# 6ª Jornada de Gestión de Riesgos Financieros Risk Lab

# Investable Hedge Fund Indices and Funds of Hedge Funds in Optimal Passive Portfolios

**by**

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# Outline

- Comparing Investable HF Indices (IHF) to Funds of HF (FoHF)
- Motivation for Alternative Investments
- Selection of Investment Proxies and data Sources
- Data Conditioning and Performance of Portfolio Constituents
- Optimization Framework – Scenarios:
  - Historical
  - Market Equilibrium
  - Market Equilibrium + Personal Views
- Results & Conclusions

# IHF versus FoHF

- **Objective: Facilitate access to skills of fund managers**
- **Launch of IHF indices**
  - **S&P May 2002, followed by HFR, CSFB/Tremont, MSCI**
  - **Composite/ Strategic**
  - **Transparency/ Selection criteria**
  - **Investment vehicles based on IHF (Index linked bonds, swaps, structured products)**
  - **Size: $20 billion**
- **Question: Is IHF selection more efficient/ less costly than by FoHF managers?**
  - **Context of growing size and competition**

# Scope of Research

- **Seek position of IHF and FoHF proxies in optimal portfolios**
  - **Passive Equity + Bond holdings**
  - **Other alternative investments:**
    - **Commodity**
    - **Volatility**
- **Various Risk Adjusted Performance Measures (RAPM) to cope with 'non-normality' of returns**
- **A range of expected return scenarios**

# Motivation for AI

- **Market for Alternative Investments (AI) and key features**
- **Hedge Funds**
  - **High Sharpe ratios + good diversification**
  - **But negative skewness and high kurtosis?**

    [Fung & Hsieh (97), Ranaldo & Favre (2004), Kat (2005), Black (2006)]
- **Commodities (Derivatives)**
  - **Good diversification; cyclical** [Greer (1978), Bodie (1983), Ankrim &Hensel, (1993), Anson (1998), Gibson (1999), Akey (2005)]
- **Volatility (Derivatives)**
  - **Poor returns, high volatility (of vol) but negative correlation with equities** [Alexander (2004), Black (2006)]
- **Others: Private Equity, Property**

# Selection of Investment Proxies

- **Equity:** S&P 500
  - US bias yet representative; match with volatility index
- **Bond:** Lehman Brothers Global Aggregate Bond Index
  - Broad (govvies, corporate, credit & MBS)
  - US$ fully hedge (NB: Siegel's paradox)
- **Volatility:** VIX
  - 30 day vol. index on S&P 500; reference for futures, options, variance swaps
  - Liquidity only recently picked up

# Selection of Investment Proxies

- **Commodity:** Reuters-CRB
  - 17 commodities, equally weighted
- **IHF:** S&P
  - Data since Sept 2002
  - Representative: similar to CSFB/Tremont, MSCI and HFRX
  - A basket would bring unwarranted diversification
- **FoHF:** Homemade notional
  - No single representative FoHF
  - Create a basket of 30 + 8 +7 = 45 FoHFs from Eureka database
  - Adjust for average volatility of FoHF

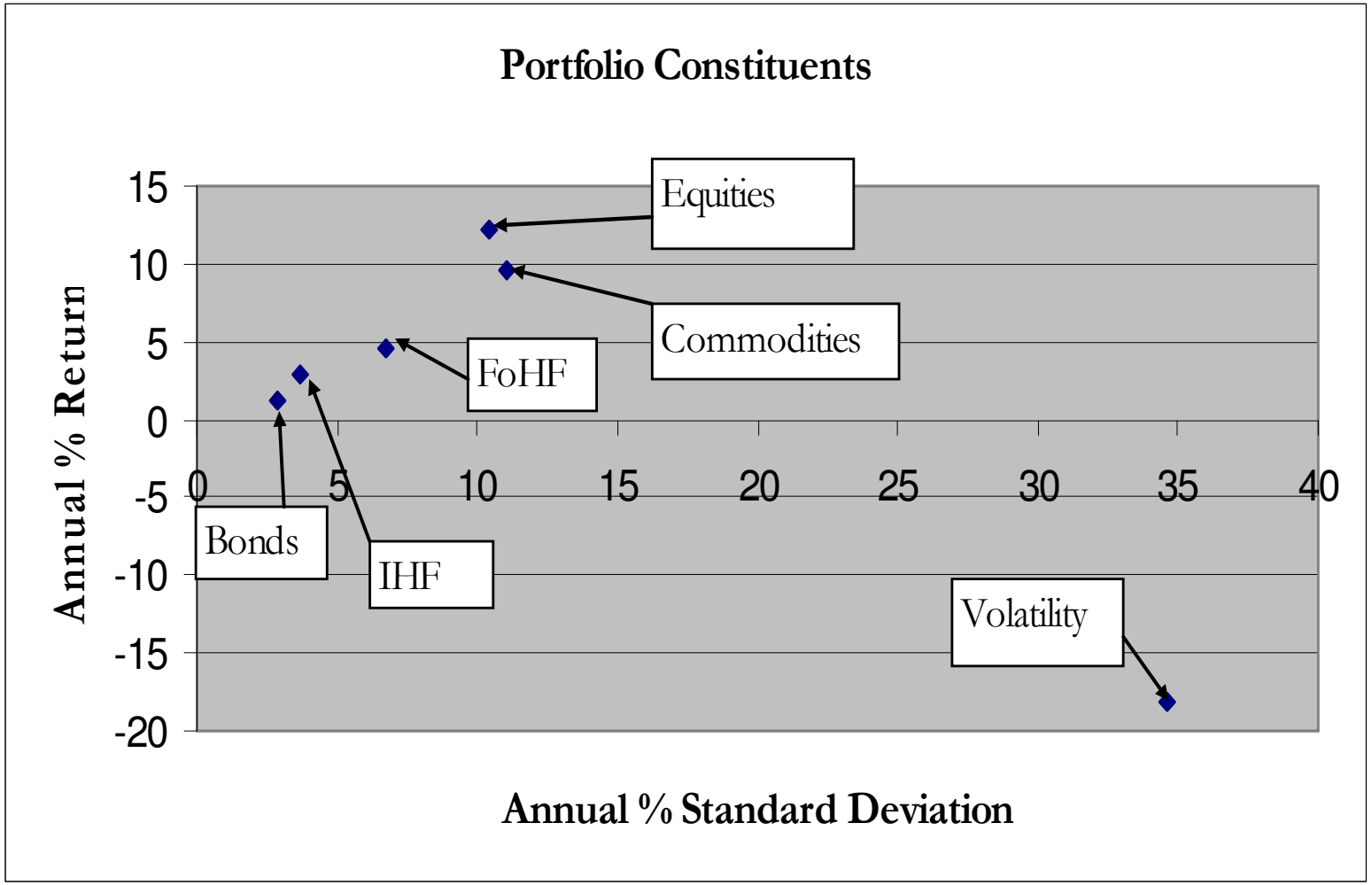
# Data Conditioning

- **Trading Costs**
  - IHF investment vehicles: subscription, management & redemption fees $\Rightarrow$ 2% p.a. over 2 years
  - FoHF: Some with redemption fees $\Rightarrow$ 0.5% p.a. over 2 years
  - Others: Negligible transaction fees
- **Serial Correlations** (monthly)
  - IHF (+0.37), FoHF (+0.33), Volatility (-0.32)
  - Should not be significant in liquid, efficient markets
  - De-autocorrelate using Blundell-Ward filter based on AR(1) assumption for observed returns
- **Excess returns over US T-Bill**

# Performance of Constituents

| Excess Returns | Equity | Bond | Volatility | Commod | IHF | FoHF |
|---|---|---|---|---|---|---|
| Mean | 12.16% | 1.27% | -18.18% | 9.63% | 2.85% | 4.64% |
| StDev | 10.45% | 2.89% | 34.61% | 11.10% | 3,73% | 6.76% |
| Skewness | 0.11 | -0.09 | 0.26 | -0.14 | -0.04 | -0.17 |
| Kurtosis | 0.02 | 0.01 | 0.12 | 0.00 | -0.06 | -0.03 |
| Sharpe R | 1.16 | 0.44 | -0.53 | 0.87 | 0.76 | 0.69 |
| 1m Autocorr | 0.12 | 0.10 | -0.32 | -0.01 | 0.37 | 0.33 |

# Risk Return Profiles



# Correlation Matrix

| | Equity | Bond | Volatility | Commodity | IHF | FoHF |
|---|---|---|---|---|---|---|
| Equity | 1.00 | | | | | |
| Bond | -0.15 | 1.00 | | | | |
| Volatility | -0.57 | 0.04 | 1.00 | | | |
| Commodity | 0.08 | 0.09 | -0.15 | 1.00 | | |
| IHF | 0.53 | 0.23 | -0.41 | 0.50 | 1.00 | |
| FoHF | 0.47 | 0.20 | -0.42 | 0.45 | 0.75 | 1.00 |

# Optimization Framework

- **The Three Expected Return Scenarios**
  - **Historical (45 months)**
  - **Market Equilibrium (Markovitz: $\Pi = \gamma.V.W$) + Determ. Scenarios**
  - **Market Equilibrium + Black-Litterman Scenarios**
- **Why Markovitz mean-variance analysis little used?**
  - **Unstable allocations**
  - **'Corner portfolios'**
- **Solution:**
  - **Market implied equilibrium forecasts**
  - **Consistent combination with personal views**

# Historical vs Equilibrium

| Historical Scenario | Equity | Bond | Volatility | Commod | IHF | FoHF |
|---|---|---|---|---|---|---|
| Annual excess returns | 12.16% | 1.27% | -18.18% | 9.61% | 2.85% | 4.64% |
| Annual volatility | 10.45% | 2.89% | 34.61% | 11.10% | 3.73% | 6.76% |

| | Equities | Bonds | Volatility | Commod | IHF | FoHF |
|---|---|---|---|---|---|---|
| Market Values ($ bn) | 40,460 | 62,767 | 0 | 16 | 20 | 426 |
| Market Weights (%) | 39.02% | 60.53% | 0.00% | 0.02% | 0.02% | 0.41% |

| Equilibrium Scenario | Equity | Bond | Volatility | Commod | IHF | FoHF |
|---|---|---|---|---|---|---|
| Annual excess returns | 3.65% | 0.09% | -8.14% | 0.27% | 2.85% | 4.64% |
| Annual volatility | 15.59% | 2.80% | 59.35% | 10.32% | 3.73% | 6.76% |

# Equilibrium + Personal Views

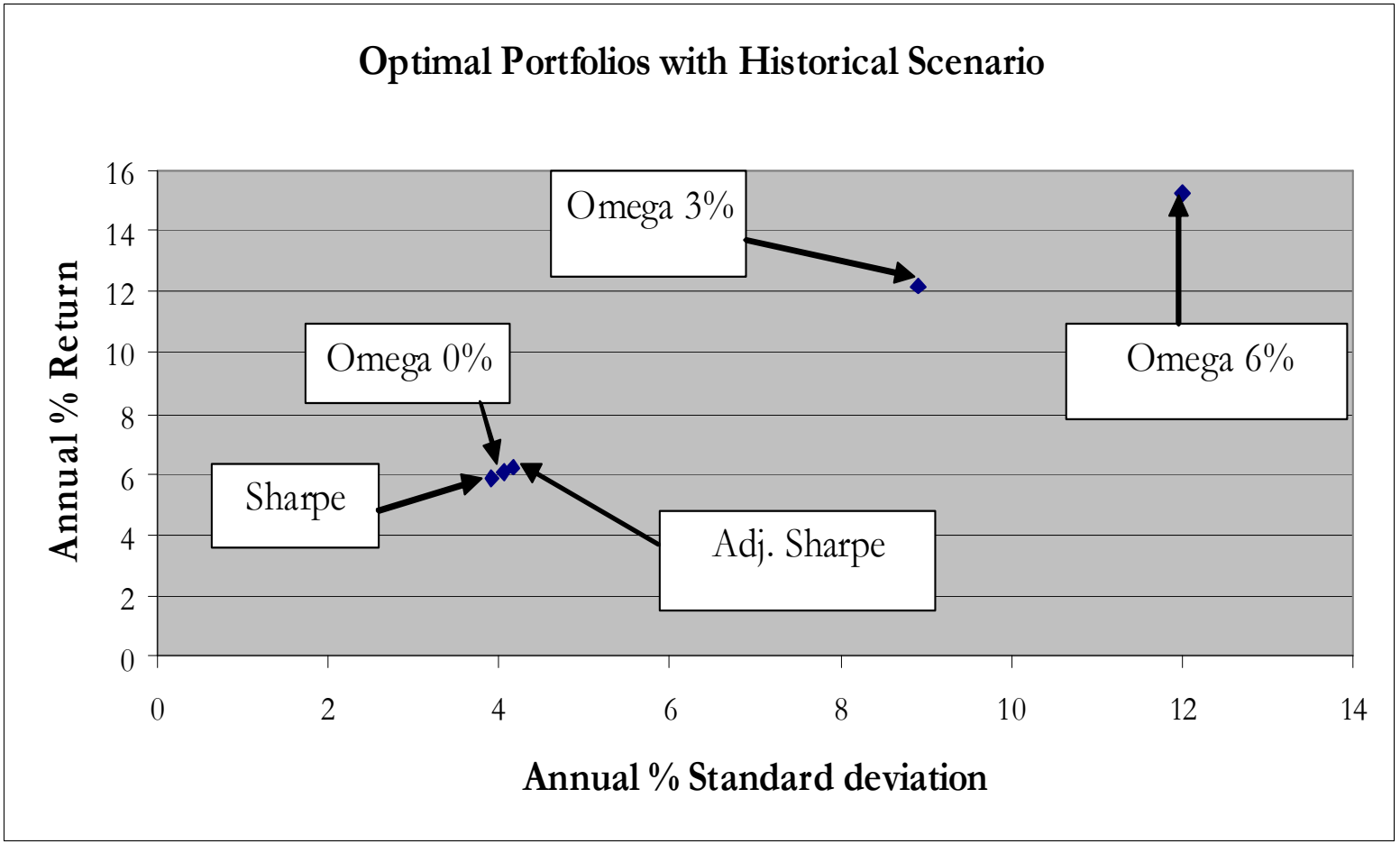
| BL Posterior Return | Equity | Bond | Volatility | Commod | IHF | FoHF |
|---|---|---|---|---|---|---|
| Q1 - FoHF 5% : IHF 3% | 7.24% | 0.37% | -19.55% | 2.57% | 2.06% | 3.57% |
| Q2 - FoHF 4% : IHF 2% | 6.02% | 0.27% | -15.85% | 1.79% | 1.53% | 2.76% |
| Q3 - FoHF 3% : IHF 1% | 4.81% | 0.18% | -12.14% | 1.02% | 0.99% | 1.94% |
| Q4 - FoHF 2% : IHF 0% | 3.59% | 0.08% | -8.44% | 0.25% | 0.45% | 1.13% |
| Q6 - FoHF 1% : IHF 0% | 3.22% | 0.05% | -7.06% | 0.01% | 0.33% | 0.71% |
| Q7 - FoHF 0% : IHF 0% | 2.86% | 0.02% | -5.68% | -0.22% | 0.21% | 0.29% |

| BL Parameters | Equity | Bond | Volatility | Commod | IHF | FoHF |
|---|---|---|---|---|---|---|
| Equilibrium returns | 3.64% | 0.09% | -8.13% | 0.27% | 0.54% | 0.69% |
| Posterior Volatility | 16.58% | 3.01% | 63.37% | 10.98% | 3.85% | 6.98% |

# Optimal Allocations - Historical

| Allocations | Equity | Bond | Volatility | Commod | IHF | FoHF |
|---|---|---|---|---|---|---|
| Omega (0%) | 37.94% | 45.52% | 2.70% | 13.84% | 0.00% | 0.00% |
| Omega (3%) | 71.46% | -10.00% | 0.33% | 38.21% | 0.00% | 0.00% |
| Omega (6%) | 78.39% | -10.00% | -10.00% | 41.61% | 0.00% | 0.00% |
| Adj. Sharpe | 37.03% | 43.30% | 2.44% | 17.23% | 0.00% | 0.00% |
| Sharpe | 34.25% | 46.07% | 2.70% | 16.97% | 0.00% | 0.00% |

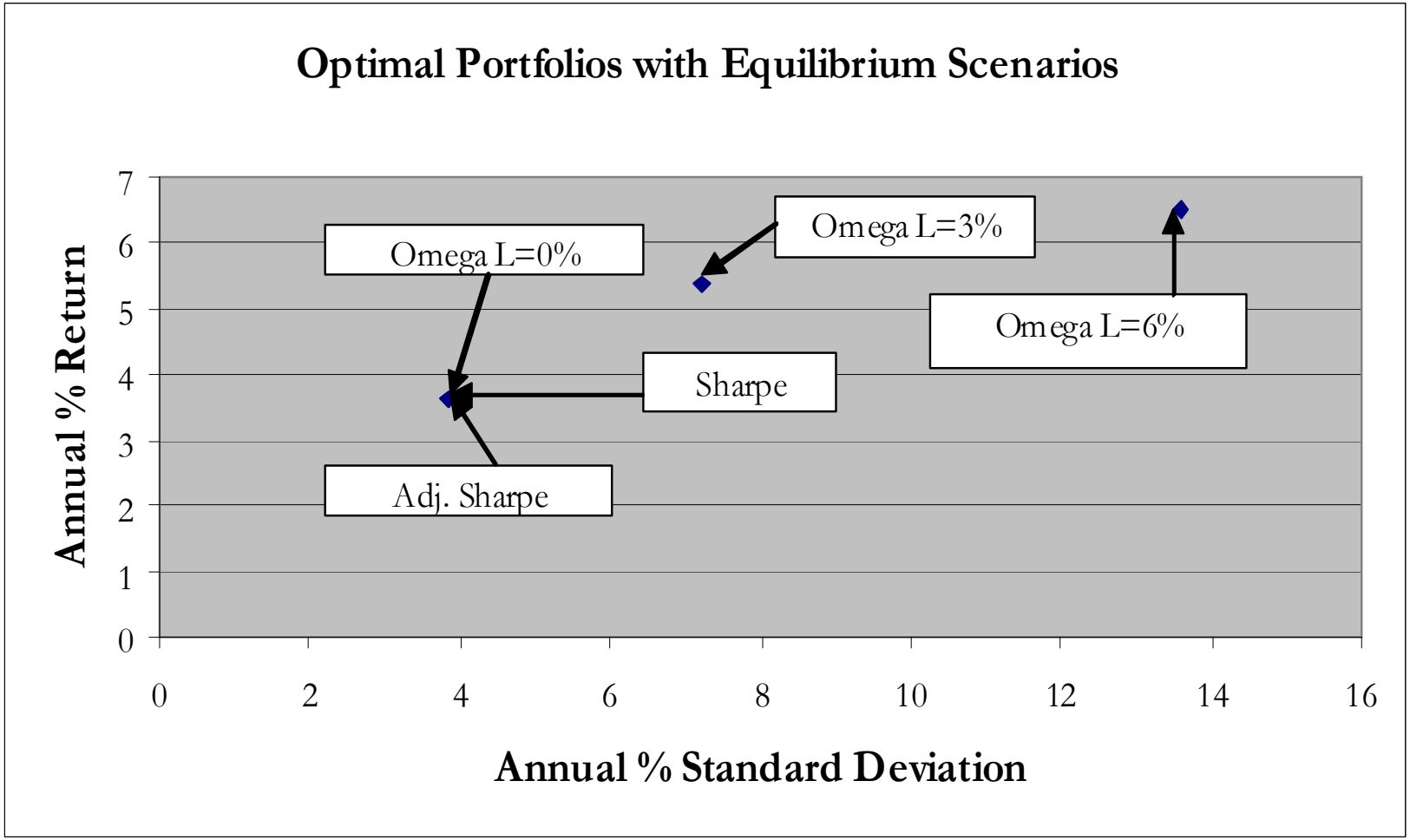
# Optimal Portfolios - Historical



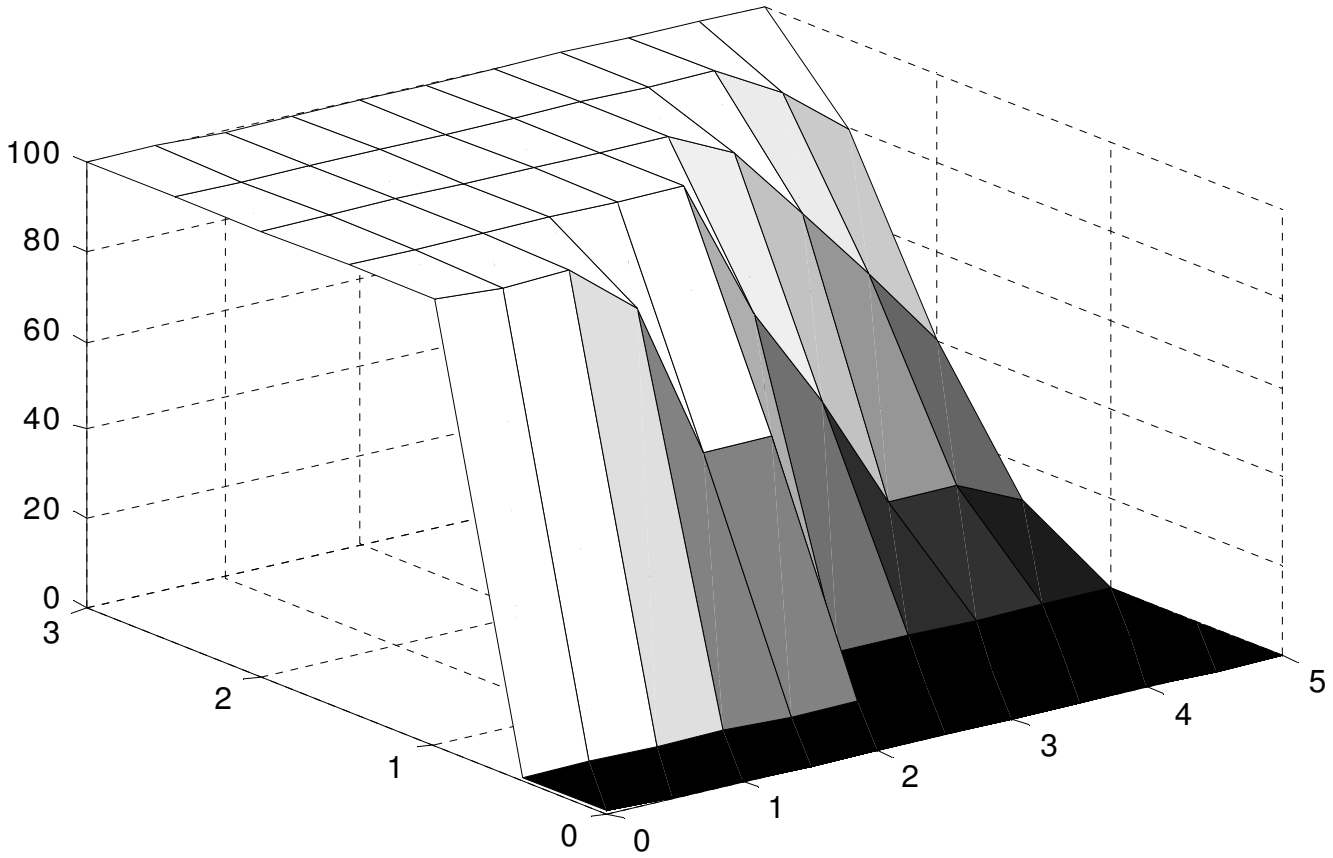
# Optimal Allocations - Equilibrium

| Allocations | Equity | Bond | Volatility | Commod | IHF | FoHF |
|---|---|---|---|---|---|---|
| Omega (0%) | -6.97% | -10.00% | 1.59% | -10.00% | 100.00% | 25.38% |
| Omega (3%) | -10.00% | -10.00% | -2.58% | -10.00% | 32.58% | 100.00% |
| Omega (6%) | 30.00% | -10.00% | -10.00% | -10.00% | 0.00% | 100.00% |
| Adj. Sharpe | -7.09% | -10.00% | 1.61% | -10.00% | 100.00% | 25.48% |
| Sharpe | -6.74% | -10.00% | 1.58% | -10.00% | 100.00% | 25.16% |

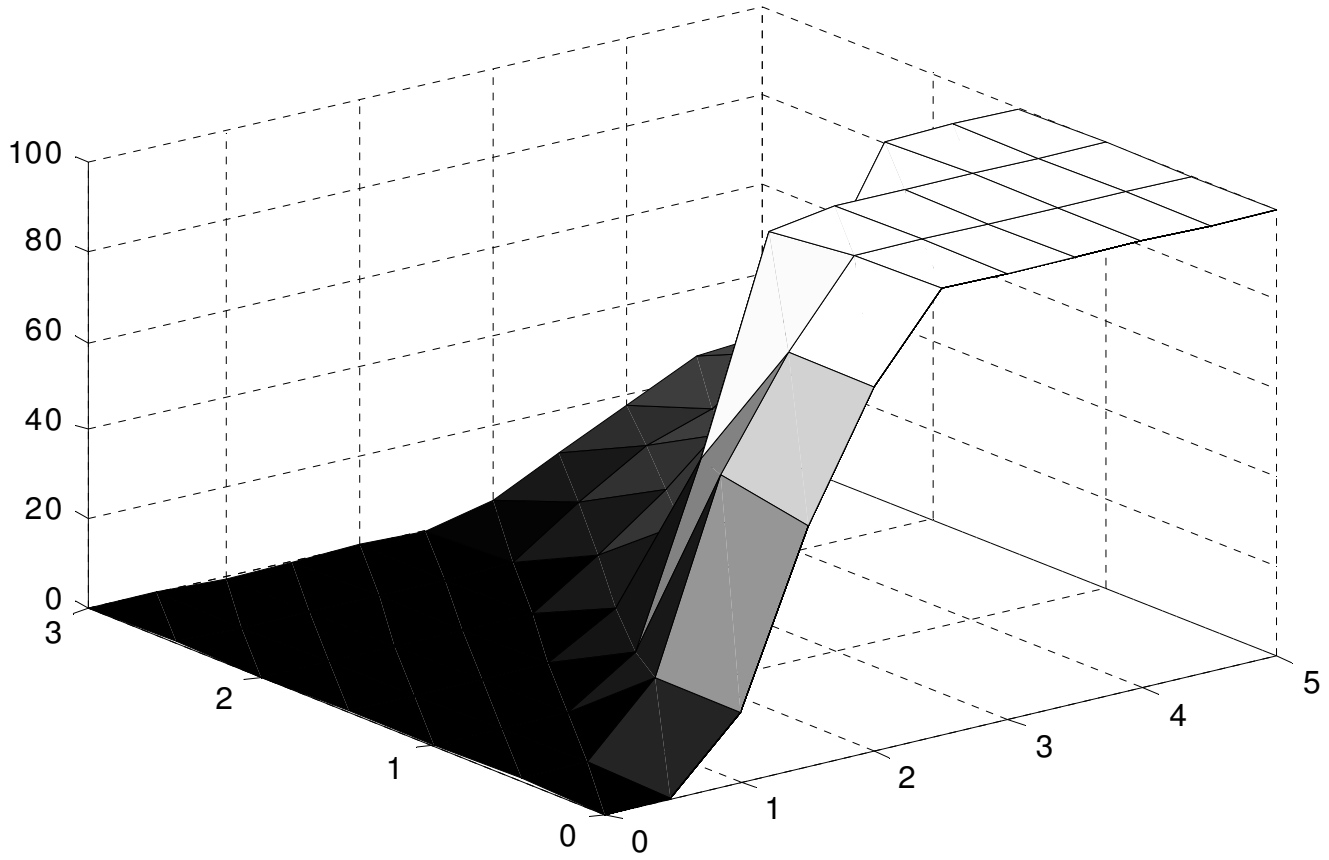
# Optimal Portfolios - Equilibrium



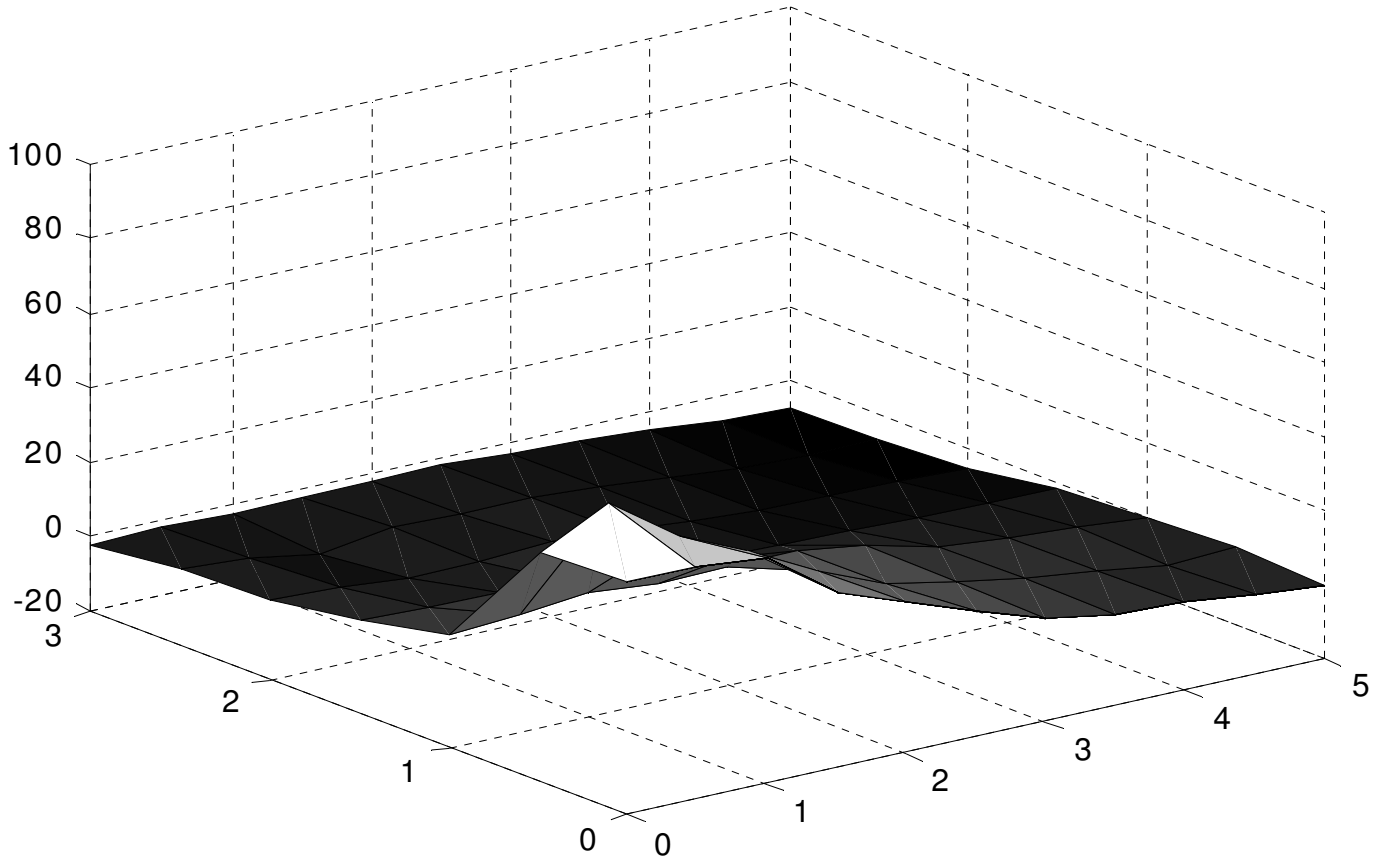
# Det. Scenarios - IHF



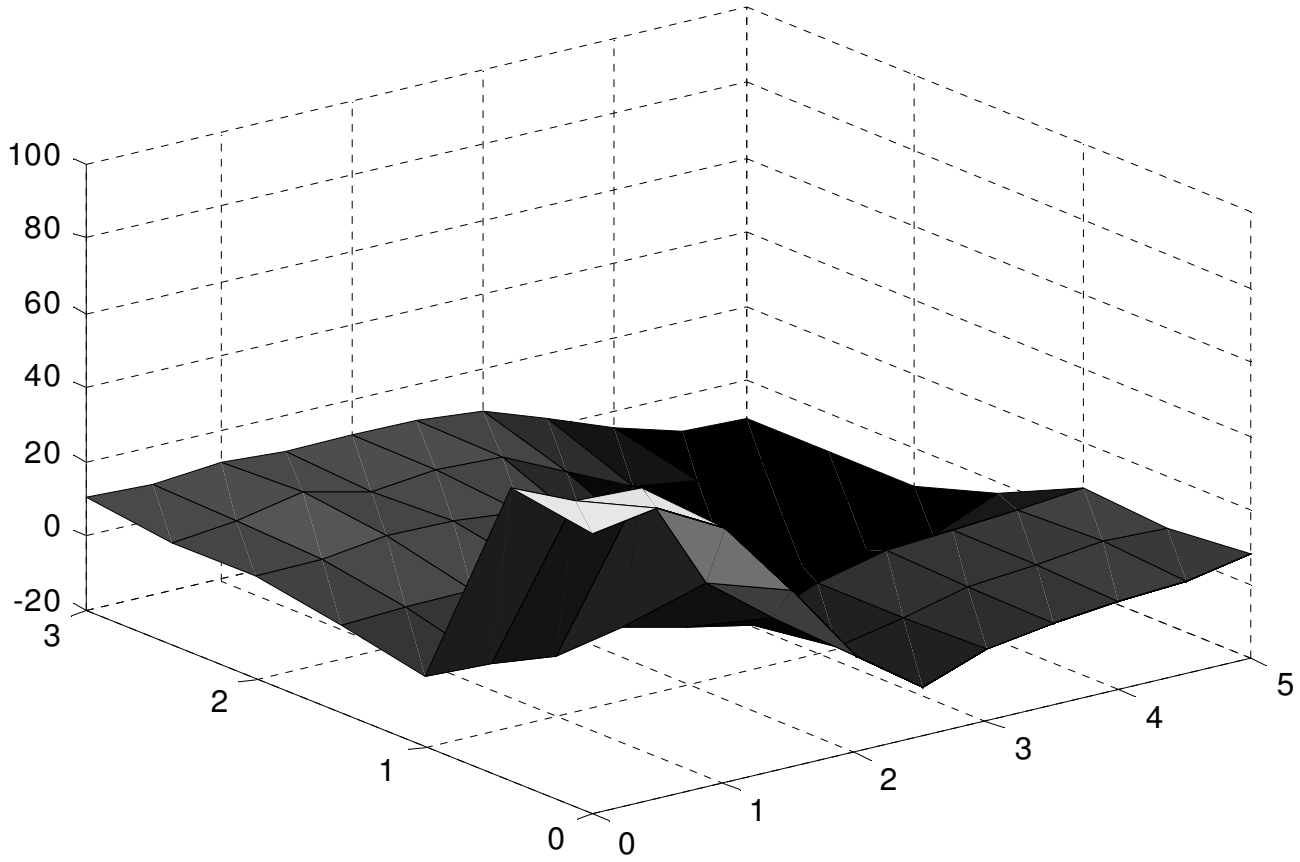
# Det. Scenarios - FoHF



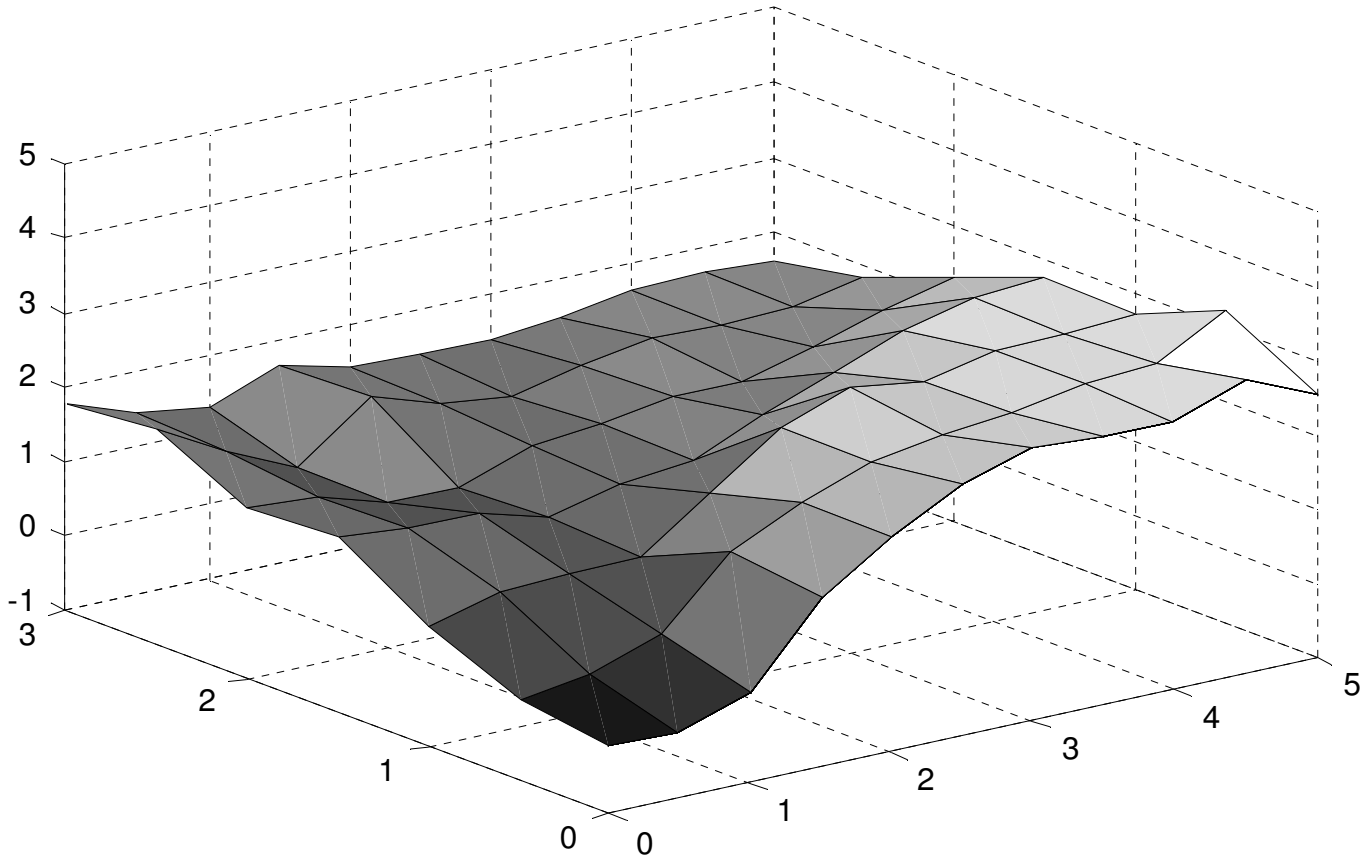
# Det. Scenarios - Equity



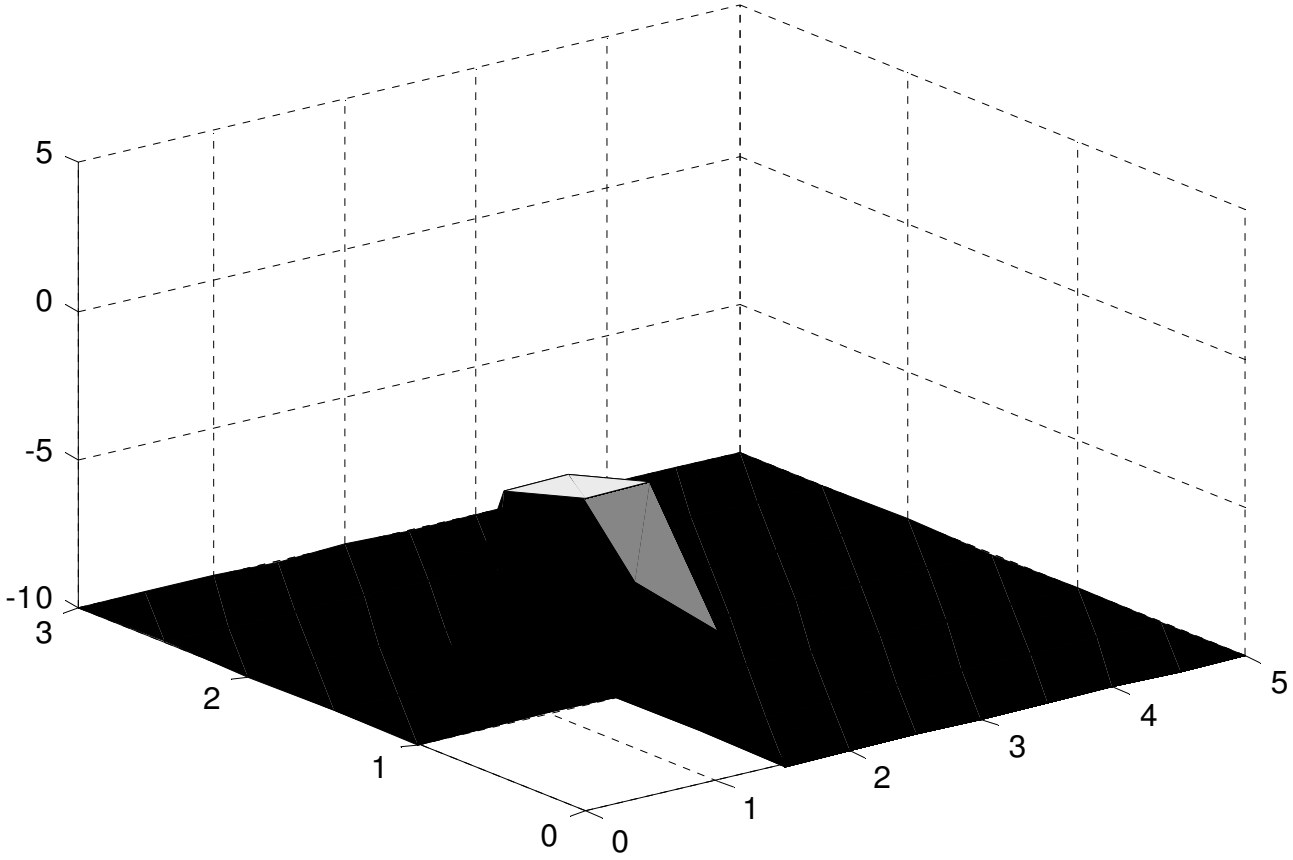
# Det. Scenarios - Bonds



# Det. Scenarios - Volatility



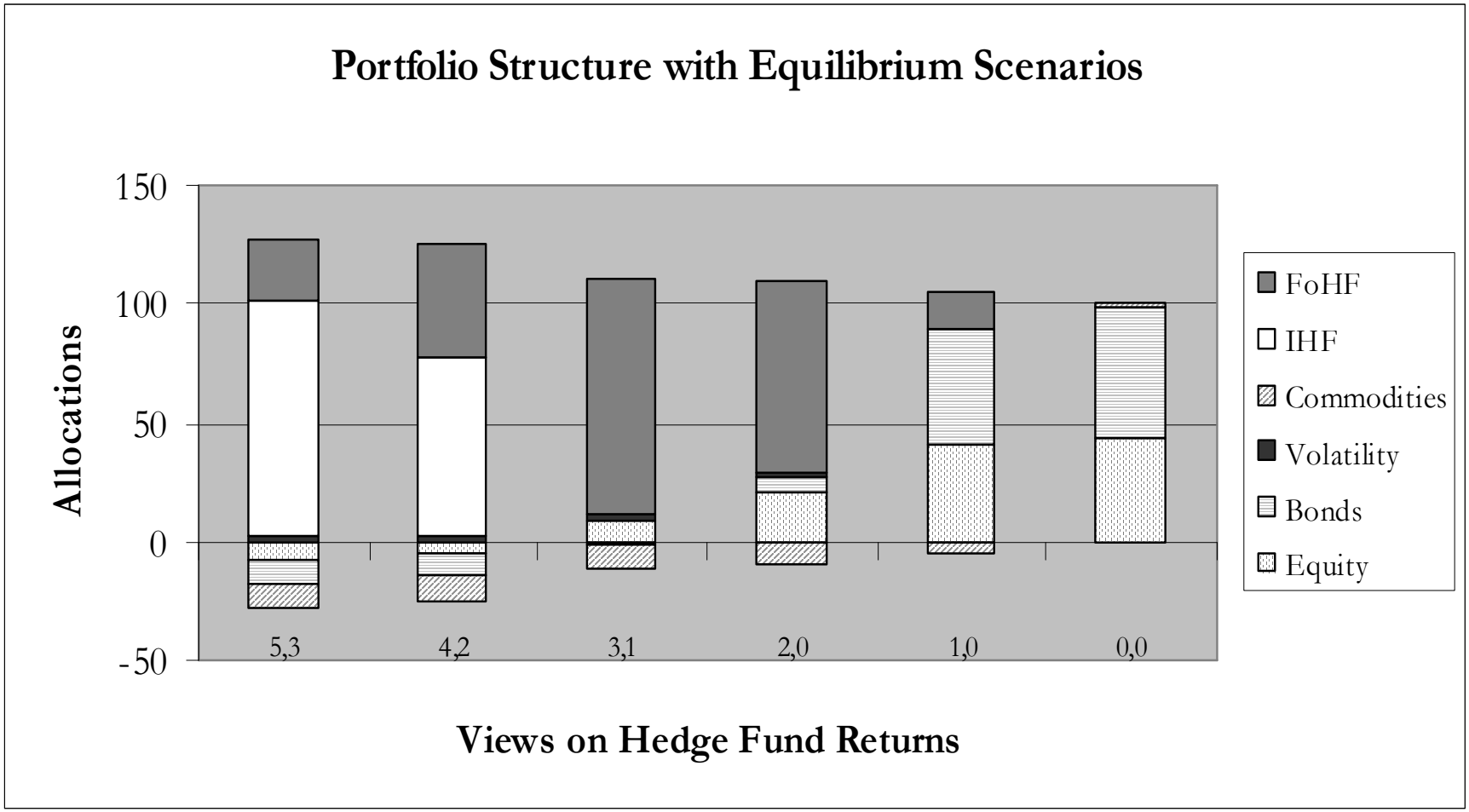
# Det. Scenarios - Commodity



# Det. Scenarios - Diagonal

| Scenarios\Allocations | Equity | Bonds | Volatility | Commodities | IHF | FoHF |
|---|---|---|---|---|---|---|
| FoHF 5% : IHFI 3% | -7.82 | -10.00 | 1.60 | -10.00 | 100.00 | 26.2 |
| FoHF 4% : IHFI 2% | -4.63 | -10.00 | 1.79 | -10.00 | 75.75 | 47.09 |
| FoHF 3% : IHFI 1% | 8.77 | -1.35 | 2.57 | -10.00 | 0.01 | 100.00 |
| FoHF 2% : IHFI 0% | 20.73 | 6.10 | 1.89 | -9.99 | 0.00 | 81.28 |
| FoHF 1% : IHFI 0% | 40.89 | 48.53 | 0.21 | -4.97 | 0.00 | 15.34 |
| FoHF 0% : IHFI 0% | 43.26 | 56.16 | -0.05 | 0.63 | 0.00 | 0.00 |

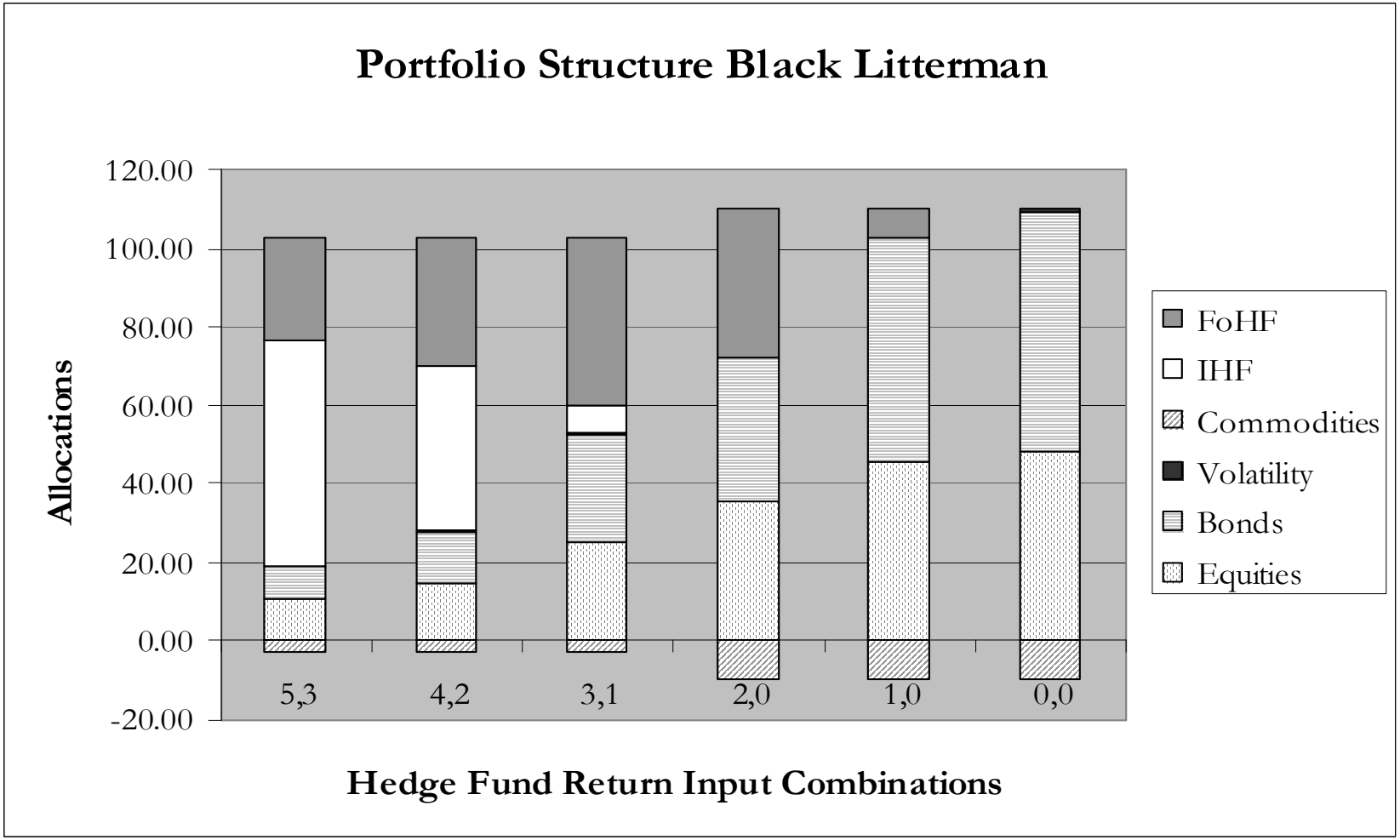
# Det. Scenarios - Diagonal



# Black-Litterman Scenarios

| Allocations | Equity | Bond | Volatility | Commod | IHF | FoHF |
|---|---|---|---|---|---|---|
| FoHF 5% : IHF 3% | 10.69% | 7.94% | 0.16% | -2.40% | 58.08% | 25.53% |
| FoHF 4% : IHF 2% | 14.85% | 13.19% | 0.14% | -2.43% | 41.96% | 32.29% |
| FoHF 3% : IHF 1% | 25.23% | 27.48% | 0.30% | -2.79% | 7.08% | 42.70% |
| FoHF 2% : IHF 0% | 35.47% | 36.56% | 0.30% | -10.00% | 0.00% | 37.67% |
| FoHF 1% : IHF 0% | 45.94% | 56.43% | 0.11% | -10.00% | 0.00% | 7.52% |
| FoHF 0% : IHF 0% | 48.17% | 61.01% | 0.82% | -10.00% | 0.00% | 0.00% |

# Black-Litterman Scenarios



# BL Scenarios - Performance

| Performance | PF. Retn | PF. Std | Skew | Xkurt. | Sharpe | ASR | Omega |
|---|---|---|---|---|---|---|---|
| FoHF 5% : IHF 3% | 2.82% | 4.80% | 0.11 | -0.14 | 0.59 | 0.62 | 0.19 |
| FoHF 4% : IHF 2% | 2.39% | 5.23% | 0.12 | -0.13 | 0.46 | 0.47 | 0.18 |
| FoHF 3% : IHF 1% | 2.10% | 6.21% | 0.17 | -0.07 | 0.34 | 0.35 | 0.21 |
| FoHF 2% : IHF 0% | 1.68% | 7.19% | 0.24 | 0.06 | 0.23 | 0.24 | 0.23 |
| FoHF 1% : IHF 0% | 1.55% | 7.73% | 0.33 | 0.16 | 0.20 | 0.20 | 0.24 |
| FoHF 0% : IHF 0% | 1.37% | 7.63% | 0.37 | 0.21 | 0.18 | 0.18 | 0.23 |

# Empirical Conclusions

- **Both IHF and FoHF proxies should play an important role in enhancing passive bond/equity portfolios, if we think that their expected excess returns are of the order of 1% or more**
- **The IHF proxy has lower volatility $\Rightarrow$ preferred by conservative investors. FoHF may be preferred by investors with larger risk appetite**
- **Long volatility positions are also likely to be valuable; they are already in with unrealistically low expected returns**
- **Commodities tend to be cyclical, on the basis of current small expected returns, they should rather be shorted, but investors must rely on their personal views**

# Methodological Conclusions

- **Historical Scenarios are naïve**
  - Produce extreme allocations
  - Unstable to small changes in parameters
- **Equilibrium + Deterministic Scenarios**
  - Better starting point
  - But still unstability to scenario changes
- **Black-Litterman Equilibrium + Uncertain scenarios**
  - More logical
  - More stable
  - Need to develop experience in assigning uncertainties

# Key References


- Amin, G., & Kat, H. (2003). Stocks, Bonds and Hedge Funds: No Free Lunch! *Journal of Portfolio Management, 29*(4), 113-120.
- Black, F., & Litterman, R.. (1992). Global Portfolio Optimization *Financial Analyst Journal,* Sep/Oct; *48, 5, 28-43.*
- Brooks, C., & Kat, H. (2002). The Statistical Properties of Hedge Fund Index Returns and their implications for Investors. *The Journal of Alternative Investments, Fall*, 26-44.
- Drobetz, W.(2001), "How to avoid the Pitfalls in portfolio Optimization? Putting the Black-Litterman Approach at Work", Financial Markets and portfolio Management", 15, 1, 59-75.
- Fung, W., & Hseih, D. (1997). Empirical Characteristics of Dynamic Trading Strategies: The Case of Hedge Funds. *The Review of Financial Studies, 10*(2), 275-302.
- Litterman, R., & He, G. (1999). *The Intuition Behind Black-Litterman Model Portfolios* Unpublished manuscript, New York.

# Methodological Conclusions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