swiss:finance:institute

Practitioner Roundups

sfi:knowledge
www.sfi.ch/knowledge

May 2016 | No 5

Mean-Variance and the Carry Trade—An Ideal Match?

Despite its longstanding prominence, mean-variance analysis still leads to portfolios that are outperformed. Is it, then, a blind alley? A new paper focusing on the carry trade suggests not.

Mean-variance analysis is the highest-profile application of mathematical optimization in the practice of finance. Introduced by Markowitz in 1952, it provides a simple answer to the question of how to construct a diversified portfolio of risky assets. Using optimization, it builds portfolios by trading off the assets' returns and risks. Despite its prominence however, the empirical verdict of asset managers after decades of experience in using mean-variance analysis to choose stocks has been largely negative. Considerable evidence shows that mean-variance portfolios often perform worse than even a naive strategy of simply holding equal positions in every asset. So was the optimization approach to portfolio choice a blind alley?

"The carry trade offers considerable scope for diversification—a mean-variance optimal strategy outperforms naive diversification strategies."

A new paper by three authors, including SFI's Karl Schmedders, shows that such a conclusion may be premature. The paper considers a different setting, where mean-variance analysis works well. The carry trade–borrowing in currencies where the interest rate is low and investing where the interest rate is high–is a high-risk, high-reward strategy. The authors show that the carry trade offers considerable scope for diversification, and that a mean-variance optimal strategy outperforms naive diversification strategies.

The mechanism behind the carry trade is simple. For example, in June 2011 the interbank interest rate for a one-year, yen-denominated loan was 0.56 percent, while that for an Australian dollar loan was 5.70 percent. If the exchange rate remains unchanged, an investor will make a return of 5.14 percent in one year. But how successful is this approach once we take into account exchange rate risk? The economic theory, *uncovered interest parity*, suggests that it should not be successful at all. It predicts that exchange rates will move to close up any opportunities for profit. But this theory has not fared well when confronted with data. Instead, much empirical evidence shows that in the short run exchange rate movements are unpredictable, and resemble a so-called random walk.

About the Authors

Karl Schmedders
Karl Schmedders is Professor of Quantitative Business Administration at the University of Zurich and heads the SFI Knowledge Center. He holds a PhD in Operations Research from Stanford University. His research interest focuses on computational economics and finance.

Fabian Ackermann
Zürcher Kantonalbank.

Walt Pohl
University of Zurich.

The full paper can be found at http://bit.ly/1NF2bQh.

Key Words
Carry trade
Mean-variance analysis
Portfolio optimization
Sharpe ratio

These results imply that while the carry trade investor still faces exchange rate risk, on average the strategy has a positive expected return. The carry trade has long had a disreputable reputation in both the financial press and the academic literature. Ever since Japan's economic woes pushed its interest rate below 1 percent for almost two decades, borrowing in yen to invest in high-rate currencies has provided an easy route to investment wealth. But did this strategy carry with it a commensurately high risk?

"The carry trade 'goes up by the stairs, but down by the elevator'."

In the wake of the Lehman brothers bankruptcy a worldwide flight to quality caused the yen to appreciate by more than 28 percent in October 2008 against the Australian dollar. This experience suggests that the carry trade strategy carries with it considerable systematic risk. In the academic literature this risk has been identified as "crash risk"–the risk that many small upward moves are paired with the occasional large downward move, such as those that occurred in the immediate wake of the Lehman bankruptcy. This notion is captured by a piece of market folk wisdom: the carry trade "goes up by the stairs, but down by the elevator". This observation suggests a simple explanation for the high returns of the carry trade: they are a compensation for bearing this crash risk. The historical performance of the typical simple carry trade—borrowing in a single, low-interest-rate currency and investing in a single, high-interest-rate currency—is consistent with this explanation, producing Sharpe ratios comparable to those of the S&P 500 stock market index.

In stark contrast to the crash risk theory, the optimal portfolio of 11 common currencies presented in the new paper, which the authors construct using mean-variance analysis, significantly outperforms both the simple carry trade strategy and the S&P 500, producing a Sharpe ratio of 0.91 over the period 1990–2015. A naive diversification strategy of holding the five highest interest rate currencies and shorting the five lowest interest rate currencies improves over the simple (1 long, 1 short) strategy but falls well short of the optimal strategy, with a Sharpe ratio of 0.62.

The results in optimizing the carry trade provide a sharp contrast to the performance of mean-variance analysis in the stock market. A critical difference between mean-variance analysis in the stock market and mean-variance analysis for the carry trade is that—for the latter—expected returns are not estimated from prior return data. Instead, under the random walk hypothesis, they are given by the interest rates themselves. Therefore, unlike the stock market case, in the currency setting expected returns are not affected by statistical estimation error. While the covariance matrices must be estimated, the paper finds that the ex ante prediction of the volatility of the optimal portfolio provides a reasonable guide to the ex post realized volatility.

"Applying mean-variance analysis to currency markets can work—three elements in particular contributing to the strategy's success."

In summary, extending the mean-variance analysis to the currency market can work well, the following three aspects contributing to the success of the strategy described: For each asset in isolation, the procedure takes into account the risk–return trade-off between assets. For example, over the sample period, the three lowest interest rate currencies are the yen, the Singapore dollar, and the Swiss franc. The yen generally has the lowest interest rate of the three, but both the franc and Singapore dollar have had lower exchange rate volatility. This makes these last two currencies potentially superior choices on a risk-adjusted basis. Second, the mean-variance strategy exploits the correlation between the assets. In the sample, the two highest interest rate currencies are the Australian and New Zealand dollars. They are both highly correlated, which makes them close substitutes for one another. An optimal strategy can use one as a hedge against the other. Finally, the optimal portfolio can use the aggregate risk–return to choose the total exposure. There is considerable time variation in interest rate spreads. A target mean criterion, for example, will automatically decrease exposure when the spreads are wide, and increase it when the spreads narrow.

Practitioner Roundups

SFI Practitioner Roundups aim to present the latest industry-oriented research findings and ideas from SFI faculty in a concise, focused manner. Any views expressed in this document are those of the authors of the paper cited, and those authors alone are responsible for the document's content.

SFI Knowledge Center

The SFI Knowledge Center promotes and supports dialogue, information flow, and collaboration between academia and the financial services industry.

Contact

SFI Knowledge Center
knowledge@sfi.ch
www.sfi.ch/knowledge