The Effect of Regulatory Constraints on Fund Performance: New Evidence from UCITS Hedge Funds*

JUHA JOENVÄÄRÄ and ROBERT KOSOWSKI

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ABSTRACT

Based on geographically disparate regulatory constraints, such as share restrictions and risk/leverage limits, we economically motivate and test a range of hypotheses regarding differences in performance and risk between UCITS-compliant (Absolute Return UCITS (ARUs)) and other hedge funds. We demonstrate that hedge funds have more suspicious patterns in their reported returns than ARUs, which have stricter reporting rules. Inconsistent with the notion that UCITS rules reduce operational risk we find that ARUs are more exposed to operational risk measures and exhibit more external conflicts of interest than hedge funds. Although ARUs deliver lower risk-adjusted returns than other hedge funds on average, this difference disappears when we compare subsets of the two groups of domicile matched funds that have the same liquidity or share restrictions. Leverage and margin constraints are less binding for funds that impose tight share restrictions, and thereby, these funds tend to have more exposure to betting-against-beta factor. Finally, we find that there are limits to the ability of investors to exploit the superior liquidity of ARUs through portfolio rebalancing since they exhibit lower performance persistence.

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1. Introduction

One of the aims of financial regulation is to protect investors by ensuring that markets are fair and fraudulent activities are eliminated. Despite calls by the G20 in 2009 for coordinated international financial regulation following the recent 2007-2008 financial crisis, financial regulation around the world has been geographically disparate. Regulatory responses in the area of alternative investment funds, in the form of the Dodd-Frank Act in the US and the AIFMD[1] in the EU, for example, also show significant geographic differences regarding liquidity requirements, remuneration rules and risk limits. These differences are likely to have a welfare impact in the form of performance and risk difference between alternative investment funds, which are held by pension funds, sovereign wealth funds and other investors. UCITS[2] is one particular type of EU investment fund regulation that has global implications and leads to testable restrictions regarding the effect of investor protection such as liquidity terms on fund performance and risk. We use UCITS restrictions on hedge funds as a natural test bed to motivate and test a range of hypothesis related to hedge fund performance.

The UCITS funds universe is economically important. UCITS funds' AuM (Assets under Management) is around $8 trillion which is comparable to that of the US mutual fund industry of $11.6 trillion.[3] UCITS funds account for more than half of fund assets worldwide outside of the US and 70-80 percent of funds publicly sold in Asia are UCITS funds.[4] UCITS is relevant even for non-European investors and managers. UCITS funds can be established by fund management companies inside or outside the EU and can be marketed to investors inside and outside the EU (including Switzerland, Singapore, Chile, South Africa, Taiwan and Hong Kong). As an example, Paulson & Co, perhaps one of the most famous hedge fund in the US, launched a UCITS version of its flagship offshore hedge fund with Deutsche Bank in 2010.[5] In 2012 NCB Capital

[1] The objective of the AIFMD is to create a comprehensive and secure framework for the supervision and prudential oversight of alternative investment fund managers (AIFM) in the EU.
[2] UCITS (Undertakings for Investment in Transferable Securities) refers to the European harmonized regulated fund product which can be sold on a cross border basis within the European Union ("EU") based on its authorization in one EU member state. Appendix A provides further details about UCITS.
[3] See ICI(2012) factbook and http://www.efama.org.
[4] See 'UCITS Guide for Alternative Managers', Carne Group, 30 June 2012.
[5] 'Investment management: Europe's changing face' by Sam Jones, Financial Times, 10 May 2012.

launched the first Sharia-compliant UCITS fund that invests in Saudi Arabia and the Gulf Co-operation Council region.[6]

However, the UCITS directive imposes restrictions on alternative investment fund managers that, in some respects, are more stringent than those imposed by US regulation on fund managers regulated by the SEC. This implies that UCITS-compliant hedge funds may exhibit performance and risk that differs from that of other hedge funds. We gather data on UCITS-compliant hedge funds, also known as *absolute return UCITS*, and compare them to a large global hedge fund database.[7] We abbreviate UCITS-compliant hedge funds as absolute return UCITS (ARUs) to distinguish them from other non-UCITS hedge funds (HFs).[8] Although the size of the ARU universe based on our sample stands at $230 billion or about 12 percent of the $1,981 billion global hedge fund assets, the number of ARU funds has grown 500 percent since 2003.

Geographically disparate hedge fund regulation leads to several testable implications. We start by focusing on return misreporting and asset illiquidity. From the prior literature (e.g., Agarwal, Daniel and Naik (2011) and Bollen and Pool (2008, 2009)) we know that hedge funds tend to sometimes misreport their returns. Regulation imposes tight reporting requirements for UCITS-compliant funds. Therefore, our *Misvaluation Hypothesis* (*H1*) states that UCITS funds should engage less in return management than hedge funds. Although is not straightforward to disentangle return misreporting from asset illiquidity, using a set 'red flags' proposed by Bollen and Pool (2013), we provide strong evidence that hedge funds' reported returns exhibit more suspicious patterns. Thus, in terms of accurate valuations, our results can be interpreted as consistent with the interpretation that UCITS regulation protects investors and thereby achieves one of its goals.

Second, we hypothesize that *Operational Risk* (*H2*) should be lower for UCITS-compliant funds than for more opaque and less transparent, other hedge funds. This is due to the fact that the UCITS directive imposes strict requirements for organizational and

[6] 'First Saudi Ucits fund to open in Dublin', by Sophia Grene, Financial Times, 2 December 2012.

[7] ARUs are funds that follow a hedge fund type strategy aiming to generate absolute return or absolute performance. They are, in other words, simply UCITS that take advantage of certain investment techniques allowed by the UCITS regulations which enable them to pursue strategies that were previously more common in the alternative investment sector – in particular, the hedge fund sector.

[8] UCITS-compliant hedge fund strategies are sometimes referred to as or Newcits or 'absolute' UCITS in the media.

internal control, and conflicts of interest. To test this hypothesis and measure operational risk, we follow the recent literature initiated by Brown, Goetzmann, Liang, and Schwarz (2008, 2009) and use information revealed in ADV forms. Given that ARUs are domiciled in European Union Member countries and therefore may report less often to US-based regulators, we control carefully for the potential impact of selection bias by means of the Heckman correction when we estimate the proxy of operational risk – the Omega-measure – for each individual fund. We find that selection bias is not a serious issue and does not drive our results. Inconsistent with the idea that UCITS regulation reduces operational risk, we document that ARUs are more exposed to operational risk measures. To understand this striking finding, we investigate the sources of operational risk further. We find that ARUs tend to have more potential conflicts of interest than HFs. In particular, ARUs exhibit more external conflicts of interest that are revealed as their close relationship to banks and brokers. Some European UCITS funds are launched by larger banking and asset management groups and this may explain this funding. In contrast, perhaps due to the Volcker rule, USA-based and offshore hedge funds exhibit a decreasing trend in close relationships with banks and brokers. To sum up, using the existing measures of operational risk; it seems that UCITS regulation may not be able to protect investors from external conflicts of interest.

Third, our analysis turns to another aspect of risk and performance and we motivate the *Risk-adjusted Returns Hypothesis* (*H3*). The requirement of (i) a separate risk management function in UCITS funds as well as (ii) leverage limits and (iii) VaR (Value-at-Risk) limits leads to the hypothesis that the financial risk of ARUs is lower than that of HFs. Measuring the risk-return trade-off is a complex issue and therefore we apply a range of different risk metrics to capture tail-risk in addition to volatility (Patton (2009)) and control for effects of serial correlation in fund returns (Getmansky, Lo and Makarov (2004)). In contrast to the prediction of our financial risk hypothesis, we show that hedge funds generally exhibit lower volatility, systematic risk and tail risk than UCITS-compliant funds. This is consistent with hurdles to the transportation of hedge fund techniques to the UCITS universe. Because UCITS funds face restrictions regarding the use of derivatives, the reduced flexibility in the use of derivatives may make ARU returns less counter-cyclical than those of HFs. Hence, our results suggests that even

though UCITS regulation puts strong emphasis on protecting investors from market risk, it seems that less regulated hedge funds have tight internal control that may not allow them to take excessive risk.

Since one of the pillars of UCITS regulation is in the form of liquidity requirements and the asset pricing literature has identified liquidity premia in many markets, we next formulate our *Liquidity Hypothesis* (*H4*). According to the UCITS directive, funds need to manage all aspects of liquidity risk and provide redemption facilities to their clients at least twice a month. In contrast, US and offshore hedge funds are not subject to such tight regulation. Therefore, our hypothesis states that ARUs should deliver lower average performance than funds with strict share restrictions that can potentially earn a liquidity premium for holding less liquid assets (Pastor and Stambaugh (2003)), (Amihud and Mendelson (1986)).

Our findings raise questions about the resulting welfare implications and the acceptable liquidity-performance trade-off. Although UCITS-compliant hedge funds underperform other hedge funds on average, when we compare liquidity (i.e. share restriction) matched subsets of the two groups of funds we find that the performance of the two groups converges. Similar results can be found when funds are categorized by hedge fund domicile. We find that European hedge funds underperform their offshore and US peers. One of the reasons appears to be the fact that European onshore hedge funds do not impose tight share restrictions.

To better understand the economic mechanism of how share restrictions may help funds to manage their portfolios more efficiently, we investigate whether leverage and margin constraints are less binding for funds that impose tight share restrictions. We find that hedge funds with long redemption periods have more exposure to the Frazzini and Pedersen (2014) betting-against-beta factor, while funds providing generous liquidity terms such as ARUs, do not have significant loadings to this factor. One potential criticism of our analysis so far is that we are not comparing equivalent funds, by not matching funds within management companies. In our baseline analysis, by comparing an ARU fund from management company A and a HF from management company B we may be comparing apples and oranges. To address this criticism, we investigate this issue further. In robustness tests, within management companies, we carefully match the

closest possible UCITS and non-UCITS fund pairs. Even after controlling for firm level effects, we find that the difference in those returns can be explained by differences in liquidity terms or length of notice period as well as exposure to betting-against-beta factor. Thus, we uncover a strong performance-liquidity trade-off and evidence of less binding leverage constraints even after matching HFs and ARUs within management companies.

Performance differences on average are an important issue but market efficiency tests and investors are particularly concerned with the question of whether risk-adjusted performance persists. Therefore, we finally formulate our *Persistence Hypothesis* (*H5*). The ARU universe provides a fertile setting to test whether performance persists and whether it can be exploited in practice. However, the recent theoretical and empirical evidence suggest that the transparency required by regulatory rules may be harmful for UCITS investors. Glode and Green (2011) show that performance persistence for hedge funds can be explained by the desire for secrecy. The persistence may not be entirely due to skill, but it can be explained by techniques or strategies that other managers are not aware of. Their model's predictions are supported by Agarwal, Jiang, Tang and Wang (2013), who document that hedge funds' confidential holdings are associated with superior performance. Our empirical results clearly support the view that although ARUs' investors could, in principle, due to the bi-weekly regulatory liquidity requirement rebalance their portfolios on a monthly basis, there are limits in their ability to exploit the superior liquidity since ARUs exhibit *lower* performance persistence than certain HFs.

Our paper sheds light on the debate about the costs and benefits of increased financial regulation. In light of investor protection regulation, one of the main contributions of our work to this debate is that we quantify the cost of regulation and liquidity requirements. Given evidence of a substantial liquidity premium in alternative investment funds, policy makers should carefully consider the impact that higher liquidity requirements have on the expected returns that alternatively investment funds can generate. Since institutional investors such as pension funds are one of the largest groups of hedge fund investors, this ultimately will also affect the growth of pension assets in Europe and other countries where ARUs funds can be marketed. Similarly, the lack of performance persistence among ARUs should caution against return chasing by retail and

institutional hedge fund investors.

The paper is structured as follows. Section 2 reviews the regulatory restrictions imposed on UCITS funds and motivates the resulting testable hypotheses. Section 3 describes the HF and ARU universe. Section 4 summarizes the empirical results on differences in operational risk between HFs and ARUs. Section 5 focuses on the impact of fund domicile, liquidity and leverage constraints and fund performance and risk. Section 6 reports results on performance persistence to answer whether investors could in practice exploit the superior liquidity of ARUs. Section 7 concludes.

2. UCITS Restrictions, Related Literature and Testable Hypotheses

The UCITS directive was implemented by the EU in 1985 with the aim of facilitating cross-border marketing of investment funds and maintaining a high level of *investor protection*. The directive was aimed at regulating the organization and oversight of UCITS funds and imposed constraints concerning diversification, liquidity, derivatives and leverage use.

Our focus is on a comparison of absolute return UCITS funds (ARUs) to hedge funds, but it is possible to subdivide the hedge fund group further. Instead of using UCITS structures, hedge fund managers who aim to target European investors also use, for example, Irish Qualifying Investor Funds (QIFs) and Luxembourg Specialised Investment Fund (SIFs). Broadly speaking these fund types are more flexible than UCITS funds, but not as flexible as an "offshore" fund, such as a Cayman fund structure, for example. Thus in addition to the distinction between ARUs (*group 1*) and hedge funds (*group 2*), that we focus on in most of the paper, we can subdivide the group of hedge funds further into European onshore funds such as QIFs/SIFs (group 2a), offshore hedge funds such as Cayman funds (group 2b) and onshore US-domiciled hedge funds such as Delaware funds (group 2c). Investor types differ significantly between these fund structures. Hedge fund managers use offshore vehicles for non-US investors and for US non-taxable investors and US onshore funds for US-taxable investors. European onshore funds such as QIFs and SIFs targeted to institutional investors, while UCITS structures also allow retail investors.

[Please, insert Figure 1]

One of the key features of the UCITS fund format is the emphasis on *risk management* as an integral requirement for any fund seeking the UCITS label. According to the most recent UCITS IV directive and ESMA guidelines, all risks that could be material to the fund should be properly addressed by the management company in a key document termed the *Risk Management Policy*. This includes exposure to market risks, liquidity risks, counterparty risks and to all other risks, including operational risk, which might be material to each UCITS it manages.

We start by spelling out our hypothesis regarding operational risk management. Following the discovery of the Madoff Ponzi scheme, operational risk has been a key concern of investors, regulators and academics (e.g. Brown, Goetzmann, Liang, and Schwarz (2008, 2009, 2012). Interestingly, one of the Madoff's feeder funds, LuxAlpha, was a UCITS-regulated fund. Is this example an exception and do ARUs have lower operational risk than hedge funds?

One of the main focuses of the UCITS fund format is to protect investors by requiring funds to report to investors net-asset valuations that are timely and accurate. As a rule, the latest official market closing prices must be used to value publicly-traded securities, and if they are not available then the 'fair market value' should be used. Rules require that UCITS funds must put in place valuation procedures for derivatives that are appropriate for their level of complexity, and disclose them to investors. It is possible to appoint an outside firm to carry out such valuations, or if valuations are done internally, then the process must be independent of the portfolio management to avoid conflicts of interest.

Motivated by the findings of Agarwal, Daniel and Naik (2011) and Bollen and Pool (2008, 2009) that hedge funds misreport or 'manage' their returns, our *Misvaluation Hypothesis* (*H1*) states that UCITS funds engage less in return management than hedge funds. We test this issue by constructing a set of indicators proposed by Bollen and Pool (2013) to detect suspicious patterns in reported fund returns. It is worthwhile to construct a large set of proxies because of challenges to differentiate between asset illiquidity and misreporting-based explanations. Casser and Gerakos (2011) document evidence

suggesting that asset illiquidity is the major factor driving the anomalous properties of self-reported hedge fund returns, and Jorion and Schwarz (2014) show that incentive fees can mechanistically create discontinuity or a kink in the net return distribution.

To understand whether UCITS management companies are better at managing operational risk we follow Brown, Goetzmann, Liang, and Schwarz (2008, 2009) and construct a set of operational risk measures using the information revealed in ADV files. This allows us to test the implications of the "organization directive". The directive contains requirements for organizational and internal control, and conflicts of interest. Given the focus of this directive, our *Operational Risk Hypothesis (H2)* predicts that UCITS funds should have lower operational risk and fewer conflicts of interest than less regulated hedge funds. On the other hand, using a sample of due diligence reports, Cassar and Gerakos (2010) document evidence suggesting that internal controls are stronger in offshore hedge funds that have potentially higher agency costs with limited legal redress for fraud and financial misstatements. Hence, shedding more light on whether a tighter regulations can protect investors from operational risk is still an open question and we examine it further in this paper.

The UCITS I directive already allowed hedging using derivatives in 1985, but the UCITS III extended the permissible use of derivatives to speculation in 2002. Depending on whether derivatives are used to speculate or to hedge, funds that use derivatives may have higher or lower risk than funds that do not use derivatives. UCITS funds are subject to leverage and value-at-risk (VaR) restrictions and also require a separate risk management function. This can be expected to reduce the ex post risk of ARUs. We therefore test our *Risk-adjusted Performance Hypothesis* (*H3*) that states that the market risk of ARUs is lower than that of HFs for the same investment objective. EU countries have some leeway in the implementation of the risk management requirements on VaR of the UCITS directive. Restrictions regarding the investment opportunity set may imply that ARUs cannot use leverage to the same extent as HFs. ARUs are allowed to take embedded leverage and short sell via derivatives, but they are not allowed to borrow and short physically. Restrictions on the use of derivatives can also limit the ability to hedge against market downturns and this leads us to test whether the returns of ARUs are less counter-cyclical than that of HFs. We use exposures to commons risk factors, such as

market beta, to measure how cyclical hedge fund returns are. The instruments used by hedge funds depend on their investment objective and therefore we condition each of our tests on the type of investment objective followed by a fund.

From a theoretical point of view, investment and risk restrictions may prevent managers from risk shifting, that is strategically changing portfolio volatility, to maximize the value of their implicit incentive contracts and fees (Buraschi, Kosowski and Sritrakul (2012)). On the other hand, hedge funds may have tight internal controls for risk taking without any regulatory oversight. Indeed, using a sample of due diligence reports, Cassar and Gerakos (2013) find that funds using formal models performed better in the extreme down months of 2008 and, in general, had lower exposures to systematic risk. In addition, their findings suggests that funds employing value at risk and stress testing had more accurate expectations of how they would perform in a short-term equity bear market. In addition, Aragon and Martin (2012) find that hedge funds using options deliver higher performance and lower risk than nonusers.[9] Hence, it is important to investigate whether UCITS regulation is able to protect investors from financial risk.

We next formulate our *Liquidity Hypothesis* (*H4*). According to regulatory rules, UCITS funds must carefully monitor and manage liquidity risk and valuation. UCITS funds must take into account liquidity risk when they invest in any financial assets. The directive defines 'liquidity risk' as "*the risk that a position in the UCITS portfolio cannot be sold, liquidated or closed at limited cost in an adequately short time frame and that the ability of the UCITS to [repurchase or redeem its units at the request of any unit-holder] is thereby compromised.*" Based on the rules, the funds should consider, for example, bid-ask spreads and the quality of the secondary market. In practise this means that they are required to be able to allow 20% of NAV to be redeemed at any point. Only 10% of NAV is allowed to be invested in illiquid assets with a requirement that they can meet the redemption requests. UCITS funds must value their investments and provide liquidity to their investors at least twice a month. In contrast, less regulated non-UCITS hedge funds can accept longer redemption periods and even introduce gates and side pockets for illiquid hard-to-value assets.

[9] Our research is also related to that of Koski and Pontiff (1999) and Almazan et al. (2004) who investigate the difference in performance between mutual funds that use derivatives and mutual funds that do not.

Furthermore, the distributional properties of ARUs and HFs are also likely to be affected by the liquidity of the underlying assets. The UCITS directives contain a range of rules concerning concentration and counterparty risk. The exposure to any security or money market instruments by the same issuer, for example, may not exceed 10% of NAV, and in combination with derivatives it may not exceed 20% of NAV. As a result of restrictions may harm UCITS funds ability to hold concentrated portfolios of potentially illiquid securities.

Fund domicile can have important effects on fund performance and risk since difference domiciles imply different restrictions on liquidity and leverage. As we explain above, offshore and US funds do not typically face any restrictions. Regulation for European non-UCITS funds such as QIFs and SIFs does not impose as tight restrictions on these funds as is the case for UCITS funds. For example, Irish hedge funds can be structured as open-ended, open-ended with limited liquidity and closed-ended schemes. Open-ended funds need to provide redemption facilities for investors on at least a quarterly basis, while open-ended ones with limited liquidity are required to provide redemptions at least annually. In addition, Irish professional investor funds (PIFs) are subject to borrowing and leverage constrains so as they are generally restricted to 50% of net asset value, whereas QIFs are not subject to any regulatory limit. In principle this leads to testable restrictions and could be used to test how UCITS and AIFMD compliant funds perform against their less regulated US and offshore counterparties.

According to asset pricing theory, the return on an illiquid asset is associated with an illiquidity premium.[10] In the case of hedge funds, Aragon (2007) finds that hedge funds with strict share restrictions (in the form of longer lockup, notice, and redemption periods) can earn a premium. Aragon, Park and Liang (2013) find that onshore US funds are associated with greater share restrictions than offshore funds. They also document some evidence that onshore funds deliver better performance than offshore funds. Sadka (2011) demonstrates that liquidity risk explains the cross-section of hedge fund performance. In contrast, Teo (2011) shows that HFs granting favourable redemption possibilities for investors, but taking liquidity risk is harmless for investors, it is

[10] Amihud, Mendelson, and Pedersen (2005) provide a comprehensive survey that discusses the role of liquidity in asset pricing theory.

interesting to examine whether this is also the case for ARUs.

The difference in funding liquidity risk may also explain performance differences between ARUs and HFs. Frazzini and Pedersen (2014) present a model with leverage and margin constraints that vary across investor types. In their dynamic model with constrained investors, some investors cannot use leverage and therefore overweight high-beta assets, causing those assets to offer lower returns. Other investors can use leverage but face margin constraints and may sometimes need to de-lever. These investors underweight (or short-sell) high-beta assets and buy low-beta assets that they lever up. Hedge funds with longer notice and redemption periods than ARUs may be more exposed to this so called 'betting-against-beta' factor.

Based on the reasoning above, our *Liquidity Hypothesis* is related to the effect of liquidity or share restrictions and tests whether less liquid funds (as captured by notice and redemption period) have higher performance, and are more exposed to market liquidity risk (Pastor and Stambaugh (2003)) and leverage and margin constraints (Frazzini and Pedersen (2014)).

As we note above, one of several major differences between ARUs and HFs relates to fund liquidity. Apart from the effect on fund performance these differences in liquidity also raise the question of whether investors can exploit the superior liquidity in practice, for example, by regularly rebalancing their portfolio of funds. In particular we examine whether there is evidence of differences in performance persistence between ARUs and HFs. On the one hand, one could reason that the requirement of at least bi-weekly liquidity for ARUs may allow investors to exploit any performance persistence. On the other hand, the mandatory disclosure of their investment strategies may be harmful for their performance.

Glode and Green (2011) rationalize performance persistence for hedge funds by showing that persistence can be explained by the desire for secrecy. They argue that the source of superior returns may not be entirely due to abilities intrinsic to the manager, but outperformance may also be attributable to strategies or techniques that could be expropriated and exploited by others if they were informed about them. This view is supported by Agarwal, Jiang, Tang and Wang (2013) who investigate hedge funds' confidential holdings that are disclosed with a delay through amendments to Form 13F.

They document that these confidential holdings exhibit superior performance up to 12 months, and tend to take longer to build.

According to the rules, UCITS funds must publish a prospectus, annual and semi-annual reports, and a Key Investor Information Document (KIID). The KIID replaces another document known as the simplified prospectus. In practise this means that UCITS funds need to provide comprehensive details of the fund's investment goals and strategies, and of the inherent risks. This implies that alternative UCITS funds need to disclose much more information about their trading strategies than hedge funds. In contrast, hedge funds are often sold through private placement and offered only to accredited or qualified investors in the US and sophisticated qualifying investors in Europe. Because these funds are not offered to the public, there are fewer requirements to disclose information and this may benefit hedge funds.

Our *Persistence Hypothesis (H5)* states that HFs should have more performance persistence than ARUs because the trading strategies of the former are more secretive.

The performance persistence of HFs may also be driven by the fact that HFs with more stringent share restrictions can pick up a liquidity premium and generate consistent alpha and therefore performance persistence. Finally as part of this hypothesis we examine whether evidence of performance persistence changes for HF and ARU once liquidity is taken into account.

3. Description of Hedge Fund Universe

3.1 Absolute Return UCITS (ARU) and Hedge Fund database

In this section, we describe the aggregate ARU and HF databases. We combine five major hedge fund databases (BarclayHedge, EurekaHedge, and Hedge Fund Research (HFR), Morningstar and TASS Lipper) to form an aggregate data set.[11] The sample period is from January 2003 to June 2013 and contains live and defunct funds with at

[11] The TASS hedge fund database does not include information on whether a fund is an ARU or HF. Our careful merging of the databases indicates that the TASS database contains very few ARUs. Morningstar divides its databases into a hedge fund and a mutual fund database. ARUs fund can be found within the mutual fund database.

least 12 non-missing monthly returns. We find that our consolidated database contains 888 ARUs with total AuM of around $230 billion.[12] This compares to 13,044 hedge funds in our sample with a total AuM of around $1.981 billion. Our sample is very comprehensive in terms of ARU and hedge fund coverage. A leading absolute return UCITS index provider, named ALIX, reports that they follow 794 funds as of February 2013. In a February 2013 report Preqin states that 701 ARUs are in existence.

It is not a trivial task to merge several commercial hedge fund databases and to identify unique hedge funds based on information on multiple share classes. The main reason is that commercial data vendors only provide an identifier for unique share classes, but they do not provide identifiers for distinct hedge funds. Using the Joenväärä, Kosowski, and Tolonen (2013) merging approach, we identify unique funds. Given that ARUs have their origin in the European Union we do not limit our focus to USD share classes, but also include funds that have only non-USD share classes. In those cases, we convert their returns and AuM information into USD before including them in the analysis. Our consolidated database contains monthly net-of-fees returns, AuM, and other characteristics, such as manager compensation (management fee, performance-based fee, and high-watermark provision), share restrictions (lockup, notice and redemption periods), domicile, currency, style category, and inception. We classify funds into 11 main categories: CTA, Emerging Markets, Event Driven, Global Macro, Long Only, Long/Short Equity, Market Neutral, Multi-Strategy, Relative Value, Sector and Short Bias. Figure 2 shows the strategy distribution and AuM across geographic regions.

[Please, insert Figure 2]

Table 1 presents the aggregate AuM, number of funds, attrition rates for the HF and ARU universe at the end of December of each year. The table shows that growth has been extremely fast for the ARU universe during the sample period from January 2003 to

[12] 682 of the 786 ARUs are active and only104 are defunct. Of the 23,204 HFs, 11,092 are active and 12,112 are inactive.

June 2013.[13] Both aggregate AuM and number of funds have increased significantly.

[Insert Table 1 here]

Table 1 shows that on average, HFs' attrition rates are significantly higher compared to ARUs, but at the end of the sample the ARU's attrition rate is almost as high as that of HFs. During the period from 2003 to 2009, ARU attrition rate is negligible. We believe that there are two main reasons why the attrition rate is so low. First, during this period, many management companies started to offer alternative ARU funds, and therefore there are relatively few closed (or defunct) ARU funds in the database. Second, and more importantly, during the period from 2003 to 2008 the BarclayHedge, EurekaHedge, HFR and Morningstar databases had not yet started to gather information on whether a fund is UCITS-compliant. This implies that if a fund moved to the graveyard module of a database during that period, this happened without the addition of an indicator variable pointing out that the fund is UCITS-compliant. Later in the sample, commercial databases started to provide UCITS indicator information for active funds, but not for those funds that entered the graveyard database earlier on. In other words, commercial databases only provide comprehensive data for ARUs that survived. Therefore, the average ARU return could be biased upwards at the beginning of the sample.[14] Our results can therefore be viewed as a conservative estimate of the underperformance of ARUs on average. It is, therefore, important to examine subsamples of the data given the potential survivorship bias in the ARUs database. In addition to subsamples, we mitigate backfilling bias by excluding the 12 first return observations and tiny funds that have AuM below $5 million.

3.1 Fund Characteristics Differences

[13] We calculate aggregate hedge fund AuM figures using December observations given that month's AuM figures are considered to be more accurate for hedge funds.
[14] Given the fact that UCITS hedge funds are a relatively recent development it is possible that in the early part of our sample, some funds that are now classified as UCITS hedge funds may have been non-UCITS hedge funds initially.

We next examine how fund characteristics differ between ARUs and HFs as well as across HF domiciles. On average, we find that HFs are smaller, charge higher fees and impose tighter share restrictions. Among hedge funds, redemption restrictions are tightest for USA domiciled funds and lightest for European funds.

Table 2 presents fund size and age as well as compensation structure and share restriction variables for HFs and ARUs. It shows that an average ARU (with a mean size of $246.02 million) is larger than its average HF peer ($162.98million). At first glance, this finding may appear counter intuitive. However, UCITS regulation imposes minimum capital requirements, while HFs' minimum size is not regulated in general. Moreover, compliance and other fixed costs associated with running a UCITS funds are likely to be higher than those of a HF which explains why there are many small HFs which may not be economically viable if they were UCITS-compliant. Among HFs, USA domiciled funds are smaller than their offshore and European peers. We define the fund's age using the fund inception date reported to data vendors. We find that HFs are slightly older than ARUs, since HFs' average age is 6.31 years, but ARUs' average age is only 4.82 years.

[Insert Table 2 here]

Given that the UCITS format is dominated by mutual funds, ARUs can be expected to charge fees that are lower than those of HFs and closer to those of mutual funds. We find that HFs' average management fee is 1.54%, which is slightly higher than that of ARUs (1.29%). HFs also charge higher performance-based fees and impose more often high-water mark provisions. Indeed, HFs' average performance based fee is 17.66% compared to ARUs' 12.38%. Hedge funds domiciled in Europe charge lower incentive fees than offshore and USA based funds. Performance differences between HFs and ARUs can therefore potentially be at least partly explained by the fact that ARUs charge lower performance-based fees. Both theoretical models and empirical evidence suggest that compensation structure variables are associated with managerial incentives and potentially higher gross returns. On the other hand, by construction higher fees should also imply lower net (after-fee) returns for investors.

Given that by regulation ARUs are required to provide at least bi-weekly liquidity to investors, it is not surprising that we find that HFs impose significantly tighter share restrictions compared to ARUs. 25% of HFs impose a lockup period, allow investors monthly or quarterly redemptions with 30 days advance notice. In contrast, the majority of ARUs provide daily redemptions and no lockups.

Among hedge funds, it is US-based funds that most frequently impose a lockup period, and have the tightest redemption terms in general. European onshore HFs impose light redemption terms compared to other hedge funds. As discussed earlier, for example, Irish QIFs are required to offer at least quarterly redemptions, while their offshore and USA peers do not need to follow such a rule. Thus, it is interesting to investigate whether lighter share restriction for European hedge funds lead to lower performance.

3.2 Performance and Risk Evaluation

It is not straightforward to measure funds' risk-adjusted performance and risk. Therefore, throughout the paper, we apply a range of robustness tests to address potential concerns.

We augment the Fung and Hsieh (2004) model with emerging market and currency factors because of global geographic focus of ARUs. As factors, we use the excess return of the S&P 500 index (SP), the return of the Russell 2000 index minus the return of the S&P 500 index (SCLC), the excess return of ten-year Treasuries (CGS10), the return of Moody's BAA corporate bonds minus ten-year Treasuries (CREDSPR), the excess returns of look-back straddles on bonds (PTFSBD), currencies (PTFSFX), and commodities (PTFSCOM) as well as MSCI Emerging Market index (MSEMKF). The currency risk factor is constructed following Lustig, Roussanov, and Verdelhan (2011).

We also use the Frazzini and Pedersen (2014) betting-against-beta factor and the Pastor and Stambaugh (2003) liquidity risk factor to test effects related to leverage constraints and liquidity. We finally execute a set of robustness tests using a large of risk factors including Fama and French (2012) global risk factors. Appendix discusses how these factors are constructed.

We obtain the data for the three equity market-related factors (SP, SCLC and MSEMKF) from Datastream and for the two bond factors from the Federal Reserve

Board's H.15 reports. The three primitive trend following factors are downloaded from the David Hsieh's webpage. Currency risk factor is downloaded from Adrien Verdelhan's webpage. Betting-against-beta factor from the Andrea Frazzini's webpage. Liquidity risk factor from Lubos Pastor webpage.

4. Misvaluation, Operational Risk and Risk-adjusted Returns

In this section, we first examine valuation and operational risk differences between ARUs and HFs. Second, we study differences in statistical return properties and risk-adjusted performance between ARUs and HFs using the individual fund level measures. Third, we investigate how fund-level risk and performance measures differ between ARUs and HFs.

4.1 Autocorrelation and Suspicious Patterns in Reported Returns

We next compare misreporting behavior between ARUs and HFs. Based on the argument of tighter oversight, our *Misvaluation hypothesis (H1)* states that ARUs may manage or manipulate their reported returns less than HFs. We investigate this issue using a set of so called 'red flags' proposed by Bollen and Pool (2013) that are aimed at detecting suspicious patterns in reported fund returns.[15] These include: (i) a discontinuity in the distribution of hedge fund returns, (ii) two measures of low correlation between hedge fund returns and the returns of style factors, and (iii) a family of data-quality indicators. The data-quality indicators include measures such as the percentage of negative returns, and the number of returns exactly equal to zero. Following Bollen and Pool (2013), we use appropriate statistical significance tests. However, it is not straightforward to differentiate between asset illiquidity and misreporting-based explanations. With respect to asset illiquidity versus misreporting, Casser and Gerakos

[15] Following Bollen and Pool (2013), we require that each fund has at least 24 return observations over the period from January 2003 to June 2012. See details of these 'red flags' from the Appendix of the paper.

(2010) find that asset illiquidity is the major factor driving the anomalous properties of self-reported hedge fund returns. To better distinguish between different interpretations of suspicious patterns in returns, we investigate this issue using a large set of misreporting proxies.

We start by comparing the asset illiquidity between ARUs and HFs. Table 2 shows that HFs tend to exhibit more serial correlation in their returns than ARUs. This is consistent with the fact that ARUs need to provide at least bi-weekly redemptions to investors, while HFs can impose longer redemption, notice and lockup periods and, therefore, they may harvest a premium by investing in less illiquid assets. On the other hand, autocorrelation can be also due to misreporting.

[Insert Table 3 here]

We next explore the frequency of red flags in fund returns. We find that HFs exhibit suspicious patterns in reported returns significantly more often than ARUs. We also find that two measures of low correlation between hedge fund returns and the returns of style factors, and 3 out of our 4 data-quality indicators suggests that HFs have more suspicious patterns in their reported returns than ARUs.

The kink flag, measuring the abnormal rate of reporting small losses is significantly higher for hedge funds suggesting that they have more discontinuity in the distribution of returns. However, Jorion and Schwarz (2014) show that incentive fees can mechanistically create a kink in the net return distribution. Hence, observed hedge fund return discontinuities are not direct proof of manipulation.

However, our other proxies support the view that HFs manipulate returns more. Table 3 shows that both measures of low correlation between hedge fund returns and the returns of style factors suggest that HFs' reported returns are more suspicious than those of ARUs'. Furthermore, HFs have a significantly higher number of returns that are repeated or zero, and uniform last digits. Only one of the data quality measures – the fraction of negative returns – is not significantly higher for HFs. As we show below, this finding can be explained be the fact that HFs simply have higher returns and lower standard deviation and consequently a lower fraction of negative returns.

We finally investigate whether HF's domicile is driving the results. For example, less regulated offshore HFs could exhibit more return manipulation than others? However, this is not the case, because we find quantitatively similar results across fund domiciles. We therefore conclude than in general HFs tend to be more prone for return manipulation than ARUs and UCITS regulation seems to protect investors.

4.2 Operational Risk and Conflict of Interest

As discussed above one of the motivations behind UCITS regulation is to protect retail investors and reduce risk. Therefore, we next examine whether operational risk measures are lower for ARUs than HFs. In contrast to the prediction of our *Operational Risk* (H3) hypothesis, we find evidence that ARUs are more exposed to operational risk measures and tend to have more potential conflicts of interest than HFs.

To investigate this issue, we first classify as "problem" funds, those funds that answered yes to at least one question in Item 11 of their ADV filing. Item 11 identifies any problems that the management or related advisory affiliates have, including felonies, investment-related misdemeanors or any agency, SEC, CFTC, or self-regulatory issues, regulatory disciplinary action as well as civil lawsuits.

Surprisingly, Panel A of Table 4 shows that the larger portion of ARUs are problem funds than HFs. In addition, we find that the Omega-scores – the operational risk measures – proposed by Brown, Goetzmann, Liang and Schwarz (2008, 2009) tend to be significantly higher for ARUs than HFs. This suggests that ARUs are more exposed to operational risk measures.

[Insert Table 4 here]

However, when we compare Europe domiciled funds – ARUs and onshore hedge funds with offshore and USA hedge funds, then then conclusion is mixed. We find the larger portion of problem funds and higher operational risk measures for European domiciled funds than others. It can be the case that not all Europe-based funds report their ADVs to US-based regulator (SEC). Therefore we control for the potential selection bias when we estimate operation risk measures. The appendix presents the details of the

Heckman adjustment that we use to correct for the potential selection bias. The overall empirical evidence suggests that despite the tighter regulation regime in Europe, the funds domiciled in Europe seems to have higher operational risk measures than onshore US or offshore funds tend to exhibit.

To better understand the sources of operational risk, we present a set of proxies for the potential external and the internal conflicts of interest. We first focus on external relationships between the fund and other entities that represent potential conflicts of interest. Panel B reports the frequencies for questions such as whether the manager has a related broker/dealer, commodities broker, investment adviser, bank or insurance company, or whether the manager is the sponsor of an LLP. Again, we find clear evidence that ARUs have answered more often yes to these questions than HFs. Out of 6 questions, a typical ARU (HF) gave 2.54 (1.85) yes answers. On the other hand, we seen observe from the right-hand-side of the panel that European hedge funds have more potential external conflicts than offshore and USA-based funds. The most interesting difference is that both ARUs and European hedge funds tend to be related to banks and brokers.

To shed light further on this issue, Figure 3 plots the percentage of live funds whose advisor reports having external relationship with a bank (Panel A) and broker/dealer (Panel B). We find that both European fund types have a significantly higher portion of such relationships.

Panel C of Table 4 reports the differences for a set of proxies for internal potential conflicts of interest. Consistent with the findings above, on average ARUs have answered more frequently yes to questions related to internal conflicts of interest than hedge funds suggesting that they exhibit more internal conflicts. Although the results are less clear-cut than for external conflicts of interest, the total frequency of internal conflicts is higher for ARUs and statistically significant at the 5% significance level. This seems to be driven by the variables *RecSalesInterest* and *OtherResearch.* This suggests that ARUs have more conflicts with related parties that recommend securities with a sales interest. In addition, ARUs also make more use of external research than HFs. In unreported results we do not find any statistically significant differences between conflicts of interest among ARUs (Column 1) and European onshore funds such as QIFs and SIFs (Column 5).

3.3 Risk-adjusted Performance and Financial Risk

We examine differences in HFs and ARUs return and risk characteristics using the individual fund level measures. To test our *Risk-adjusted Performance (H3)* hypothesis described in Section 2, we estimate measures for each individual fund that has at least 24 return observations after we have mitigated backfilling bias by excluding the 12 first return observations and very small funds that have AuM below $5 million. We use the Getmansky, Lo and Makarov (2004) serial correlation adjusted returns once we compute measures.[16] We take the cross-sectional median within each category and test the difference between HFs and ARUs.[17] To address potential survivorship bias in ARUs returns, we examine two subsamples through January 2005 to December 2009 and through January 2010 to June 2013.

Table 5 shows that HFs exhibit higher risk-adjusted performance and lower risk than ARUs especially during the latter period when there no problems related to attrition rates. The qualitative conclusions are not sensitivity to whether we use standard measures or other more sophisticated metrics that take into account potential performance manipulation and nonlinearities in fund returns as well as omitted risk factors in hedge fund returns. The main conclusions hold across investment objectives. It is plausible that restrictions on the use of derivatives and other impediments to the implementation of hedge fund-like strategies may lead to ARUs lower performance and higher risk.

[Insert Table 5 here]

Panel A of Table 5 reports a set of performance and risk measures estimated for the study period through January 2005 to December 2009, while Panel B shows the measures for the study period through January 2010 to June 2013. Perhaps, due to survivorship bias related issues the median difference for average returns and Sharpe ratios are statistically insignificant during the earlier period. However, during the later period these medians are

[16] This assumption does not drive the results.
[17] Conclusion remains unchanged when we use mean tests. As a baseline, we report medians because they more robust for outliers.

significantly higher for HFs. Autocorrelation and nonlinearities in hedge fund returns do not seem to explain why HFs have lower risk then ARUs. Using the Getmansky, Lo and Makarov (2004) adjusted returns, we find that median volatility and expected shortfall is higher for ARUs.[18] Because Goetzmann, Ingersoll, Spiegel and Welch (2007) show that standard performance measures such as alpha and the Sharpe ratio can be "gamed" by means of time-varying leverage and particular option strategies than are more often used by HFs. We compare Manipulation-proof Performance Measures (MPPMs) between HFs and ARUs. MPPMs are significantly higher for HFs suggesting that HFs do not engage in information-less option-strategies and therefore outperform ARUs.[19]

Next, we turn to the individual HFs' and ARUs' augmented Fung and Hsieh (2004) alphas and systematic risk measures. In both subperiods, the risk-adjusted results confirm our conclusions that HFs significantly outperform ARUs. The right-hand-side of the table presents the cross-sectional median alphas and their associated *t*-statistics. The *t*-statistic of alpha can be expected to be less sensitive to leverage, which, due to regulatory risk constraints, can be lower for ARUs than for HFs. We find that the cross-sectional alphas and their *t*-statistics are significantly higher for HFs compared to ARUs. For the latter period, HFs' median annualized alpha is 0.86% with a *t*-statistic of 0.27, whereas ARUs' alpha is 0.36% with a *t*-statistic of 0.06. This evidence suggests that HFs seem to outperform ARUs in terms of risk-adjusted performance.

To understand the sources of these differences, we estimate systematic risk and idiosyncratic risk measures for HFs and ARUs. We find that both medians of systematic risk measures are statistically greater for ARUs, whereas HFs tend to take on more idiosyncratic risk. We also measure systematic risk using the R^2 with respect to the 9-factor model. Our findings suggest that R^2 are significantly higher for ARUs than HFs. Hence, ARU returns are less counter-cyclical than HFs returns. Another important insight from these results is that the augmented Fung and Hsieh (2004) model seems to work very well for ARUs, since the median adjusted R^2 is from 75% (80%) for the earlier (latter) study period.

In unreported tests, following Titman and Tiu (2010) we use 30 risk factors in a

[18] Results are quantitatively similar when we measure HFs and ARUs tail risk using the maximum drawdown. We estimate maximum drawdown using the geometric cumulative returns.
[19] We repeat analysis using the base currencies instead of USD returns. They remain quantitatively similar.

stepwise regression model. For example, we include regional Fama and French factors given that UCITS may focus more on European and on global markets compared to HFs. We find that the results remain robust.

Panel C in Table 5 shows that the results remain consistent across investment objectives. This suggests that performance differences between ARU and hedge funds are not investment objective specific and points to more fundamental differences between the two groups.

Long Only HFs and ARUs exhibit an interesting convergence in terms of risk and performance. This may be due to the fact that in this investment style impediments to the implementation of hedge fund like strategies play a smaller role since hedge funds in this group are less likely to use derivatives and other dynamic trading strategies

Our conclusion that HFs deliver higher alphas and are exposed less to systematic risk holds across all the investment objectives. For some of the investment objectives, HFs have lower exposure to idiosyncratic risk than ARUs. This finding is not very surprising, since on average, HFs and ARUs only exhibit marginally different idiosyncratic risk differences.

5. Liquidity, Leverage Constrains and Risk-adjusted Returns

In this section, we examine our *Liquidity Hypothesis (H4)*. We first investigate how fund domicile and redemption restrictions impact on fund performance. We shed some light on the economic mechanism that allows funds that have strict redemption restrictions to generate high performance. Finally, as a robustness check, we identify the most closely matched pair of ARU and non-UCITS hedge funds with a given management company.

5.1. Fund Domicile, Restrictions and Leverage Constrains

To evaluate the overall performance of funds, we construct value-weight (VW) portfolios over the sample period from January 2005 to June 2013. Panel A of Table 6

presents risk-adjusted performance measures as well as systematic risk loadings for VW portfolios of ARUs and across hedge fund domiciles – Europe, offshore, and USA. We find an increasing monotonic relationship showing that the domiciles that imposed the strictest share restrictions have the highest performance. The order is from lowest to highest as follows: ARU, Europe, offshore and USA. The bootstrapped *p*-value for the Patton and Timmermann (2011) monotonicity test in alphas (*t*-statistics of alphas) is 0.05 (0.10). We find that the performance difference across domiciles is partly explained the currency differences. The Lustig, Roussanov, and Verdelhan (2011) currency risk factor (*FX*) is the highest for ARUs and lowest for USA-based funds, and it also monotonically decreasing as the performance metrics. This highlights the importance of taking currency risk into account.

Panel B reports that ARUs and European hedge funds have roughly equal performance, whereas offshore funds seem to outperform their European peers, as Dalores (2011) also show. It also shows that European HFs' and ARUs' alpha difference is statistically indistinguishable from each other.[20] The augmented Fung and Hsieh (2004) alpha is slightly higher for European HFs, but still negative, -0.23% per annum.

[Insert Table 6 here]

To gain a better understanding whether fund domicile impacts on hedge fund performance, we compare European hedge funds to their offshore peers. Panel C provides evidence that offshore funds deliver better performance than European onshore funds. Alphas and their associated *t*-statistics are lower for Europe-domiciled funds suggesting that they underperform offshore funds.

To analyze the robustness of these results, we control for the impact of currency fluctuations and regional focus. We re-run the analysis (i) without US dollar share classes, (ii) only Euro share classes, (iii) only using US dollar share classes. The conclusion main conclusion remains quantitatively consistent across specifications. To save space, we do not report these results in the paper but they are available upon request.

[20] Unreported Sharpe ratio difference tests leads to the same conclusion.

The above performance comparison may not be fair however since ARUs and HFs have very different liquidity terms or share restrictions. To avoid comparing apples and oranges, we examine liquidity-performance trade-off between ARUs and HFs. Both theoretical asset pricing models and empirical evidence suggest that illiquid assets deliver higher average returns. Aragon (2007) shows that hedge funds with strict share restrictions are able to earn an illiquidity premium. Teo (2010) finds that hedge funds that provide liquidity for investors, but hold illiquid assets, deliver poor performance during the liquidity shocks. The dynamic model of Frazzini and Pedersen (2014) also suggest that HFs may face margin requirement, but ARUs may face even tighter leverage constraints that impact on their performance. Hence, it is interesting to examine whether the liquidity-based story can explain performance differences between ARUs and HFs.

UCITS regulations stipulate that Absolute Return UCITS need to offer at least bi-weekly redemptions to investors, while European domiciled hedge funds can impose longer redemption and notice periods.[21] We divide HFs into 3 groups based on the restriction period defined as the sum of redemption and notice periods, and then we tests whether 'liquid' and 'illiquid' HFs differ from ARUs in terms of performance.

[Insert Table 7 here]

Panel A of Table 7 shows that European onshore HFs exhibit a monotonic liquidity-performance relationship. HFs that provide the strictest redemption terms deliver the highest performance, whereas the funds that offer investors the possibility of redeeming at least on a bi-weekly basis deliver the lowest performance. We report results for 9-factor and 11-factor models.

This finding is partly driven by the importance of leverage constraints and liquidity risk as the results for 11-factor model shows. We find that the Frazzini and Pedersen (2014) betting-against-beta factor exposure is highest (lowest) for the funds with the longest (shortest) restriction periods. There is also evidence that this relationship is monotonic. The Patton and Timmermann (2011) monotonicity test (*pMR_Up*) gives a

[21] Given that UCITS are domiciled in Europe, we compare their performance against European onshore hedge funds. There liquidity-performance trade-off results holds for other hedge funds domiciled in US or offshore. To save space, we do not report results.

p-value of 0.014. We also find some evidence that the Pastor and Stambaugh (2003) liquidity risk has a monotonic relationship with restriction periods, because the p-value of the monotonicity test is 0.067. We can observe that the 11-factor alpha is lower than 9-factor alpha especially for funds with tight restrictions. Hence, leverage constraints and liquidity risk seem to be an important difference between illiquid and liquid funds, not differences in their loadings on market liquidity risk.

Panel B of Table 7 shows that ARUs risk-adjusted average performance converges with European onshore HFs when we draw inference from liquidity matched portfolios. Both 9-factor and 11-factor alphas are statistically indistinguishable for ARUs and HFs (providing at least bi-weekly liquidity). However, we find totally different results for illiquid HFs, since both alphas are significantly higher for illiquid HFs than ARUs. Importantly, only for illiquid HFs, do we find a positive and statistically significant loading on the BAB factor. We do not find evidence that liquidity risk is higher for illiquid HFs compared to ARUs. Thus, our evidence suggests that leverage constraints may be less binding for hedge funds imposing long restriction periods.

To compare funds with different fund formats and domiciles, we repeat the analysis using only hedge funds and UCITS-compliant funds from Luxembourg and Ireland. Panels C and D shows that the liquidity-performance trade-off results is very robust. Tight share restrictions come with a cost because ARUs deliver lower risk-adjusted-returns than HFs domiciled in Ireland and Luxembourg. Indeed, AIFMD-compliant SIFs and QIFs imposing long restriction periods on their clients are able to deliver higher 9-factor and 11-factor alphas than ARUs. Again, the results are partly driven by their higher exposure to BAB-factor.

5.2 Comparing UCITS and non-UCITS pairs within the same management firm

As we stated in the introduction many hedge fund management companies such as Paulson, for example, are offering both UCITS-compliant funds for their "offshore" hedge funds and pure hedge funds. We therefore match within the management company the closest possible UCITS and non-UCITS share class pairs.

We run the regression within management firms that manage both UCITS and non-UCITS funds. Our aim is to examine the fund-specific characteristics that drive the performance difference between firm's UCITS and hedge funds. The two main candidates are liquidity and leverage differences. Given that hedge funds can impose tighter share restrictions, this may help them to more efficiently manage capital flows and thus facilitate the implementation of arbitrage strategies with longer term horizons. Regulations limit UCITS ability to take leverage, whereas hedge funds can take more leverage. In the light of the Frazzini and Pedersen (2014) UCITS funds face more leverage constraints, but hedge funds may suffer from margin calls during times of financial stress.

[Insert Table 8 here]

To address these questions, we run the following panel regression within management companies that manage both types of funds:

$$R_{m,t}^{HF} - R_{m,t}^{UCITS} = \gamma_0 + \gamma_1 \, \Delta \, ShareRestrictions + \gamma_2 \Delta AverageLeverage + \gamma_3 \, \Delta \, Controls + \varepsilon$$

where $R_{m,t}^{HF} - R_{m,t}^{UCITS}$ refers to the return difference between the closest possible hedge fund and UCITS-compliant fund pair within a management company. In our baseline, we restrict the sample to the pairs that exhibit a return correlation between each other of at least 90%.[22] Δ*ShareRestrictions* represents the difference of restriction periods between hedge fund and UCITS share classes. $\Delta AverageLeverage$ is defined as the difference between the average leverage of the hedge fund and the UCITS pair. $\Delta Controls$ is a the difference between hedge funds and UCITS share classes for a set of control variables (defined above). We base the selection of control variables on the fast growing literature on cross-sectional performance differences among hedge funds which shows that funds with stricter share restrictions (e.g., Aragon (2007)), less binding capacity constraints

[22] Results are not sensitive to this assumption; we find similar results using the other correlation limits such as 85% and 95%.

(e.g., Teo (2010)) and greater managerial incentives (e.g. Agarwal, Daniel, and Naik (2009), younger funds (Aggarwal and Jorion (2010)), on average, outperform their peers on a risk-adjusted basis. On the relationship between liquidity and hedge fund performance, Aragon (2007) argues that share restrictions allow hedge funds to manage illiquid assets and earn an illiquidity premium. Teo (2011) examines hedge funds that grant favorable redemption terms to investors. He finds that hedge funds that are exposed to liquidity risk, but not shielded by strict share restrictions, underperform during times of financial distress due to costly capital outflows. Finally, we control for strategy and time fixed effects and following Petersen (2009) adjust standard errors within firm-level cluster correlation.

Panel A of Table 8 reports the results within management companies that manage both hedge funds and UCITS funds. There is evidence that share restrictions differences are driving the difference between UCITS and non-UCITS share classes. We find a positive and statistically significant coefficient for notice period differences. This suggests that hedge funds with longer notice period than their UCITS counterpart seems to outperform. We, however, do not find evidence that the level of leverage matters. We repeat the analysis for the alpha difference and find very similar results. Hence these results support our *Liquidity Hypothesis (H4)*.

We finally examine within management firms whether leverage constraints matter. We form an equal-weighted portfolio from the closest possible UCITS and non-UCITS pairs defined as in the multivariate analysis above. In Panel B of Table 8, we report results from a time-series regression of the difference in returns between matched UCITS and non-UCITS hedge funds on different factors. We find that only the factor loading on the BAB factor is statistically significant. This implies that non-UCITS HF share classes have higher exposure to the BAB factor than UCITS-compliant share classes. This may be the result of non-UCITS HFs facing less binding leverage constraints than UCITS-compliant ARUs funds.

6. Performance Persistence and Transparency

Hedge funds typically restrict capital withdrawals by imposing lockup, advance notice, and redemption periods. All these restrictions indicate that investors are not able to withdraw capital from hedge funds in a timely fashion. On the other hand, by regulation, ARUs must provide at least bi-weekly liquidity to investors. This implies that real world HF investors may not be able to exploit short-term performance persistence, if any, while ARU investors can rebalance their portfolios given the low redemption restrictions. It is also important to note that a significant proportion of HFs provide similar portfolio rebalancing possibilities than ARUs. Hence, it is interesting to examine whether redemption restrictions hinder investors to exploit short-term performance persistence.

Glode and Green (2011) rationalize performance persistence for hedge funds by showing that persistence can be explained by a desire for secrecy. They argue that the source of superior returns may not be entirely skills or abilities intrinsic to the manager, but outperformance may also be attributable to strategies or techniques that could be expropriated and exploited by others if they were informed about them. These arguments are consistent to the "zero-profit" condition of a competitive economy suggesting that "enough money chasing a given pattern in returns will necessarily eliminate that pattern. Hence, our *Performance Persistence Hypothesis (H5)* predicts that hedge funds exhibit more performance persistence than ARUs.

We examine performance persistence of HFs and ARUs using a standard methodology. In the spirit of Carhart (1997), we sort funds into quintile portfolios based on their past 9-factor alpha *t*-statistics that are estimated over the prior two years data. Given superior statistical properties of the alpha *t*-statistic, the performance persistence is expected to be stronger than in case we sort on fund alpha.[23] We use different portfolio rebalancing periods ranging from 1 month to 1 year. Across rebalancing horizons, we

[23] Funds with a short history of monthly net returns will tend to generate alphas that are outliers. The alpha *t*-statistic provides a correction for outliers by normalizing the fund alpha by the estimated precision of the fund alpha (e.g. Kosowski Timmermann, Wermers and White (2006), Kosowski, Naik and Teo (2007)).

calculate returns for each of the quintile portfolios.[24] Thereafter, we estimate the alpha spread between the top and the bottom quintile portfolios.

[Insert Figure 4 here]

Figure 4 presents performance persistence tests across rebalancing horizons. We find that HFs performance persists, while ARUs cannot deliver any long-term performance persistence.

Our findings also suggest that HFs providing at least bi-weekly liquidity provide significant performance persistence during the sample period, but HFs that impose above one month notice and redemption periods as well as a lockup period cannot deliver significant performance persistence on an annual basis.

[Insert Figure 5 here]

Given that ARUs and some of the HFs provide investors the possibility to redeem their capital in a timely fashion, we conduct performance persistence tests. We use one-month lagged *t*-statistic of alpha in forming the out-of-sample strategies so as real-time investor could rebalance her portfolio in-practice. Figure 5 presents these performance persistence tests. It shows significant performance persistence for liquid HFs, but we cannot find any performance persistence for ARUs. In contrast, HFs that provide at least bi-weekly liquidity provide significant performance persistence.

To summarize, we find that HFs' performance persists, but ARUs cannot deliver significant performance persistence even at monthly horizons.

7. Conclusion

Our findings raise questions about the resulting welfare implications and the acceptable liquidity-performance trade-off. We uncover a strong performance-liquidity

[24] The portfolios are equal-weighted monthly, so the weights are readjusted whenever a fund disappears.

tradeoff. Although ARUs underperform other hedge funds on average, when we compare liquidity (i.e. share restriction) matched groups of ARUs and hedge funds we find that the performance of the two groups converges. Our results show that hedge funds generally exhibit lower volatility and tail risk than ARUs which is consistent with hurdles to the transportation of hedge fund risk management techniques to ARUs. We find that geography and domicile matter for fund performance and risk. Finally we find that there are limits to the ability of investors to exploit the superior liquidity of ARUs since they exhibit lower performance persistence than certain HFs.

Moreover, UCITS and ARUs are likely to attract researchers' attention in the future for two further reasons. First, the UCITS and ARU universe are growing very fast and are becoming increasing economically important. Second, the latest UCITS rules impose remuneration caps on managers of UCITS funds including UCITS hedge funds. This can be expected to affect performance.

According to a recent Financial Times Article, '*US fund groups have rapidly expanded into Ucits funds in recent years as a way of accessing both the European and Asian markets. More than 1,000 such funds, with assets of €765bn, are now domiciled in Ireland alone, …,However "the US managers that have set up Ucits funds are extremely exercised" about proposals from the European Parliament's economic and monetary affairs committee to limit asset managers' bonuses to 100 per cent of their salary'.* [25]

In the data that we analyse in this paper there are no regulatory restrictions and funds are free to choose their fee and compensation structures. Since we find that performance increases with incentive fees it is plausible that if UCITS-compliant funds were forced by regulators to implement bonus caps that this would drive a further wedge between the average ARUs and HF performance and have welfare implications for investors such as pension funds that invest in alternative investment funds. We leave this analysis to future work.

Alternative investment fund managers are increasingly deciding to implement alternative strategies through traditional investment vehicles such as mutual funds in order to access assets from retail and institutional investors that, for various reasons (such as investment mandates, for example), cannot invest through less regulated structures.

[25] 'EU pay cap a concern for US funds', by Steve Johnson, *Financial Times*, March 24, 2013.

Third, The Dodd-Frank requirement for hedge funds to register with the SEC has increased the popularity of UCITS type products in the US. "*An American version of the "hedge-fund lite" Ucits funds popular in Europe – so-called liquid alternative funds, registered under the Investment Company Act of 1940 – is in vogue."*[26] Packaging hedge fund strategies in a traditional format is not straightforward, however, and it raises a lot of challenges for the managers as well as for the brand of the regulatory format.[27] An important question is to know whether structuring hedge fund strategies through mutual funds will compromise these strategies and provide the same level of returns, considering the constraints under mutual fund regulations such as investment restrictions, liquidity requirements, operational requirements and risk management.

[26] 'Investor demand drives US move to alternative mutual funds' by Ellen Kelleher, *Financial Times*, 1 December 2013.

[27] Hedge funds have an absolute return objective, i.e. achieving returns uncorrelated with the market (Ineichen (2002)). The absolute return objective implies that risk reduction techniques such as long-short strategies and derivatives positions are used to reduce benchmark exposures.

References

Ackermann, C., McEnally, R., Ravenscraft, D., 1999. The performance of hedge funds: risk, return and incentives. Journal of Finance 54, 833-874.

Agarwal, V., Boyson, N. M. and N. Naik, 2009, Hedge Funds for Retail Investors? An Examination of Hedged Mutual Funds, Journal of Financial and Quantitative Analysis, Vol.44, No.2, Apr. 2009, pp. 273-305.

Agarwal, V., Daniel N. D., and Naik N. Y., 2009. Role of managerial incentives and discretion in hedge fund performance. The Journal of Finance 64(5), 2221-2256.

Agarwal, V., and Naik, N.Y., 2000. Multi-period performance persistence analysis of hedge funds. Journal of Financial and Quantitative Analysis 53, 327-342.

Aggarwal, R., K. and Jorion, P., 2010. The performance of emerging hedge funds and managers. Journal of financial economics. 96, 238-256.

Almazan, A., Brown, K.C. Carlson, M. and D.A. Chapman, 2004. Why Constrain your Mutual Fund Manager? Journal of Financial Economics, 73, 289-321.

Amihud, Y., H. Mendelson, and L. H. Pedersen, 2006. Liquidity and asset prices. Foundations and Trends in Finance 1(4), 269–364.

Aragon, G. O., 2007. Share restrictions and asset pricing: Evidence from the hedge fund industry. Journal of Financial Economics 83(1), 33.58.

Aragon, G.O., M. Kang and J.S. Martin, 2011. Risk-Shifting in Hedge Funds: Evidence from Option Holdings, Working paper.

Aragon, G. O. Liang, B., and Park H., 2013. Onshore and offshore hedge funds: Are they twins? Forthcoming in Management Science.

Bali T., G., S. J. Brown, and M. O. Caglayan, 2012. Systematic Risk and the Cross-Section of Hedge Fund Returns. Journal of Financial Economics 106, 114-131.

Bollen, N. P., and Pool, V. K., 2008. Conditional return smoothing in the hedge fund industry, Journal of Financial and Quantitative Analysis 43, 267-298.

Bollen, N.P., Pool, V.K., 2009. Do hedge fund managers misreport returns? Evidence from the pooled distribution, Journal of Finance 64, 2257-2288.

Bollen, N.P., and V.K. Pool. 2013. Suspicious patterns in hedge fund returns and the risk of fraud. Review of Financial Studies 25, 2673-2702.

Brown S., W. Goetzmann, B. Liang, and C. Schwarz, 2008, Mandatory Disclosure and

Operational Risk: Evidence from Hedge Fund Registration, Journal of Finance, 63(6), pp. 2785- 2815.

Brown S., W. Goetzmann, B. Liang, and C. Schwarz, 2009, Estimating Operational Risk for Hedge Funds: The Ω-Score, Financial Analysts Journal, 65(1), pp. 43-53.

Brown S., W. Goetzmann, B. Liang, and C. Schwarz, 2012, Trust and Delegation, Journal of Financial Economics, 103(1), pp. 221-234.

Buraschi, A., Kosowski, R. and Sritrakul, W., 2012, Incentives and Endogenous Risk Taking: A Structural View of Hedge Funds Alphas. Forthcoming at Journal of Finance.

Carhart, M (1997), On Persistence in Mutual Fund Performance. Journal of Finance, 52, 57-82.

Cassar, G., Gerakos J., 2011, Hedge funds: pricing controls and the smoothing of self-reported returns. Review of Financial Studies, 24 pp. 1698–1734

Coval, J. and T. Moskowitz, 2001. The Geography of Investment: Informed Trading and Asset Prices. Journal of Political Economy, 4, 811-841.

Darolles, S., 2011, Quantifying Alternative UCITS, Working Paper.

Edelmann, D. Fung, W., and D. A. Hsieh, 2013, Exploring Uncharted Territories of the Hedge Fund Industry: Empirical Characteristics of Mega Hedge Fund Firms, Journal of Financial Economics 109 (3), 734-758.

Fama, E. F., and MacBeth J.D., 1973. Risk, return, and equilibrium: Empirical tests. Journal of Political Economy 81, 607-636.

Frazzini A. and L.H. Pedersen (2014), Betting Against Beta, Journal of Financial Economics, 111, 1–25.

Fung, W., Hsieh, D., 2000. Performance characteristics of hedge funds and CTA funds: Natural versus spurious biases. Journal of Financial and Quantitative Analysis 35, 291-307.

Fung, W., Hsieh, D., 2004. Hedge fund benchmarks: a risk based approach. Financial Analyst Journal 60, 65-80.

Fung, W. and Hsieh D., 2009, Measurement biases in hedge fund performance data: An update, Financial Analysts Journal 65, 36-38.

Fung, W., Hsieh, D., Naik, N., Ramadorai, T., 2008. Hedge funds: performance, risk, and capital formation. Journal of Finance, 63 (4), 1777-1803.

Getmansky, M., A. Lo, and I. Makarov, 2004. An Econometric Model of Serial Correlation and Illiquidity of Hedge Fund Returns. Journal of Financial Economics. 74, 529-610.

Glode, V., Green, R. C., 2011. Information spillovers and performance persistence for hedge funds. Journal of financial economics. 101, 1-17.

Darolles, S., 2011, Quantifying Alternative UCITS, Working Paper.

Hau, H. 2001, Location Matters: An examination of Trading Profits. Journal of Finance, 56, 267-306.

Ineichen, A. 2006, Asymmetric Returns: Future of Active Asset Management, Wiley.

Ivkovic, Z ands. Weisbenner 2005, Local does as local is: Information context of geography of individual investors' common stock investments. Journal of Finance, 60, 267-306.

Jagannathan, R., Malakhov A., and Novikov D., 2010. Do hot hands exist among hedge fund managers? An empirical evaluation. The Journal of Finance 65(1), 217.255.

Joenväärä, J., Kosowski, R., and Tolonen, P., 2013. Hedge fund performance: What do we know? Imperial College Business School.

Liang, B., 1999. On the performance of hedge funds. Financial Analysts Journal 55(4), 72.85.

Liang, B., 2000. Hedge funds: The living and the dead. Journal of Financial and Quantitative Analysis 35(3), 309.326.

Lustig, H., N. Roussanov and A. Verdelhan. (2011). Common Risk Factors in Currency Markets. Review of Financial Studies. 24 (11), 3731-3777.

Koski J., and Pontiff J., 1999. How are Derivatives Used? Evidence from the Mutual Fund Industry", Journal of Finance 54, 791-816.

Kosowski, R., Naik N. Y., and Teo M., 2007. Do hedge funds deliver alpha? A Bayesian and bootstrap analysis. Journal of Financial Economics 84(1), 229.264.

Kosowski, R., A. Timmermann, R. Wermers, and H. White (2006). Can mutual fund "stars" really pick stocks? New evidence from a bootstrap analysis. The Journal of Finance 61(6), 2551–2595.

Malloy, C. 2005. The geography of equity analysis. Journal of Finance 60, 719-755.

Newey, W., West, K., 1987. A simple, positive semi-definite, heteroscedasticity and autocorrelation consistent covariance matrix. Econometrica 55, 703-708.

Pascalau, R. (2011), An Empirical Analysis of UD Dollar Trading Newcits, working paper.http://ssrn.com/abstract=1910658.

Patton, A. J., 2009, Are 'Market Neutral' Hedge Funds Really Market Neutral? Review of Finanical Studies.

Patton, A. J. and A. Timmermann (2010). Monotonicity in asset returns: New tests with applications to the term structure, the CAPM, and portfolio sorts. Journal of Financial Economics 98, 605{625.

Pastor, L. and R. F. Stambaugh (2003). Liquidity risk and expected stock returns. Journal of Political Economy 111 (3), 642-685.

Stefanini, F., Derossi, T., Meoli, M. and S., Vismara (2010), Newcits: Investing in UCITS Compliant Hedge Funds, Wiley Finance Series, First Edition.

Szylar, C., 2012 UCITS Handbook. Wiley-Blackwell.

Teo, M., 2010. Does size matter in hedge fund industry? SMU - School of Business.

Teo, M., 2011. The Liquidity Risk of Liquid Hedge Funds, Journal of Financial Economics, 100, 24–44.

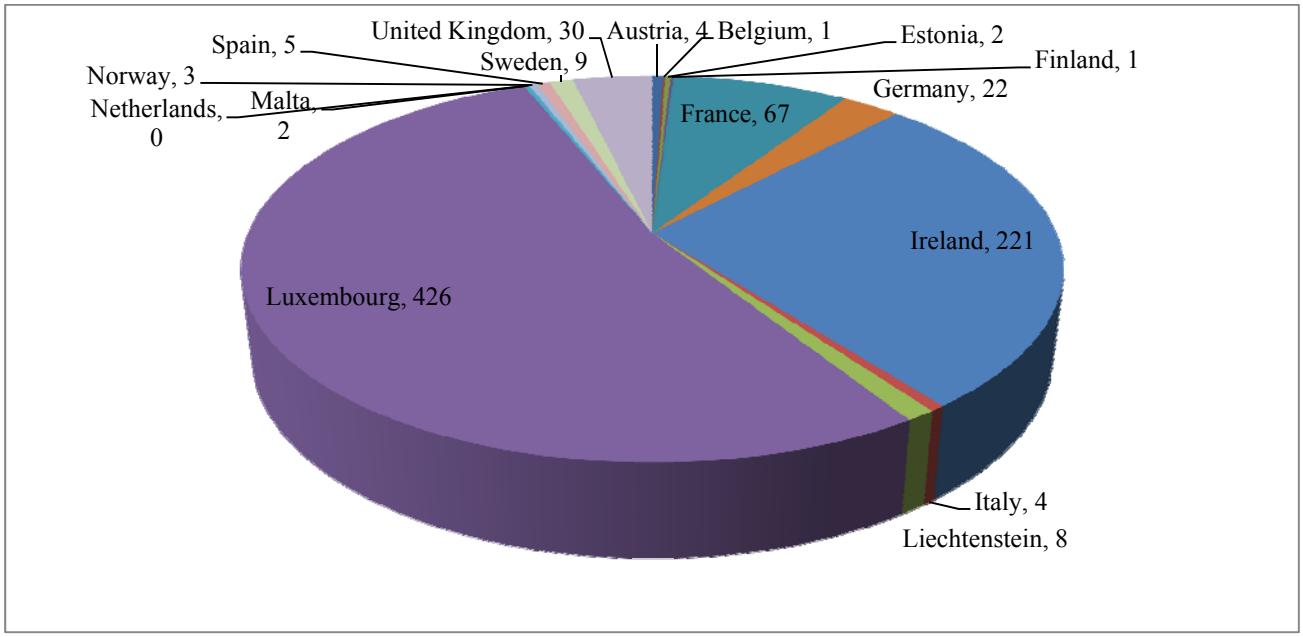
Titman, S. and C. I. Tiu (2011). Do the best hedge funds hedge? Review of Financial Studies 24(1), 123-168.

Tuchschmid, N.S., Wallerstein, E. and L., Zanolin (2010), Will Alternative UCITS Ever be Loved Enough to Replace Hedge Funds, working paper, Haute Ecole de Gestion de Genève. http://ssrn.com/abstract=1686055.

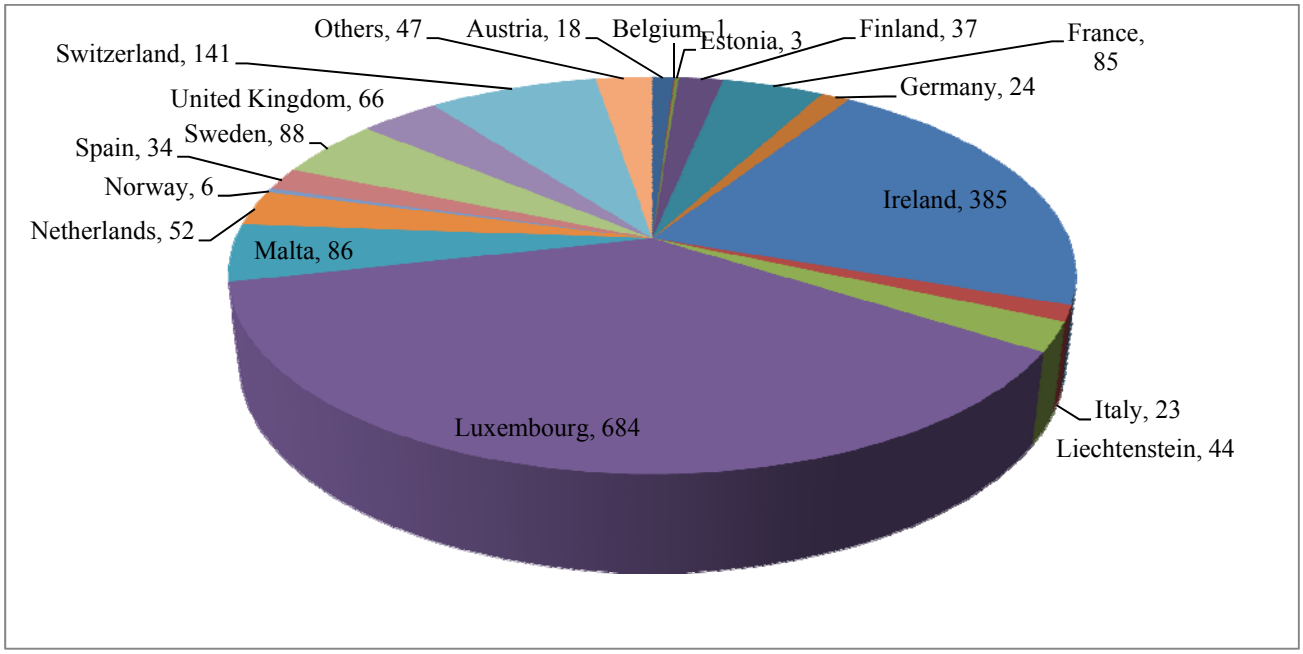
Figure 1. Portion of funds across fund domiciles

This Figure displays the fund domicile distribution of Absolut return UCITS funds (Panel A), European onshore hedge funds (Panel B), offshore hedge funds (Panel C) and all funds (Panel D) as of June 2013.

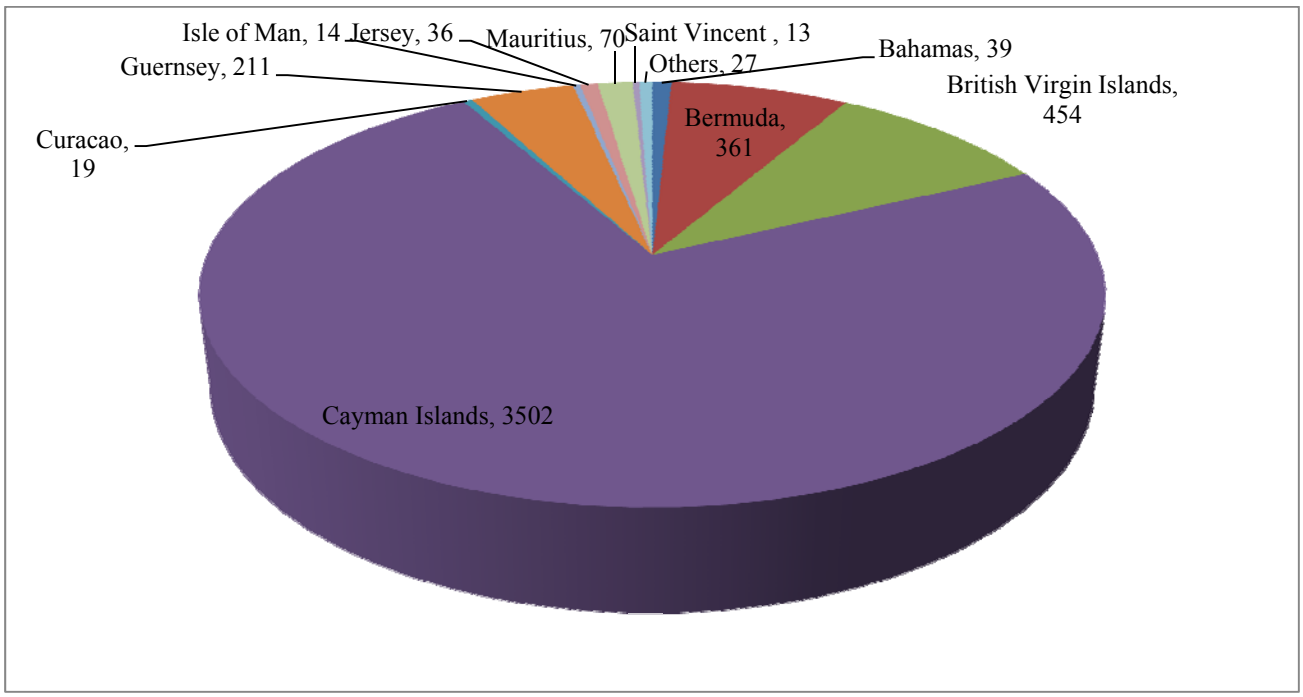
Panel A. Absolute Return UCITS funds



Panel B. European onshore hedge funds



Panel C. Offshore hedge funds



Panel D. All funds

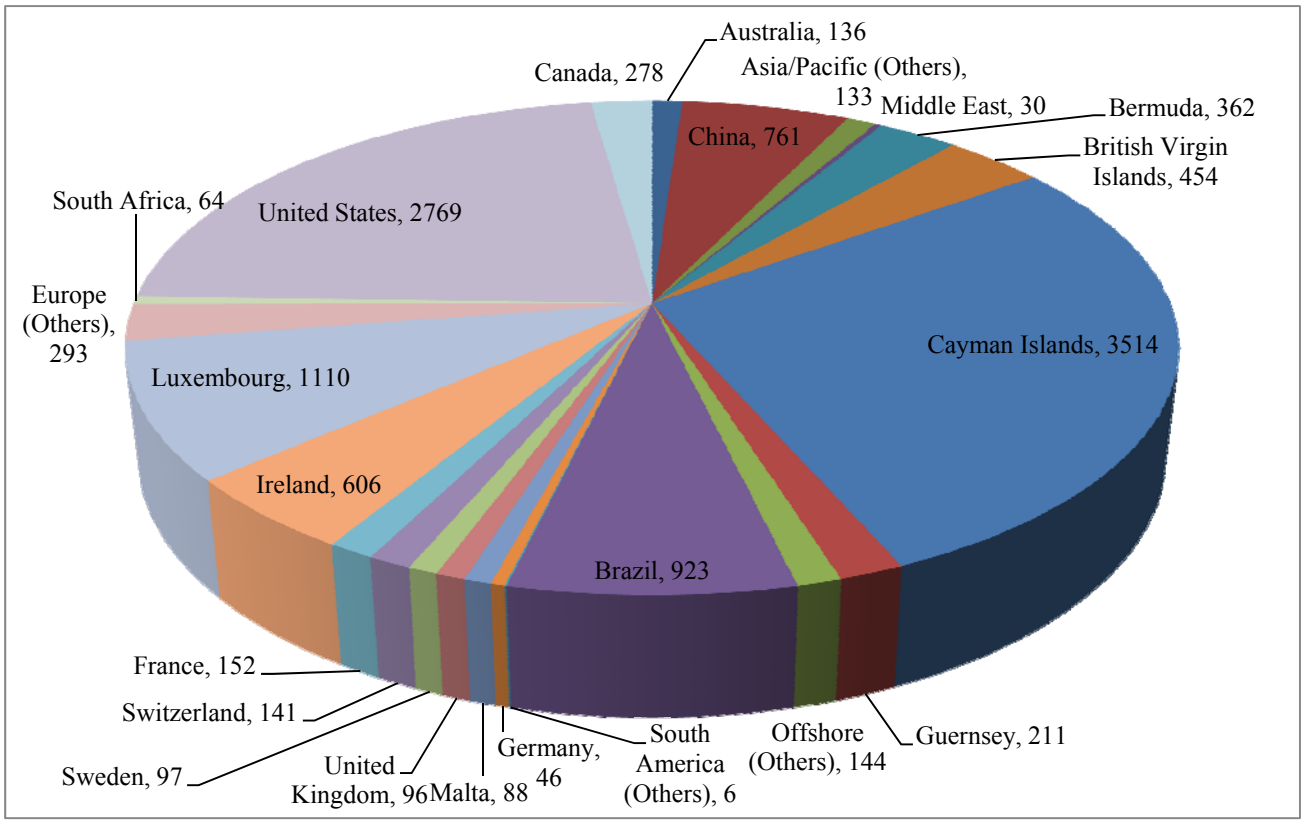
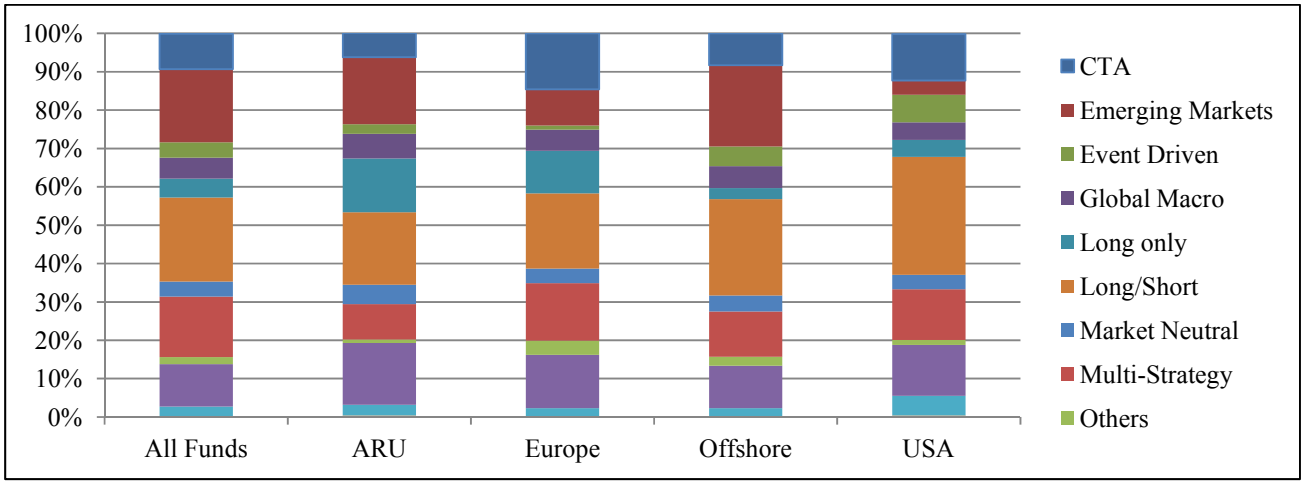


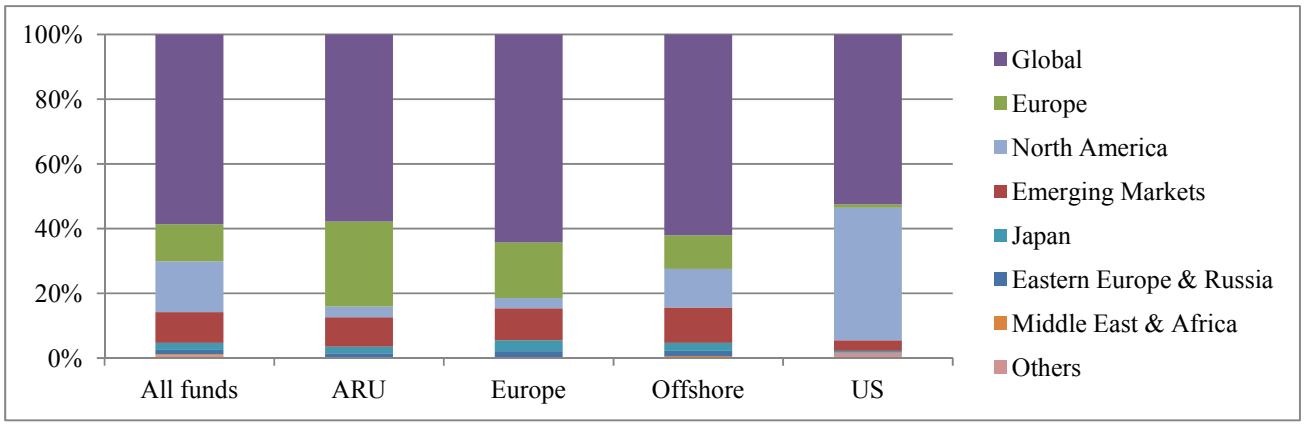
Figure 2.

This figure displays the strategy distribution (Panel A), AuM invested in geographic regions (Panel B), and fund size distribution (Panel C) across fund domiciles.

Panel A. Investment strategy distribution across fund domiciles



Panel B. Proportion of AuM invested in geographic regions



Panel C. Fund size distribution across fund domiciles

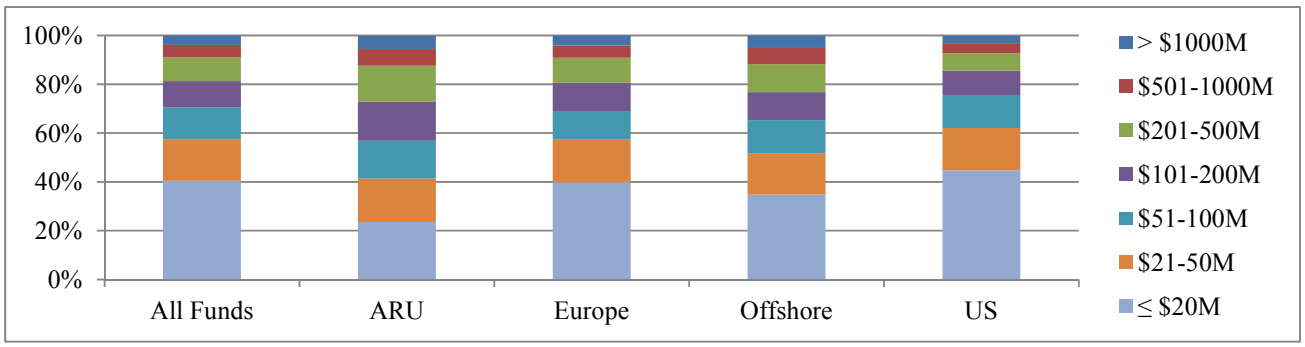


Figure 3. External Conflicts of Interest.

This figure shows the percentage of live funds whose advisor reports having an external conflict of interest. Monthly Form ADV data are obtained from SEC's historical archive of investment adviser reports, and merged to funds by advisor's name. A fund is deemed alive from its inception date to its last observed return (or AuM) observation. In this figure we use only the advisors that have Form ADV observations through the whole years 2011 and 2012 to avoid the effect of entering and leaving advisors. The relevant Form ADV variables were not available from December 2011 to March 2012, which is shown by the two vertical bars.

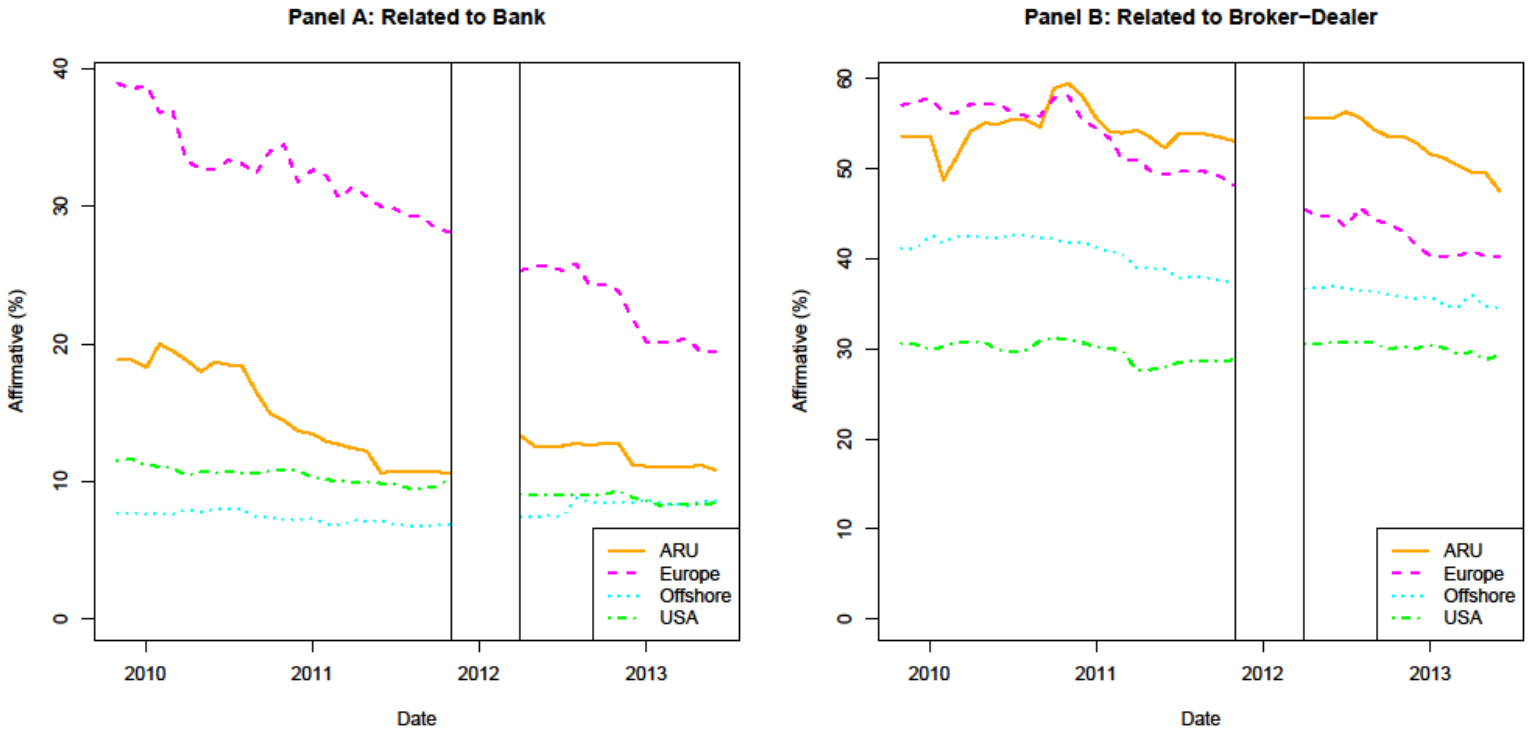


Figure 4. Performance persistence differences between ARUs and HFs

This figure plots the (annualized) 9-factor FH alphas for the ARUs and HFs. It displays the top and bottom quintile alphas across rebalancing frequencies. Using *t*-statistics of the nine-factor FH alpha, funds are sorted into quintile portfolios that are rebalanced at 1, 2, 3, 4, 6 and 12 months frequencies. The *t*-statistics are estimated using the 24 most recent return observations.

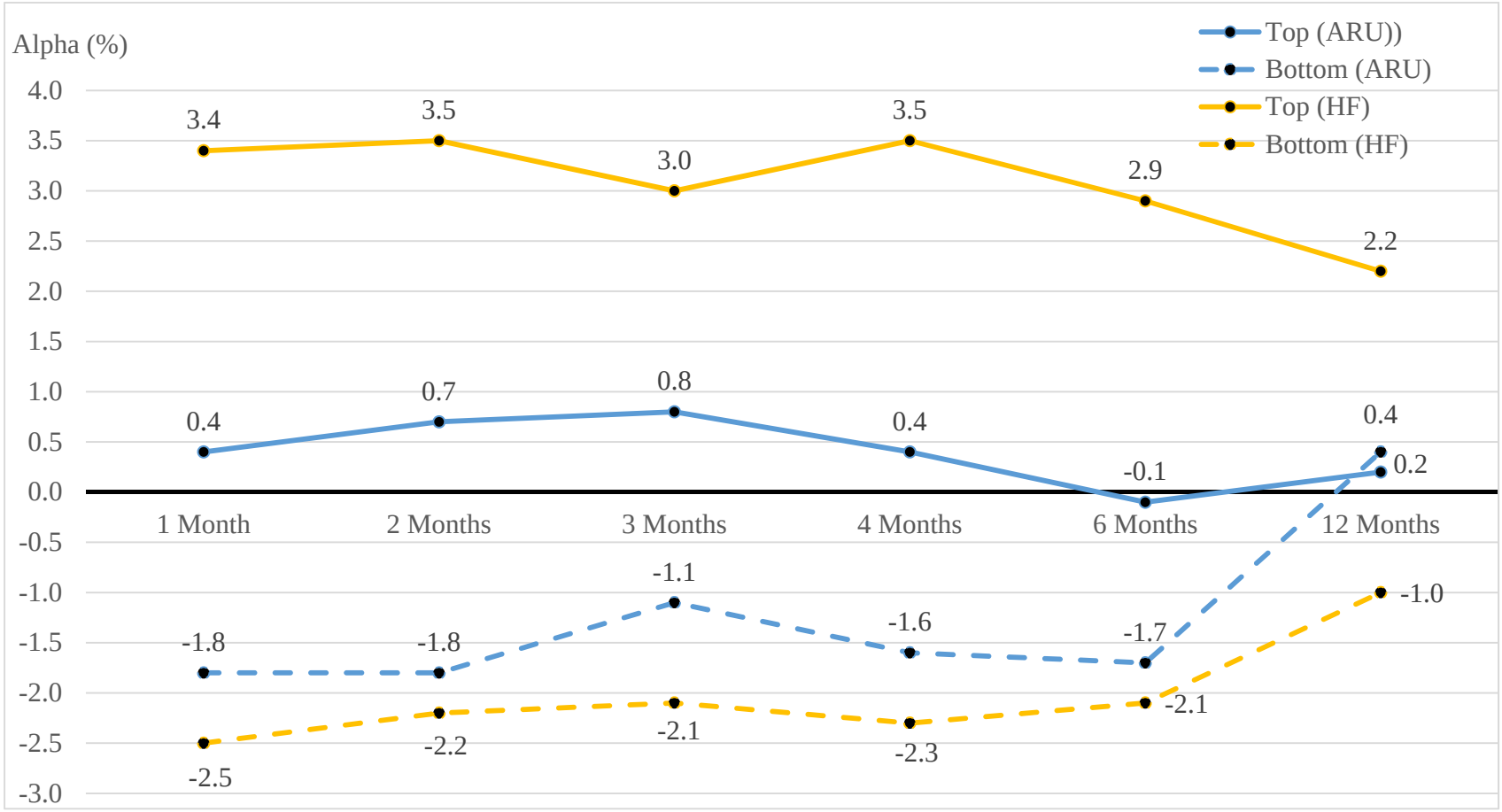


Figure 5. Feasibility and Performance Persistence

This figure plots the (annualized) 9-factor FH alphas for the ARUs and HFs. We control for Figures displays the top and bottom quintile alphas across rebalancing frequencies. Using *t*-statistics of the nine-factor FH alpha, funds are sorted into quintile portfolios that are rebalanced at 1, 2, 3, 4, 6 and 12 months frequencies. The *t*-statistics are estimated using the 24 most recent return observations.

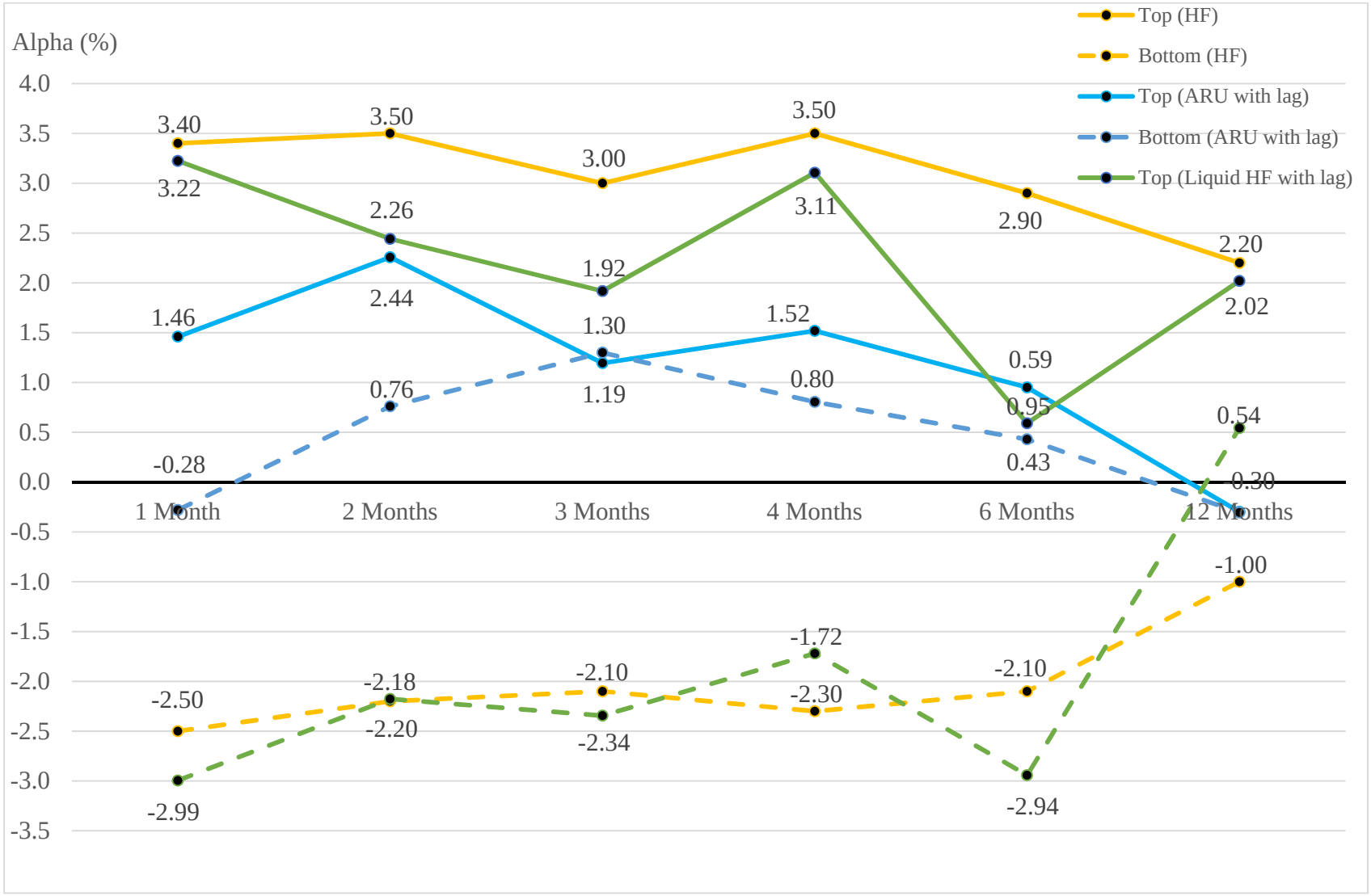


Table 1: Capital formation of Hedge Funds and Absolute Return UCITS

This table presents the capital formation process of hedge funds and Absolute Return UCITS from December 2003 to December 2012. *N* is the number of funds in given year. 'AuM' provides aggregate assets under management for Hedge Funds and Absolute Return UCITS. Attrition rate is the percentage of funds that became inactive during the year.

Year	Hedge Funds			Absolute Return UCITS		
	N	AuM	Attrition rate	N	AuM	Attrition Rate
2003	10081	895,585	5.2	144	5,835	0
2004	11991	1,344,230	5.9	180	11,365	0
2005	13621	1,599,562	7.8	229	22,301	0
2006	14972	2,119,883	9.1	301	48,216	0.7
2007	15891	2,666,225	10.6	381	62,941	0.8
2008	15190	1,832,842	17.1	466	38,298	1.7
2009	14936	1,828,022	13.0	618	78,892	1.1
2010	14801	1,992,104	12.5	801	137,382	3.7
2011	14403	2,028,704	12.9	878	177,347	8.6
2012	13044	1,981,433	16.1	854	226,485	12.0

Table 2: Fund Characteristics

Right hand-side of this table presents the summary statistics for fund size and age as well as compensation and share restrictions variables of Hedge Funds (HF) and Absolute Return UCITS (ARU). Left hand-side presents fund characteristics across hedge fund domicile. Table presents cross-sectional difference tests for each fund characteristics. Size denotes the fund's size in millions of US dollars. Age denotes the fund's age in years based on the fund inception data. Management Fee (%) shows the management fee within a specific category. Incentive Fee (%) shows the incentive fee within a specific category. Incentive Fee denotes the performance-based fee that fund charges. High-water mark indicates whether a fund imposes a high-water mark provision. Redemption denotes redemption frequency. Notice is the advance notice period. Restriction is the sum of redemption and notice periods. Lockup denotes the length of period when investors are restricted to withdraw their initial investment. Lockup Dummy denotes the proportion of funds imposing a lockup period. Minimum Investment is the fund's minimum subscription amount in US dollars. Leverage Dummy reports to proportion of funds that use leverage. Average Leverage is the amount of average leverage.

	Mean difference between ARUs and HFs				Hedge Fund Domicile		
	ARU	HF	Diff	*t*-statistic	Europe	Offshore	USA
Size	246.02	162.98	83.04	3.15	194.84	202.02	129.76
Age	4.82	6.31	-1.49	-10.28	5.22	6.54	7.38
Management Fee	1.29	1.54	-0.24	-13.35	1.50	1.59	1.51
Incentive Fee	12.38	17.66	-5.29	-19.99	14.86	18.10	18.81
High-water Mark	0.6	0.72	-0.11	-7.73	0.59	0.82	0.69
Redemption Period	2.3	57.76	-55.45	-122.33	24.32	49.22	87.60
Notice Period	1.42	30.85	-29.43	-143.47	13.00	36.38	33.49
Lockup Period	0	89.23	-89.23	-77.27	21.14	70.17	151.86
Lockup Dummy	0	0.25	-0.25	-96.62	0.05	0.19	0.41
Minimum Investment (USD)	0.49	2.05	-1.56	-5.71	1.32	1.77	2.29
Average Leverage	31.48	57.71	-26.23	-7.98	56.40	69.73	45.62
Leverage Dummy	0.33	0.52	-0.19	-12.97	0.43	0.59	0.45

Table 3: Autocorrelation and Suspicious Patterns in Reported Returns

This table compares autocorrelation suspicious patterns in reported returns of absolute return UCITS (ARU) and hedge funds (HF) across domiciles (Europe, Offshore and USA). We require that each fund has at least 24 return observations over the period from January 2005 to June 2012. A set of used measures is based on Bollen and Pool (2012). Greater manipulation in reported returns are indicated by + or − sigs. Table reports the cross-sectional means and their difference tests. Panel A reports the asset liquidity proxy. Autocorrelation refers to the test statistic of the first-order coefficient in a MA(1) model of returns. Panel B reports discontinuity in the distribution of returns proxy. Kink refers to the test statistic of the kink flag, measuring the abnormal rate of reporting small losses. Panel C reports two measures of low correlation. Index R^2 is the p-value of the slope coefficient from a regression of fund returns on a corresponding style index. Max R^2 refers to the adjusted R-square of fund returns against the seven Fung-Hsieh factors and the four Agarwal-Naik factors. Panel D reports four measures of data-quality. % Repeat is triggered by a high number of returns that are repeated. # Zero refers to the number of zero returns. % Negative refers to the fraction of negative returns. Uniform refers to the test statistic of the uniformity of the last digit in reported returns.

Panel A: Asset liquidity

						Hedge Fund Domicile		
	Manipulation	HF	ARU	Difference	t-statistic	Europe	Offshore	USA
Autocorrelation	+	0.96	0.26	0.70	15.17	0.58	1.20	1.02

Panel B: Discontinuity in the distribution of fund returns

						Hedge Fund Domicile		
	Manipulation	HF	ARU	Difference	t-statistic	Europe	Offshore	USA
Kink	−	-0.16	0.11	-0.27	-6.70	-0.07	-0.15	-0.17

Panel C: Measures of low correlation between fund returns and the returns of style factors

						Hedge Fund Domicile		
	Manipulation	HF	ARU	Difference	t-statistic	Europe	Offshore	USA
Index R^2	+	0.09	0.02	0.07	17.47	0.06	0.08	0.13
Max R^2	−	0.43	0.57	-0.14	-22.15	0.46	0.41	0.44

Panel D: Family of data-quality indicators

						Hedge Fund Domicile		
	Manipulation	HF	ARU	Difference	t-statistic	Europe	Offshore	USA
% Repeat	+	0.03	0.01	0.02	6.18	0.03	0.03	0.03
# Zero	+	0.38	0.27	0.11	3.59	0.58	0.41	0.30
% Negative	+	0.38	0.42	-0.04	-11.77	0.41	0.38	0.38
Uniform	+	16.81	15.79	1.02	4.25	16.29	16.75	17.33

Table 4: Operational Risk and Conflicts of Interest

This table compares the operational risk measures and their sources of hedge funds and absolute return UCITS. Panel A reports operational risk measures. Panel B (Panel C) report a set of proxies for the external (internal) conflicts of interest. We report results separetely across hedge funds domiciles. ADV-filers (%) is the portion of funds file ADV for SEC. Problem Funds (%) refers to funds that answered «yes» to at least one question in Item 11 of ADV filing. Item 11 identifies any "problems" that the management or related advisory affiliates have, including felonies, investment-related misdemeanors or any agency, SEC, CFTC, or self-regulatory issues, regulatory disciplinary action as well as civil lawsuits. ω-score is the Brown, Goetzmann, Liang and Schwarz (2008, 2009) operational risk measure estimated using all funds and only European domiciled funds. Heckman's λ refers to Heckman's selection correction. Broker/Dealer is 1 if the fund has a related broker/dealer. Investment Adviser, Commodities Broker, Bank, Insurance and Sponsor of LLP are 1 if the fund is related to one of these companies respectively. BuySellYourOwn is 1 if the company buys and sells between itself and clients. BuySellYourselfClients is 1 if a related party buys and sells securities also recommended to the fund. RecSecYouOwn is 1 if the fund recommends securities in which a related party has an ownership interest. AgencyCrossTrans is 1 if the fund performs agency cross transactions. RecUnderwriter is 1 if a related party recommends securities to clients for which they are the underwriter. RecSalesInterest is 1 if a related party recommends securities with a sales interest. RecBrokers is 1 if a related party recommends. OtherResearch is 1 if the fund uses external research. Frequency of conflicts is the total sum of conflicts within a specific category.

Panel A: Problem Funds and Operational Risk

	All Funds				Hedge Fund Domicile		
	ARU	HF	Diff	*t*-statistic	Europe	Offshore	USA
ADV-filers (%)	0.24	0.26	-0.02	-1.47	0.17	0.31	0.31
Problem (%)	0.40	0.27	0.13	3.69	0.45	0.29	0.18
ω-score	0.33	0.25	0.09	24.05	0.28	0.26	0.21
Heckman's λ	-1.25	-1.23	-0.02	-1.91	-1.34	-1.16	-1.25

Panel B: Potential External Conflicts of Interest

	All Funds				Hedge Fund Domicile		
	%Yes				%Yes		
With:	ARU	HF	Diff	*t*-statistic	Europe	Offshore	USA
Broker/Dealer	0.46	0.32	0.14	4.67	0.52	0.31	0.28
Commodities Brokers	0.70	0.48	0.22	7.93	0.58	0.56	0.33
Investment Adviser	0.87	0.67	0.19	9.30	0.84	0.76	0.51
Bank	0.20	0.13	0.07	2.92	0.41	0.10	0.09
Insurance	0.15	0.11	0.04	1.90	0.23	0.09	0.11
Sponsor of LLP	0.17	0.14	0.03	1.20	0.22	0.16	0.10
Frequancy of External Conflicts	2.54	1.85	0.69	7.13	2.80	1.98	1.41

Panel C: Potential Internal Conflicts of Interest

	All Funds				Hedge Fund Domicile		
	%Yes				%Yes		
	ARU	HF	Diff	*t*-statistic	Europe	Offshore	USA
BuySellYourOwn	0.12	0.15	-0.03	-1.13	0.14	0.13	0.17
BuySellYourselfClients	0.74	0.75	-0.02	-0.61	0.58	0.72	0.84
RecSecYouOwn	0.54	0.46	0.07	2.19	0.62	0.39	0.54
AgencyCrossTrans	0.10	0.07	0.03	1.44	0.15	0.06	0.07
RecUnderwriter	0.52	0.52	0.00	-0.04	0.55	0.48	0.57
RecSalesInterest	0.31	0.19	0.13	4.03	0.39	0.16	0.17
RecBrokers	0.39	0.51	-0.12	-3.66	0.39	0.46	0.60
OtherResearch	0.89	0.69	0.20	9.20	0.69	0.69	0.71
Frequency of Internal Conlicts	3.60	3.34	0.26	2.31	3.50	3.09	3.66

Panel C: Total Frequency of Conflicts of Interest

Frequency of Conflicts	6.41	5.28	1.13	5.87	6.51	5.18	5.16

Table 5: Risk-adjusted Performance and Risk

This table presents risk-adjusted performance and risk measures for Absolute Return UCITS (ARU) and hedge funds (HF). Measures are computed for fund that have at least 24 return observations. Panel A (Panel B) reports cross-sectional medians and their differences tests within a specific category through the study period from January 2005 to December 2009 (January 2010 to June 2013). Panel C reports cross-sectional medians and their difference tests across investment objectives. *Mean* denotes the fundäs avarage rerturn. *Std* denotes the fund's return standard deviation. *Sharpe* denotes the annualized Sharpe ratio. *ES* denotes historical expected shortfall at the 10% level. *MPPM* is the Goetzmann, Ingersoll, Spiegel and Welch's (2007) Manipulation-proof Performance Measure. *Alpha* is the annualized 9-factor Fung and Hsieh (2004) alpha within a specific category. *t-stat* presents the *t*-statistic of FH alpha. *SystRisk* is defined as the difference of return standard deviation and residual risk. *IdioRisk* denotes the residual risk that is obtained from the 9-factor model. R^2 is the adjusted R-squared of the 9-factor model

Panel A: Medians from January 2005 to December 2009

			A set of performance and risk measures					9-Factor Model				
		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	All Funds	132	3.07	23.53	0.15	12.13	-13.66	-0.48	-0.08	11.92	10.64	0.75
HF		9151	3.13	16.78	0.20	8.19	-4.75	0.65	0.09	5.28	10.92	0.40
Difference			-0.06	6.75	-0.05	3.94	-8.91	-1.12	-0.17	6.64	-0.28	0.35
t-statistic			-0.73	5.35	-0.85	5.92	-5.08	-3.00	-2.02	10.62	-1.49	13.95

Panel B: Medians from January 2010 to June 2013

		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	All Funds	456	1.35	15.13	0.10	7.76	-4.63	0.36	0.06	8.93	5.38	0.80
HF		8460	3.42	14.61	0.27	7.04	-1.93	0.87	0.14	5.75	7.24	0.51
Difference			-2.07	0.52	-0.17	0.72	-2.70	-0.51	-0.08	3.17	-1.86	0.30
t-statistic			-5.90	4.05	-8.26	7.11	-7.48	-3.36	-3.94	14.19	-9.94	19.71

Panel C: Medians across investment objectives from January 2010 to June 2013

		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	CTA	24	-0.98	15.09	-0.06	7.62	-6.50	-1.27	-0.17	7.33	7.55	0.56
HF		752	0.78	14.99	0.05	7.12	-5.15	-0.86	-0.12	4.09	9.65	0.24
Difference			-1.75	0.10	-0.12	0.50	-1.34	-0.41	-0.05	3.24	-2.10	0.33
t-statistic			-2.30	0.86	-2.01	1.49	-1.53	-1.47	-1.23	3.50	-1.00	4.41

		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	Emerging Markets	77	1.79	22.26	0.09	11.48	-10.52	-0.35	-0.06	13.87	7.30	0.82
HF		1334	2.89	17.60	0.17	8.73	-4.59	1.24	0.19	7.53	8.93	0.58
Difference			-1.10	4.66	-0.09	2.75	-5.93	-1.59	-0.24	6.35	-1.63	0.25
t-statistic			-0.95	3.97	-2.02	4.92	-3.74	-2.24	-2.58	7.78	-3.01	8.83

			A set of performance and risk measures					9-Factor Model				
		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	Global Macro	36	-0.12	11.94	-0.05	6.42	-3.91	-1.45	-0.36	6.84	5.12	0.71
HF		443	1.46	14.09	0.12	7.18	-3.75	0.09	0.01	4.95	7.11	0.46
Difference			-1.58	-2.15	-0.17	-0.76	-0.15	-1.54	-0.37	1.89	-1.99	0.25
t-statistic			-2.13	-2.19	-1.77	-1.05	-0.09	-2.12	-2.51	1.51	-5.25	4.67
		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	Long Only	80	4.84	18.45	0.29	9.27	-4.02	-1.38	-0.20	12.49	5.36	0.87
HF		288	6.75	17.19	0.47	8.00	0.36	1.64	0.29	8.91	6.35	0.77
Difference			-1.91	1.26	-0.18	1.27	-4.38	-3.01	-0.49	3.58	-0.99	0.10
t-statistic			-2.72	1.29	-4.02	2.34	-3.47	-4.02	-4.17	4.07	-2.56	5.30
		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	Long/Short	80	2.75	15.72	0.17	8.08	-4.38	1.38	0.29	9.03	5.93	0.78
HF		2136	4.71	14.91	0.36	7.03	-0.79	0.78	0.14	6.47	7.38	0.59
Difference			-1.96	0.81	-0.18	1.05	-3.58	0.59	0.15	2.56	-1.44	0.19
t-statistic			-2.80	1.69	-3.90	3.26	-3.51	0.67	0.59	5.21	-3.52	6.79
		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	Market Neutral	27	0.55	12.91	0.05	4.79	-3.63	1.63	0.35	7.69	4.63	0.79
HF		346	3.07	10.13	0.33	6.45	0.59	1.77	0.33	2.51	6.04	0.30
Difference			-2.52	2.78	-0.28	1.66	-4.22	-0.14	0.02	5.18	-1.41	0.49
t-statistic			-2.85	2.31	-3.39	3.16	-3.54	-0.66	0.75	4.18	-1.92	5.48
		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	Multi-Strategy	33	-0.97	13.97	-0.10	7.26	-5.70	-0.42	-0.15	7.50	5.76	0.77
HF		1454	1.75	15.36	0.12	7.56	-3.76	-0.37	-0.05	7.11	7.17	0.57
Difference			-2.72	-1.39	-0.23	-0.30	-1.94	-0.06	-0.09	0.39	-1.41	0.20
t-statistic			-2.70	-1.33	-2.65	-0.52	-1.09	-0.17	-0.31	1.32	-2.94	3.94
		N	Mean	Std	Sharpe	ES	MPPM	Alpha	*t*-stat	SystRisk	IdioRisk	R^2
ARU	Relative Value	71	1.29	12.67	0.09	6.83	-2.45	1.40	0.36	7.98	4.44	0.82
HF		830	5.53	9.39	0.64	4.23	2.98	3.06	0.73	2.80	4.97	0.40
Difference			-4.24	3.28	-0.55	2.60	-5.43	-1.66	-0.36	5.19	-0.53	0.42
t-statistic			-5.44	4.21	-6.84	5.55	-6.46	-1.94	-2.31	7.50	-2.12	9.05

Table 6: Fund Domicile and Risk-adjusted Returns

Panel A reports the monotonicity test for the value-weighted domicile portfolios from January 2005 to June 2013. Panel B reports results for ARUs and European hedge funds. Panel C reports results for Offshore and European hedge funds. Alpha refers to the annualized intercept of the 9-factor model. *t*-statistic is the Newey-West (1987) adjusted *t*-statistic of alpha . Risk loadings are estimated using the excess returns of the S&P 500 index (SP), the return spread between the Russell 2000 index and the S&P 500 index (SCLC), the excess return of ten-year Treasuries (CGS10), the spread return between Moody's BAA and ten-year Treasuries (CREDSPR), the excess returns of look-back straddles on bonds (PTFSBD), currencies (PTFSFX), and commodities (PTFSCOM) as well as the excess return of the MSCI Emerging Market Index (MSEMKF). RX is the Lustig, Roussanov, and Verdelhan (2011) currency risk factor. R^2 refers to the R-squared of the model. pMR_Up and pMR_Down refers to the bootstrapped (5,000 iterations) *p*-values of the monotonicity test in returns, risk loadings or R^2.

Panel A: Monotonicity in Alphas, Risk Loadings and R^2

	Alpha	*t*-statistic	SP	SCLC	CGS10	CREDSPR	PTFSBD	PTFSFX	PTFSCOM	MSEMKF	RX	R^2
ARU	-1.06	-0.86	0.092	-0.117	-0.078	0.145	0.013	0.000	-0.004	0.173	1.087	0.93
Europe	1.15	0.63	0.021	-0.137	-0.079	-0.025	0.017	0.010	0.023	0.144	0.760	0.71
Offshore	1.67	1.63	0.021	-0.097	-0.079	0.122	0.006	-0.002	0.003	0.170	0.228	0.82
USA	1.86	1.71	0.087	-0.026	-0.048	0.124	0.001	0.000	0.003	0.132	0.006	0.74
ARU - USA	2.91	2.57	-0.005	0.091	0.030	-0.020	-0.012	0.000	0.008	-0.040	-1.080	-0.20
t-statistic	2.04	2.04	-0.11	1.73	0.29	-0.52	-0.78	0.03	0.98	-1.22	-11.04	-4.85
Patton and Timmermann (2011) monotonicity tests												
pMR_Up	0.05	0.10	0.67	0.28	0.14	0.98	0.64	0.91	0.98	0.79	1.00	1.00
pMR_Down	0.83	0.73	0.61	0.73	0.32	0.93	0.28	0.84	1.00	0.63	0.00	0.99

Panel B: ARUs vs. European HFs

	Alpha	*t*-statistic	SP	SCLC	CGS10	CREDSPR	PTFSBD	PTFSFX	PTFSCOM	MSEMKF	RX	R^2
ARUs	-1.06	-0.98	0.142	-0.078	-0.044	0.151	0.008	0.003	-0.004	0.261	0.862	0.95
European HFs	-0.23	-0.20	0.101	-0.091	-0.096	0.088	0.014	0.006	0.003	0.126	0.883	0.91
ARUs - Europe HFs	-0.83	-0.77	0.041	0.013	0.051	0.063	-0.006	-0.003	-0.007	0.135	-0.021	0.04
t-statistic	-1.30	-1.32	1.77	0.48	1.16	2.76	-0.84	-1.15	-1.70	8.28	-0.43	3.57

Panel C: Offshore HFs vs. European HFs

	Alpha	*t* -statistic	SP	SCLC	CGS10	CREDSPR	PTFSBD	PTFSFX	PTFSCOM	MSEMKF	RX	R^2
Offshore	1.41	1.59	0.020	-0.070	-0.118	0.113	0.004	0.002	-0.005	0.190	0.367	0.90
European HFs	-0.23	-0.20	0.101	-0.091	-0.096	0.088	0.014	0.006	0.003	0.126	0.883	0.91
Offshore - European HFs	1.64	1.80	-0.081	0.021	-0.022	0.025	-0.010	-0.004	-0.008	0.064	-0.516	-0.01
t -statistic	3.03	3.45	-4.23	0.78	-0.85	1.16	-2.60	-1.37	-2.22	4.09	-10.05	-0.79

Table 7: Impact of Liquidity and Leverage Constraints of Fund Performance

Panel A reports evidence of liquidity-performance trade-off between liquid and illiquid European onshore Hedge funds. We divide HFs into 3 groups based on the Restriction period defined as the sum of redemption and notice periods. 9-Factor Model is defined in previous table. 11-Factor Model includes the additional factors. BAB is the factor loading for Betting-against-Beta factor (Frazzini and Pedersen (2014)). LIQ is the factor loading for the market liquidity risk (Pastor and Stambaugh (2003)). Panel B reports the liquidity-performance trade-off for European onshore hedge funds and ARUs. Panel C (Panel D) reports the liquidity-performance trade-off results within Luxembourg (Ireland). P-values of the Patton and Timmerman (2010) monotonicity tests (pMR_Up and pMR_Down) that are obtained using 5,000 bootstrap iterations

Panel A: Monotonicity in European Onshore Hedge Fund Alphas and Risk Loadings

9-Factor Model			11-Factor Model					
	Restriction	Alpha		Restriction	Alpha	…	BAB	PS
Liquid HF	[0, 14]	-0.61	Liquid HF	[0, 14]	-0.92	…	0.074	0.015
HF	[15,100)	-0.10	HF	[15,100)	-0.68	…	0.145	0.025
Illiquid HF	[100, ∞)	1.99	Illiquid HF	[100, ∞)	1.25	…	0.177	0.036
Patton and Timmerman (2010) Monotonicity Tests								
pMR_Up		0.20	pMR_Up		0.26	…	0.014	0.067
pMR_Down		0.84	pMR_Down		0.80	…	0.965	0.495

Panel B: Liquidity-Performance Trade-off for European Onshore Hedge Funds and ARUs

9-Factor Model			11-Factor Model					
	Restriction	Alpha		Restriction	Alpha	…	BAB	PS
ARU	[0, 14]	-1.06	ARU	[0, 14]	-1.32	…	0.062	0.013
Liquid HF	[0, 14]	-0.61	Liquid HF	[0, 14]	-0.92	…	0.074	0.015
Difference		0.45	Difference		0.40	…	0.011	0.002
t-statistic		0.54	t-statistic		0.49	…	0.520	0.081

9-Factor Model			11-Factor Model					
	Restriction	Alpha		Restriction	Alpha	…	BAB	PS
ARU	[0, 14]	-1.06	ARU	[0, 14]	-1.32	…	0.062	0.013
Illiquid HF	[100, ∞)	1.99	Illiquid HF	[100, ∞)	1.25	…	0.177	0.036
Difference		3.05	Difference		2.57	…	0.115	0.023
t-statistic		1.97	t-statistic		1.76	…	2.561	0.820

Panel C: Liquidity-Performance Trade-off for Luxembourg HFs (SIFs) and ARUs

9-Factor Model			11-Factor Model					
	Restriction	Alpha	Class	Restriction	Alpha	…	BAB	LIQ
ARU	[0, 14]	-1.69	ARU	[0, 14]	-1.94	…	0.036	0.026
Liquid HF	[0, 14]	-0.54	Liquid HF	[0, 14]	-1.08	…	0.135	0.024
Difference		1.16	Difference		0.86	…	0.099	-0.002
t-statistic		0.96	t-statistic		0.75	…	3.212	-0.063

9-Factor Model			11-Factor Model					
	Restriction	Alpha	Class	Restriction	Alpha	…	BAB	LIQ
ARU	[0, 14]	-1.69	ARU	[0, 14]	-1.94	…	0.036	0.026
Illiquid HF	[100, ∞)	6.04	Illiquid HF	[100, ∞)	5.52	…	0.121	0.028
Difference		7.73	Difference		7.46	…	0.085	0.003
t-statistic		4.36	t-statistic		4.37	…	1.658	0.061

Panel D: Liquidity-Performance Trade-off for Ireland HFs (QIFs) vs. ARUs

9-Factor Model

	Restriction	Alpha
ARU	[0, 14]	-1.131
Liquid HF	[0, 14]	0.111
Difference		1.242
t-statistic		0.892

11-Factor Model

Class	Restriction	Alpha	…	BAB	LIQ
ARU	[0, 14]	-1.206	…	0.091	-0.038
Liquid HF	[0, 14]	-0.018	…	0.041	0.000
Difference		1.188	…	-0.049	0.038
t-statistic		0.880	…	-0.972	1.073

9-Factor Model

	Restriction	Alpha
ARU	[0, 14]	-1.131
Illiquid HF	[100, ∞)	2.418
Difference		3.549
t-statistic		1.932

11-Factor Model

Class	Restriction	Alpha	…	BAB	LIQ
ARU	[0, 14]	-1.206	…	0.091	-0.038
Illiquid HF	[100, ∞)	1.786	…	0.196	0.006
Difference		2.991	…	0.105	0.044
t-statistic		1.627	…	1.538	1.032

Table 8: Comparing the matched UCITS and non-UCITS Funds

Panel A presents the pooled regression results for the matched UCITS and non-UCITS funds that belong to the same management firm. In the left-hand-side of the panel, we compute the return difference (HF Return - ARU Return) for the closest possible UCITS-compliant and non-UCITS fund that belong to the same management firm. In the right-hand-side of the panel, we compute the risk-adjusted return difference (HF Alpha - ARU Alpha). We include only pairs with above 90% return correlation between UCITS and non-UCITS fund. The Return (Alpha) difference is explained by the fund characteristics difference of UCITS-compliant and non-UCITS fund pair. For example, Δ Notice Period is the difference of notice period between the same firm's hedge fund and UCITS share classes. We control for role of strategy fixed effects and adjust standard errors within cluster correlation following Petersen (2009). Panel B reports the intercepts and the loadings for factors that explain the return difference of the closest possible UCITS and non-UCITS fund. We restrict the sample to the pairs that have at least 90% correlation between each other. The 11 factors used in the model are defined in the text.

Panel A: Multivariate Evidence from Matched UCITS and non-UCITS funds

	HF Return - ARU Return		HF Alpha - ARU Alpha	
	Par. Est.	*t*-statistic	Par. Est.	*t*-statistic
Δ Lockup Period	0.0002	0.85	-0.0004	-1.69
Δ Notice Period	0.0271	3.29	0.0340	4.31
Δ Redemption Period	-0.0069	-0.87	-0.0098	-1.23
Δ Minimum Investment	0.0004	0.56	0.0009	0.92
Δ Average Leverage	0.0002	0.65	0.0002	0.85
Δ Management Fee	-0.1028	-1.47	-0.1619	-2.10
Δ Incentive Fee	-0.0127	-2.42	-0.0055	-1.25
Δ High-water Mark	0.0004	0.80	0.0015	2.31
Δ Lagged Size	-0.0001	-0.30	-0.0001	-0.61
Δ Lagged Age	-0.0002	-1.39	-0.0003	-2.60
Δ Lagged Flow	-0.0008	-0.64	-0.0005	-0.45

Panel B: Equal-weighted Portfolios for Matched UCITS and non-UCITS Funds

All Fund Pairs (above 90% return correlation between fund returns)

	Intercept	…	BAB	LIQ	RX
HF - ARU Return	0.000	…	0.047	-0.001	-0.020
t-statistic	-0.01	…	2.64	-0.08	-0.56

Fund Pairs that have Δ Notice Period below median

	Intercept	…	BAB	LIQ	RX
HF - ARU Return	-0.001	…	0.057	-0.003	-0.076
t-statistic	-2.01	…	3.28	-0.26	-2.16

Fund Pairs that have Δ Notice Period above median

	Intercept	…	BAB	LIQ	RX
HF - ARU Return	0.001	…	0.068	0.023	0.167
t-statistic	1.45	…	3.16	1.62	3.81

The Spread Portfolio between high and low Δ Notice Period groups

	Intercept	…	BAB	LIQ	RX
HF - ARU Return	0.002	…	0.011	0.025	0.242
t-statistic	3.08	…	0.53	1.84	5.57