

## **Household Balance Sheets, Aggregate Demand and Unemployment**

ATIF MIAN and AMIR SUFI

U.S. households accumulated debt at an unprecedented pace between 2001 and 2007. In the aftermath of the housing downturn, deleveraging by highly indebted households is the most important factor responsible for the current economic slump. The deleveraging process has led to sharp drops in both aggregate demand and employment. We argue that meaningful policies aimed at facilitating debt-reduction for under-water homeowners in the short run, and replacing non-contingent debt with contingent-debt in the long run are essential for a robust and sustained recovery.

I am honored to be given this opportunity by the Pakistan Society of Development Economists to deliver the Quaid-i-Azam Lecture at the annual general meeting in Islamabad.<sup>1</sup> My lecture—which is based on research over the years with Amir Sufi of University of Chicago Booth School of Business—is divided into three parts.

First, I discuss the magnitude and nature of household debt accumulation in the U.S. over the past decade. Second, I show how the timing and severity of the current economic collapse is closely related to the deleveraging of U.S. household balance sheets in the aftermath of the housing market downturn. Deleveraging by highly indebted households forces them to cut back on consumption. The resulting loss in aggregate demand is responsible for a majority of the jobs lost during the 2007-09 recession. Finally, I discuss the type of reforms needed to resolve the U.S. household leverage crisis and put the economy back on track.

### **1. THE ACCUMULATION OF U.S. HOUSEHOLD DEBT**

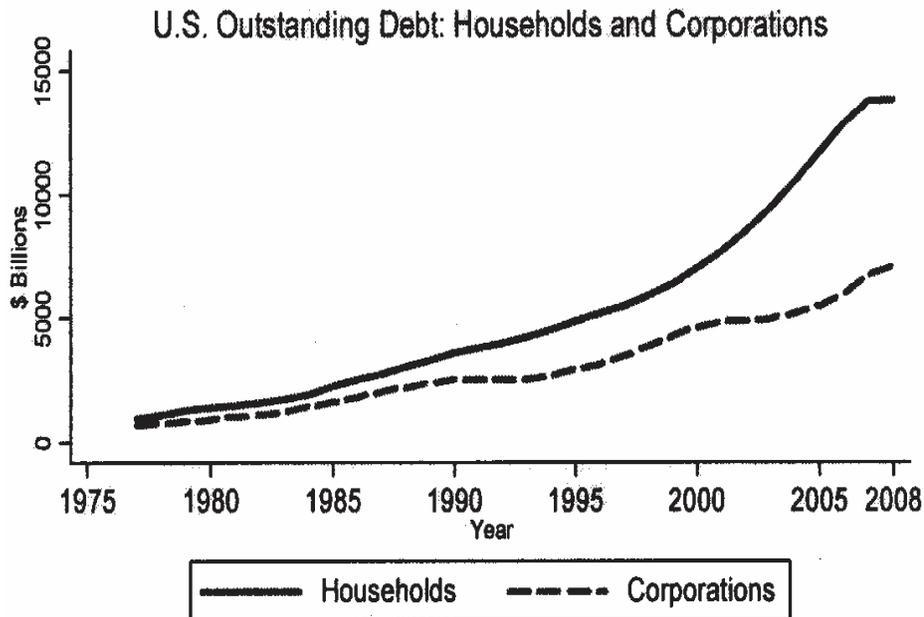
The increase in household leverage prior to the recession was stunning by any historical comparison. From 2001 to 2007, household debt doubled from \$7 trillion to \$14 trillion (see Figure 1). The household debt to income ratio increased by more during these six years than it had increased in the 45 years prior. In fact, the household debt to income ratio in 2007 was higher than at any point since 1929. Recent data suggest that over a quarter of mortgaged homes in the U.S. are underwater relative to their mortgage value.

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*Authors' Note:* The research cited in this lecture is available at: <http://faculty.haas.berkeley.edu/atif/research.htm>. This lecture was also presented as testimony on Oct 4th, 2011 by Atif Mian before the U.S. Senate subcommittee on the U.S. macro-economic situation.

<sup>1</sup>Lecture delivered by Atif Mian.

Fig. 1. Total Household Debt in the U.S.



Why did U.S. households borrow so much and in such a short span of time? What kind of households borrowed the most? I explore this question in a couple of papers with Amir Sufi [Mian and Sufi (2009 and 2011a)]. Our explanation for the increase in household debt begins with the dramatic expansion in mortgage originations to low credit quality households from 2002 to 2007. Mortgage-related debt makes up 70 to 75 percent of household debt and was primarily responsible for the overall increase in household debt.

We argue that the primary explanation behind the dramatic increase in mortgage debt was a securitisation-driven shift in the *supply* of mortgage credit. The fraction of home purchase mortgages that were securitised by non-GSE institutions rose from 3 percent to almost 20 percent from 2002 to 2005, before collapsing completely by 2008. Moreover, non-GSE securitisation primarily targeted zip codes that had a large share of subprime borrowers. In these zip codes, mortgage denial rates dropped dramatically and debt to income ratios skyrocketed.

An important lesson regarding mortgage expansion during the 2000's is that the expansion does *not* reflect productivity or permanent income improvements for new borrowers. In particular, mortgage credit growth and income growth were *negatively* correlated at the zip code level from 2002 to 2005, despite being positively correlated in every other time period back to 1990. Mortgage credit flowed into areas with declining incomes at a faster pace.

One consequence of the rapid increase in supply of mortgage credit was its impact on house prices. As credit became more easily available to households that were historically rationed out of the credit market, house prices began to rise. Moreover, the

increase in house prices was not uniform across the U.S. House price appreciated faster in areas that had difficult-to-build terrain, i.e., where housing supply was inelastic. While this mechanism does not explain all of the cross-sectional variation in house price growth across the U.S., it does explain a major proportion of it.<sup>2</sup>

The increase in house prices had a large impact on further encouraging the accumulation of debt by households. In Mian and Sufi (2011a) we focus on the feedback effect from house prices to household borrowing by analysing individual level borrowing data on U.S. household that already owned their homes in 1997 before mortgage credit expanded. We find that existing homeowners borrowed 25 to 30 cents against the rising value of their home equity from 2002 to 2006.

The home equity-based borrowing channel is strongest for low credit quality borrowers, borrowers with high credit card utilisation rate, and younger borrowers. Moreover, home-equity borrowing was not used to purchase new properties or to pay down expensive credit card balances, implying that the new debt was likely used for real outlays such as home improvement and consumption. Overall, we estimate that the home-equity based borrowing channel can explain 50 percent of the overall increase in debt among homeowners from 2002 to 2006.

To summarise, rapid increase in the supply of securitisation-driven mortgage credit in early 2000's induced U.S. households particularly those in subprime neighbourhoods to accumulate debt. The expansion in credit supply also fuelled a remarkable increase in house prices and U.S. homeowners borrowed aggressively against the rising value of their houses. While overall debt increased by 7 trillion dollars, the increase was not uniform across the U.S. Household leverage growth was concentrated in areas with relatively inelastic housing supply, and among younger households and households with low credit scores.

## **2. HOUSEHOLD DELEVERAGING, AGGREGATE DEMAND, AND UNEMPLOYMENT**

### **(a) The Beginnings of the Crisis**

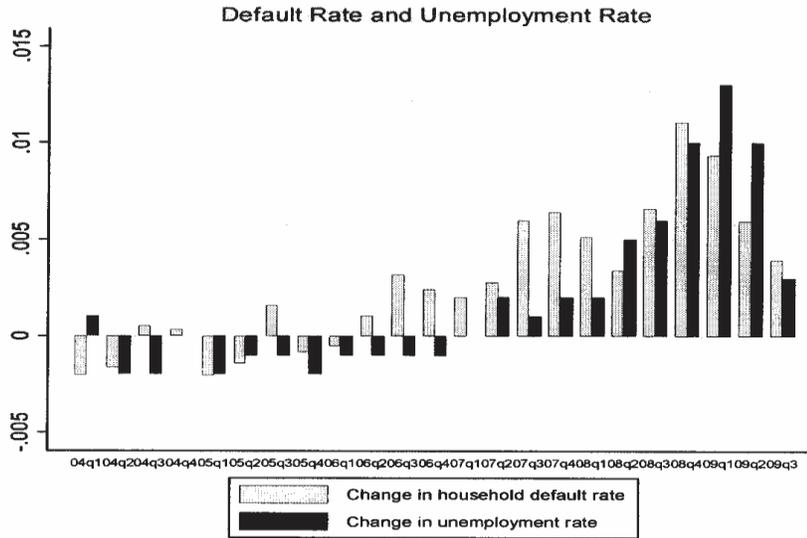
The accumulation of debt by households with largely stagnant real wages was not sustainable. Markets began to realise this towards the second half of 2006 as mortgage delinquencies crept up. In fact many of the first set of borrowers to default were those who could not even afford to carry their first few months of mortgage payments. Unable to refinance or sell their homes at a higher price, many homeowners began defaulting on their loan obligations.

Figure 2 plots the quarterly change in mortgage defaults and unemployment, and shows that default rates kept increasing for five straight quarters before there was an increase in the unemployment rate in the second quarter of 2007. This evidence is suggestive of the causal role that high household leverage and a weak housing market played in generating employment and output declines [see Mian and Sufi (2010) for details]. The next section shows more direct evidence of this channel.

<sup>2</sup>In particular, cities in Arizona and Nevada are important outliers. See Mian and Sufi (2009 and 2011a) for more details.

### Fig. 2. Household Defaults and Unemployment

The figure plot quarterly change in household mortgage delinquency rate and unemployment rate. Household default rate data come from Equifax and the unemployment data are from the Bureau of Labour Statistics.



#### (b) Deleveraging and Aggregate Demand

How has the sharp rise in household debt from 2002 to 2007 affected economic recovery? When a large class of consumers see the value of their houses decline and realise that they can no longer rely on further borrowing to sustain their standard of living, they go into a “de-leveraging mode”. Deleveraging refers to the process where consumers stop relying on more credit for consumption and start making efforts to pay down existing debt to more manageable level. The scale of this problem can be judged from a recent study by Core Logic that reports that almost a quarter of homeowners who are current on their mortgages are under-water.

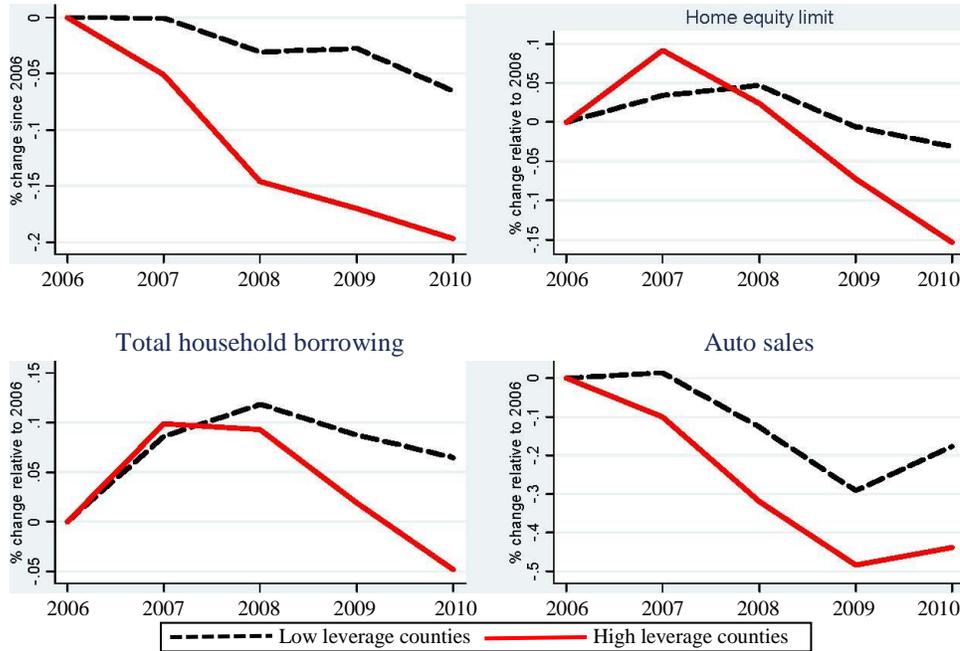
Once a large fraction of homeowners start cutting back on consumption as a result of deleveraging, there is a reduction in aggregate demand and the economy goes into a recession. Interest rates fall to help slowdown the fall in consumption and output. However, whether interest rate drop is sufficient to halt aggregate demand decline depends critically on the extent to which lenders (i.e. savers) increase their consumption in response to declining interest rates. If—as has been the case in the current slump—even an interest rate of zero fails to boost consumption sufficiently for the lending class, aggregate demand will fall and the economy goes into a recession.

I explain below how this deleveraging—aggregate demand channel is responsible for the large drop in U.S. output and employment. As noted earlier, the accumulation of leverage across the U.S. differed widely, depending in part on the elasticity of housing supply in an area. There are thus important differences across the U.S. in the extent to which a given area has suffered from the deleveraging shock. These differences are illustrated in Figure 3 that comes from Mian and Sufi (2011c).

Figure 3 splits U.S. counties into four quartiles based on the debt to income ratio as of 2006. High (low) household leverage counties are counties in the top (bottom)

**Fig. 3. Deleveraging and Consumption**

This figure plots house prices, home equity limits, household borrowing, and auto sales for high and low household leverage counties in the U.S. from 2006 to 2010. High and low household leverage counties are defined to be the top and bottom quartile counties based on the debt to income ratio as of 2006. Quartiles are weighted by the outcome variable in question as of 2006 so that both quartiles contain the same amount of the outcome variable as of 2006 (for house prices we weight by population).



quartile of the 2006 debt to income distribution. The top left panel shows that high household leverage counties experienced much more severe house price declines during the recession and afterward. House prices declined from 2006 to 2010 by 40 percent in these areas.

The decline in house prices represented a severe credit shock to households. As the top left panel shows, home equity limits from 2007 to 2010 declined by 25 percent in high leverage counties. The shock to credit availability translated into lower household borrowing. From 2007 to 2010, debt in these counties dropped by 15 percent, which translates into \$600 billion.

The deleveraging shock also translates into aggregate demand. The lower right panel shows that consumption—as proxied by sale of new automobiles—drops significantly more in high leverage counties. High household leverage counties experienced a drop in auto sales of 50 percent from 2006 to 2009, with only a slight recovery in 2010. Mian, Rao, and Sufi (2011) show that the pattern in auto sales in Figure 3 also holds for consumption across other goods, including furniture, appliances, grocery, and restaurant spending. Moreover, within high leverage counties, the drop in auto sales is significantly higher in more subprime neighbourhoods that are hit larger by the deleveraging shock.

The magnitude of the drop in these variables is far smaller in counties with low household leverage before the recession. As of 2010, house prices were down only 10 percent, home equity limits had dropped only 8 percent, and household borrowing was down only slightly relative to the 2008 peak. Auto sales dropped sharply even in low leverage counties, but the drop was much less severe and the recovery in 2010 is stronger.

### (c) Deleveraging and Unemployment

Figure 3 shows evidence of weak consumer demand for durable goods in high household debt counties. How does the sharp decline in consumption in high leverage areas affect aggregate unemployment? Answering this question with geographical variation has been difficult given an obvious barrier: the goods consumed in one part of the country are not necessarily produced in that area. For example, if Californians sharply reduce auto purchases because of excessive leverage, the decline in auto purchases will likely reduce employment in Michigan. Given this cross-state effect, one would underestimate the effect of household leverage on employment if one only examines job losses in high leverage areas such as California.

However job losses in goods and services that are non-tradable and hence must be produced in the city where they are consumed do not suffer from this problem. We therefore split consumption goods into those consumed locally (non-tradable) and those consumed nationally (tradable), and use the impact of deleveraging shock on local non-tradable employment to back out the total effect of deleveraging and reduced aggregate demand on employment [see Mian and Sufi (2011c) for details].

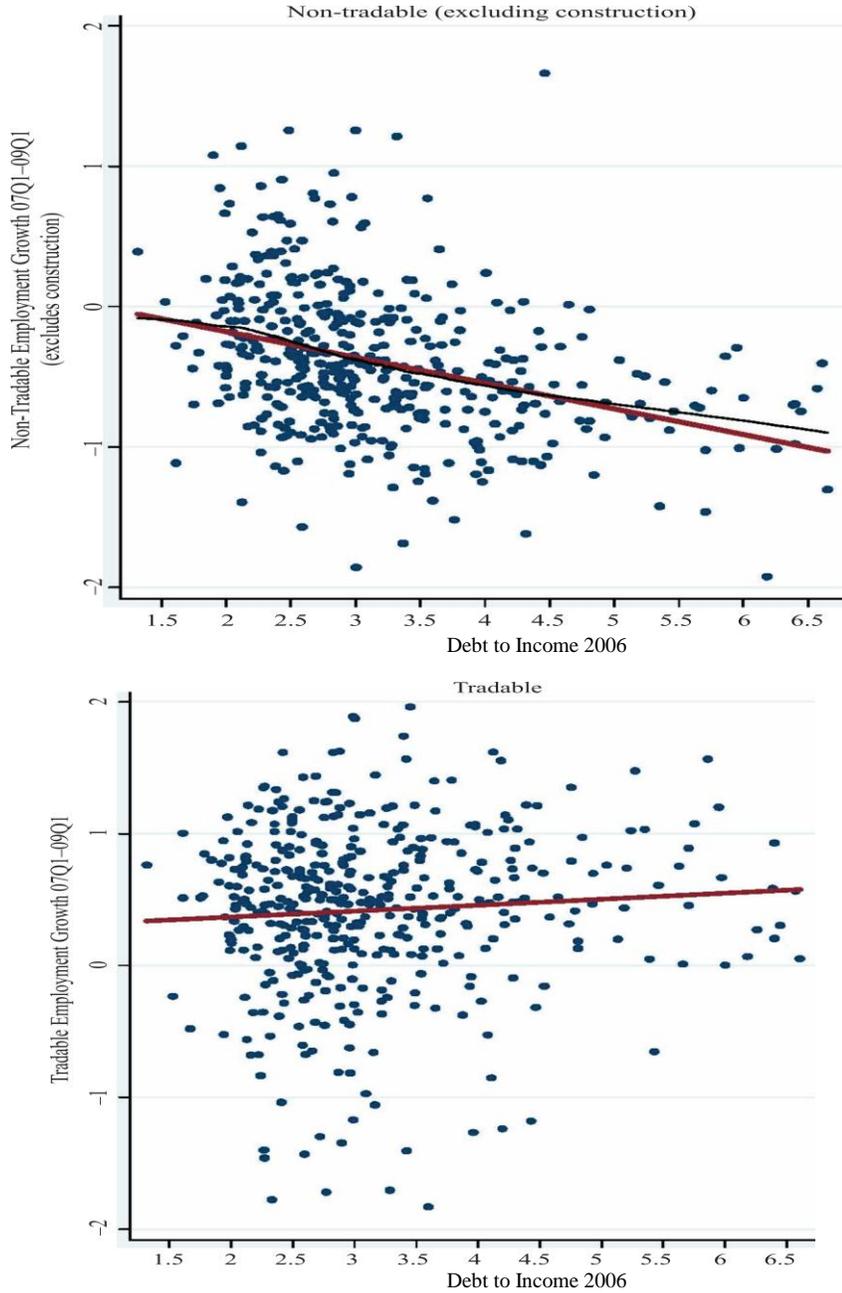
The central insight of our approach is that one can estimate the aggregate effect of household deleveraging on unemployment by examining how non-tradable employment varies across counties with varying degrees of deleveraging shocks. We classify industries as non-tradable if they are focused in the retail or restaurant business. Given that high leverage counties are those with a large boom and bust in residential investment, we explicitly remove construction from the non-tradable sector. In other words, our non-tradable industry category does not include construction or any other real estate related business.

The first step of the empirical methodology is to estimate the effect of deleveraging on employment in industries producing non-tradable goods. The left panel of Figure 4 show a very strong and quantitatively large relation between household leverage measured as of 2006 and employment declines in non-tradable industries from 2007 to 2009. For example, going from the 10th to the 90th percentile of county distribution by leverage increase job loss as a fraction of total employment in the county by 4.4 percentage points.

The right panel of Figure 4 repeats the analysis for employment losses in the tradable sector and shows that there is no relationship between county deleveraging shock and job loss in the tradable sector. The reason for this is that losses in the tradable sector are distributed equally across the U.S. as mentioned earlier. However, we can use the relationship between job losses and deleveraging shock in the non-tradable sector to back out the number of nation-wide jobs that have been lost in the tradable sector due to the deleveraging shock and resulting decline in demand.

**Fig. 4. Deleveraging and Employment across Counties: Non-Tradable and Tradable Industries**

This figure presents scatter-plots of county level employment growth from 2007Q1 to 2009Q1 against the debt to income ratio of the county as of 2006. The left panel examines employment in non-tradable industries excluding construction and the right panel focuses on tradable industries. The sample includes only counties with more than 50,000 households. The thin black line in left panel is the non-parametric plot of non-tradable employment growth against debt to income.



We do this calculation carefully in Mian and Sufi (2011c) and perform a number of checks to ensure that the number we compute is driven by the deleveraging—aggregate demand phenomena and not any alternative explanation. The total number of job losses that we can conservatively attribute to the deleveraging—aggregate demand channel is staggering. We estimate that deleveraging of the household sector accounts for 4 million of the 6.2 million jobs lost between March 2007 and March 2009 in our sample. In other words, 65 percent of total jobs lost in the U.S. are due to deleveraging and the drop in aggregate demand as a result of it.

### 3. POLICY CHOICES

The analysis above identifies the deleveraging—aggregate demand channel as the most important mechanism responsible for economic downturn and job losses in the American economy. The sharp drop in consumer demand in areas that accumulated the most leverage and large employment losses associated with the drop in consumer demand highlight the economic importance of the deleveraging—aggregate demand channel.

Unfortunately the current deleveraging cycle in the U.S. is painfully slow. How long will this cycle last? Despite more than three years since the start of this cycle, the amount of debt paid off or written down remains stubbornly small. Out of the 7 trillion dollars accumulated over 2001–2007, only about one trillion has been paid down or written off. U.S. household balance sheets remain highly levered by historical standards. The most recent monthly auto sales data also continue to show significant weakness in consumer demand among high leverage counties.

In the face of the very slow deleveraging process and its high economic cost, we urgently need policies that help reduce leverage for highly indebted households without forcing them into costly actions such as bankruptcy and foreclosures.<sup>3</sup> The threat of foreclosure and losing one's home may force many underwater homeowners to continue paying their mortgage bills but the resulting drop in aggregate demand hurts everyone. Indeed most recent data from Core Logic suggests that a quarter of U.S. homeowners owe more than their house is worth, and yet continue to make mortgage payments.

The dilemma for efforts to reduce household indebtedness is that from a lender's perspective it is not in their interest to write down debt that continues to be serviced on time. But as my analysis highlights, the *collective* consequences of such "individually rational" actions are quite unpleasant. If a large number of financially distressed homeowners cut back on consumption in order to protect their homes and continue paying their mortgages, the aggregate demand and employment consequences hurt everyone.

An obvious policy proposal to facilitate leverage reduction is principal write-down on underwater mortgages. While the government did initiate some related programmes in the past, they have been largely ineffective in achieving the desired goal. To be sure, there are complicated legal issues pertaining to mortgage debt restructuring. Similarly any orderly mechanism of debt restructuring should minimise unwanted disruptions in

<sup>3</sup>Foreclosures is a very costly mechanism to reduce indebtedness, especially in the current environment. In a recent paper, Mian, Sufi and Trebbi (2011), we show that foreclosures significantly reduce the value of homes in the neighbourhood of foreclosed home and lower house prices have a negative feedback effect on local consumption and investment.

the banking and financial system. These are difficult and complex problems, but not impossible to address and require collective regulatory and legislative action.

While the focus of my discussion has been the recent U.S. economic downturn, the relationship between high household leverage and long economic slumps is not limited to our current experience. In his seminal paper, Fisher (1933) described the role that high household indebtedness and the process of deleveraging played in perpetuating the Great Depression. More recent empirical work by scholars such as Mishkin (1978), Olney (1999), and Eichengreen and Mitchener (2003) further supports this view of the Great Depression. Evidence from Japanese and European recessions [e.g. King (1994)] also highlights problems associated with leverage.

Our collective experience from historical recessions as well as the most recent global slump point to a fundamental weakness in the modern financial system: its inability to distribute downside risk equitably and efficiently across the population. The tendency to rely too much on debt-financed economic activity implies that in the event of a negative economy-wide shock, most of the financial pain is pushed on a particular segment of the population (i.e. the borrowing class). As the recent U.S. experience reminds us, pushing most of the downside risk on one segment of the population is seriously damaging for the overall economy.

Going forward, in order to avoid deep economic slumps resulting from an over-levered household sector, we need to put in place contingencies that will automatically write down the value of outstanding debt if the overall economic environment is sufficiently negative. There is a lot to think through here before implementing a particular policy. However, it is practically feasible to re-design debt covenants by introducing contingencies for economic downturns.

For example, mortgage principal can be automatically written down if the local house price index falls beyond a certain threshold. Since such contingencies are written on aggregate states of nature, they do not suffer from the standard moral hazard criticism. Lenders will obviously price such contingencies in before extending credit, but it is a price that benefits borrowers and the economy in the long run. If we had such contingencies present in the current mortgage contracts, we could have avoided the extreme economic pain due to the negative deleveraging—aggregate demand cycle.

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