Volatility-Based Asset Allocation

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March 2008
Volatility-Based Asset Allocation

- Application of static asset allocation
- Volatility model
- Tests of volatility model
- Global Alpha Model
- Historical simulations of Global Alpha Model
Static Allocations

- Investors are frequently warned by advisors and consultants not to change their asset allocation.

- As a result, pension plan asset allocations are very static. In the 1980’s, one well-known consultant joked that
Static Allocations

- Investors are frequently warned by advisors and consultants not to change their asset allocation.

- As a result, pension plan asset allocations are very static. In the 1980’s, one well-known consultant joked that

  “I don’t know what the question is, but the answer is 60% .”
General Concept

• In theory, an institutional investor chooses a volatility level that is appropriate for the investment goals and time horizon for the overall fund.

• The asset allocation SHOULD be dependent on changes in market conditions – particularly volatility.

• However, we know that in practice that does not happen – asset allocations are more static than they should be.
Daily S&P 500 Stock Returns
1986-2006
Static Allocation – A Live Example

How many of you have changed your asset allocation over the past year?
Static Allocation – A Live Example

How many of you have changed your asset allocation over the past year?

Last 3 months of MSCI EAFE volatility as of 3/1/07?

10.7%

Last 3 months of MSCI EAFE volatility as of 3/1/08?
Static Allocation – A Live Example

How many of you have changed your asset allocation over the past year?

Last 3 months of MSCI EAFE volatility as of 3/1/07?

10.7%

Last 3 months of MSCI EAFE volatility as of 3/1/08?

24.7%
EVERYTHING
YOU KNOW
IS WRONG
Volatility and Risk Reduction

- If volatility shifts over time, it may be optimal to alter the asset allocation.
- Reduce proportion invested in equities during periods when volatility is expected to be high.
- Increase proportion invested in equities during periods when volatility is expected to be low.
Simulation of Volatility Based Allocation

- Stocks and bonds have zero correlation
- Bonds have return of 7% and volatility of 2%
- Stocks have return of 12% and volatility of 16%
- 20 years of data are simulated, 100 trials of simulation
- Basic allocation is 50% stocks, 50% bonds
- Signal is created suggesting volatility is either increasing or decreasing – if increasing, stock allocation drops to 47%, and if decreasing, allocation increased to 53%
Simulation 1

- Volatility never changes

- False signal is created with 50% chance of suggesting volatility increase and 50% chance of suggesting volatility decrease
## Results for Simulation 1

<table>
<thead>
<tr>
<th></th>
<th>Static Allocation Strategy</th>
<th>Varying Allocation Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Return</strong></td>
<td>9.29%</td>
<td>9.29%</td>
</tr>
<tr>
<td><strong>Standard deviation</strong></td>
<td>8.08%</td>
<td>8.10%</td>
</tr>
<tr>
<td><strong>Number of trials with lower standard deviation</strong></td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td><strong>Maximum difference in standard deviation</strong></td>
<td>0.24%</td>
<td></td>
</tr>
</tbody>
</table>
Simulation 2

- Volatility either increases to 21% or decreases to 11%

Two signals are created:

- False signal with 50% chance of suggesting volatility increase and 50% chance of suggesting volatility decrease

- Correct signal predicting the volatility change
## Results for Simulation 2

<table>
<thead>
<tr>
<th></th>
<th>Static Allocation Strategy</th>
<th>Incorrect Varying Allocation Strategy</th>
<th>Correct Varying Allocation Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return</td>
<td>9.30%</td>
<td>9.29%</td>
<td>9.29%</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>8.50%</td>
<td>8.53%</td>
<td>8.22%</td>
</tr>
<tr>
<td>Trials with lower std dev than static</td>
<td>43</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Max difference in std dev from static</td>
<td>0.31%</td>
<td>-0.49%</td>
<td></td>
</tr>
</tbody>
</table>
Simulation Implications

- Changing the allocation because of an incorrect signal causes an increase in volatility – but the change in volatility is very slight

- Changing the allocation because of a correct signal causes a large decrease in volatility
Quarterly Volatility for the S&P 500
1980-2005
Volatility and Return Enhancement

- Historical data indicate that in periods of low volatility stocks will earn higher returns than in periods of high volatility.

- Because future volatility is correlated with recent past volatility, it may be advantageous to vary the allocation to stocks to improve overall returns along with lowering risk.
Volatility and Return Enhancement

Average return for 20 groups of days ranked by volatility
Tests of Volatility Model

• Create benchmark 60/40 model
• During periods of high volatility, decrease allocation to equities by 3% -- during periods of low volatility, increase allocation to equities by 3%
• Determine increase in return and decrease in risk caused by varying allocation
• Tests conducted on 19 markets (18 developed countries plus U.S. small cap) for which data is available from 1986-present
## Test: U.S. Large Cap Example 1986-2006

<table>
<thead>
<tr>
<th></th>
<th>Varying Allocation (63%-57% equity)</th>
<th>Fixed Allocation (60% equity)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Return</strong></td>
<td>10.33%</td>
<td>10.17%</td>
</tr>
<tr>
<td><strong>Standard Deviation</strong></td>
<td>10.16%</td>
<td>10.36%</td>
</tr>
<tr>
<td><strong>Excess Return</strong></td>
<td>16 basis points</td>
<td></td>
</tr>
<tr>
<td><strong>Decrease in Risk</strong></td>
<td>20 basis points</td>
<td></td>
</tr>
</tbody>
</table>
Decrease in Risk Caused by Varying Allocations Based on Recent Volatility: 1986-2006
Increase in Return Caused by Varying Allocations Based on Recent Volatility: 1986-2006
Volatility Model Test: 
Summary Results for 1986-2006

<table>
<thead>
<tr>
<th>Proportion of markets with decreased risk</th>
<th>79%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of markets with increased return</td>
<td>89%</td>
</tr>
<tr>
<td>Average decline in risk</td>
<td>9 basis points</td>
</tr>
<tr>
<td>Average increase in return</td>
<td>14 basis points</td>
</tr>
<tr>
<td>Average increase in return per change in allocation</td>
<td>2.26%</td>
</tr>
</tbody>
</table>
How Can Return Enhancement Exist?

Inefficiencies created by:

• Country preference biases

• Static allocations

• Static volatility assumptions
The Global Alpha Model

Combine volatility with three other factors:

- Market valuation
- Economic conditions
- Price momentum

Net result of model is a favorable (bullish) or unfavorable (bearish) signal of market conditions.

When favorable, invest 100% in stocks -- when unfavorable, invest 100% in bonds.
Returns in Markets Identified by Global Alpha Model as Favorable and Unfavorable by Model: 1986-2006
Returns in Markets Identified by Global Alpha Model as Favorable and Unfavorable by Model: 1986-2006

- Favorable
- Unfavorable
Excess Return of Global Alpha Model over 60/40 Benchmark by Country: 1986-2006
Hypothetical Portfolios with Global Alpha Model

• Model can be applied as an overlay or used to develop a fund
• In a fund, we create 22 separate positions in a portfolio
• Proportion of portfolio invested in equity is the proportion of countries identified as favorable
• Constrained optimization determines the relative weights of the countries in the portfolio
Global Alpha Model Hypothetical Portfolio Returns: 1986-2006

<table>
<thead>
<tr>
<th></th>
<th>Return</th>
<th>Standard deviation</th>
<th>Sharpe ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Alpha Model</td>
<td>15.1%</td>
<td>7.7%</td>
<td>1.2</td>
</tr>
<tr>
<td>MSCI World</td>
<td>10.5%</td>
<td>14.6%</td>
<td>0.3</td>
</tr>
</tbody>
</table>
Global Alpha Model Hypothetical Annual Portfolio Returns
Global Alpha Fund Actual Returns:
December 1, 2006 - February 29, 2008

<table>
<thead>
<tr>
<th>Model</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Alpha Model</td>
<td>6.8%</td>
</tr>
<tr>
<td>MSCI World</td>
<td>1.7%</td>
</tr>
</tbody>
</table>
Conclusion

- There is no justification for maintaining static asset allocation weights in the face of dynamic capital markets.
- Varying the allocation consistent with recent volatility shifts has added return and decreased risk.
- Tactical models based on the volatility variable provided good hypothetical and actual performance.
Volatility Based Asset Allocation

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