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Portfolio Strategies

Pair sees MPT flaw over risks of leverage

Managers contend investors getting hurt by omission

By Barry B. Burr

A fundamental tool of modern portfolio theory fails to account for unique risks of leverage, according to two investment managers.

That incompleteness can cause investors to take on more risk than intended and create excessive risk to the financial system that might trigger turmoil leading to events such as the 2008 market crisis.

The mean-variance optimizer — a foundational tool in modern portfolio theory that investors use to select investment portfolios optimized with the best expected returns to match risk tolerances — has volatility as its only source of risk, said Bruce I. Jacobs, principal of Jacobs Levy Equity Management Inc., Florham Park, N.J.

“Modern portfolio theory doesn’t recognize the unique risk of leverage,” Mr. Jacobs said. These risks include abrupt margin calls, forcing portfolio managers to liquidate securities — selling long positions and covering short positions — at adverse prices and possibly causing portfolio losses beyond capital invested. That’s an especially relevant scenario in the contemporary market as pension funds and other institutional investors increase their use of leverage in their portfolios to enhance investment strategies.

“Leverage has contributed to or caused many ... financial crises we have experienced,” Mr. Jacobs said. “Whether the leverage is in the housing industry, investment banks or hedge funds, the impact has been profound. With less leverage in the system, the likelihood of systemic crisis is lessened.”

“If investors were to recognize in their portfolio optimizations their aversion to these unique risks of leverage, there would be less leverage in the system and possibly fewer systematic events,” Mr. Jacobs said.

“MPT recognizes the increase in expected volatility associated with using leverage,” Mr. Jacobs said. “But it does not take into account the unique risks of leverage.”

To overcome that MPT shortcoming, Mr. Jacobs and Kenneth N. Levy, also a principal of Jacobs Levy, have modernized the mean-variance optimizer to add a factor for leverage risks along with the existing volatility risk factor.

Their work transforms the mean-variance optimization’s output — the efficient frontier, a set of optimal portfolios that reflect the best return for a level of risk along a two-dimensional curve — to trade off



ALERTING: Bruce Jacobs, left, and Kenneth Levy argue leverage should be factored into MPT calculations.

between the two factors of expected return and volatility risk. By adding a factor for leverage risks, they transform the optimizer to create a set of portfolios optimized for expected return, volatility risk and leverage risks along a curved three-dimensional efficient frontier surface.

“That is what we are bringing to bear” in the new work, Mr. Jacobs said, noting it expands the efficient frontier and shows tradeoffs between expected return, volatility and leverage risk.

Messrs. Jacobs and Levy describe the transformation of MPT in two papers, one published in October in the *Financial Analysts Journal*, and another coming out in the spring issue of the *Journal of Portfolio Management*.

“As you leverage a portfolio, the volatility will increase,” Mr. Jacobs said. “So there is recognition in MPT that leverage gives rise to (more) volatility, but MPT doesn’t account for unique risk of leverage.”

Not seeing

Setting arbitrary constraints or limits on leverage as investors typically do in mean-variance optimization doesn’t enable them to see the impact of leverage and leads them to pick portfolios with more or

less risk than intended, Mr. Jacobs said.

A constraint or limit “doesn’t take into account any of the unique risks of leverage,” Mr. Jacobs said. “Using a constraint for your leverage risks would be analogous to using a constraint for your volatility level.”

Their revised optimizer produces a set of optimal portfolios of expected return based on an investor’s tolerance for volatility and leverage risks, Mr. Jacobs said.

“We are doing what Harry (Harry M. Markowitz, the father of MPT and creator of the foundational mean-variance model) did, but we have a third dimension,” he said.

When MPT was created about 60 years ago, investors generally didn’t use much leverage. Publicly traded financial futures, options and other derivatives didn’t exist, Mr. Jacobs said. Updating MPT would sensitize investors to the risks of leverage.

“If you use Harry’s optimizer without a leverage constraint, you can end up with enormously leveraged portfolios.” Mr. Jacobs said. Investors “realize it’s too much leverage, so they put a constraint on it. But that isn’t the optimal way to proceed because with a constraint (that is too loose), investors could wind up with more leverage risk than they really want,” as has been the case sometimes, with detrimental impact on the financial system.

Mr. Markowitz said in an interview he understands the devastation leverage risk can inflict.

“If you are leveraged, there is certain chance in some very short run ... you could have an October 1987 (market crash) deviation and get wiped out or sold out at very bad prices,” Mr. Markowitz said. “I think (that’s) motivation for thinking about not leveraging too much because of short-run fluctuation.”

But Mr. Markowitz said he disagrees about adding leverage as a separate risk factor to the model. Investors optimizing portfolios should instead use leverage as a constraint or set a limit on leverage along with setting constraints on turnover or liquidity or other risks, he said.

“Yes, I think there should be leverage constraints because even if you are in for the long run, you don’t want to get wiped out in the short run,” he said.

“All sorts of other things are handled by your use of constraints and ... you can vary these constraints to see their effect,” Mr. Markowitz said. “My preference is to stick (to) where you show a risk-return trade-off” or traditional mean-variance modeling, “but you do it subject to constraints.”

“You get to the same portfolios either by constraints or having separate criteria. ... It doesn’t seem to me the leverage constraint is any more urgent than the turnover constraint or the liquidity constraint.”

“The general portfolio selection model expects things other than portfolio mean (expected return) and variance to be represented by

constraints,” Mr. Markowitz said.

Since the introduction of MPT, Mr. Markowitz hasn’t seen anything that would necessitate a change in the optimizer model. “What’s changed are the types of things you can invest in,” he said. “The notion that you are worried about risk and return of the portfolio as a whole is still true. ... There are other things to take into account and you can handle (them) with constraints.”

Sebastián Ceria, CEO of New York-based Axioma Inc., whose focus includes developing tools for portfolio management and risk analysis, said in e-mail: “Leverage has indeed not been taken into account before this paper as an explicit source of portfolio risk in quantitative portfolio construction models, as far as I know.”

“Jacobs and Levy make a good case that leverage does, indeed, have unique properties,” Mr. Ceria said. “They also formulate a new optimization problem in which the objective takes leverage into account, but which retains the form of a mean-variance problem. The idea is theoretically promising.”

Ronald Kahn, global head of equity research in the scientific active equity team of BlackRock Inc., New York, said in an e-mail that he sees the Jacobs-Levy approach as “less of a practical breakthrough than a justification for what investors already do.”

A research paper that Mr. Kahn co-authored showed that “separately targeting risk and leverage levels usually leads to suboptimal portfolios,” Mr. Kahn said in the e-mail. “Investors typically fix (or constrain) leverage and then separately target risk via the optimization.”

But Mr. Kahn said he believes the Jacobs-Levy approach shows that “choosing a leverage aversion basically fixes the amount of leverage. That is consistent with the currently standard approach of simply constraining leverage,” an approach Mr. Markowitz suggested.

Agrees with approach

Mehmet Bayraktar, executive director and head of equity research in the portfolio management analytics of MSCI Inc.’s Barra unit, New York, agrees with the Jacobs-Levy approach. “I like the idea of using leverage as a separate parameter of control because it allows (investors) to make the trade-off decisions between investment opportunities and leverage and risk.”

Investors “going into 2007 ... overlooked the inherent risk related to leverage,” he said. “They were so confident with their investment views and risk in the marketplace, they increased their leverage to the limit.”

“I do agree with the authors that there is specific risk related to leverage due to margin calls and ... potential to lose more than you put in. That needs to be specifically accounted for in the framework of making trade-off decisions.”

But he added that it’s “not always going to give you a better portfolio.” ■