

Craig Burnside's discussion of:

“Asset bubbles, domino effects and ‘lifeboats’: Elements of the East Asian crisis”

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My discussion is going to summarize what questions this paper addresses and how it addresses them. I will then say what I think its main policy message is, and make some comments on what the paper lacks.

The paper first asks two simple questions: what happens to a financial system in which loans are backed by collateral when there is a real shock to the productivity of land, or when a property price bubble bursts. It turns out that the answers to these two questions are roughly the same. The paper also asks how the answers to these questions change when you have a margin requirement in place.

Most of the rest of the paper, which I suppose is the part that is most interesting, talks about how different types of crisis management might work, and focuses on two examples: a “squeeze” and a “freeze.” A squeeze is when policy makers allow unfettered loan recalls to take place. A freeze is when policy makers enforce debt rollovers with write-downs.

There is also some discussion at the end of the paper about how contagion happens, but I won't say much about that. I think most of that discussion is outside the context of the model in the paper and is largely speculative.

The framework for the paper is the model outlined in Kiyotaki and Moore's (1997) paper. It's a model with two types of agents: borrowing constrained agents, which in this paper are thought of as property companies, and unconstrained agents, which are all the other landholders in the economy. This is a nice framework because it's one in which i.i.d. shocks have persistent effects on the economy. It is, of course, a framework in which asset markets are incomplete. What kinds of asset markets exist in the model? Really just two: a spot market for land and a market for loans. You can borrow funds from the loans market, but all lending must be collateralized and is not state contingent.

I turn, now, to some of the basic workings of the model. There are three important equations. One is the budget constraint of the constrained agents:

$$(1) \quad q_t k_t \leq (\alpha_t + q_t) k_{t-1} + b_t - R b_{t-1},$$

where b_t is what they borrow, k_t is the amount of land they have at the end of period t , α_t is the productivity of land, and q_t is its price.¹

The second equation is the borrowing constraint,

$$(2) \quad R b_t \leq k_t E_t q_{t+1}$$

¹ More generally the left-hand side of this equation would include consumption purchases, while the right-hand side would have the “special” output from the land that cannot be eaten by anybody other than the person who tends the land. Since these come out to be equal in equilibrium, they drop out of the equation. It's also worth noting that in the background you should think of all agents as having linear utility.

which is straightforward. It restricts what can be borrowed, b_t , in terms of how much has to be repaid in the next period, Rb_t . In particular, what needs to be repaid in the next period can be no greater than the expected value of the land in the next period. In equilibrium the constraint turns out to bind.²

The last equation is a straightforward pricing equation that comes from the unconstrained agent's problem:

$$(3) \quad \begin{aligned} q_t &= R^{-1} E_t(q_{t+1} + MPK_{t+1}^U) \\ &= R^{-1}(E_t q_{t+1} + \beta k_t). \end{aligned}$$

It says that the price of land today is just the discounted expected price of land tomorrow plus the marginal productivity of that land in the unconstrained sector tomorrow. The fact that MPK_{t+1}^U ends up being related to the landholdings of the constrained, k_t , follows from the assumption of a fixed supply of land. The linearity follows from the further assumption that there is a quadratic production function in the unconstrained sector.

The paper answers the questions I outlined at the beginning of my discussion using these three equations. The questions are addressed by assuming that an unanticipated shock happens at some date that I'll call T . You start the model off at a steady state, in terms of the allocation and price of land: $k = R\alpha / \beta$, $q = R\alpha / (R - 1)$. Then a shock happens, which nobody anticipated (this is exactly what Kiyotaki and Moore look at as well), but from then on agents have perfect foresight.

How will the effects of a real shock to the productivity of land be analyzed? This will be done by assuming that, unexpectedly, α_t (the productivity parameter) is a little lower in the initial period, T , and then it is constant forever after. That is, $\alpha_T = \alpha(1 - \Delta)$ and $\alpha_{T+j} = \alpha$ for $j \geq 1$.

What will a bursting bubble be? An assumption is made that prior to the date of the bubble bursting, T , you have the price of land going along an arbitrary bubble path, $q_t = q + cR^t$, and then at time T you sort of switch back to the stable path for the price of land, $q_t = (\beta / R) \sum_{j=0}^{\infty} R^{-j} k_{T+j}$. It turns out that this type of shock has the same qualitative effect on the economy as the real shock, it's just that bursting-bubble shocks can plausibly be much bigger than productivity shocks. I will narrow my focus by only looking at productivity shocks.

Margin requirements are modeled by inserting a wedge, $1 - m$, in (2) between the expected value of the land and the amount that can be borrowed.

A "squeeze" is a policy response to a shock where the policy maker tries to enforce repayment according to the original contracts. When the unanticipated bad shock

² This follows from some of the auxiliary assumptions in the paper about agents' different rates of time preference and about the relative magnitude of the "special" output that can only be eaten by the person who tends to the land.

happens, the amount the borrower needs to repay will simply be Rb_{T-1} which would have been set equal to $k_{T-1}E_{T-1}q_T$. Prior to the shock the economy was in steady state so $k_{T-1}E_{T-1}q_T = kq$; this is the amount the borrower needs to repay in a squeeze. To analyze the effects of a shock with a subsequent squeeze, one simply uses the steady state as an initial condition and solves equations (1), (2) and (3) forward through time. The margin requirement affects this analysis because it changes equation (2).

A “freeze” involves a debt rollover and a debt write-down. It can be analyzed in much the same way as a squeeze. The only difference is that because of the rollover you must solve the three equations forward by temporarily relaxing the borrowing constraint. Then in some period $T^* \geq T$ you force some of the debt to be written off by inserting a w term on the right hand side of the budget constraint, where w represents the value of the write-down.

I'm going to focus on how the squeeze works. A minor amount of algebra using (1)-(3) leads to the following three equations.

$$(4) \quad \beta R^{-1}k_T^2 = [\alpha(1 - \Delta) + q_T]k - qk$$

$$(5) \quad k_{T+j} = k^{1/2}k_{T+j-1}^{1/2}, \quad j > 0$$

$$(6) \quad q_T = \frac{\beta}{R} \sum_{j=0}^{\infty} R^{-j} k_{T+j}$$

The first two equations describe the dynamics of k_t . As (5) indicates, after the period of the shock the dynamics are straightforward; they are purely deterministic. The last equation determines the price of land in the period of the shock. Equation (4) provides some direct intuition about how the shock will cause k_T to fall below k . Part of the decline is due directly to Δ , but there is an indirect effect caused by the decline in the value of collateral that works through q_T .

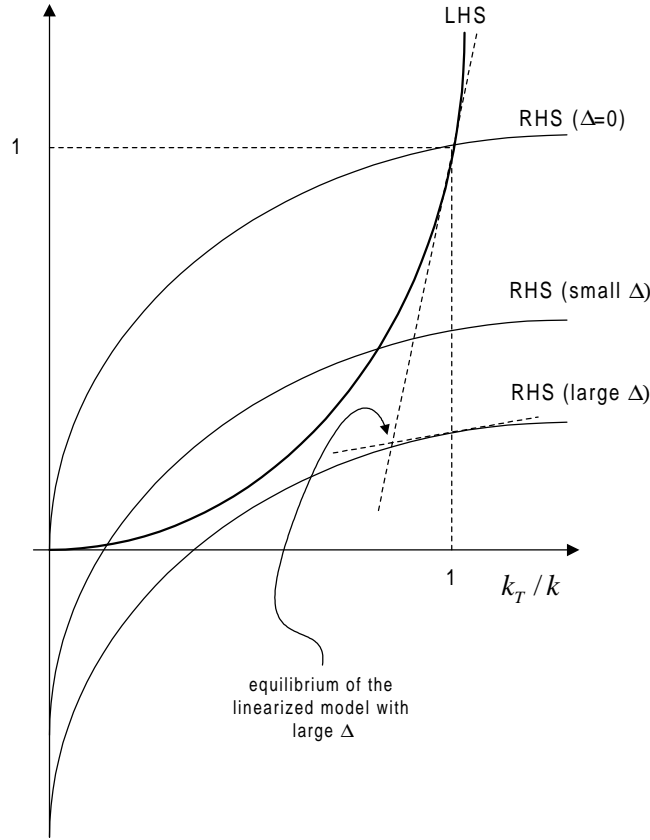
Substituting (5) into (6), and the resulting equation into (4), one gets

$$(7) \quad \left(\frac{k_T}{k} \right)^2 = 1 - \Delta + \sum_{j=0}^{\infty} R^{-j} \left(\frac{k_T}{k} \right)^{2^{-j}} - \frac{R}{R-1}.$$

From (7) it is easy to see that if $\Delta = 0$, $k_T = k$. With no shock the economy stays at the steady state. Figure 1 shows that for $\Delta < 0$, $k_T < k$, if a solution even exists. The authors linearize their model so they always find a unique solution, but Figure 1 shows quite clearly that there can be multiple equilibria, or, for a large shock, no equilibrium. It's these large shocks that are the authors' focus: if a big enough shock happens the whole system just collapses.

When a margin requirement is inserted in the borrowing constraint, this leads to smaller responses to the shocks. Furthermore, the dynamic equations are changed somewhat to ones which deliver more persistent responses. Instead of the half-life of the shock being one period, which it is in the standard case, it is longer than a period. On the other hand, the response to the shocks is smaller.

Figure 1



Another feature of margin requirements is that they reduce an allocative inefficiency in the base model. The “special” output that cannot be used as collateral, γk , causes the steady state level of k , $R\alpha/\beta$, to be less than what would otherwise be its efficient level $(\alpha + \gamma)/\beta$. The margin requirement induces a rise in the price of land, and, as a consequence, the steady state level of k rises to $R\alpha/[\beta(1-m)]$, thus reducing the inefficiency. It’s important to note that as the margin requirement is made larger, and the inefficiency becomes smaller, the internal logic of the model fails. The arguments used to show that the borrowing constraint binds no longer work.

To analyze what happens with a freeze I’ll make things simple by ignoring the rollover part, and assume that the write-down, w , happens in period T . A write-down is just a transfer of wealth from a lender to a borrower that relaxes the borrower’s budget constraint. Equation (4) becomes

$$(8) \quad \beta R^{-1} k_T^2 = [\alpha(1 - \Delta) + q_T] k - qk + w$$

while equations (5) and (6) remain the same. This implies

$$(9) \quad \left(\frac{k_T}{k}\right)^2 = 1 - \Delta + \sum_{j=0}^{\infty} R^{-j} \left(\frac{k_T}{k}\right)^{2^{-j}} - \frac{R}{R-1} + \frac{w_T}{\alpha k}.$$

It's easy to see what a write-down does by referring to equation (9) and Figure 1. The 'RHS' curves in Figure 1 shift up by $w_T / (\alpha k)$. By writing down debt enough you can force an equilibrium to exist when it otherwise wouldn't. You can also prevent the shock from having any effects if you set $w_T = \alpha k \Delta$.

So the basic message of the paper is as follows: with collateralized lending, small shocks can make the whole financial system collapse if you allow a squeeze to happen.³ This is probably the most interesting message of the paper. I think the authors also want to argue that the only way to reestablish equilibrium is to enforce, ex post, the rolling over and writing down of debts.

I don't find this message satisfying for a simple reason. In the experiments I've just described, agents are exposed to an *impossible* event. Kiyotaki and Moore carried out the same kinds of experiments but with one important distinction. In their paper the shocks were positive, whereas in this paper the shocks are negative. Positive shocks, as Figure 1 makes clear, do not lead to disequilibrium—they lead to unique equilibria at higher values of k . When the shock is negative, on the other hand, you can reach a lack of equilibrium. What you really want to do, in some sense, is to analyze that lack of equilibrium fully inside the context of the model. You want agents to think about how to anticipate the systemic collapse that could occur if a shock were to happen. In fact, it's exactly this sort of thinking on the part of agents that motivates the borrowing constraint in Kiyotaki and Moore. Borrowers must have collateral because lenders worry about borrowers walking away from their obligations. Now imagine a world in which negative shocks can happen—in such a world you want to think about how the lenders would react to their environment. They would probably behave differently than they do in this model.

It's important to distinguish between an *impossible* and an *unpredictable* shock. Here, it's as if everybody is moving along happily thinking that a shock could never happen, and then it does. That's very different than what would happen if you modeled events as being unpredictable—people know the bad shock could happen, it's just that they don't know when, and maybe they don't know where. Analogously, I know that my house *could* burn down, though I have no predictions to offer as to when it might happen. As a result, I insure myself against the possibility of a fire. In the financial world, agents know that bubbles can burst, they know that land prices can fall, etc. Predicting where and when these events will happen is difficult—knowing that they will happen is not.

In conclusion, I think this paper leaves unanswered the central policy questions regarding how to deal with financial shocks. I don't think we can learn much from a model that assumes that agents treated the events of 1997-98 in Thailand, Korea and Indonesia as impossible prior to their occurrence. Perhaps people behaved *as if* a financial crisis was impossible—but given the number of crises and bursting property

³ Quantitative experiments with Figure 1 suggest that quite modest percentage declines in the productivity of land can lead to disequilibrium.

price bubbles that have been observed over the years, I don't think it's reasonable to conclude that people acted out of certainty. If I didn't insure my house against fire, would it be because I thought a fire was impossible, or because, for some other reason, it was optimal for me to remain uninsured?

To me it's exactly the mechanisms for bankruptcy and crisis management that are crucial to figuring out why people behaved as if a shock was impossible. We need to think about crisis management policies and bankruptcy laws/enforcement as things that affect agents' decision making *before* shocks happen. This paper ignores the effects of policy on pre-shock behavior and assumes that policy only affects the cleanup after the shock occurs. Designing policies on the basis of their effects during the cleanup phase of a crisis while ignoring their effects on economic behavior would be misguided.

Reference

Kiyotaki, Nobuhiro and John Moore (1997) "Credit Cycles," *Journal of Political Economy*, 105(2), 211--48.