The Subprime Virus
Agarwal, Ambrose, and Yildirim

Discussion by Shane M. Sherlund
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Summary

• Very nice paper!!!

• Describes how subprime mortgages might have imposed negative externalities on more prudently underwritten prime mortgages.
  o Subprime originations
  o Foreclosure externalities

• Model simulation; empirical evidence.

• Subprime originations and subprime defaults **do** appear to be linked with prime defaults.
Model Simulation

• House price paths depend on local house prices, house price volatility, and default.

• When a borrower defaults, that house sells for a 20% discount; all other house prices update. Any borrower with negative equity defaults. Repeat.

• More prime defaults when:
  o More subprime originations.
    • Subprime originations begin with less equity so exposed to HP declines.
  o Higher house price volatility.
Things to Think About…

• Quite a bit of evidence that foreclosure externalities can be extremely local.
  - Foreclosure discounts can be fairly large.
  - Effects on surrounding homes limited to as little as 1/10th of a mile.
    - Campbell et al. (2011)
    - Harding et al. (2009)
    - Immergluck & Smith (2006)
  - Can one specify these types of declining effects in the house price equations?

• Merton model of default.
  - Bhutta, Dokko, and Shan (2010) show that borrowers have pretty high thresholds for negative equity before exercising their default option.
Data


• Sample splitting:
  o Non-qualified ZIP codes (always subprime)
  o Qualified ZIP codes
    • Non-prime ZIP codes (prime turned subprime)
    • Prime ZIP codes (always prime)

• Non-qualified ZIP codes do NOT look like qualified ZIP codes.

• Non-prime ZIP codes do NOT look like prime ZIP codes.
Empirical Model

• Relate ZIP-code prime default rates to:
  - Cumulative ZIP-code subprime originations share
  - Change in MSA unemployment rate
  - Change in MSA house prices
  - MSA house price volatility
  - ZIP-code subprime default rate
  - ZIP-code mortgage refinancing rate
  - ZIP-code demographics; time and MSA fixed effects

• Three empirical strategies: Baseline, cumulative change in prime default rates, two-stage least squares.

• Most interested in effect of subprime originations and subprime defaults on prime defaults.
Empirical Evidence

• Prime defaults are higher when:
  o House prices decline
  o House price volatility increases
  o Unemployment rates increase
  o Credit scores decline
  o SUBPRIME ORIGINATIONS INCREASE
  o SUBPRIME DEFAULTS INCREASE

• Fairly consistent across implementations.
Things to Think About...

- LPS undersampling of subprime; data cliffs.
- Alt-A mortgages.
- ZIP-code credit scores.
- Measure of subprime originations.
The LPS data undersamples subprime originations.

Suppose \( y_i = \beta x_i + \varepsilon_i \).

Assume that \( \tilde{x}_i = \gamma x_i \), where \( \gamma < 1 \).

Then \( y_i = \beta \frac{1}{\gamma} x_i + \varepsilon_i = \beta^* x_i + \varepsilon_i \).

Because \( \frac{1}{\gamma} > 1 \), \( \beta^* > \beta \).

So it's possible that the results might overstate the true underlying relationship between cumulative subprime originations and prime default rates.
Subprime Undersampling

Subprime Originations

Source: Calculations from CoreLogic ABS and LPS data.
Subprime Undersampling

Subprime Originations (60629 ZIP)

# Loans

- Source: Calculations from CoreLogic ABS and LPS data.
Data Cliffs

• The LPS data adds servicers and loans over time.

• The paper addresses problems associated with backfilling of data.

• But the addition of a new servicer might also increase the data’s exposure to new originations.
Data Cliffs

Subprime Originations (95206 ZIP)

Source: Calculations from CoreLogic ABS and LPS data.
Alt-A Mortgages

• LPS definition of subprime up to each individual servicer.
  o Subprime definitions can very greatly (Mayer & Pence (2008)).

• Many alt-A mortgages end up on the prime mortgage book.
  o LPS does not include an alt-A designation.
  o 87 percent of 2003-2008 option-ARMs classified as prime in LPS.

• Alt-A mortgages behaved much like subprime mortgages heading into and during the crisis.

• Inclusion of alt-A, particularly option ARMs, in “prime” default rates might be misleading.
Alt-A Mortgages

Source: Calculations from CoreLogic ABS data.
Underwater Mortgages

Subprime

Percent of loans

2005 2006 2007 2008

CA, AZ, FL, NV

OH, MI, IN

Rest of U.S.

Alt-A

Percent of loans

2005 2006 2007 2008

CA, AZ, FL, NV

OH, MI, IN

Rest of U.S.

Source: Calculations from CoreLogic ABS and CoreLogic HPI data.
Ser. Delinq. Mortgages

**Subprime**

- CA, AZ, FL, NV
- Rest of U.S.

**Alt-A**

- CA, AZ, FL, NV
- Rest of U.S.

Source: Calculations from CoreLogic ABS data.
ZIP-code Credit Scores

- Paper controls for ZIP-code credit scores in its results.

- How are these defined?

- Optimally, average of new prime originations for each quarter for each ZIP code???

- Condition on prime LTVs? (Percent with $LTV \geq 80$)

- Condition on no/low doc? (Keys et al. 2010)
Subprime Originations

• Subprime mortgages refinanced A LOT.
  o Does the cumulative measure of subprime originations double (or triple +) count actual subprime concentration in an area?

• The paper uses a cumulative proportion measure of subprime originations.
  o Use time-varying STOCK shares as a measure of subprime concentration?
Conclusion

• Very nice paper!!!

• Subprime mortgages imposed negative externalities on more prudently underwritten prime mortgages.
  o Subprime originations
  o Foreclosure externalities

• Model simulation; empirical evidence.

• Subprime originations and subprime defaults **DO** appear to be linked with prime defaults.