

CPBI Professional Development Day

The Equity Volatility Anomaly

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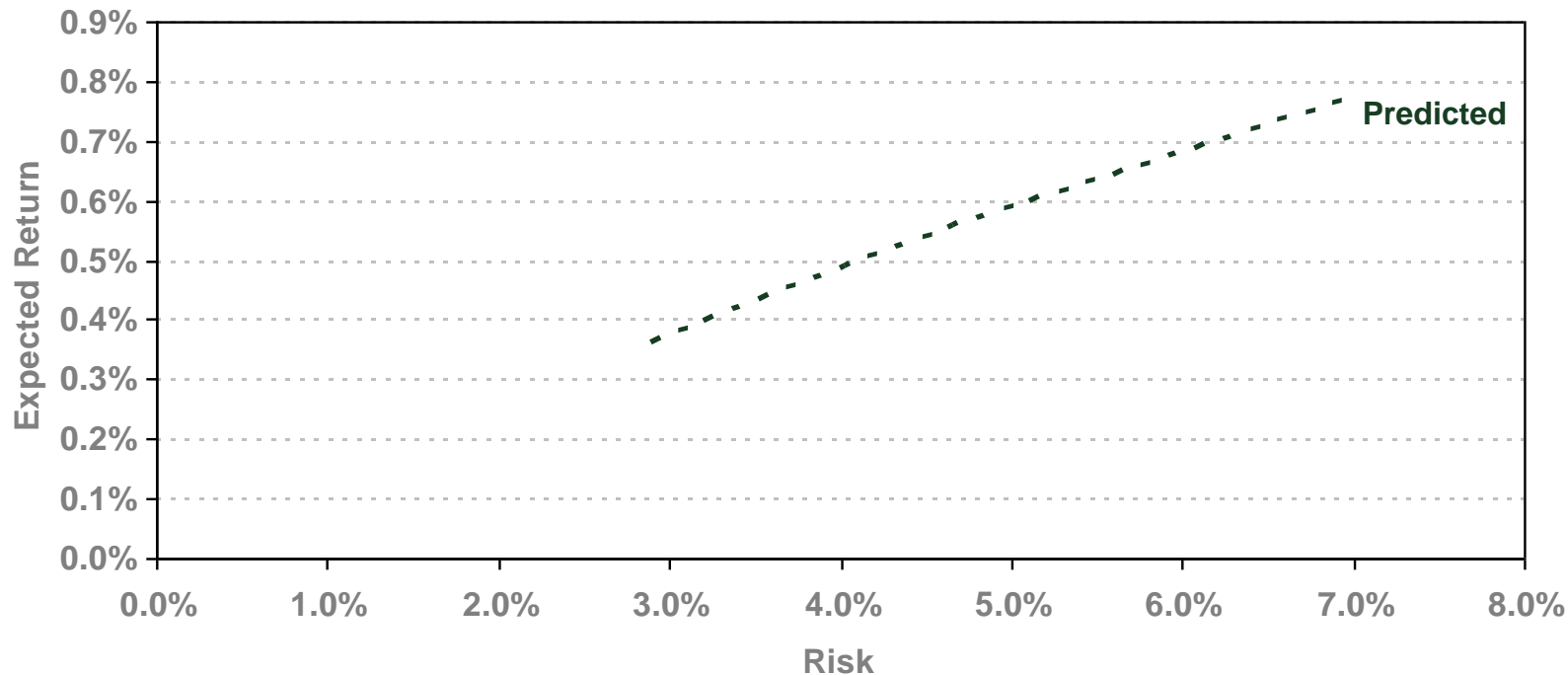


The Equity Volatility Anomaly

- Evidence on risks and returns in Canadian and global equity markets
- Hypotheses
- What low volatility equity portfolios look like?
- How low volatility equities would have performed in the past?

Theory & intuition: Higher expected returns on higher risk equities

Expected Monthly Returns vs. Expected Monthly Risk



Source: TD Asset Management (TDAM).

Predicted return from Capital Asset Pricing Model (CAPM) using betas from TDAM Developed Markets Risk model

For illustrative purposes only.

**Capital Asset Pricing Model:
Expected return should rise with systemic risk.**

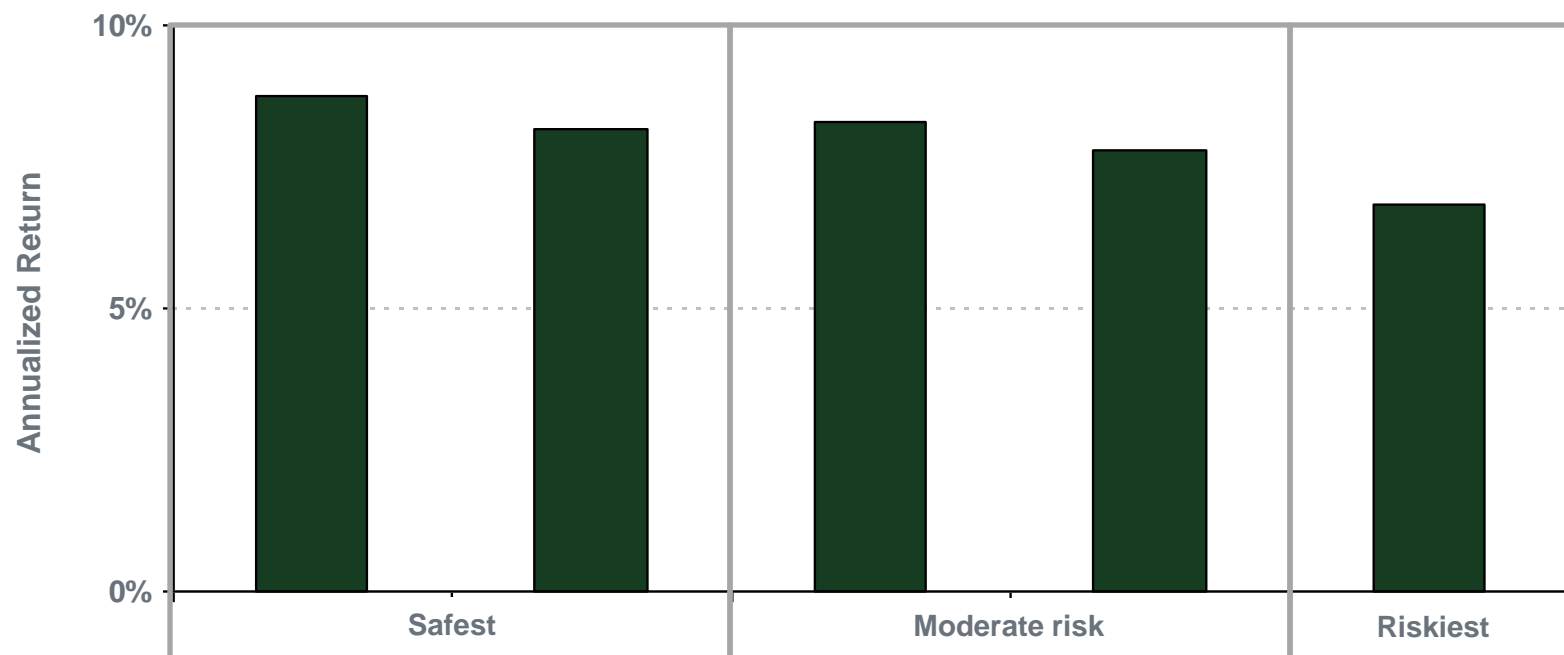
Large Body of Empirical Research Against Theory

- Stock return – Market risk (Beta) relationship much flatter than predicted by theory
 - Black, Jensen & Scholes (1972)
 - Fama & MacBeth (1973)
- Equities with more stock-specific risk under-perform less volatile equities.
 - US: Ang, Hodrick, Xing, and Zhang (2006)
 - International (including Canada) : Ang, Hodrick, Xing, and Zhang (2009)
 - Baker, Bradley, Wurgler (2011)
- Traditional indices (S&P/TSX, MSCI World, S&P 500) not as efficient as minimum variance combination of same equities:
 - Haugen & Baker (1991, 2012)
 - Blitz and van Vliet (2007)
 - MSCI BARRA (2008)
 - Bodjov and Masson (2009, TD Asset Management white paper)

Support for cap-weighted indices stronger in the field than in the lab

Re-thinking the Risk-Return Relationship Within Global Equities

MSCI World Equity Returns and Risks March 1997 – March 2014



Source: TDAM, MSCI,

Quintiles represent equally-weighted portfolios constructed monthly from equities sorted by trailing 36 months standard deviation.

Annualized returns on quintile portfolios constructed from constituents of the MSCI World Index from March 1997 through March 2014.

For illustrative purposes only.

Higher risk has not translated into higher returns

Re-Thinking the Risk-Return Relationship

Market Direction and Pay-off for Global Stocks in Different Market Conditions

Strong Up Markets

Average return > 4%
(occurs 24% of time)



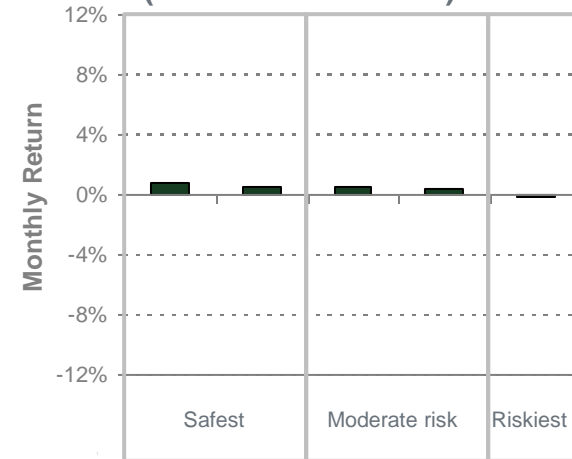
Strong Down Markets

Average return < - 4%
(occurs 12% of time)



“Normal” Markets

Average return within $\pm 4\%$
(occurs 65% of time)



Sources: TDAM, MSCI.

Quintiles represent equally-weighted portfolios constructed monthly from equities sorted by trailing 36 months standard deviation.

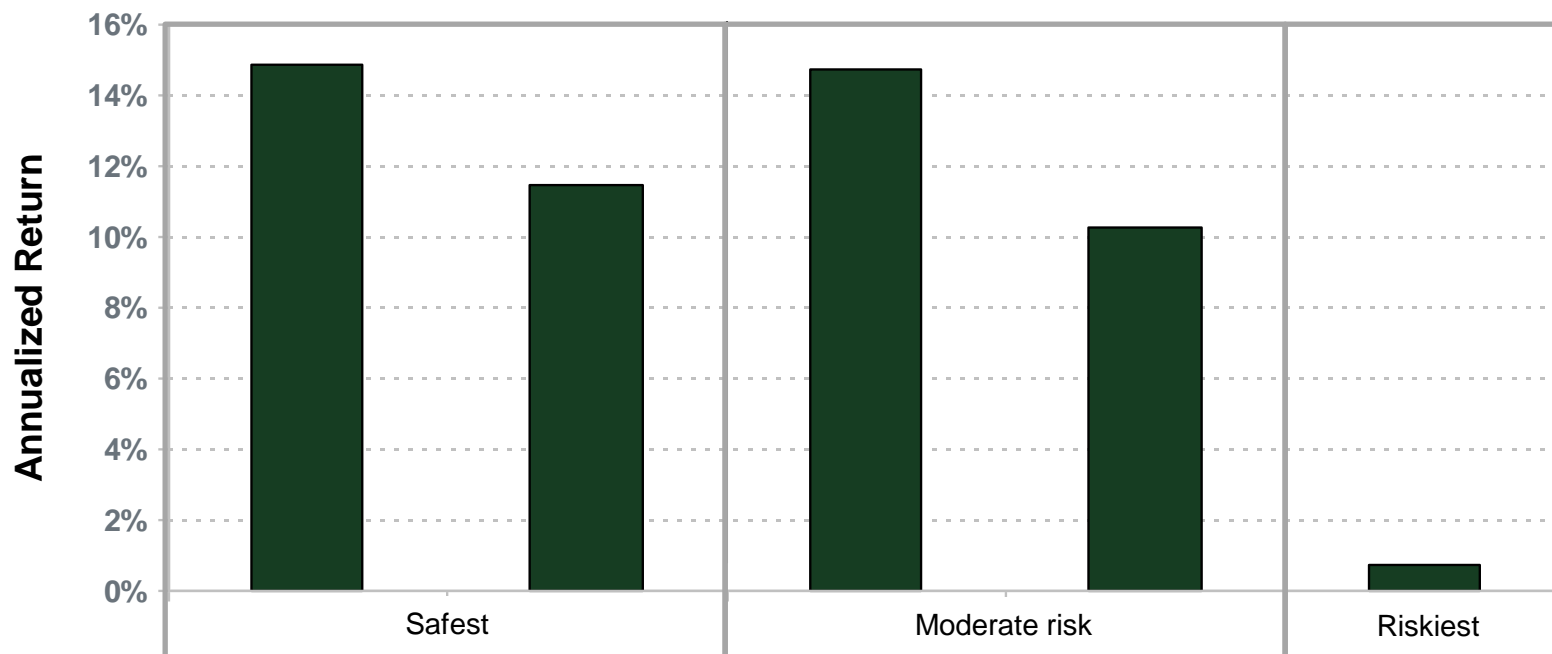
Average monthly returns on MSCI World Index constituents from March 1997 through March 2014.

For illustrative purposes only.

Investors in high volatility equities typically receive most of their compensation for bearing risk during strong bull markets

The risk-return relationship within Canadian equities

S&P/TSX Composite Index Return and Risk December 1991 – March 2014



Source: TDAM, MSCI

Quintiles represent equally-weighted portfolios constructed monthly from equities sorted by trailing 36 months standard deviation.

Average monthly returns on S&P/TSX Composite Index constituents from December 1991 through March 2014.

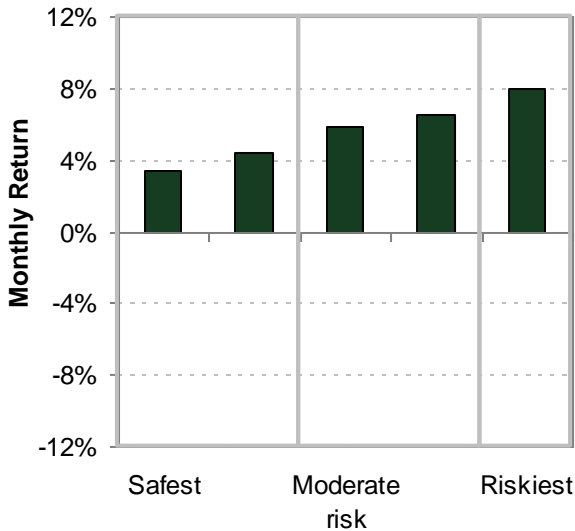
For illustrative purposes only.

Higher risk has not translated into higher returns

Pay-offs for Canadian stocks depend on market conditions

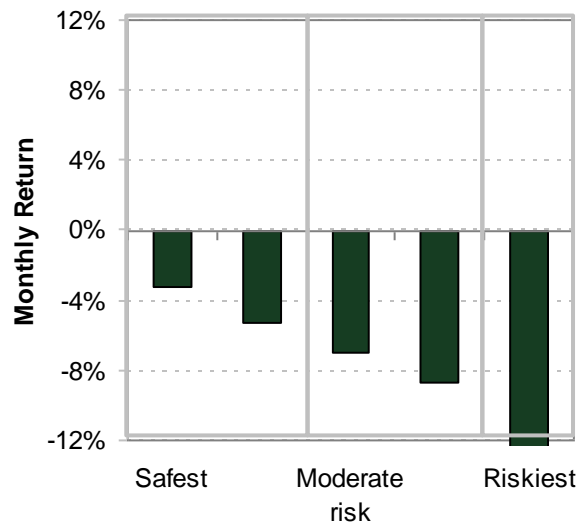
Strong up markets

Average return > 4%
(occurs 37% of time)



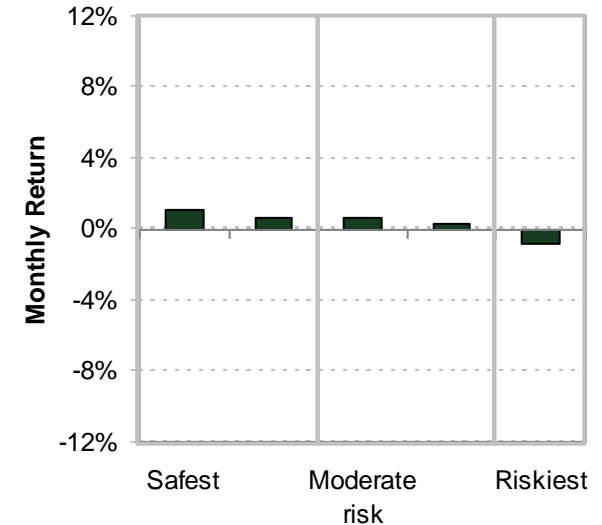
Strong down markets

Average return < - 4%
(occurs 12% of time)



“Normal” markets

Average return between -4% and 4%
(occurs 51% of time)



Sources: TDAM, MSCI.

Quintiles represent equally-weighted portfolios constructed monthly from equities sorted by trailing 36 months standard deviation.

Average monthly returns on S&P/TSX Composite Index constituents from December 1991 through March 2014

Risk computed as the standard deviation of monthly quintile returns over the entire period.

For illustrative purposes only.

Investors in high volatility equities typically receive most of their compensation for bearing risk during strong bull markets

Consistent Evidence from Emerging Markets

Market Direction and Pay-off for Emerging Markets Stocks

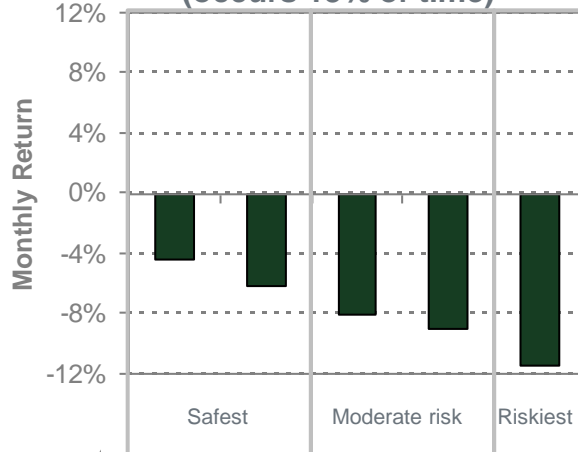
Strong Up Markets

Average return > 4%
(occurs 25% of time)



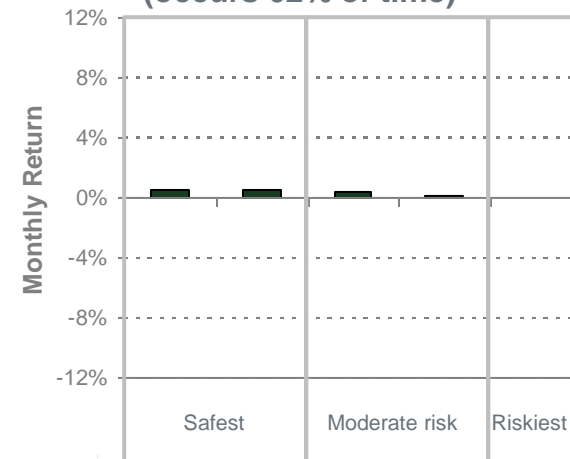
Strong Down Markets

Average return < - 4%
(occurs 13% of time)



“Normal” Markets

Average return between -4% and 4%
(occurs 62% of time)



Sources: TDAM, MSCI.

Quintiles represent equally-weighted portfolios constructed monthly from equities sorted by trailing 36 months standard deviation.

Average monthly returns on MSCI Emerging Markets Index constituents from July 2001 through March 2014.

For illustrative purposes only.

Investors in high volatility equities typically receive most of their compensation for bearing risk during strong bull markets

Hypotheses for the "Volatility Anomaly"

- "Keeping with the Joneses"
 - Investors worry more about relative than absolute wealth
- Portfolio managers maximize option-like incentives
 - Bonus is function of positive excess return
 - Top performing managers receive a lot of attention
- Constraints on leverage and on shorting

Envy may be more important than greed

What Do Low Volatility Equity Portfolios Look Like?

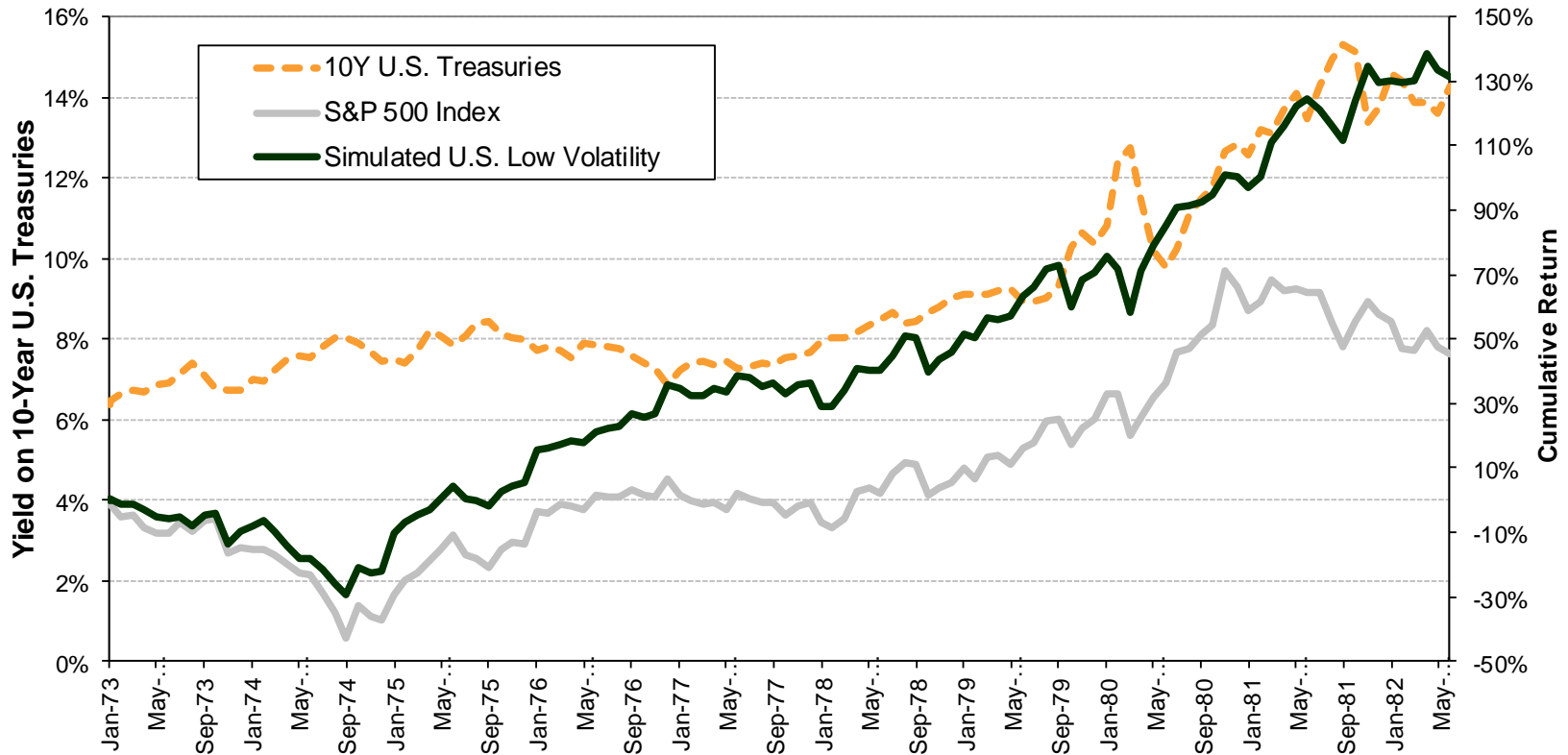
- Long-only portfolio with equities selected on the basis of their contribution to risk
 - From traditionally defensive non-cyclical sectors (Utilities, Consumer Staples)
 - Zero or little exposure to cyclical sectors (Info Tech, Materials)
- Designed as a defensive strategy
 - Less sensitivity to market movements (lower beta)
 - Expect to outperform traditional index in bear markets
 - Expect to underperform traditional index in strong bull markets

Low Volatility Equities: Can be a Good Fit for Pension Plans

Low Volatility Equities and Interest Rates

Based on Simulated Monthly Returns from January 1973 through June 1982

Rising Interest Rates: Low Volatility vs Cap-Weighted Index Cumulative Returns (1973-1982)



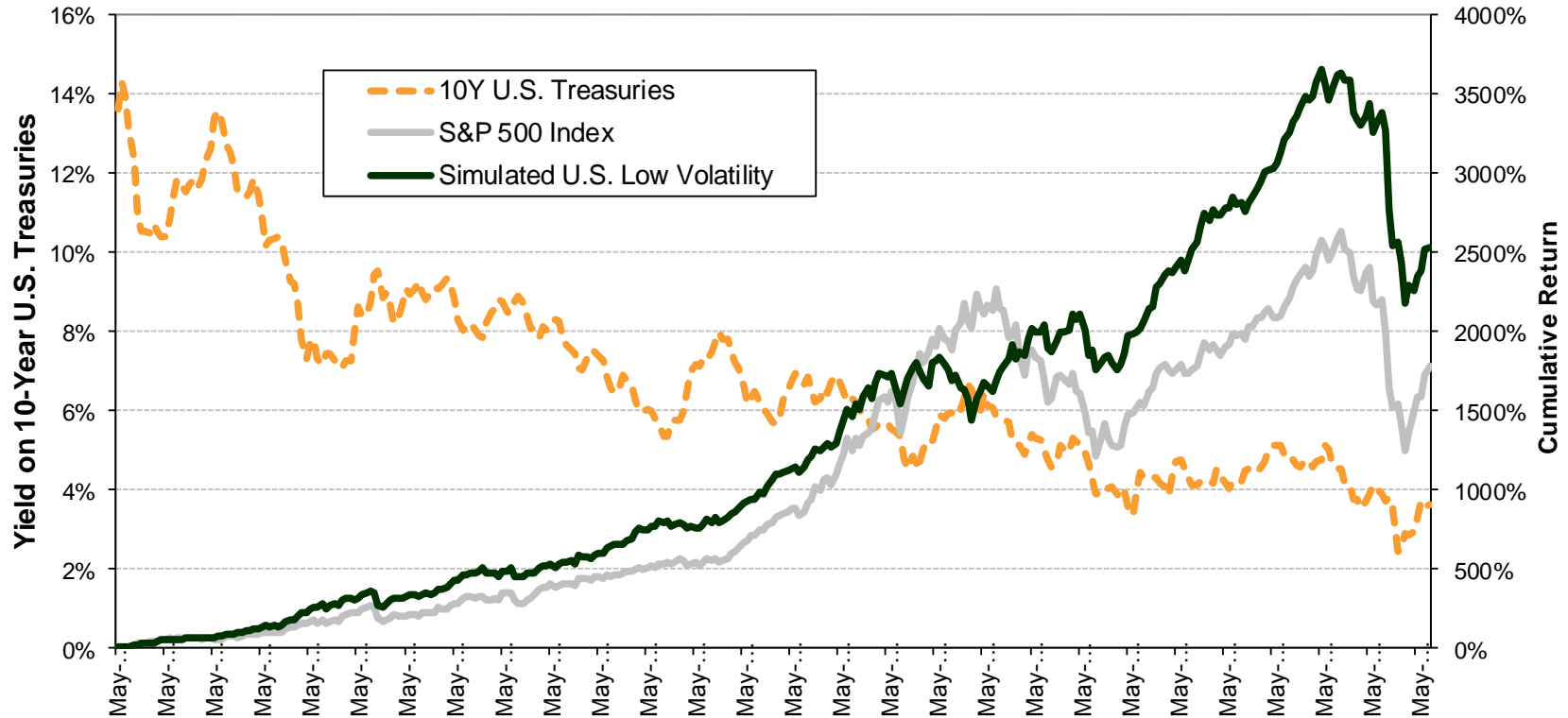
Sources: TDAM, U.S. Federal Reserve, and Standard & Poor's. Please see disclosures at end of the document for details on simulations.

Simulated returns 5.21% annually greater than the S&P 500 Index
Only 78% of the S&P 500 Index volatility

Low Volatility Equities and Interest Rates

Based on Simulated Monthly Returns from July 1982 through August 2009

Falling Interest Rates: Low Volatility vs Cap-Weighted Index Cumulative Returns (1982-2009)

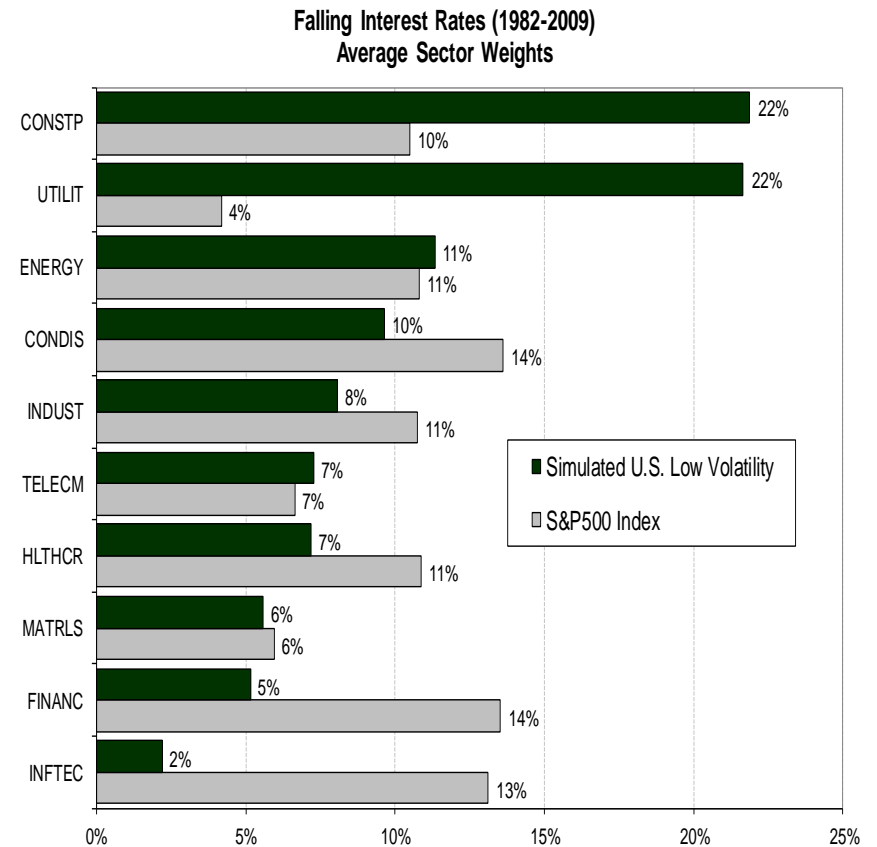
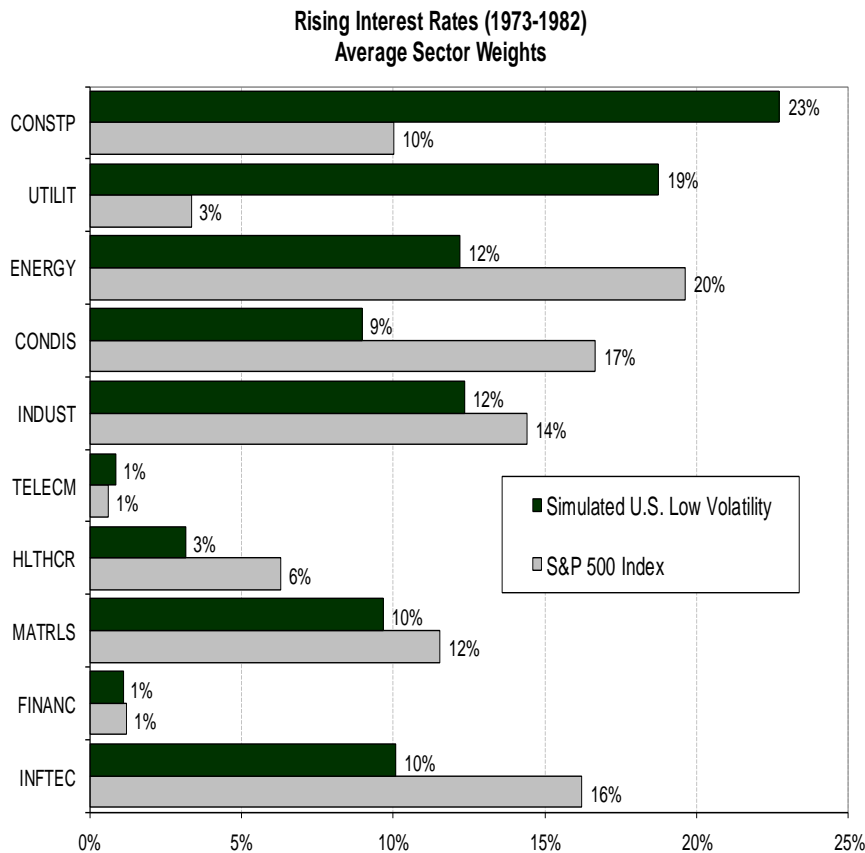


Sources: TDAM, U.S. Federal Reserve, and Standard & Poor's. Please see disclosures at end of the document for details on simulations.

Simulated returns 1.36% annually greater than the S&P 500 Index
Only 77% of the S&P 500 Index volatility

Low Volatility U.S. Equities and Interest Rates

Based on Simulated Monthly Returns from January 1973 through August 2009



Sources: TDAM and Standard & Poor's. Please see disclosures at end of the document for details on simulations.

Low volatility equities tend to prefer the same sectors regardless of the interest rates environment

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All simulated returns referenced in this presentation are expressed in U.S. dollars. Simulated returns are shown for illustrative purposes. Past performance is not indicative of future returns. Prior to April 2004, simulated U.S. Low Volatility returns assume transactions costs of 0.28%. After March 2004, simulated returns factor transactions costs of \$0.02 per share plus market impact costs from a volume-weighted average program as estimated by ITG version 2.2. The risk model used in the simulations of the U.S. Equity Low Volatility strategy is the MSCI Barra USE3. We imposed a maximum single stock weight of 3% and a maximum single sector weight of 25%.

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