Right Model, Wrong Focus?

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Modern portfolio theory (MPT), composed of Harry Markowitz’s mean-variance optimization (MVO) and the capital asset pricing model (CAPM), is the bedrock of all finance courses. Sufficient evidence suggests MPT is wrong on at least two fronts—behavioral finance (as noted by prospect theory [PT]) and factors other than market portfolio matters (summarized by Fama-French [FF]). Its proponents and opponents have been awarded the Nobel Memorial Prize in Economic Sciences and MPT continues to be taught by academics and employed by investors worldwide.

The very simplicity of the model and its recommendations may explain MPT’s popularity, thus defying the strong evidence of its fallibility. This article presents the thought-provoking case that MPT may not be as problematic as its critics suggest; instead, the variable that the Nobel Prize-winning MPT academics focused on, namely a focus on absolute wealth, may have been partially incorrect. A study of investor behavior demonstrates how pivoting to a more practical, but slightly different, variable, relative wealth, may validate the basic concepts of MPT and also potentially reconcile opposing PT and FF theories. In short, rather than focusing on wealth, asset-pricing finance theories ought to focus on the funded status ratio, defined as assets/liabilities. Including this stochastic liability variable into asset-pricing theory, and a liability-centric perspective, may help reconcile many of the seemingly retrograde behaviors of individuals and markets.

Primary Focus of MPT and Behavioral Critique

MPT assumes investors derive utility from wealth and are fundamentally averse to volatility. It employs a simple yet elegant equilibrium model that provides robust recommendations for asset pricing, asset allocation, and risk-adjusted performance calculations. Few other models provide such a complete perspective of the key aspects of investor behavior. For example, to establish the expected return on an asset, only the return on a market portfolio and the asset’s beta (and return on a risk-free rate) are required. Further, all investors must split their portfolio allocations between a risk-free asset and the market portfolio, in a process termed two-fund separation. In practice, most investors do not appear to implement two-fund separation, but they use CAPM inputs on returns to structure portfolios using MVO. In addition, elegant ratios of risk-adjusted performance such as the Sharpe ratio or the M-square derive neatly from CAPM.

What CAPM ignores is that investors and individuals do not require and seek to increase wealth for wealth’s sake but rather to service a specific cash outflow. For institutional funds, these cash outflows are explicit stochastic liabilities such as pensions, insurance payments, endowment spending, etc. Institutional investors worry about the ratio of assets/liabilities or funded status and not just the size of their portfolios, and this may be what PT and FF detected. For retail investors, the liabilities are implicit as individuals worry about retirement, education, or other spending needs (Merton 2014).

Prospect theory goes to the heart of MPT. It questions whether investors truly behave as hypothesized and whether they derive utility from wealth. But tests conducted across varied groups reveal that individuals are more concerned about gains/losses and demonstrate loss aversion, which seems inconsistent with MPT behavior. The key point of the PT critique is that “the previous theory fails because it fails to talk about reference points” (Kahneman 2011). In other words, utility does not appear to be derived from absolute but rather from relative levels of wealth. However, PT proponents struggle to identify what this notion of relative wealth pertains to—is it a level of customary wealth? Is it the wealth of peers? Is it the level of the overall stock market or a particular stock (Barberis 2013)? We will argue that liabilities would be a most appropriate and practical reference point and the objective should be to maximize the ratio of assets/liabilities or wealth relative to liabilities as does Merton (2014).

Factor Critique

The second group that diverges from MPT considers the model too limited in postulating that all returns can be estimated with a single market factor and a beta parameter. By this approach, in addition to a proxy for the market factor, empirical tests conclusively show that other factors, such as economic growth, inflation, slope of the yield curve, term premiums, market capitalization/size premium, and type of asset (value...
minus growth) also matter (e.g., Harvey et al. [2014] test as many as 312 factors). The challenge with the factor approach is that the theory does not specify clear factors, so their determination can be attributed to data mining. Moreover, none of these papers (Chen et al. 1986, or Fama and French 2004) has been able to explain clearly why many of these additional factors are expressed as difference variables (e.g., value–growth; small–large capitalization; long-term yields–short-term yields; higher-yielding bonds–default-free bonds). Stated otherwise, why should some factors have a positive factor loading and others have a negative factor loading? Again, introducing the ratio of assets/liabilities into an MPT framework may provide some relief.

**Investor Behavior: Implications for Asset-Pricing Theories**

For simplicity, assume the representative investor is the chief investment officer (CIO) of a defined benefit pension fund. The extension of these concepts to CIOs of endowments, foundations, insurance companies, or even individuals in charge of retail investment pools is trivial. These CIOs do not invest to maximize the pool of assets they have under their purview; rather, they try to maximize funded status. Merton (2014) makes a similar argument in his work on improving investment outcomes for individual investors, so this is not just an institutional approach. As Merton (2014) notes, “[T]he trouble is that investment value and asset volatility are simply the wrong measures if your goal is to obtain a particular future income.” Further, in a survey of 32 global CIOs from a range of institutional funds, 62.5 percent stated that maximizing funded status was their primary objective (with additionally one response for “Fulfill obligations,” another for “Provide for as much as possible inflation-adjusted pensions,” and one for “Minimize shortfall risk,” which one could argue are related concepts). Even retail investors save and invest to achieve some future spending objective, which could broadly be termed a liability as noted most recently in Merton (2014), or it could be segmented into multiple sub-liabilities if the investment is for different needs. Therefore, a large section of the investing universe is focused on maximizing funded status and not just wealth as assumed by MPT.

Institutional liabilities usually are expressed as a series of cash flows into the future, which creates a conundrum for the investment team (or retail advisor) because they do not speak the language of cash flow. Typically, they think in terms of asset classes, returns, securities, valuation of assets, and volatility. As a result, the first step in the investment process is a sort of transfiguration, where the investment team develops a proxy liability, expressed in asset-speak, mimicking or closely tracking future cash outflows. CIOs establish a strategic asset allocation (SAA) meant to act as a proxy for the liability portfolio and capture the fund’s objectives. A typical SAA comprises a series of benchmark indexes (e.g., S&P 500, MSCI EAFE), each with a target weight, such that the sum of the weights is 100 percent. The same operation of establishing an SAA occurs for retail investors (especially through robo-advisors, which are gaining traction), though they do so to meet some target return that they believe helps them achieve a spending goal (which is nothing but a liability). However, wide variations in liability replication can exist within an industry segment, given differing regulations, demonstrated by U.S. public and corporate pension funds. Further, as Merton (2014) notes in critiquing the typical SAAs and investment approaches for defined contribution participants, “[T]he difference is that risk should be defined from an income perspective, and the risk-free assets should be deferred inflation-indexed annuities.”

The implication for asset pricing is that investors seek to maximize relative, not absolute wealth. Further, this relative concept is not driven by the stock market, the wealth of peers, or some previous wealth level, but by an independent, practical, stochastic variable: liabilities. Hence, the true model for asset pricing should be a relative asset pricing model (RAPM), with CAPM being a very specific case of this more general approach (Muralidhar et al. 2014, 2015). In other words, CAPM assumes that the liability is deterministic and hence equals the risk-free asset (proxied by T-bills). Using the new variable/ratio, funded status (or even surplus, a related concept) in the original elegant CAPM equilibrium model produces an expanded model in which the expected return of an asset depends on relative betas, a market factor (with a positive coefficient), and a liability factor (with a negative coefficient).

Other researchers have developed similar models while examining the impact of delegation to agents but have not recognized the role of liabilities and the importance of the funded status ratio. Also, many have looked at asset allocation implications in the presence of liabilities but have not examined the impact of liabilities on asset pricing theory (e.g., Sharpe and Tint 1990; Elton and Gruber 1992). So this idea or model is not new, but the asset pricing perspective clearly is new, and this leads to some interesting implications.

**RAPM retains the simplicity of CAPM with prescriptions for asset pricing, asset allocation, and even risk-adjusted performance, but the additional variable—liabilities—potentially helps reconcile some of the earlier critiques. Interestingly, asset allocations in market segments with strong regulations (e.g., European pensions, U.S. corporate pensions) actually show a “three”-fund separation, as predicted by an RAPM model, with allocations to a liability hedge, a risky portfolio, and cash.**

**Reconciling These Approaches**

PT has detected many behavioral biases that would be hard to reconcile with a simple RAPM. But it’s difficult to ignore that PT and RAPM share a tangible reference point that is connected to investor behavior: liabilities. Some interesting evidence, especially from public pension fund portfolios, shows that risk aversion is not linked to the size of assets but rather to funded status. As funded status declines, the allocation to risky assets increases (demonstrating loss aversion, but it’s still tied to the funded status ratio and not to total assets). Further, when individuals are posed the same questions as in the original PT research but given information about how much they must spend (liabilities),
models for financial behavior. However, if they were all based on how investors behave, namely with a desire to maximize funded status (or have sufficient assets to service a certain liability), then the foundation of investment finance would have been an equally simple relative asset pricing model. This shift from an asset/market portfolio-centric view to a liability-centric view and introducing this stochastic variable, liabilities, with its own unique characteristics for each investor segment, into asset pricing models may help explain the seemingly retrograde behaviors of individuals and asset markets as noted by factor approaches and prospect theory. Further, incorporating this variable into asset pricing theory may have the interesting effect of unifying finance rather than splitting it into factions. As the opening quote suggested, the magic might all be in the ratio. 

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Endnotes
1. Seife (2000) notes that the Greek word for ratio was λόγος (logos), which is also the term for word.
2. These Nobel Memorial prize winners include Harry Markowitz and William Sharpe (1990), Daniel Kahneman (2002), and Eugene Fama (2013).
3. Additional criticisms of MPT include the distribution of returns, assumptions about frictionless markets, etc. For simplicity, we ignore them and focus on the big picture.
4. The same case can be made for individual savings for a house, car, retirement, education, etc.
5. Adrien et al. (2014) demonstrated how a single factor relating to financial intermediation, namely the leverage of broker–dealers, outperforms the multi-factor models. Research along these lines that focuses on the role of financial intermediaries may also similarly validate the model we propose below.
6. This information is from the author’s unpublished research (Muralidhar 2014) based on a formal poll of global CIOs. In many market segments, liability-driven investing (LDI) is all the rage and there is a lot of literature on asset allocation in the presence of liabilities, but surprisingly none of the authors, including Nobel Prize winner William Sharpe, examined the implications for asset pricing and CAPM.
7. The relative beta is

\[
\text{cov}(r_{M*}, r_i) / \text{var}(r_{M*})
\]

where \( r_{M*} \) is the generic asset, \( r_i \) is the market portfolio of all assets including risky and risk-free assets, \( M \) is the market portfolio of all risky assets (as in MPT), \( F \) the traditional risk-free asset, and \( w \) to be the market value weight of \( M \) in \( M* \), i.e., \( r_{M*} = w r_F + (1-w) r_M \). \( L \) is the global liability portfolio.
9. One also can rationalize the momentum factor because all CIOs and some retail investors have a formal rebalancing policy attached to the SAA. Rebalancing is a contrarian strategy and hence momentum would offer a positive factor loading.
10. See Barclays (2014). The researchers examine factor loading of stocks and bonds broken out by volatility decile and the factors with negative loadings offer an intriguing possibility to the idea presented here regarding reconciliation with FF.

References