Markowitz was Wrong!*

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“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:

\[
\text{Max } U = R_p - \rho V_p \quad \text{s.t. } S x_i = 1
\]
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 :-

\[ V_{P} = \sum_{i}^{N} \sum_{j}^{N} x_i x_j C_{ij} \]

\[ \rho^2 \] R-Squared Ltd
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 or Momentum characteristics, as well as Country or Industry membership
- All of these are common factors
- Stocks might also be chosen for stock specific reasons (alpha)
Deliberate vs Incidental Bets

• However, the stocks selected will also have many other factor exposures
• Stock selection models usually focus on a relatively small portion of total return
• Risk models, on the other hand, need to capture ALL the common factor and stock specific risks in the portfolio to be useful
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, these Skill returns can easily be dominated by the Noise returns from the Incidental (unwanted) 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.
A Real Case Study

- Global Equity manager, $1.8bn fund
- Long only, between 50 to 60 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

- Historical Risk Management Overlay was run from December 2003 to July 2006
- This was a bull market for global equities - MSCI World rose 34.04% over this period
- The total portfolio return was 50.19%
- We were given month-end holdings, and re-balanced the Overlay monthly
Deliberate Factor Bets

• This portfolio manager was positive on:
  - Japan for the whole period
  - Global Healthcare for the whole period
  - Global Energy from December 2003 to September 2005

• 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
Results – Portfolio Performance

- Original Portfolio
- Risk Mgt. Overlay
- Hedged Portfolio
- NOISE Returns
- MSCI World Net Div
Results - Performance Decomposition

- Original Portfolio
- Risk Mgt. Overlay
- Hedged Portfolio
- SKILL Factor Returns
- NOISE Returns
Components of Skill Returns
## Summary Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Annualised Return</th>
<th>Annualised Risk</th>
<th>Annualised Sharpe ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-free rate (T-Bills)</td>
<td>2.93%</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>Original Portfolio Skill + Noise</td>
<td>17.63%</td>
<td>10.20%</td>
<td>1.441</td>
</tr>
<tr>
<td>Overlay Portfolio - Noise</td>
<td>-6.32%</td>
<td>6.23%</td>
<td>-1.484</td>
</tr>
<tr>
<td>Hedged Portfolio = Skill</td>
<td>10.30%</td>
<td>8.16%</td>
<td>0.902</td>
</tr>
<tr>
<td>SKILL Factor Returns</td>
<td>6.05%</td>
<td>3.48%</td>
<td>0.896</td>
</tr>
<tr>
<td>Portfolio Alpha</td>
<td>3.67%</td>
<td>7.73%</td>
<td></td>
</tr>
<tr>
<td>Hedged Portfolio = Skill</td>
<td>10.30%</td>
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<tr>
<td>MSCI World</td>
<td>12.36%</td>
<td>8.08%</td>
<td>1.167</td>
</tr>
</tbody>
</table>
This is an Improvement?

- At first sight, it is hard to see how this is an improvement
  - The Hedged Portfolio (HP) return is lower
  - The HP Sharpe ratio is lower
  - The HP underperforms MSCI World
- However, this manager is actually seeking to generate absolute returns
- In a bull market, Noise tends to be positive
A Longer Term Perspective
Comments - 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 down -17% while the index was down -45%
Comments - 2

- The Noise returns in the nine month bull market of 2003 would probably have been positive.
- However, during the bear market over the previous three years the Noise returns would obviously have been negative.
- Given the total returns, and assuming constant Skill, the HP would therefore have significantly outperformed the index over this earlier period.
Summary - 1

• If the manager had forecast a bull market three years ago, we would have left global market exposure as a deliberate bet.
• At the time, however, most investors expected a period of low positive returns.
• Despite not being right about everything, this manager clearly has useful Skill.
Summary - 2

• 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

• Perhaps the real problem is that managers true Skill is being obscured by Noise?
Summary - 3

- Absolute Return funds have become popular as investors have become aware of the problems with capitalisation-weighted benchmarks.
- It makes no sense for investors to pay fees for Noise returns 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 (nearly 50 years later) no-one has yet come up with a better paradigm
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