Property Values and Flood Risk:
What Happens to Risk Premiums over Time?

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Property Values and Flood Risk

- Previous studies have documented the price reduction from location in a floodplain and compared the price reduction with the capitalized insurance costs.
  - Shilling, Benjamin, and Sirmans (*The Appraisal Journal* 1985)
    - Baton Rouge, LA , 6.4% discount for floodplain location
  - MacDonald, Murdoch, and White (*Land Economics* 1987)
    - Monroe, LA, 6.3% (above avg. home) and 9.3% (below avg. home) discounts
  - Donnelly (*Water Resources Bulletin* 1989)
    - La Crosse, WI, 12% discount for floodplain location
  - Speyrer and Ragas (*J. of Real Estate Finance and Econ.* 1991)
    - New Orleans, LA , 4.2% (suburban) and 6.3% (urban) discounts
  - Harrison, Smersh, and Schwartz (*J. of Real Estate Res.* 2001)
    - Alachua County, FL, 1.5% (pre-NFIR) and 4.1% (post-NFIR) discounts
  - Bin, Kruse, and Landry (*J. of Risk and Insurance* 2008)
    - Carteret County, NC, 6.2% (500-year zone) and 7.8% (100-year) discounts

Property Values and Flood Risk

- A common finding is that location within a floodplain lowers property value anywhere from two to twelve percent of average.
- With the exception of Harrison, Smersh, and Schwartz (2001), these studies find that the price reduction is more than the capitalized value of insurance premiums.
- The study area in Harrison, Smersh, and Schwartz (2001) had not experienced any major flooding in the recent past.

Bin and Polasky (Land Economics 2004)

- Hurricane Floyd damaged about 4,300 structures in Pitt County and the total value of property damage was $346 million (Pitt County Finance Office).
- Data contain 8,375 single-family residential homes sold between July 1992 and June 2002 in Pitt County, NC.
  - On average, property values are reduced by an estimated 5.8% when located in a floodplain.
  - The estimated discount for the floodplain for post-Floyd sales (8.4%) is larger than the discount for pre-Floyd sales (3.8%).
  - The price differentials for pre-Floyd are smaller than the insurance costs while the differentials for post-Floyd are larger.

Data

- Pitt County GIS data as of January 2009
- A total of 3,495 single-family residential properties sold between Sep 1996 and Aug 2002 (6 years) are used for the difference-in-differences analysis.
- A total of 3,360 single-family residential properties sold between Sep 2002 and Aug 2008 (6 years) are used for the comparison of risk premiums over time.

A Difference-in Differences Approach

- It could be difficult to distinguish the effect of Floyd from the effect of other contemporaneous changes.
- It uses a before and after design with a comparison group that did not receive the treatment but was subject to the same contemporaneous influences (Meyer 1995).
  - The treatment is Hurricane Floyd.
  - The treatment group is the properties located within a flood zone.
  - The untreated comparison group is the properties outside the flood zone that do not receive the treatment but experience the contemporaneous influences.

A Spatial Hedonic Model

- A spatial autoregressive hedonic model is estimated to account relevant spatial dependence.

$$ln P_{it}^{j} = \beta_0 + \sum_{k=1}^{K} \beta_k X_{kit} + \gamma_1 d_t + \gamma_2 d^{j} + \gamma_3 d_t^{j} + \varepsilon_{it}^{j}$$

$$\varepsilon_{it}^{j} = \lambda W_i \varepsilon + u_{it}^{j}$$

- The coefficient $\tilde{\gamma}_3$ represents the true causal effect of Hurricane Floyd on the flood-prone property values.

$$\tilde{\gamma}_3 = \overline{lnP_1^1} - \overline{lnP_0^1} - (\overline{lnP_1^0} - \overline{lnP_0^0})$$

MLE Results: 1996-2002 (obs=3,497)

Variable	Coefficient	Std.Error	Probability
AGE	-0.011	0.001	0.000
SQFT	0.000	0.000	0.000
LOTSIZE	0.009	0.007	0.171
BATHRM	0.278	0.027	0.000
HDWDFLOOR	0.039	0.009	0.000
GASHEAT	0.023	0.008	0.006
FIREPLACE	0.124	0.010	0.000
LNCRK	-0.004	0.003	0.208
LNAIR	0.018	0.015	0.232
LNRAIL	0.008	0.005	0.075
LNTAR	-0.033	0.008	0.000
LNPARK	-0.011	0.006	0.057
FLOOD	**-0.042**	**0.019**	**0.027**
FLOYD	**0.019**	**0.007**	**0.005**
DFLOYD	**-0.046**	**0.026**	**0.076**
LAMBDA	0.465	0.133	0.000

MLE Results: 2002-2008 (obs=3,360)

Variable	Coefficient	Std.Error	Probability
AGE	-0.010	0.001	0.000
SQFT	0.000	0.000	0.000
LOTSIZE	0.012	0.008	0.156
BATHRM	0.227	0.032	0.000
HDWDFLOOR	0.072	0.011	0.000
GASHEAT	-0.006	0.009	0.493
FIREPLACE	0.112	0.012	0.000
LNCRK	0.000	0.004	0.984
LNAIR	0.015	0.019	0.433
LNRAIL	0.020	0.005	0.000
LNTAR	-0.048	0.008	0.000
LNPARK	-0.017	0.007	0.013
FLOOD	**-0.010**	**0.016**	**0.536**
LAMBDA	0.402	0.057	0.000

Summary

- Re-examine the results from Bin and Polasky (2004) using a difference-in-difference framework.
- Compare flood zone price differentials for a more recent sample of Pitt County property sales.
- Results confirm that the estimated discount for the floodplain for post-Floyd sales (8.8%) is larger than the discount for pre-Floyd sales (4.2%).
- Results indicate that the flood risk premiums associated with lower flood risk diminish over time, in the absence of severe storm events.