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Home-Buyer Sentiment and Hurricane Landfalls

Abstract

Hurricanes impact home values, the willingness of home-buyers to purchase homes and the overall housing market. The goal of this article is to examine data from the Cape Fear region of North Carolina, an area at elevated hurricane risk, to answer the question: Does the market become “forgetful” after a period of unprecedented hurricane activity or do elements of the market’s measured fear of hurricane exposure become embedded in local home prices? This article reports that home values and buyer sentiment are clearly impacted by the storms and that the market recovered far more slowly following Hurricane Floyd in 1999 than with three earlier storms. Buyers and sellers seem to develop an aversion to the risks in the area after four hurricane landfalls in as many hurricane seasons, and are slow to become “forgetful.” However, in time, sentiment returns to normal, and homebuyer willingness to buy is restored.

Key words: *Hurricane risk, home values, buyer willingness*

Introduction

Tropical Storm Hanna rolled through the Cape Fear region of North Carolina in early September of 2008, and an unnamed sub-tropical storm later that month pushed the largest storm surge in almost nine years over the banks of this area’s coastal communities. Soon after, local appraisers and real estate buyers were reminded of the still-evolving impact of hurricanes on the local economy and real estate values. This article seeks to provide some additional clarity, and some new insights, into how to estimate the valuation impact of hurricanes on real estate, as those impacts relate to the “sentiment” of the real estate buyer and seller.

Sentiment is a lively and current topic. Debate has recently focused on the “animal spirits” of the American consumer; measures of consumer sentiment recall the work of Keynes, where the depression-era economy was purportedly unable to gain traction until the government stepped in to “grease the gears” and re-prime economic activity. The broad premise of the New Deal was that economic actors (consumers, business, and investors) were discouraged and did not provide the input to move the economy forward; the sentiment of those actors had changed, for the worse, and the economy suffered. Measured by such metrics as bid/ask spreads, trading volumes and price/earnings ratios, the capital markets have long and often been described using these proxies for investor sentiment; such measures have not been employed in the real estate literature to specifically describe real estate market sentiment.

We believe that we have the opportunity to extend the understanding of real estate with a coupling of contemporary financial theory and real estate market behavior, in an environment where increasing levels of catastrophic risk – as suggested in the area by four damaging hurricane landfalls in just over three years - seem to be influencing the behavior of home buyers.

Wind-swept fires near San Diego in late 2007 and the damaging hurricanes of 2004 (Frances, Jeanne, and Ivan), 2005 (Katrina and Wilma) and 2008 (Gustav and Ike), highlight the catastrophic exposure of homeowners, and underscore the need for a greater understanding of real estate market behavior, and the resultant effects upon real estate prices, in the context of catastrophic risk. The academic and practitioner press remark on the personal and financial costs

of fires, floods, earthquakes and hurricanes; suggestions vary from encouraging greater government involvement in the prediction of natural disasters to more focused lender, builder and insurance measures to minimize losses when these catastrophes occur. But, the manner with which real estate market sentiment might change around these events is unclear. With this study, we measure responses to catastrophic risk, and develop a platform from which to better appreciate the impact of hurricane risk on home values and buyer sentiment.

“Buyer sentiment” is our focus, but it cannot be directly observed; only an echo of changes in that sentiment can be seen, and we seek to measure those changes. The spread between listing (asking) and selling prices of homes and the average number of days a house is on the market before sale are measures of the changing sentiment of real estate buyers and sellers. We use these metrics, along with controls for the influence of general economic activity, including interest rate, inflation, and employment data.

We discover progressively greater and more significant changes in this sentiment with successive hurricane strikes in an area with seemingly increasing exposure to hurricane risk; a more volatile market seems to evolve as the perceptions of increased risk exposures develop. Of particular interest in this study will be the observed changes, over time, in the willingness of home buyers to actually complete a purchase. Does the market become “forgetful” or do elements of the market’s measured fear of hurricane exposure become embedded in the local home-pricing paradigm?

We observe a shift in home-buyer sentiment around and following hurricane landfalls on the southeastern North Carolina coast. The area of study is given in Figure 1. With four hurricanes striking the region in just over three years, it appears the market’s participants became more and more averse to the seemingly increased catastrophic risk echoing from these events; housing prices and market sentiment suffered, and did not fully recover after more than two years following the last significant hurricane – Floyd – in 1999.

This pricing and market behavior were observed during a period that was well before the dramatic run-up in coastal home values in the early 2000’s, and prior to the correction in those prices being observed more recently. While home prices and the overall residential market may have improved during the study period from 1995 to 2002, we find clear evidence that the market would have behaved in a more positive fashion absent all the hurricanes.

The wealthiest areas, along and near the coast, exhibited the greatest absolute declinations in value following the last couple of hurricanes, but we observed no statistically significant difference compared to the interior, and less wealthy, areas. Except for brief and mild corrections in the months following 9-11, both the local and national residential markets during the study period were growing, with prices and sales activity generally moving upward, but not at anywhere near the frenetic pace of 2004-2006. We were fortunate to have a study period uncompromised by the real estate run-up from late 2002 through 2007, and the collapse since then.

Recent housing market activity will provide ample fodder for later real estate research, but would likely have obscured the impact of hurricanes on changing real estate market sentiment. Our sentiment findings are important not only to the area homeowner, but also to the lender, builder and policymaker tasked with developing an understanding of a residential marketplace in an area exposed to recurring catastrophic events, such as hurricanes.

We next review existing research on investor sentiment and real estate pricing. In the following section, we develop a model with which we measure changes in home-buyer sentiment as a function of a series of hurricane landfalls in the study region. We then describe our data collection and provide summary statistics. Our findings are summarized as the paper closes.

Background

A substantial literature considers the economic impacts of hurricanes. Some studies anticipate no substantial impacts from even high-intensity storms as government rebuilding programs buoy output, employment, and government tax revenues.¹ Others note that migration caused by high-intensity hurricanes can offset any gains in economic conditions after an intense hurricane, and even low-intensity storms can cause significant impacts to regional economies through business interruption.²

Several studies consider the impact of hurricanes on home values. With changing perceptions of increased catastrophic risk following a period of unprecedented hurricane activity in the Cape Fear region of North Carolina, both home values and real estate market sentiment suffer.³ Home values declined following the last in a series of hurricane strikes, the market effectively “giving up” and throwing in the towel after four hurricane landfalls in as many years. Likewise, market sentiment deteriorated as evidenced by declining monthly home sales and widening spreads between asking and selling prices, following the last of these hurricanes. A premise forwarded was that the market was able to “shrug off” the first one or two hurricanes as “bad luck,” but with Hurricane Bonnie in 1998 and Hurricane Floyd in 1999, perceptions of the likelihood of hurricane strikes in the study region changed, and with increased expectations of hurricane activity, home prices and the housing market suffered.

Heightened concern over hurricane risks, given the activity of the last few years, has led one group of authors to examine the impact on housing values of a homeowner’s investment in hurricane mitigation, with the mitigation including such structural improvements as storm blinds and structural enhancements to the home; homebuyers value these self-insurance expenditures by homeowners. In the study area – one at perceived elevated hurricane risk similar to the Cape Fear region used in this study – home values were enhanced with the improvements, highlighting the awareness by the market of the increased risk exposure of the sample homes.⁴ Valuation impacts were also discovered in the northwest Florida housing market due to the flooding and damaging winds of Hurricane Ivan in 2004.⁵ Other authors consider changes in real estate values and home-buyer behavior adjacent to California earthquakes.⁶ Recent work reveals the recovery of home prices in the years following the Cape Fear landfalls of the late 1990’s; however, no specific mention of home-buyer sentiment is made as that research focused on home prices.

Adjacent to discoveries of a real estate market recovery in southeastern North Carolina since the unprecedented series of hurricane landfalls in the late 1990’s, we test a series of empirical expectations. First, we affirm that home prices rebound after a period of instability in the years following Hurricane Floyd, the last major storm to hit the region in 1999. Second, we assemble metrics to proxy for investor sentiment, and use those metrics to illustrate the market’s improving sentiment since early this century.

Spread between the listing and selling prices of homes

The first metric we consider is the spread between listing and selling prices. We believe that spreads between listing and selling prices increase as home-buyer sentiment changes with perceptions of increased exposure to hurricanes and catastrophic risk. Home buyers become less willing to purchase at current prices, *ceteris paribus*, due to expectations of possibly greater future hurricane losses; it is the new sense of uncertainty surrounding these losses that results in a greater bid/ask spread. Both buyers and sellers search for a market-clearing price, with neither quickly able to impute the cost of this new element of uncertainty – sentiment suffers. As a result, sellers are forced to provide some price concession to compensate buyers for the assumption of additional risk. We expect that this widening spread will narrow over time.

A broad literature considers the spread between home listing and selling prices.⁷ Findings vary; some simply acknowledge the complex relationships between listing prices and selling prices and housing market conditions, with others showing that the spread narrows with increased time of the house on the market. A greater variability in offers is found to be associated with wider spreads. A narrower spread is found with homes on the market longer, as well as a declining listing price, and narrower spread, for a distressed seller. Findings echo across foreclosures, a distressed element of the housing market.⁸

Average days a house is on the market

We also believe that with growing homebuyer aversion to a perception of increased catastrophic risk, the average days a typical home remains on the market, absent the sorts of price concessions noted above, will increase. Our second premise is that observed changes in the sentiment of the residential real estate market, as a result of the successive hurricanes of the late 1990's, will be tempered; the market sentiment and average days on the market will return to normal with the passage of time.

As with the information provided by the spread between home sales and asking prices, varied conclusions have been reached concerning the meaning of the average number of days homes spend on the market prior to sale. Some of the findings? Sales prices increase with more time on the market, other things equal; a positive relationship exists between price discounts and days on the market for mid-price homes (the longer on the market, the larger and more likely are later price discounts); a longer marketing time, and increased days on the market, is associated with atypical homes that invite a greater variation in offers relative to more conventional homes that can be more easily priced by both buyers and sellers. Others show that the probability of a sale increases with the days a home is on the market; days on the market are increased with lot size and decreased with price concessions and fireplaces (especially in one study area of Fargo, North Dakota!); variability in the days on the market is related to higher mortgage interest rates; attempts by sellers to extract higher prices in periods of low interest rates are typically unsuccessful and newer homes sell faster. Each of these earlier findings augments the story told by a home's days on the market, but none ties this marketing period to overall market sentiment.⁹

Methodology

To test our premises, housing sales data from December of '95 to March of '02 were gathered for the contiguous New Hanover, Brunswick, and Pender Counties in southeastern North Carolina. Prices were reported by the Multiple Listing Service (MLS) and the Association of Realtors in Wilmington. Additional data on national housing prices, proxied by housing indexes provided by the federal government, and the Center for Business and Economic Services at the University of North Carolina Wilmington, are gathered, as are general economic data. Table 1 illustrates some of these details of the housing market during the study period.

Table 1: Average Price, Days on the Market, and Spread for 1996-2002.			
Coastal Areas*			
Year	PRICE	DOM	SPREAD**
1996	\$156,318	110	0.029
1997	174,676	113	0.031
1998	187,127	136	0.035
1999	191,341	147	0.035
2000	203,184	162	0.038
2001	197,188	152	0.034
2002****	208,244	147	0.039
Non-Coastal Areas***			
Year	PRICE	DOM	SPREAD

1996	\$112,152	91	0.029
1997	116,819	100	0.027
1998	120,642	116	0.027
1999	123,090	137	0.027
2000	121,752	145	0.035
2001	128,688	145	0.034
2002	144,161	138	0.027
All Areas			
Year	PRICE	DOM	SPREAD
1996	\$139,639	103	0.029
1997	151,563	108	0.029
1998	161,547	128	0.032
1999	166,481	143	0.032
2000	174,750	156	0.038
2001	173,776	150	0.034
2002	184,735	143	0.034

*Includes Northeast New Hanover County, Southeast New Hanover County, Wrightsville Beach, Pleasure Island, Coastal Pender County, and Coastal Brunswick County.

**Spread is the Listing Price minus the Selling Price divided by the Listing Price.

*** Includes Southwest New Hanover County, Northwest New Hanover County, and Non-coastal Pender County.

****Data for the first quarter of 2002 is annualized in this table.

Data in Table 1 reveal increasing prices among coastal properties in particular. Days on the market increase after the successive hurricane strikes but decline in 2001. The spread between list price and selling price increases after Floyd in the coastal regions through early 2002.

That we only examine data through 2002 bears mention, as more recent data is available, but is not employed. Two issues preclude the facility and advisability of using more recent data: First, the local realtor association began in early 2002 to assemble its data across new and previously unused geographical boundaries; combining data prior to that date with more recent data is not practicable, absent reassembling either the older or newer data sets along shared boundaries. With unit sales across all examined areas averaging over 2,000 per year – and each sale requiring manual re-entry into a new data set to make it usable - we examined only the existing data through early 2002; results below obviate the need to consider more recent sales. Second, the time since 2002 is compromised by first the run-up in coastal-area home values, and secondly by the sub-prime dilemma, obscuring the intent of our study and lending further support to the use of only the available data through early 2002.

Given any area at observed levels of catastrophic risk, random catastrophic events such as hurricanes or earthquakes should have no impact on the perception of home-buyers of the susceptibility of the area to this risk. However, a series of these events in a short period of time, such as the successive hurricane strikes in our study region, likely impacts market perceptions of the likelihood of increasing expected future catastrophic losses.

To test this premise, with monthly data, we estimate the following sentiment model using the average percentage difference between asking and selling prices (SPD), the average days a selling home spends on the market (DOM), and the natural log of the average selling price (PRICE):

$$SEN = \beta_0 + \beta_1 SENLAG + \beta_2 COAST + \beta_3 FRAN + \beta_4 BONNIE + \beta_5 FLOYD + \beta_i X_i + \varepsilon,$$

where SEN is a housing market sentiment variable (either PRICE, DOM, or SPD), SENLAG is the lag of SEN, COAST denotes homes located in coastal areas, and X_i is a set of additional explanatory variables, which capture the state of the economy.

The FRAN, BONNIE, and FLOYD hurricane variables portray potential changes in market sentiment following hurricanes Fran (August 1996 – we note that Bertha struck earlier that same summer, and is subsumed by the Fran factor), Bonnie (August 1998), and Floyd (September 1999). In the simplest model run, these variables were dummy variables that take on a value of 1 in the first month only after a landing hurricane. In other model runs, the dummies take on a value of 1 for up to twenty-four months, or in the case of Floyd up to 30 months, after the strike. These variables allow us to test the assumption that sentiment changes for a precise period of time before returning to normal.

Alternative specifications of the hurricane variables are constructed and used to test the premise of full market recovery.¹⁰ These variables assume that market sentiment is acutely impacted immediately after a landfalling hurricane, but then the market experiences a linear recovery back to normal. For example, a three month recovery variable takes on the value of 1 in the month of the hurricane strike, a value of 0.67 in the month immediately after the strike, a value of 0.33 two months after the strike, and 0 in all other time periods. These recovery variables are constructed to allow for various recovery times.

With the creation of these variables, we seek to test for increasingly adverse market responses in the periods following, respectively, hurricanes Bonnie and Floyd. Fran could be considered a random event, with no significant market impact. With Bonnie and Floyd, however, we anticipate that the market develops a perception of changing catastrophic risk, and with the years since the time of Floyd, the impacts of hurricanes subside.

For example, we anticipate that days on the market will not be significantly impacted or that the impact will be short-lived after hurricane Fran, but days on the market will increase for a lengthy duration after Floyd. This premise is confirmed if either the Fran intervention variables are insignificant or if the shorter term Fran intervention variables provide a better statistical fit; we likewise expect the longer term Floyd variables to provide a better fit than the shorter duration Floyd variables. We expect similar short-term impacts with Fran, and longer-term effects for Bonnie and Floyd for the spread factor.

Results

We employ pulse and intervention variables to first capture the impact of a given factor, and to then portray its diminishment. A pulse variable reveals a hurricane's impact on a selected measure of sentiment – either spread or days on the market – with an even magnitude for a certain length of time, when that impact abruptly ends. A recovery variable, on the other hand, describes changing sentiment of a decreasing magnitude for a certain length of time until the impact of the storm on the sentiment finally disappears.

Our statistical discoveries are generally in line with our expectations. Results for the various model runs using days on the market and the relative spread are given in Table 2. The beta or coefficient estimates in column two reveal the suggested change in spread, days on the market, and price as a result of an increase in the listed explanatory factor. For example, the

Floyd P-18 factor in Panel A of Table 2 suggests, with its beta estimate, that the storm was associated with about a 1% (.0096) increase in the relative spread between the asking and selling prices of selling homes within 18 months following Floyd. The t-statistic in column 2 is simply a measure of the meaningfulness of the coefficient estimate; in statistical parlance, the t-stat reveals the significance of a coefficient estimate. If the t-stat is low (under 2, for instance), as for the t-statistic for Fran P-3 in Panel C (there we see that Fran had no appreciable impact on home values), we can conclude the coefficient is not significantly different than zero. The p-value, in the last column of Table 2, affirms the intensity of the t-statistic; if the p-value is above .10, as with the p-value of HINF in all three panels of Table 2, we have provided evidence that housing inflation is not appreciably associated with average spreads or days on the market or price. The coefficient or beta estimate and p-value for Floyd R-18 suggest that Hurricane Floyd, on the other hand, was significantly correlated with increasing, and later declining, days required for a home sale following its landfall. The p-value of .0674 for that factor in column three underscores the message of the t-statistic.

In the table, hurricane intervention variables are noted with the hurricane name followed by an indication of whether the variable is a pulse variable or a recovery variable and how many months the pulse or recovery lasted. FRAN-R9, for example, indicates that, after hurricane Fran, the real estate market encountered an initial pulse with a following linear recovery. BONNIE-P3 indicates that the market experienced a three month pulse after Bonnie.

The DOM factor increases over time while the SPD variable did not exhibit a time trend. Lagged DOM (DOMLAG) does not impact future DOM while lagged SPD (SPDLAG) is correlated with current SPD. Areas distinctly coastal experienced increased days on the market and increased spreads. Regional and national macroeconomic indicators like the regional unemployment rate (UNRATE), the percent change in the federal government’s housing price index (HINF), and mortgage interest rates (INT) do not significantly impact DOM and SPD, while controlling for the other variables in the model.

Considering the hurricane variables, we find that hurricane Fran significantly increased SPD and that hurricane Floyd increased both DOM and SPD. The results of the analysis also support our findings regarding the duration of these effects; the Fran effect is short and unpronounced, while the Floyd effects are progressively longer and more pronounced.

Table 2: Regression Results for Dependent Variables: DOM, SPD, and PRICE.			
Panel A: SPD			
Variable	β	t-stat	p-value
Intercept	0.0549	2.7350	0.0062
SPDLAG	0.00003	2.9390	0.0033
COAST	0.0072	3.4340	0.0006
FRAN – P12	0.0141	2.8230	0.0048

BONNIE – P3	-0.0053	-0.9900	0.3224
FLOYD – P18	0.0096	3.3150	0.0009
UNRATE	0.0014	1.2190	0.2227
HINF	-0.0039	-1.0410	0.2978
INT	-0.3824	-1.5030	0.1327
Unrestricted LL		1496.952	
Restricted LL		1478.904	
F-stat		4.57	
Panel B: DOM			
Intercept	114.3099	1.9210	0.0547
TIME	0.8725	6.1350	0.0000
DOMLAG	0.0356	0.9440	0.3452
COAST	15.6929	3.1870	0.0014
FRAN – P6	11.2910	1.3230	0.1860
BONNIE - P6	12.2170	1.2330	0.2177
FLOYD – R18	23.8820	1.8290	0.0674
UNRATE	-1.0587	-0.3830	0.7016
HINF	8.0514	0.9430	0.3457
INT	-371.9153	-0.5020	0.6158
Unrestricted LL		-3647.59	
Restricted LL		-3693.36	
F-stat		10.74	
Panel C: PRICE			
Intercept	12.1475	29.6220	0.0000
TIME	0.0052	2.0610	0.0393
PRICELAG	-0.0006	-4.0190	0.0001
COAST	0.5486	16.0330	0.0000
FRAN – P3	0.0189	0.2030	0.8391
BONNIE – P12	-0.0750	-1.0470	0.2950
FLOYD – P30	-0.1430	-1.2570	0.2087
UNRATE	-0.0437	-1.9390	0.0524
HINF	0.0161	0.2660	0.7902
INT	-6.9456	-1.5080	0.1316
Unrestricted LL		-353.858	
Restricted LL		-476.331	
F-stat		32.42	

Our premises are largely confirmed. This implies that isolated hurricanes (of moderate strength) have little impact on the long-run health of the housing market. Successive hurricanes tell a different story. After Floyd, days on the market increased with some recovery over 18 months. This is the first evidence of improving market sentiment. This makes intuitive sense; in a declining market such as the one in the Cape Fear Region in the late 1990's, as sellers finally come to terms with the need to accept even the lower offers, such acceptances begin to occur with greater frequency as “competing” sellers observe the successively more competitive closing prices. As fewer days on the market occur, unit sales would subsequently rise, and with more competitive pricing, the bid-ask spread – the last of the two sentiment proxies we employed – would fall, as well. Market sentiment improves, with the first evidence of that improvement revealed by the days on the market variable, and later by spread.

Concluding Remarks

We review and augment studies that find relationships between home prices and a series of catastrophic events. Prior work affirms an adverse relationship between a series of hurricane strikes and home selling prices. In this paper we also find that home buyer sentiment is negatively impacted by the implied perceptions of increasing catastrophic risk that come with a series of hurricane landfalls in the study region. Our proxies for the sentiment of the residential real estate market deteriorate following the most recent storm, Floyd, in 1999.

No direct measures of investor sentiment exist for either the securities or real estate markets. However, it is possible to infer patterns in home-buyer sentiment with the use of selected surrogates. We adopt measures in this paper that we believe begin to describe the sentiment of the residential real estate market. We hold that the sentiment of this coastal region's housing market is compromised by a perception of increased exposure to the catastrophic risk posed by an unprecedented number of hurricane landfalls in a short period of time. With the potential home-buyer anticipating greater future expected property losses, and the seller similarly aware of those changing risk perceptions, we find greater relative spreads and increased average days a home spends on the market – particularly for properties along the coast – in the periods following the most recent hurricanes.

Importantly, we also find that sentiment begins to improve with the passage of time, as both days on the market and measures of a home's relative spread decrease near the end of the examined period. Homes that sold eighteen months or so after Hurricane Floyd exhibited larger spreads and required greater time to sell; homes sold more than eighteen months after Floyd sold in shorter periods of time, and sold at prices closer to the ask.

The results presented here are of interest to several audiences. First, real estate appraisers can use these findings to amend or extend estimates of home values where a given home is significantly exposed to hurricane risk, either by its location within a coastal community or its proximity to coastal storm surge; conversely, substantial structural mitigation to a home, or a home's location near, but not *on*, the water, might amend value estimates, as well. Second, knowledge of this influence on housing may help developers plan their building activity. Third, this growing understanding will allow real estate agents to better market properties in a given area, whether recognizing the exposure of some homes, or “celebrating” the mitigation or geographic separation of others from more grave catastrophic risk exposure. Fourth, local government planners could use the results in directing growth to minimize hurricane losses. Finally, lenders might use the data to more appropriately plan their activities and manage their exposure to changing real estate market sentiment.

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