation	0.70
Statistics calculated since inception of index	

(https://www.hedgefundresearch.com/indices/hfrx-event-driven-index)

Long/Short Equity

"The HFRX Equity Hedge Index shows performance of funds which maintain positions both long and short in primarily equity and equity derivative securities. A wide variety of investment processes can be employed to arrive at an investment decision, including both quantitative and fundamentals techniques". (https://www.hedgefundresearch.com/indices/hfrx-equity-hedge-index)

Graph 16 - HFRX Equity Hedge Index Performance (2006-2017)

(https://www.hedgefundresearch.com/indices/hfrx-equity-hedge-index)

The Performance of hedge funds using a Long/Short Equity strategy dropped from a 1,343.51 on May 2008 to 988.99 on December 2008 for a total loss of -25.45%. After the 2008 shock Long/Short Equity Funds seemed to recover quickly but they suffered another heavy loss (-19.08%) in 2011.

After the 2011 collapse they struggled to reach again previous values, on August 2017 it reached 1,215.01.

Table 8 - Rate of Return of the HFRX Equity Hedge Index (2007-2017)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YTD
2017	0.85%	1.17%	0.66%	0.72%	-0.57%	0.86%	0.87%	0.50%					5.15%
2016	-4.50%	-1.12%	2.79%	0.03%	0.44%	-1.47%	1.99%	-0.18%	1.53%	-0.84%	1.47%	0.18%	0.10%
2015	-0.66%	2.27%	0.60%	1.19%	-0.18%	-0.84%	-0.29%	-3.08%	-2.08%	1.90%	0.04%	-1.10%	-2.33%
2014	-1.01%	2.67%	-0.37%	-1.42%	-0.06%	1.52%	-1.55%	1.65%	-0.12%	-0.14%	0.87%	-0.54%	1.42%
2013	2.64%	1.17%	1.24%	0.56%	0.83%	-1.89%	2.57%	-1.89%	1.36%	1.92%	0.96%	1.25%	11.14%
2012	2.07%	1.42%	0.40%	-0.09%	-3.07%	0.52%	0.55%	0.84%	0.78%	0.43%	0.49%	0.44%	4.81%
2011	-0.17%	0.23%	-3.13%	-0.51%	-2.63%	-2.36%	-0.84%	-5.64%	-4.85%	1.36%	-1.34%	-0.85%	-19.08%
2010	-0.84%	0.04%	1.13%	1.04%	-3.39%	-1.38%	2.28%	-0.41%	3.48%	1.55%	0.16%	5.19%	8.92%
2009	-0.15%	-1.28%	2.21%	1.74%	4.48%	-1.06%	1.51%	1.00%	2.70%	-1.51%	3.12%	-0.16%	13.14%
2008	-3.37%	1.39%	-2.81%	2.40%	2.39%	-1.06%	-3.45%	-0.90%	-8.59%	-9.99%	-2.49%	-1.69%	-25.45%
2007	1.47%	-0.21%	0.40%	2.77%	3.02%	-0.42%	-1.40%	-1.58%	0.56%	2.90%	-3.67%	-0.44%	3.21%

(https://www.hedgefundresearch.com/indices/hfrx-equity-hedge-index)

Table 9 - Statistics HFRX Equity Hedge Index

TYPE	HFRXEH
Std. Deviation	2.28
Annualized Return	5.12
Risk Free Rate	1.94
% of Winning Mo.	61.02
Sharpe Ratio	0.43
Monthly Alpha	0.29
Monthly Beta	0.37
Correlation	0.72
Statistics calculated since inception of index	

(https://www.hedgefundresearch.com/indices/hfrx-equity-hedge-index)

Emerging Markets

"HFRX Emerging Markets Composite Index is designed to track the returns of Emerging Markets regions with an emphasis on global macroeconomic, political or specific secular market growth trends. Exposure includes, but is not limited to, Emerging Asia, Russia, Eastern Europe, Latin America, Africa and Middle East regions". (https://www.hedgefundresearch.com/indices/hfrx-emerging-markets-composite-index)

HFRX Emerging Markets Composite Index has fallen from a value of 1,677.58 on May 2008 to a value of 1,256.44 on November 2008. Differently from what happened to the majority of the other hedge funds, the HFRX Emerging Market Composite index recovered almost immediately; in fact, it reached the value it had on May 2008 on September 2009.

Graph 17 - HFRX Emerging Markets Composite Index Performance (2006-2017)

(https://www.hedgefundresearch.com/indices/hfrx-emerging-markets-composite-index)

Table 10 - Rate of Return of the HFRX Emerging Markets Composite Index (2007-2017)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YTD
2017	1.22%	0.52%	0.62%	0.81%	0.69%	0.47%	0.57%	1.61%					6.69%
2016	-2.30%	-2.18%	3.15%	0.89%	0.35%	1.71%	-0.25%	-1.29%	0.99%	0.05%	-1.97%	-0.78%	-1.77%
2015	-1.01%	0.00%	0.65%	4.74%	-0.90%	-0.91%	-3.80%	-3.41%	-0.78%	-0.32%	1.32%	-0.72%	-5.26%
2014	-0.87%	0.80%	-0.32%	-2.00%	-0.20%	1.89%	0.39%	0.93%	0.55%	-2.65%	-4.47%	-2.00%	-7.83%
2013	0.41%	0.24%	0.38%	2.32%	-0.14%	-0.82%	-0.04%	-1.80%	0.28%	0.36%	-1.00%	0.10%	0.23%
2012	1.93%	3.55%	0.02%	-0.10%	-0.97%	0.32%	0.21%	0.54%	-0.10%	-0.13%	1.36%	1.79%	8.67%
2011	0.16%	0.36%	-0.12%	0.78%	-0.65%	-0.43%	-0.53%	-1.62%	-2.25%	0.51%	-0.84%	-1.83%	-6.33%
2010	0.00%	2.68%	2.03%	2.92%	-2.50%	-0.80%	2.88%	2.55%	2.49%	0.60%	1.71%	0.91%	16.45%
2009	0.46%	0.25%	2.59%	4.10%	7.66%	3.74%	3.45%	-0.17%	3.46%	0.99%	1.93%	0.90%	33.31%
2008	-3.75%	2.67%	-5.52%	2.90%	2.06%	-1.50%	-1.75%	-3.76%	-6.86%	-12.90%	-0.88%	3.20%	-24.22%
2007	0.37%	-0.13%	0.10%	5.10%	3.96%	2.54%	3.76%	-1.60%	4.78%	4.59%	-2.76%	2.88%	25.86%
2006	5.61%	8.20%	3.59%	5.11%	-0.38%	-1.10%	-0.92%	1.80%	1.56%	1.98%	2.24%	3.85%	35.95%

(https://www.hedgefundresearch.com/indices/hfrx-emerging-markets-composite-index)

Table 11 - Statistics HFRX Emerging Markets Composite

TYPE	HFRXEMC
Std. Deviation	2.58
Annualized Return	5.56
Risk Free Rate	1.02
% of Winning Mo.	60
Sharpe Ratio	0.54
Monthly Alpha	0.33
Monthly Beta	0.30
Correlation	0.74
Statistics calculated since inception of index	

(https://www.hedgefundresearch.com/indices/hfrx-emerging-markets-composite-index)

Market Directional

"HFRX Market Directional Index is comprised of all eligible hedge fund strategies; including but not limited to convertible arbitrage, distressed securities, equity hedge, relative value arbitrage. The index selects constituents which characteristically exhibit higher volatilities and higher correlations to standard directional benchmarks of equity, bind market and hedge fund industry". (https://www.hedgefundresearch.com/indices/hfrx-market-directional-index)

Graph 18 - HFRX Market Directional Index Performance (2006-2017)

(https://www.hedgefundresearch.com/indices/hfrx-market-directional-index)

The HFRX Market Directional Index as well as the other indexes lost a big part of its value after May 2008, in fact it dropped from 1,286.68 to 890.61 on December 2008.

After the second part of 2008 it recovered quickly but from 2010 its performance was a cycle, a succession of ups and downs. For example on 2011 it registered a negative performance of -18.86%, it was succeeded by three positive YTD of 3.50%, 9.50% and 5.31% respectively in 2012, 2013 and 2015.

It dropped again in 2015 but immediately recovered in 2016.

Table 12 - Rate of Return of the HFRX Market Directional Index (2007-2017)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YTD
2017	1.09%	1.87%	0.19%	-0.72%	-1.93%	0.59%	0.97%	-0.63%					1.39%
2016	-8.45%	-1.50%	3.64%	5.31%	1.46%	2.16%	2.50%	1.15%	1.97%	-1.66%	1.83%	1.73%	9.86%
2015	0.19%	1.80%	0.70%	2.20%	-0.42%	-1.84%	-0.74%	-3.43%	-4.45%	3.36%	-2.07%	-3.88%	-8.58%
2014	-0.56%	2.83%	0.19%	-0.93%	0.64%	2.02%	-1.09%	2.51%	-0.47%	-0.93%	1.26%	-0.18%	5.31%
2013	2.57%	0.62%	1.36%	1.63%	0.27%	-2.70%	1.87%	-1.47%	2.23%	1.73%	0.25%	0.89%	9.50%
2012	1.88%	1.86%	-0.54%	0.32%	-4.51%	-0.02%	1.78%	0.82%	0.98%	-0.02%	0.31%	0.76%	3.50%
2011	0.64%	1.29%	-1.27%	-0.51%	-1.88%	-2.62%	-0.08%	-5.45%	-7.63%	-0.02%	-1.38%	-1.44%	-18.86%
2010	0.23%	-0.04%	2.37%	1.10%	-2.46%	-1.14%	3.04%	0.38%	4.22%	0.04%	-0.02%	1.40%	9.32%
2009	1.71%	0.18%	1.52%	2.50%	5.20%	0.97%	3.82%	1.63%	3.26%	1.76%	1.88%	1.67%	29.34%
2008	-2.47%	3.72%	-2.55%	1.01%	2.00%	-0.19%	-2.65%	-1.17%	-8.90%	-13.94%	-5.15%	-3.07%	-29.70%
2007	1.38%	-1.00%	0.13%	3.10%	4.03%	0.29%	-1.82%	-3.21%	2.10%	3.94%	-3.52%	0.09%	5.28%

(https://www.hedgefundresearch.com/indices/hfrx-market-directional-index)

Table 12 - Statistics HFRX Market Directional Index

TYPE	HFRXMD
Std. Deviation	2.58
Annualized Return	5.17
Risk Free Rate	1.94
% of Winning Mo.	63.56
Sharpe Ratio	0.39
Monthly Alpha	0.28
Monthly Beta	0.43
Correlation	0.73
Statistics calculated since inception of index	

(https://www.hedgefundresearch.com/indices/hfrx-market-directional-index)

2.4 How did the Financial Crisis Influenced Hedge Funds Performance?

As we previously saw, every type of hedge funds, no matter what strategy of investment they pursued, suffered heavy losses after the 2007 financial crisis, it

may be due to the fact that the crisis that arose that year hit almost every area, from real estate to stock market, and almost every country, from consolidated countries such as United States and the European Union countries to emerging countries such as Brazil.

Of course, not every fund lost the same amount or recovered in the same time, it differed depending on the strategy they decided to use and of course on the type of asset they decided to invest in. For example, if an hedge fund decided to invest its money on stock of, let's say, Greek corporations, which struggled a lot and some of them are still struggling, of course then that fund would have struggled a lot to recover from the 2008 crash.

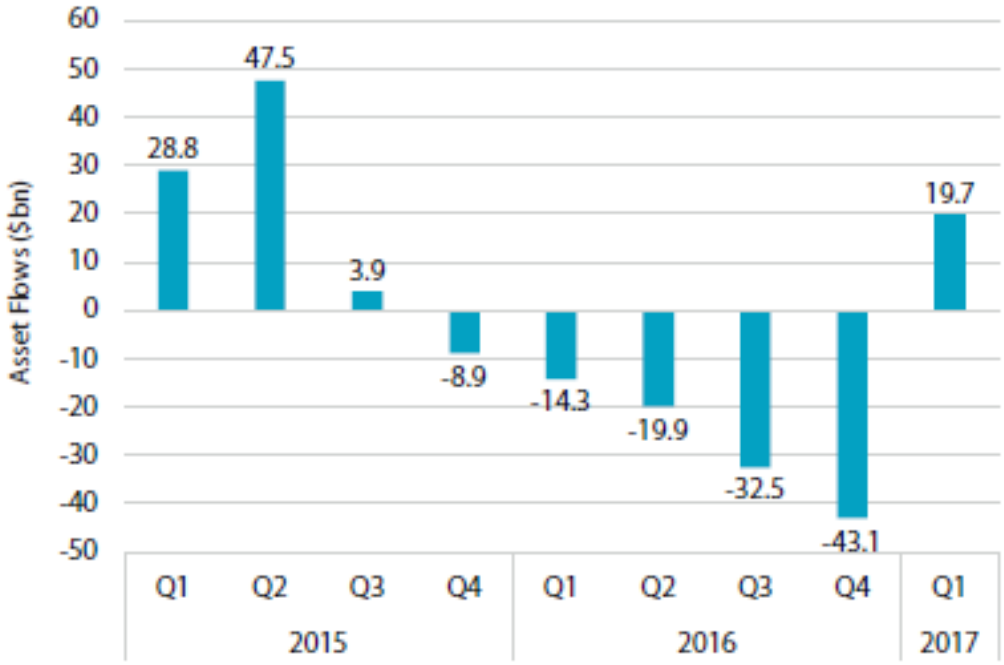
We can differentiate the performance and the recovery of each strategy which can be used by the funds.

We can say that hedge funds who decided to adopt an Long/Short Equity strategy are the ones who struggled the most to recover from the crisis and right now have not recovered completely yet, it may due to the fact that the stock market was the sector which had the heaviest loss, and so, a fund who decide to invest in this sector would be affected even though hedge funds, as the name suggests, should guarantee a positive payoff no matter what.

The type of strategy which suffered least is the one summarized by the HFRX Emerging Market Composite Index, after a drop in its value it recovered quickly and after the recovery it outperformed the period prior to the crisis. It may be due o the fact that after 2008 the emerging markets, especially the Middle East ones and the Asian ones had a great growth and this may have drove the index up.

2.5 Changes in the Volume of Investments

Graph 19 - Cash Flows, Q1 2015 - Q1 2017



(Preqin)

As we can see from Graph 19, after the first three quarters of 2015 on which many new investors decided to put their money into the hedge fund industry, it followed five quarters (the last of 2015 and all 2016) in which many investors decided to invest the money somewhere also.

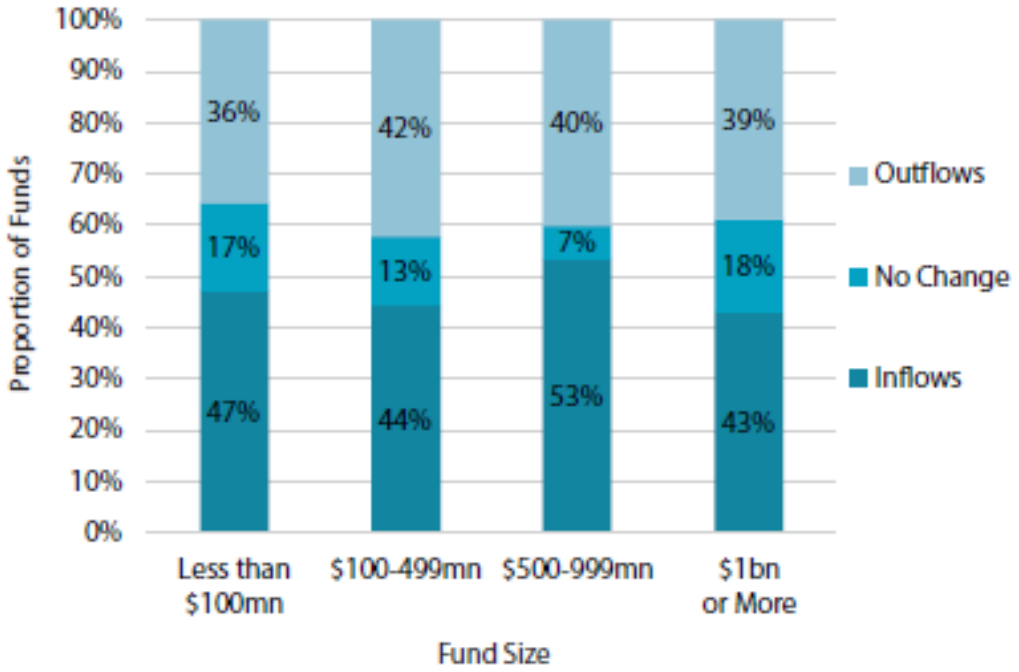
According to Preqin, the combination of positive inflows and performance gains has seen the industry assets grow by 3.2% during the first quarter of 2017, to $3.35tn.

Macro and event driven strategies attracted the largest amount of new capital during the quarter. The biggest loss of capital for the hedge fund industry in 2016 was due to the outflows in the equity strategies funds, in fact they accounted 46% of the total industry outflows.

The largest inflows in the first quarter of 2017 were received by mid-sized funds ($500-900mn) and by funds headquartered in North America, but we can say that in the majority of funds in both Asia-Pacific and Rest of the World inflows

were larger than outflows. A little exception in that quarter was Europe, in fact many funds lost investments.

Graph 20 - Asset Flows over Q1 2017 by Fund Size



(Preqin)

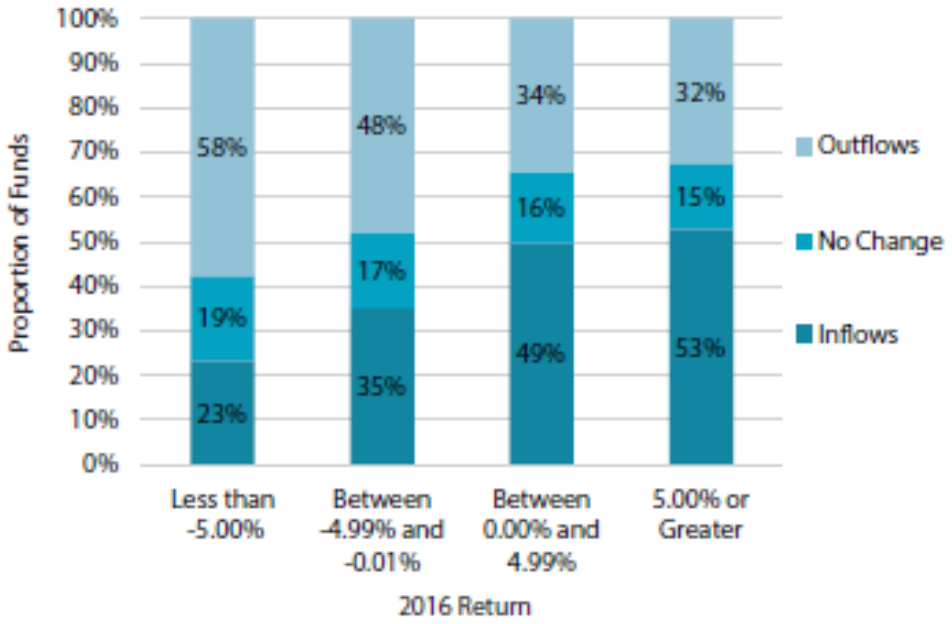
Table 13 - Asset Flows by Fund Manager Headquarter, Q1 2015 - Q1 2017

Fund Manager Headquarters	2015 Asset Flows ($bn)	H1 2016 Asset Flows ($bn)	H2 2016 Asset Flows ($bn)	2016 Asset Flows ($bn)	Q1 2017 Asset Flows ($bn)	Q1 2017 AUM ($bn)	Percentage Change in AUM - 2017 YTD
North America	79.6	-12.8	-43.0	-55.7	19.9	2,490	3.0%
Europe	31.7	-2.4	-32.9	-35.4	-8.5	663	1.0%
Asia-Pacific	-1.3	-17.7	-0.6	-18.3	2.2	148	9.3%

(Preqin)

As shown in Graph 21, past performance can be seen as an indicator of the ability of a fund in attracting new capital, in fact 53% of funds with a return equal or higher than 5.00% in 2016 received more capital in 2017.

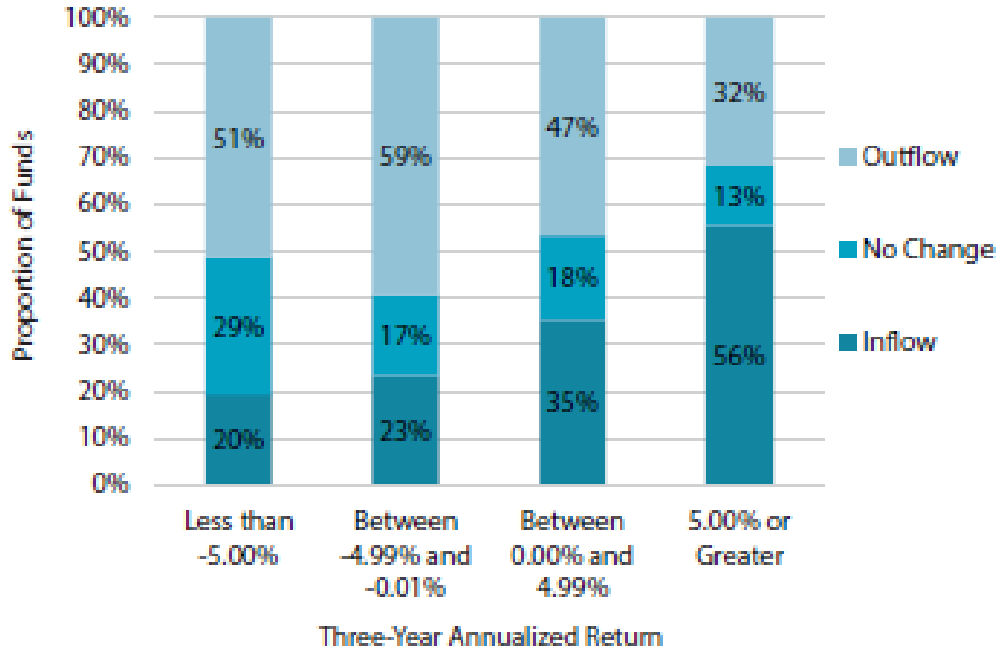
Graph 21 - Asset Flows over Q1 2017 by 2016 Performance



(Preqin)

The trend according to which past performance influence the amount of inflow in the funds is even more apparent when we look at the longer term, for example the three-year track records as shown in Graph 22.

Graph 22 - Asset Flows over Q1 2017 by Three-Year Annualized Return



Graph 1 (Preqin)

In the following quarters, the trend of an increasing inflow in the hedge fund industry continued with a 2Q inflow of $6.7 billion.

The majority of this capital was invested in funds using a Global Macro strategy which exhibit low correlation to equity markets, investors invested $6.0 billion on Macro strategies in the first half of 2017 bringing it to a total capital of $579.2 billion.

Not only Global Macro strategy received many investments, also Equity Hedge strategies receive $3.8 billion in the second quarter of 2017 bringing its total capital to $893.8 billion, the largest strategy area.

Conclusion

After the research made in order to write this thesis and after we studied both how hedge funds work and how they performed in the last years we could answer our final question: *How did the financial crisis influenced hedge funds' performance?*

Of course, the financial crisis influenced the hedge funds markets, almost every hedge fund, no matter which strategy adopted, suffered heavy losses between May 2008 and December 2008.

The difference between the difference strategy may be given, not by how quickly they recovered, but looking on how they performed in the following year, let's say from 2011 to 2017.

The best performing strategy was the *Emerging Market* strategy, as previously said, it was driven by the high performance of the Middle East and Asian countries.

Every index we considered beat the market performance at least 60% of the month, which can be considered a big number.

After a struggling 2016 investors are becoming more confident and are beginning to invest again their money into the hedge funds industry, in fact we saw a positive inflow ratio for the first quarters of 2017.

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