

## Financial Bubbles and Self-Enforcing Debt

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This study addresses the classic question whether debt can be sustained purely by a reputation mechanism. Suppose that the only punishment imposed on a borrower who defaults on his obligations is that he will not be able to borrow again in the future. A seminal result in Bulow and Rogoff (1989) claims that, under this type of punishment, debt is unsustainable. They analyze the case of a small open economy, borrowing at a given positive world interest rate. In that environment, if the country ever borrows a positive amount, it will eventually reach a point where it is strictly better off defaulting and financing all future consumption with positive asset positions, out of a 'savings' account.

This result has sparked a rich literature on reputational mechanisms for sustaining debt. Some of these contributions have augmented Bulow and Rogoff's (1989) framework to sustain debt by non-competitive mechanisms, such as reduction of trade, loss of trade credit, or other non-financial sanctions, collusion among non-competitive lenders (Kletzer and Wright 2000, Wright 2001), loss of reputation in other dimensions (Cole and Kehoe 1998), time inconsistency in the borrower's preferences (Gul and Pesendorfer 2003, Amador 2003), or reduced access to state-contingent securities (Pesendorfer 1992, Thomas 1992, Grossman and Han 1999). A separate branch of the literature has studied markets with stronger consequences of default, such as outright exclusion from markets into autarky (Eaton and Gersovitz 1981, Kehoe and Levine 1993, and Kocherlakota 1996), or loss of productive collateral (Lustig 2004). One appealing feature of this latter class of models is the endogenous determination of debt limits in general equilibrium, so as to provide proper incentives to honor existing outstanding debt (Alvarez and Jermann 2000).

In this study I go back to the original Bulow and Rogoff (1989) setup, but frame the problem in a general equilibrium model with endogenous debt limits. I consider a symmetric environment in which all agents have limited commitment, and default is punished only by the exclusion from future borrowing. I show that positive amounts of debt are sustainable in equilibrium.

Key to my analysis is that, when all the agents have limited commitment, the equilibrium interest rate adjusts endogenously so as to ensure that agents repay their debt. Related results appear in Chari and Kehoe (1993) and in Krueger and Uhlig (2005). Chari and Kehoe consider government debt in a model with distortive taxes and lack of commitment by the government, but not the households. Krueger and Uhlig analyze competitive risk-sharing contracts with one-sided commitment by the insurers, and show that such contracts never allow the insured to incur debt. Both papers have in common with each other and with BR the assumption of one-sided commitment and access to savings at competitive market rates after a default.

My main argument can be split in two steps. First, I show that incentives for default disappear if the interest rate is sufficient low. Second, I show that interest rates low enough to be consistent with repayment can emerge in equilibrium in an economy where no agent can commit to repay. To illustrate these results, the author first present a simple deterministic example where positive borrowing is sustained in equilibrium. In the example, private debt is self-enforcing as long as the equilibrium interest rate is smaller than or equal to the growth rate of debt limits, which equals the growth rate of aggregate endowments in steady-state. In the rest of the paper, I give a full characterization of the conditions under which private debt is sustainable.

For the general analysis, I consider a stochastic endowment economy with sequential trade in complete contingent securities markets. Agents may issue securities up to a state-contingent limit. If they default, they are denied credit in all future periods. The equilibrium debt limits are determined endogenously as the largest possible limits such that repayment is always individually

rational. My first general result states that debt limits are self-enforcing if and only if they allow all individuals to exactly finance outstanding obligations by issuing new claims. In a deterministic environment, this is satisfied if and only if they grow at a rate equal to or larger than the real rate of interest.

My second main result establishes conditions for the existence of an equilibrium with self-enforcing debt and gives a characterization of sustainable equilibrium allocations, by means of an equivalence result. Consider an alternative environment with no private debt, but where we allow a government to issue state-contingent debt that is not backed by any fiscal revenue, i.e., where the government must finance all existing claims by issuing new debt. This unbacked public debt has the feature of a rational bubble (Tirole 1982); in a deterministic environment, it can be reinterpreted as fiat money. I show that any equilibrium allocation of the economy with self-enforcing private debt can also be sustained as an equilibrium allocation of the economy with unbacked public debt, and vice versa. Since there exist well known conditions for the sustainability of positive levels of unbacked public debt, or the existence of rational bubbles or fiat money more generally (see Santos and Woodford 1997 for a general analysis), these conditions also characterize the sustainability of positive levels of private debt in a general equilibrium Bulow-Rogoff economy.

#### References

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