JOHN GEANAKOPLOS: Managing the Leverage Cycle

Thank you very much for the introduction and the invitation to speak here in Washington. I have called my talk '*Managing the leverage cycle*'. I wrote about the leverage cycle 10 years ago, before the current crisis. It is *leverage* which, I think, was at the heart of the crisis. This is my narrative, even though I realize there were other problems.

It is traditional in economics to think of the interest rate as the most important variable in the economy and to think of the interest rate as the most important policy tool to manage when you try to solve economic problems. In the United States, the Fed has a mandate to manage interest rates *and* also to manage margins and collateral, but since a few years after the Great Depression, the Fed has concentrated almost entirely on managing the interest rate. Whenever there is a problem, at least in the United States, and output is sluggish, the press and the public clamor for lower interest rates and the Fed usually delivers them. When there is too much inflation, everybody says: raise the interest rate. And that is what the Fed does. In this latest crisis the Fed has already lowered the interest rate to zero. It cannot do more on this score, and the crisis is not over. I don't think the interest rate was actually the key problem in any case. Much more important, I think, is the collateral rate or leverage. The Fed has paid more attention to collateral than any Federal Reserve since the Depression, but that does not mean it has paid enough attention.

This idea that collateral rates might be more important than interest rates is not entirely original. As you know, Shakespeare had the same thought, four hundred years ago, in the Merchant of Venice. If you remember, in that play, there was a negotiation over a loan. Shylock, the money lender, is asked for a loan by Bassanio and Antonio. Bassanio needs the money to woo the beautiful (and rich) Portia and he enlists the aid of his friend Antonio and they go to Shylock and ask for a loan. They spend five pages in the play, at least in my little copy of it, negotiating the interest rate in a fascinating discussion in which Shakespeare anticipates the modern impatience theory of interest. Shylock says: Like all my tribe, I am a patient man; Antonio says: I need the money to satisfy the ripe wants of my friend. So they are arguing about what interest rate to put in the contract, and that seems to be the main focus of the negotiation. But they also agree on the collateral. And now, which do we think Shakespeare thought was the more important? That is pretty obvious: Shakespeare thought the collateral was the more important, because nobody can remember the interest rate. Who here remembers the interest rate that Shylock charged Antonio and Bassanio? Yet, all of you, I am sure, you can all tell me what the collateral was: a pound of flesh. So Shakespeare realized the collateral was more important than the interest rate and not only that. If you remember how the play ends, the play ends with a trial and Portia disguises herself as the Judge. The Judge has to decide what to do. All of Antonio's boats have apparently sunk, and he cannot repay the 3000 ducats he owes Shylock. The Judge says that enforcing contracts is crucial to business, the lifeblood of Venice. She acknowledges that the entire contract was freely entered into by both parties. Nevertheless, she says it is for the benefit of the city that she must intervene. The Judge does not adjust the amount owed, the three thousand ducats, nor does she change the interest rate. The Judge, the Regulatory Body, just like the Federal Reserve you might say, adjusts the collateral: she says it should be a pound of flesh, but not a drop of blood! And that is my message in this talk, that the Regulatory Authority should not be changing the interest rate, it should be regulating collateral rates.

Let me start by reminding you that collateral is something like a house that you put up to guarantee a loan. If you don't pay back the money, the bank can seize your house, or whatever else you put up as collateral. Now, if you have a hundred-dollar house and you borrow eighty dollars, the lender has got a margin of

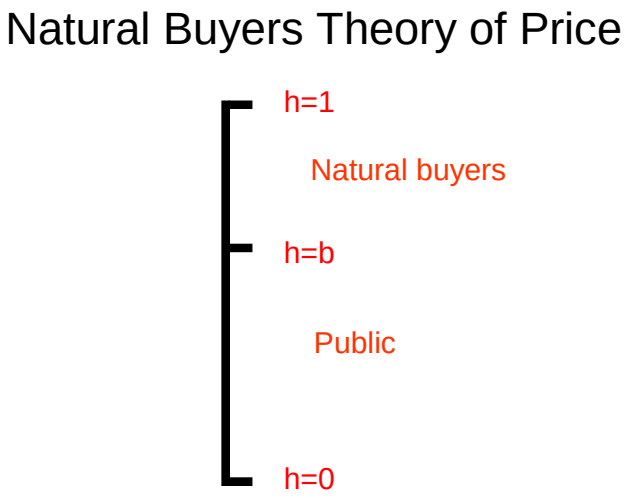
safety of 20%, so we say the margin that the bank has charged you is 20%, which is also the down-payment percentage. The loan-to-value ratio is 80%, that eighty-dollar loan is eighty dollars out of a hundred-dollar collateral. The collateral rate is 125%, because a hundred-dollar house protects an eighty-dollar loan, that is 125%. Another way of saying the exact same thing is that leverage is 5: with twenty dollars of cash for a down payment you can buy a hundred-dollar asset, that is your cash gets leveraged five times, so you can buy something five-times as valuable as how much money you have. All those *ratios*, of course, mean the same thing. The difference between my work on collateral and Bernanke's is that I emphasized that collateral rates (or equivalently leverage) can change, and change quite dramatically. I am going to use the word leverage from now on, to describe the second component to the deal: there is the interest rate and then there is the collateral rate or the leverage. Once we acknowledge that leverage can change, we need to know why. What determines leverage?

In standard economic theory they have talked, since Irving Fisher, about supply and demand determining the interest rate. Irving Fisher suggested that impatience was the key driver of supply and demand for loans, and therefore the key determinant of the interest rate. Well, I want supply and demand to determine leverage as well as the interest rate. That seems paradoxical, because how can one equation, supply equals demand, determine two variables: the interest rate and the leverage? Probably because of this puzzle, economists did not study the determinants of leverage very much. If you look at any standard text book in finance or in macroeconomics, they never mention equilibrium collateral rates. They rarely even use the word leverage. My theory is about how supply and demand determine both interest and leverage. Common sense, everybody knows, practitioners know, I mean, Shakespeare understood it, interest has to do with impatience, leverage or collateral has to do with how nervous the lender is about whether he is going to be repaid. If the markets are more volatile, the lender will ask for more collateral, if the markets are less volatile, the lender is going to ask for less collateral. It is a perfectly common-sense thing and the question is just how to work the common sense into the equations of supply and demand. Unfortunately, I don't have time to talk about my equilibrium leverage theory, even though I have some slides for the end, I doubt I will ever get there, but in any case, the gist of it is that supply equals demand equations do indeed determine interest rates *and* collateral rates.

Practitioners, if not economists, have long recognized the importance of collateral and leverage. For a Wall Street trader, leverage is important for two reasons. The first is that if he is leveraged 5 times, then a 1% change in the value of the collateral means a 5% change in the value of his capital. (If the house in our example goes from $100 to $101, then after selling the house at $101 and repaying the $80 loan, the investor is left with $21 of cash on his $20 investment, a 5% return.) Leverage thus makes returns riskier, either for better or for good. Second, a borrower knows that if there is no-recourse collateral, so that he can walk away from his loan after giving up the collateral without further penalty, then his downside is limited. The most the borrower can lose on the house loan is his $20 of cash, even if the house falls in value all the way to $0 and the lender loses $80. No-recourse collateral thus gives the borrower a put option. Recently several commentators have linked leverage to the crisis, arguing that if banks were not so leveraged in their borrowing they would not have lost so much money when prices went down, and that if homeowners were not so leveraged, they would not be so far underwater now and so tempted to exercise their put option by walking away from their houses. Of course these two points are central to my own leverage cycle theory; I shall discuss them in more detail later. But there is another deeper point to my theory that has so far not received as much attention, which I think is the real story of leverage.

The main implication of my leverage cycle theory is that when leverage goes up prices go up and when leverage goes down, prices go down. Now, why should there be this asymmetry? Why does more leverage

make prices go up instead of go down? Imagine the people in the economy arranged on a vertical continuum, ranked by how much they would pay for say a mortgage security asset. Some people like the asset more than others; these are the people at the top of this continuum. Most of the general public has no desire to buy any of these complicated mortgage securities; they are at the bottom of the continuum. This continuum picture stands in contrast to the usual story in financial economics, where everybody would have the same view of the "fundamental" value, if they had the same information. I don't believe in fundamental value; I think different people may have different views about the value of an asset. So the people at the top think the asset is worth more than the people at the bottom, even with the same information. Now, how many people does it take to buy the asset? Given a price, the buyers will be the people who think the asset is worth more, namely the top segment of the continuum. You can imagine the continuum divided into two segments; the top segment contains all the buyers, and the bottom segment contains all the sellers who think the asset is overpriced. The guy right on the margin between the two segments I call the marginal buyer. He is indifferent to buying or selling. In other words, the price corresponds to his valuation of the asset. Now, as leverage goes up and the people at the top are able to borrow more money, *it takes fewer of them to buy the assets*, so the marginal buyer, the cut-off between buyer and seller, will become higher. So, the price will rise: why is that? Because the marginal buyer, the person indifferent between buying and selling, he is the one setting the price and it will now be someone with a higher opinion of the value of the asset. So, when the person on the boundary between buying and selling is more optimistic, the price is going to be higher, because the price reflects his opinion, instead of this lower guy's opinion. Everything else might be the same in the economy, the same fundamentals in the economy, but if there is more leverage, the marginal buyer will be a more optimistic person and the price will rise. That is completely contrary to the standard view that price is always equal to fundamental value.



14

So, what is the reason for the valuation difference between people? Why are there differences in attitude? Well, one is risk tolerance: many people just can absorb risk more easily than others; they are willing to pay more because they are not as scared of the asset. Some people are more risk tolerant because they know how to hedge. Some people, I will skip a couple of other reasons listed on my slides, some get higher utility for holding the asset,

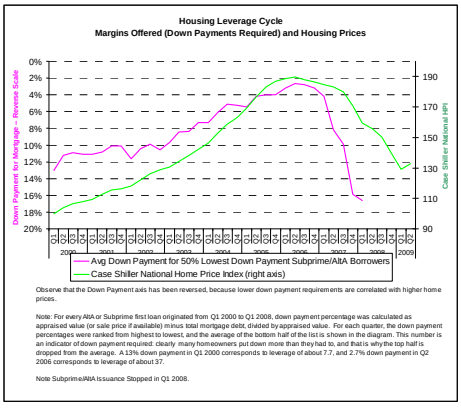
for example living in a house. A New York banker lending the money would not get the same utility from living in a house as the buyer does. Some people know how to use the asset more profitably than others; a farmer in the Midwest might know how to get more out of his farm than the banker lending him the money. Finally, and most simply, it may be that some people are just more optimistic about the future value of the asset than others. So, all these different reasons contribute to the heterogeneity between people and their outlooks on the value of assets today. So, as I said, in the standard theory the asset price is equal to the fundamental value but that theory explicitly ignores heterogeneity, it assumes that once people have the same information, they are all going to think the same thing about the value of the asset. In my "natural buyers" theory of valuation, there is an irreducible difference in the views of different people.

Getting back to the leverage cycle, the leverage cycle simply asserts that there is too much leverage in normal times and therefore too-high asset prices and there is too little leverage in crisis time and therefore too-low asset prices. The cycle recurs over and over again. Leverage, and not fundamentals alone, partly determines asset prices. As leverage goes up and down, asset prices go up and down and that is damaging to the economy.

Let me just give you a taste of how dramatically leverage has changed. Consider the so-called toxic mortgage securities, some of which are triple-A and some of which are not triple-A. You know this is a technical word, 'toxic mortgage securities', it is the technical word that Summers and everyone else is using to describe assets the banks were holding whose prices are now in doubt. A bank in 2006, at the height of leverage, if they wanted to buy such a AAA mortgage security, could pay 1.6% in cash and borrow the other 98.4%. That is 60 times leverage. I went through the toxic mortgage securities security by security and found out how much money would have been needed to purchase of all these in 2006. The assets altogether were worth $2.5 trillion in 2006, and on average the leverage was 16 to 1. That means $150 billion of cash was needed to buy $2.5 trillion dollars of assets, the other $2.35 trillion was borrowed. In 2006 there were two people, Bill Gates and Warren Buffett, who between them, had 150 billion dollars. So, two people could have bought all of the mortgage toxic assets in the entire country in 2006! You see it would have been possible to cut the continuum not in half, not here in our picture, but way up here, with just two people buying. Fortunately Bill Gates and Warren Buffett were not the most optimistic people, but with that kind of leverage available this dividing point was very high and the price represented the opinion of a very optimistic marginal buyer. By the end of 2008 leverage collapsed in many sectors, especially in the toxic mortgage security sectors and went down from 16 to 1, to 1.2 to 1. The marginal buyer was much less optimistic, and the prices collapsed as well.

The same thing happened with borrowing on homes. I am going to show you a graph of how high leverage got, you could put 3% down in 2006 to buy a home, now you have to put 25% or 30% down, unless you get a Government loan. The Government is basically the only mortgage lender, and is probably overleveraging. I am going to come back to what the Government is doing in the United States now with home lending. But I want to show you a graph here to illustrate this. The green line is the famous Case-Shiller Housing Price Index, so here you see that in January 2000 it is normalized to be 100. Bob Shiller, my colleague at Yale, is famous, as you know, for his irrational exuberance theory. He said: look, housing prices were stable for a long time, then suddenly they went up from 2000 to 2006 because of a crazy irrational exuberance to 190, they went up 90%. Then people got worried, the narrative changed, they got upset, people started telling bad stories and everybody was telling each other bad stories and the housing prices collapsed to 130 in 2009 and now they are going up a tiny bit again. So, that is Shiller's famous graph, containing data he collected. His explanation is also famous, that it is all irrational exuberance, people's animal spirits. I am

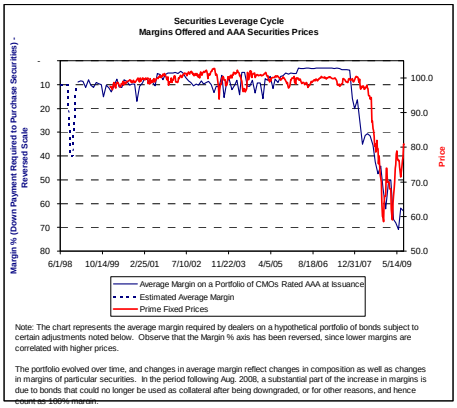
offering a different explanation, based on leverage. I looked loan by loan for all the non-government mortgage loans in America (you can get loan-by-loan data for non-government loans but not for government loans) and I checked what the leverage was. I measured this by the loan-to value (LTV), or equivalently the down-payment. You see on the vertical axis this is 100% LTV or equivalently, 0% down-payment, then 98% LTV or 2% down-payment, then 97% LTV or 3% down-payment and so on. Every month I looked at what the down-payment was on each new house mortgage. In this graph I took the average down-payment for the 50% of people who had the lowest down-payment. I chose this half because it is a conservative estimate of how low a down-payment you easily could have got if you wanted to. The other half of the people chose to make higher down-payments, not because they had to but because they were more conservative. But the aggressive half of the people were able to get these loans and actually chose them, so the down-payments depicted in this graph really were offered and a lot of people really took them. In 2000 the graph shows they put down 14% to buy a house, on average. As the years went by the down-payment went to 6% and to 4%, then to 3%. By 2006 people were putting down less than 3% to buy a house. After the first quarter of 2006 you can see that leverage suddenly changed direction and went down, that is, you had to put much higher down-payments. Leverage collapsed, and down-payments went very quickly to 25% and 30% in 2007 and 2008. At that point the private non-government loan market disappeared. Notice that the down-payment graph (written as loan to value so low down-payment means high loan to value) displays exactly the same shape as the price graph. Loan to value reaches its peak of just over 97% (just less than 3% down-payment) in exactly the same quarter of 2006 as housing prices reaches its peak. And then LTV plummets and housing prices follow it down. So my theory is that yes, irrational exuberance, optimism, animal spirits, maybe that was an important factor, I don't doubt it, but another very important factor was leverage. Leverage went up, prices went up. Leverage went down, prices went down. Ok? And the interest rate was not really changing so drastically all this time, so during this time leverage was a more important determinant of asset prices than the interest rate. That is basically my theory.



21

Let me show you another graph, the same kind of graph, but for mortgage securities, the assets Wall Street investors trade. For these assets, down-payment histories are much harder to get, because the investment

banks that offer the loans keep the numbers private. And the Federal Reserve has not bothered to keep track of them! But let us proceed in the same way we did for housing. First we begin with prices. The red line is the history of an index of bond prices on AAA prime mortgage securities floaters, compiled by JP Morgan. The mortgages underlying these securities are taken by people with perfect credit ratings, stable jobs, you could not ask for better quality people. They tend to be richer than the average, because this is not the Government Freddie Mac loans, these are mostly Jumbo loans, so they are taken by people who get big houses. These people have nearly perfect credit ratings and if you look at the price history for these bonds starting in 1999-2000, that is from the date the index begins, you see basically nothing but 100. The value, the red, is 100, it just stays around a hundred; since they are floaters the price moves only a tiny bit because of the interest rate, and basically it stays around a hundred from 1999-2007. Then in 2007, the middle of 2007, the price index starts to collapse, going down to 60 in late 2008 and then it goes back up to 80 toward the end of 2009. The crash of these prices in 2007-2009 is a symptom of the crisis. Banks and other financial institutions were losing money on bonds just like these when their prices fell from 100 to 60. These same investors made a lot of money in 2009 when the prices went back up from 60 to 80. What explains this amazing change in prices? Shiller might well say that in 2007 panic set in, people thought the financial system was imploding and they sold off the bonds. He might say that as confidence came back in 2009, prices rose again: another tale of irrational exuberance. Now, he might also argue that rationality could not possibly explain these price moves. A price of 60 means basically that a rational buyer is forecasting 40% losses on the underlying mortgages. A 40% loss could happen if 80% of the homeowners got thrown out of their homes for not paying, and then the lenders only recouped 50% of the loan value selling the house. For such high quality homeowners such numbers seem absurd. For one thing, it would mean the whole country was on the verge of collapse. The losses so far for these bonds are round 3%, 4%, you know, or 6%, something like that, so that would explain a price drop from 100 to 94. The price went from 100 to 60 and then back to 80! I have a different explanation for these price changes, different from irrational exuberance, based on leverage. The blue line represents the margin that you had to put down to buy AAA securities, or equivalently the loan to value, all the way back to 1998. How did I get these data? I should say that I got these data because I helped start a mortgage hedge fund, called Ellington Capital Management, which I should reveal, in case you think that experience has biased me in any way, I helped start a mortgage hedge fund, and the blue line is the record Ellington kept of the margins that banks were offering us. The Federal Reserve should be keeping data like this, but they don't have it. They asked me for these data a year or two ago. I am going to come back to the Fed and data in a little while. But anyway, the record shows that in early 1998 Ellington had to put down 10% to buy a AAA security, and then suddenly the down-payment shot up to 40% in late 1998. This was the last leverage cycle crisis in the US. In that 1998 crisis the famous hedge fund Long-Term Capital, started by two Nobel Prize winners in finance, went out of business. I do not have price data back that far, but obviously prices collapsed during the crisis: that is why Long Term went out of business. Just a few months later the margins went back down to 10%: the leverage cycle crisis of 1998 lasted only a few months. By 2006 the margins had fallen to 5%, so in 2006 you could be 20 to 1 leveraged. Then in 2007 the leverage collapsed. You can see in the graph that margins rose from 5% to 70% in 2008. Then leverage started to come back. You see the amazing thing is that once again leverage and prices go together. As leverage plummeted in 2007-8 from 20 to 1 to 1.5 to 1, prices collapsed. The optimistic buyers at the top of the continuum could no longer hold all the securities; the marginal buyer became some investor who did not really want them, or did not really know much about them, and so he was willing to pay much less. When leverage started back up in 2009, prices went back up. That is the essence of my theory.



20

The same three things happen in every crash, including the crisis of 2007-2009. First, there is bad news. But there is often bad news without a crash, so I am talking here about a peculiar kind of bad news: it is bad news that creates more uncertainty, or "scary" bad news. All news reduces uncertainty on average. That is why it is news, you learn something from it. But some kinds of bad news actually can increase uncertainty and increase volatility. For example, suppose you are waiting at the gate to take an airplane. You know there is a small chance the plane will be late. If a minute goes by and nothing happens you are a little surer the plane will be on time. That is what usually happens. Sometimes an announcement is made that the plane will be delayed by 10 minutes; this creates much more uncertainty, because now you think there is a pretty good chance the delay could be much longer. When a bank suddenly announces a $5 billion loss, investors immediately wonder whether the losses will be much bigger. That is the kind of news that makes lenders nervous. And it is exactly what happened in our crisis, especially with subprime loans. People used to think that losses on subprime loans would be on average 4% and somewhere between 2% and 6%. All of a sudden people thought: it might be 30%, that is bad news. But it is not just that they thought it could be 30%, they were not sure, maybe it could be 80%,that is the scary part: they were uncertain about how bad the next piece of news was going to be and that is when they started tightening all their lending. Once there is bad news that causes more volatility, the lenders ask for more collateral and leverage plummets. That is the second event of a crisis. The bad news naturally lowers prices, causing the owners (many of whom are leveraged) to lose huge amounts of money. Since it is the optimists who lose the money, the top of the continuum of people I mentioned earlier gets wiped out. That is the third symptom of a crisis. So after the scary bad news many optimists are wiped out and the remaining optimists cannot borrow as much. So the marginal buyer is far lower down the continuum. These three disasters (scary bad news, tighter leverage, and losses for the optimists) then feed back on each other. Tighter leverage and collateral requirements force more optimistic leveraged owners to sell, further depressing prices and causing further losses for them, which in turn alarms lenders more who tighten collateral requirements again, and so on. Eventually many borrowers/buyers go bankrupt or else they go insolvent or underwater, like homeowners and banks today. They are still alive, but who knows whether they will survive and pay eventually, or just walk away? That creates more uncertainty, which leads for further feedbacks on lending and so on. Eventually things settle down and the prices stabilize at lower levels. The worst seems to be over. Lenders

become less nervous and leverage creeps back up. It is a big opportunity for the optimists who survived the crisis. So, that is my basic theory of the leverage cycle. It seems to describe the crisis we are going through right now quite accurately. And I wrote it 10 years ago!

Anyway, this kind of cycle of leverage going up, leverage going down, prices going up, prices going down, happens over and over again. I myself have lived through three of these crises, in 1994, 1998 and this recent crisis, which I should say probably is going to go on to 2010, so the crisis of 2007- 2010.

What is so bad about the leverage cycle? So what if prices go up and down, and some optimists get wiped out? Of course every leverage cycle has its particulars, but there are definitely some generic problems. The first is that when leverage gets very high, very few people who are the most optimistic, they can buy all the assets, they are setting the price. Why should the very craziest, possibly, part of the population, be determining the price of our most important asset? If they could not borrow as much, the marginal buyer would be lower and the price would be set by a more middle-of-the-road person. Second, high prices lead to more construction: for example, once housing prices go high, of course people are going to construct more, you get a lot of projects happening that would not have happened otherwise. Similarly when prices fall in the crisis stage, construction and new activity more generally grinds to a halt. Even if we thought the same total construction would occur over the cycle if prices stayed stable, we might worry that the mix of projects is less good over a more volatile cycle. Third, and much more importantly, the people doing the construction at different stages of the cycle are likely to be different. When the markets collapse and the prices fall down many activities stop: in the recent crisis for a time people could not get new credit cards, because the prices of credit card loans fell so low, no one would let you get a new credit card. Many people could not borrow money to get a car, because the price of car loans fell so far. So, the general public that does not participate in the leverage cycle suffers. We have to protect the general public from the low stage of the leverage cycle. Smoothing the leverage cycle would provide a kind of insurance to the general public that they cannot buy on the market. A fourth problem with the leverage cycle is that if the news continues to be good, the people borrowing a lot, the optimists are making a huge amount of money, because they are leveraging. That is what leveraging means: to make a lot of money when things go well. Inequality is a big mystery in America: why did inequality rise so much? The pundits cannot really explain it. I think the leverage cycle has a lot to do with it: people who were leveraging and seeing their fortune rise just because news was good and they were so leveraged, of course they got rich. Growing inequality is another problem of the leverage cycle. A fifth problem with the cycle is that the optimists, the ones who drive the economy, the ones who are doing all the buying and the borrowing, when they fail and go out of business, we are now lacking and missing a very important part of our economy or if they are still there, but they are under water, a very important part of our economy is not functioning correctly. So, that is the debt overhanging problem. When these people are under water, they don't behave the same way they do when they are sound. Banks that are near insolvency hunker down and stop making loans, even if they are good investments. Homeowners who are under water do not make repairs to their houses, even if they would raise the value of the house more than the cost of the repair, because they fear they will eventually lose the house anyway to foreclosure. A sixth problem is that when the down cycle comes and people and institutions default, confiscating the collateral is a very expensive operation. In the United States, when a subprime loan is made and the homeowner defaults, it takes eighteen months to throw him out of the house. During those eighteen months he does not make his monthly loan payments, of course, he does not pay his taxes, he does not fix the house and you know, a few months before the end he usually leaves the house and then the house gets vandalized and trashed, you know, all the coppers ripped out, it is a ruined house and on average now, these homes are being sold for a quarter of the price of the loan: 25% is what

you get out: a terrible waste. And each time a homeowner is thrown out of his house, the houses nearby fall in value, and then it is more likely their owners will walk away from their loans and the waste and destruction spreads.

Now, why was the crisis worse this time than any previous time, maybe all the way back to the Great Depression? The most important reason is that leverage got higher than ever before, then fell faster than ever before. I don't have time to explain the forces that made leverage get so high. One is that we were in a long tranquil period; the period called the great moderation, with very low volatility. Another force is the securitization boom. Securitization is a remarkable mechanism for spreading risk and making lenders feel safer so they will lend more money. A second important reason for the severity of this leverage cycle is that it spread to housing and it infected all the banks. Never in our history were so many homeowners allowed to put so little money down. More people and more banks are under water than at any time since the Depression: they owe more money than the value of their operations. When you take somebody who owes more money than his house is worth, he is not going to fix the house, he is not going to take care of it, he is not even going to try to sell it, there is no point in selling it, he is not going to tell his children it is going to be theirs. Eventually he is going to trash the house when he has to leave it and there are going to be huge losses. But what is true for the home owners is also true for the banks: they are behaving horribly. Why are they behaving horribly? Partly because they are too scared to lend, partly because they know that they are underwater. The Government has not revealed how far underwater they are, but they know that they are underwater and they just want to disguise that from the public. The banks are just hanging on, waiting till they get more and more money from Government subsidies, until they are out from being underwater, and during that time they are just not lending. When important entities go underwater, they don't behave efficiently and when they don't behave efficiently, lots of bad things happen. That is the main thing that is going on now in the country. A third reason this leverage cycle got so bad I already alluded to: the double leverage cycle. Housing got much more leveraged, people could put almost nothing down to buy a house, but then, when the housing loans were securitized and packaged together into securities, the buyers' of those could also leverage tremendously, 60 to 1 or 16 to 1, as I said. The housing leverage cycle and the mortgage security leverage cycle interact with each other, there is a feedback between the two. If you can leverage securities very easily, security prices will be high. That means mortgages will sell for a higher price, because they can be packaged into valuable securities. Homeowners effectively will be able to borrow more money on the same house, i.e. houses will be leveraged more. Housing prices will go up. Since the houses back the mortgages which back the securities, lenders who take securities as collateral will feel safer and allow for more leverage on securities. Thus higher leverage on securities makes for higher leverage on mortgages which leads to higher leverage on securities. There is a feedback. Of course it works in the reverse direction too. When leverage starts to go down in securities it will go down in housing, which will make housing prices fall and increase defaults and lead back to lower leverage on securities.

There is a fourth reason this leverage cycle has been so violent, which also gives an explanation for a so-far unresolved puzzle: what caused this cycle to go bad precisely when it did? Why did housing prices start to go down in 2006? Why did leverage start to go down here? I believe the turning point was the standardization of the credit default swap or CDS at the end of 2005. (The CDS, I think, was mentioned in the last session.) CDS contracts are insurance on various bonds; they have been around since the 1990s for corporate bonds, but did not become standardized in mortgages until late 2005. Their creation gave pessimists the ability to leverage for the first time in the mortgage market. I said at the beginning of my talk that when leverage increased, the pessimists at the bottom of the continuum could do nothing but

watch from the sidelines, because it was difficult to sell short. With the CDS market, a pessimist could buy insurance, effectively betting on the asset going down in value (when he would collect his insurance payment). Moreover, because there were no limits to the amount of insurance, pessimists could buy much more insurance on the bonds than the bonds were worth themselves, effectively leveraging his negative position. Just like a few optimists could by themselves prop prices up by using leverage, so a few pessimists could push the market down by buying lots of CDS insurance. That is the reason why the securities prices started to fall, and as lenders realized securities prices might fall, they realized that there was going to be more danger and so they asked for more collateral and that forced the prices to fall much further and so started the negative feedback to housing prices and back that I described in the last paragraph. People say, so what was the big shock that started the crisis, and in particular, started the decline in housing prices in 2006? I think the answer is first, the market simply ran out of new people to lure into homes by offering such low down-payment mortgages. That stopped the increase in prices. And second, the market engineered its own negative shock by creating the CDS, which started the prices down. Had the CDS been actively traded from the beginning, prices might never have got so high. But CDS only got going at the very peak of the cycle, when prices were very high. So there was a long way for prices to go down to get to the level they might have been had there been CDS from the beginning.

The CDS market by itself is a topic of great relevance to my theme of leverage. By buying say $5 of insurance on $1 of a bond, the pessimists could effectively leverage their negative bet. A 1% drop in the value of the bond (say because the market perceived a 1% increase in the chance of default) would increase the pessimists insurance position by 5 cents. The writers of the insurance tended to be the big banks and AAA companies, like AIG, and many buyers of insurance did not insist that these writers put up collateral. This effectively allowed optimists to lever more as well, partly reducing the negative impact of CDS on price, but creating more losses when the losses came. I do not have the time to get into this in detail, but there is also an interesting connection between CDS and the CDO market. Since the people writing the CDS insurance were taking a similar position to owning mortgages, CDS were used in the CDO market to create synthetic mortgages. This is another way to see why the introduction of CDS lowered mortgage prices: they were tantamount to increasing the supply of mortgages. CDOs represent the securitization of BBB mortgages. As with any securitization, they allowed optimistic investors in BBB mortgages to leverage more, and so tended at first to raise the prices of BBB mortgages: as long as the BBB mortgages were real mortgages that could be leveraged more, fewer optimistic buyers were needed to hold them. But over time more and more of the BBB mortgages in the CDOs were synthetically created out of CDS. To the extent that the CDO BBB mortgages were synthetic, they in effect created more supply of mortgages and thus started to depress the prices of mortgages.

What should we do about the leverage cycle? I am finally coming to the punch line. The first thing to do is to monitor it. You cannot solve a problem until you can recognize and measure it. The Government, the Fed, should be collecting the kind of leverage data that I have shown you in those two charts. It is astonishing to me that the Fed did not have these data and it is astonishing that to the best of my knowledge, they are still not collecting such data. They should be going to every big bank and saying: what are the margins you are giving on your loans? They should go to all these big banks that lend in the US, whether they are American banks, or foreign banks like Crédit Suisse, and force them to report the leverage they are permitting borrowers to take on all their loans. That especially includes the Repo market. Had they been doing this ten years ago, the Fed would have seen in that graph that leverage, you know, suddenly went up from 10 to 1 to 20 to 1 and they would have known that something had happened in the economy, they would have known that they had to worry about it. The Fed didn't even have the data in the

chart I showed you about leverage in housing, which is a very easy thing to get, the Fed was not monitoring even that. I never saw a picture like that in any newspaper or Fed publication. The Fed should be collecting this data and making it public, so everybody knows what leverage is in the economy. The Fed should monitor all CDS contracts, and the margins they require. Putting CDS on an exchange would make this much simpoler. The Fed should also be monitoring the leverage at all the big investment firms, including hedge funds. Summary figures of security leverage numbers (LTV by security type) and investor leverage numbers (what is the average leverage across securities at hedge funds) should be published monthly. Publishing leverage numbers would focus the public's attention on leverage and keep the pressure on the Fed to act. Next the Fed should officially commit to managing economy wide leverage. In normal times leverage will get too high; that is the dynamic. Leverage has to be regulated and held down. People usually ask me, how will the Fed know when leverage is too high? I answer by asking how does the Fed know when interest rates are too low? Typically the Fed monitors the interest rate and monitors prices. If interest rates are falling and inflation is rapidly rising, the Fed knows it is time to step in. The Fed could act on leverage the same way. If margins on some asset like housing were rapidly falling, while the price of housing was rapidly rising, the Fed would be alerted to act. Of course it will take time to iron out the optimal intervention. But we have to start somewhere.

There are four reasons why monitoring and regulating securities leverage is more important than monitoring investor leverage at a few selected firms (like at the big banks). The first is that many other firms leverage, and if these were not monitored, then economy-wide leverage might be underestimated. In particular, if leverage is regulated at big banks but not elsewhere, leverage will move out of the banking sector and into the unmonitored sector. Second, investor leverage often moves in a misleading direction. Just as a crisis approaches, and security leverage is dropping like a stone, many investors' equity will be falling, and so their debt/equity ratios will be rising, giving the wrong impression that leverage is on the way up. Third, securities leverage is harder to lie about. For every loan there is a borrower and a lender, so the government would be getting all the reported numbers checked with the counterparty. Fourth and finally, it seems to me that it is harder to exert political pressure on a regulator to fudge or ignore security leverage than it is to pressure him into allowing a firm to increase its investor leverage.

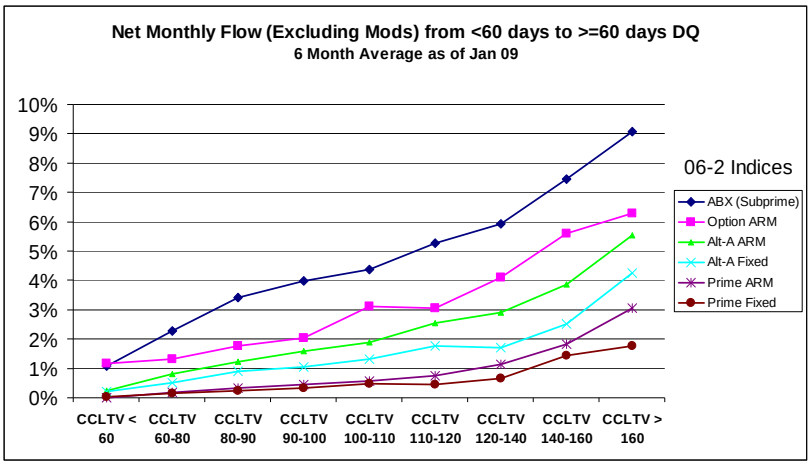
What about in the crisis? How do you get out of a crisis, like the one we are in now? My answer is that you have to reverse the problems that always arise in the crises. The first is that all these players are underwater, well, the first is the uncertainty, remember? I said there was scary bad news that created uncertainty. So you have to contain the uncertainty. And how do you contain the uncertainty? Well, it started in the mortgage market with foreclosures, not knowing whether the losses would be 80% or 30% or 10%. You have to somehow get the housing market under control and the way to do that, as I will say in the next slide, is to write down principal. A related part of the uncertainty is the banking sector, resolving which of those will fail. Secondly, leverage is collapsing, so the Fed and the Government have to step in and go around the banks, who are refusing to lend, and lend directly. Not at a lower interest rate, that is irrelevant. The Fed should lend at the same interest rate, but with less collateral. Thirdly, the most optimistic buyers have been wiped out, so the Treasury must step in and replace some of this buying power. The problem here is that many of the securities are very complex and opaque. The government is in no position to figure out which securities to buy, and at what price. So they must partner with private buyers, or buy generic securities.

So what have the Fed and Treasury done to get us out of the crisis? They bailed out a number of failing banks. They also seem to have slowly moved toward embracing the principles enunciated here. But they have not implemented the plan in exactly the way I would have recommended. Let me concentrate on aspects 1 and 2, the writing down of principal and the re-leveraging of the economy, starting with leverage.

The Fed recognized that the collapse in leverage in late 2008 had shut down many markets, and it moved to restore leverage in several targeted areas through a program called TALF. It said: it has become impossible to get a new credit card, so the Fed is going to the securitized credit-card market and lending to buyers at leverage of 20 to 1. You may not realize, but the Federal Reserve today is lending at 20-to-1 leverage on securitized credit cards, 20-to-1 leverage on new auto loans, 20-to-1 leverage on a bunch of different things, so the Fed has picked out a few little markets and leveraged them 20-to-1. The housing authority in America, FHA is now lending with 3% down-payments again. They are leveraging home owners for certain classes of people, letting them buy with only 3% down, so they have recognized that they have to re-leverage but in my opinion they are doing it in exactly the wrong way, by leveraging at almost the same dangerous ratio we had before in a few little places. What they should have done instead is leverage many more securities, but not at 20-to-1, but rather something like 2-to-1. They should, say, on these mortgage securities that people used to be able to put, you know, 1.6% down, the Fed should lend with 50% down, instead of 1.6% down, that would be a safe way of lending that would restore leverage to a rational level and it would not astronomically leverage in a few small sectors. And it would actually help those small sectors more than they are being helped by the excessive leverage the Fed is doing in those small sectors. Let me explain why. There is a very important point here, I think, that the famous American economist James Tobin called Q, by which he meant the ratio of old asset prices to new construction cost. It is hard to securitize new mortgages today; private lenders are not eager to give anyone a new mortgage. Why is that? Because you can buy an old mortgage promise of $100 from a very good borrower for $65 or $80: remember I said the prices went down to $60? Ok, now it is $80. Why should you lend (i.e. pay) $100 to a new borrower when you can pay just $80 to buy someone else's promise to repay $100 from three years ago who is just as good a borrower? The Fed reasons that if you let the buyer of the new promise leverage 20-to-1, so that he only needs to put $5 down in cash, then he might be willing to buy the new promise at a price of $100 instead of putting down all $80 in cash to buy the old promise. Now you see why the leverage needs to be so high. The problem is that this leverage is dangerously high. And more importantly, there are many other new things besides credit cards and auto loans that the Fed has not thought to leverage which will not get loans if investors can better spend their money on cheap legacy assets. In my opinion you have to get all the legacy prices back to a reasonable level in order to get people to do many new things. If the old things have such a low price, people will invest in the old things, they will not do anything new. So, the Fed is making a mistake trying to directly prop up a few targeted new things. If it leveraged all the old assets at 2-to-1, their prices would rise, they would not be such attractive investments, and the Fed could prop up the new auto loans with much less than 20-to-1 leverage. Of course there is nothing magical about 2-to-1 leverage. It might need to be a bit higher. And some sectors could be leveraged more than others. But my recommendation is to leverage everything modestly instead of a few narrowly targeted areas to extremes.

I am going to close now with this last slide, this is my last slide, describing what is going on in housing. I said earlier that millions of people are underwater. Let us see how they act. On the horizontal axis I measure how far under water the house is. I record the loan-to-value LTV ratio, so 160 means, if you add up all the loans on a house they are 160% of the value of the house. That would be the case for example if the house is now worth $100,000, and the amount outstanding on the first and second mortgages add up

to $160,000. On the vertical axis we measure what percentage of homeowners who were current or 30 days late become 60 days delinquent on their mortgages. This is called the *monthly* default rate. Here we have prime, subprime, and other categories of borrowers. Let's look at the subprime borrowers. When they are 140 LTV it is 6% a month! This isn't a year, it is a month! The guys who are 160 LTV, it is 8% a month. That means in a year they will have all defaulted, almost every single one of them. They are defaulting at an astronomical rate. Why are they defaulting? Because they would be crazy not to default! If their loan is 160% of the value of the house and it is a hard economic time, how can the parents tell their children, you know: we are going to stop eating and do all kinds of other stuff to pay off our loan, when they could just walk away from their house and get a much cheaper house and save themselves 60,000 dollars (assuming their house is worth $100,000)? They are not going to make that decision, so, in fact, they are defaulting. Of course homeowners who have equity in their houses do not default. Why would they, when they could sell the house and grab the equity?



29

The really interesting thing is that when these subprime homeowners default, the lender only gets back 25% of his loan. In our example, that means the lender would only get back $40,000. One quarter of 160 is 40. Now, if the house is worth 100 and the loan is 160 and throwing the owner out of the house you can only get 40 back, why not cut the loan to 80? Tell the guy: you only owe 80? Then you get 80 back, because the guy will try to fix the house and sell it for 100 to make a profit, or he will realize he has got equity back in his house and he will pay the 80. Either way, it is better for the lender and also for the borrower. And the government pays nothing at all. So cutting principal, I think, is the only way to make all these underwater homeowners, who are not behaving properly anymore, behave properly. Reducing the principal is obviously good for the home owners, but it is also good for the lenders. This may strike you as paradoxical. But it is true. I mentioned earlier that I had helped start a hedge fund. We were unfortunately among the buyers of these subprime securities. But I can tell you that we, as lenders, would love to see the loan, half the loan forgiven, because it the end it would save us money. Some people just want to punish these subprime guys and throw them out of their houses. But I do not agree that these subprime borrowers are necessarily bad people. You know, it is not their fault that the lender did not ask for more collateral, it was up to the lender to demand more money down, not up to the borrower. If a grocer wants to sell you something at half his

cost, are you to blame when he goes bankrupt? It is the grocer, the lender, who sets too low collateral. So why should we blame the borrower who is in the house?

If you write down the principal to a little below the current value of the house, you are going to save the home owner and you are also going to save the lender. And the Government does not have to pay a penny; the lender should absorb the loss of principal. So if this is so good for everybody, why hasn't this happened? I can give a different explanation depending on whether the loan has been securitized, or held as a whole loan in some bank portfolio. I don't have time to talk about these reasons now; perhaps during the question period I can elaborate. But let me note that my hedge fund, which holds mortgage bonds that have been securitized, can't talk to the home owners. Only the Servicer of the deal can talk to the home owners and modify the loans. But they don't have any incentive to cut the principal. The Obama plan in fact, encourages them not to cut the principal. Maybe in questions I will explain why that is. It has to do with the fact that the Servicers are mostly all owned by the four biggest banks.

The rest of the loans that are not securitized, most of them are held by the big banks. If these banks write the loans down from 160 to 80, they have to immediately recognize the 50% loss. They don't want to recognize the loss immediately, because they are trying to hide from the public that they might be insolvent. So they will not recognize the loss. Eventually they are only going to get 40 back, so the loan should only be worth 40 to them now, and exchanging something worth 40 for something worth 80 should be in their interest. But they can still mark the loan at 160, or close to that, because maybe the guy is still paying. Even though they know very well that, within a year, he is going to default and then they are going to get 40 back, they are not required any more to mark it at 40. Marking to market has been suspended. The desire to stay solvent in the short run, and so not jeopardize the government bailout package all the banks are getting, is worth more to the banks then getting 80 instead of 40 in the long run on their loans.

The banks who are underwater behave the same way homeowners do who are underwater. I mean, why make home repairs if somebody is going to throw you out of your home eventually? Much better if you are an insolvent bank is to pay money out as dividends, or as bonuses, then to plow it back into the firm. if they don't have equity, they are not going to behave in the interest of themselves or the economy. Some people have taken to calling these underwater homeowners and banks zombies, because they live on but they act dead. To reduce the uncertainty in the economy we must resolve their debt positions. The choice should be between rushing them into foreclosure or bankruptcy, or else writing down their debts until they have positive equity. With the banks, we have to figure out some way that they should default on some of their lenders, instead of just getting the Government to subsidize them to keep paying all the lenders off.

In summary, I think that the best way to prevent a future crisis is to monitor and limit leverage. If we have another crisis, or if we want to get out of this crisis, we must reverse the three symptoms of every crisis. The first order of business is always to rationally re-leverage the system. That means restoring moderate leverage everywhere, rather than leveraging a few small sectors to too high levels. The second order of business in a really bad crisis like the one we are in today is to restore people to life, these zombie home owners and banks, by cutting some of their principal. If they are going to default anyway, let us default them now in a rational way. And thirdly, the Government is going to actually have to pay some money to replace the lost optimistic capital. I am not saying everything is for free, the Government might decide, it has got to actually pump some money into a bank or into the housing sector or something like that. Ok, I see my time is up.

Managing The Leverage Cycle

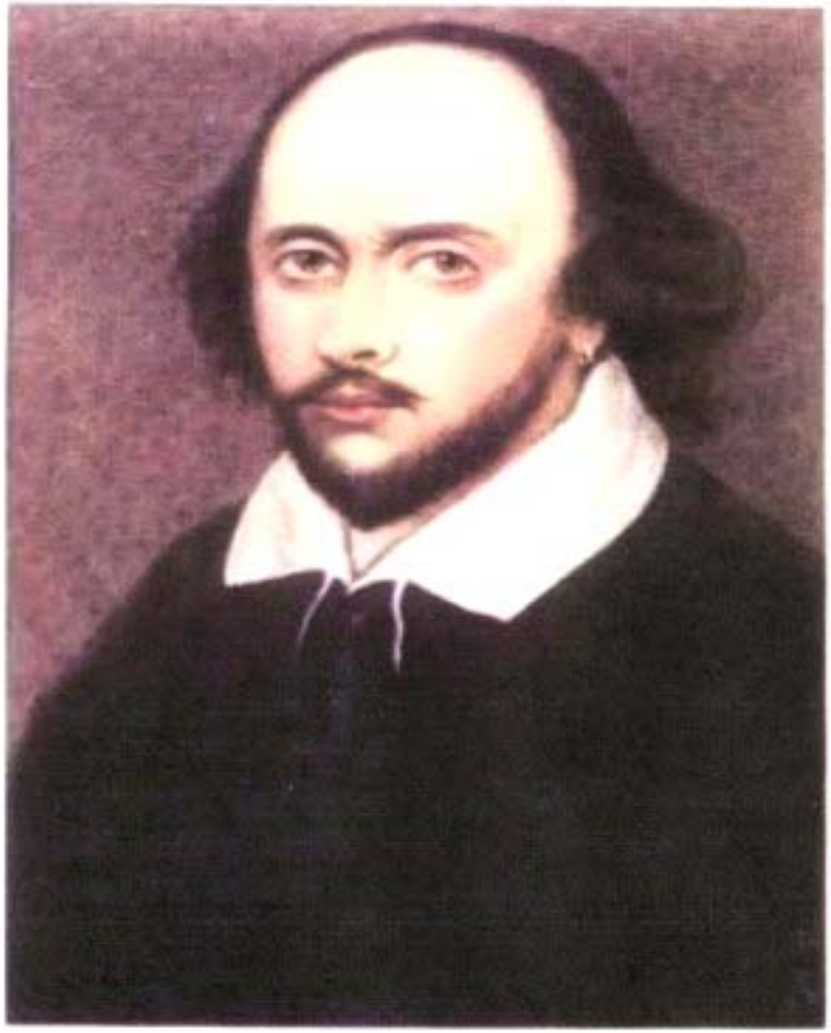
John Geanakoplos

Fed Should Manage Leverage as well as Interest Rates

- From Irving Fisher in 1890s and before it has been commonly supposed that the interest rate is the most important variable in the economy.
- When economy slows, public clamors for lower rates, and Fed obliges.
- Fed has been pumping out billions of dollars in bank loans. Fed just lowered fed funds rate in December to zero.
- But collateral rates or leverage more important in times of crisis.

Leverage Cycle Papers

- Geanakoplos 1997 “Promises Promises”
- Geanakoplos 2003 “Liquidity, Default, and Crashes: Endogenous Contracts in General Equilibrium”. Invited address World Congress 2000.
- Fostel-Geanakoplos 2008 “Leverage Cycles and the Anxious Economy”. AER.
- Geanakoplos-Zame 1997, 2002, 2005, 2009



Shakespeare got this
Right 400 years ago.

The Merchant of Venice

Negotiation

- Over interest rate (many pages)
- And over collateral.

Which did Shakespeare think more important: Interest or Collateral?

- What interest did Shylock charge? Nobody remembers.
- Everybody remembers collateral of pound of flesh.

Judgment: Wrong Collateral level!

- **P:** “Wait a moment. There is something else. This bond
- Does not give you one drop of blood. The words
- Expressly are “a pound of flesh”. So take your
- Bond. Take your pound of flesh. But if, in cutting it, you shed
- One drop of Christian blood, your lands and goods, under the
- Laws of Venice, will be confiscated to the sate of Venice.”

Pound of flesh but not a drop of blood.

Collateral Papers

- Bernanke-Gertler-Gilchrist 1996, 1999
- But this ignored changes in leverage.

Definition of Securities Leverage

- Collateral = Asset put up as guarantee of loan. Often a house. I will assume no-recourse loans, like housing.
- If can use $100 house to borrow $80, then:
- margin or down-payment or haircut is 20%,
- LTV is 80%,
- leverage is 5.

Equilibrium Leverage

Standard Economic Theory:

Equilibrium (supply = demand) determines interest rate.

In my theory:

Equilibrium determines Leverage as well.

Surprising that one equation can determine two variables. In standard theory either ignore default (hence need for Collateral) or fix leverage at some constant.

What Determines Leverage

- Interest rates determined by impatience.
- Leverage determined by uncertainty about and disagreement over future collateral prices. Volatility is crucial.

Why Leverage is important

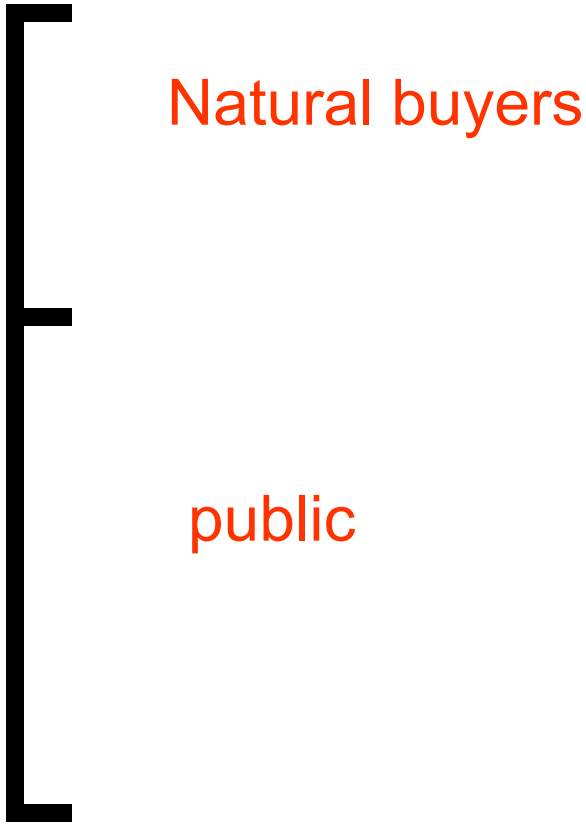
- As every trader knows, if leverage is 5, and asset moves by 1%, your return moves by 5%. If house price is $101, sell it, return $80 and make $1 on $20 = 5%.
- No-recourse collateral gives borrower the “put option” to walk away from the house. House falls in value to $0, borrower walks away and loses only $20 even though lender loses $80.
- Pundits say this has to do with crisis.
- But real significance of leverage is that it allows just a few investors to buy so many assets.

More Leverage → Higher Asset Prices

Low Leverage → Lower Asset Prices

- Leverage gives optimists more buying power.
- Relies on no short sales.

Natural Buyers Theory of Price



Heterogeneous Agents

- Natural Buyers vs Public
- Differ in risk tolerance.
- Differ in ability to hedge.
- Differ in sophistication and knowledge.
- Might use assets for production.
- Might get higher utility for holding assets
  - Like houses
  - Leads to equilibrium leverage giving default
- Or just more optimistic.
  - Leads to equilibrium leverage without default, like Repo market.

Standard Theory

- Asset Price = Fundamental Value.
- Heterogeneity is missing.

Leverage Cycle

- Too much equilibrium leverage in normal times
- Too high asset prices in normal times

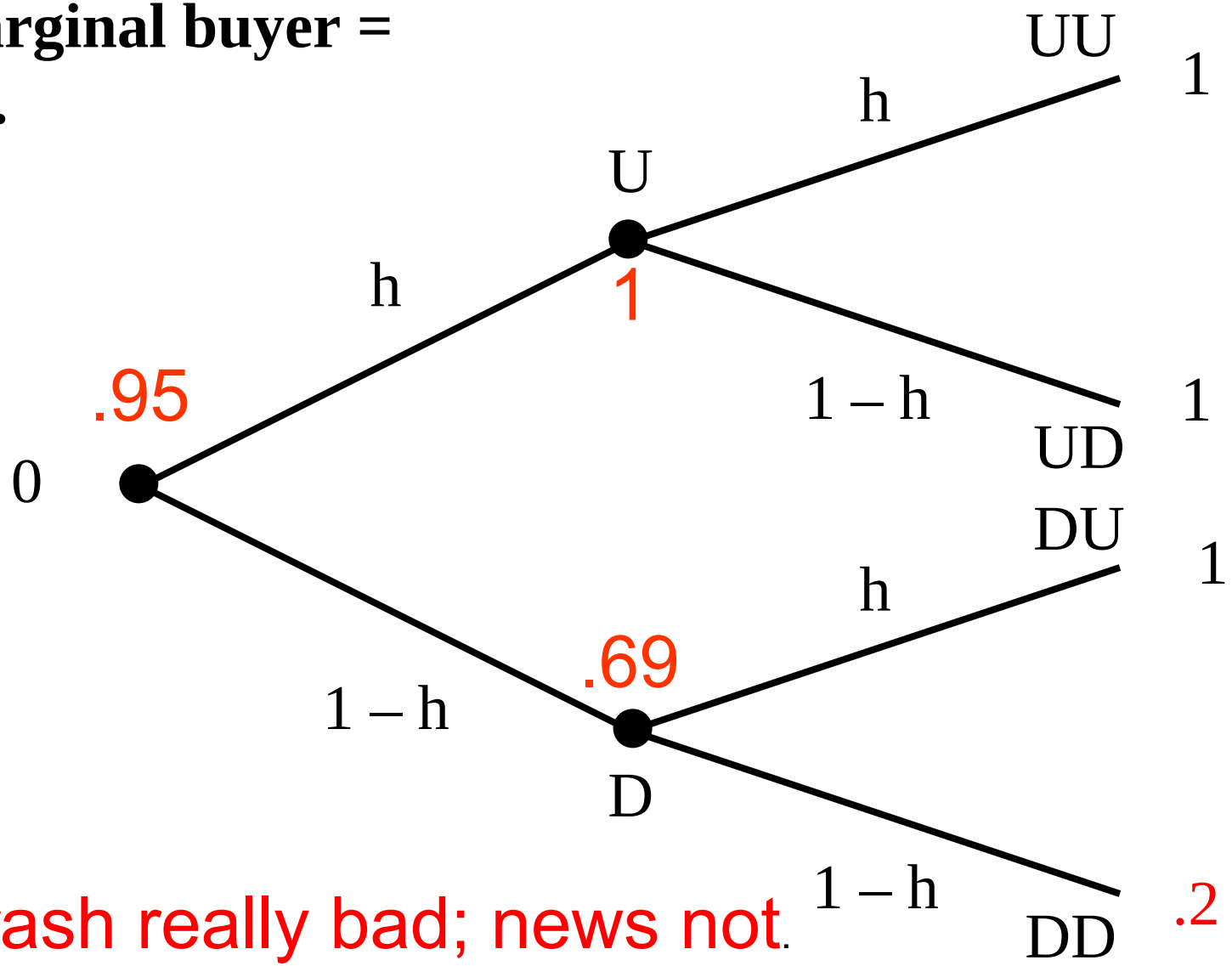
- Too little leverage in crisis
- Too low asset prices in crisis

- Recurring cyclical problem.

Leverage Cycle Crashes Always Have same three aspects

- Scary Bad news creating more uncertainty and more disagreement = high volatility
  - FORECLOSURES
- De-leveraging because nervous lenders ask for more collateral
- Leveraged buyers (optimists) crushed, some go bankrupt, others insolvent and functioning poorly

Marginal buyer = .87.



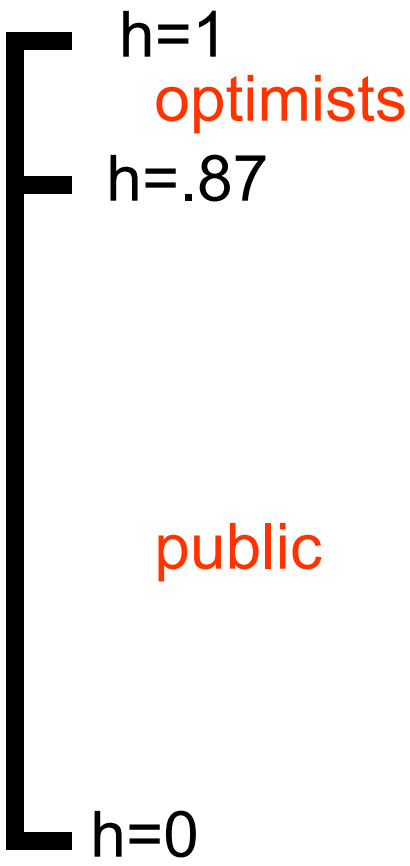
Crash really bad; news not.

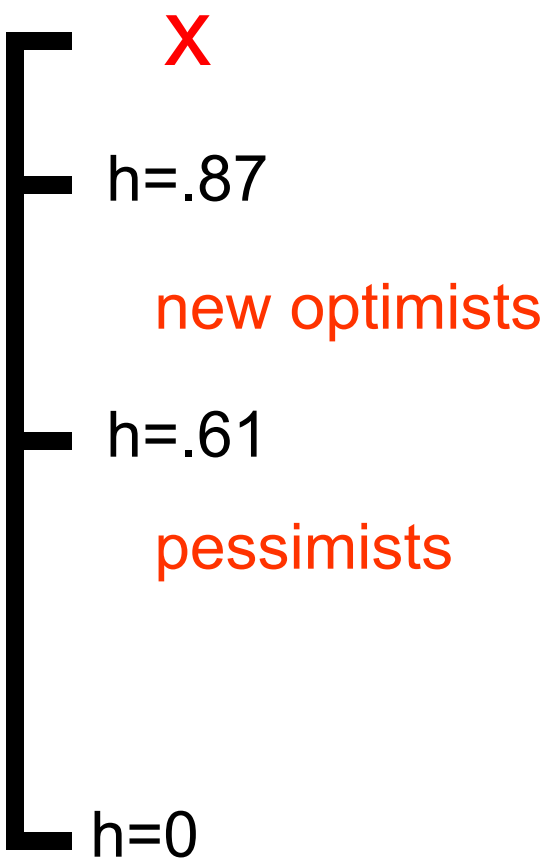
Top 13% of buyers go bankrupt.

Leverage at 0 = .95/.26 = 3.6; Leverage at D = .69/.49 = 1.4

Interest rates = 0.

Natural Buyers-Margins Theory of Crashes

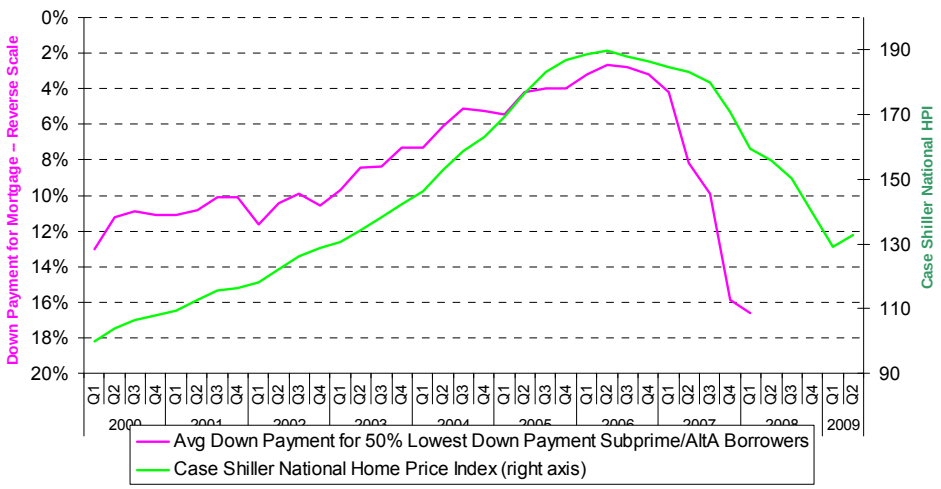



X
h=.87
new optimists
h=.61
pessimists
h=0

Recurring Leverage Cycles

- 1994 derivatives crisis, bankrupted Orange County
- 1998 emerging markets and mortgages, bankrupted Long Term Capital
- 2007-8 mortgage crash

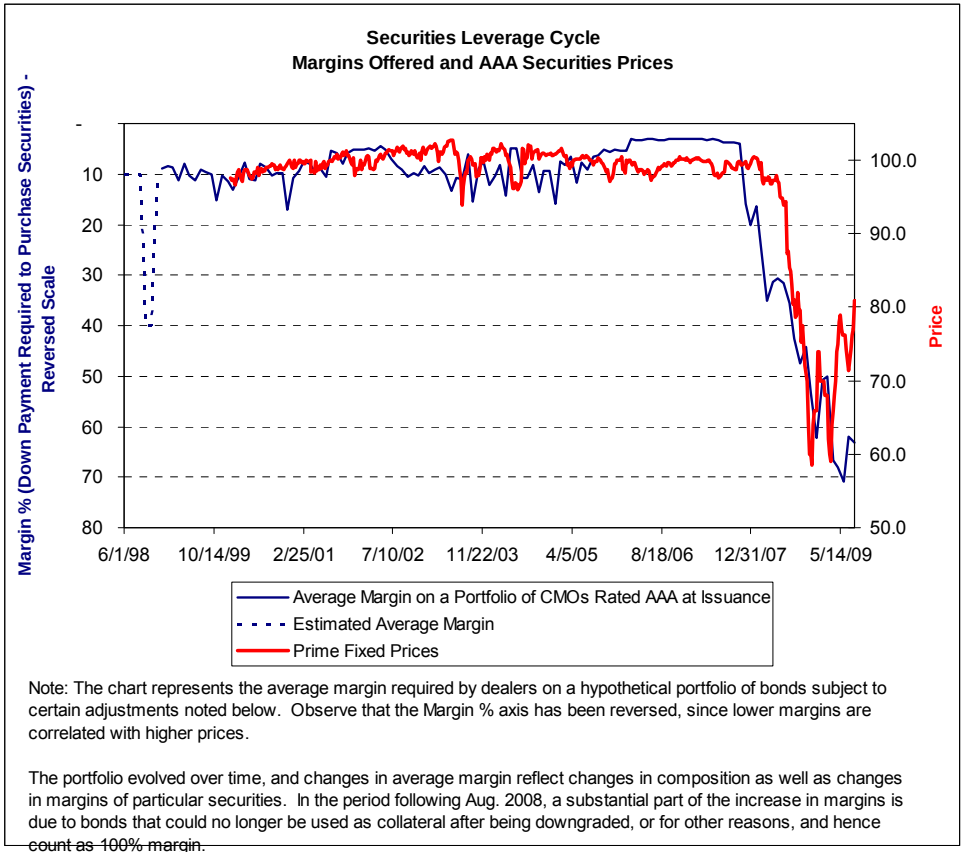
Housing Leverage Cycle
Margins Offered (Down Payments Required) and Housing Prices



Observe that the Down Payment axis has been reversed, because lower down payment requirements are correlated with higher home prices.

Note: For every AltA or Subprime first loan originated from Q1 2000 to Q1 2008, down payment percentage was calculated as appraised value (or sale price if available) minus total mortgage debt, divided by appraised value. For each quarter, the down payment percentages were ranked from highest to lowest, and the average of the bottom half of the list is shown in the diagram. This number is an indicator of down payment required: clearly many homeowners put down more than they had to, and that is why the top half is dropped from the average. A 13% down payment in Q1 2000 corresponds to leverage of about 7.7, and 2.7% down payment in Q2 2006 corresponds to leverage of about 37.

Note Subprime/AltA Issuance Stopped in Q1 2008.



Note: The chart represents the average margin required by dealers on a hypothetical portfolio of bonds subject to certain adjustments noted below. Observe that the Margin % axis has been reversed, since lower margins are correlated with higher prices.

The portfolio evolved over time, and changes in average margin reflect changes in composition as well as changes in margins of particular securities. In the period following Aug. 2008, a substantial part of the increase in margins is due to bonds that could no longer be used as collateral after being downgraded, or for other reasons, and hence count as 100% margin.

Leverage dramatically increased from 1999-2006

- A bank that wanted to buy a AAA mortgage security could borrow 98.4% of purchase price, paying down only 1.6% cash. That's over 60 to 1 leverage.
- Average leverage in 2006 across all $2.5 trillion of toxic mortgage securities was 16 to 1.
- So buyers only had to pay $150 billion cash, and borrow $2.35 trillion!

- Home buyers could get mortgage with 3% down in 2006, for leverage 33 to 1.

Then leverage drastically curtailed by nervous lenders wanting more collateral

- Toxic mortgage securities leverage fell to average less than 1.2 to 1.

- Homes leveraged 3 to 1 unless get government guaranteed loan

2007-9 Worst Leverage Cycle because

- Leverage got higher than ever before.
- Houses and banks further underwater making for bigger foreclosure deadweight costs
- Double leverage cycle, in housing and securities.
  - Feedback between the two
- CDS appeared for first time at peak of cycle
  - Made losses for optimists bigger than losses of asset value
  - Allowed pessimists to leverage and helped cause crash.

Why is leverage cycle so bad?

What's so bad about so much leverage? (Even without default)

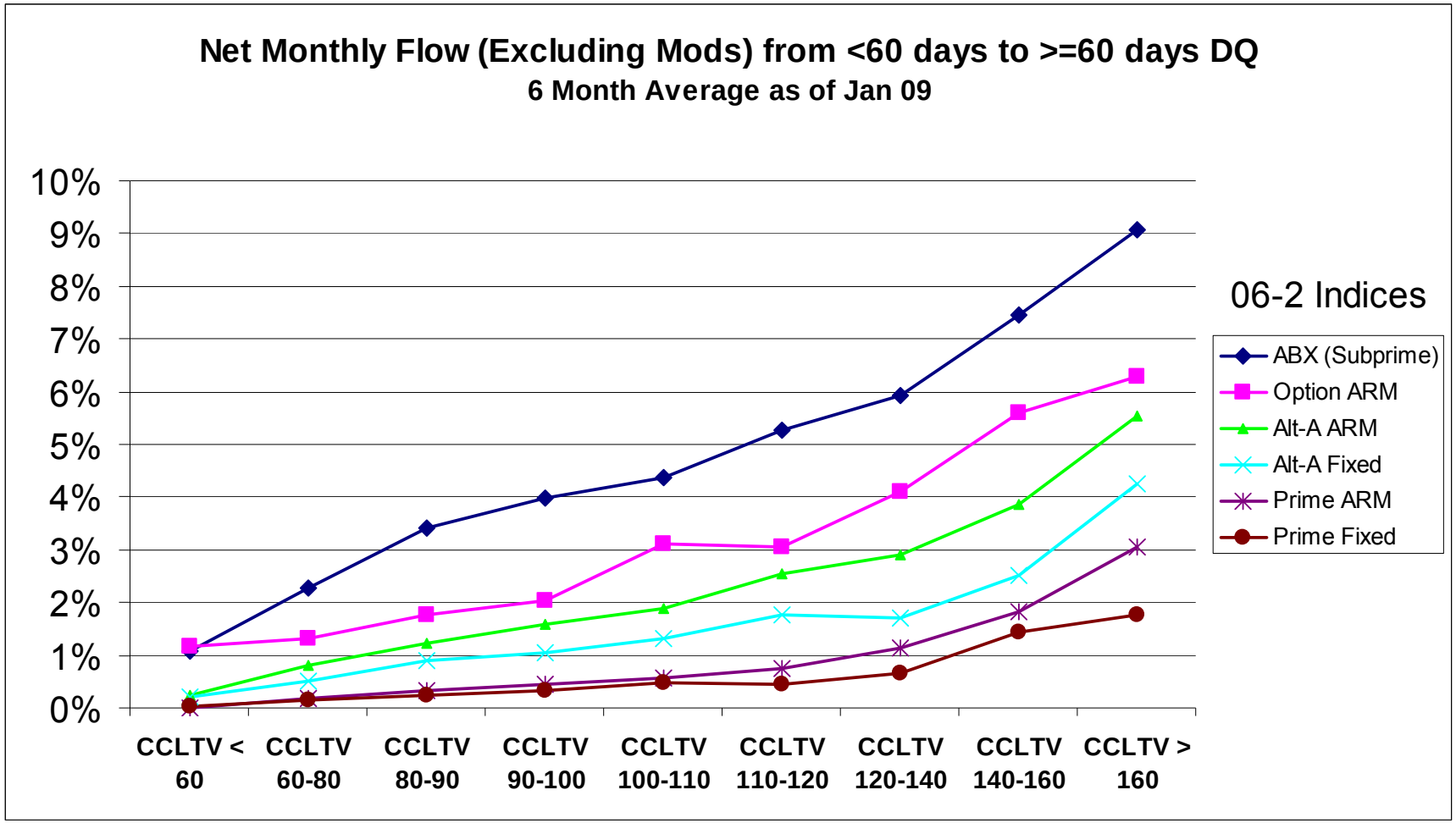
- At top so few buyers have such a big effect on prices. What if they are crazy?
- Construct many projects which look ridiculous in retrospect when cycle turns down. Costly if irreversible investment.
- Fortunes of natural buyers rise and fall through cycle. Changing inequality over cycle.
- Has real effects on economic activity, and welfare of risk averse third parties. Unfair to subject public to so much volatility. Tobin Q.
- What if optimists indispensable to economy: too big to fail

What's so bad about leverage (with default)

- Debt overhang: When underwater will not choose PV > 0 projects because old investors get the money
- Cost of confiscation of collateral – homes today fetch ¼ of subprime loan amount when sold, after vandalism etc.
- Restricting leverage can change relative prices, often in ways that improve risk allocation.

What to Do About Leverage Cycle?

- Collect leverage data and make it public.
- Put CDS on exchange.
- Regulate leverage in normal times.
- In the crisis, reverse the three symptoms:
  - Stop foreclosures in order to avoid deadweight losses, and to stabilize uncertainty and margins: write down principal.
  - Releverage the system by going around banks to lend with less collateral
  - Spend govt money to replace natural buyers.

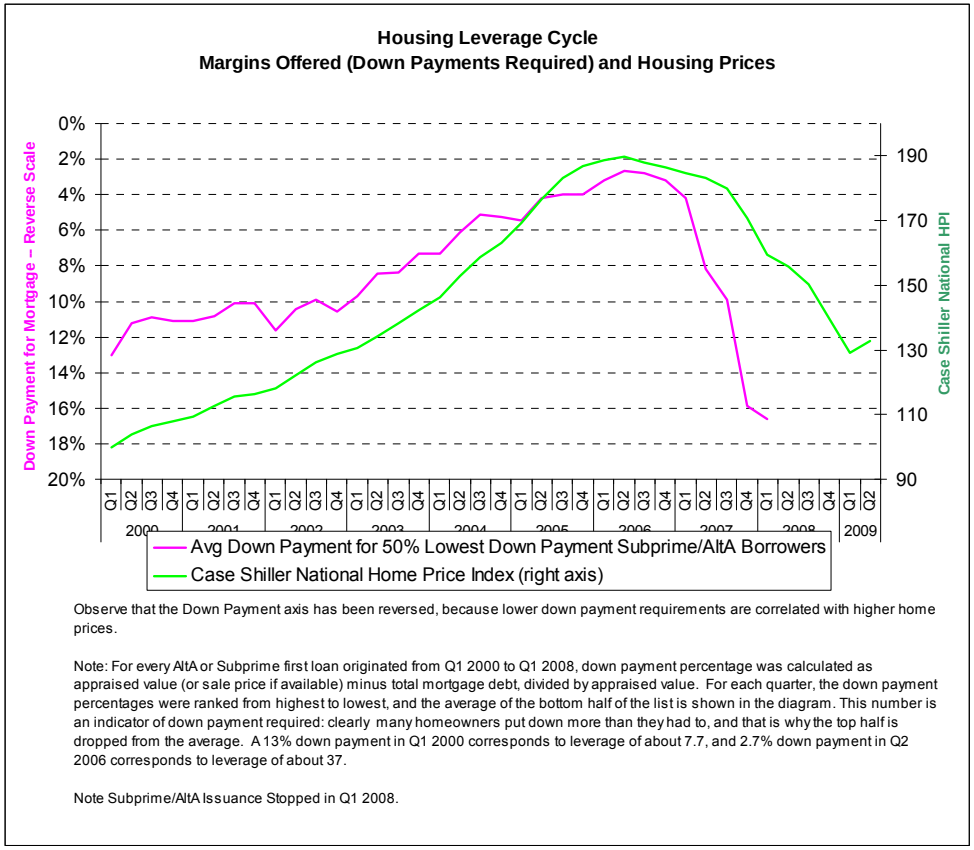

Net Monthly Flow (Excluding Mods) from <60 days to >=60 days DQ
6 Month Average as of Jan 09
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
CCLTV < 60
CCLTV 60-80
CCLTV 80-90
CCLTV 90-100
CCLTV 100-110
CCLTV 110-120
CCLTV 120-140
CCLTV 140-160
CCLTV > 160
06-2 Indices
ABX (Subprime)
Option ARM
Alt-A ARM
Alt-A Fixed
Prime ARM
Prime Fixed

Securities Leverage vs Investor Leverage

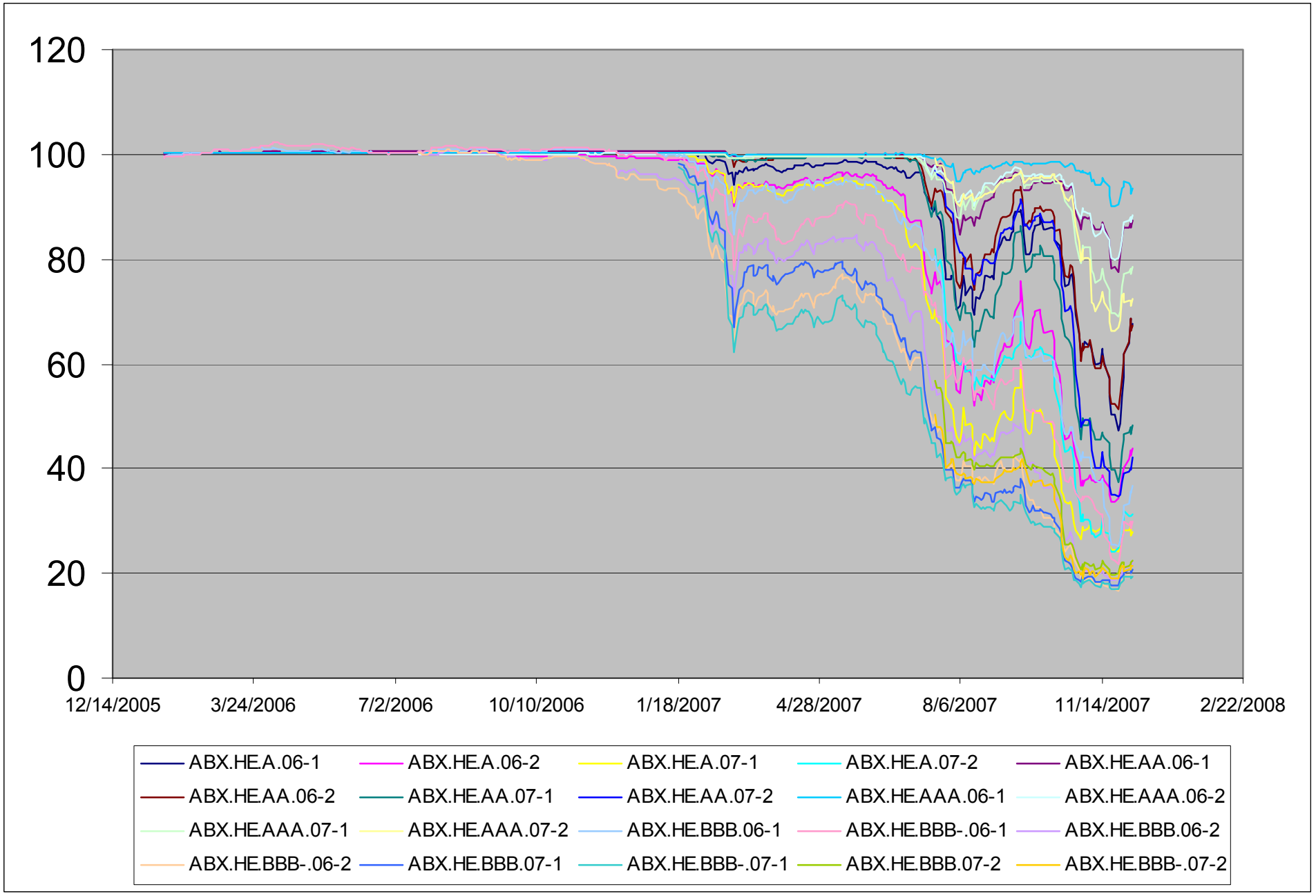
- Hard to lie about securities leverage, because another party is reporting
- If some loans long term, investor leverage will often go in wrong direction.
- If investor leverage controls only for big banks, others leverage. Also leverage will move. Securities leverage captures it.
- Harder to put political pressure on regulator who manages security leverage.

end

Look More Closely at Timing



Peak at Q2 2006
Slightly down Q4 2006
CDS created on subprime late 2005
ABX securities index collapses Jan 2007
Double leverage cycle by Q4 2007


120
100
80
60
40
20
0
12/14/2005
3/24/2006
7/2/2006
10/10/2006
1/18/2007
4/28/2007
8/6/2007
11/14/2007
2/22/2008
ABX.HE.A.06-1
ABX.HE.A.06-2
ABX.HE.A.07-1
ABX.HE.A.07-2
ABX.HE.AA.06-1
ABX.HE.AA.06-2
ABX.HE.AA.07-1
ABX.HE.AA.07-2
ABX.HE.AAA.06-1
ABX.HE.AAA.06-2
ABX.HE.AAA.07-1
ABX.HE.AAA.07-2
ABX.HE.BBB.06-1
ABX.HE.BBB-.06-1
ABX.HE.BBB.06-2
ABX.HE.BBB-.06-2
ABX.HE.BBB.07-1
ABX.HE.BBB-.07-1
ABX.HE.BBB.07-2
ABX.HE.BBB-.07-2

Cum Loss

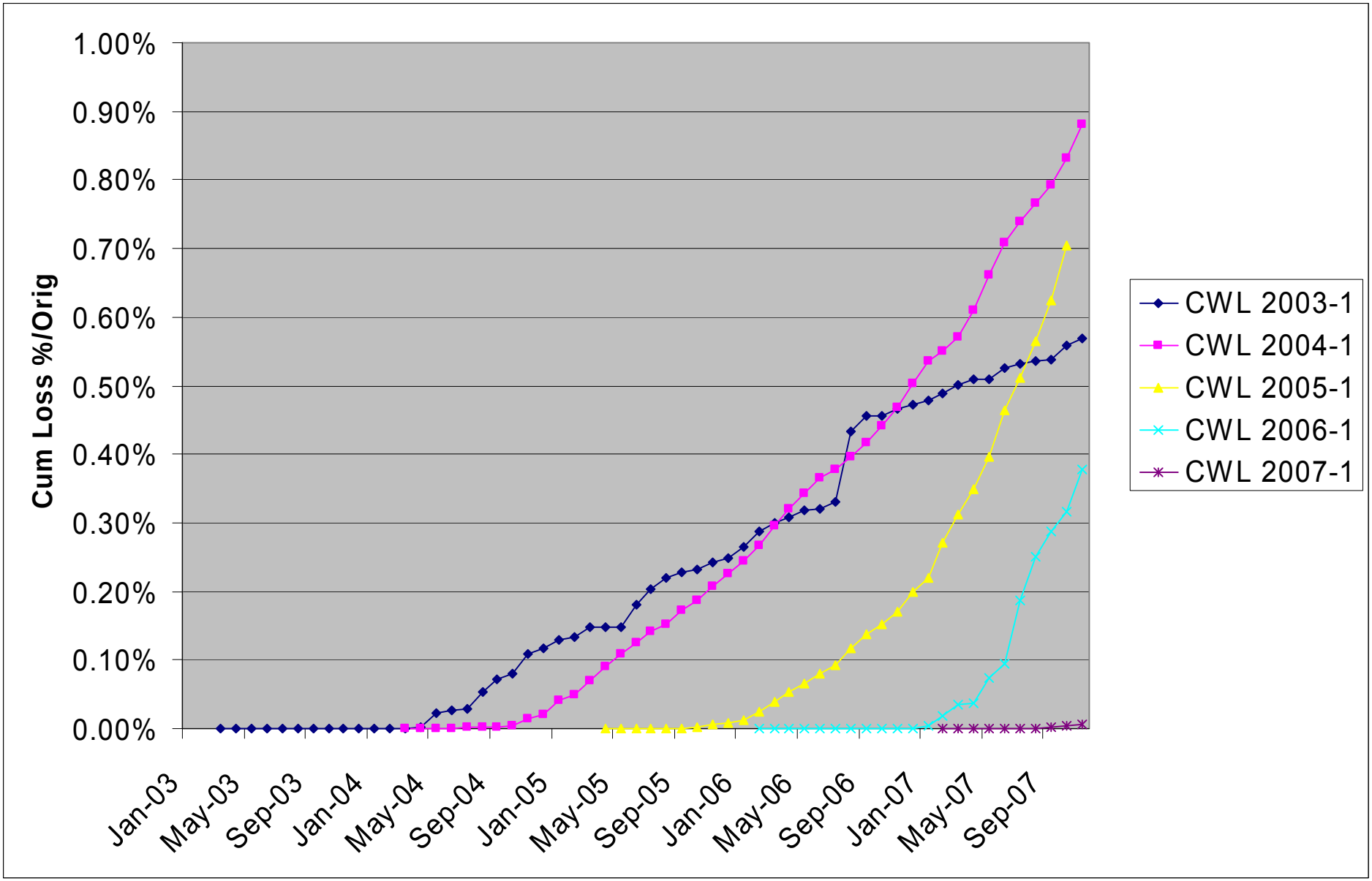

Cum Loss %/Orig
1.00%
0.90%
0.80%
0.70%
0.60%
0.50%
0.40%
0.30%
0.20%
0.10%
0.00%
Jan-03
May-03
Sep-03
Jan-04
May-04
Sep-04
Jan-05
May-05
Sep-05
Jan-06
May-06
Sep-06
Jan-07
May-07
Sep-07
CWL 2003-1
CWL 2004-1
CWL 2005-1
CWL 2006-1
CWL 2007-1

Chart 3: ABX.HE cumulative loss by reporting month

% of original balance

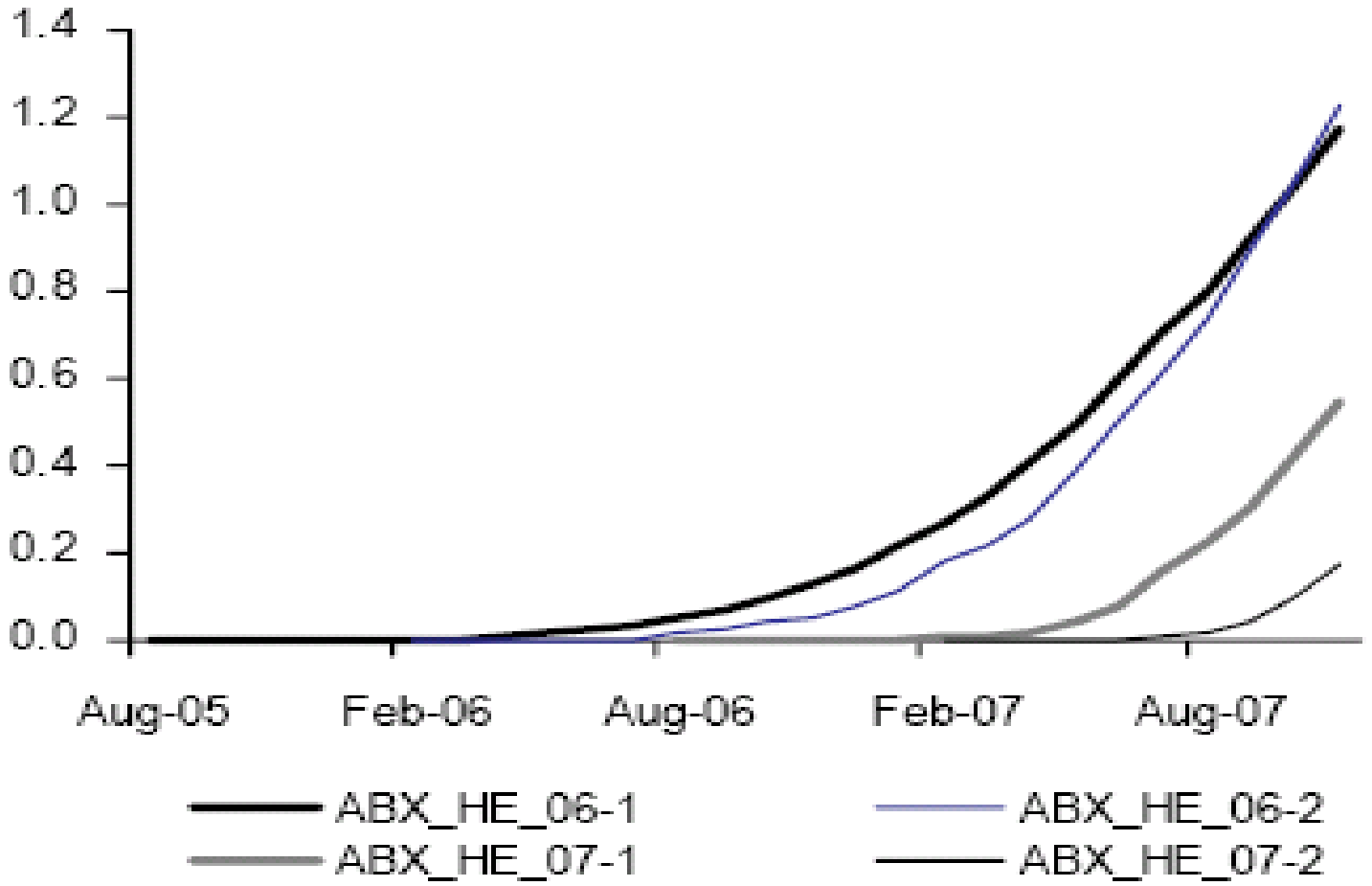
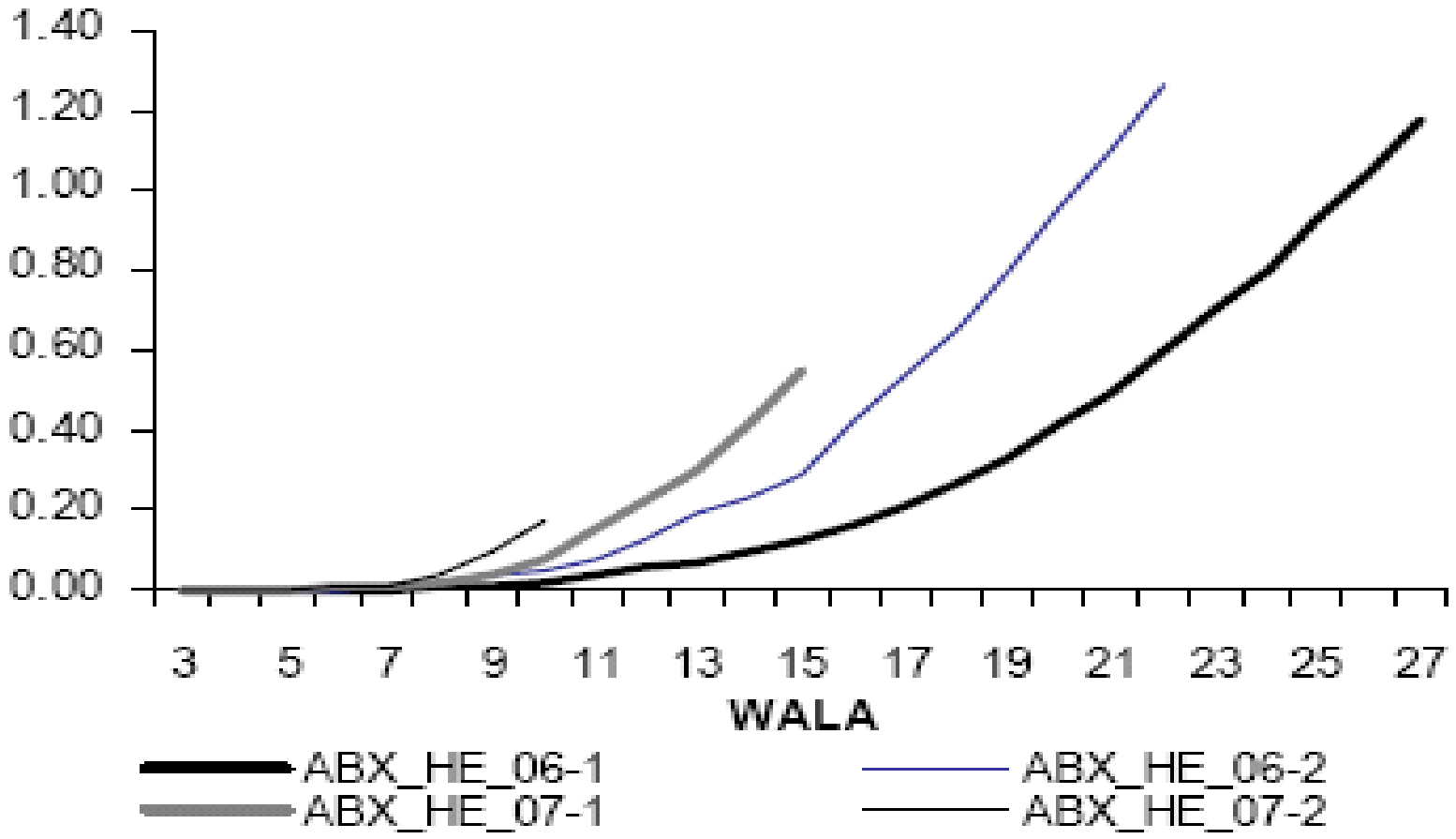


Chart 6: ABX.HE cumulative loss by WALA

% of original balance



DQ / Orig

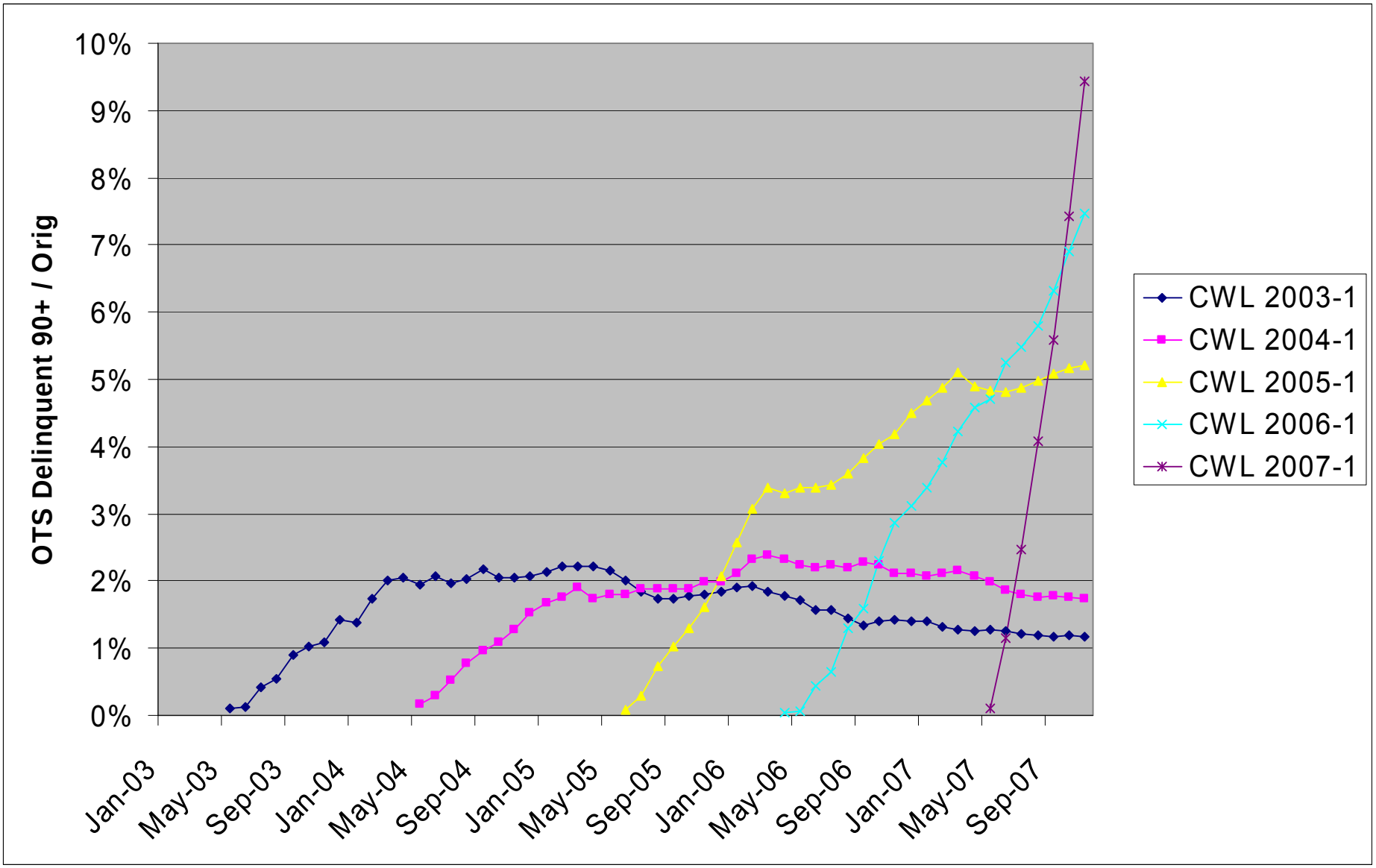

OTS Delinquent 90+ / Orig
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
Jan-03
May-03
Sep-03
Jan-04
May-04
Sep-04
Jan-05
May-05
Sep-05
Jan-06
May-06
Sep-06
Jan-07
May-07
Sep-07
CWL 2003-1
CWL 2004-1
CWL 2005-1
CWL 2006-1
CWL 2007-1

Chart 1: ABX.HE 60+ delinquencies by reporting month
Includes foreclosures and REO (%)

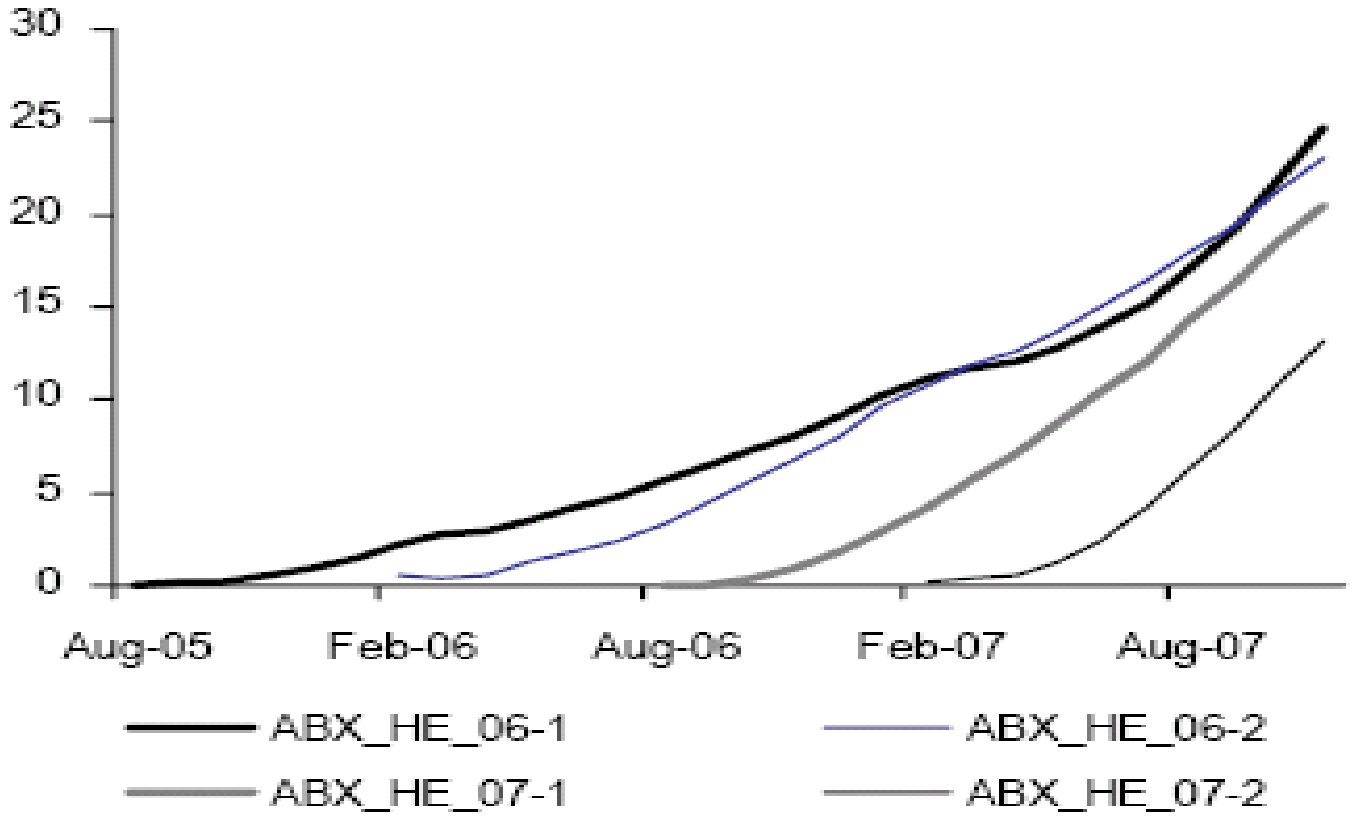
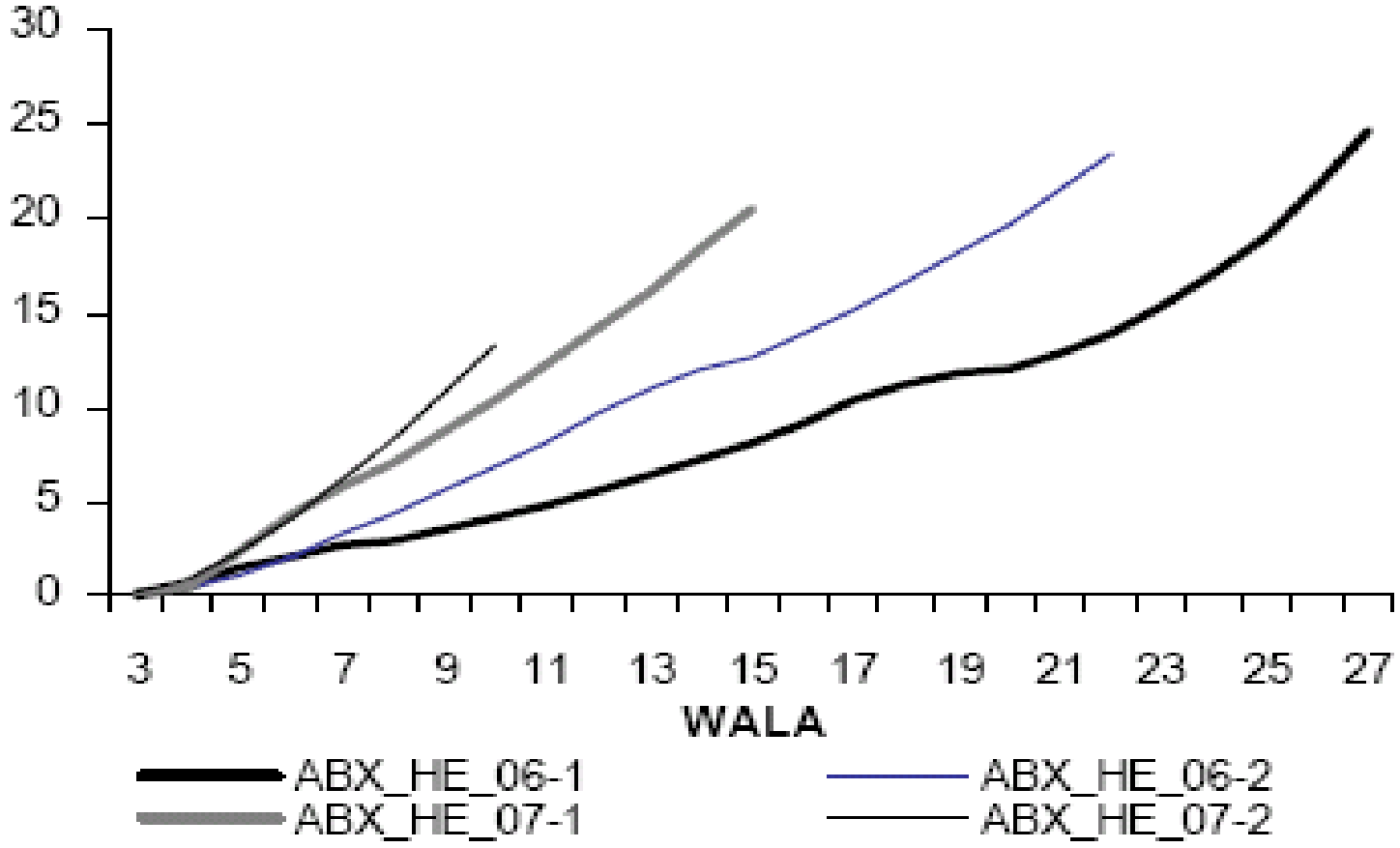


Chart 4: ABX.HE 60+ delinquencies by WALA

Includes foreclosures and REO (% of current balance)



Credit Default Swaps CDS

- Insurance
- Writer of insurance goes long the bond
- Buyer of insurance is shorting bond
- Amounts to leverage
- Short side gets to leverage much more if price is high