Expected Returns & the Effect of Loss Adjustment

Popular tools in the fields of economics and finance often use the concept of expected returns. An expected return is the probability weighted return of each possible outcome. A person's investment decision however, is not solely based on expected returns. In cases where the "*effect of loss*" is great, this factor is the major determinant of investing. This commentary will review the concept of expected returns and provides a simple argument for why the *effect of loss* should be included when analyzing individuals' investment decisions.

Note: The *effect of loss* is simply income after an unwanted investment outcome has occurred.

What is an expected return?

Let's imagine an example in which a booming economy occurs with a probability of 60% resulting in an asset return of $1,000; a declining economy occurs with a probability of 40% resulting in an asset return of $400. In this scenario the strategic decision maker would obtain an expected asset return of 0.6*$1,000 + 0.4*$400 = $760.

Expected returns are also often applied to the study of risk behavior. For example risk aversion exercises commonly demonstrate that persons will often choose the certain outcome even if the expected return is the same as the risky outcome. For example 20 students are given an option between two investments. The first option requires payment of $1,000 in order to receive $2,000 with surety. The second option requires a payment of $1,000 that will give a 50% chance of receiving $3,800 as well as a 50% chance of receiving only $200. Perhaps eighteen of the 20 students will choose the sure investment. This exercise demonstrates that even though the expected payoff on the risky investment is the same as the sure investment, (0.5*$3,800 + 0.5*$200), persons are risk averse and therefore will prefer the sure investment.

The examples inspires the question of, to what extent should the non-economist use an expected return analysis in decision making? This question is further motivated given that there is always a bias between the expected return and the true outcome. Let's demonstrate this bias with the use of an example with a 0,1 outcome.

Expected Return and the True Outcome Bias

LCG Inc. has a 4 year investment option giving an annual return of 12%. There is 50% probability that in the 4^{th} year, LCG Inc. will default on the product. The non-economist considers investing $8,000. She/he can calculate the expected return on this product as:

$$\text{Expected Return}_{\text{year 4}} = \text{Probability of no default*[\$8,000*(1.12)\^{}4] + Probability of default*[\$0]}$$

$$\text{Expected Return}_{\text{year 4}} = \$6,294.01$$

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Certainly the rational economist will not invest. But the question is, what bias did an expected return calculation create, if the true outcome was no default? With no default the payoff is, [$8,000*(1.12)^4] = $12,588.15. Here we see that the expected payoff will always deviate from the true outcome. However this bias decreases as the probability of the true outcome increases.

The following question then arises, how does the bias in expected returns vary with the probability of the true outcome? In other words, what is the value of the bias as the probability of no default approaches 1? What is the value of bias as the probability of no default approaches 0?

Let's take for example the scenario in which the true outcome is no default with a payoff of $12,588.15.

$$\text{Bias} = \text{Expected Return}_{\text{year } 4} - \$12{,}588.15$$

Therefore, $\lim_{prob.\ no\ default \to 1} Bias = 0$ & $\lim_{prob.\ no\ default \to 0} Bias = -\$12{,}588.15$

In general the bias in expected returns will widen as the probability of each state occurring diverges.

So what?

What's the relevance of all of this? We know sampling theory will predict that the expected return will approach the true outcome given there is the opportunity to take the investment repeatedly. But based on the student exercise described earlier, the issue is how does the individual use her/his information on the probabilities and expected returns in their single decision making process? Recall that it is demonstrated that even if there is a positive expected return, a rational investor may choose the sure option. The writer suggests that individuals use a "effect of loss" calculation to determine their choice.

Simply put, a 50% chance of making 57% return on investment or losing everything on an $8,000 investment, is fundamentally different for one evaluating this against her/his wealth of $80,000 as opposed to $800,000. After all, the opportunity to make a 57% actual return on investment is enticing. But even after a calculated net positive expected return on investment, the decision may not be wise, given not the probability of loss, but the effect of loss.

It is the writer's proposal that expected returns analysis should and needs to incorporate the "effect of loss" impact. That is adjusting the probability of each event by the effect of loss. If this is done, the 20 students will then be indifferent between the risky investment and sure outcome.

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