MANAGING THE LEVERAGE CYCLE:
A Brief Talk in Milan with Questions and Answers

BY

John Geanakoplos

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Box 208281
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MANAGING THE LEVERAGE CYCLE

JOHN GEANAKOPLOS
Professor of Economics, Yale University, Department of Economics

Thank you very much for the introduction and the invitation to speak here in Milan. I regret that I had to teach two classes in New Haven yesterday, so I just arrived this morning and I missed most of this morning's session, so I am not quite sure what everyone else has said. I imagine it was a very broad look at the crisis and that many important causes and aspects were discussed. I am going to focus on a *single* narrative for what I think went wrong in the crisis and I will use that narrative to suggest ways that we could avoid crises in the future and, maybe most importantly, to explain how I think we should try to emerge from the current crisis. So I have called my talk '*Managing the leverage cycle*'. 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, a city near where we are here, in Italy. 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.

I have written about collateral rates for quite a while, since 1997 by myself, and with a bunch of coauthors and some students later. Collateral was also discussed by Bernanke, the current Chairman of the Federal Reserve, in some papers around the same time. I cannot say that people paid much attention to my work then, but I am going to tell you a little bit about it now; it differs from Bernanke's in a way that is quite important, I think. 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? Well, the reason is that the buyers are the people who are

going to use the extra leverage. They get to change what they do, they get to demand more, because they can get more money, so, of course, they try to buy more and that pushes the prices up. The other people who don't want to buy, just because they can borrow more does not make them change what they are going to do, because they did not want to buy or borrow in the first place. (I am assuming that it is impossible to sell short, but I will come back to this a little later). So, there is an asymmetry: more leverage affects the optimists but not the pessimists and that is why the prices go up. So, the theory I have, the idea, the framework, I mean, I keep saying the theory, it is just a common-sense thing,

To be a little more precise, 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.

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.

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.

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!

I have talked very slowly here, Im sorry. I was told once when I gave a talk in Rio that was being simultaneously translated into Portugese that I had to talk slowly. During the talk the woman behind the booth who was doing the translation ran out and said: don't you know for every two words you say in English I have to say three or four in Portuguese? Talk slower. So I have tried to talk slower this time and now I am way behind schedule.

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 wa-

ter, 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 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.

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?

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.

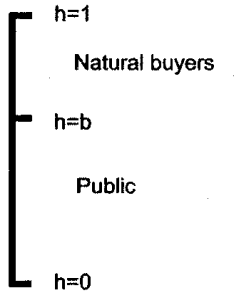
The rest of the loans that are not securitized, most of them are held by the big banks. If these banks write the loans down from 160 to 80, they have to immediately recognize the 50% loss. They don't want to recognize the loss immediately, because they are trying to hide from the public that they might

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.

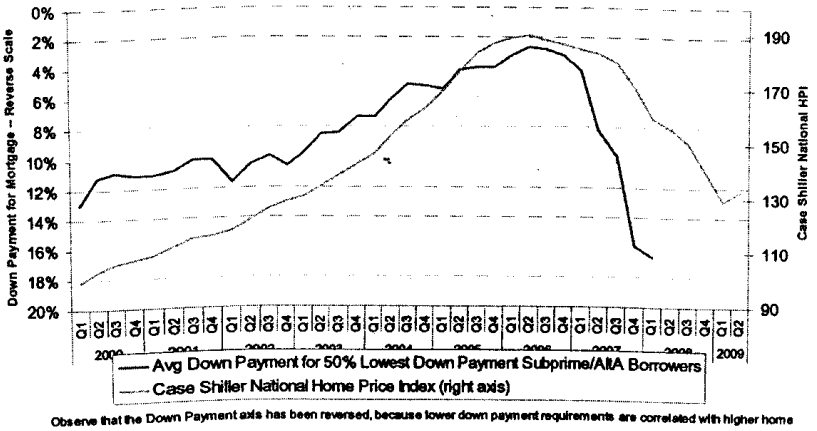
The banks who are underwater behave the same way homeowners do who are underwater. I mean, why make home repairs if somebody is going to throw you out of your home eventually? Much better if you are an insolvent bank is to pay money out as dividends, or as bonuses, then to plow it back into the firm. 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.

John Geanakoplos
Natural Buyers Thoery of Price.



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

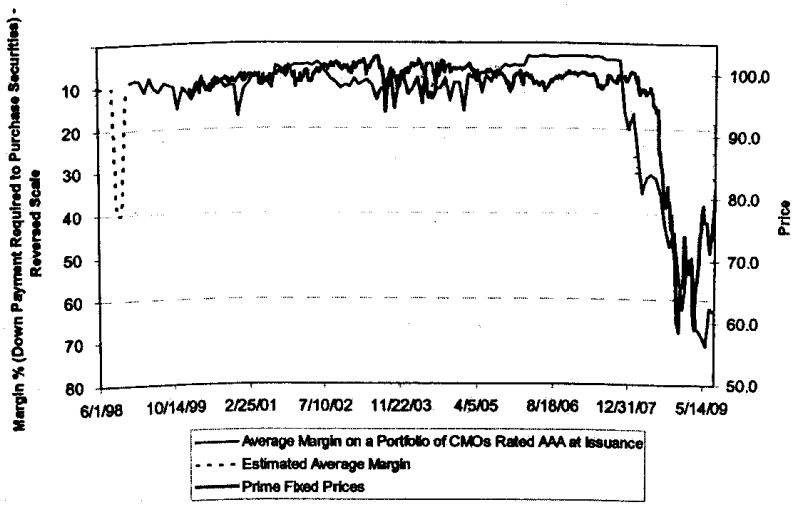


Observe that the Down Payment axis has been reversed, because lower down payment requirements are correlated with higher home prices.

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.

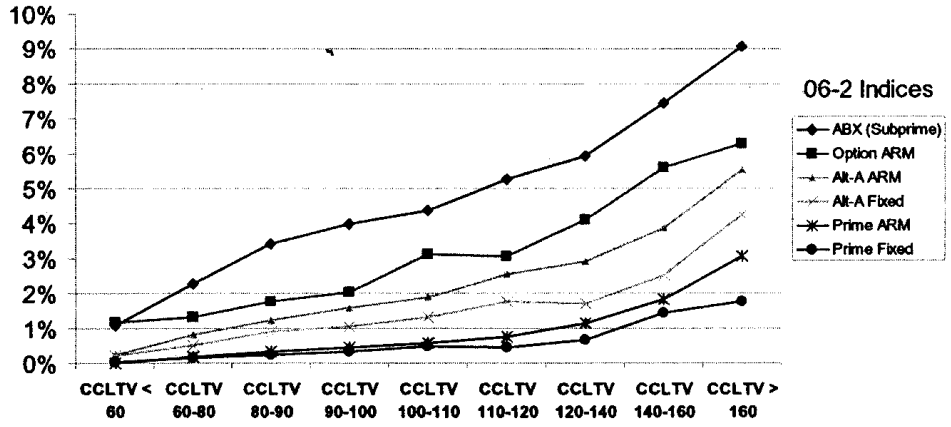
Securities Leverage Cycle. Margins Offered and AAA Securities Prices.



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.

Net Monthly Flow (Excluding Mods) from <60 days to> = 60 days DQ. 6 Month Average as of Jan 09.



LUIGI CAMPIGLIO

Grazie per la presentazione, che forse ad alcuni risulterà nuova, ma che è parte del lavoro del professor Geanakoplos, il quale ci ricorda quanto sia costoso il *deleveraging*, non diversamente da ciò che è avvenuto per esempio in Giappone, il che dimostra la delicatezza del tema affrontato.

Ci sono molte domande che immagino anche dal pubblico possano arrivare, ma le sposterei alla fine. Ora do la parola al professor Francesco Denozza.

JACK BIRNER
professore associato di economia politica nell'Università degli Studi di Trento

I will speak English so that the foreign guests don't need their headphones. I have a question for Professor Geanakoplos. Perhaps you were hoping for this question. As with so many problems in the field of economics, once we have pulled ourselves out of trouble, proposed solutions make sense, and so does yours. But there is a problem of the transition from the current situation to the one you are talking about. I think your proposal of allowing banks — or even forcing banks — to write down principal and henceforth have customers put up more collateral seems perfectly sound. As it is, however, the credit default swaps keep « lenders from talking to borrowers », as you put it. What do you think can be done about this major impediment of lenders talking to borrowers, which is the presence of credit default swaps. How do you think that overhang can be eliminated or resolved?

JOHN GEANAKOPLOS

Thank you for the question. The starting point for the American crisis was the home owner foreclosure problem. We have seen many foreclosures already, but more ominous than that, we have now reached a situation where many home owners are underwater, that means they owe more money than their house is worth. The graph I put up suggested that they are defaulting not because they have lost their jobs, but because their homes are underwater and it does not make sense for them to pay more money than the house is worth. When they owe more money on the loan than the house is worth, it is really not their house anymore. They are never going to be able to give it to their children, there is no point for them in fixing it up, it is not their house and they are going to treat it accordingly and their house is going to get ruined. So, this is a familiar problem, any old-fashion banker from fifty years ago who saw that there was a neighborhood where all the houses had plummeted in value would realize that the bank was not going to get repaid in full and the banker would have written down the principal, that was the standard practice and they would have at least got something back, rather than throwing the people out of their houses, which takes a long time to do. (The law protects home owners, so it is not easy to throw someone out of his house, it takes a long time during which the house gets ruined, basically.) So, the question is: why hasn't principal been written down, and if will be written down, how do

I envision it happening? There are two reasons principal has not been reduced so far. One is that when the loan is securitized, the lenders don't get to talk directly to the home owners. There is someone called the Servicer who is the manager of the package. The Servicer sends out the letter saying: you have got to pay your loans. When the loans are paid the Servicer collects the money and sends it out to the different bond holders, the bond holders don't even know the names of the home owners, they cannot legally talk to the home owners. So even though the bond owners might want to write down the principal, if the Servicer does not want to do it, it won't happen. Now, the question suggested that one of the reasons why the Servicers might be hesitant to write down the principal is that people who own credit default swaps, insurance, would be dramatically affected, and maybe they would sue the Servicer. That used to be a reason why the Servicer did not do it. But the Servicers have now been protected by Congress from lawsuits, they cannot be sued anymore for changing the terms of the contract. I think the Congress thought they had done a brilliant job, liberating the Servicer to do what was right, but actually they just liberated the Servicer to make more money and to make the market even worse. So, the Servicers still are not writing down the principal and that is for a variety of reasons. They get paid a percentage of the principal every month, so if they cut the principal in half, they cut their fees in half. If they cut principal low enough so that the home owner can now sell the house, then they lose their loan altogether and their fee disappears altogether. The big banks who own the Servicers, own the second loans, they own almost a trillion dollars of second loans. If they write down the principal on the first loan, then they are probably going to have to write the second loan to zero, which means they are going to lose their money. They would much rather tell the home owner: you don't have to pay the interest on your first loan for a while, just keep paying your second loan. That makes the Servicer the most money, because they still get their fees, and they get paid on their second loans, but in the long run that is not solving the problem. Unfortunately it is the plan the Obama administration foolishly put into place, of writing down interest on first loans. I think that what should be done instead is that the Government has to simply get involved in renegotiating the loan and if that means changing a contract that says 'only the Servicers can do it', then the Government should get involved in refashioning the contract. Now you are a collection of Law Professors, you know more about the Law than I do. I don't believe that the fact that there are some contracts which now serve nobody's benefit should stand in the way of making the borrower and lender both better off. The original contract was between the lender and the borrower. The Servicer is an agent of the lender, and owes a fiduciary responsibility to the lender. The Servicer should not be able to avoid that responsibility and use its powers to enrich itself, at the expense of both the lenders and the borrowers. So I think the Government has to step in and clarify the contract, clarify the rights of the bond holders to help renegotiate the loan and push the process along. There are arguments challenging my view, about takings and things like that, which I barely understand, but I believe that a correct understanding of the Law would allow the Government to intervene in this way, but you know that better than I do.

There are also many loans that have been made directly by banks with-

out being securitized: these are called whole loans or portfolio loans. The reason why these loans are not being written down fast enough is that the banks who have made the loans don't want to admit that they are not going to get the money back. So if they cut the loan in half, by writing down the principal, they have to admit they are losing half the money. Of course if they throw the home owners out of their house, they are going to lose three quarters of the money. So what do they do? They sit there, marking the bond as if they are going to have all the money back, when they know very well the home owners are defaulting at 8% a month, so within a year the loan surely will end up defaulted and they will end up with a quarter of the money, but they don't have to mark it at a quarter, like a hedge fund would, because they don't have to mark to market. They have been spared the obligation of marking to market. So I believe if we force the banks to mark to market, they will start to mark down the value of the loans, they will have to mark down the loans and therefore they will be forced to make the loans as valuable as possible, by writing down the principal.

So I think you have to have two different solutions: when the loans are owned directly by the banks, just force them to mark to market. Their own desire for profit will then get them to write down the principal. When the loans are in a securitized package, the Government, I am afraid, is going to have to get involved in taking away the power from the Servicer to control everything when he is not serving the purpose of the bond holders or the lenders. Instead we have done the opposite, we have now freed the Servicer to do whatever he wants and that is a terrible situation.

GABRIELLA CHIESA *
ordinario economia politica, Facoltà di Economia nell'Università di Bologna

Hello, sorry, I have a question for Geanakoplos. Actually he is one of the leading economists who is not very well known from the public, maybe, but certainly was the one to see what is going on and since, I think, 2000, something like that, your works are related to what was leveraged and the leverage cycle goes back to long ago. Anyway, I have got two questions. One is something which interests me as an economist, as a researcher, the question is: whether you have a theory for this maturity shortening, shortening of debt maturity? There has been securitization, ok and a lot of trading, but the impression is very short maturity. I wonder whether your leverage cycle, which gives a certain theory of leverage and collateral, has something to say about the shortening of that maturity and whether heterogeneity is the thing that can actually explain that? And the second question is related to your more practical work or life, which is also, as a hedge fund principal, what is your impression about the prospect of financial stabilization of leverage? Actually you seem to be quite pessimistic about what the Fed is actually doing. I saw that this quantitative easing was actually managing leverage. It seems that whatever you start doing, whenever you manage leverage on market niche, things eventually will be all right. Now you seem to say that if you just target a market niche and you do excessive leverage there, you may actually run the risk of having a bubble instead of having the stability you want to have. Thank you.

JOHN GEANAKOPLOS

I was not sure that anybody was listening closely to my talk, but I see that at least one person heard lots of details of it, so I appreciate these questions. Her first question was: does my theory explain why debt maturity is so short? And does it have anything to do with the heterogeneity of borrowers that I talked so long about? The answer is yes to both questions. I must distinguish two cases, the Repo market, where loans are one day long, and the mortgage market, where loans are often for 30 years.

The rationale for the question, which applies in spades to the Repo market, is that investors are borrowing from day to day or making very short-term borrowing and yet they are locked in to some illiquid security and so, every day, they are forced to repay the loan, which they can only do by reborrowing and since their security is very hard to sell, that makes the system more vulnerable. She is wondering why people would ever get themselves in that situation.

Heterogeneity in how people like the asset, as I said, has many sources, one of which is that some people are more optimistic than others. Another

* *Testo corretto redazionalmente.*

source is that some people like to live in the house more than others. They are not more optimistic, they just want to live in the house, so they value the house more than the lenders do. Those two different kinds of heterogeneity will give rise to different kinds of loans: in the kind where there is optimist and pessimist, like in the Repo market, there will be very short-maturity loans and very low chances of default. Why should there be very little default if borrowers and lenders are optimists and pessimists, respectively? Suppose the promise is so high that in a bad event default is inevitable. Recall that by assumption the pessimist will regard that bad event as very likely and so be unwilling to pay much for the loan. The pessimist will not value the extra money he gets in the good event. The optimistic borrower gets a better deal by promising something that he will almost surely repay in both events. Once we accept the idea that in optimist-pessimist loans, defaults will be rare, we can easily understand why the loan maturities are so short. In 30 years or even one year a lot can go wrong, so a loan that would almost surely be kept for a year would need to be very small. In a day-to-day loan, not that much can go wrong in a day. So, when the difference in valuation comes from optimism and pessimism, the loans will be very short. If the loans were longer, the lenders would lend vastly less money, so the reason why the maturity shortens so much is if you are a borrower and you go to a lender and you say: I want to borrow money. The guy will say: I will loan you a huge amount of money just for a day, if you want a loan for a year, I am very worried about what might happen in a year and I am going to lend you a lot less money on the same collateral. So, in order to get more money, you will shorten the loan more and more, that is what happens in these markets: the leverage goes up and the maturity shortens and that is what happens when there are differences in optimism. In the Repo market there is day-to-day lending, and there are almost never defaults, even in this crisis of 2007-2010, even in the crises of 1998 and 1994, there were virtually no Repo defaults. When there is a difference in how much you like the house, you see longer-term loans, like mortgages and everybody knows there might be a default, so even in the best of times, lenders on mortgages realize there is going to be a certain percentages of default, maybe 1/2% in the prime market and 2% or 4% in the subprime market. There is going to be default. Why is that? Because the borrower wants the money now to get the house. If he promises more he can get more money today, because the lender (who is not more pessimistic, in contrast to the last case) will indeed value the extra money he gets in the good state from a bigger promise, even if he anticipates a default in the bad event. I can't give a more detailed explanation, but the answer is: depending on the heterogeneity, you will see shorter maturity and higher leverage. So, the theory does explain it.

Now, for the second question, which was about, you know, as a hedge fund manager, how optimistic am I about the future? And do I think the Government is doing the right thing? In the short run I am not that optimistic about the future. I think that the fundamental problems have not been solved. One fundamental problem was: how are we going to manage leverage? We have done nothing about this problem, there is no Regulation in place to do it. The Fed has not even started to figure out how to regulate it, we know that, because they are not gathering the data yet. No matter what they decide to do, they are going to need data to do it and they are not gathering it. So we know

that they are very far away, you know, all these Committees that are being created, you know, to have systemic risk hazards, I said it already, it is so vague what the mandate is, I am not very confident it is going to make a big difference. So, that was the first major problem. The second major problem, since we have had the foreclosure crisis in America, nothing has been done of any substance to solve that problem. There are 3.5 million people in America who are more than sixty days delinquent. They are all going to be thrown out of their houses. That is 3.5 million families. Every month, I told you, 3% of the people who are current become delinquent on average in the subprime loans. So there is another few million people, probably another 3 million who are paying now but who eventually are not going to pay and get thrown out of their houses, so we now have 6.5 million families that are going to be tossed out on the streets. We have not done anything to solve that problem and we have not seen the result of that problem: when that happens, more bad things are going to happen. Thirdly we have got the banks: the small banks are defaulting faster and faster, and the big banks have been propped up by the Government but we have not really come to grips with how insolvent or how solvent they are. How are we going to get them working again? They are still not functioning in the way they should, because they are close to insolvent or actually insolvent, so the best strategy for them is disguise from the public that they are actually broke, wait for the Government to give them more money, hope that nothing terrible happens in the next couple of years and then they actually will be solvent and all their competition will be gone and they will all make a fortune. If I were running a bank, that would be the strategy I would adopt. Why give any risky loans to people? Better to just sit there accumulating money and investing in these undervalued assets. So, as an economist I am worried about the country over the next couple of years. As a hedge fund manager I say: this is great, we have a great opportunity now to invest in assets that are undervalued. My mortgage hedge fund did not do very well in 2007 and 2008, I don't think that is any surprise. Certainly it was not very pleasant to go through, it was the worst two years of my entire life dealing with the crisis. But we survived and as I told you, those who survive the crisis stage of the leverage cycle almost always do very well thereafter.

So, lastly, about the strategy of leveraging little niches, like new credit card bonds but not leveraging old credit card bonds, yes, I think the Fed is making a mistake. I mean, I have talked to them quite a bit about this and obviously they don't agree with me, so it is not like this is uncontroversial, but I think it is a mistake to super-leverage little niche areas, where you see there is a problem. Why do they have to super-leverage them? Because all the other prices are so depressed, the investors are going to buy the cheap general overhang of old securities that have low prices, so to get a new security, like a new credit card done, in order to get anybody to buy it, you have to leverage them 20 to 1, so the Government is leveraging these little niche areas at an astronomical level, running the same risks that we ran before. Why not just try and raise leverage to moderate levels across the board, instead of picking little areas to super-leverage? The reason they are doing this is they think: if we only lend in this small area there is less Government commitment and it does not look it is a big deal. But there is a much bigger risk of actually losing their money, if things go wrong again. The Government is on the hook for lots and

lots of money. So I think this is another risk. If things turn bad, all of a sudden we are going to find out that our Government is trillions of dollars in the hole, or at least a trillion dollars in the hole and that can raise all kinds of new problems. Don't forget that the government took on all of the Fannie and Freddie debt and loan guarantees. The government could easily lose a trillion dollars there. I am pessimistic then, but not shockingly pessimistic. As Rockefeller said: bet on America. So I will still bet on America, but I think it is going to be very tough times in America for quite a while, because we have not solved the basic problems.

ALBERTO MEOMARTINI
presidente Assolombarda

Intanto colgo l'occasione per salutarvi nuovamente, e se mi concedete un minuto, concludere con un sorriso: vi ricordo che il sito web della Regina d'Inghilterra è veramente meraviglioso (*www.royal.gov.uk*), c'è tutto, ci sono gli impegni di lavoro della Regina, c'è il suo guardaroba... È un bell'esempio di democrazia.

Ma quello che volevo dire è che la Regina andò alla *London School* e pose alzando il dito la famosa domanda « Ma scusi... Com'è possibile che nessuno si sia accorto che stava arrivando questa crisi spaventosa? » al direttore Luis Garicano, il quale, con la prontezza dello spagnolo e l'*aplomb* dell'inglese, si rivolse a lei chiamandola « signora » (perché quando la Regina d'Inghilterra fa una domanda diventa automaticamente una persona come le altre) e le diede una risposta che potrebbe essere il sottotitolo del vostro convegno, cioè: « *Ciascuno di noi pensava che fosse responsabilità di un altro* ».

GUIDO CALABRESI

Dico solo che Harold Koh riguardo ai diritti umani dice proprio: « siccome le regole vengono dalle Nazioni Unite, siccome c'è una Corte, possiamo cercare di avere un diritto che funzioni ».

JOHN GEANAKOPLOS

It is an honor to be on the same stage with these two eminent Guidos, Guido Rossi and Guido Calabresi. The Guidos agree with each other, and not only do they agree, but in similar language they call for a return, almost to Greek philosophy. They both seek principles, but at the same time, they despair of ever solving our problems, because the problems today are global and not amenable to national remedies. It is difficult to disagree, first of all, with that view and also with two giant thinkers. By the way I thought Guido Rossi's talk was quite a beautiful talk. I want to add just a couple of points.

First, I think the search for principles is very important. I think the most important outcome of this crisis will be the change it brings in our principles

and thinking, rather than the effect it will have on the economy or on GDP. There are a number of principles which the crisis has clarified. For instance the idea that free markets, many speakers referred to this, the idea that free markets work best. That principle was never generally true; it holds only under many special conditions. In 1986 I proved that these conditions almost never simultaneously hold. In other words, I proved that free markets almost always need to be regulated. The latter is a more correct statement than the statement that free markets work best. This crisis might enable the public to come to a subtler understanding of the situations in which free markets work and don't work.

Second, I agree that the regulation of leverage is a very difficult problem of global coordination. I agree with Guido, Yale Guido, instead of Harvard Guido, I agree with Yale Guido that it would not do any good to the United States to say American banks can't lend at a too high leverage, if some European banks can come and lend to the same borrower at higher leverage, because the Americans can't regulate the European leverage, so clearly there has to be some cooperation. So I agree that, because we have global problems, instead of national or State problems, it is going to be harder to implement whatever principles you come up with. But in one respect I am more optimistic. I think that once you have principles in place and they are public and they are generally understood and there is data quantifying what people are doing, you are going to see better behavior. So, on the question of leverage, I think that America is still so important in the financial world, that America could get the cooperation of European banks, if there was a will in the United States to regulate leverage and if it depended on the European banks cooperating with American banks, I think that could be achieved. I don't think it is impossible to come to a global understanding about regulating leverage, I think if you published how everybody was leveraged and you know, publish what security leverages were, you would awaken a lot of the public to the problem and public pressure would help in this move to regulations. Precisely because I agree with the Guidos that new and clearer principles will emerge from this crisis, I am more optimistic than they are that the global coordination problems can be overcome.

One example of this concerns the problem of manager compensation. You already see, in hedge funds, the compensation has changed. It used to be, you would pay everybody, all the managers, they would be paid on the profits of their position during the year. Now after the crisis it has become clear that a manager can have a very profitable year by leveraging too much and getting himself into such an illiquid position that he is very vulnerable going forward, where it is possible to lose a lot of money the next year. That was not understood so clearly before the crisis, now it is understood and now in many hedge funds, like my own, we have completely changed the way we pay our managers. They don't get paid anymore on what has happened in their position this year, they have to leave the money there for awhile and we are encouraging our investors to do the same thing: not to pay us right away, but to wait to see how things have really turned out. So I think that, once a problem has been identified and it is entirely understood and what people are doing becomes public, I think there is a lot of pressure to change behavior and I

think in compensation you are starting to see that a little bit and I believe you will get the same positive pressures with leverage.

Identifying principles, of course, is really hard. Take the principle of transparency, which the two Guidos agree is something which is obviously the right thing to do and is their first principle. That is not such an obvious principle to me. For instance, in the early golden age of securitization Fannie Mae and Freddie Mac bundled together home loans and hid from the buyers what the details were of each of the homes. They would say: ok, we are selling a pool of home mortgages, we will not tell you anything about the homes, we will just assure you that we picked them randomly. As a buyer, you only had to figure out the average behavior, you didn't need to slice and dice and figure how the guy in Vermont was different from the guy in Texas. Unfortunately people started to get suspicious that Fannie and Freddie were cheating and creating different kinds of pools, selling off the bad loans and holding the good loans. The buyers insisted on more information. So more information got given and now you have to waste a lot of time distinguishing between how people in Vermont behave versus Texas. Some people will not buy some pools at all. The market has become less liquid. More transparency has made the market worse, so transparency does not always necessarily help, even that obvious principle, sometimes has problems to it. Nonetheless I am still optimistic. I think the crisis will make us more philosophical, that the public will see a need for academics like us to formulate better principles. Slowly but surely these principles will help. The Guidos desire for principles inevitably becomes a need for academics and philosophy, and that is indeed almost Greek.

Guido next to me talked about the CDS market and regulating and putting it on an exchange. As I tried to say in my own talk, I wholeheartedly agree. There are many benefits that would bring. Putting it on an exchange would force everyone to put up collateral. Before the crisis many people, like AIG, were making wild promises to pay insurance without putting up the collateral, so they never had to prove they had the ability to pay. They would just say: look, we are a very good triple-A company, don't ask us for collateral. If they were on an exchange, they would be treated equally with everybody else. If they had to put up the collateral, they would have never made all those promises and they would have never lost all that much money and we would never have been forced to bail them out. Putting CDS on an exchange also breaks the chain of defaults. If A defaults against B, and if B then has no money and in turn defaults against C, there is a chain of defaults. Once CSD trading is on an exchange, the first default gets diffused to the whole exchange and so there is no second person to default. So that would solve the second problem. The third problem is that you can buy more insurance than the underlying property is worth, no home owner can do that. Yet, with CDS you see bonds that are worth a million, insured for a billion dollars. So that creates terrible incentives and if we are on an exchange, that could be prevented from happening too.

So, I think that the crisis is going to give us an opportunity to form better principles than we had before and I have a great faith that once people understand those principles, that will lead to better behavior. On the basis of those principles I think we will take a number of little concrete steps that will help make the world better. I think the world is going to get better and we are

going to take all these concrete steps. I agree with the two Guidos that globalization is going to make it a difficult road but I am a little more optimistic than they are.

GUIDO ROSSI

Io ho solo un'ulteriore osservazione da fare.

Sono d'accordo sul discorso della trasparenza. Cito un grande giudice americano, il giudice Brandeis secondo il quale la trasparenza è *sunshine*, come la luce del sole, che si ritiene essere *the best disinfectant*, il miglior disinfettante. Noi però aggiungiamo anche che troppo sole rischia di far venire il cancro alla pelle.

La seconda osservazione è che sono veramente felice che sia Guido che John siano d'accordo con me sul fatto che i principi, a questo punto, sono fondamentali. Quella dei principi è una strada ripida, ma è l'unica che abbiamo davanti.

GUIDO CALABRESI

Una parola in risposta a John, anzi due.

Sulla questione della *transparency* sono completamente d'accordo, c'è sempre il problema di stabilire a quale livello generale si attua la *transparency*. Mi fa molto piacere sentire un economista che dice che troppa informazione può essere costosa. Di solito gli economisti dicono: « più informazione c'è, meglio si sta ». Io non voglio sapere tutte le cose che mi possono succedere se prendo un'aspirina, altrimenti impazzisco, voglio che un medico si assuma la responsabilità di darmi l'aspirina e che quel medico sia una persona di cui ho fiducia. Quindi bisogna sapere a che livello si attua la *transparency*, il che non significa che quello della *transparency* non sia un principio giusto.

Quanto all'idea che i principi aiutino, io lo spero davvero. Ho proprio la speranza che il mondo possa cambiare tramite lo stabilire ed il riconoscere degli ideali, anche se questi ideali non vengono messi in atto immediatamente dappertutto... Concetto importantissimo anche per i diritti umani, che risale proprio alla filosofia greca. E mi fa molto piacere che John Geanakoplos raccolga questa tradizione... Perché suo padre è un grandissimo professore greco di storia medioevale a Yale... Cioè, io credo che questo sia un modo molto importante di parlare di come il mondo possa veramente migliorare attraverso l'attuazione di ideali che ci possano far stare meglio.