Why Low Volatility Wins:
History, Explanations and the Future of Low Volatility

Nardin Baker, Global Alpha Chief Strategist, Guggenheim Investments
Robert Haugen, President, Haugen Custom Financial Systems
History and Explanations for the Low Volatility Anomaly

Robert Haugen
President
Haugen Custom Financial Systems
Bibliographic History of the Volatility Anomaly


2006 Ang, Hodrick, Xing, & Zhang, “The Cross Section of Volatility and Expected Returns,” *Journal of Finance*


2009 Haugen & Baker, “Case Closed,” *Handbook of Portfolio Construction*

Haugen and Heins (1975)

Geometric Mean Returns Regressed on Volatility

Return

Volatility

1926-1971
Slope: -.0353
T-stat: -4.87

• Sample consists of all stocks on the CRSP Data Files

(Example)

115 stock portfolios of 25 stocks each
Fama & French (1992)
Graph created from data in F&F 1992 Table 1.

- Annualized arithmetic mean returns plotted against beta for beta-sorted deciles within their largest size decile (1963-1990).
Ang, Hodrick, Xing & Zhang (2006)

July 1963 through 2000
US Stocks

- Risk adjusted returns* for cap-weighted volatility quintiles.

* Jensen’s alpha (Similar results were found when adjusting with the Fama-French three-factor model.)
Risk adjusted* rates of return to equally weighted portfolios sorted by residual volatility (September 1980 - 2003)

* Using a variant of the Fama French three-factor model.
Blitz & van Vliet (2007)

- 1986 – 2006
- Stocks ranked in each month by trailing 3-year volatility of weekly return
Blitz & van Vliet (2007)
Blitz & van Vliet (2007)
Baker, Bradley & Wurgler (2010)

- Risk premiums for equally weighted volatility quintiles
- Publicly traded US stocks (1968-2008)
Baker, Bradley and Wurgler, 2010

Time Series for Volatility Quintiles

Value of $1 Invested in 1968

Time Series 1968 - 2000
New Results on Emerging Markets
Blitz and van Vliet (2011)

- 1989 - 2010
- One month holding periods
Explanations for the Low Volatility Anomaly
Agency Problems Associated with Professional Money Management

A. Money managers are attracted to volatile stocks because they see them as interesting rather than risky.

B. Manager compensation is option-like and creates an incentive for them to increase the volatility of the portfolios they manage.
A. Volatile, Story Stocks Are Easier for Managers to Defend

- Career-related pressures to impress colleagues and superiors, may cause professional analysts to be attracted to exciting, volatile stocks -- stocks for which they can make compelling cases for inclusion in model portfolios.

- Widespread demand is created for exciting, volatile stocks putting upward pressure on prices and downward pressure on expected returns.
B. Option-like Manager Compensation

Compensation/Probability

High Volatility Portfolio

Low Volatility Portfolio

Salary

Performance

Bonus

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Haugen Results on Institutional Ownership and Volatility

- Time period 2000-2009
- 1000 largest stocks on NYSE
- Volatility calculated using monthly data over the trailing 24 months
- We group into 10 size deciles and 3 institutional ownership groupings
Haugen (2011)
Volatility of Stocks with High and Low Institutional Ownership

![Bar chart showing volatility of stocks with high and low institutional ownership across different size deciles. The chart compares high institutional ownership (blue bars) and low institutional ownership (red bars) for each decile from smallest to largest. The x-axis represents size decile, and the y-axis represents volatility percentage.]
Low Volatility Developments: Present and Future

Nardin Baker
Global Alpha Chief Strategist
Guggenheim Investments
Theory: All Investors Optimize and the Market Index is Efficient

- Theoretically, in the Capital Asset Pricing Model (CAPM), the Market Index has higher return and higher risk than the Minimum Volatility (MV) portfolio.

- The theoretical model has not been confirmed by evidence.
Academics and investment professionals generally agree that the CAPM does not match empirical results.

- Over many time periods and many countries, the Minimum Volatility portfolios outperform the Market Index.
- Investors can create more efficient allocations, providing higher risk-adjusted returns.
March 4, 1991 P&I Introduces the “Efficient Index”

A benchmark alternative

_P&I_ to publish the Efficient Index as regular feature

By Chuck Paustian

“Nardin Baker said the technology used to construct the Efficient Index also can be used to build equity portfolios that, in addition to low volatility, are sensitive to other factors.”

“Mr. Haugen has argued capitalization-weighted indexes are not appropriate benchmarks for the equity market because they are inefficient portfolios.”

Source: Pensions & Investments, March 4, 1991
Minimum volatility portfolios are favored by changes in the investment climate

• Markets
  • Since 2000, market returns have been lower than projected
  • Liabilities have increased due to lower discount rates
  • Funded Status (assets-to-liabilities) has dropped 50% for many firms

• Regulatory Controls
  • Governments are working to prevent future liability disasters
  • In Europe, Asia and Americas, regulatory bodies are introducing new risk controls and funding requirements

• Consultants
  • Consulting firms are suggesting liability driven approaches and recognize that fixed income rates are at historic lows
  • Benchmarking is moving away from capitalization weighted indexes
  • Proposing lower volatility equity strategies that combine efficiently with other asset classes
Do High Risk Stocks have Higher Return?

• Simple Test Procedure:
  – Stocks sorted by 24 month volatility into deciles for 21 developed countries over 21 years
  – Returns for each country and decile calculated monthly

<table>
<thead>
<tr>
<th>All Developed Countries</th>
<th>Lowest Risk</th>
<th>Highest Risk</th>
<th>Bottom Decile – Top Decile</th>
<th>Bottom Decile – Top Decile</th>
<th>Bottom Decile – Top Decile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 1990 – Jun 2011</td>
<td>Decile 1</td>
<td>Decile 10</td>
<td>Risk</td>
<td>Return</td>
<td>Hit Ratio</td>
</tr>
<tr>
<td>Average Return</td>
<td>8.5%</td>
<td>-13.9%</td>
<td>22.4%</td>
<td></td>
<td>86.4%</td>
</tr>
<tr>
<td>Std Dev of Returns</td>
<td>8.1%</td>
<td>21.6%</td>
<td>-13.5%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Guggenheim Global Alpha
Global – Returns And Risk Of Decile Portfolios

All Countries

Return vs. Risk of Decile Portfolios

Decile 1

Decile 10

Decile 1 = Lowest Risk
Decile 10 = Highest Risk

Source: Guggenheim Global Alpha

Excess Return

Risk (std. dev.)
Consistent Results Across Developed Equity Markets

Low Risk Portfolios have high returns

<table>
<thead>
<tr>
<th>Jan 1990 - Jun 2011</th>
<th>Annualized returns</th>
<th>Difference</th>
<th>Hit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decile 1</td>
<td>Decile 10</td>
<td>Decile 1-10</td>
</tr>
<tr>
<td>USA</td>
<td>12.2%</td>
<td>-11.4%</td>
<td>23.6%</td>
</tr>
<tr>
<td>Japan</td>
<td>-2.1%</td>
<td>-22.4%</td>
<td>20.3%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>9.0%</td>
<td>-12.2%</td>
<td>21.3%</td>
</tr>
<tr>
<td>France</td>
<td>9.8%</td>
<td>-11.7%</td>
<td>21.4%</td>
</tr>
<tr>
<td>Canada</td>
<td>12.3%</td>
<td>-20.5%</td>
<td>32.8%</td>
</tr>
</tbody>
</table>

Risk remains low in low risk deciles

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decile 1</td>
<td>Decile 10</td>
</tr>
<tr>
<td>USA</td>
<td>10.2%</td>
<td>31.7%</td>
</tr>
<tr>
<td>Japan</td>
<td>13.6%</td>
<td>30.5%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>10.2%</td>
<td>24.7%</td>
</tr>
<tr>
<td>France</td>
<td>10.7%</td>
<td>23.6%</td>
</tr>
<tr>
<td>Canada</td>
<td>10.0%</td>
<td>28.0%</td>
</tr>
</tbody>
</table>

Source: Guggenheim Global Alpha
Low Volatility Wins in Return and Risk Dimensions

- Each bar represents the lowest risk decile performance relative to the highest risk decile
- In each of 21 developed countries, the lowest risk decile outperforms

Return and Risk Differences (low - high deciles)

Source: Guggenheim Global Alpha
Global - Low Risk Wins Consistently Over Rolling Periods

Return comparison for rolling three-year periods: return of low risk decile less high risk decile

Source: Guggenheim Global Alpha
Constructing Optimal Low Volatility Portfolios

Optimal
- Universe of global stocks representing opportunity set
- Historic volatility used in constructing risk model
- Limits on stock weights in the index
- Controls on country and sector diversification
- Transparent process requiring no proprietary information

Reliable
- Return is difficult to forecast, but risk is persistent
- Rules based approach using sophisticated technology
- Simple strategy with what we believe is a better return for investment risk

Practical
- Portfolios need to have good liquidity to be investable
- Minimum volatility portfolios control trading volume
- Benchmarking is driven by investment theory and results
Low Volatility Global Portfolio Outperforms

Starting in 1990, we create an optimal Low Volatility portfolio and update holdings monthly

Return vs. Risk

Source: Guggenheim Global Alpha
Do High Risk Emerging Market Stocks have Higher Return?

Same Test Procedure in Emerging Markets:
- Stocks sorted by 24 month volatility into deciles for 13 emerging countries over 10 years
- Returns for each country and decile calculated monthly

<table>
<thead>
<tr>
<th>All Emerging Countries</th>
<th>Lowest Risk</th>
<th>Highest Risk</th>
<th>Bottom Decile – Top Decile</th>
<th>Bottom Decile – Top Decile</th>
<th>Bottom Decile – Top Decile</th>
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</thead>
<tbody>
<tr>
<td>Jan 2001 – Jun 2011</td>
<td>Decile 1</td>
<td>Decile 10</td>
<td>Risk</td>
<td>Return</td>
<td>Hit Ratio</td>
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<tr>
<td>Average Return</td>
<td>18.0%</td>
<td>-2.5%</td>
<td>20.4%</td>
<td>90.9%</td>
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<tr>
<td>Std Dev of Returns</td>
<td>13.2%</td>
<td>23.1%</td>
<td>-9.9%</td>
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</table>

Source: Guggenheim Global Alpha
Low Volatility Outperforms in Emerging Markets

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<tr>
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<td>Statistic</td>
<td>Decile 1</td>
<td>Decile 10</td>
<td>Risk Difference</td>
<td>Return Difference</td>
<td>Hit Ratio</td>
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<td>Brazil</td>
<td>Average Return</td>
<td>23.1%</td>
<td>18.9%</td>
<td>4.3%</td>
<td>63.6%</td>
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<td>Std Dev of Returns</td>
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<td>23.9%</td>
<td>-10.5%</td>
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<td>Chile</td>
<td>Average Return</td>
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<td>9.6%</td>
<td>3.9%</td>
<td>63.6%</td>
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<td>19.5%</td>
<td>-13.9%</td>
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<td>China</td>
<td>Average Return</td>
<td>8.9%</td>
<td>5.0%</td>
<td>3.9%</td>
<td>81.8%</td>
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<tr>
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<td>Std Dev of Returns</td>
<td>26.5%</td>
<td>37.1%</td>
<td>-10.7%</td>
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<tr>
<td>India</td>
<td>Average Return</td>
<td>23.8%</td>
<td>-2.3%</td>
<td>26.1%</td>
<td>72.7%</td>
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<td>Indonesia</td>
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<td>2.5%</td>
<td>8.2%</td>
<td>63.6%</td>
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<tr>
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<td>Israel</td>
<td>Average Return</td>
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<td>14.4%</td>
<td>63.6%</td>
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<tr>
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<td>Korea</td>
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<td>100.0%</td>
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<td>-12.3%</td>
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<td>Philippines</td>
<td>Average Return</td>
<td>6.8%</td>
<td>-5.7%</td>
<td>12.5%</td>
<td>72.7%</td>
<td></td>
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<tr>
<td></td>
<td>Std Dev of Returns</td>
<td>10.2%</td>
<td>32.0%</td>
<td>-21.9%</td>
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<td></td>
</tr>
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<td>Poland</td>
<td>Average Return</td>
<td>5.0%</td>
<td>-3.5%</td>
<td>8.5%</td>
<td>63.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Std Dev of Returns</td>
<td>17.9%</td>
<td>31.7%</td>
<td>-13.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>Average Return</td>
<td>21.9%</td>
<td>4.6%</td>
<td>17.3%</td>
<td>81.8%</td>
<td></td>
</tr>
<tr>
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<td>Std Dev of Returns</td>
<td>10.8%</td>
<td>17.9%</td>
<td>-7.2%</td>
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<td>Taiwan</td>
<td>Average Return</td>
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<td>16.0%</td>
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<td>Thailand</td>
<td>Average Return</td>
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<td>72.7%</td>
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<td>Std Dev of Returns</td>
<td>9.4%</td>
<td>29.2%</td>
<td>-19.8%</td>
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</tr>
</tbody>
</table>

Source: Guggenheim Global Alpha

Please see Disclosures and Legal Notice at the end of this document.
Emerging Markets - Low Risk Wins Consistently Over Rolling Periods

Return comparison for rolling three-year periods for all emerging countries

Source: Guggenheim Global Alpha
Low Volatility Investing Summit

Low Volatility Emerging Portfolio Outperforms

Starting in 1998, we create an optimal Low Volatility portfolio and update holdings monthly

Return vs. Risk

Source: Guggenheim Global Alpha

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Why Does Low Volatility Win Consistently?

<table>
<thead>
<tr>
<th>Low-risk stocks</th>
<th>High-risk stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>boring</td>
<td>exciting</td>
</tr>
<tr>
<td>low growth</td>
<td>high growth expectations</td>
</tr>
<tr>
<td>expectations</td>
<td>low dividends</td>
</tr>
<tr>
<td>higher dividends</td>
<td>high dividends</td>
</tr>
<tr>
<td>low share turnover</td>
<td>high trading activity</td>
</tr>
<tr>
<td>higher assets / market cap</td>
<td>lower asset values / market cap</td>
</tr>
<tr>
<td>analysts ignore them</td>
<td>heavy analysts coverage</td>
</tr>
</tbody>
</table>
High Volatility Stocks Cost More and are Expected to Grow Rapidly

Source: Guggenheim Global Alpha
Low volatility stocks have higher average market capitalization than high volatility stocks.

Source: Guggenheim Global Alpha
Consistent Fundamentals Across the World

Sales are growing faster for stocks in the highest quintile of volatility

Sales Growth

Source: Guggenheim Global Alpha
High volatility stocks turn over a larger percentage of their shares outstanding - these exciting stocks are traded more actively.
Higher volatility stocks are more expensive based on earnings

Source: Guggenheim Global Alpha
Consistent Fundamentals Across the World

Low volatility stocks have higher average profit margins

Profit Margin

Exposure

Low Risk  Quintiles  High Risk

Source: Guggenheim Global Alpha
Low Volatility stocks pay out more dividends to their investors

Dividend Yield

Source: Guggenheim Global Alpha
A Rational Market Competes for High Return-on-Capital

Low Volatility stocks revert upward to higher average return-on-capital and High Volatility stocks revert downward to lower return-on-capital.

Source: Guggenheim Global Alpha
Why Does Low Volatility Win Consistently?

• High risk stocks tend to disappoint and low risk stocks tend to improve

• This is a direct result of market competition - capital flowing to high return areas

• Market competition for high return-on-capital drives reversion to the mean

• Low risk stocks tend to grow slowly, face less competition, and outperform relative to expectations

• High risk stocks with high growth attract competition and underperform expectations
Low Volatility Provides Higher Return and Lower Risk Across Regions

Source: Guggenheim Global Alpha
Please see Disclosures and Legal Notice at the end of this document.
What does the Future hold for Low Volatility Investing?

- Consultants are recommending lower risk equity strategies to their clients
- Capitalization weighted indexes are no longer the only benchmarks
- Recent performance of Low Volatility has attracted attention
- Investors are moving capital into Low Volatility strategies
- Facing low interest rates, investors require high risk-adjusted returns to meet liabilities
- As more investors move into Low Volatility strategies, returns will be even higher than in the past
- Prices for High Volatility stocks will gradually fall and prices for Low Volatility stocks will increase as the market equilibrates return relative to risk
- Risk models and optimization technology will distinguish between strategies
- Investment managers will compete based on risk-adjusted returns
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• Indices are unmanaged. The figures for the index reflect the reinvestment of dividends but do not reflect the deduction of fees or expenses which would reduce returns. Investors cannot invest directly in the indices.

• The MSCI ACWI (All Country World Index) Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed and emerging markets. As of May 27, 2010 the MSCI ACWI consisted of 45 country indices comprising 24 developed and 21 emerging market country indices. The developed market country indices included are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States. The emerging market country indices included are: Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand, and Turkey.

• The MSCI EAFE Index (Europe, Australasia, Far East) is a free float-adjusted market capitalization index that is designed to measure the equity market performance of developed markets, excluding the US & Canada. As of May 27, 2010, the MSCI EAFE Index consisted of the following 22 developed market country indices: Australia, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, and the United Kingdom.

• The MSCI World Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets. As of May 27, 2010 the MSCI World Index consisted of the following 24 developed market country indices: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

• The MSCI Emerging Markets Index is a free float-adjusted market capitalization index that is designed to measure equity market performance of emerging markets. As of December 31, 2010, the MSCI Emerging Markets Index consists of the following 21 emerging market country indices: Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand, and Turkey.

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