Overview of the paper

Note: The views expressed are ours alone and do not represent those of the institutions with which we are affiliated. We thank FNC, Inc., and Marshall & Swift, a CoreLogic company, for providing the data for the paper.
Introduction

• Key lesson from the financial crisis: better information is needed to evaluate risk in housing and mortgage markets.

• Our goal in this paper and related work is to help fill this gap.

• Separately, have constructed mortgage risk indexes based on a rigorous stress test. Available at www.housingrisk.org.

• This paper quantifies collateral risk at a finer level of geography than is currently available.
  - Focus on land value, as land is the risky part of house price
  - Estimate land value at the property level; no previous study has done so on such a large scale
  - Use the estimates to characterize the recent boom/bust cycle in land prices and house prices in the Washington area at the zip-code level
  - Continuing to refine the methodology
Key Takeaways

• Over the boom/bust cycle, land prices were more volatile than house prices everywhere, but especially so in the areas where land was inexpensive and represented a small fraction of home value in 2000.

• In those areas, the land share of property value jumped the most during the boom, and this rise in the land share was a useful predictor of the subsequent crash in house prices.

• This implies that a substantial rise in land shares, even when not accompanied by a relatively large increase in house prices, provided a valuable signal about the risk of a severe house-price drop.

• These results highlight the value of focusing on land for assessing house-price risk.
In recent cycle, land prices moved up and down much more than house prices. Reflects the regularity that land prices are more volatile than structure prices.

Source: Nichols, Oliner, and Mulhall (2013).
Scope of the Paper

• Washington, DC metro area

• Detached single-family homes in five jurisdictions:
  ➢ City of Washington, DC
  ➢ Two counties in Maryland: Montgomery and Prince George’s
  ➢ Two counties in Virginia: Fairfax and Prince William

• Jurisdictions chosen to represent range of localities in DC area
### Snapshot of the Washington, DC Area

<table>
<thead>
<tr>
<th>County/city</th>
<th>Population</th>
<th>Median Household Income</th>
<th>% of Adults w/ Bachelors Degree</th>
<th>% Black or Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fairfax Co., VA</td>
<td>1,118,602</td>
<td>$107,923</td>
<td>57.8%</td>
<td>24.8%</td>
</tr>
<tr>
<td>Montgomery Co., MD</td>
<td>1,004,709</td>
<td>$94,767</td>
<td>56.8%</td>
<td>34.6%</td>
</tr>
<tr>
<td>Prince George's Co., MD</td>
<td>881,138</td>
<td>$72,254</td>
<td>29.8%</td>
<td>78.4%</td>
</tr>
<tr>
<td>Prince William Co., VA</td>
<td>430,287</td>
<td>$95,427</td>
<td>37.2%</td>
<td>40.4%</td>
</tr>
<tr>
<td>Washington, DC</td>
<td>632,323</td>
<td>$64,610</td>
<td>51.7%</td>
<td>58.7%</td>
</tr>
<tr>
<td>Memo, U.S. total</td>
<td>313,914,040</td>
<td>$51,771</td>
<td>28.6%</td>
<td>29.1%</td>
</tr>
</tbody>
</table>

Note: Population and percent Black or Hispanic are as of 2012. Median household income and percent with bachelors degree are averages over 2010-2012; median household income is in 2012 dollars. Source: U.S. Census Bureau.

- Compared to US average, Washington area as a whole is affluent, with a well educated and ethnically diverse population. But there are differences across the area.
- Fairfax and Montgomery: high income and education; low Black and Hispanic share
- Prince George’s: lower income and education, high Black and Hispanic share
- Prince William and Washington, DC have a blend of these characteristics
Key Data Sources

• Property-level data
  ➢ House characteristics, location, year built, sales history, and AVM value: FNC, Inc.
  ➢ Reconstruction cost as new: Marshall & Swift (M&S), a CoreLogic company

• Zip-level data
  ➢ House price indexes: FNC
  ➢ Construction cost indexes: M&S

• Dataset contains about 590,000 detached single-family homes across 119 zip groups. About 90% coverage of universe.
Estimating Land Value

• Create market-based land value for new homes built since 2000
  ➢ Have sale price for these homes
  ➢ Also have M&S reconstruction cost as of 2013:Q3. Move back to sale date using construction cost index for home’s zip code
  ➢ Land value = sale price minus redated M&S reconstruction cost. “Land” is a shorthand for amenities of a given location.

• Apply results to all homes
  ➢ Impute land value in 2000:Q1 (or later if there were too few new-home sales in the home’s zip group in 2000:Q1)
  ➢ Back out (depreciated) structure value as AVM minus land value

• Result is a market-based “stake in the ground” for every home
Creating Time Series

- Roll AVM forward to 2013:Q3 (and backward to 2000:Q1 if needed) using house price index for home’s zip.

- Roll structure value forward to 2013:Q3 (and backward to 2000:Q1 if needed) using construction cost index for home’s zip.

- Back out land value for each home in each quarter as AVM minus structure value.

- Take average of house-level results within each zip group.
House prices are relatively low in Prince George's County and outlying areas and relatively high in Fairfax County and the affluent parts of Montgomery County and DC.

*Range of average AVM values by quintile (rounded to nearest $1000) is $128,000 to $294,000, $294,000 to $416,000, $416,000 to $542,000, $542,000 to $621,000, and $621,000 to $1,593,000.

Source: Authors’ calculations using data from FNC, Inc.
Average Lot Value, 2013:Q3

Lot values mirror the pattern for house prices.

*Range of average lot value by quintile (rounded to the nearest $1000) is $6,000 to $96,000, $96,000 to $193,000, $193,000 to $290,000, $290,000 to $432,000, and $432,000 to $1,057,000.

Source: Authors’ calculations using data from FNC, Inc. and Marshall & Swift/Boeckh, a CoreLogic company.
Average Lot Size, 2013:Q3

As expected, lots tend to be small in close-in areas and larger further out.

*Range of average lot size by quintile (rounded to the nearest 1000 square feet) is 4,000 to 9,000, 9,000 to 13,000, 13,000 to 17,000, 17,000 to 30,000, and 30,000 to 167,000.

Source: Authors' calculations using data from FNC, Inc.
Average Standardized Land Price per Square Foot, 2013:Q3

After controlling for differences in lot size, the price of land is highly correlated with house prices. That is, house prices reflect the amenity value of a given location.

*Range of average land price per square foot for a quarter-acre lot by quintile (rounded to the nearest dollar) is $1 to $10, $10 to $17, $17 to $24, $24 to $37, and $37 to $119.

Source: Authors’ calculations using data from FNC, Inc. and Marshall & Swift/Boeckh, a CoreLogic Company.
Average Land Share of Property Value, 2013:Q3

The land share tends to be high in areas with high land prices and vice versa. But there are outliers; the land shares in the outlier zip groups should be viewed as less reliable than those elsewhere.

*Range of average land share of property value by quintile (rounded to the nearest 1%) is 3% to 35%, 35% to 47%, 47% to 58%, 58% to 70%, and 70% to 76%.

Source: Authors’ calculations using data from FNC, Inc. and Marshall & Swift/Boeckh, a CoreLogic company.
Substantial variation across the zip groups. Increases generally were the smallest in affluent areas.

DC metro area clearly is not a homogeneous housing market.

*Range of house price increase by quintile (rounded to the nearest 1%) is 89% to 127%, 127% to 130%, 130% to 146%, 146% to 165%, and 165% to 204%.

Source: Authors’ calculations using data from FNC, Inc.
House Price Decline, 2006-2012

Sharper geographic differentiation than in the boom period. House prices fell the most in Prince George’s County and in outlying areas. Prices fell much less in the affluent, close-in areas.

*Range of house price decline by quintile (rounded to the nearest 1%) is less than 15%, 15% to 22%, 22% to 34%, 34% to 41%, and 41% to 51%.

Bottom quintile includes zips 20007, 20008, 20016, and 20815, where index rose.

Source: Authors’ calculations using data from FNC, Inc.
Land Prices over Time


Index, 2006=100

Note: Observations for 2013 represent average of Q1, Q2, and Q3.
Source: Authors' calculations using data from FNC, Inc. and Marshall & Swift, a CoreLogic company.
Land prices rose more than house prices everywhere, especially in zips with low land prices. Construction costs accounted for little of the rise in house prices.

Zips grouped into quintiles by quarter-acre land price in 2000:Q1

Source: Author's calculations based on data from FNC, Inc. and Marshall & Swift, a CoreLogic company.
Prices and Construction Costs: 2006-2012

Land prices fell more than house prices everywhere, especially in zips with low land prices, where the declines were staggering. Construction costs continued to rise.

Source: Author’s calculations based on data from FNC, Inc. and Marshall &Swift, a CoreLogic company.
Land Shares over Time

For zips grouped into quintiles by quarter-acre land price in 2000:Q1. Large swing in land share for low-price zips, while share is much more stable for high-price zips.

Note: Observations for 2013 represent average of Q1, Q2, and Q3.
Source: Authors’ calculations using data from FNC, Inc. and Marshall & Swift, a CoreLogic company.
House prices fell more from 2006 to 2012 in zips where the land share rose a lot during 2000-06.

Source: Authors’ calculations using data from FNC, Inc. and Marshall & Swift, a CoreLogic Company.
Predictive Power of Changes in Land Share: Excluding Zip Groups with Adjusted Land Shares

Fit improves after excluding zip groups with less reliable land shares.

Source: Authors’ calculations using data from FNC, Inc. and Marshall & Swift, a CoreLogic Company.
Land Shares and Changes in House Prices

Zip groups with lowest land prices and lowest land shares had the most severe drop in house prices after 2006.

Conversely, zip groups with the highest land shares had the mildest declines.

Counter to the prediction of the land-leverage hypothesis of Bostic et al. (2007).

Prediction doesn’t hold because land prices were most volatile in places with low initial land shares, causing the shares to move up and down the most in these places.

### Zip-group quintiles, by quarter-acre land price, 2000:Q1

<table>
<thead>
<tr>
<th>Zip-group quintiles</th>
<th>Land share (pct., annual average)</th>
<th>House-price change (pct.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest</td>
<td>22.9</td>
<td>59.8</td>
</tr>
<tr>
<td>Second</td>
<td>33.1</td>
<td>66.2</td>
</tr>
<tr>
<td>Third</td>
<td>38.7</td>
<td>67.4</td>
</tr>
<tr>
<td>Fourth</td>
<td>51.8</td>
<td>74.8</td>
</tr>
<tr>
<td>Highest</td>
<td>52.8</td>
<td>72.2</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations using data from FNC, Inc. and Marshall & Swift, a CoreLogic company.
Summary of Results

• Housing submarkets are important in Washington, DC area. House-price swing was:
  ➢ Mildest in affluent, close-in areas
  ➢ Considerably more severe in places where land was relatively cheap (outlying suburbs and areas with large Black and Hispanic population)

• Land prices were more volatile than house prices everywhere, but especially in areas with initially inexpensive land.

• Large rise in land share was a useful predictor of sharp house price correction later on.

• Results highlight the value of focusing on land for assessing house-price risk.
Next Steps

• Bring fundamentals and loan quality into the analysis
  - Fundamentals: focus on such factors as changes in employment and income at the zip-code level
  - Loan quality: assess the contribution of high-risk mortgage lending during the boom to explosion in land prices in certain areas

• Extend analysis to other metro areas across the U.S.
  - Data collection has already begun for nine other metros (Boston, Miami, LA, Phoenix, Seattle, Chicago, Detroit, Memphis, Oklahoma City)
  - Eventually, intend to expand coverage to include all of the largest metro areas and a broad sampling of mid-size cities