Study of

Florida's Hurricane Mitigation Credits

Submitted by

The Florida Catastrophic Storm Risk Management Center

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Executive Summary

Florida's mandated windstorm mitigation premium credits and their effects on insurer solvency and the residual market are important public policy considerations that warrant examination. This report reviews recent Florida studies related to the issue of premium credits for windstorm mitigation features and analyzes the engineering and actuarial dimensions of the issue. Studies reviewed include those completed by the Florida Commission on Hurricane Loss Projection Methodology and The Florida State University Florida Catastrophic Storm Risk Management Center.

The Florida Commission on Hurricane Loss Projection Methodology (Commission) issued a report on February 1, 2010[1], that contained recommendations for improving the process of assessing, determining, and applying windstorm mitigation discounts. The report noted the complexity of the mitigation credits issue and outlined the contributing factors, among them the use of modeling to determine the impact of various mitigation features on expected loss costs and the translation of loss cost relativities to mitigation credits. Other factors noted included the application of mitigation credits into the ratemaking process, the gathering of information regarding the insured population, and the potential for inspection fraud in determining windstorm mitigation credits. The report also discussed the causes of market distortions.

The Florida Catastrophic Storm Risk Management Center (Storm Center) conducted a three-month study of both the My Safe Florida Home program and private windstorm inspection systems in Florida. This study, the Hurricane Mitigation Inspection System Study, researched, reviewed and recommended an infrastructure for the performance of hurricane mitigation inspections, including who should perform such inspections, how such inspections should be conducted and what processes, policies and procedures should be in place to optimize the effectiveness and efficiency of the hurricane mitigation system and to prevent fraudulent activity.

This report contains the input of leading experts in the fields of wind engineering, actuarial science, insurance law and insurance economics and provides economic evidence supporting the conclusions of the Commission and Storm Center reports. After a review of prior research regarding mitigation, this report provides a brief history of the mitigation discount program in Florida. The report then provides an analysis of three major areas:

- Science – the Applied Research Associates (ARA) studies used to generate the loss cost relativity tables
- Implementation – the conversion of the loss cost relativities to mitigation discount tables
- Industry Performance – the impact of mitigation credits on insurer performance

Findings

This report contains the detailed findings of the analysis. The science behind the ARA studies is sound, however the implementation of the mitigation credits appears to have had a significant impact on the performance of the insurance industry including that of Citizens Property Insurance Corporation (Citizens).

[1] A copy of the Commission's full report is available at:
http://www.sbafla.com/methodology/pdf/2010/wmc/Mitigation%20Discount%20Report%202-1-10.pdf

Science

A summary of the findings indicates that the science used by ARA in their loss costs relativity studies is sound. It appears that the mitigation features modeled are the most relevant features regarding windstorm damage mitigation. The assumptions underlying the ARA loss cost projections are sound and the loss costs relativities were created in a correct manner. ARA fulfilled all the requirements of the study's scope of work agreed to with the Office of Insurance Regulation (OIR). There are, however, some things that could have been done differently, some of which were outside the scope of work of the study, which may have a material impact on the modeling of loss relativities. For example:

- ARA did not model double entry doors, which are common in Florida and more prone to failure under windstorm conditions.
- ARA did not explicitly model treed or marine exposure conditions, which represent significant regions of interest for Florida.
- The uncertainties associated with the estimation of the loss costs relativities was not reported, however they are important to understanding the level of confidence and resolution associated with the loss relativity application to mitigation credits.
- The ARA study collapsed the results into a single table of relative loss costs applicable statewide, which may not be appropriate given the variation that is possible in loss costs relativities by location.
- The computed relativities were compressed by ARA using a judgment factor, which is not based on any scientific standards.

Implementation

Expert review of the implementation of the loss relativity studies to create mitigation credits raised concerns that can be categorized as follows:

- Weakest Structure - Use of the "weakest risk" as the base structure without allowing a recalculation of a base rate using that "weakest risk" structure
- Single Model - Use of a single model for mitigation credits may create a mismatch between model(s) used for calculating rates and the mitigation credits
- Over-application - Over-application of the mitigation credits to risks beyond the scope of the study
- Single Metric - Relative loss costs were the only metric used to define mitigation credits

Weakest Structure. One salient review of the implementation is found in ARA's 2008 loss costs relativity study. That study stated that "If the rate differentials are implemented as credits from the weakest building, then the base rates should be adjusted to reflect the weakest building. Implementation of the rate differentials with offset calculations eliminates many problems…" That report noted that "Generally, base rates are more reflective of the expected loss costs, statistically averaged over strong and weak buildings, which is significantly different then the loss costs of the weakest structure."

Single Model. Material differences exist between the models used for pricing (calculating rates) and the model used for development of mitigation loss relativities. The ARA-generated relativities were used in calculating the windstorm loss reduction credits. However the other

hurricane loss models[2] are widely used in rate making. The January 23, 2003 OIR memorandum states that credits were developed and tempered by 50%. One reason given for the tempering was "the potential for differences in results using different hurricane loss models." Thus an issue that needs to be examined is whether the percentage credits would be significantly different in each of the modelers' mitigation studies. The ARA model is known to indicate a wide spread between minimum and maximum loss costs around the state when compared to the other Commission accepted models. This was confirmed by the Florida Commission in 2007 in its special study of comparative loss costs by county among all accepted models[3]. Given that insurers use various models to generate the base rates, the use of a single model in setting mitigation credits may elevate the actuarial risks of arriving at an unfairly discriminatory rate.

Over-application. If credits are applied to the entire wind premium rather than just to the loss costs portion, over-application of the credits occurs because only loss costs are reduced through home hardening efforts. Since the fixed expense portion of the wind premium is not reduced through mitigation, the application of a credit to the entire premium may result in "over discounting". Furthermore, mitigation credits are applied to portions of premium which were not part of the relative loss cost reductions demonstrated by ARA, notably:

- Coverage B (other structures);
- HO-4 (renters contents) and HO-6 (condominium unit-owners contents) policy types;
- Non-hurricane events such as tornado and hailstorms to the extent included in the "wind" peril.

None of these credit applications were supported by the ARA study. Broadening the premium base subject to the mitigation rating plan may result in inadequate rates for certain policy types and/or perils if the models do not support the premium reductions. Finally, the institution of structure-level wind mitigation credits creates overlap with existing credits in the homeowners insurance market. The Building Code Effectiveness Grading System (BCEGS) had the purpose of differentiating wind risk according to the quality and effectiveness of building codes in each community. Insurers offer BCEGS credits at the community level that now overlap with the structure-level wind mitigation credits. While the BCEGS credits were tempered, the overlap still exists.

Single Metric. Relative loss costs (modeled expected annual average losses per unit of insured value) are the only metric used to define mitigation credits. Given that reinsurers set premiums for insurers using "risk loads," often a percentage of the standard deviation of modeled losses or a percentile of the modeled loss distribution, a different "cost factor" may be the appropriate metric used to derive a relative cost. Modeled mitigation features also modify the cost of capital component, not just the expected annual hurricane loss component, of premiums. Insurers maintain a combination of internal capital and capital "rented" by transferring risk to reinsurers or securities investors. Accepted actuarial models link the cost of such capital to the volatility,

[2] In addition to ARA, AIR Worldwide (AIR), EQECAT (EQE), Risk Management Solutions (RMS) and the Florida Public Model (FPM) all provide hurricane loss models.
[3] See the Commission's "Report to the Florida House of Representatives – Comparison of Hurricane Loss Projection Models", Nov. 5, 2007.

not just the average, of the hurricane loss distribution. Thus, relativities that include volatility may be more appropriate than those based solely on relative loss costs.

Industry Performance

The mandated mitigation credits/discounts have had a substantial adverse impact on revenues for Florida's homeowner insurers. First, premium reductions have not been met with commensurate reductions in losses or related costs. This has led to higher loss ratios, expense ratios, and combined ratios (all measures of insurer underwriting performance). This means that, from the standpoint of underwriting performance alone, non-mitigated homes are relatively more attractive to insurers than are the mitigated homes, quite opposite the intended result.[4] Overall, the 2007-2009 actual underwriting performance of Florida's homeowners insurance market has been poor despite the fact there have been no hurricane losses in Florida during the same period of time. Thus, the ability of insurers to accumulate surplus is impaired, resulting in less capital available to pay for future catastrophic losses. In the third quarter of 2009, the average premium per $1,000 of insured value, an actuarial measure of insurance rates, was more than 20% lower than it was in the final quarter of 2005.

Recommendations

1. Financial Incentives to Mitigate - From a public policy perspective, mitigation efforts to reduce catastrophic exposure to wind continue to be important. However, as noted in the review of research on mitigation, there are a variety of reasons why individuals choose not to mitigate. In addition to actuarially appropriate insurance premium rating with consideration of mitigation, other methods for financing or incentivizing property owners need to be considered to develop a sustainable system. For example, programs that reduce the up-front cost of mitigation efforts or programs that tie mitigation efforts to the "green initiative" may be necessary.

2. Long-Term Plan Development - The state needs to develop a long-term plan for managing the catastrophic windstorm risk to which the state is exposed. A proactive approach will avoid unintended consequences that may result from an ad hoc approach. The vision should address the state's role in:
    - Life safety
    - Emergency management
    - Managing windstorm exposure
    - Financing windstorm risk

3. Simplify the Ratemaking Process for Windstorm Coverage - Differentiating between rating variables and actionable mitigation activities by the property owner is one example. Certain mitigation features are not actionable by the property owner (e.g. roof shape) and should not be presented to the property owner as a mitigation credit. These features should be considered rating variables since they are relevant to loss costs and be incorporated into an insurer's rating plan. Features that are actionable,

[4] While mitigated homes have lower expected losses than non-mitigated homes, the reduction in premium from the mitigation credits outweighs the reduction in expected losses, therefore, insurers view mitigated homes as relatively more underpriced than unmitigated homes.

for example, opening protection, should be part of the mitigation credit program and be marketed to the property owner to incentivize cost-effective mitigation.

4. Promote Risk-Based Rating to Induce Mitigation Activities - Allowing actuarially fair risk-based rating will increase the incentives to property owners to undertake cost effective mitigation efforts. Affordability issues regarding insurance premiums should be addressed outside of the insurance rating system. By subsidizing insurance premiums only for those who express a financial need, public financing would support those most in need of financial assistance. An example of this type of program would be insurance premium vouchers similar to a food stamps program.

The Commission made the following recommendations regarding rating and mitigation discounts in their report which are supported by this report.

5. The Florida Commission on Hurricane Loss Projection Methodology should determine appropriate windstorm mitigation standards and review models according to those standards.

6. Windstorm mitigation discounts should be fair and based on the best actuarial and scientific approaches rather than merely shifting cost from one set of policyholders to another.

7. The determination and application of windstorm mitigation discounts to a policyholder's rates should be actuarially appropriate.

8. The base rates and the mitigation plan need to be balanced to achieve adequate rates. The current application of windstorm mitigation credits should be modified to allow an insurance company to use debits as well as credits if more appropriate given its base rate, and offsets should be applied in an actuarially appropriate manner.

9. Windstorm mitigation discounts should only apply to that portion of the premium affected by the mitigation features.

10. Mitigation features should be considered separately for Coverage A (structure), Coverage B (external structures), Coverage C (contents only), and Coverage D (additional living expense).

The Commission made the following recommendations regarding catastrophe modeling which are supported by this report.

11. Although the currently accepted hurricane loss models have met standards regarding the projection of loss costs and probable maximum loss levels, they have not been reviewed in depth for their ability to model windstorm mitigation relativities as applied to policies on individual residential structures. This would require an expanded role for the Commission.

12. Insurers should use the same hurricane loss model(s) to justify windstorm mitigation discounts as they do for justifying loss costs.

The Commission made the following recommendations regarding the residential structure inspection process which are supported by this report. All of these recommendations were also supported by the Hurricane Mitigation Inspection System Study.[5]

13. Statutory penalties should be increased to the level of a felony for conviction of fraudulent activities.

14. The current residential structure inspection process should be replaced with an independent inspection organization that would provide oversight and administer all aspects of the inspection process.

15. Insured residential structures should be inspected periodically (e.g., every five or ten years) in order to verify mitigation features. This will facilitate error correction and monitoring of mitigation features that deteriorate with age of the installation. The property owner should be responsible for a copayment for the inspection not to exceed $25. The Hurricane Mitigation Inspection System Study supported this recommendation by adding that these inspections were necessary for the following reasons:
    - All stakeholders [policymakers, insurers, reinsurers, Citizens Property Insurance Corporation (Citizens), catastrophe modelers, Florida Hurricane Catastrophe Fund (Cat Fund), homeowners] need a better understanding of the state's exposure to catastrophic windstorm damage.
        i. Policymakers need more information when making decisions regarding exposure to catastrophic storm damage and its impact on issues such as population growth, economic development, or emergency response.
        ii. Insurers, reinsurers, Citizens, and the Cat Fund need a better understanding of the properties that make up the existing housing stock and their books of business.
        iii. Catastrophe modelers need more accurate data to develop more realistic models for estimating future catastrophe losses.
        iv. Removing uncertainty from the exposure measures should lower the cost of capital associated with financing catastrophic risk.
    - Important goals of an inspection system should be to eliminate moral hazard incentives and reduce the size of the residual market.

16. An inspector pool would be created and each inspector should be certified by the independent inspection organization based on meeting various standards, background, training, and experience requirements. An inspector could be de-certified for poor performance.

[5] The Hurricane Mitigation Inspection System Study was completed on March 1, 2010 by the Catastrophic Storm Risk Management Center at The Florida State University for the Department of Financial Services. The grant number was DFS CS RFP 09/10-10.

The Commission made the following recommendations regarding data quality which are supported by this report. All of these recommendations were also supported by the Hurricane Mitigation Inspection System Study.

17. The Commission recommends that policies and procedures be put in place to ensure complete and high-quality data. The data should be consistent with hurricane computer modeling needs and sufficient for the level of "granularity" required for modeling. These include the following:

    - All residential structures in the state should ultimately be inspected and the results entered into a centralized database.
    - On-line data collection systems need to be utilized that have built-in data and edit checks.
    - Re-inspections of residential structures should be conducted on a random sample of the residential structures to establish an error rate as a base line for quality improvement measurement purposes.
    - The uniform home grading system should be repealed since it is not feasible and presumes a level of accuracy that does not currently exist.

The Hurricane Mitigation Inspection System Study made the additional recommendations that are supported by this study.

18. High Quality Data Collection – Developing a long-term plan for managing Florida's catastrophic risk exposure is hampered by poor data quality and inefficient gathering and storage practices. A data collection system that is accessible, flexible and user friendly is vital to the future risk management of catastrophic storm exposures.

19. The database needs to be electronically accessible, similar to the Department of Motor Vehicles (DMV) or Comprehensive Loss Underwriting Exchange (CLUE) databases, for all relevant stakeholders. Therefore, the database should be developed with input from insurers, reinsurers, regulators, catastrophe modelers, the Cat Fund, and Citizens.

20. The database needs to properly address all privacy issues and concerns.

Introduction

The state of Florida needs a comprehensive plan to address the hurricane problem in Florida. Little can be done about the frequency of storm activity, but Florida needs to address the risk to lives and property that windstorms pose. This comprehensive plan needs to provide a long term vision of how the state will adapt to the windstorm risk and address the short term issues that may prevent the state from realizing its long-term vision. Tools available to the state to develop a long-term vision include zoning and land use restrictions, urban planning, building code development and enforcement, state and local incentive programs, education programs, emergency management, and research programs to reduce the impact of windstorms on the economy, population and infrastructure in Florida.

Once the long-term vision is developed, and the components of the system that are vital to the success of that vision are determined, a short-term plan on how to implement and support those components is necessary. Focusing on the property damage aspect of the windstorm risk, the current building stock in Florida varies widely with regard to its resistance to windstorm damage. Given the length of time it takes for the housing stock to decay and be replaced, the short-term plan must address mitigating the existing housing stock.

The primary focus of risk mitigation efforts in the state of Florida should be reducing vulnerability and exposure to windstorm damage. Lessening the impact of natural disasters by saving lives, reducing injuries, and lowering property losses is a tangible result of properly implemented mitigation programs. While all stakeholders agree on the value of effective mitigation in general, there is often little consensus on specific mitigation measures. Furthermore, ensuring that proper incentives are in place to undertake effective mitigation has not been achieved in Florida. There are a variety of reasons why individuals do not undertake the proper mitigation steps to protect themselves and their property from windstorm damage. The state needs to develop an incentive system that induces proper behavior from individuals, organizations, local governments and state agencies. Without the proper incentives long-term success managing the state's catastrophic property exposure risks may not be acheived.

Recent Florida Reports and Recommendations

Florida Commission on Hurricane Loss Projection Methodology

The Florida Commission on Hurricane Loss Projection Methodology (Commission) was directed by the Florida Legislature pursuant to s. 627.0628(4), F.S. (2009), to hold public meetings for the purpose of receiving testimony and data regarding the implementation of windstorm mitigation discounts. The Commission received information at six public hearings and presented a report dated February 1, 2010, to the Governor, the Cabinet, the President of the Senate, and the Speaker of the House of Representatives. The report contained recommendations for improving the process of assessing, determining, and applying windstorm mitigation discounts.

The report stated on page 3 that "a logical conclusion was that windstorm mitigation efforts would lead to a healthier property insurance market in Florida. Instead, during the time since the windstorm mitigation discounts were implemented, the residential property insurance market has

deteriorated." The report further noted that the issue of mitigation credits is complex and outlined the following factors that contribute to the complexity "1) the use of modeling to determine the impact of various mitigation features on expected loss costs, 2) the translation of mitigation relativities to mitigation credits, 3) the application of mitigation credits into the ratemaking process, 4) gathering information regarding the insured population and reflecting that in the ratings, and 5) potential inspection fraud in determining windstorm mitigation credits". The report also attributed market distortions to " 1) decisions on how those credits are to be applied to the ratemaking process, 2) timing issues related to insurer delays in requesting rate relief and the insurance regulator's determination that insurers have failed to provide sufficient justification for offsets to account for windstorm mitigation credits, 3) the use of one modeling firm's mitigation relativities to develop state approved mitigation credits, and 4) the potential presence of fraud, errors, misinterpretation of rules, etc. that impact premium sufficiency and the reliability of future loss data".

The recommendations of the Commission included the following[6]:

Rating and Determination of Windstorm Mitigation Discounts

1. The Office of Insurance Regulation (OIR) should not be in charge of mitigation discounts. Since the discounts are determined by modeling, they should be part of the model review process.
2. The discounts should be actuarially fair.
3. The discounts should still lead to adequate rates, which may be reached through a debit and credit system, rather than just credits.
4. The discounts appropriate for each coverage section should be considered separately.
5. Property owners who add mitigation features should be offered lower deductibles on windstorm damage.

Residential Structure Inspection Process

1. Increase penalties for fraud in the inspection process.
2. Create third party independent oversight of the inspection process.
3. Periodic inspections
4. Certified inspectors

Data Quality

1. Create a high-quality database of the windstorm mitigation features of Florida's housing stock for use by stakeholders.
2. Provide an online data collection system.
3. Require a quality assurance component to the system that requires reinspections.
4. Repeal the uniform home grading system since it appears to be unobtainable in the near future.

Hurricane Computer Modeling

1. Allow the commission to determine mitigation standards.
2. Add a structural engineer to the commission.

[6] Windstorm Mitigation Discounts Report to the Governor, the Cabinet, the President of the Senate, and the Speaker of the House of Representatives, February 1, 2010, Florida Commission on Hurricane Loss Projection Methodology.

3. Require the models to be reviewed every year.
4. Match the model used to generate the discounts to the model used to generate the rates.

Hurricane Mitigation Inspection System Study

The Florida Catastrophic Storm Risk Management Center conducted a three-month study of both the MSFH and private windstorm inspection system in Florida[7]. The main objective of the study was to research, review and recommend an infrastructure for the performance of hurricane mitigation inspections, including who should perform such inspections, how such inspections should be conducted and what processes, policies and procedures should be in place to optimize the effectiveness and efficiency of the hurricane mitigation system and to prevent fraudulent activity.

The primary findings of the project support the anecdotal evidence that error rates in the inspections conducted by private market windstorm inspectors are higher than the error rates found in the inspections conducted by certified inspectors in the MSFH program. Furthermore, the private market inspector error rates appear to be higher than the error rates found in inspections conducted by Wind Certification Entities (WCEs), regardless of whether those inspections were conducted inside of or outside the MSFH program.

The size of the market for private windstorm inspections is difficult to ascertain. The MSFH program conducted 400,000 inspections, which represent approximately 10% of the site built single family residences in the state. The reinspection information obtained from a private insurer only had 6.7% of the inspections conducted by WCEs which could have been done inside or outside of the MSFH program. This may indicate that private market inspectors are providing more than 90% of the inspections currently being submitted for insurance premium credits.

The findings also indicate a need for a high quality database of the wind mitigation features of the current housing stock in the state. All stakeholders, including public policy makers, insurers, reinsurers, Citizens Property Insurance Corporation (Citizens), Florida Hurricane Catastrophe Fund (Cat Fund), catastrophe modelers and property owners throughout the state will benefit from such a database. A better understanding of the property exposure throughout the state will remove some uncertainty in the pricing of catastrophic risk products and should lead to a lower cost of capital.

The Hurricane Mitigation Inspection System Study's general recommendations included:

1. Long-Term Plan Development - The state needs to develop a long-term plan for managing the catastrophic windstorm risk to which the state is exposed. A proactive approach will avoid unintended consequences that may result from an ad hoc approach.

2. Mandatory Inspections - As part of this long-term plan every insured property needs to be periodically inspected (e.g. every 5 years or during a real estate transaction) for

[7] Hurricane Mitigation Inspection System Study Final Report, DFS CS RFP 09/10-10, March 1, 2010, Catastrophic Storm Risk Management Center, The Florida State University.

windstorm mitigation features. These inspections are necessary for the following reasons:

a. All stakeholders (policymakers, insurers, reinsurers, Citizens Property Insurance Corporation (Citizens), catastrophe modelers, Florida Hurricane Catastrophe Fund (Cat Fund), homeowners) need a better understanding of the state's exposure to catastrophic windstorm damage.
    i. Policymakers need more information when making decisions regarding exposure to catastrophic storm damage and its impact on issues such as population growth, economic development, or emergency response.
    ii. Insurers, reinsurers, Citizens, and the Cat Fund need a better understanding of the properties that make up the existing housing stock and their books of business.
    iii. Catastrophe modelers need more accurate data to develop more realistic models for estimating future catastrophe losses.
    iv. Removing uncertainty from the exposure measures should lower the cost of capital associated with financing catastrophic risk.
b. An important goal of an inspection system should be to eliminate moral hazard incentives and reduce the size of the residual market.

3. Dispute Resolution – With mandatory inspections, the feasibility of a dispute resolution process needs to be considered for property owners who disagree with inspection results. A process similar to the Department of Financial Services Rule 69JER06-01, "Mediation Procedures for Resolution of Disputed Personal Lines Insurance Claims Arising from the 2004 and 2005 Hurricanes and Tropical Storms" could be established to resolve disputes regarding the inspection results and appropriate credits.

4. Centralized Oversight – The windstorm mitigation inspectors should be certified by a central monitoring and data collection agency.

5. Certified Inspectors - All windstorm mitigation inspections should be completed by certified inspectors.

6. High Quality Data Collection – Developing a long-term plan for managing Florida's catastrophic risk exposure is hampered by poor data quality and inefficient gathering and storage practices. A data collection system that is accessible, flexible and user friendly is vital to the future risk management of catastrophic storm exposures.

7. The Financial Services Commission should adapt the new OIR-B1-1802 (Rev. 02/10) form – the new form requires photo documentation of mitigation features and includes language notifying the inspector and homeowner of the criminal penalties for fraud.

8. The Florida Commission on Hurricane Loss Projection Methodology recommended development of a central data storage and retrieval system. This study supports that recommendation. It is imperative that a secure, high quality database of information regarding Florida's housing stock exposure to catastrophic windstorm damage be developed.

9. The database needs to be electronically assessable (similar to the Department of Motor Vehicles (DMV) or Comprehensive Loss Underwriting Exchange (CLUE) databases) for all relevant stakeholders and therefore should be developed with input from insurers, reinsurers, regulators, catastrophe modelers, the Cat Fund, and Citizens.

10. The database needs to properly address all privacy issues and concerns.

Review of Prior Research Regarding Mitigation

Prior research regarding mitigation supports the common-sense concept that mitigation is good, yet it also indicates that due to informational problems and loss subsidy expectations inherent in the individual's cost-benefit analysis, many individuals choose not to mitigate or to undermitigate against the risk of catastrophic loss. While the academic literature focuses on why individuals often fail to mitigate, the literature is sparse regarding how to optimally incentivize individuals and local governments to mitigate.

Kunreuther, Meyer, and Michel-Kerjan (forthcoming, listing in Wharton Issue Brief 2010, Informed Decisions on Catastrophe Risk) list eleven psychological and situational barriers that can lead to underinvestment in mitigation:

1. Lack of risk awareness
2. Underestimation of the risk
3. Budget constraints
4. Difficult computations for understanding cost-benefit tradeoffs
5. Hyperbolic discounting (too much weight on immediate considerations)
6. Short planning horizons
7. Procrastination
8. Learning failures (not learning from past catastrophes)
9. The levee effect (enough safety already)
10. Samaritan's dilemma (government rescue)
11. The politician's dilemma (politically unpopular to force costly mitigation programs)

All of these barriers have been studied in the academic literature. The Wharton study also addressed the need for insurance premiums to reflect level of exposure, the need to provide long-term loans for loss reduction measures, and the need to adhere to well-enforced building codes. Other suggestions included the need to grant seals of approval and to offer tax credits.

Effectiveness of Mitigation in Achieving Economic and Social Goals

Prior research conducted in the area of mitigation has primarily emphasized the 1) socioeconomic effectiveness of mitigation; and 2) factors that influence the decision to mitigate. Ehrlich and Becker (1972), in their primary study of mitigation, distinguished between self-insurance and self-protection. Self-insurance mitigation efforts were defined as reducing damage resulting from a disaster but not affecting the probability of the disaster. Self-protection mitigation investments were defined as probability reducing. The realities of hurricanes dictate that the self-protection mitigation efforts are aimed at the decisions of where to build and when

to evacuate (i.e., loss prevention). Virtually all other hurricane mitigation efforts are self-insurance mitigation oriented, and thus focused on loss reduction.

Studies regarding the social and economic effects of mitigation have consistently found that mitigation can result in both public and private good. The view of mitigation today is different than the one that existed prior to Hurricane Andrew. A study reviewing the damage following Andrew found that "consumers have substituted homeowners insurance for structurally sound homes that are built to withstand hurricanes," (Fronstin and Holtman 1994, p. 388). That study found that older homes suffered proportionally less damage than newer homes (homes built during the 1980's). Research conducted by Risk Management Solutions (RMS), following the 2004 and 2005 hurricanes in Florida, demonstrated that lower losses were suffered by structures built in compliance with the most up-to-date building codes (RMS Special Report Analyzing the Effects of the My Safe Florida Home Program on Florida Insurance Risk, May 14, 2009, page 5). Mitigation increases the value of the home, decreases expected losses, and decreases the burden placed on the public in the event of a catastrophic event (Kleindorfer and Kunreuther, 1999). To determine the value of the mitigation, it is important to understand what effect it will have on the loss profile of a home, or on an area. Risk factors, such as proximity to the hazard (distance to coast), are important in making this determination. Christoplos, Liljelund, and Mitchell (2001) found that mitigation not only reduces direct losses (i.e., saves lives, reduces injuries, and lowers property losses), but also measurably increases the public good through alleviation of the indirect poverty effect of catastrophes. Regarding the private good of property value enhancement, Simmons, Kruse and Smith (2002) observed increased home resale prices for homes that made a mitigation investment in a Florida Gulf-Coast city.[8]

Affordability of Mitigation Measures

Policy and industry studies have indicated again and again that the primary reason property owners provide for why they do not engage in home hardening is the cost. Cost is ranked even higher as a constraint among minorities and low-income homeowners, who unfortunately are also more likely to own properties in the most need of hardening (Peacock, 2003; International Hurricane Research Center, 2004).

Many loss-reducing mitigation techniques are associated with high up-front costs that may be financially prohibitive, especially for lower-income property owners. Without access to long-term, cost-effective financing arrangements, many homeowners may not seriously consider making the expenditure. In 1992, Kunreuther and Kleffner found that using financial considerations alone, homeowners may not mitigate due to information asymmetry between costs and benefits. (The costs can be determined easily, but the future benefits may be ambiguous.) Later (2006), Kunreuther further found that individuals tend to make cost-benefit decisions regarding mitigation using a two- or three-year expected payback period. Since insurance and/or loss savings from mitigation expenditures may be realized slowly over many years, such a decision rule may restrict homeowners from participating in home hardening unless the cost of mitigation measures can be incurred over many years as well.

[8] See also two newer studies by Randy Dumm, Stacy Sirmans, and Greg Smersh (2009) available at www.stormrisk.org.

The Insurance Effect

Much historical evidence is available regarding the actual relationship between the availability/pricing of insurance and personal investments in risk-reducing activities.

Insurance as Substitute

Ehrlich and Becker, in a 1972 study, found that insurance and mitigation are treated as substitutes by individuals. Kunreuther and Kleffner (1992) further show that if full (no or low-deductible) insurance is required, the incentive to engage in mitigation is reduced. Precisely because insurance serves a vital purpose in protecting property owners from catastrophic financial loss in the event of a windstorm, it inherently results in reduced financial consequences to the property owner on a post-loss basis. Therefore, the incentive to make mitigation expenditures is reduced, all else the same.

Imperfect Loss Modeling & Pricing

Kleffner and Kelly (2001) found that if premiums are not risk based, policyholders will invest less in mitigation. Inadequate, excessive and/or unfairly discriminatory insurance premiums result in market problems (e.g., under-insurance, over-insurance, non-optimal mitigation efforts, fraud). Forecasting the location, frequency, and magnitude of future storms is necessary to the proper risk-based pricing of property insurance, but the science is far from perfect. Even if loss modeling were accurate, regulatory constraints on property insurance pricing in many states makes it difficult for insurers to maintain rates that are accurately based on the risks faced. Exacerbating the problem, many insurers still do not systematically discriminate by either zone of risk or implementation of loss-reducing measures, despite the fact that the conditions of housing stock and investment in mitigation differ widely among their policyholders.

Individual Attitudes Toward Risk of Catastrophic Loss

Rational individuals can be expected to be averse to loss of property and/or risk of injury, and increasingly risk averse in light of potential catastrophic loss resulting from windstorm. Dionne and Eeckhoudt (1985) showed that increases in risk aversion result in increased expenditures on mitigation, and Hiebert (1989) found evidence of the same given the effectiveness of the mitigation technique is predictable. Generally then, we expect rational property owners to purchase adequate insurance and engage in home hardening in an effort to prevent or reduce windstorm losses. Research has shown that homeowners may not, in fact, behave in the ways we expect, for various reasons. Following are some reasons for their seemingly irrational decisions.

- **Underestimation of Event Probability.** Given the (relatively) low frequency risk of natural disasters and their complexity, individuals are susceptible to incorrect risk assessment and irrational risk management decisions. Kunreuther (1978) showed the probability of disaster is underestimated by most leading to underinsurance. Kunreuther and Pauly (2006) submitted that individuals treat insurance as an investment, rather than as protection, and will drop coverage if a “return” is not realized. Thus, after several years with no loss, or if the probability of loss is low, individuals may “forget” about the chance of a loss.

- **Expectation of Disaster Relief.** In addition to the relationship between cost-benefit analysis and mitigation, evidence supports the idea that in cost-benefit analysis individuals likely incorporate expectations regarding assistance and/or financing from public sources on a post-loss basis. Research into the effects of government intervention on mitigation efforts have come back with similar results – all supporting the concept that an expectation of disaster assistance reduces the property owner's incentives to engage in personal mitigation. Kaplow (1991) and Kelly and Kleffner (2003), based on their separate research findings, each asserted that government relief distorts mitigation incentives because individuals no longer bear the full cost of their (in)actions. Kunreuther and Pauly (2006) further submit that individuals behave as if they believe government will provide mitigation/disaster relief if enough people move to an area, and demand public relief ex post.

- **Loss Experience and Hurricane Knowledge.** Property owners differ with regard to their personal experience with hurricanes and their knowledge of the hurricane risk. Peacock (2003) looked at hurricane shutter usage and envelope coverage of owner-occupied, single-family detached housing in Florida and found the influence of a variety of factors as determinants of household mitigation. He found that perceptions of hurricane risk and knowledge and past hurricane experience both were significant positive factors – those homeowners with greater perceived hurricane knowledge and those who had experienced hurricanes were more likely to use hurricane shutters. Kunreuther et al (2009), in an experimental study of students, found corroborating evidence of a connection between prior catastrophe experience and mitigation. Students who experienced a hypothetical loss, or observed another participant experience a loss, were more likely to invest in loss-reduction techniques during the next experiment period.

- **The Community Influence.** Whether simply a matter of education by observation or a sense of peer pressure, there is evidence that individuals are more likely to engage in mitigation if their neighbors do. The two studies mentioned immediately above – Peacock (2003) and Kunreuther et al (2009) – both indicate that individuals react positively to efforts made by their neighbors. Peacock found that the proportion of neighbors with shutters was directly related to an individual homeowner's usage of shutters. Kunreuther's experiment revealed that, at least among his students, a person is more likely to invest in risk-reduction activities if a counterpart invested in the last period.

- **Demographic Differences.** Research has also found that demographic factors, such as household income, education, and race/ethnicity, are significantly related to mitigation expenditures. For example, both the Peacock (2003) and Kunreuther (2009) studies showed systematically higher levels of participation from whites than non-whites. Kunreuther additionally found that more highly educated individuals are more likely to cooperate. Peacock's findings revealed that higher household incomes were associated with higher levels of hurricane shutter usage.

How to Incentivize Property Owners Beyond the Barriers to Home Mitigation

The prior research supports the common-sense concept that mitigation is good, yet it also indicates that due to informational problems and loss subsidy expectations inherent in the individual's cost-benefit analysis, many individuals choose not to mitigate or to undermitigate against the risk of catastrophic loss. The literature is sparse regarding how to optimally incentivize individuals and local governments to mitigate. Kelly and Kleffner (2003) assert that if governments were to subsidize mitigation, people would spend more on mitigation and less on insurance. Kleindorfer and Kunreuther (1999) submit that often, poorly constructed homes are owned by impoverished individuals or families who cannot afford mitigation or rebuilding costs. The government is likely to provide relief for these people after a large loss at an expense to the public, so it may be particularly desirable to subsidize the cost of mitigation for them. Incentives from the private sector, as well as the public sector, are worthwhile for consideration. For instance, financial institutions (banks) support mitigation if the mitigation decreases the probability of mortgage default due to property loss (Kunreuther, 2006).

Background and Overview of Construction Mitigation Features

Residential construction in the state of Florida varies widely with regard to its resistance to windstorm damage. Wind engineers have yet to reach a consensus as to what are the most relevant features/factors of residential construction that reduce the amount of damage caused by windstorms. These features need to be evaluated individually and in conjunction with one another to ensure that any mitigation efforts undertaken by property owners are effective in reducing any future damage due to windstorms. For example, investing in strong opening protections alone may be considered a good mitigation step. Strong opening protections with the proper roof covering and roof-to-wall attachments is even better. Investing in strong opening protections with a weak roof may not be worth the investment. There is consensus on some factors (e.g. hip roof); other factors may not have that consensus.

The Florida Commission on Hurricane Loss Projection Methodology requires each catastrophe model submitted for approval to list the range of changes in damage due to individual mitigation measures at a specific location. This range of changes in damage is reported on Form V-2. The V-2 form uses two reference structures: a frame structure and a masonry structure. These features are listed in table 1.

Table 1: Reference Structure Features

Reference Frame Structure	Reference Masonry Structure
1. wood framed exterior walls	1. masonry exterior walls
2. one story	2. one story
3. unbraced gable end roof[9]	3. unbraced gable end roof
4. normal shingles (rated for 55 mph winds)	4. normal shingles (rated for 55 mph winds)
5. 1/2" plywood roof deck	5. 1/2" plywood roof deck
6. 6d nails[10] (connecting roof deck to roof members)	6. 6d nails (connecting roof deck to roof members)
7. truss to wall anchor is toe-nailed[11]	7. truss to wall anchor is toe-nailed
8. 5/8" diameter anchors at 48" centers for wall/floor/foundation connections	8. no vertical wall reinforcing
9. no shutters	9. no shutters
10. standard glass windows	10. standard glass windows
11. no door covers	11. no door covers
12. no skylight covers	12. no skylight covers
13. constructed in 1980	13. constructed in 1980

The individual mitigation measures (for both frame and masonry structures) included in this form are listed in Table 2.

Table 2: Mitigation Features Added to Reference Structures

Mitigation Feature	Options
Roof Strength	Braced gable ends, hip roof[12]
Roof Covering	Metal roof, rated shingles (110 MPH), membrane, nailing of deck (8d) [13]
Roof-Wall Strength	Clips, straps
Wall-Floor Strength	Ties or clips, straps
Wall-Foundation Strength	Larger anchors or closer spacing (frame), straps (frame), vertical reinforcing (masonry)
Opening Protection	Plywood window shutters, steel window shutters, engineered window shutters, door and skylight covers
Window, Door, Skylight Strength	Laminated, impact glass
Combination of Features	Rated shingles (110 MPH), 8d nails on deck to roof members, truss straps at roof, plywood shutters

[9] A gable ended roof meets the wall in the shape of a vertical triangle
[10] 6d nails are 2 inches in length.
[11] Toe-nailing is driving the nail in at an angle to connect the truss to the wall anchor which are only butted against one another.
[12] A hip roof is sloped toward a central ridge regardless of which side of the building you are facing. The roof meets the wall in a straight line and the roof looks like a triangle leaning back toward the ridge line.
[13] 8d nails are 2.5 inches long.

Applied Research Associates (ARA) conducted loss relativity studies in 2002 (ARA, 2002a, 2002b) and 2008 (ARA 2008). The loss mitigation features for single family homes used in the ARA 2002 and 2008 studies are summarized in Table 3[14].

Table 3: ARA Mitigation Features

Single family and Group I Multi-family 2002 Features	Features Added in 2008
1. Terrain[15]	1. Number of Stories
2. Roof Shape	2. Roof Cover Material
3. FBC, Non-FBC Roof Cover[16]	3. Roof Slope[17]
4. Secondary Water Resistance[18]	4. Soffit Construction
5. Roof-to-Wall Connection	5. Vinyl Siding
6. Roof Deck Material/Attachment	6. Window/Door Water Leak Potential
7. Opening Protection	7. FBC Roof Cover Age
8. Gable End Bracing	8. Group I Only: Parapets and Rooftop Equipment
9. Wall Construction	9. Minimal Condition Requirements
10. Wall-to-Foundation Restraint	

Brief History of the Mitigation Discount Program in Florida

In implementing a mitigation credit program it is useful to review the history of mitigation credits. It is also important to consider prior efforts to promote policyholder participation in hardening homes and understand the effects of implementation of the premium discounts had on the insurance market and the availability of property insurance.

In 1993 the Florida legislature enacted section 627.0629, Florida Statutes, to require rate filings for residential property insurance include appropriate discounts, credits, or other rate differentials, or appropriate reductions in deductibles, for properties on which fixtures actuarially demonstrated to reduce the amount of loss in a windstorm have been installed. (s.13, ch.93-410, Laws of Florida). In 1997 the Department of Insurance issued rule 69O-170.017 F.A.C. The rule required shutter discounts at least equal to the Insurance Services Office discounts.

In 2000 section 627.0629, Florida Statutes, was amended to provide rate filings for residential property insurance must include "actuarially reasonable" discounts, credits, or other rate differentials, or appropriate reductions in deductibles, for properties on which fixtures "or construction techniques" demonstrated to reduce the amount of loss in a windstorm have been installed "or implemented."

[14] Source: Applied Research Associates Inc., 2008 Florida Residential Wind Loss Mitigation Study October 2008 http://www.floir.com/pdf/ARALossMitigationStudy.pdf

[15] Terrain refers to location relative to the coastline and is defined in the Florida Building Code.

[16] The structure has roof covering that meets Florida Building Code.

[17] The angle at which the roof is pitched.

[18] The structure has something under the roof covering that prevents water from entering the building if the roof covering begins to leak.

New language added to the statute stated that "The fixtures or construction techniques shall include, but not be limited to, fixtures or construction techniques which enhance roof strength, roof covering performance, roof-to-wall strength, wall-to-floor-to-foundation strength, opening protection, and window, door, and skylight strength. Credits, discounts, or other rate differentials for fixtures and construction techniques which meet the minimum requirements of the Florida Building Code must be included in the rate filing. All insurance companies must make a rate filing which includes the credits, discounts, or other rate differentials by June 1, 2002" (s.99, ch.2000-141, Laws of Florida). The Legislature subsequently amended the law and changed the filing date to December 31, 2002 and then to February 28, 2003.

As mentioned earlier, in 2002 Applied Research Associates conducted two studies to quantify wind loss reduction for wind mitigation construction features. "Development of Loss Relativities for Wind Resistive Features of Residential Structures" focused on single-family homes (ARA, 2002a). "Development of Loss Relativities for Wind Resistive Features for Residential Buildings with Five or More Units" addressed condominium and renter occupancies in buildings with five or more units (ARA, 2002b).

The Florida Office of Insurance Regulation issued Informational Memorandum OIR-03-001M on January 23, 2003. In essence the Memorandum states that only premium credits should be offered. Thus, the results of implementation would be premium neutral or result in premium decreases, but there would be no premium increases. The Memorandum goes on to state "Credits were then determined and tempered by 50%. This tempering was applied in view of the large rate changes which might otherwise be induced, the approximations needed to produce practical results (such as the specifications of the houses used for modeling and the number of rating factors used), and the potential for differences in results using different hurricane models."

Rule 69O-170.017 F.A.C. was amended effective December 16, 2006, to require insurers to make new rate filings by March 1, 2007, to double the credits to 100% of the study's indicated value or provide actuarial justification for an alternative system. Informational Memorandum OIR-07-03M issued February 27, 2007, stated that the "windstorm mitigation discount filing shall not include any modification of the rating factors or base rates for any purpose, including the offset of revenue impact on current business."[19]

Table 4 summarizes the history of the mitigation discount program in Florida and the impact of these changes will be discussed later in this paper.

[19] As mentioned above, ARA updated the study of mitigation credits. The new study recommends implementation steps and is available at http://www.floir.com/pdf/ARALossMitigationStudy.pdf .The Uniform Home Grading System is under development. It is to be implemented in 2011 and will replace the current mitigation discount system it will require discounts to be based on a numerical score of the Uniform Home Grading System.

Table 4: Florida Mitigation Discount Program Summary

Year	Action
1993	Florida Legislature Enacts Mitigation Statute Following Hurricane Andrew
1997	Insurers Required to Meet or Exceed Specified Discounts
2000	Discount Statute Expanded to Include Construction Techniques
2002	Initial ARA Study Released
2003(February)	Insurers Required to File Modified Discounts (50%)
2007(March)	Insurers Required to File Full Mitigation Discounts
2007(June)	Mandatory Discount Notice Form Updated
2007	OIR to Reevaluate Discounts
2008(October)	ARA Updated Report
2011	Begin Conversion to Discounts Based on Uniform Home Grading System
2014 (approximate)	Phase-Out of Current Mitigation Discount Approach

Analysis of the Mitigation Discount Program in Florida

The Office of Insurance Regulation created and applied the methodology used to convert the relative loss costs developed in the 2002 ARA study to mandated mitigation credits for existing premiums.

Creation of Loss Relativities

The 2002 ARA studies analyzed individually-modeled buildings at numerous locations in Florida. The 2008 report described the 2002 studies as follows. “Each building was modeled with a specific set of wind-resistive features. By evaluating all possible combinations of the basic wind mitigation features, tables were produced that showed the relative difference in loss costs for buildings with different construction features. For new construction to the 2001 Florida Building Code (FBC), model buildings were designed to the FBC in the various wind zones in the state. Simplified tables of loss relativities were produced for these new code buildings such that year built provided a basic input to determine the wind loss relativity. ARA’s HURLOSS methodology, which is based on engineering models of individual buildings, was used to analyze each modeled building for damage and loss.” The 2008 study was described as follows. “The technical approach for this 2008 loss relativity update is fundamentally the same as the approach used in 2002. However, the scope of this study is naturally broader than the 2002 scope in that we now have significant amounts of new information. This new information includes engineering research on building loads and resistances, additional hurricane windfield measurements, laboratory tests, full-scale testing, damage surveys and, perhaps most importantly, insurance loss data from recent Florida hurricanes. This information is used to improve both the modeling and the validation of the loss relativities.” The new information came from the 2004-2005 hurricanes.

The 2002 ARA study created the loss cost relativities for existing construction in the form of a set of tables. Two main tables (one for Terrain B and one for Terrain C) were provided for the seven primary rating factors (terrain, roof shape, roof cover, roof deck attachment, roof-to-wall connection, opening protection, and secondary water barrier) with additional tables developed

for four secondary rating variables. The terrain definitions are from the Florida Building Code. The loss cost relativities in Terrain B are primarily for inland locations. The relativities in Terrain C are primarily for barrier islands and locations within 1500 feet of the coastline.

Table 5 is based on averaging the relativities for each of three modeled houses with composition roof shingles in the 17 Terrain B locations. Table 6 is based on the 14 Terrain C locations.

Table 5: Loss Costs Relativities– Terrain B Locations with 2% Deductible

Terrain Category B – 2% Deductible				Roof Shape			
				Other		Hip	
Roof Cover	Roof Deck Attachment	Roof-Wall Connection	Opening Protection	No Secondary Water Resistance	Secondary Water Resistance	No Secondary Water Resistance	Secondary Water Resistance
Non-FBC Equivalent	A	Toe Nails	None	2.37	2.22	1.26	1.18
			Basic	1.53	1.37	0.91	0.83
			Hurricane	1.33	1.15	0.80	0.71
		Clips	None	1.55	1.37	0.91	0.80
			Basic	1.26	1.08	0.75	0.65
			Hurricane	1.19	1.01	0.72	0.61
		Single Wraps	None	1.53	1.35	0.91	0.79
			Basic	1.25	1.07	0.75	0.65
			Hurricane	1.19	1.00	0.72	0.61
		Double Wraps	None	1.53	1.35	0.91	0.80
			Basic	1.25	1.07	0.75	0.65
			Hurricane	1.19	1.00	0.72	0.61
	B	Toe Nails	None	2.16	2.05	1.22	1.14
			Basic	1.27	1.17	0.88	0.81
			Hurricane	1.04	0.92	0.76	0.68
		Clips	None	1.00	0.84	0.76	0.64
			Basic	0.84	0.71	0.65	0.56
			Hurricane	0.80	0.66	0.63	0.55
		Single Wraps	None	0.95	0.76	0.75	0.64
			Basic	0.79	0.64	0.64	0.55
			Hurricane	0.77	0.63	0.63	0.55
		Double Wraps	None	0.94	0.76	0.75	0.64
			Basic	0.79	0.63	0.64	0.55
			Hurricane	0.77	0.62	0.63	0.55
	C	Toe Nails	None	2.15	2.04	1.22	1.15
			Basic	1.27	1.16	0.88	0.81
			Hurricane	1.03	0.92	0.75	0.68
		Clips	None	0.98	0.82	0.75	0.64
			Basic	0.82	0.70	0.64	0.56
			Hurricane	0.78	0.66	0.63	0.55
		Single Wraps	None	0.91	0.73	0.75	0.63
			Basic	0.77	0.63	0.64	0.55
			Hurricane	0.75	0.62	0.63	0.55
		Double Wraps	None	0.90	0.72	0.75	0.63
			Basic	0.75	0.61	0.64	0.55
			Hurricane	0.74	0.61	0.63	0.54
FBC Equivalent	A	Toe Nails	None	2.11	2.05	1.07	1.04
			Basic	1.26	1.22	0.71	0.69
			Hurricane	1.03	0.99	0.59	0.57
		Clips	None	1.22	1.19	0.67	0.65
			Basic	0.94	0.91	0.53	0.51
			Hurricane	0.88	0.84	0.49	0.47
		Single Wraps	None	1.21	1.18	0.67	0.65
			Basic	0.94	0.90	0.53	0.51
			Hurricane	0.87	0.84	0.49	0.47
		Double Wraps	None	1.21	1.17	0.67	0.65
			Basic	0.93	0.90	0.53	0.51
			Hurricane	0.87	0.83	0.49	0.47
	B	Toe Nails	None	1.95	1.90	1.03	1.01
			Basic	1.06	1.02	0.69	0.67
			Hurricane	0.80	0.78	0.56	0.55
		Clips	None	0.72	0.69	0.53	0.50
			Basic	0.59	0.56	0.44	0.42
			Hurricane	0.54	0.51	0.43	0.41
		Single Wraps	None	0.65	0.61	0.52	0.50
			Basic	0.53	0.49	0.43	0.41
			Hurricane	0.51	0.48	0.43	0.41
		Double Wraps	None	0.65	0.60	0.52	0.50
			Basic	0.52	0.48	0.43	0.41
			Hurricane	0.51	0.47	0.43	0.41
	C	Toe Nails	None	1.94	1.89	1.03	1.01
			Basic	1.05	1.02	0.69	0.67
			Hurricane	0.80	0.77	0.56	0.55
		Clips	None	0.70	0.67	0.52	0.50
			Basic	0.58	0.55	0.44	0.42
			Hurricane	0.53	0.51	0.43	0.41
		Single Wraps	None	0.62	0.58	0.52	0.49
			Basic	0.51	0.48	0.43	0.41
			Hurricane	0.49	0.47	0.42	0.41
		Double Wraps	None	0.61	0.57	0.52	0.49
			Basic	0.50	0.46	0.43	0.41
			Hurricane	0.49	0.46	0.42	0.41

Notes: 1. This table is based on averaging the relativities for each of the three modeled houses (with composition shingle roof coverings) for all 17 Terrain B locations.
2. This table applies to single family houses in Terrain B except those with a reinforced concrete roof deck.
3. Secondary factors are not considered in this table, including: (i) board roof decks (dimensional lumber and tongue and groove); (ii) masonry walls and reinforced masonry walls; (iii) all openings protected versus just glazed opening protected; (iv) unbraced gable end for gable roofs (other roof shape); and (v) unrestrained foundation.

Table 6: Loss Costs Relativities– Terrain C Locations with 2% Deductible

Terrain Category C – 2% Deductible				Roof Shape			
				Other		Hip	
Roof Cover	Roof Deck Attachment	Roof-Wall Connection	Opening Protection	No Secondary Water Resistance	Secondary Water Resistance	No Secondary Water Resistance	Secondary Water Resistance
Non-FBC Equivalent	A	Toe Nails	None	1.60	1.49	1.16	1.09
			Basic	1.13	0.99	0.71	0.61
			Hurricane	0.98	0.83	0.57	0.45
		Clips	None	1.31	1.19	0.89	0.79
			Basic	0.99	0.83	0.58	0.45
			Hurricane	0.90	0.73	0.51	0.38
		Single Wraps	None	1.28	1.15	0.88	0.78
			Basic	0.97	0.81	0.58	0.45
			Hurricane	0.90	0.73	0.51	0.38
		Double Wraps	None	1.27	1.15	0.88	0.78
			Basic	0.97	0.81	0.58	0.45
			Hurricane	0.90	0.73	0.51	0.38
	B	Toe Nails	None	1.46	1.37	1.13	1.07
			Basic	0.89	0.80	0.65	0.58
			Hurricane	0.72	0.62	0.50	0.42
		Clips	None	1.00	0.89	0.69	0.56
			Basic	0.60	0.47	0.43	0.33
			Hurricane	0.49	0.35	0.39	0.28
		Single Wraps	None	0.84	0.68	0.64	0.47
			Basic	0.53	0.38	0.41	0.30
			Hurricane	0.48	0.32	0.38	0.28
		Double Wraps	None	0.79	0.59	0.63	0.45
			Basic	0.51	0.34	0.41	0.29
			Hurricane	0.47	0.31	0.38	0.27
	C	Toe Nails	None	1.45	1.37	1.13	1.07
			Basic	0.88	0.79	0.65	0.58
			Hurricane	0.71	0.62	0.50	0.42
		Clips	None	0.98	0.88	0.69	0.56
			Basic	0.57	0.46	0.43	0.33
			Hurricane	0.46	0.34	0.38	0.28
		Single Wraps	None	0.81	0.64	0.63	0.44
			Basic	0.49	0.36	0.40	0.29
			Hurricane	0.43	0.30	0.38	0.27
		Double Wraps	None	0.72	0.47	0.62	0.41
			Basic	0.45	0.30	0.39	0.27
			Hurricane	0.42	0.28	0.37	0.26
FBC Equivalent	A	Toe Nails	None	1.49	1.44	1.07	1.03
			Basic	0.97	0.93	0.59	0.56
			Hurricane	0.81	0.77	0.43	0.40
		Clips	None	1.16	1.12	0.75	0.73
			Basic	0.80	0.76	0.43	0.39
			Hurricane	0.71	0.67	0.36	0.32
		Single Wraps	None	1.12	1.09	0.75	0.72
			Basic	0.79	0.74	0.43	0.39
			Hurricane	0.71	0.66	0.36	0.32
		Double Wraps	None	1.12	1.08	0.75	0.72
			Basic	0.78	0.74	0.43	0.39
			Hurricane	0.71	0.66	0.36	0.32
	B	Toe Nails	None	1.36	1.32	1.04	1.01
			Basic	0.78	0.75	0.55	0.53
			Hurricane	0.60	0.57	0.38	0.36
		Clips	None	0.87	0.84	0.54	0.51
			Basic	0.46	0.42	0.31	0.28
			Hurricane	0.35	0.30	0.26	0.23
		Single Wraps	None	0.68	0.63	0.46	0.41
			Basic	0.38	0.33	0.28	0.24
			Hurricane	0.32	0.27	0.26	0.22
		Double Wraps	None	0.60	0.53	0.45	0.39
			Basic	0.35	0.29	0.27	0.23
			Hurricane	0.32	0.26	0.25	0.22
	C	Toe Nails	None	1.36	1.32	1.04	1.01
			Basic	0.78	0.74	0.55	0.53
			Hurricane	0.59	0.56	0.39	0.36
		Clips	None	0.86	0.83	0.54	0.50
			Basic	0.44	0.41	0.30	0.27
			Hurricane	0.32	0.29	0.26	0.23
		Single Wraps	None	0.64	0.59	0.45	0.39
			Basic	0.35	0.31	0.27	0.23
			Hurricane	0.29	0.25	0.25	0.22
		Double Wraps	None	0.51	0.41	0.43	0.36
			Basic	0.30	0.25	0.26	0.22
			Hurricane	0.28	0.23	0.25	0.21

Notes: 1. This table is based on averaging the relativities for each of the three modeled houses (with composition shingle roof coverings) for all 14 Terrain C locations.
2. This table applied so single family houses in Terrain C except those with a reinforced concrete roof deck.
3. Secondary factors are not considered in this table, including: (i) board roof decks (dimensional lumber and tongue and groove); (ii) masonry walls and reinforced masonry walls; (iii) all openings protected versus just glazed opening protected; (iv) unbraced gable end for gable roofs (other roof shape); and (v) unrestrained foundation.

The Assumptions Underlying ARA Loss Cost Projections

Currently, the only published reports on mitigation features/factors and their impact on loss costs are the two ARA reports (ARA 2002 and ARA 2008). There are several major assumptions implicit in the ARA studies that need to be examined.

Assumption #1: The mitigation features and corresponding categories used in the 2002 and 2008 ARA studies (see Table 7) are the most relevant mitigation features in reducing windstorm losses.

ARA defined the various categories for each construction feature using linguistic descriptions and photographs or diagrams in many cases. However, other wind engineering and catastrophe modeling firms often define the categories or breakdowns for each construction feature differently. Classification of features is an extremely important exercise and must be done with anticipation of the practical implications for field inspections, training of insurance agents and customer services representatives, insurer data collection, underwriting manual rules, actuarial rating algorithms, and reporting on the success of public mitigation programs.

Table 7: Mitigation Features[20]

Study Year	Feature	Categories
2002 & 2008	Terrain	FBC Terrain B, Terrain C
2002 & 2008	Roof Shape	Hip, Other
2002 & 2008	Roof Covering	FBC Equivalent, non-FBC Equivalent
2002 & 2008	Secondary Water Protection	No, Yes
2002 & 2008	Roof-to-Wall Connection	Toe-nail, Clip, Wrap, Double Wrap
2002 & 2008	Roof Deck Material/Attachment	Plywood/OSB 93 - Nail Size/Spacing Patterns, Dimensional Lumber, Reinforced Concrete
2002 & 2008	Openings: Protection Level	None, Basic, SFBC/SSTD 12/ASTM E 1996
2002 & 2008	Openings: Protection Coverage	All Openings, Only Glazed Openings
2002 & 2008	Gable End Bracing	No, Yes
2002 & 2008	Wall Construction	Frame, Masonry, Reinforced Masonry
2002 & 2008	Wall-to-Foundation Restraint	No, Yes
2008	Number of Stories	One, Two or more
2008	Roof Covering Material	Tile, Non-tile
2008	Roof Slope	4/12, 7/12
2008	Soffit Construction	Wood, Other
2008	Vinyl Siding	No, Yes
2008	Window/Door Water Leak Potential	Fixed/Casement, Other
2008	FBC Roof Cover Age	< 5 years remaining, Other
2008	Minimal Condition Requirements	Good, Other

A review of engineering literature, the ARA reports, and the expertise of engineers was used to determine if the methodologies used in the ARA studies are appropriate.

Key questions in the analysis included:

1. Were mitigation factors included in the study that should not have been?
2. Were relevant factors excluded?
3. Are assumptions and simplifications justified from both a scientific and project logistics (budget, timeframe, capabilities) standpoint?

From an engineering perspective, the ARA 2008 study has analyzed a comprehensive and appropriate set of residential building features that can be used to assess the wind vulnerability of single-family and multi-family residential structures. There are only a few exclusions that may influence the completeness and accuracy of the relativity results:

[20] Table 3-1 in the 2002 study and Table 4-1 in the 2008 study.

- Double entry doors were not modeled in single family homes. Such doors are known to fail in high winds, permitting extensive interior damage from wind driven rain. Double entry doors are a common feature in more recent construction. Entry door type should be used as a classifier for the home, such as hip or gable roof is used, and explicitly modeled.
- Awning windows were excluded and should have been grouped with casement and fixed operator types.
- Stucco renderings and decorative cementious coatings are known to leak around window openings and less often, through the wall itself. This issue can be represented as a feature within the ARA leakage model.

Assumption #2: The development of the impact of such features on damageability is sound and within the range of results accepted by hazard science and wind engineering communities.

A review of the ARA modeling methods by engineers and actuaries determined the strengths as well as any shortcomings in the methodology used by ARA to derive the relative loss costs of weaker versus stronger feature categories. This analysis includes:

1. Review of the ARA loss model methodology including:
    a. Meteorological (wind force) component
    b. Vulnerability (engineering) component
    c. Peer reviews of model components in the literature
    d. Professional reviews of the model
        i. FEMA HAZUS oversight of ARA model development
        ii. Florida Commission on Hurricane Loss Projection Methodology

2. Compare the wind damage relativities from other modeling firms across mitigation features to the ARA model using the data in the Form V-2: Mitigation Measures collected by the Florida Commission on Hurricane Loss Projection Methodology.

From an engineering perspective, significant portions of the ARA model are documented in the public domain. Technical papers detailing its engineering and meteorological components have been anonymously peer-reviewed and published in scholarly journals (e.g., Vickery et al. 2009a, 2009b, 2006a, 2006b, 2000a and 2000b and Vickery and Twisdale 1995). The approach described in the 2008 ARA study for estimating hurricane-related losses to residential buildings has been vetted by a multi-disciplinary expert panel as part of the annual review process coordinated by the Florida Commission on Hurricane Loss Projection Methodology. The technical experts reviewed the model components in the public domain as well as the proprietary components of the model. The 2008 ARA study adopted the hurricane portion of FEMA's multi-hazard HAZUS model that was also developed by ARA. The HAZUS model has been regularly reviewed over its multi-year development by a team of recognized experts in wind engineering, building vulnerability, and atmospheric science.

Based on a limited review of the study, wind engineers conclude that that ARA's technical approach is sound, relative to the completeness and quality of the research from which it originates. However, three outstanding issues need to be addressed:

1. Relativities were not computed for dwellings located in treed and marine exposure conditions, which are significant regions of interest in Florida. It is understood that the scope of work agreed upon by ARA and the OIR did not include these terrain conditions. Nonetheless there are significant implications with regard to the applicability of the study results to the Florida residential building stock located in treed and marine exposure conditions. The wind loads that act on buildings are deeply sensitive to the upwind terrain conditions. A building located immediately at the coast is expected to experience larger wind loads than the same building located in open country terrain, assuming the approach wind field conditions are the same. Ignoring the effects of trees, which can be both positive (sheltering) and negative (falling trees), in the determination of loss relativities of homes located in treed terrain represents a significant omission.

2. Limitations are imposed on the accuracy of predicted losses by constructing a damage model based on incomplete and/or not well understood engineering and science. This issue is an inherent feature of catastrophe modeling in general and is not specific to the ARA model. There is a critical need to develop performance data and models to predict the wind resistance of residential building components. Because so few engineering failure models or experimental data are available for residential structures, field observations of hurricane damage and engineering judgment are widely used to categorize and calibrate the damage against incident wind speeds. However, calibrated models that capture the effects of aging and environmental load (thermal cycling, solar radiation etc.) on the long-term behavior of most residential building components currently do not exist. Little is known about how homes that have been situated in Florida's subtropical climate for five, ten years or more will perform relative to their newly built counterparts. This issue creates one of many sources of uncertainty within the relativity results.

3. The uncertainties associated with estimation of the relativity values were not quantified in the ARA 2008 study. The level of confidence associated with any given relativity value is important for determining its appropriate application. Further, the resultant outcome may not be accurate if the models chosen to represent the various loads and components, and the load sharing assumptions, are not well understood. This is particularly relevant given the rapidly evolving nature of hazard vulnerability science. A quantification of the uncertainties associated with the relativities is necessary to determine appropriate resolution and application.[21] The known existence of uncertainties in probabilistic hazard loss modeling is in contrast to the presentation of relativities using four places after the decimal in the relativity tables in the ARA 2008 study. This level of precision is simply not achievable and implies more confidence in the results than can be justified.

[21] This point is also emphasized in the actuarial review below.

From an actuarial perspective, the assumptions underlying ARA loss cost projections seem reasonable. Actuaries find it necessary, and are professionally allowed, to rely on models outside their expertise when certain prudential steps are taken[22], namely:

"In performing actuarial work, an actuary may find it appropriate to use models that incorporate specialized knowledge outside of the actuary's own area of expertise. When using such a model, the actuary should do all of the following:

a. Determine appropriate reliance on experts;
b. Have a basic understanding of the model;
c. Evaluate whether the model is appropriate for the intended application;
d. Determine that appropriate validation has occurred; and
e. Determine the appropriate use of the model.

The actuary's level of effort in understanding and evaluating a model should be consistent with the intended use of the model and its materiality to the results of the actuarial analysis."

In the case of hurricane models which assess loss mitigation at the construction feature level, it also matters to the actuary whether the features modeled meet the definitions of desirable risk classification elements[23] common to the profession. Of particular importance in designing a new set of rating elements are operational considerations such as

- Ability to reliably measure/categorize the feature;
- Expense associated with collecting feature data;
- Lack of ambiguity among feature categories;
- Inability for insureds to manipulate the data.

The features used in the ARA studies generally align well with these considerations. The residential features (categories) are summarized in the study's Table 6-3, with a detailed physical description of each category, and include (from "worst" to "best" category in each feature):

- Year and building code of construction (pre-FBC, post-FBC[24])
- Roof shape (other than hip, hip-mansard-pyramid)
- Roof covering (non-FBC equivalent, FBC equivalent)
- Roof deck and attachment (Level A, Level B, Level C, reinforced concrete)
- Roof-wall connection (toe nails, clips, single wraps, double wraps)
- Secondary water resistance (none, present)
- Opening protection (none, basic, hurricane)

along with some further categories driven by geography:

- Terrain category of location (B, C, High Velocity Hurricane Zone of Broward and Dade)
- FBC wind speed contour (100, 110, 120 or higher)

[22] Actuarial Standards Board, Actuarial Standard of Practice #38, "Using Models Outside the Actuary's Area of Expertise (Property and Casualty)", adopted June 2000.
[23] American Academy of Actuaries Committee on Risk Classification, "Risk Classification Statement of Principles", adopted 1990.
[24] FBC generally took effect for buildings permitted after March 1, 2002, but insurers commonly code all buildings with a year of construction of 2002 or newer as subject to the FBC.

- FBC wind borne debris region (yes, no)

for a total of about 600 combinations or "cells" in a matrix. The ability to distinguish among categories when inspecting a structure requires some expertise, which is why professional inspections are needed to classify a structure. However, once those data are collected, actuaries can use the mutually exclusive, collectively exhaustive structure provided to consistently classify risks.

Other Issues

There are some other technical points from the ARA study that may require further study to ensure that the approach used in the study was appropriate:

1. Geography – The ARA study collapsed the results into a single table of relative loss costs applicable statewide.

2. Judgment Factor - The computed relativities were compressed by ARA using a judgment factor.

3. Building Envelope – Engineers have documented the importance of the "building envelope" in governing insured wind losses, yet very little research on this topic is in place to develop quantitative relationships to model damage as a function of storm intensity.

4. Base Structure - ARA chose a single base structure that appeared to mimic the most common site built home in Florida when it may be more appropriate to use different base structures in different geographical areas.

5. Relative Loss Costs - Relative loss costs was the only metric used to define mitigation credits.

Geography

Given the number of locations simulated in the study and the wide variation in results when segregated by areas of the state, compressing the relative loss costs into a single table may not be appropriate. ARA utilized 31 locations (17 in terrain B and 14 in terrain C) in the 2002 study (18 locations in the 2008 study) in their models and then collapsed the relativities into a single table for each terrain by averaging across locations. Variation in relativities across areas will result in under/over pricing by location which may lead to adverse selection in the marketplace. The result may be the perpetuation of a large residual market.

Insurers try to achieve both actuarial efficiency – the collection of proper aggregate revenue to fund the portfolio of risk – and actuarial equity – the proper distribution of that revenue among the various types of properties making up the portfolio – in their rating plans. Though of high quality given its scope, the architecture used by ARA to develop the final algorithm for

determining its mitigation relative loss costs raises several practical issues documented in the actuarial literature[25].

First is the issue of overlap with existing rating elements. Traditionally, insurers considered just two main construction features:

- Age of home (typically a schedule of factors varying by year built)
- Wall construction (typically wood frame, masonry, and superior masonry, sometimes with a "masonry veneer" category between frame and masonry)

In addition, insurers use geographic location or "territory" as a catch-all rating element. In an era where detailed risk data was scarce, territory was the most important element.

ARA did not offer separate, parallel tables indexed by year of construction, but did offer a choice of separate "existing" and "new" construction tables, with the criteria for "new" construction being properties which are built to the FBC. Actuaries therefore must expect overlap between age of home factors and mitigation factors to the extent age of home relativities were derived based in part on relative windstorm risk.

The ARA mitigation relativities apply regardless of wall construction. Actuaries are on reasonably solid ground leaving existing wall construction rating factors in place, with monitoring of the premium outcomes relative to modeled loss costs for properties in each wall construction type.

ARA used 31 locations around the state for its modeling of hypothetical properties. By contrast, the Florida Commission on Hurricane Loss Projection Methodology requires that hurricane modeling firms wishing to be accepted in Florida rate filings annually submit loss costs for a variety of hypothetical building types located at the centroid of every 5-digit ZIP code of Florida[26], and aggregate those statistics to the county level as well. Only two sets of tables (Terrain B and C) are used to characterize mitigation status, but it is possible that the relativities would have varied more significantly depending on region if more simulation points had been used. However it appears that ARA took they approach they did in order to provide some spatial variety and represent the entire state in a reasonable manner while meeting the deadline to complete the study. Further, regional tables would have alleviated some of the potential overlap between mitigation relativities and hurricane base rates modified by territory rating factors.

Judgment Factor

The computed relativities were compressed by ARA using a judgment factor. ARA stated in their report that "The resulting loss relativities, while reasonable estimates at this time, are likely to evolve with more data and further model improvements" (ARA 2002, Section 1.3 Technical Approach and Limitations). ARA used a 5% tempering factor that had little basis in science. This provides another example of the uncertainty involved with the modeling process.

[25] See John W. Rollins, "A Modern Architecture for Residential Property Insurance Ratemaking", Proceedings of the Casualty Actuarial Society, 2005, pp. 486-578.
[26] See Florida Commission on Hurricane Loss Projection Methodology's annual "Report of Activities", Forms A-1 and A-6.

Building Envelope

Limitations are imposed on the accuracy of predicted losses by constructing a damage model based on incomplete and/or not well understood engineering and science. This issue is an inherent feature of catastrophe modeling in general and is not specific to the ARA model.

Building envelope systems in residential structures historically have not been engineered, and many lack a continuous wind load path. The design responsibility for building envelope components in the past has been with the architect or construction manager and not the engineer for two reasons: i) structural engineers seldom design houses and ii) building envelope components were not considered part of their structural systems. Recent storm events showed that other performance metrics (besides the ultimate "life safety" metric) should be considered when selecting building components if the economic losses from hurricanes are to be reduced. Frequent failures of building envelopes in moderately strong wind events (i.e. leakage at windows and doors, damage to roof edge flashing, water intrusion through soffits and roof vents etc.) highlighted the need for improving designs. ARA has addressed some of these issues by including a leakage model for fenestration and soffits, but data to calibrate this is very limited.

The building envelope industry relies almost exclusively on structural tests of full-scale components to develop wind-resistant design guidelines. Most tests are conducted on individual components isolated within a test frame that does not represent actual installation. Further, uniform (mainly static) pressure tests do not represent the fluctuating nature of wind forces that occur during hurricanes. As a result, standard testing may at best provide comparative ratings (of similar products) rather than results to establish performance-based design criteria for actual wind load conditions.

As a result any probabilistic modeling of building envelope performance based on the available limited data is likely to include considerable uncertainty. There is a critical need for studies on the performance of asphalt shingles, tile and other roof coverings, vinyl siding, windows and doors, etc… to establish their performance limits. Such studies will reduce the inherent uncertainties in building envelope performance modeling.

Base Structure

We can assess the predominant residential structural systems distributed throughout the state by understanding the changes that have occurred in the building codes. A reasonable process to select a base structure may be to divide the residential inventory by age of construction, within each geographic region. For each age group the code in force at that time will establish minimum structural systems. Thus the base structure can be developed based on the structural (and other) systems that would just meet the minimum building code provisions at the time of construction for each jurisdiction.

Relative Loss Costs

Relative loss costs are the only metric used to define mitigation credits. Given that reinsurers set premiums for insurers using "risk loads," often a percentage of the standard deviation of modeled losses or a percentile of the modeled loss distribution, a different "cost factor" may be the appropriate metric used to derive relativities.

Relative loss costs is the only statistic used to represent the relative differences associated with properties of varying mitigation levels. Since loss costs are just the ratio of average annual losses to an exposure base, they summarize the entire modeled hurricane loss distribution for a location into a single point. When working with relativities (ratios of loss costs), the base cancels out. The great advantage of this metric is that results are additive across locations, making them robust against the choice of the number and location of properties in the simulation. Given the calculation-intensive process of relativity development, this advantage may be decisive in building the study tables.

However, mitigation credits are used to modify the cost of capital component, not just the expected annual hurricane loss component, of premiums. Insurers maintain a combination of internal capital and capital "rented" by transferring risk to reinsurers or securities investors. Accepted actuarial models link the cost of such capital to the volatility, not the average, of the hurricane loss distribution. Thus, relativities that include volatility may be more appropriate than those based solely on relative loss costs. Reinsurers consider the distribution of hurricane losses which exceed the insurer's "retention," like a deductible. One implication is that reinsurance costs are not expected to drop proportionately when loss costs drop due to mitigation – but whether they should theoretically drop more or less is not clear without knowledge of the specific parameters.[27] Reinsurers may not gather information regarding mitigation at the specific exposure unit level.

Analysis of How These Loss Cost Projections Were Converted Into Mitigation Credits.

Informational Memorandum OIR-03-001M indicated that only credits could be offered. Implementation consisted of taking the ARA relativities in the above table and dividing them by 2.37. The result was that the weakest structure was recalibrated to be the base risk. The resultant windstorm loss reduction credits are found in Appendix A.

In 2003 the required credits shown in Appendix A were initially cut in half by the OIR until data to support a new base rate filing was available. The rationale for the tempering was that the insurers did not have detailed mitigation information on their books of business and thus could not demonstrate that their base rates did not already represent the weakest house but requiring use of the full credits would cause a large drop in revenue. In 2007, however, the OIR eliminated the 50 percent tempering of the credits, and insurers were told that base rates could not be modified to offset lost revenue. This method of implementation is contrary to the suggestions in the 2008 ARA study which states on page 208, "If the rate differentials are implemented as credits from the weakest building, then the base rates should be adjusted to reflect the weakest building. Implementation of the rate differentials with offset calculations eliminates many problems…"

[27] Since the ceded (e.g. reinsurer's) loss distribution is based only on losses exceeding an attachment point, it is unclear whether a reduction or an increase in relative variability will occur in the excess layer as a result of a reduction in variability in total (gross) losses. It depends on the entire modeled catastrophe loss distribution as well as the attachment point. This can be demonstrated by using a measure such as the coefficient of variation (CV, or ratio of standard deviation to mean) on a gross and excess basis, before and after catastrophe modeling is performed on a baseline property data set, then one containing the same properties but augmented with additional mitigation features. Reinsurance prices are often derived as a multiple of the CV of modeled losses, loaded for overhead.

The ARA study explains the problem on page 191 where the report states "The problem with applying credits from the weakest building is that the base rate should be based on the loss costs of the weakest building. The loss costs of the weakest building can only be developed through a model, similar to the process used herein. Generally, base rates are more reflective of the expected loss costs, statistically averaged over strong and weak buildings, which is significantly different than the loss costs of the weakest structure. If the credits are computed from the weakest building but are applied using rates that are derived from an average building, then there is a significant economic disconnect. This disconnect can be alleviated with a proper rate effect or offset calculation that reflects the rate differentials and an insurer's distribution of business."

The report also commented on the problems associated with the way the Florida program was implemented on page 188 where the report states "…Florida's insurance implementation of its wind mitigation program needs significant improvement. Maximum long-term success will occur when an insurance company inspects its book of business in the high wind zones, provides each building owner with a mitigation report that includes rate differential information (economic incentives) for improvements to the building, and applies the loss relativities as rate differentials. Applying the loss relativities as rate differentials avoids the problems associated with a credit program that is based on normalization of relativities to the weakest structure."

The report suggests that implementation of a rate differential program should.

1. Require accurate determination of the presence/absence of wind mitigation features.
2. Encourage building owners to invest in cost-effective mitigation to achieve lower insurance rates.
3. Encourage insurance companies to collect wind mitigation data on their portfolio of buildings so that rates can be accurately determined.
4. Provide for adequate and fair rates for insurance companies. The implementation of rate differentials should be a "win-win" situation for the insurance company and the building owner.
5. Encourage reinsurance programs to reflect the actual distribution of wind mitigation features within an insurance company portfolio.
6. Promote continued improvements to the Florida Building Code.
7. Promote validation, updates, and refinements to loss mitigation modeling, building ratings, and rate differentials.

The 2008 ARA report notes on page 189 that the implementation of the loss relativities in Florida has not been very successful because it is viewed as an insurance credit program rather than a cost-effective mitigation program. The problem is that the focus has been on insureds receiving premium credits rather than engaging in mitigation activities that are cost-effective with the additional costs being offset by reduced premiums over time.

Appropriateness of Loss Relativities

Another issue concerns the relativities being used in determining mitigation credits. Material differences exist between the models used for pricing and the model used for development of mitigation loss relativities. The ARA-generated relativities were used in calculating the windstorm loss reduction credits. However the other hurricane loss models (AIR,

EQE, RMS and FPM) are more commonly used in rate making by both insurers and reinsurers. In the January 23, 2003, OIR memorandum it states that credits were developed and tempered by 50%. One reason given for the tempering was because of "the potential for differences in results using different hurricane loss models." Thus an issue that needs to be examined is whether the percentage credits would be significantly different in each of the modelers' mitigation studies.
.
A recent study (Cole et al., 2010) demonstrated that while the major hurricane models consider a consistent set of factors, there are variations in how the factors are treated in the models. This can lead to considerable variation in the modeled average annual losses (AALs), even at the exposure level, based on the catastrophe model used. As such, the model selected could have a dramatic impact on price. The paper used a large dataset of wind-only policies in order to analyze the impact of housing, insurance, and mitigation characteristics on AALs for four hurricane loss models. The study found that while there is some correlation among the modeled loss costs, the extent of the correlation does vary overall and with respect to housing, insurance, and mitigation characteristics. In addition, the results indicate that there are significant differences in the direction and magnitude of the relation of AAL and housing, insurance, mitigation characteristics across the models.[28]

From an actuarial perspective, actuaries are encouraged to use multiple models, particularly when the rating elements are outside the actuarial profession's core expertise and the expert opinions may fall in a wide range[29]. The ARA's model is known to indicate a wide spread between minimum and maximum loss costs around the state when compared to the other Commission accepted models. This was confirmed by the Commission in 2007 in its special study of comparative loss costs by county among all accepted models[30]. The use of a single model elevates the actuarial risks of arriving at unfairly discriminatory rates in implementing the program.

Over-application of Credits

If credits are applied to the entire wind premium rather than just to the loss costs portion over-application of the credits occurs because only loss costs are reduced through home hardening efforts. Since the fixed expense portion of the wind premium is not reduced through mitigation, the application of a credit to the entire premium results in "over discounting". For example, fixed cost provisions for the net cost of reinsurance (e.g. the portion of reinsurance costs other than expected ceded losses) should not be discounted unless reinsurers actually reduce their charges as a result of mitigation. So, even if insurers were allowed to "catch up" with respect to the overall rates needed for adequacy and surplus accumulation, this "over discounting" creates market anomalies that compromise the long-term sustainability of the marketplace.

Further, the institution of structure-level wind mitigation credits creates overlap with existing credits in the homeowners' insurance market. The Building Code Effectiveness Grading System

[28] Another study that addresses the issue is Watson, Charles C. Jr., Mark E. Johnson, and Martin Simons. 2004. Insurance Rate Filings and Hurricane Loss Estimation Models. *Journal of Insurance Regulation* 22(3): 39-64.
[29] See Actuarial Standard of Practice #38, ibid.
[30] See the Commission's "Report to the Florida House of Representatives – Comparison of Hurricane Loss Projection Models", Nov. 5, 2007.

(BCEGS) had the purpose of differentiating wind risk according to the quality and effectiveness of building codes in each community. Insurers offer BCEGS credits at the community level that now overlap with the structure-level wind mitigation credits. While the BCEGS credits were tempered, the overlap still exists.

Finally, current mitigation credits are applied to portions of premium which were not part of the relative loss cost reductions demonstrated by ARA[31], notably:

- Coverage B (other structures);
- HO-4 (renters contents) and HO-6 (condominium unit-owners contents) policy types;
- Non-hurricane events such as tornado and hailstorms to the extent included in the "wind" peril

None of these credit applications were supported by the ARA study. Broadening the premium base subject to the mitigation rating plan may result in inadequate rates for certain policy types and/or perils if the outside expert models do not support the premium reductions.

Insurer Financial Performance

Notwithstanding the design and implementation of the mitigation credits, one of the most important questions to be answered is "what are the outcomes – intended or unintended – for the Florida insurance market as measured by financial and actuarial data?" Before examining the actual financial performance of insurers selling property insurance in Florida, an actuarial analysis of premium rates and mitigation credits is warranted to determine if the resulting rates are excessive, inadequate, or unfairly discriminatory.

Analysis of Premium Rates and Mitigation Credits

An actuarial study was completed to investigate the excessiveness, inadequacy and/or discriminatory nature of the premium rates and mitigation credits as defined by both Florida law and by professional Actuarial Standards of Practice binding on U.S. property-casualty actuaries.

The wind mitigation credits (and the remaining premiums collected by the insurers) must comply with Florida Statutes 627.062 regarding rate standards. The sections of the statute relating to whether rates are excessive, inadequate or unfairly discriminatory are shown in Exhibit 1. These statutory definitions reflect sound actuarial principles and if applied in an appropriate manner should result in rates that are not excessive, inadequate, or unfairly discriminatory.

[31] Filing correspondence from, for example, OIR Filing #FCP 03-02284 demonstrates the regulatory position.

Exhibit 1: Florida Statutes 627.062

627.062(1) The rates for all classes of insurance to which the provisions of this part are applicable shall not be excessive, inadequate, or unfairly discriminatory.

Section 627.062 (2) (e)

> *3. Rates shall be deemed inadequate if they are clearly insufficient, together with the investment income attributable to them, to sustain projected losses and expenses in the class of business to which they apply.*
>
> *5. A rate shall be deemed inadequate as to the premium charged to a risk or group of risks if discounts or credits are allowed which exceed a reasonable reflection of expense savings and reasonably expected loss experience from the risk or group of risks.*
>
> *6. A rate shall be deemed unfairly discriminatory as to a risk or group of risks if the application of premium discounts, credits, or surcharges among such risks does not bear a reasonable relationship to the expected loss and expense experience among the various risks.*

Inadequate Rates

As noted previously when the initial wind mitigation credits were introduced in 2003 the Office of Insurance Regulation required the use of a table that provided only credits, see Appendix A. This table was developed by adjusting the relativities in the ARA study to use the "weakest house" as the base. This alone would not produce inadequate rates; however, insurers were not allowed to adjust their base rate to that rate that should be charged for the "weakest house". In other words, the base rate charged by insurers should match the base house on which mitigation credits are determined.[32] As noted under Section 627.062(2) (e) 3 above, the statutory requirement is that rates must sustain projected losses. The projected losses did not change due to implementing the credits, though as more accurate mitigation feature data is collected and utilized in simulation models one could expect the modeled loss costs to change.

In practice, the same houses with the same mitigation features were being insured after the credits were implemented as before. What has changed however, is the premium revenue generated by insuring the same stock of property. There are two possibilities:

1. Prior to the implementation of the mitigation credits rates that were approved by the OIR were adequate and not excessive
2. Prior to the implementation of the mitigation credits, rates that were approved for use by the OIR were excessive

If the first interpretation is true then the current rates (after the implementation of the mitigation credits) are inadequate. Providing only credits without an offsetting adjustment to the base rates

[32] There are two methods of accomplishing this: 1. Normalize the loss relativities to the "weakest house" so that all relativities are reflected as credits (this is the current method) and also adjust the base rate used to the "weakest house". 2. Use both debits and credits off of the "average house" and leave the base rate as the "average house".

can only produce inadequate rates. If the second interpretation is true, then the current rates may be adequate.

Appendix B shows a highly simplified example of the dynamics of the implementation chosen by the Office of Insurance Regulation and the effect on premium income. Note that simply introducing a credit for some feature of the house being insured does not change the expected losses for that house. Changes in the mitigation features of a house would change the expected losses; however, a majority of mitigation credits actually given are based on house features that have existed for some time, probably since the house was constructed. According to the 2008 My Safe Florida Home Annual Report, 55% of homes inspected were eligible for insurance savings without making a single improvement.[33] It is clear that the implementation procedure chosen by the Office of Insurance Regulation has the potential for large reduction in wind premium collected by insurers. The premium lost is directly related to the number of houses receiving a mitigation credit. If no houses receive a credit, there is no lost premium. If a large number of houses receive a credit the premium lost is substantial.

Unfairly Discriminatory Rates

The wind mitigation credits do not create unfairly discriminatory rates unless the relative loss costs themselves are inaccurate. This is true even using the "weakest house" as the base, since the credits do reflect the difference between risks as specified in the statute. The rates may still be inadequate; they are just all inadequate to the same extent. The use of credits that were tempered by 50% in the original Table I was unfairly discriminatory since they did not reflect the full difference in expected losses developed in the ARA report. The tempering did not offset all lost revenue.

Insurer Financial Performance

The mandated mitigation credits/discounts have had a substantial impact on revenues for Florida's homeowner insurers. First, premium reductions have not been met with commensurate reductions in projected losses or related costs leading to higher loss ratios, expense ratios, and combined ratios. This means that, from the standpoint of underwriting performance alone, non-mitigated homes are relatively more attractive to insurers than are the mitigated homes, quite opposite the intended result. Overall, the 2007-2009 actual underwriting performance of Florida's homeowners insurance market has been deteriorating despite the fact there have been no hurricane losses in Florida during the same period of time. Thus, the ability of insurers to accumulate surplus has been impaired, resulting in less capital available to pay for future catastrophic losses.

Evidence of Actuarial Soundness of Current Rate Levels: Market Share Data

Notwithstanding the concurrency of the major legislative and regulatory efforts to lower base rates and increase mitigation credits on those lower base rates with the observed reduction in premium revenues, no simple time series data for revenues, exposures, and policies can establish cause and effect.

[33] See MSFH 2008 Annual Report.

The OIR's Quarterly Supplemental Reporting System (QUASR) is the best single source of data on the size and composition of the Florida property insurance market. It contains, among others, certain data elements relevant to this examination:

- Insurance company (each insurer separately identified by NAIC company code)
- Line of business (defined by OIR, separates homeowners, renters, condo unit-owners, dwelling fire, and commercial-residential sublines)
- Wind coverage (multi-peril, wind-only, or ex-wind for each subline)
- County
- Direct written premium during quarter
- Policies in force at end of quarter
- Total insured value for structure coverage (Coverage A in homeowners) at end of quarter

The individual reports are compiled for each insurer. Though the data is unaudited, it is collected in accordance with a detailed administrative Rule[34]. It is typically available 1 to 2 quarters behind the valuation date; this analysis uses data valued at quarter-ends valued from year-end 2005 to the third quarter of 2009.

An important first step is to broadly characterize the market into three groups:

1. "Domestics", Florida-domiciled insurers who write primarily property insurance and most often only in Florida. Many of these insurers formed after Hurricane Andrew, and some more recently during the course of the Insurance Capital Build-Up Incentive Program which provided start-up surplus loans to about a dozen new property insurers in 2006-07.
2. Citizens Property Insurance Corporation, Florida's alternative market property insurer.
3. "Others", which includes both foreign-domiciled insurers, often traditional national property writers, and the usually Florida-domiciled "pups" or subsidiaries of national insurers focused solely on property insurance in Florida.

A list of company names and NAIC codes reporting to QUASR, divided into "domestics" and "others," underlying these results is included as Appendix C.

In an analysis of Florida's residential property insurance market using QUASR data, the most important takeaways from the trends since the final quarter of 2005 are in the areas of

- Market allocation between "other" insurers (chiefly national writers and pups) and "domestic" insurers focusing on Florida property
- Size and growth of the Citizens residual/alternative market
- Unit revenue statistics, both average premiums per policy in force and average rate (premium per $1,000 of insured value)

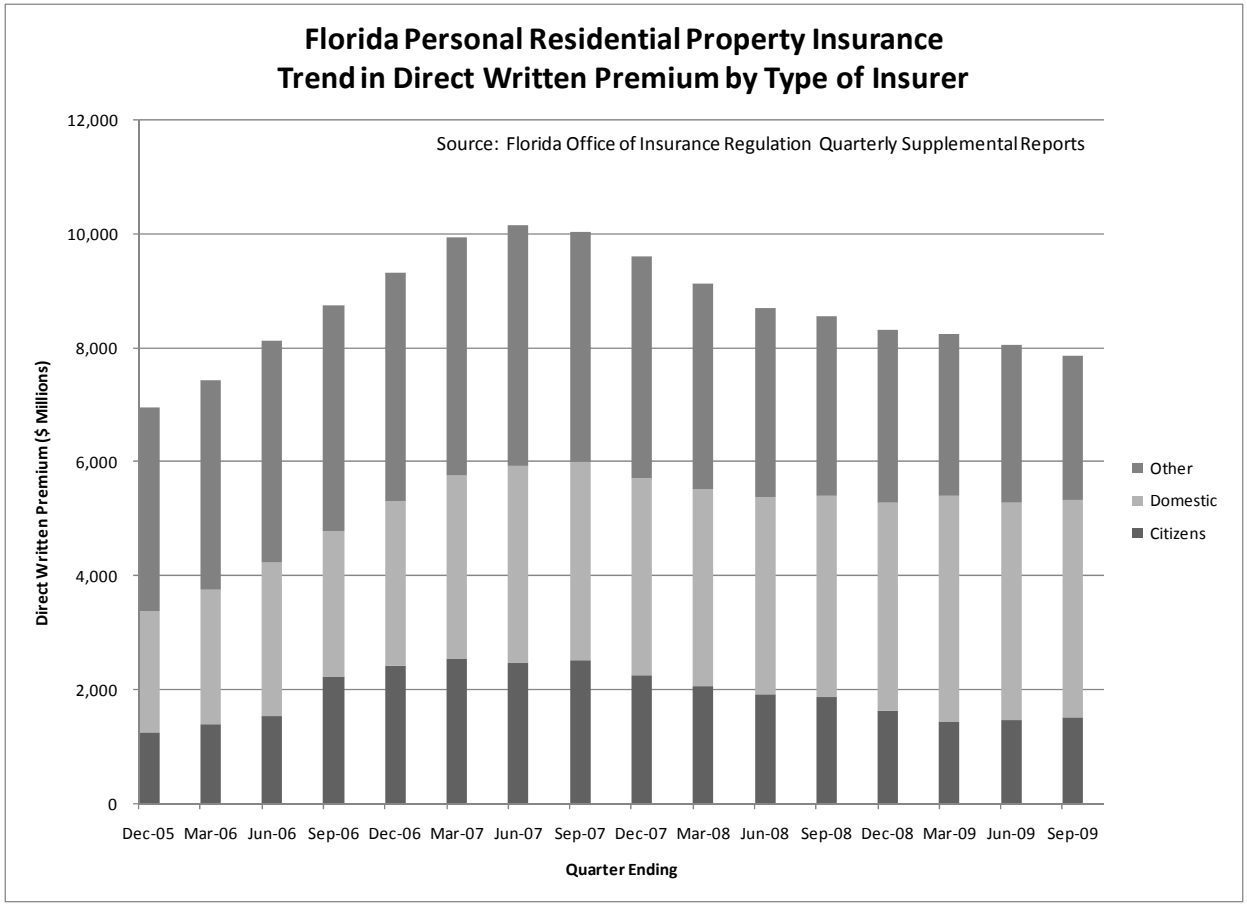
Three indicators of market performance are used to analyze the property insurance market at the macro level: overall premium volume, insured value, and policy count. The time series of these indicators reveals the trends in how they are distributed among the three market segments. The overall gross "premium base" for personal residential (excluding commercial-residential apartments, condominium buildings, and homeowners associations) property insurance rose rapidly from 2005Q4 to 2007Q1, due to a combination of rate increases and insured value

[34] Rule 69O-137.009

increases. The rate increases were in turn driven by cost pressures, primarily a reinsurance capacity shortage in 2006 accompanied by a spike in reinsurance prices, and also by legislation (SB1980)[35] which allowed a higher cost of capital in filed rates for the expected portion of hurricane losses retained by the insurer. The insured value increases were driven primarily by the booming housing economy and significant increases in construction replacement costs during a period of scarce materials and labor.

In 2007, with the passage of HB1A's rate rollbacks ("presumed factors") and Rule 69O-170.017s modifications doubling the original mandated mitigation credits, premium volume began to decline steadily, though insured values did not. The trends in aggregate premium and insured value are shown in Charts 1 and 2.

Chart 1



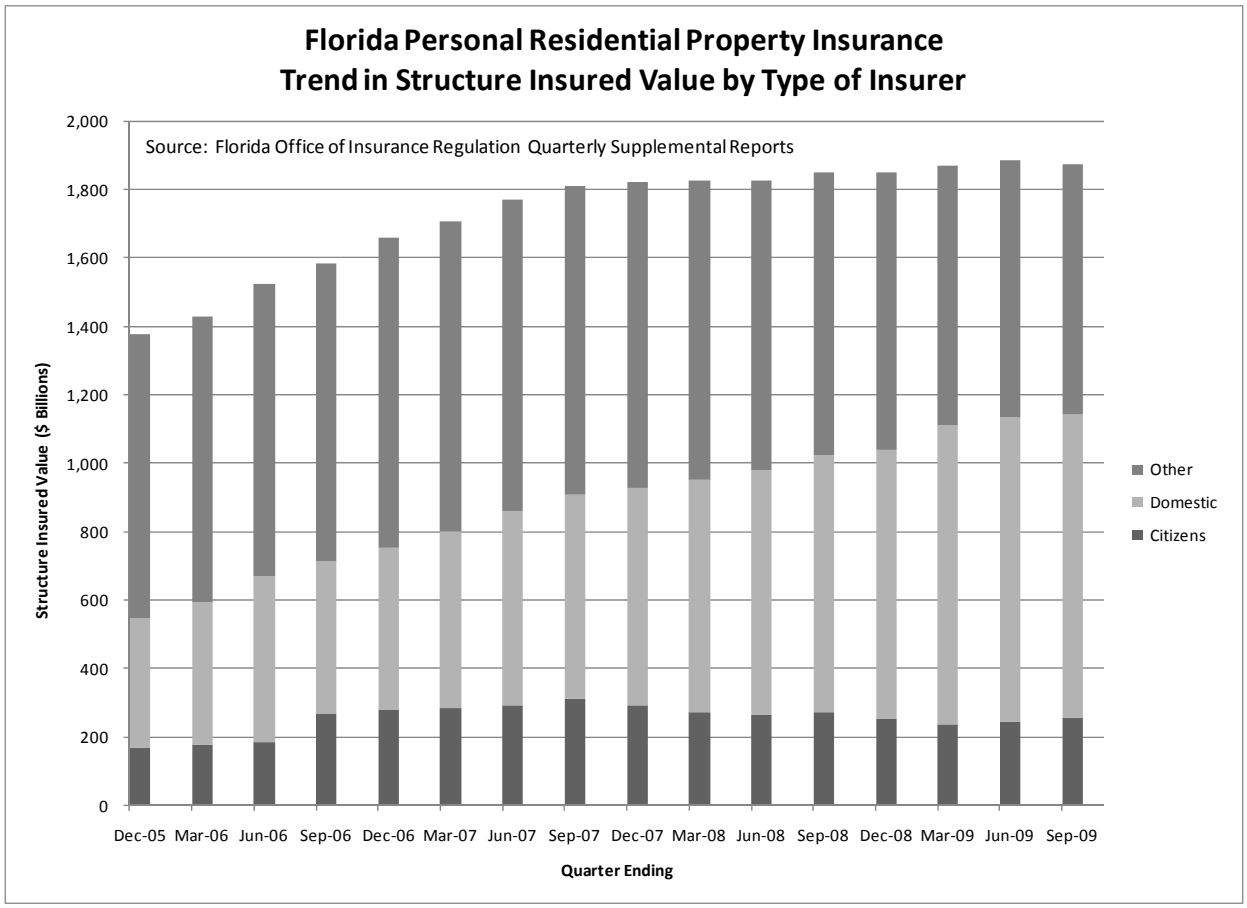
The premium base grew from about $7 billion in 2005, to over $10 billion by 2007Q2, but has declined to below $8 billion by 2009Q3. However, the premium base of domestic insurers has increased from $1.9 billion at 2005Q4 to $3.2 billion at the overall peak in 2007Q2, and now nearly $3.5 billion at 2009Q3. The premium base of other insurers grew from $3.8 billion to $4.5 billion during the run-up, but has declined to just over $2.8 billion at 2009Q3. In other

[35] This law added language to the list of factors to be considered in rate filings as follows: *"For that portion of the rate covering the risk of hurricanes and other catastrophic losses for which the insurer has not purchased reinsurance and has exposed its capital and surplus to such risk, the office must approve a rating factor that provides the insurer a reasonable rate of return that is commensurate with such risk."*. The language was repealed as part of HB1A in 2007 Special Session A.

words, the premium market share of domestics has increased from 27% to nearly 45%, while others have declined from 55% to 36%.

Citizens' premiums rose from less than $1.3 billion to almost $2.5 billion at 2007Q2. Its rates were frozen for three years starting with the effective date of HB1A in March 2007[36], at which it had to return to the rates effective during most of 2006. Citizens premiums declined to just over $1.5 billion which represents a market share of just over 19%, not much more than its 18% share in 2005Q4.[37]

Chart 2



Measures of actuarial soundness apply to the rate (per unit of insured value), not the premium volume, so insured values must also be compiled for any actuarial revenue analysis. Insured values rose from just under $1.4 trillion to nearly $1.8 trillion at the time the premium base peaked in 2007Q2. They have continued to rise, albeit more slowly as the housing economy has recessed in Florida since approximately the same time. Recall that insured values are based on

[36] HB1A originally mandated a rescission of a rate filing (a significant increase) effective Jan. 1, 2007 and a return to the rates effective April 1, 2006 for just one year. However, in the 2007, 2008, and 2009 regular session the rollback was extended repeatedly, culminating in an end on Jan. 1, 2010, at which time Citizens filed rates based on an actuarially sound standard, but must implement such rates on a "glide path" which ensures no single policyholder experiences a renewal rate increase (or decrease) of more than 10%.

[37] Note that this analysis includes only data from policies covering wind perils, and it does include the wind-only personal lines policies of Citizens (but not the commercial lines policies of any type).

replacement costs of construction, not market real estate values, though real estate values and construction costs often increase in tandem when labor and materials are scarce. Slack markets have resulted in only slow inflation in replacement costs since 2007Q2, but the trend is still upward. In addition, insurers faced with poor profitability have looked to make operations more efficient by aggressively monitoring insured values in accordance with the insure-to-value requirement in most personal residential programs. The net rise since 2007Q2 to just under $1.9 trillion reflects this.

Measured by insured values, domestics have taken significant market share from other insurers, growing from under $350 billion to nearly $810 billion since 2005Q4. The growth has been more aggressive since 2007Q2, from $530 billion to the current $888 billion, while others have shrunk from $945 billion to $730 billion. In percentage terms, domestics have grown from 25% to 47% of the market, while others have declined from 62% to 39% during the same 15 quarters.

Citizens' insured values grew from $169 billion to $293 billion in 2007Q2 and has since declined to approximately $255 billion. Its market share, based on insured values, grew from 12% in 2005Q4 to a peak of over 17% in 2007Q3, and now stands at under 14%.

Note that, per Chart 3, personal lines policy count has remained roughly flat over the 2006-2009 era at around 5.7 million – the run-up in exposures is almost entirely based on increases in the insured value of existing properties. Further, two of every three dollars of premium base increase has been due to rising insured values, a fact which is more clearly demonstrated below.

Chart 3

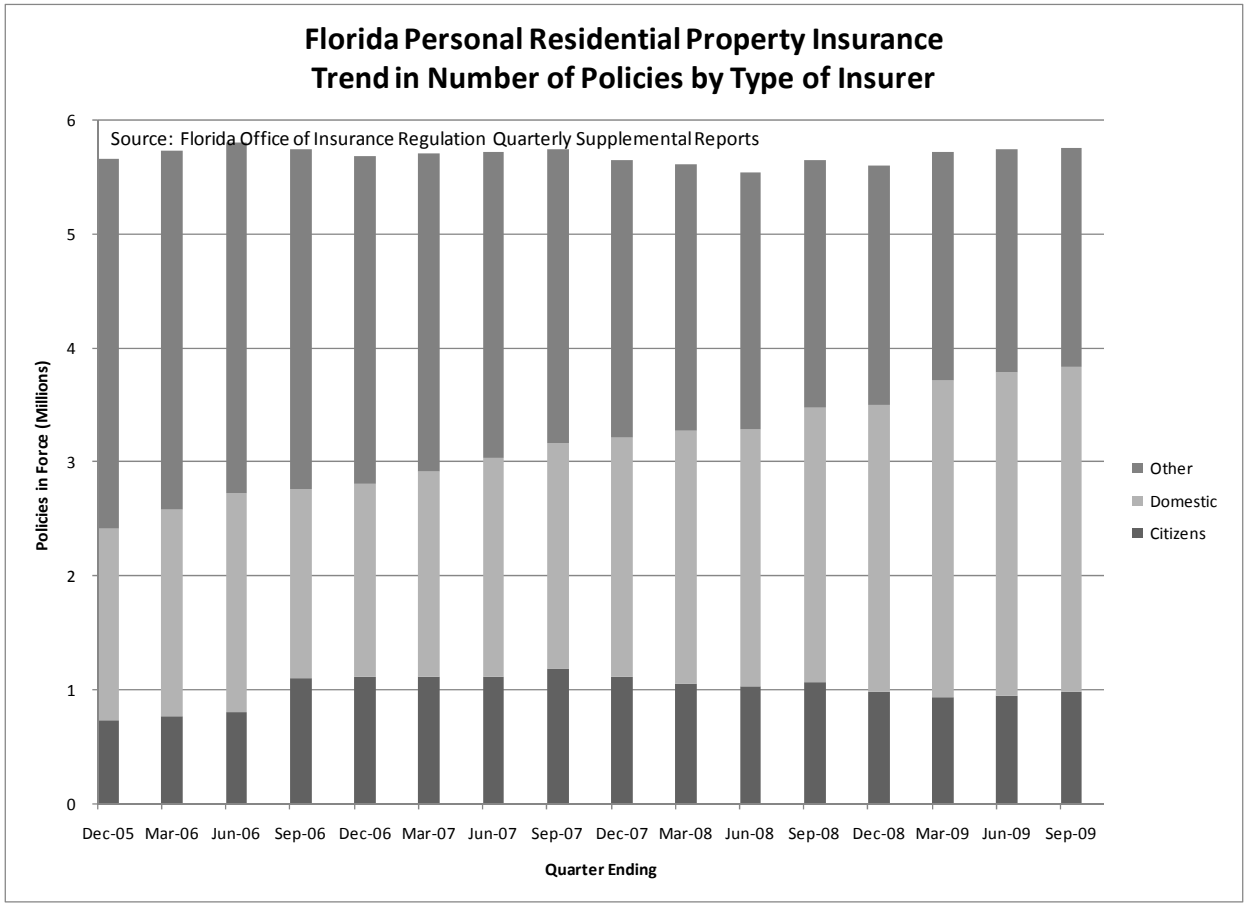
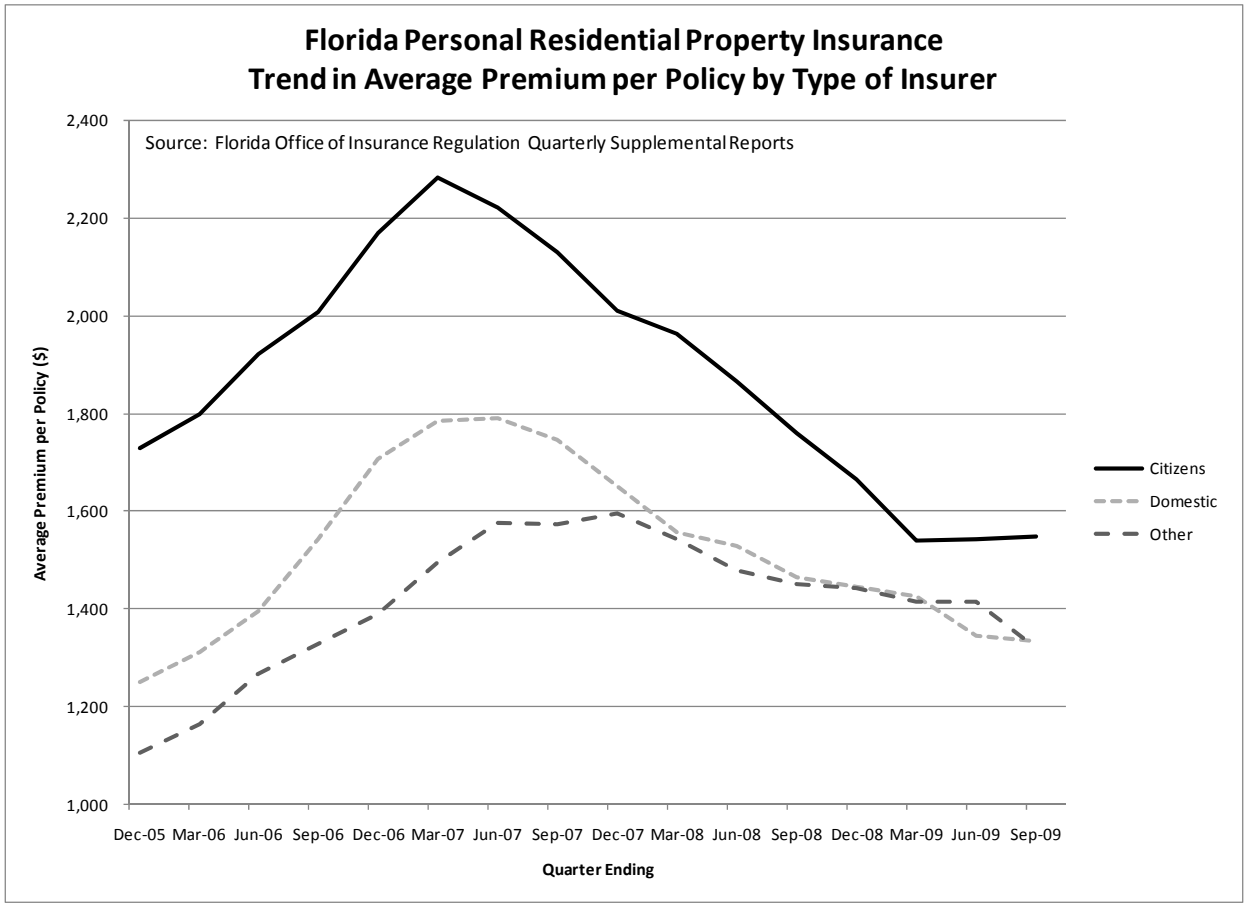


Chart 4 converts the overall premium to average premiums per policy, by simply dividing QUASR direct written premium by policies in force for the same insurers, lines, and quarters.

Chart 4



Average premiums are historically lowest for others, higher for domestics, and highest for Citizens. This supports historical trends, as national insurers had a dominant position inland, where the actuarially sound premiums tend to be lower, and new domestics were often started by "taking out" policies from the Citizens population weighted toward coastal properties. Citizens itself, as a market of last resort, therefore retained the most hazardous risks and also charged the highest rates based on a competitive formula[38].

Average premiums grew for all groups as domestic and national insurers filed for higher rates to reflect expected capital costs, while Citizens rates floated with the voluntary market. The expansion of the Florida Hurricane Catastrophe Fund (FHCF) and requirement that insurers roll back rates to reflect its provision of lower cost reinsurance, along with the parallel and nearly simultaneous requirements to increase wind loss mitigation credits in revised Rule 69O-170.017, pushed average premiums down.

[38] Until the first changes to the Citizens rating laws in SB1980, which established a specific standard of actuarial soundness based on probable maximum losses and reinsurance costs, and the subsequent reversal in HB1A, which rescinded the SB1980 standards and rolled back the approved actuarially sound rates, Citizens was required to maintain rates at or above competitive levels, enforced by a formula based on the rates for sample properties charged in each territory by the top twenty residential property insurers (by market share) in the state.

The average premium per policy began falling in 2007Q2 and continued declining over a period of approximately two years. These trends are consistent with the passage of HB1A and the longer term effect of mitigation credits as:

- Individual policies renewed with higher mitigation credits than before, and
- New mitigation credits were applied as insureds accessed them for the first time.

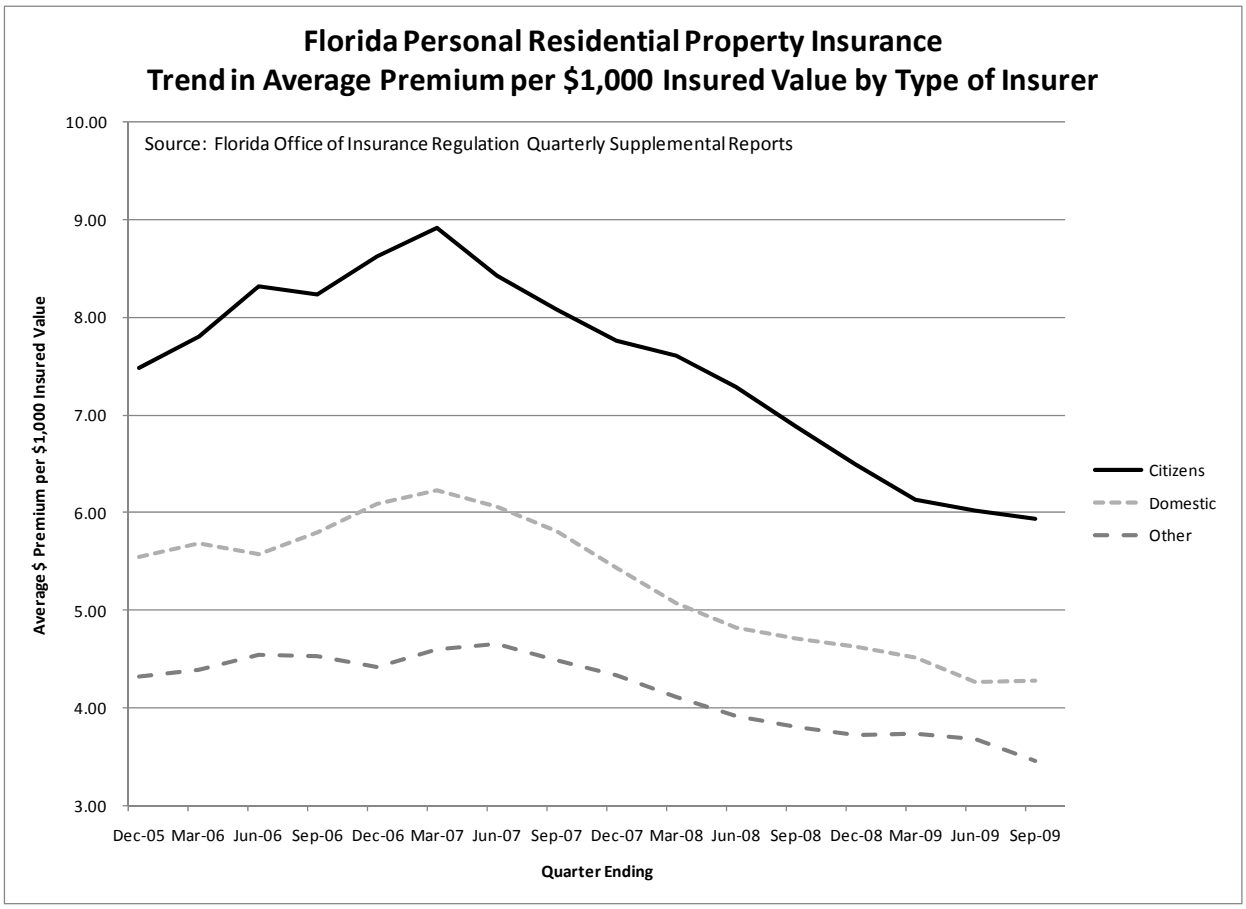
Chart 4 shows that the domestics average premium fell faster than that for the other insurers' group in 2007 and since 2008Q1 has roughly tracked evenly with that group as both groups experience continuing average premium declines. Average premiums are now $1,341 for domestics, nearly back to the 2005 levels, after peaking at $1,773 in 2007Q2 and then falling 24%. For others, average premiums are $1,313, higher than the $1,113 in 2005Q4 but still 18% below the peak of about $1,600. Citizens has been affected most severely, as average premiums of $1,547 have declined 32% from their 2007Q1 peak of $2,284 and actually stand 11% below the $1,730 average in 2005Q4.

Average premium per policy analysis removes distortions based on market share, but is still distorted by changes in insured value, which rose rapidly during 2005Q4 through mid-2007. Therefore, the revenue trend is even more apparent on the actuarial rate basis of average premium per $1,000 of insured value, as shown in Chart 5.

Domestics average rates of $5.47 at 2005Q4 grew to a peak of $6.13, or 12%, at 2007Q1, and have fallen to $4.32, or about 30%, now standing 21% below 2005Q4 levels. For other insurers, the picture is similar – average rates grew from $4.41 to $4.75, or about 8%, peaking in 2007Q2, then steadily fell to their current level of $3.51, which is 25% below peak and 20% below 2005Q4..

Citizens once again has seen more dramatic effects, with average rates of $7.48 rising to peak at $8.91 at 2007Q1, then plummeting to $5.94 at 2009Q3. Rates are now 33% below their peak and 21% below their year-end 2005 levels.

Chart 5

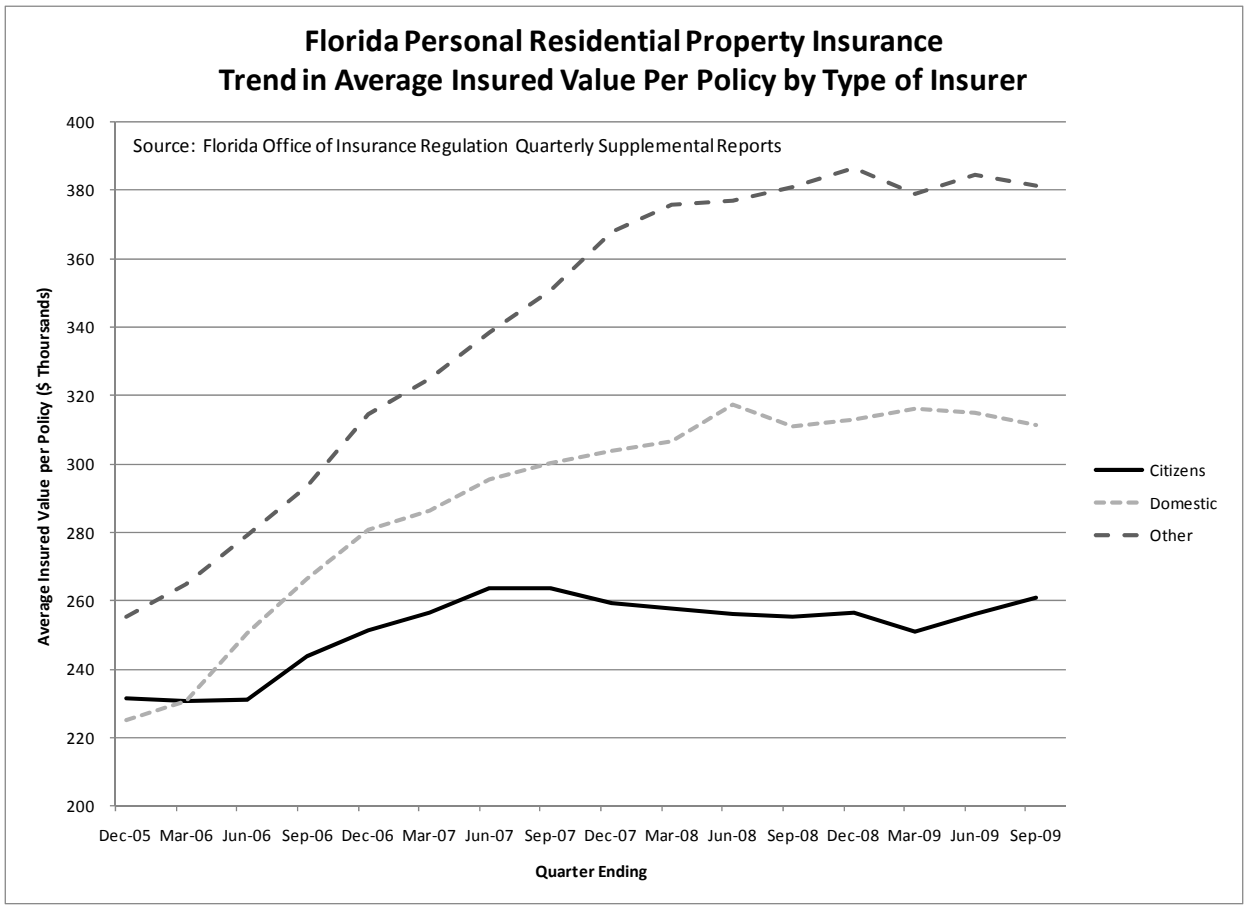


Another view of the importance of insurance-to-value can be gleaned from the overall trend in insured values and the differences among market segments. Chart 6 tracks the increase in average insured value per policy for each group since 2005Q4.

The national insurers have had their average (structure or Coverage A) insured values rising over 40% from $253,000 at year-end 2005, to $364,000 by the end of 2007. Meanwhile, domestics' average insured values increased 32%, from $228,000 to just over $300,000. Both groups' insured values have been relatively flat since early 2008.

Citizens has not had the same insured value growth. Citizens average insured values increased 14% from 2005Q4 to a peak of $264,000 in 2007Q3, then flat since. Possible explanations for the differences include a lack of adjusting insured values to match growing replacement costs or a possible shift in the make up of their book of business. It appears that Citizens average insured values began rising again in March 2009 with a Citizens effort to begin adjusting insured values to match replacement cost values.

Chart 6

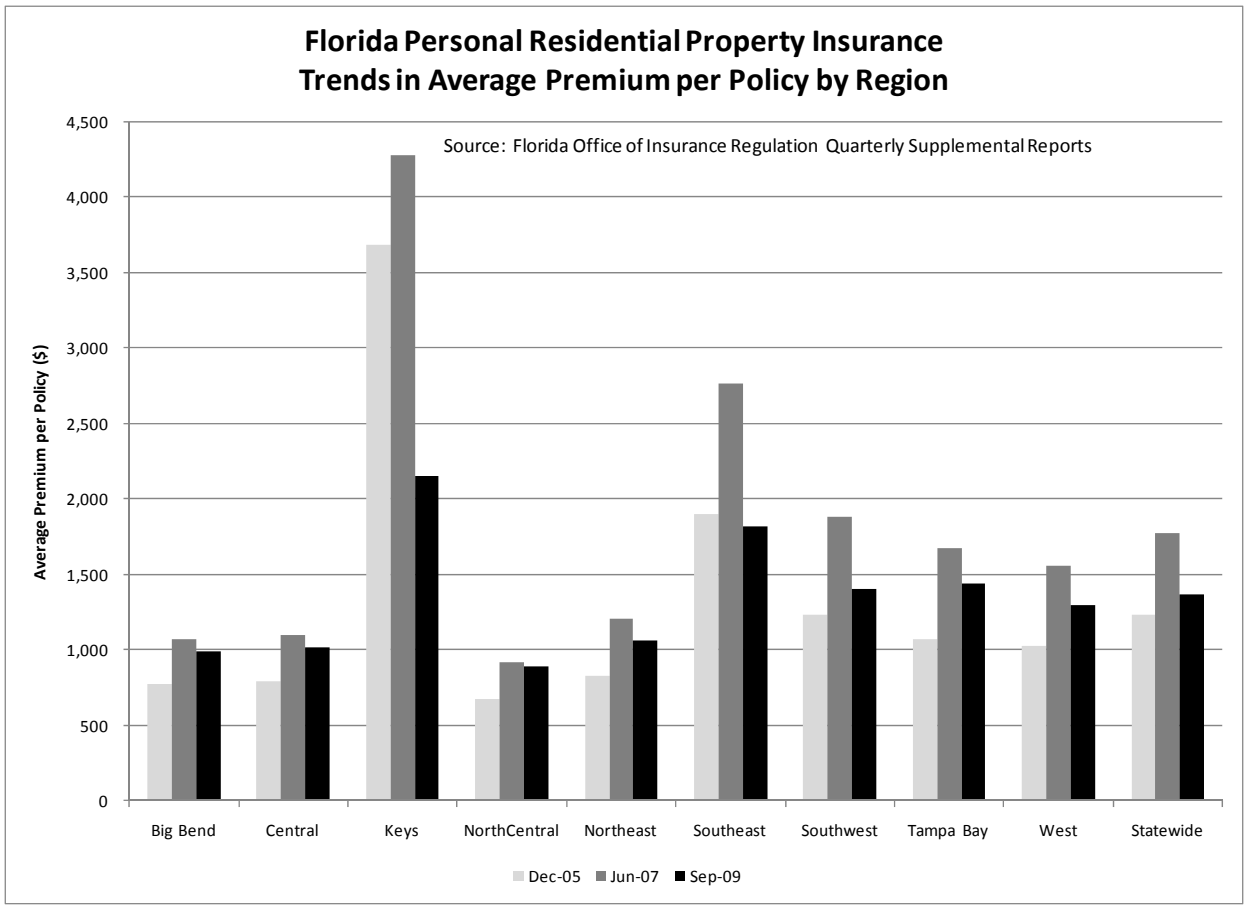


Regional breakdowns of the QUASR statistics may offer additional insight into the geographic areas driving the declines in premium and rates. The analysis below divides Florida into nine regions by county[39]. First, the average premium per policy at the baseline quarter (2005Q4), the peak quarter for premium base and average rates (2007Q2), and the most recent quarter (2009Q3) are compared for each region – for all insurers combined – in Chart 7.

[39] County assignments are as follows:

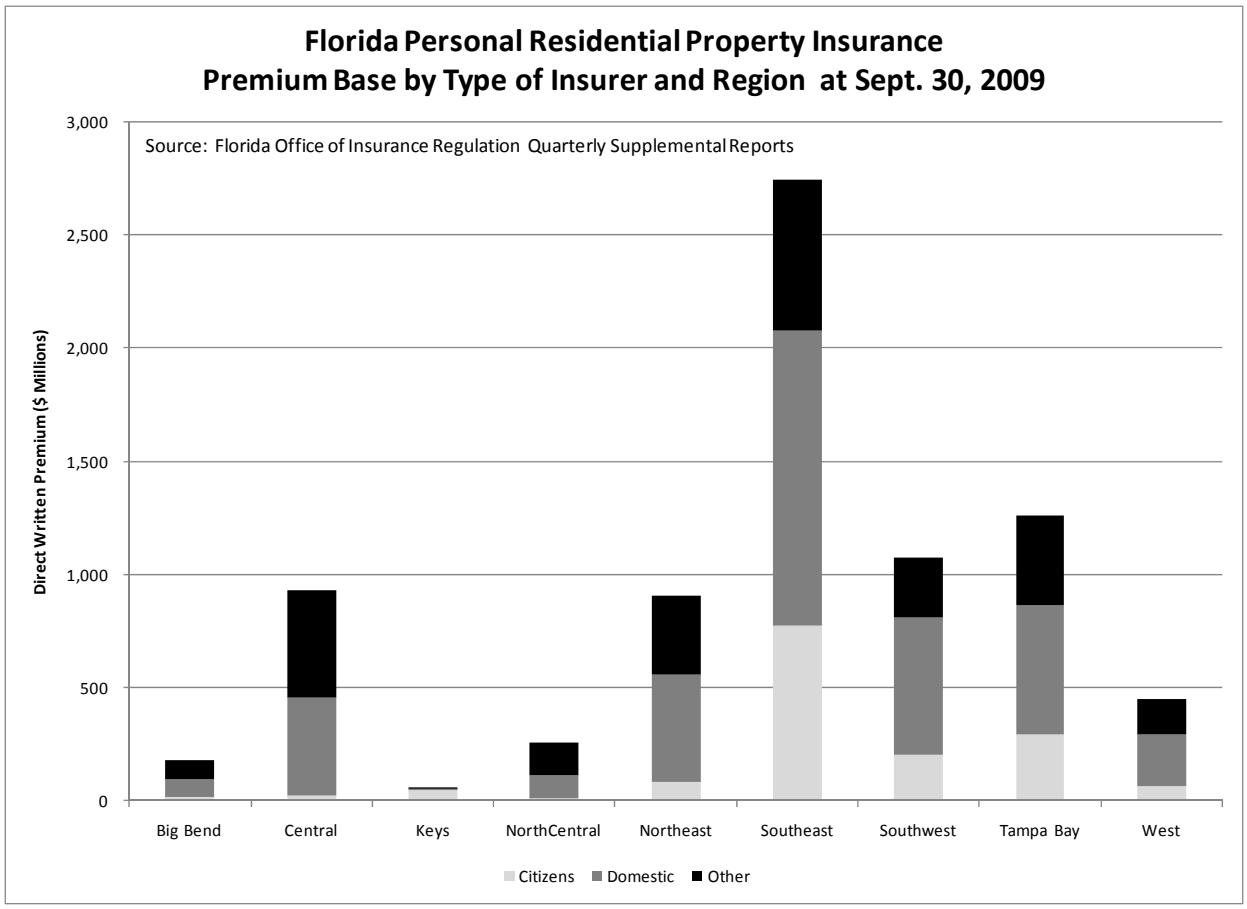
Keys:	Monroe
Southeast:	Miami-Dade, Broward, Palm Beach, Martin, St. Lucie, Indian River
Southwest:	Collier, Lee, Charlotte, Sarasota, Hendry, Manatee
Northeast:	Brevard, Volusia, Flagler, St. Johns, Duval, Nassau, Baker, Clay
Tampa Bay:	Hillsborough, Pinellas, Pasco, Hernando
Big Bend:	Citrus, Levy, Taylor, Calhoun, Franklin, Jefferson, Madison, Leon, Wakulla
West:	Gadsden, Jackson, Gulf, Bay, Liberty, Holmes, Washington, Walton, Okaloosa, Santa Rosa, Escambia
Central:	Glades, Okeechobee, Highlands, Hardee, DeSoto, Polk, Osceola, Orange, Seminole, Lake
North Central:	Sumter, Marion, Putnam, Alachua, Gilchrist, Dixie, Columbia, Bradford, Union, Suwannee, Lafayette, Hamilton

Chart 7



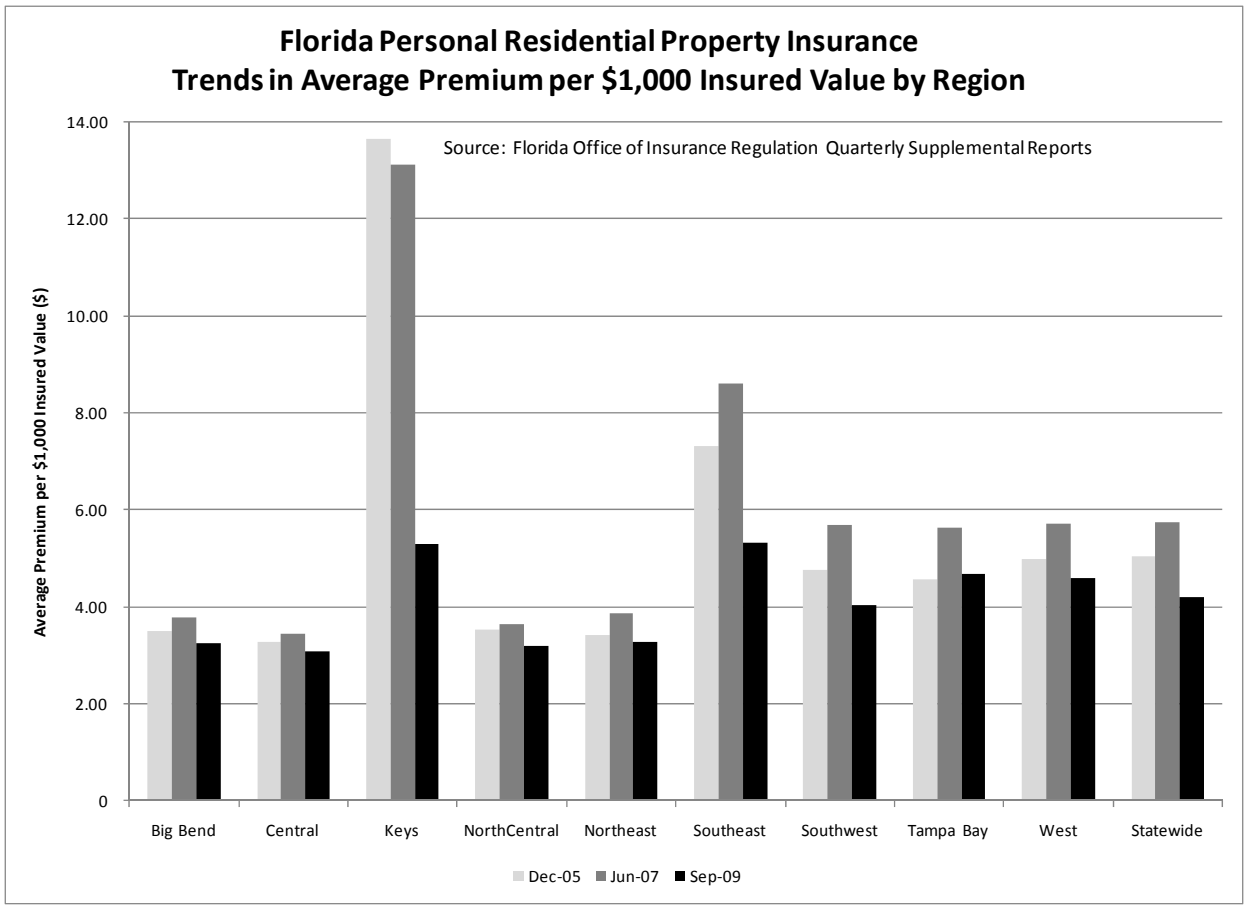
Average premiums have fallen most precipitously in the Keys and in the Southeast, the only two regions where premium per policy is lower than it was in 2005. As a reference, the premium base by region at 2009Q3 is shown in Chart 8 below. Private insurers (both domestics and others) have a dominant share of premium in the most competitive areas of the state, but premium volume for private insurers is still highest in the areas also chiefly served by Citizens – the Southeast, Southwest and Tampa Bay regions. The exception is the Keys, where Citizens is nearly the only option for most homeowners. The area in which premium volume is highest for both private insurers and Citizens, the Southeast, is where the average premiums have fallen the most since 2007, concurrent with HB1A and the new mitigation rule.

Chart 8



This evidence is further bolstered by the analogous chart of average rates per $1,000 of insured value in Chart 9 below. In every region, the rate per $1,000 Insured value has declined below the 2005 levels. The largest rate decreases are in the Keys and the Southeast.

Chart 9



Evidence of Soundness of Current Rates: Financial and Cost Data

The requirements for actuarially sound rates are encapsulated in the Casualty Actuarial Society's Statement of Principles regarding Property-Casualty Ratemaking:

"Ratemaking is prospective because the property and casualty insurance rate must be developed prior to the transfer of risk.

Principle 1: A rate is an estimate of the expected value of future costs.

Ratemaking should provide for all costs so that the insurance system is financially sound.

Principle 2: A rate provides for all costs associated with the transfer of risk.

Ratemaking should provide for the costs of an individual risk transfer so that equity among insureds is maintained. When the experience of an individual risk does not provide a credible basis for estimating these costs, it is appropriate to consider the aggregate experience of similar risks. A rate estimated from such experience is an estimate of the costs of the risk transfer for each individual in the class.

Principle 3: A rate provides for the costs associated with an individual risk transfer.

Ratemaking produces cost estimates that are actuarially sound if the estimation is based on Principles 1, 2, and 3. Such rates comply with four criteria commonly used by actuaries: reasonable, not excessive, not inadequate, and not unfairly discriminatory.

> Principle 4: A rate is reasonable and not excessive, inadequate, or unfairly discriminatory if it is an actuarially sound estimate of the expected value of all future costs associated with an individual risk transfer."

A rejoinder to the trend of declining premiums in the face of increasing exposure might be that though average rates are dropping, they could be dropping from actuarially excessive levels. In other words, insurers overestimated the risk in the past due to ignorance of mitigation features. So, if rates were excessive before the recent decline in premium levels, they would have been excessive relative to the sum of all expected costs associate with risk transfer during that period. While we can't observe expected costs after the fact, we can observe actual costs by analyzing financial statement data from the National Association of Insurance Commission (NAIC). The relationship of all costs to premiums can be represented by combined ratios and related statistics.

The NAIC financial statement summaries for year-end 2005-2008 and year-to-date through 2009Q3 are compiled for the domestic insurer population and some aggregate values shown in Table 8. Focusing on the domestic companies ensures that the financial performance is due to underwriting Florida property coverage only, not due to insurer operations in other lines of business or other states. To match the definition of domestic companies used in the previous section, the Florida subsidiaries of State Farm, Nationwide and Allstate are not included in the analysis presented in this section.[40]

Table 8

			Valuation Date				
Item	Source	Description	End 2005	End 2006	End 2007	End 2008	2009 Q3 (YTD)
[1]	NAIC data	Number of Insurers	34	40	46	48	48
[2]	NAIC data	Surplus as regards Policyholders	530,495	984,787	1,469,187	1,583,623	1,544,396
[3]	NAIC data	Direct Written Premium	1,581,244	2,899,429	3,663,974	3,687,343	3,258,651
[4]	NAIC data	Net Written Premium	783,229	1,212,287	1,660,827	1,836,353	1,155,195
[5]	NAIC data	Net Earned Premium	621,046	857,297	1,450,018	1,723,144	1,327,433
[6]	NAIC data	Net Losses+LAE Incurred	545,987	498,727	715,719	946,109	821,902
[7]	NAIC data	Net Other U/W Expenses Incurred	181,228	432,077	644,912	686,938	649,244
[8]	[6]/[5]+[7]/[4]	Net Combined Ratio (Trade Basis)	111.1%	93.8%	88.2%	92.3%	118.1%
[9]	[6]/[5]	Net Loss Ratio	87.9%	58.2%	49.4%	54.9%	61.9%
[10]	[7]/[4]	Net Expense Ratio	23.1%	35.6%	38.8%	37.4%	56.2%
[11]	[3]/[2]	Gross Leverage (DWP to Surplus)	2.98	2.94	2.49	2.33	2.11
[12]	[4]/[2]	Net Leverage (NWP to Surplus)	1.48	1.23	1.13	1.16	0.75

The data is easier to compile on a net (of reinsurance) basis than a direct (prior to reinsurance) basis due to the nature of statutory accounting and financial statements, though this limitation creates the disadvantage of not being able to observe reinsurance costs as a ratio to original direct premium.

[40] The results of the financial analysis of Florida property insurers are worse when including the four Florida subsidiaries (State Farm, Nationwide, and the two Allstate companies) in the analysis, see Appendix D. The underwriting results show higher loss ratios, expense ratios and combined ratios and a larger drop in surplus than reported here. Those results are available from the Florida Catastrophic Storm Risk Management Center.

In 2005, the population of domestic insurers was fewer, and the eight hurricanes which affected Florida drove poor net retained loss results. Since 2007, we see a steady trend upward in combined ratios (the costs paid out per $1 of premium, or the complement of a "profit margin"). The trend is summarized in Chart 10. Loss ratios have deteriorated from under 50% to over 60%, while expense ratios have increased from about 35% to 56% on the declining premium base. Combined ratios in years without storms need to be low for insurers to build an adequate capital base to pay for catastrophic losses in storm years. The only non-storm year in which the combined ratio was below 90% was in 2007. Combined ratios increased 16% from the end of 2008 through the 3rd quarter of 2009. Losses and expenses are not declining proportionately with premium; in fact both are trending slightly upward matching the trend in insured values.

Surplus, or claims-paying capital, is the ultimate measure of financial stability and surplus growth is the cumulative product of annual profitability. Years of unprofitable operations would be expected to eventually erode overall industrywide financial strength, and that is confirmed by the trend downward in total capital shown in Table 8 and Chart 11. As new domestic insurers entered the market and combined ratios allowed for healthy growth in claims-paying strength, surplus for the group peaked at $1.6 billion at year-end 2007. As premiums eroded and losses and expenses increased, it has dropped in 2009, by a total of about $100 million. These surplus figures do not distinguish between capital generated or consumed by operations, additional capital paid-in from parent holding companies or new investors, or investment returns generated. Focusing on surplus alone does not provide an isolated picture of the effect of mitigation credits, but does provide additional evidence.

Since financial statements are only available on an all-lines, all-states combined basis, it is important to focus on the population of dedicated insurers writing primarily Florida property insurance in order to draw any useful conclusions. This analysis indicates that insurers have lost revenue each year since the 2007 rules and legislation took effect, and are losing both income and capital at an accelerating rate as we approach 2010. These effects are more dramatic when the four Florida subsidiaries of national insurers are included in the analysis.

Chart 10

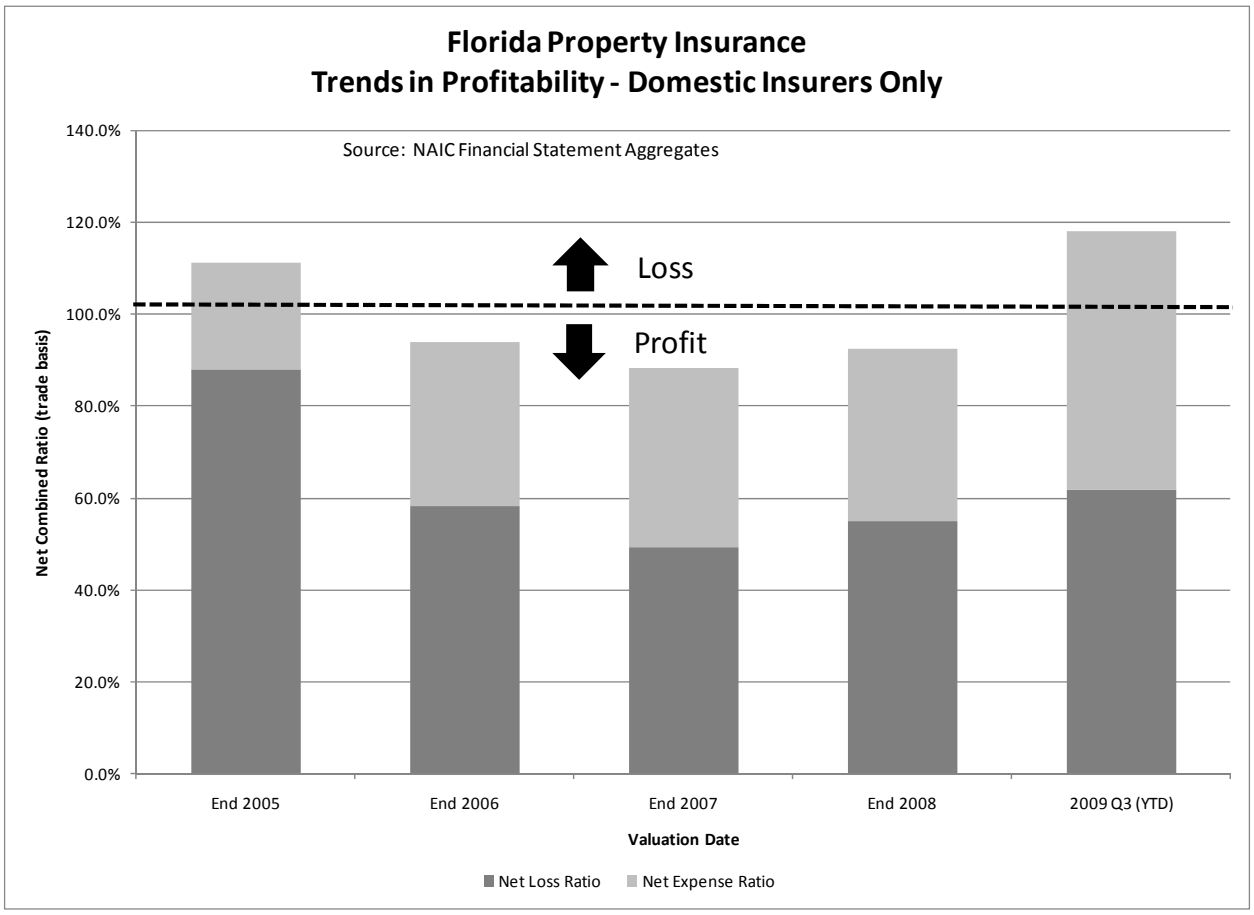
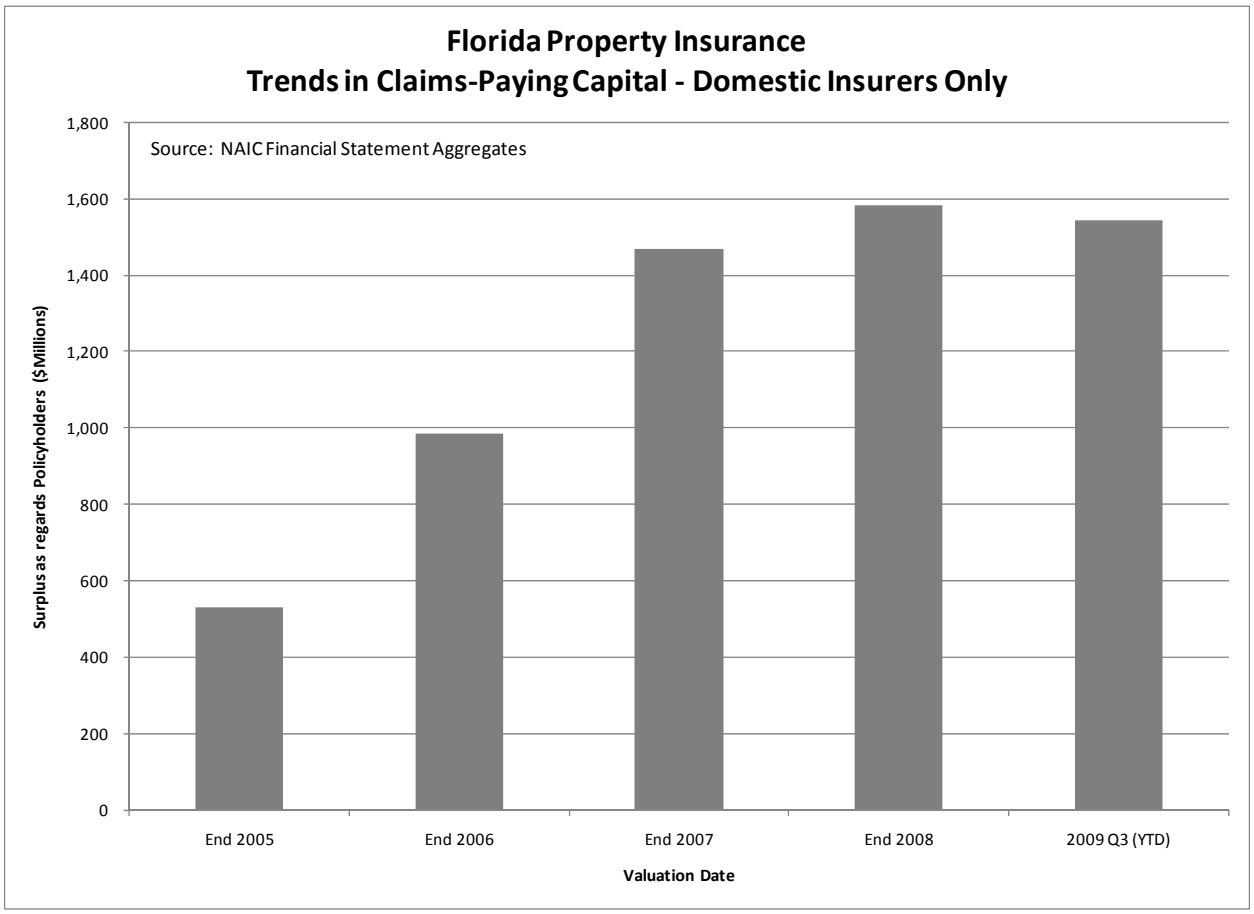

Florida Property Insurance
Trends in Profitability - Domestic Insurers Only
Source: NAIC Financial Statement Aggregates
Loss
Profit
Net Combined Ratio (trade basis)
140.0%
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
End 2005
End 2006
End 2007
End 2008
2009 Q3 (YTD)
Valuation Date
Net Loss Ratio
Net Expense Ratio

Chart 11



Concurrency is not causality, and it is impossible to definitively state that the proximate cause of poor performance is either the HB1A rate rollbacks or the mandatory mitigation credit system in place since 2007. Demonstrating causality would require rating each policy "before and after" changes to rates and rating factors to show the decline in revenue solely attributable to those factors, and even then the effects on the competitive dynamics of the marketplace and the incentives to enter and remain in Citizens would be difficult to tease out with economic models. However, it is reasonable to conclude that the stated specific intent of the two major legislative and regulatory actions (reduce rates), along with the earning and accounting pattern of insurance premiums and the data, investment performance, managing general agent fees, and other factors collectively imply a significant impact on the health and financial stability of the Florida insurance market. This impact takes the form of weakened domestic insurers, reduced market share of national insurers, and growth of market share by Citizens.

The Effects of Incentives for Mitigation

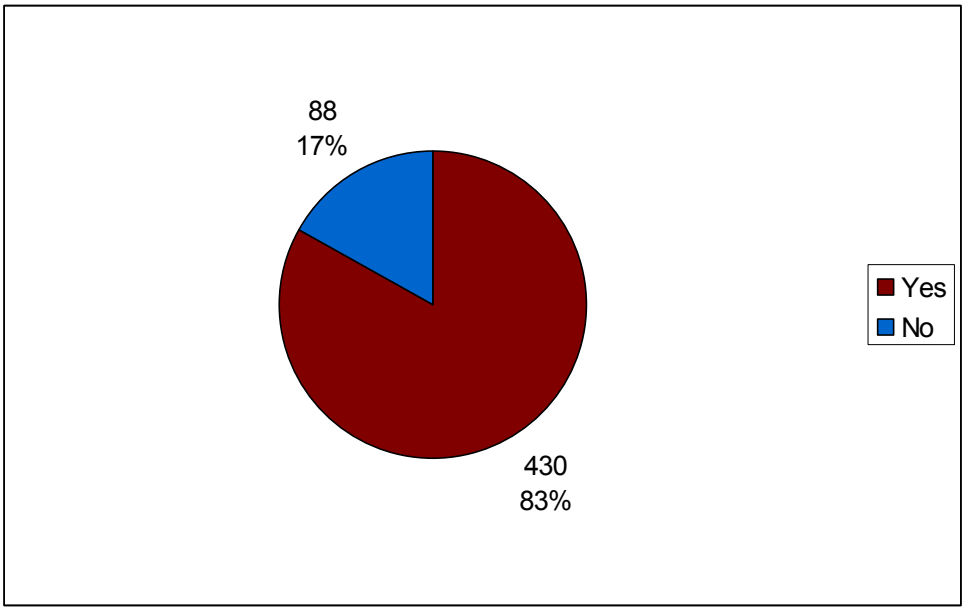
The Commission report stated on page 3 that "a logical conclusion was that windstorm mitigation efforts would lead to a healthier property insurance market in Florida. Instead, during the time since the windstorm mitigation discounts were implemented, the residential property insurance market has deteriorated".

It is unclear whether the mitigation credit structure has actually increased the incentives for Floridians to mitigate their homes. While it has better defined the benefits of mitigation in that it quantifies the amount of money that can be saved annually on insurance premiums, it is not clear that there has been an increase in mitigation activities. According to the My Safe Florida Homes 2008 Annual Report more than 55% of the participants receiving free inspections qualified for a mitigation discount without having to do anything. This group of homeowners then has a reduced incentive to undertake mitigation.

Evidence indicates that under this system, insurers are less likely to encourage their policyholders to undertake mitigation because of the magnitude of the mandatory discounts that must be granted. The Hurricane Mitigation Inspection System Study surveyed insurance agents regarding whether a differential perceptibly exists between the companies' desire to insure inspected homes receiving credits and their desire to insure non-inspected homes. The results provided a measurement of the "value" the companies place on the reduction in loss costs induced by mitigation program incentives.

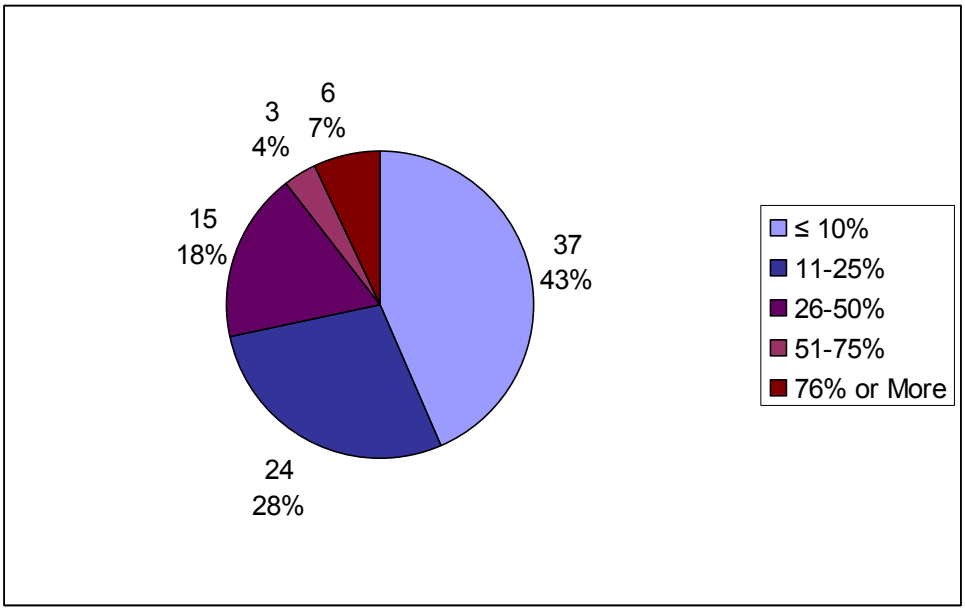
Agents were asked whether they knew of any insurers that refuse to write coverage based on the magnitude of the credits rendered by windstorm inspections. An overwhelming 83% of respondents answered in the affirmative, as illustrated in Chart 12.

Chart 12: Agents Response - Knowledge of Insurers That Refuse to Write Coverage Based on Magnitude of Credits



When asked what percentage of insurers with whom they do business have refused to write coverage on this basis, however, most answered that 25% or fewer had engaged in such a practice. 43% responded that 10% or fewer insurers with whom they do business had refused to write coverage due to credits generated by the inspections. See Chart 13 below.

Chart 13: Agents Response - Percentage Insurers With Whom They Do Business That Refuse to Write Coverage Based on Magnitude of Credits



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Appendix A

WINDSTORM LOSS REDUCTION CREDITS
SECTION 627.0629(1), F.S.
WIND PREMIUM CREDITS FOR EXISTING CONSTRUCTION

				TERRAIN B - 2% DEDUCTIBLE				TERRAIN C - 2% DEDUCTIBLE			
				FRAME, MASONRY, OR REINFORCED MASONRY							
				ROOF SHAPE				ROOF SHAPE			
				OTHER		HIP		OTHER		HIP	
ROOF COVER	ROOF DECK ATTACHMENT	ROOF-WALL CONNECTION	OPENING PROTECTION	NO SWR	SWR	NO SWR	SWR	NO SWR	SWR	NO SWR	SWR
NON - FBC EQUIVALENT	A (6d @ 6" / 12")	TOE NAILS	None	0.00	0.06	0.47	0.50	0.00	0.07	0.28	0.32
			Basic - Windows or All	0.35	0.42	0.62	0.65	0.29	0.38	0.56	0.62
			Hurricane - Windows or All	0.44	0.51	0.66	0.70	0.39	0.48	0.64	0.72
		CLIPS	None	0.35	0.42	0.62	0.66	0.18	0.26	0.44	0.51
			Basic - Windows or All	0.47	0.54	0.68	0.73	0.38	0.48	0.64	0.72
			Hurricane - Windows or All	0.50	0.57	0.70	0.74	0.44	0.54	0.68	0.76
		SINGLE WRAPS	None	0.35	0.43	0.62	0.67	0.20	0.28	0.45	0.51
			Basic - Windows or All	0.47	0.55	0.68	0.73	0.39	0.49	0.64	0.72
			Hurricane - Windows or All	0.50	0.58	0.70	0.74	0.44	0.54	0.68	0.76
		DOUBLE WRAPS	None	0.35	0.43	0.62	0.66	0.21	0.28	0.45	0.51
			Basic - Windows or All	0.47	0.55	0.68	0.73	0.39	0.49	0.64	0.72
			Hurricane - Windows or All	0.50	0.58	0.70	0.74	0.44	0.54	0.68	0.76
NON - FBC EQUIVALENT	B (8d @ 6" / 12")	TOE NAILS	None	0.09	0.14	0.49	0.52	0.09	0.14	0.29	0.33
			Basic - Windows or All	0.46	0.51	0.63	0.66	0.44	0.50	0.59	0.64
			Hurricane - Windows or All	0.56	0.61	0.68	0.71	0.55	0.61	0.69	0.74
		CLIPS	None	0.58	0.65	0.68	0.73	0.38	0.44	0.57	0.65
			Basic - Windows or All	0.65	0.70	0.73	0.76	0.63	0.71	0.73	0.79
			Hurricane - Windows or All	0.66	0.72	0.73	0.77	0.69	0.78	0.76	0.83
		SINGLE WRAPS	None	0.60	0.68	0.68	0.73	0.48	0.58	0.60	0.71
			Basic - Windows or All	0.67	0.73	0.73	0.77	0.67	0.76	0.74	0.81
			Hurricane - Windows or All	0.68	0.73	0.73	0.77	0.70	0.80	0.76	0.83
		DOUBLE WRAPS	None	0.60	0.68	0.68	0.73	0.51	0.63	0.61	0.72
			Basic - Windows or All	0.67	0.73	0.73	0.77	0.68	0.79	0.74	0.82
			Hurricane - Windows or All	0.68	0.74	0.73	0.77	0.71	0.81	0.76	0.83

NON - FBC EQUIVALENT	C (8d @ 6" / 6") AND D (8d @ 6" / 6") DIMENSIONAL LUMBER DECK	TOE NAILS	None	0.09	0.14	0.49	0.51	0.09	0.14	0.29	0.33
			Basic - Windows or All	0.46	0.51	0.63	0.66	0.45	0.51	0.59	0.64
			Hurricane - Windows or All	0.57	0.61	0.68	0.71	0.56	0.61	0.69	0.74
		CLIPS	None	0.59	0.65	0.68	0.73	0.39	0.45	0.57	0.65
			Basic - Windows or All	0.65	0.70	0.73	0.76	0.64	0.71	0.73	0.79
			Hurricane - Windows or All	0.67	0.72	0.73	0.77	0.71	0.79	0.76	0.83
		SINGLE WRAPS	None	0.62	0.69	0.68	0.73	0.49	0.60	0.61	0.73
			Basic - Windows or All	0.68	0.73	0.73	0.77	0.69	0.78	0.75	0.82
			Hurricane - Windows or All	0.68	0.74	0.73	0.77	0.73	0.81	0.76	0.83
		DOUBLE WRAPS	None	0.62	0.70	0.68	0.73	0.55	0.71	0.61	0.74
			Basic - Windows or All	0.68	0.74	0.73	0.77	0.72	0.81	0.76	0.83
			Hurricane - Windows or All	0.69	0.74	0.73	0.77	0.74	0.83	0.77	0.84
FBC EQUIVALENT	A (6d @ 6" / 12")	TOE NAILS	None	0.11	0.14	0.55	0.56	0.07	0.10	0.33	0.36
			Basic - Windows or All	0.47	0.49	0.70	0.71	0.39	0.42	0.63	0.65
			Hurricane - Windows or All	0.57	0.58	0.75	0.76	0.49	0.52	0.73	0.75
		CLIPS	None	0.49	0.50	0.72	0.73	0.28	0.30	0.53	0.54
			Basic - Windows or All	0.60	0.62	0.78	0.78	0.50	0.53	0.73	0.76
			Hurricane - Windows or All	0.63	0.65	0.79	0.80	0.56	0.58	0.78	0.80
		SINGLE WRAPS	None	0.49	0.50	0.72	0.73	0.30	0.32	0.53	0.55
			Basic - Windows or All	0.60	0.62	0.78	0.78	0.51	0.54	0.73	0.76
			Hurricane - Windows or All	0.63	0.65	0.79	0.80	0.56	0.59	0.78	0.80
		DOUBLE WRAPS	None	0.49	0.51	0.72	0.73	0.30	0.33	0.53	0.55
			Basic - Windows or All	0.61	0.62	0.78	0.78	0.51	0.54	0.73	0.76
			Hurricane - Windows or All	0.63	0.65	0.79	0.80	0.56	0.59	0.78	0.80
FBC EQUIVALENT	B (8d @ 6" / 12")	TOE NAILS	None	0.18	0.20	0.57	0.57	0.15	0.18	0.35	0.37
			Basic - Windows or All	0.55	0.57	0.71	0.72	0.51	0.53	0.66	0.67
			Hurricane - Windows or All	0.66	0.67	0.76	0.77	0.63	0.64	0.76	0.78
		CLIPS	None	0.70	0.71	0.78	0.79	0.46	0.48	0.66	0.68
			Basic - Windows or All	0.75	0.76	0.81	0.82	0.71	0.74	0.81	0.83
			Hurricane - Windows or All	0.77	0.78	0.82	0.83	0.78	0.81	0.84	0.86
		SINGLE WRAPS	None	0.73	0.74	0.78	0.79	0.58	0.61	0.71	0.74
			Basic - Windows or All	0.78	0.79	0.82	0.83	0.76	0.79	0.83	0.85
			Hurricane - Windows or All	0.78	0.80	0.82	0.83	0.80	0.83	0.84	0.86
		DOUBLE WRAPS	None	0.73	0.75	0.78	0.79	0.63	0.67	0.72	0.76
			Basic - Windows or All	0.78	0.80	0.82	0.83	0.78	0.82	0.83	0.86
			Hurricane - Windows or All	0.78	0.80	0.82	0.83	0.80	0.84	0.84	0.86

FBC EQUIVALENT	C (8d @ 6" / 6") AND D (8d @ 6" / 6") DIMENSIONAL LUMBER DECK	TOE NAILS	None	0.18	0.20	0.57	0.57	0.15	0.18	0.35	0.37
			Basic - Windows or All	0.56	0.57	0.71	0.72	0.51	0.54	0.66	0.67
			Hurricane - Windows or All	0.66	0.68	0.76	0.77	0.63	0.65	0.76	0.78
		CLIPS	None	0.70	0.72	0.78	0.79	0.46	0.48	0.66	0.69
			Basic - Windows or All	0.76	0.77	0.81	0.82	0.73	0.74	0.81	0.83
			Hurricane - Windows or All	0.78	0.78	0.82	0.83	0.80	0.82	0.84	0.86
		SINGLE WRAPS	None	0.74	0.76	0.78	0.79	0.60	0.63	0.72	0.76
			Basic - Windows or All	0.78	0.80	0.82	0.83	0.78	0.81	0.83	0.86
			Hurricane - Windows or All	0.79	0.80	0.82	0.83	0.82	0.84	0.84	0.86
		DOUBLE WRAPS	None	0.74	0.76	0.78	0.79	0.68	0.74	0.73	0.78
			Basic - Windows or All	0.79	0.81	0.82	0.83	0.81	0.84	0.84	0.86
			Hurricane - Windows or All	0.79	0.81	0.82	0.83	0.83	0.86	0.84	0.87
REINFORCED CONCRETE ROOF DECK			None				0.82				0.80
			Basic - Windows or All				0.84				0.88
			Hurricane - Windows or All				0.84				0.88

Appendix B

This example assumes all houses are inspected for mitigation features and the appropriate credit is given, or in the case of the implementation with the average house as the base, the appropriate credit/surcharge is given. In practice the mitigation credit is a voluntary credit. An inspection of mitigation features is not required for any homeowner. Therefore, if the credits were implemented with the average house as the base, as shown in Section C of Table III, it is unlikely that homeowner X would volunteer to have his house inspected if he knew the consequences of that action. This raises the question what relativity should be applied to uninspected houses if mitigation relativities were implemented with the average house as the base. The table implicitly assumes that uninspected houses would be rated as though they have the weakest mitigation features. If uninspected houses are rated at the average, a relativity of 1.00, then it is very likely that few surcharges would ever be applied. In Table III this results in homeowner X being charged $1,000 instead of the correct $1,500 as shown in Section C. The difference in total profit to the company would be a $225 loss instead of the $150 profit.

Application of rating factors is almost never voluntary in any type of insurance. There is no actuarial basis for making wind mitigation credits voluntary. No insurer would ever apply rating factors for the value of a home on a voluntary basis. An expensive house should always pay more than a less expensive house, all other factors being equal. Ultimately wind mitigation rating needs to be treated like any other rating factor. It needs to be mandatory and the rate level effect needs to be recognized both on an actual basis and an expected basis. This adds to the need for an effective and efficient inspection system to remove the “unknown” house from the rating system.

A house that has been modified to add mitigation features will have a lower expected loss than previously. In practice, the catastrophe losses are almost always determined by use of a catastrophe model. This model should be incorporating the revised mitigation features of each house as part of the input to the model. This will produce the correct expected losses needed for the rate indication.

Table III

EXAMPLE OF EFFECT OF WIND MITIGATION CREDITS

WIND ONLY PREMIUM

A. COMPANY BOOK OF BUSINESS BEFORE MITIGATION CREDITS

House	Mitigation	Premium Prior to Mitigation Credits	Expected Loss	Company Expense	Profit	% Profit
X	Weakest	$1,000	$1,050	$250	-$300	-30%
Y	Average	$1,000	$700	$250	$50	5%
Z	Strongest	$1,000	$350	$250	$400	40%
Total		$3,000	$2,100	$750	$150	5%

B. COMPANY BOOK OF BUSINESS AFTER MITIGATION CREDITS
Office of Insurance Regulation Implementation (Weakest House as Base)

House	Mitigation	Premium After Mitigation Credits	Expected Loss	Company Expense	Profit	% Profit
X	Weakest	$1,000	$1,050	$250	-$300	-30%
Y	Average	$667	$700	$167	-$200	-30%
Z	Strongest	$333	$350	$83	-$100	-30%
Total		$2,000	$2,100	$500	-$600	-30%

C. COMPANY BOOK OF BUSINESS AFTER MITIGATION CREDITS
Implementation with Average as Base

House	Mitigation	Premium After Mitigation Credits	Expected Loss	Company Expense	Profit	% Profit
X	Weakest	$1,500	$1,050	$375	$75	5%
Y	Average	$1,000	$700	$250	$50	5%
Z	Strongest	$500	$350	$125	$25	5%
Total		$3,000	$2,100	$750	$150	5%

Notes: The above assumes that there is no change in the house mitigation features before and after the implementation of credits.

The premium and expected loss are based on cols 1 and 2 below. Col 1 shows wind mitigation relativities based on the average house as the base. Col 2 uses the weakest house as the base. Column 3 shows the actual relativity from the 2002 ARA Report on Wind Mitigation.

	1	2	3
Weakest	1.50	1.00	2.37
Average	1.00	0.67	1.00
Strongest	0.50	0.33	0.41

The average expected loss ratio is assumed to be 70%.
The company expense ratio is assumed to be 25%.
The Profit = Premium - Expected Loss - Expense.

Appendix C

This is the list of insurers classified as "domestic" in the analysis of QUASR data and NAIC financial data. Since insurers routinely commence and cease operations, the population used in any one quarter or year is somewhat dynamic. The NAIC analysis uses only "surviving" insurers still operating in late 2009, whereas the QUASR historical analysis uses whatever population of insurers reported data during each quarter, including those that subsequently merged, failed, or ceased writing in Florida.

NAIC Code	Company Name	In QUASR?	In NAIC Data?		NAIC Code	Company Name	In QUASR?	In NAIC Data?
10117	Security First Insurance Company	Yes	Yes		12314	American Modern Insurance Company of Florida	Yes	Yes
10132	Florida Peninsula Insurance Company	Yes	Yes		12359	American Traditions Insurance Company	Yes	Yes
10136	Southern Fidelity Insurance Company	Yes	Yes		12438	Homewise Insurance Company, Inc.	Yes	Yes
10149	First Home Insurance Company	Yes	Yes		12482	Edison Insurance Company	Yes	Yes
10186	Fidelity Fire & Casualty Company	Yes	Yes		12538	Royal Palm Insurance Company	Yes	Yes
10203	Argus Fire & Casualty Insurance Company	Yes	Yes		12563	Safe Harbor Insurance Company	Yes	Yes
10661	Southern Family Insurance Company	Yes	No		12568	Northern Capital Insurance Company	Yes	Yes
10663	Florida Select Insurance Company	Yes	No		12582	Homewise Preferred insurance Company	Yes	No
10688	Florida Family Insurance	Yes	Yes		12601	American Capital Assurance Corp.	Yes	Yes
10860	Sunshine State Insurance Company	Yes	Yes		12841	American Integrity Insurance Company of Florida	Yes	Yes
10861	Universal Property & Casualty Insurance Company	Yes	Yes		12873	Privilege Underwriters Reciprocal Exchange	Yes	Yes
10872	American Strategic Insurance Corp.	Yes	Yes		12894	American Keystone Insurance Company	Yes	No
10897	First Protective Insurance Company	Yes	Yes		12944	Homeowners Choice Property & Casualty Insurance Company	Yes	Yes
10902	Atlantic Preferred Insurance Company, Inc.	Yes	No		12954	Olympus Insurance Company	Yes	Yes
10908	Capitol Preferred Insurance Company, Inc.	Yes	Yes		12957	Modern USA Insurance Company	Yes	Yes
10953	Cypress Property & Casualty Insurance Company	Yes	Yes		12968	American Coastal Insurance Company	Yes	Yes
10954	Vanguard Fire and Casualty Insurance Company	Yes	No		13023	Landmark One Ins Co	Yes	Yes
10955	Liberty American Insurance Company	Yes	Yes		13038	ARK Royal Insurance Company	Yes	No
10969	United Property & Casualty Insurance Company, Inc.	Yes	Yes		13125	People's Trust Insurance Company	Yes	No
11027	Tower Hill Prime Insurance Company	Yes	Yes		13139	Avatar Property &Casualty Insurance Co.	Yes	No
11072	Home Pointe Insurance Company	Yes	Yes		13141	Magnolia Insurance Company	Yes	Yes
11156	Homesite Insurance Company	Yes	Yes		13142	ASI Preferred Insurance Company	Yes	Yes
11577	Florida Preferred Property Insurance Company	Yes	No		13619	Sawgrass Mutual Insurance Company	Yes	No
11844	St. Johns Insurance Company	Yes	Yes		13621	Star & Shield Insurance Company	Yes	No
11956	Coral Insurance Company	Yes	No		13990	First Community Insurance Company	Yes	Yes
11986	Universal Insurance Company of North America	Yes	Yes		17248	Safeway Property Insurance Company	Yes	Yes
12011	Tower Hill Select Insurance Company	Yes	Yes		27980	Federated National Insurance Company	Yes	Yes
12196	Asi Assurance Company	Yes	Yes		29050	Tower Hill Preferred Insurance Company	Yes	Yes
12237	Gulfstream Property and Casualty Insurance Company	Yes	Yes		33162	Bankers Insurance Company	Yes	No
12247	Southern Oak Insurance Company	Yes	Yes		36560	Service Insurance Company	Yes	No
12306	Hillcrest Insurance Company	Yes	Yes		38664	Omega Insurance Company	Yes	Yes

Appendix D

The table and charts in this appendix include the four Florida subsidiaries of national insurers in the definition of domestic insurers. Table D-1 should be compared with Table 8 in the body of the report. Chart D-1 should be compared with Chart 10 in the body of this report and Chart D-2 should be compared with Chart 11.

Table D-1: Domestics including Florida Subsidiaries of National Insurers

	Valution Date				
Line Item	Year-end 2005	Year-end 2006	Year-end 2007	Year-end 2008	2009 Q3 (YTD)
Surplus as regards Policyholders	1,525,740	2,210,854	2,749,632	2,616,543	2,464,912
Direct Written Premium	3,749,444	5,427,301	6,005,139	5,397,025	4,293,343
Net Written Premium	2,467,435	2,749,308	2,492,854	2,545,351	1,497,967
Net Earned Premium	2,195,255	2,292,299	2,744,844	2,679,480	1,829,880
Net Losses+LAE Incurred	2,115,248	1,111,632	1,513,490	1,872,869	1,464,959
Net Other U/W Expenses Incurred	701,422	1,018,045	1,223,553	1,068,403	941,485
Net Combined Ratio (Trade Basis)	124.8%	85.5%	104.2%	111.9%	142.9%
Net Loss Ratio	96.4%	48.5%	55.1%	69.9%	80.1%
Net Expense Ratio	28.4%	37.0%	49.1%	42.0%	62.9%
Gross Leverage (DWP to Surplus)	2.46	2.45	2.18	2.06	1.74
Net Leverage (NWP to Surplus)	1.62	1.24	0.91	0.97	0.61

Chart D-1: Domestics including Florida Subsidiaries of National Insurers

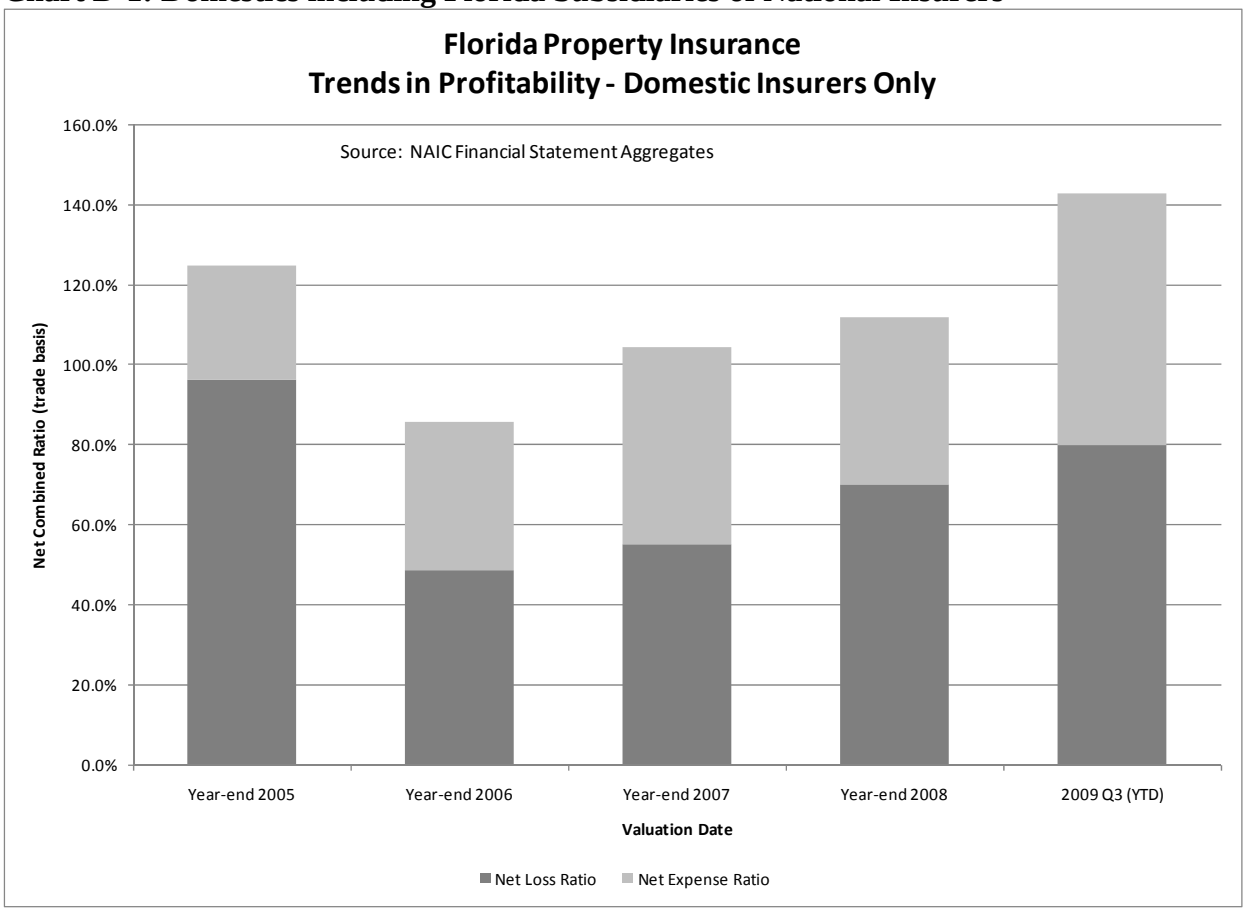

Chart D-2: Domestics including Florida Subsidiaries of National Insurers