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Responsible Compensation Structure: Shock Absorber Fees

Kirill Ilinski [1] ,

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Abstract

In this paper we introduce a novel structure for performance-based compensation, the Shock Absorber Fee (SAF). SAF includes three main structural elements: *partial transfer of risk from investors to the manager* through recourse to the manager's fees; *asymmetric nature of the recourse* when manager is covering larger percentage of loss than he is receiving in gains; *dynamical nature of the exposure* when the amount of protected exposure is linked to the fees already accumulated. Due to the risk-transfer feature of the structure, investment products with the Shock Absorber Fees demonstrate dramatic improvement of statistical characteristics of returns, such as downside volatility, maximal drawdown and Sharpe Ratio, which makes the products more desirable for investors. Managers too benefit from the structure by increasing stability of the investment base, effective mechanism of increasing assets under management in performing products through dynamical change in the exposure, and by ability to earn overall higher fees in performing strategies. Wide implementation of SAF-like structures will contribute to improving global financial stability by removing the conflict of interests between investors and managers, which is inherent in simple percentage performance fees, and will create an incentive for responsible money management. It is argued here that *SAF would have considerable social and economic benefits by partial de-risking of investments, better protection of non-professional clients directly or indirectly involved in financial markets, wider participation in financial markets leading to higher rate of investment and global productivity growth.* While the main SAF application considered here is chosen to be compensating investment managers for performing investment management services, the proposition is applicable to wide range of decision-making and resource-managing services.

[1]Fusion Asset Management, 29 Queen Anne's Gate, London SW1H 9BU, UK; e-mail: kirill.ilinski@fusionam.com

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1 Importance of incentive structure for global financial stability

It has been long understood that the simple structure for the performance and management fees to compensate financial managers for managing investors capital has a strong incentive for managers to take short-term decisions and to accept excessive risks.

A typical fee structure, which we call in this paper "simple", has a management fee, proportional to the amount of assets under management, and a performance (or incentive) fee, proportional to the positive performance of the investment in a particular calendar period. It has been customary for managers to charge management fee on a monthly basis, while taking the performance period from one quarter to one year[2]. The management fee allows the manager "to pay the bills": maintain investment team and trading infrastructure, finance marketing efforts and to pay for external research and services. The performance fee is designed to incentivize research and trading stuff, attract trading talent and, generally, expand the business.

Yet, it was noticed that the performance part of the fee structure is equivalent to the call option on the profit-and-loss of the investment, which investor grants to the manager as an incentive to perform. This call option give the manager a right to receive part of positive performance without any obligation to compensate investor for any negative performance. The cost of the option to the manager is zero and it is optimal for the manager to maximize the payout by increasing volatility and, hence, risk on the investment. This behaviour is usually accompanied by accepting rare event risks (selling "tails") and leveraging up investment positions. By doing so, the manager damages investment risk-return profile[1] and creates a negative value for the investors. Therefore, the free-call type performance fee structure achieves exactly opposite to what it is designed to do.

It was long argued that wrong incentives lead to trading style herding, which, in turn, pushes managers to sell the "tails"[2]. These trades then have to be leveraged up because the absolute price of the "tails" is small and getting squeezed even smaller by the herd. The leveraging up is equivalent to selling options on events of sudden loss-forced unwinds, accompanied by liquidity hits, which are exacerbated further by the herding[3]. Selling these options explicitly damages the investors risk-return profile and destabilizes the financial system. The situation can be corrected by making a deliberate change in portfolio construction to compensate the negative convexity, by changing the compensation structure or by additional requirements and checks applied by regulators. The first root is covered in detail in [1]. The second root is considered in this paper.

Existence of the management fee component is intended to rectify the mis-alignment of interests between managers and investors. Indeed, large losses would cause redemption requests, which, in turn, would reduce the capital base and take away the "easy money" of

[2]Private equity or special purpose vehicles have performance periods of several years during which the investment capital is locked, thus removing a risk of investment redemptions and securing steady flow of management fees independent on the manager's performance.

[3]These options happen to be the same options investors sold to managers in the form of performance fees.

management fee. Since the management fees are reccurring and essential for covering running costs, their withdrawal poses a business risk for the manager and, in theory, incentivizes him to avoid excessive risks. The same fees also serve as a main component of manager's equity valuation which, also in theory, is supposed to give the manager a long-term perspective, aligning his interests with whose of the investors. In short, the management fees are there to balance the "greed-and-fear" equation by calling to the "fear" the same way as the performance fees are calling to the "greed".

Several attempts were made to find an optimal combination of management and performance fees depending on the characteristics of the underlying investment strategy to maximize utility for investors (see ex. Refs [4], [5], [6], [7]). In particular, in Ref.[8] Ilinski and Melezhik showed that investors are better off if a certain balance between fixed management fee and variable incentive fee is chosen. In particular, the value of the optimal fee ratio that maximizes the investor utility grows monotonously with the Sharpe Ratio of the underlying strategy.

The results cited above were based on the assumption of stability of capital in case of low volatility return, which guaranties the stability of the management fees. What is ignored here is the well-reported chase of returns by investors: investors try to achieve maximal rate of return by redeeming from "underperforming" managers to invest in "top-performing" ones (see, ex. Refs[9], [10], [11] and [12]). While by doing so investors, on average, reduce their returns, they also produce an incentive for managers to demonstrate short-term performance, possibly at the expense of quality of risk-return profile. Selling risks of low probability events in various forms is the most common yield enhancer and a source of short-term out-performance. Since the price of these rare risks is lower, managers have to employ leverage to achieve required rate of return, thus pushing the price even low and creating negative optionality profile in the portfolio, which might eventually result in unpredictably large losses [1]. Fear of underperformance and loss of the management fees force managers therefore to accept risks which they would not otherwise be willing to accept. In this scenario *the management fee, instead of being a counter-weight for pro-risk-taking performance fee, effectively doubles-up the incentives for excessive risk taking.* Moreover, if taking excessive risks to generate the performance fee is seen as a triumph of "greed", accepting the risks to generate performance in line with excessive risk takers is seen as the only survival tactics for prudent managers. One can say that the combination of "free call" nature of performance fees and investors chasing of yield together totally compromise the stabilization role of the management fee.

One can argue that the same compensation structure with a fixed salary and a percentage of profits is common in all industries and that it gives managers the same sort of negative incentives as in the financial industry. Saving on costs to bust profitability at expense of reduced quality, taking risk of some rarely observable event, the "tail risk", which can improve short-term earnings and the managers paychecks but jeopardize long-term shareholder value, are the standard examples of principal-agent problem. Management text books and newspapers are full of examples of such behavior, ranging from top balance sheet "window dressing" to executive compensation and corrupt privatization. *What differs financial services from other industries is that herding behavior prompts managers to take risks which are*

similar in nature, even if they look different on formal risk reports, thus creating a situation where the negative performance is synchronized across the whole industry in time of financial stress.

Wrong incentive structure coupled with herding and globalization of financial flows create a structural instability where initially localized stress propagates through the world as a forest fire in woods, damaging on its way the global economy. This makes finding an appropriate compensation structure for investment managers to be one of central problems in quest for a more efficient and stable financial system. While other stabilization measures, such as enforcing pro-cyclical risk reserves and state supervision of counterparty risk solutions, are restrictive in nature and prompt market participants to look for loop-holes, establishing a responsible compensation structure removes the incentive for these misplaced efforts and re-direct the creative energy towards achieving best quality returns for investors and managers.

2 Criteria for efficient fee structure

Let us list the main issues which a good compensation structure needs to address:

1. Stability of capital for long-term performing managers. The compensation structure should increase social utility by having a feature, which gives a *negative incentive to an investor to redeem from a performing manager*. This would suppress the mentioned yield chasing, breaking down the first link in the chain of self-enforcing herding.

2. *Investing in the investment manager should not be a better investment than investing with the investment manager*. When his investments under-perform, the manager has to suffer not implicit but explicit losses on the same scale as he benefits on when the investments perform. Currently, this point is partially addressed by requiring the manager to place own capital alongside with investor capital. However, own capital is typically a small proportion of the total capital under management. Loss of own capital is relatively immaterial for the manager, while the performance fee is order of $10 - 20\%$ of the total capital under management, i.e. order of magnitude more than the potential own loss. Removing this inequality puts investors and managers "in the same boat".

3. Removing the "free call" feature. This feature prompts optimal manager to increase volatility of the underlying portfolio to maximize his payout. In option parlor, the manager is long sensitivity to volatility, vega, while his investors are short the same sensitivity on the underlying investment portfolio. To balance the situation, *manager has to sell the optionality back to the investor*. Investors do not mind upside volatility, but they do mind if the manager is better protected. Therefore, the manager has to sell some of the downside protection, or downside vega, back to the investors. This feature of the performance fee would improve risk-return profile for the investors instead of damaging it.

4. *The structure should result in increase of overall fees for performing managers, in comparison with the "simple fee" structure, to incentivize managers to agree to provide the downside protection to their investors*. This percentage increase in performance fee should be seen as a price investors agree to pay to manager for protecting investors capital. One has to note that the overall dollar fees received by a manager would increase only if the realized losses the manager takes are smaller than the protection price he receives. Thus, only the performing managers will earn more money, while the non-performing managers will be penalized.

We now describe a proposed fee structure which satisfies to all of the above criteria.

3 Shock Absorber Fees (SAF)

Fee structure is an integral part of any investment product not only because it affects indirectly investment characteristics of the underlying strategy but also because it directly changes end characteristics of the product. The described here fee structure explicitly targets improvement in the loss characteristics of an investment product, including decreasing downside volatility and diminishing its drawdown.

Before moving further let us introduce some useful terminology.

Definitions

1. We call the period between physical payments to the manager the *performance period*. Typical performance period for hedge funds and fund of funds is one year but can be as short as one quarter and as long as several years.

2. Liquidity characteristics of the product are defined by the *liquidity period*, the period between two dates on which it is possible to redeem or invest in the product[4]. Liquidity periods, or liquidity, can vary from one day to several years to reflect liquidity characteristics of the investment strategy and its underlying instruments.

3. *Net Asset Value (NAV) period* is a period between two consecutive calculations of the Net Asset Value for the product. NAV Periods typically vary from one day to one month and depend on availability of pricing information for the underlying instruments in the investment portfolio.

To fully appreciate the difference between SAF and the standard fee structure we first consider briefly an effect of "simple" 20% performance fee on return characteristics of an investment product. During the performance period which is longer than the NAV period at the end of each NAV period with positive performance the performance fee is calculated and allocated to the manager account therefore reducing positive performance by 20%. If the NAV period performance is negative, than 20% of the negative move is covered by transferring back to the investment vehicle account unpaid accumulated performance fees from previous NAV periods[5]. Therefore, the unpaid accumulated performance fees dampen the volatility of the investment, reducing in equal proportion (symmetrically) upside and downside moves.

Shock Absorber Fees are designed to enhance this effect by adding *dynamical asymmetry* into the dampening effects on up and down moves. SAF has three distinctive features [13]: for every NAV period

1. As performance fees in SAF account are accumulated, the manager increases the size

[4]One has to note that liquidity periods for redemptions do not have to coincide with the liquidity periods for subscriptions. In what follows we ignore this complication and assume that on liquidity dates both redemptions and investment are allowed.

[5]Assuming that accumulated unpaid performance fees are larger than the amount of the transfer. Otherwise, the balance is transferred.

of the protected amount[6] so that investors can benefit from the cash the manager is hording away. This is *dynamical* feature of the fee structure. Introducing notations B for the SAF account balance, $\{B_1, B_2, B_3, ..., B_{n+1}\}$ for the set of balance thresholds and $\{L_1, L_2, L_3, ..., L_{n+1}\}$ for the set of target leverages, one can use piece-linear function [7] to define investment exposure for which the manager provides asymmetric protection covered below:

$$L(B) = \theta(B - B_{n+1})L_{n+1} + \sum_{i=0}^{n} \theta(B - B_i)\theta(B_{i+1} - B)(\frac{L_{i+1} - L_i}{B_{i+1} - B_i}(B - B_i) + L_i) \quad .$$

2. Investor has *asymmetric* recourse against manager's performance fees, meaning that *manager's unpaid accumulated performance fees are used to cover a share of NAV period loss at the rate different from the performance fee itself.* In this form the performance fee is a compensation to the manager for undertaking to provide investors with downside protection. An example of the asymmetry would be the SAF structure where managers account (SAF account) is credited at rate of, say, 20% for the undertaking of covering 75% of loss in NAV periods with negative performance. In more general case one can use piece-constant functions for the accumulation (percentage performance fee) $\{p_1, p_2, p_3, ..., p_n\}$ and distribution (percentage protection) $\{r_1, r_2, r_3, ..., r_n\}$ which depend on the accumulated balance B in SAF account:

$$p = p_i \quad , \quad r = r_i \quad , \quad \text{if} \quad B \in [B_i, B_{i+1}] \quad .$$

3. *"Going concern"* principle at the end of performance period manager does not receive the whole balance of SAF account but only a distribution percentage d which can depend on the accumulated balance of the SAF account B:

$$d = d_i \quad , \quad \text{if} \quad B \in [B_i, B_{i+1}] \quad .$$

In this form manager always has "skin in the game" and the investment performance demonstrate less seasonality due to the fee calendar.

Example.
To give a simple but yet practical example, let us assume that the investment strategy in question has average return of 10%, annualized volatility of 5% and two-sigma projected drawdown of 10% of NAV. Performance, liquidity and NAV periods are all coincide and equal to one week. Manager has 50% weekly performance fee for covering 100% of weekly drawdown:

$$p_i = 50\% \quad , \quad r_i = 100\% \quad .$$

[6] Alternatively this can be formulated as a different percentage of coverage for the same amount of exposure.

[7] Other functional forms are, of course, admissible. We discuss here piece-linear leverage function to simplify the consideration while illustrating the main features of SAF.

It is advisable to establish a cushion of $B_1 = 10\%$ in SAF account, in which case the investment product becomes two-sigma capital protected. However, as the balance in SAF account grows to, say, 20% of NAV, investor is not benefiting from the cash which manager accumulates in SAF with 50% speed. To address this and to align interests of investors and the manager, the manager can incorporate the dynamical feature in his SAF arrangement: the manager increases underlying exposure of the portfolio linearly in B/B_1 above B_1, subject to maximal leverage of 2. This permits investors to earn higher return with the same level of protection and allows manager to capitalize on his skill and performance fees which are stashed away in SAF account. Effectively, the manager invests along side with investors in the underlying strategy. In this example the general notation we introduced above take the following values:

$$B_0 = 0 \quad , \quad B_1 = 10\% \quad , \quad B_2 = 20\% \quad ,$$

and

$$L_0 = 1 \quad , \quad L_1 = 1 \quad , \quad L_2 = L_{max} = 2 \quad .$$

Finally, one can allow, say, 10% of distribution out of 50% performance fee to be paid to the manager as soon as the leverage reached maximal level of 2:

$$d_0 = d_1 = 0 \quad , \quad d_2 = 10\% \quad .$$

Possible variations of the described above fee structure are endless and concrete details of a particular arrangement should depend on statistical characteristics of the underlying strategy.

4 Comparison with existing fee structures

There are several structures which aim to overcome shortfalls of "simple" performance fee structure.

4.1 "Clawback" fee arrangement

The most currently popular one is the so-called "clawback" fee arrangement. The "clawback" fees arrangement is implemented typically where the investment cannot be redeemed for relatively long periods (e.g. 2-3 years set as a "Lock Up period"). The performance fee crystallisation period (performance period) is shorter than the lock up period (e.g. 1 year) and considerably longer than period of Net Asset Value calculation (NAV period).

This type of fee arrangement is common in private equity or distressed debt funds (e.g. Sothic Capital European Opportunities Fund, 2009), and also in restructuring scenarios. This fee arrangement is designed to mitigate the discrepancy between unrealised gains (on which performance fees are calculated at the end of Performance Period and paid in part to the manager) and gains realised at the end of the liquidity period.

The clawback fees operate as follows. At the end of the performance period, a portion (typically a third to one half) of the "simple" performance fees (e.g. 10% - 20% of profits) are paid into an escrow account or is reinvested into the fund. This reserve is known as a Balancing Payment. Effectively, at the end of the performance period, the manager receives from 1/3 to 1/2 advance of his "unrealised gains" before "realised gains" are determined at the end of the Lock Up Period. At the end of the Lock Up period, the performance ("realised gains") is recalculated between launch and end of the Lock Up period (the performance period is replaced with the Lock Up Period). The adjustment is made to performance fees by way of withholding if necessary the Balancing Payment to reflect realised gains.

However, this fee arrangement is disadvantageous because the compensation available to the investor is not asymmetrical to what the manager gains as performance fees. The manager gives "clawback" against performance fees over the Lock Up Period, but only proportionately to what the manager gains as performance fees. At the end of the Lock Up period such performance fees are adjusted to reflect the realised as opposed to unrealised gain. Thus the manager is still encouraged to take excessive risk over at least part of the Lock Up period.

Furthermore, with this fee arrangement, the performance period is not always aligned with NAV period. This results in potential for volatility spikes of the trading performance.

4.2 Collaterized Debt Obligations (CDO)

SAF arrangement can be seen as an analogue of CDO-type risk transfer mechanism for liquid strategies and short-term investment horizons. Indeed, there is a number of similarities between the SAF arrangement and managed CDO-type structures. Both structures are best suited for strategies which systematically extract risk premium and aiming at providing (partial) protection against sharp but temporary selloffs in risk appetite or technical,

position-driven corrections. While SAF is best utilized for short-term liquid products rather then long-term illiquid strategies typical for CDOs, in both cases the manager takes the first loss piece and has dynamical exposure which is defined by accumulated performance.

There are two main differences. The first one, of course, is that in typical CDOs investors in higher tranches receive returns through fixed income coupons, while in SAF structure investors participate in unlimited upside. The second difference is in mark-to-market sensitivity of the investments: while SAF is specifically designed to decrease downside volatility and mark-to-market drawdowns, investors in CDO tranches are fully exposed to swings in illiquid markets and model valuation.

4.3 Pre-Funded Accrual Balance arrangement (PFAA)

US patent US 7,624,059 [14] describes the Pre-Funded Accrual Account (PFAA) arrangement as an alternative to "simple" performance fee arrangement as well as a mechanism to decrease downside volatility of an investment.

PFAA is a fee structure where a loss in the investment vehicle is compensated from a specially set up account (PFAA) up to the amount of loss equal to accrued performance fees (typically 20%). The account is replenished from performance of the fund by first re-directing all gains into PFAA up to the point when the balance of the account reaches its previous high watermark[8], after which the usual arrangement resumes. Here the high watermark is taken as the maximum value of PFAA of the previous periods.

PFAA clearly has a certain degree of asymmetry in its performance fees which is, however, path-dependent rather than just depending on last balance, as in SAF. PFAA also envisages a use of "layered" performance fees, which depend on the absolute amount of profit on NAV date (ex, 20% on profits of $0-2\%$ but 40% on moves above 2%) and a use of "Client Negotiated Reverse Accrual Basis", when one wants to protect a loss larger than certain pre-defined amount. Both these uses are volatility-dependent and will provide different sorts of protection in different volatility environments.

Other interesting features of PFAA include Long Term Calculation Cycle with Fractional payouts when only a fraction (ex. 1/12) of the performance fee is paid on NAV dates while the balance is paid at the end of long cycle (ex. 5 years). This fractional payout arrangement is an analogue of SAF d distribution which is defined by SAF balance rather than time.

While PFAA arrangement addresses some of the issues listed in Section 1,2 it clearly has some drawbacks.

First, after a drawdown of the underlying strategy, which covered by transfers from PFAA, investors have a strong incentive to redeem, since the subsequent first gains will be used to replenish PFAA, rather than to benefit the investors. Dealing with this issue might require to apply a lock on the investment capital, thus changing the liquidity characteristics of the investment.

Second, the protection available to the investor from PFAA is limited because below the high watermark the protection is financed by the investors performance, not the performance

[8]See "Priority Return", page 3, 45:50, "Fractional Payment Accrual with Rolling Carry Forward" page 6 5:10, "General Schema of Application of the Present Method" page 14, 15:20 in [14]

fees. *The PFAA arrangement is asymmetric only when the PFAA is above the high watermark*. This dependence on high watermark poses also another problem: it introduces the path-dependence of the level of performance fees and PFAA balances and makes the analysis of optimal PFAA parameters much more complicated. Statistical analysis of PFAA requires modelling of the drawdown distribution and dynamics of the recovery of the drawdowns thus making the problem similar to the problem of pricing of barrier options. In contrast, SAF arrangement only requires the final value of the SAF balance and is in this respect similar to pricing of European options. It is well-known that the problem of pricing of barrier options is considerably more complex than the problem of pricing of European options and involves modelling of volatility of volatility and "tails" for the underlying strategy. Therefore, *the SAF structure, in comparison with PFAA, is achieving both constant asymmetric schedule of performance fees and simplicity and stability of analysis of optimal SAF parameters*.

Finally, the balance of the PFAA is only utilized to provide compensation of trading losses on a fixed size investment. There is no dynamic change in the exposure depending on the accumulated fees. Therefore, the investor cannot benefit from the cash that the manager is storing away.

The structure suggested in this paper is designed to overcome the above-mentioned problems, at least in part.

5 Simple model of fair fees

In this section we derive a simple relationship for the fair value of performance fees in SAF setup. The model introduced here is simplistic in its nature and does not account for many realistic features of investment returns, such as short-term auto-correlation, skew and kurtosis. We consider here zero interest rate. The model also does not account for partial payments to the manager at the end of performance periods and, in general, ignores path-dependence of SAF balances. All these features can be included in practical calculations for particular strategies. What is important for us here is the transparent and robust relationship between fair amount of fees and the measure of downside protection, quality of underlying returns (Sharpe Ratio) and length of the NAV periods. This simple yet universal result also helps to quantify the risk-transfer mechanism within SAF and to demonstrate the dramatic effect of SAF on decreasing downside volatility, minimizing drawdown and improving Sharpe Ratio for investment returns.

5.1 Relationship between performance fee and protection

We consider the following model of investment return[9] dx with time step dt:

$$dx = \mu dt + \sigma dW \ , \tag{5.1}$$

where dW is the standard Wiener process. It is well-known from option pricing theory that this process permits a simple lattice discretisation, also known as the Binomial model[15]. In this model on every step $i = 1, ..., N$ of duration T (NAV period), the strategy return x_i can take only two values:

$$x_i = \tilde{\sigma} \quad \text{with probablitity} \quad \frac{1}{2} + \pi$$

or

$$x_i = -\tilde{\sigma} \quad \text{with probablitity} \quad \frac{1}{2} - \pi \ .$$

Since

$$< x_i >= \mu T \equiv \mu_T \quad \text{and} \quad < x_i^2 > - < x_i >^2 = \sigma^2 T$$

the parameters in the Binomial model are defined as

$$\pi = \frac{\mu T}{2\tilde{\sigma}} \quad \text{and} \quad \tilde{\sigma}^2 = \sigma^2 T + \mu^2 T^2 \ .$$

Introducing Term Sharpe Ratio

$$R_T = \frac{\mu T}{\sigma \sqrt{T}} = R_{1Y} \sqrt{T} \ , \tag{5.2}$$

[9] In case of existence of a benchmark the process can be considered for the rate of out-performance of strategy with respect to the benchmark.

one can rewrite the parameters as

$$\pi = \frac{R_T}{2\sqrt{R_T^2+1}} \ , \tag{5.3}$$

and

$$\tilde{\sigma} = \sigma \cdot \sqrt{T}\sqrt{R_T^2+1} \ . \tag{5.4}$$

Let us now consider the fee structure where the manager on every time step i undertakes to cover fraction r of the negative performance of the strategy. The manager agrees to be compensated for this undertaking by receiving fraction p of the positive performance. *Assuming that the manager wants to achieve, in average, the same performance fee P as earned in simple performance fee arrangement*, one can link parameters r and p by the following equation:

$$p \cdot (\frac{1}{2}+\pi)\tilde{\sigma} - r \cdot (\frac{1}{2}-\pi)\tilde{\sigma} = P \cdot (\frac{1}{2}+\pi)\tilde{\sigma} \ ,$$

which results in the following relationship:

$$p = P + r \cdot \frac{1-2\pi}{1+2\pi} = P + r \cdot \frac{1 - R_T \frac{1}{\sqrt{R_T^2+1}}}{1 + R_T \frac{1}{\sqrt{R_T^2+1}}} \ . \tag{5.5}$$

Figure 1 shows dependence of Shock Absorber Fee, p on percentage of downside protection r for several values of Sharpe Ratios R_{1Y} and time windows T ($P = 20\%$).

The relationship (5.5) demonstrates several interesting features:

1. *It is a generalization of the simple fee arrangement* in a sense that when the percentage of downside protection is zero, the fee is reduced to simple performance fee structure:

$$p = P \quad \text{if} \quad r = 0 \ .$$

2. *Performance fee is linear function of the downside protection percentage r with the coefficient, which depends on statistical characteristics of the investment strategy*, i.e. the quality of returns. Higher the quality of returns and more certain the positive outcome, lower the performance fee required by the manager.The ratio $\frac{p}{r}$ agreed by the manager is a measure of his conviction in his own strategy.

3. *The formula (5.5) links the performance fee with the time step, the NAV period.* If investors want smooth returns and smaller mark-to-market fluctuations, NAV periods have to be short and the manager has to charge higher performance fee. In an example where the strategy has Sharpe Ratio of 3, $R_{1Y} = 3$, monthly NAV periods with full protection $r = 1$ would entitle manager to the performance fee higher than P by 20%, while weekly NAV periods in the same setup would bring the performance fee to $P+44\%$. This considerable increase in the performance fee expected by the manager is an analogue of the fact that price of series of short-term put options are more expensive than a single put option for the whole period.

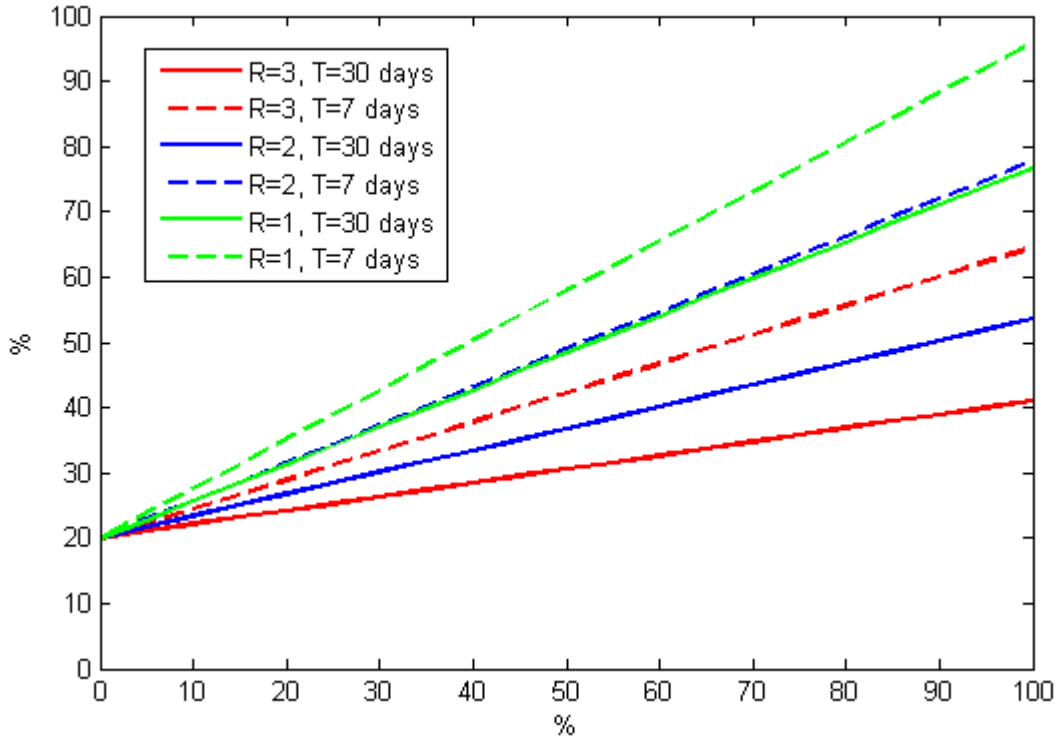

Figure 1: Dependence of Shock Absorber Fee, p on percentage of downside protection r for Sharpe Ratios of the underlying strategy $R_{1Y} = 1, 2, 3$ and time windows T of 1 week and 1 month. $P = 20\%$.

4. *The same relationship (5.5) can be used for time-varying size of the underlying portfolio* since it does not depend on absolute amount of protection. We use this feature in SAF structure, when the absolute amount of protection varies together with previously accumulated fees without affecting the fee calculation. This allows investors to continuously benefit from fees already earned by the manager while giving the manager a new mechanism to raise capital in performing strategies and an opportunity to earn higher fees overall.

5.2 SAF and risk transfer

It is instructive to examine the effect of the fee structure on statistical characteristics of the investment as well as on the manager's renumeration. One can check that the expected returns for investors

$$< x_{investor;T} >= \mu_{investor;T;r} = \mu_T P \cdot \tilde{\sigma} \cdot (\frac{1}{2} + \pi)$$

and the manager

$$< x_{manager;T} >= \mu_{manager;T;r} = P \cdot \tilde{\sigma} \cdot (\frac{1}{2} + \pi)$$

are the same as in the case of "simple" fee arrangement and do not actually depend on r:

$$\mu_{investor;T;r} = \mu_{investor;T;r=0} \quad , \quad \mu_{manager;T;r} = \mu_{manager;T;r=0} \ . \tag{5.6}$$

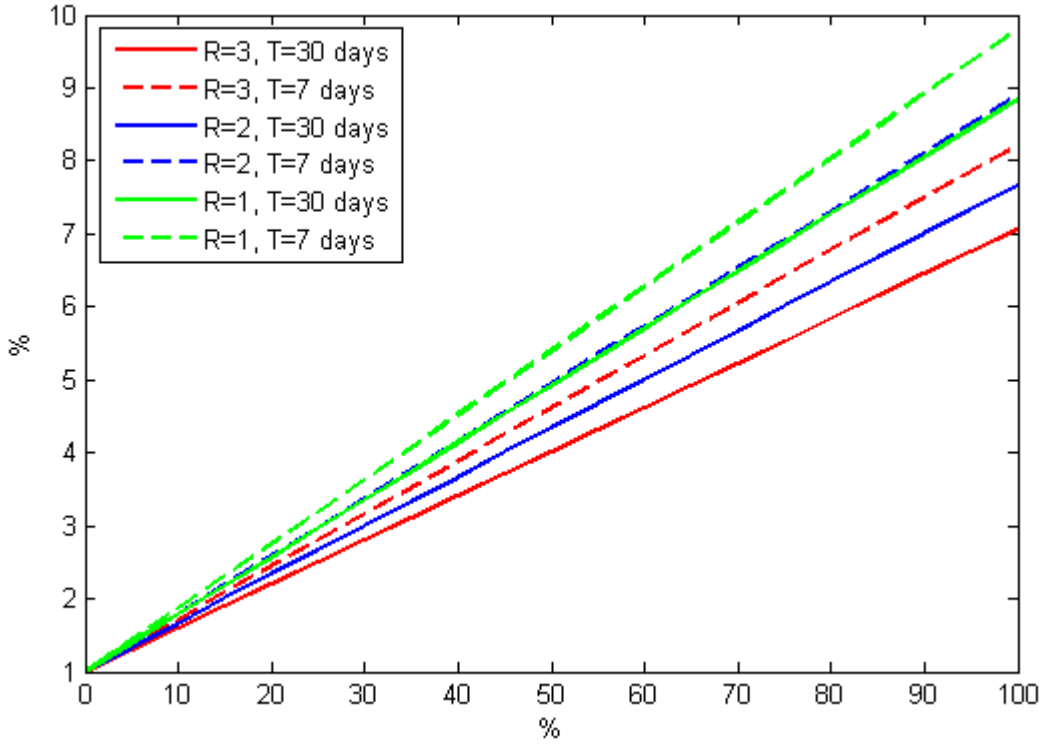

Figure 2: Increase in manager's risk, measured by standard deviation of manager's return, depending on downside protection r for Sharpe Ratios of the underlying strategy $R_{1Y} = 1, 2, 3$ and time windows T of 1 week and 1 month. Values of model parameters: $P = 20\%$ and $\sigma = 10\%$.

As before, investors and the manager are sharing return of the underlying strategy. However, in new fee arrangement they also sharing risk, while in the "simple" fee arrangement whole risk was carried by investors. This highlights the fact that SAF structure is an effective new mechanism to transfer part of the investment risk from investors to the manager thus improving return characteristics for the investors. To see this we calculate square of volatility of manager's returns

$$< x^2_{manager;T;r} > - < \mu_{manager;T;r} >^2 =$$

$$(< x^2_{manager;T;r=0} > - < \mu_{manager;T;r=0} >^2) + r \cdot \tilde{\sigma}^2 (\frac{1}{2} - \pi)(r + p + P) \ . \tag{5.7}$$

which highlights the fact that *the amount of the risk transfer from investors to the manager is, indeed, governed by the percentage of the downside protection assumed by the manager.* Figure 2 demonstrates increase of manager's risk depending on downside protection r for several values of Sharpe Ratios R_{1Y} and time windows T ($P = 20\%$ and $\sigma = 10\%$).

In the same way it is possible to calculate the covariance between manager's return and investors' return:

$$Cov(x_{investor;T;r}; x_{manager;T;r}) =$$

$$Cov(x_{investor;T;r=0}; x_{manager;T;r=0}) + r \cdot \tilde{\sigma}^2(\frac{1}{2} - \pi)(2 - (r + p + P)) \ . \qquad (5.8)$$

The last term in the right hand site is typically positive. Figure 3 illustarates this effect for several values of R_{1Y} and T, assuming $P = 20\%$ and $\sigma = 10\%$. For all values of parameters manager's and investors returns remain 100% correlated (*"same boat" concept*).

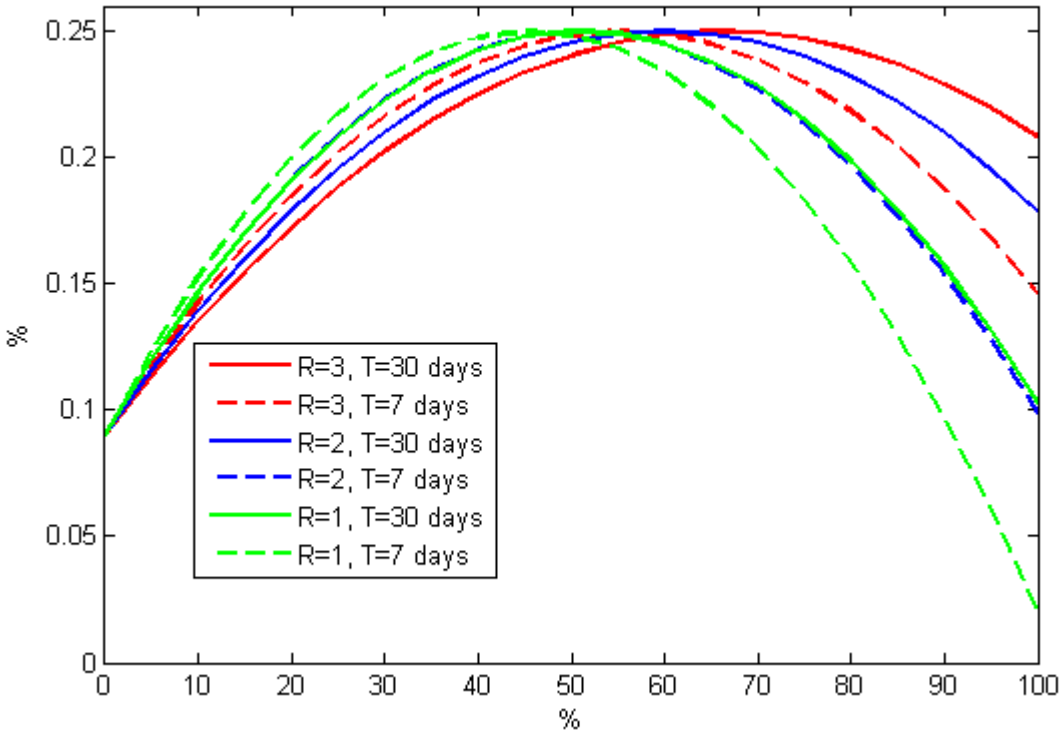

Figure 3: Covariance of manager's and investors returns depending on downside protection r for Sharpe Ratios of the underlying strategy $R_{1Y} = 1, 2, 3$ and time windows T of 1 week and 1 month. Values of model parameters: $P = 20\%$ and $\sigma = 10\%$.

In a similar manner one can calculate square of standard deviation of investors returns

$$< x^2_{investor;T;r} > - < \mu_{investor;T;r} >^2 =$$

$$(< x^2_{investor;T;r=0} > - < \mu_{investor;T;r=0} >^2) - r \cdot \tilde{\sigma}^2(\frac{1}{2} - \pi)(4 - (r + p + P)) \qquad (5.9)$$

The last term in Eq (5.9) is negative and proportional to r. This demonstrates the fact that *investors risk decreases proportionately to the amount of protection manager provides to the investors* and this, indeed, corresponds to the risk transfer from investors to the manager. Figure 4 shows decreasing investor's risk depending on the parameters of the risk transfer r for several values of R_{1Y} and T ($P = 20\%$ and $\sigma = 10\%$).

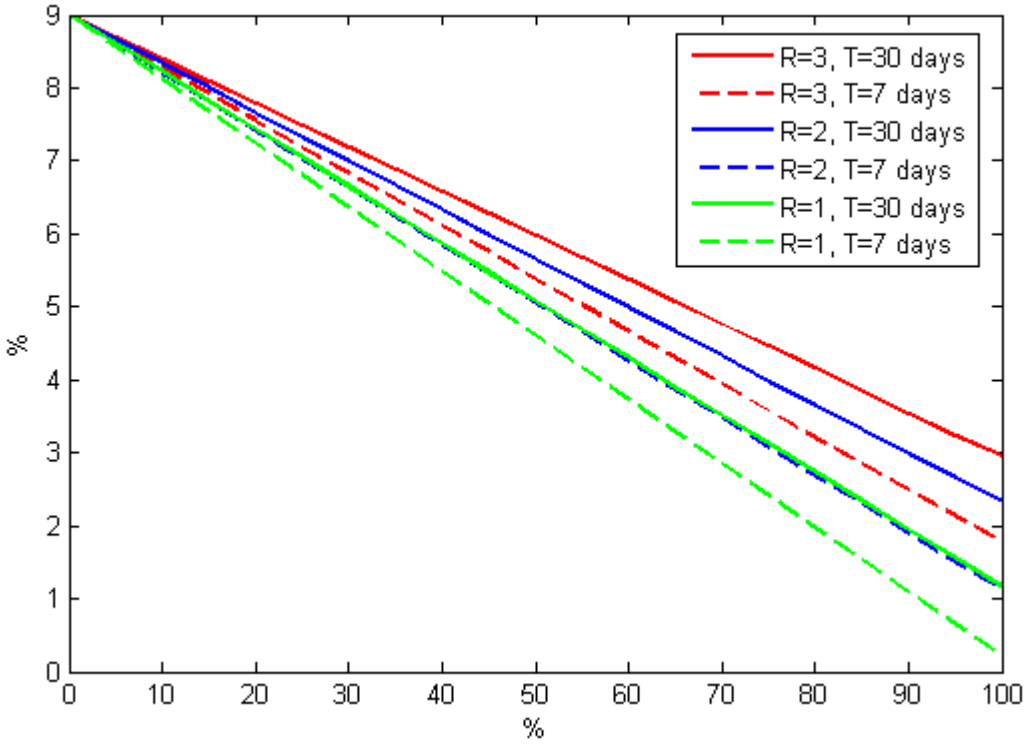

Figure 4: Increase in investors risk, measured by standard deviation of investors return, depending on downside protection r for Sharpe Ratios of the underlying strategy $R_{1Y} = 1, 2, 3$ and time windows T of 1 week and 1 month. Values of model parameters: $P = 20\%$ and $\sigma = 10\%$.

The exact amount of risk transfer depends on statistical characteristics of the investment strategy, NAV period and the downside protection percentage, but *for all values of the parameters investors benefit from the arrangement.*

5.3 What is fair to ask from manager?

We can now address the question of what is the fair amount of protection which manager should agree to provide to investors. One can argue that, if management fees are only a

compensation for setting up and maintaining the strategy, *quality of investors' performance and manager's performance should be the same*. In other words, one can expect that manager would be willing to provide the protection until his investment profile is no worse than that of the investors. Otherwise, the manager would be better off if he invests his money as an investor rather than through the performance fee arrangement. At the same time investors have collective pricing power, at least in theory, to demand the highest possible level of protection because, as we saw above, this increases quality of their returns. This leaves us with an equation for the fair amount of protection investors can demand from the manager and the manager would agree to undertake:

$$\frac{< \mu_{manager;T;r} >}{\sqrt{< x^2_{manager;T;r} > - < \mu_{manager;T;r} >^2}} = \frac{< \mu_{investor;T;r} >}{\sqrt{< x^2_{investor;T;r} > - < \mu_{investor;T;r} >^2}} , \qquad (5.10)$$

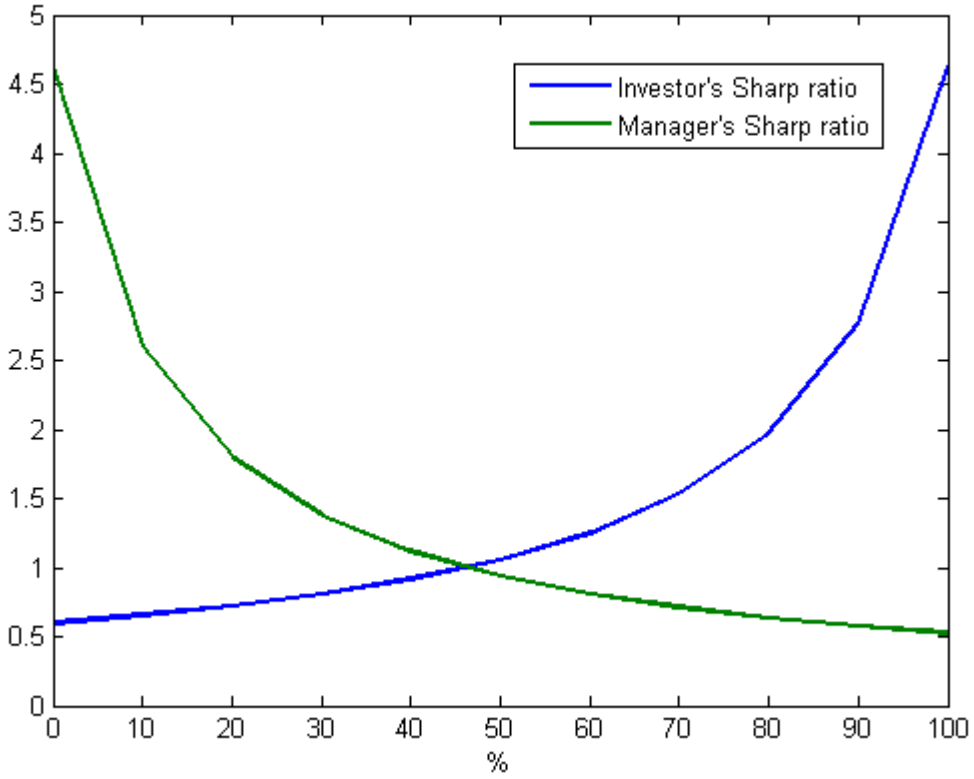

Figure 5: Solution for fair value of downside protection. Sharp ratio of the underlying strategy $R_{1Y} = 1$ and time windows $T = 1$ month. Values of model parameters: $P = 20\%$ and $\sigma = 10\%$.

i.e. Sharpe Ratios $R_{manager;T;r}$ and $R_{investor;T;r}$ of both ways to invest in the strategy should be the same. This is the embodiment of the concept that *investing with the manager should*

be no worse than investing in the manager. Equations (5.5) and (5.10) together completely define a solution for parameters p, r of fair SAF arrangement depending on characteristics of the underlying strategy and time window.

As it follows from Eqs (5.7), (5.9) and (5.6), the right hand side of Eq (5.10) is a decreasing function of r while the right hand side of Eq (5.10) is an increasing function of r. This means that the solution of the problem is unique and it exists if

$$R_{manager;T;r=0} > R_{investor;T;r=0} \quad \text{and} \quad R_{manager;T;r=1} < R_{investor;T;r=1} \ .$$

Figure 5 shows an example of the solution for the case of a strategy with $R_{1Y} = 1$, weekly NAV periods and $P = 20\%$.

6 Mutual benefits of SAF arrangement

Important consequence of the SAF arrangement is the existence of mutual benefits for all market participants and the resolution of long-standing conflict of interests between investors and managers.

6.1 Investors: Improving risk-return characteristics of investments

Risk transfer, covered in the last section, improves quality of the investment for the clients. This is most transparent if one plots Sharpe Ratio of investors return versus the percentage of the downside coverage r (Figure 6; same parameters as in Figure 5).

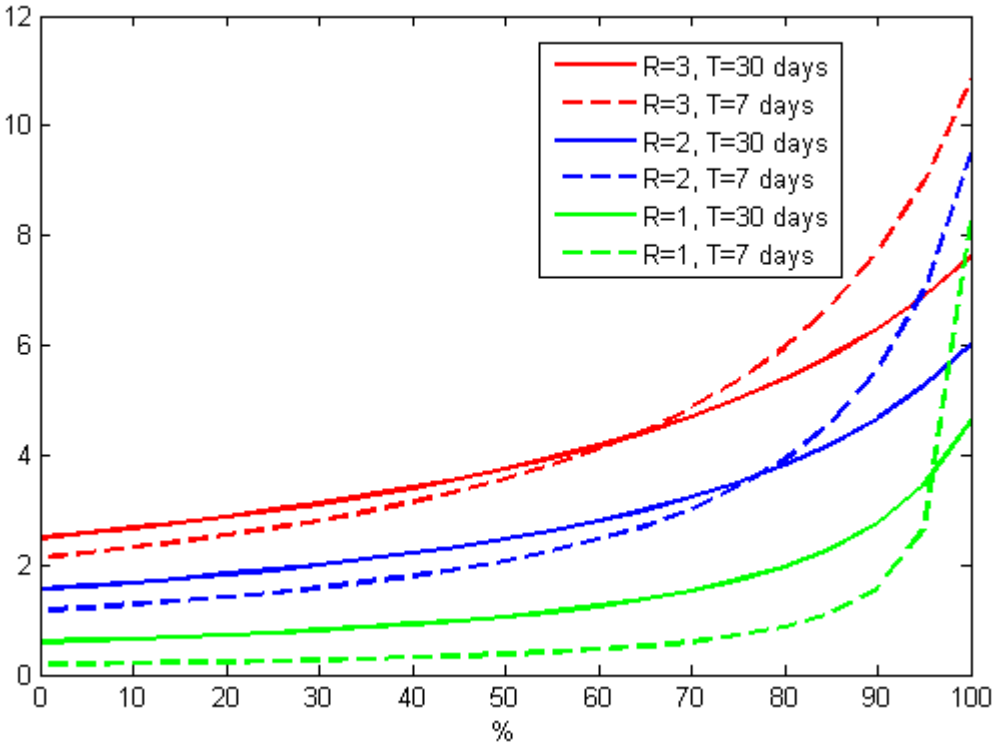

Figure 6: Investors Sharpe Ratios depending on downside protection r for Sharpe Ratios of the underlying strategy $R_{1Y} = 1, 2, 3$ and time windows T of 1 week and 1 month. Values of model parameters: $P = 20\%$ and $\sigma = 10\%$.

It is obvious from Figure 6 that the quality of the returns is only improved by the SAF arrangement, which prompts investors to choose maximal downside protection among available fee structures: although optically SAF performance fee seems high, average return of the investors remains the same for all r but their risk decreases sharply.

The fee structure is best suited for investment strategies with systematic risk premium extracting component, which generates steady returns most of the time, but suffers badly from sudden change in the risk appetite or technical dislocations. These sudden blasts make such strategies overall risky, with negative skew and kurtosis (negative "tail" risk) and prevent prudent investors from over-sizing the investment. This class of strategies cover most of known investment styles, including carry-type strategies, credit, relative value strategies, systematic quant strategies, growth-value styles, and many others with systematic risk and(or) liquidity premium extraction and short wings.

6.2 Managers: stable business with higher overall fees

Manager is also benefiting from the arrangement.

1. The arrangement gives investors negative incentive to redeem, because as long as the SAF cushion exists the investor is protected. By redeeming from the manager, investor forfeit this protection for free. This, rather than redemption fee, is a price of liquidity for investors. Therefore performing managers benefit from better stability of the capital base.

2. The dynamical exposure feature of SAF arrangement implies that as long as the SAF cushion is accumulated, exposure is growing as well. This means that if the strategy is performing, manager can earn fees on larger amount of capital without additional subscriptions, i.e. effectively raise capital without marketing, legal and operational expenses.

3. If the manager out-performs the assumed random process for the investment returns (5.1), the manager earns more money than in the "simple" fee arrangement.

Table 1: Statistical characteristics of Fusion Libor+450 strategy with "simple" fees and with Sock Absorber Fees.

Investment Characteristics (period Jan 00- Dec 09)	Simple 10% fees	SAF ($35\% - 100\%$)
Annual Return	7.5%	10.3%
Annual Volatility	2.1%	1.5%
Annual Sharpe Ratio	2.2	4.9
Maximal Drawdown	-1.8%	0%

7 Examples of investment products

The effect of the structure is defined by the quality of the underlying returns. Higher the Sharpe Ratio, shorter the NAV periods the strategy can support, thus making the smoother the investors returns.

Example 1: Fusion LIBOR + 450 (FUAMLIB4 INDEX)

- Investment Objective: Absolute return;
- Investment Strategy: Systematic and flexible cash management strategy based on quantitative analysis of FX and interest rate dynamics, overlaid with volatility forecast;
- Trading only spot G10 currencies, no derivatives are permitted;
- Target return LIBOR + 450bps, historic return 7.5% pa with annual volatility 2.5%;
- Subscription / Redemption: daily liquidity;
- Customary fee structure: 10% performance fee, semi annual performance fees.

We use the following SAF fees parameters:

- Reserve Value, $B_0 = 0$, $B_1 = 2\%$, $B_2 = 3\%$;
- Downside Protection , $r = 100\%$;
- Amount of Performance Fees, $p = 35\%$;
- Exposure parameters, $L_0 = L_1 = 1$, $L_2 = L_{max} = 1.5$;
- NAV Period weekly.

Figure 7 shows the investor return profile with SAF arrangement comparing with "simple" performance fees. Table 1 demonstrates the considerable improvement in the statistical characteristics of the investment product (same parameters as for Figure 7).

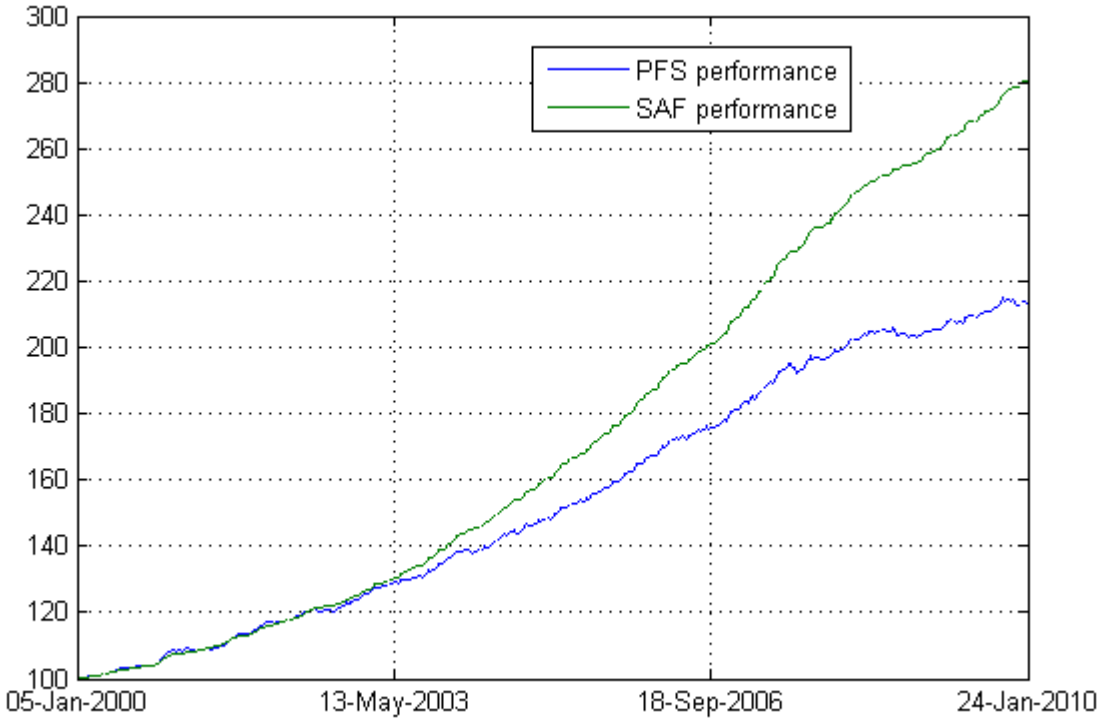

Figure 7: Comparison of SAF arrangement and "simple" fees: investment performance for Fusion Libor+450 strategy.

The application of SAF fees to the Fusion LIBOR + 450 product materially improves the investment characteristics of the product by dramatically decreasing the volatility, noticeably improving Sharpe Ratio, and diminishing the maximal drawdown. It is interesting to point out that manager's compensation is also improving as it can be seen from the Figure 8.

In this example SAF arrangement improves investment and business profiles of the manager and investors and is mutually beneficial for the both parties. This shows that the structure succeeds in removing the conflict of interests considered in details in Section 1.

The second example shows a product with lower Sharpe Ratio which still can be considerably improved by using SAF with monthly NAV periods.

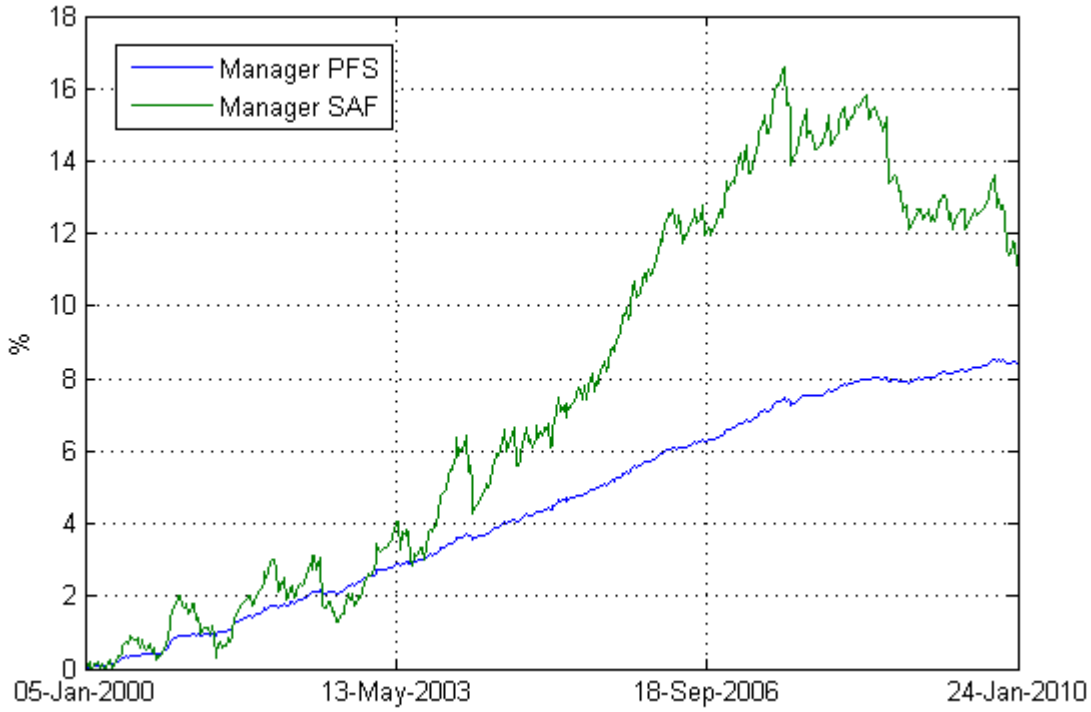

Figure 8: Comparison of SAF arrangement and "simple" fees: Manager's compensation for Fusion Libor+450 strategy.

Example 2: GLG European Long Short Fund (GLGELSA KY Equity)

- Investment objective: absolute return with a reduced market correlation;
- Investment Strategy: Long-Short European Equity;
- Monthly subscription and redemption;
- Historic return 12% pa;
- Customary Fee Structure: 20% performance fee, semi-annually;
- Maximal annual drawdown (pa) -15.5%.

Here we use the following SAF parameters:

- Reserve Value, $B_0 = 0$, $B_1 = 10\%$, $B_1 = 20\%$;
- Downside Protection, $r = 100\%$;

- Amount of Performance Fees, $p = 55\%$;
- Exposure parameters, $L_0 = L_1 = 1$, $L_2 = L_{max} = 2$;
- Performance period - monthly;

Figure 9 shows the investor return profile with SAF arrangement comparing with simple performance fees.

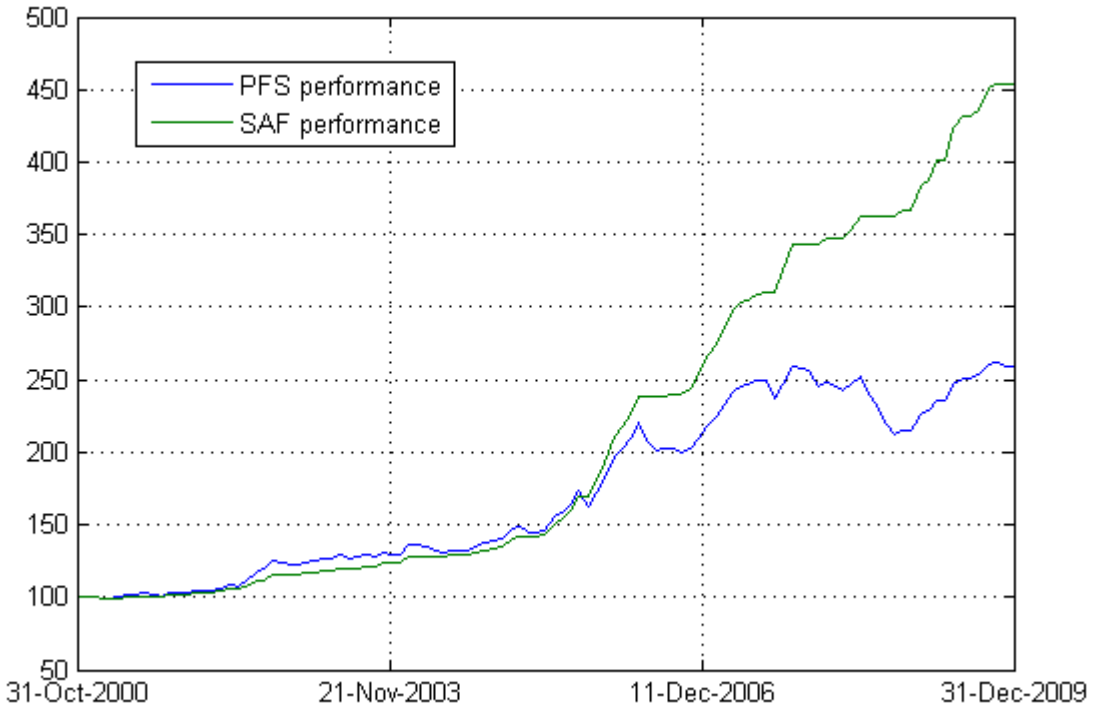

Figure 9: Comparison of SAF arrangement and "simple" fees: investment performance for GLG European Long Short Fund.

The application of SAF to the GLG European Long Short Fund again materially improves the investment characteristics of the product by dramatically decreasing the volatility, improving Sharpe Ratio, and reducing the maximal drawdown.

Figure 10 shows that on long-term horizon manager compensation in SAF structure is beneficial for the manager, although noticeably more volatile. Table 2 demonstrates the considerable improvement in the statistical characteristics of the investment product (same parameters as for Figures 9, 10).

Table 2: Statistical characteristics of GLG European Long Short Fund with simple fees and with Sock Absorber Fees.

Investment Characteristics (period Oct 00- Dec 09)	Simple 20% fees	SAF $(55\% - 100\%)$
Annual Return	11.1%	12.52%
Annual Volatility	9.3%	5.1%
Annual Sharpe Ratio	0.9	1.9
Maximal Drawdown	-15.5%	0%

It is clear from both examples that the SAF arrangement improves investment characteristics of both products, creating incentives for managers and investors to utilize the structure.

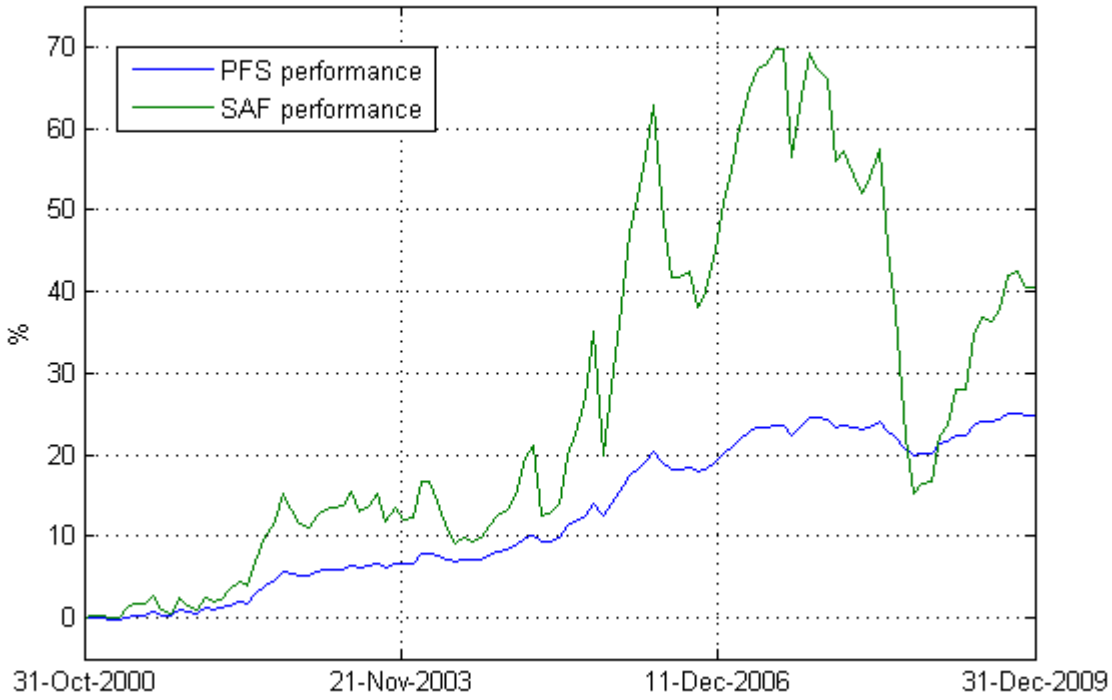

Figure 10: Comparison of SAF arrangement and "simple" fees: Manager's compensation for GLG European Long Short Fund.

We now consider wider economic and social implications of adopting SAF-type structures.

8 Socio-economic benefits of SAF-type structures

8.1 Better investment products

There are not that many systematic factors generating consistent returns. Forward bias in FX, excessive implied rate of defaults in credit, mean-reversion of volatility, small cap-large cap premium and technical trends in short-term price dynamics - these are most popular drivers of systematic returns. They form a basis for a multitude of versions of common investment strategies such as carry trades, long credit and credit relative value, short-biased volatility arbitrage and equity long-short. All these strategies suffer from short term risk unwinds which generate spikes in volatility of returns. They result in considerable performance drawdowns which damage the quality of returns and make the strategies less attractive for investors. One can spend years on developing know-how for filtering strategy signals to prevent large drawdowns, while only marginally improving statistical characteristics of the strategy. Shock Absorber Fees allow to make a big step in this direction by absorbing short-term shocks from technical and risk unwinds and permitting managers to run the strategies in larger size, achieving greater returns for their investors with the same or lower volatility.

8.2 Improving stability of global financial system

It is not difficult to spot where improvement comes from: it comes from the risk transfer and risk sharing between investor and managers, which is achieved in the SAF structure. Not only interests of investors and managers are now aligned but they are also sharing same risks of tail events, which in "simple" performance fee structure investors were selling to managers for free. Managers facing the first loss in SAF structure will be inclined to exercise prudence to protect themselves against rare, but disastrous events, created by systematic biases and amplified by herding behavior[2]. This will reduce the extent of irresponsible risk taking practices. It will improve stability of the global financial system by minimizing sources of potential systematic stress and destroying the mechanism of contamination and amplification of the stress in the system. This is why *we expect that the new arrangement would be welcomed by financial regulators*, currently striving to improve market stabilization mechanisms in the wake of 2007-2009 crisis and to avoid future use of public funds for bailing-out of failing financial institutions at expense of taxpayers.

One can ask why managers would accept a new, more risky, fees structure in place of "simple" customary arrangement. The answer lies in the pricing power of clients who would select investment products with better risk-return characteristics. Indeed, less sophisticated strategies with lower quality of returns of the underlying strategy but with the risk-transferring mechanism can comfortably outperform complex strategies of highly sought-after managers who refuse to accept the risk-sharing. Negative signaling of managers who are not ready to take risk on their own strategies, who are defending their preferential position in the existing conflict of interests with investors, who are deliberately causing lower quality of investors returns will face reduction of their capital base and eventual loss of their competitive positions.

8.3 Better social security

Professional investors are not the only beneficiaries of the new structure. General public gains from the new arrangement through multiple collective investment schemes, pensions and savings. Pension plans, endowments and saving organizations are among largest institutional investors. *By making their investments safer, SAF contributes to higher level of social protection and better educational and living standards.*

8.4 Higher rate of economic growth

The new performance compensation structure partially de-risks investment products, run by professional investment managers and, in general, providers of financial services[10]. It has being observed many times before that the ability to decrease risk due to financial innovations, such as financial derivatives in portfolio hedges or credit derivatives in banking lending portfolios, usually does not lead to reduction of the risks for the same rate of return, but rather increases the rate of return matching the previous level of risk. It is, therefore, natural to expect that the same behaviour will be take place with the adoption of SAF: reduced risk of investments would prompt investors to increase the size of investments to match the previous level of risk but achieve the higher rate of return.

Typical SAF improves Sharpe Ratio of investments by 1.5-2 times which indicates that *wide acceptance of SAF-type structures can lead to considerable increase in available investment capital.* It is difficult to estimate economic impact of the increase in investments due to new risk-sharing arrangement but one should expect that *such increase would contribute to wider availability of investment capital and, as a result, to higher investment and higher rates of GDP growth.* The latter, together with safer savings, will lead to increase in economic prosperity, higher level of life standards and social security.

[10]In January 2010 financial services accounted for nearly 20% of companies in $S\&P500$ equity index in terms of total capitalization.

9 Practical implementation

SAF structure is very flexible and can be implemented on a fund or managed account level. It can be done against any benchmark, hurdle and can include tracker funds or absolute return funds. The arrangement can be applied to single-manager funds or fund-of-funds, as well as it can be adapted for performance-related renumeration of single traders or trading desks within larger organisations. In more general framework SAF structure has to be seen as a particular solution of a general principal-agent problem, which can result in multiple applications ranging from managing limited resources (ex. electricity [13]) to setting up socially-acceptable mechanisms of executive-enterpreneurial compensation.

9.1 Equalisation

On a fund level the arrangement requires some sort of equalization procedure to allow subscription and redemptions at different times. One of simplest forms of equalization is described below based on the implementation utilized by Fusion Asset Management for its Fusion Garant+450 product based on Fusion Libor+450 product with SAF arrangement.

In the proposed equalisation algorithm for any subsequent (by the same investor) or additional (by a new investor) subscription the total amount of the investment is split into two parts: Equalisation Reserve and Capital Added. Equalisation Reserve is transferred into SAF account and is proportional to SAF account existing balance. The remaining amount of the subscription

$$\textbf{Capital Added = Investment - Equalization Reserve} \ ,$$

is invested into the fund. If we introduce nav = NAV per share and saf = SAF balance per share, the investment I buys n = I / (nav + saf) shares of the fund and

$$\textbf{Capital Added / nav = Equalization Reserve / saf} \ .$$

When an investor redeems he receives the amount equal to the minimum of Equalisation Reserve and investor's share of the SAF account (saf times n) at the time of redemption:

$$\textbf{Equalization Repayment = min (Equalisation Reserve ; saf times n)} \ .$$

In relation to subsequent investment, the redemption proceeds for each investor are calculated on "the last in, last out" principle to ensure that the investor gets the benefit from the "most full" Reserve. When an investor redeems from the fund investment, any positive balance from the investor's share SAF account less his Equalization Repayment is released to the manager.

9.2 Initial funding

Initial funding can be achieved in several different ways.

One option can be *initial funding through equalisation*. In this scheme manager funds the cushion for its own small initial investment and then later utilizes the equalization process described above for new investors. In this way investors who track investment in the fund on mark-to-market basis and the equalization reserve on accrued basis (i.e. record profit and loss on the realized basis, when investment is redeemed from the fund) will immediately benefit from the SAF arrangement.

Alternatively, a more sophisticated scheme of *initial funding through subscription or placement fees can be suggested*. On day one, an investor is charged a placement fee by the manager. The fee is then treated as on expense and is amortized during 12-36 months in the same way as other legal or setup costs are amortized. Simultaneously, the manager transfers the full amount of the placement fee to the SAF account to fund the initial cushion. This arrangement is more complicated from accounting stand point but it will be beneficial for investors who have to treat both fund investment and equalization reserve on mark-to-market basis. In this scenario investor is effectively borrows money against future earnings to fund the initial contribution to the SAF account.

Both schemes described above can be implemented for the same fund as different share classes. In this way investors can select the pre-funding mechanism which suits them most.

Concrete details of the initial funding are subject to legal and accounting procedures in the country of the fund (and client) domicile and can vary to take into account differences in the treatment. One can also envisage different forms of initial funding not covered above, including managers contribution in exchange for higher performance fees, third party funding in exchange for a share of managers revenues or priority payments. We do not describe these, as well as many other, options in detail here as they are specific to particular situation in question and should be covered separately on case-by-case basis.

10 Conclusion

In this paper we introduced a novel performance fee structure, the Shock Absorber Fee, SAF. The structure is characterized by three main features:

1. Performance fee is a compensation for a manager's undertaking to provide full or partial downside protection to investors secured by, and up to, accumulated previously performance fees;

2. Asymmetry: for every Nav period the ratio of the performance fee to the percentage of the downside protection is defined by statistical characteristics of the underlying investment strategy and investment time horizon;

3. Dynamical exposure: amount of the protected exposure is defined by the balance of SAF account, which contains accumulated performance fees and can be either pre-funded or not.

While there is a number of similarities with previously proposed structures, including CDOs and clawbacks, which tackle some of the problems related to the manager compensation and investor-manager risk transfer, we believe that SAF is the first structure to answer the questions in full. Wide implementation of the structure in financial services will lead to safer and more profitable investments, better social security, improved stability of global financial system and higher rate of economic growth. At the same time, it does not require extensive changes in business processes or expensive infrastructure. It takes so little to get so much.

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