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Preferences for risk in dynamic models with adjustment costs

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ABSTRACT

This paper characterizes the solution to a consumption/savings decision problem in which one of the consumption goods involves transaction costs. It then analyzes how such adjustment costs affect consumers' risk attitudes. Previous studies have suggested that transaction costs, by resulting in infrequent but lumpy adjustments, magnify consumers' risk aversion with respect to moderate-stake risk and, simultaneously, stimulate the demand for large-stake wealth lotteries. This paper argues that such predictions, while naturally arising in static models, may disappear or even reverse in a dynamic setting, in which consumers can choose *when* to make an adjustment. Namely, it shows that such an option can eliminate the demand for large-stake lotteries, and that the consumers choosing to delay the adjustment may be more tolerant to moderate-stake risks than in the absence of adjustment costs. The paper also illustrates that both predictions crucially depend on the relationship between the time discount rate in the utility function and the interest rate.

1. Introduction

Consumption of many durable goods, most notably housing, can be adjusted only if significant transaction costs are paid. As a result, the adjustments of such goods are infrequent and lumpy. These implications have drawn attention in the existing literature (e.g., Chetty and Szeidl, 2007), due to their potential to explain two well-documented anomalies of risk behavior: high risk aversion with respect to moderate-state income shocks and simultaneous purchasing of insurance and lotteries. This paper argues that while such predictions naturally arise in static models, they may disappear, and even reverse, in dynamic settings. In particular, it shows that the possibility of choosing *when* to implement the adjustment may (i) make some consumers more tolerant to moderate-stake risks than in the environment without any adjustment costs; and (ii) eliminate the gambling motive that appears in a static setting due to the lumpiness of the adjustments.

To derive these results, I characterize the consumption/saving behavior of an agent who has access to a risk-free saving technology and derives utility from consuming two distinct goods – a *flexible* good (e.g., food) that does not involve any transaction costs, and a *commitment* good (e.g., housing) that can be adjusted only if a bounded-from-zero adjustment cost

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is paid. The agent's endowment of the commitment good is exogenously given. In a static setting, depending on his total wealth, the agent may either consume the endowment level of the commitment good or make an adjustment. Due to the presence of adjustment costs, the former option is chosen within a range of wealth levels. In this range, moderate-stake shocks to income or wealth are fully absorbed by changes in flexible consumption, while in the absence of adjustment costs, the same shocks would lead to changes in both goods. That is why previous studies have suggested that adjustment costs, by raising the volatility of flexible consumption in response to moderate shocks, increase the welfare cost of such risks and may help explain the equity premium puzzle.

The dynamic setting gives rise to a new type of behavior: In addition to never adjusting the consumption of the commitment good or adjusting it immediately, the agent can also opt to delay the adjustment. This paper illustrates that, while the risk attitudes of the first two types of consumers are very similar to those in a static model, the risk attitudes of the third type are drastically different. Such agents respond to moderate-stake income/wealth changes by adjusting their savings behavior, which, in turn, affects the timing of the adjustment in the commitment good. Due to time separability of lifetime utility function, such uncertainty over the timing of the adjustment may be not as costly as the uncertainty over actual consumption levels. In fact, I show that consumers adopting such behavior may be risk-neutral or even risk-loving with respect to moderate-state risks. If there were no adjustment costs, all consumers would be risk-averse. Thus, the first contribution of this paper is to show that adjustment costs, by triggering delayed adjustments of the commitment goods, may actually make some consumers more tolerant to moderate-state risks – a prediction that would be impossible to obtain in a static setting.

The second contribution of this paper addresses the ability of adjustment costs to explain the demand for large wealth lotteries. In a static setting, the indirect utility function, as a function of total wealth, is not globally concave since the presence of transactions costs leads to lumpy adjustments. That is why previous studies have suggested that adjustment costs may also help explain why consumers, while displaying risk aversion towards small risks, may simultaneously demand large wealth lotteries. In contrast, in a dynamic environment, the possibility of choosing when to adjust the consumption level of the commitment good may help the consumer to smooth out the kinks in the indirect utility function. I illustrate that, under certain conditions, delaying the adjustment of the commitment good may completely eliminate the demand for lotteries. Intuitively, the possibility of delaying the lumpy adjustment allows the agent to average his consumption of the commitment good over his lifetime, thereby mitigating the impact of the adjustment's lumpiness.

Notably, the two aforementioned effects of the adjustment costs on risk preferences in dynamic models critically depend on the relationship between the rate of return to a risk-free asset and the time discount rate in the lifetime utility function. In particular, I find that the agent who accumulates assets in order to adjust the level of the commitment good in the future is risk-averse if the time discount rate is below the interest rate (i.e., the agent is sufficiently patient); is a risk lover if the opposite relationship holds (i.e., the agent is sufficiently impatient); and is risk-neutral if the two rates are equal to each other. This occurs because, as described above, small income shocks translate into uncertainty over the timing of the switch to a new level of the commitment good. When the switch happens, the agent's instantaneous utility function discretely increases. Due to time separability and geometric discounting, the lifetime utility is a convex function of the time period at which such utility gain occurs.[2,3] The degree of this convexity increases as the time discount gets higher. Thus, the less-patient consumers also end up being the less-risk-tolerant ones. This relationship between patience and risk attitudes, to my knowledge, has not been described in the existing literature.[4] Another immediate implication of this property is that the possibility of delaying the adjustment of the commitment good helps to eliminate the non-convexities in the value function *only* if the agent is sufficiently patient – that is, if the time discount rate does not exceed the interest rate. While the idea that 'time averaging' may eliminate the demand for lotteries appears in the existing literature (e.g., Mulligan, 2001; see the discussion in the literature review below for more details), the observation that this holds only if the agent is sufficiently patient is, to my knowledge, a novel one.

The results developed in this paper are not specific to the particular modeling environment analyzed here. Instead, they naturally extend to a wider class of dynamic discrete choice models, where discrete adjustments occur endogenously (usually due to the presence of adjustment costs, as in this paper) or exogenously (usually due to some exogenous indivisibilities). Examples of such settings are numerous: models of occupational choice (e.g., Quadrini, 2000; Buera, 2006 or Vereshchagina and Hopenhayn, 2009); technology adoption (e.g., Greenwood and Jovanovic, 1990, or Khan and Ravikumar, 2002); endogenous retirement (e.g., Prescott et al., 2009); bankruptcy (e.g., Athreya, 2001); adjustment of illiquid capital stock (e.g., Khan and Thomas, 2003) or illiquid asset (e.g., Kaplan and Violante, 2012), to name just a few. In all these environments, agents may optimally choose to delay the discrete adjustment. This paper argues that adopting

[2] If a utility gain of size Δu occurs at time t, its present value at time 0 is measured by $\beta^t \Delta u$ in discrete time, with $\beta \in (0,1)$, or $\exp^{-\rho t} \Delta u$ in continuous time, with $\rho > 0$, which is convex in t.

[3] Note, however, that such convexity with respect to the timing of the adjustment does not imply that the consumer must be a risk lover regarding income (or wealth) shocks. This is because randomizing over income (or wealth) may, depending on the size of the risk-free interest rate, increase or reduce the expected time needed to accumulate the amount of wealth at which the adjustment becomes optimal.

[4] For example, in a standard single-good, perfect-foresight model with constant relative risk aversion instantaneous utility function, the consumption profile is proportionate to the agent's wealth, and the coefficient of relative risk aversion for the indirect utility function is independent of the relationship between the time discount rate and the interest rate.