DID THE DODD-FRANK ACT IMPACT HEDGE FUND PERFORMANCE ?

BY

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ABSTRACT

Title IV of the Dodd-Frank Act introduced the most significant regulatory change in the history of the hedge fund industry in the United States, boosting the permissible regulatory oversight of the hedge fund industry to an unprecedented level. Title IV and SEC implementation rules introduced a registration requirement for hedge fund managers and increased the disclosure requirements pertaining to confidential and proprietary information. We study the impact of Title IV of the Dodd-Frank Act and the SEC's implementation of these requirements on hedge fund performance by means of Regression Discontinuity and Difference-in-Difference empirical designs.

Contrary to the hedge fund industry's claims that increased supervision and disclosure would affect their profitability, we find statistical evidence of a positive effect of the requirements introduced by the Dodd-Frank Act on hedge fund performance. In particular, we find that the registration requirement for hedge fund advisers under the Dodd-Frank Act creates a discontinuity in hedge fund returns at the registration effective date, March 30, 2012. However, this effect is not persistent and is completely absorbed in the months following the registration effective date for private fund advisers under the Dodd-Frank Act. Strategic actions by fund advisers lead to a strong increase in the discontinuity around the AUM registration threshold, despite the effect being absorbed in later months.

***Keywords*:** Dodd-Frank Act, Hedge Funds, Performance, Regression Discontinuity Design, Difference-in-Difference Design

***JEL Classification*:** G23, G24, G28, K22

I. INTRODUCTION

Hedge fund managers fear that the registration and disclosure requirements under the Dodd-Frank Act could lower their returns (Oesterle 2006, Kaal 2013a, Kaulessar 2012). A survey of hedge fund managers conducted in 2012, after the registration effective date for hedge fund managers under the Dodd-Frank Act, revealed that a clear majority of hedge fund managers believed that increased compliance costs affect the industry. However, while Dodd-Frank Act compliance costs affect the profitability of hedge fund advisors' investment management companies, registration and disclosure requirements under the Dodd-Frank Act do not seem to affect the returns of hedge funds (Kaal 2013a).

For the first time since the inception of the hedge fund industry, Title IV of the Dodd-Frank Act (the Act or Dodd-Frank) and Securities and Exchange Commission (SEC) rules implementing the Act require hedge fund manager registration and enhanced disclosure of sensitive proprietary information (Dodd–Frank Act § 401, 402, 408). The SEC's rules introduced controversial disclosure obligations that require the reporting of risks metrics, counterparties and credit exposure, strategies and products used by the investment adviser and its funds, performance and changes in performance, financing information, positions held by the investment adviser, percentage of assets traded using algorithms, and the percentage of equity and debt, among others (SEC Form PF 2012, SEC Form ADV 2012). The true impact of these regulations on the hedge fund industry and their effect on hedge fund advisor performance is unclear. Some analysts estimate that the cost will range from $50,000 to $400,000 per year (Kaal 2013a and 2013b).

The enactment of Title IV of the Dodd-Frank Act was controversial. Despite reservations on both sides, the regulation of hedge funds in Title IV was included in the Dodd-Frank Act (CoE 2011, Paletta and Lucchetti 2010). In a 2009 white paper, the Treasury Department favored the registration of advisers of hedge funds and other private pools of capital with the SEC to ensure that financial institutions that are critical to market functioning are subject to strong oversight (Department of the Treasury, 2009). SEC Commissioner Louis Aguilar commented: "'We're totally unable to discern what's going on in [the hedge fund] market, [we] have no idea how many dollars are involved, [. . .] what type of risk-taking is happening, [we] don't know if they're investing in vanilla securities or investing in the riskiest instruments."(Goldfarb and Cho, 2009). In the debate over the measure, Senator Jack Reed (D-RI) commented (2009, 1): "These private pools of capital are responsible for huge transfers of capital and risk, and so examining these industries and potential regulation are extremely important." Rep. Paul E. Kanjorski (D-PA) (2009, H14420) stated: "[F]or the first time regulators will have the information needed to better understand exactly how these entities operate and whether their actions pose a threat to the financial system as a whole." Opponents of Title IV were concerned that regulation would invade the privacy of clients and would place an unnecessary burden on investment advisers (Strasburg, 2009). Banking Committee ranking member Richard Shelby (R-Ala.), complained that the bill represents a 'squandered opportunity' for streamlining the regulatory system and predicted that the measure will foster 'unrestrained and unaccountable' agencies." (Ferullo, Bruce, Hill, and Manickavasgam 2010).

Did Congress by enacting Title IV of the Dodd-Frank Act overburden the hedge fund industry? This study aims to estimate the impact of hedge fund adviser registration and increased disclosure requirements under the Dodd-Frank Act on hedge fund performance. We use self-reported Morningstar earnings data for 2145 hedge fund advisers that are based in the United States and are subject to the registration and disclosure requirements under Title IV of the Dodd-Frank Act and SEC rules.

We find evidence that hedge fund adviser registration under the Dodd-Frank Act positively affects hedge fund adviser returns in March 2012, but this effect is not persistent in the subsequent months after the registration effective date for hedge fund advisers under the Dodd-Frank Act. Contrary to the claims of the hedge fund industry, we find no empirical evidence that would suggest that hedge fund adviser registration under the Dodd-Frank Act negatively affects hedge fund performance. To our knowledge, no other study has analyzed the implications of hedge fund adviser regulation. Because the hedge fund industry is a significant representative of Wall Street's interests and regulating hedge funds is somewhat politically sensitive, the preliminary findings in this study are intended to provide guidance to policy makers who seek to implement a regulatory framework for the hedge fund industry.

Part II explains the core aspects of hedge fund registration and enhanced disclosure requirements under the Dodd-Frank Act and SEC implementation rules and provides a short overview of the literature on hedge fund performance. Part III describes our dataset, hypotheses, and the empirical methodology. Part IV reports the empirical results of the impact of Title IV of the Dodd-Frank Act and SEC implementation rules on hedge fund performance, provides a summary of key findings, and discusses their implications, limitations, and the need for future research. Part V concludes.

II. HEDGE FUND ADVISER REGULATION UNDER THE DODD-FRANK ACT

The hedge fund industry evolved without substantial regulatory oversight (Kaal 2009, Fung and Hsieh 1999). Since the development of the hedge fund model by Alfred Winslow Jones in the late 1940s (Jones 1949, Loomis 1966, Landau 1968), balancing the interests of hedge fund managers, investors, and regulators to attain a suitable level of regulatory oversight has proved contentious (Kaal 2013a). The SEC and the hedge fund industry reached a workable compromise in the mid 1980s, allowing hedge funds to remain exempt from regulation as long as they complied with accredited investor standards (SEC Regulation D, IA Release No. 2576, IA Release No. 2628) and safe harbor requirements (Kaal 2011 and 2013a).

The expansion of the hedge fund industry in the late 1990s and its increasing importance in financial markets in combination with the creation of global financial markets and the non-stop flow of new financial instruments (Schumer 2008) changed the delicate balance of interests. The retailization of the hedge fund industry (IA Release 2333, Kaal 2009, Donaldson 2003), the rise of hedge fund fraud (IA Release 2333), and the collapse of large hedge funds such as Long Term Capital Management in 1998, Tiger Funds in 2000, and Amaranth in 2006 (Roth and Fortune 2001, Jickling and Raab 2006, Jorion 2000), among others, precipitated politicians and policy makers to voice concern over the alleged systemic risks posed by the hedge fund industry (Cox 2006, Kaal 2009 and 2013a). A combination of these factors amplified calls for increased supervision of the hedge fund industry (SEC HEDGE FUND REPORT 2003).

Following the global financial crisis of 2008-09, however, the tension between the hedge fund industry and the regulators flared up again. Politicians and the media accused hedge funds for taking undue risks that contributed to the financial crisis (Lee 2009, Economist 2010). Capitalizing on the political support for increased oversight of the hedge fund industry, legislatures in the United States and Europe enacted new rules intended to address the perceived shortcomings of the global hedge fund industry (Dodd-Frank Act §§ 401-416, Commission AIF Proposal 2009). In the United States, Congress enacted the Private Fund Investment Advisers Registration Act of 2010 (PFIARA) in Title IV of the Dodd-Frank Act (Dodd–Frank Act §§ 401-416). Title IV was intended to close regulatory gaps, provide greater protections for investors, and curtail speculative trading practices (House of Representatives Joint Explanatory Statement 2010).

Title IV established rules and regulations for the registration of private funds with the SEC and expands the reporting requirements of private advisers to the SEC (Dodd–Frank Act § 408). The registration of hedge fund advisers was intended to limit systemic risk, prevent fraud, provide information to investors (Durbin 2010), and help the SEC to restrict market participants operating in the "shadows of our markets" (Kanjorski 2009). Hedge fund managers with assets under management (AUM) in excess of $150 million were required to register with the SEC as investment advisers and had to disclose information about their trades and portfolios to the SEC (Dodd Frank Act §§ 408, 403, IA Release 3221, IA Release 3222). Required disclosures under Title IV include: counterparty credit risk exposures, trading and investment positions, trading practices, the amount of AUM, valuation policies, side letters, the use of leverage, and other information deemed necessary and appropriate to avoid systemic risk (Dodd–Frank Act §§ 404, 405).

1. Registration

Title IV of the Dodd-Frank Act exempts private fund advisers with less than $150 million AUM from registration (Dodd-Frank Act § 408) and requires the SEC to examine factors including the investment strategy, size, and governance of an investment adviser in order to determine the systemic risk of hedge funds and to impose registration and examination procedures accordingly. To prevent the exemptions from registration to "swallow the rules," Title IV authorizes the SEC to utilize its rulemaking authority (Kanjorski 2010). The SEC can require the disclosure of any other reports it considers necessary to protect investors (Dodd-Frank Act § 408).

Investment advisers registering with the SEC are required to file the pertinent disclosure document - Form ADV (Form ADV, Sorady 2011, Coakley and Allen 2011, Koehler and Lambert 2011). To implement the new registration requirements under Title IV, the SEC amended Form ADV. On March 30, 2012 investment advisers in the United States, including those who had previously registered with the SEC, had to file the SEC's amendment to Form ADV (Rule 203A-5(b), IA Release 3221), reporting to the SEC information regarding the private funds they manage (Form ADV Part 1A).

2. Disclosure

In addition to mandatory registration requirements, amended Form ADV requires disclosure of information regarding the fund structure, ownership, the gross asset value,

the investment strategy, the scope of services provided, and the fund's use of consultants and other gatekeepers (Amendments to Form ADV). Amended Form ADV also demands disclosure of non-advisory activities, financial industry affiliations, the number and types of its clients, and an assessment of the percentage of AUM attributable to each client type (Form ADV Part 1A). In addition to the regular annual filing, investment advisers also have to update Form ADV if the disclosures therein become materially inaccurate (Form ADV Part 1A).[1]

In addition to the filing requirements under Amended Form ADV, Title IV requires registered hedge fund advisers to file periodic reports (Dodd-Frank Act § 404, IA Release 3308). In January 2011, in a joint effort to implement the Dodd-Frank Act provisions, the SEC and the Commodity Futures Trading Commission (CFTC) together proposed Form PF (IA Release 3308). In October 2011, the SEC enacted Form PF (IA Release 3308, Rule 204(b)-1). In adopting the final rules, the SEC attempted to balance FSOC's interest in monitoring systemic risk through analyzing high quality information with industry concerns.

Form PF filing requirements apply to all registered investment advisers that manage RAUM in excess of $150 million for private funds at the end of their most recently completed fiscal year (IA Release 3308). Hedge fund advisers managing less than $1.5 billion RAUM attributable to hedge funds must file Form PF annually (IA Release 3308), whereas advisers managing RAUM in excess of $1.5 billion attributable to hedge funds must file Form PF quarterly (IA Release 3308). The quarterly reporting requirement for large hedge fund advisers is intended to provide timely data that enables the FSOC to identify trends in systemic risk (IA Release 3308).

Mandatory Form PF disclosures include the following items: credit exposure, strategy, risks metrics, products used by the investment adviser, performance and changes in performance, financing information, the funds managed by the investment advisor, and information about individual investors and positions held by the investment advisor (Form PF). Counterparty credit exposure is an important item on Form PF, requiring hedge fund advisers to identify the five trading counterparties to which the reporting funds have the greatest net counterparty credit exposure (Form PF Section 1c, 2b).

3. Previous work on Hedge Fund Performance

Hedge fund performance has received a lot of attention in the literature. Prior studies have investigated the effects of various variables on hedge fund performance persistence. Several studies evaluate performance persistence in various contexts, (Fung et al. 2008, Jagannathan et al. 2010, Koh et al. 2003, Liang 2000 and 2003, Naik et al. 2007, Teo 2009, Agarwal and Naik 2000, Agarwal et al. 2006 and 2007, Baquero et al.

[1] Amended Form ADV obliges advisers to disclose advisory activities, clients, employees, compensation arrangements (IA Release 3221, Form ADV Part 1A). Once advisers file Form ADV they can no longer deduct accrued but unpaid liabilities and other outstanding debt from their totals, because rather than reporting net Regulatory Assets Under Management (RAUM), advisers are required under Amended Form PF to report their gross RAUM (IA Release 3221). Amended Form ADV also curtails investment advisers in their ability to exercise discretion in including or excluding assets from RAUM (Amended Form ADV, Part 1 A, instr. 5.b) and identifying the adviser's total RAUM and the ownership of RAUM by type of client (Form ADV Part 1A Item 5.D.(2)).

2005, Cassar and Gerakos 2009, Ding and Shawky 2007, Eling 2009, Fung and Hseih 1997, 2000, 2001 and 2004), among others. Other studies consider fund regulation and governance in the United States (Hu and Black 2007, Kaal 2013a and 2013b, Brown et al. 2008, Verret, 2008, Cassar and Gerakos, 2009, 2011), and internationally (Cumming and Dai 2009, 2010a and 2010b, Cumming and Johan 2008).

A significant part of the literature focuses on the performance of hedge funds in comparison with other market participants. Ackermann, McEnally and Ravenscraft (1999), for instance, find that while hedge funds are more volatile than mutual funds and market indices, they consistently outperform mutual funds, but not standard market indices. Incentive fees used by hedge funds may explain some of the higher performance, but cannot explain the increased total risk (Ackermann, McEnally and Ravenscraft 1999). Other studies evaluate the strategies employed by hedge fund managers and their impact on performance. De Los Rios, Diez and Garcia (2011), for instance, find that only a few hedge fund strategies provide significant value to investors and not all fund categories exhibit significant nonlinearities. Hedge fund managers' unique investment strategies are associated with better hedge fund performance (Sun, Wang and Zheng, 2012). Hedge fund strategy can also influence hedge funds' performance persistence (Elgin, 2009).

Absolute and relative performance of hedge funds is an important factor in the hedge fund industry. According to Amin and Kat (2003), hedge funds investments show the best results when 10%-20% of the portfolio value is invested in hedge funds but do not offer a superior risk-return profile as a stand-alone investment. Among more than three thousand hedge funds with similar style classification in 2011, Fung and Hsieh (2011) find that less than 20% of long/short equity hedge funds delivered persistent, significant, and stable positive non-factor related returns for investors. Past performance is associated with risk levels in hedge funds (Brown, Goetzmann and Park 2001). Absolute and relative performance of hedge funds is an important factor contributing to fund disappearance (Brown, Goetzmann and Park 2001). Average hedge fund returns are related positively to fund assets, lockup period, and incentive fees (Liang 1999)**.** Funds performance and skills have been challenged by Lo and Hasanhodzic (2007) and Gramouridis and Paterlini (2010), that show that some hedge funds strategies can be replicated by combining simple financial tools.

Because hedge funds evolved in a regulatory environment with low or no regulatory supervision until the enactment of the Dodd-Frank Act, most prior studies on hedge fund performance do not assess the implications of hedge fund regulation. Prior studies have explored the impact of earlier attempts by the SEC to register hedge fund managers and increase disclosure requirements for hedge funds. In the context of the SEC's attempt in 2004 to register hedge fund advisers and file Form ADV disclosures (Kaal 2013a), Brown, Goetzmann, Liang and Schwarz (2008) investigate the effect of hedge fund manager registration on hedge funds' operational risk. The study concludes that market participants were already aware of operational risk. Cumming and Dai (2010) also analyze the impact of pre Dodd-Frank Act hedge fund regulation on fund structure and performance. They report that lower fund alphas, lower average monthly returns, and higher fixed fees are associated with the location of key service providers and permissible distributions.

The enactment of Dodd-Frank Act increases significantly regulatory oversight in hedge fund industry. Our study estimates the causal effect of an exogenous regulatory shock on hedge fund performance. More specifically, we estimate the causal effect of hedge fund manager registration and increased disclosure requirements under Title IV of the Dodd-Frank Act on hedge fund performance. Other studies investigate other effects of the Dodd-Frank Act. Among others, Dimmock and Gerken (2014) show that the increased regulatory oversight introduced by the Dodd-Frank Act reduces returns misreport by hedge funds.[2]

III. Data Sources and Descriptive Statistics

To assess the impact of the registration effective date for hedge fund advisers under the Dodd-Frank Act on the hedge fund industry, we use data from the Morningstar Hedge Fund Database, Inc. on monthly hedge fund earnings (measured in US dollars) reported by about 7,000 hedge funds and more than 3,700 hedge fund advisers. Before the mandatory registration requirement for hedge fund advisers under the Dodd Frank Act, some hedge fund advisers voluntarily disclosed information about their investment strategies and earnings. After the mandatory registration requirement for hedge fund advisers under the Dodd Frank Act became effective on March 30, 2012, hedge fund advisers with AUM above $150 million are required to comply with increased disclosure obligations. Hedge fund advisers with less than $150 million AUM can choose to disclose information to the SEC.

Due to missing data and the presence of outliers, we extract a sample of 2,145 hedge funds that report all the monthly earnings data and monthly AUM in each period from January to October 2012. The data set contains information on individual hedge fund advisers and their managed funds (SEC identification number, name of the hedge fund, inception date, domicile) including legal structure and quality of management (manager name and tenure).

The main descriptive statistics related to the monthly hedge funds returns and the logarithm of the AUM are reported in Table 1. We focus not only on the entire period but also on March 2012, the registration effective date for hedge fund advisers under the Dodd-Frank Act. The average number of funds with AUM larger than $150 million is about the 20% of the entire sample of funds. There are minor differences in the reported results between the entire period and March 2012. While the statistics related to the AUM are quite similar in the two considered periods, we notice that the average performance in March 2002 is negative compared to the average on the entire sample period, while the median is very close to zero, the minimum value of -28.78 confirms the presence of large losses.

Because disclosure under the Dodd-Frank Act is mandatory only for the hedge fund advisers with AUM exceeding the threshold set at $150 million, we have divided our sample into three subsamples: the first and second subsamples include all the hedge funds with AUM always smaller or equal to $150 million or always larger than $150 million, respectively. Such subsamples are referred to as "Small" and "Large"

[2] The Dodd-Frank Act aims to increase stability of financial markets. See, for example, Kane (2012) and Bhanu and Cyree (2014) investigating the effect of Dodd-Frank Act on the stability of financial systems and market discipline on banks.

respectively. The third subsample, henceforth referred to as "Strategic" includes the remaining hedge funds with AUM larger than $150 million for at least one month but not in the entire sample period from January to October 2012.

		Average Values	March 2012
	Number of funds ≤150 mil	1743	1735
	Funds with AUM>150 mil	402	410
Returns	Min	-27.54	-28.78
	Mean	0.44	-0.34
	Median	0.43	0.01
	Max	46.61	27.21
	Std	3.52	3.19
Log(AUM)	Min	6.29	6.82
	Mean	17.06	17.11
	Median	17.23	17.27
	Max	23.86	23.84
	Std	2.15	2.12

Table 1 – *Descriptive statistics on the entire sample, in the period January-October 2012*

Figures 1 and 2 report the mean values for the hedge fund returns and the AUM (in logarithmic scale) for the three subsamples considered, while Table 2 and 3 display the main descriptive statistics for the entire period and for March 2012. As we notice from Figure 1, the average performance is better for the "Small" subsample in January, February, June and September, while the "Strategic" subsample outperforms on average the "Large" subsample in July and August. There is a strong variability in the performance of the subsamples, with on average no clear dominant group. Figure 2 shows that average AUM is stable across the entire period with the "Large" group having the largest AUM, followed then by the "Strategic" and the "Small" groups, respectively.

Table 2 provides more detailed information on the composition of the three groups in the sample period. About 79% of the entire sample of 2145 hedge funds consists of funds with AUM smaller than $150 million. Only 17% represents the "Large" subsample and 4% the "Strategic" subsample. While the median and mean return performance are similar for the three subsamples, the standard deviation and the minimum and maximum average performance suggest that the "Small" and "Strategic" group have a larger dispersion. When considering the AUM, we notice that, as expected, the "Small" subsample is more heterogeneous with respect to the size of the AUM, while the other two groups are quite stable, with smaller dispersion for the "Strategic".

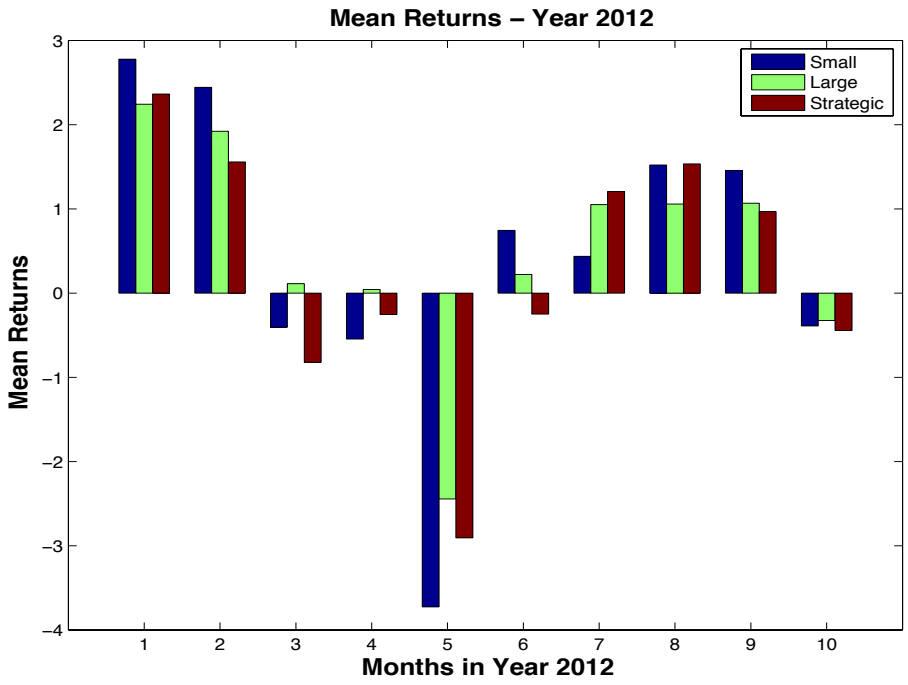


Figure 1 – *Average mean hedge fund returns in the period January-October 2012*

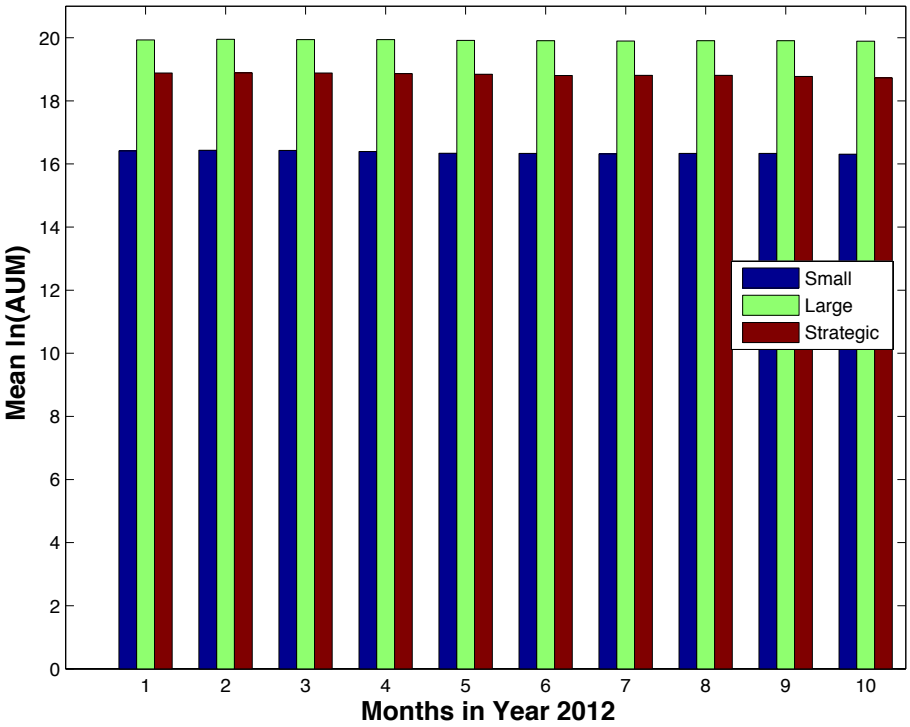


Figure 2 – *Average mean hedge fund logarithm AUM in the period January-October 2012*

		Sample Period: January-October 2012		
		Small	Large	Strategic
	Number of funds	*1700*	*358*	*87*
Returns	Min	-27.54	-11.34	-21.14
	Mean	0.43	0.49	0.30
	Median	0.41	0.52	0.49
	Max	46.61	11.13	11.94
	Std	3.64	2.63	3.99
Log(AUM)	Min	6.29	18.85	17.58
	Mean	16.36	19.92	18.83
	Median	16.74	19.76	18.83
	Max	18.80	23.86	19.75
	Std	1.83	0.84	0.31

Table 2 – *Descriptive statistics disaggregated on basis of AUM: average values in the period January-October 2012*

		March 2012		
		Small	Large	Strategic
	Number of funds	1700	358	87
Returns	Min	-28.78	-9.18	-24.33
	Mean	-0.41	0.11	-0.82
	Median	-0.06	0.25	0.18
	Max	27.21	8.53	7.67
	Std	3.28	2.17	4.42
Log(AUM)	Min	6.82	18.87	18.25
	Mean	16.43	19.94	18.88
	Median	16.81	19.79	18.85
	Max	18.82	23.84	19.73
	Std	1.79	0.83	0.24

Table 3 – *Descriptive statistics on subsamples, partitioned on basis of AUM in March 2012*

The picture does not change much when we look at the statistics in a single period, namely March 2012, shortly before the registration effective date for hedge fund advisers, March 30, 2012. Only the standard deviation of the returns of strategic subsample increased from 3.99 to 4.41. The other two subgroups reported a slightly lower standard deviation for March 2012.

Figure 3 shows the boxplots of the hedge funds returns for the three subsamples in March 2012. We notice that the "Large" group is the one characterized by the smaller dispersion and largest median value, while the "Small" sample is the one characterized by the largest number of extreme observation (i.e. the red crosses). The strategic group has the largest dispersion in distribution of the data, but only few observations fall outside of the box, mostly in the left tail, pointing out a negative performance in the period considered. Results for the entire sample period are available upon request.

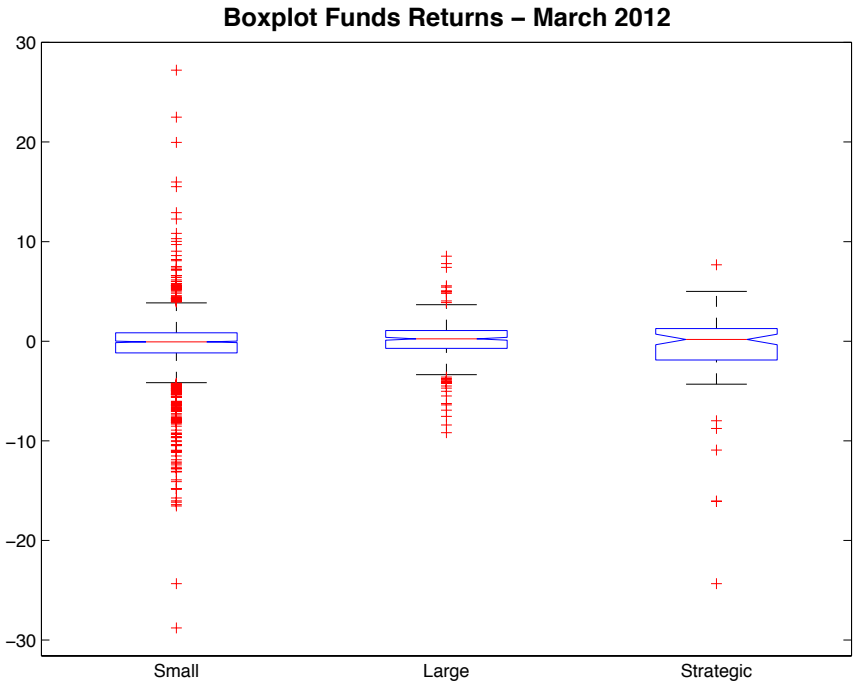


Figure 3 – *Hedge funds returns boxplot for the 3 subsamples in March 2012*

Figure 4 displays the times series of the 87 hedge funds in the strategic group from January 2012 to October 2012. The dotted line identifies the threshold set under the Dodd-Frank Act for mandatory disclosure. We notice that only few hedge funds sensibly decrease or increase their AUM under or above the threshold and then keep such position. Most funds in the sample have AUM very close to the threshold, with oscillations around it.

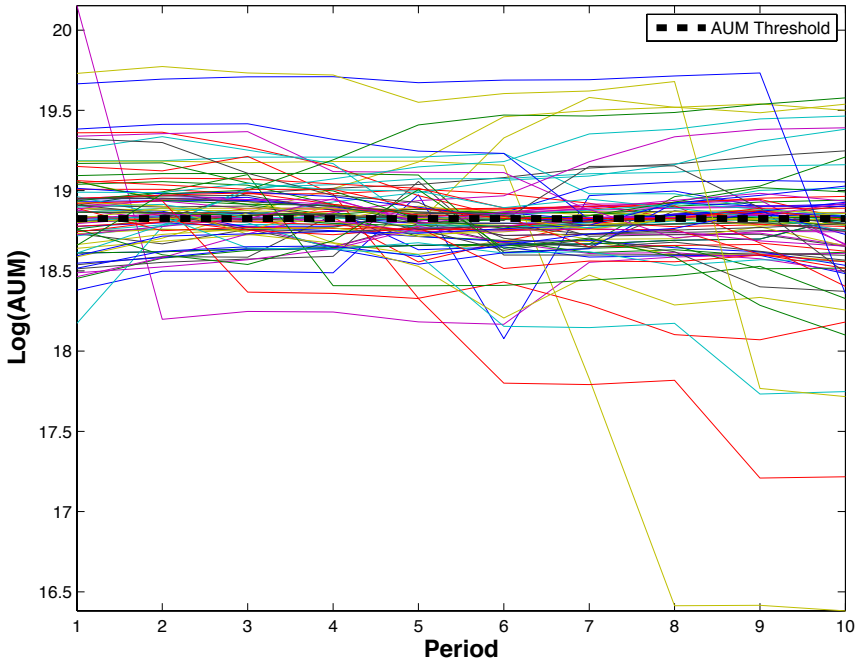


Figure 4 – *Hedge funds AUM time series of the strategic sample in the period January-October 2012*

Figure 5 displays the histogram of the strategic sample with respect to the number of times that such funds had AUM larger than $150 million. Considering the interval January-October 2012, the sample is quite heterogeneous. Among the 87 funds, there are 14 funds that had AUM larger than $150 million only once and 14 funds for 8 out of the 10 periods. For the remaining number of periods, the number of periods in which funds had AUM larger than $150 million varies from 6 to 10.

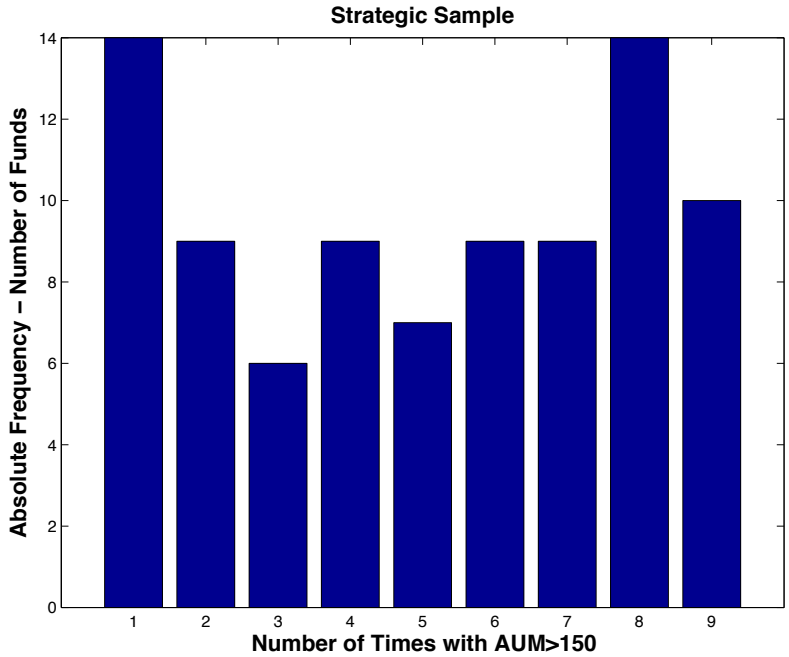


Figure 5 – *Histogram of the number of times the strategic hedge funds had AUM larger than 150 million during the period January-October 2012*

Figure 6 shows the evolution of the AUM from time *t* to time *t+1* of the number of funds in the strategic sample. The blue dashed dotted line displays the number of funds that have changed their AUM from above $150 million to below for the different time periods (i.e. the first bin in the x-axis refers to the variation between January 2012 and February 2012, the second bin in the x-axis refers to the variation between February 2012 and March 2012, etc). The red continuous line displays the number of funds that have reported AUM below $150 million in period *t* and above $150 million in the next period, with an increase in the AUM. The green dotted line refers to the funds that had no variation from one period to the next one in the AUM, above or below the threshold of $150 million for two consecutive periods.

We notice that on average 71 funds do not significantly change their AUM in time (green line), while there are some negative spikes from March to April 2012 and from July to August 2012 for the funds that record a decrease of the AUM under the threshold. The largest positive spike, which corresponds to the largest number of funds that decreased their AUM below $150 million is in the period April-May 2012, possibly suggesting some lagged effect of the registration effective date for hedge fund advisers under the Dodd-Frank Act.

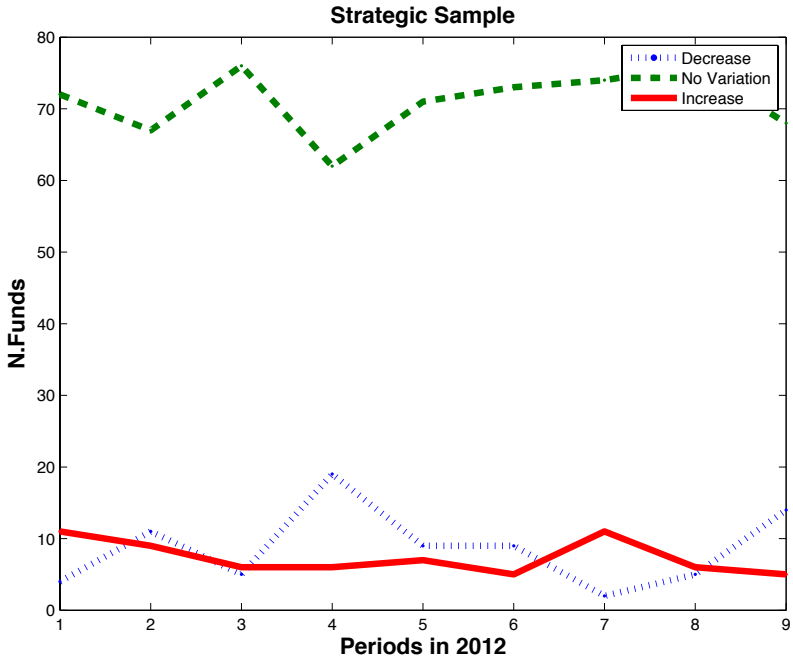


Figure 6 – *Evolution in time of the AUM for the strategic group*

IV. ESTIMATING THE EFFECT OF ADVISER REGISTRATION ON PERFORMANCE

For each period, from January 2012 to December 2012, we focus first on the empirical results from estimating linear regressions, considering the entire sample of 2145 funds. Then, we use the sharp regression discontinuity approach (Imbens and Rubin 2007) to provide more insights on the effect of hedge fund adviser registration on performance.

1. Linear Regression

As a first step, we estimate the parameters of a simple linear regression model, considering the entire sample of 2145 funds for each period, from January 2012 to October 2012. We want to evaluate the possible presence of a relationship between the funds' returns (Y) and the logarithm of the AUM(X) at time t (t= Jan 2012, ...Oct 2012). Moreover, as a second step, we introduce a dummy variable, which assumes value equal to 1 if the AUM is larger than $150 million or 0 otherwise.

Tables 4 and 5 below report the results of our investigation. In particular, we report the estimated values of the intercept (alpha), of the beta coefficient of the logarithm of the AUM (beta) and of the dummy variable, when present. For each coefficient, we also report the corresponding p-values. Finally, the value of the F-statistics with the corresponding p-value and the R-squared are reported.

When considering the entire sample and no dummy variable, the estimated beta for the logarithm of the AUM are statistically significant at 5% level only in the period March-August 2012. We cannot reject the null hypothesis that the beta is equal to zero in the remaining period. The F-statistics also leads us to reject the null hypothesis that the coefficients are jointly equal to zero, supporting the validity of the model.

Examining the beta coefficients, we notice that in the period March-May 2012 and July 2012, beta coefficients are positive, suggesting that a larger AUM could explain a better performance, while in June and August 2012 the beta coefficients are

negative. In the period close to and following the registration effective date for hedge fund advisers under the Dodd-Frank Act, the size of funds seems to have a positive relationship with the fund performance.

	March 2012	April 2012	May 2012	June 2012	July 2012	August 2012
Alpha	**-1.735***** (0.002)	**-1.452***** (0.000)	**-8.909***** (0.000)	**2.529***** (0.000)	**-2.289***** (0.000)	**3.067***** (0.000)
Beta	**0.082**** (0.012)	**0.059**** (0.013)	**0.319***** (0.000)	**-0.112***** (0.002)	**0.168***** (0.000)	**-0.095**** (0.006)
F-stat	**6.373**** (0.012)	**6.157**** (0.013)	**29.007***** (0.000)	**9.286***** (0.002)	**26.142***** (0.000)	**7.584***** (0.006)
R-squared	0.003	0.003	0.013	0.004	0.012	0.004

Table 4 – *Regression statistics for a linear model in the period March-August 2012*

If we look at the results in Table 5, where the simple linear regression models also include a dummy variable, with value equal to 1 for funds with AUM larger than $150 million and 0 otherwise. We notice that in March 2012, no variable is statistically significant at 5% significance level while in April 2012, the dummy variable is statistically significant. In the following periods, no dummy variable or beta coefficient is significant. The F-statistics support the validity of the models, while the explanatory power, measured by the R-squared is still very limited.

The empirical results from the simple regression analysis seem to suggest that close to the registration effective date for hedge fund advisers under the Dodd-Frank Act, the size of AUM, above or below the regulatory threshold of $150 million can play a role in explaining the hedge funds returns of the entire sample of data, which a regression model with dummy variables cannot capture.

	March 2012	April 2012	May 2012	June 2012	July 2012	August 2012
Alpha	**-1.131*** (0.099)	-0.422 (0.402)	**-8.046***** (0.000)	**2.297***** (0.003)	**-2.107***** (0.002)	**2.939***** ($5.29e^{-05}$)
Beta	0.043 (0.302)	-0.007 (0.806)	**0.263***** (0.0005)	**-0.097*** (0.037)	**0.156***** (0.0002)	**-0.087**** (0.048)
Dummy	0.339 (0.128)	**0.591***** (0.000)	0.509 (0.222)	-0.137 (0.598)	0.109 (0.641)	-0.075 (0.758)
F-stat	**4.345**** (0.013)	**9.427***** ($8.39e^{-05}$)	**15.251***** ($2.64e^{-07}$)	**4.780***** (0.008)	**13.175***** ($2.055e^{-06}$)	**3.838**** (0.021)
R-squared	0.004	0.008	0.014	0.004	0.012	0.004

Table 5 – *Regression statistics for a linear model with a dummy variable, in the period March-August 2012.*

2. Regression Discontinuity Design

a) Entire Sample

Our main identification strategy is based on the potential discontinuity generated by the enactment of the Dodd-Frank Act and SEC implementation rules that require hedge fund advisers with an AUM greater than $150 million to comply with registration after March 30, 2012.

Our empirical methodology is based on a regression discontinuity design, using the Rubin Causal Model (RCM) (Rubin 1974, Holland 198, Imbens and Rubin 2007, Imbens and Wooldridge 2007). The regression discontinuity design allows us to examine the causal effect of a binary treatment of units (which may be individuals, firms, or other entities), that may have been exposed or may not have been exposed to a specific treatment. In our analysis, the unit of observation is a specific hedge fund before and after the treatment, represented by the registration effective date for hedge fund advisers under the Dodd-Frank Act, March 30, 2012. Additionally, the treatment may affect the units, each hedge fund adviser in our sample, in a heterogeneous way, which needs to be controlled for.

In the following, we use the Sharp Regression Discontinuity (SRD) design (Trochim 1984 and 2001, Imbens and Kalyanaraman 2012). Our analysis has been performed in STATA and MATLAB, using the code described in Fuji, Imbens and Kalyanaraman (2009) and the STATA packages **rd** (Nichols 2007) and **rdrobust** (Calonico et al. 2013).

In the SRD design, the assignment of units to the treatment group is governed by the variable W_i, defined as a deterministic function of the forcing (or treatment-determining) variable X and the fixed threshold c, and takes the following value:

$$W_i = \begin{cases} 1 \; if \; X_i > c \\ 0 \; otherwise \end{cases}$$

All units with a value of X_i at least equal to c are assigned to the treatment group. On the contrary, all units with a covariate value less than c are assigned to the control group (and are not eligible for the treatment). The basic idea behind the RD design is that any discontinuity in the conditional distribution of Y_i as a function of X_i at the cutoff value c is interpreted as evidence of a causal effect of the treatment.

In the context described here, the registration of the hedge fund advisers under the Dodd-Frank Act is the treatment. The Dodd-Frank Act requires a hedge fund adviser to be registered if the AUM exceeds $150 million after March 30, 2012, the registration effective date. Hedge fund advisers are assigned to the treatment group only when these two conditions are met. The outcome variable Y_i is the hedge fund advisers' returns in each period of the sample, after the registration effective date for hedge fund advisers under the Dodd-Frank Act. The forcing variable X_i is the log AUM of each hedge fund adviser i, with the threshold c set equal to $150 million, which has been re-scaled to zero in the following figures.

We apply the data-driven optimal choice of evenly-spaced bins in Calonico et al. (2013). The procedure aims to use bins to approximate the underlying regression functions by local sample means. The optimal solutions provided by their approach would suggest to partition our data in seven bins, which is too small. Hence, we increased the optimal number of bins by a factor of 20 and 100 to obtain a plot showing a cloud of points as shown in Figure 7 below. We notice that the variability on the returns (y-axis) is larger for the funds with large AUM and as we increase the number of bins, the regression function clearly gets smoother. However, the presence of discontinuity is evident, not matter what number of bins we consider.

Under a SRD approach, following Imbens and Kalyanaraman (2012), we focus on the estimation of the average effect of the treatment for units with covariate values equal to the threshold, denoted with coefficient τ_{RD}. We perform the regression on the entire sample from January 2012 to October 2012. Only in March 2012, i.e. the registration effective date for hedge fund advisers, the estimated coefficient has value larger than one, while it is always close to zero in the other periods. Moreover, the coefficient in March 2012 is the only one with p-value smaller than 5%, while all the estimates in the following months are not significant.

	Mar 12	Apr 12	May 12	Jun 12	Jul 12	Aug 12	Sep 12	Oct 12
τ_{RD}	**1.104*** **	0.029	0.574	0.021	0.002	0.122	0.144	0.200
Std. Err	0.452	0.254	0.824	0.399	0.391	0.315	0.312	0.330
p-value	0.015	0.909	0.486	0.958	0.995	0.697	0.645	0.545
Opt. Bandwidth	1.032	2.019	1.337	2.319	1.951	2.022	2.410	2.006

Table 6 – *SRD estimated coefficient on entire sample of 2145 funds in March 2012*

The impact of mandatory registration of hedge fund advisers under the Dodd-Frank Act is not persistent in the subsequent months after March 2012, i.e. after the registration effective date, except for May 2012. Compliance with mandatory registration could have occurred in the months prior to the registration effective date, March 30, 2012. We have extended our analysis using a Fuzzy Regression Discontinuity (FRD) approach on the entire sample. FRD design allows us to model the probability of receiving the treatment (compliance with mandatory information disclosure) as a smaller jump at the threshold (i.e. lower than 1), rather than a sharp change from 0 to 1 as in the SRD design. However, because the denominator is very close to 1 in our investigation, empirical results show that the differences between the SRD and the FRD approach are of minor importance.

Figure 8 illustrates the discontinuity effect on hedge fund earnings occurred at the registration effective date, on March 30, 2012. Figure 8 suggests that the requirements introduced by the Dodd-Frank Act create a positive effect on hedge fund performance. By contrast, the hedge fund industry expected the introduction of the Dodd-Frank Act to result in negative effects on hedge fund returns. However, this discontinuity effect we observe in March 2012 is not persistent and is completely absorbed in the months following the registration effective date for private fund advisers under the Dodd-Frank Act.[3]

Figure 9 reports the results obtained by using the density test proposed by McCrary (2008). The results reported in Figure 9 further support and underscore the presence of a discontinuity in March 2012 at the threshold of 150 million.

The estimates reported in Table 6 are computed in correspondence of the optimal bandwidth. As a robustness check, we computed such estimates when considering different bandwidths. As Figure 10 shows, the estimates are statistically significant and rather stable also for larger bandwidths. Smaller bandwidths, which are of limited

[3] All statistical results and graphs of SRD analysis for the subsequent months are available upon request.

interest in our application, eventually result in confidence intervals that include the zero value, suggesting that such bandwidth would not lead to detect any discontinuity.

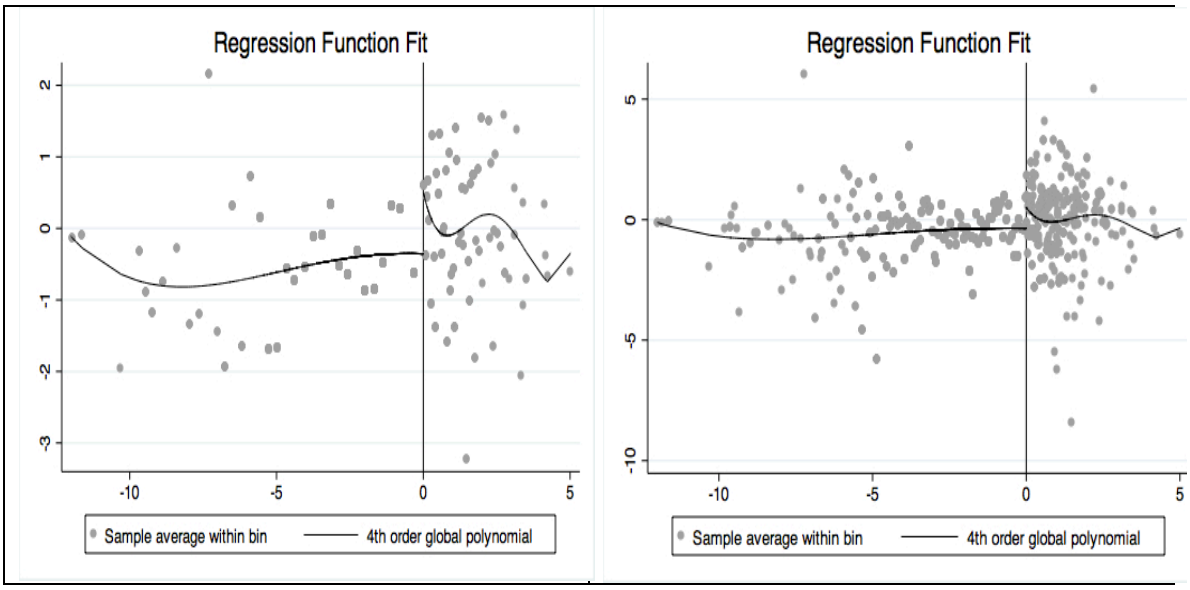


Figure 7 –*RD plot using* a) (on the left) *a factor 20 and b) (on the right) a factor 100 scaled down optimal bin-length choice relative to the entire sample of 2145 funds in March 2012. X-axis: logarithm of the (AUM) after subtracting the threshold of log(150mil), y-axis: log-returns in March 2012*

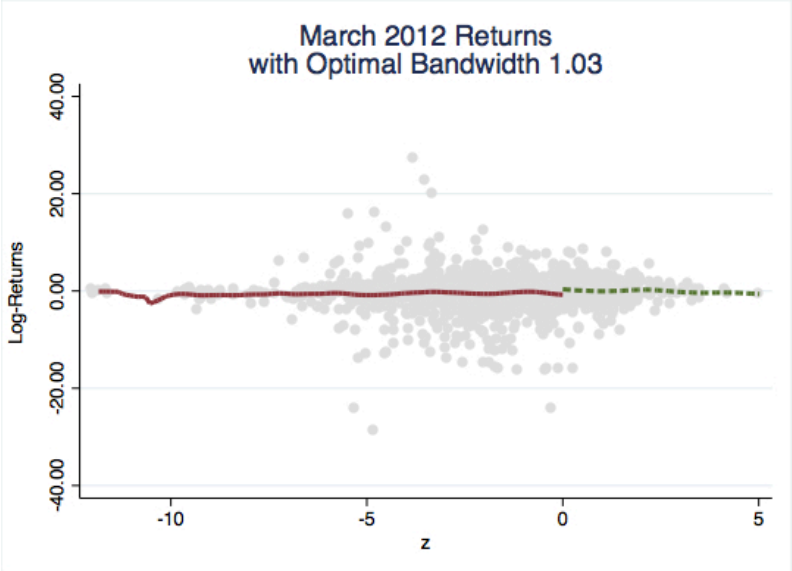


Figure 8 – SRD *graph for registration effective date March 30, 2012*

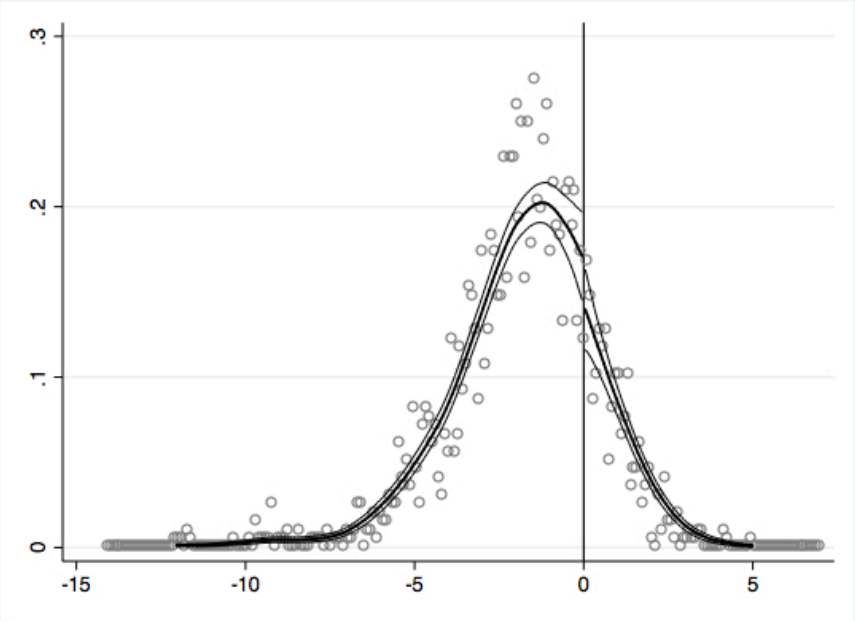


Figure 9 – *Jump in density of Assignment Variable for registration effective date March 30, 2012*

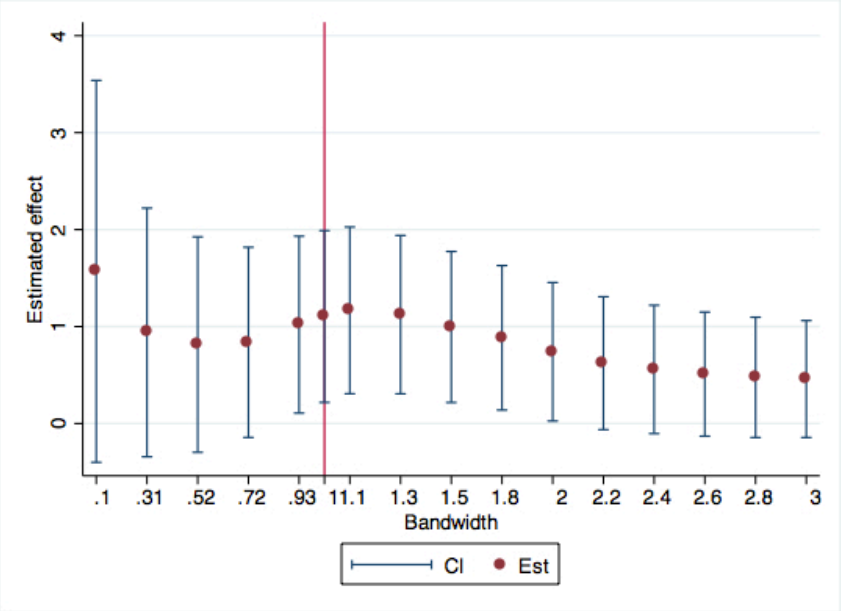


Figure 10 – *Confidence intervals for the estimated effect in March 30, 2012 when different bandwidths are applied*

Figure 11 shows that the optimally chosen bandwidth is very close to the value that cross-validation would select, as implemented by Calonico et al. (2013), supporting the validity of the results. Increasing the bandwidth size does not dramatically affect our estimates. Larger values could also be considered as viable alternatives.

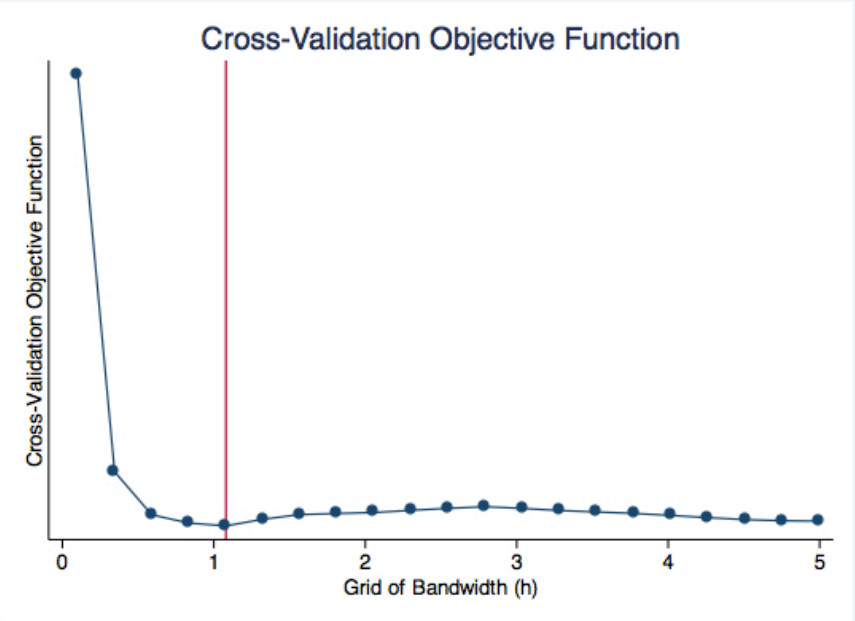


Figure 11 – *Confidence intervals for the estimated effect in March 30, 2012 for different bandwidths*

Finally, following the approach proposed by Calonico et at. (2013), we compared the estimates computed by the conventional RD method with the Bias-Corrected and Robust ones. As Table 7 below shows, all the estimates are very close to each other in magnitude and all of them have a p-value smaller than 5%, affirming the presence of a discontinuity in March 2012.

Method	Coef.	Standard Error	z	p-value	95% Conf. Interval	
Conventional	1.1302	0.47117	2.3988	0.016	0.206749	2.05372
Bias-Corrected	1.3306	0.47117	2.8241	0.005	0.407146	2.25411
Robust	1.3306	0.52251	2.5466	0.011	0.306533	2.35472

Table 7 – *Robust alternative estimates for the RD coefficient in the period March 30, 2012*

b) Strategic Subsample

The registration effective date for hedge fund advisers under the Dodd-Frank Act, March 30, 2012, may have affected hedge fund advisers in an asymmetric way. Hedge fund advisers with a very small AUM would have probably been unresponsive to the regulation, anticipating that information disclosure would remain on a voluntary basis. Hedge fund advisers with an AUM sufficiently larger than $150 million had to comply with the new requirements. This would not be the case for those hedge fund advisers with an AUM level floating above and below $150 million during the 10 months of observation in the sample. It is possible that the enactment of the Dodd-Frank Act introduces incentives that are powerful enough to cause some hedge fund advisers to opt out of Dodd-Frank Act registration and disclosure through a strategic change of AUM size. There would be room for strategic decisions by advisers to reduce the AUM size below $150 million, to avoid compliance with mandatory information disclosure.

As previously described, we build a subsample, called "Strategic", made of 87 hedge fund advisers characterized by an AUM level above $150 million for at least one month in the sample period but not in the entire sample period from January to October 2012. We extend the analysis to consider the effect of the registration effective date for hedge fund advisers on the subsample of hedge fund advisers. We perform a FRD regression on the strategic hedge fund adviser subsample in March 2012, i.e. after the registration effective date, and in all the subsequent months in the period January 2012-October 2012.

Table 8 reports the values of the estimated coefficients, the standard errors, and the number of funds in the strategic subsample with AUM smaller or larger than $150 million and the value of the optimal bandwidth. Figure 9 reported below shows the value of the discontinuity coefficient for the entire sample and the strategic sample from March 2012 to October 2012. While the entire sample has a value always very close to zero, except for March 2012, the strategic subsample has a value always above zero. The strategic subsample reaches its lowest estimates in March 2012 and then the magnitude of the coefficients in the following periods increases sensibly until August 2012. Moreover, looking at the number of advisers with AUM above or below the threshold, we notice that while in March and April 2012 we have basically no change, there are relevant changes in the following months, from May until August 2012. In particular, some large advisers reduce their AUM. This leads to a strong increase in the discontinuity around the AUM registration threshold, suggesting a stronger separation between the two groups. The effect vanishes during the last months of our sample period.

	March 2012	April 2012	May 2012	June 2012	July 2012	August 2012	September 2012	October 2012
τ_{RD}	2.59	4.74	4.25	-1.82	1.21	-2.04	0.28	2.13
Standard Error	0.95	2.17	2.73	1.76	1.71	1.08	1.14	1.09
Funds with AUM>150 mil	52	53	40	38	34	43	44	35
Funds with AUM<150 mil	35	34	46	47	52	41	42	51
Optimal Bandwidth	0.10	0.12	0.13	0.15	0.14	0.17	0.18	0.19

Table 8 – *FRD estimated coefficients on strategic subsample in period March-October 2012*

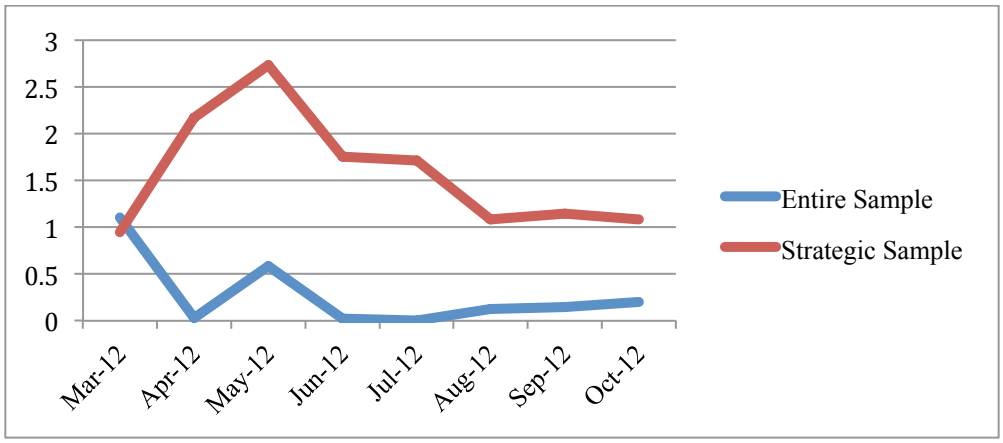


Figure 12 - *Tau coefficient for FRD for the entire sample vs the strategic sample. In the period March - October 2012*

The most important limitation of our study is the availability of data. For the preliminary findings in this study, we worked with ten months of available hedge fund advisers earnings data. Available data includes earnings data from January 2012 to October 2012. However, because the registration effective date for hedge fund managers under the Dodd-Frank Act, is March 30, 2012, the results for the last seven months of the sample are of most interest.

3. Difference-in-Difference Design

Thus far, we have used a SRD design (Trochim 1984 and 2001, Imbens and Kalyanaraman 2012) and a FRD design to assess whether the registration effective date under the Dodd-Frank Act and SEC implementation rules affect hedge funds' earnings post treatment. We use here an alternative approach, difference-in-difference (DiD) analysis, to test our earlier results. In the DiD analysis we consider hedge funds to be "treated" by the Dodd-Frank Act and SEC implementation rules if they have more than $150 million AUM. In this DiD analysis, funds with less than $150 million AUM are controls.

The simple comparison of the mean of the outcome in treatment and control groups (the "differences" estimator) can be justified because the randomization ensures that mean comparison does not have any systematic differences in any other pre-treatment variable. Even without the assumption that the treatment and control groups are the same apart from the treatment, we can assume that, in the absence of the treatment, the unobserved differences between our treatment group (funds with AUM larger than $150 million) and control group (funds with AUM lower than $150 million) are the same over time.

A key assumption for the DiD strategy is that the outcome in treatment and control group follow the same time trend in the absence of the treatment, but this does mean that the outcomes have the same mean. Using additional pre-treatment performance data, Figure 13 suggests that the trends in our dataset are the same for the treatment and control group.

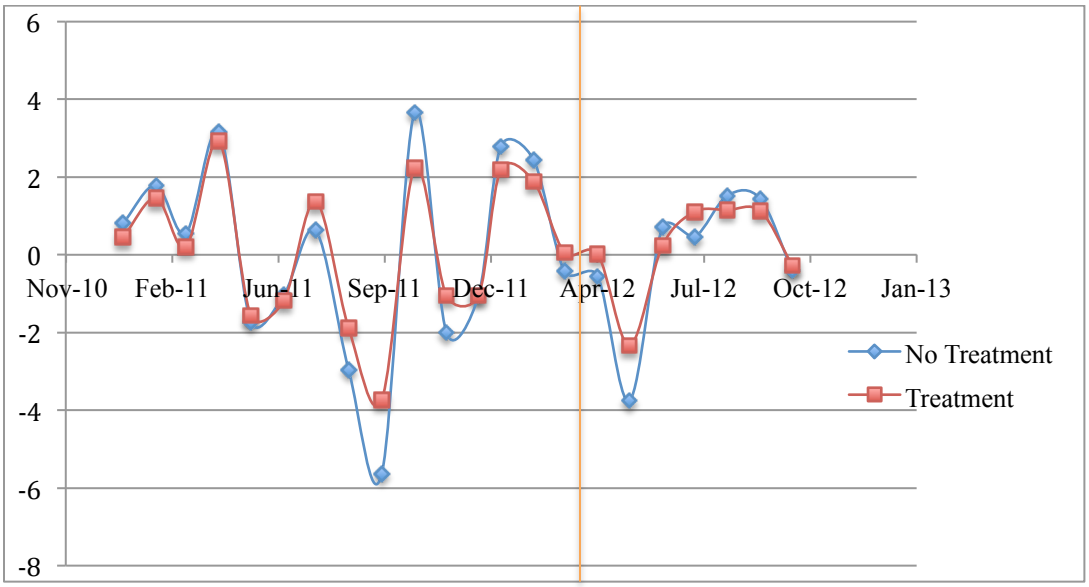


Figure 13 - *Time series comparison for treatment group and control group: earnings in the period January 2011 – October 2012. The yellow bar indicates the beginning of the treatment*

The difference estimator simply uses the difference in means between treatment and control group post-treatment as the estimate of the treatment effect. We use t=0 to denote the pre-treatment-period and t=1 to denote the post-treatment-period, y_{it} denotes the outcome for individual i in period t. Given these specifications, an alternative regression-based estimator that uses the level of the outcome variable can be modeled as:

$$y_{it} = \beta_0 + \beta_1 X_i + \beta_2 T_t + \beta_3 X_i * T_t + \varepsilon_{it}$$

where X_i is a dummy variable with value 1 if the fund is in the treatment group and 0 if the fund is in the control group. T_t is a dummy variable with value 1 in the post-treatment period and 0 in the pre-treatment period. The DiD estimator is the OLS estimate of β_3, that is, the coefficient on the interaction between X_i and T_t. This is a dummy variable that takes the value 1 only for the treatment group in the post-treatment period.

Our DiD analysis confirms the results of our RD design. Table 9 shows the dummy variable that identifies the treatment with a positive coefficient that is highly significant. Table 9 also shows that the dummy variable that identifies the treatment group univocally (year 2012 and AUM>150M) is positive and statistically significant in March, April and May 2012. It loses significance in June and July, but it becomes significant again in August, September (with a negative coefficient) and October (with a positive coefficient).

Dependent Variable	**Monthly Return**							
Month	March	April	May	June	July	August	September	October
Post Reform Dummy * Monthly AUM Dummy *95% confidence interval*	**0.8216***** [0.23] *[0.3609, 1.2823]*	**0.8193***** [0.23] *[0.3651, 1.2737]*	**1.1962***** [0.37] *[0.4763, 1.9161]*	-0.3098 [0.25] *[0.3609, 1.2823]*	-0.0843 [0.27] *[-0.7977, 0.1781]*	**-1.4256***** [0.35] *[-0.6145, 0.4459]*	**-2.2199***** [0.39] *[-2.1134, -0.7377]*	**1.5731***** [0.39] *[0.7993, 2.3468]*
Constant	Yes	yes	yes	yes	yes	yes	Yes	Yes
Number of observations	4290	4290	4290	4290	4290	4290	4290	4290
R^2	0.0202	0.2558	0.0458	0.0662	0.0095	0.1768	0.3114	0.1261

Table 9 - Difference-in-Differences regressions, of individual hedge fund *monthly returns* over March-October 2012 on post-reform dummy (=1 for March 2012 and later), monthly AUM dummy (=1 for hedge funds with AUM greater than $150 millions), interaction between these variables, and constant term. Amounts in $. *t* statistics, with standard errors, in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% levels. Significant results (at 5% or better) are in **boldface**.

V. DISCUSSION & CONCLUSION

For much of its history, the hedge fund industry has viewed hedge fund adviser registration and the disclosure of proprietary information as a threat to its profitability. Regulators have attempted for decades to increase the monitoring and supervision of the hedge fund industry. Ending the struggle between the industry and regulators, Title IV of the Dodd-Frank Act introduced a mandatory registration and disclosure requirement for hedge fund managers.

Contrary to the hedge fund industry's claims that increased supervision and disclosure would affect its profitability, we find statistical evidence of a positive effect of the requirements introduced by the Dodd-Frank Act on hedge fund advisers' performance. More specifically, upon an examination of beta coefficients in the period following the registration effective date, the size of funds seems to have a positive relationship with fund performance. Moreover, the empirical results from a simple regression analysis suggest that the size of AUM, above or below the regulatory threshold of $150 million can play a role in explaining hedge fund returns in the time period following the registration effective date for hedge fund advisers under the Dodd-Frank Act.

The results of this study suggest that a discontinuity exists at the threshold value of $150 million AUM, above which hedge fund adviser registration under the Dodd-Frank Act becomes mandatory. Despite the great volatility of hedge fund adviser returns displayed over the period under examination, the empirical evidence is robust. The discontinuity is not persistent and dissipates in the subsequent months after the registration effective date for hedge fund advisers. Comparing the discontinuity of those fund advisers that act strategically with the remainder of the sample, strategic actions by fund advisers lead to a strong increase in the discontinuity around the AUM registration threshold. However, the effect disappears during the last months of the sample period.

Prior studies have demonstrated that mandatory hedge fund adviser registration under the Dodd-Frank Act affects the cost structure of the industry (Kaal 2013a). Kaal (2013a) collected data on hedge fund managers, showing that registration and increased

compliance requirements under the Dodd-Frank Act increase the cost structure of hedge funds. However, that increase may be marginal. Kaal (2013a) finds non-robust evidence that the higher administrative costs imposed by the Dodd-Frank Act are a second-order effect of the regulation, thereby not affecting the overall returns of hedge funds. Kaal's (2013a) result is consistent with our findings because the impact of Dodd-Frank Act registration requirements on hedge fund manager profitability does not persist in the long run.

Our regression analysis also suggests that the mandatory registration requirement imposed by the Dodd-Frank Act affects the hedge fund industry asymmetrically. We find some evidence that hedge fund advisers with AUM floating above and below the threshold value of $150 million may strategically reduce their AUM size. Because the Dodd-Frank Act affects hedge fund advisers with AUM greater than $150 million, hedge fund advisers may be incentivized to change their organizational structure or act otherwise strategically to avoid the registration and disclosure requirements imposed by the Dodd-Frank Act.

The preliminary results in this study suggest that the SEC's collection of proprietary hedge fund data via Forms ADV and PF does not negatively impact the hedge fund industry's performance as a whole. It seems to affect merely a subset of the hedge fund industry. However, our analysis needs to be extended further in order to assess more carefully the impact of the Dodd-Frank Act on administrative costs.

References

155 Cong. Rec. H14419-20 (daily ed. Dec. 9, 2009) (statement of Rep. Paul Kanjorski).

155 Cong. Rec. H14441–42 (daily ed. Dec. 9, 2009) (statement of Rep. Sheila Jackson Lee).

156 Cong. Rec. H5233, H5235–39 (daily ed. June 30, 2010) (statement of Rep. Paul Kanjorski).

156 Cong. Rec. S5902, S5912 (daily ed. July 15, 2010) (statement of Sen. Patrick Leahy).

156 Cong. Rec. S5902, S5925 (daily ed. July 15, 2010) (statement of Sen. Dick Durbin).

17 C.F.R. § 275.203A–5(b) (2012).

17 C.F.R. § 279.9 (2012).

Ackermann, Carl, Richard McEnally, and David Ravenscraft. 1999. The Performance of Hedge Funds: Risk, Returns, and Incentives. Journal of Finance 54 (3), 833-874. doi:10.1111/0022-1082.00129.

Agarwal, Vikas, and Narayan Y. Naik. 2000. Multi-Period Performance Persistence Analysis of Hedge Funds. Journal of Financial and Quantitative Analysis 35 (3), 327-342. doi:10.2307/2676207.

Agarwal, Vikas, and Narayan Y. Naik, 2006. "Flows, Performance, and Managerial Incentives in the Hedge Fund Industry", London Business School Working Paper.

Agarwal, Vikas, and Narayan Y. Naik, 2007. "Why is Santa So Kind to Hedge Funds? The December Return Puzzle." London Business School Working Paper.

Agarwal, Vikas, Naveen D. Daniel, and Narayan Y. Naik. 2009. Role of Managerial Incentives and Discretion in Hedge Fund Performance. Journal of Finance 64 (5), 2221–2256. doi:10.1111/j.1540-6261.2009.01499.

Amenc, Noël, and Lionel Martellini. 2003. "The Alpha and Omega of Hedge Fund Performance Measurement." Risk and Asset Management Research Center, EDHEC Business School, Lille, France. http://www.edhec-risk.com/events/EDHEC_Events/Event.2004-12-09.1402/attachments/alpha%20and%20omega.pdf.

Amenc, Noël, Sina El Bied, and Lionel Martellini. 2003. "Predictability in Hedge Fund Returns." *Financial Analysts Journal* 59 (5): 32-46.

Amendments to Form ADV, Investment Advisers Act Release No. 3060, 75 Fed. Reg. 49,234 (July 28, 2010) (IA Release 3060).

Americas' Financial Services Regulatory Center of Excellence (CoE). 2011. "Regulatory Reform for the Financial Services Industry--and Beyond." KPMG, issued May 4, 2011, and accessed December 3, 2012. http://www.kpmg.com/US/en/IssuesAndInsights/ArticlesPublications/Documents/dodd-frank-quickhits.pdf

Amin, Gaurav S., and Harry M. Kat. 2003. "Hedge Fund Performance 1990–2000: Do the 'Money Machines' Really Add Value?" *Journal of Financial and Quantitative Analysis* 38 (2) 251-274. doi:10.2307/4126750.

Bhanu Balasubramnian A. and Ken B. Cyree. 2014. "Has market discipline on banks improved after the Dodd–Frank Act?", *Journal of Banking and Finance* 41, 155-166

Baquero, G., J. t. Horst, M. Verbeek, 2005. "Survival, Look-Ahead Bias, and Persistence in Hedge Fund Performance." *Journal of Financial and Quantitative Analysis* 40(3): 493-517.

Brown, Stephen J., William N. Goetzmann, and James Park. 2001. "Careers and Survival: Competition and Risk in the Hedge Fund and CTA Industry." *Journal of Finance* 56 (5): 1869-1886. doi:10.1111/0022-1082.00392.

Brown, Stephen, William Goetzmann, Bing Liang, and Christopher Schwarz. 2008. "Mandatory Disclosure and Operational Risk: Evidence from Hedge Fund Registration." *Journal of Finance* 63 (6): 2785-2815. doi: 10.1111/j.1540-6261.2008.01413.x.

Cassar, G., and J. Gerakos, 2009. "Determinants of Hedge Fund Internal Controls and Fees," *The Accounting Review*, 85, 1887-1919.

Cassar, G., and J. Gerakos, 2011. "Hedge Funds: Pricing Controls and the Smoothing of Self-Reported Returns." *Review of Financial Studies*, 24 (5), 1698-1734.

Caglayan, Mustafa O., and Sevan Ulutas. 2012. "Emerging Market Betas and the Cross Section of Hedge Fund Returns." Working Paper. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2037039.

Chelsea Technologies. 2012. "Hedge Fund Managers Ramping up Mock Due Diligence Audits in Preparation for First Post Dodd-Frank SEC Examinations." News release, February 13. http://199.195.116.193/news+events/2012/02/hedge-fund-managers-ramping-up-mock-due-diligence-audits-in-preparation-for-first-post-dodd-frank-se.html

Cheng, M.-Y., Fan, J. and Marron, J.S. 1997. "On Automatic Boundary Corrections," *The Annals of Statistics*, 25, 1691-1708.

Coakley, Michael P., and Matthew P. Allen. 2011. "The New Form ADV Part 2 and the 'Plain English' Movement of the SEC, FINRA and Michigan's OFIR." *Michigan Business Law Journal* 31 (1): 19-30.

Colonico, Sebastian, Matias D. Cattaneo, and Rocio Titiunik. 2013. "Robust Data-Driven Inference in the Regression-Discontinuity Design", The Stata Journal, ii, 1-34.

_____. 2013. "Robust Nonparametric Confidence Intervals for Regression-Discontinuity Designs.", (working paper). http://www-personal.umich.edu/~cattaneo/papers/RD-robust.pdf

Commission of the European Communities. "Commission Proposal for a Directive of the European Parliament and of the Council on Alternative Investment Fund Managers and amending Directives 2004/39/EC and 2009/…/EC." COM (2009) 207 final, April 30, 2009. http://ec.europa.eu/internal_market/investment/docs/alternative_investments/fund_managers_proposal_en.pdf

Cumming, Douglas, and Na Dai. 2009. "Capital Flows and Hedge Fund Regulation" *Journal of Empirical Legal Studies*, 6, 848-873.

_____. 2010a. "A Law and Finance Analysis of Hedge Funds." Financial Management 39 (3): 997-1026. doi:10.1111/j.1755-053X.2010.01102.x.

_____. 2010b. "Hedge Fund Regulation and Misreported Returns", *European Financial Management* 16, 829-867.

Cumming, Douglas, and Sophia A. Johan, 2008. "Hedge Fund Forum Shopping",

University of Pennsylvania Journal of Business Law 10(4), 783-831.

De Los Rios, Antonio Diez, and René Garcia. 2011. "Assessing and Valuing the Nonlinear Structure of Hedge Fund Returns." *Journal of Applied Econometrics* 26 (2): 193-212. doi:10.1002/jae.1147.

Department of the Treasury. 2009. *Financial Regulatory Reform: A New Foundation: Rebuilding Financial Supervision and Regulation*. Accessed December 3. http://www.treasury.gov/initiatives/Documents/FinalReport_web.pdf

Dichev, Ilia D., and Gwen Yu. 2011. "Higher Risk, Lower Returns: What Hedge Fund Investors Really Earn." *Journal of Financial Economics* 100 (2): 248-263. doi:10.1016/j.jfineco.2011.01.003.

Dimmock, Stephen G. and William C. Gerken, 2014. "Regulatory Oversight and Return Misreporting by Hedge Funds", mimeo.

Ding, B., and H.A. Shawky, 2007. "The Performance of Hedge Fund Strategies and the Asymmetry of Return Distributions". *European Financial Management* 13, 309-331.

Dodd–Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, §§ 401, 402, 408, 124 Stat. 1326 (2010).

Economist. 2010. "A Few Minutes of Mayhem: America's Stockmarket Plunge." May 15, United States edition, 82.

Edelman, Daniel, William Fung, David A. Hsieh, and Narayan Y. Naik. 2012. "Funds of Hedge Funds: Performance, Risk and Capital Formation 2005 to 2010." *Financial Markets and Portfolio Management* 26 (1): 87-108. doi:10.1007/s11408-011-0180-z.

Eling, Martin. 2009. "Does Hedge Fund Performance Persist? Overview and New Empirical Evidence." *European Financial Management* 15 (2): 362-401. doi:10.1111/j.1468-036X.2008.00471.x.

Ernst and Young. 2012. "Global Hedge Fund and Investor Survey 2012." Accessed November 28. http://www.ey.com/Publication/vwLUAssets/Global-hedge-fund-and-investor-survey_2012/$FILE/CK0582_Global-HF-Survey-2012.pdf

Exemptions for Advisers to Venture Capital Funds, Private Fund Advisers with Less Than $150 Million in Assets Under Management, and Foreign Private Advisers, Investment Advisers Act Release No. 3222, 76 Fed. Reg. 39,646 (July 6, 2011) (IA Release 3222).

Ferullo, Mike, R. Christian Bruce, Richard Hill, and Malini Manickavasgam. 2010. "Senate Sends Regulatory Reform Bill To White House for President's Signature." *Securities Regulation and Law Report* 42: 1353.

Fuji, Daisuke, Guido Imbens and Karthik Kalyanaraman (2009), Notes for MATLAB and STATA Regression Discountinuity Software, Technical Report.

Fung, William, and David A. Hsieh. 1997. "Empirical characteristics of dynamic trading strategies: The case of hedge funds", *Review of Financial Studies,* 10(2), 275-302.

____. 2000. "Performance Characteristics of Hedge Funds and CTA Funds: Natural Versus Spurious Biases", *Journal of Financial and Quantitative Analysis*, 35 (3), 291-307.

____. 2001. "The Risk in Hedge Fund Strategies: Theory and Evidence from Trend Followers", *Review of Financial Studies*, 14 (2), 313-341.

____. 2002. "Risk in Fixed-Income Hedge Fund Styles." *Journal of Fixed Income* 12 (2): 6-27. doi:10.3905/jfi.2002.319321.
____. 2004. "Hedge Fund Benchmarks: A Risk Based Approach", *Financial Analyst Journal* 60, 65–80.
____. 2011. "The Risk in Hedge Fund Strategies: Theory and Evidence from Long/Short Equity Hedge Funds." *Journal of Empirical Finance* 18 (4): 547-569. doi:10.1016/j.jempfin.2011.04.001.
Fung, William, David A. Hsieh, and T. Ramadorai, 2008. "Hedge Funds: Performance, Risk, and Capital Formation" *Journal of Finance,* 63, 1777-1803.
Goldfarb, Zachary A. and David Cho. 2009. "Hedge Funds Making Way for Government Regulation; Industry Faces New Realities, Investors Who Want Assurances." *Washington Post,* March 14, D.2.
Giamouridis, Daniel and Sandra Paterlini. 2009. Regular(Ized) Hedge Fund Clones, CAREFIN Research Paper No. 1/09. http://ssrn.com/abstract=1600539
H.R. Rep. No. 111–517, at 865 (2010) (Conf. Rep.).
Hahn, J., Todd, P., and Van Der Klaauw, W. 2001. "Regression discontinuity," *Econometrica*, 69(1), 201-209.
Hu, H.T.C., and B. Black, 2007. "Hedge Funds, Insiders, and the Decoupling of Economic and Voting Ownership: Empty Voting and Hidden (Morphable) Ownership," *Journal of Corporate Finance 13*, 343-367.
Imbens, G. and T. Lemieux. 2008. "Regression discontinuity designs: A guide to practice," *Journal of Econometrics*, 142: 615–635.
Imbens, G., and K. Kalyanaraman. 2012. "Optimal Bandwidth Choice for the Regression Discontinuity Estimator," *Review of Economic Studies* 79 (3): 933-959.
Investment Advisers Act of 1940, Pub. L. No. 76-768, 54 Stat. 847 (1940).
Investment Company Act of 1940, Pub. L. No. 76-768, 54 Stat. 789 (1940).
Jagannathan, Ravi, Alexey Malakhov, and Dmitry Novikov. 2010. "Do Hot Hands Exist Among Hedge Fund Managers? An Empirical Evaluation." *Journal of Finance* 65 (1): 217–255. doi:10.1111/j.1540-6261.2009.01528.x.
Jickling, Mark, and Alison A. Raab. 2006. *CRS Report for Congress: Hedge Fund Failures*. Congressional Research Services, RL33746, 5, issued December 4, 2006.
Jones, Alfred Winslow. 1949. "Fashions in Forecasting." *Fortune*, March, 88.
Jorion, Philippe. 2000. "Risk Management Lessons from Long-Term Capital Management." *European Financial Management* 6 (3): 277-300. doi:10.1111/1468-036X.00125.
Kaal, Wulf A. 2009. "Hedge Fund Valuation: Retailization, Regulation, and Investor Suitability." *Review of Banking and Financial Law* 28 (2): 581-637.
____. 2011. "Hedge Fund Regulation Via Basel III." *Vanderbilt Journal of Transnational Law* 44 (2): 389-463.
____. 2013a. "Hedge Fund Manager Registration Under the Dodd-Frank Act." *San Diego Law Rev*iew 50 (1).
____. 2013b. "The Impact of Dodd-Frank Act Compliance Cost on the Hedge Fund Industry." (forthcoming). http://ssrn.com/abstract=2389423

Kane, Edward J. 2012. "Missing elements in US financial reform: A Kübler-Ross interpretation of the inadequacy of the Dodd-Frank Act", *Journal of Banking and Finance* 36, 654-661.

Kaulessar, Ricardo. 2012. "Survey: Fund Managers Welcome Regulations – With Reservations." eVestment Alliance, last modified April 13, and accessed December 4. http://news.hedgefund.net/default.aspx?story=13554.

Kelly, Kate. 2012. "A Secretive Hedge Fund Legend Prepares to Surface." *CNBC,* February 13. http://www.cnbc.com/id/46351343/A_Secretive_Hedge_Fund_Legend_Prepares_to_Surface.

Koehler, James F., and P. Wesley Lambert. 2011. "Impact of the Dodd-Frank and Registration Acts of 2010 on Investment Advisers." *Duquesne Business Law Journal* 13 (1): 29-42.

Koh F., W.T.H. Koh, and M. Teo, 2003. "Asian hedge funds: return persistence, style and fund characteristics," Working paper, Singapore Management University.

Kosowski, Robert, Narayan Y. Naik, and Melvyn Teo. 2007. "Do Hedge Funds Deliver Alpha? A Bayesian and Bootstrap Analysis." *Journal of Financial Economics* 84 (1): 229-264. doi:10.1016/j.jfineco.2005.12.009.

Landau, Peter. 1968. "Alfred Winslow Jones: The Long and the Short of the Founding Father." *Institutional Investor*, August, 1.

Lee, D., and T. Lemieux. 2009. "Regression Discontinuity Designs in Economics," Working Paper, Dept of Economics, Princeton University.

Liang, Bing. 1999. "On the Performance of Hedge Funds." *Financial Analysts Journal* 55 (4): 72-85.

____. 2000. "Hedge Funds: The Living and the Dead", *Journal of Financial and Quantitative Analysis* 35, 309-326.

____. 2003. "The Accuracy of Hedge Fund Returns", *Journal of Portfolio Management* 29, 111-122.

Lo, Andrew and Jasmina Hasanhodzic. 2007. "Can Hedge-Fund Returns Be Replicated?: The Linear Case," *Journal of Investment Management 5 (2007), 5–45.*

Loomis, Carol J. 1966. "The Jones Nobody Keeps Up With." *Fortune*, April, 237. *Nomination of William H. Donaldson: Hearing Before the Comm. on Banking, Housing and Urban Affairs*, 108th Cong. 1, 37 (2003).

McCrary, Justin. 2008. "Manipulation of the running variable in the regression discontinuity design: A density test." *Journal of Econometrics*, 142(2): 698-714.

Naik, N.Y., T. Ramadoria and M. Stromqvist, 2007. "Capacity Constraints and Hedge Fund Strategy Returns". *European Financial Management* 13, 239-256.

Nichols, Austin. 2007. "Causal Inference with Observational Data." The Stata Journal, 7, 4, 507-541.

Oesterle, Dale A. 2006. "Regulating Hedge Funds." *Entrepreneurial Business Law Journal* 1 (1): 1-42.

Paletta, Damian, and Aaron Lucchetti. 2010. "Law Remakes U.S. Financial Landscape." *Wall Street Journal*, July 16, New York edition, A.1.

Prohibition of Fraud by Advisors to Certain Pooled Investment Vehicles; Accredited Investors in Certain Private Investment Vehicles, Investment Advisers Act Release No. 2576, 72 Fed. Reg. 400 (January 4, 2007) (IA Release 2576).

Prohibition of Fraud by Advisers to Certain Pooled Investment Vehicles, Investment Advisers Act Release No. 2628, 72 Fed. Reg. 44,756 (August 9, 2007) (IA Release 2628).

Registration Under the Advisers Act of Certain Hedge Fund Advisers, Investment Advisers Act Release No. 2333, 69 Fed. Reg. 72,054, 72,059 (December 10, 2004) (IA Release 2333).

Regulating Hedge Funds and Other Private Investment Pools: Hearing Before the United States Subcomm. on Securities, Insurance, and Investment, 111th Cong. 1 (2009) (statement of Jack Reed, Chairman, Senate Comm. on Banking, Housing, and Urban Affairs, Subcomm. on Securities, Insurance, and Investment).

Regulation of Hedge Funds: Hearings Before the United States Senate Comm. on Banking, Housing, and Urban Affairs, 109th Cong. 7 (2006) (statement of Christopher Cox, Chairman, Securities and Exchange Commission).

Reporting by Investment Advisers to Private Funds and Certain Commodity Pool Operators and Commodity Trading Advisors [sic] on Form PF, Investment Advisers Act Release No. 3308 (October 31, 2011), 76 Fed. Reg. 71,128 (November 16, 2011) (IA Release 3308).

Reporting Form for Investment Advisers to Private Funds and Certain Commodity Pool Operators and Commodity Trading Advisors, *available at* http://www.sec.gov/about/forms/formpf.pdf. Accessed December 4, 2012 (Form PF).

Roth, Paul N., and Brian H. Fortune. 2001. "Hedge Fund Regulation in the Aftermath of Long Term Capital Management." In *Hedge Funds: Law and Regulation*, edited by Iain Cullen and Helen Parry. London: Sweet and Maxwell.

Rules Implementing Amendments to the Investment Advisers Act of 1940, Investment Advisers Act Release No. 3221, 76 Fed. Reg. 42,950 (July 19, 2011) (IA Release 3221).

Securities and Exchange Commission. 2003. *Implications of the Growth of Hedge Funds*. Accessed December 4, 2012. http://www.sec.gov/news/studies/hedgefunds0903.pdf.

Uniform Application for Investment Adviser Registration and Report by Exempt Reporting Advisers. Accessed December 4, 2012. http://www.sec.gov/about/forms/formadv.pdf. (Form ADV).

Sorady, Marybeth, Daren Domina, Wendy Cohen, Fred Santo, Henry Bregstein, Meryl Wiener, Marilyn Okoshi, and Jack P. Governale. 2011. "*Summary and Analysis of Dodd-Frank Rules for Investment Advisers: Registration Requirements, Exemptions, Family Offices, Performance Fee Eligibility." Journal of Investment Compliance* 12 (4): 4-17. doi:10.1108/15285811111188126.

Strasburg, Jenny. 2009. "U.S. would have hedge funds register and disclose clients." *Wall Street Journal*, February 3, Asia edition, M.3.

Sun, Zheng, Ashley Wang, and Lu Zheng. 2012. "The Road Less Traveled: Strategy Distinctiveness and Hedge Fund Performance." *Review of Financial Studies* 25 (1): 96-143. doi:10.1093/rfs/hhr092.

Teo, M., 2009. "The Geography of Hedge Funds." *Review of Financial Studies* 22, 3531-3561.

Trochim, W. 1984. *Research Design for Program Evaluation: The Regression-Discontinuity Design*. Sage Publications, Beverly Hills, CA.

Trochim, W. 2001. Regression-discontinuity design. In: Smelser, N.J., Baltes, P.B. (Eds.), *International Encyclopedia of the Social and Behavioral Sciences*, vol. 19. North-Holland, Amsterdam, pp. 12940–12945.

Van Der Klaauw, W. 2008. "Regression–Discontinuity Analysis: A Survey of Recent Developments in Economics," *Labour*, 22(2): 219-245.

Verret, J.W., 2007. "Dr. Jones and the Raiders of Lost Capital: Hedge Fund Regulation, Part II", *Delaware Journal of Corporate Law* 32, 799-841.

Appendix A - Descriptive Statistics

Table 1- (*Selective) Descriptive Statistics in the period January-October 2012*

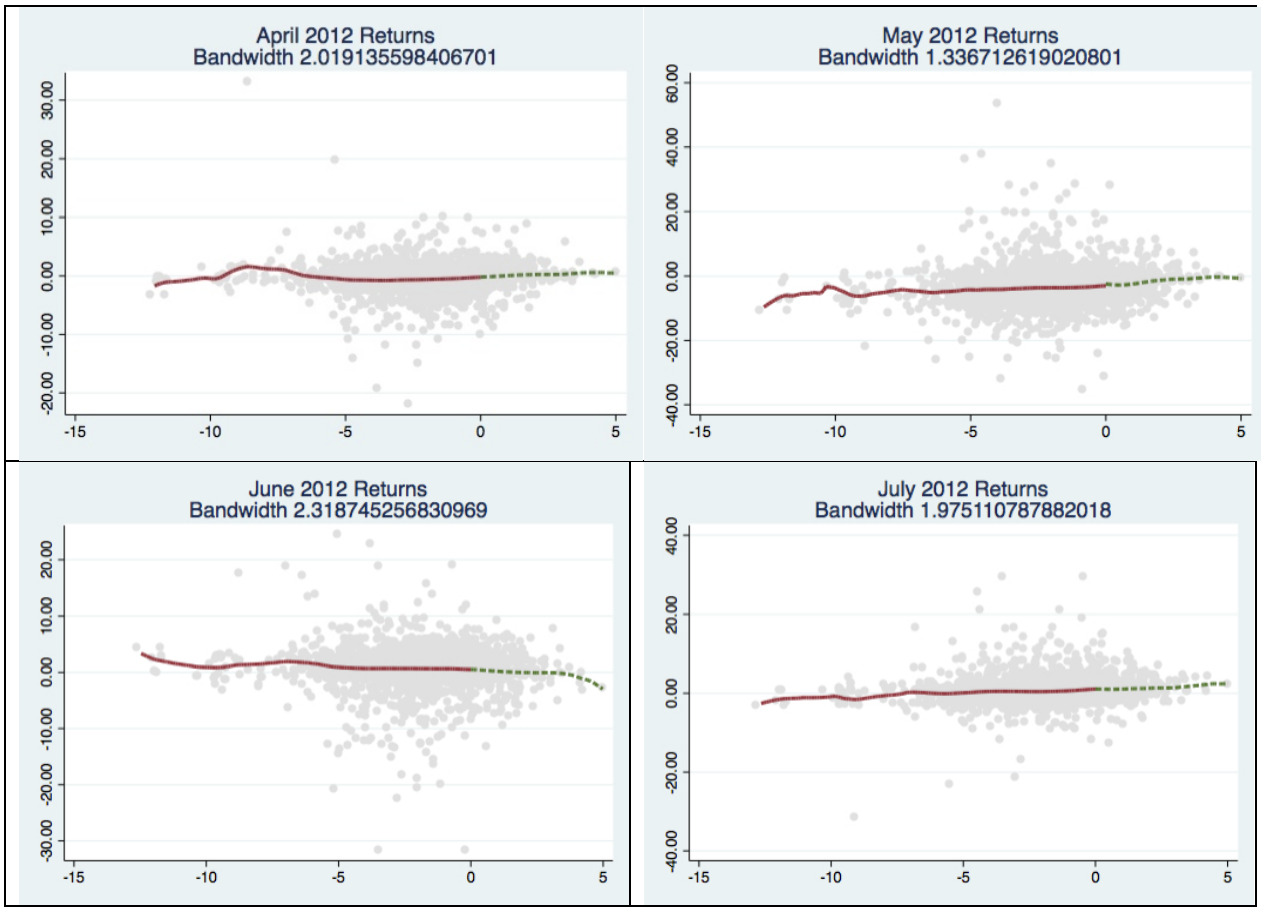
	Jan 2012	Feb 2012	March 2012	April 2012	May 2012	June 2012	July 2012	Aug 2012	Sept 2012	Oct 2012
Min	-38.32	-16.18	-28.78	-22.03	-35.27	-31.80	-31.67	-15.38	-34.84	-21.15
Mean	2.67	2.32	-0.335	-0.435	-3.478	0.616	0.571	1.444	1.371	-0.381
Median	2.07	2.12	0.01	-0.34	-3.250	0.660	0.500	1.27	1.28	0.02
Max	44.33	48.55	27.21	32.96	53.410	24.37	29.28	107.3	18.71	80.01
St Dev	4.007	3.118	3.185	2.391	5.071	3.695	3.321	3.471	2.770	3.251

Panel a) - *Hedge Fund Monthly Returns*

	Jan 2012	Feb 2012	March 2012	April 2012	May 2012	June 2012	July 2012	Aug 2012	Sept 2012	Oct 2012
Min	6.761	6.737	6.823	6.608	6.040	6.204	6.006	5.902	5.849	5.963
Mean	17.101	17.119	17.112	17.083	17.038	17.031	17.017	17.027	17.027	17.004
Median	17.275	17.293	17.269	17.269	17.200	17.207	17.183	17.187	17.187	17.175
Max	23.839	23.849	23.843	23.853	23.844	23.811	23.845	23.877	23.923	23.926
St Dev	2.122	2.124	2.120	2.151	2.165	2.161	2.169	2.163	2.177	2.177
# Funds with AUM> $150M	405	412	410	411	398	396	392	401	402	393

Panel b) - *Hedge Fund Monthly Asset Under Management (AUM)*

Appendix B – Sharp Regression Discontinuity for Optimal Bandwidth. Period: April – September 2012



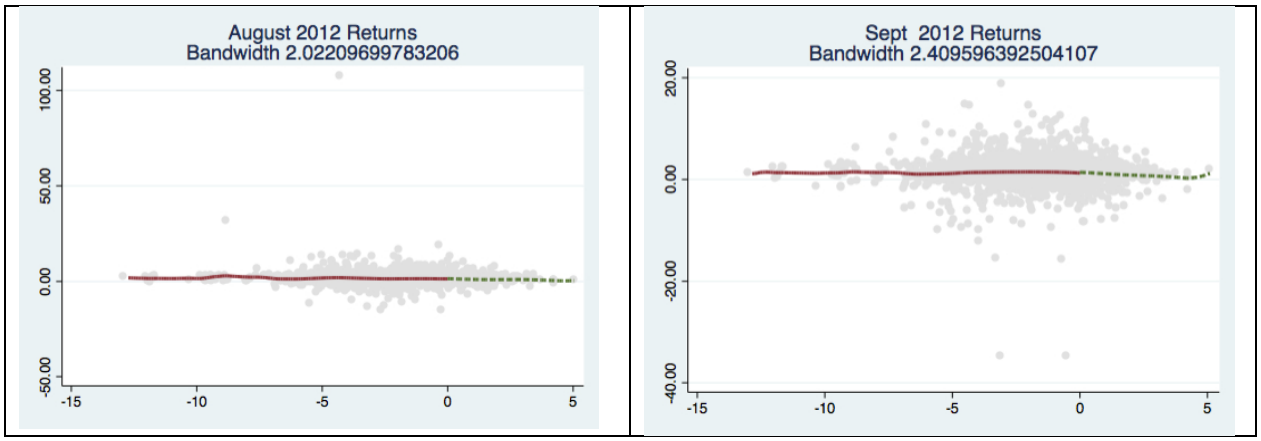


Figure A.1 Sharp Regression Discontinuity for optimal bandwidth. Period: April-September 2012