# Bubbles in Real Estate Markets

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## Introduction

Real estate bubbles may occur without banking crises. And banking crises may occur without real estate bubbles. But the two phenomena are correlated in a remarkable number of instances. The consequences for the real economy depend on the role of banks in the country's financial system. In the US, where banks hold only about 22% of total assets, most borrowers can find substitutes for bank loans and the impact on the general level of economic activity is relatively slight. But in countries where banks play a more dominant role, such as the US before the Great Depression (where banks held 65% of total assets), or present day Japan (where banks hold 79% of total assets), or emerging markets (where banks often hold well over 80% of total assets), the consequences for the real economy can be much more severe.

In this paper, we develop an explanation of why real estate bubbles and banking crises are related and why they occur. First we review the determinants of real estate prices and ask why the real estate market is so vulnerable to sustained positive deviations from fundamental prices. We place special emphasis on the role played by the banking system. Increases in the price of real estate increase the economic value of bank capital to the extent that banks own real estate. Moral hazard may also contribute to bank's supply of capital to real estate, exacerbating the bubble.

Bank behavior also plays an important role in exacerbating the collapse of real estate prices. A decline in the price of real estate will decrease bank capital directly by reducing the value of the bank's own real estate assets. This will reduce the supply of credit to the real estate industry. In addition, supervisors and regulators react to the resulting weakening of bank capital positions by increasing capital requirements and instituting stricter rules for classifying and provisioning against real estate assets, further diminishing the supply of credit to the real estate industry and placing additional downward pressure on real estate prices.

This conceptual framework of interactions between the real estate market and bank behavior can be used to interpret recent examples of real estate booms linked to banking crises. We conclude with a discussion of the policy implications of our analysis emphasizing measures to limit the amplitude of real estate bubbles and ways to insulate the banking system.

## Bubbles: The Role of Optimists

We begin with a model of land prices developed by Mark Carey (1990). This provides a straightforward explanation of how bubbles may begin in a simple setting where it is plausible to assume that supply is fixed. This is directly relevant to commercial real estate booms, moreover, because the dynamics of land prices undoubtedly drive overall real estate prices and because, in the cases we analyze in which

real estate prices rise, construction lags result in supply that is fixed for a lengthy period. We will consider complications introduced by construction lags in the following section.

Carey's model[1] assumes that N potential investors are identical except with regard to their reservation prices for land, P. These differences of opinion may occur because investors make errors in computing the "fundamental value" of land[2] or because investors may have private information about future expected income from land or the appropriate capitalization rate.[3] These reservation prices are distributed along a continuum around the "fundamental value" of land according to a distribution function F(P)[4]. In most markets, one could argue that sustained deviations *below* the fundamental value are unlikely because sophisticated investors who know the fundamental value will profit by buying until the price rises to the fundamental value. This presumption seems plausible for the market for land. Conversely, it is tempting to assume that if the price is too *high*, sophisticated investors will profit by selling short until the price falls to the fundamental value. But this assumption is *not* plausible in the market for land because of difficulties in selling land short.[5] Moreover, increases in the supply of land cannot be expected to moderate the rise in price because the supply of land is fixed, at least in the short run.[6]

Optimists, those with reservation prices above the fundamental value, will determine the price in this kind of market with no short sales and fixed supply.[7] Indeed, even if their optimism is unfounded by analysis of fundamental value, they are likely to remain in business so long as the upward trend in prices continues. As we shall see, even if they earn substandard returns, they are likely to be able to borrow against their capital gains so long as lenders value their land at market prices when determining its value as collateral.

The price of land in Carey's model is determined by the proportion of investors willing to pay the price, P, which is sufficient to clear the market for the entire supply of land, Z. The demand for land at any arbitrary $P'$ depends on the proportion of investors who have a reservation price, $P \geq P'$, which is $(1-F(P'))$, times the number of investors N

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[1] The complete exposition of this model may be found in Carey (1990) Chapter 3, "A Model of the Farm Land Market."

[2] The fundamental value of land is the price that is equal to the discounted present value of the net income that can be generated from renting the land. The "fundamental value" is the value consistent with long-term equilibrium. In Section 2 below, the concept is broadened to include commercial real estate and the fundamental price is defined as the price at which the current stock of real estate structures is precisely equal to its replacement cost.

[3] As Carey (1990) notes, if investors are permitted to be risk averse, differences in reservation prices may also reflect differences in risk aversion and/or private information regarding the covariance of returns on land and other assets.

[4] Carey (1990) shows that the assumption that F is continuously differentiable with a nonzero variance and a symmetric density will yield the key results regarding the impact on P of increases in heterogeneity, the mean and financial resources.

[5] Such markets are not inconceivable. Indeed, it may be useful public policy to nurture an organized options market in land. Publicly traded property companies are relatively common, but they do not provide a very efficient means of selling land short.

[6] Of course, this is not precisely true. Zoning laws may change freeing up land for commercial use, but generally such measures take a significant amount of time.

[7] Krugman (1998) develops a model based on moral hazard that yields similar results in which "Pangloss" values dominate markets for assets in fixed supply.

times the resources, L, available to each investor[8]: N(1-F(P′))L. In equilibrium, the demand for land must equal the value of the total supply, PZ, and so:

$$P= [N(1-F(P))L]/Z. \quad (1)$$

For ease of exposition we will make the simplifying assumption that F(P) is a uniform distribution centered on the fundamental price, P*, with a range equal to P*± h, where h is the measure of the heterogeneity of reservation prices among investors. Since 1-F(P) = (P*+h-P)/2h we can rewrite (1) for the special case of a uniform distribution as:

$$P = [N(P^*+h)L]/[2hZ+NL]. \quad (2)$$

Partial differentiation of (2) indicates that P will increase with increases in the number of investors (N), the fundamental price (P*), and the resources available to investors (L). P will also increase in response to increases in the extent of heterogeneity (h), so long as the total resources available to half of the investors exceed the value of land at the fundamental price, P*.[9,10]

We can transform (2) from a static to a dynamic equation by introducing time subscripts for each of the variables. We will first consider $P^*_t$ and broaden the discussion to include commercial real estate.

The demand for the stock of commercial real estate depends on the price and the discounted present value of the expected stream of future rents which, in turn, depends on demographic factors, the expected growth in income, anticipated real interest rates, taxes and the structure of the economy.[11] In the formation of a bubble, it is plausible that the initial increase in real estate prices was a response to an increase in demand. As examples, in some cases the growth of the economy may accelerate, in others the structure of output may shift in favor of the office-intensive service sector, or anticipated real interest rates may decline.

$P_t$ equilibrates the demand and supply for ownership of the stock of real estate structures, while rents equilibrate the demand and supply of the flow of services from the stock of commercial real estate.[12]

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[8] At this stage L represents both the investor's equity and loans available to the investor. In section 3 we shall consider L to be loans. This simplification is useful because land and commercial real estate tend to be highly leveraged investments. Indeed, the extent of leverage gives rise to some difficult principal agent problems, which are discussed below.

[9] The sign of $\partial P/\partial h$ will be positive so long as NL/2>P*Z. If total resources available to half the investors fall short of the value of land at the fundamental price, P will fall below P*. The optimists will lack sufficient resources to raise the price above P*.

[10] Note also that if opinions are homogeneous (h=0) and centered on the fundamental price, the equilibrium price will not deviate from the fundamental price.

[11] Allen and Gale (2000) emphasize that expectations regarding the supply of credit may also play an important role in the dynamics of real estate and equity prices.

[12] In the empirical literature, rent adjustment equations are specified with rent change a lagged function of the deviation in the actual vacancy rate from the natural vacancy rate. That is, the expected rate of change in real office market rents is modeled as depending positively on the gap between the actual vacancy rate and the beginning-period vacancy rate. A natural vacancy rate is imbedded in the constant term, which is interpretable as the product of the adaptation coefficient and the natural vacancy rate (See Shilling, Sirmans, and Corgel (1987) and Wheaton and Torto (1988))

When the price for the stock of existing commercial real estate structures rises above the replacement cost, developers have an incentive to initiate new construction that will increase $Z_t$ (now redefined to represent the stock of commercial real estate structures). This will eventually restore long-run equilibrium in which the ratio of the price of the stock of existing commercial real estate to replacement cost equals one. The price at which the stock of existing commercial real estate is equal to the replacement cost is $P^*_t$, the fundamental price consistent with long-run equilibrium. New construction, however, takes a substantial amount of time – perhaps two to six years – and so the adjustment process is likely to be slow (Malpezzi and Wachter, 2002).

In general the number of potential investors in commercial real estate (N) will not be an important determinant of the dynamics of real estate prices because it does not vary much. But one exception may have been important during the 1980s and 1990s when many countries began to liberalize financial regulation and open their markets to foreign investors. The liberalization of financial regulation may have increased $N_t$, by increasing the number of institutions that were permitted to invest in real estate directly or by permitting foreigners to invest in real estate, as in several emerging markets.

Finally, the supply of financial resources available to real estate investors, $L_t$, appears to have been an important factor that increased the boom in real estate prices and extended its duration in all of the cases we analyze. This raises the question, why, despite the evident dangers of heavy concentrations of real estate lending, did banks permit their exposures to real estate become so large?

**The Role of Banks**

A bank's loan-concentration decision can be modeled as the outcome of an expected profit calculation subject to the constraint that the perceived risk of bankruptcy be no greater than some probability $\gamma$ (Guttentag and Herring (1985, 1986b)). We can express this constraint as:

$$\Pr(A \leq M) \leq \gamma \qquad (3)$$

where A is the value of the bank's portfolio of assets at the end of the period and M the bank's minimum acceptable value of assets which is determined either by internal risk guidelines or the capital ratio required by regulators, whichever is binding. By making use of Tchebysheff's inequality we can rewrite this constraint as

$$\gamma\,(E(A) - M)^2 - \sigma_p^2 \geq 0 \qquad (4)$$

where $\sigma_p^2$ is the variance of the expected return on the bank's portfolio of loans. Using this formulation of the constraint, we can form the Lagrangian expression:

$$G(L_j, V) = \sum_{j=1}^{n} L_j (r_j - i) + V(\gamma(E(A) - M)^2 - \sigma_p^2). \qquad (5)$$

Where V is the shadow price of the risk constraint, $r_j$ is the expected return on asset j and i is one plus the opportunity cost of funds. For ease of exposition we will focus on the two-asset case in which the risk constraint is binding (V>0). $L_1$ is the amount the bank will choose to lend to the real estate sector given $L_2$, the other assets in the bank's portfolio:

$$L_1 = \left[\frac{1 + 2V\gamma(E(A) - M)}{\sigma_1^2 2V}\right](r_1 - i) - \frac{L_2\sigma_{12}}{\sigma_1^2}. \qquad (6)$$

The concentration of loans to the real estate sector – the amount lent relative to capital – will be greater the higher the expected return relative to the opportunity cost of funds and the lower the perceived covariance of returns with the rest of the portfolio. Differentiation of the first-order conditions (see Appendix A, available from authors) shows that the desired concentration *increases* as the promised return *increases* ($\partial L_1/\partial R_1>0$); *declines* as the expected probability of a default *increases* ($\partial L_1/\partial \pi_1<0$); *declines* as the perceived correlation with the rest of the portfolio *increases* ($\partial L_1/\partial \rho_{12}<0$ for $\rho_{12}>0$); *declines* as the capital requirement *increases* ($\partial L_1/\partial M<0$); and *increases* as the expected value of assets *increases* ($\partial L_1/\partial E(A)>0$).

This model of bank behavior is nonetheless useful for making inferences about what may motivate banks' decisions to take on increasing concentrations of loans to the real estate sector. First, lending to the real estate sector is attractive when it is expected to be profitable. Promised returns (where $R_1$ is interpreted to include not just the contractual interest rate but also fees stated in interest-equivalent form) are often higher than rates available on prime corporate loans. Indeed, the initial lending to real estate may occur when banks receive expanded powers intended to increase bank profits and help them to compete more effectively with less heavily regulated financial firms.

Rising real estate prices may also directly encourage greater lending to the real estate sector in two ways. First, to the extent that the bank's own holdings of real estate rise in value, E(A) and the economic value of the bank's capital increases, so would the bank's willingness to hold more real estate loans. Second, to the extent that the market value of collateral on outstanding real estate loans increases, the risk of loss on the existing portfolio of loans declines and it is possible to lend more without increasing the probability of bankruptcy, $\gamma$. Increasing real estate prices may also have a more subtle impact on the subjective probability of a default which banks applied to new real estate lending, a possibility we discuss in the next section.

Despite these factors, which increase the attractiveness of real estate lending, it is clear (at least with the benefit of hindsight) that banks often fail to assess risks appropriately. Why do banks underestimate the risks of heavy concentrations of real estate lending? Two hypotheses are plausible: (1) banks underestimate risks because they are subject to disaster myopia; (2) banks ignore risks because of perverse incentives.

**Disaster Myopia**

The ability to estimate the probability of a shock – like a collapse in real estate prices – depends on two key factors. First is the frequency with which the shock occurs

relative to the frequency of changes in the underlying causal structure. If the structure changes every time a shock occurs, then events do not generate useful evidence regarding probabilities.

On the other hand, if the shock occurs many times while the structure is stable, probabilities may be estimated with considerable confidence. High-frequency shocks affect many kinds of activities conducted by banks. For example, default rates on credit card receivables and car loans or routine deposit withdrawals can be estimated with considerable confidence. Consequently, high frequency shocks are not a significant source of insolvency exposure for banks. Banks have both the knowledge and the incentive to price high-frequency shocks properly and to make adequate provisions to serve as a buffer against loss.

In contrast, the causal structure underlying low-frequency economic shocks by definition do not remain stable for long enough to permit empirical estimation of shock probabilities with much confidence. How do banks make decisions with regard to low-frequency shocks with uncertain probabilities? Specialists in cognitive psychology have found that decision-makers, even trained statisticians, tend to formulate subjective probabilities on the basis of the "availability heuristic," the ease with which the decision-maker can imagine that the event will occur (Tversky and Kahnenman (1982)). Since the ease with which an event can be imagined is highly correlated with the frequency that the event occurs, this rule of thumb provides a reasonably accurate estimate of high-frequency events. But ease of recall is also affected by other factors such as the time elapsed since the last occurrence. Under such circumstances the availability heuristic can give rise to an "availability bias."

At some point, this tendency to underestimate shock probabilities is exacerbated by the threshold heuristic (Simon(1978)). This is the rule of thumb by which busy decision-makers allocate their scarcest resource, managerial attention. When the subjective probability falls below some threshold amount, it is disregarded and treated as if it were zero.

Once this threshold has been reached, behavior seldom changes even in the face of evidence that the actual shock probability has increased as, for example, in the cases discussed in succeeding sections where commercial real estate lending continues despite evidence of rising vacancy rates.

The availability and threshold heuristics together cause "disaster myopia," the tendency over time to underestimate the probability of low-frequency shocks (Guttentag and Herring (1984, 1986a)). To the extent that subjective probabilities ($\pi_t$) decline even though actual probabilities remain constant or increase, banks take on greater exposures relative to their capital positions and the banking system becomes more vulnerable to a disaster. This is an insidious process. Disaster myopia can lead banks to become more vulnerable to a disaster without anyone having taken a conscious decision to increase insolvency exposure.

Susceptibility to disaster myopia is often reinforced by several institutional factors. For example, managerial accounting systems may inadvertently favor activities subject to low-frequency shocks. Although standard accounting practices are helpful in monitoring, pricing and provisioning for high-frequency shocks, they are not useful in controlling exposure to a low-frequency hazard because the shock occurs so infrequently that it will not be captured in the usual reporting period. Indeed, the absence of bad

outcomes in the accounting data may intensify pressures to reduce default premiums and reserves. Moreover, in the absence of appropriate provisions for potential losses, an activity subject to low-probability shocks will appear misleadingly profitable. This problem is often compounded by the practice of recognizing fees (which may be considerable in some lines of real estate finance) up front, when the loan is booked, rather than amortizing them over the life of the loan.[13]

The illusion of high profitability creates additional problems. To the extent that salaries and bonuses are based on reported short-term profits without adjustment for reserves against shocks, the line officers who are in the best position to assess such dangers will be rewarded for disregarding them (Pavlov and Wachter, 2002).

In addition, competition may interact with disaster myopia in two related ways to increase vulnerability. First, competitive markets make it impossible for banks that are not disaster myopic to price transactions as if there were a finite probability of a major shock when banks and other competitors who *are* disaster myopic price them as if that probability were zero. Second, if banks are apparently earning returns above the competitive level (disregarding the need for reserves against future shocks), equally myopic banks will be encouraged to enter the market, thus eroding those returns. In response, banks can protect target rates of return on equity for a time by increasing their leverage and rationalizing such actions in terms of the need to maintain target returns in the face of shrinking margins, and in terms of similar actions by other banks. Thus competition, interacting with disaster myopia, may accelerate the process through which banks become increasingly vulnerable to a major shock like a collapse in real estate prices.

Once a shock occurs, disaster myopia turns into disaster magnification. The availability heuristic may exacerbate financial conditions because, just after a shock has occurred, it is all too easy to imagine another sharp decline in real estate prices and the subjective shock probability will rise well above the true shock probability. As Guttentag and Herring (1984) show, this will result in sharply increased tiering of interest rates in financial markets as lenders try to reduce exposures and increase risk premiums in response to sharply higher shock probabilities. The extent of credit rationing is likely to expand for borrowers who cannot offer a credible contractual rate that will compensate for the increase in the perceived risk of default.

The abrupt drop in the flow of credit to the real estate market will put further downward pressure on real estate prices. This is also likely to diminish lending to other sectors of the economy as banks try to rebuild their reserves and capital to cope with the increased risk of default. To the extent that supervisors and regulators are susceptible to disaster myopia, they are also likely to suffer from disaster magnification. In response to the greatly increased subjective probability of a disaster they may seek to protect the banking system by insisting on higher capital ratios and more aggressive provisioning against potential losses.

**The Role of Perverse Incentives**

[13] While we focus here on disaster myopia on the part of banks, it clearly impacts optimists' behavior as well.

Commercial real estate is often highly leveraged. Real estate developers usually operate with a minimum of capital in order to shift as much risk as possible to the lender. Banks generally try to protect themselves by requiring low loan-to-value ratios, guarantees, takeout commitments for longer-term financing, and strict loan covenants that will protect them against risky behavior by the developer after the loan is made. But when real estate markets become overheated, underwriting standards may deteriorate.

When disaster myopia sets in, lenders believe that they can accept higher loan-to-value ratios, weaker commitments or guarantees and looser loan covenants without increasing their risk of loss. Moreover, intensified competition from other disaster myopic lenders may force prudent lenders to accept weaker underwriting standards or withdraw from the market. In this environment real estate developers have increased opportunities for exploiting their creditors by increasing the riskiness of their projects, which are often difficult to monitor.[14] Moreover, when a project is near default, developers may lack incentives to contribute new capital to rescue the project, since most of the benefits would accrue to their creditors (Myers, 1977). Thus high leverage combined with asymmetric information between bank lenders and real estate investors can give rise to perverse incentives for real estate investors to increase the riskiness of real estate investments. But banks may also be subject to perverse incentives.

Some banks may *ignore* the risk of a disaster because they believe they would be protected if a disaster were to occur. Virtually every country has erected a safety net for depository institutions to guard against a banking disaster that might ignite a financial crisis by disrupting the payments system and interrupting the flow of credit to bank-dependent firms, thereby causing a decline in economic activity.

Banks are structurally vulnerable to a liquidity shock because they finance holdings of opaque, imperfectly marketable assets (like real estate loans) with short-term liabilities, which they promise to redeem at par. Depositors are aware of their informational disadvantage vis-à-vis banks, and they understand that banks are highly leveraged. Thus when a shock, such as a collapse in real estate values occurs they know that even a relatively small percentage decline in asset values, will result in a much larger percentage change in net worth, perhaps rendering the bank insolvent. Depositors may abruptly reduce their estimate of the bank's net worth and run to redeem their deposits, forcing the bank to incur firesale losses to liquidate assets or to borrow at an interest rate sharply higher than its customary rate.

Once begun, runs tend to be self-reinforcing. This vulnerability to runs is a public policy concern (rather than the strictly private concern of an individual bank and its customers) because of the fear that a loss of confidence in the solvency of one bank may lead to a contagious loss of confidence in other banks.

The safety net erected to guard against a contagious collapse, which often includes deposit insurance or other government guarantees and access to an official lender of last resort, tends to insulate banks from potential market discipline. This is especially evident in the case of state-owned banks. All creditors in state-owned banks are likely to believe that they are protected by a state guarantee and thus have virtually no incentive to monitor the riskiness of their bank's lending decisions.

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[14] Allen and Gale (2000) emphasize this asset substitution problem in their model of bubbles and financial crises.

Deposit insurance plays a similar role in privately-owned banks, undermining the incentives for insured depositors to monitor and discipline bank-lending decisions. Moreover, uninsured creditors of large banks may believe that they are protected by implicit deposit insurance because of the way in which lender-of-last resort assistance is usually provided and administrative discretion to terminate a bank is usually exercised. Lenders of last resort routinely lend to banks long after they become insolvent. This permits creditors who are not covered by explicit deposit insurance the opportunity to withdraw their deposits before a bank is terminated. Even then, the authorities usually avoid liquidating the bank and imposing loss on uninsured depositors and creditors, but instead provide assistance while keeping the bank open, or arrange a purchase and assumption transaction in which all liabilities are honored by the acquiring bank.

The protection that the safety net affords gives rise to the classic moral hazard problem in which the existence of insurance may undermine the incentive for depositors to be concerned to prevent the insured risk from occurring. As a consequence bank managers find that if depositors do not demand greater compensation when greater risks are taken, they can increase expected returns to their shareholders by substituting riskier assets, such as commercial real estate loans, for safer assets.

Shareholders will constrain risk exposures to some extent so long as their equity stake is high relative to the potential loss. But as the equity stake falls relative to the potential loss on existing exposures – as in the aftermath of a collapse in property prices, for example – the bank will be tempted to take increasingly greater risks. The reason is that shareholders value a distribution of returns that is truncated at the termination point. They reap all the positive returns above this point, but shift all returns below this point, including negative returns, to the creditors, the deposit insurer or taxpayers.

Workout loans become especially problematic when potential losses exceed the bank's capacity to bear loss (Herring 1989). Under these circumstances a bank may be willing to extend a workout loan to a troubled borrower, for example, a real estate developer who cannot pay interest, even when the expected return on the loan is not sufficient to compensate for the opportunity cost of the new funds. Keynes (1931, p.258) clearly saw this danger when he observed, "Owe your banker £1,000 and you are at his mercy; owe him £1 million and the position is reversed."

Extending a workout loan becomes an especially attractive option for the bank, if it enables the borrower to keep current on interest so that the bank can delay (perhaps indefinitely) the costs of writing down the book value of its outstanding exposure.[15] More generally, the bank has incentives to manipulate its accounts to mask the deterioration in its condition by understating loan losses or by 'gains trading' in which assets with market values above book values are sold and those with market values below book are kept at book value.

Perverse incentives may also explain the behavior of supervisory and regulatory authorities in the aftermath of a collapse in real estate prices. Because the safety net tends to shield depository institutions from market discipline, the closure of banks has been converted from a market-driven to an administrative process, with lots of scope for the exercise of administrative discretion. Without the market pressure of a bank run, supervisory authorities are free to engage in forbearance, which opens the possibility of agency problems between supervisory agents and their taxpayer principals.

[15] In the United States, this practice is known as "evergreening." Bank examiners seek to prevent it.

In the aftermath of a major shock, such as a collapse in commercial real estate values, a long delay usually occurs before insolvencies are recognized and resolved. The supervisory authorities may be simply overwhelmed by the magnitude of the crisis and lack sufficient resources to pay-off insured depositors or to make good on implicit guarantees. Because a collapse in real estate prices is often coincident with a decline in aggregate income, the government may be especially reluctant to increase the fiscal deficit to make good on explicit and implicit government guarantees for bank depositors or other creditors.

In addition, the supervisory authorities are usually hesitant to admit the scale of the crisis. On the one hand, supervisors, who are as likely to be subject to cognitive dissonance as bankers, realize that such an admission would raise question about the quality of oversight they had provided. On the other, they may be apprehensive that public acknowledgment of the extent of insolvencies might undermine confidence and increase the risk of igniting a financial crisis.

Finally, the prospect -- however remote -- that real estate prices might return to levels attained before the collapse provides a rationale for delay in the hope that the passage of time would eliminate the problem. In effect, the supervisory authorities often decide to forbear and gamble that the decline in real estate prices will be reversed.

The reluctance of the authorities to take strong disciplinary action when the banking system is in jeopardy provides another, more cynical motive for herding. A bank knows that if it takes on an idiosyncratic risk exposure and loses, it may face harsh regulatory discipline, including termination. But if it is careful to keep its risk exposures in line with those of other banks, even if a disaster occurs, the regulatory consequences will be much lighter. The supervisory authorities cannot terminate all banks or even discipline them harshly. Indeed, the authorities may be obliged to soften the impact of the shock on individual banks in order to protect the banking system.

In summary, perverse incentives resulting from the combination of high leverage and asymmetric information may lead to riskier real estate projects than if they were financed largely through equity claims. Highly leveraged real estate developers will initiate riskier projects when they can shift most of the downside risk to banks. Like real estate developers, banks are also highly leveraged with opaque assets. Although this would usually impel depositors and other creditors to monitor and discipline bank risk taking, the official safety net undermines their incentive and so banks will be more willing to undertake risky real estate lending than they would in the absence of the safety net. The supervisory authorities could prevent this by substituting regulatory discipline for market discipline acting as if they were faithful agents for the taxpayers who underwrite the safety net. But, in practice, they often respond by protecting banks from market discipline, rather than protecting the taxpayer principals from bank risk-taking.

**Concluding Comment**

As illustrated by the recent Asian financial crisis, real estate booms often end in banking busts. Because real estate is in fixed supply (at least in the short term), and is difficult to sell short, real estate markets are vulnerable to waves of optimism.

The extent and duration of the resulting rise in prices will be increased so long as banks augment the financial resources of the optimists. The willingness of banks to

increase their exposure to real estate lending is likely to increase to the extent that they and their supervisors are subject to disaster myopia.

Moral hazard also plays a critical role, especially when bank shareholders have little to lose and bank depositors believe they will be protected by the safety net. These perverse incentives place a heavy burden on regulators and supervisors, which few have been able to shoulder. When bank capital positions weaken, they often forbear, hoping for the best, and the vulnerability of the banking system to a collapse in real estate prices grows.

When the real estate boom begins to collapse, banks may also hasten the decline in real estate prices. Disaster myopia may turn to disaster magnification leading to a withdrawal of credit. Supervisors may react to the consequent weakening of bank capital by requiring that banks write down nonperforming real estate assets and raise new capital. Or they may choose to forbear, continuing to hope that real estate prices will recover.

Forbearance may also have significant costs. If decapitalized institutions are permitted to operate they may be tempted to gamble for redemption, increasing losses still further. Moreover, even if they do not gamble for redemption, banks which are crippled by large holdings of nonperforming real estate loans will be unable to generate sufficient retained earnings to restore their capital in a timely manner. Instead, they will shed assets, scaling back new lending to all sectors of the economy and declining to roll over outstanding loans when they mature.

In economies where banks are the main source of financing, this can have a devastating impact on investment and economic growth. Moreover, as the Asian financial crisis has made evident, an economy with a decapitalized banking system is highly vulnerable to external shocks such as foreign exchange crises that can severely damage the real economy. Thus the banking sector's importance and link to the real estate sector not only amplifies the real estate bubble but also can have major implications for the overall stability of the economy.

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