



Markowitz was Wrong!*

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 **R-Squared Risk Management**

What is the Use of Risk Management?

- Every investment firm pays lip service to “Risk Management”
- In practice, this often means producing (and filing) monthly tracking error reports
- The Risk team is usually in the same department as the Performance team, suggesting that Risk Analysis is viewed as an ex post activity

Not quite what Markowitz meant?

- Markowitz' idea was that **FUND MANAGERS** should take Risk into account *ex ante* when rebalancing their portfolios
- His (Nobel Prize winning) idea was that Expected Returns should be traded off against Risk in a portfolio optimisation
- In practice, this turns out to be so hard that very few managers actually do this

Why Bother? 'Alpha' is what matters!

- Besides, Risk is dull and boring . . . the real excitement lies in Returns!
- ALPHA - the most abused term in Finance
- Market Efficiency for Active Managers -
 - Why is it so hard to demonstrate statistically that managers actually have any Skill?
- Optimisation pitfalls ...

Portfolio Investment Revisited

- In this talk, we will take a different look at the notion of trading off Expected Return against Risk
- We will show how Risk Management can be turned into Return Enhancement
- We will also be quite rude about a number of widely-accepted investment practices

“Return is Good, Risk is Bad”?

- The best way to manage equity portfolios is to maximise expected return while minimising risk
- The Finance textbooks teach us to do this by maximising Utility, usually defined as:-

$$\text{MaxU} = \mathbf{R}_p - \lambda \mathbf{V}_p \quad \text{s.t.} \quad \sum \mathbf{x}_i = 1$$

A Little More Detail

- We can expand this expression to see where portfolio return and risk are coming from

- For return, we have :-
$$R_{Pt} = \sum_i^N x_i R_{it}$$

- And for risk, we have :-
$$V_P = \sum_i^N \sum_j^N x_i x_j C_{ij}$$

Practical Critique

- In this simple world, managers have an Expected Return for each stock, a full covariance matrix from somewhere(?), and an optimiser
- All return is regarded as equally attractive and all risk is regarded as equally bad
- The manager simply optimises the portfolio to maximise return and minimise risk (subject to the usual well-known limitations of optimisers)

A Different Perspective

- However, these days most active managers use multi-factor models of return to help them pick stocks and build their portfolios
- In these (sometimes implicit) models, stock return consists of a number of factor-related components, plus a stock alpha
- Typically, managers use both the factor exposures and the alpha to select stocks

A Multi-factor Model of Stock Return

$$R_{it} = \sum_{f=1}^K \beta_{if} R_{ft} + \alpha_{it}$$

Multi-Factor Portfolio Return and Risk

$$R_{Pt} = \sum_{f=1}^K \beta_{Pf} R_{ft} + \alpha_{Pt}$$

$$V_P = \sum_{f=1}^K \sum_{g=1}^K \beta_{Pf} \beta_{Pg} C_{fg} + RSD_P^2$$

Stock Selection

- Managers typically use a relatively small number of criteria to select stocks
- These might include Value, Growth, Size, Momentum or Size characteristics, as well as Country or Industry membership
- All of these are common factors
- Stocks might also be chosen for stock specific reasons (Alpha)

The Number of Factors

- A Risk Model is only useful if it captures all the common factors at work in a portfolio
- For this reason, Risk Models typically have up to 50 factors in them
- However, Stock Selection models only need to forecast a relatively small part of return for them to be able to outperform
- Such models typically have 6 to 10 factors

Deliberate vs Incidental Bets

- Note, however, that stocks selected for their exposure to return-generating factors will also have exposures to other factors - as will the portfolio itself
- A portfolio built using a multi-factor stock selection model will therefore contain several large Deliberate factor bets and a lot of (probably) smaller Incidental factor bets, as well as some Stock Specific risk

Skill vs. Noise (a.k.a. Luck!)

- The manager's **Skill** is represented by the portfolio returns due to its exposure to the Deliberate factor bets plus any stock Alpha
- Unfortunately, the **Skill** returns are often dominated by those due to **Noise (Good or Bad Luck)** from the Incidental factor bets

Not All Risk is Bad

- If we select stocks this way, then it is clear that not all risk is equally bad
- The portfolio has deliberate exposures to certain factors in order to capture an Expected Return, or Risk Premium
- What we actually want to do is to minimise the **UNWANTED** bets

Efficient Portfolios

- Ideally, we would want to ensure that the Expected Returns from the portfolio's exposure to each factor was matched against its contribution to portfolio risk
- An efficient portfolio is one in which each unit of risk is compensated for by a unit of Expected Return
 - scaled by the Risk Aversion parameter

A Real Case Study

- Global Equity manager, \$1.8bn fund
- Long only, between 15 to 25 holdings
- Mostly Developed Market stocks
- Small number of Emerging Market stocks

- Value added by stock selection (Alpha), plus a few country and global sector bets

Portfolio Historical Data

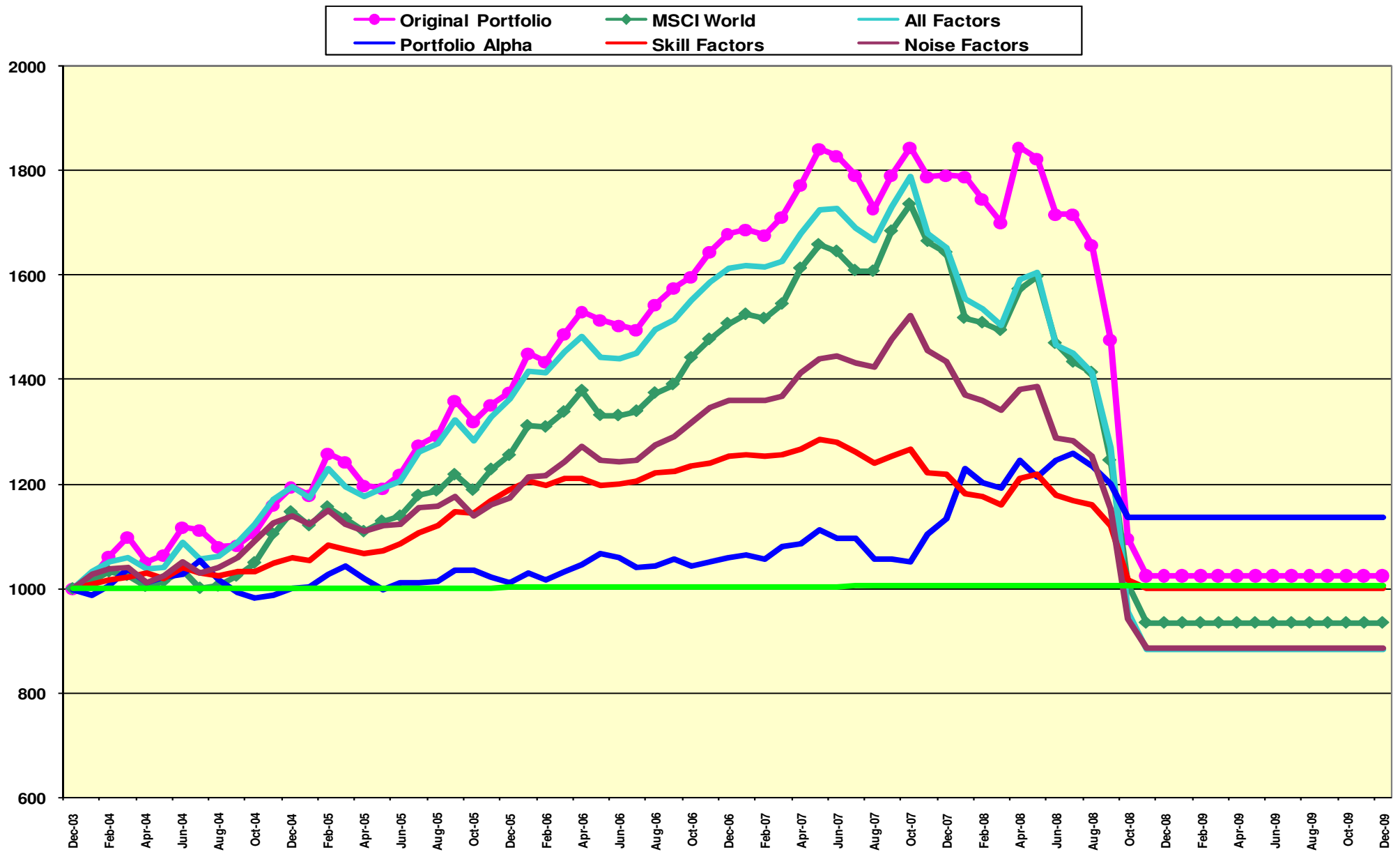
- We created Risk Management Overlays from December 2003 onwards
- This was initially a bull market for global equities, followed by a severe bear market
- We were given month-end holdings, and re-balanced the Overlay monthly

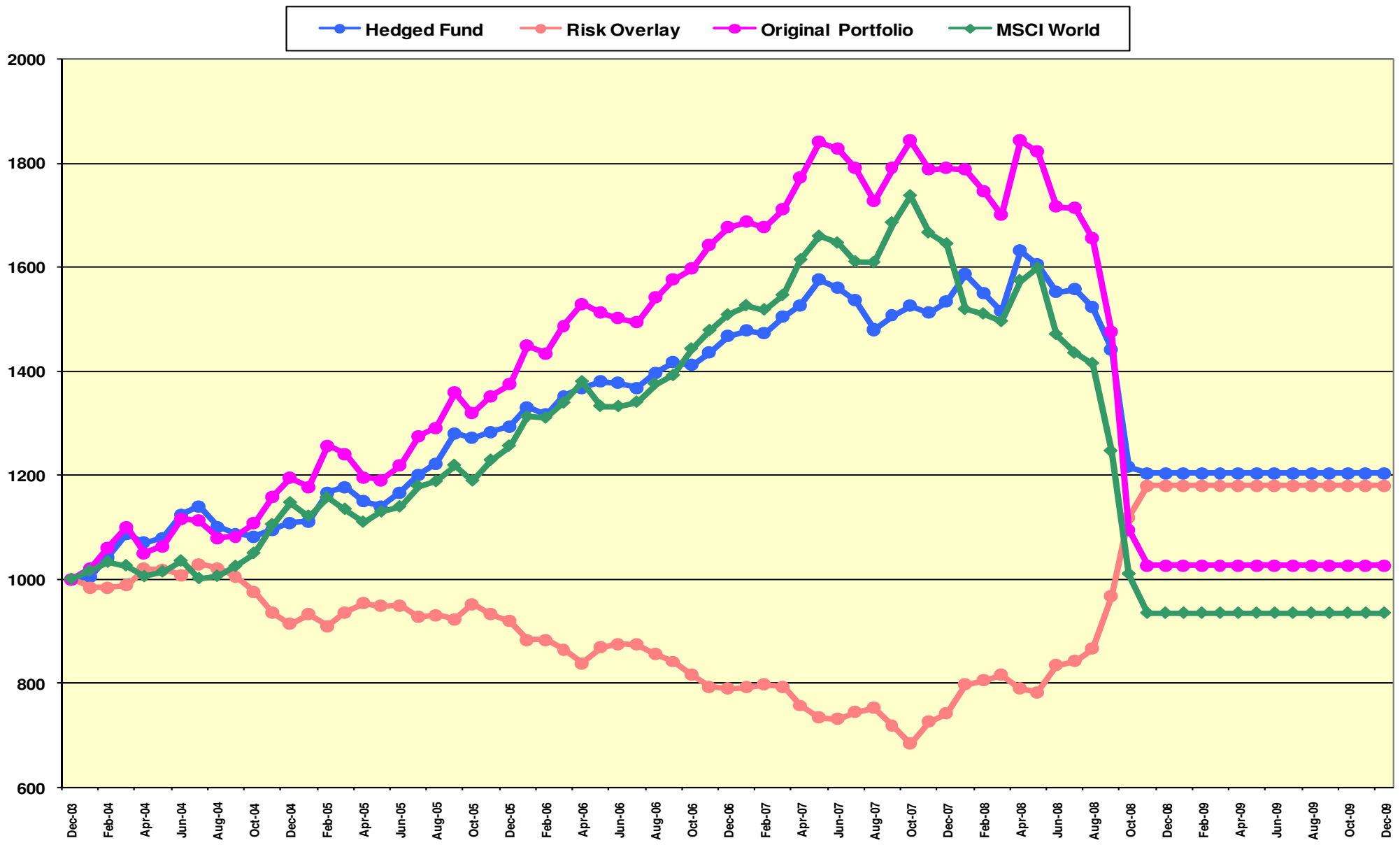
Deliberate Factor Bets

- This portfolio manager was positive on :
 - Japan from Dec 2003
 - Global Energy from Dec 2003 to Sept 2005
 - Global Healthcare from Dec 2003 to Nov 2006
 - US House-builders from July 2006
 - Global Financials from Jan 2008 to Oct 2008
- All other country, sector and currency bets were to be hedged away with the Overlay

Risk Management Overlay Process

- Run a risk analysis of the updated portfolio with the existing Overlay each month
- Optimise to rebalance the Overlay using all permissible hedge instruments
- Iteratively squeeze out the smallest trades until an acceptable solution is found
- Monitor and analyse performance

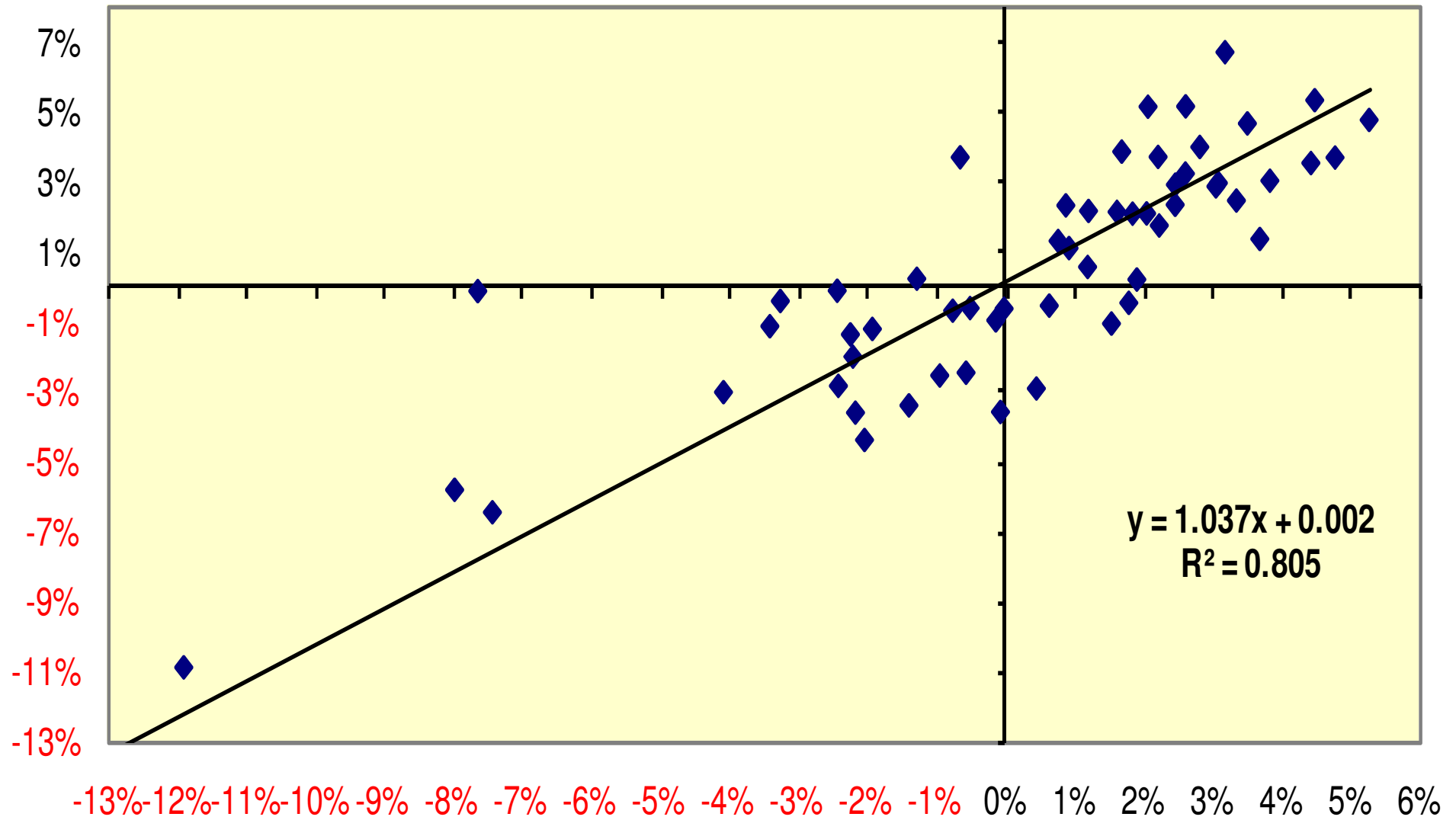




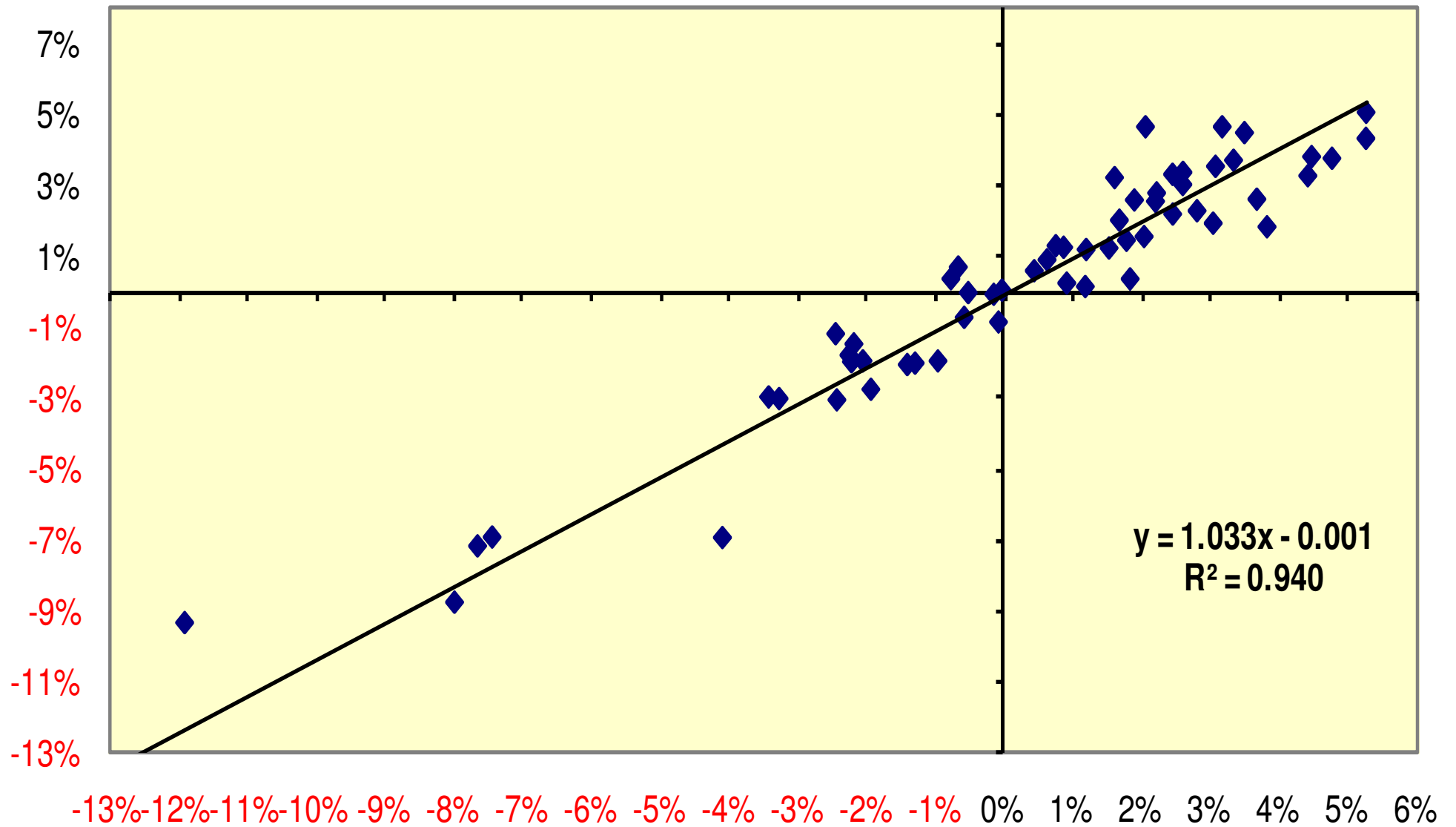
SUMMARY CHARACTERISTICS		Annualised Return	Annualised Risk	Annualised Sharpe ratio
Risk-free rate (US T-Bills)	Cash	3.40%	1.59%	
Original Portfolio	Skill + Noise	0.51%	16.87%	-0.171
Portfolio Cash returns	Skill	0.07%	0.02%	
Invested Portfolio returns	Skill + Noise	0.44%	16.88%	-0.175
All Factors	Skill + Noise	-2.28%	15.55%	
Portfolio Alpha	Skill	2.81%	6.57%	
Skill factor returns	Skill	0.33%	5.25%	
Noise factor returns	+ Noise	-2.08%	10.94%	
Risk Overlay	- Noise + Cash	2.58%	9.52%	
Hedged Fund	Original Skill	4.66%	9.73%	0.129
Return Overlay	Skill	-1.56%	9.56%	
Enhanced Fund	Enhanced Skill	2.38%	17.31%	-0.059
MSCI World	Benchmark	-1.36%	14.60%	-0.326

Relative to MSCI World	Alpha	Beta	Correlation	R-Squared
Original Portfolio	0.19%	1.037	0.897	80.5%
Portfolio Cash returns	0.01%	-0.000	-0.050	0.3%
Invested Portfolio returns	0.19%	1.037	0.897	80.5%
All Factors	-0.06%	1.033	0.970	94.0%
Portfolio Alpha	0.25%	0.004	0.008	0.0%
Skill factor returns	0.05%	0.312	0.866	75.0%
Noise factor returns	-0.11%	0.721	0.963	92.7%
Risk Overlay	0.24%	-0.634	-0.972	94.4%
Hedged Fund	0.43%	0.403	0.605	36.6%
Return Overlay	-0.08%	0.544	0.830	69.0%
Enhanced Fund	0.35%	0.947	0.799	63.8%
MSCI World	0.00%	1.000	1.000	100.0%

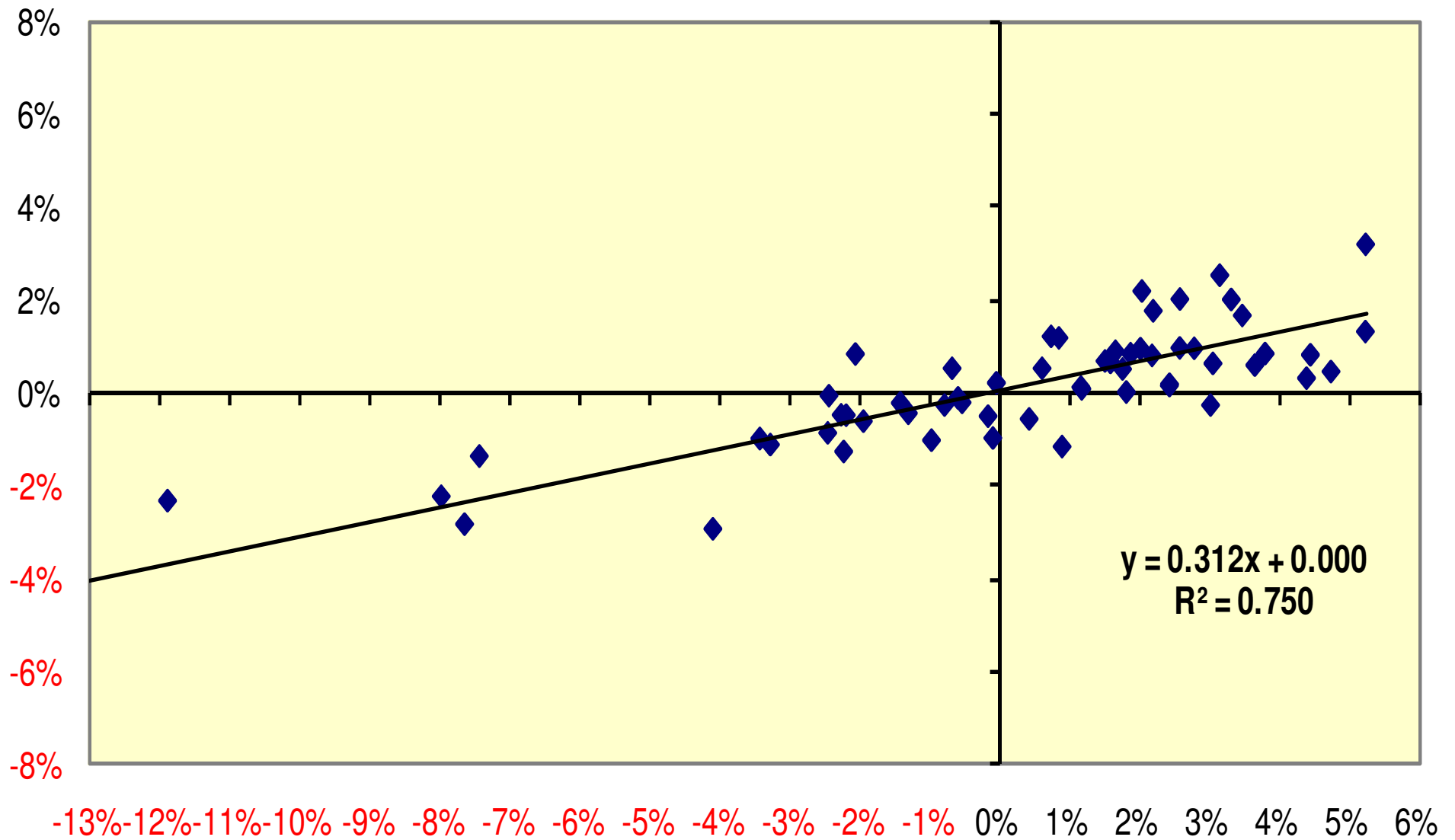
Original Portfolio returns vs. MSCI World returns



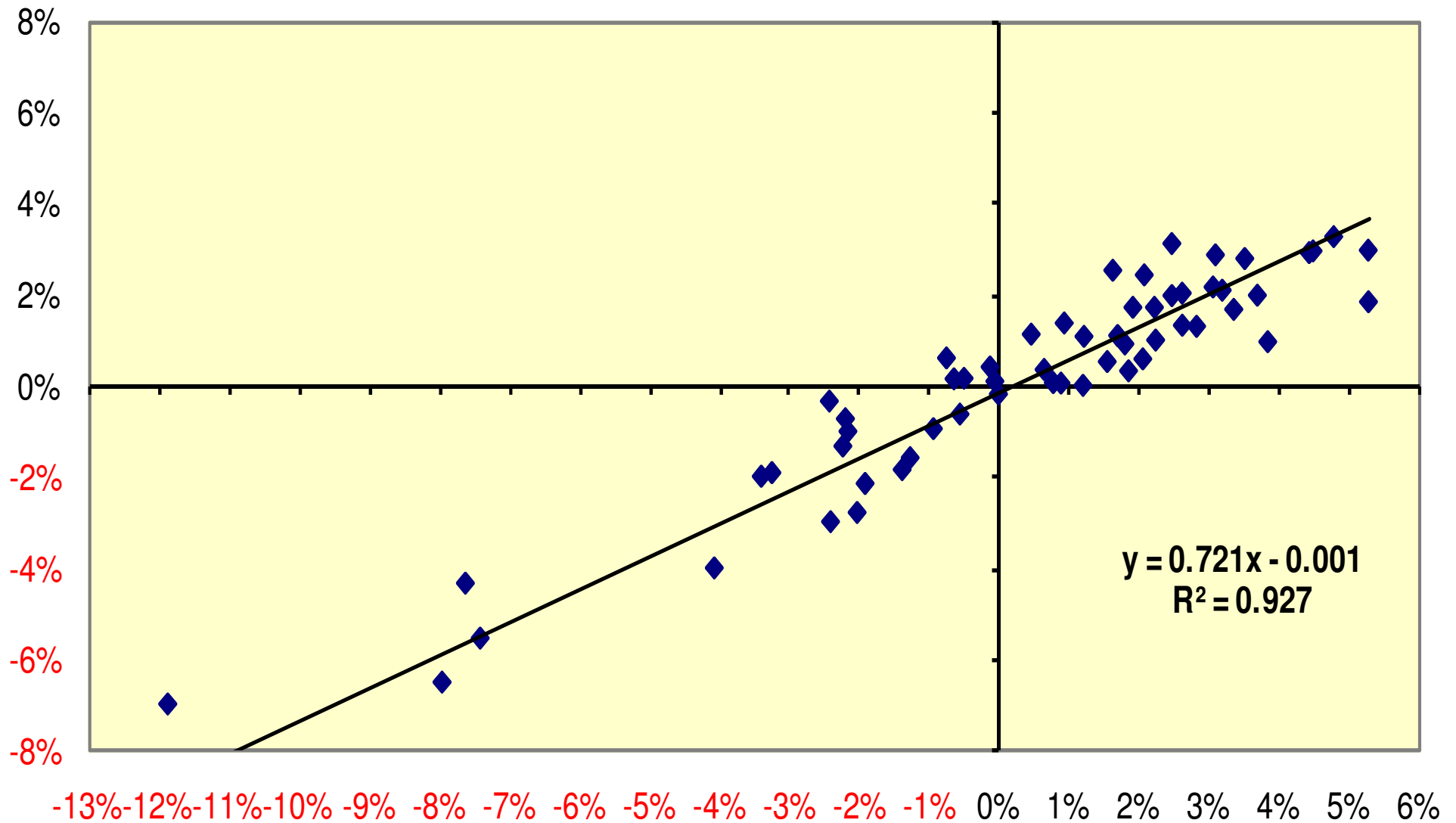
Portfolio factor returns vs. MSCI World returns



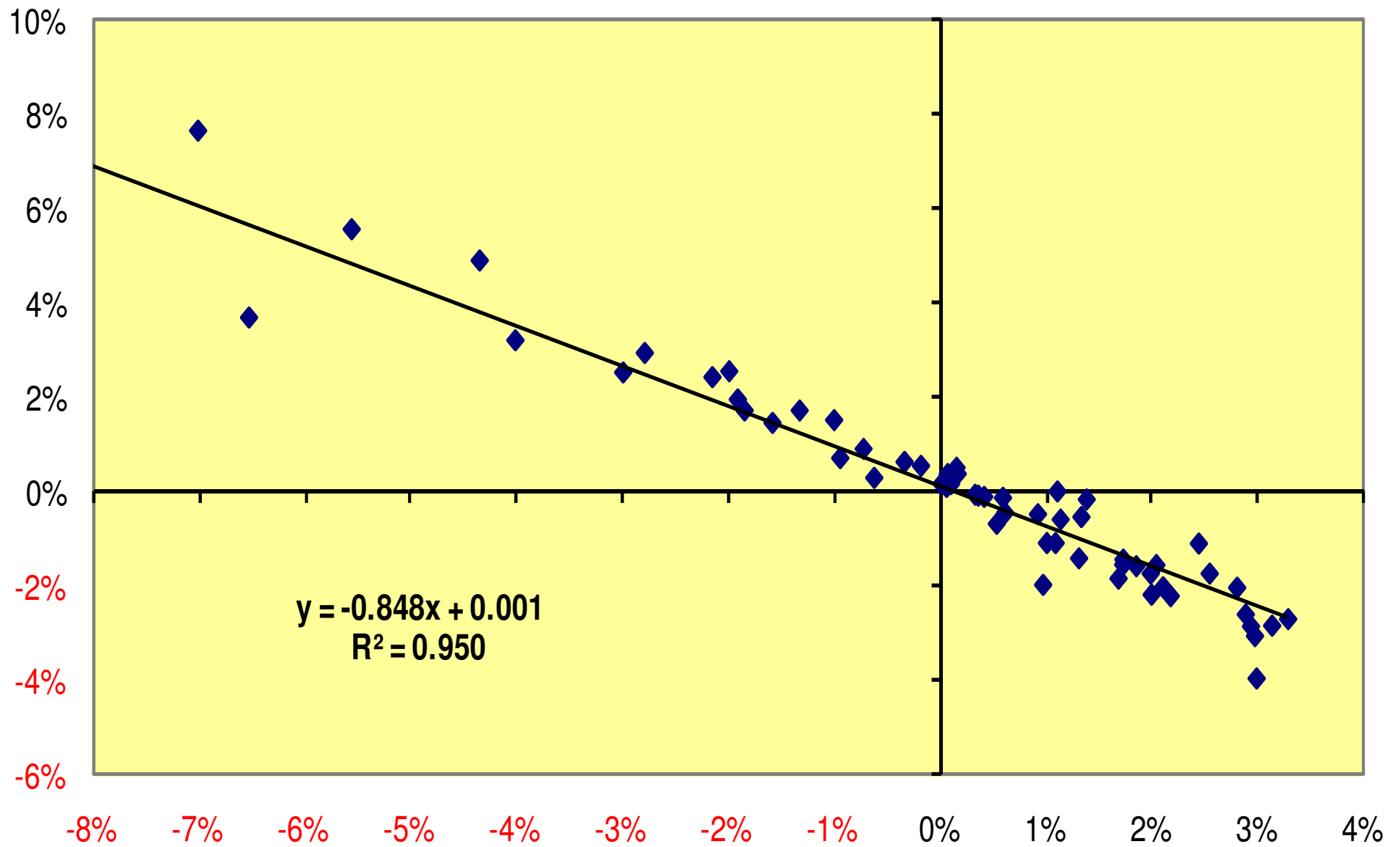
Skill factor returns vs. MSCI World returns



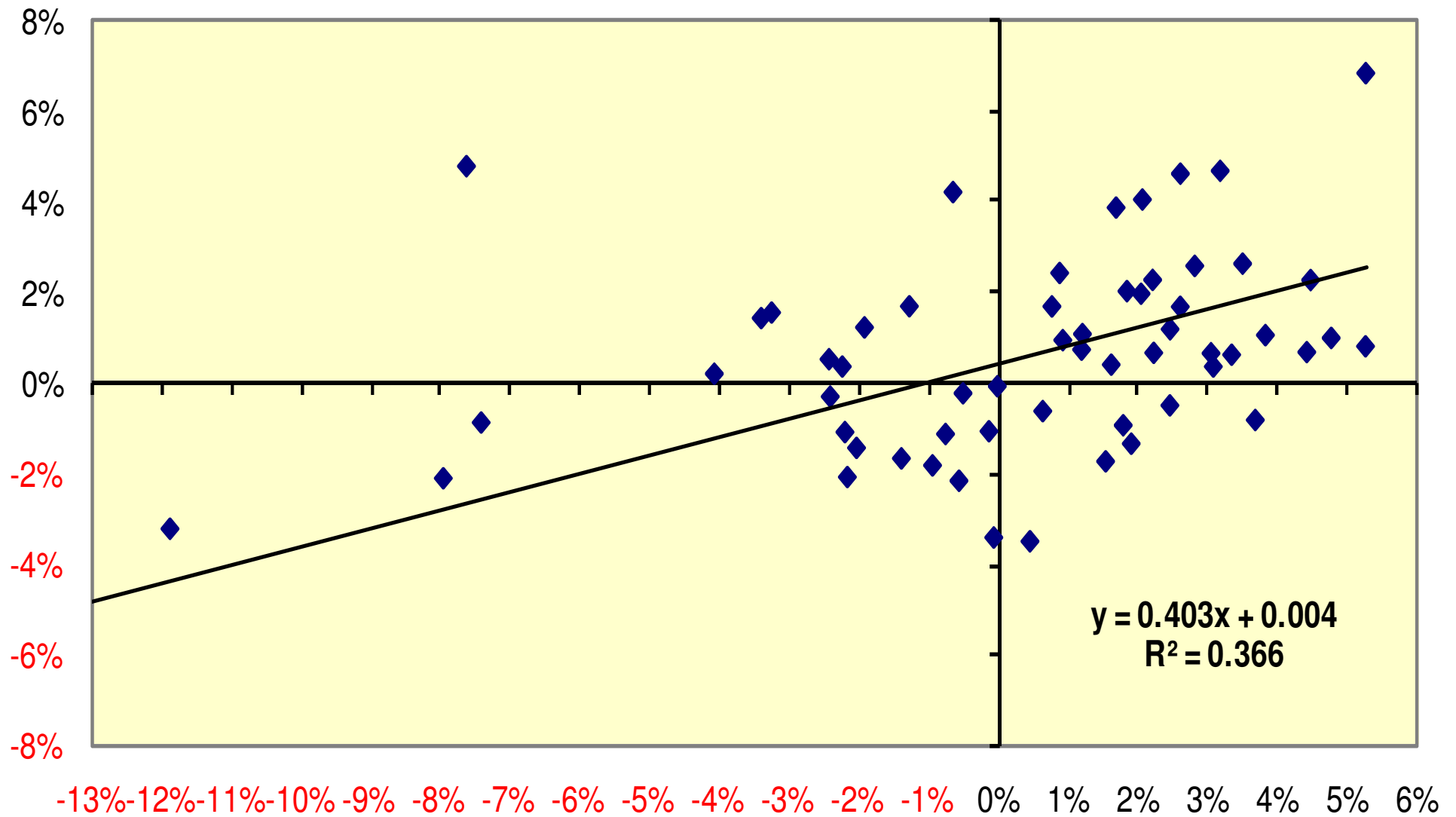
Noise factor returns vs. MSCI World returns



Risk Overlay returns vs. Noise factor returns

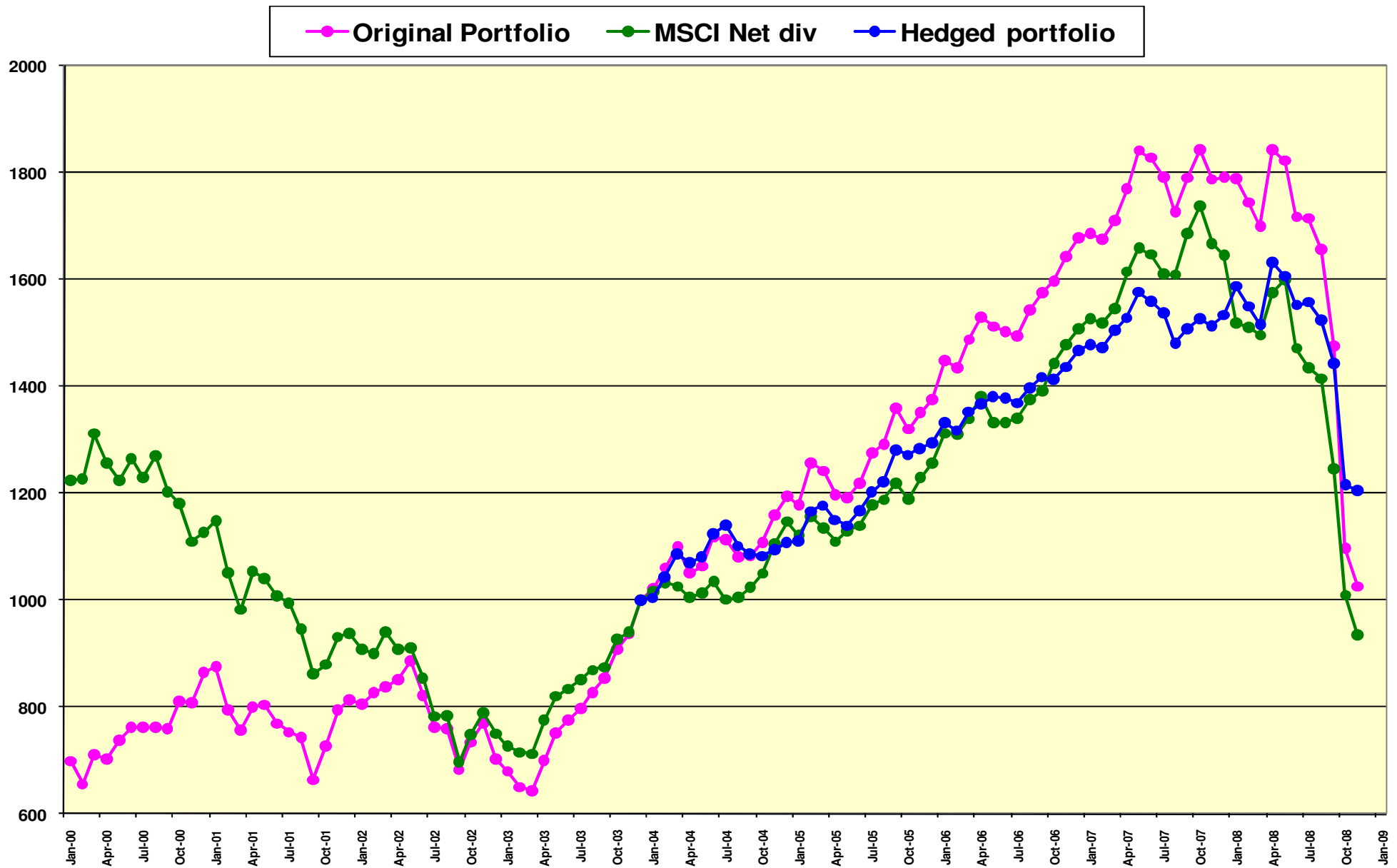


Hedged Portfolio returns vs. MSCI World returns



Comments on the Hedged Fund

- During the bull market (from Jan 2004 to May 2007) the Hedged Fund underperforms the benchmark (although it also has lower risk)
- During the bear market, it significantly outperforms the benchmark
- The Hedged Portfolio's performance now reflects the manager's Skill
- In a bull market, Noise tends to be positive
 - but it is not always that way . . .



Comments on Longer History - 1

- We were unable to extend the backtest beyond January 2004. However, . . .
- During the last nine months of 2003, the fund was up **56%** and the index was up **40%**
- During the 39 months from 31 Dec 1999 to 31 Mar 2003, the fund was only down **-8%** while the index was down **-42%**

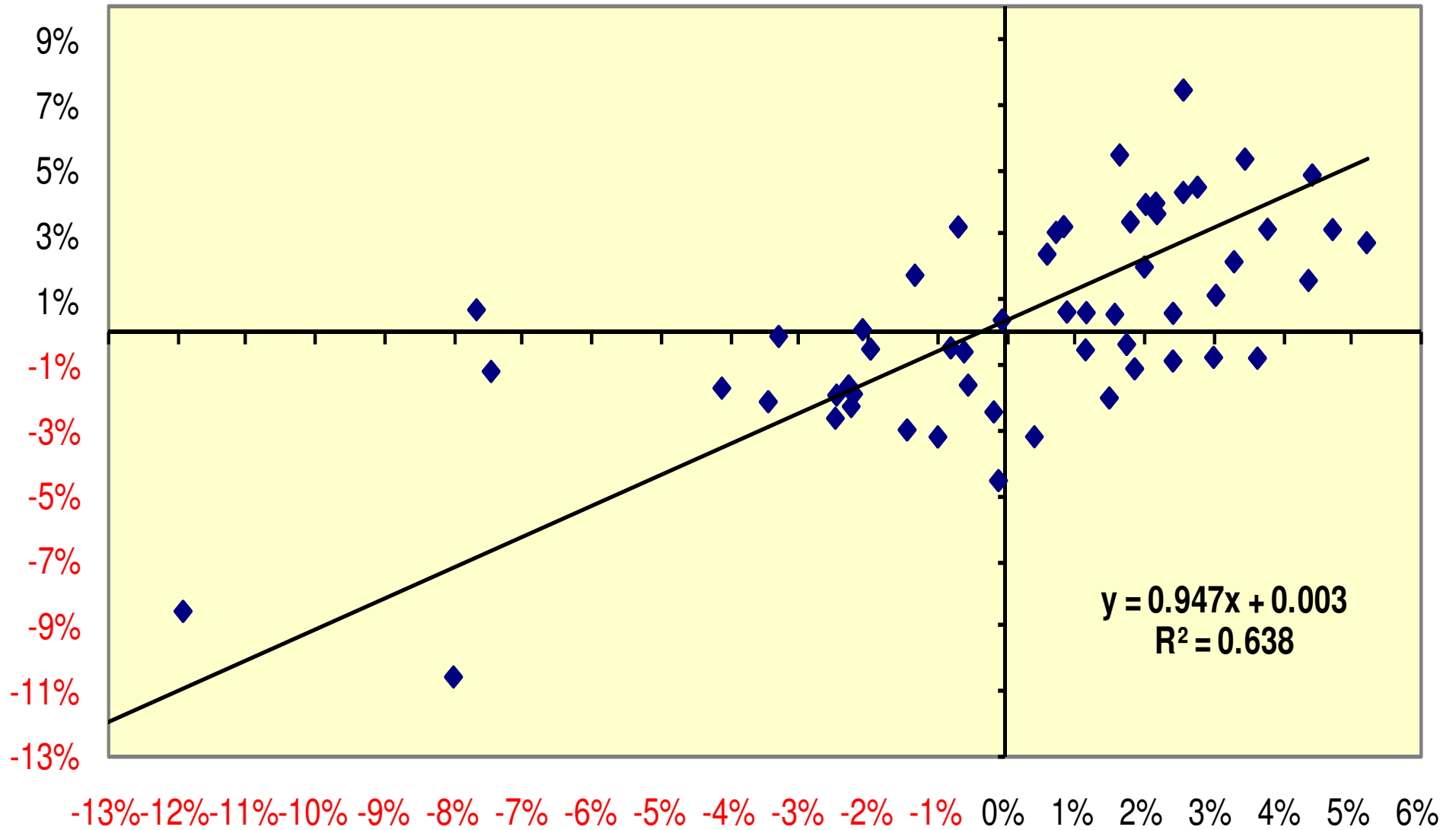
Comments on Longer History - 2

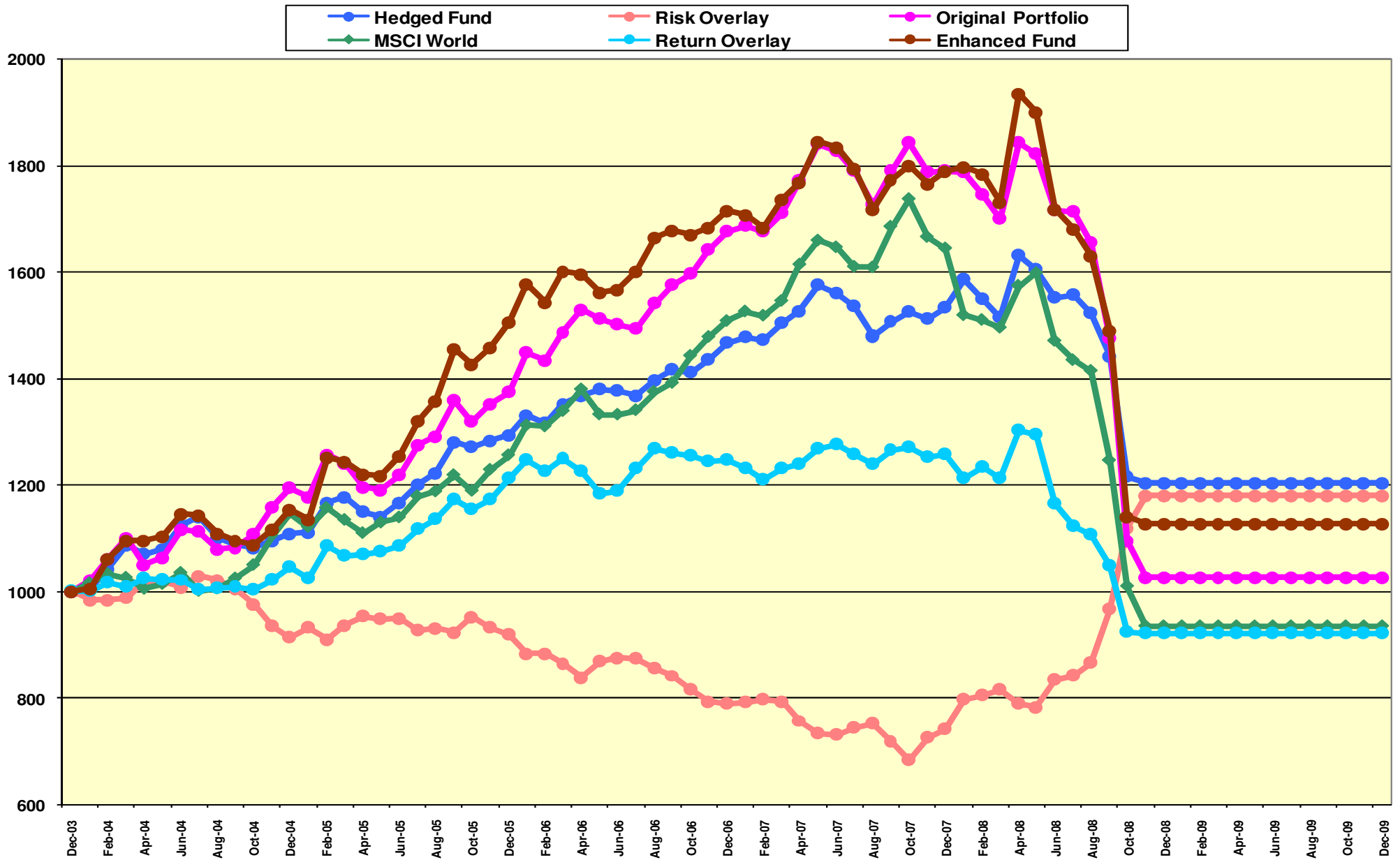
- The **Noise** returns in the last 9 month bull market of 2003 would have been positive (**Good Luck**)
- However, during the bear market over the previous 39 months, the **Noise** returns would obviously have been negative (**Bad Luck!**)
- Given the total returns, and assuming the manager has constant **Skill**, it is clear that the Hedged Portfolio would have significantly outperformed the index over this earlier period

Leveraged Skill

- So far, we have focused only on taking out the **Noise** bets
- This will reduce the risk of the portfolio
- However, if the manager was happy with the original level of risk, we can also leverage the **Skill** bets, by going long of futures and ETFs
- The result is shown on the next charts ...

Enhanced Fund returns vs. MSCI World returns





Summary - 1

- Most investors believe that few managers have real **Skill**
- It is also said that it would take a lifetime of performance data to demonstrate that a manager had statistically significant **Skill**
- In fact, the real problem is that managers' **Skill** is being obscured by **Noise (or Luck)**

Summary - 2

- It makes no sense for investors to pay fees for **Noise returns (i.e. Luck)** when they can be easily removed with Risk Management Overlays
- On the other hand, investors should be happy to pay performance fees for true **Skill returns**
- This is the future of fund management

Oh yes, the *

- My sincere apologies to Harry Markowitz for the cheap gag at his expense
- Harry got the Nobel Prize for the idea that the best way to manage portfolios is to trade off expected return against risk
- To this day (over 50 years later) no-one has yet come up with a better paradigm

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