

# **The Effect of Size, Age, Beta and Disclosure Requirements on Hedge Fund Performance**

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*Abstract: Analyzed hedge fund returns in excess of the S&P 500 to determine the effects of beta, fund size, age, and enforced registration in 2006 due to Rule 203(b)(3)-2. Discovered that beta had a positive effect on performance, while the increasing age of a fund caused managers to suffer from “style drift,” thereby reducing the hedge fund’s performance. Registration increased returns by 11.6% by raising the net worth requirement for accredited investors, thereby providing funds with a more knowledgeable investor and increased asset base stability. This suggests that advisers have been able to fund more efficiently by taking on more leveraged positions and holding less cash on hand, while pursuing a greater number of strategies.*

## Introduction

Although hedge funds have been in existence since 1949, their performance has only attracted significant attention over the past decade. While there is no set definition for a hedge fund, it is usually an actively managed investment pool that does not advertise, and is privately organized to be exempt from the Securities Acts of 1933 and 1934. These features allow it to engage in a larger variety of investment strategies than funds regulated under the Securities Acts of 1933 and 1934. The recent attention received by hedge funds is a result of various factors. First, is the large returns generated by hedge funds for their investors. The second factor is a result of the increasing regulation of hedge funds by the SEC to protect investors from fraud.

Since the investment strategies of hedge funds are not restricted by the SEC, they have been able to generate large returns by using aggressive investment strategies that are normally unavailable to mutual funds. These include unrestricted use of leverage, derivatives, short selling and undiversified portfolios; however, the US government allows only institutions and high net worth individuals to invest in hedge funds. These restrictions aim to ensure that only educated investors participate in these funds.

Despite these regulations, several large hedge funds have failed and these failures have caused the SEC to rethink the adequacy of their actions thus far. Long Term Capital Management, a hedge fund created in 1994, relied on arbitrage as its primary investment strategy. By the beginning of 1998, LTCM was highly leveraged with only \$5 billion of equity in comparison to \$125 billion of borrowings, and was investing in mortgage backed securities and emerging markets. When Russia experienced their ruble crisis on August 17, 1998, LTCM's portfolio suffered greatly. By September 1998, LTCM's equity was reduced to \$600 million, and banks realized there was a potential the firm would default. To prevent a worldwide financial crisis, the Federal Reserve organized a \$3.5 billion safety package by US investment

banks. Although the investing banks became LTCM's new management, LTCM was eventually liquidated, and many banks made substantial write-offs. Not many hedge fund losses have had a significant systemic impact as that of LTCM; however, since the 2006 regulation by the SEC, funds such as Amaranth Advisors and MotherRock have lost half their assets to bad bets in energy futures. These losses, which amounted to \$4.5 billion and \$230 million respectively led to the eventual shutdown of these funds. Similarly, in mid-2007, the sub-prime mortgage crisis brought about the collapse of two major Bear Sterns hedge funds, as well as permanent, adverse changes to 40 others.

To understand whether additional government regulation is necessary to protect investors from future losses of this magnitude, it is first necessary to understand what effect the short-lived, 2006 regulation had on hedge fund performance. This paper will analyze the relationship between a hedge fund's returns in excess of the S&P 500 as a function of its age, size, beta and effect of 2006 regulation. Since this regulation required most hedge funds advisers to register, but did not limit their investment strategies, the effect should be an increase in hedge fund performance due to the transparency of their activities and the investor protection it offered.

We find that holding constant a series of determinants of hedge fund performance, this registration requirement did not have an adverse impact on hedge fund performance and may have even increased performance.

## History of Hedge Fund Regulation

Over the past few years, the United States government has gradually started regulating hedge funds. According to the Securities Act of 1933, Regulation D – Rule 501, an “accredited investor” is defined as an individual with an income of at least \$200,000 (\$300,000 with a spouse) in each of the two most recent years. An individual may also qualify if their net worth (individual or with a spouse) is in excess of \$1 million. Additionally, institutions are allowed to invest if they have assets in excess of \$5 million. By limiting investors to those that qualify under the previous conditions, hedge funds were able to avoid registering with the government and any subsequent regulation. While the Securities Act of 1933 applied to the primary market, the Securities Exchange Act of 1934 created the SEC and extended their reach to the regulation of secondary market trading. Finally, the Investment Company Act of 1940 created two additional guidelines regarding the regulation of investment funds with the introduction of Section 3(c)1 and 3(c)7. Section 3(c)1 limited the size of hedge funds to under 100 “accredited investors” and states that the fund is unable to obtain its investors through a public offering. In 1996, Section 3(c)7 was added to this Act. Section 3(c)7 mandated that hedge funds were not limited to 100 investors if they were comprised of “qualified purchasers.” These are individuals with over \$5 million in investments. Finally, Rule 203(b)3 of the Investment Advisers Act of 1940 stated that to be exempt from federal registration, an adviser must have had fewer than 15 clients in the past 12 months. This individual also may not advertise their services as an investment adviser to the public. These guidelines allow the SEC to ensure that hedge fund investors are knowledgeable individuals who do not require extensive government protection.

In September 2003, the SEC added an additional stipulation for hedge funds, to assure that investors were protected from fraudulent activity on behalf of hedge fund advisers. Rule 203(b)(3)-2 required that hedge fund advisers be registered with the SEC by February 1, 2006. This was accomplished by amending the definition of “client” under Section 203(b)3. Prior to this amendment an investment fund that used Sections 3(c)1 or 3(c)7 to avoid regulation could consider all the clients within a hedge fund as a single “client.” Since the investment adviser did not create a separate investment strategy for each individual, they could be considered a single entity. Section 203(b)3-2 stated that each shareholder, limited partner, member or beneficiary of the firm must be counted as a partner. Furthermore, if this hedge fund provided services to a mutual fund or any other investment fund which was regulated under the Investment Company Act of 1940, then it needed to consider each of their investors as a separate client as well. By requiring hedge fund advisers to register with the SEC, the net worth requirement for accredited investors was effectively raised to \$1.5 million so these advisers could continue to collect performance based fees. Hedge funds could still avoid registration with the SEC if they had less than \$25 million under management or if investors’ funds required a lockup longer than 2 years.

Under Part I of this Uniform Application for Investment Adviser Application (Form ADV), advisers listed their business location, ownership structure, basic operations and past disciplinary events. Part II, which is provided to the client, discloses the adviser’s fees, investment style, potential conflicts of interest, brokerage practices, affiliations with other securities professionals, education and business background, as well as any other information that may be relevant to a client’s decision whether to hire an adviser (Edwards 2006).

On June 23, 2006, the US Court of Appeals for the DC Circuit invalidated Section 203(b)3-2 in *Goldstein et al. v. Securities and Exchange Commission*. The court stated that “the [SEC]’s interpretation

of the word 'client' comes close to violating the plain language of the statute. At best, it is counterintuitive to characterize the investors in a hedge fund as the 'clients' of the adviser." The SEC had 45 days to petition this ruling; however, their failure to do so caused some hedge funds to deregister once the window had passed.

One consequence of the 2006 registration was that it provided hedge fund investors as well as researchers with the ability to collect hedge fund data that was a lot less biased. Prior to 2006, researchers had to gather the data themselves or pay for data collected by private firms, all of which relied on the data hedge funds decided to make available to the public. Obviously, the primary issue with the accuracy of this data is that hedge funds would mainly report their strategies and performance if they were successful in producing high returns. Therefore, the data used by the studies is biased and not representative of the entire hedge fund population. Additionally, many of these studies were not able to use large data sets due to the limited availability of information and the substantial costs involved in procuring them. On the other hand, studies during the 2006 regulation window could rely on data from every domestic hedge fund, since it was necessary for this information to be presented to the SEC, making them less prone to bias.

### **Literature Review**

A number of studies have examined the determinants of hedge fund performance. Regarding the effect of hedge fund size on performance, there are studies available that support each of the three possibilities: positive, negative and no relationship. Liang (1999) compared a set of 385 hedge funds and 4,776 mutual funds over a 3 year period between 1994 and 1996. The first part of the study proved that

high returns by hedge funds over mutual funds could be attributed to actively managed portfolios, investment strategies, and fees which linked management incentives with those of their investors. These features are due to the lack of regulation on hedge funds. The second part of the study used a cross-sectional regression of average monthly returns on fund characteristics such as incentive fees, fund age and assets. While incentive fees, assets and lockup period had a positive relationship with performance, age showed a negative relationship.

Nevertheless, Gregoriou and Rouah (2002) examined 204 hedge funds between 1994 and 1999, and found that hedge fund size had no impact on its performance, whether or not they controlled for Sharpe and Treynor ratios. In contrast, Jones (2006) analyzed 1,790 small funds (up to \$100M in assets), 480 medium funds (\$100M-\$500M) and 137 large funds (over \$500M) to show that as fund size increased, its returns decreased.

Similarly, Ammann and Moerth (2005) used a sample of 4,014 hedge funds broken down into 100 “percentiles” based on their asset size, to test how asset size affects a fund’s performance, standard deviation and Sharpe ratio. There was a negative relationship between fund size and performance; however, on average, fund’s with an asset size of under \$1 million tended to underperform. This was explained by the higher relative operational costs involved with firms of this size. The same negative relationship exists between assets size and standard deviation. Finally, the relationship with the Sharpe ratio was not statistically significant.

In her 2006 study, Jones also showed that a firm’s age is inversely related to its performance as well. Funds under two years performed better than those between two to four years, which still performed better than funds over four years.

Since beta is a measure of systematic risk, it portrays the volatility of a stock or portfolio compared to the market. Therefore, it would be expected that funds with a beta much higher than 1 or lower than -1 would experience greater losses and returns than those that tend to mimic the S&P 500; however, by definition, hedge funds should be using hedging strategies, which would cause hedge fund returns to have no significant relationship with this variable. By simultaneously taking long and short positions in an investment, a hedge should be able to create large returns with a beta close to zero. Nevertheless, Ibbotson's (2005) analysis of 3,000 hedge funds showed that beta is significant in explaining a large portion of their returns, with the remainder attributable to alpha and management fees. Géhin and Vaissié (2006) further demonstrated the significance of beta when accounting for hedge fund performance. In particular, the portion of these returns that is attributable to market exposure and exploiting market opportunities.

Ackermann (2000) used the risk adjusted returns from hedge funds and mutual funds, between 1988 and 1995, to understand the effects of government regulation. The unique characteristics of hedge funds, such as their extensive use of leverage, short selling, derivatives, lock-up periods and incentive fees were used to explain hedge funds' ability to outperform mutual funds during this period. The study found no indication that leverage, short selling and derivatives inhibit mutual fund returns. However, lock-up periods and incentive fees have a significant relationship with the higher hedge fund returns.

### **Data and Methods**

Unlike most prior studies which used cross-sectional regressions by segmenting hedge funds based on age or size, we used a fixed effects panel data model to better understand the consequence of regulation across the entire hedge fund industry over nine quarters, between May 2005 and July 2007.



While a time-series framework could have been used to portray the change in hedge fund returns above the S&P 500 before and after regulation, it would have ignored the differences among hedge funds.

Using the fixed effects model, each hedge fund is assumed to have time independent effects:

$$Ret_{it}-SPX_t = \alpha_i + \beta_{it}x + u_{it}$$

with  $i$  hedge funds over  $t$  quarters;  $Ret_{it}$  represents the hedge fund's average return in percentage terms, while  $SPX_t$  is the average return on the S&P 500 in the same period. By subtracting the two terms, the dependent variable becomes the excess returns hedge funds are able to achieve through various factors. These independent variables are represented by  $\beta_{it}$ , while  $\alpha_i$  represents the other characteristics of hedge funds that may affect excess returns but do not vary with time. Finally,  $u_{it}$  is the random error term.

Here we regressed hedge fund returns above the S&P 500 as a function of hedge fund size, measured by their assets (Size), fund age in months (Age), volatility compared to the S&P 500 (Beta), and a dummy variable for government enforced hedge fund registration (Reg). This dummy variable was represented by a 1 for those quarters when the SEC required hedge funds to register according to Rule 203(b)(3)-2, and a 0 otherwise.

While we expect assets and age would to decrease excess hedge fund returns, the opposite is true for the other two factors. An adviser at a smaller hedge fund can pursue only its best investment ideas; however, as a hedge fund increases, this is not the case. A larger fund must look to their secondary ideas and even further, since the profitability of any investment or arbitrage opportunity diminishes as demand increases and the market adjusts. Therefore, these funds suffer from diminishing returns as assets increase. Similarly, with age, advisors tend to suffer from "style drift" the longer they manage a fund. This means that the advisor will start to pursue investment strategies outside their area

of expertise, thereby leading to lower returns. One would normally expect beta to have little effect on hedge fund returns, since by definition these funds should be hedging their positions, thereby attaining betas close to zero. Due to the number of firms in existence and the amount of assets in their possession, this is not the case with modern hedge funds. Many of today's hedge funds use risky strategies to earn high returns for their investors. Since the S&P 500 had positive returns during this period, we can expect funds with larger betas to have earned higher returns in excess of the market.

Finally, registration is a little more difficult to explain. One would normally expect regulation to lower returns, as hedge funds are able to earn higher returns than mutual funds since their investment strategies are not limited. However, Rule 203(b)(3)-2 did not regulate hedge funds. Instead, it required these funds to register with the SEC, to ensure investor confidence. Therefore, this registration would be expected to increase returns for two reasons. First is the reduction of fraudulent or unethical behavior by advisors. All advisors were required to register with the SEC, and their use of investor funds became transparent, thereby increasing the efficient use of the fund's assets. Second, the increased net worth requirement for accredited investors improved the knowledge and experience of the average hedge fund investor. This meant that hedge fund investors were less likely to panic or act inappropriately in response to market and portfolio volatility. Instead of limiting investment strategies, this opened new opportunities for advisors. By providing a more stable asset base and experienced investor, advisors could keep less of their assets as cash, invest in more illiquid securities, and take on more leveraged position, without worrying about losing investors.

Using these variables, our equation becomes:

$$\text{NetRet}_{it} = \alpha_i + \beta_1 \text{Beta}_{it} - \beta_2 \text{Age}_{it} - \beta_3 \text{Size}_{it} + \beta_4 \text{Reg}_{it} + u_{it}$$

Using a Bloomberg terminal, it is possible to access an enormous collection of comprehensive data for over 60,000 funds; however, once the criteria was limited to domestic hedge funds, the number was reduced to around 13,000 funds. For this analysis, a random population of 50 hedge funds was collected. These hedge funds were chosen using a Monte Carlo simulation that randomly chose two numbers: the first indicated the Bloomberg page number on which to find the hedge fund, while the second was the position of the fund on this page. For each of the hedge funds, data was collected regarding the fund's returns, beta, fund age and size for each of the three quarters prior to the February 2006 regulation, as well as the three quarters following this period. After this regression was run, additional data was collected to observe how hedge funds performed during the three quarters after they were no longer required to register with the SEC. Finally a second regression analyzed the behavior of hedge fund returns over the 9 quarters, while a third regression only used the last six quarters.

Q<sub>1</sub> to Q<sub>6</sub> covers pre-registration to registration, Q<sub>4</sub> to Q<sub>9</sub> covers registration to post-registration, and Q<sub>1</sub> to Q<sub>9</sub> covers the entire period. Initially, we analyzed Q<sub>1</sub> to Q<sub>6</sub>, consisting of data from the six quarters between May 2005 and October 2006, to observe whether the introduction of government enforced disclosure in February 2006 had any effect on hedge fund performance. Once we established that a relationship exists, we analyzed Q<sub>1</sub> to Q<sub>9</sub> which spanned across nine quarters from May 2005 to July 2007. This analysis was performed to observe whether the increased returns from the 2006 legislation were still significant once enforced registration was retracted and the SEC failed to appeal by the end of August 2006. Finally, the last data set from Q<sub>4</sub> to Q<sub>9</sub> was analyzed to focus specifically on hedge fund performance when enforced disclosure was invalidated.

## Results

Table 1 reports means and standard deviations for the independent and dependent variables in three separate time periods:  $Q_1$  to  $Q_6$ ,  $Q_1$  to  $Q_9$ , and  $Q_4$  to  $Q_9$ .

The ability of hedge fund managers to pursue aggressive investment strategies that are not regulated by the SEC allow them to create large returns for their investors. This is evident by the mean for NETRET, which shows that the average hedge fund return is over 10% above that of the S&P 500. Additionally, the mean for BETA is around 1.1, which shows that these hedge funds are practicing very volatile strategies to produce the correspondingly large returns. Due to the considerable number of hedge funds today, and the competition among financial institutions to create large returns for their investors, it is no longer realistic for hedge funds to rely solely on arbitrage opportunities and hedging strategies. Instead, these funds take advantage of their unregulated nature to undertake much riskier strategies that result in a beta much greater than 0 or 1.

The mean AGE for this sample was between 10 to 11 years with a standard deviation of 105 months. This is a very interesting aspect, since it mimics the characteristics of a perfectly competitive market. There are many opportunities to earn a profit, so hedge funds attract many new entrants. As more entrants join the market, investment opportunities are quickly exploited and disappear. Therefore, new entrants must differentiate their product by pursuing much riskier strategies to attract investors. Unfortunately, this means that small drops in the market will cause hedge funds to incur large losses. This leads to the demise of many hedge funds in their earlier years. The number of hedge funds that have failed due to the sub-prime mortgage crisis is a good example of this. Finally, mean SIZE ranged between \$789 million in the first regression to over \$1 billion in the third regression, with a

standard deviation of around \$1.5 billion and a maximum of \$14 billion over the nine quarter time span. Therefore, it is apparent that hedge funds require a large asset base to pursue their strategies and could have a large impact on the market.

Table 2 displays the results from three regressions: (1) uses data from  $Q_1$  to  $Q_6$ , (2) uses data from  $Q_1$  to  $Q_9$ , and (3) uses data from  $Q_4$  to  $Q_9$ . Tests showed no evidence of heteroskedasticity.

During the initial regression, all of the variables were significant at a 95% level of confidence. As predicted, age and size had a negative effect on hedge fund returns in excess of the S&P 500, while registration increased hedge fund returns. A one month increase in AGE resulted in a 1.3% decrease in hedge fund returns above the S&P 500; a \$1,000,000 increase in assets reduced returns by .007%; enforced registration increased returns by 11.6%. The largest effect was observed by BETA, for which a one point rise resulted in a 22% increase in returns.

A second regression was performed on the data, while adding observations from the three quarters after the 2006 regulation was invalidated, to observe the long-term effects of this registration. Once this new data was added, the variable for size was no longer significant in determining hedge fund returns at even a 0.1 level of confidence. Additionally, while registration was still significant, the coefficient decreased to 5.5. Age and beta still caused returns to increase, although both coefficients experienced a slight decrease. A one month increase in the age of a hedge fund reduced returns by .64%, while a one point increase in beta increased returns by 17.5%.

Finally, a third regression was performed using only the data during enforced registration and the three quarters after invalidation. Once again, size was not significant; however, registration was no longer significant in determining hedge funds returns as well. AGE and BETA remained significant

factors in determining hedge fund returns, and we observed an increase in these coefficients to almost their initial values: -1.2 and 19.3 respectively.

## **Conclusion**

As we expected, the introduction of Rule 203(b)(3)-2 caused an 11.6% increase in hedge fund returns above the S&P 500 in the first regression, and a 5.5% increase in the second regression, holding all other variables constant. Although both assets and enforced registration were not significant in the third regression, the reason for both of these may be related. The ability of hedge funds to rely on a stable asset base should allow them to practice a greater number of strategies, and make more efficient use of their assets (by taking a more leveraged position and keeping less cash on hand). As a result, it is not the size of a hedge fund's asset base that determines their returns, but rather the quality of their investors. Similarly, the qualifications for an accredited investor have become outdated since the mid 20<sup>th</sup> century. By requiring hedge funds to register with the SEC, the net worth requirement was effectively raised to \$1.5 million, supplying hedge funds with a more educated investor and a more stable asset base. This explains the positive relationship between the registration variable and returns during the first regression. During the last three quarters analyzed, most of the hedge funds remained voluntarily registered with the SEC. By July 2007, 1,990 hedge fund advisers were still registered with the SEC (of the just over 2,700 advisers who were registered in July 2006). This amounted to 10,446 individual firms. Therefore, these hedge funds would still produce high returns in the last three quarters even though enforced disclosure was not present. This would make it seem as though 2006 registration

was not significant in increasing hedge fund returns, even though most hedge funds retained a \$1.5 million net worth requirement by remaining registered with the SEC.

From this analysis, it is also apparent that age and beta are both important factors in determining hedge fund returns in excess of the S&P 500. Although a larger beta increased hedge fund returns, this is mainly because the S&P 500 achieved positive returns during this 27 month time period. From the mean and standard deviation of beta in this data set, we observed that hedge fund managers pursue risky strategies that are much more volatile than the market. Therefore, negative returns by the S&P 500 would have resulted in huge losses for investors. Age has a negative relationship with hedge fund returns. As a fund's age increases, its managers suffer from style drift, leading to lower returns.

Due to the risk and volatility involved with hedge funds, it is imperative for hedge fund advisers to ensure that they cater to knowledgeable investors, so they can secure a stable asset base. This is especially true with the significant losses experienced by hedge funds in the past year. By raising the net worth requirement, hedge funds can increase the certainty that they are attracting experienced investors who will not redeem their funds when their portfolio experiences the slightest decline, thereby allowing advisers to make better use of their funds.

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**Table 1 – Means and Standard Deviations**

Variable	Mean	Standard Deviation	Minimum	Maximum
NETRET (Q <sub>1</sub> -Q <sub>6</sub> )	17.86	19.12	-19.10	102.38
NETRET (Q <sub>1</sub> -Q <sub>9</sub> )	13.50	18.71	-29.76	102.38
NETRET (Q <sub>4</sub> -Q <sub>9</sub> )	12.39	19.94	-29.76	102.38
AGE (Q <sub>1</sub> -Q <sub>6</sub> )	127.25	105.77	5.00	684.00
AGE (Q <sub>1</sub> -Q <sub>9</sub> )	131.76	105.87	5.00	693.00
AGE (Q <sub>4</sub> -Q <sub>9</sub> )	136.28	105.76	14.00	693.00
SIZE (Q <sub>1</sub> -Q <sub>6</sub> )	789.4	1,314.3	.663	10,534.4
SIZE (Q <sub>1</sub> -Q <sub>9</sub> )	921.5	1,590.6	.663	14,496.1
SIZE (Q <sub>4</sub> -Q <sub>9</sub> )	1,042.3	1,770.5	.775	14,496.1
BETA (Q <sub>1</sub> -Q <sub>6</sub> )	1.101	0.557	-0.210	4.165
BETA (Q <sub>1</sub> -Q <sub>9</sub> )	1.104	0.516	-0.210	4.165
BETA (Q <sub>4</sub> -Q <sub>9</sub> )	1.172	0.538	-0.127	4.165

NETRET: Average fund return in excess of the S&P 500 in percent form.

AGE: Age of the hedge fund since its inception date. Measured in months.

SIZE: Average size of the fund in millions, as determined by its assets.

BETA: Beta of the fund, compared to the S&P 500.

**Table 2 – Regression Results**

Regression	(1)	(2)	(3)
Variable			
Constant	165.0464*** (41.83379)	81.48805*** (12.33877)	157.7779*** (44.94443)
AGE	-1.302319*** (.3416174)	-.6397526*** (.0973115)	-1.212333*** (.3162462)
SIZE	-.0066** (.00281)	-.00225** (.00146)	-.00509 (.00226)
BETA	22.00247*** (4.691858)	17.45982*** (3.241205)	19.28518*** (3.682787)
REG	11.56365*** (3.223096)	5.481181*** (1.47784)	.5710909 (3.152632)
	n = 287 R <sup>2</sup> = .1437 F = 9.82 Pr > F = 0.0000	n = 434 R <sup>2</sup> = .2358 F = 29.39 Pr > F = 0.0000	n = 294 R <sup>2</sup> = .3463 F = 31.92 Pr > F = 0.0000

Standard errors in parentheses.

\*\*\* = significant at 0.01

\*\* = significant at 0.05