Markowitz Bites Back…Again: How The Options Market Boom And ETFs May Result In The Next Deleveraging Meltdown

By Vineer Bhansali| March 18, 2024

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In December of 2006, which is almost 17 years ago, I wrote the original version of this short paper titled "Markowitz Bites Back: The Failure of CAPM, Compression of Risky Asset Spreads and Paths Back to Normalcy". It was influenced by a simple yet elegant publication by Harry Markowitz, the founder of modern portfolio theory ("Market Efficiency: A Theoretical Distinction and So What?" Financial Analysts Journal, Vol. 61, No. 5, pp 17-30, 2005).

At that time, I was at PIMCO, and we were witnessing the precursor to one of the largest bubbles and busts in financial history which came to be known as the GFC (Global Financial Crisis). The plethora of implicitly levered "synthetic credit" products imploded in a spectacular fashion, and took down Bear Stearns, Lehman Brothers and many global financial institutions. For those who were able to foresee the dynamics and events and position defensively, the next two decades were more profitable, both personally and financially, as opportunities abounded in the debris of the global financial crisis.

17 years later, with the current boom in index ETFs and retail options trading, are we setting up for another meltdown? What does Markowitz's framework say?

As markets echo the behavior of the pre-GFC era, I went through my old notes and realized that the time might again be here to dust off Markowitz's work on the influence of leverage on market structure; in the recent evolution of the markets possibly lie the seeds, quite rationally, of the next major implosion. The characters and places have changed; the securities are different, and the story-line also seems to be different. But the plot feels very much still the same.

In the 2006 paper Markowitz shows how the capital asset pricing model (CAPM) crumbles in the real world in the presence of leverage available selectively to some investors. A striking consequence of this paper, which he did not mention but was relevant for investors in 2006-

2010 and is also relevant today, is that the increasing availability of leverage for some investors may actually drive all risky security prices higher, even those not held by levered investors, potentially leading to a market far from equilibrium and with an ultimately destabilizing outcome. Pre-GFC, explicit leverage was available to credit investors, and un-levered investors were pulled into securities such as synthetic credit and structured notes that provided implicit leverage.

> "Today, with the boom in levered ETFs and retail options trading via phone apps, explicit leverage has been democratized and available to all; and those who manage passive index based funds and unlevered equity portfolios are being pulled into holding implicitly leveraged securities through concentrated baskets of momentum stocks."

The roles between retail and institutional investors might have been reversed, but the fragility of the system is tending in the same direction as it was previously.

To recap Markowitz's paper and conclusions briefly: If we leave out the ability to lever as an assumption, or limit borrowing, for some investors, the following consequences follow:

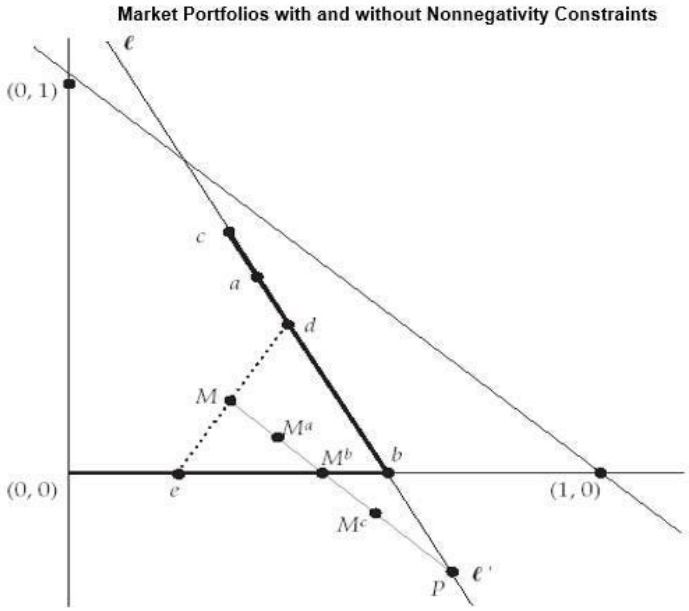
1. The market portfolio is no longer the mean-variance efficient portfolio.

2. The returns of securities are no longer proportional to their beta with the market portfolio.

Markowitz's analysis is strikingly simple. Assume that there are three investable securities. For simplicity, the securities are taken to be uncorrelated and their expected returns, standard deviations and Sharpe ratios are as following: Security 1 has an expected return of 15% and standard deviation of 18%, for a risk to return ratio of 0.83. Security 2 has an expected return of 10% and standard deviation of 12%, for a risk to return ratio of 0.83 as well. Security 3 has a higher expected return of 20% and also a higher volatility of 30%, for a risk to return ratio of 0.66. Thus, on this simple risk-return metric security 3 has the highest expected return but the lowest return to risk ratio.

The figure on the next page (taken from his paper) illustrates the difference in portfolio allocation between two investors, one who can use leverage (i.e., does not have the constraint

that all weights be positive), versus another investor, who cannot use leverage.



The horizontal axis is the allocation to asset 1 and the vertical axis is the allocation to asset 2. The allocation to the third asset is determined by the budget constraint $X_1 + X_2 + X_3 = 1$ where X_1, X_2 and X_3 are the fractions in the three assets. For an un-levered investor, the point (1,0) denotes full allocation to asset 1 only; point (0,1) full allocation to asset 2 only, and point (0,0) full allocation to asset 3 only.

The following consequences follow from his paper:

1. c is the minimum variance (risk) portfolio and is unique. Being on c pre-determines the portfolio return (12.4%, obtained by plugging in the weights (0.28, 0.62, 0.10)). To increase return, one has to take more risk. The optimal portfolio with more return (and risk) lies along the line ℓ′ moving down towards b.

2. As return needs increase, a levered investor can move down beyond point b (say to point P), but an unlevered investor has no choice but to move along from point b to point e. The unlevered investor cannot go any further than point (0,0), at which his return is maximized. If an unlevered investor tries to compete with a levered investor for returns, he can only access

higher yielding, risky securities. As a consequence, the presence of leverage for some investors drives down the risk-premium for ALL securities, including the riskiest securities with worse risk-reward profiles.

3. The market portfolio is obtained by taking the wealth-weighted average of the portfolio allocation of various investors. If everyone remains on the line l′, then the market portfolio also lies along l′. The market portfolio is efficient (i.e., it has the least risk for the desired return). However, if some unlevered investors lie along the line connecting (0,0) and (1,0), and some investors lie along l′ between points c and b, then the market portfolio is at M, which is not mean-variance optimal. Further, if the levered investors are based at P, the overall market portfolio in the presence of all three types of investors (unlevered lying on mean-variance frontier, levered lying on mean-variance frontier, and unlevered off the mean variance frontier), is somewhere like the point M_a, M_b or M_c. This portfolio is off l′, so it is clearly not optimal for the levered investors who would rather lever up.

4. Security returns: Markowitz shows in his paper that the returns of securities are no longer proportional to their betas relative to the portfolio M, since M is not the mean-variance efficient market portfolio. Rather, returns are now proportional to the levered optimal portfolio P.

So What?

We can now take the Markowitz paradigm to explore the dynamic impact of leveraging on the market portfolio and security prices. As more and more investors are able to lever, they buy securities that can be levered and move further out and down the l′ line. This puts pressure on investors who cannot lever, and they move further out to the left on the (0,0), (1,0) line, until they are all the way at (0,0), (i.e., they hold only the riskiest asset).

In the aftermath of the financial crisis, central banks cut rates and flooded the system with liquidity, creating an environment where both implicit and explicit leverage became easy. Even with the recent increase in interest rates, long term yields, which drive investment behavior, have remained persistently lower than short term rates; these dynamics have enhanced main-street to access this leverage. Retail investors have received the message as massive leverage using short-dated (including zero day to expiry or 0DTE) options has

exploded. The most recent development in this vein is the double and triple levered ETFs on single name story stocks such as NVDA.

We want to ask again as we did in 2006: What are the consequences?

Unlevered investors are forced to hold the riskiest security, e.g. security 3, which has the highest expected return but also the lowest information ratio. The market portfolio of the unlevered investor lies along the line connecting d and e, which in the limit lies right on top of the point (0,0). In this limit, there is zero net demand for both security 1 and security 2, which are *ex ante* more attractive on a risk-reward basis. The market is distorted in that high information ratio securities are not held at all by unlevered investors. Note that the point labeled M_c cannot be an equilibrium because there is net negative demand for security 2. The consequence is that the demand for the riskiest security drives up their price, and drives down the price of the securities with better risk-reward profiles. For those investors who have been wringing their hands looking at the Mag-7 stocks demolish value stocks this is one explanation of how we get to this sort of local, unstable equilibrium. One could even go so far as to say the the major equity market indices are simply not the best places to be in terms of risk-return tradeoffs and do not represent equilibrium in the presence of differential leverage.

"Passive managers have to buy indices that have higher concentration of stocks that are being held on a levered basis by those who can lever. Active managers who have to beat the passive benchmarks are sucked into holding the same stocks or risk underperforming the passive benchmarks. The presence of leverage for some pulls everyone into holding the riskiest securities."

Unlevered investors finally realize that their inability to lever is forcing them to hold the wrong securities, so they begin to relax their leverage constraints either explicitly or implicitly (e.g., with "packaged" solutions that allow leverage to be had via a structured note, or in the current era levered single stock ETFs, options and even many large-capitalization ETFs and passive funds). They would like to do what the levered investors do, but the only way to do this is to (1) sell off the large unlevered holdings of risky securities and exchange them for a

more optimal, explicitly or implicitly levered mix; or (2) wait until the levered investors de-lever and come back inside the triangle, which could be longer than their patience since they run the risk of holding an underperforming portfolio.

To avoid the conundrum of being rational they might throw in the towel and start to lever. *At this point, the levered investors and the unlevered investors are all completely committed to holding market optimal but highly levered portfolios.*

A levered up market is obviously more vulnerable to fat-tail shocks, such as a crisis of confidence or liquidity and financing potholes. If unrealized fat-tail events occur, the simultaneous de-leveraging occurs, and everyone rapidly moves their holdings back into the triangle towards point c. Market equilibrium returns with a vengeance.

As in other similar episodes there are ways to deal with this inevitable de-leveraging. One way of dealing prospectively with the threat of fat-tail events in the presence of leverage is to build in a return penalty, *ex ante*, in the expected returns of the most vulnerable securities. Another approach is to not chase the mean-variance optimal portfolio but set hard limits on the maximum amount of leverage allowed at security level, thereby constraining holdings of the riskiest securities. A final approach is to purchase hedges, either explicit or implicit, as embedded in security prices. The low cost of hedging at this writing certainly justifies making portfolios more robust if one finds it chock-full of hidden leverage. In selecting between these choices an investor has to carefully analyze the tradeoffs between the prospective loss of returns from not being fully invested in risky securities, versus the immediate cost of purchasing insurance.

"As we have seen from Markowitz's analysis, the selective ability to lever can create significant market distortions, and astute investors will again be well served by positioning themselves for the inevitable state when the unraveling of these distortions bites back."

Important Disclosures

Vineer Bhansali, Ph.D. is the Founder and Chief Investment Officer of LongTail Alpha, LLC, an SEC-registered investment adviser and a CFTC-registered CTA and CPO. Any opinions or views expressed by Dr. Bhansali are solely those of Dr. Bhansali and do not necessarily reflect the opinions or views of LongTail Alpha, LLC or any of its affiliates (collectively, "LongTail Alpha"), or any other associated persons of LongTail Alpha. You should not treat any opinion expressed by Dr. Bhansali as investment advice or as a recommendation to make an investment in any particular investment strategy or investment product. Dr. Bhansali's opinions and commentaries are based upon information he considers credible, but which may not constitute research by LongTail Alpha. Dr. Bhansali does not warrant the completeness or accuracy of the information upon which his opinions or commentaries are based.

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