Depreciation: a Dangerous Affair

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Abstract

What if the statutory fiscal depreciation of buildings was higher than their effective economic depreciation? This would imply that markets would value buildings more than their social fundamental value. I prove that this would allow house price bubbles to emerge and open the door to sudden crashes. This paper provides an example of how a misaligned fiscal policy measure could generate potentially destabilizing self-fulfilling prophecies even in an economy with fully rational and forward-looking individuals.

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"*A lot of my write-off was depreciation...she'll always allow it, because the people that give her all this money, they want it. That's why....I pay tax and I pay federal tax too. But I have a write-off, a lot of it is depreciation, which is a wonderful charge. I love depreciation.*" Donald Trump *vs* Hillary Rodham Clinton, Second presidential debate, October 9, 2016.

1 Introduction

When a firm buys a building it is entitled to deduct parts of its value from taxes at rates which are supposed to approximate the actual economic depreciation rate of the building. However fiscal schedules are often the result of political compromise and sometimes accused to be too generous to real estate holders willing to minimize their income taxes. For example, according to the federal *Modified Accelerated Cost-Recovery System* (MACRS) introduced by the US Tax Reform Act of 1986, businesses may recover investments in buildings through depreciation deductions up to a substantial amount: typically a house is assumed to be depreciated in 27.5 years, but the owner can opt for accelerated depreciation, so short as to 5 years. Hence, the government could be actually subsidizing house prices. We claim that this is sufficient to render a house price bubble sustainable. Moreover, this allows for self-fulfilling prophecies to generate house price bubble collapses even in a rational and otherwise very stable economy.

The rest of this study is organized as follows. Section 2 a simple stylized house price model. Section 3 characterizes and proves the existence of rational bubbles and sunspot equilibria in this model. The final section concludes.

2 A Simple Model of House Prices

Let us assume that infinitely lived families - identical and with constant population normalized to 1- choose consumption, savings and investment by maximizing their intertemporal utility functional represented by

$$\sum_{j=0}^{\infty} \beta^j \frac{c_{t+j}^{1-\sigma} - 1}{1-\sigma}$$

where time $t = 0, 1, ...$ is unbounded and discrete, σ is the inverse of the intertemporal elasticity of substitution, $\beta = \frac{1}{1+\rho}$ is the subjective discount factor, with subjective interest rate $\rho > 0$. Individuals work for firms and are paid wages w_t per unit time. Family wealth, a_t, grows according to:

$$a_{t+1} = a_t r_t + w_t - c_t.$$

The associated Euler equation is:

$$c_t^{-\sigma} = \beta c_{t+1}^{-\sigma}(1 + r_t). \tag{1}$$

3 Real Estate Bubbles

Financial intermediaries - which we will call "banks" - invest individual savings into "houses", which are in limited supply. We assume that the price of a house paid by a bank, p_t is refunded in a fraction $\theta \in [0;1]$ per period by the government. Parameter θ is set by the legislation on the depreciation of physical investment. For simplicity, we will assume balanced government budget, with lump sum taxes financing the fiscal depreciation of the buildings.[1]

Following Caballero and Krishnamurthy (2006), we assume for simplicity that real estates are unproductive and irreproducible assets. Hence any positive price would be a bubble. An extension would complicate notation, but would imply that the bubble would be the difference between the price of the asset and the expected present value of the rents it generates.[2] We look for the possibility of bubbles with constant probability $\lambda \in [0;1]$ of bursting each period. Financial intermediaries, perfectly competing and risk neutral, view real estate investment as equivalent to consumption loans. Hence the no arbitrage equation between the activities is:

$$\frac{p_{t+1}(1-\lambda)}{p_t(1-\theta)} = (1+r_t). \tag{2}$$

3.1 Equilibrium

In this section we characterize the rational bubble equilibrium in this economy. For a housing bubble to be stationary it is necessary that the price of the asset grows at the same rate as the real GDP, assumed exogenous and denoted by $\gamma > 0$. Hence:

$$\frac{p_{t+1}}{p_t} = 1+\gamma. \tag{3}$$

In a steady state consumption will grow at the same rate, that is

$$\frac{c_{t+1}}{c_t} = 1+\gamma. \tag{4}$$

Therefore, eq. (4) and the Euler equation (1) imply:

$$1+r_t = (1+\gamma)^{\sigma}(1+\rho). \tag{5}$$

Combining eq.s (2), (3), and (5) we obtain:

$$\lambda = 1 - \frac{(1+\rho)(1-\theta)}{(1+\gamma)^{1-\sigma}} \equiv \lambda^*(\rho,\sigma,\gamma,\theta). \tag{6}$$

[1] Hence non-distortionary taxation is fully compensated by trasfers and does not interphere with our assumed intertemporal wealth constraint.

[2] Our model is purposefully very stylized, but it could be complicated in several directions. For a very useful survey of recent housing macroeconomics, see Piazzesi and Schneider (2016).

Notice that $\lambda^*(\rho, \sigma, \gamma, \theta)$ denotes the equilibrium probability of the bubble bursting as a function of the subjective interest rate, the elasticity of intertemporal substitution, the economy's growth rate, and the amortization rate. From (5) we see that λ^* is non-negative if and only if:

$$\theta \geq 1 - \frac{(1+\gamma)^{1-\sigma}}{1+\rho} \equiv \theta_{\min}. \tag{7}$$

The threshold level, $\theta_{\min}$, of fiscal depreciation for the existence of a stationary rational real estate bubble with constant probability of exploding is positive, because the convergence of representative agent utility restricts parameters to $1 + \rho > (1+\gamma)^{1-\sigma}$. Therefore if government forced the fiscal amortization rate to be low enough the real estate bubble would not exist in this economy. Existence becomes possible only if the government allows for a level of θ at least as large as $\theta_{\min}$. Interestingly, the higher θ the higher the probability of the bubble collapsing each period.

Therefore we can conclude with the following:

Proposition 1. *A stationary rational house price bubble equilibrium exists if and only if the fiscal depreciation rate θ is above a minimum level $\theta_{\min}$. The higher the allowed depreciation rate the higher the probability of house price bubble crash.*

Notice that the crash probability is an example of a rational stationary sunspot equilibrium (Cass and Shell, 1983), that would not emerge in this economy (see, Tirole 1982) if the government did not introduce a house depreciation rate.

4 Conclusion

This paper has shown that in a rational world in which real estate price bubbles would not exist, governments could induce the emergence of house price bubbles by allowing estate owners to fiscally depreciate their real estates at a rate higher than the actual physical depreciation of the estate. Moreover, the very existence of such house price bubbles allows for a probability of their crash. Finally, the crash probability is increasing in the fiscal depreciation rate.

References

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