How Much Is That Home Really Worth?

Appraisal Bias and House-Price Uncertainty*

BY LEONARD NAKAMURA

With house prices often below the face value of mortgages these days, the expected return on many mortgages has tumbled, since one of the major forces supporting mortgages, the collateral, has weakened. One source of these mortgage problems has been the validity of the home appraisal, which is supposed to be an objective and expert dollar valuation of the house that should help make a mortgage less risky. Unfortunately, the appraisal process can go awry and often has. As Leonard Nakamura shows in this article, appraisals have been biased upward, making mortgages riskier. Now a reverse risk is at work: The bias is going the other way, causing home valuations to be underestimated, possibly making new mortgages harder to obtain. In addition to problems of bias, Nakamura discusses the appraisal process, how it's supposed to work, and how it can go awry.

When housing prices fall and mortgage borrowers lose their jobs and fall behind on mortgage payments, an important question arises: How much is any given house worth if it were to be sold? In the not-too-distant past, say, 2005, when house prices were still spiraling upward, the answer was almost always "more than the amount borrowed." However, more recently, a typical answer has been, "not so much." With many house prices below the face value of mortgages, the expected return on many of these mortgages has tumbled since one of the major forces supporting mortgages, the collateral, has weakened.

As we now know, that situation fed the creation of a major world financial crisis. As we pick ourselves up from the crisis, we see that one source of these mortgage problems has been the validity of the home appraisal, which is supposed to be an objective and expert dollar valuation of the house that should help make a mortgage safer and more marketable. Unfortunately, the appraisal process can go awry and often has. As we shall see, appraisals have been biased upward. This made mortgages riskier, since too much was lent out on homes. One of the safeguards, the appraisal, failed to perform its role of limiting mortgages to the underlying value of the houses.

Now a reverse risk is at work: The bias is going the other way, causing home valuations to be underestimated, and this may make new mortgages harder to obtain. If so, this could delay improvement in housing markets, which, in turn, could cause house prices to fall more than they otherwise would, possibly causing additional losses to mortgage lenders.

One way in which an appraisal can go awry is that the information upon which the house is valued may be very thin; recent nearby comparable house sales may be so few that the price at which the house is likely to be resold may be difficult to predict precisely. A second reason the appraisal process can go awry is that all parties may not want a genuinely independent appraisal.

As we reform our system of mortgage lending, one piece we might

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wish to focus on is the appraisal system. Indeed, some steps have already been taken in this direction.

HOW APPRAISALS ARE SUPPOSED TO WORK

A standard part of a home mortgage is an appraisal, an independent evaluation of the home's value. After the seller and buyer have agreed on a price, the mortgage lender usually requires an appraisal. This is an estimate of the value of the house, made by a professional appraiser and based on local market conditions; the appraiser examines nearby recently sold houses and compares them in terms of characteristics such as size, location, and condition with the house to be mortgaged.

A typical appraisal costs $250 to $400. In a boom year like 2005, when there were more than 7 million new home mortgages on purchases of new and existing one- to four-unit family homes and a similarly large number of refinancings, roughly $4 billion was spent on appraisals in the U.S. These appraisals are part of an underwriting process whose aim is to determine whether lenders accept mortgage applications. This is a serious process with trillions of dollars at stake. In that same year, more than 5 million mortgages were denied, representing nearly $1 trillion of loans applied for.[1]

The appraisal further certifies to the mortgage originator and — if the loan is securitized — to the ultimate lender the value of the collateral for the mortgage. The appraisal addresses the lender's worries about whether the loan will be repaid. In the past, mortgages have generally been relatively safe loans because the borrower's home backs the promise to repay.[2] A house as collateral has two advantages for the lender: First, the borrowing household is usually loath to lose its home: Moving is costly and so is the loss of concomitant personal ties to neighbors and schools. So if a family can make the payments, it generally will. Second, even if the household cannot make the payments, the house can be resold, and the loan usually can be mostly or entirely repaid out of the proceeds.

The typical mortgage loan's safety is connected to the down payment made by the borrower; this fact is well-established by empirical research on U.S. data. Briefly, the down payment provides an equity stake for the borrower — a commitment of dollars by the borrower that the borrower loses if he or she defaults — as well as security for the mortgage lender.[3] One cause of recent mortgage losses has been house values that have fallen below the amount borrowed, a case in which the borrower's home equity stake has disappeared as a consequence of borrowing too much and the price of the house falling.

While most homeowners will continue to pay their mortgages even after their home equity has disappeared, many find themselves unable to keep up with payments, often as a result of unemployment or illness, and some of them will eventually lose their homes to foreclosure. In addition, in recent years, a significant proportion of homes were bought by investors, many of whom are more likely to default as home equity is lost.[4] During the recent housing boom, housing market participants lost sight of the importance of the down payment, in many cases because house prices kept rising so consistently. If house prices rise continuously, the down payment may not matter. If a house is purchased without a down payment, the mortgage loan is worth the same as the house, and the lender has no margin of safety. But if the house price goes up 20 percent, the margin of safety will have reappeared, and the loan will turn out to be safe. In the U.S., during the six years from the end of 1999 to the end of 2005, house prices rose at an annual rate of 11.3 percent (according to the Case-Shiller U.S. house-price index). During that period, on average, house-price appreciation created more than a 20 percent margin of safety in two years' time. During this period, it appeared as if mortgages made with no down payments were reasonable investments. By contrast, in the longer period from 1970 to 1999, house prices appear to have risen about 5 to 6 percent annually.

In more normal times, when prices aren't rising quite so quickly, the precise value of the home on the market, and whether it will be sufficient to repay the mortgage, is crucial information for the mortgage lender, since it influences both the likelihood that the mortgage will lose value and how the mortgage lender will approach legal options if the borrower falls behind in payments.

One way the lender attempts to gauge the underlying value of the house at the time the loan is made is

[1] National mortgage data are from the HMDA National Aggregate Report, 2005, available at http://www.ffiec.gov/hmdaadwebreport/NatAggWelcome.aspx. It is difficult to know from these data how many of the denials were due to appraisals, but the limited data suggest that appraisals were responsible for only a small proportion of denials.

[2] In the 1980s, the savings and loan crisis also had mortgage lending at its root, but this had less to do with mortgage defaults and more to do with unusually high long-term interest rates.

[3] For a fuller discussion of the risks of loans and the value of the down payment, see Ronel Elul's *Business Review* article.

[4] See, for example, Shane Sherland's working paper on default rates of subprime mortgages and Yuliya Demyanyk and Otto Van Hemert's forthcoming article on the decline in mortgage lending standards in recent years.

from the sale price of the house: What the borrower is willing to pay for the house is usually a good measure of its worth. But the buyer may have overpaid. Worse yet, the buyer may have deliberately overpaid to a partner, with the pretend "transaction" intended to fraudulently extract money from the lender. In a classic "land flip," criminal A sells a house to criminal B at an inflated price, and the two then abscond with the cash lent by the mortgage lender.

To collect more information about the underlying value, the lender obtains an appraisal of the house's value, that is, an estimate by a professional appraiser, based on prices paid for local comparable houses. This additional information may be needed because the borrower may have overbid for the house, in which case the lender may be leery of financing it. Moreover, even if the borrower has paid the right price for the house, other sales testify that the market for houses in that neighborhood is active, and that if the house needs to be sold, the market is not so thin that an additional house for sale will result in a large drop in price.

How is the information from the appraisal used in the mortgage? First, if the information from the appraisal does not give the lender confidence in the appraisal valuation, the lender may refuse to make the mortgage loan. For example, if the comparable houses used in the appraisal are in a different neighborhood from the house being appraised, the loan may be refused. Second, a conservative rule is used to determine the value of the house for the purposes of the mortgage. The lender bases whether to approve the mortgage on whichever is lower, the appraised value or the transaction price. The standard conventional prime mortgage must have a loan-to-value (LTV) ratio of 80 percent to qualify for a low interest rate; the valuation used for this purpose is the lower of the appraised value or the transaction price.[5]

Suppose a prospective home buyer reaches a purchase agreement to buy a house for $100,000. The buyer has $20,000 with which to make a down payment, so she just qualifies for the lowest interest rate, borrowing $80,000. However, suppose the appraisal comes in at $95,000. In calculating the loan-to-value ratio, the mortgage lender will set the value of the house at the lesser of the appraisal valuation ($95,000) or the sale price ($100,000). Thus, the mortgage document records a house value of $95,000 and a loan of $80,000, so the loan-to-value ratio is 84 percent, too high to qualify for the best interest rate.

Appraisals are also used by lenders when the borrower wants to refinance an existing mortgage or take out a second mortgage, also called a home equity loan. Whenever mortgage rates have fallen, as they did dramatically in 2003, households have refinanced their homes to take advantage of lower interest rates. Many households have taken these opportunities to do cash-out refinancing, where they increase the size of the mortgage loan and reduce their implied home equity. Freddie Mac has estimated that from 2002 to 2008, over $1 trillion in cash was taken out of prime mortgages. While in many cases this cash was used to improve the properties — improvements that may raise the properties' value and thus only partially reduce home equity — research shows that many of these cash-outs were used to finance consumer expenditures or to reduce other debts.[6] The high loan-to-value ratios resulting from cash-out refinancing are by no means limited to low- and moderate-income populations; many examples come from expensive houses in wealthy neighborhoods.

One way the lender attempts to gauge the underlying value of the house at the time the loan is made is from the sale price of the house: What the borrower is willing to pay for the house is usually a good measure of its worth.

APPRAISALS, MORTGAGES, AND LOCATION

Location and Valuation. Let us briefly explore the relationship between location and value that underlies the appraisal and justifies the real estate motto: location, location, location. One way that houses differ from mass-produced goods is that each house's value is in part based on its unique location. Location affects various attributes of the house, in particular its distance to other locations, such as work sites, shopping, transportation,

[5] In its guide to mortgage originators (known as underwriters), Fannie Mae states, "For a purchase mortgage, the LTV ratio is calculated by dividing the amount of the mortgage by the lower of the appraised value or the sales price of the property" and that "an LTV ratio greater than 80 percent requires credit enhancement, such as primary mortgage insurance."

[6] See the article by Alan Greenspan and James Kennedy.

and leisure amenities. Houses together constitute neighborhoods, united by schools, social networks, building codes, and political units. Houses close to one another are relatively substitutable, and their prices will tend to move together; houses distant from one another are not such easy substitutes for one another, and their prices may not move together.

Put another way, a house consists of a structure and a piece of land. The structure can be valued at its replacement cost, which is likely to be similar from one location to the next. As a result, structures are more like mass-produced goods than unique goods. The value of the land, which differs by location, can differ very substantially from place to place.[7]

Economists group the determinants of land valuation into amenities and work opportunities. Although labor economists often see work as the main determinant of wages, urban economists see amenities and work opportunities as jointly determining both wages and land prices.[8] In particular, the greater the amenities and the higher the productivity of nearby work opportunities, the greater the price of land. By contrast, greater amenities tend to lower the wage rate because workers may be willing to work for lower pay to live in a nice location.

The House Sale. A homeowner will typically have a general idea of what the house is worth. However, exactly what the house will fetch on the market from an actual sale may depend on many factors. The potential buyers of a given unit have some knowledge of the house's value to themselves as specific households relative to other units. In addition, they may know the prices of recently purchased nearby units and the offering prices of nearby for-sale units. They then bargain with the seller over the particular unit, and a sale may take place.[9] The price paid will depend on bargaining skill, the availability of substitute units, characteristics of the particular unit, and the buyer's and seller's tastes for the amenities offered by the particular unit. For example, committed sellers, that is, those who must sell because they are moving to another city or have already agreed to purchase another house, are more likely to accept a sale price below the expected value than sellers who are waiting to see what their home will fetch.

All of this matters to the mortgage lender because the fact that a house has sold at a given price may not be a strong guarantee that the house can be resold at that same price, should a resale prove necessary. In a foreclosure sale, that might mean that the lender will not be fully repaid for the loan. To get a better fix on the underlying value of the house, the mortgage lender turns to an appraiser.

The Appraisal. In making a home appraisal, the appraiser typically presents the lender with sales data on recent comparable house sales. As part of this process, the appraiser will note whether these sales are indeed recent and closely comparable. All this information helps the lender know how accurate the appraisal is likely to be. The lender wants to know how much the house in question is likely to sell for if a resale is necessary, that is, how much the collateral is worth. If a lot of similar houses have been sold in the neighborhood for similar prices, the lender can be reasonably sure that the house can be resold, if necessary, for a price close to the sale price. However, when there aren't many comparable sales, it is possible that no other buyers will be found for this particular house at or near the sale price.

In a typical appraisal, the appraiser is expected to give an appraised value and to document the basis of the valuation. Appraisers are subject to state regulation; typically, they have certification that they have met both education and experience requirements. In addition, appraisers are expected to be objective and not be swayed by the participants in the transaction. Yet the participants have an important stake in the success of the transaction.[10]

From the buyer's perspective, the down payment represents the difference between the sale price and the amount the buyer must borrow. If the house costs $180,000 (the median sale price in the fourth quarter of 2008) and the buyer can put $36,000 down after meeting transaction costs so the down payment is 20 percent of the house value, the amount the buyer needs to borrow is $144,000. However, if the resale value of the house is really, say, $160,000, from the perspective of the lender, $20,000 has been lost due to the borrower's overpaying for the house, and the effective down payment is only $16,000, or 10 percent of the house value.

[7] This distinction is not absolute, of course, and structures can become highly idiosyncratic, while plots of land within a single development or homes within an apartment building may be quite similar. Moreover, a structure may be unsuited to its location, in which case the structure does not add its full value to the land. In this case, it is inappropriate to value a house as the sum of its value as a structure and a piece of land, which can be seen as an upper limit on the value of the house.

[8] See Gerald Carlino's *Business Review* article and the chapter by Glenn Blomquist.

[9] A formal model that describes a housing market in this way is set forth in the article by Daniel Quan and John Quigley.

[10] "Today, many appraisers feel that their ethics are under assault from clients who expect favorable assignment results in return for future business…Even so, the pressures appraisers feel today are little different from those of the past…" See Bruce M. Closser's article.

Discrepancies between the sale price and the appraised value thus create a problem for the lender. If the appraisal comes out to be less than the agreed sale price, the down payment may be insufficient for the loan, and the loan may be canceled or lose its prime status.

Because each house is unique, there is no perfect estimate of its underlying true value. What the lender and the borrower both want to know is: What would the house sell for if it were sold again? The answer to that question can only be an estimate, subject to some uncertainty.

HOUSE APPRAISALS ARE SYSTEMATICALLY BIASED

Empirical Evidence Shows That Appraisals Have Been Biased Upward in the U.S. Modern studies of the accuracy of home mortgage appraisals in the U.S. began with an article by Man Cho and Isaac Megbolugbe, economists at Fannie Mae's Office of Housing Research, who studied the 1993 Fannie Mae loan acquisition file, which contained over 600,000 home-purchase mortgages. They found that in this group of prime mortgages, only 5 percent had appraisals that were lower than the transaction price, while over 30 percent had appraisals that were exactly the transaction price. The other 65 percent were above the purchase price. On its face, these data suggest that appraisals may be biased. Too many mortgage appraisals are exactly at the transaction price, and the distribution is highly asymmetric (Figure 1).

Similar evidence is found in the article by Terry Loebs, published by the Collateral Assessment and Technologies Committee, a group founded by real estate information companies. The article takes a sample of 2.9 million home appraisals, from 1977 to 2004, and finds that the appraisal price is greater than or equal to the transaction price more than 97 percent of the time.

The reason for this asymmetry is that appraisals below the sale price have a different impact from appraisals above the sale price. Specifically, the home valuation, for the purposes of calculating the loan-to-value ratio, is equal to the lower of the sale price or the appraisal. An appraisal above the sale price does not affect the loan-to-value ratio, but one below the transaction price does. If the loan-to-value ratio rises, this may influence whether the mortgage lender makes the loan. To quote Cho and Megbolugbe, "The way to ensure the deal is to appraise slightly high. The appraiser asks for or receives the transaction price and then adds a bit to it. Since the mortgage lenders employ the lesser of the sale price or the appraisal, whichever is lower, in determining the loan value, no further information is added because of the appraisal."

It is clear that, in some cases, when the appraiser reports that the appraised value of the house is below the transaction price, the seller lowers the price, and so the transaction price and the appraised value of the house come out exactly the same. In addition, it is possible that when the appraised value is below the sale price, the borrower may withdraw from the sale, since the mortgage becomes harder to complete.[11]

This would account for some of the bias and some of the large propor-

FIGURE 1

Appraisal Bias

Positive bias means appraisal higher than transaction price

Appraisal bias is defined as appraised value less transaction value as a percent of transaction value. When the bias is positive, the appraised value is greater than the transaction value, and there is no impact on the mortgage loan-to-value ratio. On the other hand, when the bias is negative, the appraised value is less than the transaction price, and the mortgage loan-to-value ratio will be higher (see text).

Source: Cho and Megbolugbe, 1996, Table 1, p. 48

[11] Note a further asymmetry here. An appraisal that is too low may cause the mortgage to be turned down and may allow the borrower to back out of the transaction. An appraisal that is too high doesn't affect the mortgage contract directly and doesn't allow the seller to renegotiate.

tion of appraisals in which the bias is exactly zero. However, as shown in Figure 1, 25 percent of mortgages were between zero and 1 percent above the purchase price, while only 1.6 percent were between zero and 1 percent below the purchase price. If this were resulting from the transaction price being changed or the mortgage being denied, it would imply that roughly one-fourth of all mortgages were being changed or lost due to a 1 percent difference in appraisals. This seems unlikely on its face and is not confirmed by professionals.[12]

Why Are Appraisals Likely to Be Biased Upward? What appears to be occurring is that the parties directly involved in the transaction have a mutual interest in a somewhat upwardly biased appraisal. A difficulty with the underlying contract is that if a house's value is taken to be the lesser of the sale price or the appraisal, and both are good but imperfect estimates of the true value of the house, the lesser of the two will be biased low.

If the house value was taken to be the average of the two values, and both the appraisal and the sale price reflected the underlying value of the house but with some error, the house value would be unbiased. The lesser of either value, however, is always going to be less than the average of the two and hence biased downward.

As we have seen, when the appraiser typically errs by setting the appraised value at or above the sale price, the loan-to-value ratio is unaffected. This appears to be what happens overall; only in relatively few cases (perhaps 5 percent) are the appraisals below the sale price. Such a practice deprives most appraisals of having independent value as measures of the value of the house. Only if the appraiser is convinced that the home buyer has substantially overpaid for the house will the appraiser signal this to the lender by setting an appraisal below the sale price.

A somewhat different issue arises with appraisals to refinance mortgages because there is no sales transaction, since the homeowner stays in place.

With this criterion for estimating house value, the mortgage contract gives the appraiser too much power to accidentally prevent house sales from concluding. This creates a strong incentive for the appraiser to bias the appraisal upward and for the other parties — the mortgage lender and the real estate broker — to want to hire biased appraisers.

Note that typically the buyer is not a "victim" of an appraisal that is biased high. If the appraisal is too low, and if the seller will not lower the price, the buyer will have to come up with a larger down payment.

Appraisals for Refinancings May Be Even More Biased. A somewhat different issue arises with appraisals to refinance mortgages because there is no sales transaction, since the homeowner stays in place. Thus, when a house is refinanced, there is no sale price with which to compare the appraisal. However, there may be a "target" price the borrower is hoping for. In any case, it is generally believed that, in recent years, the appraisals for refinancing have been more biased than those for home-purchase loans. According to Loebs' report, refinance transactions had a somewhat greater appraisal bias (5.6 percent) than purchase transactions (3.6 percent), when median values are compared.

Apparently, this was a particular problem during the recent subprime boom. Many subprime mortgage loans were refinanced from prime to subprime mortgages. When borrowers who had originally had good credit and prime mortgages ran into financial difficulties, perhaps because of job loss, illness, or divorce, these borrowers were faced with a choice: They could sell their homes and pay off the mortgage, or they could refinance. But, as mentioned before, homeowners generally will avoid having to move if at all possible. Such borrowers were encouraged to refinance their mortgages with a subprime loan while taking cash out. The cash-out would then permit the borrower to become current on the new but more expensive and larger mortgage and thus to remain in their homes rather than be forced to sell or be foreclosed on.[13] As we can see in Figure 2, as long as home prices kept rising ever faster, through late 2005, foreclosure rates were kept artificially low, even though the underlying mortgages were increasingly risky.

These subprime mortgages made sense as long as house prices kept rising; however, they become highly

[12] A further indication of the bias is that house-price indexes that were created using both sale prices and refinancing appraisals are now widely considered to be biased relative to house-price indexes constructed using only sale prices, despite the fact that a lot of observations are lost when refinancing appraisals are ignored. Indeed, Andrew Leventis has written a paper on how to eliminate the bias from the Federal Housing Finance Agency's (formerly the Office of Federal Housing Enterprise Oversight, or OFHEO) house-price index while continuing to incorporate information from appraisals.

[13] See the article by Kristopher Gerardi, Adam Hale Shapiro, and Paul Willen for a discussion of the history of borrowers who wind up using subprime loans.

risky when house prices began falling. They were even more tempting during the period from 2003 to 2005, when long-term interest rates, and mortgage interest rates in particular, were unusually low. In Figure 3, we see that beginning at 2003, 30-year mortgage rates (as measured by Freddie Mac) fell below 6 percent for the first time in over 30 years. As a consequence, the rate of mortgage originations rose to about $1 trillion a quarter! Refinancings drove these record rates of originations.

Consequences of Bad Appraisals. If appraisals are not trustworthy, lenders may wind up lending too much money relative to the home's value. When this happens, defaults are more likely to occur.[14] Unfortunately, there has been very little academic work on the impact of biased appraisals despite the importance of the subject.

The lone published academic article, by Michael Lacour-Little and Stephen Malpezzi, uses a small data set from Alaska in the 1980s to show evidence that for a single thrift institution in Alaska, appraisal bias was positively associated with more frequent default.

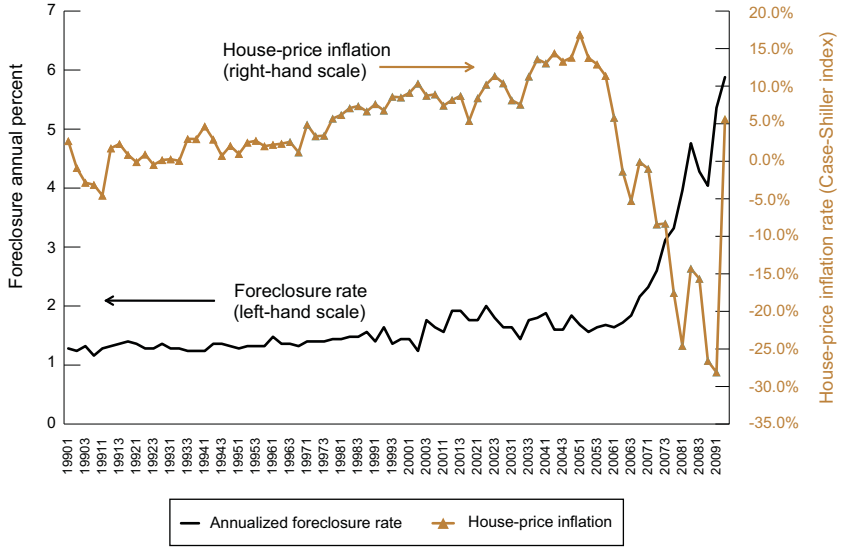
If, indeed, appraisal bias has been larger for *subprime* loans, then since we know that subprime loans have experienced a very high rate of delinquency and loss,[15] there may be a substantial relationship between appraisal bias and poor loan performance. But, in general, one might expect a relationship between appraisal bias and subsequent loan performance, not only because

[14] An article by Yongheng Deng, John Quigley, and Robert Van Order provides the best evidence of the size of this default impact, and Ronel Elul's *Business Review* article provides a more accessible qualitative view.

[15] As of mid-2009, reports say that half of all subprime loans are either in foreclosure or are delinquent, that is, at least 30 days behind in payment.

FIGURE 2

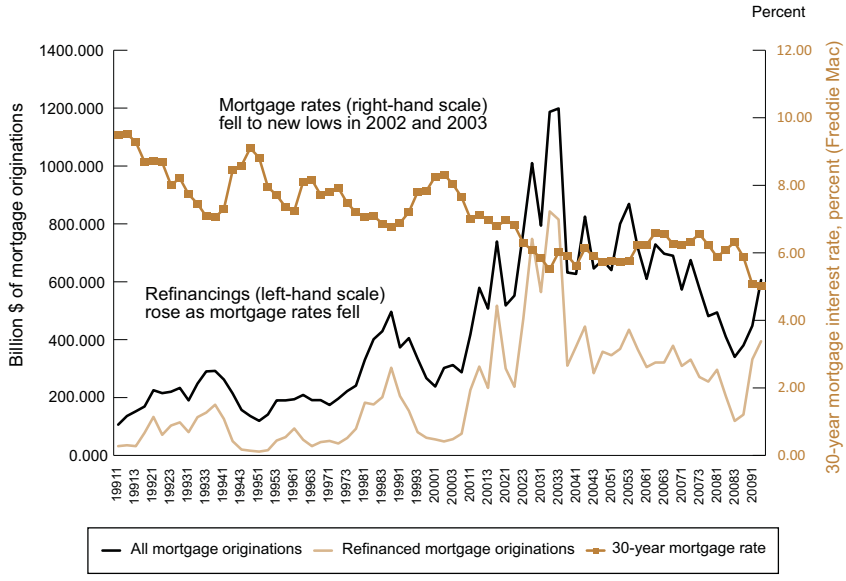
Foreclosure Rates Remained Low As Long As House-Price Inflation Remained High



Sources of data: (1) Foreclosure rate: Mortgage Bankers Association, mortgage foreclosures started, quarterly, seasonally adjusted, and annualized, Haver Analytics; (2) House-price inflation: S&P/ Case-Shiller U.S. National House Price Index, seasonally adjusted, quarterly, at annual rates, Haver Analytics.

FIGURE 3

Total Mortgages, Refinances, and Interest Rate



Sources of data: All data, Freddie Mac, Primary Mortgage Market Survey, Haver Analytics. (1) Mortgage rates: 30-Year Fixed Rate Mortgage Interest Rate, percent; (2) Total Mortgages and Refinancings: Mortgage Originations, 1-4 Family: Total and Refinance, billions of dollars, nominal.

appraisal bias may be evidence of poor lending practices but also because appraisal bias may permit weak or fraudulent loans. Disentangling the role of appraisal bias in the recent housing crisis is an important avenue for research.

A FEEDBACK LOOP IN APPRAISAL ACCURACY

The Current Situation. Beginning in 2008, we have entered a period of high home foreclosures in which many homeowners have lost their homes due to nonpayment of their mortgages. A large proportion of all house sales in 2009 appear to have been homes that had been foreclosed in the 12 months before sale, as much as 20 percent, according to zillow.com.[16] While this report is difficult to verify, it is clear that total foreclosures — whether they are soon sold or not — are indeed very substantial. According to the Mortgage Bankers Association, as we can see in Figure 1, the annual foreclosure rate has risen to over 5 percent. Since in 2007, according to the American Housing Survey, there were an estimated 50 million mortgages held by households who occupy their own homes, and that number is unlikely to have fallen much by 2009, that implies over 2 million foreclosures. With total single-family home sales running less than 5 million annually in 2009, this suggests that the zillow.com rate of foreclosures is by no means implausibly high.

Why does the proportion of foreclosure sales matter? Because they could be reducing even further the appraised value of homes. In some areas, many of the house prices available for comparison in appraisals may be from foreclosure or otherwise distressed sales. Many of these houses are being sold at foreclosure auctions. This may cause some of them to be sold below their usual market price and may cause a downward drag on estimates of house prices.

While auctions are often a good way to sell objects, it is not clear that they fetch the best price in real estate, where information costs are high, and when obtaining finance is often difficult. Indeed, there is some evidence that an impatient seller does not get the best price.[17] According to a study by John Campbell, Stefano Giglio, and Parag Pathak, using data from Massachusetts, they find that foreclosed homes sell for nearly 30 percent less than they otherwise would. If foreclosure sales, on average, produce low prices, this may make it more difficult to ascertain what the true underlying value of homes is.

Uncertainty and foreclosure may now be causing house appraisals to be biased too low. Under current arrangements, low mortgage appraisals will tend to cause too few mortgage loans to be approved. This, in turn, lowers the demand for homes and may cause the price of homes to sink lower than they otherwise would.

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In addition to these distressed-market price distortions, the *volume* of sales affects the accuracy of appraisals. This is a network effect that generates economies of scale[18] — the more participants, the better — that can create a feedback loop: Fewer sales mean less accurate appraisals, thereby making lenders leery of lending, which further reduces sales. William Lang and I developed a model of home sales and appraisals back in 1993 in which a reduction in completed home-sale transactions can feed on itself.

A Possible Vicious Cycle. The reason for this particular feedback loop is that if the pace of home sales slows, the appraisal becomes less precise. This makes the mortgage riskier, making it more likely the lender will reject it. If the home mortgage application is rejected, the transaction may fall through and thus no sale will be made. This further reduces the precision with which the underlying value of houses in that neighborhood is known and possibly induces more mortgage rejections.

Our model identifies two somewhat separate issues. One is that *small* changes in, say, borrowers' risk, which

[16] Zillow.com is a website that seeks to aggregate information about home sales. This estimate is taken from Dan Levy, "U.S. Underwater Mortgages May Reach 30%, Zillow Says," Bloomberg News, August 11, 2009.

[17] See the article by David Genesove and Christopher Mayer.

[18] A classic economy of scale exists when a firm's per unit costs fall the more output increases. When this is true, the most efficient way to produce is to have a single firm produce for the entire market. Another kind of economy of scale is a network economy of scale: The more participants there are, the more valuable participation is.

may cause a given loan to be rejected, can lead to *large* and persistent changes in the market equilibrium. The feedback effect can cause mortgages to become much riskier and therefore make a real estate market face lower transactions and lower prices for a sustained period of time. The second issue is that these effects may be inefficient because they are caused by a market failure and therefore may call for some form of public intervention.

The problem is that one person's transaction provides information (about the local value of homes) that is useful to others' ability to complete their own transactions on nearby homes. In an ideal world, the buyers who come later would be able to compensate earlier buyers for providing this information. But there is no simple way for a potential buyer to compensate an earlier buyer. In turn, the number of transactions will typically be lower than would occur if some system of compensation were feasible.

This type of market failure is called an *externality*: An activity external to a given economic action affects the value of the action. Other, more familiar examples of externalities are air pollution (such as carbon emissions) and pollination by insects such as bees. When an externality occurs, existing markets may not be efficient, and it is possible that a government policy intervention could improve economic outcomes. For example, the Internet presents a network externality: The greater the number of people who use the Internet, the more valuable the Internet becomes. Government assistance helped establish the first Internet link-up, and we can argue that this was a good use of public funds because the first users of a network such as the Internet do not gain as much value as those who use it once there is widespread adoption.

But these externalities cut both ways. Growing networks add value to all users, but shrinking networks fall in value. When a given technology becomes less used, it may become less efficient for all users. Anyone who has recently rented a shopworn videocassette of a classic movie has experienced this effect.

Similarly, a mortgage loan may be denied because the lender thinks there is a chance the borrower may default on the loan. But if the loan is close to being acceptable, perhaps the lender would make the loan if the borrower paid a small amount extra. Now because future buyers and sellers (and lenders) would benefit from the sale going through (because it would shed light on the value of properties in that neighborhood), this information might be worth enough to warrant paying the additional amount the lender would require to make this loan. That is, society as a whole might be better off if the mortgage was accepted, although private incentives lead to the mortgage being rejected.

Quantitative Importance of Appraisal Information Externalities. Empirical papers, some gathered in two issues of the *Journal of Real Estate Finance and Economics*, have served to confirm a number of the points raised in this model. For example, Paul Calem showed that in white households, the mortgage denial rate rises as the number of home sales increases. It does appear that fewer transactions are associated with a higher rate of loan rejection. However, an interesting variation can occur.

The model we have been discussing supposes that borrowers and lenders are individual players in a large, competitive market, rather than dominant players, so that the price information provided by a transaction is not of much value to either party: It can be used by any lender or borrower. As a result, neither party has an incentive to go the extra mile to conclude the deal because of the information value alone. However, if one lender is a predominant lender in an area, the lender may take future potential transactions into account: In a neighborhood where deals are few, the lender may push through a mortgage for the sake of providing more information, knowing that by encouraging future transactions, the lender may be recompensed for making a slightly excessively risky loan. That is, the externality can be *internalized* by the lender.[19]

To the extent that this occurs, the externality may be mitigated by the marketplace, and public intervention may not be justified. However, monopoly lending will itself tend to be a problem: Ignoring the informational externality, monopolists tend to charge higher rates and make fewer loans than would competitive lenders.

A more recent paper by McKinley Blackburn and Todd Vermilyea presents a test of the relevance of these informational externalities on mortgage loan data primarily from 1998. To test for information externalities, they use a sample of over 2,000 mortgage loans that comes with detailed data about the borrowers. They confirm the existence of these informational externalities and estimate that 10 percent of the tracts in their sample are materially affected by the externality. This is in addition to the economies of scale by lender that Avery and co-authors found.

In essence, what Blackburn and Vermilyea do is show that the probability that a lender will turn down a particular mortgage application varies

[19] A paper by Robert Avery, Patricia Beeson, and Mark Sniderman argues that all of the externality was internal to the lender. However, this paper had the weakness of not having detailed information about the borrowers.

with the average number of home sales successfully completed in the census tract. Unlike previous studies, their study has detailed data about the mortgage applicant and the mortgage application, including detailed credit information about the applicant and the applicant's income, employment history, race, sex, and marital status. These effects on denials apply to census tracts with 20 or fewer home sales in the previous year, or about 10 percent of census tracts. In addition, more denials occur when the lender has fewer than eight sales in a given tract.

One reason that house prices might fall further than they otherwise would is that after a period of having appraisals that were biased upward, we have entered a period in which appraisals are being performed with less bias and which are now less precise. This may well have resulted in a substantial increase in the number of mortgage applications denied, applications that would have been accepted a few years earlier. This in turn may have made it harder for purchasers to buy houses, reducing effective demand and resulting in lower house prices.

APPRAISAL INACCURACY: CAN SOMETHING BE DONE?

Appraisals have become more inaccurate for three reasons: bias, fewer home sales, and foreclosures. Can the contract be rewritten so that there is more room for variation in the appraisal, so that the appraisal will typically be more informative? This is a matter for future research, but it is an urgent question.

Negotiations between Fannie Mae, Freddie Mac, and the New York attorney general's office have resulted in a "Home Value Protection Program and Cooperation Agreement," whose main aim is to prevent lenders from influencing appraisals.

The major impact of the new agreement is to ensure that appraisers are not chosen by parties whose only incentive is to make the loan and who have little regard for the loan's safety. Thus, mortgage brokers are excluded from choosing appraisers, and restrictions are placed on how the "in-house" appraisers used by mortgage lenders are chosen; in particular, the process must be independent of the loan production staff.

Appraisals have become more inaccurate for three reasons: bias, fewer home sales, and foreclosures.

This agreement will tend to ensure that appraisals are arrived at more objectively. However, it may have the side effect of making mortgage loans harder to obtain and may cause some sound home loans to be rejected.

Moreover, we have emphasized that if appraisals are unbiased estimates of a house's value, the house value — which is based on the lesser of the sale price and the appraisal value — is biased downward. So the downward bias will likely have a larger impact on causing sound mortgages to be rejected as appraisals become more objective.

How to reduce the incentives for an upwardly biased appraisal is a difficult problem that has not been solved. The fundamental problem is that a low appraisal can cause the mortgage to be rejected, and this may be due not to the intrinsic value of the house, but to the fact that the appraisal is an estimate, and is not exact.

One possible solution to this problem is to deliberately add a small, fixed amount, say, 3 percent, to the appraisal. This would provide a reasonable leeway for the possible error in the appraisal. Then the house value used in determining the loan-to-value ratio would be the sale price or the appraisal plus 3 percent, whichever was lower. In most cases, this would mean that the appraisal (plus 3 percent) was higher than the sale price, and the house value would be affected only when the appraisal was substantially below the sale price. This would largely eliminate the direct incentive for the appraisal to be biased upward and permit the appraiser to honestly value the house without excessively discouraging home mortgages. If appraisers become used to unbiased appraisals, this might also encourage more balanced appraisals of refinanced properties.[20] However, possible changes to the mortgage contract like this one need much careful study.

Here it would be helpful if more appraisal data were available. Although both the appraisal and the sale price are recorded as part of the mortgage data required by the lender, many real estate data sets do not separately include the appraisal and the sale price. Rather, what is recorded is the house value, almost always the sale price in a home-purchase mortgage and the appraisal in a refinance. This

[20] If the procedures used by the appraisers are the same for home-purchase mortgages as for refinancings, lower bias in the home-purchase mortgage may spill over into the refinanced mortgage. In either case, lenders and others can monitor the bias of appraisers using tools such as automated appraisal systems.

makes it difficult for most researchers to examine appraisal practices.

For those who have the data, Fannie Mae, Freddie Mac, and other processors of mortgage data have created proprietary loan valuation products, called automated valuation models, to estimate the underlying value of mortgages, that is, to create an automated second appraisal that can be used to further judge the value of a house. These statistical models do not provide as good an appraisal as the local appraiser on the ground could, but they are highly useful in helping lenders to gauge the risk in valuations and to detect appraisal bias.

It would be very helpful if the data sets that include appraisals — such as those of Fannie Mae and Freddie Mac and the other mortgage-lending government entities such as the Federal Housing Administration and the Veterans Administration — were made broadly available to researchers, analysts, lenders, and appraisers, subject to standard privacy protections. These data sets could, for example, be used to verify that appraisers have in fact reformed their procedures and are generally providing unbiased appraisals.

If we do not act to improve the appraisal system, we may end up with the worst of both worlds.

Note, however, that basing appraisals on sales of foreclosed homes is likely to cause a further downward bias. On the other hand, appraisers may not be able to find enough sales of nonforeclosed homes to provide a good estimate of normal home sales. To the extent that more data can be made easily and quickly accessible, some of these problems may be overcome.

The current appraisal process may make it more difficult for sound borrowers to conclude home purchases. If so, that could be limiting the demand for existing homes, which could result in house values falling further. And that could worsen financial losses and delay a return to normalcy in home real estate markets.

If we do not act to improve the appraisal system, we may end up with the worst of both worlds. That is, we may experience a period of objective appraisals that cause more mortgages to fail, but as the current crisis fades from memory, end up back in a situation in which all parties desire biased appraisals. And that might well mean that biased appraisals could eventually reappear and help reflate another housing bubble.

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