

7.3: Interpreting Expected Return and Standard Deviation

Expected return gives us an idea of how much we will make on the investment. Remember that it is **not** how much we **will** make, but how much we would make **on average** if we could repeat the holding period an infinite number of times. Think of a situation where you are asked to pick a number between 1 and 10. If you select the correct number you get \$100 and if not you get nothing. Any one time that you try this, you will either receive \$100 (if you are lucky) or \$0. However, if you could repeat the exercise 100,000 times, you would find that you would make almost exactly \$10 per time. It is critical to know expected values when selecting investments. For instance, if someone offered you the opportunity to do this exercise for \$9 per pick and you could pick as often as you wanted, it would be an excellent opportunity. Alternatively, if you were offered the same thing for \$11, you would (hopefully) walk away. However, it is just as important to understand that the expected return is only an average return and not the return you **will** receive in any particular instance. This example also illustrates why it is so important to focus on the process and not the result. If you had the opportunity to play this game once for a cost of \$2 and you lost, it still was a smart decision to play and you should do it again if you got the chance. If you had the opportunity to play this game once for a cost of \$20 and you won, it was still a bad decision to play and you should pass if offered the opportunity to try again.

Now consider a similar exercise — pick a number between 1 and 5. If you select the correct number, you get \$50 and if not you get nothing. The expected value for this exercise is the same as the previous exercise (\$10). So, imagine that you are offered the opportunity to participate in either one (pick from 10 numbers or pick from 5 numbers) for \$8. You can only play once. Most people will now choose to pick from 5 numbers. Why? Because it has less risk (a lower standard deviation) and offers the same expected return. This is the concept of risk aversion. As a side note, if you still picked the 10-number game it is likely because the stakes are small (the entertainment value of the gamble outweighs the financial aspect). As the stakes increase, the vast majority of people will choose the 5-number game.

Moving away from our example, let's put this in finance terms. Consider two stocks. Stock A has an expected return of 10% and a standard deviation of 25%. Stock B has an expected return of 10% and a standard deviation of 30%. Which should you choose and why? (Answer to follow ...think about it first)

Now consider two other stocks. Stock C has an expected return of 7% and a standard deviation of 20%. Stock D has an expected return of 9% and a standard deviation of 28%. Which should you choose and why? (Again, spend some time thinking before reading the next paragraph).

In the first example, you should choose stock A and so should everyone else. Stock B offers us no additional compensation (expected return) to entice us to take the higher risk (standard deviation). Therefore, it is irrational in a risk-averse framework to invest in stock B. In the second example, you could choose stock C or stock D and someone else may make the same choice or the opposite choice. Here, the choice is based on your individual level of risk aversion. Stock D is riskier, but it also compensates us for that risk with a higher expected return. Is the compensation enough? That depends on the individual. For those that are less risk-averse, they require less additional compensation to take on the extra risk so they will likely take stock D. For those that are more risk averse, they will take stock C because the extra compensation is not enough for them to take the extra risk. Take a few moments and try to think of what factors impact **your** level of risk aversion. Typically we find that age, personality, number of dependents, wealth, income, variability of income, past life experiences, and other factors all combine to influence one's level of risk aversion. One last thought — remember that taking stock D does not mean you will earn a higher return, just that you will earn a higher return **on average**. If you always earned a higher return from stock D, then it wouldn't be riskier. Visually, you can think of it along the lines of the diagram below. At low levels of risk the range of returns will be close to the expected return. At high levels of risk, the range of returns will be higher. The expected return increases with risk, but so to does the range of potential returns.

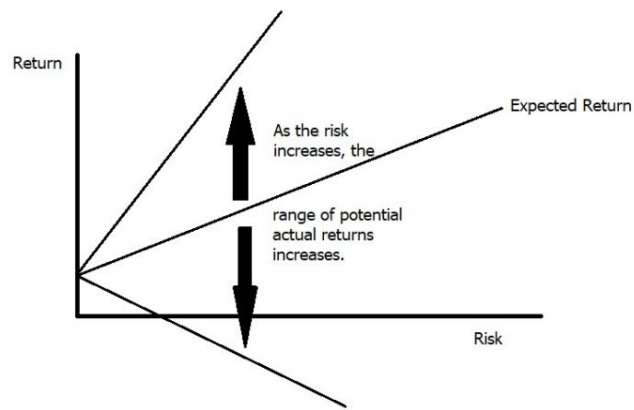


Figure \(\PageIndex{2}\): **Range of Potential Actual Returns**

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