# Higher Risk Does Bring Higher Returns in Stock Markets Worldwide

Financial market participants routinely use stock market volatility—that is, the size of fluctuations in stock returns—to gauge stock market risk. When risk-averse investors expect more stock market volatility, they reduce their stock holdings by selling stocks and buying safer assets, such as Treasury bills. This increase in demand for Treasury bills (relative to stocks) tends to raise current Treasury prices and reduce stock prices. Ultimately, a rise in expected stock volatility should raise the expected equity premium, which is the difference between the return on the stock market index and a risk-free rate.

The positive relation between expected stock market volatility and returns is a crucial building block of modern asset pricing theories: For a given level of stock market volatility, the more risk-averse investors are, the higher the expected equity premium must be for them to hold stocks in their portfolios.

Although researchers have intensively investigated this relation between expected stock market volatility and returns using both U.S. and international data, they have not firmly established evidence of a positive risk-return trade-off. That is, they have found no proof that higher risk results in higher returns; in fact, researchers usually estimate the risk-return trade-off to be economically very small or even negative.

A failure to control for other risk factors might explain the elusiveness of such evidence. One of these risk factors is the book-to-equity ratio, the ratio of the value of a firm's tangible assets (e.g., machinery, land) to that firm's market value. Stocks with high book-to-equity ratios (i.e., relatively low market values) tend to be risky investments, and investors require high expected returns for holding these stocks. This extra return is called the "value premium." Fama and French (1998) have shown that book-to-

equity ratios are important determinants of stock returns both at home and abroad.[1]

In a recent study, Guo et al. (2007) investigate the risk-return relation using both (i) the sum of squared daily stock market returns in a given period and (ii) conditional volatility estimated from an econometric model.[2] After controlling for the influence of the value premium on stock prices, the equity premium tends to be higher during periods of higher volatility in stock returns.

The table reproduces their estimates of the risk-return trade-off—the increase in the expected equity premium due to a one-unit increase in the expected stock market volatility—for major international stock markets. For example, the coefficient for the U.S. market shows that, holding other things constant, investors require a 4.74-percentage-point increase in the expected equity premium to compensate them for a 1-percentage-point increase in expected stock market volatility. In contrast with previous studies, these results show that the risk-return trade-off is positive and economically important in U.S. data, as well as the world stock market index and stock returns for all other G7 countries.

Controlling for the value premium reveals that there is a positive risk-return trade-off in stock markets worldwide.

—Hui Guo

[1] Fama, E.F. and French, K.R. "Value versus Growth: The International Evidence." *Journal of Finance*, 1998, *53*, pp. 1975-99.

[2] Guo, H.; Savickas, R.; Wang, Z. and Yang, J. "Is the Value Premium a Proxy for Time-Varying Investment Opportunities: Some Time Series Evidence." Forthcoming in *Journal of Financial and Quantitative Analysis*, 2007.

### Risk-Return Trade-off Estimated by Guo et al. (2007)

| U.S. | Canada | France | Germany | Italy | Japan | U.K. | World |
|------|--------|--------|---------|-------|-------|------|-------|
| 4.74** | 1.51 | 1.84* | 1.88** | 0.65 | 1.90* | 2.45** | 3.16** |

NOTE: */** indicate significance at the 10/5 percent levels, which means that there is a 90/95 percent likelihood these results did *not* occur by chance.

*Views expressed do not necessarily reflect official positions of the Federal Reserve System.*