Flow-Induced Redemption Costs in Funds of Funds

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Abstract

We show that FoF managers are best advised to carefully track the possible costs from selling target funds with redemption fees when facing outflows. In this study we show how different the costs to be incurred may be: While a static approach of estimating the costs to be incurred in the presence of a liquidity shock delivers insight on the span of possible costs at one point of time, a dynamic approach with path-dependent cost effects takes into account the possibility of successive periods of fund cash flows and the resulting cost effects.

Keywords: Liquidity Risk, Liquidity Costs, Redemption Costs, Back-End Load Fees, Funds of Funds

JEL Classification: G11

The authors thank Stephan Brünner and Frank J. Fabozzi for helpful comments. We bear responsibility for any remaining errors. The views expressed herein are those of the authors and do not necessarily represent those of Credit Suisse.

Introduction

The recent crisis has clearly demonstrated that the direction and magnitude of capital flows are crucial to the survivorship and performance of financial market assets. While the years following the dotcom crisis were characterized by very low costs of capital, the global economy and the financial markets were flooded with excess liquidity. Until the sub-prime mortgage crisis unfolded and triggered the worst economic slump since the Great Depression, along with the worst year for global stock market performance, capital was available in huge lot sizes and at both low borrowing costs and restrictions. As this came to an end and money was withdrawn from investments in unprecedented speed and strength, the problems surrounding cash-flows and liquidity management came back into the discussions in the financial world and academia.

As many fund management companies try to find ways to protect from new problems caused by capital flows, the appropriate handling of load fees, or redemption fees, is crucial for investors. Especially when investors to funds are themselves exposed to capital flows they cannot control, as are most funds of funds (FoFs in the following), the holding of funds that may not be redeemed without costs calls for appropriate tracking of the cost that may be incurred when funds must be sold. In this study we show how this may be done in two differing ways: While a static view with calculating the costs to be incurred in the presence of a liquidity shock delivers insight on the span of possible costs at one point of time, a dynamic approach with path-dependent cost effects takes into account the possibility of successive periods of fund cash flows and the resulting cost effects.

Fund Flows, Liquidity Risk and Liquidity Costs in Funds (of Funds)

The topic of fund flows and liquidity risk has been researched in the past, with research concerning mutual fund flows by Ippolito (1992), Sirri and Tufano (1998), Hendricks *et al*

(1994), Warther (1995), Zheng (1999) and Greene *et al* (2007) being important among others. Nanda *et al* (2000) model the interaction of flows, performance, and load structure for mutual funds. Although the primary focus of many theoretical and empirical studies has been on determining factors driving fund flows and how investors are affected by the loads and fees that are charged by the respective mutual funds, the management of flow-induced liquidity and flow-induced selling of target investments on the fund side has been studied as well. While Edelen (1999) finds that flow-induced trades are lowering fund performances, Chan and Lakonishok (1997) and Keim and Madhavan (1997) focus on the fact that trading costs increase with the size of the trades that are necessary to meet unexpected redemptions.

The majority of studies focussed on funds however, rather than on funds of funds, which have sort of a special problem: As many FoFs invest at least part of their capital into funds that may nor be redeemed at net asset value, they face the danger of performance losses when outflows occur and they have to sell off costly funds. The practical relevance of these problems is very high, and the lessons learned from the recent crisis are implying that this will be amplified in the future:

The problem in practice was that in the upswing of financial markets, the management of liquidity and the costs and risks that come along with it have been ignored or at least were at minor positions in the priorities of asset managers. Caused by steady and growing capital flows, the markets grew and prospered along with the ignorance of market players concerning the potential risks associated with leverage and consequences that would come should the funding sources run dry. The consequence was excessive leverage not only on the balance sheets of banks and households, but in asset management firms as well. Firms such as hedge funds and private equity funds that traditionally use large amounts of debt were heavily leveraged in the hunt for stellar returns and in a market that was pushed upward only with huge pressure on market participants not to fall behind their successful peers.

In what has become a downturn in financial markets called the sub-prime crisis and the following credit crunch, the globally increasing interest rates and the burst of the housing price bubble in the United States has ended the spree and money was withdrawn from all kinds of investments. Of course this severely affected the asset management industry as well: A large number of funds had to close business or at least turned out to be unable to fulfil the redemption wishes of their investors and had to lock in those. “If everybody panics, panic first” was the phrase best describing the mood in the industry, with investors withdrawing huge amounts from investments that are or could be in any way be affected by the crisis.

The large outflows that the asset management world was facing were redemptions of shares by both retail investors and institutional investors. While the massive withdrawals of money took place in every kind of financial asset class, we will focus on the problems of funds of funds in the presence of share redemptions. While funds investing into stocks or bonds for example may have the problem that their underlyings are turning illiquid or a high spread is charged, FoFs have to sell target funds and may face the problem of redemption costs or back end load fees. With many asset management companies now taking actions to prevent from problems induced by share redemptions, one can expect to see increased use of redemption fees, causing fund investors to be conscious on the possible cost consequences of their investments.

Of course, the discussion of flows in mutual funds and the fee structure of the funds with front-end and back-end load fees is highly relevant when it comes to investment and divestment decisions as well as concerning performance expectations. Among others, Ippolito (1989), Elton *et al* (1993), Gruber (1996), Zheng (1999), Alves and Mendes (2007) investigate the performance differences between load and no-load funds, with the latter reporting the back-end load fees being influential on investor (non-)reaction to poor performance. Therefore, an assessment of the possible costs that are caused by an investment when being sold should be in line with the possible benefits of that particular investment when FoF managers select their target funds.

Generally, it has been the focus to assess the differences of funds with and without load fees, to investigate the differing performances, and how the flow-induced trading filters through to the funds. However, neither has there been a detailed analysis of the inside of the funds, that is, of how the flows and the costs incurred may be seen as a risk factor to the fund liquidity, nor has there been an analysis on how funds of funds may deal with load fees when faced with flows on their own side. Although the current crisis has shown the immediate need of dealing with liquidity shocks, there appears to be a lack of approaches that enable portfolio managers to track the risks appropriately when being invested in shares that may not be redeemed at the book value. We will show in the next sections how different the effects of redemption fees can be with an example of time-dependent back-end load fees.

The Static Framework: Liquidity Shock Analysis

In this section, we show a slim approach that can be used by FoF managers to track the effects of their investments with respect to costs when needing liquidity and their own possible future cash flow pattern. We suggest FoF managers track their portfolio of investments according to time spans and fund volume spans as the baseline. This is straightforward, as some target funds held by FoFs can only be redeemed at a cost (for example back-end load fees), after lock-up periods or a combination of both (time-dependent discounts when redeeming shares). Of course, the costs to be incurred when reducing positions in the respective funds have changing magnitude with regard to the volume the FoF has when redeeming and with regard to the size of the redemption.

While borne out of practical considerations for FoFs facing redemption costs, the analysis of costs when facing capital outflows is crucial for other effects as well. For example during times where target funds turn illiquid and suspend the redemption of shares, FoF managers may be forced into secondary markets, where funds often are traded at discounts to

their NAV, the discount being a result of the illiquidity and the expectation concerning the NAV at a future date when the fund shares may be redeemed at NAV. This holds true even for open-end funds, if those need to (temporarily) suspend the redemption of shares or introduce restrictions.

In this section, we consider a one-off redemption of shares to the FoF, and use an example to show how a FoF may be affected by costs that are caused by the forced selling to meet investors' demand for capital. Consider the following example:

A FoF currently has US $500 million of assets under management. The FoF has invested in several target funds with back-end load fees. To keep the analysis tractable and transparent, we set all funds with a back-end load fee to charge 5%, 3% and 1% for shares held less than 1 year, 2 years and 3 years, respectively. This means that for any time point after the first investment into a back-end load fee fund, we are able to calculate which costs at this point of time would have to be incurred depending on the amount of the redemption and the time held. Of course, these costs have direct impact on the FoF performance, with the magnitude depending on the size of the FoF at the time the shares are sold.

We now look at the investments done by a FoF in Table 1. The example FoF has invested a total of 100 million US $, or 20%, of the fund volume into funds that may charge a cost when positions are reduced, depending on the time of selling.

- Table 1 about here –

We have chosen to set the date of observation to 1st of March 2010, when the first investment already may be redeemed without charge of costs as can be seen from the right column. However, it is even more interesting to see how these positions influence the potential costs over time and over different fund volumes. As the fund volume in the future is far from certain, one is best advised to calculate possible effects form redemption costs up front.

- Figure 1 about here –

From Figure 1 we can see the time- and fund volume- dependent costs that would have to be incurred when being faced with redemptions, thereby assuming that the redemptions are made on an allocation neutral basis (for example an outflow of capital of 10% of the FoF volume would lead to a 10% reduction in the positions in funds that charge redemption fees).

It is obvious that the differing investment points are determining where the peaks in the possible costs from redeeming are, and that performance effects of over 5% are possible even though the maximum charged is 5%. This is due to the fact that a large outflow of capital that leads to a fund volume that is even smaller than the total share of capital allocated to funds with redemptions fees would leverage the costs on a relative basis. For example a reduction of 450 million US $ (90% of the original fund volume) would lead to a fund volume of 50 million US $, the redemptions of costly funds would be 90 million US $ (90% of the invested 100 million US $) and one would have to pay costs that will be calculated into the new fund volume of 50 million US $ in the next period. Admittedly, this is a very strong scenario that there will be a hit in the fund with outflows of 90% of the fund volume, but this can be seen as a high stress-test level.

In addition, FoFs normally have notifications of redemptions and can sell off target funds before the outflows are booked, that is, the costs are calculated into the fund volume at the time the outflows occur, rather than afterwards. One the one hand, this is done to be able to serve all liquidity demands by FoF investors, on the other hand, waiting to sell assets and then pay the costs on the new fund volume is both more performance damaging and punishing remaining investors. How tremendous the influence of direct selling is, can be seen in Figure 2, where the dimension of resulting fund volume is irrelevant as cost have to be incurred by the fund volume of 500 million US $ when the liquidity shock occurs, as here the effects are less severe than in Figure 1.

- Figure 2 about here –

Apart from the extreme events, the plane of costs over time and possible fund volumes (the line when selling directly) is informative on the potential costs that have to be incurred when liquidity is needed due to own outflows of capital. Please note that even the moderate share of 20% of assets invested into costly funds may lead to large costs (especially in the case of high outflows and when selling may be possible only after outflows occurred, as seen in Figure 1). However, the assumption underlying this kind of static overview is that there is a single hit at the specified time point, a more realistic view is to see how the costs would affect the portfolio when there are several periods of outflows, i.e. the fund volume changes from time to time and the FoF management must liquidate positions in target funds in tranches. This brings us to a path-dependent view of the liquidity costs, where the process of forced redemptions is gradual, rather than a one-hit event in the preceding baseline example.

The Dynamic Framework: Path-Dependent Analysis

In this section, we take a look at the path-dependent costs, thereby modelling the fund volume with Monte Carlo simulations for possible flow patterns.

For problems related to the analysis of liquidity and cash-flows, the modelling of cash-flows is crucial. While from a general view the modelling of the expected cash-flows seems to be highly desirable, the very nature of those makes it complicated to do so. Inflows and outflows into and from investments are caused by a large variety of factors. Not only do market (participant) expectations, general economic surroundings, historic performance and observable information heavily influence the cash flow patterns. With the institutionalization of the asset management industry, sales power, mutual agreements, contracting, communication and marketing, and executive decision making plays a major role when it comes to the direction and magnitude of fund flows. This makes an extrapolation of historic cash-flows inappropriate for the vast majority of investments, even if there is data available at all. If a fund or FoF is erased

from a recommendation list of a wealth management company for example, or if a distribution arm is lost in the course of a restructuring process, any historic data becomes useless, as the state of the world is no more the same.

The choice of distribution is crucial to the outcomes of the analysis and any risk manager, portfolio manager or other to apply the analysis needs to select the distribution type that fits best the nature of the flows and/or the needs and aims of the analysis. We model daily flows with a chi squared distribution, using 1 and 3 degrees of freedom for the random number generation and to obtain both positive and negative flows, we multiply the number generated with the sign of a random number form a normal distribution. Flows are modelled on a daily basis and a time span of 1000 trading days begins on the 1st of January 2009 when the last investment in shares charging costs was done. Of course, the path for the possible fund volumes over time may be largely differing. While the restrictions of holding period based redemption fees are generally based on calendar days rather than trading days, we left out the weekend days following 5 trading days. Of course, the choice of the appropriate frequency is left to managers and should be done in accordance to the respective product structures. For redemptions, we use a first in-first out premise, an assumption that is not very strong as we model the funds to be equal. In practice, one would simply adjust for first in- first out for each of the respective funds.

Our approach yields a considerable large span of possible outcomes, with the paths to the final outcomes being heavily differing as well as the final volume of the simulated FoF.

We employ two different strategies: One is a conservative strategy, where inflows do not lead to successive investments into the funds with redemption fees; this means that the management successively reduces the cost-prone investments when there are outflows but does not buy shares when there are inflows.

The second strategy is an allocation neutral strategy, such that if there is a decrease in capital, the respective share is divested and if there is an increase, the additional capital is

invested proportionally into "costly funds", this means that the 20% share is maintained throughout the analysis.

Strategy 1: The Conservative Strategy

The rationale behind the conservative strategy in the presence of flow-forced rebalancing may be for example a FoF whose management is expecting that there will be more outflows than inflows in the future and therefore the positions in cost-prone investments are reduced.

In this section we show the results that were obtained from the path-dependent analysis using the conservative approach, where inflows are not invested into funds that charge back-end load fees but for each outflow, the same proportion of "costly" target funds is redeemed. As this means that over time the allocation into such funds is decreasing due to a pessimistic outlook, we can expect that the relative performance effects from redemption costs that have to be incurred decrease because of two facts: First, the holdings are decreased successively and second, increasing amounts of shares may be sold at no cost after minimum holding periods have expired.

We need to keep in mind that even when there is a fund volume of for example 2 billion US $, an outflow of x % of the total volume leads to a reduction in the respective costly positions of x % as well, a very pessimistic approach. However, this is in line with several policies, guidelines, and management rules that have been implemented throughout the industry, to face the redemption and liquidity risks, especially during the recent crisis. First, this is to ensure that all investors are treated equal, i.e. to prevent from the problem of the losses being loaded on remaining investors only and second, to prevent from to high relative costs to be incurred when selling off at reduced fund volumes later on.

Figure 3 shows the example for 5 of the 10.000 simulated paths. As expected, the different paths lead to very different costs that have to be incurred over time. The earlier

outflows occur, the higher are the fees that have to be paid, and if large outflows occur at the end of the 1000 day analysis, the additional costs are only marginal or tend to zero.

- Figure 3 about here –

As we can see from Figure 7 in the top left graph, the distribution of the total percentage costs, i.e. performance effects, while being diverse regarding the magnitude, no path did lead to total costs of even 1 percent with the used parameters. The performance effects therefore are considerable small for little over 2.5 years, meaning that less than about a third of one percent point is lost per year.

- Figure 7 about here –

How influential the pessimistic or conservative strategy is on the costs to be incurred can be seen in Figure 4 and in the bottom left graph of Figure 7: Although the magnitude of the flows is greatly enlarged, the strategy of selling proportionally but not re-investing when receiving inflows of capital is limiting the performance effects such that still over 90% of the paths do not lead to total costs of one percent or above for the 1000 day period. This has strong implications for the selection of investments into cost-prone target funds, as the 20% share has an implied outperformance requirement of less than one percent over about 2.5 years to justify its selection with respect to additional gains for additional (possible) costs.

- Figure 4 about here –

Strategy 2: The Allocation Neutral Strategy

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The rationale behind an allocation neutral strategy in the presence of flow-forced rebalancing may be for example a FoF product structure that needs to be maintained, when product characteristics of target funds with and without redemption fees may be different.

In this section we show the results that were obtained from the path-dependent analysis using the allocation neutral approach, where inflows are invested into funds that charge back-

end load fees as for each outflow, the same proportion of "costly" target funds is redeemed. Therefore, a constant proportion of 20% of costly funds is maintained, regardless the fund volume. This means that over time, we can expect that the relative performance effects from redemption costs that have to be incurred over time remain fairly stable apart from some major steps due to expiration of holding periods from the initially invested tranches of larger lot sizes and the first in-first out assumption.

Figure 5 shows the example for five of the 10,000 simulated paths. As in the conservative framework, the different paths lead to very different costs that have to be incurred over time. However, as expected the timing of the flows is not as influential, because inflows are invested into cost-prone funds and therefore costs when facing outflows have to be incurred even in later stages of the analysis.

- Figure 5 about here –

Of course, the allocation neutral strategy results in considerably higher total costs over the simulation span, with the majority of the total percentage effects being between 2.5% and 4%, as seen in the top right graph of Figure 7. This implies that any of the invested shares of back-end load fee funds should annually yield about over 1% more than other funds to justify the investment. Naturally, the magnitude of the costs to be paid is larger for the analysis using 3 degrees of freedom (Figure 6), with the majority of the simulation paths resulting in 9% to 12% performance losses as can bee seen on the bottom right of Figure 7, where the implied required outperformance of the restricted funds versus other funds is becoming vast.

- Figure 7 about here –

Conclusions

FoF managers that invest into funds that may charge redemption fees are in the need of appropriately tracking the costs that may be incurred when target funds need to be sold. This is

necessary both for existing positions as well as for new investments to be done. Especially in times of strong outflows of capital, the effects from flow-induced redemptions of target funds may be severe for a fund portfolio. We therefore suggest that FoF managers adequately mirror their risks over time and over possible fund volumes.

Our analysis using the static approach yields insight into how a FoF is affected by a liquidity shock due to a large outflow of capital and delivers direct information on how severe performance effects may be in the future. This information may be best processed as part of a risk analysis, as well as part of investment selection, with the possible cost-induced performance drain implying how large the outperformance of cost-prone investments versus other holdings should be for an investment to be justified.

The dynamic, path dependent analysis of the influence of flows on the costs that have to be incurred by a FoF investing into funds with time-dependent redemption fees, has shown that a very conservative strategy leads to considerable small performance effects, even in the presence of large changes in the fund volume. However, if a pessimistic approach is not demanded, for example due to additional gains to be expected from the back-end load fee funds if they are differing in nature from the other funds, the costs are heavily increasing in an allocation neutral approach. Therefore, both FoF managers and risk managers are best advised to closely model the possible performance effects of investments and holdings of cost-prone target funds over time.

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Investment Number	Amount (in US $)	Date	Time passed (in years)	Cost (in US $)	Cost (in % of fund volume)
1	20 million	1-Mar-2007	3,0	0	0,00%
2	10 million	1-Apr-2007	2,9	100.000	0,02%
3	10 million	1-Jun-2007	2,8	100.000	0,02%
4	5 million	1-Sep-2007	2,5	50.000	0,01%
5	10 million	1-Sep-2007	2,5	100.000	0,02%
6	5 million	1-Nov-2007	2,3	50.000	0,01%
7	5 million	1-Jan-2008	2,2	50.000	0,01%
8	20 million	1-Jan-2008	2,2	200.000	0,04%
9	10 million	1-Jul-2008	1,7	300.000	0,06%
10	5 million	1-Jan-2009	1,2	150.000	0,03%

Table 1: Investment schedule of the FoF. Date under consideration: 1st of March 2010. Fund volume at date for relative cost in percent: 500 million US $.

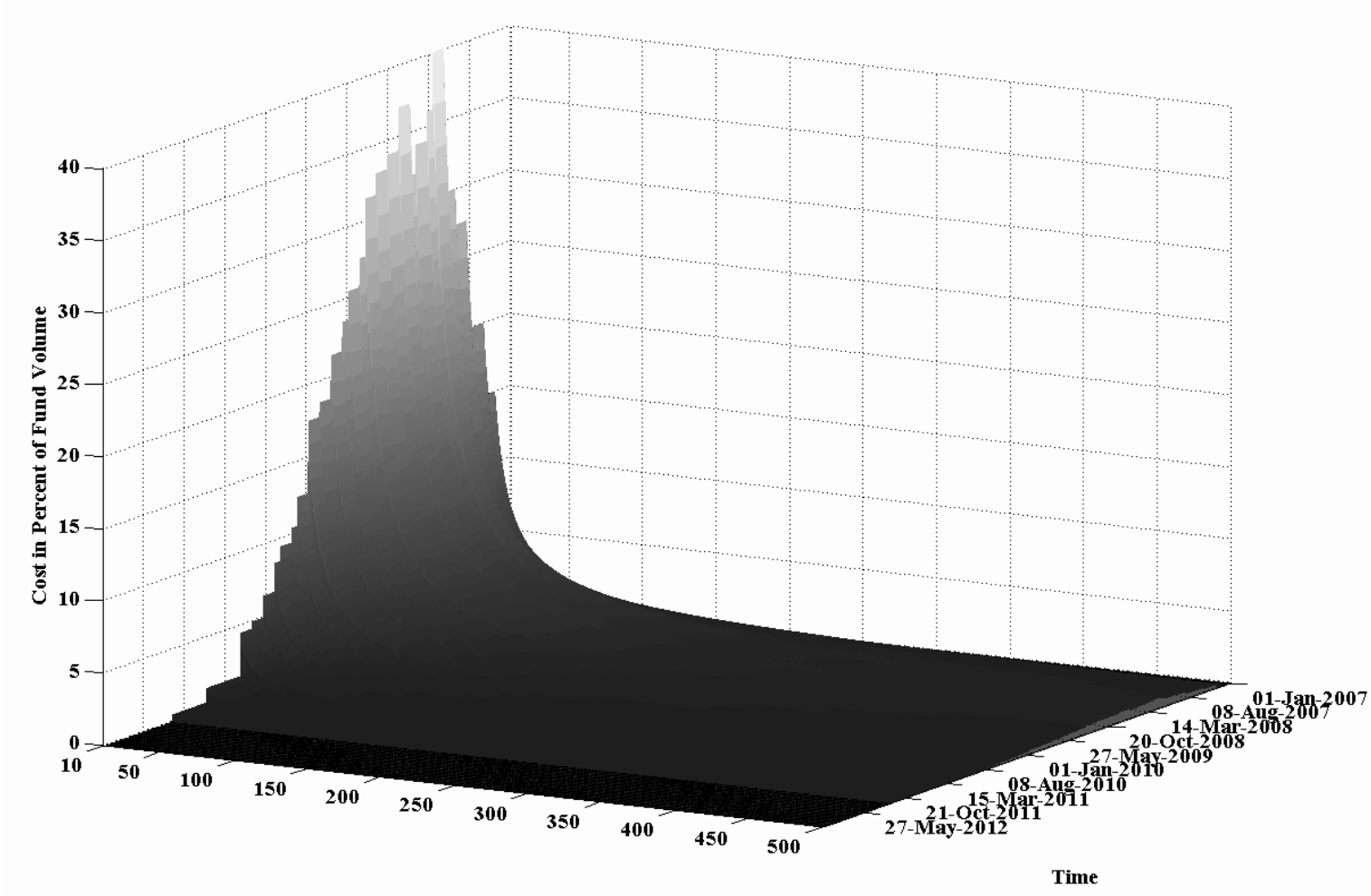

Figure 1: Costs of redemptions over time and fund volume spans. Assumption of redemption according to fund volume reduction (allocation neutral), i.e. if the FoF has outflows of 10%, the respective share of 10% of funds with redemption fees is sold. Costs calculated into new fund volume, after outflows.

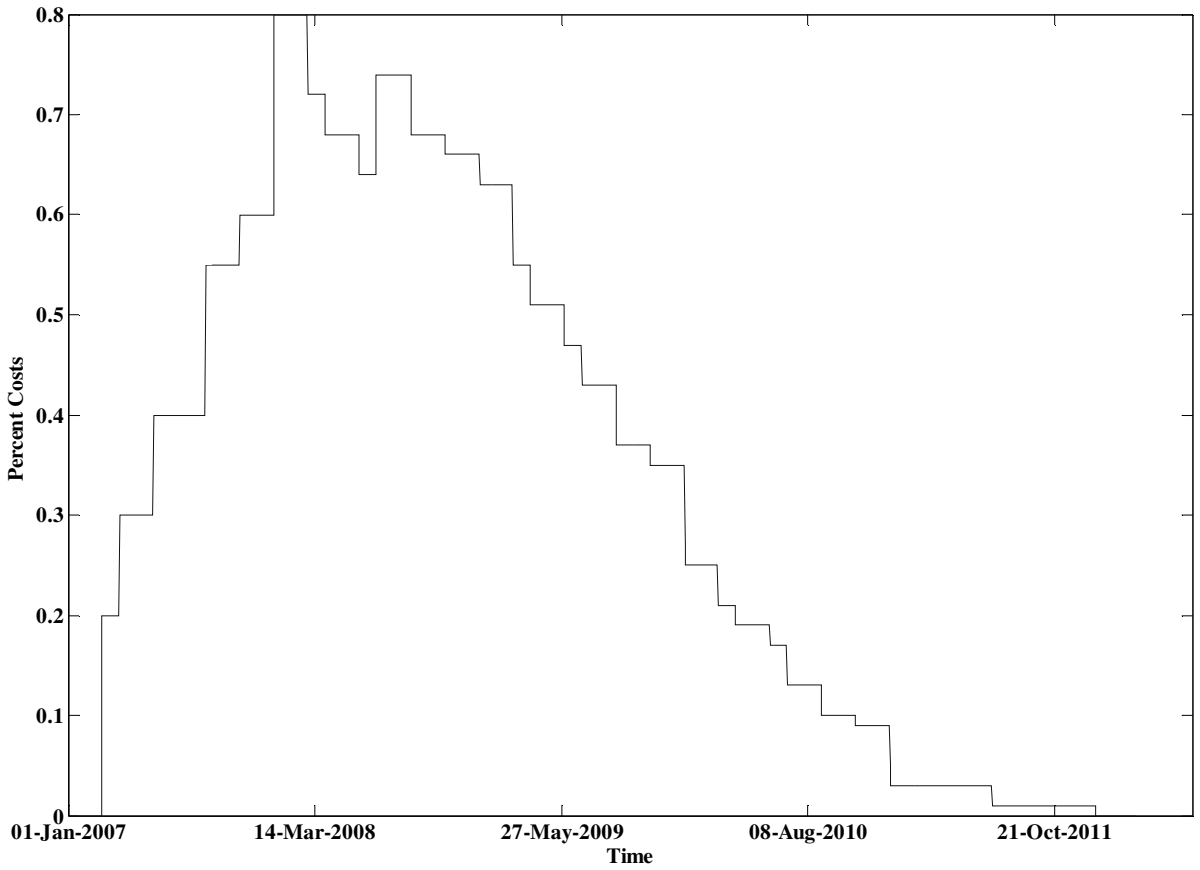

Figure 2: Costs of redemptions over time. Assumption of redemption according to fund volume reduction (allocation neutral), i.e. if the FoF has outflows of 10%, the respective share of 10% of funds with redemption fees is sold. Costs calculated into old fund volume, i.e. 500 million US $.

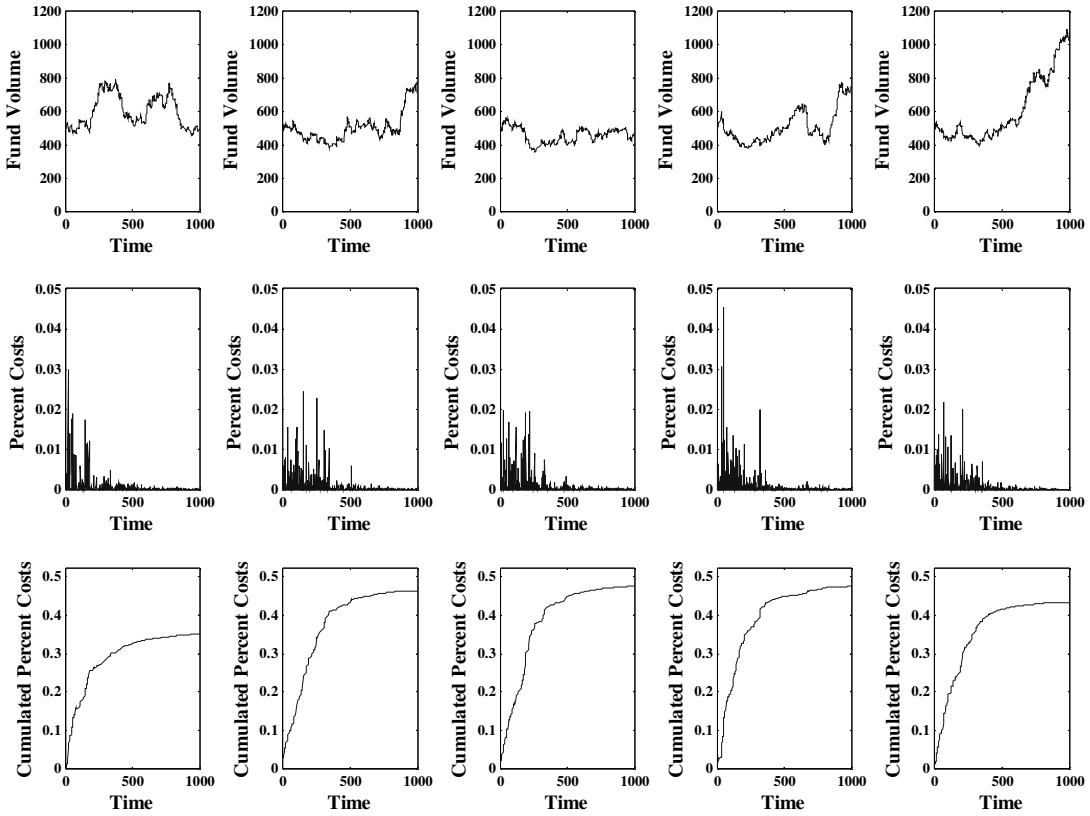

Figure 3: Fund volume paths and resulting costs of redemptions over time (conservative strategy, 1 degree of freedom)**.** Assumption of redemption according to outflows, no new investments in inflow periods, i.e. if the FoF has outflows of 10%, the respective share of 10% of funds with redemption fees is sold, an inflow of 10% does not lead to buying. 5 examples from 10.000 simulations.

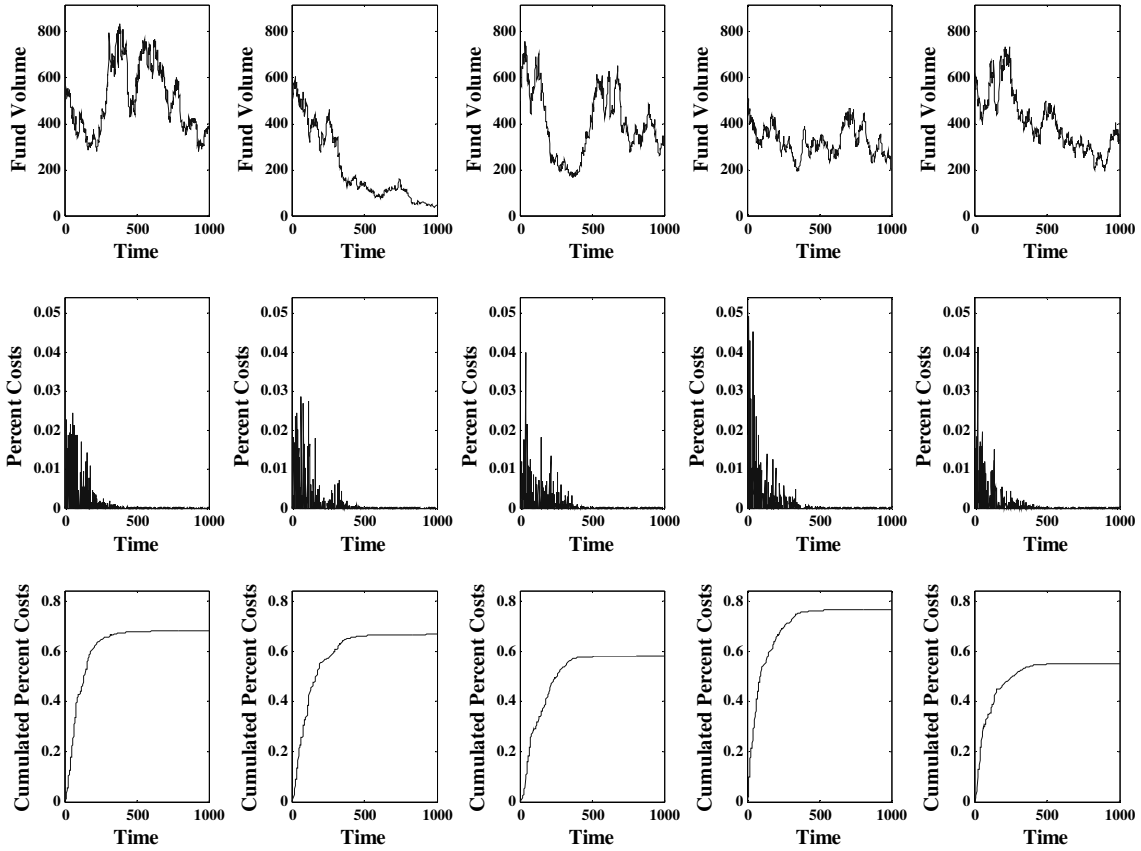

Figure 4: Fund volume paths and resulting costs of redemptions over time (conservative strategy, 3 degrees of freedom). Assumption of redemption according to outflows, no new investments in inflow periods, i.e. if the FoF has outflows of 10%, the respective share of 10% of funds with redemption fees is sold, an inflow of 10% does not lead to buying. 5 examples from 10.000 simulations.

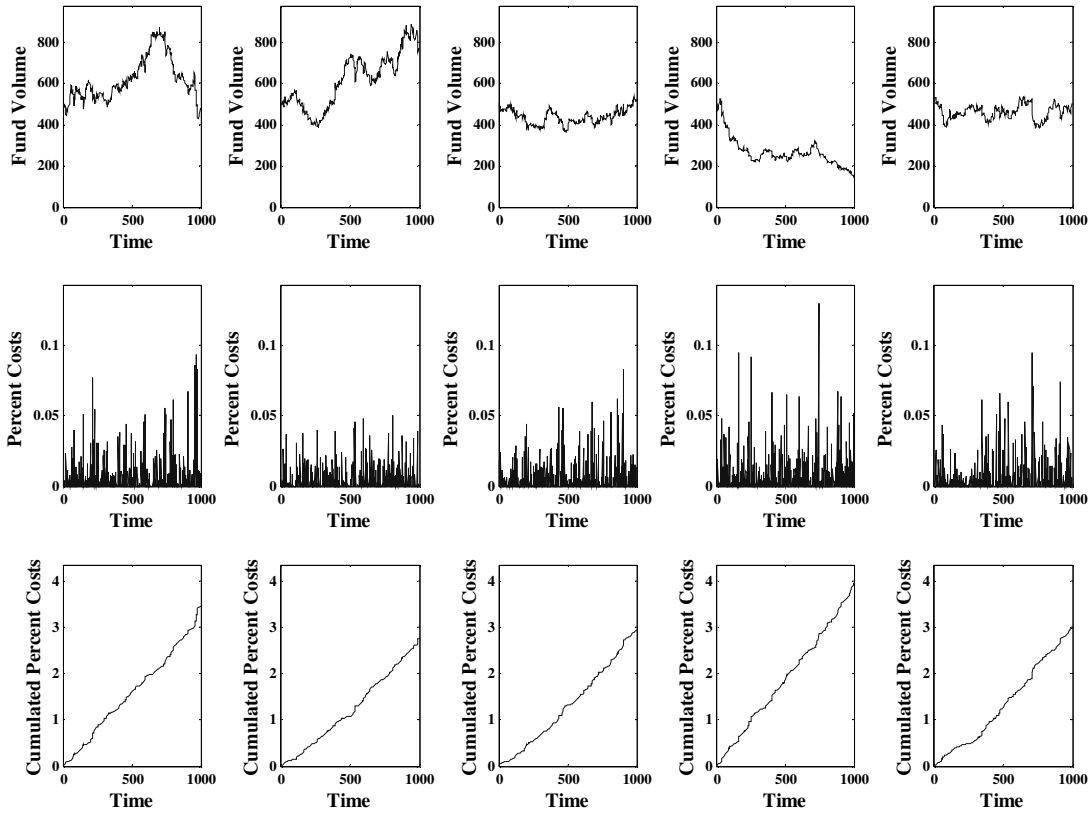

Figure 5: Fund volume paths and resulting costs of redemptions over time (allocation neutral strategy, 1 degree of freedom). Assumption of redemption according to outflows and new investments in inflow periods, i.e. if the FoF has outflows of 10%, the respective share of 10% of funds with redemption fees is sold, an inflow of 10% leads to buying. 5 examples from 10.000 simulations.

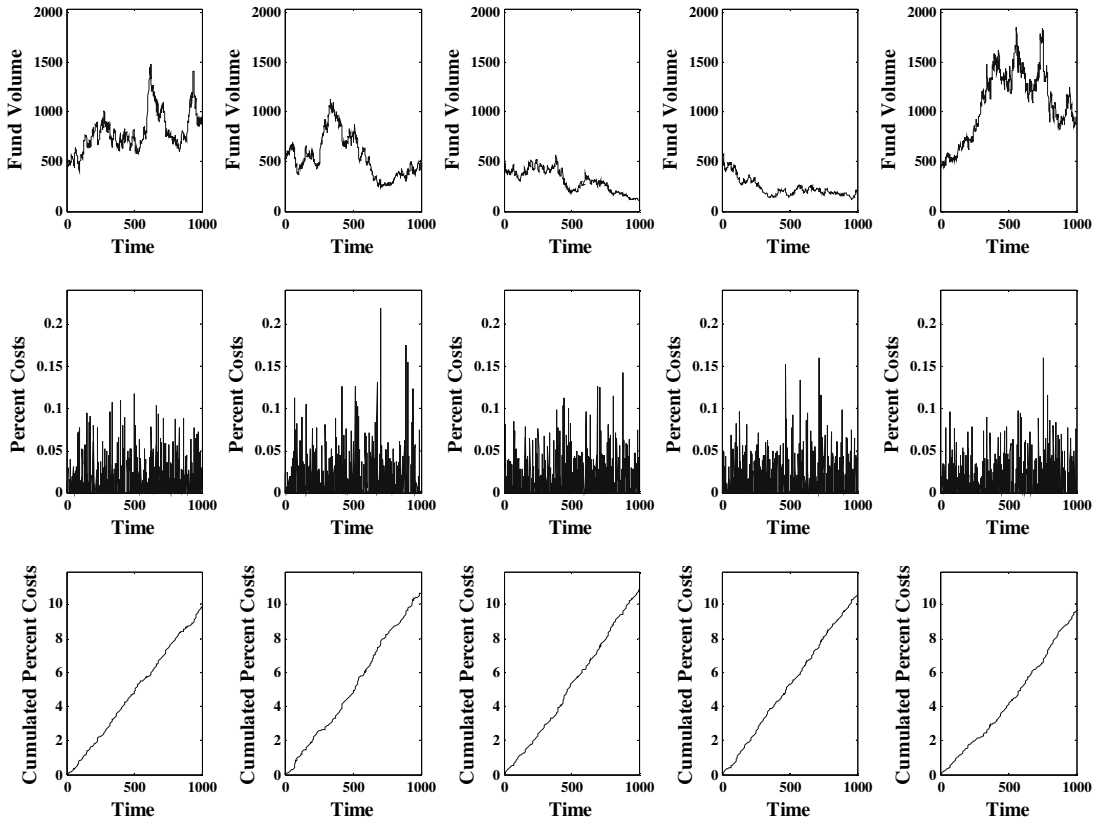

Figure 6: Fund volume paths and resulting costs of redemptions over time (allocation neutral strategy, 3 degrees of freedom)**.** Assumption of redemption according to outflows and new investments in inflow periods, i.e. if the FoF has outflows of 10%, the respective share of 10% of funds with redemption fees is sold, an inflow of 10% leads to buying. 5 examples from 10.000 simulations.

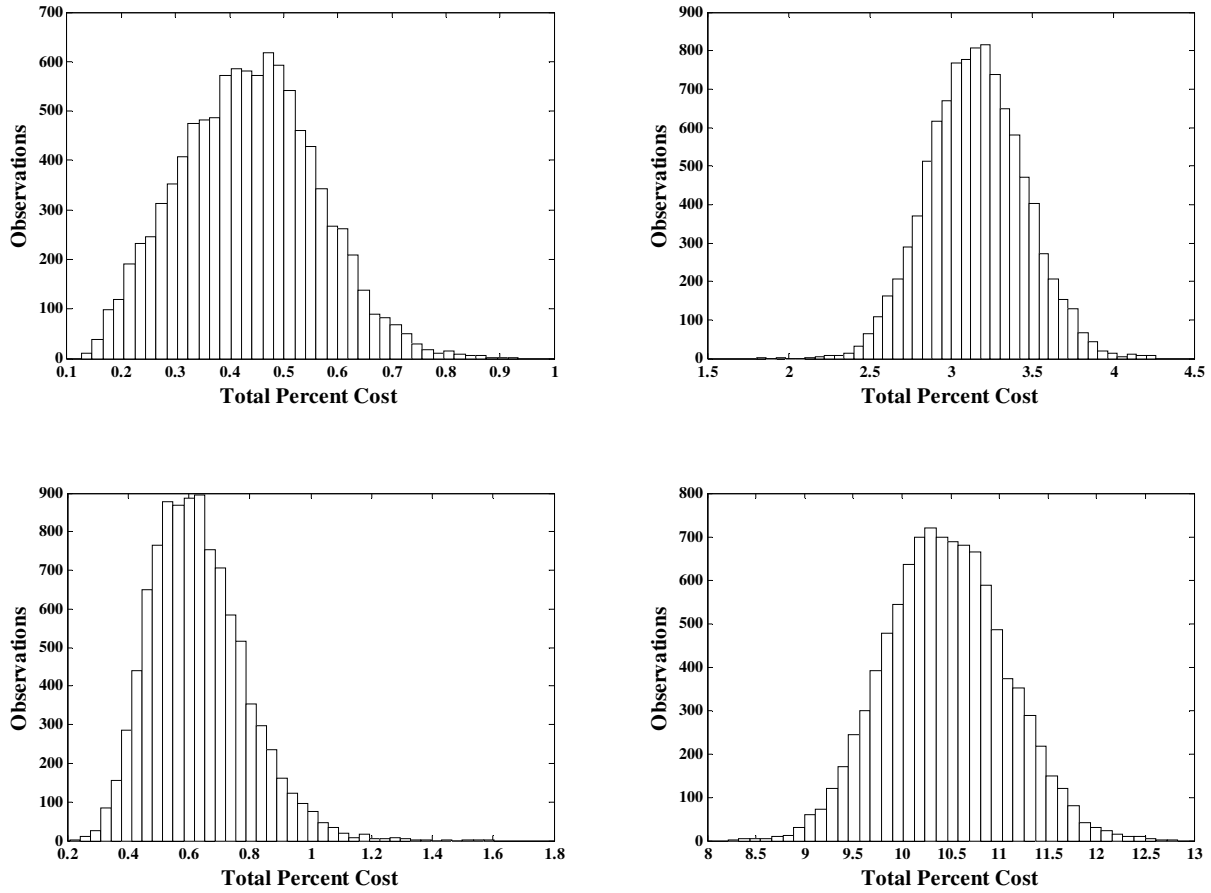

Figure 7: Total percent costs of redemptions over time, distribution comparison. Histograms of total costs of 10.000 simulations. Conservative strategy on the left, allocation neutral strategy at the right. Simulations with 1 degree of freedom on top, results using 3 degrees at the bottom.