Is There a Risk Premium Puzzle?

Costas Azariadis, UCLA*
and
Luisa Lambertini, UCLA†

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Abstract

We investigate the impact on asset returns of self-enforcing intertemporal constraints in a three-period pure-exchange lifecycle economy with uncertain incomes, no durable goods and contingent claims on future consumption. We find that the absence of commitment restricts the supply of claims most in low income states and least in high income states; lifecycle consumption profiles tild toward old age when aggregate income is high. Rationing of the young increases the covariance of old-age consumption with aggregate income, raising the premium for bearing risk as well as the volatility of that premium.

JEL Classification: E32, D91, D52

1 Introduction

This paper examines the pricing of contingent claims on future consumption when claims sellers can walk away from their promises at the cost of asset seizure and exclusion from all subsequent trading. Credible promises to deliver goods in this setting are limited by self-enforcement constraints that restrict promises for future delivery to amounts that the seller would willingly pay when default implies loss of assets and exclusion from markets.

By rationing the supply of claims, self-enforcement constraints put limits on intertemporal arbitrage and on risk sharing that tend to raise the reward to risky assets and lower the yield of riskless ones. Recent research has made good use of these ideas in re-examining the fundamental theorems of welfare economics (Kehoe and Levine [5]) and anomalies in asset returns (Alvarez and Jermann [1]) in economies with infinitely-lived consumers and infinitely-lasting market exclusion after default. Here we examine whether asset returns anomalies, especially a large premium on risk bearing, are equilibrium properties of lifecycle economies with self-enforcement constraints. Our work builds on the contribution of Constantinides et al. [4], who analyze the equity premium puzzle in a lifecycle environment with exogenous borrowing restrictions on young households.

Finite lifecycles have two important implications. First, they greatly reduce the space of credible contracts traded by any individual. Second, individuals near the end of their lifecycle face stringent trading restrictions because they do not greatly value market participation.

In fact, these restrictions can be quite sensitive to changes in expected market yields to the point where the income effect of that change on a rationed trader overcomes the substitution effect, forcing intertemporal consumption goods to become complements. Azariadis and Lambertini [3] show how this property generates multiple steady states and complex dynamics in a riskless lifecycle economy. In what follows, we extend that work to risky environments.

We study a pure-exchange economy with one consumption good. This economy is inhabited by overlapping generations of homogeneous households who live for three periods. There is no fiat money or durable goods. Individuals can buy or sell a complete array of contingent claims on future consumption which exist in zero net supply. Endowments are hump-shaped and stochastic; young agents want to borrow and middle-aged ones want to lend. Borrowing means that young people sell claims against their uncertain future income to members of the previous cohort and consume the revenue. Lending is simply the purchase of these claims by well-endowed middle-aged people.

The key feature of this paper is that self-enforcement constraints prohibit young individuals from issuing as many claims on states of low future income as they would in an ideal economy with full commitment. That leads to binding self-enforcement constraints on the supply of claims in low-income states, to higher-than-ideal prices, limited trading of risky assets, and an extra reward for bearing risk.

The rest of the paper is organized as follows. Section 2 lays out the economic environment. Equilibria with commitment are reviewed in section 3 and equilibria without commitment are studied in section 4. Section 6 concludes.

2 The economic environment

We study a closed, pure-exchange economy of overlapping cohorts with a typical life-cycle $L = 3$ periods. For simplicity, we abstract from production, population growth and finite lifecycles of length $L > 3$. We focus on steady states. Time is indexed by $t = 1, 2, \ldots$ and cohorts by $v = -1, 0, 1, \ldots$. Members of cohort t are identical, and are double-indexed by a cohort superscript and a calendar-time subscript. There are N individuals in each cohort. Cohorts $v = -1, 0$ are transitional with lifecycles of 1 and 2 periods respectively. All subsequent cohorts $v \geq 1$ live three periods: youth at $t = v$, middle age at $t = v + 1$, old age at $t = v + 2$. There is a single, perishable good.

Individuals have stochastic endowments and trade contingent claims on next period's consumption; the net supply of these claims is zero in each state. Endowments and preferences are common knowledge. In particular, for a generation-t household the endowment profile is

$$y^t = (y_0 s_t, y_1 s_{t+1}, y_2 s_{t+2}) \tag{1}$$

with $y_0 + y_1 + y_2 = 1$. $s_t \in S$ is the stochastic shock at time t. The state space in period t is

$$S = \{\sigma_1, \sigma_2, \ldots, \sigma_N\} \quad \forall t. \tag{2}$$

The states σ_i are i.i.d. and belong to a positive bounded support $0 \leq \sigma_1 < \sigma_2 < \ldots < \sigma_N$. $\alpha(s_{t+1}|s_t) = \alpha(s_t, s_{t+1})$ is the probability that state s_{t+1} occurs conditional on the current state s_t and $\sum_{t+1} \alpha(s_{t+1}|s_t) = 1$.

The utility function at the beginning of economic life for the generation t individual is

$$V_t^t = \log c_t^t(s^t) + \beta E \log c_{t+1}^t(s^{t+1}) + \beta^2 E \log c_{t+2}^t(s^{t+2})$$

where $c^t = (c_t^t(s^t), c_{t+1}^t(s^{t+1}), c_{t+2}^t(s^{t+2})) \in \mathcal{R}_+^3$ is the household life-cycle consumption vector, $\beta > 0$ is the subjective discount factor, and $u : \mathcal{R}_+ \to \mathcal{R}$ is a twice continuously differentiable, strictly increasing concave function. In this economy, all variables are history-dependent: varribales at time t are a function of all shocks up to time t and therefore of shocks that occurred before the current generations were born. Variables are history-dependent because of the trading of current young with current middle-aged, who in turn traded with the middle-aged last period and so on.

In this paper, we focus on Markov equilibria of a specific type. Current consumption levels depend on current and last period shocks only. This is the simplest equilibrium that delivers variable consumption shares in an environment without commitment, but it is analytically tractable. More importantly, there are many other equilibria with a more complicated time structure that we do not analyze. To keep our notation simple, with $'s, s, s', s''$ we denote the shock that occurred last, current and next period and the period after the next. With $c_0('s, s)$ we denote the consumption of the current young agent and postulate that her consumption depends on current and last period shocks; with $c_1(s, s')$ and $c_2(s', s'')$ we denote middle-age and old-age consumption by the current young agent. Using this notation, the utility function at the beginning of economic life for the generation t individual can be rewritten as

$$V_t^t = \log c_0('s, s) + \beta E \log c_1(s, s') + \beta^2 E \log c_2(s', s''). \tag{3}$$

Individuals trade claims contingent on next period's consumption. $p('s, s, s')$ is the price of the claims delivering one unit of consumption next period in state s' and zero otherwise, with current state s and last period state $'s$. Claims prices are Markovian because two different cohorts are trading: supply depends on future income while demand depends on current income.

The budget constraints for the generation t individual are

$$c_0('s, s) = y_0 s - \sum_{s'} p('s, s, s') x_0(s, s'), \tag{4}$$

$$c_1(s, s') = y_1 s' + x_0(s, s') - \sum_{s''} p(s, s', s'') x_1(s', s''), \tag{5}$$

$$c_2(s', s'') = y_2 s'' + x_1(s', s''), \tag{6}$$

where $(x_0(s, s'), x_1(s', s''))$ denote the holdings of contingent claims by young agents at time t for the future state s' and s'', respectively. $x_0 < 0$ is a sale of contingent claim by the current young, while $x_0 > 0$ is a purchase.

Individual asset demands are influenced by the discount factor β, the utility function u, the endowment profile and the enforcement mechanism for loan contracts. If endowments consist of collateral goods that can be seized in the event of default, we have an environment of commitment in which households do not default on any loans they can afford to repay. Environments without collateral income cannot set up this enforcement technology; they must rely instead on the self interest of borrowers to enforce repayment promises. In such setting, self-enforcement or individual rationality constraints (IRC's henceforth) on borrowers must supplement lifecycle budget constraints.

We focus on stationary equilibria. We focus on economies with bell-shaped life-cycle endowments such that

$$\frac{y_2}{y_1} < \beta < \frac{y_1}{y_0}. \tag{7}$$

This guarantees that young individuals want to borrow while middle-aged ones want to lend.

3 Commitment equilibria

We consider first an environment in which individuals can commit to their contracts. A competitive equilibrium maximizes lifetime expected utility (3) subject to the budget constraints (4) to (6) and it satisfies the resource constraint

$$c_0('s, s) + c_1('s, s) + c_2('s, s) = s. \tag{8}$$

Given s, the first-order conditions for the generation t agent with respect to x_0, x_1, $\forall s'$ lead to the familiar state-by-state Euler equations

$$\frac{p('s, s, s')}{c_0('s, s)} = \beta \frac{\alpha(s, s')}{c_1(s, s')}, \quad \forall s', \tag{9}$$

$$\frac{p(s, s', s'')}{c_1(s, s')} = \beta \frac{\alpha(s', s'')}{c_2(s', s'')}, \quad \forall s'', \tag{10}$$

At time t, two state-by-state Euler equations hold: (9) for the young and

$$\frac{p('s, s, s')}{c_1('s, s)} = \beta \frac{\alpha(s, s')}{c_2(s, s')}, \quad \forall s', \tag{11}$$

for the middle-aged. We focus on Markov stationary commitment equilibria, that is, on lists $\{c_0('s, s), c_1(s, s'), c_2(s', s''), x_0(s, s'), x_1(s', s''), p('s, s, s')\}$ which satisfy the budget equations (4) to (6), the Euler conditions (9) and (10), and the market clearing condition

$$x_0(s, s') + x_1(s, s') = 0, \qquad \forall s'. \tag{12}$$

One easily verifies that a stationary equilibrium is the solution to the resource constraint (8), the Euler equations (9) and (11) and

$$c_0('s, s) - y_0 s + y_2 \sum_{s'} p('s, s, s') = \beta c_1('s, s). \tag{13}$$

For $s' =' s = s$, it follows that

$$c_0(s, s) = \frac{y_0 s - y_2 \sum_{s'} p(s, s, s') s'}{1 - \frac{\beta^2 \alpha(s,s)}{p(s,s,s)}}. \tag{14}$$

Using the Euler equations (9) and (10), the resource constraint can be written as

$$c_0(s,s) = \frac{s}{1 + \frac{\beta\alpha(s,s)}{p(s,s,s)} + \left(\frac{\beta\alpha(s,s)}{p(s,s,s)}\right)^2}. \tag{15}$$

Next, we guess that the price of contingent claims has the form

$$p('s,s,s') = \; p(s,s'); = \; \beta\frac{\alpha(s,s')s}{As'}, \quad A > 0, \tag{16}$$

substitute it into (14) and (16) and equate them to obtain

$$\frac{1}{1+A+A^2} = \frac{y_0 - y_2\beta/A}{1-A\beta}. \tag{17}$$

It is easy to show that there exists a unique $A > 0$ that solves (17). In the stationary state, consumption levels are

$$(c_0('s,s), c_1('s,s), c_2('s,s)) = \frac{s}{1+A+A^2}(1, A, A^2). \tag{18}$$

In equilibrium, young individuals borrow from middle-age ones. More precisely, young individuals sell contingent claims on future consumption to pay for current consumption; middle-age individuals, on the other hand, purchase contingent claims on future consumption to provide for their old-age consumption. All generations alive share the aggregate risk. In particular, consumption shares of the young, middle-aged and old are the same as they would be without uncertainty and each cohort consumes a constant fraction of total current available resources.

The safe yield is the reciprocal of the cost of buying one unit of consumption in every state, namely

$$R_f(s) = \frac{1}{\sum_{s'} p('s,s,s')} = \frac{A}{\beta s E\left(\frac{1}{s'}\right)}, \tag{19}$$

where the expectations are taken with respect to the future state s'. The expected safe yield therefore is given by

$$ER_f = \frac{A}{\beta}. \tag{20}$$

The risky yield on the market portfolio for claim s' is

$$\tilde{R}(s,s') = \frac{x_1(s,s')}{\sum_{s'} p('s,s,s')x_1(s,s')} = \frac{As'}{\beta s}, \tag{21}$$

and the expected risky yield on the market portfolio is

$$E\tilde{R}(s) = \frac{A}{\beta s}E(s'), \tag{22}$$

and the expected risky yield

$$E\tilde{R} = \frac{A}{\beta}E(s')E\left(\frac{1}{s'}\right). \tag{23}$$

Let $q(s)$ be the market risk premium. Then

$$q(s) \equiv \frac{E\tilde{R}(s)}{R_f(s)} = -Cov\left\{s_{'}, \frac{1}{s'}\right\} > 0, \tag{24}$$

Since the returns on contingent claims on future consumption are positively correlated with income, they are bad instruments to insure against future income shocks. Hence, the risk premium is always positive in this economy.

4 No-commitment equilibria

In this section, we remove commitment from our economic environment and investigate how this changes asset returns and the risk premium. Specifically, we now assume that individual endowments cannot be used as collateral and households cannot credibly commit to make good on their contracts. As in Kehoe and Levine [5] [6], the legal environment has the following characteristics: all information, including default, is public; there are no restrictions on asset transactions, as agents can purchase and sell claims at any point in life, even after default; in the event of a default, the defaulter's private endowments cannot be seized while her holdings of claims on future consumption (her assets) can be garnished by the harmed creditor. Notice that this rule of law is more sophisticated than bilateral punishment.

The assumption that endowments, such as labor and human capital, cannot be confiscated following default is justified by legal arguments (ban on involuntary servitude) as well as by incentives (labor supply would be strongly discouraged). For example, if wages above a certain minimum are attacked to repay debts, the debtor has no incentive to supply labor in excess of that minimum. On the other hand, assets like stocks, bonds and the proceeds from loan contracts easily change ownership and may be seized in case of default.

The legal environment of our model means that the private cost of default is asset seizure and the forgone gain from trading in the intertemporal market for the rest of the agent's life. This feature does *not* rely on any restriction on asset transactions; rather, defaulters' cannot sell assets that have been seized and have no incentive to purchase assets after default because public information and the rule of law make such assets vulnerable to claims by prior debtors. In our environment, default does not occur in equilibrium because fully informed rational agents will never enter a contract that the other part is not willing to abide by.

In this setting, young agents want to borrow more when the current state is low rather than high. As a result, they build a portfolio of contingent claims by selling promises to deliver consumption when middle-aged. Once they become middle-age, they must choose between making good on their promises and defaulting. Defaulting agents are excluded from intertemporal markets for the remainder of their lifecycle and consume their autarkic income vector $(y_1 s, y_2 s)$. If income is low in middle-age and they promised to deliver a large amount of consumption, the latter option is preferable to repayment.

subsectionImplementability of commitment allocation Formally, equilibrium allocations without commitment must satisfy the individual rationality constraint (IRC henceforth) for middle-aged agents

$$c_2(s', s'') \geq y_2 s'' \quad \forall t, \forall s, s'', \tag{25}$$

and the IRC for young agents

$$\log c_1(s,s') + \beta E \log c_2(s',s'') \geq \log y_1 s' + \beta E \log y_2 s'', \quad \forall s'. \tag{26}$$

The IRC's above amount to self-enforcement of contracts. (26) states that no contracts are signed that the agent expects to find preferable to autarky when middle-aged; (25) states that no contracts involving a payment by the agent when old are signed, as they will be defaulted with certainty.

It is easy to verify that the IRC on middle-aged agents is not binding if

$$A^2 \geq y_2(1 + A + A^2) \tag{27}$$

while the IRC on young agents is not binding if

$$\frac{A^{1+2\beta}}{1 + A + A^2} \geq y_1 y_2^{\beta}. \tag{28}$$

The commitment allocation is implementable if both (27) and (28) are satisfied.

subsectionAutarkic equilibria Autarky is an equilibrium in this economy and we can easily find the shadow prices of the contingent claims that would generate autarky as an equilibrium.

Suppose the IRC on middle-aged agents holds for all s'' while the IRC on young agents does not hold for some s', so that

$$\frac{\beta\alpha(s,s')}{p('s,s,s')} = \frac{y_2 s'}{y_1 s} < \frac{y_1 s'}{y_0 s}.$$

If we assume that claims prices have the form

$$p('s,s,s') = \frac{\beta\alpha(s,s')s}{A_a s'},$$

then we obtain that

$$A_a = \frac{y_2}{y_1} < A.$$

In autarky, shadow claims prices are higher (and therefore raters of returns are lower) than under commitment.

4.1 Non-autarkic equilibria

The optimal portfolio decision for a young agent in state s_t who cannot credibly commit to her contracts is the solution to the maximization of (3) with respect to asset holdings $x_0(s,s')x_1(s',s''), \forall s', s''$, subject to the budget constraints (4) to (6) and the IRC's (26) and (25).

The IRC's restrict claim portfolios so that households never choose to default. At low values of youth and middle-age income, these constraints may be binding and will rule out the commitment allocation described in equation (18). If that is the case, then the equilibria with and without commitment differ a great deal. In general, the division of total income between the three generations that co-exist at any point in time will depend on the prevailing state of nature, that is, whether or not claims portfolios are rationed in this state.

Stationary equilibria in our environment without commitment are solutions to (8), (13) and two other sets of equations. These equations are the IRC's (25) for the states in which young agents are constrained, the IRC's (26) for the states in which the middle-aged are constrained and the Euler equations (9) and (11) for all the other states. In this paper we focus on the case where middle-aged individuals are never constrained while young ones may be so. Hence, stationary equilibria are the solution to (8), (13), (11), (25) for the states in which the young are constrained and (9) for the states in which they are unconstrained.

Young agents want to borrow independently of their current income realization because face an increasing income profile. In particular, they want to borrow more in low than in high states of youth income, but they are constrained from issuing claims in low states of middle-age income. Default followed by autarky for the remainder of life is preferable to large debt repayment in low middle-age income states. The shortage of claims in low current and future states will drive up prices and lower the safe yield below the commitment equilibrium values specified in equation (20). At the same time, binding IRC's on young agents lower youth and old consumption shares while slack IRC's raise these consumption shares. Hence, there is a positive covariance between current income realization, the risk premium and the share of consumption of old individuals.

Figure 1 illustrates the point above. Consumption in middle age is on the horizontal axis while consumption in old age is on the vertical axis. There are two states, high and low. Endowment in middle age is $y_1 s_L$ in the low state and $y_1 s_H$ in the high state; $\tilde{y}_2$ is the certainty of income in old age. The indifference curves passing through the endowment points represent utility under autarky. Young individuals cannot issue more than x_{0L} claims against future low state, as a larger amount would be defaulted on. On the other hand, young individuals can issue up to x_{0H} claims against future high states, where x_{0H} is larger in absolute value than x_{0L}. When their income is high, middle-age agents value market participation a lot because they want to transfer consumption from middle- to old-age; as a result, in youth they can issue more claims against their future high income state. In addition, since the supply of claims is large in the high income state, prices are low and returns are high. In terms of Figure 1, this results in a steeper budget line that, in turns, allows a larger debt limit.

Formally, let U be the set of states $\{s, s'\} \in S^2$ such that the IRC on young individuals is binding. Stationary equilibria are the solution to the following system of equations

$$c_0('s,s) - y_0 s + y_2 \sum_{s'} p('s,s,s') = \beta c_1('s,s),$$

$$c_0('s,s) + c_1('s,s) + c_2('s,s) = s,$$

$$\frac{p('s,s,s')}{c_1('s,s)} = \beta \frac{\alpha(s,s')}{c_2(s,s')}, \quad \forall s'$$

$$\frac{p('s,s,s')}{c_0('s,s)} = \beta \frac{\alpha(s,s')}{c_1(s,s')}, \quad \forall \{s,s'\} \in U,$$

$$\log c_1(s,s') + \beta E \log c_2(s',s'') \geq \log y_1 s' + \beta E \log y_2 s'', \qquad \forall \{s,s'\} \notin U$$

It is useful to express consumption levels as

$$(c_0('s,s), c_1('s,s), c_2('s,s) = s(z_0('s,s), z_1('s,s), z_2('s,s)), \quad \forall t \tag{29}$$

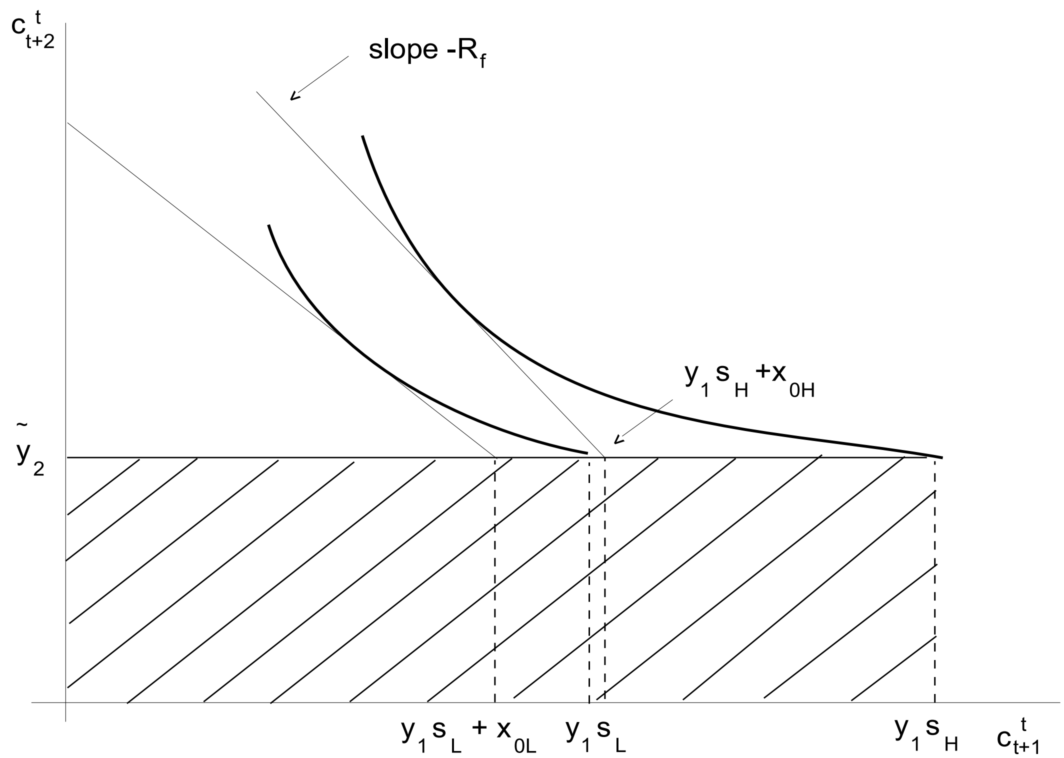

Figure 1: Default in high and low states

where z_0, z_1, z_2 are the shares of consumption of the young, middle-aged and old agents. We know that in the commitment equilibrium these shares are constant – see equation(18); without commitment, these shares varies and are a function of current and previous states.

Using this notation, we can write asset returns in this environment without commitment. The safe yield is

$$R_f('s, s) = \frac{1}{\beta s z_1 E\left(\frac{1}{s' z_2}\right)} \tag{30}$$

and the rate of return on the market portfolio for claim s' is

$$\tilde{R}('s, s, s') = \frac{s(z_2 - y_2)}{\beta s z_1 \left[1 - y_2 E\left(\frac{1}{z_2}\right)\right]}. \tag{31}$$

The risk premium on the market portfolio for claim s' is

$$q('s,s,s') = E\left(\frac{1}{s'z_2}\right)\frac{s'(z_2-y_2)}{1-y_2E\left(\frac{1}{z_2}\right)} - 1, \tag{32}$$

and expected risk premium on the overall market portfolio is

$$Eq('s,s) = E\left(\frac{1}{s'z_2}\right)\frac{E(s'z_2)-y_2E(s')}{1-y_2E\left(\frac{1}{z_2}\right)} - 1. \tag{33}$$

These expressions simplify a lot when old agents have no income, namely $y_2 = 0$. In this case asset returns are not a function of history and can be easily compared to the corresponding expressions in the commitment economy. More precisely, the expected risk premium now is

$$Eq('s,s) = -Cov\left(s'z_2, \frac{1}{s'z_2}\right). \tag{34}$$

Comparing this with (24), one can easily see that the risk premium is higher without commitment as long as the consumption share of the old z_2 is procyclical and it moves in the same direction as the aggregate state s'. Intuitively, in high income states young agents are not constrained and the supply of contingent claims is high; as a result, middle-aged agents purchase large amount of claims to smooth their consumption profile between middle- and old-age, thereby raising the old-age consumption share. Conversely, in low income states young agents are likely to be constrained and the supply of contingent claims is low; this, in turn, allows limited transfer of consumption between middle- and old-age, thereby lowering the old-age consumption share.

When $y_2 = 0$, the risk premium on the s' claim is

$$q('s,s,s') = E\left(\frac{1}{s'z_2}\right)s'z_2 - 1. \tag{35}$$

When z_2 is procyclical, the risk premium is more volatile than under commitment, raising in good aggregate states and falling in bad ones. Hence, the risk premium is procyclical and more so than the old-age consumption share.

When $y_2 \neq 0$, the expressions are more convoluted but the same forces are at play. In particular, the expected risk premium is higher in the absence of commitment if

$$-Cov\left(s', \frac{1}{s'}\right) < -Cov\left(s'z_2, \frac{1}{s'z_2}\right) - y_2 E(s') Cov\left(\frac{1}{s'}, \frac{1}{z_2}\right). \tag{36}$$

On one hand, a strongly procyclical consumption share for the old raises the right-hand side of the inequality; on the other hand, higher expected old age income reduces the demand for claims by the middle-aged, thereby raising asset returns in all states.

5 Some examples

This section presents some numerical simulations. We consider an economy where the aggregate shock can take two values, s_H, s_L. The parameter values are:

$$\beta = .6, y_0 = .1, y_1 = .8, y_2 = .1, s_H = 1 + \epsilon, s_L = 1 - \epsilon, \alpha(s_H) = .5, \alpha(s_L) = .5$$

Since this is a three-period OLG model and every period should be considered to be roughly equal to twenty years, the corresponding annual value for β is 0.975. We simulate the economy for three values of $\epsilon = (.2, .4, .6)$. Increasing values of the parameter ϵ imply a more volatile economy with stronger booms and deeper recessions.

We consider a specific equilibrium: youth supply of claims is restricted for low current and future states, independently of last period state. This is one possible equilibrium, but we believe there could be many more.

Table 1 summarizes the rates of return for three economies; all returns are expressed in annual values. The first two columns show the risk-free rate and the risk premium in the commitment economy; the third column is the risk-free rate in the economy without commitment; the fourth to seventh columns show the risk premium for all possible combinations of current and future states in the economy without commitment and the last column shows the expected risk premium.

For the economy studied here, the commitment allocation is not implementable because the IRC is binding on youth agents. As a result, the supply of claims is

R_f^c	q^c	R_f	$q(s_L,s_L)$	$q(s_H,s_L)$	$q(s_L,s_H)$	$q(s_H,s_H)$	Eq
				$\epsilon=.2$			
5.9	0.2	5.1	-4.1	0.5	-1.4	6	1.6
				$\epsilon=.4$			
5.9	0.9	4.6	-3	1	.6	5.7	2
				$\epsilon=.6$			
5.9	2.3	4.1	-3	2.4	2.7	7.8	3.7

Table 1: Returns

restricted and the risk-free rate is lower than in the commitment economy. Since the return on the contingent claims is procyclical, agents must be paid a positive risk premium to hold such claims even in the commitment economy. The risk premium increases as the shock becomes larger, as we would expect. More importantly, the risk premium is always positive and higher in the economy without commitment. The risk premium in the economy with no commitment also displays a strongly procyclical pattern: the risk premium is high in current good states but low in current bad states.

Figure 2 shows the consumption shares in the economy without commitment for the three economies of table 1. ϵ is plotted on the horizontal axis; the vertical axis measures the consumption share. The left column shows the consumption shares when last period shock realization was s_L, while the right column shows the consumption shares when last period shock was s_H. In each diagram, the thick line is the consumption share for future high state, while the thin line is for future low state.

6 Conclusions

To be written.

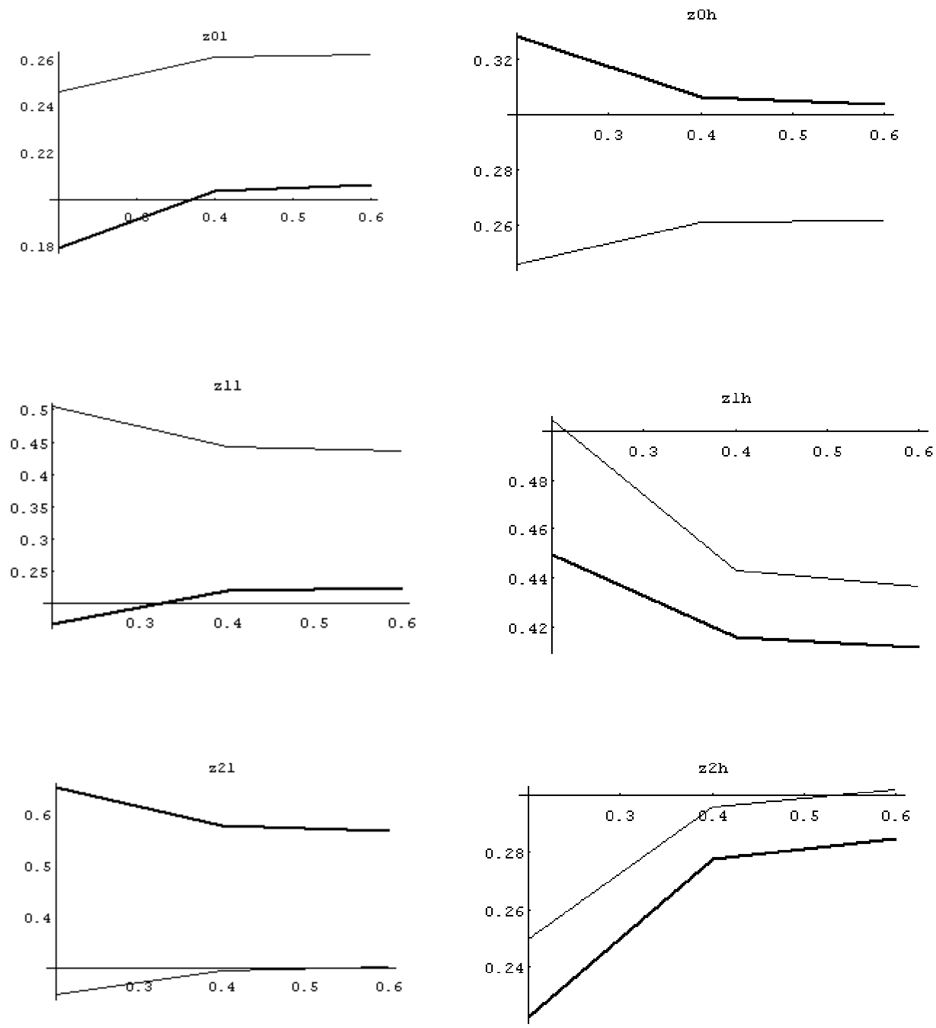

Figure 2: Consumption shares

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* Costas Azariadis, Department of Economics, University of California, Los Angeles, CA 90095–1477, USA. E-mail: azariadi@ucla.edu

† Luisa Lambertini, Department of Economics, University of California, Los Angeles, CA 90095–1477, USA. E-mail: luisa@econ.ucla.edu