



Does your hedge fund manager smooth returns intentionally or inadvertently?

Tae Yoon Kim^a, Hee Soo Lee^{b,*}

^a Department of Statistics, Keimyung University, 1095 Dalgubeol-daero, Daegu 704-701, Republic of Korea

^b Department of Business Administration, Sejong University, 209 Neungdong-ro Gwangjin-gu, Seoul 05006, Republic of Korea

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ABSTRACT

We propose an econometrically logical approach that distinguishes intentional from inadvertent smoothing of hedge fund return. Other than the hedge fund return (Y) we introduce an explanatory variable: a market portfolio of hedge fund returns (X). By connecting X and Y , some critical parameters are found to be effectively related to testing the two types of return smoothing. Using those parameters, we develop distinct desmoothing algorithms against intentional and inadvertent smoothing. Our empirical results show that although intentional smoothing is partly responsible for hedge fund smoothing and is done more consistently than inadvertent smoothing, return smoothing is mainly caused by the nature of underlying assets.

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1. Introduction

Many hedge funds hold illiquid securities or difficult-to-price, over-the-counter securities of which publicly available traded prices often do not exist. Unlike mutual funds, hedge funds are not regulated entities, and hence, some fund managers do not disclose their strategies and positions and are known to report their returns at their discretion. The lack of securities' prices and transparency may induce hedge fund managers to manage, either intentionally or inadvertently, their positions for reporting returns. Although most hedge fund managers are good and honorable people, they have a strong incentive to show returns that are consistent and uncorrelated with traditional markets, and some managers likely engage in the unsavory practice of intentional return smoothing (Getmansky et al., 2004). Liang (2003) shows that the returns of hedge funds audited are "more precise and consistent" across databases. Thus, it is generally suspected that data generated by hedge funds are contaminated by inadvertent return smoothing due to pricing problems or intentional return smoothing due to the manager's agenda. These behaviors often cast reasonable doubts on benefits from the portfolio diversification of hedge funds.

Bollen and Pool (2009) infer hedge fund managers' return smoothing through a discontinuity at zero in the hedge fund net return distribution; that is, the number of small gains far exceeds the number of small losses. They argue that their finding is caused by fund managers' manipulating their returns to avoid showing

small losses. However, Jorion and Schwarz (2014) show that the incentive fees for hedge funds as well as asset illiquidity and the bounding of yields at zero for fixed-income securities can generate such distribution discontinuities. Therefore, they conclude that the observed hedge fund return discontinuities are not direct evidence of intentional smoothing.

Cassa and Gerakos (2011) study the two types of smoothing by incorporating hedge fund due diligence reports into hedge fund return data and notice that funds using less verifiable pricing sources and funds that provide managers with greater discretion in pricing investment positions are more likely to have consistent intentional smoothing. More recently, Cao et al. (2017) examine the extent to which hedge fund return smoothing is due to intentional smoothing using a new hedge fund data set from a separate account platform that trades pari passu with matching main hedge funds and that features third-party reporting and permissive share restrictions. They find that 33% of reported smoothing is classified as intentional smoothing and 67% of reported return smoothing as inadvertent return smoothing due to the properties of the underlying assets and other factors common to main funds and separate accounts. These studies are done based on data that are not easily available, such as due diligence reports or separate accounts, to distinguish between the two types of smoothing.

In the literature, there are also econometric modeling approaches for return smoothing. In other words, autoregressive model-based solutions to adjust biases caused by return smoothing are suggested by Brook and Kat (2002) and Getmansky et al. (2004). These bias adjustments, however, fail to disentangle the effects of underlying assets' illiquidity smoothing from intentional

* Corresponding author.

E-mail addresses: tykim@kmu.ac.kr (T.Y. Kim), heesoo@sejong.ac.kr (H.S. Lee).

smoothing by hedge fund managers because of insufficient endogenous or explanatory information (refer to Section 2 below). The above discussions show that the desmoothing problem likely suffers from a shortage of data as well as a lack of proper explanatory variables.

In this paper, we develop an econometric approach that distinguishes intentional smoothing from inadvertent illiquidity smoothing. For this, we consider not only the hedge fund return Y itself but also a market portfolio of hedge fund returns X as an explanatory variable. By connecting X and Y via single equation error correction model (SEECM), some critical parameters, if properly controlled, are found to be effectively related to testing intentional smoothing and inadvertent illiquidity smoothing. *Based on these critical parameters and AR(1) type model by Brook and Kat (2002), desmoothing algorithms against intentional smoothing and against inadvertent illiquidity smoothing are developed.*

As empirical applications of our algorithms, we test smoothing behavior for individual hedge funds in the TASS database. Our empirical findings are intuitive as well as consistent with previous results (Getmansky et al., 2004; Cassa and Gerakos, 2011; Cao et al., 2017). Funds containing illiquid securities for which managers and brokers have any discretion in marking their position (e.g., fixed income arbitrage funds and convertible arbitrage funds) appear to be prone to involve return smoothing. In contrast, return smoothing is found to be less involved by funds that contain liquid assets easily marked to market (e.g., long/short equity funds and managed futures funds). We also find that although intentional smoothing is partly attributable to hedge fund smoothing, return smoothing is mainly caused by the nature of the funds' underlying assets (inadvertent smoothing) and that intentional smoothing is done more consistently than inadvertent illiquidity smoothing. These consistent and intuitive findings verify that our methodology resolving the shortage of data and explanatory variables is a logically reasonable tool for detecting intentional smoothing.

We organize this paper into the following sections. Section 2 discusses our methodology of desmoothing and testing return smoothing; two distinct desmoothing algorithms are described in this section. Section 3 describes our data and discusses the main results of empirical tests. Section 4 offers concluding remarks.

2. Desmoothing and testing methodology

To desmooth the smoothed hedge fund returns, Brook and Kat (2002) consider a model

$$Y_t^* = \tau Y_{t-1}^* + (1 - \tau) Y_t. \quad (1)$$

where $|\tau| < 1$, Y_t^* is a smoothed return, and Y_t is an original (true) return without smoothing at time t (presumably unavailable unless $\tau = 0$). Note that (1) leads to

$$Y_t^* = (1 - \tau) \sum_{j=0}^{t-1} \tau^j Y_{t-j}. \quad (2)$$

which shows that the smoothed hedge fund return at time t (Y_t^*) is a weighted average of its true returns over the past periods. It is noted from Eq. (1) that a sufficiently small $|\tau|$ implies an insignificant amount of return smoothing because a small $|\tau|$ makes $Y_t^* \cong Y_t$. A value of $|\tau|$ close to 1 implies substantial return smoothing because fund managers report Y_t^* with a relatively higher weight of Y_{t-1}^* (smoothed return at a previous time) than that of Y_t (true return). Thus, τ is an important smoothing profile parameter, and the choice of τ is critical for a successful desmoother recovering true return Y_t . From Eq. (1), desmoother $Y_t(\hat{\tau})$ with estimate $\hat{\tau}$ is

given by

$$Y_t(\hat{\tau}) = \frac{Y_t^* - \hat{\tau} Y_{t-1}^*}{(1 - \hat{\tau})}. \quad (3)$$

Brook and Kat (2002) sets a smoothing profile estimate $\hat{\tau}$ equal to the smoothed returns' autocorrelation coefficient at lag 1, which forces the first order autocorrelation of desmoothed data $Y_t(\hat{\tau})$ to be zero. Thus, their desmoothing implicitly assumes that the original (and unavailable) hedge fund returns are independent, and return smoothing only causes serial autocorrelation in hedge fund returns. This naive assumption could be subject to serious bias because the autocorrelation might result from other factors besides return smoothing. Getmansky et al., (2004) methods set the observed (smoothed) hedge fund return at time t (Y_t^*) as a weighted average of its true return Y_t over the most recent $k+1$ periods, including the current period

$$Y_t^* = \theta_0 Y_t + \theta_1 Y_{t-1} + \dots + \theta_k Y_{t-k}. \quad (4)$$

where $0 \leq \theta_i \leq 1$, $i = 0, 1, 2, \dots, k$, and $\theta_0 + \theta_1 + \dots + \theta_k = 1$. The performance of Getmansky et al. (2004) critically depends on the choice of k and θ_i s, which requires a knowledge of the autocorrelation of Y_t . For this, Getmansky et al. (2004) introduces a linear single-factor model for Y_t . By doing so, it separates the effects of illiquidity from the intentional return smoothing. As discussed there, the most difficult challenge in implementing their method is to correctly identify the single common factor with proper additional information. Overall, the difficulty with correctly identifying intentional smoothing mainly comes from the unavailability of Y_t . Also refer to Asness et al. (2001), Bollen and Pool (2008), Cassar and Gerakos (2011), and Cao et al. (2017) for related references.

In order to resolve the unavailability of Y_t more efficiently, we consider model (1) and introduce the market portfolio of hedge fund returns X as an additional explanatory variable. We assume that X and an individual hedge fund return Y are modeled as

$$X_t = \theta_x W_t + \delta_x u_{x,t} \quad Y_t = \theta_y W_t + \delta_y u_{y,t}. \quad (5)$$

where W_t represents a common latent factor with the non-zero loadings θ_x and θ_y while $u_{x,t}$ and $u_{y,t}$ are idiosyncratic factors unique to X_t and Y_t , respectively, with the loadings δ_x and δ_y . It is assumed that W_t and $u_{x,t}$ are stochastic processes with zero mean and unit variance, i.e., $W_t \sim (0, 1)$ and $u_{x,t} \sim (0, 1)$.

To complete the specification of the common factor model, all factors are assumed to be independent:

$$E(u_{x,t} u_{y,t}) = 0, \quad E(u_{x,t} W_t) = 0, \quad E(u_{y,t} W_t) = 0,$$

In addition, we employ an AR(1) model for idiosyncratic shocks that occur in fund Y as

$$u_{y,t} = \rho u_{y,t-1} + a_{u,t}. \quad (6)$$

where $E(a_{u,t} W_t) = 0$, $E(a_{u,t} u_{y,t}) = 0$, $0 < \rho < 1$, and $a_{u,t} \sim iid(0, 1)$. The AR(1) model imposed by (6) is appropriate because the idiosyncratic factors for a hedge fund's returns certainly progress dynamically over time. Note that $\text{Var}(u_{y,t}) = \frac{1}{1-\rho^2}$, that is, the volatility of the idiosyncratic factor of Y_t is determined by ρ . As Y_t in (5) contains W_t as systematic illiquidity factors and $u_{y,t}$ as an idiosyncratic factor via (6), the two smoothing behaviors to the hedge fund could be tested and analyzed via a set of parameters in (5) and (6), respectively.

It is econometrically reasonable to assume that the dynamic system behind the returns of an individual hedge fund Y_t and a market portfolio of hedge funds X_t keeps a long-term equilibrium. From this point of view, one may employ a single equation error correction model (SEECM) and link it to the latent factor model (5) with (6). The SEECM is useful for estimating both short-term

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