The Government Risk Premium

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Abstract

What should the goernmet risk preimum be ?

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1. Introduction

What risk premium should the government use in deciding on projects? First, we must narrow the scope of the question. Let's suppose the government must decide whether to build a pollution facility that has an immediate cost which is known and a benefit which will come in one lump sum in one year.[1] Suppose the riskfree rate of interest is zero. The benefit is uncertain, and is perfectly correlated, in expectation, with increases in social wealth– a beta of one, so to speak.[2] The expected rate of return on this project is 5%. The expected rate of return on a project with the same risk characteristics but in the private sector is 6%.[3] The government funds come from general revenue, financed by nondistortionary lump sum taxes. Should the government take the project?

One view is that the government should not apply any risk premium at all, so it should take the project. The rationale for this is that people are too risk averse in their private investments. The Equity Premium Puzzle says that if we use our standard models of risk aversion as motivated by concave utility, the decreasing marginal utility of consumption, the risk premium on the stock market should be far less than it is. Rather than being 7.5%, it should be .5%. People misunderstand risk. Thus, the private rate of return cannot be taken as a guide to public investment. Perhaps we should use .5%, but for simplicity we might as well use 0, since our estimates of the benefits and riskiness of the project are going to be inaccurate anyway. (That's not really a good argument– it's easy enough to tack on a requirement of a risk premium of .5% for all risky projects , ignoring details of riskiness, and more accurate than tacking on 0%).

Another view is that the government should reject the project, because

[1] A well-known problem with simply increasing the discount rate to adjust for risk is that this mixes discounting for time and discounting for risk improperly. It leads, for example, to a cost ten years out being discounted to a *smaller* value because of its risk, not a bigger value. The solution is to convert all cash flows to certainty equivalents first and only then to do time discounting. Here I avoid the problem by having zero time discounting.

[2] If the risk is nonsystematic, then since it is spread across all citizens, it is trivial and should be ignored. This is the well-known advice of Arrow & Lind (19xx).

[3] Although the return on the project is not known with certainty, the value of 6% for the private return is known. Thus, we are not in the situation analyzed by Weitzman (2001), who looks at what happens when the discount rate itself is uncertain.

it should use the private sector's risk premium of 6%. A first rationale for this is that the government could take the money and invest it in the stock market instead of the pollution project, for a higher return. One might reply that although that is a good idea, the best thing might be to invest in *both* the stock market and the pollution project, investing in the stock market till stock returns fall to 5%. A second rationale, however, is that the rate of 6% represents society's required return for risk in the private sector, and the government should take its cue from what people do in their own decisionmaking.

I will argue for a third view: the government should reject the project, and should even reject it if the project's return were 6%, the same as the private sector's. The rationale is that the government should indeed take its cue from what people do in their own decisionmaking, but not all people are willing to accept as little as 6% for bearing risk– only people who are investing in the stock market. Other people are choosing not to invest, showing that the risk premium they require is higher. How high is hard to say.

We need more of a framework to make this argument, though. One thing we need is an objective function. What is the social planner trying to do, anyway? As a first cut, let us suppose that he is choosing a risk premium which is a weighted average of each citizen's risk premium, for whatever weights one might choose.

There are n citizens, each with his own strictly concave utility function $u_i(c_{i1})$, where c_{i1} is his consumption and $i = 1, \ldots n$. Citizen i has w_{it} in wealth, for $t = 0, 1$. Amount $\bar{y}_{it}$ is an illiquid risky asset. He cannot sell this asset. He chooses to put $\widetilde{x}_{it}$ of it in a liquid risky asset whose return is perfectly correlated with the illiquid risky asset and s_{it} into a safe risky asset. Consumption occurs in period 1. Each citizen consumes his own wealth plus his share of government wealth, which we will assume is equal for every citizen. Government wealth can be put into either the safe liquid asset or a risky project (amount $\widetilde{p}_{gt}$) which has a risk perfectly correlated with the citizens' risky asset, but has a return which is higher by the possibly negative amount k. We subscript government wealth by g.

Thus, for $i = 1, \ldots n$,

$$\bar{w}_{i0} = \bar{y}_{i0} + \widetilde{x}_{i0} + s_{i0} \tag{1}$$

and

$$w_{i1} = \bar{y}_{i1} + \widetilde{x}_{i1} + s_{i1}, \tag{2}$$

where for $r_s > -1$ and $\widetilde{r}_x$ such that $E\widetilde{r}_x > r_s$,

$$\begin{array}{ll} \bar{y}_{i1} & = \bar{y}_{i0}(1 + \widetilde{r}_x) \\ \widetilde{x}_{i1} & = \widetilde{x}_{i0}(1 + \widetilde{r}_x) \\ s_{i1} & = s_{i0}(1 + r_s) \end{array} \tag{3}$$

For the government,

$$\bar{w}_{g0} = \widetilde{p}_{g0} + s_{g0} \tag{4}$$

and

$$w_{g1} = \widetilde{p}_{g1} + s_{g1}, \tag{5}$$

where

$$\begin{array}{ll} s_{g1} & = s_{g0}(1 + r_s) \\ \widetilde{p}_{g1} & = \widetilde{p}_{g0}(1 + r_s + k) \end{array} \tag{6}$$

All wealth is consumed at the end of period 1. Consumption is, for $i = 1, \ldots n$,

$$\begin{aligned} c_i &= y_{i1} + \widetilde{x}_{i1} + s_{i1} + \widetilde{p}_{g1} + s_{g1} \\ &= (1 + r_s)(y_{i0} + \widetilde{x}_{i0} + \widetilde{p}_{g0}) + k\widetilde{p}_{g0} + r_s(s_{i1} + s_{g1}) \end{aligned} \tag{7}$$

The order of play is:

0-1. Citizens and the government start with wealths $\bar{w}_{i0}$ and $\bar{w}_{g0}$.
0-2. Everybody simultaneously chooses a risk ratio $\frac{\widetilde{x}_{i0}}{\bar{w}_{i0}}$ or $\frac{\widetilde{p}_{i0}}{\bar{w}_{g0}}$.
1-1. The value of $\widetilde{r}_x$ is realized.
1-2. Citizens consume all the wealth.

If every citizen wanted to have more than $\bar{y}_{i0}$ at risk and $k = 0$, then the government policy wouldn't matter. It would just affect the split between p and x.

If lending and borrowing were possible, we wouldn't need the "more than $\bar{y}_{i0}$" qualifier, though we'd need a different one about aggregate private holdings of the illiquid asset. Someone who didn't like how much the

government was putting at risk could lend to someone else who didn't mind it.

Suppose $k < 0$. Then the government should put nothing in the risky asset. It is a bad substitute for private risk-taking.

Suppose $k > 0$. If everybody wanted to have more than $\bar{y}_{i0}$ at risk, the government should put all its wealth into the government project, because it is a superior substitute for the risky asset.

If some people want to have less at risk and either no borrowing is allowed or the aggregation condition fails, then we must use a social welfare function to decide what to do, or use efficiency. If k is small enough but positive, I claim the efficient thing is to invest nothing in the risky project.

I can think about making $w0g$ endogenous. Let the government give some back right away, so people ca ninvest in the stock market if $k > 0$.

This model works very well.

Do this for $k = 0$, $k = -\epsilon$, $k = \epsilon$.

The illiquid asset is meant to represent such things as human capital and housing. Human capital is easiest to see as a risky illiquid asset. Housing fits the category to the extent that a citizen chooses it because for tax or consumption-hedge reasons but must accept the resale risk that goes with it (see Sinai in QJE 2005,Campbell in JF 2006).

Finance theory tells us that everybody should own at least a small amount of the risky asset, because if someone holds a small enough amount, the second-order risk effect is tiny compared to the first- order high-return effect. Transaction costs might prevent that. Or, it might be that people already own so much of the illiquid asset that they do not want to hold more risk. Which is the true reason is very important to my argument. If it is transaction costs, then the government might help these people by buying risk on their behalf. Otherwise, it might hurt them.

Most people, in reality, do not hold the liquid risky asset (if we don't count housing as that). They are unwilling to hold it at the market risk premium. Thus, their risk premia are higher.

Most people don't hold much of the liquid safe asset either, though. So it could be that they are not risk averse– just impatient.

Look for the efficient solution. This is NOT a matter for a social welfare function. Taxes and transfers deal with that, not choosing consumption items or risk.

THe equity premium puzzle. What if utility is not separable across time, and takes the simple form of U = Min(C1, C2, ...)? I guess you wouldn't save much. Loss aversion is another possible explanation.

$$label e1sdf \tag{8}$$

$$label e1sdf \tag{9}$$

$$label e1sdf \tag{10}$$

$$label e1sdf \tag{11}$$

5. Closely Held Corporations

This can be applied to closely held corporations too. What is the efficient amount of risk taking ?

9. Concluding Remarks

The other possiiblity is that high transaction costs mean that only rich people save in risky assets. Bank accounts need ot be in the safe asset becaue they need to be of predictable size for transactions.

But do we really think poor people would save in risky assets if they saved? And that rich, sophisticated people are fooled about risk?

Ewijk & Tang (2003) say that the U.S. government uses a discount rate of 7%, France uses 8%, Germany uses 3%, and the Netherlands 4%.

References

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