Long-term Asset Management Strategy under Loss Aversion: A Quasi-Ladder Payoff Distribution Approach

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Abstract

The prospect theory implies that the inclusion of a gain-lock-in device into the floor of portfolio insurance can benefit the long-term asset management under loss aversion. We find that the relaxation of the multiple of the CPPI from a constant to a dynamic can improve the performance in the short-term. Thus, integrating these two properties into one model, we propose the contingently ratcheted floor variable proportion portfolio insurance (CRF-VPPI).

Keywords: Behavioral Finance, Loss Aversion, CPPI, Quasi-Ladder Payoff Distribution.

1. Introduction

With the fact that payoffs under a portfolio insurance strategy are truncated, the payoff distribution violates the assumption of normal distribution implied by the CAPM. Thus, the CAPM-based criteria are inappropriate to measure the performance created by portfolio insurance. Originated from the prospect theory, we propose the KT's index (initial after Kahneman and Tversky, 1979) as an alternative performance measurement.

Based on implications of loss aversion, we incorporate a gain-lock-in device into the floor of a portfolio insurance to result in an upward ladder payoff distribution, and further relax the multiple from a constant to a dynamic of the CPPI to form a contingently ratcheted floor variable proportion portfolio insurance (CRF-VPPI) strategy. The proposed strategy is able to create a smooth participation pattern in the long-term, hence resulting in a better utility satisfaction under loss aversion.

2. Utility Theory and Implications to Strategy Design

Prospect theory refers to depicting the process that investors are conscious gains or losses over a reference point hence to change their utility status. Since KT's theory was a one-period model, people usually treat initial wealth as the reference point. Benartizi and Thatler (1995) extended the study to multiple periods and asserted that the reference point of an investor is a dynamic which is adjusted by about every twelve months. Thus, investors adjust their reference points in a discrete pattern. With loss aversion, this implies that investors are chasing an upward ladder payoff distribution in the long-term. Since investors adjust their reference point in a discrete pattern, their utility is affected by the house money effect (Thalter and Johnson, 1990) when conducting continuous investments.

The house money effect refers to if there exist gains in the first stage and then experience losses in the later stage during an investment, the accumulated gains soften the utility loss in the later stages. Thus, the house money effect suggests including a gain-lock-in device into a strategy could increase the utility satisfaction under loss aversion.

The prospect theory consists of two different slopes of utility. This contingent property shows that investors conscious more utility loss when suffer one unit wealth loss versus utility gain when have one unit wealth gain. Thus, this implies that avoiding losses is more important than chasing gains to suggest a portfolio insurance based strategy. Berkelaar *et al.* (2004) showed that optimal wealth profiles for prospect theory are similar with those for portfolio insurance. In sum, the loss aversion suggests that a strategy for long-term asset management under loss aversion is incorporating a gain-lock-in device into portfolio insurance and its mechanism is able to create an upward ladder-payoff distribution.

3. Performance Measurement

Tversky and Kahneman (1992) estimated the parameters of the prospect theory model. Berkelarr *et al.* (2004) derived the technique to estimate new reference point. Thus, incorporating estimation of new reference point into the prospect theory, the prospect theory not only is a utility function, but a performance measurement. The KT's index $_t$ is as follows

$$\begin{cases} -2.55(\theta_t - W_t)^{0.88}, W_t \le \theta_t \\ (W_t - \theta_t)^{0.88}, W_t > \theta_t \end{cases} \tag{1}$$

where θ_t denotes the reference point in the beginning of period t and W_t denote the payoff at the end of period t.

4. The Model

In the generic model of multiple-cushion model, the cushion after rebalance $i-1$ is the sum of the initial cushion and sum of value changes of the asset with respect to the changes of the floor before a rebalance. Since the exposure is the product of cushion and multiple, if without a gain-lock-in device, it varies with changes of the risky asset price. If assigning partial value changes to the cushion, and the left to the floor (i.e., incorporating the gain-lock-in device into the floor), in good states; keeping the floor unchanged in bad states, we are able to create different payoff distributions. In theory, portfolio insurance maintains payoffs above the current floor all the time, and hence a quasi-upward ladder floor discipline hauls all payoffs moving upward. Thus, the floor discipline under loss aversion should be contingently ratcheted and can be written as

$$F_i = \max(F_{i-1}, F_{i-1} + q\Delta A_{i-1}) \tag{2}$$

where F_i denotes a new floor after conducting a rebalance, F_{i-1} denotes the floor before the rebalance i, q $(0 < q < 1)$ is a proportion of wealth change which is to be set by investors in advance. This forms a quasi-ladder pattern floor discipline. As a result, the smallest payoff is hauled by increment of the floor to reduce the chance of suffering losses when conducting an asset management.

VPPI (variable proportion portfolio insurance) with fixed floor is able to effectively perform upside capture and downside protection. As a result, this constructs a striking short-term performance. Whereas, the contingently ratcheted floor discipline with a constant multiple could mitigate the reversal cost and haul payoffs moving upward as a whole over the time. Thus, to integrate these two mechanisms into one model, we propose a contingently ratcheted floor variable proportion portfolio insurance (CRF-VPPI) strategy which to be written as follows:

$$\begin{cases} E_i = (U_{i-1} + p\Delta A_{i-1}) \cdot \left[\eta + a\ln(S_i / S_{i-1}) \right], S_i > S_{i-1} \\ E_i = (U_{i-1} + \Delta A_{i-1}) \cdot \left[\eta + a\ln(S_i / S_{i-1}) \right], S_i < S_{i-1} \end{cases}$$

where E_i denotes the exposure after rebalance $i-1$. The first term in the right-hand side is the cushion where U_{i-1} denotes the cushion in rebalance $i-1$, p ($0 < p < 1, p + q = 1$) is the proportion of wealth changes, and ΔA_{i-1} denotes the wealth change between rebalance $i-1$ and i. The second term in the right-hand side is the multiple where η denotes a constant multiple (same as the CPPI) which is greater than 1 to be set heuristically in advance, and $a\ln(S_i / S_{i-1})$ denotes the multiple adjustment factor that a is greater than 1 and $\ln(S_i / S_{i-1})$ is the market move rebalance discipline to be set in advance.

5. Conclusion

The contributions of this paper are: First, findings of implications for strategy design under loss aversion could be guidelines for future strategy design. Second, the proposed KT's index is an alterative for CAPM-based measurement. Third, the proposed strategy CRF-VPPI is an easy tool for institutional investors to conduct asset management. Finally, illustrations of properties of the CRF-VPPI and the CPPI provide insight of the mechanism about the dynamic portfolio insurance.

References

1.Benartzi, S. and R.H. Thaler, (1995). "Myopic Loss Aversion and the Equity Premium Puzzle". *The Quarterly Journal of Economics*, 110, 73-92.

2.Berkelaar, A.B., R. Kouwenberg, and T. Post, (2004). "Optimal Portfolio Choice under Loss Aversion." *The Review of Economics and Statistics*, 86, November, 973-987.

3.Thaler, Richard H., and Eric J. Johnson, (1990), "Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice," *Management Science*, XXXVI, 643-660.

4.Tversky, A., and D. and D. Kahneman, (1992), "Advances in Prospect Theory: Cumulative Representation of Uncertainty," *Journal of Risk and Uncertainty*, 5, 297-323.