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Research Paper

Performance Analysis of Global Hedge Funds

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ABSTRACT

The purpose of this paper is to provide an overview of research on hedge fund performance. In the first step, we review recent studies and put them into a joint evaluation of hedge fund performance. Stressful market conditions have a negative impact on HF performance in terms of alphas as the majority of HF strategies do not provide significant excess returns. In addition, fund managers are concerned more about risk at times when it is difficult to find opportunities and deliver high returns. There are some strategies such as Long Short that even see statistically significant reversals of their exposures to some factors, to protect themselves from risk. Furthermore, we conclude that performance stability is related to the type of strategy. This study examines the performance of hedging funds that are active in the world and evaluates the feasibility of its creation in Iran. To conduct this study and evaluate the performance of hedging funds, for the first time, the international data of hedging funds from Barclay hedge, Eurkhedge, and Credit Suisse databases during the last 20 years were examined. The statistical population of the present study was international hedging funds from the years 2000 to 2020. The sample size according to the screening method and after removing the pert observations is equal to 150 international hedging funds. In this study, Spss, Amoz, and Lisrel software were used. Has been. The results of hedge fund data analysis using multivariate regression at a 90% confidence level show that there is a significant and positive relationship between institutional investor strategy and fund returns. Other research results also show that cost stickiness has a positive effect on the efficiency of hedging funds. Also, according to the results of this research, in the short-term return, the performance of the hedging fund is better than the long-term time horizon. This study reviewed the laws of hedge funds in various countries, including the United States, Germany, the United Arab Emirates, and other countries. We concluded that First, short-term persistence for horizons of up to six months is reported by nearly all authors. Second, investment strategies have a correlation with the return of hedge funds.

1 Introduction

In the hedge fund literature there are many studies dealing with performance along with other studies that investigate the relationship between fund returns and fund specific characteristics such size, age and fees [1]. Although these studies use different databases and time periods, they can nevertheless provide a useful guide to investors. Investors expect performance to be stable over time and that some

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fund managers outperform their peers. Ref. [2]"funds show an association between their returns and characteristics such as size, age, fees or other fundamental factors. Until now, there has been no survey summarizing all the results and there is no uniform conclusion on these issues, thus creating confusion for investors. Consequently, the present study closes an important gap. Studies conducted by many researchers prove that hedge funds are capable of producing alpha [3]. Hedge funds cite the seven-factor model of Fang and etc as a measure of diversifying return on Hedge funds. The model showed that in the period 1994 to 2001, seven risk factors could account for up to 80% of the variation in hedge fund returns. In another study, proposed a multi-factor alternative model. Statistically, only 25% of hedge fund can create effective alpha. Hedge funds in the 1980s performed significantly better than mutual funds. With the rise of hedge funds, many of these funds have used long-term leverage strategies to maximize profits, focusing on equity selection along with risk reduction.

Inappropriate investment strategies by Hedge Funds in the years 1969-1970 resulted to heavy losses and with the increase in stock market sales in 1973-1974, a number of hedge funds went bankrupt. In the following years, well-performing hedge funds gained high returns, and investors flocked to thousands of hedge funds with unusual strategies, including derivative markets and foreign exchange trading. In the late 1980s and early 1990s, the financial market was hit by a number of well-known hedge funds, including Robertson. Since that time, hedge funds have grown tremendously. Contrary to popular belief, many hedge funds aim to maximize returns rather than reduce risk. The introduction of the Fung and Hsieh seven-factor model was developed to demonstrate that passive risk factors can explain hedge fund returns. With a 1994-2001 sample, Fung and Hsieh demonstrate that seven common risk factors can explain up to 80 per cent of the variation of hedge fund returns, See [4]. Also Fung et.al [5] explained the classification of hedge funds is according to the type of investment strategies are as follows [6]:

i. "Market Neutral (or Relative Value) Funds: attempt to produce return series that have no or low correlation with traditional markets such as the US equity or fixed income markets. They are highly quantitative in their portfolio construction process, and market themselves as an investment that can improve the overall risk/return structure of a portfolio of investments.

ii. Event Driven Funds: seek to make profitable investments by investing in a timely manner in securities that are presently affected by particular events. Such events include distressed debt investing, merger arbitrage (sometimes called risk arbitrage) merger& acquisition and corporate spin-offs and restructuring.

iii. Long/Short Funds: generally invest in equity and fixed income securities taking directional bets on either an individual security, sector or country level. For example a fund might do pairs currency trading, and buy stocks that they think will move up and sell stocks they think will move down or go long sectors they think will go up and short countries they think will go down. Long/Short strategies are not automatically market neutral that is, a long/short strategy can have significant correlation with traditional markets, and surprisingly have seen large down turns in exactly the same times as major market downturns.

iv. Tactical Trading: refers to strategies that speculate on the direction of market prices of currencies, commodities, equities and/or bonds. Managers typically are either systematic or discretionary. Systematic managers are primarily trend followers who rely on computer models based on technical analysis. Discretionary managers usually take a less quantitative approach and rely on both fundamental and technical analysis. This is the most volatile sector in terms of performance because many managers combine long and/or short positions with leverage to maximize returns [7-9]."

The remainder of this paper is organized as follows. Section 2 is an overview of 25 studies on hedge

fund performance persistence. The empirical examination of hedge fund performance persistence as well as the analysis of reasons for persistence is performed in Section 3. In Section 4 we develop a rationale for choosing between different performance persistence methodologies. We conclude in Section 5.

2 Literature Review

2.1 Overview

"G´ehin [10]" provides an overview of 25 academic studies on hedge fund performance persistence. Table 1 summarizes the main features of these studies. The first column gives the authors. The second and third columns display the database and the number of funds considered. The fourth and fifth columns show the investigation period and the time horizon. Columns 6 and 7 present the performance measures and the statistical methodology. Finally, in Column 8 the results of the studies are summarized. The rest of this section is subdivided by the columns listed in Table 1. The hedge fund industry in the world is competitive and complex because they have to provide the best performance to different investors, including: national development funds, investment funds, Sovereign Wealth Funds(SWF), family offices and investors do not easily trust these funds. The Hedge Fund grew significantly in 2015.

Fig. 1: Hedge fund in global

Also Brown et.al [11-12] in their study employed the Hedge Fund performance using the TASS database from 1986 to 1997. They were used regression, due to unregulated returns for risk-free rates. More precisely, the $\alpha = \sigma$ ratio is used, where α efficiency is higher than the index criterion and σ is the standard deviation of the fund. They found that performance persistence for one year and could reflect future performance. However, performance stability may vary significantly from year to year which similar results were found for commodity trading advisors (CTA). In their research [13], examined the stability of the fund's performance from 1982 to 1998 using the Hedging Fund's research database. They used a traditional periodic and multi-period framework, and they also measured whether the stability is due to the measured efficiency of more than three months (short-term) or more than a few years (long-term). Does it affect the stability of hedging funds or not?

Several studies have examined the effect of fund size on returns or alpha, and reported results are mixed. Some studies found an inverse relationship between a fund's size and its returns [10]. Turing to the

mechanism via which scale effects performance, our results are consistent with those of a number of recent studies, [11-12] argue that fluctuations in the supply of capital by active money managers have an impact on stock prices, which in turn affect performance. Other researchers [13] suggest that in imperfectly liquid markets, suppliers of liquidity (for example, particular hedge funds) should earn positive rates of return in exchange for absorbing liquidity risk. Furthermore, in their model, the liquidity discount is larger when few suppliers provide liquidity. This table reports the main characteristics and results for 25 studies on hedge fund performance between 1998 and 2020. Column 1 gives the authors, Column 2 the considered database, Column 3 the number of funds, Column 4 the investigation period, Column 5 the time horizon, Column 6 the performance measures, Column 7 the statistical methodology, and Column 8 the results. Abbreviations: CISDM: Center for International Securities and Derivatives Markets, CSFB: Credit Suisse First Boston, HFR: Hedge Fund Research, LSE: Long/Short-Equity, MAR: Managed Account Reports, MSCI: Morgan Stanley Capital International, TASS: Tremont Advisory Shareholders Services.

2.2 Hedge fund Investment strategies

Tactical Macro: Hedge fund managers' strategy for investing in domestic securities and global market opportunities.
Managed Futures: Hedge fund managers invest in derivatives of various commodities, including coffee, gold, flash memory and other commodities traded on commodities exchanges, in order to gain high profits while following the market trend.
Sector Specific: A strategy that the hedge fund manager uses in specific markets to obtain a buy, sell or any investment position.
Long / short equity: Hedge fund manager strategy to buy stocks or sell stocks.
Emerging Market: A strategy that the hedge fund manager shares in companies in less developed and emerging countries.
Market Timing: A strategy that the hedge fund manager timing to buys, sells, and invests in various assets that are expected to be profitable in the short term.
Short Selling: A strategy that sells borrowed securities hedge fund managers to buy them at a lower price in the future and generate profit.

2.3 Relative value or arbitrage

Convertible Arbitrage: A strategy used by the fund manager to take advantage of the inequality of other convertible securities.
Fixed-income Arbitrage: A strategy that a hedge fund manager buys fixed-income securities and sells other fixed-income securities in a borrowing way to minimize market risk and take advantage of price gap fluctuations.
Equity Market Neutral: A strategy that buys hedge funds and sells the equity index by borrowing to neutralize market risk.
Distressed Securities: A strategy that the hedge fund manager invests in equity or debt securities of bankrupt companies to rebuild and restructure them and sell them at much higher prices.
Relative Value: A strategy that the hedge fund manager invests in securities that are sold at lower prices than their real value, which are either ignored or unknown in the investing community.

Table 1: Studies on hedge fund performance

References	Database	Number of Funds	Investigation Period	Time Horizon (Months)	Performance Measure	Statistical Methodology	Result
	IASG, Barclay Hedge, Channel Capital Group, Cogent Investment Research, Eurekahedge, HFR, Lipper,	3200 3423	2000–2019		Return	Regression	persistence at yearly horizon
[1]	DM, HFR, MSCI, TASS	7333	1994–2002	12	return	chi square, regression	persistence at yearly horizon
[2]	HFR	746	1982–1998	3, 6,12	alpha, appraisal ratio	cross product ratio, chi square, regression, Kolmogorov-Smirnov	persistence at quarterly horizon
[3]	HFR	167	1995–1998	3	alpha, appraisal ratio	cross product ratio, regression	persistence at quarterly horizon
[4]	CSFB/Tremont indices	9	1994–2000	1	return	regression	persistence at monthly horizon
[5]	TASS	1797	1994–2000	3, 12, 24	return, alpha	none (descriptive comparison of rankings)	persistence at quarterly and yearly horizon, but not at two-year horizon
[6]	Financial Risk Management	4934	1992–2000	1, 3, 6,12	return, alpha	descriptive comparison of rankings, regression	persistence at monthly and quarterly horizon
	TASS	1659	1994–2000	3	alpha	regression	persistence at quarterly horizon
[7]	TASS	1295	1992–1998	12	return	regression	no persistence at

Table 1: Studies on hedge fund performance

References	Database	Number of Funds	Investigation Period	Time Horizon (Months)	Performance Measure	Statistical Methodology	Result
							yearly horizon
[8]	US Offshore	399	1989–1995	12	return, alpha,	regression	no persistence at
	Funds				appraisal ratio		yearly horizon
	Directory						
[9]	CISDM, HFR,	2894	1994–2002	12	alpha	regression	no persistence at
	TASS						yearly horizon
[10]	HFR, MAR	2796	1988–1995	12	alpha	regression	no persistence at
[11]							yearly horizon
[12]	TASS, HFR	76	1990–2002	12	alpha	regression	no persistence at
							yearly horizon
	HFR	314	1997–2002	24, 36	return, standard	cross product ratio,	no persistence at
					deviation,	regression,	two-and three year
					Sharpe ratio		horizon with
							returns, but with
							risk
[13]	MAR	1665	1990–1998	12, 24	alpha	cross product ratio,	persistence at one-year
						regression	and two-year
							horizons
[14	Zurich/LaPorte	(n/a)	1988–1999	12	alpha	descriptive	no persistence at
						comparison of	yearly horizon
						rankings	
[15]	LaPorte	1209	1977–1998	1, 2, 3,	return,	Spearman,	persistence at all
				. . . to	information	regression	horizons
				24	ratio, Sharpe		
					ratio, alpha		
[16]	EurekaHegde	1217	1994–2004	1, 3, 12	return	cross product ratio	persistence at monthly,
							quarterly and yearly

Table 1: Studies on hedge fund performance

References	Database	Number of Funds	Investigation Period	Time Horizon (Months)	Performance Measure	Statistical Methodology	Result
							horizon
[17]	HedgeFund.net,	3300	1995–2001	12	return, Sharpe	rank information	no persistence at
	Altvest, Spring				ratio, max.	coefficient	yearly horizon with
	Mountain				draw. standard		returns, but with
	Capital				deviation,		risk
					correlation		
[23]	HFR	2141	1996–2003	36	alpha	regression	persistence at
							three-year horizon
[18]	TASS	324	1994–2001	36	return, standard	cross product ratio,	no persistence at
					deviation,	regression	three-year horizon
					skewness,		with returns, but
					kurtosis,		with the higher mo.
					correlation		
[22]	EurekaHegde,	3810	1999–2003	1, 2, 3,	return, alpha	cross product ratio,	persistence at monthly
	AsiaHedge	(only		6, 9,12		chi square,	and quarterly but
		Asian				Kolmogorov-	not at yearly horizon
		funds)				Smirnov	
[20]	TASS, HFR,	9338	1990–2002	12	alpha	regression,	persistence at yearly
	CISDM, MSCI					bootstrap	horizon
						approach,	
						Bayesian	
						approach	
[21]	Zurich (MAR)	2614	1995–2000	36	return, alpha,	chi square	persistence at
					Sharpe ratio		three-year horizon
[24]	TASS	2065	1996–2003	12	return	chi square	no persistence at
							yearly horizon
[19]	TASS	n/a	1986–1997	12	appraisal ratio	chi square,	persistence at yearly
						Spearman	horizon

Merger Arbitrage: A strategy by which a hedge fund manager invests in mergers where there are unique opportunities for profitability.
Opportunistic Events: A strategy that the hedge fund manager invests in securities that provide temporary profitable opportunities while creating short-term event-driven positions.
Hybrid (hybrid)
Multi Strategy: A strategy used by a hedge fund manager to execute two or more strategies at a time.
Fund of Funds (FOF): A strategy that a hedge fund manager invests in two or more hedge funds rather than direct investment in securities.
Values-based: A strategy that a hedge fund manager invests in based on personal values and principles.
Hedge funds do not disclose information about their performance and even their management structure. In 2018, there has been significant growth in the hedge fund industry. Total fixed income strategies, multiple strategies, emerging and event markets accounted for 51% of total hedge fund management. Total assets under management in the first quarter of 2020 totalled more than $ 2.7 trillion. This volume of investment does not include Fund of funds and commodity trading advisors (CTA), which is $ 500 billion and $ 330 billion, respectively. The following figure shows the volume of asset management (AUM) up to the second quarter of 2020. Four strategies (fixed income, multiple hedging strategy, emerging and event-based markets) account for 51% of the total AUM.

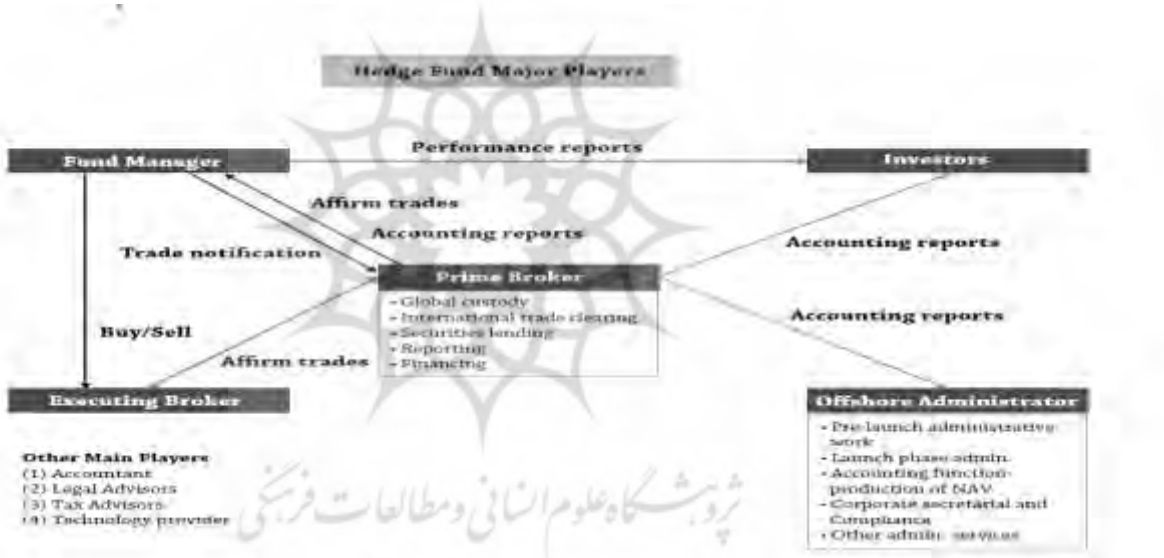


Fig. 1: Hedge Fund Players

Most hedge funds attempt to find trades that are almost arbitrage opportunities-pricing mistakes in the markets that can produce low-risk profits. Once a mispriced asset is identified, hedges are devised for their position so that the fund will benefit from the correction of the mispricing but be affected by little else. The origins of hedge fund performance research can be traced back to the asset pricing and mutual fund performance literature. The early hedge fund studies conducted by Brown et, al.,[14] estimated significant hedge fund alpha, however, these findings were driven by omitted variable bias. This issue of omitted variables in the hedge fund literature led subsequent researchers including Capocci and Hubner and Fung and Hsieh to explore other market factors that may explain the variation of hedge fund returns. In another study, Capocci and Hubner[15] propose an alternative multi-factor model which includes the Fama and French [16]and Carhart [17-18] risk factors. They revealed that hedge funds enjoy earning the small firm risk premia in equity returns. With a 1994-2000 sample, they estimate that only 25 per cent of all hedge funds generate statistically significant alpha.
A critique of the hedge fund performance literature reveals two unresolved issues. First, the Fung and Hsieh model includes independent variables (IVs) which are returns derived from lookback straddle option strategies in bond, FX and commodity markets. These IVs make it difficult for the Fung and

Hsieh model to be readily deployed by investors. An alternative model without the complex use of option strategies may better serve investors and researchers when examining hedge fund performance. Second, the work of Capocci and Hubner reveals the overuse of IVs in their eleven factor model and high problems associated with various bond indices. Furthermore, they do not consider foreign exchange markets as a source of return and risk in global hedge fund returns. Whilst these hedge fund studies reveal a small variation in results due to various datasets, time periods and methodologies, a consistent conclusion from Capocci and Hubner and Fung and Hsieh is their important contribution that conventional market returns and risk factors can readily explain hedge fund returns. Table 2 summarises the results of the 25 studies. '↑' indicates that performance persistence was found; '↓' indicates no performance persistence. '-' means that the time horizon was not analysed.

The main results of hedge fund performance persistence studies can be summarized as follows. First, short-term persistence for horizons of up to six months is reported by nearly all authors. Second, evidence for longer horizons is mixed, as the studies come to conflicting conclusions. For example, at the annual horizon, there are eight studies finding performance persistence, whereas ten studies reject the hypotheses of persistence in hedge fund performance. Also Harri and Brorsen [19] estimated persistence for both short- and long-term horizons. However, both studies mention that the return persistence significance levels weakens as the measurement horizon is extended.

Table 2: Hedge Fund Performance

	Time horizon (month)					
References	1	3	6	12	24	36
[1]	↑	↑	↑	↑	↑	-
[2]	-	↑	↑	↑	-	-
[3]	-	↑	-	-	-	-
[4]	↑	-	-	-	-	-
[5]	-	↑	-	↑	↓	-
[6]	↑	↑	↓	↓	-	-
[7]	-	↑	-	-	-	-
[8]	-	-	-	↓	-	-
[9]	-	-	-	↓	-	-
[10]	-	-	-	↓	-	-
[11]	-	-	-	↓	-	-
[12]	-	-	-	↓	-	-
[13]	-	-	-	-	↓	↓
[14]	-	-	-	↑	↑	-
[15]	-	-	-	↓	-	-
[16]	↑	↑	↑	↑	↑	-
[17]	↑	↑	-	↑	-	-
[23]	-	-	-	↓	-	-
[18]	-	-	-	-	-	↑
[22]	-	-	-	-	-	↓
[20]	↑	↑	↑	↓	-	-
[21]	-	-	-	↑	-	-
[24]	-	-	-	-	-	↑
[19]	-	-	-	↓	-	-
[16]	-	-	-	↑	-	-
Total	5 ↑	8 ↑	3↑1↓	8↑10↓	2↑2↓	2↑2↓

This table reports the results for 25 studies on hedge fund performance. The first column gives the authors and the second the results. We distinguish between six time horizons (from 1 to 36 months). '↑' indicates that performance persistence was found; '↓' indicates no performance persistence. '-' means that the time horizon was not analysed.

There is persistence in hedge fund performance at short horizons of up to six months, but that the longer the time horizon, the lower is the significance of performance persistence. The following are several additional insights revealed by comparing the 25 studies:

It was analyzed whether winners or the losers persist. Researchers find that persistence is driven mostly by losers. However, the level of persistence found by Edwards and Caglayan [20] holds across both winners and losers. There is no consensus in the literature about whether fund strategy is a driver of persistence. Our studies find that persistence is not related to the type of strategy followed. However, other researchers Brown and Goetzmann [14]and Harri and Brorsen. [20] find that persistence of fund returns has a great deal to do with the style of fund management. Regarding whether survivorship bias might influence results, Malkiel et.al [21]find no persistence if all funds are considered, but slightly more persistence if dead funds are dropped from the database. Finally, many authors discussed reasons for persistence. One possible reason for short-term performance persistence could be that monthly returns are smoothed out, either due to holding illiquid securities or managed returns.

Bar`es et al. [22] and Jagannathan et al. [23] believes that short-term persistence is related to the hot-hands effect documented in mutual fund literature, See Hendricks et al.,[23] The hot-hands effect occurs when securities held by funds that had better performance during one year realise superior returns the following year.

We thus can identify several consistent general themes in the literature in regard to short-term persistence, but nothing even this clear can be discovered regarding long term-persistence and other characteristics. The following empirical study will shed light on these issues. There are some strategies such as Long Short that even see statistically significant reversals of their exposures to some factors, to protect themselves from risk. Second, directional strategies have, on average, more common exposures between themselves, within all business cycles/different market conditions; compared to less directional. strategies as by nature they have more systematic risk than non-directional strategies.

3 Methodology

3.1 Empirical Specification

Linear factor models such as the CAPM, and its ex-tensions as represented by the APT model are the foundation of most of the theoretical and empirical asset pricing literature. Within the linear multi factor model the rates of returns of funds are dependent via a linear relationship on several variables, that is, factors:

$$Ri = \alpha i + \beta i ,1F1 + \beta i ,2 F2 + \ldots + \beta i , k Fk + \varepsilon i \quad (1)$$

or equivalently:

$$Ri = \alpha i + \sum_{j=1}^{k} \beta i , j Fj + \varepsilon i \quad (2)$$

where Ri denotes the return on the ith fund (or strategy), K > 0 is the number of factors, F1, …, FK are the values of the factors, βi, 1, …, βi, K are the relevant sensitivities and εi is a zero mean random variable. However, the theory constrains the factors to be linearly related to the fund (or security) returns. It cannot price funds where the payoffs are no□-linearly related to risk factors, as in the case of returns that characterized by the implementation of dynamic strategies.

For this reason and in the spirit of other authors we examine HFs so as to capture dynamic strategies but in a different way. We propose a parsimonious empirical specification using the stepwise regression. technique that contains structural breaks or break points so as to capture HFs' non-linearity.3 Moreover; we move one step further toward other authors (mentioned in this section) by implementing the stepwise regression technique at a regime/cycle level for more accurate results. Our empirical specification is

agile due to its flexibility to determine, for each group observations, the "best" set of HF factors.

The exogenous break points depend on the expansion and recession periods of multiple business cycles.4 Our model takes the form:

$$RiS = \alpha\, iS + \beta i\,,1F1\,(S\,) + \beta i\,,2\,F2\,(S\,) + \ldots + \beta i\,,\,k\,Fk\,(S\,) + \varepsilon i\,(S) \quad (3)$$

where

$$S = \{GR \text{ is the state variable}, \quad (4)$$

is the growth variable that takes the vector values Gm, m = 1,…, m, when we are in one of the m periods, R is the recession variable that takes the vector values Gn, n = 1,…n, when we are in one of the n periods, RiS and αiS are the return and the constant for HF i in the state S, respectively, Fk is a systematic factor, k = 1, …, K, and βj, k is the sensitivity of the HF to factor k. Our model is able to adjust taking into consideration only the variables (dependent and non-dependent) that belong to a particular stage of the economy. Employing a combination of statistical methods and empirical judgment we use the most appropriate factors for a given strategy under a specific state of the economy.

Within each state of the economy we apply a step-wise regression technique to limit the final list of factors for each strategy. This eliminates variables with less significant relationship to ratings from the beginning and certainly it is much better than manually selected factors, just based on other authors' suggestions, only. This technique has been used by many authors. In this technique the variables are added or removed from the model depending on the significance of the F-value. 5% significance is used for both inclusion and exclusion. The single best variable is chosen initially. That is, variable i is added to the p-term equation if

$$Fi = \max i \frac{RSSp - RSSp+1}{(\sigma\hat{p}i)^2 + } > Fin \quad (5)$$

The subscript (p + i) refers to quantities calculated when variable is adjoined to the current p-term equation, one at a time. The specification of the quantity Fin results in a rule for terminating the computations. Where RSSp+i denotes the residual sum of squares when a variable i is added to the current p-term equation. Our study considers a large number of monthly observations (from 01/1990 to 03/2020), hence, the stepwise regression allows us to examine the importance of a large set of variables. It is important to mention that the independent.

4 Statistical Methodology

Agarwal and Naik [2] distinguish between two-period and multi-period statistical approaches that can be used to examine performance persistence. In the first case, two consecutive time units, e.g., months, are compared to each other while in the multi-period case more than two consecutive time units are considered. The statistical methodologies that build upon the two-period framework can be further distinguished into nonparametric and parametric approaches. To the nonparametric approaches belong the contingency-table-based cross-product ratio test and chi-square test, the correlation-based rank information coefficient test, and Spearman's rank correlation test. The para-metric approach is a linear regression. In the multi-period framework, a Kolmogorov-Smirnov test can be applied.

The contingency table based methods are based on the construction of tables of winners and losers. Winners are funds whose performance is higher than the median return of all funds following the same

strategy over the chosen period, and losers are funds whose performance is lower than the median performance of all funds following the same strategy. Persistent are those funds that are winners (WW) and losers (LL) in both periods. Winners during the first period that are losers during the second period are denoted WL or LW in the opposite case. The cross-product ratio (CPR) test (also called log-odds ratio test) is the ratio of the funds which persistent to the funds that did not persist:

$$CPR = (WW \cdot LL)/(WL \cdot LW). \quad (6)$$

CPR is equal to 1 in the null hypothesis of no persistence, i.e., each of the four categories WW, LL, WL, and LW represent 25% of all funds. The statistical significance of CPR can be tested using the standard error $\alpha \ln(CPR)$ of the natural logarithm of CPR. The resulting Z-statistic is the ratio of the natural logarithm of the CPR to the standard error of the natural logarithm. Corresponding to the standard normal distribution, a value greater than 1.96 (2.58) indicates significant persistence at the 5% (1%) confidence level:

$$Z = \ln(CPR)/\alpha\ln(CPR) \quad \ln(CPR) \quad \frac{1}{WW} + \frac{1}{WL} + \frac{1}{\overline{LW}} + \frac{1}{LL}. \quad (7)$$

In the chi-square test , the observed frequency distribution of WW, WL, LW, and LL is compared with the expected frequency distribution:

$$2 = (WW - D1)2/D1 + (WL - D2)2/D2 + (LW - D3)2/D3 + (LL - D4)2/D4, \quad (8)$$

with D1 = (WW + WL) · (WW + LW)/I, D2 = (WW + WL) · (WL + LL)/I, D3 = (LW + LL) · (WW + LW)/I, and D4 = (LW + LL) · (WL + LL)/I; I is the number of all funds. Following the chi-square distribution with one degree of freedom, a value of 2 greater than 3.84 (6.64) indicates significant persistence at the 5% (1%) confidence level. The rank information coefficient, RIC; used by Herzberg and Mozes, [24]) measures the correlation between the value of a given variable for period 1 (e.g., the prior month)

4.1 Research Hypotheses

The following hypotheses can be made as a result; it is assumed that:

Hypothesis 1) There is a relationship between the investment strategy of hedge funds in the world and their annual return

Hypothesis 2) There is a relationship between Asset under management and their annual return

Hypothesis 3) There is a relationship between the performance fee and management fee and its annual return.

Hypothesis 4) The return of investment for 6 months are more effective than annual returns of hedge funds.

Hypothesis 5) Hedge funds that established younger and their inception date is higher annual returns than older funds.

The data will be reviewed from the IASG databases for 2004 to 2019.

4.2 Statistical Model

Correlations

Control Variables			Asset Under management (AUM)	Minimum Investment K	Inception date	Management Fee	Performance Fee
One Year Return	Asset Under management (AUM)	Correlation	1.000	-.194	-.106	-.096	-.026
		Significance (2-tailed)	.	.020	.211	.253	.756
		df	0	140	140	140	140
	Minimum Investment K	Correlation	-.194	1.000	.177	-.040	-.042
		Significance (2-tailed)	.020	.	.035	.635	.619
		df	140	0	140	140	140
	Inception date	Correlation	-.106	.177	1.000	-.065	-.136
		Significance (2-tailed)	.211	.035	.	.445	.108
		df	140	140	0	140	140
	Management Fee	Correlation	-.096	-.040	-.065	1.000	-.158
		Significance (2-tailed)	.253	.635	.445	.	.061
		df	140	140	140	0	140
	Performance Fee	Correlation	-.026	-.042	-.136	-.158	1.000
		Significance (2-tailed)	.756	.619	.108	.061	.
		df	140	140	140	140	0

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.887[a]	.787	.776	3.61881	.787	70.273	7	133	.000	1.756

a. Predictors: (Constant), 6 months returns, Minimum Investment K, Performance Fee , Management Fee , Asset Under management (AUM) , Inception date , CAROR

b. Dependent Variable: One Year Return

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6441.925	7	920.275	70.273	.000[b]
	Residual	1741.739	133	13.096		
	Total	8183.664	140			

a. Dependent Variable: One Year Return

b. Predictors: (Constant), 6 months returns, Minimum Investment K, Performance Fee , Management Fee , Asset Under management (AUM) , Inception date , CAROR

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	135.844	88.610		1.533	.128
	Asset Under management (AUM)	-.002	.002	-.045	-1.092	.277
	Inception date	-.068	.044	-.066	-1.558	.122
	Minimum Investment K	.000	.002	.012	.293	.770
	CAROR	.314	.073	.275	4.273	.000
	Management Fee	-.256	.458	-.023	-.558	.578
	Performance Fee	.142	.070	.084	2.026	.045
	6 months returns	1.266	.129	.635	9.849	.000

a. Dependent Variable: One Year Return

Correlations

Control Variables			Asset Under management (AUM)	Minimum Investment K	Inception date	Management Fee	Performance Fee
One Year Return	Asset Under management (AUM)	Correlation	1.000	-.194	-.106	-.096	-.026
		Significance (2-tailed)	.	.020	.211	.253	.756
		df	0	140	140	140	140
	Minimum Investment K	Correlation	-.194	1.000	.177	-.040	-.042
		Significance (2-tailed)	.020	.	.035	.635	.619
		df	140	0	140	140	140
	Inception date	Correlation	-.106	.177	1.000	-.065	-.136
		Significance (2-tailed)	.211	.035	.	.445	.108
		df	140	140	0	140	140
	Management Fee	Correlation	-.096	-.040	-.065	1.000	-.158
		Significance (2-tailed)	.253	.635	.445	.	.061
		df	140	140	140	0	140
	Performance Fee	Correlation	-.026	-.042	-.136	-.158	1.000
		Significance (2-tailed)	.756	.619	.108	.061	.
		df	140	140	140	140	0

Asset Under management (AUM)

Correlations

			Asset Under management (AUM)	CAROR
Kendall's tau_b	Asset Under management (AUM)	Correlation Coefficient	1.000	.138*
		Sig. (2-tailed)	.	.013
		N	150	147
	CAROR	Correlation Coefficient	.138*	1.000
		Sig. (2-tailed)	.013	.
		N	147	147
Spearman's rho	Asset Under management (AUM)	Correlation Coefficient	1.000	.207*
		Sig. (2-tailed)	.	.012
		N	150	147
	CAROR	Correlation Coefficient	.207*	1.000
		Sig. (2-tailed)	.012	.
		N	147	147

*. Correlation is significant at the 0.05 level (2-tailed).

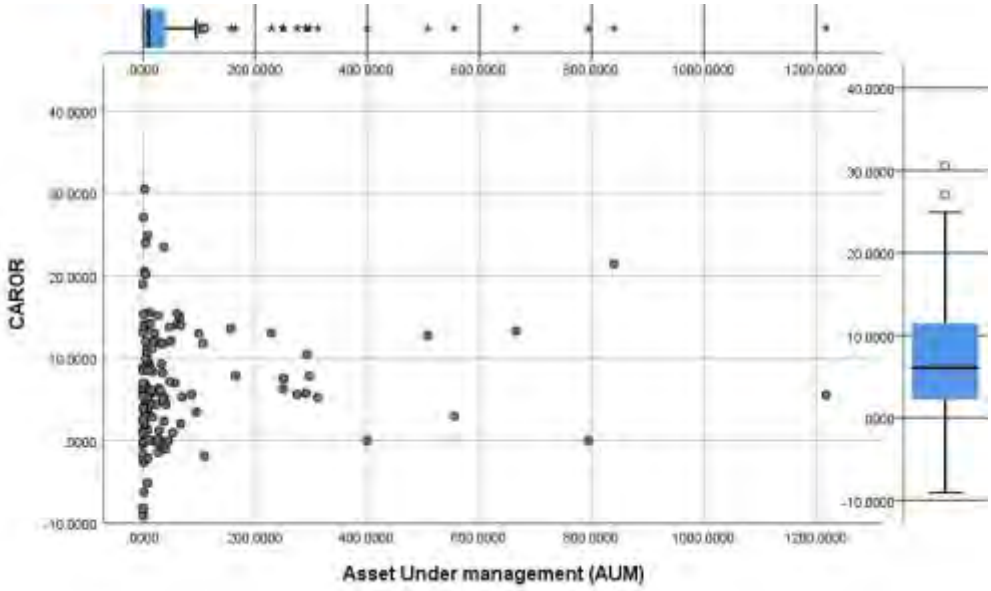
Autocorrelations

Series: Asset Under management (AUM)

			Box-Ljung Statistic		
Lag	Autocorrelation	Std. Error[a]	Value	df	Sig.[b]
1	-.038	.081	.218	1	.640
2	.014	.081	.250	2	.883
3	-.070	.080	1.010	3	.799
4	-.017	.080	1.056	4	.901
5	.031	.080	1.202	5	.945
6	-.078	.079	2.164	6	.904
7	.126	.079	4.685	7	.698
8	-.053	.079	5.143	8	.742
9	.143	.079	8.428	9	.492
10	-.074	.078	9.331	10	.501
11	-.037	.078	9.549	11	.571
12	-.023	.078	9.640	12	.648
13	-.067	.078	10.395	13	.661
14	-.027	.077	10.518	14	.723
15	-.073	.077	11.412	15	.723
16	.016	.077	11.453	16	.781

a. The underlying process assumed is independence (white noise).

b. Based on the asymptotic chi-square approximation.



4.2.1 CAROR

Fixed Coefficients[a]

Model Term	Coefficient	Std. Error	t	Sig.	95% Confidence Interval Lower	Upper
Intercept	6.840	.5634	12.140	.000	5.726	7.953

Probability distribution: Normal

Link function: Identity[a]

a. Target: CAROR

Fixed Coefficients[a]

Model Term	Coefficient	Std. Error	t	Sig.	95% Confidence Interval Lower	Upper
Intercept	6.840	.5634	12.140	.000	5.726	7.953

Probability distribution: Normal

Link function: Identity[a]

a. Target: CAROR

Residual Effect

Residual Effect	Estimate	Std. Error	Z	Sig.	95% Confidence Interval Lower	Upper
Variance	46.664	5.462	8.544	.000	37.098	58.696

Covariance Structure: Scaled Identity

Subject Specification: (None)

4.2.2 Management Fee and Performance Fee

Model Description

Dependent Variable		CAROR
Independent Variables	1	Management Fee
Weight	Source	Performance Fee
	Power Value	.000

Model: MOD_2.

Model Summary

Multiple R	.126
R Square	.016
Adjusted R Square	.009
Std. Error of the Estimate	6.666
Log-likelihood Function Value	-473.181

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	101.344	1	101.344	2.281	.133
Residual	6265.294	141	44.435		
Total	6366.638	142			

4.2.3 Management Fee

Coefficients

	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	Std. Error	t	Sig.
(Constant)	4.889	1.351			3.618	.000
ManagementFee	1.235	.818	.126	.084	1.510	.133

4.2.4 6 months' return

Model Description

Dependent Variable		CAROR
Independent Variables	1	@6monthsreturns
Weight	Source	OneYearReturn
	Power Value	1.000

Model: MOD_3.

Model Summary

Multiple R	.909
R Square	.827
Adjusted R Square	.825
Std. Error of the Estimate	1.102
Log-likelihood Function Value	-319.787

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	735.381	1	735.381	605.059	.000
Residual	154.354	127	1.215		
Total	889.735	128			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	Std. Error	t	Sig.
(Constant)	-.484	.277			-1.748	.083
@6monthsreturns	1.959	.080	.909	.037	24.598	.000

4.2.5 Inception date

Model Description

Dependent Variable		CAROR
Independent Variables	1	Inceptiondate
Weight	Source	One Year Return
	Power Value	.000

Model: MOD_4.

Model Summary

Multiple R	.098
R Square	.010
Adjusted R Square	.002
Std. Error of the Estimate	6.099
Log-likelihood Function Value	-415.287

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	45.467	1	45.467	1.222	.271
Residual	4723.809	127	37.195		
Total	4769.276	128			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	Std. Error	t	Sig.
(Constant)	169.440	146.047			1.160	.248
Inceptiondate	-.080	.073	-.098	.088	-1.106	.271

5 Conclusions

We review recent studies on hedge fund performance persistence and to provide new empirical evidence on this widely discussed and controversial topic. Hedge Fund the extant literature varies widely in the results, which is possibly due to the use of different performance measures, and statistical methodologies. Most authors find short-term persistence for horizons of up to six months, but the return persistence significance levels weaken as the measurement horizon lengthens.

Hypothesis	Result
There is a relationship between Asset under management and their annual return	Positive correlations
There is a relationship between the performance fee and management fee and its annual return.	Positive correlations
There is a relationship between The return of investment for 6 months are more effective than annual returns of hedge funds.	Negative Correlations
There is a relationship between Hedge funds that established younger and their inception date is higher annual returns than older funds.	Positive Correlations

Stressful market conditions have a negative impact on HF performance in terms of alphas as the majority of HF strategies do not provide significant excess returns. In addition, fund managers are concerned more about risk at times when it is diiffcult to find opportunities and deliver high returns.

First, short-term persistence for horizons of up to six months is reported by nearly all authors. Second, evidence for longer horizons is mixed, as the studies come to conflicting conclusions. For example, at the annual horizon, there are eight studies finding performance persistence, whereas ten studies reject the hypotheses of persistence in hedge fund performance. Agarwal and Naik and Harri and Brorsen report persistence for both short- and long-term horizons. However, both studies mention that the return persistence significance levels weaken as the measurement horizon is extended.

5.1 Results and Discussion

There are some strategies such as Long Short that even see statistically significant reversals of their exposures to some factors, to protect themselves from risk. Second, directional strategies have, on average, more common exposures between themselves, within all business cycles/different market conditions; compared to less directional strategies as by nature they have more systematic risk than non-directional strategies.

There are some suggestions for further topics that the researcher believes have a higher priority in the current situation in Iran, are introduced as follows for future research:

1. Identifying institutional investors and examining their attraction and motivation factors for investing in hedge funds;
2. Structuring of hedge fund based on countries local economy
3. Providing value-added services to start-ups by the Hedge Fund;
4. Simultaneous investment of several Hedge Funds in a start-up company in the form of a

syndicate;
5. Factors affecting the success of hedging fund investment;
6. Study of approaches how National Development Fund, pension funds can invest in hedge funds;
7. Rules related to the tax on investment of hedge funds in small businesses, capital gains tax, equity tax
8. Regulations affecting bankruptcy law, labor law, reporting requirements of hedging fund investment funds;
9. Examining the feasibility of applying various clauses of the Hedging Fund Investment Transaction Contract in Iran from a legal and sharia point of view, including priority in liquidation, clauses related to control and withdrawal provisions;
10. Focusing on investment strategies such as global investment strategies, investing in securities of companies and companies that are being restructured, as well as commodity hedging funds so that the transfer of these experiences can be useful in the economic development of our country.

5.2 Suggestions for future work

1. The preliminary structure of the hedge fund can be in the form of a Managed Account so that investors can manage their assets such as various currencies, or invest in commodity exchanges through a brokerage account, such as a stockbroker account.
2. Hedge funds can invest in different sectors, including new technologies, and offer good profits to investors while investing in projects that need financing. At the same time, these funds can invest in different physical currencies and provide a fixed annual profit to investors who want to obtain foreign exchange returns, and prevent the influx of investors to maintain the value of their rials to different levels. These funds can even participate in the purchase of aircraft and the development of the transport fleet, and lease it to airlines to pay dividends to investors.
3. one of the best ways to finance various projects, are hedge funds. We have hyperinflation in iran and have implication on supply of commodities. the housing process in the country has become such that supply Demand has decreased and the influx of investors into this sector has caused confusion, while hedging funds can easily invest in this sector by forecasting supply and demand for the coming years and produce more than the supply of suitable housing for different groups.
4. Hedge funds can play an important role in commodity trading and can take a short or long position in various commodities that are predicted to be required for a country, such as investing in various industries using fundamental and technical price analysis.
5. Another function of the hedging fund is to invest in cryptocurrencies that have been launched in many neighboring countries. Thus, the government can act as a policymaker while welcoming and benefiting from new ideas and various international experiences that have been tested in the world for a long time and using the financial elite from the new financial instruments of cumbersome laws.

Hedge fund is not developing very well. We have not any hedge fund in Iran. I have couple of suggestions for establishing hedge fund in Iran as follows:
1. There is a need for hedge funds for investors in Iran, so first step in setting up such funds, it is suggested to provide the necessary legal framework for their activities including the legal framework, design the structure required for their operation, which would require amending the business law and defining these funds in the securities market law. Therefore, it is necessary to revise trading law and securities market law to define a limited partnership structure or similar structure with the same characteristics to set up these funds.
The Private Equity Funds model guidelines and bylaws have been approved by the Stock Exchange,

dealing with private equity fundraising and its major allocation to hedging in equity and corporate equity. Fund investing in venture capital firms is aimed at gaining control of the company and guiding its financial and operating policies to achieve the desired goals and then exit the venture capital firm.
Also, under the established criteria, the platform for the support of publicly traded companies not listed on the stock exchange, companies listed on the market of small and medium-sized companies of Farabours of Iran and companies that have lost the admission criteria will also be provided through private equity funds. Companies that have been subject to Article 141 of the Business Law Amendment for the past two years may also benefit from the protection of private equity funds under certain conditions. The minimum capital of private equity funds was set at 500 billion Rials. The term of activity for these funds is a maximum of seven years, with the first 4 years being the investment fund period.
Private equity funds are fundamentally different from the nature and function of equity funds operating in conventional securities markets, and the investment framework and strategies of private equity funds lead to higher risks in these funds, so applicants for equity funds should then Complete the Statement of Risk Statement in order to invest in the fund by studying the details of the charter and trust fund. Also, the minimum amount of investment per investor in private equity funds is set at one thousand million Rials. As such, it can be acknowledged that a broad and suitable platform has been provided for financing non-public corporations and public corporations under certain conditions. This guideline also attempts to address the risk management issue by setting some requirements and constraints. It is noted that the measures taken by the Stock Exchange in this area, we will see an appropriate framework for financing firms that need to reform their financial and operational structures as well as diversify their investment tools.
1. The creation and emergence of new financial institutions requires the necessary tools for that entity, which in this respect has a lot of obstacles in the Iranian financial market. Therefore, it is recommended to design and approve financial instruments using financial engineering and jurisprudence experts.
3. Development of new financial instruments and institutions requires simultaneous development of other sectors that play a complementary role in the markets and without the simultaneous growth and development of financial institutions and instruments there is no growth. Sectors include brokers, investment banks, depository companies, and cash dispensers. Therefore, it is recommended to focus more on the development and development of different areas of the capital market, especially the aforementioned sectors, and to identify their needs for expanding their activities.
3. According to the studies, there is no hedge fund in Iran based on the structure of international hedge funds. In recent years, the issue of crypto currency hedging or coding has been suggested as a way of Iranian currency hedging to convert their assets into currency assets so that they can benefit from its international returns.

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