Picking up dollar bills in front of a steam roller

Peter A. Forsyth*

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Not a day goes by without reading about some new financial product which generates superior returns by exploiting some sort of market anomaly. Current popular examples are: alternative assets, private debt and private equity.

A healthy bit of skepticism is in order here. As an example, let's consider the junk bond market. Junk bonds are bonds issued by corporations with low credit ratings. Suppose the yield on a junk bond is y, and the interest rate on a government bond with the same maturity is r, then, to a first approximation

$$y = r + \lambda \times (1 - R)$$

where λ is the average default rate per year (the default intensity), and R is the recovery rate (i.e. what you get back after a default occurs). We can get an intuitive understanding of this equation in the following way. Suppose $R = 1$, i.e. if the bond defaults, then you recover 100% of your investment. Then, this bond has no risk, and market forces would tend to drive the yield on this bond towards equivalent government bond rate. On the other hand, suppose $R = 0$, so you lose everything on default. Imagine holding a diversified portfolio of bonds with similar default rates. In other words, in any given year, we can expect that λ fraction of the bonds default, so you have to get a yield of $r + \lambda$ to make up for the losses. There are some other subtle effects due to the timing of interest payments, which we ignore to keep things simple.

Let's imagine a marketing story put forward by an investment banker. The banker has done a extensive study of the widget industry. For the past ten years, widget manufacturers have had an average default rate of just 4% per year. Even in bad times, widgets are in high demand, and if a widget manufacturer goes bust, there is always a market for widget machines, so the historical recovery rate is about 0.5. So, to a first approximation, the spread of a portfolio of widget manufacturer bonds (compared to the government bond rate) should be $(y - r) = .04 \times .5 = .02$ or about 2%. But the historical average spread for widget bonds (over the last ten years) is about 6%. So, this seems like a very good deal. A portfolio of widget bonds, even accounting for the defaults, will yield on average 4% more than a government bond. Clearly, this is a market anomaly, and you can benefit from getting in on the action.

So, you buy up a portfolio of widget bonds. For several years, you are happy to receive an average return 3.5% higher than the government bond rate (you pay a fee of 0.5% per year to the brilliant investment banker). Your retirement looks secure.

But, suddenly a breakthrough in widget technology occurs. Using new generation widget manufacturing machines, Chinese companies can produce widgets for one quarter of the previous cost. Over one year, 50% of the widget bonds in your portfolio default. Since these companies have old

*David R. Cheriton School of Computer Science, University of Waterloo, Waterloo ON, Canada N2L 3G1, paforsyt@uwaterloo.ca, +1 519 888 4567 ext. 34415.

widget machines, nobody wants them, so the recovery rate $R = 0$. Consequently, your portfolio has lost 50% of its value.

What about the investment banker? He has received enormous bonuses for several years, and retires to the south of France before he gets fired. Nobody asks for the bonuses back.

So, what's the flaw in the reasoning? The problem is that the spread equation $(y-r) = \lambda \times (1-R)$ is only really valid if the widget manufacturer defaults are uncorrelated.[1] However, as we can see, sometimes bad things can happen to an entire industry (or economy) at the same time, and all the correlations go to one.

In fact, we should interpret the observed spread in the market as

$$(y - r) = \lambda_a \times (1 - R_a) \tag{0.1}$$

where λ_a, R_a are the *risk adjusted* default intensity and recovery rate. In other words, the market isn't stupid. The market knows that every now and then, correlations go to one, so investors have to be compensated for this risk. These unusual events, where on rare occasions, everything turns out bad, are termed *jump risk* (the correlations jump to one). So, the risk adjusted value of $\lambda_a \times (1 - R_a)$ will be higher than the historical value, to take into account this jump risk.

So, what's the takeaway message here? Sometimes, based on historical returns, it appears that certain investment products (or strategies) look like they produce better returns at lower risk than the market does in general. There are two possible explanations for this

Case 1: A market anomaly has been discovered. You can invest in this strategy and get rich.

Case 2: The market has priced in the jump risk, so that the higher than usual returns in *normal times* compensate the investor for the large losses which occur in bad times.

Remember sub-prime loans? This looked like a good investment until it blew up.

Of course, undoubtedly some market anomalies exist, but it is very hard to determine a true anomaly (Case 1) from reward for bearing the jump risk (Case 2).

So, when looking at an investment in alternative assets (or private equity), undoubtedly the investment will look good based on historical results (otherwise, nobody is going try to sell you on the strategy). But, more often than not, this is just Case 2.

Note that the investment banker does not really care whether it is in fact Case 1 or Case 2. He collects his bonuses in either case.

So, if you are going to invest in these non-transparent markets (any investment that starts with the word *private* or *alternative*), you have to carefully distinguish between historical returns and risk adjusted returns which take into account the jump risk.

The problem with Case 2 investments, is that this is just like picking up dollar bills on the pavement in front of a steam roller. Most of the time, steam rollers move very slowly. It is easy to pick up the dollar bills. However, one day, you don't notice the oil slick on the pavement in front of the steam roller. You slip when you reach down to pick up the dollar bill and slide into the roller. Hopefully, your surviving spouse has saved all those dollar bills.

[1] Correlation is a measure of the degree to which two random variables move in relation to each other. Correlation coefficients have a value between -1 and $+1$. A correlation of $+1$ would mean that two variables move in lockstep, in the same direction. A correlation of -1 would imply that the two variables move in opposite directions, while a correlation of zero, means there is no relationship between the variables.