**The Florida Catastrophic Storm Risk Management Center**

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# The Capitalization of Homeowners Insurance Premiums in House Prices

THE FLORIDA STATE UNIVERSITY
COLLEGE OF BUSINESS
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# THE CAPITALIZATION OF HOMEOWNERS INSURANCE PREMIUMS IN HOUSE PRICES

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# THE CAPITALIZATION OF HOMEOWNERS INSURANCE PREMIUMS IN HOUSE PRICES

## Executive Summary

The primary questions of interest in this study are whether and, if so to what extent, changes in homeowners insurance premiums affect real estate prices. As a cost of owning a home, homeowners insurance would have an impact on the homeownership decision, but in normal times one would expect the impact to be marginal**.** However, during a period of high insurance costs or rapidly increasing premiums, these costs would likely have a stronger effect on housing demand and the capitalization of these higher costs into house prices could create a downward pressure on prices. The supply of housing could also be affected as homeowners find the increasing ownership costs a hardship or unbearable and decide to terminate ownership. As such, higher insurance costs could have a significant impact by both reducing the demand and increasing the supply of housing.

Following the seven named hurricanes that impacted Florida in 2004 and 2005, Florida's current and prospective homeowners found themselves caught in the perfect storm. Beginning in 2006 mortgage costs, property taxes, and homeowners insurance all began to see significant increases. First, homeowners with adjustable-rate mortgages, which had become popular in the early-mid 2000s, experienced increasing contract rates and payments as these loans reset. Borrowers with interest-only adjustable-rate loans, which had also become more popular over the last several years, saw an even more dramatic increase as payments became amortizing. Second, the dramatic increase in property values in the early-mid 2000s led to continual increases in property taxes as property assessments increased. Insurance provided the third, and in some cases, most visible evidence of increasing homeownership costs. A doubling of premiums was not uncommon in areas of the state that had the highest natural disaster risk exposure. Many highly leveraged homeowners had little or no additional income to offset these increasing costs and were forced to consider selling their properties. Simultaneously, however, demand for real estate was decreasing as prospective buyers factored these additional costs into the prices they were willing to pay.

The size and price volatility of the Florida housing market over the 2004-2009 time period in conjunction with the shock losses that the property insurance market sustained over this period provide an excellent setting in which to examine the relationship between a significant housing cost factor (homeowner's insurance) and the demand for residential real estate. Given that property taxes are a main

revenue source for many states and local jurisdictions and given that property tax collections are based on property values that can be affected by factors such as changes in insurance costs, it is important to better understand the cost factors that ultimately have a significant impact on the demand for real estate and real estate prices. A better understanding of these relationships can provide for more effective public policy decisions regarding insurance pricing and regulation of the insurance industry in general.

This study examines the extent to which changes in homeowners insurance premiums affect the demand for housing. Previous research, using primarily floodplain data, has shown that increased insurance costs are negatively capitalized into house prices. This study used Miami-Dade County home sales and Citizens Property Insurance Corporation data for the period 2004 through 2009 to measure the capitalization effect of increases in premiums on house prices. Using a hedonic pricing model and measures of changes in homeowners insurance premiums over one-, two- and three-period segments prior to the sale of the property, the results showed that increases in premiums are negatively capitalized in prices.

In the data used in this study, homeowners spent an average of $2,145 per year for property insurance. The changes in insurance premiums during the time period were dramatic: the one-, two-, and three-year percentage changes were 18.08 percent, 41.44 percent, and 72.58 percent, respectively. The results indicate that the one-year premium increase of 18.08 percent ($387.82) resulted in a $3,363.09 decrease in the average house price. The two-year premium increase of 41.44 percent ($888.89) decreased the average house price by $9,963.54. The three-year premium increase of 72.58 percent ($1,556.84) decreased the average house price by $13,484.62. These changes in the average house price produce implied cap rates of 11.53%, 8.92%, and 11.55%, respectively for the one-, two-, and three-year premium increases.

# THE CAPITALIZATION OF HOMEOWNERS INSURANCE PREMIUMS IN HOUSE PRICES


## Abstract

This study examines the impact of changes in property insurance premiums on house prices. Previous research, using primarily floodplain data, has shown that increased insurance costs are negatively capitalized into house prices. This study uses Miami-Dade County home sales and Citizens Property Insurance Corporation data for the period 2004 through 2009 to measure the capitalization effect of increases in premiums on house prices. Using a hedonic pricing model and measures of changes in homeowners insurance premiums over one-, two- and three-period segments prior to the sale of the property, the results show that increases in premiums are negatively capitalized in prices.

# THE CAPITALIZATION OF HOMEOWNERS INSURANCE PREMIUMS IN HOUSE PRICES

## I. Introduction

While reflecting the national upward then downward trend in house prices over the 2000s decade, house price movements in south Florida were more volatile than the average across the U.S. The S&P/Case-Shiller Home Price Index shows that, from 2000 to 2006, house prices in Miami-Dade County increased by about 180 percent while the national average was 105-125 percent. The subsequent price decline after 2006 has been about 50 percent (compared to about a 30 percent national average). Explanations for the collapse of the south Florida housing market, as elsewhere, can be found in the interrelated factors that impact housing demand and supply. On the supply side, easy access to low-cost construction financing led to overbuilding and a significant expansion of the housing stock. On the demand side, availability of low-cost mortgage financing and relaxed underwriting standards played key roles in creating high demand for housing. Speculative investors (as well as some first-time and traditional homebuyers) that normally would not have qualified for credit during normal market conditions were able to obtain financing.

An additional homeownership cost that could affect the demand for housing along with the cost and supply of credit is homeowners insurance. As a cost of owning a home, homeowners insurance would have an impact on the homeownership decision, but in normal times one would expect the impact to be marginal**.** However, during a period of high insurance costs[1] or rapidly increasing premiums, these costs would likely have a stronger effect on housing demand and the capitalization of these higher costs into house prices could create a downward pressure on prices. The supply of housing could also be affected as homeowners find the increasing ownership costs a hardship or unbearable and decide to terminate ownership.[2] As such, higher insurance costs could have a significant impact by both reducing the demand and increasing the supply of housing.

[1] Due primarily to the catastrophic wind exposure, Florida is ranked as the third most expensive state for homeowners insurance.

[2] Given the lack of sufficient income and/or capital, speculative investors and first time home buyers were more at risk to increases in homeownership costs.

This study examines the extent to which changes in homeowners insurance premiums affect the demand for housing. It would be expected that consumers capitalize these changes in costs into their buying decisions and, as such, the price that consumers are willing to pay for homes is affected. The study uses a hedonic pricing model to measure the effect of changes in homeowners insurance premiums on house prices in the Miami-Dade County area.[3] For a hurricane-prone area such as Miami-Dade County, a simple cost-benefit rule should guide rational homebuyer behavior with regard to insurance costs. The appropriate economic assessment of increased insurance costs would be the design of price-efficient insurance policies balanced against the perceived exposure to disaster risk. In the empirical real estate literature this tradeoff has typically been measured by applying revealed preference models to housing data within floodplains. Studies such as Skantz and Strickland (1987), Shilling, Sirmans, and Benjamin (1989), and Speyrer and Ragas (1991) show that flood insurance premiums are negatively capitalized into house prices.

## II. Hurricane Losses and Florida Property Insurance

The willingness of homebuyers to pay increased insurance costs may be affected by a perception bias as the objective probability of a given risk diverges from the homebuyer's perception of the risk. As Daniel, Florax, and Rietveld (2009) have shown, individuals tend to overestimate low probability events and underestimate risks over which they have active control. As they point out, one way to at least partially identify differences between objective and subjective probabilities of risk (and therefore a willingness to pay for protection) is to compare house prices before and after an event. An example would be the occurrence of a catastrophic event such as a hurricane followed by an increase in insurance premiums.

Following the seven named hurricanes that impacted Florida in 2004 and 2005, Florida's current and prospective homeowners found themselves caught in the perfect storm. Beginning in 2006 mortgage costs, property taxes, and homeowners insurance all began to see significant increases. First, homeowners with adjustable-rate mortgages, which had become popular in the early-mid 2000s, experienced increasing contract rates and payments as these loans reset. Borrowers with interest-only adjustable-rate loans, which had also become more popular over the last several years, saw an even more dramatic increase as

[3] Hedonic pricing models are useful tools in measuring the implicit marginal prices of housing attributes, including changes in insurance premiums.

payments became amortizing. Second, the dramatic increase in property values in the early-mid 2000s led to continual increases in property taxes as property assessments increased. Insurance provided the third, and in some cases, most visible evidence of increasing homeownership costs. A doubling of premiums was not uncommon in areas of the state that had the highest natural disaster risk exposure. Many highly leveraged homeowners had little or no additional income to offset these increasing costs and were forced to consider terminating their homeownership. Simultaneously, however, demand for real estate was decreasing as prospective buyers factored these additional costs into the prices they were willing to pay.

It is interesting to note that, while the financial impact of changes in either mortgage payments or property taxes can be significantly larger than the change in insurance premiums, consumers have responded more aggressively to significant increases in insurance premiums (Dumm et al, 2010). For example, in response to consumer anger over perceived excessive property insurance premiums, the pricing of insurance became a salient feature of the 2006 Florida statewide elections (Dumm et al, 2010). As a candidate for governor, Charlie Crist pledged to call a special session of the legislature to address excessive residential property insurance rates. After winning the election, he called the legislature into special session in January 2007 and the resulting legislation promised rate relief by significantly expanding the capacity of the Florida Hurricane Catastrophe Fund (mandating low-cost reinsurance by this state reinsurer) and freezing the rates of Citizens Property Insurance Corporation.

This recent history of property insurance in Florida provides an excellent illustration of the tension between the two seemingly conflicting regulatory goals of (1) setting rates that are sufficient to pay claims and (2) giving consumers rates that are affordable. The combined losses from the 2004 and 2005 hurricane seasons were in excess of $35 billion while premiums collected during this two year period were just over $7 billion. Thus rate increases were anticipated but the magnitude of the increases was not. The backlash from these increases resulted in the legislation discussed above.

Because of the level of premiums, rate volatility, and the efforts to constrain rates, Florida provides an interesting setting to evaluate the impact of insurance rates on real estate demand. Leading up to the 2004 and 2005 hurricane seasons, much of the residential property development was in the coastal zones. The rapid price increases in property insurance premiums was, in large part, due to this coastal development and the uncertainty surrounding future hurricane losses and the concentrated risk exposure that it created.

## III. Market Demand and the Availability/Affordability of Insurance

There are numerous examples showing that insurance market imperfections (availability/affordability) have impacted the supply and demand for products or services. For example, employees of small firms may go without coverage due to the high cost of health insurance (Cebala, 2008). Others suggest that the high cost of malpractice insurance may impact health care through both the practice of defensive medicine and decisions to specialize. Companies may avoid offering products or services due to the high cost of (or in some cases, the lack of) liability insurance. The existence of non-standard insurers (i.e., excess and surplus lines insurers) and residual markets help to address these market imperfections; however, they do not eliminate them and may, in some cases, magnify the problem.

Previous research has focused on the demand for insurance as it relates to pricing/moral hazard (e.g., Ehrlich and Becker, 1972) or has examined insurance purchase decisions in the face of catastrophic loss (Kleindorfer and Kuhnreuther, 2000). Compared with papers that examine factors impacting the demand for insurance (e.g., Lin and Grace, 2007), there are relatively few studies that directly investigate the impact of insurance premiums on the demand for products or services. Research on the capacity constraint model (e.g., Gron, 1994; Winter, 1995; Doherty and Posey, 1998) argues that the byproducts of natural catastrophes are temporary-duration supply shortages and large increases in premiums (Nyce and Doherty, 2004). Nyce and Doherty (2004) develop a theoretical model to evaluate the impact of property insurance premiums on property prices following a natural disaster. They use data from the American Housing Survey and find some empirical support for the notion that increases in insurance premiums have an adverse effect on housing prices.

This study extends the work of Nyce and Doherty by examining the impact that risk transfer costs (i.e., insurance premiums) have on the residential real estate market. The size and price volatility of the Florida housing market over the 2004-2009 time period in conjunction with the shock losses that the property insurance market sustained over this period provide an excellent setting in which to examine the relationship between a significant housing cost factor (homeowner's insurance) and the demand for residential real estate. Given that property taxes are a main revenue source for many states and local jurisdictions and given that property tax collections are based on property values that can be affected by factors such as changes in insurance costs, it is important to better understand the cost factors that

ultimately have a significant impact on the demand for real estate and real estate prices. A better understanding of these relationships can provide for more effective public policy decisions regarding insurance pricing and regulation of the insurance industry in general.

## IV. Public Policy Effects of Insurance Subsidies

The primary questions of interest in this study are whether and, if so to what extent, changes in homeowners insurance premiums affect real estate prices. The public policy implications of the impact of insurance on real estate prices relate in part to the general question surrounding subsidies. The classic adverse selection problem is a direct result of subsidies within the risk pool itself (e.g., low risk subsidizing high risk). However, the question of subsidies goes beyond their impact on the insurance markets to the broader issue of explicit subsidies providing benefits beyond supporting higher risk exposures. For example, if it were documented that one dollar used to subsidize insurance rates generates two dollars of net economic benefit to the state in the form of increased revenue, then the argument for the state providing subsidies is much stronger.[4] In the context of this study, the potential net economic benefits include (1) higher (or more stable) property tax revenue and other revenues (e.g. from fees) that an active real estate market generates and (2) more stable real estate prices.[5]

Property insurance rates are affected by other factors related to those noted above. For example, rates may include a load for reinsurance; but reinsurance rates are set by reinsurers operating outside of regulatory rate control. Additionally, insurance is a product where subsidies exist at some level. In Florida, inland homeowners (lower risk) subsidize homeowners who live on the coast. Moreover, research (e.g., Nyce and Maroney, 2010) has shown that subsidies are occurring within the coastal region itself with properties that are slightly inland subsidizing properties directly on the coast.[6] An important point with subsidies is that they are generally already embedded to some degree in the residential property insurance system. If insurance premiums are one of the factors driving the demand for housing, public policy would dictate that consideration be given to directly subsidizing coastal insurance premiums. This

[4] The argument is likely stronger from the perspective of the state than an individual taxpayer who may not see or understand the benefits noted above.
[5] This has significant public policy implications given the fact that property taxes serve as the primary revenue source at the local level and that the home represents the largest asset that many individuals or families own.
[6] Florida currently has over $1.3 trillion in insured residential property exposures and over 80 percent of this exposure base is coastal.

would provide the greatest support for price stability in the real estate market. As such, a better general understanding of the impact of insurance costs on real estate in general, and particularly when these factors are related to catastrophic risk, should lead to better public policy decisions regarding not only whether subsidies should be considered but also the amount and timing of these subsidies.

## V. House Prices and Insurance Premiums

There is evidence that increased insurance costs have a negative effect on house prices. Several studies have examined the effect of floodplain insurance on house prices. Shilling, Benjamin, and Sirmans (1989) examine the effect of floodplain location and the accompanying cost of flood insurance on house prices. Using Baton Rouge, Louisiana, data they find that location in a floodplain reduces sale price by about $4,500 on average. Using the actual flood insurance premium, they find that the premium is capitalized into the house price at a discount rate of about 4 percent. MacDonald, Murdoch, and White (1987), using Monroe, Louisiana data, find a similar capitalization rate (about 3 percent) of flood insurance cost in house prices. Skantz and Strickland (1987), examining urban flooding in Houston, Texas, find that an increase in insurance rates has a significant negative effect on house prices. Speyrer and Ragas (1991) use an insurance cost index to show that the increased cost of flood insurance has a significant negative effect on house prices. For different locations, they find that the implied discount rate ranges from about 1.50 percent to 4 percent. Donnelly (1989), using housing data from LaCrosse, Wisconsin, finds a negative effect of floodplain location on house prices but also finds that the perceived risk measured by the sales price differential was not equal to the actual risk measured by the capitalized flood plain insurance premiums.

More recent studies confirm the effect of floodplain location on house price. Harrison, Smersh, and Schwartz (2001), using Alachua County, Florida, data, find that housing characteristics for properties located within a floodplain are priced less, on average, than characteristics of properties located outside a floodplain. Interestingly, they find that the price differential is less than the present value of future flood insurance premiums. A 2002 paper by Dei-Tutu, using home sales from Pitt County, North Carolina, finds lower prices (about 6 percent on average) for homes located within a floodplain. But, in contrast to Harrison, Smersh, and Schwartz, he finds that this price differential is greater than the present value of future flood insurance premiums.

## VI. Data and Methodology

### A. The Model

The real estate literature has typically used hedonic regression analysis to identify the marginal effect on house prices of various housing characteristics and other factors. Sirmans, Macpherson and Zietz (2005) examine hedonic pricing models for more than 125 empirical studies and find that these hedonic models have included a vast number of variables.

Generally, the hedonic pricing model takes the form

$$\ln(sp_i) = \alpha_0 + \beta_j X_{ij} + \varepsilon_i$$

where $\ln(sp_i)$ is the natural log of selling price for property i, $\alpha_0$ is a constant term, $\beta_j$ is the regression coefficient for the $j^{th}$ housing characteristic for property i, $X_{ij}$ is a vector of j housing characteristics (structural,/spatial/environmental) for property i, and $\varepsilon_i$ is the residual error term for property i.

To examine the effect of the cost of insurance on residential real estate prices, our model is expanded such that:

$$\ln(sp_i) = \alpha_0 + \beta_j X_{ij} + \beta_k \, TotPrem_i + \beta_L \, PctPrem_j + \varepsilon_i$$

where $\beta_k$ is the regression coefficient for total premium, $TotPrem_i$ is the annual homeowners insurance premium in the year of sale for property i, $\beta_L$ is the regression coefficient for the change in premium, and $PctPrem_i$ is the percentage change in the homeowners premium for property i. Three change-in-premium variables are estimated: (1) the percentage change in the homeowners premium over the last year before the sale of the property, (2) the percentage change in the premium over the last two years prior to sale, and (3) the percentage change in premium over the last three years prior to sale. A priori, the expected finding is a positive relationship between house prices and total premium and a negative relationship between house prices and changes in premium.[7]

### B. The Data

The data are created by merging parcel level data for Miami-Dade County with property sales data and insurance data.[8] The parcel level shape file, including parcel number and address, was obtained from

[7] Premium is related to the coverage necessary to rebuild the house (replacement cost) and increases as the exposure amount increases. The focus of the study is on the change in premium and we would argue that substantial increases in premium costs across time will adversely impact on selling prices.

8 Since the data comprise a single county, the tax rates will not vary and need not be considered in the model.

the Miami-Dade GIS website (www.miamidade.gov/gis/). The sales data included all single unit sales between 2004 and 2009 in Miami-Dade County. There were 103,869 sales of 85,722 unique parcels. The sales data included the parcel number, sale month and year, the sale price, and housing characteristics (number of bedrooms, bathrooms, square footage, age, and lot size). The insurance data is from Citizens Property Insurance Corporation and included all policies in force in Miami/Dade County from 2004 through 2009. The insurance data included the address of the property, the premium, the policy limits, and the type of policy. The Citizens data was matched to parcels (and the parcel level data) by address matching using the ArcGIS software. To obtain the lagged changes in insurance premiums necessary for the analysis, the insurance data were limited to policies on 215,541 parcels where multiple years of policy information was available. The sales data were also matched to the parcel level data (and Citizens data) by parcel number. Nearly 50,000 parcels had multiple years of Citizens premium history and were sold during the 2004 through 2009 timeframe. Of those 50,000 parcels nearly 45,000 became Citizens policyholders following the sale, so no insurance premium information was available prior to the sale. The remaining 5,000 observations have multiple years of Citizens premium information prior to the year of sale and are used in the analysis.[9]

Table 1 provides definitions for the variables included in the model. Along with housing characteristics (square footage, lot size, age, number of bedrooms, number of bathrooms, etc.), the model also includes variables to capture spatial and environmental characteristics. The variable *HO* is a binary variable that equals 1 if the property is insured under a homeowners' policy and 0 if insured by a dwelling policy.[10] The variable *140MPH* is included in the model to capture locational wind risk and is a binary variable with a value of 1 if the property is located within the 140 mile per hour wind zone and 0 otherwise. A second locational risk measure for flood is also included in the model. *FloodHigh* is a binary variable with a value of 1 if the property is located in one of the high risk flood zones and 0 otherwise.

[9] This is consistent with the Florida homeowners' insurance market during this timeframe. Very few private market insurance companies were selling new policies in storm prone coastal areas. Most new policies were being offered by Citizens.

[10] A homeowners policy offers broader coverage than a dwelling policy and can only be issued for owner-occupied housing. If the property is a rental property, the owner may insure with a dwelling policy. Therefore, owner-occupied housing may be insured with either a homeowners policy or a dwelling policy but a rental property will only be insured with a dwelling policy.

## VII. EMPIRICAL RESULTS

Summary statistics for the variables included in the model are provided in Table 2. For the model that includes the one-period percentage change in homeowner premium, there were 4,929 observations. The model measuring the impact of a two-year change in premium had 2,003 observations while the model that includes the three-year change in premium had 830 observations.[11]

As seen in Table 2, over the period 2004 through 2009 homes sold for an average price of $383,639 with a minimum price of $63,000 and a maximum of $6,950,000. The average square footage was 1,826 and the average lot size was approximately 9,311 square feet. The average age of the houses in the sample was 42.4 years and the average number of bedrooms and bathrooms were 3.04 and 1.90 respectively. Based on the location of the houses in the sample, almost 90 percent of the homes were within the 140 mile per hour wind zone and 43.5 percent were within the high risk flood zones.

For the insurance variables, homeowners during this time period spent an average of $2,145 per year for property insurance with premiums ranging from $156 per year to $24,397 per year. As Table 2 shows, the changes in insurance premiums were dramatic: the one-, two-, and three-year percentage changes were 18.1 percent, 41.4 percent, and 72.6 percent, respectively. The table also shows the dramatic transition in sales activity for residential real estate in Miami-Dade County. Sales increased each year from 2004 through 2006 and then declined rapidly over 2007 through 2009. Note that only 4.93 percent and 2.72 percent of the homes in the sample sold in 2008 and 2009, respectively.

The regression results are presented in Table 3. Model 1 includes the one-period percentage change in the premium, P*ctPremL1* and has an R-square of 0.78. The housing characteristics behave generally as expected and are all statistically significant, with the exception of age. Square footage and number of bathrooms are positive and bedrooms are negative.[12] The age variable is not significant while age squared is positive. As expected, *TotPrem* is positively related to price since the total premium increases as the size of the exposure increases. The *HO* variable is positive, indicating that the average selling price for owner-occupied homes is greater than that for rental properties.[13] The measure of locational wind risk, *140MPH*, is negative indicating that homes located with the highest risk location had lower average

[11] The limiting factor is the number of years the property was insured with Citizens prior to sale.
[12] The bedroom coefficient is negative because it represents the marginal value of an additional bedroom while holding square feet of living area constant.
[13] Owner-occupied homes are likely better maintained and marketed.

selling prices while *Floodhigh* is positive.[14] With *Y2007* omitted, the year variables, *Y2004* through *Y2009*, indicate that home prices increased steadily through 2007 and then decreased substantially in 2008 and 2009.

The variable of primary interest is the one-period percentage change in premium. The coefficient on *PctPremL1* is negative showing that the one-year increase in premium leading up to the sale had an adverse impact on selling price. The coefficient is -0.0487, indicating that a 100 percent increase in the premium would result in a 4.87 decrease in the log price of the average house (a 4.75% decrease in selling price). In other words, a premium increase of $2,145 (100% increase in average premium) would result in a $18,236 drop in sale price of the average house (from $383,638 to 365,402). For the actual one-year premium increase of 18.08 percent ($387.82), the house price would have decreased by 0.88 percent (0.1808 x 0.0487) or $3,363.09. This represents a cap rate of 11.53 percent. A cap rate this high may indicate that the full cost of premium increases are not being reflected in sales prices or that buyers do not believe that the rate increases are permanent annual recurring costs. The chart below summarizes the decrease in house price relative to the increase in the homeowners premium for the one-, two-, and three-year periods prior to sale.

The second regression model (Model 2) includes the two-period percentage change in premium and has an R-squared of 0.794. The housing characteristics results are consistent with those for Model 1with all the variables being significant except *LotSize*, *Age*, and *Y2006*. As with the one period model, the coefficient on the two-period change in premium, *PctPremL2*, is negative indicating that home prices fell in response to increasing premiums over the previous two years. The coefficient is about 50 percent greater than *PctPremL1*, indicating that the two-year premium increase had a greater impact on sale price. The coefficient of -0.0635 shows that the two-year premium change had a greater impact on sale price and that a 100 percent increase in the premium would result in a .0635 decrease in the log price or a 6.15% decrease in the average selling price. For the actual two-year increase in the premium of 41.44 percent ($888.89), the average house price declined by 2.63 percent (0.4144 x 0.0635), or $9,963.54. This represents a cap rate of 8.92 percent.

The third regression model (Model 3) includes the three-period percentage change in premium, *PctPremL3*. The R-square for the model is 0.795 and the overall results are consistent with the results for

[14] The flood plain variable could be reflecting distance to the coast and the subsidized nature of insurance costs.

Model 1 and Model 2. *PctPremL3* is again negative with a coefficient of -0.0493, indicating that the cumulative premium increase over the last three years drove down selling price. With the three-year increase in the premium of 72.58 percent ($1,556.84), the price of the average home would have declined by 3.59 percent (0.7258 x 0.0495) or $13,484.62. This represents an implied cap rate of 11.55 percent.

| Variable | Parameter Estimate | Mean %Δ in Premium | $ Increase in Premium | Change in ln Price | Decrease in Property Price | Cap Rate |
|---|---|---|---|---|---|---|
| *PctPremL1* | -0.0487 | 18.08% | $387.82 | -0.880% | $3,363.09 | 11.53% |
| *PctPremL2* | -0.0635 | 41.44% | $888.89 | -2.631% | $9,963.54 | 8.92% |
| *PctPremL3* | -0.0493 | 72.58% | $1,556.84 | -3.578% | $13,484.62 | 11.55% |

## VIII. SUMMARY

Over the 2000s decade, real estate prices in south Florida (Miami-Dade County) showed a greater volatility than the national average. After the peak in prices in 2006, prices in the Miami-Dade County area declined more rapidly than prices in most other areas. One possible contributing factor to this decline in prices was rapidly increasing homeowners insurance premiums. Rational homebuyer behavior in regard to homeowners insurance should reflect price-efficient policies relative to disaster risk exposure. Revealed preference models relative to the increased cost of floodplain insurance have shown a negative capitalization of flood insurance premiums in house prices.

This study examined the impact of changes in property insurance premiums on house prices. Previous research, using primarily floodplain data, has shown that increased insurance costs are negatively capitalized into house prices. This study used Miami-Dade County home sales and Citizens Property Insurance Corporation data for the period 2004 through 2009 to measure the capitalization effect of increases in premiums on house prices. Using a hedonic pricing model and measures of changes in homeowners insurance premiums over one-, two- and three-period segments prior to the sale of the property, the results showed that increases in premiums are negatively capitalized in prices.

**REFERENCES**


Cebula, R., Small Firm Size and Health Insurance: A Private Enterprise Perspective, *Journal of Private Enterprise*, 2008, pp. 51-77.

Daniel, V. E., R. J. G. M. Florax, and P. Rietveld, 2009, "Flooding Risk and Housing Values: An Economic Assessment of Environmental Hazard," *Ecological Economics*, 69:2, 355-365.

Dei-Tutu, V., "Flood Hazards, Insurance, and House Prices: A Hedonic Property Price Analysis," M.S. Research Paper, Department of Economics, East Carolina University, 2002.

Doherty, Neal and Lisa Posey, 1998, On the Value of a Checkup: Adverse Selection, Moral Hazard and the Value of Information, Journal of Risk and Insurance, 65:189-211.

Donnelly, W., "Hedonic Price Analysis of the Effects of a Floodplain on Property Values, *Water Resources Bulletin* 24 (1989): 581-586.

Dumm, R., Liebenberg, A., Liebenberg, I., and J. Ruhland, 2010, Market Reaction to Regulatory Capture and Political Risk in a Highly-Salient Environment*, Journal of Insurance Regulation*, 29:6, pp 141-166.

Dumm, R. E., G. S. Sirmans, and G. Smersh, "The Capitalization of Stricter Building Codes in Miami, Florida House Prices." Project completed for the Florida Catastrophic Storm Risk Management Center, Florida State University, 2008.

Dumm, R. , G. Stacy Sirmans and Greg Smersh, 2009, "The Capitalization Of Building Codes In House Prices," *Journal of Real Estate Finance and Economics*, 42:1, 30-50.

Dumm, R. E., G. S. Sirmans, and G. Smersh, "The Capitalization of Stricter Building Codes in Jacksonville, Fla., House Prices." Project completed for the Florida Catastrophic Storm Risk Management Center, Florida State University, 2009.

Ehrlich, I. and Becker, G.S., 1972, "Market Insurance, Self-Insurance, and Self Protection," *Journal of Political Economy*, 80:4, 623-648.

Gron, Anne, 1994, Capacity Constraints and Cycles in Property-Casualty Insurance Markets, *The RAND Journal of Economics*, 25: 110-127.

Harrison, D., G. Smersh, and A. Schawartz, 2001,"Environmental Determinants of Housing Prices: The Impact of Flood Zone Status," *Journal of Real Estate Research* 21: 3-20.

Kliendorfer, P. R., and H. Kunreuther, 2000, "Managing Catastrophe Risk," *Regulation***,** 23:4: 26-31**.**

Lin, Y. and Grace, M. F., 2007, Household Life Cycle Protection: Life Insurance Holdings, Financial Vulnerability, and Portfolio Implications, *Journal of Risk and Insurance*, 74: 141–173.

MacDonald, D., J. Murdoch, and H. White, 1987, "Uncertain Hazards, Insurance, and Consumer Choice: Evidence from Housing Markets," *Land Economics* 63: 361-371.

Nyce, Charles and Patrick Maroney (2010), Granularity in the Florida Property Insurance Market, *Risk Management and Insurance Review*, forthcoming.

Nyce, C. and N. Doherty, 2004, Into Harm's Way: The Relationship Among Homeowners' Insurance Premiums, Property Values, and Natural Hazards, dissertation (1999) and working paper.

Shilling, J., C.F. Sirmans, and J. Benjamin, 1989, "Flood Insurance, Wealth Redistribution, and Urban Property Values," *Journal of Urban Economics* 26: 43-53.

Sirmans, G. S., D. A. Macpherson, and E. N. Zietz,1005, "The Composition of Hedonic Pricing Models," *Journal of Real Estate Literature* 13:1: 3-46.

Skantz, T. and T. Strickland, 1987, "House Prices and a Flood Event: An Empirical Investigation of Market Efficiency," *Journal of Real Estate Research* 2: 75-83.

Speyrer, J. and W. Ragas, 1991, "Housing Prices and Flood Risk: An Examination using Spline Regression," *Journal of Real Estate Finance and Economics* 4: 395-407.

Spinner, Kate, 2008, "Growth Rate Ebbs in Florida Area," Herald Tribune, March 20, 2008, http://www.heraldtribune.com/article/20080320/NEWS/803200321?p=3&tc=pg&tc=ar

University of Florida's Bureau of Economics and Business Research, http://www.bebr.ufl.edu/

Winter, Ralph, 1995, The Dynamics of Competitive Insurance Markets, *Journal of Financial Intermediation*, 3:279-315.

**TABLE 1. VARIABLE DEFINITIONS**

| Variable | Definition |
|---|---|
| *Ln(sp)* | Log of sale price ln(*sp)* = dependent variable |
| *Bed* | Number of bedrooms |
| *LotSize* | Size of the lot in square feet |
| *Bath* | Number of bathrooms |
| *SqFt* | The square footage of the house |
| *Age, Age*$^2$ | Age of house at the time of sale and Age squared |
| *TotPrem* | Total annual premium paid on the homeowner policy in the year of sale |
| *PctPremL1* | Percentage change in homeowners insurance premium in the year leading up to sale of the property |
| *PctPremL2* | Percentage change in homeowners insurance premium in the previous two years leading up to sale of the property |
| *PctPremL3* | Percentage change in homeowners insurance premium in the previous three years leading up to sale of the property |
| *HO* | Binary variable for residence equals home, zero otherwise |
| *140 MPH* | Binary variable for location within the 140 MPH wind zone, zero otherwise |
| *FloodHigh* | Binary variable for location within the high risk flood zones, zero otherwise |
| *Y2004 – Y2009* | Time trend variables for the years 2004 through 2009 (Y2007 is the omitted year) |

| Table 2<br>Descriptive Statistics | | | | | |
|---|---|---|---|---|---|
| **Variable** | **Mean** | **Min** | **Max** | **StdDev** | **N** |
| *Price* | 383638.9 | 63000 | 6950000 | 402492.24 | 4929 |
| *Bed* | 3.043214 | 1 | 8 | .7959 | 4929 |
| *LotSize* | 9310.92 | 1240 | 96450.55 | 6115.55 | 4929 |
| *Bath* | 1.896125 | 1 | $7.50 | .8274 | 4929 |
| *SqFt* | 1826.192 | 801 | 9231 | 834.98 | 4929 |
| *Age* | 42.42179 | 0 | 92 | 18.01 | 4929 |
| *TotPrem* | 2145.421 | 156 | 24397 | 1756.16 | 4929 |
| *PctPremL1* | .1808 | -.6561 | 3.6435 | .2711 | 4929 |
| *PctPremL2* | .4144 | -.6408 | 4.4729 | .4600 | 2003 |
| *PctPremL3* | .7258 | -.5283 | 4.6020 | .6856 | 830 |
| *HO* | .8223 | 0 | 1 | .3823 | 4929 |
| *140 MPH* | .8990 | 0 | 1 | .3014 | 4929 |
| *FloodHigh* | .4352 | 0 | 1 | .4958 | 4929 |
| *Y2004* | .4118 | 0 | 1 | .4922 | 4929 |
| *Y2005* | .2211 | 0 | 1 | .4151 | 4929 |
| *Y2006* | .1960 | 0 | 1 | .3970 | 4929 |
| *Y2007* | .0945 | 0 | 1 | .2926 | 4929 |
| *Y2008* | .0493 | 0 | 1 | .2165 | 4929 |
| *Y2009* | .0272 | 0 | 1 | .1626 | 4929 |

**Table 3**
**Regression Results**
**(Cluster by Parcel; Dependent Variable= LPRICE)**

| | **Model 1** **1 Period Premium Change** | | | **Model 2** **2 Period Premium Change** | | | **Model 3** **3 Period Premium Change** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **Coef** | **SE** | **VIF** | **Coef** | **SE** | **VIF** | **Coef** | **SE** | **VIF** |
| Constant | 11.694 | .0340 | | 11.7368 | .0572 | | 11.8067 | .0875 | |
| *Bed* | **-.0527** | .0078 | 1.93 | **-.0543** | .0123 | 1.99 | -.0337* | .0174 | 2.15 |
| *LotSize* | .0000* | .0000 | 1.59 | .0000 | .0000 | 1.76 | .0000 | .0000 | 1.85 |
| *Bath* | **.0962** | .0099 | 3.06 | **.0920** | .0159 | 3.50 | **.0816** | .0227 | 3.69 |
| *SqFt* | **.0004** | .0000 | 4.33 | **.0004** | .0000 | 4.93 | **.0004** | .0000 | 5.16 |
| *Age* | .0007 | .0009 | 14.79 | .0025 | .0015 | 15.51 | -.0011 | .0023 | 16.68 |
| $Age^2$ | **.0001** | .0000 | 13.72 | **.0001** | .0000 | 14.24 | **.0001** | .0000 | 15.42 |
| *TotPrem* | **.0001** | .0000 | 2.34 | **.0001** | .0000 | 2.58 | **.0001** | .0000 | 2.52 |
| *PctPremL1* | **-.0487** | .0184 | 1.53 | | | | | | |
| *PctPremL2* | | | | **-.0635** | .0184 | 1.70 | | | |
| *PctPremL3* | | | | | | | -.0493* | .0220 | 1.94 |
| *HO* | **.0530** | .0121 | 1.20 | **.0844** | .0194 | 1.17 | **.1111** | .0333 | 1.25 |
| *140 MPH* | **-.1918** | .0152 | 1.24 | **-.1929** | .0271 | 1.31 | **-.1723** | .0380 | 1.34 |
| *FloodHigh* | **.0464** | .0095 | 1.24 | **.0473** | .0142 | 1.24 | .0240 | .0217 | 1.23 |
| *Y2004* | **-.2809** | .0160 | 3.71 | | | | | | |
| *Y2005* | **-.0680** | .0170 | 2.95 | **-.0885** | .0200 | 2.36 | | | |
| *Y2006* | .0373* | .0175 | 3.16 | .0104 | .0210 | 2.44 | -.0049 | .0259 | 1.74 |
| *Y2008* | **-.1967** | .0258 | 1.46 | **-.1990** | .0350 | 1.52 | **-.1877** | .0400 | 1.45 |
| *Y2009* | **-.5317** | .0307 | 1.27 | **-.5556** | .0383 | 1.32 | **-.5660** | .0537 | 1.32 |
| N | 4929 | | | 2003 | | | 830 | | |
| $R^2$ | .776 | | | .794 | | | .795 | | |

Bold= Significant at the 1% level, *= significant at the 5% level SE= Robust Standard Errors. Cluster based on parcels that were resold during the period 2003 to 2008.