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Asset bubbles, economic growth, and a self-fulfilling financial crisis

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ABSTRACT

A tractable model in which asset bubbles can exist in spite of infinitely lived agents is presented. An intrinsically useless asset has a positive value and raises welfare because it helps investors with idiosyncratic productivity to obtain more credit in imperfect financial markets. However, the bubbly equilibrium is only the second best. Moreover, bubbles may burst, and this leads to recessions. The model's analytical solution allows for the study of many policies. We find that a policy of purchasing the asset avoids financial crises but nevertheless results in the second-best outcome. A policy that taxes depositors and subsidizes investors both prevents crashes and achieves the first-best outcome.

1. Introduction

Economic history has repeatedly witnessed growing asset prices, which possibly promote economic growth, and the crash of asset prices has seemed to cause severe economic depressions. Given historical observations from real economies, we develop a tractable dynamic general equilibrium model with infinitely lived agents to demonstrate that asset bubbles promote economic growth and the collapse of asset bubbles causes severe depressions. Using the model, we describe a financial crisis accompanied by a bubble bursting as a rational expectations equilibrium. Moreover, effective government policies are proposed to avoid self-fulfilling financial crises and the occurrence of asset bubbles.

In our model, agents have access to investment projects in each period to produce general goods. Although agents are ex ante homogeneous, they are heterogeneous when they engage in investment projects, as in the model developed by Angeletos (2007), because they receive uninsured idiosyncratic productivity shocks in each period. Although the manner of introducing uninsured idiosyncratic shocks is similar to that employed by Angeletos (2007), our model departs from Angeletos' model in that agents face credit constraints and depositors and investors (or equivalently, borrowers) endogenously appear in our model. Heterogeneous productivity is continuously distributed

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across agents, and owing to the endogenous market segmentation with respect to agents' participation in the financial market, a productivity cutoff that divides agents into depositors and investors is simply derived in each period, whereby less productive agents become depositors and more productive agents become investors. Investors can borrow from a representative financial intermediary, only up to a certain proportion of their net worth, to produce general goods because they face credit constraints. An intrinsically useless asset is introduced into our model. Because of credit constraints, bubbles can appear on the asset despite the assumption of infinitely lived agents.

Asset bubbles can occur in growth models if the equilibrium interest rate is less than the economic growth rate.[1] In standard dynamic general equilibrium models with an infinitely lived representative agent, bubbles cannot exist in equilibrium. In a regular economy with no frictions, a unique equilibrium converges to a steady state, and the steady-state interest rate is always greater than the economic growth rate; thereby, any bubbly dynamic paths do not satisfy the transversality condition. In a financially constrained economy, however, the interest rate is generically less than in a financially unconstrained economy because the demand for borrowing is smaller in a financially constrained economy than in a financially unconstrained economy. If agents face credit constraints, the market interest rate in the *bubbleless* steady state deviates downward from the marginal product of capital, and under certain parameter conditions, it becomes smaller than the economic growth rate. In this case, asset bubbles á la Tirole (1985) can occur with infinitely lived agents because the sum of the present values of future total output becomes infinite, although agent preferences are locally nonsatiated and each individual lifetime budget constraint is binding.

In our model, two steady states can be obtained. One is a steady state in which the intrinsically useless asset has no value, which is called a *bubbleless* steady state. The other is a steady state in which the intrinsically useless asset has a positive value, which is called a *bubbly* steady state. The presence of asset bubbles corrects inefficiency in resource allocation and promotes economic growth when the financial market is imperfect. When an intrinsically useless asset is initially introduced into an economy and is valued, being distributed evenly across agents, all agents become wealthy (the net worth effect, stressed by Hirano and Yanagawa, 2010), and each agent's consumption and saving become larger than when asset bubbles do not exist. Under these circumstances, the supply of capital decreases because some savings in the economy are stored by holding the asset (the crowd-out effect á la Tirole, 1985). The net worth effect of asset bubbles relaxes the credit constraints faced by investors, and thus the demand for borrowing increases. The decreased supply of capital and the increased demand for borrowing lead to a higher interest rate in the *bubbly* steady state than in the *bubbleless* steady state. The higher interest rate excludes less productive agents from production activities, resulting in a smaller number of investors in the *bubbly* steady state than in the *bubbleless* steady state. However, because the presence of asset bubbles excludes less productive agents from production activities, agents who draw a higher productivity invest to a greater extent, and inefficiency in resource allocation is corrected (the allocative efficiency effect, found in this paper). This effect promotes economic growth. Although the net worth effect renders highly productive investors wealthy and plays a role in promoting economic growth, we find that the allocative efficiency effect is the most important for promoting economic growth and the net worth effect is instead important for correcting constrained dynamic inefficiency, thereby increasing aggregate consumption. Because the presence of asset bubbles increases consumption at each point in time relative to the case without them, asset bubbles increase ex ante lifetime welfare. However, the presence of asset bubbles only achieves the second-best outcome.

Although the presence of asset bubbles partially corrects constrained dynamic inefficiency, the bursting of asset bubbles causes an economic depression. Then, two types of government policy are suggested: One is designed to avoid the bursting of asset bubbles, and the other is designed to avoid the occurrence of asset bubbles. The first government policy imposes a tax on agents' net incomes and purchases a small amount of the intrinsically useless asset using the resulting tax revenue. The first policy provides institutional backing for the intrinsically useless asset and eliminates the bubbleless steady state. As a result, only a unique unstable bubbly steady state remains. Self-fulfilling financial crises, therefore, never occur. Although there is a trade-off between the economic growth rate and the government's asset purchase, the decrease in the growth rate caused by this policy is very small under mild parameter conditions. However, the first-best outcome is unachievable under this policy. In contrast, the second government policy that avoids the occurrence of asset bubbles can achieve the first-best outcome. The second policy imposes a tax on deposits and subsidizes investment, being designed to correct allocative inefficiency. If the government can implement this policy, asset bubbles never occur because the economy becomes equivalent to that embodied by a Ramsey-type growth model without any frictions.

Various policies have been discussed in the context of the bursting of asset bubbles, such as bailouts (e.g., Kocherlakota, 2009; Hirano et al., 2015) and capital inflow sterilization (e.g., Caballero and Krishnamurthy, 2006).[2] The occurrence of asset bubbles is a symptom of financial market imperfections, and asset bubbles only partially correct allocative inefficiency in our model. Although a policy that cures a root cause is necessary, few studies

[1] See Theorem 3.3 in Santos and Woodford (1997). A bubble is defined as the difference between the fundamental and market values of an asset.

[2] Caballero and Krishnamurthy (2006) consider a small open economy with an overlapping generations model in which asset bubbles promote domestic investment. They propose capital inflow sterilization to mitigate credit crunches that may occur when asset bubbles burst.