

Real Estate Crashes and Bank Lending

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[Sidebar: The role of non-recourse bank lending in generating boom and bust cycles in real estate.]

All non-recourse, asset-backed loans imply a put option on the underlying asset. If the value of the asset falls below the outstanding balance of the loan (less any transaction costs), then the borrower may simply “put” the asset to the lender, and walk away from any future payments of principal or interest on the loan. While it might seem that the lender is “giving away” this put option, it’s important to note that the lender is compensated for the imbedded option through a higher interest rate on the loan.

Completely rational lenders may choose to underprice the put option imbedded in a non-recourse loan. By doing so they would maximize their performance-based compensation, as long as the demand for the collateral assets was stable. Standard economic theory predicts that the losses following a market crash would preclude such underpricing behavior. However, due to agency issues, deposit insurance covering potential losses, and limited liability, the losses to the banks and their shareholders would be contained. Therefore, short-term lenders might find it rational to extend risky loans without an adequate interest rate spread and the potential consequences of a market crash.

The presence of short-term oriented lenders that underprice the put option makes it impossible for correctly pricing banks to compete, as other lenders are forced into underpricing, regardless of whether they are focused on short-term profits or on long-term performance. Ironically, under these circumstances the downside risk for banks, even in the event of a market crash, is limited. If all lenders face sudden large losses, both regulators and the public will likely blame the general economic conditions, rather than underpricing behavior by lenders.

Several outcomes are likely to accompany such systemic underpricing. First, a narrowing in the spread of lending over deposit rates. Second, an increase in asset prices above fundamental levels. Finally, a decline in lenders' expected long-run profits. Of these effects, the increase in asset prices is perhaps the most troubling, because of the implications for macroeconomic stability. Inflated real estate prices induce a construction boom and an inefficient allocation of resources within the economy. Furthermore, a market with inflated asset prices is exceedingly vulnerable to negative demand shocks. When a "healthy" market is struck by a negative demand shock, asset prices decline to reflect the new supply and demand conditions. Inflated asset prices, however, magnify this decline as prices drop not only to adjust to the new demand but also to eliminate the price inflation.

With levered real estate, asset price declines beneath mortgage value will induce defaults. At the same time, the loss in asset value will decrease the value of bank collateral. Both effects have the potential to undermine the banking system's financial soundness, as has been shown repeatedly in numerous banking crises that have accompanied real estate crashes.

UNDERPRICING MODEL

For real estate, as for all assets, the fundamental asset price is the expected discounted value of the asset's returns over all possible future states of the economy. This is the price a rational investor would pay in the absence of lending or if lending is full recourse. For an investor, with full recourse, there are (in a simple world) two possible outcomes: a high payoff and a low payoff. The price the investor is willing to pay depends on the likelihood of the two outcomes, and the discount rate. In the case of non-recourse lending, however, an investor who borrows to purchase the asset with zero equity either receives the high payoff (less the interest payments) when the good outcome occurs, or receives nothing if there is a bad outcome. With recourse, for example, a person who invests \$100,000 may in the good outcome receive \$120,000, or in the bad outcome receive \$80,000, thereby losing \$20,000. On the other hand, an investor who purchases the asset by borrowing using a non-recourse loan with zero equity either receives the price appreciation (minus the interest payment) in the good outcome or defaults and receives nothing in the bad outcome, without any losses. In the good outcome, the investor will receive \$120,000 minus the principal and interest payment, say \$105,000, for a return of \$15,000, but in the bad outcome the investor will lose nothing.

Whether these two deals are equal in value depends on the interest rate and whether it is appropriately priced to cover the risk of the bad outcome. If there were no interest cost, then there is only upside to the investor, and the second deal is preferable. Similarly, a very low interest rate, too low for the risk, will be a better deal for investors

than if investors were using their own money. In the example above, the interest charge should equal \$20,000 for the prices with and without non-recourse borrowing to be the same. This is the total interest charge that compensates the lender for the default risk (although the investor/developer may still profit through entrepreneurial effort).

Moreover, if the loan is priced attractively, investors will pay more for the asset for which such loans are available. Thus the market price of the asset is driven above the fundamental price. This effect of underpricing is critical since it causes all investors to pay more for the asset, even rational full-recourse borrowers and equity investors.

Another market outcome of underpricing is that the premium of a bank's lending rate over the deposit rate declines. The deposit rate used by banks to pay for funds must be less than the lending rate for profits in the long run. The lending rate is higher than the deposit rate because it must cover the risk of the put option as well as the cost (net of fees) of making the loan. To the extent underpricing occurs, the premium declines.

What motivates banks to lend at rates that do not fully reflect the risk? To the extent that bank managers' salaries and bonuses are related to bank profits, managers will be motivated to maximize profits. Typically, bank managers' compensation is related to profits in order to optimally incentivize loan production. Moreover, shareholders may support incentivized compensation structures because they contain downside risk due to their protection through limited liability. Thus, the only actors who will be fully incentivized to monitor risk are depositors or large lenders. Because depositors are generally "small" and lack the resources or capacity to track bank lending behavior, demand deposit insurance is often provided, which exacerbates the problem.

The bank manager's compensation may be considered to have two components. If bank managers price the put option correctly, they receive the salary component regardless of the outcome. In the good outcome, the bank realizes positive profits and managers receive bonuses, which are an increasing function of profits. In the absence of underpricing, compensation contracts are designed to motivate lending officers and bank managers. Our concern is that the very same compensation schemes may provide incentives for managers to underprice the put option. If they underprice the put option, they expand their market share and maximize their bonus for good outcomes.

Fundamentally, excess lending is due to managers' short time horizons, which cause them not to fully "price" the possibility of the future bad outcome. During a period of high profits and bonuses, underpricing will not be detected. In a bad outcome, on the other hand, banks will no longer be willing to make risky loans. Banks may close if too many risky loans were made, and managers may be fired. However, with short time horizons, bank managers may perceive that they have relatively little to lose when the underpricing is discovered some time in the future. Therefore, managers may decide to increase the immediate profits (and bonuses) and risk the small probability that a bad outcome will occur, and their underpricing is discovered.

Due to limited liability, deposit insurance, and uninformed depositors, the above compensation scheme is consistent with maximizing shareholder value. Thus, shareholders with limited liability may not provide incentives for the managers to prevent underpricing. This possibility is strongest for shareholders who have little equity compared to the payoff from underpricing in the good state. This means that efficient markets alone will not be able to eliminate underpricing without effective regulatory

intervention (which correctly and continuously adjusts the pricing of demand deposit insurance for the bank's risky lending).

This analysis yields a very worrisome implication: lenders that underprice steal market share from correctly-pricing banks. Thus, correctly-pricing banks have lower profits in the good state. However, correctly-pricing banks may not even be able to get to break-even in a good outcome due to competitive pressure from the underpricers. Thus, competitive pressures push all lenders to underprice to maintain market share. This result holds even for bank managers who both correctly estimate the value of the put option and have a long-term horizon.

Such lender behavior has potential for devastating effects on property markets, since if banks are not correctly pricing risk, they are producing risk. This decapitalizes the banking system and may cause an economy-wide decline, which further undermines property markets.

THE ASIAN CASE

Real estate markets are vulnerable to waves of optimism—pricing above fundamental values—by lenders, investors, and borrowers. Optimists strongly influence asset prices, and are also likely to remain in business so long as the upward trend in prices continues even if their optimism is unfounded by an analysis of fundamental value. Optimists are likely to be able to borrow against their capital gains so long as lenders rely on market prices above the fundamental price when determining the value of real estate as

collateral. The difficulty in selling real estate short, means that optimists exert significant and asymmetric influence in the setting of real estate property prices.

But who provides the funds to finance the optimists' investments? As has been discussed, bank managers with short-term horizons are incentivized to provide funds to support exuberant borrowing. The magnitude of the resultant rise in real estate property will be greater—and the duration longer—so long as banks continue to lend. Lenders will attempt to maximize their short-run pay, and will lend at rates that are too low given the expected risk.

While the divergence between market and fundamental value of real estate assets is not directly testable, if our model holds, the spread of the loan rate over the deposit rate can be used as a proxy for the extent of underpricing. This spread compensates the lender for providing the put option embedded in non-recourse loans. During a bubble which is due to widespread lender underpricing, lenders require little or no compensation for the put option. Thus, the spread of lending rates over deposit rates is narrowed, and is correlated with higher prices of the underlying asset. At the same time, periods of widespread underpricing are associated with increased lending activity. In order for lenders to support the increased lending, they must increase deposit rates. This implies that deposit rates are positively correlated with asset prices. We can test this hypothesis, and the conjecture that the spread of lending versus deposit rates are negatively correlated with asset prices.

In Asian markets in the 1990s, high deposit rates attracted capital inflows to banks, even as the spread between lending rates and deposit rates narrowed. Other research has tested our model using real estate and interest rate data from five South-

Asian countries: Hong Kong, Indonesia, Malaysia, Singapore and Thailand. The correlation between the spread of lending over deposit rates and real estate values was found to be highly negative for Thailand, Malaysia, and Indonesia, consistent with our hypothesis, and symptomatic of underpricing behavior. Interestingly, relative to their peak, the real estate markets in Thailand, Malaysia, and Indonesia declined by a shocking 95, 86, and 81 percent, respectively

The correlation coefficient between the spread of lending over deposit rates and real estate prices for Hong Kong and Singapore was either close to zero, or positive. Both of these countries exercised strong government controls over the lending market before the crash. This evidence suggests that underpricing was limited, or non-existent, in these two countries. Consequently, while Hong Kong and Singapore also experienced a substantial negative real estate demand shock, the decline of property value in these two countries was much less: 33 and 38 percent respectively.

According to our model, underpricing results in inflated asset prices above their fundamental level. After a crash, underpricing is eliminated and prices return to their fundamental level. Thus, underpricing compounds the effect of a negative demand shock and produces massive price declines. Therefore, countries that experience severe underpricing in the lending market, such as Thailand, Malaysia, and Indonesia, experience excessive price drops following a negative demand shock. Countries that prevent underpricing during periods of economic growth tend to experience relatively smaller price declines during economic stagnation.

CONCLUSION

Underpricing the put option imbedded in non-recourse mortgages leads to inflated asset prices even within efficient markets. Under certain economic conditions, rational lenders will choose to underprice the put option. Real estate and interest rate data from five Asian countries shows widespread underpricing in Thailand, Malaysia, and Indonesia, and limited or no underpricing in Hong Kong and Singapore. Although Hong Kong and Singapore did experience real estate price declines, these resulted from crisis-induced declining demand. The three countries in which underpricing was strikingly evident experienced far greater losses in real estate values, with declines reaching levels of 80 percent or more in the aftermath of the financial market crisis.

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Executive Summary

This paper analyzes the role that non-recourse bank lending plays in generating boom and bust cycles in real estate. The ability to default on a loan represents a put option written by the lender and owned by the borrower. Rational economic behavior typically dictates that lenders charge the borrower for the imbedded put option through higher interest rates, origination fees, or mortgage insurance. In this paper, we discuss the conditions that lead lenders to rationally underprice the put option imbedded in non-recourse lending and analyze the impact of put option underpricing on asset prices. We find an underpricing equilibrium in which all lenders rationally choose to underprice the put option. This underpricing results in inflated asset prices, compression in the spread between lending and deposit rates, lending booms and real estate crashes. We apply this model to the real estate bubble in five Asian countries during the 1990s. Macroeconomic instability and higher interest rates both worked to induce price declines. Nonetheless, while countries in which underpricing was curtailed through government policy or institutional improvements experienced a decline of 30 to 40 percent in real estate prices, countries that experienced the symptoms of underpricing suffered a far greater drop in real estate values of 80 percent or more.