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Investor irrationality and closed-end hedge funds

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Abstract

This study questions the rationality of people investing in HFs. I use a sample of London listed closed-end hedge funds to evaluate two criteria that imply irrational behavior. I find that the rationality of investors can not be rejected for the majority of time. However, the results also imply that investors react irrationally when facing the worsening economic conditions in the second half of 2008.

1 Introduction

The purpose of my study is to question the rationality of people investing in hedge funds (HFs). My investigation is based on the following simple proposition: it is irrational to have similiar expectations about the future performance of different HFs. The reasoning behind this proposition is as follows. If people have similiar expectations across funds, they believe that different funds follow similiar investment strategies. But, if all managers followed similiar strategies, these strategies would unlikely be the result of manager specific abilities such as an elaborate research process or profound knowledge of financial markets, more likely, these strategies would rely on publicly known investment rules. Hence investors are willing to pay for a service they could provide themselves with little effort. In light of the fact that HFs usually charge 2% management fee and 20% performance fee[1] I consider such behavior as irrational, let alone the fact that there is substantial counterparty risk involved.

I define two criteria which imply that investors do not distinguish expectations across funds, i.e. behave irrationally. Criterion 1: if investors are willing to engage in a new fund based on their believes about seasoned funds, then they behave irrationally. Criterion 2: if investors expectations about seasoned funds are driven by a common source, then they behave irrationally.

For my investigations I use a sample of London listed closed-end hedge funds (CEHFs). A CEHF is a closed-end fund (CEF) that invests its assets in one

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[1]See Goetzman et al. (2003).

or more HFs. The underlying HFs exhibit an open-ended structure, that is, investment can be redeemed at the net asset value (NAV). However, investments in HFs are usually subject to long lock-up periods.[2] The CEHFs exhibit a closed-end fund structure , that is, at inception a fixed number of shares is issued and then traded on a stock exchange. Redemption of these shares is generally not possible.

The net asset value (NAV) of the CEHF is calculated as the sum of the reported market prices of the investments in the underlying HFs. Insofar as the exact composition of the HFs is generally not known I have to assume that these prices reflect fundamentals and provide the best estimate of the *current* value of the fund. Further I assume that deviations from the share price (SP) of the fund to the NAV per share express investors' expectations about the quality of the *future* managerial decisions, i.e. the benefits from active portfolio management.[3] I refer to these deviations as discounts: if shares trade below (above) their NAV, the discount is positive (negative).[4] Positive discounts imply that investors believe the fund managers charge more fees than they add value, negative discounts imply that investors believe the fund managers' skills overcompensate the fees.

To investigate the first criterion I consider how starts of new funds are related to average discounts of seasoned funds. I find that new funds tend to get issued when seasoned funds trade at low discounts – which suggests that investors are irrational. But, using a subsample of funds for which investors have more specific information, I argue that the relation of fund starts and low discounts is the result of the informational idiosyncrasies of the IPO process rather than irrationality. Criterion 2 is examined by observing the co-movement of changes in discounts and several macroeconomic variables. The results show that investors do not behave irrationally (according to Criterion 2) for the majority of time. However, in aggregate, they react with a burst of pessimism to increasingly bad economic conditions in the second half of 2008.

I emphasize that these two criteria challenge the rationality of investors on an aggregate level. Only if the behavior of the aggregate of people investing in CEHFs exhibits a systematic irrational component, it is also observable in the results. Further these criteria are not applicable to examine the behavior of people investing in funds which have a closely limited investment focus as the perception of such funds is biased by investors' expectations about the investment range. HFs, on the other hand, are characterized as following investment strategies that are not typical for a specific market or asset class.[5]

The remainder of this study is organized as follows. Section 2 relates my investigations to other studies. Section 3 covers data and variable description. Criteria 1 and 2 are examined in Sections 4 and 5. Section 6 discusses the cross-sectional variation of discounts. Section 7 concludes.

[2] See Agrawal and Naik (2000).
[3] See Boudraux (1973) for a first discussion of this idea.
[4] I also refer to a negative discount as a premium.
[5] See AFM (2005) and EBK (2007).

2 Relation to other studies

The present paper is motivated by two streams of literature that intend to explain the often puzzling patterns in discounts of CEFs.[6] The first stream is pioneered by Lee et. al (1991) who interpret fluctuations in discounts of CEFs as a result of irrational investor behavior. A countermovement initiated by Ross (2002a) and Ross (2002b) relies on the reasoning of neoclassical finance and refuses to accept irrationality as the primary argument. These latter studies readopt several ideas first discussed in Malkiel (1977).[7] I emphazise that my study does not intend to provide new explanations for the CEF puzzle but rather investigates whether investors show indications of irrational behavior.

Lee et al. (1991) is based on the noise trader model introduced in DeLong et al. (1990). In this model discounts are driven by irrational investors who commonly react to unqualified information ('noise') and randomly drive prices of CEF below and above their NAV. Rational investors who want to exploit their superior beliefs have to account for the possibility that their irrational counterparts take even more extreme positions during their investment period. As a consequence, prices are not fully driven back to the NAV in equilibrium and usually trade below their NAV due to the additional risk infered by the noise traders. Lee et al. (1991) refer to these collective bursts of optimism or pessimism as investor sentiment.[8] Two implications of the noise trader model are relevant for my study: funds tend to get started when seasoned funds trade below their NAVs, and discounts of seasoned funds move together.

The second stream of related literature explains changes in discounts based on agency costs. These studies usually explain how funds get issued at a premium and then move into discounts.[9] However, none of these studies manages to explain the co-movement in discounts which is reported in several studies.[10] Hence co-movement in discounts across funds is a strong argument favoring irrational investor behavior.[11]

[6] These puzzling fluctuations are usually summarized as the CEF puzzle. An overview is given in Lee et al (1990).

[7] I do not consider the effect of market frictions but refer to Pontiff (1996) for a study on the influence of arbitrage costs and to Datar (2001) and Cherkes (2007) for discussion on the impact of liquidity.

[8] Lee et al. (1991) argue that investor sentiment present a new pricing factor for assets generally held by small investors. This assertion triggered a series of papers such as Chen et al. (1993), Chopra et al. (1993), Brauer (1993) and Elton et al. (1998).

[9] Weiss (1989) reports that funds usually move into discounts within 120 days. Studies explaining such behavior are Arora et al. (2003) and Ferguson and Leitstikow (2004). Additionally, the model presented in Berk and Stanton (2007) predicts the wide variation in discounts across funds by relying on managerial ability and the implications of a long-term labor contract.

[10] See Bodhurta et al. (1995), Pontiff (1997) and Doukas and Milanos (2005).

[11] To my knowledge Cherkes (2007) is the only study which can explain this behavior without having to rely on investor irrationality.

3 Description of the sample and variable definition

The sample for the main analysis of this study consists of 37 CEHFs that have been admitted to trading on the London Stock Exchange (LSE) during the years 1996 to 2008 (see Table 1). I do not consider funds that have been admitted to trading on another market before the listing on the LSE.[12] Information on the funds is gathered from several sources: annual reports are the primary source for information on the manager of the fund and the issue of new shares. The monthly newsletters provide month-end net asset values (NAVs) per share. Data on month-end shares prices and market capitalization are obtained from Datastream.

The sample of CEHFs can be divided in two classes: single manager funds (SMFs) and multi manager funds (MMFs). A SMF is a CEF that invests its assets according to the advice of a single HF manager. The SMFs usually act as feeder funds for seasoned, unlisted HFs. A MMF is a CEF that exhibits a fund of hedge funds structure. The manager of the MMF chooses to invest the fund's assets in several HFs that she expects to provide superior performance. Hence the performance of a MMF depends on the ability of several HF managers. The MMFs outnumber the SMFs both in number and market capitalization: by the end of 2008 the 24 listed MMFs account for a market capitalization of 3594.11 million Euro, the 10 SMFs exhibit a market capitalization of 1212.89 million Euro.

The difference between the SMFs and the MMFs is best observable in the fee structure. Investments in the MMFs are subject to two layers of fees. The manager of the MMFs charge management and performance fees for selecting other fund managers. Additionally the selected HF managers charge management and performance fees for their services. In my sample the managers of the MMFs charge, on average, 1.37% management fee and 11.25% performance fee. The SMFs charge only one layer of (significant) fees: while the investment in the master fund is subject to management and performance fees, on the level of the SMF a (comparably) small administration fee is charged.

Several CEHFs are offered in more than one currency class. The most common currency classes are US Dollar, Euro and GBP. Each currency class has a separate account and costs are allocated to these accounts. Moreover, each class has its own international security identification number and is individually traded. For each fund I only consider the class that exhibits the hightest market capitalization as this class is usually the most liquid one.

I express the discount $disc_{i,t}$ of the $i-th$ asset at the end of month t as

$$disc_{i,t} = \frac{NAV_{i,t} - SP_{i,t}}{NAV_{i,t}}, \tag{1}$$

where $NAV_{i,t}$ and $SP_{i,t}$ are the month-end NAV and month-end share price of

[12] The names of these funds are obtained from the analyst report on listed hedge funds by Tom Skinner, Cazenove Capital.

Table 1: **Closed-end hedge funds listed on the London Stock Exchange (LSE).** The listing date ('list date') denotes the month in which shares of the fund are traded for the first time on the LSE. Three funds are delisted before the end of 2008. The market volume ('mk 08') is denoted in million Euro and taken at the last trading day of 2008 (or the month before delisting). It summarizes the market volume of all shares classes. The discount for month t is calculated as $disc_t = \frac{NAV_t - SP_t}{NAV_T}$, where NAV is month-end net asset value of the fund, and where SP is the month-end share price. The average discount ('avg disc') denotes the average of the month-end discounts from inception of the fund to the end of 2008 (or to its delisting). The discount for the end of 2008 (or the last month before delisting) is denoted as 'disc 08'. If a share is traded in more than one currency class, I use the share class with the largest market capitalization. The last column ('type') denotes whether the CEHF invests in one (single) underlying hedge fund or in several funds (multi).

Name	**list date**	**mkt 08**	**avg disc**	**disc 08**	**type**
Alternative Invstment Stgs	12/96	197.41	3.8%	27.4%	multi
HSBC European Absolute*	04/01	19.04*	1.6%*	1.3%*	multi
Dexion Absolute	12/02	838.12	-1.7%	31.7%	multi
Thames River Hedge	02/04	211.47	-0.2%	39.9%	multi
Dexion Equity Alternative	04/04	99.77	2.1%	18.6%	multi
Dexion Trading	11/04	108.69	1.6%	21.0%	single
HSBC Global Absolute	11/04	84.3	2.2%	33.4%	multi
Absolute Return trust	01/05	202.03	-1.1%	23.3%	multi
Acencia Debt Strategies	02/05	99.37	-0.5%	40.0%	multi
Tapestry Investment Company	02/05	52.56	2.1%	36.0%	multi
RAB Special situations	05/05	15.72	16.4%	55.4%	single
KGR Absolute Return	11/05	50.74	1.6%	18.0%	multi
Value Catalyst Fund	12/05	94.36	-1.8%	-4.7%	single
The Cayenne Trust	01/06	29.87	2.0%	4.4%	single
BlueCrest All Blue	05/06	241.84	2.5%	17.1%	single
CMA Global Hedge	07/06	111.31	5.0%	56.8%	multi
Goldman Sachs Dynamic Oppt.	07/06	214.45	4.7%	43.3%	multi
New Star Abs. Ret. Growth**	08/06	20.25**	1.8%**	3.9%**	single
New Star Abs. Ret. Value**	08/06	18.24**	1.0%**	2.9%**	single
Cazenove	10/06	62.87	-0.3%	17.4%	single
New Star HDGE 250 Index 1x	11/06	52.73	1.5%	20.1%	multi
New Star HDGE 250 Index 3x	11/06	2.43	3.6%	51.7%	multi
Signet Global Fixed Strategies	11/06	35.08	-0.4%	26.3%	multi
Invesco Perpetual Select Hedge	11/06	19.54	1.2%	2.8%	multi
Aida Fund	12/06	24.16	2.4%	13.1%	multi
Dexion Alpha Strategies	03/07	60.72	5.5%	34.2%	multi

Name	list date	mkt 08	avg disc	disc 08	type
FRM Credit Alpha	03/07	56.09	1.0%	27.2%	multi
BH Macro	03/07	942.49	-1.0%	17.40%	single
Gottex Market Neutral	03/07	25.33	3.5%	31.6%	multi
JP Morgan Progressive	05/07	17.24	-1.1%	11.2%	single
F&C Event Driven	06/07	37.71	8.7%	29.9%	multi
Saltus European Debt Strategies	06/07	16.64	7.1%	35.3%	multi
Third Point offshore	08/07	123.86	11.6%	43.8%	single
Terra Catalyst	02/08	38.5	9.9%	41.3%	single
Black Rock Absolute Return	04/08	71.46	3.0%	42.9%	multi
BH Global	05/08	462.25	5.5%	28.0%	single
FRM Diversified Alpha	06/08	34.06	20.0%	32.8%	multi

*delisted in 09/08; **delisted in 07/08.

fund i for month t. Note that discounts are postive if the fund's shares trade below its NAV per share. Following Lee et al. (1991) I construct a value weighted discount (VWD) index:

$$VWD_t = \sum_{i=1}^{n_t} w_{i,t} disc_{i,t}, \tag{2}$$

where n_t is the number of funds at the end of month t, and where $w_{i,t}$ is the weight of fund i at the end of month t. The weight is calculated using the month-end market capitalization (in Euro) of the fund divided by the total market capitalization of all funds trading at the time. Monthly changes in VWD are denoted by

$$\Delta VWD_t := VWD_t - VWD_{t-1}.$$

Similiar I construct indices only considering the SMFs (VWDS) and only considering the MMFs (VWDM).

I calculate the values of VWD for the period January 2005 to December 2008 (01/05-12/08). For this period VWD contains at least 7 constituents. Its values are depicted in Figure 1. Note that for about half the time the values of VWD are negative and for the majority of time below 5% until peaking to almost 27% at the end of 2008. The average (median) of VWD is 0.37% (-0.68%). These values are considerable lower than the values reported in other studies: Lee et al. (1991) report that the average discount for U.S. funds range around 10% for the period from 1965 to 1989, Anderson et al. (2002) report that the average discount in February 2001 for all equity funds is 10.9%.

I compare the SMFs and MMFs for period 01/07-12/08. It is not possible to compare these two indices for longer periods as the SMFs tend to get issued at later times. For the period 01/07-12/08 the SMF contains at least 5 funds, the MMFs contains at least 20 funds. The mean (median) discount is 5.49% (4.43%) for VWD and 2.5% (-0.02%) for VWDM. Hence investors believe that managers of MMFs add more value in selecting the funds than they charge for it. Considering the expensive fee structure of MMFs this result is remarkable. It

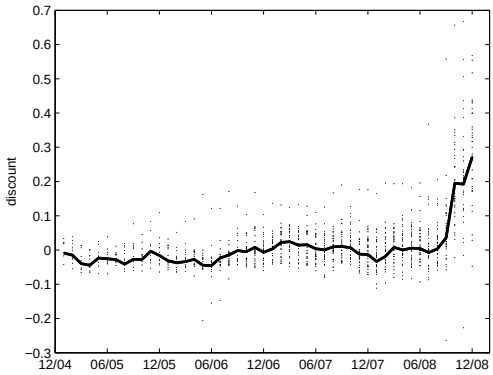

Figure 1: **Month-end values of VWD from 01/05 to 12/08.** The VWD reflects the average value-weighted discounts of all closed-end hedge funds trading on the LSE. The month-end discounts of individual funds are depicted as dots. The average (median) values of VWD is 0.0037 (-0.0068). The discounts strongly increase in the second half-year of 2008 to a maximum discount of 27%.

indicates that investors are aware that identifying managerial ability is a difficult task, and they are willing to pay large fees to professionals for providing this service.

4 Raise of new capital

This section investigates if investors are irrational according to Criterion 1. I test how the start of new funds and the issue of new capital by seasoned funds are related to average discounts of seasoned funds.

4.1 Start of new funds

Lee et al. (1991) find that new funds tend to get issued when existing funds trade at a negative discount. They interpret this finding as evidence for the noise trader model, i.e. it is the result of irrational investor behavior. Nonetheless, Lee et al. (1991) have to admit that new funds also get started when existing funds trade at a discount – a clear contradiction to the predictions of their model. I observe a similiar pattern (see Figure 2): funds tend to get issued after seasoned funds have traded at low discounts, but also in times of positive discounts managers can raise capital for new funds. Note that in 2008 four new funds get started. These IPOs raise more than 1 billion Euro.

I claim that the observed pattern is not the result of irrational behavior but based on a lack of information. For most investors the amount of information prior to the IPO of a fund is restricted to what is given in the prospectus.

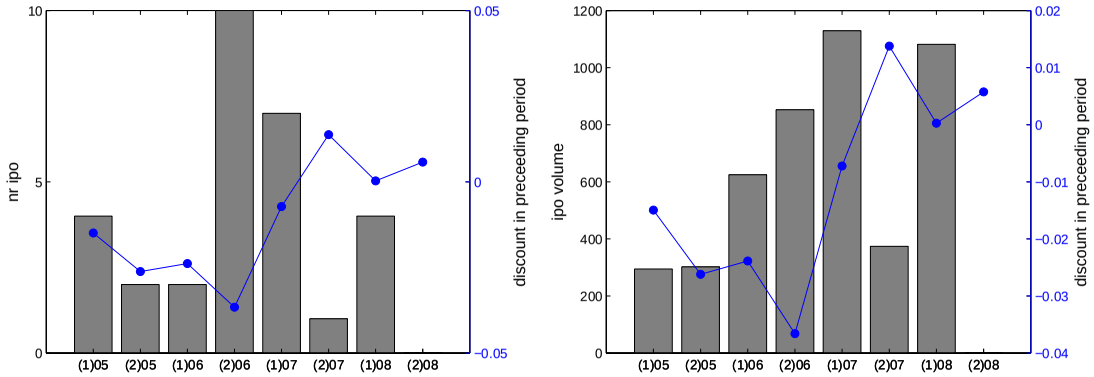

Figure 2: **Number of new fund starts in relation to preceeding average discounts.** I divide the period 01/05-12/08 in subperiods of 6 months. (1)05 refers to the first half-year of 2005, etc. For each subperiod the number of fund starts (left figure) and the volume raised (right figure) is depicted. The volume is denoted in units of 1000 Euro. The solid line depicts the value-weighted discounts (VWD) for the *preceeding* period. By comparing the fund starts with the lagged discounts I account for the fact that it usually takes several months for a fund to get issued. Note that most funds get started in the second half-year of 2006, i.e just after seasoned funds have traded at the lowest discount of -0.036. Further investor are able to raise a high volume in 2008, i.e. after average discounts have risen to a positive level. The total amount of capital issued through IPOs is 4659.34 million Euro.

Table 2: **Subsample of new issues by managers who already manage seasoned funds.** In my sample 10 new funds have entitled managers who already manage seasoned funds at the time their IPO. This table denotes the name of the new fund, the name of the seasoned fund, the listing date of the new fund and the name of the common manager. Moreover, the 6 months average of the discounts of the seasoned fund ('IPO seas.') and of VWD ('IPO VWD') before the issue of the new fund is depicted.

new fund	**seasoned fund**	**listing date**	**common manager**	**IPO seas.**	**IPO VWD**
Dexion Equity Alternatives	Dexion Absolute	04/04	Dexion Capital	-5.1%	n.a.
Dexion Trading	Dexion Absolute	11/04	Dexion Capital	-5.2%	n.a.
HSBC Global Absolute	HSBC European Absolute	11/04	HSBC Alternative Invst.	-1.3%	n.a.
New Star Hedge Index*	New Star Abs. Return*	11/06	New Star Asset Mgmt	-3.4%*	-1.8%
Invesco Perpetucal	Absolute Return trust	11/06	Fauchier Partners	-3.1%	-1.8%
Dexion Alpha Strategies	Dexion Absolute	03/07	Dexion Capital	-4.7%	0.6%
Saltus European Debt Strategies	Acencia debt Strategies	06/07	Saltus Partners	-2.3%	1.4%
Value Catalyst Fund	Terra Catalyst Fund	02/08	Laxey Partners	0.2%	-1.0%
BH Global	BH Macro	05/08	BH Macro Mgmt.	-4.1%	-0.9%
FRM Diversified Alpha	FRM Credit Alpha	06/08	FRM Invest. Mgmt	-3.1%	-0.6%

*The 'New Star Hedge Index' is listed 3 months after the listing of the 'New Star Absolute Return' fund. I depict the three month average discount in this case.

The prospectus is a legal document that provides a potential investor with information about a new fund. Its content is specified by the authorities. The prospectus usually contains (among other information) the legal incorporation of the fund, the fee structure, the potential risks of such an investments and the CV's of the managers. Therefore it is a valuable tool to enhance transparency of fund investments. Nonetheless, the information contained in the prospectus usually does not considerably differ across funds, and it does not enable the investor to distinguish the specific qualities of a new fund from the seasoned funds. As a consequence, investors use the available information about the seasoned funds as a proxy for what to expect from the new fund, and therefore, new funds tend to get issued when investors are optimistic about the existing funds. Clearly, such behavior is irrational according to Criterion 1. However, it would be premature to conclude that investors are irrational based on this relationship as, generally, there is no other information available on which investors can rationally base their decisions.

I continue the discussion of Criterion 1 by using a sub-sample (S1) of 10 funds that are issued by managers who are also responsible for the management of seasoned CEHFs (see Table 2). For the funds in S1 the investors dispose of more specific information as they can observe the manager of these new funds investing the assets of already seasoned funds. I propose that rational investors exploit this information while irrational investors still rely on their overall sentiment about CEHFs.

For each of the funds in S1 I consider the 6 months prior to its issue and calculate the average discount of the related seasoned fund (Table2, 'IPO seas.') and the average of the VWD (Table 2, 'IPO VWD') for this period. In all but one cases (the only exception is the IPO of the Terra Catalyst Fund by Laxey Partners) the seasoned funds trade at a negative discount before the listing of the new fund. Moreover, in all but one cases (the only exception is, again, the Terra Catalyst Fund) the average discount of the seaseond fund is lower than the average of the VWD, that is, at the time of the issue of a fund in S1 investors are particularly optimistic about the abilities of the manager issuing the fund. I conclude that investors exploit the available information and therefore do not behave irrationally accroding to Criterion 1.

4.2 Raise of new capital by existing funds

A substantial part of capital raised by CEHFs is by means of issues of new shares by existings funds (issued capital: 1032.03 million Euro). The issue of new shares usually proceeds as follows. First the fund management calls for the subscription of so-called C shares. The proceeds of the issue are then managed in a seperate pool. The C shares are usually not traded on a stock exchange. Once a certain limit (usually 85%) of the net proceeds is invested, the C shares are converted to ordinary shares. The rate of conversion is predefined at issue and is based on the relation of the NAVs.

Again I apply the division in sub-periods of six months and compare the issue of new shares to the average discount of the existing funds in the preceeding

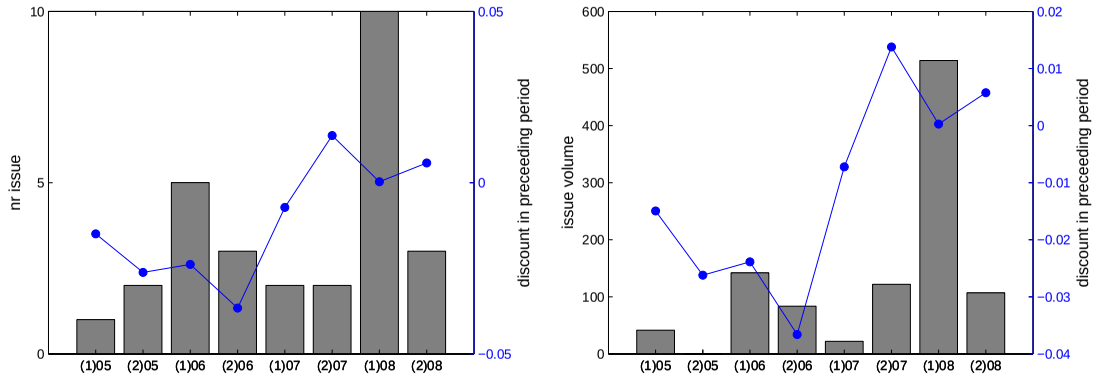

Figure 3: **Number of shares issues and issued capital by seasoned funds in relation to preceeding average discounts of seasoned funds.** I divide the period 01/05-12/08 in sub-periods of 6 months. (1)05 refers to the first half-year of 2005, etc. For each sub-period the number of fund issues (left figure) and the volume raised through issues of new shares (right figure) is depicted. The volume is denoted in units of 1000 Euro. The solid line depicts the averages of the value-weighted discounts for the *preceeding* period. By comparing the issues with the lagged discounts I account for the fact that it usually takes several months for a fund to issue new shares. Most issues (both in term of number and capital) take place in the first half-year of 2008 just after seasoned funds have moved into positive discounts.

Table 3: **Lagged discounts before new shares are issued.** In my sample I find 28 cases in which a seasoned fund raises new capital by means of a share issue. I consider the cross-sectional means (medians) of the discounts of the issuing fund for several lags. For example, to calculate the mean (median) reported as 'lag 4' I proceed as follows. If a fund issues new capital, I consider the discount 4 months prior to the issue. Hence the months in which the discounts are considered usually do not correspond across funds. If the fund issues capital in more than one occasion, I use the discounts 4 months prior to each issue. Then the mean and the median of this cross-section of discounts for each of the indicated lags are calculated. I use a Student t-test (Wilcoxon rank test) to test whether the mean (median) is significantly below 0. */**/*** denotes significance at the 1%/5%/10% level.

	t-test: mean discount< 0	rank test: median discount < 0
lag 0	-2.06%**	-3.85%***
lag 2	-2.10%**	-3.45%***
lag 4	-2.18%***	-2.08%***
lag 6	-1.30%*	-2.40%***
lag 8	0.80%	0.71%
lag 10	0.30%	0.29%

sub-period. The results are depicted in Figure 3 (left-hand side for number of issues, right-hand side for volume issued). It is not surprising that capital raises usually take place at later times as there are more funds that can actually issue new shares. But the results are still remarkable as most capital is raised in 2008 – just after the average discount of the seasoned funds has moved to a positive level. Hence there seems to be no relation between the issue of new capital by seasoned funds and general expectations of investors about CEHFs.

The previous section shows that investors' expectations about a new fund are closely related to their expecations about other funds with the same manager, that is, expectations are manager specific. In case of issues of new shares by existing funds I take this idea a step further. At the time of the issue the investors have fund specific information, hence I expect that the issuing fund trades at a low discount before the new shares are issued. Note that fund managers often appoint so-called investment advisors with the actual trading in the fund capital, that is, the performance of the fund has an additional component that is not common to all funds of a manager. The results depicted in Table 3 support my assertion. Funds which are able to raise new capital usually have significantly negative discounts up to 6 months prior to the issue. Hence the ability to raise new capital is significantly related to investors' expectations about the specific fund.

Further the values are positive for lag 8 and lag 10, i.e. significant discounts are only observable within the 6 months prior to the issue. Hence managers react quickly to low discounts and complete capital raises within few months. Moreover, as the cost of an issue usually accounts for about 1.5%-2% the 2% premium seems to be a natural boundary for investors' willingness to engange with a capital raise.

Table 4: **Correlation between ΔVWD and several macroeconomic variables.** This table shows ΔVWD_t is related to changes in macroeconomic variables and overall hege fund performance. I briefly describe these variables: $\Delta HF(t)$ proxies the overall return of hedge funds measured as $\log HF(t) - \log HF(t-1)$, where $HF(t)$ is the value of the CS/Tremont hedge fund index; $\Delta MSCIEUR(t)$ is the overall performance of European stocks measured as $\log MSCIEUR(t) - \log MSCIEUR(t-1)$, where $MSCIEUR(t)$ is the value of the MSCI Europe equity index; $MP(t)$ (respectively $(YP(t))$ is the monthly (respectively yearly) change in EU industrial production measured as $\log(IP(t)) - \log(IP(t-1)$ (respectively $IP(t) - IP(t-12)$), where $IP(t)$ is the EU industrial prductions; $CS(t)$ is the change in risk premia (credit spread) measured by $CBBB(t) - LGB(t)$, where $BBB(t)$ is the return on BBB rated corporate bonds at time t and $LAAA(t)$ is the return on AAA long term government bonds at time t; $TS(t)$ is the change in the term structure (term spread) measured by $LGB(t) - SGB(t)$, where $SGB(t)$ is the return on short-term government bonds for month t. I consider both linear and rank correlation. */**/*** implies significance at the 1%/5%/10% level.

linear correlation						
period	ΔHF_t	$\Delta MSCI(t)$	$MP(t)$	$YP(t)$	$CS(t)$	$TS(t)$
01/05-12/08	-0.24	-0.44***	-0.58***	-0.53***	0.59***	0.37***
01/05-06/08	0.23	0.03	-0.01	0.12	-0.21	-0.04
rank correlation						
period	ΔHF_t	$\Delta MSCI(t)$	$MP(t)$	$YP(t)$	$CS(t)$	$TS(t)$
01/05-12/08	0.11	-0.07	-0.10	-0.04	-0.17	-0.01
01/05-06/08	0.16	0.07	0.09	0.17	-0.26*	-0.04

5 Changes in discounts

This section investigates Criterion 2. I examine if changes in discounts of different funds are driven by a common source, that is, if investors adapt their expectations about managerial ability to the market conditions.

5.1 Drivers for changes in discounts

To find possible drivers for discounts I use several macroeconomic factors. Following Chen et al. (1986) I consider the following variables: industrial productions, risk-premia on bonds and the term structure of interest rates. As US investors are not allowed to invest in the funds in my sample I adopt these factors to the European market. Additionally, I investigate how discounts are related to overall stock market returns and to performance of the hedge fund industry. I calculate linear correlation and rank correlation between ΔVWD and innovations in these variables for the period 01/05-12/08 and for the sub-period 01/05-06/08.[13]

The results are depicted in Table 4. For the sub-period 01/05-06/08 no correlation coefficient is significantly different from zero, neither for linear nor for rank correlation. Such a pattern is what I expect from rational investors

[13] A discussion of several measures of co-movement is provided in Embrechts et al. (2005).

Table 5: **Pairwise correlation of changes in discounts.** I consider a sub-sample (S2) of 11 funds that have at least 36 months of observation. Then I calculate linear and rank correlation for every pair of funds in S2. The average of these correlation coefficients and the percentage of coefficients that are significantly greater than zero are stated. Note that the numbers drop when the last 6 months are excluded from the consideration.

linear correlation		
period	avg. pairwise correlation	positive at 5% level
01/06-12/08	0.39	54.55%
01/06-06/08	0.18	18.18%
rank correlation		
period	avg. pairwise correlation	positive at 5% level
01/06-12/08	0.24	41.82%
01/06-06/08	0.19	29.09%

paying fees to fund managers in believe that these managers have the ability to generate positive returns independent of market developments.

Now, when considering the whole sample period 01/05-12/08 the results differ. While all but one coefficients are significantly different from zero at the 5% level for linear correlation, rank correlation does not report any significant co-movement. To interpret this result I note that linear correlation is sensitive to outliners, that is, a small number of extreme, common observation can cause the result to change considerably. In contrast, rank correlation is more robust to extreme values. The second half-year of 2008 is characterized by strong changes in the macroeconomic factors and in investor expectations: economic outlook worsens and discounts increase. I conclude that small changes in macroeconomic perspective do not cause investors to adapt their expectations about future managerial performance - but once the outlook becomes considerably negative (as observed in the second half-year of 2008) investors no longer believe that managers are able to withstand the downtrend and become pessimistic about CEHFs in general.

5.2 Correlation of changes in discounts

Several studies on CEFs report that discounts tend to move together across funds. This observation is the main argument favouring irrational investor sentiment. Studies relying on irrational investors do not manage to explain such a pattern. The noise trader model, on the other hand, predicts exactly this behavior. I consider how changes in discounts are correlated for my sample of CEHFs. I use both linear and rank correlation. As a compromise of cross-sectional and time-series data availability I consider a sub-sample (S2) of funds that have at least 36 months of data availability. S2 contains 11 funds.

Table 5 reports that the average pairwise linear correlation coefficient for the funds in S2 is 0.39, and 54.55% of the coefficients are significantly positive

Table 6: **Cross-sectional variation and mean.** I use several measures to proxy cross-sectional variation: standard deviation (SD), the difference between maximal and minimal discount (MAX-MIN) and the absolute deviation from the mean (ABS). I calculate the linear and rank correlation between VWD and these monthly values of these measures. I find that cross-sectional variation is significantly corelated to VWD. */**/*** implies significance at the 1%/5%/10% level.

linear correlation			
period	corr(VWD,SD)	corr(VWD,MAX-MIN)	corr(VWD, ABS)
01/05-06/08	0.91***	0.84***	0.94***
01/05-12/08	0.79***	0.76***	0.60***
rank correlation			
period	corr(VWD,SD)	corr(VWD,MAX-MIN)	corr(VWD, ABS)
01/05-06/08	0.81***	0.81***	0.68***
01/05-12/08	0.78***	0.78***	0.59***

at the 5% level.[14] I do not want to judge whether these numbers are high enough to imply irrational behavior. Rather, I do consider how the results changes when excluding the last 6 months as investors seem to strongly react to macroeconomic factors for this period. The effect of excluding these 6 months is evident: average pairwise correlation and the percentage of significantly positive coefficients decrease to 0.1833 and 18.18%. I redo the calculations using the spearman rank correlation. The results point in the same direction, however, to a much smaller extent.

Lee et al. (1991) interpret the correlation of changes in discounts across funds as evidence for irrational noise trader risk. My results are not to be misinterpreted as further evidence for the noise trader model. I find that co-movement is especially observable in the second half-year of 2008. But, I also find that discounts are driven by macroeconomic factors for this period. Hence the widening discounts for this sub-period are not due to noise trader risk but due to investors' sensitivity to these risk-factors. Lee et al. (1991) explicitely argue that noise trader risk is a new risk factor that not proxies for other factors.

6 Cross-sectional variation

The working hypothesis of this study is that irrational investors do not distinguish expectations across funds. Note that none of the criteria to identify irrational behavior is directly based on the cross-sectional variation of discounts. The problems with such a 'direct criterion' are obvious: there are several ways to define cross-sectional variation and, more importantly, it is difficult to draw a line between irrational and rational variation. Nonetheless, the different levels of cross-sectional variation over time provide some insight into investors's ability

[14] Lee et al. (1991) report that average pairwise linear correlation for their sample is 0.248 for domestic funds and 0.267 for diversified domestic funds.

Table 7: **Closed-end hedge funds listed on the Swiss Exchange (SIX).** The listing date ('list date') denotes the month in which shares of the fund are traded for the first time on the SIX. The market volume ('mk 08') is denoted in million Euro and taken at the last trading day of 2008 (or the month before delisting). It summarizes the market volume of all shares classes. The average discount ('avg disc') denotes the average of the month-end discounts from inception of the fund to the end of 2008 (or to its delisting). The discount for the end of 2008 (or the last month before delisting) is denoted as 'disc'. If a share is traded in more than one currency class, I use the share class with the largest market capitalization. The last column ('type') denotes whether the CEHF invests in one (single) underlying hedge fund or in several funds (multi).

Name	**list date**	**mkt 08**	**avg. disc**	**disc 08**	**type**
Altin	08/96	143.61	8.37%	32.30%	multi
Creinvest	10/96	126.67	5.01%	3.76%	multi
Castle Alternative	04/97	212.07	7.28%	18.58	multi
Absolute Invest	01/01	326.89	9.79%	33.71%	multi
Absolute Manager*	06/01	120.76	8.11%	26.44%	multi

* delisted 06/08.

and willingness to distinguish between different funds.

I proxy cross-sectional variation using three different measures: standard deviation, the difference between mininmum and maximum discounts and absolute deviation from the arithmetic mean. I calculate the linear correlation and the rank correlation of each of these measures with the average weighted discount (i.e. VWD). Table 6 reports that variation is significantly related to overall average discount. Cross-sectional variation tends to be higher when discounts are generally high and vice verca. Moreover, correlation is significant both for the whole sample period 01/05-12/08 and when excluding the last 6 months. Hence investors tend to distinguish stronger across funds in times when they are less optimistic about HFs in general. I interpret this result as evidence that distinctive managerial ability becomes observable to investors primarly in difficult market conditions.

7 Concluding remarks

This study is to be understood in the sense that I use the null hypothesis that investors in CEHFs are generally rational, and I look for specific evidence to reject this hypothesis. I stress that finding no such evidence does, of course, not mean that investors are generally rational. However, based on two specific criteria I can not reject rational behavior. I find that investors (rationally) exploit the available information to decide whether to engage with a new fund. Moreover, discounts of different funds are not driven by a common source for the majority of time. Only in the second half-year of 2008 investors express a high degree of pessimism about CEHFs in general.

I stress that my conclusions rely on the definition of the criteria that, as I

argue, imply irrational behavior. There are other puzzling effects of CEHFs' discounts that challenge the rationality of investors. As an example I note that there is an international segmentation of investors expectations about the ability of managers of CEHFs. Five CEHFs have been listed on the Swiss Exchange (SIX) between 1996 and 2001 (see Table 7). For the period of 01/05-12/08 the shares of these funds trade on average at a discount of 12.19%[15] which is considerable higher then the average discount for the LSE funds. As I do not believe that London based fund managers are generally more skilled than their Swiss colleagues, this difference in discount levels gives reason for an additional investigation to question the rationality of investors.

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