

Unemployment, Negative Equity and Strategic Default

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The statements and opinions in these notes are those of the authors and are neither the official positions of the Federal Reserve Bank of Atlanta or Boston nor of the Federal Reserve System.

Disclaimer

- I am speaking today as a researcher and as a concerned citizen
- not as a representative of:
 - The Boston Fed
 - or the Federal Reserve System



- When I say “we”, I don’t mean Janet and me.

Caveat

- This is still very preliminary work
- Everything I'm about to say could be wrong:

No one who cannot rejoice in the discovery of his own mistakes deserves to be called a scholar.

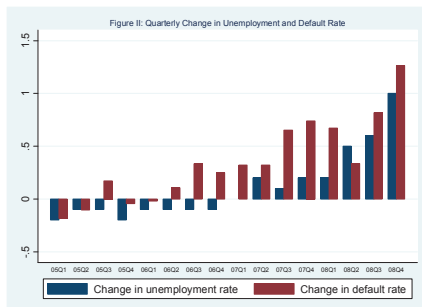
–Donald Foster

Shocks and default

- Strong anecdotal link between job loss and default.
- Cutts and Merrill (2008): Survey of delinquent borrowers
- But we no direct evidence
- Before we go on, let me make clear.
- Bad economists have argued that we can measure the link between unemployment and default using aggregate data.

Why we need Micro Data

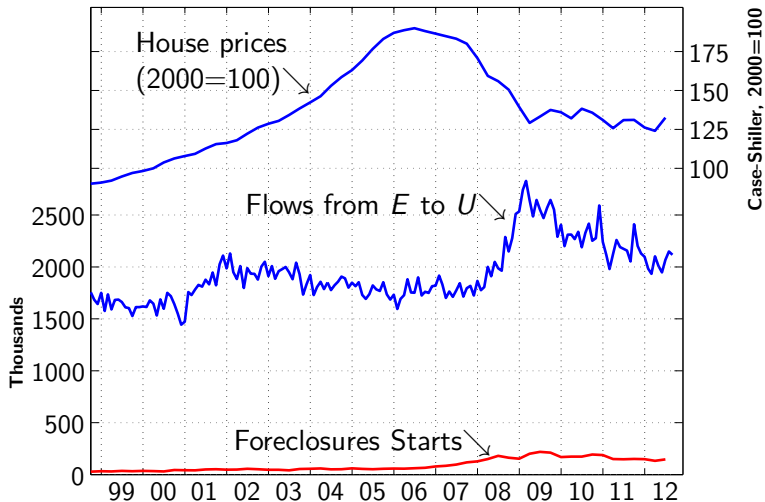
Figure II ... shows the quarterly change in the unemployment rate and the default rate for the U.S... While the change in the default rate turns positive in the second quarter of 2006, the unemployment rate does not increase until the second quarter of 2007. There are thus four straight quarters of consistent increase in mortgage default rates before the unemployment rate picks up. ... *In short the aggregate pattern in Figure II is not consistent with the view that unemployment shocks are the primary drivers of increasing default rates.* [emphasis added] (Mian, 2010)



The Double Trigger Model

| | | Negative Equity? | |
|-------------|-----|------------------|-------|
| | | Yes | No |
| Life Event? | Yes | Default | Repay |
| | No | Repay | Repay |

Gross Flows, House Prices and Defaults



Better data

Table : Monthly default transition rates for prime mortgage borrowers by occupancy, combined loan-to-value (CLTV) ratio, and MSA unemployment rate. data sources: Loan Performance, Bureau of Labor Statistics, and Amherst Securities.

| | Unemployment Rate (%) | CLTV (%) | | | |
|------------------------|--------------------------|----------|---------|--------|------|
| | | > 120 | 101-120 | 81-100 | ≤ 80 |
| Owner- Occupied | > 12.0 | 2.21 | 1.01 | 0.61 | 0.23 |
| | 10.1-12.0 | 1.77 | 0.90 | 0.55 | 0.18 |
| | 8.1-10.0 | 1.81 | 0.83 | 0.52 | 0.22 |
| | ≤ 8.0 | 0.86 | 0.66 | 0.51 | 0.24 |
| Non Owner- Occupied | > 12.0 | 1.16 | 0.48 | 0.18 | 0.13 |
| | 10.1-12.0 | 1.20 | 0.54 | 0.52 | 0.16 |
| | 8.1-10.0 | 1.06 | 0.65 | 0.36 | 0.17 |
| | ≤ 8.0 | 0.88 | 0.59 | 0.36 | 0.19 |

But we're still not there yet...

- The evidence is “consistent” with Double Trigger and even “strongly suggestive”
- But it is *not conclusive*
- Why?
 - Construction boom in Town A versus Town B
 - Lots of speculation on new homes in Town A.
 - Construction bust leads to lots of unemployment...
 - And lots of foreclosures but...
 - The people losing jobs aren't the people losing homes.
- We need micro data on employment.

What we do

- Use the Panel Study of Income Dynamics (PSID).
 - Detailed data on households
 - Demographics
 - Employment history
 - Wealth and assets, including mortgage and self-reported house value.
 - Default decision (60DQ).
 - We know if the person losing the job is the person losing the house!

What we find

- Three main findings.
 1. Shocks matter
 - 50% of the households that default have either (1) suffered a spell of U in last 18 months or (2) are divorced
 - 20% of population as a whole
 2. People who suffer shocks *less* sensitive to changes in equity
 - Shocks don't just shift the default curve
 - They change its shape
 - Suggests that some people default “strategically”. I.e. without suffering any shocks.
 3. People who suffer shocks are still pretty sensitive to equity.
 - Job losers are still behaving strategically.
 - If you lower LTV, they “find” some money.

The data

- Panel Study of Income Dynamics
 - Longitudinal Survey of households, 1968-
 - Default question appears in two waves: 2009 and 2011.
 - 3136 mortgaged homeowners in 2009
 - LHS is hazard of default in each year
 - “Panel” in which borrower leaves sample after default

| | Percentile | | | % = 0 |
|-----------------|------------|------|------|-------|
| | 10 | 50 | 10 | |
| Age of head | 30 | 45 | 59 | |
| Income | 36 | 84 | 182 | 0 |
| Liquid Wealth | 0 | 5 | 42 | 12 |
| Illiquid wealth | 1 | 20 | 230 | 9 |
| Other Debt | 0 | 4 | 40 | 34 |
| Home Value | 76 | 180 | 450 | 0 |
| UPB | 35 | 120 | 308 | 0 |
| LTV in % | 26 | 69 | 101 | |
| Monthly Payment | 479 | 1100 | 2300 | 0.03 |

Shocks Matter

- Shocks
 - 1 Spell of unemployment in last two years
 - 2 Divorced at any time
 - 3 Liquid wealth < one mortgage payment
- People with shocks *much* more likely to default.

| Unemployed | | Divorced | | Unem or Div. | | Low Wealth | |
|------------|-----|----------|-----|--------------|-----|------------|-----|
| Yes | No | Yes | No | Yes | No | Yes | No |
| 8.0 | 1.9 | 4.4 | 1.9 | 5.2 | 1.5 | 5.8 | 0.5 |

- People who default *much* more likely to have suffered a shock.

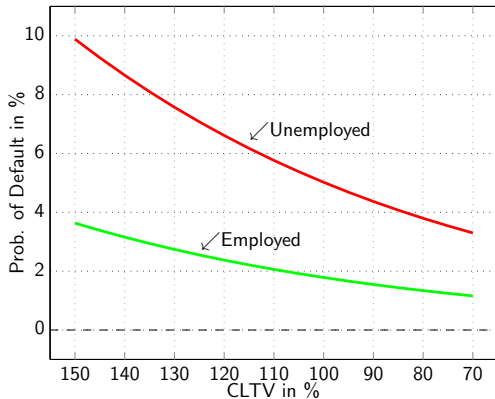
| Unemployed | | Divorced | | Unem or Div. | | Low Wealth | |
|------------|-----|----------|------|--------------|------|------------|------|
| Default | Pay | Default | Pay | Default | Pay | Default | Pay |
| 21.8 | 7.0 | 30.5 | 15.5 | 47.2 | 21.0 | 67.5 | 22.6 |

Shocks Matter

- Logit regression confirms...

| | Coefficient | Std. Err. | P> |
|--------------|-------------|-----------|-------|
| CLTV | 1.46 | 0.21 | 0 |
| Unemployment | 1.06 | 0.18 | 0.001 |
| Divorce | 0.49 | 0.17 | 0.006 |
| Low Wealth | 1.65 | 0.16 | 0 |
| DTI | 0.42 | 0.12 | 0.552 |
| Constant | -5.50 | 0.21 | 0 |

The effect of unemployment



- A fall in house prices leads to a big increase in defaults.
 - Most are due to unemployment
- Even though unemployment hasn't changed
- An increase in unemployment makes things much worse...

Interactions

- How does CLTV interact with shocks?
- An interesting pattern emerges

| LTV | | Unemployed | | Divorced | | Unem or Div. | | Low Wealth | |
|-----|-----|------------|------|----------|------|--------------|------|------------|-----|
| ≥ | < | Yes | No | Yes | No | Yes | No | Yes | No |
| All | | 8.0 | 1.9 | 4.4 | 1.9 | 5.2 | 1.5 | 5.8 | 0.5 |
| 0 | 75 | 3.9 | 0.8 | 2.1 | 0.8 | 2.5 | 0.6 | 3.3 | 0.2 |
| 75 | 100 | 10.1 | 2.0 | 5.9 | 1.9 | 6.6 | 1.5 | 5.2 | 0.8 |
| 100 | 125 | 15.9 | 4.2 | 6.9 | 4.6 | 8.8 | 3.8 | 8.6 | 0.8 |
| 125 | 250 | 28.6 | 17.4 | 21.6 | 17.8 | 25.3 | 15.9 | 26.2 | 8.6 |

- For low LTV's, shocks raise default rates by an order of magnitude
- Gap is much smaller for high LTV's

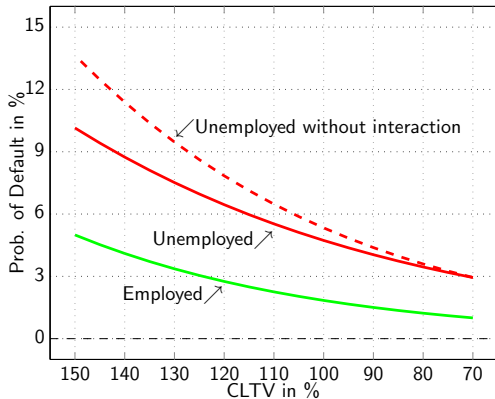
Regression with interactions

- Logit regression
- With interactions between shocks and CLTV.

| | Coefficient | Std. Err. | P> ujvn |
|-----------------|-------------|-----------|---------|
| CLTV | 2.02 | 0.38 | 0 |
| Unemployment | 1.39 | 0.40 | 0.001 |
| Unemp×CLTV | -0.41 | 0.41 | 0.32 |
| Divorce | 0.91 | 0.39 | 0.02 |
| Divorce×CLTV | -0.49 | 0.41 | 0.237 |
| Low Wealth | 2.37 | 0.42 | 0 |
| Low Wealth×CLTV | -0.78 | 0.44 | 0.08 |
| DTI | 0.16 | 0.27 | 0.552 |
| DTI×CLTV | 0.40 | 0.51 | 0.439 |
| Constant | -6.05 | 0.36 | 0 |

- Interaction terms are jointly significant at 0.03% level.

Different types of defaulters



- Positive effect of unemployment shifts curve up
- Negative effect of interaction rotates the curve
- Borrowers who have suffered shocks
 - Much less sensitive to equity

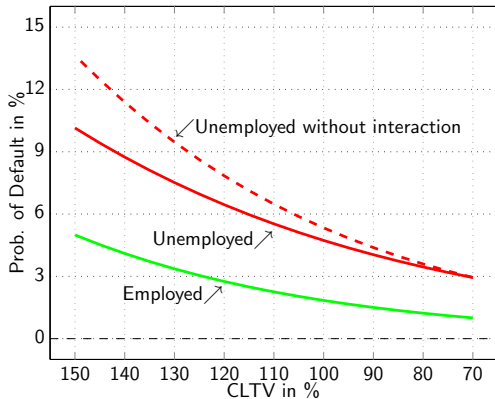
Another way to show...

- Table below shows the fraction of defaulters that have suffered shocks

| LTV | | Unemployed | | Divorced | | Unem or Div. | | Low Wealth | |
|-----|-----|------------|-----|----------|------|--------------|------|------------|------|
| ≥ | < | Default | Pay | Default | Pay | Default | Pay | Default | Pay |
| All | | 21.8 | 7.0 | 30.5 | 15.5 | 47.2 | 21.0 | 67.5 | 22.6 |
| 0 | 75 | 23.5 | 7.2 | 33.3 | 15.5 | 51.0 | 21.3 | 80.4 | 18.9 |
| 75 | 100 | 23.9 | 6.6 | 35.8 | 14.2 | 52.2 | 19.4 | 56.7 | 23.6 |
| 100 | 125 | 23.3 | 6.2 | 26.7 | 18.7 | 43.3 | 23.0 | 80.0 | 35.1 |
| 125 | 250 | 16.3 | 9.6 | 22.4 | 18.8 | 38.8 | 26.4 | 61.2 | 41.1 |

- 47.2% of all defaulters have suffered unemployment or divorce
- But for borrowers with high LTV's, the fraction is less.
- In other words, at high LTVs, we have a lot more people defaulting without facing any shocks.
- Strategic defaults...

Is everyone strategic?



- Borrowers who have suffered a spell of unemployment
 - Less sensitive to CLTV.
- But still pretty sensitive.

Strategic behavior

- Table below shows fraction of borrowers who are current.

| LTV | | Unemployed | No wealth | Unemp & No wealth |
|-----|-----|------------|-----------|-------------------|
| All | | 92.0 | 94.2 | 89.6 |
| 0 | 75 | 96.1 | 96.7 | 92.9 |
| 75 | 100 | 89.9 | 94.8 | 89.4 |
| 100 | 125 | 84.1 | 91.4 | 84.1 |
| 125 | 250 | 71.4 | 73.8 | 73.3 |

- 90% of borrowers with no job *and* no wealth.
 - Are current on their mortgages.
- But only 70% of borrowers with > 125 LTV.
- In other words, LTV matters even to borrowers with no money.
- I think the question has been to find the “strategic defaulters.”
- Equally challenging to find the “non-strategic defaulters.”

Modeling Default

- We can rule out the naive double trigger model
- It's not as simple as
 - No job *and* no equity \Leftrightarrow default
- Amount of equity matters even for people with no job.
- Appear to be borrowers with jobs who default but they are very sensitive to equity.
- How should we think about this?

The call option model of mortgages

- Mortgage is an option to repurchase the house.
 - Borrower sells the house to the lender.
 - Gets an option to repurchase the house with a strike price equal to the unpaid principal balance (UPB).
 - Default is *not* exercising the option.
- In real world: Option is to
 - Repurchase property for UPB
 - Default
 - OR make monthly payment \Rightarrow buy another option to:
 - Repurchase property next period for UPB
 - Default
 - OR make monthly payment \Rightarrow buy another option to...
- Negative equity \Rightarrow Option is out of the money.
 - The price of the option is the monthly payment.
 - Does the value of the option exceed the price?

Optimal Default

- The price of the option is given (by the monthly payment)
- Question is how much the option is worth.
 - In-the-money options are worth more
 - But out-of-the-money options aren't worthless

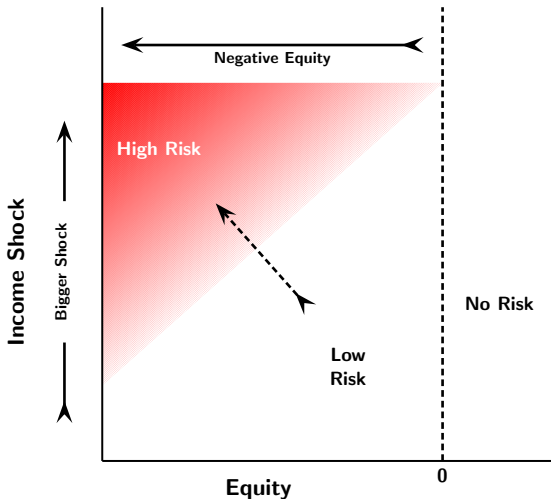
| | | | | | | | | | | | | | | | |
|--------------------|------------|----------------|------|-------------|--------|----------|--------------|---------------|------------|------------------|------|------------|---------|----------|--|
| Name | | Last | | Change | | | | | | | | | | | |
| (C) CITIGROUP INC. | | \$4.55 | | 0.08(1.79%) | | | | Options Chain | | Add to Portfolio | | | | | |
| Chain Type | | Calls and Puts | | Chain Type | | All | | Expiration | | Jan 2012 | | View Chain | | | |
| Calls | | | | | | | Puts | | | | | | | | |
| Symbol | Last Trade | Change | Bid | Ask | Volume | Interest | Strike Price | Symbol | Last Trade | Change | Bid | Ask | Volume | Interest | |
| Quote | 3.63 | 0.08 | 3.60 | 3.65 | 140 | 41,784 | 1.00 | Quote | 0.04 | 0.01 | 0.03 | 0.04 | 941 | 37,809 | |
| Quote | 2.33 | 0.11 | 2.33 | 2.34 | 5,719 | 223,897 | 2.50 | Quote | 0.23 | 0.03 | 0.22 | 0.23 | 223,434 | 389,947 | |
| Quote | 1.36 | 0.09 | 1.36 | 1.37 | 51,678 | 235,218 | 4.00 | Quote | 0.72 | 0.00 | 0.71 | 0.73 | 31,213 | 76,806 | |
| Quote | 0.92 | 0.08 | 0.91 | 0.93 | 24,473 | 943,052 | 5.00 | Quote | 1.28 | 0.01 | 1.27 | 1.29 | 4,286 | 141,438 | |
| Quote | 0.37 | 0.04 | 0.36 | 0.37 | 23,974 | 694,441 | 7.50 | Quote | 3.20 | -0.05 | 3.20 | 3.25 | 1,991 | 54,506 | |

Frictions

- Frictions: In a frictional world, value of option differs across households.
- Borrowers have different stochastic discount factors
 - current wealth
 - current income
 - future income
 - patience
- See the intuitive discussion in Foote, Gerardi and Willen (2008)
- Proposition 1 in Gerardi, Shapiro and Willen (2007) shows this formally:

“First, if we lower wealth, we get more defaults. Second, anything that reduces the relative value of future consumption (higher future income, lower current income, less patience) tends to increase the likelihood of a default decision that leads to a foreclosure. Third, as one would expect, increasing the mortgage interest rate r_M makes default and thus foreclosure more likely. Finally, reductions in rental prices make holding on to the house more expensive and increase the likelihood of default.”

The Modified Double Trigger Model



The slide you've all been waiting for...

- The end.