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Misaligned Incentives and Mortgage Lending in Asia

Richard Green, Roberto S. Mariano,
Andrey Pavlov, and Susan Wachter

3.1 Introduction

This chapter provides a conceptual basis for the price discovery potential for tradable market instruments and specifically the development of mortgage securitization in Asia. We argue that securitization in Asia may be potentially important because it may help bring transparency to the financial sector of Asian economies. We put forth a model explaining how misaligned incentives can lead to bank-generated real estate crashes and macroeconomic instability. We provide new comparative data on the banking sector's performance in Asia compared to the performance of securitized real estate returns, to provide evidence on the potential contribution of misaligned incentives to the magnitude of the declines in the real estate sector in the past. In particular, we show both theoretically and empirically that the banking sector suffers relatively low losses following a negative demand shock compared to the losses experienced by the real estate sector. The evidence suggests that the fact that banks' shares are publicly traded does not discipline the bank lending officers who are driven by origination fees and market share and does not prevent underpriced lending.

As a remedy to the inability of public ownership of banks to prevent underpriced lending, we discuss how the addition of freely tradable and liquid market instruments backed by loans (MBS) might help to inoculate markets from the shocks arising from bank-financed mortgages, through

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price signaling. Liquid securitizing mortgage loans could help to enforce greater discipline on bank underwriting and lead to improved lending evaluation standards.

The chapter proceeds as follows. Section 3.2 provides a context of bank funding of the real estate sector and its role in past real estate and financial crises. Section 3.3 presents a theoretical model of lending and development activities that demonstrates how banks can provide underpriced financing and nonetheless avoid large losses following a negative demand shock. Section 3.4 presents empirical results that indicate the impact of bank underpriced lending on real estate markets is severely negative but that the banks themselves are impacted to a far lesser extent. Section 3.5 interprets the findings and concludes.

3.2 Context

Mera and Renaud (2000) demonstrate that the phrase "Asian financial crisis" was misleading. Green's (2001) review of the book noted:[1]

> [Asian Financial Crisis] suggests homogeneity: that "Asia" is one place, and that the financial crises faced by various countries there in the late 1990s were fundamentally similar. The fact that so many countries that were geographically close faced crises that were temporally close makes it easy to conclude that the crises had common roots. (216)

Ito (2007) also underscores how much Asian currency crises varied in the late 1980s. Nevertheless, many Asian countries went through serious real estate crises. In Japan, property values began falling in 1991 and continued to do so until this year.[2] Miller and Luangaram (1998) show that in Thailand and Indonesia, property values began falling in 1991, and in Thailand fell dramatically in 1997. They also show how the market capitalization of publicly traded companies specializing in real estate fell by 48 percent in Indonesia between the second quarter of 1996 and the fourth quarter of 1997 and by 88 percent in Thailand.

While property values were falling in these countries, banks actually increased their lending share to property companies (Miller and Luangaram 1998) so that a bad situation got worse. Even though values were falling and vacancies were rising, banks continued to roll over loans to property owners until they reached the point where the property owners could no longer service their debt service. According to Renaud (2001), vacancy rates in Bangkok peaked at more than 40 percent.[3] Renaud (2001) and Fis-

1. Much of the discussion of the Asian financial crisis in the following closely follows Green (2001).

2. There has been much reporting on this. See, for example, "Around the Markets: Property Investors Look Overseas for Value," *International Herald Tribune,* May 21, 2007. http://www.iht.com/articles/2007/05/21/business/sxasia.php.

3. See http://www.cushwakeasia.com/data/Bangkok/bacom0106.pdf.

cher (2001) tell vivid stories about how poorly executed underwriting and conflicts of interest made the real estate crises in these countries worse than they needed to be.

It is worth spending a little time talking about the large real estate crises in Thailand and Indonesia as well as the ability of Korea to avoid a crisis of similar magnitude. Green (2001) summarizes Renaud and Fisher as follows:

> Lenders assume rent and property value growth at some extremely high rates, which in turn produces very low capitalization rates. This in turn causes appraisers to assign high values to properties. These high values provide the support lenders need to advance loans, which typically have higher loan-to-value ratios. The high-loan-to-value ratios are justified by the fact that property values "always" rise, and that therefore the equity in the loan will quickly get sufficiently large to discourage default. At the same time, the financial institutions had reason to believe that governments (or NGOs) would prevent them from failing, meaning that the downside risk to the risky loans was attenuated. This led to a classic moral hazard problem, where risk was not appropriately priced.
>
> The problem with this, of course, is that sometimes values and rents stop rising.

Thailand did seem able to put its problems behind it fairly quickly. Renaud (2000) points to an agency Thailand created to behave as the Resolution Trust Corporation (RTC) did in response to the United States savings and loan crisis. Like the RTC, the Financial Restructuring Agency (FRA) seized the assets of failed financial institutions and sold properties at substantial discounts to replacement cost. While we are not in a position to know whether the FRA executed sales as well as possible, it did seem to restore liquidity to the market in Thailand, and Thailand returned from crisis to growth fairly quickly.

We can return to the United States savings and loan crisis to gain some historical perspective. The ignition of inflation in the late 1960s and 1970s altered the ability of depositories to fund long-term, fixed-rate mortgages (FRMs): inflation pushed up nominal interest rates and required higher returns on deposits, while asset returns were fixed at the low levels of historical fixed rates on long-term mortgages, which made up most of the thrift industry portfolios. Inadequately capitalized depository institutions (S&Ls) then advanced unsustainable commercial mortgages. Because these institutions often had no equity to protect, their managers had large incentives to make high-risk loans. If the loans failed, the institutions and their depositors were no worse off.[4] If they paid off, however, the institution would return to solvency. Because S&Ls were not required to mark

4. Depositors have the benefit of Federal Savings and Loan Insurance Corporation (FSLIC) Deposit Insurance.

their assets to market, they were able to hide their distress until loans began defaulting. This points to the general issue, which we will return to, of the signaling power of price discovery in capital markets.

By the late 1980s, poor real estate underwriting produced overbuilding in the U.S. commercial real estate market. This led to high vacancies (according to the U.S. Census, typical Class A Office Vacancy Rates in 1991 were in excess of 20 percent[5]) and declining rents. Buildings generated insufficient cash flow to meet debt services, and default rates rose dramatically. The poor quality of assets on savings and loan balance sheets could no longer be hidden.

Congress and the Bush administration bit the bullet by passing the Federal Institutions Reform, Recovery and Enforcement Act of 1989; this legislation liquidated insolvent savings and loans and turned their assets over to the RTC, whose function was the disposition of the assets; cash raised from the sales were used to offset the costs of the S&L failure to U.S. taxpayers. At the same time, thrift portfolios were restructured by exchanging below market mortgages for MBS that could be sold and the losses amortized rather than realized immediately. Thrifts solved their asset liability mismatch by selling FRMs into the secondary market for securitization by MBS underwritten by one of the U.S. secondary market agencies.
Thompson (2006) has a good description of what happened next:

> Wall Street surveyed the mountain of defaulted S&L loans taken over by the federal Resolution Trust Corporation (RTC) and saw an opportunity to get into real estate investing in a big way. Morgan Stanley's experience is typical of other investment banks at the time. "We got into the investing side of the business primarily because the opportunity was there to buy nonperforming loan portfolios from the RTC," recalls Slaughter. From a merchant banking standpoint, Wall Street barely paid attention to commercial real estate prior to 1990. Since then, almost every major Wall Street firm has become active in real estate private equity. "Morgan Stanley alone has gone from zero dollars under management to almost $40 billion over the past fifteen years," says Slaughter.
>
> Wall Street helped the RTC solve another big problem: how to dispose of billions in S&L loans that were not in default. The agency came to Wall Street with a proposal to sell loan packages rather than one property at a time, an impractical approach given the volume of loans on the RTC books. Wall Street responded by creating commercial mortgage-backed securities (CMBS), which are similar to, but more complex than, the mortgage-backed securities long used to bundle and sell packages of residential loans. "Commercial mortgage-backed securities did not exist in 1990 and were not thought to be viable," says Slaughter. Today, CMBS represent a $550 billion market.
>
> It's hard to overestimate the impact of this market restructuring. In fif-

5. See http://www.allcountries.org/uscensus/1228_office_buildings_vacancy_rates_for_major.html.

teen years, the public equity and debt markets for commercial real estate have gone from financial infancy to trillion-dollar status.

At the same time thrifts restructured their portfolios by exchanging fixed-rate mortgages for MBS to be sold to U.S. secondary market agencies. The government encouraged this through allowing the losses to be amortized rather than realized immediately (Wachter 1990). Thrifts then solved their asset liability mismatch going forward by holding in their portfolios newly available adjustable rate mortgages (ARMs). For a time in the U.S. it appeared that the short-term ARM would become common in the United States. But inflation under control by the early 1990s, relatively flat yield curves, secondary market agency (Fannie Mae, Freddie Mac, and Ginnie Mae) guarantees, and the liquidity derived from large standardized market trading of MBS resulted in competitive FRM pricing in the U.S. Elsewhere, in the absence of secondary market institutions, ARMs remained far more common (Green and Wachter 2005). While banks solve their asset liability mismatch problem by offering ARMs, these convey larger credit risks in the long run should economic shocks cause higher interest rates.

The question remains, however, why the banking sector, in the United States and elsewhere, drove itself into near bankruptcy with severe consequences for the economy. This may be because the banking sector lacks incentives to curtail or even monitor risky lending activities. In particular, if there is either deposit insurance, or if depositors assume certain institutions are too big to fail, moral hazard becomes a serious problem, unless there is adequate supervision (see Pavlov and Wachter 2006). Basel II and many commentators are newly looking to market-based monitoring of banks (Barth, Caprio, and Levine 2006) to ensure soundness and financial stability. This requires a reliance on market forces, and the threat of lost fees and profits, to align bank managers' incentives to market outcomes. In the following sections, we present a theoretical model and empirical evidence of bank lending and development activities that demonstrate how banks can provide underpriced financing and nonetheless avoid the appearance of large losses even following a negative demand shock that is, in part, induced by the banks' own behavior.

3.3 A Model of Lender and Developer Behavior

In this section, we propose a simple one-period model with zero-profit, rational developers who bid on land prices in period 1 and supply developed real estate in period 2. These developers face an upward sloping supply of land function in period 1, and a downward sloping real estate demand function in period 2. The developers know the parameters of the demand functions and choose the optimal level of development in period 1.

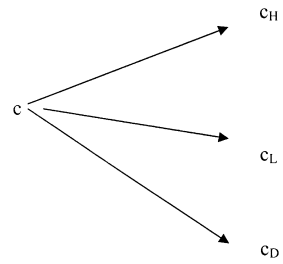


Fig. 3.1 Real estate demand function

Note: c denotes the intercept of the real estate demand function in period 2. This intercept can take one of three values, c_H, c_L, or c_D.

The uncertainty in the model is given by the intercept of the real estate demand function in period 2 (see figure 3.1). We assume it can take one of three values high (H), low (L), and disaster (D):
with probability δ_H, δ_L, and δ_D, respectively.

There are two types of developers, safe and risky, who are identical in all respects except that the safe developers default only in the disaster state, D, while the risky developers (strategically choose to) default in states L as well as D.

Lenders can correctly identify the type of developer (for example, higher loan to value borrower) and price the zero-equity loans appropriately.[6] (In a later section, we also discuss the case in which lenders cannot distinguish between the two types of developers.) We show in the following that if all loans are priced correctly, then lenders have zero expected profits, and the lending activity has no impact on the underlying real estate market development or pricing.

While our model is couched in terms of developers obtaining loans from lenders directly, the more realistic interpretation is that individual homeowners obtain the loans and commit to purchase properties from the developers. Developers are then incentivized to develop and meet the demand for presales, and individual homeowners are interested in purchasing because they can obtain loans from the lenders. Therefore, this chapter can be interpreted in its entirety as a residential real estate paper.

To gain market share (and to book more short-term fees), lenders can engage in underpricing by lending to some of the risky borrowers at the safe rate. If that occurs, risky borrowers take advantage of the cheap financing, bid up land prices in period 1 above their prior levels, and overdevelop. As a result, prices are lower in period 2 in all states, lenders have negative ex-

6. The zero equity assumption is purely mechanical and can easily be replaced with any other fixed required LTV ratio. As will become apparent in the following, higher equity requirement does not change our results, as long as the equity is not sufficient to absorb all negative demand shocks.

pected profits, safe borrowers also have negative expected profits, and risky borrowers have zero expected profits.

We further model the profits of the lenders and their ability to hide small losses due to the overall randomness of the lender's activities in sectors other than real estate. If this is the case, lenders do extend some underpriced loans to risky borrowers, with all of the negative consequences this generates. Importantly, *reported* proportional bank losses are smaller in case of outcome (*D*) than the losses to real estate investors. The compensation of bank managers is rationally maximized.

3.3.1 Safe Developers and Rational Lenders

In period zero, developers will build given the following *supply* function:

$$q = \frac{P - a}{b}, \tag{1}$$

where P denotes the price of land for development in period 1, q denotes the quantity of land that is developed for period 2 and is determined in period 1, and a and b are constants specifying the supply function.

In period 1 the price of the asset is given by the following *demand* function:

$$P_s = c_s - dq, \tag{2}$$

where c_s denotes the intercept of the demand function for each state of nature ($S = H, L, or\ D$), P_s denotes the price of developed land in period 2 in each state of nature, and d is a constant specifying the slope of the demand function.

Good borrowers default only in the case of disaster (*D*). The price they are willing to pay is given by:

$$RP = \frac{\delta_H P_H + \delta_L P_L}{\delta_H + \delta_L}, \tag{3}$$

where R denotes 1 + interest rate charged on the safe loans. Solve for q:

$$q = \frac{(c_H - aR)\delta_H + (c_L - aR)\delta_L}{(d + bR)(\delta_H + \delta_L)} \tag{4}$$

The zero-profit for a risk-neutral bank is:

$$(\delta_H + \delta_L)(R - 1)P = \delta_d(P - P_D). \tag{5}$$

Solve for q:

$$q = \frac{(a - c_D)\delta_D + a(R - 1)(\delta_H + \delta_L)}{(d + bR)(\delta_H + \delta_L)} \tag{6}$$

Equate q in expressions (4) and (6) to solve for R, substitute into equations (4) or (6) to find the equilibrium quantity of real estate developed, q^*:

$$q^* = \frac{c_H \delta_H + c_L \delta_L + c_D \delta_D - a}{b + d} = \frac{\bar{c} - a}{b + d}, \tag{7}$$

where $\bar{c}$ denotes the expected intercept of the demand function in period 2. This is exactly the quantity real estate developed one would find in the absence of lending, where full equity investors take on all gains and losses, $P = \delta_H P_H + \delta_L P_L + \delta_D P_D$. Substitute q^* into equations (1) and (2) to find the equilibrium current and future price:

$$P^* = a + b \frac{\bar{c} - a}{b + d} \tag{8}$$

and

$$P_s^* = c_s - d \frac{\bar{c} - a}{b + d} \tag{9}$$

Investor expected profits are zero:

$$\frac{\delta_H P_H + \delta_L P_L}{\delta_H + \delta_L} - RP = 0 \tag{10}$$

3.3.2 Risky Developers and Rational Lenders

Risky developers default even in moderate losses, that is, in the case of state (L) in period 2. The price they are willing to pay is given by:

$$R_B P = P_H. \tag{11}$$

The lender's zero-profit condition is:

$$\delta_H (R_B - 1) P = \delta_L (P_L - P) + \delta_D (P_D - P). \tag{12}$$

Solve for equilibrium quantity of real estate developed following the method of equations (3) to (7):

$$q^* = \frac{\bar{c} - a}{b + d} \tag{13}$$

This solution is identical to the optimal development quantity under no lending. Therefore, *if properly priced,* lending to risky borrowers does not in itself affect the real estate markets. In this situation, the bank takes all losses, and charges an appropriate interest rate. Therefore, for ease of exposition, in what follows, we assume the bank lends only at the safe rate. Otherwise, the bank can directly invest in real estate and not go through risky investors.

3.3.3 Risky Developers and Underpricing Lenders

Assume in this section that the lender makes a certain proportion, h, of the loans to risky borrowers at the safe rate. (In the following, we explicitly

model the lender behavior and how that might occur.) Because risky developers would find the ability to borrow at the safe rate very attractive, the quantity real estate developed then becomes:

$$q^*_u = (1 + h)q^*, \tag{14}$$

where q^*_u denotes the quantity developed in the underpricing case. The current price of real estate increases, as given by equation (1), and the future price of real estate in each of the three outcomes declines, as given by equation (2). Importantly, this new lower price of real estate affects even safe investors and reduces their expected profit:

$$\frac{\partial[(\delta_H P_H + \delta_L P_L)/(\delta_H + \delta_L) - RP]}{\partial_h} < 0 \tag{15}$$

Because current price, P, is higher under underpricing, and future price in each state, P_s, is lower under underpricing for all s, real estate markets decline more in economies that underprice. Specifically, following an outcomes L or D, the percent price decline in real estate is:

$$1 - \frac{P_L}{P} = 1 - \frac{c_L(b + d) - d[E(c_s) - a](1 + h)}{a(b + d) + b[E(c_s) - a](1 + h)} \tag{16}$$

$$1 - \frac{P_D}{P} = 1 - \frac{c_D(b + d) - d[E(c_s) - a](1 + h)}{a(b + d) + b[E(c_s) - a](1 + h)},$$

which is increasing in h because $a \ll E(c_s)$. (Intercept of the supply function is far smaller than the intercept of the demand function.)

3.3.4 Lender Behavior

The bank can underprice by lending to the risky borrowers at the safe rate, R. Let k denote the percent of real estate loans relative to the total lending activity of the bank. Let h denote the percent of real estate loans to risky borrowers. Because the default rates on loans in other industries in which the bank participates is noisy, the bank is able to hide losses of g or less in the real estate sector. For instance, g can be two standard deviations above the average loss on the bank portfolio.

While hiding losses is unlikely to persist over the long term, it can and does happen between market crashes. Most markets accommodate this by providing higher returns to investors during normal markets and larger losses during substantial market downturns. Thus, investors receive a fare rate of return, and the hiding during up markets can persist. The added problem in real estate is that during the normal (up) markets additional development occurs, and this additional development magnifies the effects of negative demand shocks.

Even in the absence of a negative demand shock, small losses accumulate over time and eventually get discovered. This would lead to both in-

vestor and regulator response. Such a response can, in itself, tighten lending standards, reduce the availability of credit, and add to moderately weak economic fundamentals to produce a negative demand shock. That's why even in the absence of a significant economic downturn, real estate markets tend to experience substantial negative demand shocks on a regular basis.

If the bank lends only to safe borrowers, bank profits on real estate loans, π, are given by:

$$\pi = \begin{cases} rP & \text{if } H \text{ or } L \\ P_D - P & \text{if } D \end{cases}. \tag{17}$$

If the bank lends to risky borrowers and safe borrowers at the safe rate, bank profits on real estate loans are given by:

$$\pi = \begin{cases} (1+h)rP & \text{if } H \text{ or } L \\ (P_L - P)h & \text{if } L \\ (P_D - P)(1+h) & \text{if } D \end{cases}. \tag{18}$$

We assume management compensation, M, is proportional to the loans originated:

$$M = (1+h)Pkm, \tag{19}$$

where m denotes the origination fees the management of the bank receives as a compensation.

Therefore, managers maximize compensation by setting h:

$$(P - P_L)hk = g \tag{20}$$

or

$$h = \frac{k[c_L - E(c_S)] + \sqrt{4kg[E(c_s) - a] + k^2[E(c_s) - c_L]^2}}{2k[E(c_s) - a]}, \tag{21}$$

which is an increasing function in g. For $g = 0$, $h = 0$, that is, if the bank cannot hide any losses, the optimal amount of loans to the risky borrowers is zero.

Following a D outcome, the *reported* unexpected bank losses on real estate loans, as a proportion of originated loans, are:

$$\frac{(P - P_D)(1+h) - g}{(1+h)P} = 1 - \frac{P_D}{P} - \frac{g}{(1+h)P}. \tag{22}$$

which is smaller than the losses to real estate investment, $1 - P_D/P$. Therefore, the reported proportional losses to the banking sector are smaller than the proportional losses to the real estate sector. If the bank cannot hide any losses, then $g = 0$, $h = 0$, and the proportional bank losses are the same as real estate losses. Under loan securitization with liquid standard-

ized markets, the bank cannot hide any losses, and both the real estate and the banking sectors are protected.

Note that the general outcome of price inflation shown in the preceding can be obtained in an equivalent model in which lenders cannot distinguish between safe and risky borrowers or can distinguish at a cost. In that case, a proportion of the loans will be made to risky borrowers. The only difference in this alternative model is that the proportion of loans made to risky borrowers is not an outcome of maximizing management compensation but is an exogenous variable measuring the degree to which risky borrowers can borrow at the safe rate. This implicitly assumes the lenders not only cannot distinguish between safe and risky borrowers but also do not know the proportion of loans they make to risky borrowers. If this is not the case, and the lender cannot distinguish between risky and safe borrowers, then the impact on asset markets is further magnified. Mathematically, this is equivalent to setting $h = 1$ in our model, that is, the bank can hide losses of any amount. Of course, no bank can hide losses beyond a certain magnitude. This is a purely mechanical adjustment to the model that demonstrates the implications of the bank not being able to distinguish between the safe and risky borrowers.

Finally, liquid standardized securitized real estate-backed debt can be modeled by setting k in equation (19) to 1. In other words, securitized mortgage debt is like a lender whose sole operations are in a specific real estate market and property type. While liquid, standardized securitized debt investors are not more or less sophisticated than bank shareholders, because of the far more direct, uniform, and transparent link between the underlying cash flows and the investor payoffs, lenders are able to hide only far smaller losses in this model. In other words, due to the uniformity and mechanical nature of such securitized debt, even small losses get discovered quickly, and overdevelopment is stopped before it occurs.

3.4 Data Description and Empirical Results

The first data set we utilize is the Global Property Research (GPR) indexes compiled by Eichholtz et al. (1998) and refined and extended by Dr. Christopher Shun, Menang Corporation, Malaysia.[7] These data include property indexes for twenty-five countries over twenty and twelve years for developed and emerging countries, respectively. The GPR 250 Global Property Stocks index only includes property companies with a minimum of US$50 million of freely available market value and high liquidity in terms of average last-year stock trading volume. As of December 2002, the securities included in the GPR 250 index had a combined available market

7. For further information, see the bibliographies for Eichholtz et al. (1998) and Shun (2005).

value of US$194 billion. This data set has a number of advantages. In particular, it has the deepest history and the largest cross-sectional span across the globe of any real estate property database. Because the returns are based on publicly traded and liquid securities, the data quality is high, available at a monthly frequency, and consistent through time.

The second data set we use is the financial return data from the Global Financial Database (GBF); these data are compiled for 120 industries in more than 200 countries. The GBF has a collection of more than 200,000 entries and offers accurate and verified historical world market financial data. The financial return data refers to the return of the financial sector within each market and is provided as monthly data.

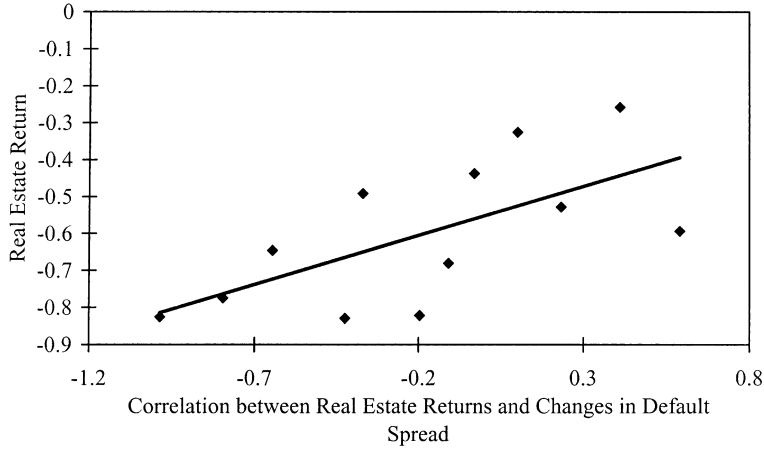
We also make use of correlation results that are derived from previous work in Pavlov and Wachter (2007). Pavlov and Wachter (2007) develop a symptom of loan underpricing in an economy. This symptom is the negative relationship between the change in lending spread and asset returns before the crash. We use the property returns data to measure the total price decline during the crash for each market as indicated in the preceding, and we calculate the correlation of the lending spread with this return to identify economies that experience lending induced real estate crashes. The lending spread for each market is calculated by the lending rate minus the deposit rate. These data are collected from the World Bank *World Development Indicators* (WDI) Web site (http://www.worldbank.org/data).

Table 3.1 provides descriptive statistics of the GPR data used. We identify twelve countries that have experienced a market decline of 20 percent or more during any period in the past. Such a large market decline corresponds to our "Disaster" outcome described in the preceding theoretical model. While market declines are a continuum, and the 20 percent cut-off is somewhat arbitrary, our empirical data really provide two types of declines—small in the order of 2 to 5 percent and large, well in excess of 20 percent. Therefore, our results are not tied to this cut-off point.

Using both the GPR and GBF databases, for each country, we compute the correlation between changes in the lending spread and asset returns *before* the market decline. This is our underpricing symptom. Figure 3.2 is replicated from Pavlov and Wachter (2007, fig. 1). The vertical axis depicts

Table 3.1 **Descriptive statistics**

	Correlation	Real estate % decline	Financial decline
Mean	–0.19	–0.60	–0.16
Standard error	0.14	0.06	0.13
Median	–0.15	–0.62	–0.20
Standard deviation	0.48	0.20	0.44



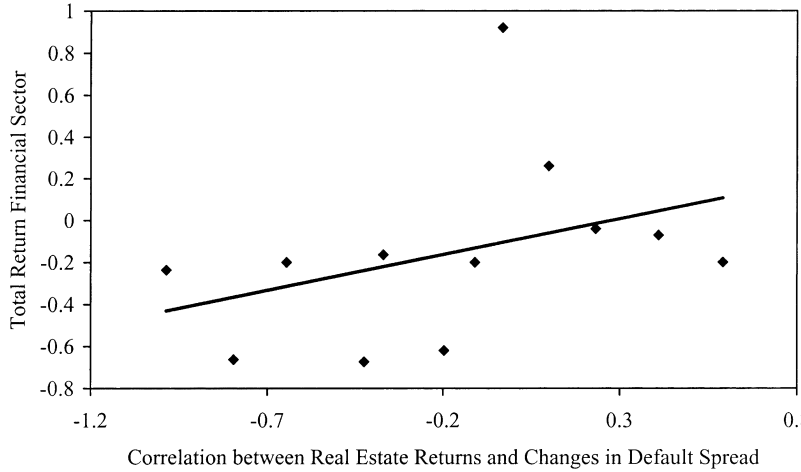
	Intercept	Slope	R^2
Estimate	0.55	0.27	0.42
t-statistic	11.30	2.72	

Fig. 3.2 Real estate return

Notes: The correlation is computed between the total index return, including dividends, and the change in the spread of lending over deposit rates. In this figure, we compute the correlation using data before the crash, that is, from the beginning of our data set to the peak of the property market. The vertical axis depicts the real estate return. This is over one or more years and is specific for each country. According to our theory, negative correlation is a symptom of underpricing and is associated with larger losses during a market downturn. Countries that do not exhibit the symptom of underpricing have zero or positive correlation, and their respective property market declines are relatively modest.

the total percent decline in the property market, from top to bottom. This is over one or more years and is specific for each country. According to Pavlov and Wachter (2007), negative correlation between price changes and changes in the lending spread is a symptom of underpricing, and, thus, we expect this negative correlation to be associated with larger losses during a market downturn, as it is. Countries that do not exhibit the symptom of underpricing have zero or positive correlation, and their respective property market declines are relatively modest, as the results indicate. We replicate this figure because it illustrates that loan underpricing can have devastating effect on the underlying real estate markets.

To test the theoretical implication of our preceding model, that the banking sector experiences smaller proportional declines than the real estate sector, we plot the same underpricing symptom against the total decline, top to bottom, of the financial services sector in the same twelve countries in figure 3.3. While the relationship is as expected, that is, lenders in countries that underprice experience larger losses following a real estate



	Intercept	Slope	R^2
Estimate	-0.09	0.15	0.14
t-statistic	-0.71	1.28	

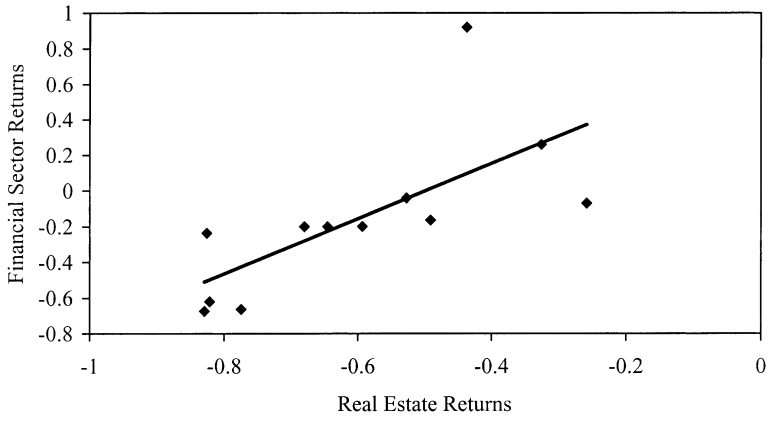
Fig. 3.3 Financial-sector return

Notes: The correlation is computed between the total real estate index return, including dividends, and the change in the spread of lending over deposit rates. The vertical axis depicts the financial-sector total return over the period of the real estate market crash. This is over one or more years and is specific for each country. According to our theory, negative correlation is a symptom of underpricing and is associated with larger losses in real estate markets during a market downturn. Countries that do not exhibit the symptom of underpricing have zero or positive correlation, and their respective property market declines are relatively modest. This figure shows that the financial-sector returns are also negatively impacted by underpricing but by a far more modest extent than real estate returns. The relationship is not statistically significant and of smaller magnitude.

negative demand shock, it is not statistically significant and very modest economically. This suggests that while underpricing hurts the financial sector following a negative demand shock, the magnitude of this effect is modest relative to the real estate sector declines.

Finally, figure 3.4 reports the relationship between real estate returns and financial-sector returns. While the relationship is positive and significant, that is, markets that experience large real estate losses also experience significant banking losses, very clearly the financial-services sector losses are far more modest. Furthermore, while we only have a few data points, it appears that real estate returns need to fall by 60 percent or more before the financial-services sector starts to experience significant losses.

There are four countries that experienced real estate market crashes but very limited banking losses or even substantially positive returns: Hong



	Intercept	Slope	R^2
Estimate	0.77	1.54	0.48
t-statistic	2.43	3.06	

Fig. 3.4 Financial and real returns

Notes: This figure depicts the total real estate returns versus the total financial-sector returns following the real estate market crash. Real estate returns and financial-sector returns are positively correlated. However, financial-sector losses are generally more modest than real estate losses. Furthermore, the financial sector does not seem to experience any significant losses until real estate losses reach 60 percent or more.

Kong, New Zealand, Belgium, and Norway. First, while substantial, the real estate crashes in these countries represent the lowest four real estate market declines in our data set. Second, each one of these countries had a particularly strong banking sector that did not appear to engage in underpricing and fared the real estate losses quite well.

Hong Kong used particularly strong underwriting standards, with very low LTV ratios and close scrutiny of loan applications. New Zealand and Belgium have always had very stable and closely monitored banking systems, and while default losses did increase during the real estate market crashes in the two countries, these increases were modest and well managed. Finally, the Norwegian financial system, while exposed to real estate, was also stable and fared relatively well during the real estate downturn for two reasons. First, the Norwegian banking system experienced a major crisis during the 1988 to 1993 period, which had a cleansing effect on its loan underwriting mechanisms. Second, during the period of the Norwegian real estate market decline, 1997 to 2001, oil prices increased from about $16 to over $30 per gallon, which helped the entire Norwegian financial system.

In summary, even though the data provide for only a limited number of observations, the findings are consistent with the theoretical model. First, the banking sector of countries with strong financial systems and solid, consistent underwriting standards fare real estate market crashes well. On the other hand, countries that are likely to engage in risky, underpriced lending tend to experience larger real estate market declines, which are translated into financial-sector declines. Nonetheless, these financial declines are relatively modest, even though banks are highly levered.

3.5 Conclusions and Implications for Alternate Financial Structures

In previous work, we have demonstrated the role that bank lending plays in generating boom and bust cycles in real estate. Rational economic behavior dictates that banks charge borrowers higher interest rates, origination fees, or mortgage insurance for their imbedded put option to default. While the presence of demand deposit insurance undermines market discipline, where are the shareholders? Why can't they monitor lending officials' behavior?

In this chapter, we develop a model to explain why underpricing of risk is not detected or curtailed by bank shareholders. As a result, underpricing persists undeterred and results in compression in the spread between lending and deposit rates, lending booms, inflated asset prices, excess building, and real estate crashes.

The link between bank lending and real estate crashes is enabled by the absence of short selling in real estate, which allows optimistic investors to drive prices up (Carey 1990; and Herring and Wachter 2003). But this is an insufficient explanation for sustained underpricing episodes because optimists still need financing to buy real estate if they are not to be constrained by their own limited assets, which will eventually go to zero due to their misjudgments. This optimist-led pricing is enabled and heightened by banks that supply funds to the optimists at rates that underprice risk. The model that we put forth here is based on the very nature of banks, their diversification that makes the identification of the signals of the underpricing of risk difficult except with considerable delay.

Such underpricing behavior forces a race to the bottom across lending institutions, with marketwide consequences. The longer the underlying real estate cycle, the greater the value of the put option, the inelasticity of the supply of real estate, and the elasticity of demand for bank loans, the greater the probability that the market will enter into an equilibrium in which all banks underprice risk with marketwide consequences that will be discovered (Pavlov and Wachter 2006). Even then with forbearance of regulatory authorities and the intervention of governments, banks may be bailed out, mitigating the consequences for shareholders. Nonetheless, the

fundamental factor that explains why episodes of bank underpricing of risk are likely to occur is the inability of banking shareholders to identify these episodes promptly and incentivize correct pricing.

References

Barth, J. R., G. Caprio, and R. Levine. 2006. *Rethinking bank regulation—Till angels govern.* Cambridge, UK: Cambridge University Press.

Carey, M. 1990. Feeding the fed: The federal lend banks, land market efficiency, and the farm credit crisis. PhD diss., University of California, Berkeley.

Eichholtz, P., N. deGraaf, W. Kastrop, and H. Veld. 1998. Introducing the GRP 250 property share index. *Real Estate Finance* 15 (1): 51–61.

Fischer, D. Indonesia's real estate disturbance, an ineluctable outcome. In *Asia's financial crisis and the role of real estate,* ed. K. Mera and B. Renaud, 219–42. Armonk, NY: M. E. Sharpe.

Green, R. K. 2001. Review of *Asia's financial crisis and the role of real estate,* ed. K. Mera and B. Renaud. *Journal of Housing Economics* 10 (2): 216–23.

Green, R. K., and S. Wachter. 2005. The American mortgage in historical and international context. *Journal of Economic Perspectives* 19 (4): 93–114.

Herring, R., and S. Wachter. 2003. Real estate bubbles. *Asset Price Bubbles: Implications for monetary, regulatory, and international policies,* ed. W. C. Hunter, G. G. Kaufman, and M. Pomerleano, 217–30. Cambridge, MA: MIT Press.

Ito, T. 2007. Asian currency crisis and the International Monetary Fund, 10 years later: Overview. *Asian Economic Policy Review* 2:16–49.

Mera, K., and B. Renaud. 2000. *Asia's financial crisis and the role of real estate.* Armonk, NY: M. E. Sharpe.

Miller, M., and P. Luangaram. 1998. Financial crisis in East Asia: Bank runs, asset bubbles, and antidotes. *National Institute Economic Review* 165:66–82.

Pavlov, A., and S. Wachter. 2006. The inevitability of market-wide underpriced risk. *Real Estate Economics* 34 (4): 479–96.

———. 2007. Mortgage put options and real estate markets. *Journal of Real Estate Finance and Economics,* forthcoming.

Renaud, B. 2000. How real estate contributed to the Asian financial crisis. In *Asia's financial crisis and the role of real estate,* ed. K. Mera and B. Renaud, 183–208. Armonk, NY: M. E. Sharpe.

Shun, C. 2005. An empirical investigation of the role of legal origin on the performance of property stocks. *European Doctoral Association for Management and Business Administration Journal* 3:60–75.

Thompson, R. 2006. Rebuilding commercial real estate. http://hbswk.hbs.edu/item/5156.html.

Wachter, S. 1990. The limits of the housing finance system. *Journal of Housing Research* 1 (1): 163–85.

World Bank. *World development report, 2001.* Washington, DC: World Bank.