

# Funds of Funds

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# Quick review

- Due to their relatively weak correlation with other asset classes, hedge funds can play an important role in risk reduction and yield enhancement strategies
- Although the inclusion of hedge funds in a portfolio may significantly improve that portfolio's mean-variance characteristics, it can also be expected to lead to significantly lower skewness and higher kurtosis

# Return distributions and risk

- The returns on portfolios of stocks and bonds risk are more or less normally distributed.
- Because normal distributions are fully described by their mean and standard deviation, the risk of such portfolios can be measured with one number: the standard deviation.
- Confronted with non-normal distributions, however, it is no longer appropriate to use the standard deviation as the sole measure of risk. In that case investors should also look at the degree of symmetry of the distribution, as measured by its skewness, and the probability of extreme positive or negative outcomes, as measured by the distribution's kurtosis.
- A symmetrical distribution will have a skewness equal to zero, while a distribution that implies a relatively high probability of a large loss (gain) is said to exhibit negative (positive) skewness. A normal distribution has a kurtosis of 3, while a kurtosis higher than 3 indicates a relatively high probability of a large loss or gain.
- Since most investors are in it for the long run, they strongly rely on compounding effects. This means that negative skewness and high kurtosis are extremely undesirable features as one big loss may destroy years of careful compounding.

# The problem

- Individual hedge fund returns tend to exhibit some negative skewness.
- When combined into portfolios, however, this negative skewness becomes worse.
- When those portfolios are combined with equity, skewness drops even further.
- The increase in negative skewness will tend to offset the lower standard deviation that results from the inclusion of hedge funds.

# FOF Readings

- Fund of Fund Portfolio Selection: A multiple-objective approach
  - Davies, Kat, Lu (2004)
- Portfolios of Hedge funds
  - Amin and Kat (2004)
- Fees of fees on funds of funds
  - Brown, Goetzman, Liang (2004)

# What are funds of funds

- A diversified portfolio of hedge funds
- These funds can be widely diversified or can concentrate on a particular style, sector or geographical location (niche funds)
- FOFs now control approximately 40-50% of the assets that are ultimately funneled to single strategy managers

# Why invest inFOFs

- Professional management and due diligence services
- Diversification seems to be the rule.
  - It reduces the impact of selecting a bad manager.
  - Low correlation between managers supports the idea of diversifying.
  - Access to otherwise closed funds
- In practice,
  - There are very few index products.
  - Dedicated hedge fund portfolio.
  - Fund of hedge funds.
- The new questions:
  - What is the optimal number of hedge funds in a portfolio?
  - What is the marginal impact of adding a new hedge fund in an existing hedge fund portfolio?

# Who invests in FOFs

- Pension funds
- Endowment funds
- Insurance companies
- Private banks
- High net worth individuals



# How many assets/funds?

- How many assets make a diversified portfolio?
    - Evans and Archer (1968): 8 to 10.
    - Statman (1987): 30 to 40.
  - How about hedge funds?
    - Billingsley and Chance (1996) for managed futures.
    - Henker and Martin (1998) for CTAs.
    - Henker (1998) for hedge funds.
    - Amin and Kat (2000)
    - Ruddick (2002)
- } 8 to 10
- } at least 20

# FOF vs Hedge funds

- [FOF vs HF.pdf](#)
- [performance.PDF](#)

# Fees on FOFs

- Major disadvantage to investor is cost of multiple fee layers
- The more diversified the fund, the greater the likelihood that the investor will incur an incentive fee on one or more of the constituent managers, regardless of the FOF performance
- Investor cannot hedge this incentive fee!!!

# An example (BGL 2004)

- [EXAMPLE.PDF](#)
- Is this example overly simplistic?
- Any empirical evidence?

# Incentive fees and performance

- Create fund of funds using pre-fee performance data for individual funds
- Create FOF comprised of increasing number of funds
- Want to decompose returns into
  - Underlying portfolio
  - Underlying manager fees
  - FOF fees
- The fees used in the study are the actual fees and highwater mark provisions of the individual funds
- The FOF charge a hypothetical incentive fee of 10% above a zero benchmark.
- [Graphs.PDF](#)

# Alternative fee structures

- FOF could absorb fees and expenses in return for a fee charged at the fund level
  - In BGL, they assume 20% above Treasury
- Essentially the FOF is short a call option on each of the funds in portfolio
  - Incentive fee is a call option on the value of the underlying hedge fund
  - What is your hedge
    - Reverse options position, Delta hedge, gamma hedge...

# Alternative fee structures

- Sharpe ratio for the investor improves
- FOF manager is made revenue-neutral in expectation
  - He is compensated for additional uncertainty

# Portfolios of hedge funds

- How best to allocate across funds?
- What do investors want?
- Which moment matters most?
- Davies, Kat Lu (2004) propose a polynomial goal programming optimization model



# Davies, Kat and Lu

- PGP allows
  - to solve for multiple objectives
    - Maximize returns
    - Minimize variance
    - Maximizing skewness
    - Minimize Kurtosis
  - Incorporate investor preferences for higher moments

# The framework

- $X$  is vector of percentage invested in each asset
- $R$  is vector of returns for representative portfolios
- $V$  is covariance matrix
- No short sale
- Risk free asset

# Incorporating preferences

*Minimize*  $Z = (1 + d_1)^\alpha + (1 + d_3)^\beta + (1 + d_4)^\gamma$

*subject to*

$$E[X'R] + x_{rf}r + d_1 = Z_1^*$$

$$E[X'(R - E(R))]^3 + d_3 = Z_3^*$$

$$-E[X'(R - E(R))]^4 + d_4 = -Z_4^*$$

$$d_1, d_2, d_3 \geq 0$$

$$X'VX = 1$$

$$X \geq 0$$

$$x_{rf} = 1 - I'X$$

# Interpretation of parameters

$$MRS_{13} = \frac{\partial Z / \partial d_1}{\partial Z / \partial d_3} = \frac{\alpha(1 + d_1)^{\alpha-1}}{\beta(1 + d_3)^{\beta-1}}$$

$$MRS_{14} = \frac{\partial Z / \partial d_1}{\partial Z / \partial d_4} = \frac{\alpha(1 + d_1)^{\alpha-1}}{\gamma(1 + d_4)^{\gamma-1}}$$

# Unsmoothing the numbers

- OTC and illiquid asset often used
- Marking to market often a problem
- Often use old or stale prices
- Problem
  - Underestimates volatility
  - How do we solve this problem?

# Optimal allocation across hedge fund strategies

- Unconstrained
  - [unconstrained\\_allocation.PDF](#)
- Constrained
  - Max 30%
  - [Constrained.PDF](#)

# Asset allocation for portfolios of stocks, bonds and hedge funds

- SP500, 7-year Solomon Bond Index
- Unconstrained
- Constrained
  - 30% max.
- [STOCK, BOND AND HEDGE.PDF](#)

# FOF vs Portfolios of hedge funds

- Do the FOF managers actually add value?
- What is the cost of due diligence and proper asset allocation?
- Is there persistence in fund returns?
- Can we use historical returns to select funds?
  - GHPR (2005)