

Solving the Present Crisis and Managing the Leverage Cycle¹

John Geanakoplos²

December 22, 2009

Abstract: The present crisis is the bottom of a recurring problem that I call the leverage cycle, in which leverage gradually rises too high then suddenly falls much too low. The government must manage the leverage cycle in normal times by monitoring and regulating leverage to keep it from getting too high. In the crisis stage the government must stem the scary bad news that brought on the crisis, which often will entail coordinated write downs of principal; it must restore sane leverage by going around the banks and lending at lower collateral rates (not lower interest rates), and when necessary it must inject optimistic capital into firms and markets that cannot be allowed to fail. Economists and the Fed have for too long focused on interest rates and ignored collateral.

Key Words: Leverage, collateral, margins, leverage cycle, externality, principal

¹ On October 3, 2008 I presented to Ben Bernanke and the Board of Governors at the Federal Reserve the substance of the proposal embodied in this paper. One addition to my original proposal that is included here is evidence on the necessity of principal reductions, taken from my March 5, 2009 New York Times op-ed with Susan Koniak. I am grateful to her for very helpful comments and advice on this paper. I am also appreciative of the very fine comments I received from the two referees of the paper.

² James Tobin Professor of Economics, Yale University, and also a Partner in the hedge fund Ellington Capital Management, which trades primarily in mortgage securities.

Introduction

The present crisis is the bottom of a leverage cycle. Understanding that tells us what to do, in what order, and with what level of urgency. The government has acted aggressively, but because its actions were not rooted in (or explained with reference to) a solid understanding of the causes of our present distress, we have started in the wrong place and paid insufficient attention and devoted insufficient resources to matters, most notably the still growing tidal wave of foreclosures and the sudden de-leveraging of the financial system, that should have been first on the agenda.

In short and simple terms by leverage cycle I mean this. There are times when leverage is so high that people and institutions can buy many assets with very little money down and times when leverage is so low that buyers must have all or nearly all of the money in hand to purchase those very same assets. When leverage is loose, asset prices go up because buyers of them can get easy credit and spend more. Similarly, when leverage is highly constrained, i.e., when credit is very difficult to obtain, prices plummet. This is what happened in real estate and what happened in the financial markets. Governments and economists have long monitored and adjusted interest rates as if doing that would suffice to ensure that credit did not freeze up and thereby threaten the economic stability of a nation. It will not. Leverage (equivalently collateral rates) must also be monitored and adjusted, if we are to avoid the destruction that the tail end of an outsized leverage cycle can bring.

Economists and the public have often spoken of tight credit markets, meaning something more than high interest rates, but without precisely specifying or quantifying exactly what they meant. A decade ago I showed that the collateral rate or leverage is an *equilibrium* variable distinct from the interest rate.³ The collateral rate is the value of collateral that must be pledged to guarantee one dollar of loan. Today many businesses and ordinary people are willing to agree to pay bank interest rates, but they cannot get loans because they do not have the collateral to put down to convince the banks their loan will be safe.

Huge moves in collateral rates, which I have called the leverage cycle, are a recurring phenomenon in American financial history.⁴ The steps we must take at the end of the current cycle emerge from understanding what makes a leverage cycle swing up, sometimes to dizzying extremes, and then come crashing down, often with devastating consequences.

All leverage cycles end with (1) bad news that creates uncertainty and disagreement, (2) sharply increasing collateral rates, and (3) losses and bankruptcies among the leveraged optimists. These three factors reinforce and feed back on each other. In particular, what begins as uncertainty about exogenous events creates uncertainty about endogenous events, like how far prices will fall or who will go bankrupt, which leads to

³ Geanakoplos (1997), Geanakoplos (2003)

⁴The history of leverage is still being written, because until recently it was not a variable that was explicitly monitored. But work by Adrian and Shin (2009) and others is helping to restore the historical record.

further tightening of collateral, and thus further price declines and so on. In the aftermath of the crisis we always see depressed asset prices, reduced economic activity, and a collection of agents that are not yet bankrupt but hovering near insolvency. How long the aftermath persists depends on how deep the crisis was and how good government intervention is.

Once the crisis has started the thematic solution is to reverse the three symptoms of the crisis: contain the bad news, intervene to bring down margins, and carefully inject “optimistic” equity back into the system. As with most difficult problems, a multipronged approach is generally the most successful. To be successful any government plan must respect all three remedial prongs, and their order. The unusual government intervention in this cycle has in many respects been quite successful in averting a disaster, precisely I would argue, because the Fed and the Treasury have begun applying some of the novel leverage cycle principles I describe here. But effective as the intervention was in some ways, it did not respect the priorities of the problem, and as a result it is losing public confidence even as it succeeds in some dimensions.

In what follows I explain what happens in the leverage cycle and why it is so bad for the economy that it must be monitored and controlled by the government. I show how this last cycle fits the pattern and I further explain why this leverage cycle is worse than all the others since the Depression. I point out that the now-famous counterparty risk problem, which has received so much attention of late, is also a matter of collateral. Next I present details on how to intervene to pull out of a leverage cycle crisis like the one we are passing through now. I conclude with a list of recommendations about managing the leverage cycle in its ebullient period that might prevent the next cycle from reaching such a devastating crisis stage.

I. Margins, the Leverage Cycle, and Asset Prices

Traditionally, governments, economists, as well as the general public and the press, have regarded the interest rate as the most important variable in the economy. Whenever the economy slows, the press clamors for lower interest rates from the Fed, and the Fed often obliges. But sometimes, especially in times of crisis, collateral rates (equivalently margins or leverage) are far more important than interest rates. The Fed should be managing collateral rates all through the leverage cycle, but especially in the ebullient and the crisis stages.

The use of collateral and leverage is widespread. A homeowner (or a big investment bank or hedge fund) can often spend \$20 of his own cash to buy an asset like a house for \$100 by taking out a loan for the remaining \$80 using the house as collateral. In that case we say that the margin or haircut is 20%, the loan to value is $\$80/\$100 = 80\%$, and the collateral rate is $\$100/\80 or 125%. The leverage is the reciprocal of the margin, namely

the ratio of the asset value to the cash needed to purchase it, or $\$100/\$20 = 5$. All of these *ratios* are different ways of saying the same thing.

Leverage is important for three reasons. At the macro level, it enables a small group of buyers with little cash to own and control a vast amount of assets. At the single investor level, as every trader knows, a buyer who leverages his purchase λ times makes $\lambda\%$ return on his cash for every 1% rise in the asset price; but he loses $\lambda\%$ of the cash he put down for every 1% decline in the asset price. (If the home price above rises to \$101, the buyer can sell it, return the borrowed \$80, and pocket the \$1 profit as 5% return on his \$20 investment.) Finally, when seizing the collateral is the only recourse the lender has for default, the borrower effectively has a “put” option to walk away if the collateral falls in value below the debt.

In standard economic theory, the equilibrium of supply and demand determines the interest rate on loans. But in real life, when somebody takes out a loan, he must negotiate two things: the interest rate, and the collateral rate. A proper theory of economic equilibrium must explain both. Standard economic theory has not really come to grips with this problem for the simple reason that it seems intractable: how can one supply-equals-demand equation for a loan determine two variables, the interest rate and the collateral rate? There is not enough space to explain the resolution of this puzzle here, but suffice it to say that supply and demand do indeed determine both. Moreover, the two variables are influenced in the equilibration of supply and demand mainly by two different factors: the interest rate reflects the underlying impatience of borrowers, and the collateral rate reflects the perceived volatility of asset prices and the resulting uncertainty of lenders.⁵

A second critical insight is that for many assets there is a class of natural buyers or optimists who are willing to pay much more than the rest of the public. They may be more risk tolerant. Or they may simply be more optimistic. Or they may like the collateral (for example, housing) more.⁶ If they can get their hands on more money through borrowing, they will spend it on the assets and drive those asset prices up. If they lose wealth, or lose the ability to borrow, they will be able to buy less of the asset, and the asset will fall into more pessimistic hands and be valued less.⁷

⁵ In Geanakoplos (1997) I showed how supply and demand can indeed simultaneously determine the interest rate and the collateral rate. In Geanakoplos (2003) I showed how intertemporal changes in volatility lead to changes in the equilibrium leverage over time as part of what I called a leverage cycle.

⁶ Two additional sources of heterogeneity are that some investors are more expert at hedging assets, and that some investors can more easily obtain the information (like loan level data) and expertise needed to evaluate the assets.

⁷ It is useful to think of the potential investors arrayed on a vertical continuum, in descending order according to their willingness to buy, with the most enthusiastic buyers at the top. The higher is the leverage, the smaller is the number of buyers at the top required to purchase all the available assets. As a result the marginal buyer, who is the agent on the cusp of selling or buying and whose opinion determines the price, will be higher in the continuum and therefore the price will be higher.

It is well known that a reduction in interest rates will increase the prices of assets like houses. It is less appreciated, but more obviously true, that a reduction in margins will raise asset prices. Conversely, if margins go up, asset prices will fall. A potential homeowner who in 2006 could buy a house by putting 3% cash down might find it unaffordable to buy now that he has to put 30% cash down, even if the Fed managed to reduce mortgage interest rates by 1% or 2%. This has diminished the demand for housing, and therefore housing prices. What applies to housing applies much more to the esoteric assets traded on Wall Street (such as the mortgage-backed investments) where the margins (i.e. leverage) can vary much more radically. In 2006 the \$2.5 trillion of so-called toxic mortgage securities could be bought by putting \$150 billion down and borrowing the other \$2.35 trillion. In early 2009 those same securities might collectively be worth half as much, yet a buyer might have to put nearly the whole amount down in cash. In section IIa I illustrate the connection between leverage and asset prices over the current cycle.

Economists and the Fed ask themselves every day whether the economy is picking the right interest rates. But one can also ask the question whether the economy is picking the right equilibrium margins. At both ends of the leverage cycle, it does not. In ebullient times the equilibrium collateral rate is too loose; that is, equilibrium leverage is too high. In bad times equilibrium leverage is too low. As a result, in ebullient times asset prices are too high, and in crisis times they plummet too low. This is the leverage cycle.

The policy implication of the leverage cycle is that the Fed should manage system-wide leverage, seeking to maintain it within reasonable limits in normal times, stepping in to curtail it in times of ebullience, and propping it up as market actors become anxious, and especially in a crisis. To carry out this task, of course, the Fed must do a much better job monitoring leverage. The Fed must collect data from a broad spectrum of investors, including hitherto secretive hedge funds, on how much leverage is being used to buy various classes of assets. Moreover, the amount of leverage being employed must be transparent. The accounting and legal rules that govern devices, such as SIV's, that were used to mask leverage levels must be reformed to ensure that leverage levels can be more readily and reliably discerned by the market and regulators alike.

The leverage cycle is no accident, but a self-reinforcing dynamic. Declining margins, or equivalently increasing leverage, are a consequence of the happy coincidence of universal good news and the absence of danger on the horizon. With markets stable and the horizon looking clear, lenders are happy to reduce margins and provide more cash. Good, safe news events by themselves tend to make asset prices rise. But they also encourage declining margins which in turn cause the massive borrowing that inflates asset prices still more.

Similarly, when the news is bad, asset prices tend to fall on the news alone. But the prices often fall further if the margins are tightened.

Sudden and dramatic increases in margins are relatively rare. They seem to happen once or twice a decade. Bad news arrives much more often than that, so it is not bad or

even very bad news alone that drastically raises margins. Bad news lowers expectations, and like all news usually clarifies the situation.

Every now and then bad news, instead of clarifying matters, increases uncertainty and disagreement about the future. It is this particular kind of scary bad news that increases margins. For example, three years ago people disagreed whether losses from defaults on prime mortgages would be 1/4% or 1/2%, and whether losses on subprime mortgages would be 1% or 5%. By contrast, after the scary news of last year, people disagreed about whether some subprime losses would be 30% or 80% and there is still substantial disagreement. Even from their current low prices, many lenders are afraid many assets could lose even more value, maybe all. The present is worse, and the future more uncertain.

The upshot of the increased uncertainty and disagreement is that margins go up drastically. Lenders are typically more pessimistic than buyers. Otherwise they too would be buying, instead of lending. Even if the optimists are not much worried about more losses, the lenders are, and they will demand high margins. When the lenders are worried about 80% losses from current levels, they will lend only if margins are at least 90%, or not lend at all.

As we have just witnessed, the rapid increase in margins always comes at the worst possible time. Buyers who were allowed to massively leverage their purchases with borrowed money are forced to sell when bad news drives asset prices lower. But when margins rise dramatically, more modestly leveraged buyers are also forced to sell. Tightening margins themselves force prices to fall further. We enter the crisis stage I discuss below.

The dynamic of the leverage cycle cannot be stopped by a tongue lashing of greedy Wall Street investors or over-ambitious homeowners in the ebullient stage of the cycle, or by exhortations not to panic in the crisis stage. The cycle emerges even if (in fact precisely because) every agent is acting rationally from his individual point of view. It is analogous to a prisoner's dilemma, where individual rationality leads to collective disaster. The government must intervene.

The intervention becomes all the more necessary if agents are irrationally exuberant and then irrationally panicked, or are prone to short-sighted greed, or to the keeping up with the Jones syndrome. If greedy investors want higher expected returns, no matter what the risk, competition will force even conservative fund managers into leveraging more. For example, an investor comes to a hedge fund and says "the fund down the block is getting higher returns." The fund manager counters that the competitor is just using more leverage. The investor responds, "well whatever he's doing, he's getting higher returns." Pretty soon both funds are leveraging more. Housing prices can rise in the same way. When some families borrow a lot of money to buy their houses, housing prices rise and even conservative homeowners are forced to borrow and leverage so they too can live in comparable houses, if keeping up with their peers is important to them. If I had to name one source of irrationality that exacerbated this leverage cycle, I would not

point to homeowners who took out loans they could not really afford, but rather to lenders who underestimated the put option and failed to ask for enough collateral.

The observation that collateral rates are even more important outcomes of supply and demand than interest rates, and even more in need of regulation, was made over 400 years ago. In the Merchant of Venice, Shakespeare depicted accurately how lending works; one has to negotiate not just an interest rate but the collateral level too. And it is clear which of the two Shakespeare thought was the more important. Who can remember the interest rate Shylock charged Antonio? But everybody remembers the pound of flesh that Shylock and Antonio agreed on as collateral. The upshot of the play, moreover, is that the regulatory authority (the court) intervenes and decrees a new collateral level -- very different from what Shylock and Antonio had freely contracted -- a pound of flesh, but not a drop of blood. The Fed too should sometimes decree different collateral levels (before the fact, not after as in Shakespeare).

The modern study of collateral seems to have begun with Kiyotaki and Moore (KM 1997), Bernanke, Gertler, and Gilchrist (BGG 1996 and 1999), Holmstrom and Tirole (HT 1997), and Geanakoplos (1997), (2003), and Geanakoplos-Zame (GZ unpublished).⁸ BGG and HT emphasized the asymmetric information between borrowers and lenders as the source of limits on borrowing. For example, HT argued that the managers of a firm would not be able to borrow all the inputs necessary to build a project, because lenders would like to see them bear risk, by putting their own money down, to guarantee that they exert maximal effort. KM and I studied the case when the collateral is an asset such as a mortgage security, where the buyer/borrower using the asset as collateral has no role in managing the asset, and asymmetric information is therefore not important. The key difference between KM (1997) and Geanakoplos (1997) is that in KM there is no uncertainty, and so the issue of leverage as a ratio of loan to value does not play a central role; to the extent it does vary, leverage in KM (1997) goes in the wrong direction, getting higher after bad news, and dampening the cycle. In Geanakoplos (1997, 2003) I introduced uncertainty and solved for equilibrium leverage and equilibrium default rates; I showed how leverage could be determined by supply and demand, and how under certain conditions, volatility (or more precisely, the tail of the asset return distribution) pinned down leverage. In Geanakoplos (2003) I introduced the leverage cycle in which changes in the volatility of news lead to changes in leverage.. During periods of scary bad news, asset prices fall because of the bad news, because leverage plummets, and because leveraged optimists go bankrupt. This line of research has been pursued by Gromb and Vayanos (2002), Fostel-Geanakoplos (2008), Brunnermeier and Pedersen (2009), and Adrian and Shin (2009), among others.

Ia. Investor Heterogeneity, Equilibrium Leverage, and Default

⁸Minsky (1986) was a modern pioneer in calling attention to the dangers of leverage. But to the best of my knowledge, he did not provide a model or formal theory. Tobin and Golub (1998) devote a few pages to leverage and the beginnings of a model.

Without heterogeneity among investors, there would be no borrowers and lenders, and asset prices would not depend on the amount of leverage in the economy. It is interesting to observe that the kind of heterogeneity influences the amount of equilibrium leverage, and hence equilibrium asset prices, and equilibrium default.

When investors differ only in their optimism about future events in a one dimensional manner, then the equilibrium leverage will consist of the maximum promise that does not permit default.⁹ For example, suppose an asset will be worth either 1 or .2 next period. Suppose further that risk neutral investors differ only in the probability h that they assign to the outcome being 1. The most optimistic investor $h = 1$ is sure that the asset will be worth 1, and the most pessimistic investor $h = 0$ is sure the asset will be worth .2. At any asset price p the investors with h big enough that $h*1 + (1-h)*(.2) > p$ will want to buy the asset, while the rest will want to sell the asset. The buyers with high h will want to borrow money in order to get their hands on what they regard as cheap assets, while the sellers with low h will not need the money and so will be willing to lend. How much will the borrowers be able to promise using the asset as collateral, assuming the promise is not contingent on the state? The answer is .2, precisely the maximum promise that does not lead to default in either state.¹⁰

Thus when the heterogeneity stems entirely from differences in opinion, equilibrium leverage entails no default. A consequence of this is that the loans will be very short term. The longer the maturity of the loan, the more that can go wrong in the meantime, and therefore the smaller the loan amount can be if it avoids any chance of default. Investors who want to borrow large amounts of money will be driven to borrow very short term.

The Repo market displays these characteristics of short, one-day loans, on which there is almost never any default, even in the worst of crises.

Much the same analysis holds when investors differ only in their risk aversion. For the most risk-averse investors, an asset that pays 1 or .2 will be regarded as too dangerous, while investors with greater risk tolerance will find it attractive at the right price. These risk-tolerant investors will leverage their purchases, by borrowing money to buy the asset, using it as collateral for their loan. Once again the equilibrium leverage will rise to the point that the promises made will be (.2,.2) but no more. To be more concrete, suppose contrary to the previous case, that all the agents regard the outcomes 1 and .2 as equally likely. But suppose that untraded endowments rise and fall together with the asset payoffs. Then risk-averse agents on the margin will regard an extra penny when the asset pays 1 as less valuable than an extra penny when the asset pays .2; on the

⁹ See Geanakoplos (2003).

¹⁰ At first glance it would seem that the most optimistic buyers might be willing to promise say .3 in both states, in order to get more money today to invest in a sure winner of an asset. But since this promise will deliver .3 in the good state but only .2 in the bad state (assuming no-recourse collateral), the lenders will not want to pay much for this debt: this risky debt is very much like the asset they do not want to hold, and so they will pay very little more for it than the (.2,.2) promise. Since the borrowers would have to give up $.3 > .2$ in the state they think is likely to occur, they will choose to use their scarce collateral for the (.2,.2) promise instead of the (.3,.3) promise.

margin they would prefer a penny when the asset pays .2. Hence they will behave as if they regarded the payoff of 1 as less likely, exactly the same way the pessimists behaved, despite having the same beliefs as the risk-tolerant agents. Equilibrium leverage with heterogeneous risk aversion becomes the same as with heterogeneous beliefs.

The situation changes when some investors simply like owning the asset for its own sake in the period they buy it, such as when a homeowner likes living in the house. A similar situation arises if a producer can get more output from the asset than can be recovered if the lender takes it over. Somewhat surprisingly, in these cases the optimal leverage might be to promise (1,1) even when the asset will only deliver (1,.2) with probabilities everyone agrees on. If there are multiple states, and a cost of seizing the collateral, then the equilibrium promise will be somewhere between the maximum and minimum delivery. Contrary to the previous two cases, equilibrium leverage will involve a distinctly positive probability of default.

Traditionally the mortgage market has always recognized a substantial probability of default. And mortgage loans are traditionally of much longer duration than Repo loans.

Ib. The crisis stage

The crisis stage of the leverage cycle always seems to unfold in the same way. First there is bad news. That news causes asset prices to fall based on worse fundamentals. Those price declines create losses for the most optimistic buyers, precisely because they are typically the most leveraged. They are forced to sell off assets to meet their margin restrictions, even when the margins stay the same. Those forced sales cause asset prices to fall further, which makes leveraged buyers lose more. Some of them go bankrupt. And then typically things shift: the loss spiral seems to stabilize—a moment of calm in the hurricane's eye. But that calm typically gives way when the bad news is the scary kind that does not clarify but obscures the situation and produces widespread uncertainty and disagreement about what will happen next. Suddenly lenders increase the margins and thus deliver the fatal blow. At that point even modestly leveraged buyers are forced to sell. Prices plummet. The assets eventually make their way into hands that will take them only at rock bottom prices.

During a crisis, margins can increase 50% overnight, and 100% or more over a few days or months. New homeowners might be unable to buy, and old homeowners might similarly be unable to refinance even if the interest rates are lowered. But, holding long term mortgages, at least they do not have to put up more cash. For Wall Street firms the situation is more dire. They often borrow for one day at a time on the Repo market. If the next day the margins double, then they immediately have to double the amount of cash they hold for the same assets. If they don't have all that cash on hand, they will have to sell the assets. This is called de-leveraging.

All this would happen even if traders were completely rational, processing information dispassionately. When we add the possibility of panic and the turmoil created by more and more bankruptcies, it is not surprising to see lending completely dry up.

Ic. The Aftermath of the Crisis

After the crisis ends, many businesses and individuals will be broke and unemployed. Parts of the economy will be disrupted, and some markets may be on the verge of shutting down. The government will then face the choice of who to bail out, and at what cost. The bailout will typically be very inefficient, causing further losses to economic productivity. Doubts about which firms will survive will create more uncertainty, contributing to a difficult lending environment.

Id. What is so Bad about the Leverage Cycle

The crisis stage is obviously bad for the economy. But the leverage which brings it on stimulates the economy in the good times. Why should we think the bad outweighs the good? After all, we are taught in conventional complete markets economics that the market decides best on these sorts of trade-offs. In Geanakoplos (2009) I discussed nine reasons why the leverage cycle may nevertheless be bad for the economy.

First, very high leverage means that the asset prices are set by a small group of investors. If agent beliefs are heterogeneous, why should the prices be determined entirely by the highest outliers? In the current crisis, as I said earlier, the \$2.5 trillion of toxic mortgage securities were purchased with about \$150 billion in cash and \$2.35 trillion in loans. As of 2006 just two men, Warren Buffet and Bill Gates, between them had almost enough money to purchase every single toxic mortgage security in the whole country! So few people should not have so much power to determine crucial prices. Leverage allows the few to wield great influence.¹¹

Second, asset prices can have a profound effect on economic activity. As James Tobin argued with his concept of Q, when the prices of old assets are high, new productive activity, which often involves issuing financial assets that are close substitutes for the old assets, is stimulated. When asset prices are low, new activity might grind to a halt.¹² When asset prices are well above the complete markets price, because of the expectation by the leveraged few that good times are coming, a huge wave of overbuilding usually results. In the bad state that overbuilding needs to be dismantled at great cost.

Third, a large group of small business people who cannot buy insurance against downturns in the leverage cycle can easily sell loans to run their businesses or pay for their consumption in the good times at the height of the leverage cycle, but have a hard time at the bottom. Government policy may well have the goal of protecting these people by smoothing out the leverage cycle.¹³

¹¹ Standard economics does not really pay any attention to the case where agents have different beliefs, and median beliefs are closer to the truth than extreme outliers. This consideration motivates reasons 1 and 2.

¹² See Tobin and Golub (1998).

¹³ Here I am relying on Tobin's Q and the absence of insurance markets. The small businessmen cannot insure themselves against the crisis stage of the leverage cycle. In conventional complete markets economics, they would be able to buy insurance for any such event.

Fourth, the large fluctuations in asset prices over the leverage cycle lead to massive redistributions of wealth and changes in inequality. A buyer who leverages his purchase λ times makes $\lambda\%$ return on his cash for every 1% rise in the asset price; but he loses $\lambda\%$ of the cash he put down for every 1% decline in the asset price. When leverage $\lambda = 30$, there can be wild swings in returns and losses. In the ebullient stage, the optimists become rich as their bets pay off, while in the down states they might go broke. Inequality becomes extreme in both kinds of states.¹⁴

This brings us to the fifth potential cost of too much leverage. Instead of regarding the optimists as crazy, let us think of them as indispensable to the economy, or at least more valuable to the economy even than they are to themselves. That is probably what is meant by the term "too big to fail". If their marginal contribution to society is bigger than what they are paid, then their bankruptcy results in an externality, since they internalize only their private loss in calculating how much leverage to take on. This happens for example when managers of a firm calculate their own loss in profits in the down states, but neglect to take into their calculations the disruption to the lives of their workers when they are laid off in bankruptcy. If in addition the bankruptcy of one optimist makes it more likely in the short run that other optimists will go bankrupt, perhaps starting a chain of defaults, then the externality can become so big that simply curtailing leverage can make everybody better off.

Sixth, debt overhang destroys productivity. Banks and homeowners and others who are underwater often forego socially efficient and profitable activities. For example, a homeowner who is underwater loses much of the incentive to repair a house, even if the cost of the repairs is less than the gain in value to the house, since increases in the value of the house will not help him if he will be foreclosed eventually anyway.

Seventh, seizing collateral often destroys a significant part of its value. The average foreclosure of a subprime loan leads to recovery of only 25% of the loan, after all expenses and the destruction of the house are taken into account.

Reasons six and seven show that default leads to efficiency losses. If it were possible to arrange contingent loans, it would be better to have loans that automatically got smaller in bad states, eliminating these losses. We shall come to this later. But one might argue that in a world absent such loans, it may be so important to get the borrower the money, and the crisis might ex ante be so unlikely, that it is "second best" to go ahead with the big leverage and bear the cost of the unlikely crisis. After all, the losses in six and seven are losses the borrowers and lenders should have anticipated and internalized. Thus I augment reasons six and seven with two more reasons that compound them.

Eighth, in an effort to mitigate the crisis, the government often intervenes in inefficient ways. In the current crisis the government is propping up the banks by holding interest rates inefficiently low at zero. And worse still, the government has botched the mortgage foreclosure relief situation, which I shall discuss in detail later.

¹⁴ This is a purely paternalistic reason for curtailing leverage.

The agents in the economy do not take into account that by putting the economy more at risk, they create more inefficient government interventions. And of course the expectation of being bailed out by the government, should things go wrong, causes many agents to be more reckless in the first place.¹⁵

Ninth, a key externality that borrowers and lenders on both the mortgage and repo markets at the high end of the leverage cycle do not recognize is that if leverage were curtailed, prices would rise less in the ebullient stage and fall much less in the crisis. Foreclosure losses would then be less, and so would inefficiencies caused by agents being so far underwater. Limits to leverage in the good times in effect would provide insurance for investors in the bad times who we could imagine need to sell promises in order to start new building, but who are unable to buy the insurance directly because of the missing markets.

II. The Leverage Cycle of 2000-2009 Fits the Pattern

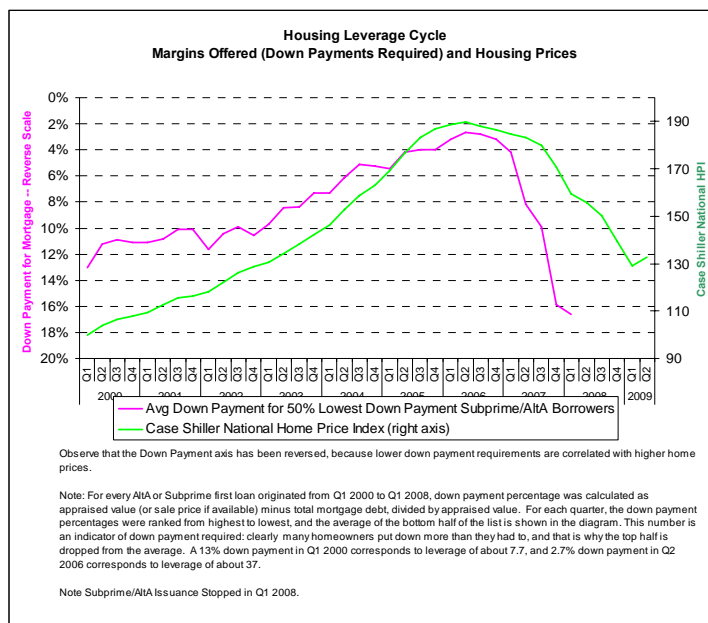
IIa. Leverage and Prices

By now it is obvious to everybody that prices soared from 1999 (or at least post the disaster period after 9/11/2001) to 2006, and then collapsed from 2007-9. My thesis is that this rise in prices was accompanied by drastic changes in leverage, and was therefore just part of the 1999-2006 upswing in the leverage cycle after the crisis stage in 1997-98 at the end of the last leverage cycle. I do not dispute that irrational exuberance and then panic played a role in the evolution of prices over this period, but I suggest that they may not be as important as leverage; certainly it is harder to regulate animal spirits than it is leverage.

Let us begin with the housing bubble, famously documented by Robert Shiller. In the graph below I display Shiller's national housing index for 2000-2009. It begins at 100 in Q1 2000, reaches 190 in Q2 2006 and falls to 130 by Q1 2009, as measured on the right vertical axis. But I superimpose on that graph a graph of leverage available to homeowners each month. This is measured on the left vertical axis and labeled by % downpayment, which is $100\% - LTV$. To compute this I began by looking house by house each month from 2000-2009 at the ratio of all the outstanding mortgage loans (usually a first and sometimes a second lien) to the appraised value of the house at the moment a first mortgage was issued for every subprime and Alt A house available in the Loan Performance Data Base. I then averaged over the 50% houses with the highest loan to value levels.¹⁶ In this way I get a robust estimate of leverage offered to homeowners. By leaving out the bottom 50% I am ignoring homeowners who clearly chose to leverage less than they could have, and by including all homes in the top 50% I am ensuring that the leverage measure was really available and not just a special deal for a few outliers. If anything my numbers underestimate the offered leverage.

¹⁵ This mechanism has been formalized in Farhi-Tirole (unpublished).

¹⁶ This data was compiled and analyzed by the research team at the hedge fund Ellington Capital Management.

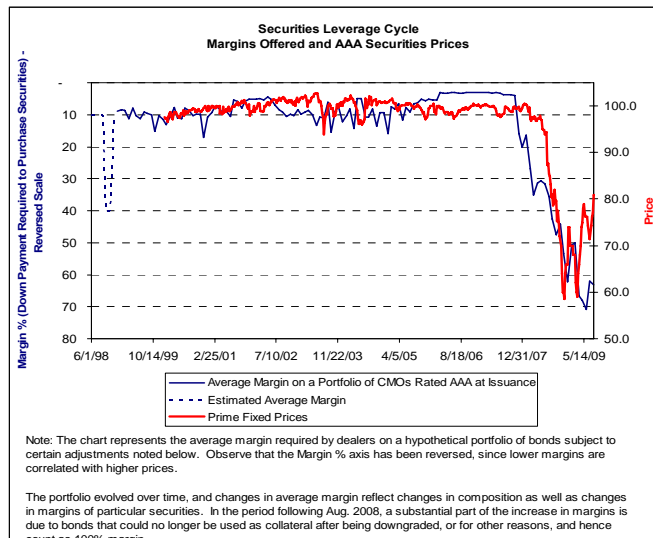


It is striking how correlated prices and leverage are, rising and then falling together. Especially noteworthy is that the leverage peaks in 2006, with less than 3% down, exactly when housing prices peak, and heads down much faster than housing prices.

In the next graph I present the history of the J.P. Morgan AAA prime floater mortgage index from about 2000-2009. The index is measured on the right vertical axis. These prime mortgages are taken out by investors with pristine credit ratings, and they are also protected by some equity in their deals. For most of its history this index stays near 100, but starting in early 2008 it falls rapidly, plummeting to 60 in early 2009. The cumulative losses on these prime loans even today are still in the single digits; it is hard to imagine them ever reaching 40%. It is of course impossible to know what people were thinking about potential future losses when the index fell to 60 in late 2008 and early 2009. My hypothesis is that leverage played a big role in the price collapse.

On the left vertical axis I give the loan to value, or equivalently the down-payment or margin, *offered* by Wall Street banks to the hedge fund Ellington Capital Management on

a changing portfolio of AAA mortgage bonds.¹⁷ As I said earlier, it is astonishing that the Fed itself does not have such historical data, and is apparently not keeping it even now. Fortunately the hedge fund Ellington that I have worked with the past 15 years does keep its own data. The data set is partly limited in value by the fact that the data was only kept for bonds Ellington actually followed, and these changed over time. Some of the variation in average margin is due to the changing portfolio of bonds, and not to changes in leverage. But the numbers, while not perfect, provide substantial evidence for my hypothesis and tell a fascinating story. In the 1997-98 emerging markets/mortgage crisis margins shot up, but quickly returned to their previous levels. Just as housing leverage picked up over the period after 1999, so did security level leverage. Then in 2007 leverage dramatically fell, falling further in 2008, and leading the drop in security prices. Very recently leverage has started to increase again, and so have prices.



1

IIIb. What Triggered the Crisis?

The subprime mortgage security price index collapsed in January of 2007. The stock market kept rising until October 2007, when it too started to fall, losing eventually around 50% of its value before rebounding to within 25% of its October peak. What, you might

¹⁷ These are the offered margins, and do not reflect the leverage chosen by Ellington, which since 1998 has been drastically smaller than what was offered.

wonder, was the cataclysmic event which set prices and leverage on their downward spiral?

The point of my theory is that the fall in price from scary bad news is naturally going to be out of proportion to the significance of the news, because the scary bad news precipitates and feeds a plunge in leverage. A change in volatility, or even in the volatility of volatility, is enough to prompt lenders to raise their margin requirements. The data show that that is precisely what happened: margins were raised. But that still begs the question, what was the news that indicated volatility was on the way up?

One obvious answer is that housing prices peaked in mid 2006, and their decline was showing signs of accelerating in the beginning of 2007. But I do not wish to leave the story there. Housing prices are not exogenous; they are central to the leverage cycle. So why did they turn in 2006?

Iic. Why did Housing Prices Start to Fall?

Many commentators have traced the beginning of the subprime mortgage crisis to falling housing prices. But they have not asked why housing prices started to fall. Instead they have assumed that housing prices themselves, fueled on the way up by irrational exuberance and on the way down by a belated recognition of reality, were the driving force behind the economic collapse.

I see the causality going in the other direction, starting with the turnaround in the leverage cycle. The leverage cycle was of course greatly exacerbated by the terrible consequences of falling housing prices, which then fed back to cause further housing declines.

As I hope I have made clear, in my view housing prices soared because of the expansion of leverage. Greater leverage enabled traditional buyers to put less money down on a bigger house, and therefore pushed up housing prices. It also enabled people to buy houses who previously did not have enough the cash to enter the market, pushing housing prices up still further.

There is, however, a limit on how much leverage can increase, and on how many new people can enter the market. Though negative amortizing loans pushed the envelope, no money down is a natural threshold beyond which it is hard to move. And as more and more households with less and less money entered the market, lenders began to become apprehensive that these people were less reliable. The rapidly expanding supply of new housing demand, fueled by access to easy mortgages, began to slow for completely rational reasons, not because of a sudden pricking of irrational exuberance. This naturally led to a peak in housing prices in 2006.

In my view the trigger that started the market falling from its peak was the creation of standardized CDS contracts on mortgages in 2005, at the very height of the market, which enabled CDS to be traded in large quantities on subprime mortgages in 2006. The

CDS is like an insurance contract paying if a particular bond (or index of bonds) defaults on part of its principal: if a homeowner mortgage default leads to a loss of capital of \$1 in some BBB bond, then a single CDS contract on the BBB bond requires a payment of \$1. The CDS payment, however, could be much more, because one speculator might have written 4 contracts to another speculator or series of speculators, effectively agreeing to pay \$4 for every \$1 somebody else lost on the BBB security. Thus there can be a tremendous magnification of gross losses by firms making bad CDS bets.

As I mentioned in Section Id, one important consequence of a leveraged *purchase* of assets is that when the underlying asset moves 1% in value, the buyer leveraged $\lambda \gg 1$ times suffers a gain or loss in his cash position of $\lambda\%$. Exactly the same multiplier applies to the CDS contract when the insurance amount is a multiple λ of the bond principal: a 1% change in the probability of default, which means basically a 1% change in the value of the bond, causes a $\lambda\%$ swing in the CDS contracts. The difference is that now instead of just the buyers of bonds bearing the big risk, both buyers and sellers of CDS are exposed to swings. In this Section we shall focus on the implication of the buyers leveraging through CDS; in Section IIIc we shall focus on the sellers leveraging through CDS contracts.

CDS allowed pessimists to leverage their views on assets for the first time, by taking out CDS insurance contracts on bonds they did not even own. For the optimists taking the other side of the CDS market this was not a new opportunity; they were essentially just increasing their leverage ratios on the underlying assets. (Many optimists were delighted to do so, with the result that they were more vulnerable to bad news, which would lead to steeper declines once the bad news hit, as I discuss more in Section IIIc.) But the point here is that some optimists, who felt they had already leveraged enough, switched from leveraging through asset purchases to leveraging by writing CDS insurance contracts on those same assets. To the extent that there were such switchers, the emergence of the CDS market induced some asset holders to sell and thus put downward pressure on asset prices even before any bad news hit.

In the leverage cycle prices soar because the most optimistic investors can leverage their views through huge borrowing. The pessimists cannot express their views because it is difficult to sell short. Once they can, in effect, sell short via the CDS, prices must reflect their views and not just the views of the leveraged optimists. I do not have access to data documenting the size of the CDS market, and how rapidly it grew in 2005 and 2006, but I suspect there lies a key to the crisis that has heretofore been overlooked.

The downward pressure on bond prices from CDS meant that the same securitizations became more difficult to underwrite. Securitizers of new loans looked for better loans to package in order to continue to back bonds worth more than the loan amounts they had to give homeowners. They asked for loans with more collateral. Thus not only did the trend to more housing leverage stop, it began to reverse in Q2 2006.

This had enormous implications. First, it meant that potential new homeowners began to be closed out of the market, which of course reduced home prices. But more

insidiously, increasing margins kept homeowners from refinancing because they simply did not have the cash to make the downpayment on a new loan. Until 2007, subprime bond holders could count on 70% or so of subprime borrowers refinancing between their second and third years in the loan. These homeowners began in pools that paid a very high rate of interest because of their low credit rating. But after two years of reliable mortgage payments, they would become eligible for new loans at better rates, which they traditionally took in vast numbers. Of course a prepayment means a full payment to the bondholder. Once downpayment requirements tightened, refinancing plummeted and this sure source of cash disappeared; the bonds became much more at risk and their prices fell more. Mortgagees who had anticipated being able to repay were trapped in their original loans at high rates; many became delinquent and entered foreclosure.

Foreclosures obviously lead to forced sales and downward pressure on housing prices. And falling home prices are a powerful force for further price reductions, because when house values fall below the loan amount, homeowners lose the incentive to repay their loans, leading to more defaults, foreclosures and forced selling. All this leads to falling security prices, making it even harder to issue new loans unless they involve higher and higher downpayments, which makes new home buying more difficult, which again forces housing prices down. And of course this leads back to tighter margins on securities.

The feedback from waffling security prices to higher margins on housing loans to lower house prices and then back to tougher margins on securities and then lower security prices is what I call the double leverage cycle.

Bond prices for 2006 vintage subprime loans began to fall in November of 2006 with the smallest trickle of bad news about homeowner delinquencies, then spiked downward in January 2007 after the year end delinquency report. This collapse of pricing is a powerful illustration of the potency of market expectations. The actual losses on subprime loans at that point were about 1% or less, yet the market was already anticipating huge losses on the order of 10%. Recall that for a pool to lose 10% of its value, the market must anticipate something like 30% of the homeowners will be thrown out of their houses, with 30% losses on each home sold. This first market crash should have been enough to alert our government to the looming foreclosure disaster, but three years later we still have not taken decisive action to mitigate foreclosures.

III. Why this Leverage Cycle is the Worst since the Great Depression

Every leverage cycle has the problems just listed. The crisis stage of every leverage cycle is bad. But the current crisis is far worse than the crises we saw in the two previous leverage cycles. There are a number of reasons why this cycle is worse than all previous cycles since the Depression, but the unifying theme behind all of them is a failure to put up enough collateral to back promises.

IIIa. Securities Leverage got Higher then Fell Farther than ever Before

In this cycle, leverage on traditional collateralizable assets increased to more than the highs from the previous cycle. One reason for this is that the lull since the previous leverage crisis included a period of especially low volatility, which led margins to sink lower and lower. That can be seen in the history of one mortgage hedge fund's margins (haircuts) over the last 11 years, given in the diagram in Section IIa. Note that before the crisis of 1997-1998 that ended the last leverage cycle, leverage was about 10 to 1 (margins were about 10%). During the 1998 crisis margins jumped to 40%, staying there about two months, before returning to their previous levels of 10%. In the "great moderation" in the 9 years afterward, leverage increased from about 10 to 1 to about 20 to 1 (the margins fell from 10% to 5%).

In 2007 leverage collapsed, with margins going from 5% to 70% on average. Two years after the collapse leverage is still low, whereas in 1998 the crisis was all over in two months.

The most dramatic change in margins has come from assets that were rated AAA, and which have been, or are about to be, downgraded. Previously one could borrow 90 or even 98.4 cents on a dollar's worth of AAA assets, and now one cannot borrow anything at all with these assets as collateral. According to Moody's, AAAs are supposed to have a 1 in 10,000 risk of default over a 10 year period. We are now seeing over 50% of all Alt-A and subprime AAA bonds partially defaulting, and we will see virtually 100% of all AAA CDOs partially default. Even when some assets have little or no chance of losing more than a few percent of their value, the market no longer trusts the AAA rating, and lenders will not lend even one percent of their current price.

In the runup to the present crisis, many new kinds of assets became usable as collateral. Thus, even if margins had not declined on old collateral, the leverage of the economy as a whole would have increased because there was new borrowing backed by previously unusable collateral, which brings us to pooling and securitization.

The process of pooling and securitization has been a crucial source of new collateral and increased leverage. Imagine a single subprime mortgage loan. Even in the days when it was believed that the expected loss from such a mortgage was between 1% and 4%, people still recognized that there was a non-trivial chance of a much bigger loss on a single loan. Lenders, inherent pessimists, would not have considered lending using a single subprime mortgage as collateral. But now consider a pool of subprime mortgages from around the country. If one believed that the loans were independent, so that a housing price decline in Detroit did not imply a housing price decline in California, then on a big enough pool of loans, the chance for more than 30% losses might be considered less than 1 in 10,000. Even a very pessimistic lender who believed in a 4% expected loss per loan would be willing to lend 70% of the value of the entire pool, provided that he got paid before anyone else. Thus a buyer of the pool of mortgages could imagine borrowing 70% of their collective value, when it would have been impossible to borrow anything on the individual loans.

Securitization took this borrowing on pools one step further by converting the loans into long term loans. The underwriter of the pool typically issued different bonds, whose payments depended on the homeowners' payments on their loans. Consider for example a bond structure with just two "tranches" or bonds. The senior tranche might pay interest slightly above the riskless government rate on the best 70% of the loans. As long as losses on the pool are below 30%, the senior tranche holder continues to get paid his interest and eventually his principal. The junior bondholder receives what is left from the pool after the senior bond holder is paid. The whole securitized structure can be interpreted as if the buyer of the junior piece actually bought the whole pool, using a long term loan from the buyer of the senior piece, collateralized by the whole pool. Once one understands the juniors as effectively borrowing from the seniors, it becomes clear how the rapid spread of securitization over the last 30 years, but especially over the last 10 years, dramatically increased the leverage in the system.

IIIb. Housing and the Double Leverage Cycle

Leverage on houses got to be much higher in this leverage cycle. In the recent leverage cycles, ending in 1994 and 1998, homeowner leverage did not get remotely as high as it did in the recent cycle. In 2006 many homeowners were borrowing with basically no money down, or as little as 3%.¹⁸ New mortgages like option arms were invented which abetted this mad rush to loan homeowners all or nearly all of the purchase price.

Thus the current cycle is really a double leverage cycle: not only are the mortgage securities subject to the leverage cycle, but their "fundamental" cash flows (namely homeowner mortgage payments) are also subject to the leverage cycle. These two cycles feed off each other. When margins are raised on homeowners, it becomes more difficult to get a new mortgage and home prices fall, jeopardizing mortgage securities backed by houses. But more importantly, it becomes more difficult for homeowners to refinance their old loans, putting these loans and the securities they back in much more jeopardy of defaulting. Similarly, when margins on securities are raised and their prices fall, then in order to sell the securities for higher prices, underwriters demand better underlying mortgages, i.e., more money down for homeowners.

IIIc. Credit Default Swaps (CDS)

The current cycle has been more violent because of the creation of the derivative credit default swap (CDS) market for mortgages in 2005, just at the top of the leverage cycle. One reason, as we discussed earlier, is that CDS allowed pessimists to leverage at just the worst time. Once CDS emerged, they were bound to put downward pressure on

¹⁸ It is deeply troubling that the government thru the FHA is now again offering mortgages with less than 3% down, which is the effect of the FHA minimum of 3.5% downpayment combined with the tax credit for homebuyers passed by the Congress. This is the wrong way to go about supporting home prices, a goal I support but not through methods that recreate the leverage problem that got us here. In Section IV I discuss methods of preventing and reversing an overcorrection in home prices that do not rely on overleveraging.

prices, because they allowed pessimists to express their views and indeed leverage those views. Had the CDS market for mortgages been around from the beginning, asset prices might never have gotten so high. But their appearance at the very top of the cycle guaranteed that there would be a fall.

A second reason that CDS made the fall much worse is because they allowed optimists to leverage even more. To the extent that CDS did not lower prices before any bad news, it was because leveraged optimists increased their leverage by taking the other side of the CDS, on top of their leveraged purchases of the underlying assets. But this made the optimists lose more and the crash much bigger once the bad news hit. CDS is a kind of insurance market for bond defaults, but instead of cushioning losses, it made them much worse because the buyers of the bonds did not buy the insurance, they sold it.¹⁹

One might mistakenly think that CDS should just wash out. In other words, for every dollar lost on the insurance, there should be a dollar gained by the recipient. But the optimistic writers of insurance are very different from the pessimistic buyers of insurance. When the bad news hits, the former lose and must reduce their purchases of assets; the latter gain, but still won't buy the assets. Writers of CDS insurance expose the economy to the same problems of excessive leverage I described earlier.

This brings us to the question of just how much leverage one could obtain via the CDS market. One difference is that a leveraged buyer of an asset has to make his downpayment in cash; this is what limits his leverage. With CDS it now appears that many firms, like AIG, were allowed to make naked bets, without any credible showing of collateral to back up their promise to pay in the event the default they were "insuring" against came to pass. If enough collateral had been put up by AIG, there would have been no reason to bail it (or more to the point, all its counterparties) out. In retrospect it seems that in some critical markets leverage knew no bounds.

The failure of some buyers of CDS insurance to insist on proper collateral from the writers of the insurance was made far worse because the gains and losses from CDS are not netted. A firm F that was neutral, betting one way against firm A on tranche BBB, and betting the opposite way on the same tranche against firm C could come out a loser anyway. If firm A defaults on its insurance payment, then F will be unpaid by A but still on the hook for paying C. So instead of just one firm A going bankrupt and another firm C going unpaid in the absence of collateral, as would happen with netting, another firm F might also go bankrupt, closing shop, firing workers, and creating other social costs.

Losses by leveraged buyers of assets can cause a chain reaction when a margin call forces a leveraged buyer to sell, which lowers the price forcing another leveraged buyer to sell and so on. But with uncollateralized CDS the chain reaction is more direct, unmediated by market price. The implication I shall draw later is that CDS should be

¹⁹ Of course there were undoubtedly some hedge funds who bought bonds they thought were undervalued, and bought insurance on similar bonds in order to hedge their position against the risk of a market downturn. These are the leveraged buyers who survived the crisis without a bailout.

traded on an exchange instead of in bilateral contracts, both to ensure that collateral is always posted by the writer of the insurance, and to make sure losses are netted.²⁰

There is another reason that there should be a limit on the size of the CDS positions people hold. In theory rational agents should be allowed to make bets of arbitrary size on exogenous events. But the CDS events are far from exogenous. Consider a credit default swap for a trillion dollars on a corporate bond promising a billion dollars. The writer of the insurance has every incentive to buy the whole failing corporation and pay off its bond holders one billion dollars rather than pay the trillion dollars of default insurance. Thus the holders of insurance can never be sure they will get their money.

In traditional insurance law, as I understand it, there is a prohibition against over-insuring by taking out insurance for more than the underlying asset, precisely because of the moral hazard such practices entail. Similar prohibitions should be adopted for CDS.

IIIId. Counterparty Risk

In bilateral CDS contracts it was often the case that the insurer did not post enough collateral to guarantee payment. This CDS problem illustrates a more general flaw in the whole system of contracting on Wall Street. These contracts to a great degree were written in such a way that only one side of every transaction was presumed liable to default, so that only the other side needed protecting. For example, in the Repo market a hedge fund borrower gets a loan from an investment bank, and puts up collateral at the bank worth more than the loan. The investment bank is protected against the potential default of the hedge fund, because in that event the collateral can be sold to recover the loan amount. But the contract does not contemplate the bankruptcy of the investment bank. What recourse does the hedge fund have if the investment bank goes out of business, shutting its doors and swallowing the collateral security? Traders who never before had to give a second thought to these counterparty risk questions suddenly had to reevaluate all their contracts, with disastrous effects on liquidity and price discovery.

Now, this unplanned-for counterparty risk has become the primary rationale for the government's seemingly-unending commitment to inject capital into "too-big-to-fail" institutions. "We can't afford another Lehman," is the common refrain; we had to bail AIG out not because it was so vital, but because if it defaulted a chain reaction might ensue. I am not at all sure that the chain reaction would have been so devastating, or that policymakers made a serious calculation of the costs of allowing the defaults to continue. The unstated and quite questionable underlying premise is that we must be able to afford whatever it now will cost to protect counterparties completely from the pain that would otherwise have attended their failure to protect themselves. That is not just doubtful, but ignores the moral hazard that such a policy creates. I will return to the question of moral hazard before I conclude.

²⁰ I note with dismay that as of this writing the measures before the House and Senate do not do nearly enough to regularize CDS trading, allowing significant continuation of over the counter CDS trading.

The prospective solution to the counterparty risk problem is to ensure that both sides put up enough collateral. Of course people are now more alert to their counterparty vulnerability than they were before, and thus pressure will grow, for example, on Repo lenders to warehouse the collateral at a third site that would not be compromised by the bankruptcy of the lender. This raises questions about whether there is enough collateral in the economy to back all the promises people want to make, which I discuss at length in Geanakoplos (1997) and Geanakoplos-Zame (unpublished). But I believe there should be a government initiative to push as many bilateral contracts onto exchanges as possible; agents trading with the exchange will be forced to put up collateral, and the netting through the exchange will economize on collateral. As for any finance-related bilateral contracting so particular that it could not be moved to an exchange, the parties could either accept strict disclosure requirements and limits on how much of this contracting they could engage in or accept doing without the instruments altogether. *CDS in particular should be traded on an exchange.*

IIIe. Government Laxity, Deregulation, and Implicit Guarantees Increased Leverage

The mildness and shortness of the crisis stage of the last two leverage cycles, in 1994 and 1998, led many people, perhaps including the regulators, to ignore leverage altogether. The abrupt tightening of margins in 1998 was explained by the supposed irrationality of lenders, who it was said, reacted by raising margins after the fact, i.e. after the fall in prices had already occurred. It appears that virtually no lenders lost money on loans against mortgage securities in that crisis. The run-up in asset prices and home prices during the current cycle was attributed mostly to irrational exuberance, instead of being understood, first and foremost, as an inevitable consequence of the increase in leverage. Partly as a result of this faulty narrative, the Fed and the other branches of government did nothing to curtail the dramatic growth in homeowner leverage, or consumer leverage more generally, or corporate leverage, or securities leverage.²¹ Banks were allowed to move assets off their balance sheets and thus avoid capital requirements, further increasing their leverage.

Not only did the Fed (and everyone else) turn a blind eye to the rising leverage pervading the system, it encouraged the deregulation that unleashed the leverage inherent in outsized credit default swaps. As I mentioned earlier, CDS contracts seem on their face to be either gambling or writing insurance in excess of the value of the property being insured. Under either interpretation they would have run afoul of state laws prohibiting gambling or over-insurance. So it took a positive act of Congress, prodded by Treasury and Fed Chairman Greenspan, to pass legislation exempting CDS from those limitations.

Perhaps the most important and unwitting government stimulus to the increased leverage was the implicit government guarantees for entities that were considered too big

²¹ I note that the Fed was not alone in its lackadaisical approach to leverage. The SEC lifted what weak leverage limits it had in 2006 and no arm of government took any steps to stop the leverage orgy that led to the present crisis.

to fail. Fannie Mae and Freddie Mac grew bigger and bigger. The presumed government guarantee on their promises enabled them to leverage their assets to 30 or more, and still issue debt just above Treasury rates. Without this implicit government backing, they would never have been able to borrow so much with such little capital. Even more important than Fannie and Freddie, many investment banks were allowed to write CDS and give Repos without collateralizing their implicit promises. It seems virtually inexplicable that Wall Street ignored this counterparty risk, unless it assumed that these banks were backstopped by the Fed. And indeed after some doubts when Lehman collapsed, that expectation proved correct.

III f. The Rating Agencies effectively increased Leverage

The expansion of the mortgage market into less credit worthy households made it more likely that a shock would someday be big and bad and scary, creating more uncertainty and more disagreement. The anticipation of that, however remote the possibility seemed, should have made lenders nervous and caused them to put a brake on leverage. This rational concern was dramatically reduced by a foolish faith many investors had in the rating agencies and their default models, which were widely relied upon by market participants (and the ratings agencies themselves), but which failed to account adequately for the probability that defaults in certain circumstances would be highly correlated. Some investors forgot the incentives of the rating agencies and the incentives of many market actors to downplay seriously the probability of highly correlated defaults. In the face of a long history of low defaults and with billions of dollars of deals waiting on the blessing of a small handful of rating agency actors it would have been astonishing if ratings had been as tough as they should have been. The same lesson applies to the mortgage brokers who were able to collect fees for signing up borrowers without facing any losses themselves if the borrowers defaulted.

III g. Global Imbalances increased Leverage

An important factor documented by Ricardo Caballero and others is that the enormous savings glut coming from Asia increased the demand for safe assets. This presented a profit opportunity to American financiers, who were thus stimulated to engineer the securitizations which created apparently safe bonds out of risky assets. It is hard to assess how important this factor is, but surely a gigantic demand for safe bonds would indeed give a big incentive to create those bonds and thus inevitably to concentrate more risk in other bonds. On the other hand, one must acknowledge that the Chinese did not buy the AAA toxic mortgage securities that have been at the center of the crisis.

III h. All Upside Down

The upshot of the huge credit boom and the plunging prices was that an extraordinary number of households, businesses, and banks ended up upside down or underwater, that is, with debt exceeding their assets. It is estimated that between 6 and 10 million homeowners will be thrown out of their houses; the government has assumed trillions of

dollars of mortgage debt, spent hundreds of billions of dollars bailing out banks and firms like AIG, and on account of the huge number of failing banks, the FDIC is on the verge of running out of money.

III. Why didn't Wall Street Risk Managers Anticipate the Collapse?

Having discussed many of the factors that exacerbated the crisis of 2007-9, we are now in a position to assess the widely held view that nobody saw it coming.

Nobody doubts that Wall Street understood that there was considerable risk in subprime mortgage pools. That is why they were tranching into different tiers, called AAA, AA, down to BBB. And these bonds were all senior to residual pieces and overcollateralization, which together provided another 8% of protection. Recall that if 25% of the loans result in homeowners being thrown out of their houses, with 25% losses on each foreclosed home, that amounts to losses of just 6.25% for the pool as a whole, which would leave the rated bonds unscathed. So the question is really not whether Wall Street overlooked the risk, but rather how it came to be that Wall Street so badly underestimated the size of the risk?

The answer I believe is that it was nearly impossible to foresee the devastating consequences of the multiple feedbacks between securities and houses embodied in the double leverage cycle. Complex adaptive systems are notoriously hard to predict. Contrary to the myth that nobody imagined that housing prices could go down as well as up, I suspect that virtually every large bank and hedge fund considered a scenario in which housing prices went down at least 10%. But how many anticipated that at the same time mortgage downpayments would rise to the point that subprime refinancing virtually stopped, as did origination, causing further house declines? And that at the same time servicers and banks would refuse to write down principal, leading to more foreclosures and further house declines? And that the government would stand by doing close to nothing about the foreclosure problem for what is now approaching three years?

IV. The Solution to the Crisis: A Multi-Pronged Approach

Once the economy is plunged into circumstances as dangerous as we saw last year, the government has no choice but to act boldly. The correct course of action is to reverse the final stages of the crisis and thus stop the panic. At the outset of this crisis I recommended the three prong approach I present here, a thematic solution to the crisis, which addresses in order of importance, all aspects of the final stages of the leverage.

As I explained above all leverage cycles end with (1) bad news creating uncertainty and disagreement, (2) sharply increasing collateral rates, and (3) losses and bankruptcies among the leveraged optimists. These three factors reinforce and feed back on each other. In particular, what begins as uncertainty about exogenous events creates uncertainty about endogenous events, like how far prices will fall or who will go

bankrupt, which leads to further tightening of collateral, and thus further price declines and so on. In the aftermath of the crisis we always see depressed asset prices, reduced economic activity, and a collection of agents that are not yet bankrupt but hovering near insolvency. How long the aftermath persists depends on how deep the crisis was and the quality of the government's response. Whether we find ourselves in a similar crisis in the future depends on whether, understanding how leverage got us here, we adopt reforms that require the Fed to monitor and regulate leverage in the good times. First, I take up what government actions should have been taken and in what order to address the final stage of the double leverage cycle that the government was called on to address in 2007.

The thematic solution once the crisis has started is to reverse the three symptoms of the crisis: contain the bad news, intervene to bring down margins, and carefully inject "optimistic" equity back into the system. To be successful any government plan must respect all three remedial prongs, and should be explainable and explained to the public in terms that it can understand. Without public confidence, which can only flow from public understanding, any government plan undermines its own objectives and limits its prospects for success. The government's actions thus far have not addressed all three prongs adequately and policymakers have thus far largely failed to explain how their various solutions are tied to the roots of the crisis we face.

Unfortunately, the government's first bailout plan was not clearly thought through and neither it, the ostensible solution, nor the problem that required a solution were clearly explained. The public, confused, afraid and suspicious, lost faith and prices fell further. But even now, after the panic has subsided, we must ask who or what is the government trying to save? Many in the public have come to believe it is merely trying to save banks, or some big banks, from failure because somehow their failure would signal a catastrophe for the American brand, to be prevented at all costs. The confusion about the government's goals has created its own set of problems, which we can ill afford. Clarifying the government's goals will be harder now, but it remains an indispensable step.

IVa. Step One: Addressing the Precipitating Cause of the Crisis: Scary Bad News (Massive Uncertainty) About Housing and the Assets Built on Housing

To foster recovery from the dramatic final stage of a leverage cycle as large as the one we have just experienced, the government must address the cause of the uncertainty that triggered the end stage. Without that, the efforts taken thus far to bring margins down and recapitalize banks, even had they been perfectly implemented, would not be enough to reverse the cycle and restore the economy to health. In this crisis with its roots in housing that means: doing something for housing prices and homeowners. This makes undeniable sense in this crisis, not just because addressing the cause of the uncertainty and disagreement (the scary bad news) is critical to reverse any leverage cycle, but because the biggest social losses will probably come from the displaced homeowners. And, of course, the biggest reason for the tumbling mortgage security prices, and the resulting insolvency of the banking sector, is fear that housing prices will keep falling.

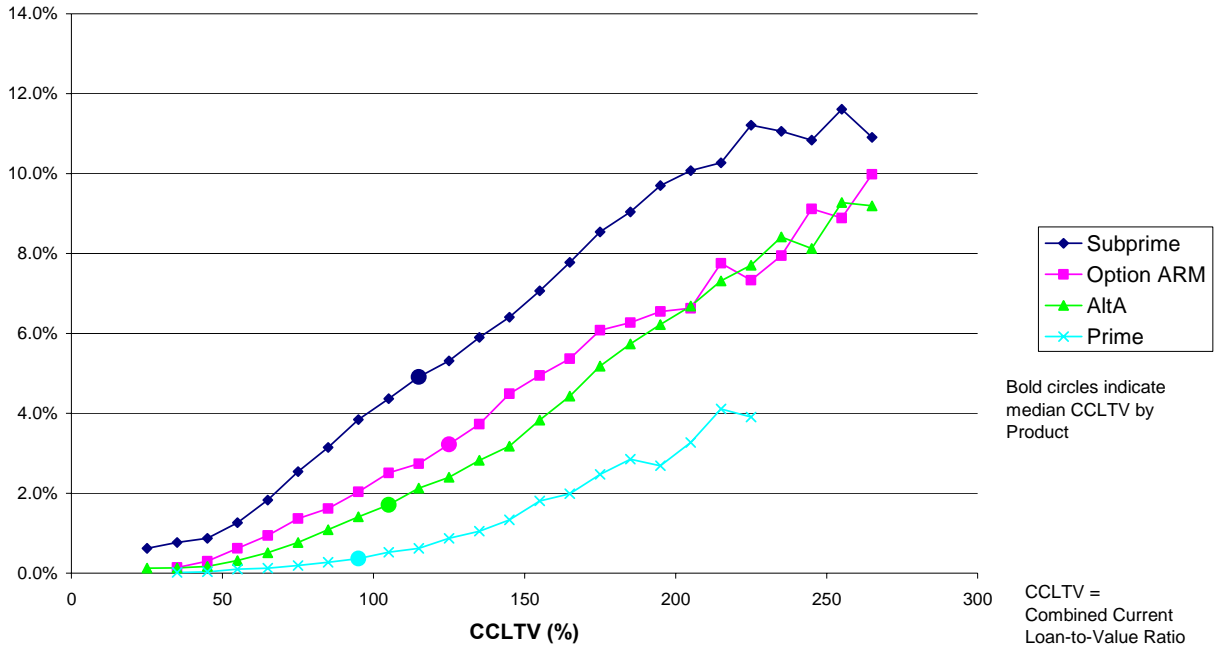
IVa1. Saving the Homeowners: Stemming the Tsunami of Foreclosures to Come

One of the saddest stories in this financial meltdown is that millions of homeowners are being thrown out of their homes for defaulting on their mortgages. Throwing somebody out of his home is tragic for the homeowner, but also very expensive for the lender. One of the shocking aspects of the foreclosure crisis is how low the recoveries have become on foreclosed properties, after expenses. (Interestingly, the mortgage bond index markets anticipated these bad recoveries.) Nobody gains when the homeowners are thrown out and the banks and/or investors collect pennies on the dollar for the money they loaned. Nevertheless, nearly 2 million homeowners have already been evicted, another 3.2 million are seriously delinquent and almost surely will be evicted in the near future, and at least another 3 million more will eventually default and be evicted if trends continue. Without much bolder action than has thus far been taken by the government, the stream of evictions and bad recoveries for lenders will continue and accelerate, becoming a torrent that will further depress housing prices and impede economic recovery.

The single most important reason homeowners are defaulting is not job loss; it is that their houses are underwater. The following study done at Ellington Capital Management in February 2009 shows the **monthly** default rate for homeowners (with various loan types), as a function of the ratio of the loan amount to the current value of the house. The study examined every home in the Loan Performance data base, taking the appraisal value of the house at the moment the first loan was given, and then assuming thereafter that the house changed in value according to the Case Shiller index for houses with the same zip code.

As can be seen, homeowners who have positive equity in their homes default infrequently. But for homeowners with negative equity, the rate of default is staggering. For subprime borrowers with a 160% loan to value ratio (that is, the ratio of all the mortgages on the home divided by the current home price), the default rate is 8% per month!

**Monthly Net Flow (Excluding Modifications)
from <60 Days to ≥60 Days Delinquent**
Based on Performance from Nov 08 - Jan 09 for all Deals Issued in 2006



These findings seemed surprising when I first presented them in a New York Times editorial written with Susan Koniak on March 5, 2009. But nowadays many other researchers are reaching the same conclusion.²² The conclusion is an inescapable matter of incentives. It is economically foolish for a homeowner to continue to pay off a \$160,000 loan when his house is only worth \$100,000.²³ Mortgage loans have turned out to be no-recourse – after seizing the house, the lender almost never comes after the borrower for more payments. The only other thing the homeowner loses by defaulting is

²² The Congressional Oversight Panel cited negative equity as the single greatest predictor of default in its report of March 6, 2009. It included the data I provide here as evidence of this fact, data which I supplied to the Panel in advance of its report, as well as data from an array of government agencies, all of which corroborated the Ellington data presented here. That is not to say that joblessness is not now having a significant effect on default rates. It is. But even now negative equity is the best predictor of default and many Americans with jobs are defaulting, and will continue to default, not just the unemployed. See generally the Congressional Oversight Panel's October 9, 2009 report on the continuing foreclosure problem and the unimpressive results from government foreclosure prevention efforts taken thus far. Finally, to the extent job loss has become (it was not at the start of this crisis) a significant cause of defaults, strong effective measures to eliminate the scary bad news, i.e., efforts to stabilize the housing market, will help the economy recover faster and thus help the employment rate.

²³ The implication of this statement is that the Obama plan of reducing interest rates to lower mortgage payments to homeowners who are underwater is, at least for those seriously underwater, an invitation or encouragement to those homeowners to act in a manner that may make no or little economic sense, i.e., stretching to make mortgage payments, albeit lowered from their highs, on homes those people will never own when many of them might be able to rent more cheaply.

his credit rating, but especially for a non-prime borrower with a low credit rating to begin with, how much can that be worth?

Foreclosures are horribly expensive. At the present time, subprime lenders collect about 25 cents per dollar of loan when they foreclose. For example, if the loan is for \$160,000 and the house has fallen in value to \$100,000 and the homeowner defaults and is evicted, the lender can expect to get back \$40,000. It takes 18 months on average to evict a homeowner, and during that time the house is often left empty and vandalized. Of course the main reason the average recoveries are so low is that the defaulters are the homeowners who are furthest underwater.

In a rational world, these foreclosure losses would never happen. The lenders would renegotiate the loans by reducing the principal so the homeowners could pay less and stay in their homes, and the lenders would actually get more by avoiding the losses from legal fees and bad home price sales. If the above loan were written down to \$80,000, the homeowner would likely find a way to pay it, or else fix up the house and sell it for \$100,000. Either way the lender would get \$80,000 instead of \$40,000. That would have the further benefit of keeping many homes off the market and thereby aid in the stabilization of home prices..

The Obama plan of paying servicers to temporarily reduce interest payments was doomed to fail from the start, and so far it has utterly failed. Cutting monthly interest payments by half will temporarily reduce the homeowners' payments by the same amount that cutting principal by half would. But under the government's plan the cut is temporary, not permanent, and thus is sure to lead to many more defaults in the long run than cutting principal would as soon as the interest rate goes back up. In fact, since the homeowner will still be underwater, he won't in any meaningful sense own his house. He will be less likely to make repairs, he will not be able to give the house to his children, he will not be able to sell it if he gets a job in another city. In short, there is every reason to think he will likely default even before the interest rate goes back up. And indeed for loan modifications where there is no principal reduction, the redefault rate is above 50% within nine months.²⁴ The government's present plan allows servicers to *increase* principal while cutting interest by adding fees and other things to the old principal amount. The plan is likely to leave more homeowners underwater than there would be absent the plan and others more deeply underwater, i.e., with even less chance of ever owning their homes and thus less incentive to keep up with mortgage payments, than they would have without this government "rescue" plan.

The Obama plan has already wasted billion of dollars, and is slated to cost \$75 billion -- all on a foolhardy mission that in the end will hurt homeowners and bondholders, but enrich servicers, as I will soon explain. In the first six months of the plan, according to the Congressional Oversight Panel's October 2009 report, only 85,000 mortgages had been modified, and of those only 1,711 were "permanent" modifications (i.e. permanent/temporary since interest rate reductions under the plan are designed to

²⁴ See OCC/OTS Mortgage Metrics Report, Q2 2009

end in a few years time), and of those only 5 involved principal reductions.²⁵ The administration apparently still does not understand that the servicers have incentives that put them at odds with bondholders and homeowners, so that they actually prevent modifications that would help lenders and homeowners but hurt servicers.

In the case of many non-prime borrowers, the loans have been pooled in a trust, and their principal has been tranching into many different bonds, each held by a different investor. The lenders are the bondholders, but they are numerous and dispersed and by contract have given up the legal right to renegotiate with homeowners, delegating that right to an agent.²⁶ That agent is the servicer, who has a fiduciary responsibility to act in the interests of the bondholders in the trust. In “normal” times this arrangement worked tolerably enough. But in this crisis, with so many mortgages in or near default, it has failed miserably for at least four reasons, all traceable to a misalignment of interests between servicers and those whose interests they are supposed to protect, which has now ruptured with terrible effects.

First, modifying loans is a time consuming and expensive operation. The servicers who have the legal right to make modifications do not get paid directly for improving the cash flows to loans. It is generally cheaper for them to move into foreclosure. In particular they have no incentive to set up the huge infrastructure and to hire and train the extra staff required to make sensible modifications on a grand scale.

Second, modifying the loans has different effects on different bondholders. It has proved difficult to modify loans in a way that pleases everyone. Writing down principal immediately would make more money for the trust as a whole. But it would immediately wipe out the BBB bonds and possibly other lower level bondholders. Letting the homeowners sit in their houses without paying for a year or two means that during all that time all the bondholders, including the BBB, get their coupons paid in full from servicer

²⁵ On December 10, 2009, as I was completing this paper, the Treasury issued a press release stating that “permanent” modifications had grown to just over 31,000 and that just over 700,000 modifications were now ‘under way’ across the country. But my criticism of the plan is not based on the number of the time-limited “permanent” modifications completed, but rather is centered on the near-exclusive concentration on interest reduction and, as I explain in the text below, on leaving the servicers in charge of the modification decision. I could find no updated information in the report on how many, if any, of the trial or permanent modifications involved principal reduction as opposed to interest reduction, and I have no reason to assume that the percentage of modifications with principal reductions as increased. It is also worth noting that in the Congressional Oversight’s Report of October 2009, see p. 127, the Panel notes that the apparent rise in modifications due to the administration’s plan might be overstated as there was some evidence of a ‘substitution effect,’ i.e., the number of “voluntary” modifications by servicers (or modifications made outside of the administration’s plan) went down in the first six months of the plan, suggesting that the gross number of modifications attributable to the plan itself might be exaggerated. The new report by the government does not provide data from which one can assess any substitution effect.

²⁶ It should be noted that this right was given up to avoid the collective action problems inherent when the lenders are numerous and dispersed, and thus was given to a third party (the servicer) to be exercised on the lenders behalf, the servicer acting as a fiduciary for the lenders. It was not given to the servicer to be used to benefit the servicer’s interests at the expense of the principals (the lenders) and using the discretion to modify or foreclose that way is self-dealing on the part of servicers and a breach of their obligation to the lenders.

advances. The servicers then recoup their advances, at the expense of the trust (which by then is mostly the AAA bonds), when the house is finally sold. The servicers say they are terrified of lawsuits from the bondholders if their modifications help most bondholders but hurt others. In reality servicers are simply using this as an excuse to keep their fees coming. That was revealed when Congress passed legislation that freed servicers from lawsuits by bondholders.²⁷ Whether or not servicers are or were afraid of lawsuits, there is a complex negotiation involving many bondholders and the servicer which is not being resolved efficiently, and the government needs to intervene to break an impasse for the public good.

Third, now that the government mortgage plan based on interest reductions has given the servicers cover to reduce interest instead of principal, they can be counted on to do the former and eschew the latter. Cutting the principal by half for example immediately reduces the servicer's fee by half (since the fee is computed as a percentage of principal), while cutting interest does not. Moreover, cutting principal increases the likelihood the homeowner will sell or refinance, which would cause the servicer to lose his fee entirely.

Fourth, the biggest servicers happen to be owned by the biggest banks, who in turn own a huge number of second loans. Cutting principal on first loans almost implies cutting the principal drastically, if not to zero, on second loans. But that would mean that the banks could no longer hold the second liens on their books at the inflated prices that they are holding them now. The banks want desperately to postpone the write-down of those second liens, which is to say, they have yet another powerful motive not to do what is in the interest of lenders, homeowners and the economy as a whole, reduce principal on the first loans they are servicing. By contrast, cutting interest on first loans makes it easier to justify carrying the second liens on bank balance sheets at inflated values for the near term (which is what matters to the banks) as homeowners are more likely to be able to make the lower monthly payments (from lower interest rates) than their original payments, at least in the short run.

Another proof that servicers have bad incentives is that when the big banks who own the servicers hold the same kind of loans in their private portfolios, they do reduce principal. During the second quarter of 2009, 30% of all loan modifications done to loans directly held in bank portfolios involved some principal reduction. During that same quarter the servicers reduced principal on 0% of their loan modifications, as did the government owned agencies Fannie Mae and Freddie Mac.²⁸

Loans that have not been securitized and are held entirely by banks (whole loans) are also not being written down fast or far enough.²⁹ The pathology this time is if

²⁷ See Section 201 of the Helping Families Save Their Homes Act of 2009, preventing lender/bondholders from suing servicers who modify mortgages under a qualified mortgage modification plan, which is defined in the Act broadly enough to include all economically sensible modifications, i.e., those with a reasonable prospect of returning more money to the lenders than a foreclosure.

²⁸ See OCC/OTS Mortgage Metrics Report, Q2 2009

²⁹ At first, it appeared that they were not being written down at any greater rate than securitized loans, although the data is not perfect on this. Foote et al (2009) argued that this showed there was no real

anything more distressing. It appears that the banks, abetted by the suspension of mark to market rules, are unwilling to take losses.³⁰ It is better for them to keep the mortgage on their books at \$160,000, even though it will eventually bring them only \$40,000, than it is to reduce the principal to \$80,000 and mark it there. The suspension of mark to market rules has also fed the pathology discussed above on second liens. Abetting the banks in their efforts to hide losses is bad government policy. It is sad to say that while the government's foreclosure plan has failed to stem the avalanche of defaults and looming foreclosures, it has succeeded (with help from the suspension of mark to market accounting) in obscuring the value of bank assets, many of which are being guaranteed by the government, and thus in turn obscuring the value of mortgage assets now owned by the government. In my terms, this only ensures the continuation of scary bad news (uncertainty) when the goal should be for government plans to clarify the situation (the value of assets) and thus help dispel what I call "scary bad news" that keeps leverage severely constricted.

As in the past, the solutions the government has proposed and tried have thus far all concentrated on interest rates, here quite destructively, and once again have ignored the equity/collateral problem that must be addressed to reverse the impending avalanche of foreclosures we now face. (For more details see my op-ed with Susan Koniak, *Principal Matters*, on why the administration's plan to stop foreclosures by chiefly relying on interest rate reductions was doomed to fail.. NY Times March 5, 2009.)

Nonetheless, the government still has a remarkable opportunity to clean up the process of reworking loans, but it must change course dramatically to do so. In October of 2008 (see my proposal with Susan Koniak summarized in the op-ed, *Mortgage Justice is Blind*, NY Times, October 30, 2008) I urged the government to take the reworking process out of the hands of the servicers and put the decision into the hands of government hired trustees. All the failed efforts to stop the ever-growing number of foreclosures have only demonstrated the need for just such a bold plan. In my approach, the government-hired trustees would be told only about the homeowners, and would be blind to the bonds built atop the loans. Their job would be to choose modifications or foreclosure, whichever they judged would lead to the greatest recovery on the original loan. They would thus be carrying out the duties of the servicers exactly as they were intended, but free from the conflicts of interest and perverse incentives which have prevented the servicers from carrying out their mission.³¹

incentive to write down loans. Now, again based on imperfect data, there seems to be some evidence that principal on whole loans, at least at some banks, is being written down more often than principal on securitized loans (which effectively never see reductions in principal), although reductions in principal on whole loans is still much less frequent and much less widespread than one would expect to see given the economics of the situation, i.e., that reducing principal for many underwater homeowners will yield much more money than foreclosure or (over the long term) than interest reductions.

³⁰ Banks may also still be holding out for some more direct government subsidy for their failing whole loans, either through government assumption of the mortgage risk or some other form of direct payment for anticipated whole loan losses.

³¹ Under this plan the servicers would still collect the servicing fees they do now. They would continue their duties of sending letters to homeowners, collecting the monthly payments and distributing them to bondholders, evicting homeowners who did not pay, selling their homes, and so on. The only change is

For a vast number of homeowners now upside-down in their mortgages, i.e., owing more than their home is presently worth, this process would likely result in a reduction of principal. Why? Because reducing principal would yield investor/lenders vastly more money than foreclosing, as we have seen.

If the government handled this correctly, most homeowners who were unable to pay the original loan but were willing and able to pay a modestly lesser amount would get to stay in their homes, the bondholders collectively would get more payments than they are currently expecting (though some tranches would be hurt), and the government would not have to invest any capital.

This plan is not the same as “cramdown” in bankruptcy, which Congress has thus far rejected and which entails costs and creates some perverse incentives that my plan avoids. To get a reduction in principal through bankruptcy (assuming the law were changed to allow that) would encourage homeowners now current on their mortgages but underwater and thus likely to default sometime in the future to default immediately to support their petition for bankruptcy relief. That might well precipitate a sudden and severe fall in housing prices and the value of mortgage securities. On the other hand, my plan, as originally conceived, builds in a presumption that underwater homeowners now current on their mortgages would **not** qualify for principal reduction if they went into default upon the adoption of this government plan unless they could show the sudden default was caused by some exogenous hardship, such as job loss or medical emergency with attendant high costs. That would give underwater homeowners now holding on for the short term a continued incentive to keep paying until the government trustees could evaluate their loans and circumstances for a reduction in principal. Second, my plan differs from bankruptcy in that it does not subject homeowners, many of whom are underwater through no fault of their own or through, at most, fault equally shared between themselves and the irresponsible mortgage hawkers who sold them a financial product that made little economic sense, to the shame and devastating harm to future credit and thus to their economic circumstance that a bankruptcy proceeding entails. Third, my plan contemplates putting experts in local housing markets, community bankers, in place as the government trustees, not bankruptcy judges who are neither numerous enough to handle the number of defaulting homeowners who should justifiably qualify for principal reduction, nor as knowledgeable as the personnel I would put in charge. Indeed, bankruptcy judges would, as they commonly do, have to hire the kind of personnel I am advocating the government hire directly, to advise the courts on the appropriateness and nature of any mortgage modifications the courts were to order. Indeed, it is highly doubtful that our bankruptcy courts could handle the job Congress would be giving them if so-called cramdown legislation were adopted, at least not if it were adopted without first having a plan like the one I propose up and running to handle the vast majority of underwater homeowners. If my plan were indeed up and running,

that the mortgage loan modification would be taken out of their hands and put into the hands of the government trustees. This reassignment of a particular duty in the contract is not a “takings” from the servicer, among other reasons because the servicers have failed to carry out their fiduciary obligations to the bondholders who employ them to get the most possible value out of the loans. See Dana (2010).

bankruptcy might be something worth considering as a true last resort for those already deeply in default. Finally, bankruptcy involves all kinds of hidden costs, like lawyer fees and trustee expenses (on top of the experts required to advise the bankruptcy judges) that are unnecessary and wasteful for the vast majority of homeowners and lenders who should be able to make a win-win deal without incurring those costs.

My plan envisions the government paying for the trustees (community bankers) to decide on whether principal modification would bring in more for bondholders than foreclosure, but I estimate that government expenditure should come to under \$5 billion. The current government plan allocates \$75 billion to pay incentives to servicers, a wasted allocation in that the incentives pulling servicers in the other direction are more powerful than the promised government payouts. My plan would eliminate the expert fees bankruptcy would entail and because my plan involves no court proceeding, the hidden costs to our court system and legal fees would also be saved.

My original plan called for legislation to cut through the agency-problem mess in securitized pools of mortgages by eliminating contract provisions in pooling arrangements that now enable servicers to act contrary to the interests of the investors the provisions were originally designed to protect. Thus, I envisioned that the government trustees would only be empowered to modify securitized mortgages. This would leave unsolved the problem of whole loans that banks are still refusing to modify sensibly, by writing down principal for underwater homeowners. I am tempted now to advocate an extension of this plan to the whole loans as well.

I believe, however, that once a government program of modifications for securitized loans proved its worth by resulting in more recovery for investors, banks would be likely to adopt similar standards to modify whole loans. In the first place, they are already starting to reduce principal on their whole loans, even when they refuse to do so as servicers for securitized loans. As I explained earlier, I believe that banks are reluctant to make sustainable mortgage modifications by reducing principal on their whole loans because they fear the massive write downs that would entail; particularly when no competitor is making that move, each bank is loathe to endanger public and investor confidence in its financial condition and also potentially jeopardize its government support. It typically takes 18 months to evict a defaulter, and sometimes longer if the homeowner temporarily resumes paying. Apparently, banks believe that by waiting to the bitter end during a period in which they are making huge profits (on the back of Fed monetary policy), they will be in a much stronger position to take losses. Nonetheless, a solid government plan to force sensible principal reductions for securitized loans would, I believe, go a long way toward convincing the banks that no better deal from the government was forthcoming, particularly if the government clearly articulated that this was so, and would make it more difficult for regulators to turn a blind eye to the inflated value of the whole loans and second liens as now priced on the banks balance sheets. Obliging the banks to mark to market would, of course, also push them to get the most value out of their loans by writing down principal for underwater homes. But assuming the continued suspension of mark to market accounting, if the government program to reduce principal on securitized loans (with the bondholders, not the

government bearing the loss) was not enough to convince banks to follow suit with their whole loans, more direct government coercion should be considered.

For some lenders, recognizing the losses of whole loans on their books might indeed put them out of business. I shall come to them later. Note that for the loans that have been securitized, such as the subprime loans, these losses have already been recognized.

Finally, what if homes prices vastly appreciate by the time the homeowner sells his home? To prevent unwarranted windfall profits to homeowners, the government plan could easily require the homeowner to share 50/50 with the lenders any appreciation in home price up to the full price of the original mortgage and might even provide that for houses sold for more than the original loan price that lenders receive a greater percentage of the original loan, depending on how much above the original loan amount the selling price was.

IVa2. A Floor to Housing Prices and Restarting Private Lending on Mortgages: Government Equity Stake in Homes

There are at least four reasons to support housing prices directly, in addition to doing so through effective foreclosure relief. First, if housing prices held firm, fewer homeowners would be under water, and so more would have an incentive to make their payments. That would keep them in their homes. Second, firm housing prices would staunch the losses on mortgage securities even if there were foreclosures. Third, once there is a floor to housing prices, pessimistic lenders would be relieved of the disaster scenario for many mortgage securities, and margins on mortgage securities would come down significantly, enabling optimistic buyers to purchase them using leverage, pushing up the price of mortgage securities.³²

Fourth, the leverage cycle is less severe for housing than for mortgage securities, and so can more easily be fixed by government intervention, since home buyers generally lock in their loans and leverage for 30 years. Only new buyers of homes, and those who want to change homes or are forced out of their current homes in foreclosures, need to confront the tougher margins. Old buyers sitting in their homes cannot be forced to put more money down, whereas mortgage security holders who borrowed on one-day Repos have found that they now face tougher margin requirements that require putting more money down. Thus there are fewer homes in play than there are mortgage securities.

The Obama administration has recognized this by cobbling together a series of ad hoc measures to prop up housing prices. I am afraid these measures will expose the government to billions of dollars of future losses, in addition to substantial current costs, while leaving private mortgage lending dead in the water. We simply cannot sustain a situation where all mortgage lending is done by the government. The plan I propose

³² Again, as I will discuss below, margins must in the future be monitored by the Fed to assure that they do not once again get excessively low, precipitating another massive and dangerous leverage cycle.

helps to stabilize housing prices and to reinvigorate private lending. And in the long run it may cost the government much less, possibly even making money.

Current government FHA policy is to make mortgage loans with as little as 3.5% down. These homeowners start with little incentive to continue payments, particularly in rough economic times, and any further decline in housing prices will find them underwater and thus a new source of future defaults. This policy is a repetition (albeit on a smaller scale) of the bad practices that got us here. It exposes the government to a huge risk of default, and does nothing to stimulate private mortgage lending.

The government has also tried to stabilize housing prices through its efforts to keep mortgage interest rates low and thereby encourage purchases and refinancing. To this end the government has bought a trillion dollars of agency mortgage securities. This choice reflects once again a lamentable concentration on interest rates and the neglect of collateral (leverage) effects that is the core of my argument. The government's interest-rate-centric approach has not been terribly successful in encouraging new purchases; in fact, after a temporary drop, for a long time the plan did not even succeed in lowering the mortgage rates. In the end it finally lowered mortgage interest rates, but surprisingly few homeowners were able to take advantage of the lower rates by refinancing because they could not find the downpayment. There are already signs that as the purchases wind down, mortgage rates are going back up.

A third government initiative is to give an \$8000 tax credit to buyers of homes. This tax credit does appear to have been more successful at stimulating home purchases. Indeed, the push to adopt and then expand it demonstrates just how ineffective the purchase of securities was. But the tax credit has no upside for taxpayers, it does nothing to reinvigorate private lending, and it asks those members of the public not benefiting from the tax credit and their children to absorb the long term costs of this government plan, precisely the kind of policy that undermines public support for the government's rescue efforts. If \$8000 were spent on 7 million homes, this deadweight cost would come to \$56 billion. By contrast the equity stake plan I propose below is a purchase of value for value; in the long run it may cost nothing and actually have upside for taxpayers. It should also stimulate demand, and it would reinvigorate private mortgage lending.

As we said earlier, toughening margins have affected housing prices, because many homeowners can no longer put up the cash payment needed to buy new homes. New homeowners are being asked to put as much as 30 to 40% down if they cannot get a government loan. The government could stimulate demand for new purchases, and also mitigate the margin problem, by offering to buy a 20% equity stake in any new home purchase (under some maximum price, as with agency conforming loans). Thus suppose a house is purchased for \$100. The government pays \$20 and gets a 20% equity piece, which it collects whenever the homeowner sells. If down the line the house sells for \$200, the government gets \$40. The government is thus earning the home price appreciation on its piece, without having to bear the expense of maintaining the house. The homeowner gains because he gets to live in the whole house while paying for only

80% of it. If the home buyer needs a loan to get the house, the government equity piece reduces the downpayment the buyer must make, and the ongoing mortgage payments he must make. And if we make the government's equity piece the second loss piece, it leaves the lenders in a very, very safe position, encouraging lending. In effect it lowers the margin to the borrower, and raises the margin of safety to the lender. Here is how it works.

Under the plan the home buyer who wanted a loan to purchase the house would be allowed to borrow at most 80% of the \$80 of the house he bought, or \$64. He would have to put up $20\% \times \$80 = \16 of his own cash. The homeowner would then have a big incentive to make his payments. If he walks away from his debt, he can save \$64, but he has to give up living in a \$100 house on which he had an \$80 ownership share. But if the borrower does default, and if the lender has to foreclose, the lender would be able to collect his debt out of the house sale proceeds ahead of the government equity piece. The government would collect next, and lastly the buyer would get any left over cash. If the house sold in foreclosure (net of expenses) for \$82, the lender would get his \$64, the government would get \$18, and the homeowner nothing. The effective margin for the homeowner is thus 16% on the asset price of \$100, but the margin of safety for the lender is 36%. This should make the lender feel very safe and encourage private lending on mortgages. The homeowner's downpayment of 16% on the total home price is about half the downpayment many non-government lenders are demanding now. On top of that, the new buyer's mortgage payments would be 20% lower than before, because he would be paying on a loan of \$64 instead of \$80.

What about the costs of my plan? Last year there were 5.5 million new home purchases, down from a high of 7 million. Even if the government had to buy the equity in the whole 7 million, at an average home price of \$200,000, it would cost \$280 billion. But the government would own equity, and be protected by the homeowner's downpayment. Housing prices would need to fall another 16% before the government lost equity value. As housing prices stabilized, the government would gradually phase out the program, in all likelihood in a year, at most two, after adoption.

A much smaller version of the same plan might accomplish nearly as much. Simply restrict the government equity plan to home buyers who do not currently live in houses.

IVb. Step Two: A Fed Lending Facility to Help Restore Reasonable Leverage

The most easily implementable step and the second priority, after addressing the source of the uncertainty (the scary bad news), in responding to the final stage of any leverage cycle should be government action to decrease astronomical collateral rates. Thus in October 2008 I suggested that the most immediate step the Fed could take was to lend money using the so-called troubled assets (those that suddenly became near worthless as collateral, as I explained earlier) as non-recourse collateral. I suggested 50% margins on average, a sane halfway level between the 5% margins required at the peak of the leverage bubble, and the 70-90% margin rate demanded in 2008. The TALF and

PPIP programs, announced in early 2009 at what turned out to be the bottom of the price cycle, embody the spirit of my recommendation. The turnaround of prices after these programs were announced seems to me to be some evidence for the wisdom of the intervention. But in some important details those programs went awry, as I shall try to explain, and in any case it now appears that having achieved their purpose, they have been drastically attenuated.

Lending on risky collateral is a great departure from the traditional role of the Fed. The orthodox view is that the Fed injects liquidity into the system by lending money to banks and others with impeccable reputations for repaying so as to reduce the riskless rate of interest on very short term loans. The banks would then presumably turn around and re-lend that money to investors, at a lower interest rate than would have obtained absent the Fed's intervention. However, the great bulk of lending in the investment world is not based on the reputation of the borrower but based instead on the value of the collateral. The lesson of the leverage cycle is that when lenders demand too much collateral for their loans, liquidity dries up. The Fed cannot undo this by making riskless loans at a lower interest rate than the market, because in liquidity crises it is not the interest rate the banks charge that impedes investor borrowing but rather the amount of collateral they require. The Fed needs to make risky loans on less collateral than the market, if it is to have the desired effect.

The mechanics of such a massive lending program require some careful thought, but nothing compared to the difficulties of directly buying. The Fed could simply announce that any arm's length buyer of any designated security could, at the moment of purchase, take that security to the Fed and receive a 5-year loan of 50% of the price in exchange for putting the security up as collateral. The Fed would not need to price the security itself. The market would have just done the pricing. With a 50% margin, the government money is still quite safe. Remember, the 50% loan is against the price the securities will be traded at, not against the original price when issued. The government should thereafter monitor prices, periodically demanding more cash from the borrower to maintain its 50% margin, which would make the government lending safer and more responsible. Monitoring the collateral price is a much easier job than deciding the price to buy, since there is a 50% margin of error: the price monitoring only has to be half right. And the government should consider charging a slightly higher interest rate than it does today, thereby potentially making a profit for taxpayers. That would also make the program easier for the public and politicians to accept.

Buyers would then be able to purchase securities using only half the cash they need to put up at the bottom of a cycle when margins might become 100%. Aside from allowing their own cash to go further, this borrowing allows investors to earn leveraged returns. If they think the security trading for 60 might only rise to 66 in the near future, they can buy it with 30 down and earn a return of 20% when it rises to 66 instead of a return of 10%. Again, with this potential for private profit, the program would make more political sense if a somewhat higher interest rate for the loans were charged thus building in a real chance for taxpayer profit.

The government might even arrange all this lending without having to come up with the money. Under this alternative, the government could loan slightly less, say 40%, and give up the right to make margin calls. The loan could then be securitized, guaranteed by the government, and then sold off to the private sector. With the government guarantee, the money would easily be raised. Or even more directly, for some bonds where this makes sense, the government could simply guarantee a certain percentage of the principal payments. Private lenders could then lend this much without any risk of default. Of course, on some securities the government might be able to lend much more than 40% and still regard the money as safe.

Lending is better than the government's first (and quickly shelved) idea, as proposed by then-Secretary Paulson, of buying up the "troubled assets." As I explained in October 2008, lending against collateral does not require the government to choose what prices to pay, as it would have to if the Treasury directly bought securities. Moreover, lending, unlike buying, is direct action to restore leverage and restoring leverage is the thematic solution to the leverage cycle crisis. It is not some stop gap band aid invented only under the pressures of the moment.

Further, lending puts taxpayer money at far less risk than buying does. Assuming the Fed loans at 50% margins, every dollar the government lends using the targeted assets as collateral will necessarily be matched by money the investor spends on those assets. The government can say its money is being leveraged. The investors who avail themselves of the government lending will still have their money at risk. Because these investors will do the buying, and not the government, there is little, if any, chance that this action will push prices to outrageous levels and enrich undeserving sellers.

The Fed has boldly gone a long way in this direction, further than any previous Fed. Through TALF and PPIP the Fed and Treasury have indeed embodied many of these ideas. PPIP lends at 50% margins on toxic mortgage securities, just as I recommended. Its announcement I believe played a pivotal role in starting what is now more than a half year rebound in security prices. But the two programs did not go far enough in general, they took too long to get going, and in some cases TALF actually took leverage up almost to the crazy levels it had been before.

In the emergency stages of the leverage cycle, the Fed should have (and still should) extend lending on more kinds of collateral. TALF restricted leverage mostly to new securities, or to securities that were still AAA rated. As more and more mortgage securities get downgraded below investment grade status, they lose their ability to be used as collateral even in the private sector. Lending against the most toxic securities is actually necessary to maintain their value.³³

³³ Again, such lending would be much less risky if the government had adopted a sensible plan to staunch foreclosures and stabilize housing prices, such as I've just outlined, because such a plan would reduce the toxicity of the securities at issue. And the quicker the government moves to do that, the less risky such lending will become, not to mention the good it would do for the value of the toxic securities the government now owns through one program or another or now guarantees, representing continuing and enormous government money still at considerable risk. This point is why I stress the importance of

The TALF program makes government loans on new credit cards, auto loans, and college loans, and other securitizations at 20 to 1 leverage. In my opinion, this repeats the error of FHA mortgage program, lending at the same inflated leverage that got us into trouble in the first place. The Fed has rightly observed that propping up new security values is more important than propping up legacy security values, because new securities represent new activities. When new prices go down, new securities are not issued and the underlying activity for which the securities would be issued (students going to school, cars being purchased, new houses being built, consumers buying with credit cards) stops. However, as I have argued more formally in Geanakoplos (2009), the Fed could raise the price of these new securities further by leveraging them less, if it would also leverage the legacy securities to modest levels. The reason is that buyers of these new securities are tempted to put all their capital into the depressed legacy assets where they are nearly sure of a high return. This indeed is one of the main reasons banks are not lending to businesses or homeowners: they can get better returns by buying depressed legacy assets. The only way TALF could redirect this private money into new securities was by giving leverage on them at astronomical 20:1 rates. If instead the Fed would give two to one leverage on all the assets, it would raise all asset prices, including even the new securities, because it would remove the bargains investors are seeking in the legacy assets.³⁴ It would thus also go a long way to solving the bank lending problem. As I showed again in Geanakoplos (2009) (in a stylized example, to be sure), despite lending on a much larger scale, by allowing leverage at two to one on a wide array of assets rather than at 20 to 1 on a narrow set of assets, the Fed could actually reduce its expected defaults while increasing the prices of all the securities.

In the crisis stage the Fed needs to go around the banks and lend directly to more investors. In theory the Fed could make no-recourse loans only to a few banks, who would turn around and relend to everyone else. But the banks are nervous about showing too much lending on their books, they ask for too much collateral, and now the Fed is giving them more profitable ways to make money than by lending; so the Fed must reach out directly to more borrowers. Curiously, PPIP has been restricted to 10 potential borrowers/investors, making its scope and size in the end less than what was anticipated. With only 10 investors taking government money the potential for conflicts of interest seem very high. If one of the 10 becomes a big enough buyer with government money, it could conceivably offer to rid a bank of toxic assets, at favorable prices, in exchange for favors like easier credit later. I, of course, realize that the Fed's lending to many may still be controversial. And there are legitimate reasons for concerns about lending to non-transparent borrowers. That, however, just means those problems should be fixed: regulators, as all now acknowledge, need to be more vigilant and transparency (long absent) must be restored by zero tolerance for hide-the-risk accounting tricks and

understanding the nature of the crisis in crafting sensible solutions and how failing to address one part of the problem, in our case the failure to adequately address housing, limits the good that otherwise sensible programs might make.

³⁴ Another reason it actually could raise new security prices is that by leveraging the legacy securities at two to one it will free some investor equity to put into the new securities.

“special” vehicles that obscure an institution’s true financial exposure. And if lending to more borrowers means subjecting new entities (like investment banks and hedge funds) to more regulatory review and greater transparency requirements, so be it.

The TALF and PPIP programs took too long to get up and running. Hopefully at the bottom of the next leverage cycle, or even earlier, similar programs could be implemented sooner. I recommend that the Fed keep a standing, permanent lending facility up and running. In normal times it would lend a little bit across a wide range of assets, to be ready to spring into action if private collateral rates became too high. This facility could be administered directly by the Fed, by people it hired, or it could be run through the Repo desks of the Wall Street Banks. In the latter case it would be wise to insist that the bank put some of its capital at risk along with the Fed money. The advantage of using Repo desks is that they are already staffed with trained personnel, who have great expertise in making margin calls. Duplicating that expertise would be expensive.³⁵ The advantage of a permanent facility is that the Fed would be ready to quickly lend on a grand scale, on many securities, and to many lenders, in the next crisis.

IVc. Step Three: Restoring Optimistic Capital

Lending will not by itself bring the prices of assets to their old levels (which is ok, given that “old” values were inflated by excessive leverage, as I’ve explained). But that means that the most optimistic buyers, unfortunately including some of the biggest and most prominent financial institutions in America, have irretrievably lost a huge amount of capital. Not only is their capital no longer available to spend on these securities, but similarly the money they borrowed to spend on these securities has also disappeared.

The easiest way to address this problem of our still-ailing banks would be to sell stock in optimistic American companies to foreigners. That started a while back, but the foreigners saw that they were losing money and stopped investing.

The next most obvious thing the government could do, it did: inject money into failing firms. The idea was that then the firms would continue to function as optimistic buyers and their workers would not join the ranks of the unemployed. But the government injected money with no strings, a mistake. In exchange the government should have received shares of stock, beyond minimal interest payments, and commitments to spend the money on distressed securities or new loans. And it should have demanded changes in management and compensation practices that reward short-term risk taking at the expense of long term stability. But the main problem with the way the government injected capital is not just the “no strings” approach, it is that this injection of capital was not coordinated with vigorous programs to address the two other prongs of the end of any leverage cycle: the source of the scary bad news (here housing) and the precipitous drop in leverage, which I’ve just addressed in speaking about Fed lending.

³⁵ I presented this proposal for a lending facility to the New York Fed in early 2009. Recently Pedersen and Santos have made a similar proposal.

Put bluntly, it makes no sense to inject money into firms that will still go bankrupt anyway or to support so-called zombie banks (too supported to fail, but too weak to succeed without rolling the dice on highly speculative and risky bets). In the absence of vigorous programs to address the first two prongs of any leverage crisis (the source of gross uncertainty and outsize demands for collateral that few, if any, can meet) injecting capital does nothing but push an ultimate reckoning down the road. And without steps one and two, the true financial status of our financial institutions is unknown and unknowable because there is no reliable way to price many of the assets they hold. As long as no one knows whether and to what extent our biggest financial institutions are sound, our economy cannot recover. To the extent our banks now appear to be “thriving” or, at least enjoy, some market confidence, it is more a function of their access to cheap money, their ability to make outsize bets with that money and the implicit government bailout that investors now expect should one of the big boys suddenly stumble. This is not a recipe for financial recovery or a stable economy.

IV.c.1 Bailouts with Punishment

After a double leverage cycle as outsized as we have just been through, it is likely that even with a lending facility established, and capital injected properly into the system, some, maybe many, firms would still fail. In general that is what we should want. The government cannot afford to make good everybody’s debt. Some debt holders must lose when a financial system is allowed to become bloated by artificially high prices maintained by excess leverage from the ebullient stage of the leverage cycle. In the ebullient phase of this cycle, too many people were drawn into the financial sector by the resultant artificial profits. Failures will remove many of these excesses.

In such circumstances, many of the failures will be banks, like those in this crisis that were or are currently holding individual loans that are internally marked 40 points higher than they are actually worth. Raising the price of securities to what they are worth will not save those institutions.

But what if those institutions are seen by the government as, in current jargon, systemically important? For those firms the Treasury might want to intervene, as the Fed did last year, on a case by case basis. But, if that approach is used, the shareholders should have to give up their shares and the bondholders should lose too, maybe all their value, and new management should be put in place. Even in cases where old management is not that old, i.e., cannot be reasonably charged with responsibility for all the excess, replacing management may be wise, if only to help bolster public support for the government’s actions and expenditures of taxpayer funds. It is also imperative that the government decide as quickly as possible after a crisis presents itself (and on grounds that can be explained as fair and objective), who it will let fail, and then coordinate an orderly liquidation.

Quite possibly the biggest mistake the government made, at least in the public opinion, was bailing out too many firms on too generous terms.

IV.c.2 Government Purchases of Assets

The government could replace the lost optimistic capital by buying distressed securities directly. In effect the Treasury would take conservative and pessimistic taxpayers' money, that would never be invested in these securities, and invest it there, assuming, of course, that it did so with the expertise necessary to make reasonably sound judgments on which securities to buy and how much to pay for them. This was the plan with which Secretary Paulson began and which has reared its head a number of times in the months since then. The banks, as I suggested above, may in fact have been waiting for just such a plan, including the government buyout of not just securities, but shaky whole loans too, and that hope may have contributed to their failure to modify whole loans in a rational manner.

Government buying plans are a risky approach, riskier than the steps I have laid out above, and thus, if ever used, must be implemented with extreme care. An argument that is often blithely made for government buying is that when security prices are terribly depressed in "fire sales", the government might make some good investments. It is likely, the argument goes, that the general taxpayer is too conservative, and by transforming pessimistic capital into optimistic capital, the government might even be directly helping the taxpayer, while at the same time staunching the collapse of security prices.

Forcing natural pessimists into purchases they fear, however much potential financial upside, may well undermine public confidence in government, especially if the investments start to go bad. But even if taxpayers were on board, caution should be the watchword. The lending mentioned earlier (a much more direct approach to restoring leverage) would probably raise security prices, so the government purchases would not be at rock bottom prices. Private investors (naturally more agile and quicker than government), knowing that the government would be buying, would rush to buy first, reducing potential government profits. Of course that, in some sense, would be what the government would want to happen because it would mean that security prices would rise more quickly. But it might also result in taxpayers getting stuck with the worst assets, causing public outrage and charges of foul play.

The biggest obstacle and the one that apparently stopped Secretary Paulson's original plan to buy the troubled assets is the enormous challenge of deciding what to buy, and at what price. We must not forget that the downward swing in the leverage cycle is always triggered by genuine bad news, which I called scary because it creates more uncertainty. Private investors hold back for fear of "catching a falling knife"; the government has far less expertise than these private investors. Since the distressed mortgages are very heterogeneous, it is not at all clear how the government acting alone could figure out what prices to pay. Indiscriminately buying assets at a fixed percentage premium over the internal prices given to the assets by the firms that hold them is a terrible idea. It rewards the firms with the largest number of bad assets and especially those with the

most distorted internal prices. But how else could the government decide what to buy, and at what prices?

One suggestion is by reverse auction. The government would divide the securities into different categories, and then buy from each category those securities that the current asset holders are willing to sell for the lowest price. But how would the government decide what the categories are, and how much to spend on each? The lobbying in Washington would be, to put it mildly, intense. And worse than that, it is a sure thing that the cheapest securities the government would get in each category would be of the lowest quality. If the purchases were to be made by an auction mechanism, I would have suggested a variation in which private bidders were allowed to enter the auction, not just private sellers. I would have recommended that the government commit to buying half the winners' purchases, at their winning prices. That way the government could ride on the expertise of the private buyers. Still, even that solution, could be gamed, particularly given that some private buyers might hold other positions, I'm thinking of CDS here, that made it worthwhile for them to overbid in a manner that might not be easy to deter or discover.

The dangers of government buying look so profound that in October 2008 I recommended that if the government were to buy at all, it would be better for the government to invest through professional money managers, again piggy backing on the choices they make to invest their own capital. Under the PPIP plan the government has set up accounts with professional money managers in which each government dollar is invested side by side in the same securities with a dollar of investor capital. The government should be able to take advantage of its enormous size to negotiate small fees for the managers, perhaps relying to some extent on the patriotic instinct of managers to keep fee demands low. Of course it is absolutely crucial that the managers have incentives to perform well. Otherwise they might be tempted to spend the taxpayers' money buying portfolios sold by the failing companies of their cronies, in exchange for favors later on. Or they might pay less attention to the government investments than the investments of their fee paying clients. These conflict of interest become more acute to the extent that the number of managers is small and to the extent they each have a huge amount of government money to wield. Moreover, the most qualified money managers are likely to hold many securities and other assets that might provide those managers with incentives to buy for the government with an eye towards benefitting their private clients.

One way to check some of these conflicts and to help ensure money managers had the right incentives would be to divide the government money up among a large number of private managers and to make the investments and returns of these companies very public. These managers would then be competing with each other on a world stage to see how their investments performed. A more conventional incentive device would be to say that a manager gets no fees until the return on the assets passes some hurdle. Only after the taxpayers make money would the managers earn any fees. As originally designed, however, the PPIP program sought to concentrate the government's investment money in just a few managers' hands. Were it not for the small size of the investment that it now appears these funds will manage, this could have been a recipe for disaster. I would

strongly encourage the government, if it continues with the program, to expand it to include many more managers, each confined to a relatively small scale. That is, of course, assuming a sufficient number of such competent, reliable and willing managers, as I imagine would be necessary, could be found.

But even with all the caveats I have offered above, buying may still not be a wise policy, particularly not as a substitute for an adequate lending program, such as I described above. Buying would leave the government holding a large portfolio of mortgage securities, even larger than that the government already holds as a result of the rescue efforts and resolutions it has already facilitated. Those investments might well lose the public money. And yet, by modifying loans and using others of its powers the government could act to mitigate those losses, and there lies the rub. All other investors might well anticipate the government doing just that. In short, the more securities the government owned outright, the more uncertainty might adversely affect security prices. Perhaps even worse, had the government bought the troubled assets outright at the start as the original Paulson plan envisioned, every other effort it should have taken to stabilize housing (modifying loans and taking equity stakes) might be viewed as the government trying to inflate the value of its own “book.”

For these reasons, and because it would have a smaller effect on restoring leverage than the lending route, I do not believe the direct buying approach is an optimal response.

V. Moral Hazard

It is often said that every bailout causes a moral hazard which leads to a bigger problem the next time. The problem would be that bailing people out in this crisis would lead to higher leverage in the next cycle. There really is only one reliable antidote to that, and that is regulation of leverage.

One observation, however, which I have made with Felix Kubler (and which Jeremy Stein has apparently come to independently), is that general system-wide interventions (like restoring sane leverage) in the crisis do not always create deleterious incentives in the long run. Surviving a crisis means tremendous profit opportunities in the good phase of the next cycle. If a systemic intervention gives a chance for the prudent firms to survive, rather than everyone going under, those firms will have an increased incentive to be prudent. Bailouts which rescue firms no matter how imprudent they have been (in fact precisely because they in particular were imprudent) are the source of moral hazard.

Some have suggested that writing down principal on mortgage loans will also cause a moral hazard. They say it will encourage homeowners to behave badly, and the government to intervene in too many markets, and threaten the sanctity of contracts. I disagree, because the writing down of principal should be done as a function of the decline in some index of housing prices. The index is beyond the control of the homeowner, so it does not distort homeowner incentives. Moreover, it should be done first for homeowners who have not defaulted yet, and only later for homeowners who have defaulted under some special hardship. It should only be done, as I have said, if it

promises to bring more money to the lenders. A good test of whether it is a good idea is whether it would be written into the contract in the first place if people had thought of the possibility of this much home price decline. I agree with Robert Shiller who suggests that just these kinds of mortgages, with principal automatically reduced if some housing index falls enough, should and will become the standard mortgages of the future.

VI. Managing the Ebullient Stage of the Leverage Cycle

After this crisis passes we must prepare for the next leverage cycle. The first step is to constantly monitor leverage at the securities level, at the investor level, and at the CDS level.

Every newspaper prints the interest rates every day, but none of them mentions what margins are. The Fed needs to settle on a menu of different security classes, monitor their haircuts daily by talking to all the big lenders and borrowers, and then making averages public.

The leverage of money managers should also be public. Moreover, legislation and regulations should contain strong and clear prohibitions against misleading the public or regulators on the degree of leverage, notwithstanding any other legal rule or accounting device employed to justify the masking of actual leverage fairly calculated. One contributing factor to the outsized nature of the crisis we faced that I may not yet have emphasized sufficiently was the ease with which capital requirements could be evaded and leverage hidden, even by the most “regulated” institutions, banks that hold deposits insured by the federal government.

We discussed at great length in Sections II and III how CDS contracts provide an opportunity to leverage, so these must be monitored as well. Putting them on an exchange would facilitate monitoring, as well as netting and ensuring enough collateral is posted.

Transparency about actual leverage should bring a great deal of discipline to the market, and warn investors of impending trouble. In my earlier leverage diagrams one can see the tremendous spikes in margins during the crisis stages of the last two cycles. One can also see a drift down in haircuts in the ebullient stage of the last cycle. The combination of security leverage data, investor leverage data, CDS leverage data, and asset price data should give the Fed tremendous information for managing future leverage cycles that they did not have, or chose to ignore, in this and in past leverage cycles.

But transparency alone is not enough. Some investors will not curtail their leverage, no matter how much the public scrutiny, and how far out of line with recent practice they become. Put bluntly, the market alone will not take care of outsize leverage. It is thus imperative that the Fed put outside limits on leverage.

The first step in controlling leverage is to make sure that even the little amounts of collateral that the markets require of most borrowers are indeed put up by all

borrowers. All too often CDS insurance buyers allowed the writers of insurance to get away without actually putting up the collateral. Repo borrowers put up collateral to protect lenders, but had no protection themselves in case the lenders went bankrupt and swallowed up their collateral. It is imperative that some sort of exchange be established so that in conventional Repo transactions both sides of the deal are protected against counterparty risk, and so that CDS contracts are properly collateralized and netted, as we discussed earlier.

But even after all this is done, it will still be necessary to regulate leverage. The lesson of the leverage cycle is that there are many externalities (nine that I listed) and we should always expect cycles of too much leverage followed by too little leverage. Many people have argued that setting margin limits is difficult because securities are so heterogeneous. But I believe this problem will eventually be solved once the haircut data history becomes more public. It was not obvious how to manage interest rates either. But little by little the Fed has gotten better at it. The same will be true with leverage. The critical thing is that with the data in hand, the Fed will be able to monitor dramatic changes in leverage and asset prices, and therefore will easily recognize when we are reaching either end of the cycle.

One way of controlling leverage is to tax firms that borrow excessively, or that borrow excessively on their collateral, or that lend excessively on collateral. A very small tax might go a long way to discouraging excessive leverage, and might also change the maturity structure, inducing longer term loans, if it were designed properly. Another advantage of the leverage tax is that revenues from it could be used to finance the lending facility the Fed would need to keep at the ready in anticipation of the downside of future leverage cycles.

Another way of controlling leverage is by mandating that lenders can only tighten their security margins very slowly. Knowing they cannot immediately adapt if conditions get more dangerous, lenders will be led to keep tighter margins in the good safe times.

It has become fashionable nowadays to say that leverage regulation should be countercyclical, by which people mean that investor leverage should be allowed to go up in bad times and down in good times. I myself would like to see much more focus put on securities leverage. The leverage of an investor is often a meaningless number, since just when things are getting bad, and margins on securities are tightening and the whole economy is being forced to de-leverage, many firms will appear to be more leveraged because their equity will be disappearing. Rather than being an argument in favor of letting their leverage rise in bad times, this phenomenon suggests to me that it is a waste of time trying to control the uncontrollable.

I would rather see regulation forbidding loans at too high leverage in ebullient times. Banks would simply not be allowed to lend 97% of the value of the house.

VII. Conclusion

The leverage cycle brought us to the edge of a cliff. We have moved back from the precipice, but unless we understand the features of the leverage cycle and design our responses to address the specific problems that characterize the end stage of an outside leverage cycle, we are left hoping for a miracle to restore our financial prosperity. Marking time and waiting for the miracle of things getting better appears to be part of the current government policy, at least as it relates to housing and foreclosures. That miracle, if it comes, will be nothing more than the start of another cycle, maybe one even worse than the one we have just experienced. And that is a miracle we cannot afford.

Bibliography

- Adrian, Tobias, and Hyun Shin "Liquidity and Leverage". 2009. Forthcoming in the Journal of Financial Intermediation
- Bernanke, Ben, Mark Gertler and Simon Gilchrist. 1996. "The Financial Accelerator and the Flight to Quality." *Review of Economics and Statistics*, 78(1): 1--15.
- Bernanke, Ben, Mark Gertler and Simon Gilchrist. 1999. "The Financial Accelerator in a Quantitative Business Cycle Framework", pp 1341-1393 in *Handbook of Macroeconomics*, Volume 1, ed by J.B. Taylor and M. Woodford, Elsevier.
- Brunnermeier, Markus, and Lasse Pedersen 2009. "Market Liquidity and Funding Liquidity." *Review of Financial Studies*, vol 22,6,2201-2238.
- Caballero, Richardo J., and Arvind Krishnamurthy. 2001. "International and Domestic Collateral Constraints in a Model of Emerging Market Crises." *Journal of Monetary Economics*, 48(3): 513--48.
- Dana, David 2010. "The Foreclosure Crisis and the Anti-Fragmentation Principle in State Property Law", *University of Chicago Law Review*, Forthcoming.
- Foote, Christopher, Kristopher Gerardi, Lorenz Goette, and Paul Willen, 2009. "Reducing Foreclosures", Federal Reserve Bank of Boston Public Policy Working Paper No. 09-02, unpublished.
- Emmanuel Farhi and Jean Tirole, 2009. "Collective Moral Hazard, Maturity Mismatch and Systemic Bailouts" NBER Working Papers 15138
- Fostel A., Geanakoplos J. 2008. "Leverage Cycles and the Anxious Economy" *American Economic Review* 2008, 98:4, 1211-1244.
- Geanakoplos, John. 1997. "Promises, Promises." In *The Economy as an Evolving Complex System II*, ed. W. Brian Arthur, Steven Durlauf, and David Lane, 285--320. Reading, MA: Addison-Wesley.
- Geanakoplos, John. 2003. "Liquidity, Default, and Crashes: Endogenous Contracts in General Equilibrium." In *Advances in Economics and Econometrics: Theory and Applications*, Eighth World Conference, Vol. 2, 170--205. Econometric Society Monographs.
- Geanakoplos, John and Herakles Polemarchakis 1986. "Existence, Regularity, and Constrained Suboptimality of Competitive Allocations when the Asset Market is Incomplete" in *Uncertainty, Information, and Communication, Essays in Honor of Ken Arrow*, edited by W. Heller, R. Starr, and D. Starrett, 65-96, Cambridge, Cambridge University Press, 1986.
- Geanakoplos, John and Felix Kubler 2005. "Leverage, Incomplete Markets, and Pareto Improving Regulation", unpublished.

Geanakoplos, John and William Zame (2009). "Collateralized Security Markets", unpublished. Earlier versions 1997, 2002, 2005.

Gromb, Denis and Vayanos, Dimitri, 2002. "Equilibrium and welfare in markets with financially constrained arbitrageurs" 66,361-407.

Harrison, J. Michael and David M. Kreps 1979 "Martingales and Arbitrage in Multi-period Securities Markets", *Journal of Economic Theory*, 20, 381-408.

Holmstrom, Bengt and Jean Tirole, 1997. "Financial Intermediation, Loanable Funds, and the Real Sector," *Quarterly Journal of Economics*, 112, 663-692.

Kiyotaki, Nobuhiro, and John Moore. 1997. "Credit Cycles." *Journal of Political Economy*, 105(2): 211--48.

Minsky, Hyman 1986. *Stabilizing an Unstable Economy*. Yale University Press, New Haven.

Myers, Stewart. 1977. "Determinants of Corporate Borrowing" *Journal of Financial Economics*, 5, 147-176.

Tobin, James and Stephen Golub 1998 *Money, Credit, and Capital*. Irwin/McGraw-Hill, New York.