Countercyclical Capital Regime: A Proposed Design and Empirical Evaluation

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*Thanks also to D. Fuller, R. Dunsky and X. Zhou

The ideas and views expressed in this presentation are those of the authors and do not necessarily represent those of FHFA.
Why Countercyclical Capital

• Housing crisis exposed concerns about procyclicality of current capital rules

• Countercyclical capital idea is to require sufficient capital before any crisis
  – Basel III Proposed Countercyclical Capital Buffer
    • Application discretionary on part of regulators
    • Raises capital on all risk-weighted assets (RWA) by same amount
    • Buffer limited to 2.5% additional capital on RWA
Our Countercyclical Capital Design Goals

• Focused on Mortgage Assets

• Outcome Related Goals:
  – Fully capitalize mortgage assets at acquisition
  – Capital requirements for new originations must increase during credit expansions, and be allowed to fall during downturns, tracking risk exposure in both cycle phases
  – If applied broadly, this design should mitigate the formation of house price bubbles
Implementation Design Goals

The stress test must be:

• Based on an appropriate risk driver(s)

• Conceptually straightforward/Easy to understand

• Focused on the risk of the firm’s assets, not necessarily the state of the overall economy
  – Capital requirement should apply at the loan level, such that high capital requirements are only assigned to assets vulnerable to significant decline in value—as with bursting of a price bubble

• **Rule-based**— not discretionary
Setting the Countercyclical Capital Requirement: Overview of Stress Path

• For Mortgage Assets, the key risk driver is the deviation of the House Price Index (HPI) from its trend

• The Stress Path consists of determining:
  – HPI trend (state level)
  – A stress path trough for HPI (state level)
  – A time-path for the HPI shock
Calculating HPI Trend

• Applied at the state-level, we define the long-run real HPI trend as equal to the growth rate determined by regressing real HPI on time
  – The regression uses HPI data from 1975-2001, to avoid including the current and still incomplete cycle
  – Other formulations made little difference

• The estimated trend was constrained to be non-negative in real terms — this only applied to a few atypical states
California Example (Jan 1975 - Aug 2021)
Real HPI, Trend, and Shock Paths

[Graph showing the real HPI and trend HPI over time from January 1975 to August 2021.]
Determining the HPI Shock Trough

• Identify the ‘worst HPI downturn’ in each state
  – Only considered downturns of sufficient length, specifically where from peak through downturn and back to trend exceeded 4 years

• Define the trough as the lowest observed real HPI identified in the ‘worst-downturn’ applied as a percentage (less than 100) of trend,
  – e.g. worst-downturn might be at 75% of trend

• **Five Percent Rule:** To ensure each state’s HPI is always subjected to some stress, if a state’s real HPI is at the trough or less than 5% above the trough, we apply a minimum shock equal to 5% of real current HPI
Defining the Shock and Time Path

• For each state, we impose a single deterministic HPI shock and time path, and corresponding interest rate shock, where:

  – **HPI Shock Depth** = the difference between current HPI and its trough

  – **HPI Shock Time Path** = 3 years current HPI to trough, 4 years flat at trough, and 3 years up to trend, then continuing at trend. We based this path on historical averages of prior worst-cycles/state.

  – **Interest Rates Shock Path** = set the same for all states and calibrated to reflect the Federal Reserve’s policy actions during the housing crisis.

• Once the HPI shock path is determined in real terms, we convert to nominal using inflation rates similar to the recent crisis.
California Example (Jan 1975 - Aug 2021)
Real HPI, Trend, and Shock Paths
Examples of Current to Trough Nominal Countercyclical HPI Shocks by State and Year

(Shocks constrained to be a minimum 5% down from current level in real terms)

<table>
<thead>
<tr>
<th>State</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>-22.2%</td>
<td>-25.5%</td>
<td>-30.0%</td>
<td>-32.4%</td>
<td>-33.8%</td>
<td>-31.2%</td>
<td>-20.1%</td>
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<tr>
<td>FL</td>
<td>-24.8%</td>
<td>-32.1%</td>
<td>-41.9%</td>
<td>-50.8%</td>
<td>-53.2%</td>
<td>-48.9%</td>
<td>-27.3%</td>
<td>-20.5%</td>
<td>-12.3%</td>
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<tr>
<td>CA</td>
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<td>-36.8%</td>
<td>-47.5%</td>
<td>-53.4%</td>
<td>-51.5%</td>
<td>-43.2%</td>
<td>-15.5%</td>
<td>-10.7%</td>
<td>-5.1%</td>
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<tr>
<td>OH</td>
<td>-19.0%</td>
<td>-19.8%</td>
<td>-20.4%</td>
<td>-17.7%</td>
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<td>-12.7%</td>
<td>-2.7%</td>
<td>-3.6%</td>
<td>-2.6%</td>
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</table>
Empirical Test of Countercyclical Shocks

• The stress HPI and interest rate shocks were imposed on Fannie Mae’s single-family fixed-rate 30-year loans
  – Capital requirements estimated for all loans in retained and guaranteed/sold (MBS) portfolios for most years 2003-2010
  – FHFA’s internal default and severity models (2010 versions) were used

• Prior Expectations:
  – Requirements (losses) should increase for new acquisitions each year as HPI increases rapidly in 2004-2007
  – Requirements should equal the fully capitalized amount in the year of acquisition--sufficient to cover future losses of each cohort
    • This means the requirement or capital for each cohort should decline in each successive year post-acquisition
Estimated Countercyclical Capital Charges for Fannie Mae SF Fixed-30’s Loans

(Capital charges are set equal to estimated loss amounts from charge-offs and REO related expenses, and assume full payment of mortgage insurance claims)

<table>
<thead>
<tr>
<th>Origination Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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<tr>
<td>2001</td>
<td>1.45%</td>
<td>1.19%</td>
<td>1.11%</td>
<td>1.02%</td>
<td>0.80%</td>
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<td>2002</td>
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<td>2.06%</td>
<td>1.78%</td>
<td>1.34%</td>
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<td>2.52%</td>
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<td>2003</td>
<td>3.51%</td>
<td>1.94%</td>
<td>1.80%</td>
<td>1.49%</td>
<td>1.12%</td>
<td></td>
<td></td>
<td>1.91%</td>
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<tr>
<td>2004</td>
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<td>4.92%</td>
<td>4.23%</td>
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<td>5.32%</td>
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<td>2006</td>
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<td>2.19%</td>
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## Estimated Countercyclical Capital Charges for Fannie Mae SF Fixed-30’s Loans

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<td>2005</td>
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<td>110*</td>
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</table>

* Losses are more than 100 because UPB of 2005 Loans was greater in 2006 than in Q3 2005

Discounted Losses in Dollars Normalized to 100 for Origination Year
Results Discussion

• Results complied with expectations:
  – Capital requirements are reasonable for 2003 and 2010 (benchmarks)
  – Requirements for all cohorts decline each passing year (certainly in absolute amount even if not in percentage of remaining balance)

• The estimated capital requirements at acquisition would have deterred the Enterprises from acquiring many of the 2005-2008 loans responsible for most recent losses
Disaggregated Results

• FICO/LTV risk bucket results show capital charges can vary significantly over risk factors when subject to a severe countercyclical shock as occurred in 2007
  – Thus, a firm could reduce its countercyclical capital requirement by either
    • Tightening underwriting standards, and/or
    • Targeting low-risk loans (high FICO, low LTV, certain geographic regions)

• State-level results also show significant differences—consistent with differing shock severities across states
Invoking the 5% Minimum

• In the worst month (Jan. 2012), 16 states were near or below their respective troughs necessitating invoking the 5% minimum rule.

• The closest to trough for the U.S. weighted avg. HPI occurred during early 2012, when it was approximately 4.5% to 5% above trough.
Since January 2008, the Lowest Level of Real HPI Relative to the Pre-2002 Shocked Trend
The Current Cycle May Soon Be Included Into Our Trend Estimation

• Real HPIs for 25 states (42% of housing stock) are currently above their pre-2002 trend level.

• Real HPI for the U.S. (weighted avg.), is rising but still 2.6% below its pre-2002 trend

• Updating trend/trough will likely have little to modest effect for several years out
Using Pre-2002 Data Versus the Entire Sample
Additional State-Level Patterns: New York

New York Real HPI, Trend Lines, and Stress Scenarios

- Real HPI
- Trend (1975-2001)
- Shock (1975-2001)
- Scenario (1975-2001)
- Trend Whole Sample
- Shock Whole Sample
- Scenario Whole Sample
Additional State-Level Patterns: Kansas

Kansas Real HPI, Trend Lines, and Stress Scenarios

- Real HPI
- Trend (1975-2001)
- Shock (1975-2001)
- Scenario (1975-2001)
- Trend Whole Sample
- Shock Whole Sample
- Scenario Whole Sample
Conclusions

• Countercyclical Capital requirement, as herein designed, meets our goals and expectations to:
  – Fully capitalize the mortgage asset at acquisition,
  – Mitigate the severity of a bubble, if broadly applied

• Evidence from recent severe cycle is that our approach is conservative—since we apply stress to all states simultaneously but not all were stressed

• Design of Trend/Trough Could be Improved, but
  – It worked well for recent cycle given it was based on pre-2002 data
  – We plan to work on modeling the stress trough as a function of the current HPI to trend distance
Comments Welcome

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jesse.weiher@fhfa.gov (202) 649-3204

Our working paper is available at: