Investing: Drawing an income

Mathieu Bouville

Drawing an income changes everything

In "Investing: Risk and return" I looked at the situation of someone thirty years away from retirement. I now turn to someone who is retired and wants to draw an income over thirty years. This case is more different than one may believe. One may think that if money is invested in stocks yielding on average 7% p.a. real then it should be possible to withdraw every year 7% of the initial capital (increased for inflation) and last for ever.

The dashed lines in Fig. 1 show that if one leaves money invested the market going up then down or down then up makes no difference: all that matters is the long-term growth, not the path. But if one draws a constant income (equal to the long-term return rate), whether the market goes up or down first makes a big difference. After the market goes down the capital is hit (by the market fall and the income) and the following rally is not sufficient to make the capital grow again (solid red line). With volatile investments, the income one can safely draw is lower than the average return of the portfolio.

How much income can safely be withdrawn

I consider the case of someone who needs a regular income (increasing with inflation) and expects to live another thirty years (e.g. someone who just retired at 65 and would die by 95). Two possible goals are considered: (i) not running out of money alive and (ii) maintaining one's capital in real terms, i.e. living off the returns only.

Figure 3 shows how the probabilities of keeping one's capital and of staying solvent when drawing a regular income depend on one's asset allocation. For an annual income of \$5 000 for 30 years from an initial capital of \$100 000, the risk of running out of money is minimized by a stock–bond portfolio half in stocks; the risk of bankruptcy is then slightly lower than a quarter. Figure 3(a) shows that the optimal allocation depends dramatically on one's objective: 100% cash to stay solvent but over 70% equity to preserve the principal.

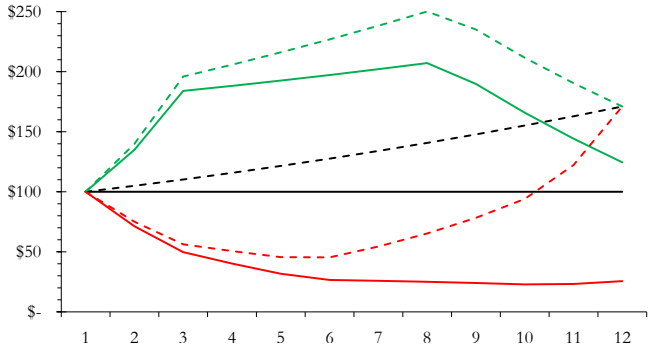

FIG. 1: Three time evolutions ending at the same value if the investment is left alone (dashed lines) but not if an income is drawn (solid).

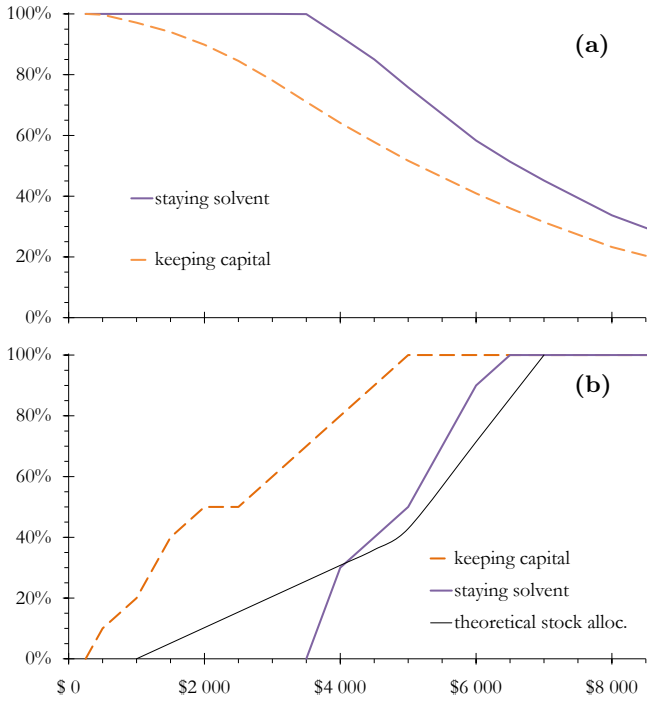

FIG. 2: The probability of keeping one's capital after inflation and of staying solvent (a) and the corresponding equity allocation (b) as functions of the annual income drawn for 30 years from an initial capital of \$100 000.

The optimal allocation shown in Fig. 2(b) is obtained from Fig. 3: for every income level one looks for the allocation maximizing the probability of reaching one's goal. The equity allocation increases with the income one wants and is higher to keep one's capital than to merely stay solvent. For incomes over 6.5% of the initial capital one will hold only equity, regardless of whether one wants to preserve principal or to stay solvent (which is a sure sign that one is trying to withdraw too much).

Figure 2(a) shows, for the optimal allocations, the probabilities of keeping one's capital and of staying solvent as functions of the level of income that one draws. Of course, it is harder to keep one's initial capital than

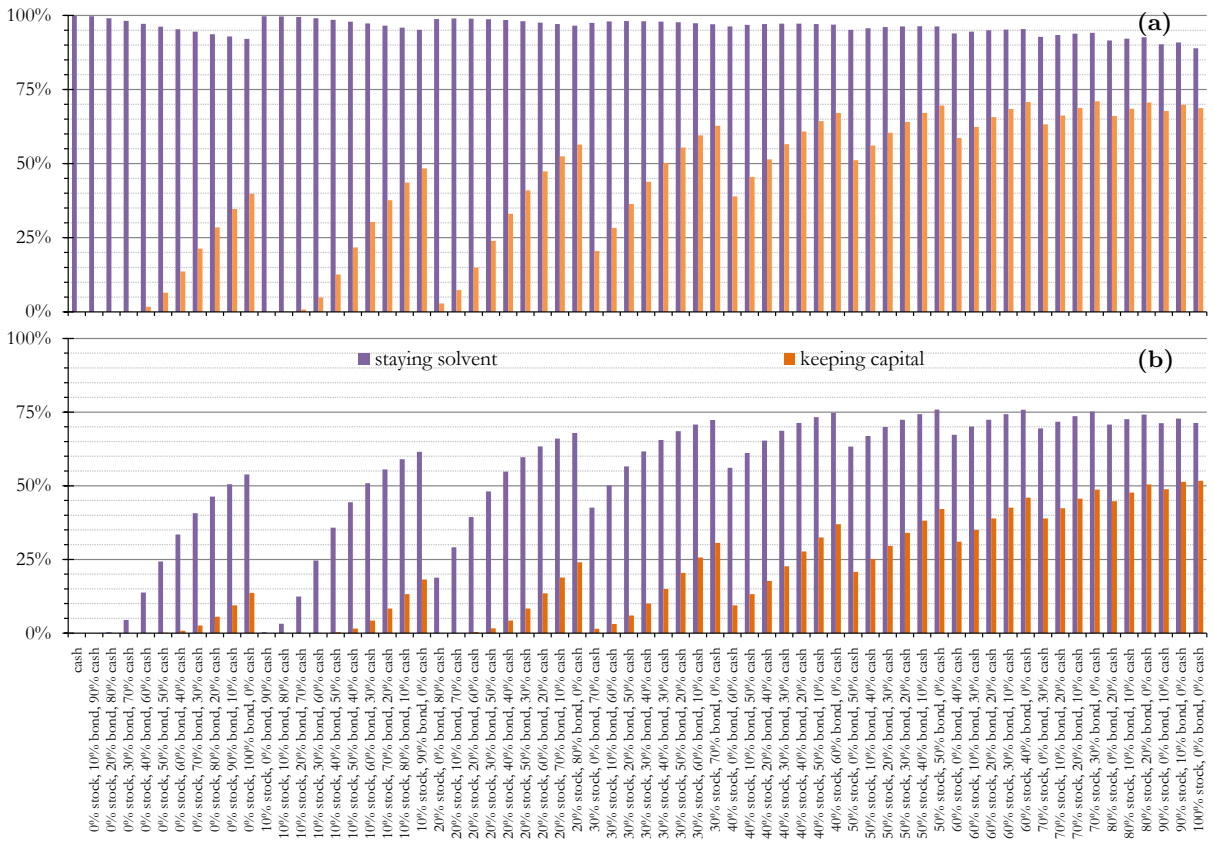

FIG. 3: The probability of keeping one's capital after inflation and of staying solvent as functions of the asset allocation when drawing \$3 500 (a) and \$5 000 (b) a year for 30 years from an initial capital of \$100 000.

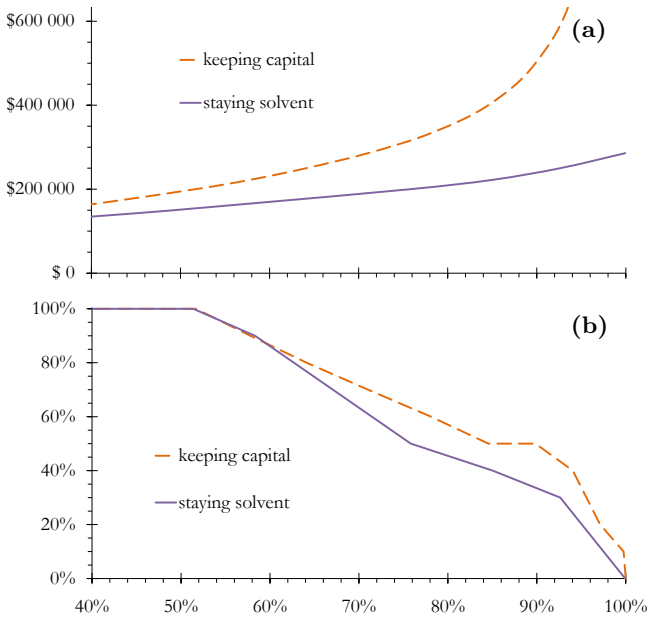

FIG. 4: Portfolio needed for an annual income of \$10 000 (a) and optimal stock allocation (b) as functions of the probability of keeping one's capital after inflation or of staying solvent.

to simply stay solvent (i.e. never lose all of one's money). With an income of \$3 500 one is nearly sure to remain solvent for thirty years but an income of \$2 000 has only a 90% chance of keeping the principal intact. Figure 4(b) shows that the equity allocation depends more on the probability of reaching one's goal than on the goal itself.

The thin black line in Fig. 2(b) shows the stock allocation that would produce —on average— this annual return (see "Investing: For the short term" for why this is not a straight line). This is the allocation one would have naïvely picked to generate a given income. It is clearly quite inadequate: what should generate the necessary income (and thus leave the capital untouched) may not even be enough to stay solvent for thirty years!

Figure 4(a) inverts Fig. 2(a): if one wants a certain probability of keeping one's capital (or of staying solvent) after thirty years of drawing \$10 000 a year, the curve gives the capital that is needed. Certainty to remain solvent for thirty years requires a capital of about \$300 000, i.e. the total amount that will be withdrawn. To have a 90% probability of keeping one's principal intact in real terms it is necessary to have half a million, but only \$200 000 for a 50% chance: certainty costs money.