Risk, Delay and Convex Self Control Costs

Drew Fudenberg and David K. Levine

Web Appendix

Time Preference, Wealth and Pocket Cash:

Here we indicate the types of calculations used to establish a plausible range of parameter values for various underlying behavioral parameters

To measure the subjective interest rate r we ordinarily think of taking the difference between the real rate of return and the growth rate of per capital consumption, but this is complicated by the equity premium puzzle. From Robert J. Shiller [1989], we see that over a more than 100 year period the average growth rate of per capita consumption has been 1.8%, the average real rate of returns on bonds 1.9%, and the real rate of return on equity 7.5%. Fortunately if the consumption lock-in once a nightclub is chosen lasts for six quarters,[1] the problem of allocating a portfolio between stocks and bonds is essentially the same as that studied by Xavier Gabaix and Laibson [2001], which is a simplified version of Sanford J. Grossman and Guy Laroque [1990].[2] Their calibrations support a subjective interest rate of 1%. This rate, and any rate in the range 1-7%, can explain the data on the Allais paradox.[3] To explain the Benjamin, Brown, and Shapiro data on Chilean high school students requires a higher interest rate of 7%, at the high end of what can be supported by Shiller's data.

From the Department of Commerce Bureau of Economic Analysis, real per capita disposable personal income in December 2005 was $27,640. To consider a range of income classes, we will use three levels of income $14,000, $28,000, and $56,000. To infer consumption from the data we do not use current savings rates, as these are badly mis-measured due to the exclusion of capital gains from the national income accounts.

---

[1] We have implicitly assumed it lasts for only a day, but the length of lock-in plays no role in the analysis, no result or calculation changes if the lock-in is six quarters.

[2] They assume that once the nightclub is chosen, no other level of consumption is possible. We allow deviations from the nightclub level of consumption – but with very sharp curvature, so in practice consumers are "nearly locked in" to their choice of nightclub. Raj Chetty and Adam Szeidl [2006] show that these models of sticky consumption lead to the same observational results as the habit formation models used by George M. Constantinides [1990] and Michele Boldrin, Lawrence J. Christiano, and Jonas D.M. Fisher [2001].

[3] Subjective interest rates outside this range are also consistent with the Allais data; we did not explore this as we focus on the range that has some prior support from macroeconomic data.

We instead use the historical long-term savings rate of 8% (see FSRB [2002]) measured when capital gains were not so important. This enables us to determine wealth and consumption from income. Specifically, we estimate wealth as annual consumption divided by our estimate of the subjective interest rate r: $w_1 = 0.92 y_1 / r$, where y_1 denotes steady state income.[4]

In determining pocket cash, we need to take account of consumption c_t^d that is not subject to temptation: housing, consumer durables, and medical expenses. At the nightclub, the rent or mortgage was already paid for at the bank, and it is not generally feasible to sell one's car or refrigerator to pay for one's impulsive consumption. As noted by Grossman and Laroque [1990], such consumption commitments increase risk aversion for cash gambles.[5] For consumption data, we use the National Income and Product Accounts from the fourth quarter of 2005. In billions of current dollars, personal consumption expenditure was $8,927.8. Of this $1,019.6 was spent on durables, $1,326.6 on housing, and $1,534.0 on medical care, which are the non-tempting categories. This means that the share of income subject to temptation is $\tau = 0.57$.

Putting together all these cases, we estimate pocket cash to be $x_1 = 0.57 \times 0.92 \times y_1 / 365 = .00144 \times y_1$.

[4] The only use of the savings rate is in inferring wealth and pocket cash from observed income as explained in this paragraph and the next paragraph. Different savings rates would lead to different estimates of wealth and pocket cash without changing the ratio between them. Since we consider three different levels of wealth and pocket cash and our results are robust to these large differences, a small difference created, for example, by using a 2% savings rate rather than an 8% savings rate will have an even smaller effect.

[5] Chetty and Szeidl [2006] extend Grossman and Laroque to allow for varying sizes of gambles and costly revision of the commitment consumption. Andrew Postelwaite, Larry Samuelson, and Dan Silverman [2007] investigate the implications of consumption commitments for optimal incentive contracts.