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HEDGE FUNDS PORTFOLIO CONSTRUCTION: QUALITATIVE AND QUANTITATIVE INSIGHTS

Abstract: Following the significant growth of hedge funds industry in recent years and increasing interest of institutional investors in the field, there has been observed a tendency to form various, client-tailored investment vehicles, such as funds-of-funds to suit investors' demand. Assets allocation among alternative investment vehicles with such a different risk profiles employs, besides strictly quantitative rules, also subjective, qualitative factors derived from due diligence process. The research investigates the subject of hedge funds portfolio construction process which has become a vivid decision making task where well known portfolio optimisation methods, such as Markowitz and Sharpe, do not apply directly. Acquisition and systemization of domain knowledge is pursued in the context of decision support within portfolio construction and compliance monitoring.

Key words: hedge fund, fund-of-funds, portfolio management, investment decision support.

1. Introduction

Despite the increasing interest that hedge funds (HF) and funds-of-hedge-funds (FOHF) have originated due to their recent development, few studies have been carried out on the portfolio construction of FOHF comparing to other portfolio optimization fields. This can be partly explained by their private characteristics and the difficulties encountered to have access to hedge funds data. Furthermore due to the subjective character of hedge fund assets allocation and manager selection process the portfolio construction problem is hardly covered by any existing econometric model. Provided above reasons little attention has been paid to analyze portfolio construction process in presence of both qualitative and quantitative determinants and in the context of domain knowledge acquisition. The objective of this paper is to fill this gap and attempt to systematize the knowledge acquired during practical qualitative and quantitative research and portfolio management. Special attention is paid to due diligence process and fund manager's preferences. The following research investigates an expert view-based approach to managing pool of capital by

investing it in separate hedge funds. A case study gathers experiences of one of long standing, successful European funds-of-hedge funds managers.

It was recently announced that the value of the hedge fund industry worldwide had passed the $1 trillion mark for the first time, with approximately 7,000 hedge funds in the world, around 1,000 of which were launched solely in 2003 [Martellini et al. 2005]. Let these numbers be indicators of the subject soundness.

The paper is arranged as follows – firstly basic definitions are introduced, to begin with hedge fund characteristics, fund-of-funds and proper risk metrics. As all of HF employ one or more strategy to investment process the last section of definitions considers HF strategies and their influence on the portfolio diversification.

In the main section FOHF portfolio construction process is depicted with two major focuses on qualitative and quantitative aspects and the due diligence of a particular HF investor. These considerations are subsequently followed by a proposal of domain knowledge-based approach to FOHF portfolio construction.

The paper is concluded with final remarks on future work and HF literature references.

2. Definitions

Hedge funds are private pools of capital, subject to relatively little regulation, that use a wide variety of investing strategies. They are usually restricted to wealthy and institutional investors. Spectacular collapses of several hedge funds, such as Long Term Capital Management in late 1990s or more recently Amaranth to mention most famous, built up the myth of HF as kind of secretive and very risky investments.

2.1. Hedge Fund and Fund-of-Funds

In the context of style of investment HF are distinctive for several reasons. One of them is that they provide opportunity to take advantage of worldwide market inefficiencies, usually unavailable to large, less flexible and strictly regulated capital pools, such as mutual funds, thus tend to increase a portfolio's reward-to-risk ratio [Phillips, Surz 2003]. Another reason is that HF provide investors with access to some of most analytic, entrepreneurial and managerial talent in the investment management industry.

According to [Phillips, Surz 2003] hedged strategies, i.e. those prosecuted by HF managers are characterized with following properties, as compared to traditional investments:
– funds are unregistered,
– absolute return-oriented, i.e. provide positive returns regardless to market conditions,
– returns largely derived from skill of the manager (not underlying asset class),

– low correlation with markets,
– diverse range of instruments,
– may use leverage,
– asset-based and performance fee,
– manager invests side-by-side with client and is often significant investor.

Fund-of-Funds, also referred to as Fund-of-Hedge-Funds (FOHF), is a fund whose investment strategy is to allocate capital to two or more hedge funds. Investors purchase an interest in a fund of funds, and their assets are commingled with those of other investors. This pool of money is invested with a number of hedge funds [Nicholas 2004].

While FOHF may be structured differently to achieve a variety of targets, the main objective is the reduction in risk and volatility achieved through diversification. FOHF can be widely diversified with respect to specific HF strategies, i.e. they can be multi-strategy funds or they might be concentrated on specific strategies, geographies, or industry sectors, such as equity or fixed income, technology or healthcare, Asian or European [Phillips, Surz 2003].

2.2. Risk measures

Apart from total return figures reported by hedge fund managers on monthly basis there are risk-adjusted measures that should be carefully **analysed during port**folio construction as they allow to compare performance of two funds having similar risk characteristics as well as funds with different risk characteristics [Fung, Hsieh 2001].

The most commonly used measure of risk-adjusted performance remains Sharpe ratio:

$$Sharpe\ ratio_P = \frac{R_P - R_F}{\sigma_P}$$

where R_P is the average return on portfolio P, R_F is the risk-free asset, and σ_P is the standard deviation of returns on portfolio P.

Along with the Sharpe ratio managers often report also the Sortino ratio which measures the incremental return over a minimum acceptable return (MAR) divided by the downside deviation (as opposed to the standard deviation) below the MAR:

$$Sortino\ ratio_P = \frac{R_P - MAR}{DD_P}$$

where R_P and MAR are respectively the average percentage returns on portfolio P and a minimum acceptable return, and DD_P is the downside deviation of returns of portfolio P below the MAR [Lhabitant 2004].

2.3. Strategies

HF strategy is the investment method a particular HF manager uses in order to achieve absolute returns. There are various classifications of HF strategies and continuously appear new variations of existing investment ideas or entirely new ones. To classify let us relate to literature and to web-based Hedge Index database. Solid understanding of strategy is crucial for portfolio construction and diversification since the strategy determines what the HF's investment style is, its performance characteristics, volatility and other risks (market, regional, etc.).

Convertible Arbitrage involves long position in a difficult-to-value security believed to be undervalued (the convertible) and short position in other security of the same issuer believed to be relatively overvalued.

Dedicated Short Bias (*Short Selling*) is used to take advantage of an expected price decline.

Event Driven deals with equities in scope of some market or in-company events, such as restructurings (*distressed securities*) or mergers/acquisitions (*merger arbitrage*).

Fixed Income Arbitrage is a relative value approach, i.e. attempt to exploit temporary price inefficiencies or discrepancies between securities or markets.

Global Macro generates investment ideas from top-down, global macro economic outlook that implies certain market directional movements to be exploited.

Equity Long/Short (*Equity Hedge*) invest in equities and equity derivatives both on the long and short side.

Managed Futures seek to capture trends in specific, highly liquid commodity markets [Phillips, Surz 2003].

Obviously the above list is neither full nor exhaustive.

Having defined HF and FOHF investment vehicles, their risk measures and investment strategies let us focus on the investment process in FOHF comprising both qualitative and quantitative research.

3. The fund-of-hedge funds investment process

One of the key reasons behind the success of hedge funds in institutional money management is that such alternative investment strategies seem to provide diversification benefits with respect to other existing investment possibilities. In order to take advantage of such benefits funds-of–hedge funds, managers must be able to rely on robust techniques for optimization of portfolios including hedge funds. Standard mean-variance portfolio selection techniques (Markowitz, Sharpe) are known to suffer from a number of shortcomings [Amenc, Martellini 2002]. Moreover, because hedge fund returns are not normally distributed, a mean-variance optimization would be severely ill-adapted [Lhabitant 2001]. Another thing – parameter uncertainty: the lack of a long history and the non-availability of high frequency data imply that

parameter estimation is a real challenge in the case of hedge fund returns [Martellini et al. 2005].

The investment management process in a FOHF becomes in a great part qualitative, as a result of efforts to overcome mentioned above shortcomings of traditional portfolio construction methods. Manager selection process includes on-site visits, interviews with CIO, investigation of investment method and risk management procedures. Figure 1 presents the FOHF investment process in detail.
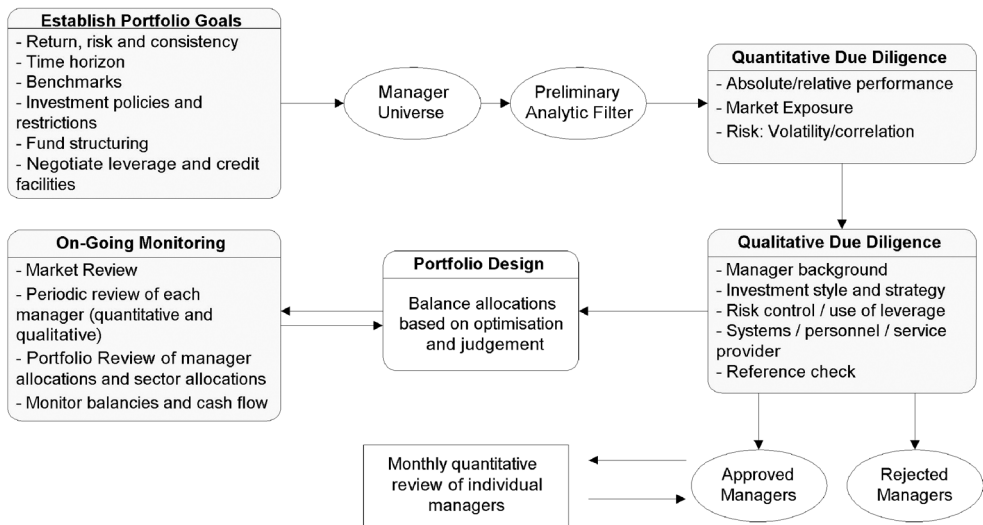

Fig. 1. Typical fund of hedge funds investment management process

Source: [Phillips, Surz 2003].

Approved managers are picked up from the, so called, hedge funds universe and are the subject of further on-going investigation and monitoring. Usually between 10 and 30 hedge fund managers are included in the portfolio and they represent various strategies. Depending on risk preferences the asset allocation into particular strategy differs by FOHF manager, although usually they diversify risk among all main strategies.

3.1. Qualitative vs. quantitative

According to experts, qualitative analysis is the main job of the hedge fund allocator, particularly important when selecting new managers.

Fundamental, qualitative aspect of portfolio construction is investment method of a HF manager. Expert general advise: select those managers whose investment method is original and easy to understand. Then select those who, compared to their peers, have clear "edge", which usually is:

– informational (Equity L/S, Distressed and Arbitrage strategies with equity or equity-linked securities),
– skill based (analytical skills in predicting flow of funds and macroeconomics fundamentals in Macro / Directional Trading and Fixed Income Arbitrage),
– operational (Statistical Arbitrage and Managed Futures – speedy and cost-effective order implementation),
– a mixture of the above.

In line with clear-cut investment style another issue is a risk management policy. Expert advice: a good manager should always be able to know when he is wrong (to check against a manager's ego hypertrophy). Furthermore, qualitative analysis includes company organization issues and personal contact with managers. All above aspects are subject of detailed description and process definition – due diligence (see 3.2).

Personal contact with managers, i.e. interviews, are the most time consuming activities within qualitative analysis process, usually carried out once a year in case of HF in portfolio and at least once in two years for screened managers – candidates to portfolio.

On the quantitative side there are issues such as:
– historical performance data analysis, which involves average monthly return, annualized return, number of positive months, maximum drawdown and time-to-recovery;
– risk-adjusted performance analysis, covered by volatility, Sharpe and/or Sortino ratios, vulnerability to fat-tail events;
– correlation of HF strategies and each separate fund to other funds in portfolio, correlation to market indexes, volatility index;
– portfolio turnover, a piece of data not always cared about but expert remark is that high turnover managers have capacity constraints;
– assets under management (AUM) – there is assumed a minimum threshold AUM base of 50M USD for a solid operation to breakeven.

In the following section a systematic approach to qualitative HF analysis is highlighted.

3.2. Due diligence

In order to gather all the relevant information regarding hedge fund managers, their professional background, also from the ethical point of view, there are due diligence procedures defined by FOHF managers. The information gathered is subsequently put under strict review – both independently and comparative to other hedge fund manager's peers.

Due diligence (DD) is the most complex, subjective aspect of FOHF management process. DD procedures are usually based on interview forms related to many aspects of HF business, including:

– Fund manager issues, such as analysis of historic returns, transparency, risk control, compliance issues, size and history of the fund, employee turnover, registrations, liquidity, etc.
– Strategy description – investment style, buy/sell disciplines, automated stop-loss conditions, geographic, sector and security-specific concentrations, etc.
– Fund administrator issues, onshore/offshore capabilities, back-office software, processing capabilities, reporting, etc.
– Custodian – independency, legal domicile, financial strength.
– Broker/dealer issues.

The golden rule in manager selection: "Do not invest in things you do not understand" applies as an outcome of due diligence process. Experienced, long-term FOHF managers follow a hedge fund performance and operations for a certain amount of time, in some cases even several years, before eventually investing. Extensive due diligence issues overview may be found in [Nicholas 2004].

Figure 2 presents simplified, basic concepts map for due diligence process, with exemplary interrelations.
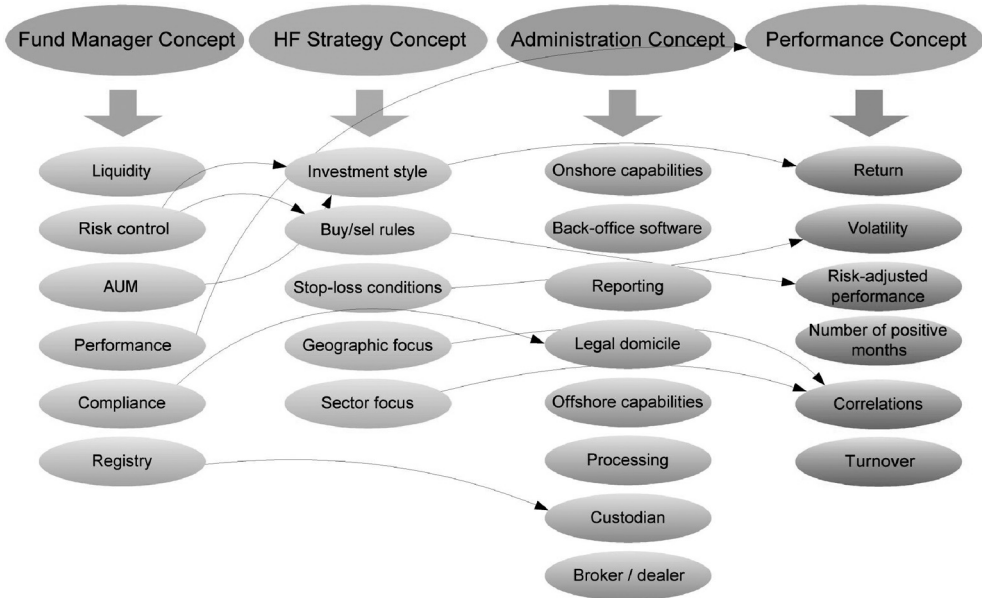

Fig. 2. High-level concept representation map for the due diligence process
with some exemplary interrelations

Building on the foundation of both due diligence and qualitative and quantitative HF research in the following section knowledge-based approach to the FOHF portfolio is proposed.

4. Knowledge-based portfolio construction

The hedge funds industry, and FOHF managers in particular, are the subject of dynamic growth poorly accompanied by any research regarding investment decision support solutions. As the next step within the management of portfolio of hedge funds focusing on structuring the qualitative knowledge and its integration with the quantitative one seems to be the priority. Hence the necessity of domain knowledge-bases design arises.

The semantic concept of the HF portfolio management should consist of three cascade dependent knowledge bases (ontology stack). The ontology of the first level defines financial market terms and dependencies, related to markets, regions, invest-ment strategies, risks on abstract level. Since hedge funds operate in financial mar-kets universe they remain in strict relations to market trends and managers tend to continuously monitor key market values, such as gold, oil, currencies, indices. etc. Furthermore managers monitor correlations among HF strategies, particular HF per-formance or volatility, and market indicators.

The hedge funds ontology depends on the general concepts defined in the finan-cial markets ontology, as a given strategy refers strictly to some instruments and in-stitutions (entities) of the global financial market. It relies also on due diligence (DD) ontology, which defines the requirements for a given HF strategy to be met while investigating particular hedge fund. All the standards, issues, terms and rules related to due diligence process, along with the due diligence template, constitute the DD process ontology. The hedge funds repository (HF Repository) consists of instances of DD ontology regarding each of investigated hedge funds, i.e. is defined as the
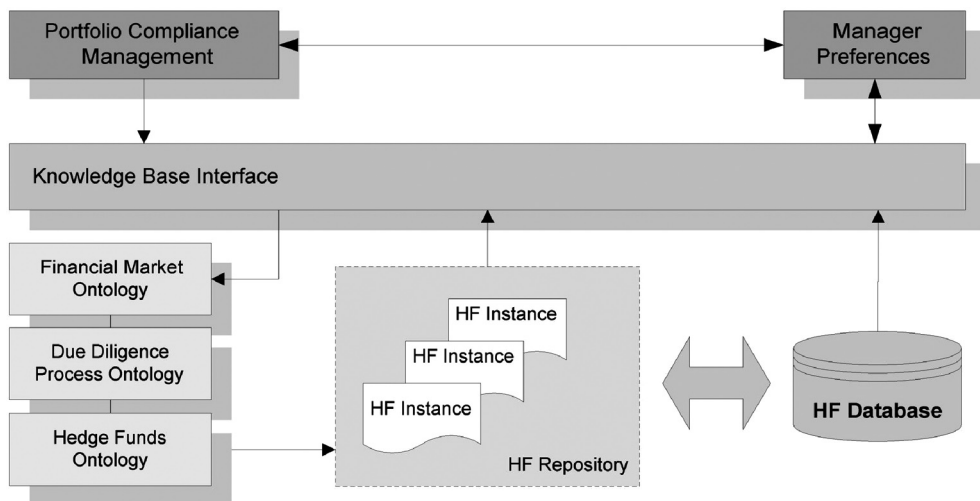

Fig. 3. The decision support concept for FOHF portfolio construction with the application of domain knowledge

detailed hedge fund description knowledge base. This most detailed knowledge base refers, directly and indirectly, to terms from all higher levels.

The block diagram in Fig. 3 illustrates the concept of the knowledge-based decision support system for FOHF portfolio construction.

HF Database contains quantitative performance, asset and volatility-related data reported on monthly basis. The database is queried if any quant data are needed to satisfy manager's inquiry. Quantitative data may be obviously accessed directly.

Manager Preferences encompass manager's investment rules and preferences i.e. FOHF expert's knowledge base using concepts and terms defined in the HF ontologies, includes expert-defined rules and portfolio constraints. Risk and performance calculation formulas are applied in the decision rules if necessary.

Portfolio Compliance Management relies on manager preferences to validate HF managers either they comply with the requirements, benchmarks and portfolio goals.

Let us consider an example, simplified due to space limitations, of knowledge-based system exploitation – in this particular case a manager's natural language-expressed query:

"Show those HF managers with assets above 250M who deal with equity related strategies, having mixed exposure to mid and large caps, in particular biotech companies in distressed situations, also having above average Sharpe ratio and experienced biotech professional in the team, with neutral correlation to MSCI World, where no major monthly drawdown has been observed within last 2 years". Let us take a quick glimpse at the query execution. Financial market ontology (FMO) defines equity as an asset class (abstract). Each of HF strategies relates to one or more of such classes, as each strategy exploits any of specified financial markets. Thus through HF ontology (HFO) defining strategies and their relations to FMO a bunch of HF instances pursuing equity-related investments is eventually derived.

Analogically the biotech sector from FMO is referenced in the investment method description (through due diligence) in HF instances as is "distressed" annotation, which narrows the HF space to those in distressed securities of the event-driven strategy. The team of biotech professionals can be identified in HF instances through the 'team' annotation in due diligence form (DD ontology).

Noteworthy, all the three ontologies might be organizationally one – in Fig. 3. the distinction is introduced form the logical point of view only.

5. Conclusions

The paper depicts a novel, knowledge-based approach to FOHF portfolio construction. The portfolio management process in case of hedge funds investments is mostly subjective, thus justifies application of domain knowledge-oriented techniques. The objective of research was to fill the gap created by inadequateness of classic portfolio theory to FOHF management and to propose knowledge-based approach in

the context of decision support in portfolio construction. Various aspects of FOHF management process were approached through systematizing domain knowledge, both qualitative and quantitative, and investigating the due diligence process of HF managers. Next steps may comprise XML query-based prototype for real-world testing, however this raises the necessity of extensive HF database.

Acknowledgment

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