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The Lost Decade for Hedge Funds: Three Threats

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Abstract

The last decade has challenged the paradigm of the hedge fund industry as a unique performer. We identify three main factors that have affected the operation of hedge funds: competition from mutual funds, the market environment, and tighter regulation. Recent trends in the financial industry have moved asset managers closer to hedge funds by introducing similar underlying strategies, such as liquid alternative funds, to directly compete with hedge funds. We find that such strategies can achieve performance similar to that of hedge funds, thus introducing more competition for hedge funds. Moreover, we find that several hedge fund styles that have traditionally worked well in crisis times—even in the last decade—are also strategies that can be replicated by liquid alternatives. Together with tighter regulation and a strong market environment, these developments continue to put pressure on the hedge fund industry. Our empirical findings add to the existing debate on the performance of hedge funds and the direct competition from liquid alternatives.

Keywords: Hedge funds, liquid alternatives, portfolio allocation, alternative investment strategies

JEL Classifications: G11, G23, K22

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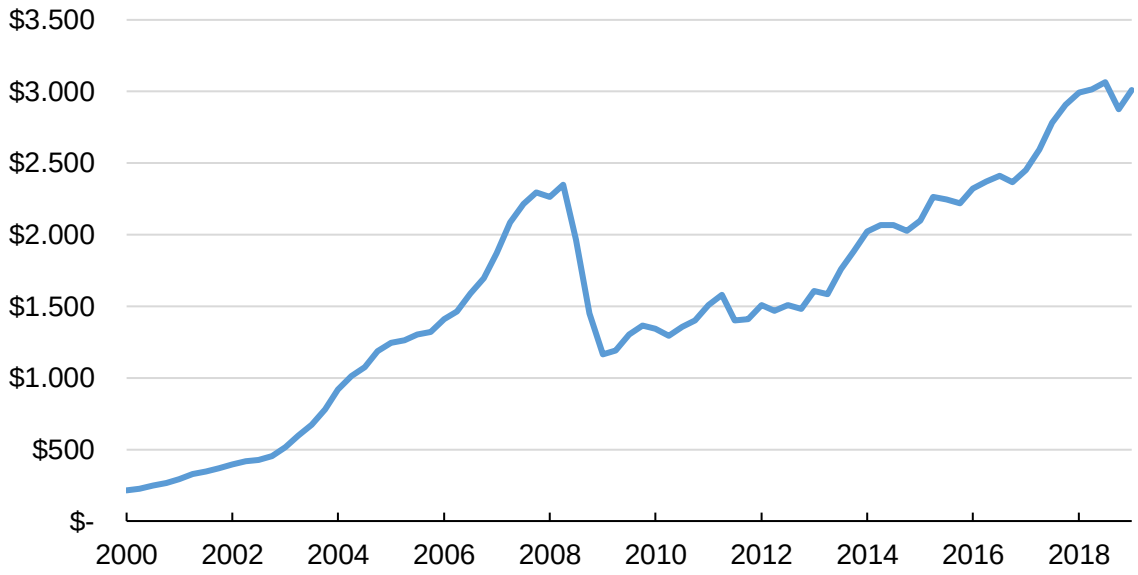
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1. Introduction

The asset management industry has changed in multiple ways over the last decade. Fee pressures and indexation has led mutual funds to introduce new types of investment strategies that were traditionally dominated by hedge funds. One of the key drivers is that many institutional investors have shifted toward a more passive approach to investing (Lewis, 2016). Meanwhile, in the United States, the imposition of new registration and reporting requirements, which is aimed at increasing transparency, appears to have reduced hedge funds' investment discretion. On top of these changes, the last decade is characterized by both strong equity and bond markets, making it harder for hedge funds to add value for investors the market. These challenges raise questions for investors about the future performance of hedge funds.

Figure 1: Assets under management in the global hedge fund industry



Amount denoted in billions of US Dollars. Source: BarclaysHedge.

The consequences of these trends can be observed in the growth of the hedge funds' assets under management (see Figure 1). The growth rate of the assets under management for hedge funds in the last decade has slowed to 8.4% yearly compared to a rate of 20.3% in the period from 2000-2010[2]. Although hedge funds have still seen a positive growth rate, the last decade has proved to be more difficult. In addition, hedge fund liquidations have increased substantially compared to pre-financial-crisis years. The number of launches was, for the first time in 2018, offset by a similar

[2] The AuM in 2000 was B$214, increasing to T$1.367 by 2009, and 2019Q1 is estimated at T$3.011 (Barclays hedge) Preqin (2019) estimates $3.6tn worldwide.

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number of liquidations up to the third quarter.[3] Since then, liquidations have continued to exceed launches, with 213 funds closing in the first three months of 2019, compared to 136 opening. At least part of the liquidations can be linked to high fees and poor performance over the last few years.[4]

Furthermore, evidence of this shift is the launches of asset managers that mimic investment strategies employed by hedge funds, called liquid alternatives. These strategies are often more transparent and liquid than their hedge fund counterparts. In response, hedge funds have introduced UCITS-compliant vehicles. A natural question is to ask what the limits and benefits of traditional hedge fund strategies are, as well as the potential value created by new mutual fund strategies, such as liquid alternatives. Taken together, the effect of these trends raises questions about the resilience of hedge funds and the potential convergence of hedge funds and mutual fund offerings.

So what can investors expect from hedge funds in this much changed and challenging environment? In this chapter, we introduce three major challenges to the traditional hedge fund industry: current market performance; competition from mutual funds; and tighter regulation of hedge funds. We focus on how these challenges may affect the ability of hedge funds to produce attractive performance returns. We make three contributions to the research on hedge funds. First, we highlight the emergence of so-called liquid alternatives, which are disrupting the hedge fund business model. Not only do they put pressure on the fee levels, but they also make hedge funds less attractive, as investors seek alternative investment strategies that are likely to outperform traditional hedge fund strategies. We show that liquid alternatives can achieve similar performance and that hedge funds do not necessarily outperform these alternatives.

Second, we argue that the new regulations imposed on hedge funds to improve transparency can further reduce these funds' potential advantages. Traditionally, the minimal disclosure policies of hedge funds and their longer lockup period allowed hedge funds to execute strategies with exposure to exotic and illiquid instruments. The stronger push of regulators globally may involve more requirements on the disclosure of funds, pushing them toward a more limited set of strategies in direct competition with liquid alternatives. Policy makers have also been more adept in their response to activist hedge funds, which may reduce the opportunity set for these hedge funds and

[3] See, for example, Hedge Fund Research; Hedge Fund Liquidations Rise in Third Quarter, Reversing Trend from First Half of 2018, retrieved [12/18/2018] https://www.hedgefundresearch.com/news/hedge-fund-liquidations-rise-in-third-quarter-reversing-trend-from-first-half-of-2018

[4] See, Bloomberg, Hedge Fund Closings Outnumber Launches Again, retrieved [07/15/2019] https://www.bloomberg.com/news/articles/2019-06-28/hedge-funds-ranks-shrink-again-as-closings-outnumber-launches

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affect their lock-up period (Clifford, 2008). As a consequence, the limited opportunity set and the focus on liquid strategies will create important advantages for mutual fund offerings.

Third, we show that the alpha generated by the hedge fund industry over the period between 2010 and 2019 is negative corrected for their market exposure. The results support the view that with lower returns and negative alphas, investors have been searching for different investment opportunities. However, we show that two important styles of hedge funds, viz. merger arbitrage and managed futures, have remained to add value in the recent 2010-2019 period when investors required diversification in their portfolio. Similar as in the previous decade, these styles performed well in equity down markets. We show that these strategies can also be replicated using liquid alternatives, as both of these strategies have exposures to investable factors. In particular, managed futures strategies can be replicated more accurately using trend following factor indices. Therefore, investors may get similar portfolio diversification benefits through liquid alternatives strategies offered by mutual funds instead of exposure to hedge fund strategies.

The article proceeds as follows. Section 2 briefly describes hedge funds and liquid alternatives and discusses the regulatory framework and consequences of new tax reforms on hedge funds. Section 3 discusses our empirical analysis of the styles of hedge funds that perform in bad states of the markets. Section 4 reviews the factor exposure of hedge funds, and Section 5 concludes.

2. Comparison of mutual funds and hedge funds

Hedge fund managers offer different investment styles, but not all styles lend themselves to be transformed to a mutual fund setting. We focus on those strategies that can be included in a mutual fund vehicle for investors to gain access to hedge fund strategies. We start by defining the hedge funds in order to contrast the current changes in the regulatory framework of these funds. In what follows, we review various parts of the literature to strengthen our hypothesis that hedge funds face a tougher environment.

2.1 Hedge funds and their performance

Hedge fund definition

Hedge funds are a pooled investment vehicle that offers exposure to a wide range of investment strategies that are typically not offered by other institutions. While there is no simple legal definition, hedge funds are typically associated with less-stringent regulation (Brav, Jian, Partnoy and Thomas, 2008). For example, in the US, hedge funds do not fall within the scope of the Investment Company Act of 1940, and the SEC has multiple definitions as to what constitutes a hedge fund. Registration

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at the SEC is required only in the case of a minimum level of regulatory assets under management (Gibson, 2000). One of the main differences is the lower disclosure requirements for hedge funds versus mutual funds. As a consequence, hedge funds have been characterized as a black box.

Early research focuses on opening the black box and documenting the differences between traditional mutual funds and hedge funds. Hedge fund strategies are known to be highly dynamic compared to those of mutual funds (Fung and Hsieh, 1997). While most mutual funds employ either a relative benchmark or reference index against a combination of market instruments to gauge their performance, hedge funds take advantage of absolute return strategies that aim to deliver performance in most market environments.[5] As a result, hedge funds can allocate their capital dynamically during the market cycle and take positions in illiquid instruments without having to report day-to-day market valuations. Thus, evaluating the performance of hedge funds typically leads to low systematic risks over longer periods of time (Liang, 2000).

Another important difference between hedge funds and mutual funds is their cost structure and the lockup periods. Hedge funds typically use incentive fees—traditionally the 2/20 fees with a 2% fixed fee and a 20% performance fee—that are higher than mutual fund fees (Servaes and Sigurdsson, 2018). While mutual funds may have longer redemption periods than, for example, exchange traded funds (ETFs) that offer intra-day liquidity, hedge funds have significantly longer lockup periods, which could be months (Agarwal and Kale, 2007). Typically, this is associated with the investment strategies of hedge funds that are less liquid. For example, unwinding illiquid positions in convergence trades before convergences can be quite costly. Moreover, given their more dynamic exposure and complex strategies, hedge funds are associated with higher costs. The fee pressure in the asset management industry and the higher fees associated with these investment strategies undoubtedly have produced real incentives to create liquid alternatives that have similar investment strategies but are considerably cheaper and more transparent.

In turn, if we contrast hedge funds with liquid alternatives, this new class of mutual fund public offerings aims to provide investors with similar underlying hedge fund strategies, though in a transparent and liquid format. The aim of liquid alternatives is similar to that of hedge funds since both try to deliver performance in up and down markets. The classification within liquid alternatives is similar to the classification of hedge funds, so that hedge funds styles can be directly mapped to the liquid alternatives. One feature is that liquid alternatives are often offered within the UCITS

[5] Different absolute targets exist. In practice, most hedge funds use a benchmark of a cash portfolio or have specific absolute benchmarks of non-tradable economic exposures such as inflation, real rates plus a fixed amount.

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framework, thus setting limits on the used strategies, leverage and the scope of market instruments. One main characteristic of these funds is that they use mainly liquid derivatives and, therefore, offer daily liquidity to investors instead of the long lockup periods as in hedge funds.

One specific category of liquid alternatives is risk premia funds that give exposure to alternative risk premia. These are systematic funds established mainly by asset managers or investment banks to offer investors exposure to a range of certain factors. The main factors have received extensive investigation by the academic literature. Factors within equity markets consist of value, size and momentum (see, e.g., the Fama French three-factor model (Fama and French, 1993) or the Carhart four-factor model (Carhart, 1997)). In a broader application, factors such as value, momentum, and carry exist for various asset classes (see, e.g., Asness et al. (2013) and Koijen et al. (2018)). Hedge fund strategies may also load on these factors and might, therefore, explain their outperformance. However, since these factors are known and accessible through investment banks or mutual fund offerings for investors, hedge funds should add value on top of these factors by, for example, giving exposure to different factors or dynamic factor timing.

We have seen that liquid alternative funds provide investors portfolio exposure to alternative premia strategies, such as value, momentum and carry, across different asset classes. Besides exposure to well-known sources of excessive returns, the growth of alternative strategies is driven by the benefits of lower costs, increased transparency and enhanced liquidity.

Hedge fund styles: understanding the investment strategies

Investment strategies of hedge funds can be split in two types. We focus on the hedge funds that deliver performance by applying investment strategies themselves, rather than fund of funds hedge funds (FOHFs). The latter, FOHFs, involve hedge fund managers investing in other hedge funds, using a single or multiple strategies to achieve their alpha (see, e.g., Fung, Hsieh, Naik and Ramadorai (2008) for more details on fund of funds hedge funds). A large empirical literature has systemically studied these strategies, including convertible arbitrage, equity market-neutral, global macro, long-short equity, managed futures, and merger arbitrage (Ang, 2014; Subhash and Enke, 2019). This literature attempts to categorize the different subsets of investment strategies based on four main categories: directional, market-neutral, event-driven and FOFHs (Gabaravicius and Dierick, 2005)

We now turn to a long-standing question: what is the relative value for investors? The early empirical literature confirms that performance assessment is less straightforward for hedge funds than for mutual funds (Brown, Goetzmann and Ibbotson, 1999; Agarwal and Naik, 2000; Fung and Hsieh,

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2000). It is not uncommon that biases in data can distort the measurement of performance. In hedge fund databases, there are a number of well-known biases. Hedge funds can stop reporting their annual performance, typically in stressful periods, causing databases to have a tilt toward higher-performing funds (Agarwal, Fos and Wang, 2010). To assess the expected outperformance of investment strategies of hedge funds, sampling of hedge funds should contain liquidated funds in order to avoid survivorship bias. In contrast, benchmarks for assessing the performance characteristics include only constituents that exist at that time or that may remove constituents from the index. Furthermore, many hedge funds often use accounting rather than market-to-market methods to value their illiquid assets due to liquidity issues. Stale pricing can, therefore, mask performance and skew the analysis of market exposures (Asness, Krail and Liew, 2001).

Another factor likely to be important for investors is whether hedge funds deliver better risk-adjusted returns in bad states of the markets. One of the key assumptions is that fund managers promise to produce positive returns in both flat and down markets. In fact, hedge funds were able to partially avoid the IT bubble while, at the same time, profiting from the up market (Brunnermeier and Nagel, 2004). This example would support the view that hedge funds are able to deliver performance in down markets, when investors need protection for their portfolios. However, the mere employment of successful strategies to mitigate turbulent markets does not by itself prove that hedge funds can generate positive returns in a down market. For example, in crisis periods, investors may revoke their capital, causing strong redemption pressure on the fund. As a result, even well-performing hedge funds would be required to sell their positions at losses. Interestingly, during the global financial crisis, hedge funds were required to liquidate assets mainly because of redemptions and margin calls. Note that the withdrawal rate of capital was about three times as intense as for mutual funds (Ben-David, Franzoni and Moussawi, 2011).

Hedge fund returns may exhibit patterns that are not fully accounted for in performance measures that rely on first or second moments. For example, option-like strategies with asymmetrical payoffs can bias reward-to-risk measures such as Sharpe ratios. (see e.g., Goetzmann et al., 2002). However, in terms of measuring relative performance of hedge funds, more-complicated techniques do not yield different conclusions (Eling and Schuhmacher, 2007).

Given the large heterogeneity of investment strategies even within sub-styles of hedge funds, manager selection is quite important in choosing well-performing funds. The literature, therefore, focuses on factors that predict high-performance funds and whether strong current performance predicts future winners. Again, the evidence is mixed. While some early studies find little differential in manager skill (Brown and Goetzmann, 1999), others find that top hedge fund performance is

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persistent over time (Kosowski, Naik and Teo, 2007). There are two competing views. The first view finds significant performance persistence for a shorter period (Agarwal and Naik, 2000; Eling, 2009). Conversely, the second view finds mixed evidence on longer periods (Brown and Goetzman, 1999). The prior literature finds limited evidence of long-horizon persistence but for a small number of extreme performers (Capocci and Hubner, 2004). However, in a recent study, Jagannathan, Malakhov, and Novikov (2010) show that, based on hedge fund style benchmarks, superior funds seem to be persistent. Furthermore, some researchers suggest that performance persistence is associated with hedge fund managers maintaining secrecy about their strategies (Glode and Green, 2011) or have 'skin in the game' (Gupta and Sachdeva, 2018).

Another important issue concerns the relationship between fund size and performance. For investors, uncertainty associated with fund size can also arise due to organizational diseconomies or hierarchy costs, such as processing soft information (Teo, 2009). There is conflicting evidence on the impact of fund size. Prior research on performance and fund size provides evidence that small portfolios outperform larger funds. Berk and Green (2004) document this negative relationship between fund size and performance. Along the same lines, Clare, Nitzsche and Motson (2015) use a dataset covering the period between 2005 and 2014 to confirm the negative relationship between fund size and performance. However, recent studies provide important evidence that casts doubt on the negative size-performance relationship between 2011 and 2016 (Smith, 2016).

2.2 Hedge funds and their effect on financial markets and regulation

In this section, we explain that there are a wide variety of factors that explain hedge fund performance. We point out that some commentators show that funds that deliver superior returns seem to be persistent, particularly if fund managers manage their own money.

The role of hedge funds in the financial markets

We now examine the evidence on the impact of hedge funds on financial markets. Much of the early literature focuses on the increase in the number of hedge funds (Getmansky, Lo and Makarov, 2004). Over the period from the late 1980s to the late 1990s, worldwide demand for hedge funds grew due to outperformance, diversification benefits relative to a set of benchmarks, and access to a wide variety of financial products unavailable to traditional investors (Jame, 2012).

This brings us to the question about the benefits of hedge funds for the financial markets. They are important contributors of liquidity in the bond and securities markets (Agarwal, Fung, Loon and Naik, 2007). This can be attributed, in part, to the higher trading turnover of hedge funds compared to other market participants. For example, it has been suggested that the hedge fund industry's share

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of trading turnover is much greater—due to its quantitative trading strategies and reliance on leverage—than its share of assets under management (OECD, 2007). This may lead to price discovery and market efficiency (Brunnermeier and Nagel, 2004). Moreover, hedge funds employ many different investment strategies. For example, strategies such as equity market neutral guarantee liquidity through continuously active trading (Muhtaseb, 2013). Similarly, hedge funds benefit from providing liquidity in niche markets, thereby profiting from the reluctance of others to invest in illiquid or narrowly focused strategies (Brophy, Paige and Sialm, 2009), although there is evidence that hedge funds seem to reduce their market exposure during periods of low liquidity (Cao, Chen, Liang and Lo, 2011). Recent experience suggests that hedge funds are more likely to pursue other strategies, such as global macro, fund of funds and managed futures, which are more profitable during liquidity crises (Ben-David, Franzoni and Moussawi, 2011).

The rapid increase in hedge fund stock ownership in the past decades has contributed to the improved informational efficiency of stock prices (Cao, Liang, Lo and Petrasek, 2017). Hedge fund managers use strategies to exploit the price differences of a security or instrument between different markets. It is important to note that while hedge funds' arbitrage activities may reduce the effective cost of trading, leveraged arbitrageurs, employing the identical strategy, are able to eliminate arbitrage opportunities. This strategy may lead to overcrowded trading in periods of stress and increases in the effective cost of trading (Cao, Liang, Lo and Petrasek, 2017).

At the same time, scholars have sought to show that hedge funds perform better in volatile financial markets. In many cases, however, higher volatility is associated with lower returns. These studies have revealed that one way in which hedge funds might perform better is through employing short strategies. Moreover, in markets with lower volatility, hedge funds are more likely to receive a demand to unwind their positions due to breaching internal limits than they are to benefit from leverage (Gabaravicius and Dierick, 2005).

In sum, there is good evidence that hedge funds benefit financial markets by providing liquidity in both bond and equity markets. The size of the hedge fund industry's trading turnover is also likely to lead to price discovery and market efficiency. Given their impact on the financial markets, regulators are increasingly more focused on external effects of hedge funds on markets and investors.

Hedge funds and corporate governance: Change in regulation

Our discussion so far has focused on hedge funds' performance and their impact on financial markets. This brings us to the question about the influence of regulation on the performance of hedge funds. Until recently, hedge funds were subject to less regulatory scrutiny than the rest of the

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asset management industry. The US regulatory regime for hedge funds remained, despite the brief registration requirement in 2006, a largely unregulated environment compared to the disclosure and registration requirements in other jurisdictions.

Evidence suggests that investors entering into contracts with hedge funds may be vulnerable to the opportunistic conduct of fund managers. Such conflicts often arise due to the high degree of information asymmetries between fund managers and investors (Cumming, Dai and Johan, 2013). To deter this threat, investors typically rely on an efficient combination of due diligence and monitoring. Offering fund managers incentives by linking fees to performance and requiring co-investment provides an important mechanism to address potential conflicts of interest and managerial abuse issues. However, many institutional investors have limited capacity and incentives to benchmark and monitor fund managers' activities. Accordingly, the framework for monitoring investment managers' activities and performance is likely to affect the selection of fund managers.

In the US and elsewhere, regulators have made progress in addressing the agency problems and other risks identified in the wake of the global financial crisis. The US, under the Dodd-Frank Act of 2010, introduced two notable developments. First, on the compliance side, registered investment advisers are required to adopt written compliance procedures, designate a chief compliance officer, maintain books for at least five years, adopt an ethics code, and follow guidelines on fees and relationships with third parties soliciting clients. Through both routine and for-cause inspections, the SEC monitors extensive recording-keeping requirements covering both advisers and funds. Regulated funds and advisers are required to disclose, annually, Form ADV filings that supply disclosures on investment style, investors, managers, assets under management, fees, accounting practices and disciplinary history.

So how do the Dodd-Frank registration and reporting requirements affect hedge funds? The early literature is mixed. On the one hand, Kaal, Luppi, and Paterlini (2014) find that the implementation of Dodd-Frank has a short-term positive effect on fund performance. On the other hand, Cumming, Dai and Johan (2013) indicate that, for a longer period, Dodd-Frank's implementation is associated with lower alphas, lower information ratios and higher risk, also detecting fund outflows. In a recent paper, Honigsberg (2019) shows that the introduction of Dodd-Franks' comply-and-explain regime leads funds to make more accurate reports of their financial performance. Based on two suspicious patterns in reported monthly returns, the study shows that investors benefit from a comply-and-explain regime that is associated with effective enforcement, which can, indeed, induce compliance. These findings highlight that reduced misreporting also influences any changes in the fund's governance structure, such as switching auditors.

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Despite these beneficial effects, enhanced registration and disclosure requirements may lead to substantial compliance costs, particularly in the area of due diligence. For instance, Kaal (2016) reports that US advisers expect to spend between $50,000 and $200,000 on compliance, with a minority of advisers spending between $200,000 and $400,000.[6] In addition, it appears that smaller funds, relative to their larger counterparts, are likely to absorb more compliance costs (KPMG, 2013). Thus, while we are not arguing against the benefits of regulation, we do raise the concern about the increasing cost of compliance as an important challenge for some funds.

Hedge Funds and Transparency: MIFID 2

As we have seen, the lack of outperformance by hedge funds in recent years has led to demands for increasing transparency between hedge fund managers and investors. Thus, it is not surprising that these concerns prompted the adoption of the MIFID II requirement mandating that managers establish a price for investment research. Accordingly, managers have the choice to pass along the costs of research to investors or to pay for the research themselves. In principle, the disclosure of the cost of research can be beneficial to investors, as it may reduce excessive spending and provide fund managers with a strong incentive to produce positive returns.

Despite its potential advantages, the provision on investment research is a highly debated topic. The reform presents a number of challenges. First, the requirement may have an excessive effect on both small and underperforming funds. A number of papers provide empirical support for the position that small funds are unlikely to absorb the research costs. For example, a recent survey finds that only 42% of respondent firms with less than one billion Euro under management expected that their firms would absorb the research costs (CFA, 2017). In contrast, 67% of large firms expected that their funds would absorb the costs.

Second, there is evidence that asset managers would prefer to absorb the costs of research (FCA, 2017). There are a number of primary drivers of this choice. Evidence suggests that absorbing the research costs involves a lower level of disclosure to investors and confers some tax advantages (Monk, Rook and Scarth, 2018; CFA, 2017). Insofar as many rival funds pay for research, fund managers are also far less likely to benefit from charging clients for research costs. A further difficulty may arise due to significant administrative costs involved in obtaining prior client agreement on the research budget.

[6] It is notable that the average regulatory compliance costs range from about $700,000 per year for small hedge funds to $6 million per year for large hedge funds (KPMG, 2013).

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Nevertheless, some investment managers fear that the reform will limit the availability of private investment research (CFA, 2017). However, this might not be the case. Interestingly, a recent survey shows that 63% of 113 hedge fund managers were billing the cost of research to clients (Bloomberg, 2019). A second concern for investors is that while investment firms disclose costs for third-party investment research, this disclosure is potentially misleading. Unfortunately, not all investment funds disclose third-party costs at the same standard at which funds report their own costs (FCA, 2019). Potentially, the emergence of a common disclosure standard will help ensure that investors are able to compare research costs incurred by investment funds (BlackRock, 2018). In Europe, a likely explanation for the delay in introducing a common disclosure standard is that many funds will find few benefits in the face of the challenging environment in which they operate.

Hedge funds and management expenses: impact of the new US tax law

There is plenty of evidence of the main differences between the role of management fees in mutual funds and hedge funds. While the negative impact on mutual funds is uncontroversial, hedge funds face reductions in their ability to impose a higher management fee due to the impact of declining performance and competition from other investment strategies. For hedge funds, compensation usually derives from two main sources—the so-called 'two and twenty' arrangement. First, hedge fund managers are typically entitled to receive 20% of the profits generated by each of the funds, the carried interest. A second source of compensation for fund managers is the annual management fee, usually 1.5%, although traditionally 2% (Braun and Roche, 2019). Over recent years, hedge funds have seen a decline in their fee levels.

Following a US Treasury Review in 2018, changes to the US Tax Code resulted in a new focus on funds' expenses, such as the deduction of management fees. Investors were quick to understand the implications of the passage of the Tax Cuts and Jobs Act of 2017. A major focus of the reform was the elimination of management fees and other expenses as miscellaneous itemized deductions, to the extent that they exceed 2% of their adjusted gross income.

So how has the industry responded to the new law? As predicted, the competitive industry environment and tax law changes led to increased pressures on hedge fund managers. On the one hand, a record number of hedge funds have closed as managers have struggled to retain assets. On the other hand, investors were already demanding more information about funds' expense ratio and disclosure of expenses allocated to the fund. It is already clear is that there is a greater focus on fund expenses. While some fund managers may reduce the expense allocation, others are considering applying a cap on fund expenses (Steinbrugge, 2019). While we have attempted to shed light on the particular investment strategies that managers might use in response to the changes

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asset management industry, it may be too early to precisely identify which strategies are likely to lead to a competitive advantage for some fund managers. Overall, regulation has increased the hurdles for the hedge fund industry, which may also affect the launches of new funds.

3. Empirical evidence on performance

We now investigate the performance of hedge funds over the last two decades. First, we examine the performance of general hedge funds indices and compare these to the market environment. We verify whether hedge funds have added value to an investor's portfolio. Second, we identify which hedge fund styles have performed well during equity down markets. The performance in equity down markets will help us to identify which hedge fund styles can diversify an investor's portfolio.

3.1 The general case for hedge funds for investors

Investors are attracted to investment strategies that can generate uncorrelated returns with the equity and bond markets over longer horizons. By employing dynamic strategies, long/short strategies or investments in less-liquid asset classes, correlation with the traditional portfolios can be low. This can add benefits to an investor's portfolio based on diversification; these types of strategies can perform in turbulent times, when equity markets and/or bond markets are down.

To verify the extent to which hedge funds are able to provide these characteristics, we investigate in Table 1 the performance of the general hedge fund index. To prevent reliance on a specific methodology of a data provider, we use three different indices for robustness. We split the sample into two periods—the most recent decade, 2010-2019, and the previous decade, 2000-2009—to put our conclusions into perspective.

Table 1: The shift of hedge funds performance over the last two decades

	Hedge fund indices			**Market environment**		
	BH	CS	HFR	World Equity	US Bond index	50-50 Portfolio
2000 – 2009						
Return	7.56%	6.57%	6.46%	0.42%	6.28%	3.35%
Std	7.04%	6.18%	6.92%	15.44%	5.33%	7.35%
Sharpe Ratio	0.62	0.54	0.47	-0.18	0.59	0.02
Alpha	7.56%	6.57%	6.46%			

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Beta EQ	0.62	0.54	0.47			
Beta FI	0.37***	0.25***	0.36***			
2010 – 2019						
Return	4.52%	4.19%	3.99%	10.61%	3.28%	6.95%
Std	5.22%	4.11%	4.89%	11.70%	3.67%	5.29%
Sharpe Ratio	0.73	0.85	0.67	0.85	0.70	1.18
Alpha	-0.42%	-0.44%	-1.12%			
Beta EQ	0.40***	0.32***	0.39***			
Beta FI	-0.02	0.18***	0.07			

The hedge fund indices are non-investible generic indices from BarclaysHedge (BH), Credit Suisse (CS) and Hedge Fund Research (HFR). Returns denote the total return including the short rate. World equity denotes the MSCI World index, and US bond the US JP Morgan Government Bond index. All indices are reported in US dollars and based on monthly data. The reported alpha is based on a simultaneous estimation of equity (EQ) and bond (FI) exposures. * (resp. **, ***) Significant at the 0.10 (resp. 5%,1%) probability level.

Table 1 confirms the positive investment performance of hedge funds in the periods from 2000-209 and 2010-2019. However, there is an important difference between the two periods. In the sub-period 2000-2009, all hedge fund indices have had returns higher than the equity or bond market. The positive alphas in this period, although not significantly different from zero, indicates that hedge funds have delivered a different source of performance than a constant exposure of equity and bonds. While the alphas are not statistically significant, these are economic meaningful given the short sample period. Therefore, investors adding hedge funds to their traditional bond equity portfolio would have benefited.

Turning to the last decade, we draw a different conclusion. The returns in 2010-2019 of hedge fund indices are instead much lower than the equity and the 50-50 portfolio. In terms of a volatility-adjusted performance measurement—e.g. Sharpe ratio—hedge funds have performed better over this period. Table 1 reveals that while hedge funds still have reasonable volatility-adjusted performance, their alphas have turned negative. The market environment for both bonds and equity in this period is enormously strong, with Sharpe ratios of 0.85 for equity and 0.70 for bonds[7]. As a result, the 50-50 portfolio has a Sharpe of 1.18, stronger than any of the hedge funds indices.

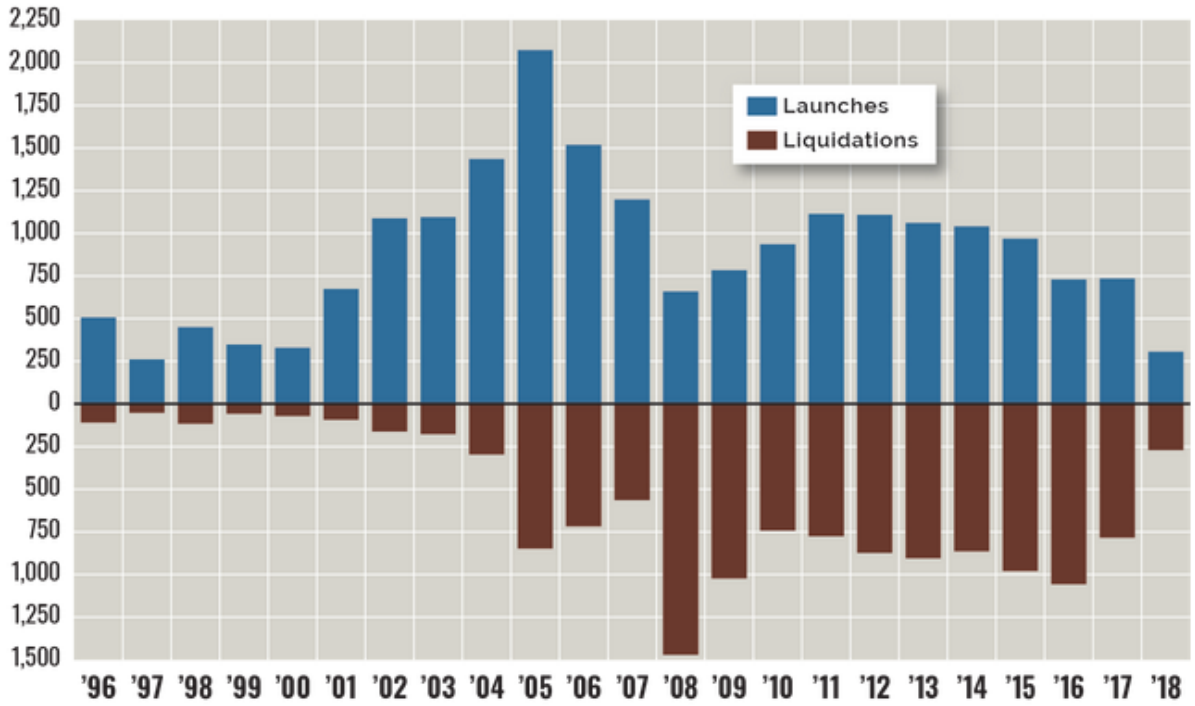
[7] A long-run estimate of the Sharpe ratio for equity is about 0.30.

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It is important to verify whether the alphas of hedge funds are positive. Hedge funds load significantly on either the equity and bond market during both sub-samples. Since the decline in government bond yields from the end of the 1980s, the returns of bonds have been quite strong in both periods. Without adequate dynamic investment strategies of hedge funds, their returns may instead be replicated with a constant bond investment. The period from 2000-2009 shows that the dynamic strategies of hedge fund were profitable, even though these funds loaded significantly on bond returns.

Table 1 suggests that hedge funds may appear to be attractive investments. However, as described above, two concerns need to be addressed. First, the hedge fund indices suffer from several biases. Reporting bias and survivorship bias lead to higher measured performance. Many funds over time have liquidated, yet these indices only include active funds. Figure 2 shows that, over time, the fund composition of a hedge fund index may differ. While many hedge funds were launched, a large proportion has also been liquidated. Liquidation rates of funds are in the recent period close to the launch rate.

Figure 2: The dynamics in the hedge fund universe



The estimated hedge fund launches and liquidations from 1996 up to 2018Q3. Source: Pensions & Investments; Hedge Fund Research, Inc. <Last retrieved: 23 December 2018: https://www.pionline.com/article/20181001/PRINT/181009985/emerging-hedge-fund-firms-facing-many-roadblocks >

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The second concern is the investment replication of these general hedge fund indices for investors. Given the large heterogeneity between hedge fund managers, even within similar investment styles, this creates a challenge to replicating the index. In practice, investors select several hedge fund managers for their alternative bucket in the portfolio. One issue in evaluating performance and risk measures of aggregate indices is the large number of hedge funds in an index that can cause the index to have a lower volatility. Another issue is that some hedge funds, typically well-performing, are closed to new investors.

Finally, hedge funds may also report different returns to different sources (Liang, 2003). In our analysis, we do not rely on a single data provider and use data from several different providers such as Barclays Hedge, Credit Suisse (CS), Eurekahedge (EH), and Hedge fund Research (HFR). This prevents us from relying on a single methodology. The differences between hedge fund indices is well established in the literature (see, e.g., Fung and Hsieh (2002)). In a recent study, Joenväärä et al. (2019) evaluate the differences between most of the available hedge fund databases. While they find that only half of the funds performances is reported in only one database, most aggregate performance statistics are in line with their results for their joint database statistics. Therefore, using data from several providers will allow us to reduce the bias in our sample selection. In section 3.3 we explicitly address the replication of the hedge fund index for investors. In the following section, we continue by investing the sub-styles of the hedge fund indices.

3.2 The hedge fund styles in bad states during the last decade

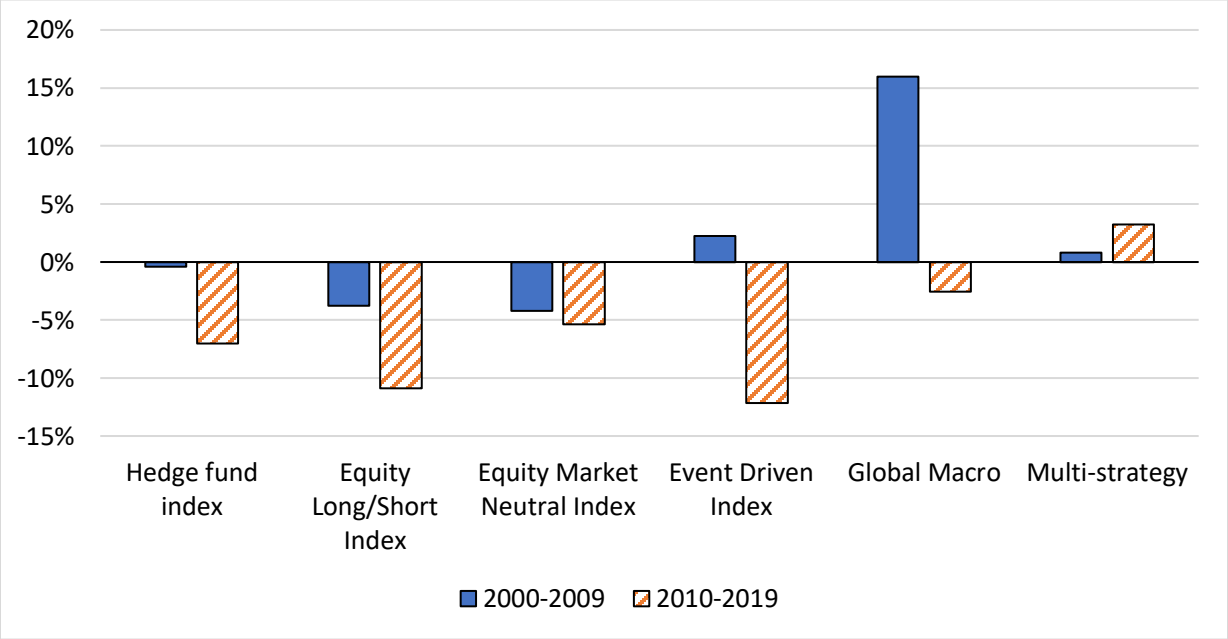
The purpose of hedge funds is not necessarily to deliver strong outperformance in good states of the equity markets, but, rather, to deliver performance in market downturns (Asness, Krail and Liew, 2001). Since most hedge funds are absolute return funds, meaning they hold the short rate or cash as their benchmark, we should expect them to have a positive performance above the short-term rate in downward equity markets. We investigate hedge fund investment styles during bear markets. We define downward equity markets as months for which the 12 months equity return is negative. For this purpose, we divide our sample in two sub-periods—2000 - 2009 and 2010- 2019—to observe significant differences in performance for each strategy. In each sub-period, we scale the indices to a 10% volatility for the ease of comparability.

Figure 3 shows that the performance of the general hedge fund indices did not perform well in bear markets in both periods. Even in the stronger performance period of 2000-2009, the general index has a negative performance in bad states of the equity markets. This effect is even more visible in the recent period, in which the performance is more negative. As a result, the general hedge fund was not beneficial to investors' portfolios. In terms of investment styles, the two most dominant

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styles—event-driven and long/short equity—have not been able to perform when equity markets go down. The finding is similar for equity market neutral, which implies that the investment strategies are not equity market neutral in the down market. The negative performance in Figure 3 implies that the majority of funds do have a large equity market exposure, causing them to have negative performance when markets drop. Therefore, their performance is based mainly on the bull markets, suggesting that the market beta in these funds is prominent. This investment style is not a beneficial payoff for investors that want to diversify their long-only portfolio of stocks and bonds. The strong market exposure is in line with the previous literature (see, e.g., Malkiel and Saha (2005)). In Appendix Table A, we report the statistics for different data providers.

Figure 3: Bear market performance of non-performing hedge fund styles

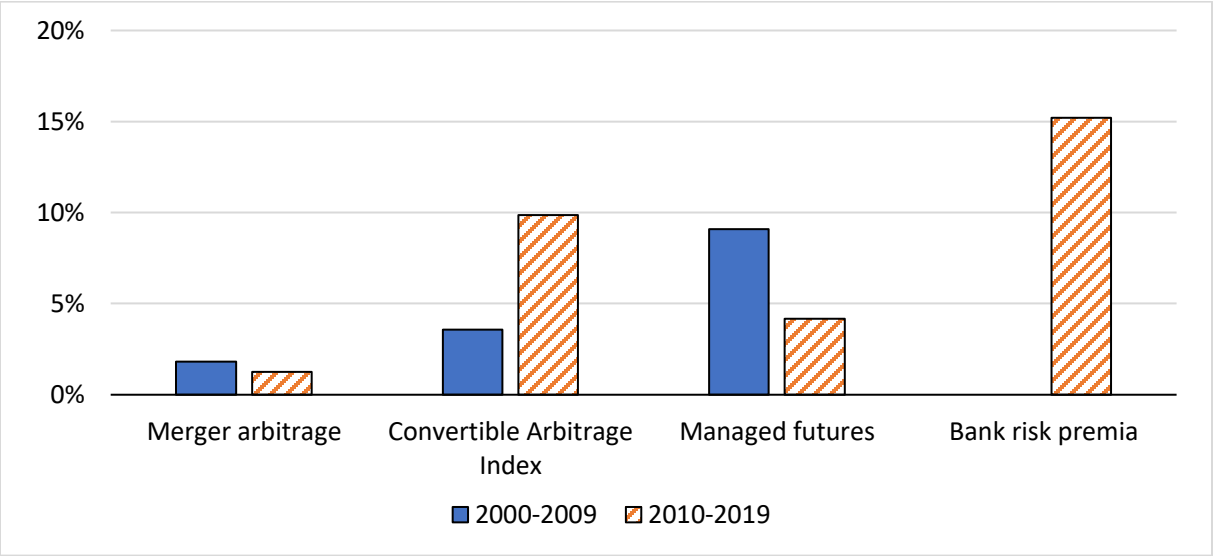


Performance is calculated in bear markets that are defined based on months with a negative 12 months return of the equity market (MSCI World Developed). The performance of the indices using Credit Suisse (CS) is denoted in excess return over the short rate. All indices are volatility scaled to 10% for each decade.

For global macro, the results strongly shifted over the two sample periods. In the period 2000-2009, this style was able to add value in bad states of the equity market. However, in the more recent period, the style led to negative returns in such market periods. While multi-strategy performs well in Figure 3 for both regimes, we show in Appendix Table A that using a different data provider leads to a different conclusion. Therefore, we classify both global macro and multi-strategy as non-performing, even though they are stronger than the other categories in bear markets.

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Figure 4: Hedge fund styles that perform in bear markets



Performance is calculated in bear markets that are defined based on months with a negative 12 months return of the equity market (MSCI World Developed). The performance of the indices using Credit Suisse (CS) and EurekaHedge (EH) for bank risk premia is denoted in excess return over the short rate. All indices are volatility scaled to 10% for each decade.

Managed futures funds are reputed to hedge against market downturns since their investment strategies are aimed at adapting to the market environment. Taking net short positions in market downturns will lead to a hedge for investors. Figure 4 confirms that managed futures strategies were able to hedge bad states of equity markets in both decades. The convertible arbitrage index is one of the styles with the least assets under management, but it is still able to deliver performance in bad states. Given convertible arbitrage is mostly investing in the fixed-income asset class, it may explain the good performance in bad states of the equity markets. Bond returns tend to be negatively correlated with equity markets in equity down markets[8]. The underlying investment strategy of merger arbitrage is intended to profit from mispricing in convertible securities. To execute these strategies, funds typically use a market neutral approach, so that the movement in the underlying security does not affect their investment. Hence, such strategies are much less vulnerable to market downturns, which is also what we find in Figure 4.

Finally, we also look at bank risk premia as an approximation of other alternative investment strategies, which have a strong link to risk premia recognized in the academic literature. As introduced earlier, bank risk premia rely on the foundations of factors exposures in multiple-asset

[8] The equity-bond correlation in equity down markets is negative in both subsamples. Over the full sample, the equity-bond correlation is negative as well.

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classes that can entail long-short strategies. Given the composition of multiple bank offerings in the risk premia space, the index can be seen as a generic categorization of these factors. Figure 4 confirms that these strategies may hedge investors' portfolios in bad states of the market. Since bank risk premia were not available before 2010, it is not possible to further evaluate them in the previous decade, except to evaluate them based on backtested results. In Appendix Table B, we also report another index of bank risk premia indices and find that the performance of this index in the bear markets is rather flat. Therefore, this raises questions regarding the extent to which bank risk premia can outperform in bear markets.

In summary, we find three categories of hedge funds that have underlying strategies that may perform well in down markets. Merger arbitrage and the convertible arbitrage index may profit from the market neutral approach taken in their strategies to profit from their convergence strategies. Managed futures remain a sub-style of hedge funds that performs well in bear markets. Furthermore, bank risk premia may also be able to hedge in bear markets.

3.3 Hedge funds and liquid alternative strategies: empirical evidence

Replicating hedge fund returns for investors can be difficult. As explained before, direct investments in hedge funds will not necessarily achieve the risk-return characteristics similar to the indices. Data providers account for part of these issues by calculating indices with restrictions that only use funds that open to new investors. In this section, we evaluate the performance differences of these indices compared to other investment options.

Other ways to replicate hedge fund returns are investing in liquid alternatives or hedge fund replication. On the one hand, one can replicate the underlying investment strategy of a hedge fund in a mutual fund vehicle, also known as liquid alternatives. In this way, the underlying strategy is implemented with liquid instruments. Highly illiquid arbitrage strategies that require leverage in infrequent traded instruments may not necessarily be replicated using a liquid strategy. Not all investment strategies of hedge funds can, therefore, be replicated using liquid market instruments such as S&P 500 futures of bond futures. We investigate only the strategies that remain attractive from a portfolio perspective, as concluded from Figure 4 and that can be offered in a liquid alternative vehicle. Therefore, we focus only on merger arbitrage and managed futures.[9]

[9] Convertible arbitrage strategies profit from illiquidity and therefore rendering these strategies less suitable for offerings in liquid alternatives, see e.g., Batta et al. (2010).

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On the other hand, one can copy the hedge fund exposure to various markets, also known as hedge fund replication strategies. This type of strategy can be based on return-based style analysis, by measuring the exposure of the hedge fund index to the underlying market exposure, such as equity and bonds. We investigate the replication strategies together with the liquid alternatives that are based on factor investing and compare these to the more traditional styles of hedge fund strategies.

Table 2 dissects the difference between the hedge fund replication on one side and the liquid alternatives on the other side. In general, we may conclude that replication and liquid alternatives are a good substitute for a hedge fund exposure in terms of performance. Important is the huge difference between the investable hedge fund index and the broad universe hedge fund index. Although the broad universe has better performance, it is not investable by investors. We also find this for merger arbitrage, but not for managed futures. Since managed futures typically follow a trend-based strategy on liquid derivative instruments, it may have higher capacity in terms of asset under management that the strategy can handle before it becomes nonprofitable.

Table 2: The performance of hedge funds and the alternatives

	Hedge fund index				**Merger arbitrage**			
	General (CS)	Investable (CS)	Repli. (CS)	Liq. Alt. (HFR)	General (CS)	Investable (CS)	Repli. (CS)	Liq. Alt. (HFR)
Mean	3.44%	1.14%	2.85%	0.67%	2.58%	-0.09%	1.61%	1.45%
Std	3.82%	4.62%	4.59%	2.67%	2.87%	5.92%	3.32%	3.16%
Sharpe	0.70	0.09	0.46	0.25	0.64	-0.14	0.26	0.46
	Managed futures							
	General (CS)	Investable (CS)	Repli. (CS)	Liq. Alt. (HFR)	UCITS CTA (EH)	UCITS CTA (BH)		
Mean	0.89%	0.90%	1.41%	1.61%	0.74%	3.49%		
Std	10.26%	10.98%	9.22%	3.40%	6.34%	6.05%		
Sharpe	0.01	0.01	0.07	0.25	0.00	0.45		
	Alternative Risk premia							

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	Bank index (EH)	Bank Index (HFR)
Mean	2.85%	1.42%
Std	4.33%	2.67%
Sharpe	0.48	0.61

The sample is taken from Jan 2011 - June 2019. The general hedge fund index (General) is not investable; the reported investable index (investible) would be. The replication strategy (Repli.) aims to replicate the aggregated market exposures of the general hedge fund index using liquid market instruments. The liquid alternatives index (Liq. Alt.) is a broad categorization of funds in which alternative risk premia is a sub-style. The UCITS CTA index may incorporate both hedge fund vehicles in UCITS formats and mutual fund offerings. Sources: Credit Suisse (CS), Eurekahedge (EH), BarclaysHedge (BH), Hedgefund Research (HFR).

The first comparison in Table 2 considers the general hedge fund index and the investable hedge fund index. The hedge fund index is typically not replicable, as many funds may not be open to new investors. The investable index in Table 2 has a much lower performance, with a Sharpe ratio of 0.09 compared to the general index of 0.70. Therefore, it is more in line with the replication strategy and the liquid alternative UCITS index's performance. From an investor's perspective, these strategies will probably be lower fee vehicles replicating market exposure with similar performance over this period.

Next, we focus on merger arbitrage. Table 2 also reports a strong drop in performance when we use the investable index rather than the total hedge fund index. The investable index even has a negative performance over the sample period from 2011 to 2019. The liquid alternative and the replication strategy produce higher performance, with Sharpe ratios of 0.46 and 0.26, respectively. We can conclude that performance is higher than with the investable hedge fund index.

The final category that we investigate is managed futures; this style yields a difficult conclusion since we find that the performance of the traditional index is in line with that of the investable index. Similarly, we find that replication strategies and UCITS vehicles of managed futures have similar performance over this period. Managed futures are traditionally invested in liquid market derivatives and, therefore, are more prone to being replicated using market exposure and liquid market instruments. Table 2 confirms this, as the differences between the replication strategies and liquid alternative index are much more in line with each other. Table 2 also reports in this case the UCITS CTA categories that can be composed of hedge fund vehicles that are put forward in a UCITS framework. As a result, the difference between the vehicles for managed futures strategies is much smaller, causing hedge funds and the mutual funds to be more comparable.

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Finally, we also investigate whether multi-risk premia funds perform better than traditional hedge funds over the study period, and we find that they do. Since we have seen that these funds also hedge the investors' portfolio in equity market downturns during the period 2010-2019, these may be an important consideration for an investor. Given the lower fees compared to those of traditional hedge funds, they may add more pressure to the traditional hedge fund. In all, this section shows that for investment strategies that hedge portfolio in equity down markets, the choice for the vehicle is much smaller from a return perspective.

4 Understanding HF through liquid alternative premia

In this section, we verify the exposure of merger arbitrage and managed futures to the underlying risk premia. We evaluate how much hedge fund styles load on these liquid alternative premia and whether hedge funds generate alpha compared to these premia. To proxy the risk premia, we use bank indices that consist of aggregate funds with similar factor strategies. Unlike other studies, we employ an investable benchmark that is accessible to investors, compared to an academic factor approach (Joenväärä et al., 2019). The investment industry has picked up the academic insights of factor investing and introduced them in several investment strategies. There are a wide variety of vehicles in which investors can get exposed to such strategies. For example, there are ETFs, mutual funds and investment banks that expose investors to one of the factors or groups of factors.

Hedge funds would need to give exposure to different sources of returns other than standard asset class exposures or generic factor exposure. If hedge funds were only to give static exposure to these generic factors, they would not be worth their fees for active management. As mentioned before, investors can easily acquire bank indices to get exposure to generic factors. Our previous results indicate that general hedge fund indices can be replicated with statistic exposure to asset classes. Note that the literature shows that common factors are typically not used by hedge funds and would, therefore, be worth the fee (Titman and Tiu, 2010). Thus, investors would not be able to replicate hedge funds through liquid alternative risk premia, as they would not be able to achieve the alpha of hedge funds.

We begin our analysis by assessing the factor loadings of the hedge fund categories using aggregated factors per asset class. We employ a linear regression model in which we regress the hedge fund index on these groups of factors by asset class. If we find a statistic significant alpha, it would imply that the individual hedge fund category cannot be replicated using a static exposure of these groups of factors. A second evaluation criteria is whether there is a high fit of the model, which measures the uncertainty involved in the replication.

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Table 3 confirms that hedge funds load significantly on generic risk premia. We find that the general investable hedge fund index load mostly on equity factors. The Credit Suisse index also loads on factors in other asset classes such as commodities, credits and currency. In terms of alpha, we find that both general hedge fund indices have an insignificant alpha, although the economic significance is quite different. The Hedgefund Research investable hedge fund index has an annualized estimate of 0.07% alpha indicating that in terms of economic significance investors could replicate the investable hedge fund index without performance cost. The results for the Credit Suisse index indicate that the static replication with the estimated loadings would also fall short by 1.06% p.a. Given the large difference between these estimates, it is not clear what the economic cost would be for an investor, as it can range from negligible to substantial.

Moreover, we find substantial r-squares for the factor decomposition of the investable hedge fund index. This implies that an investor is able to replicate the hedge fund exposure using bank risk premia without large uncertainty. Given the substantial r-squared and the economic alpha that is small, the general hedge fund index is not a substantial different source of return for investors.

Table 3: Hedge fund returns decomposed by asset class returns of alternative risk premia

	Investable HF index		**Merger arbitrage**		**Managed Futures**	
	CS	HFR	CS	HFR	CS	HFR
Alpha	1.06%	0.07%	1.29%	0.29%	-0.12%	-1.70%
ARP Commodity Index	0.09***	0.03	0.08*	-0.03	0.34***	0.12***
ARP Credit Index	0.01*	0.01	0.01*	0.03	-0.16	-0.05
ARP Currency Index	0.04*	0.03	0.06*	0.01	0.10	0.00
ARP Equity Index	0.27***	0.28***	0.45***	0.40***	0.15	0.06
ARP Rates Index	0.04	-0.03	-0.07	-0.09**	0.44***	0.09*

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Observations	121	121	121	121	121	121
R^2	0.61	0.64	0.59	0.53	0.24	0.08

This table presents the results of a linear regression model explaining the performance of hedge fund indices by performance indices of alternative risk premia (ARP) that are grouped by asset class as regressors. The model is estimated on a monthly sample period ranging from 2008 to 2019. The source of the dependent variable is either Credit Suisse (CS) or Hedgefund Research (HFR) denoted in each column. The independent variables are sub-indices taken from HFR. The results for the alpha are annualized and the factor loadings are reported as is. The * (resp. **, ***) denote significance at the 0.10 (resp. 5%,1%) probability level.

The results for the sub-style merger arbitrage are similar as for the general hedge fund index. The pattern of significant factor loadings for merger arbitrage that emerges from Table 3 is similar to the general hedge fund index, except for the significance of alternative risk premia in rates. Also, we observe a higher factor loading for equity alternative risk premia. The alpha of both indices is slightly higher than the general hedge fund index, indicating that the replication is more costly. Therefore, merger arbitrage would be harder to replicate using these factor exposures. The r-squared is also in line with the general index.

Table 3 shows that managed futures are a sub-style of hedge funds that can be replicated using alternative risk premia. The first difference is that the factor loadings of managed futures are significant for commodity and rates alternative risk premia instead of equity. Second, the estimated alpha of both sub-style indices is negative, indicating that managed futures do not add value on top the replication strategy. While significantly not different from zero, in terms of economic significance investors could replicate managed futures without losing performance. The low r-squared indicates that the replication does not provide the same fit as the previous categories. Therefore, we further investigate managed futures with a larger set of factors, as managed futures may load mainly on trend factors instead of other factors.

Another conclusion from Table 3 is that the alpha of the Credit Suisse indices is larger than the ones of the Hedgefund Research. One explanation may be the difference of the methodology in constructing these indices. The alternative risk premia indices used in our linear regression model are based on data from the Hedgefund Research data provider, which may explain the better fit for the Hedgefund Research indices. This may explain part of the large differences between the two approximations for the hedge fund indices. We continue to investigate the two sub-styles by investigating the individual exposures to alternative risk premia for each asset class. We follow Asness, Moskowitz and Pedersen (2013) and Koijen et al. (2018) in the selection of the alternative

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risk premia. The individual estimation of alternative risk exposures comes at the cost of a shorter sample period.

Table 4 confirms that allowing for loading to individual alternative risk premia will decrease the alpha of the indices and allows for better replication of the hedge fund indices. Merger arbitrage has significant factor loadings on mostly on carry in equity and fixed income, and depending on the approximation of the sub-style a factor exposure to equity. The long-short nature of merger arbitrage aligns with the carry concept. The carry factor profits from its long-short positions when priced asset differences materialize, which is similar to the convergence of the asset prices of the target and the acquirer. The r-squared drops for the Credit Suisse index, whereas for the HFR index it remains similar as in Table 3. This suggests some robustness in the results for Table 4 in a short sample period.

Table 4: Hedge fund returns decomposed by alternative risk premia per asset class

	Merger arbitrage		**Managed Futures**			
	CS	HFR	CS	HFR	CS	HFR
Alpha	0.34%	-1.30%	-1.74%	-1.35%	1.00%	-1.16%
Commodity						
Carry	-0.08	0.03	-	-	0.28**	0.20**
Momentum	0.02	-0.05	-	-	0.17***	0.05
Value	0.01	-0.01	-	-	-0.03	-0.13
Currency						
Carry	0.07	0.04	-	-	0.05	-0.02
Momentum	-0.01	-0.01	-	-	0.33***	0.17***
Value	-0.11*	-0.09	-	-	-0.04	-0.02
Rates						
Carry	-0.20***	-0.21***	-	-	0.02	-0.10
Momentum	0.09	0.08	-	-	0.40***	0.14**

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Value	0.02	0.01	-	-	0.14**	0.06
Equity						
Carry	0.17**	0.15*	-	-	0.27***	0.12*
Momentum	0.03	0.09	-	-	0.02	0.04
Value	0.10	0.36***	-	-	-0.15	0.00
Low Volatility	0.02	0.08	-	-	0.20***	0.13***
Quality	0.00	-0.09	-	-	-0.02	-0.07
Trend-Following Index	-	-	0.85***	0.36***	-	-
Observations	61	61	77	77	61	61
R^2	0.30	0.51	0.72	0.63	0.72	0.46

This table presents the results of a linear regression model explaining the performance of hedge fund indices by performance indices of alternative risk premia (ARP) as regressors. The model is estimated on a monthly sample period ranging from 2013 to 2019. The source of the dependent variable is either Credit Suisse (CS) or Hedgefund Research (HFR) denoted in each column. The independent variables are sub-indices taken from HFR. The results for the alpha are annualized and the factor loadings are reported as is. The * (resp. **, ***) denote significance at the 0.10 (resp. 5%,1%) probability level.

As hypothesized earlier, managed futures load strongly on the momentum factors. Table 4 confirms that managed futures load strongly on momentum in rates, currencies, commodity. Interestingly, we also find three other significant factor loadings; low volatility in equity and carry in equity and commodities. The alpha of managed futures estimated in Table 4 is similar as in Table 3, except for the Credit Suisse index. While this alpha switches to positive, it remains insignificant. The r-squared for both indices increases substantially, suggesting an improved replication.

Again, we notice a similar pattern in Table 4 as in Table 3. The results for the Hedgefund Research indices are more favorable in terms of replication than the Credit Suisse index. For robustness, Table 4 also provides results if we only use a trend-following-index, which consists of several bank indices. Since investment strategies in managed futures are dominated by trend strategies, we expect an improved performance. Table 4 confirms this hypothesis, as the factor loadings are significant and the alpha turns negative for both indices. Moreover, the r-squared improves, suggesting that the trend-following index is the best approximation for the replication of managed

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futures. Although the negative alpha is not significant, it implies that investing in a bank trend-following-index can be beneficial for investors in terms of replicating a managed futures exposure using liquid alternatives.

Recall that our previous results in Table 2 indicate that bank risk premia have a stronger performance than hedge fund indices over the recent sample period. This implies that while replication of the hedge fund strategies may not be as accurate, in terms of overall performance investors can still benefit from exposure to these. Since liquid alternatives premia also perform well in equity down markets, the hedging ability of these strategies can be similar as the hedge fund sub-styles. Therefore, the lower replication using liquid alternative premia may be of a lesser concern for investors as the primary objective would to select investment strategies that diversify their portfolios.

Overall, our results imply that liquid alternative premia and liquid alternative strategies may be a good substitute for hedge funds, in particularly for managed futures. This finding suggests that the hedge fund industry is facing more competition from the asset management industry, since their investment strategies are moving closer to hedge funds. Therefore, the gap in terms of vehicles delivering alternative performance has become smaller in the last decade and have offered substitutes for hedge funds.

5 Conclusion

In this chapter, we study the challenges to hedge fund in the last decade. By canvassing the theoretical and empirical literature, we evaluate the three major challenges to hedge funds: current market performance, competition from mutual funds and tighter regulation. We initially examine how these challenges may affect the ability of hedge funds to produce attractive performance. We find that the general performance in the last decade has been much less convincing for investors to invest in hedge funds than in the previous decade. The last decade was characterized by strong markets to which investors could have exposure at low cost.

At the same time, hedge funds seem less attractive to investors seeking other low-cost alternative investment strategies. In particular, we highlight the emergence of hedge-fund-like strategies, often called liquid alternatives, and consider whether they are likely to disrupt the hedge fund business model. We focus on hedge fund styles that are beneficial to investors and show that these strategies can be substitutes. While the trend of downward fee pressure in asset managed industry has also affected hedge funds, competition from liquid alternatives will continue to put pressure on fee levels. We then consider how the new regulations imposed on hedge funds are likely to improve

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transparency but may reduce the opportunity set for hedge funds and create important advantages for liquid alternatives.

This chapter also provides evidence that the gap between hedge funds and mutual fund offerings is narrowing. Our study shows that some hedge fund strategies can add value for investors in terms of their hedging ability in bad markets. Even in the last decade with strong markets, these strategies were able to reduce tail risk in investors' portfolios. Mutual fund offerings can, therefore, become an important vehicle to which investors can access these types of investment strategies.

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Appendix

Table A: Bear market performance of non-performing hedge fund styles

	Hedge fund index			Equity Long/Short Index			Event-driven Index		
	BH	HFR	CS	BH	HFR	CS	BH	HFR	CS
2000-2009									
Mean	-0.02%	-1.15%	-0.25%	-0.13%	-4.30%	-3.35%	2.06%	0.75%	1.24%
Std	8.79%	8.30%	6.92%	6.74%	10.73%	8.67%	7.87%	9.05%	6.91%
Sharpe	0.00	-0.14	-0.04	-0.02	-0.40	-0.39	0.26	0.08	0.18
2010-2019									
Mean	-1.86%	-1.33%	-2.90%	-3.05%	-4.01%	-7.00%	0.23%	-1.20%	-6.83%
Std	7.91%	7.13%	4.69%	6.10%	11.03%	8.65%	7.88%	7.54%	7.59%
Sharpe	-0.23	-0.19	-0.62	-0.50	-0.36	-0.81	0.03	-0.16	-0.90

	Global Macro			Equity Market Neutral Index			Multi-strategy	
	BH	HFR	CS	BH	HFR	CS	BH	CS
2000-2009								
Mean	5.27%	6.01%	9.81%	0.51%	-0.73%	-5.63%	3.18%	0.47%
Std	5.59%	5.77%	7.03%	3.59%	3.44%	19.93%	6.99%	7.34%
Sharpe	0.94	1.04	1.40	0.14	-0.21	-0.28	0.46	0.06
2010-2019								
Mean	-1.63%	0.95%	-1.03%	-0.53%	0.78%	-2.59%	-0.29%	1.11%
Std	3.41%	3.47%	2.77%	2.36%	3.38%	4.86%	3.86%	3.94%
Sharpe	-0.48	0.27	-0.37	-0.23	0.23	-0.53	-0.07	0.28

This table presents the annualized summary statistics for hedge fund indices in monthly periods of bear markets. Each column denotes the data source used for the subs-style; BH: Barclays Hedge, HFRI: Hedge Fund Research, and CS: Credit Suisse. Performance is denoted in excess return over the short rate. Bear markets are defined as monthly periods where the equity market performance measured over 12 months is negative.

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Table B: Hedge fund styles that perform in bear markets

	Merger arbitrage			Convertible Arbitrage Index		Managed futures		Bank risk premia	
	HFR	CS	BH	HFR	CS	HFR	CS	HFR	EH
2000-2009									
Mean	0.12%	0.69%	6.50%	4.85%	2.98%	3.37%	10.95%	-	-
Std	4.02%	4.46%	11.31%	13.10%	11.66%	7.40%	13.17%	-	-
Sharpe	0.03	0.15	0.58	0.37	0.26	0.45	0.83	-	-
2010-2019									
Mean	0.18%	0.37%	2.73%	1.52%	3.58%	3.91%	4.39%	-1.37%	6.91%
Std	2.35%	3.07%	4.56%	6.15%	4.92%	6.56%	8.68%	18.05%	3.67%
Sharpe	0.08	0.12	0.60	0.25	0.73	0.60	0.51	-0.08	1.88

This table presents the annualized summary statistics for hedge fund indices in monthly periods of bear markets. Each column denotes the data source used for the subs-style; BH: Barclays Hedge, HFRI: Hedge Fund Research, CS: Credit Suisse and EH: Eurekahedge. Performance is denoted in excess return over the short rate. Bear markets are defined as monthly periods where the equity market performance measured over 12 months is negative.

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