

Modeling Demand Surge

Presented by

Auguste Boissonnade, Ph.D.

Collaborators:

Stephane Hallegatte, Ph.D. (CIRED, France)

Robert Muir-Wood, Ph.D.

Marc Etienne Schlumberger

Risk Acceptance and Communication Workshop

March 26-27, 2007

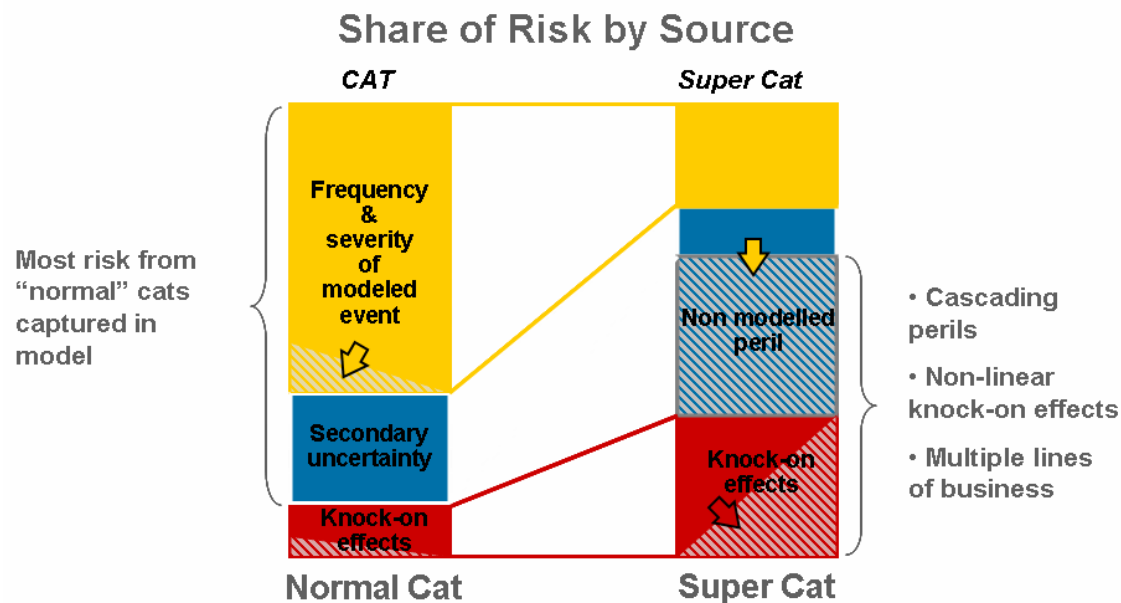
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Insurance and Catastrophe Risk

- Insurance is founded on the principle of risk diversification
- Key challenge to the insurance industry is risk correlation
 - Insurers buy insurance from reinsurers to protect themselves against Catastrophic (CAT) losses
 - Reinsurers often find it difficult to diversify their own **'Super-CAT'** losses beyond the insurance industry



Loss Amplification

- **'Loss amplification'** reflects all those ways in which the costs incurred for a certain level of original damage become amplified when the damage is situated within a major catastrophe
- The components of loss amplification
- Historical reconstruction pricing analysis following 2004 and 2005 U.S. hurricane seasons
- Modeling economic demand surge
- Summary

Recent Experience of Loss Amplification

- 1992 Hurricane Andrew
 - Significant increases in costs of labor, materials, underinsurance – estimated at 20%
- 1994 Northridge Earthquake
 - Major loss amplification effects from shortage of builders and expansion of coverage terms – estimated at 40%
- 1999 Windstorms Lothar and Martin (France)
 - Government intervention after widespread power outages forced insurers to reduce deductibles and apply 'no claims assessor thresholds' – insurers proceeded to 'outbid' each other
- 2001 WTC Attacks
 - Contamination and evacuation sources of loss amplification, as well as systemic economic impacts (seen in contingent BI)
- 2004 Hurricanes
 - Four hurricanes superimposed onto a tight building economy caused significant demand surge - measurable for individual building components and labour costs (concept of '**accumulation**')
- 2005 Hurricanes
 - Major loss amplification adds to impacts from 2004 (concept of '**residual**')

The Core Components of Loss Amplification

■ Economic Demand Surge

- Inflation in costs as a result of the excess of demand over supply in the market for both labor and materials

■ Repair Cost Delay Inflation

- Time dependent damage escalation caused by delays in making repairs

■ Claims Inflation

- Relaxation of insurers procedures for policing claims to resist exaggeration and fraud

■ Coverage Expansion

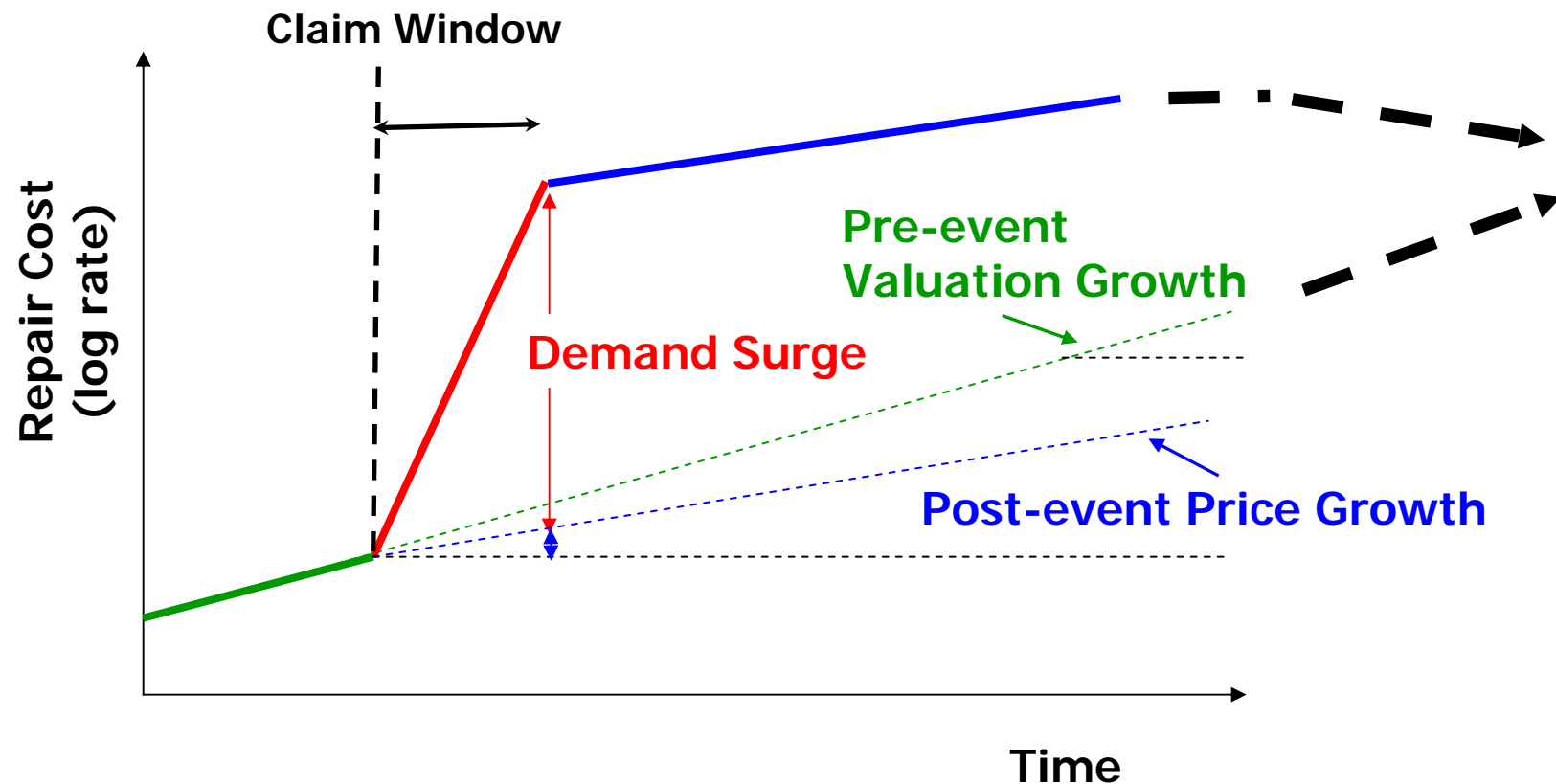
- Expansion of insurance terms and coverages often as a result of political pressure

Economic Demand Surge

- Within insurance context: “A temporary increase in repair costs above the standard level of costs”
- Causes:
 - Direct:
 - Sudden increase in demand for construction materials and labor force beyond the capacity of the local market
 - Indirect:
 - When labor force reduced due to evacuation
 - When local construction sector impaired by damage to facilities
 - When infrastructure damage disrupts access and transport
 - Exogenous:
 - Reflects available ‘capacity’ of the construction sector before the event
 - Global pressures on material prices prior to the event

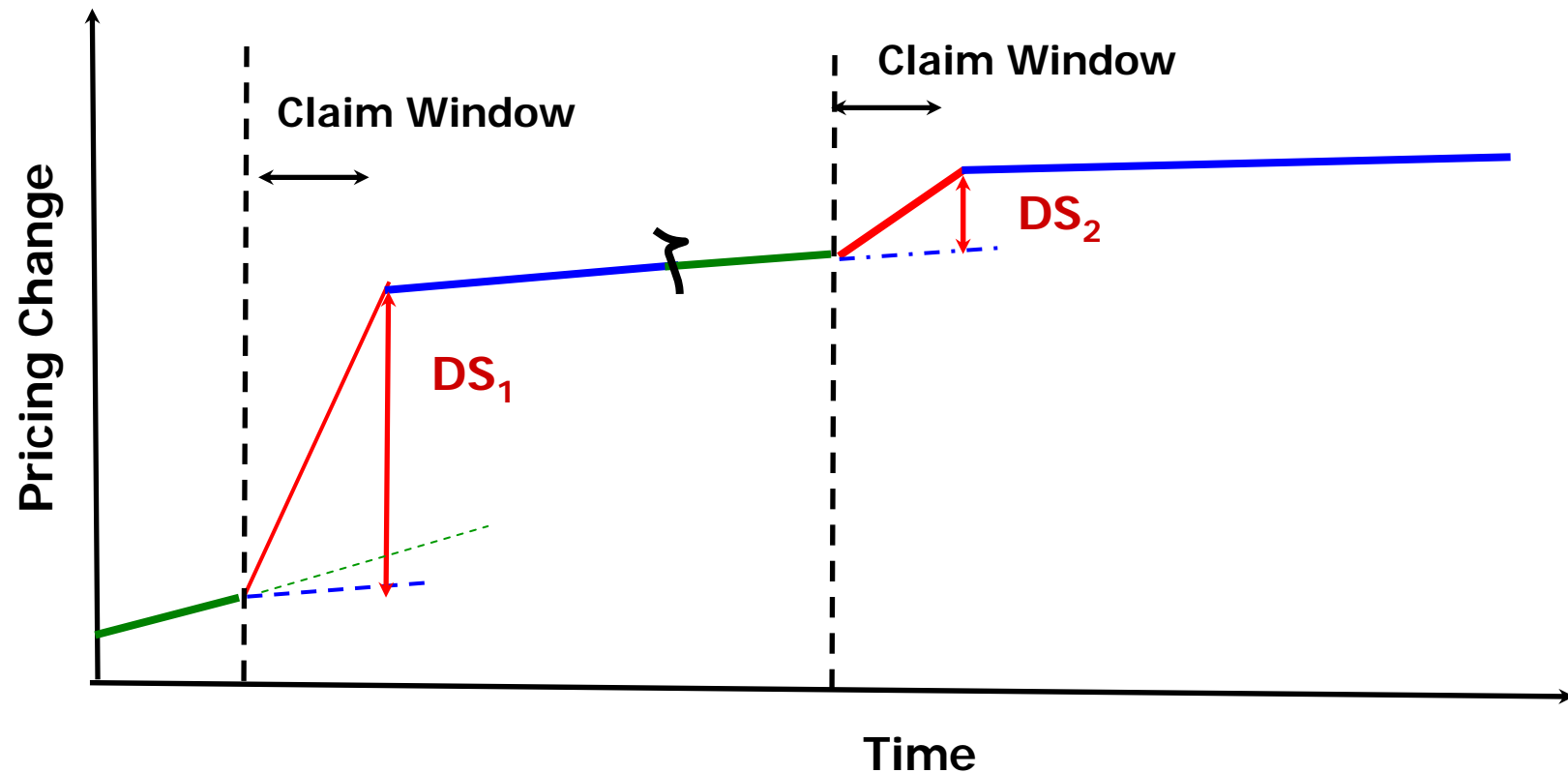
Definition of Demand Surge – One Event

- Comparing pricing before and after a CAT event
- Remove underlying growth trends outside demand surge period



Definition of Demand Surge – Over 2 Seasons

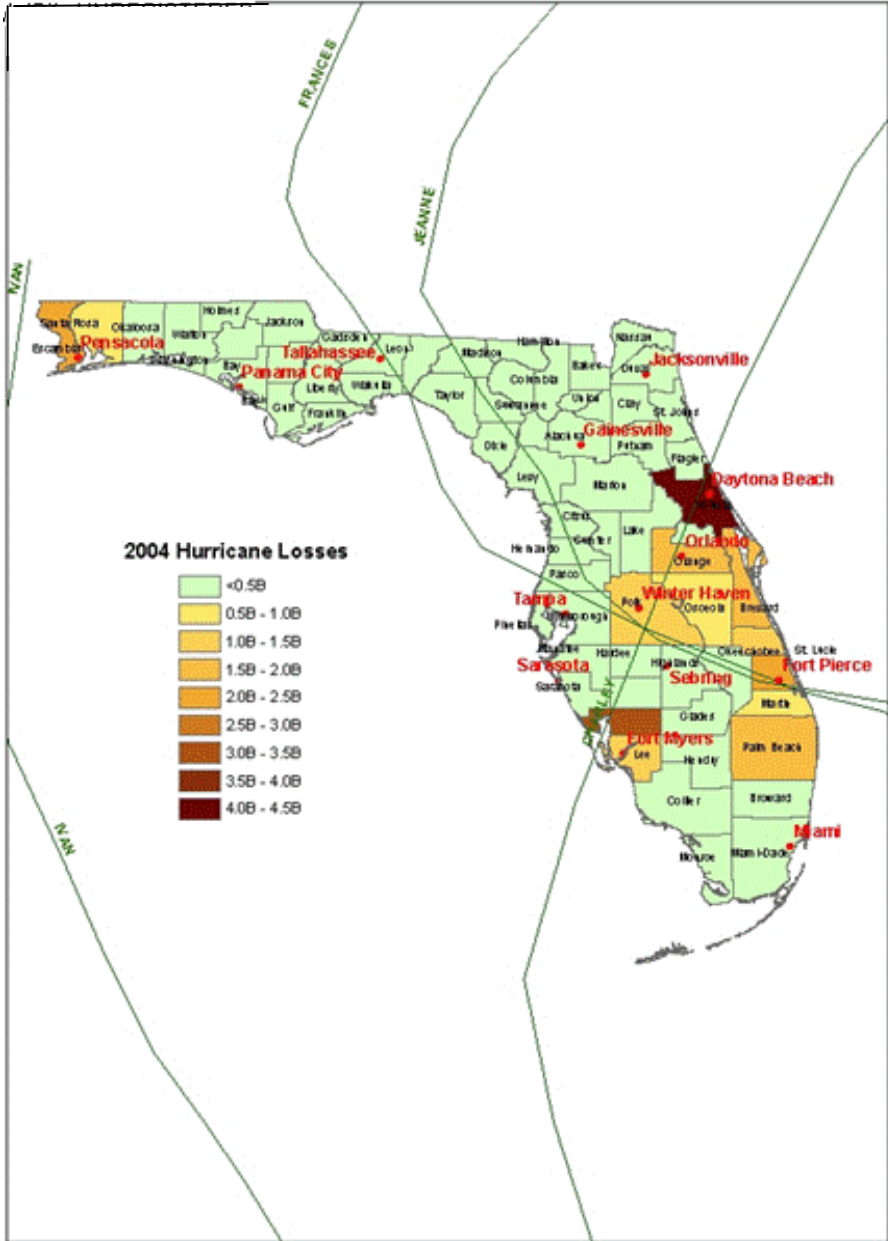
- Economic demand surge is based on the assumption that the valuation has been performed for the year of the event accounting for the long-term growth trend and legacy in the regional economy from previous CAT events or other economic factors



Historical Demand Surge Quantification

- Reconstruct actual industry losses at county level
- Use detailed claims data and cost estimates after 2004 and 2005 hurricane seasons for reconstructing price changes and estimating demand surges
- Gather other economic indicators for assessing the rate of reconstruction
 - Building permits,
 - Monthly employment,
 - Etc.

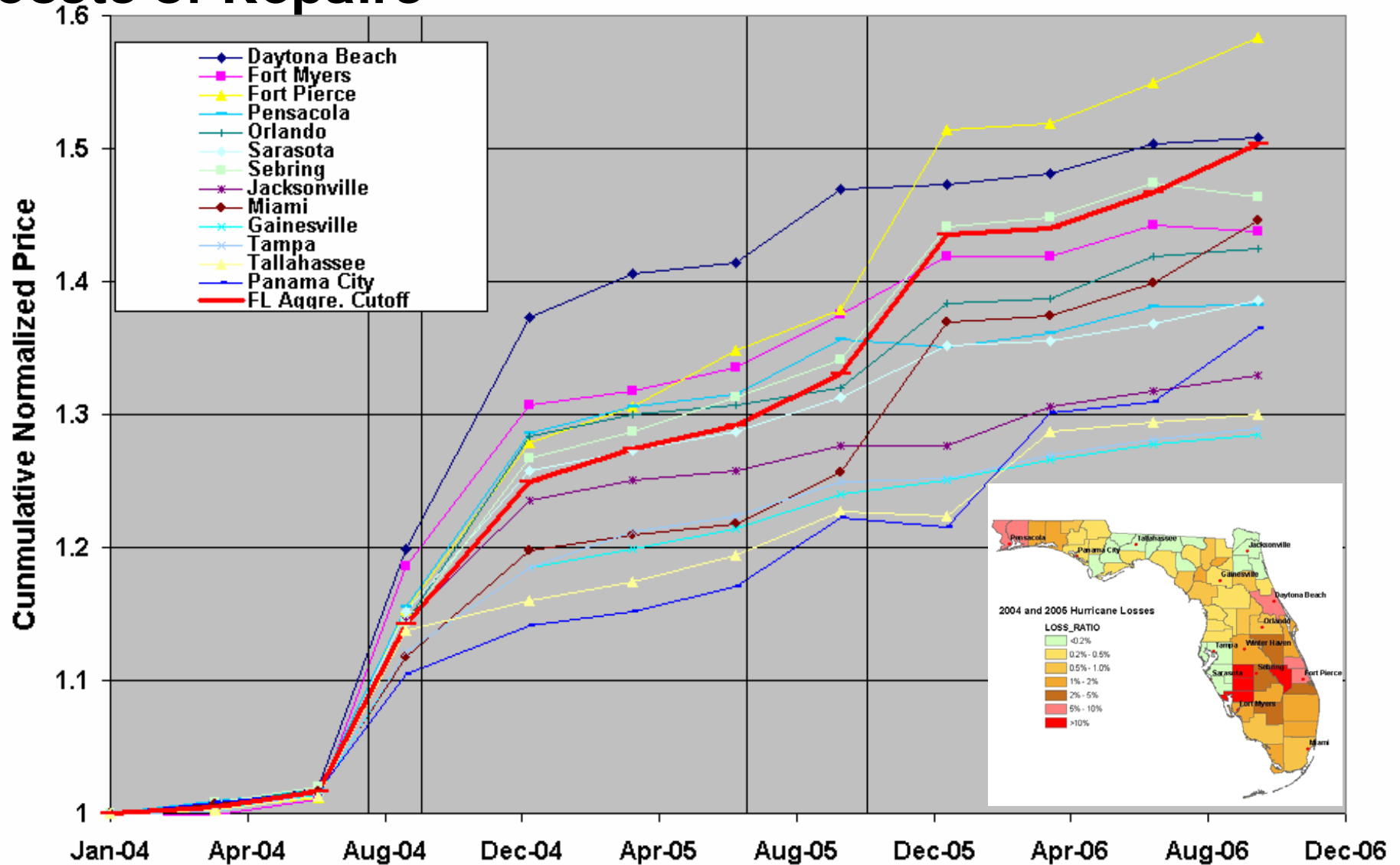
Florida Hurricane Insured Losses



Historical Reconstruction of Repair Pricing Changes

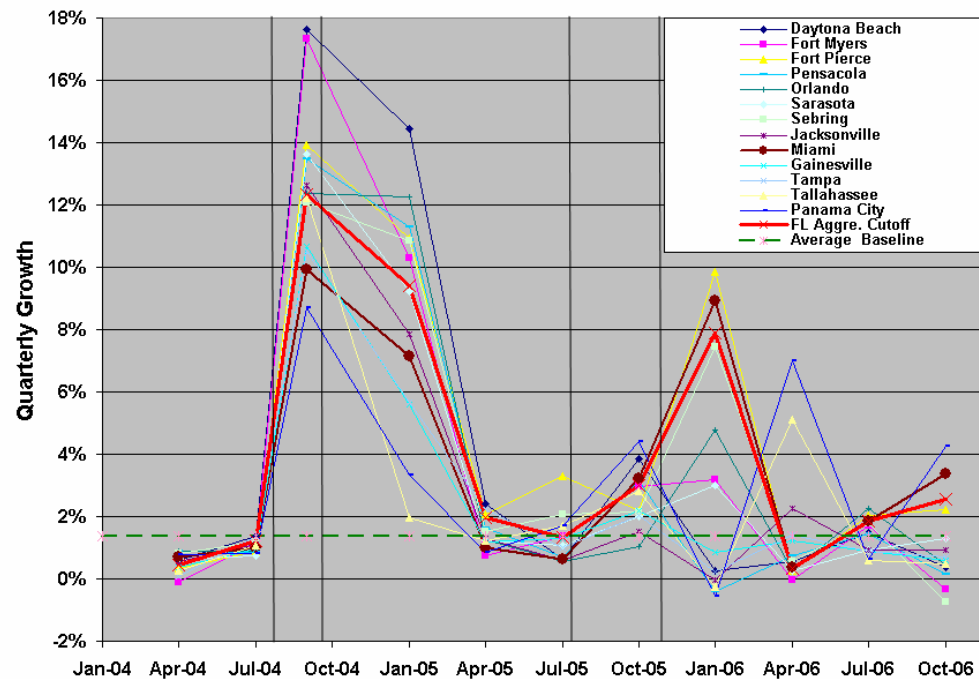
- Sample claims that are representative of losses observed in Florida during the 2004 and 2005 hurricane seasons
 - Range of paid losses
 - Range of loss ratios
 - Building characteristics
- Estimate repair cost for the sample using one of the cost estimator tools used by claim adjusters at given time periods
 - Before and after the event
 - Several locations
- Calculate the price change over time
- Calculate economic demand surge at several locations within Florida

Reconstruction of Temporal and Spatial Changes in Costs of Repairs

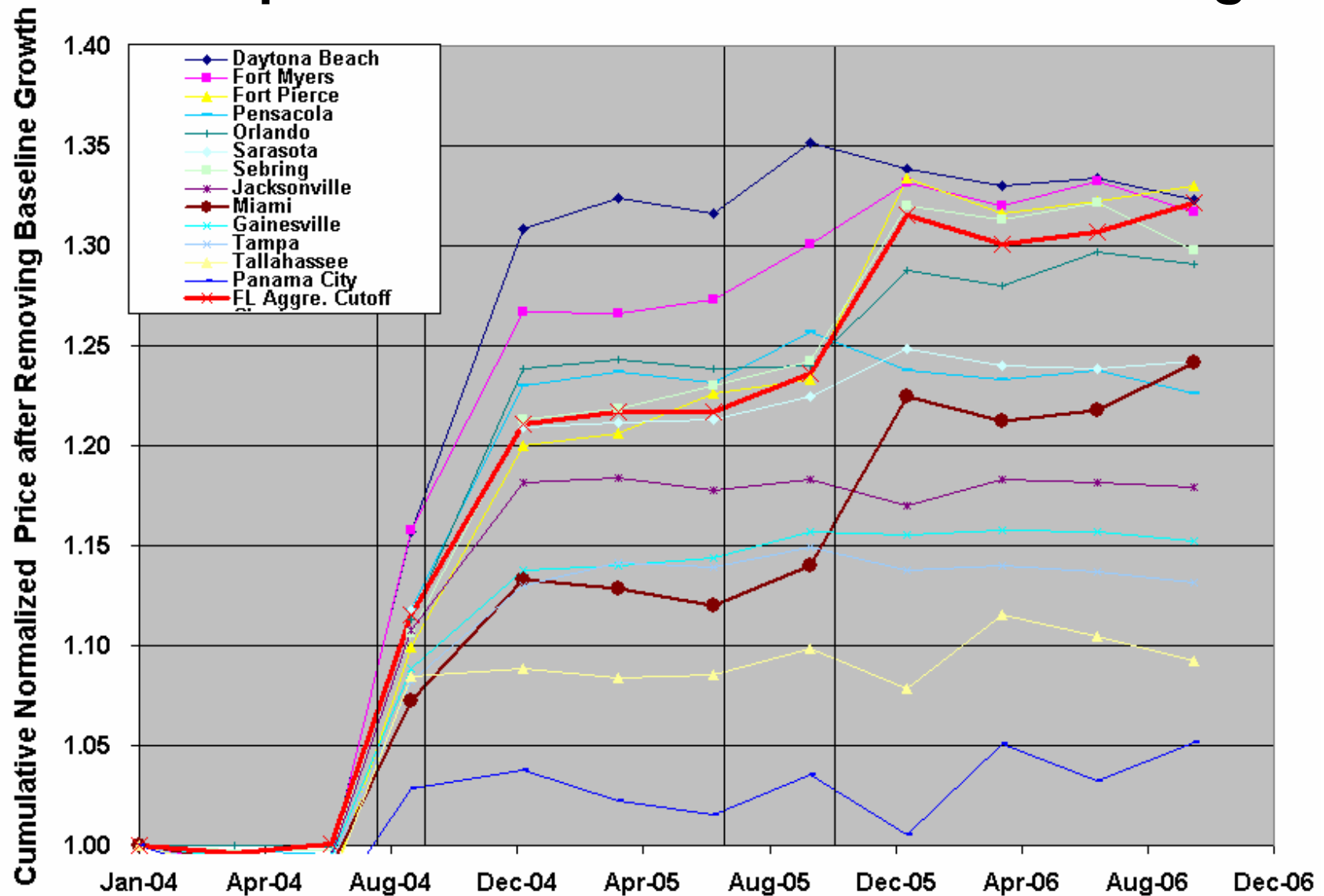


Florida - Quarterly Price Growths

- Quarters without a catastrophe saw prices increase at normal rates and provide baseline growth rates for prices outside of catastrophic conditions
- “Catastrophe” quarters in 2004 were October 2004 and January 2005
- “Catastrophe” quarters in 2005 were October 2005 and January 2006

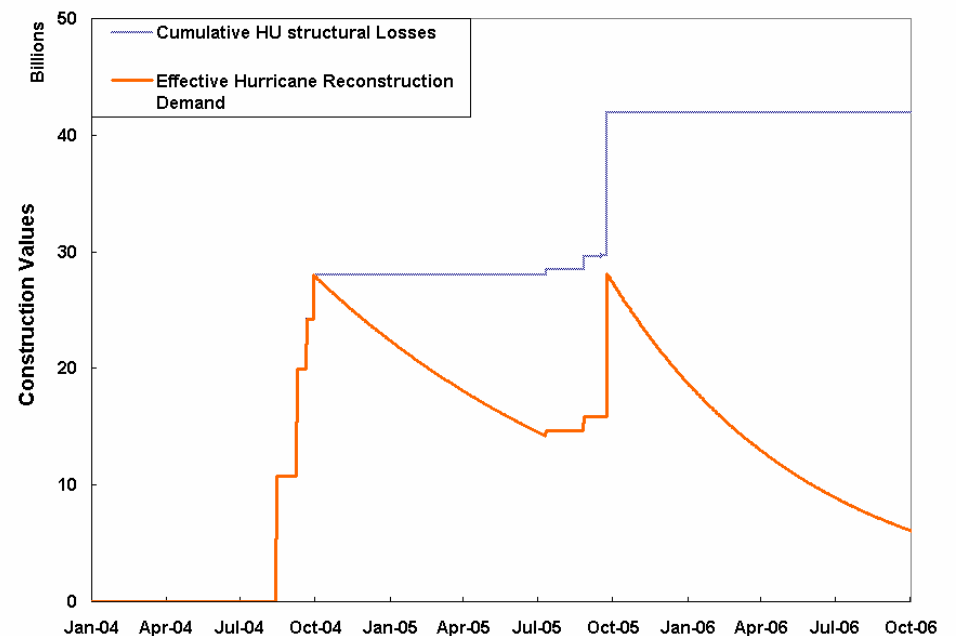


Reconstruction of Temporal and Spatial Changes in Costs of Repairs due to Economic Demand Surge

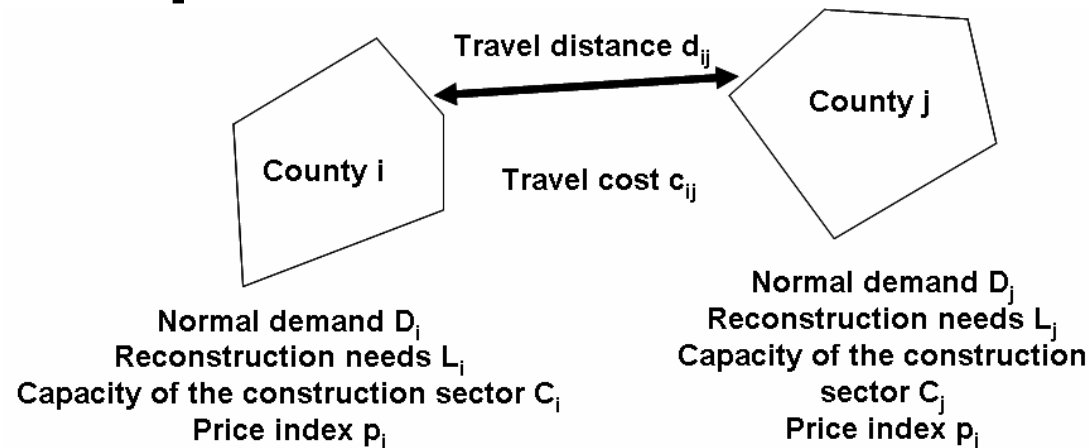


Modeling Economic Demand Surge – Main Drivers for Construction Sector

- Overall economic demand surge pressure is a function of the total work time involved in restoring all the damage from the catastrophe
- Threshold for demand surge is determined by the capacity in the repair sector prior to the catastrophe
- As costs of labour rise, workers are drawn in from outside the region
- Eventually prices tend to plateau as additional costs of travel and accommodation are built in to the rates charged by out of region workers
- Any limitation on workers arriving from out of region will allow demand surge to continue to increase



Model Principles



■ Market clearing in the construction sector

Price (p) is such that demand ($D+L$) equals capacity (C) in each county i

$$(D_i + L_i) f(p_i) = C_i$$

■ Incentive to work in the construction sector

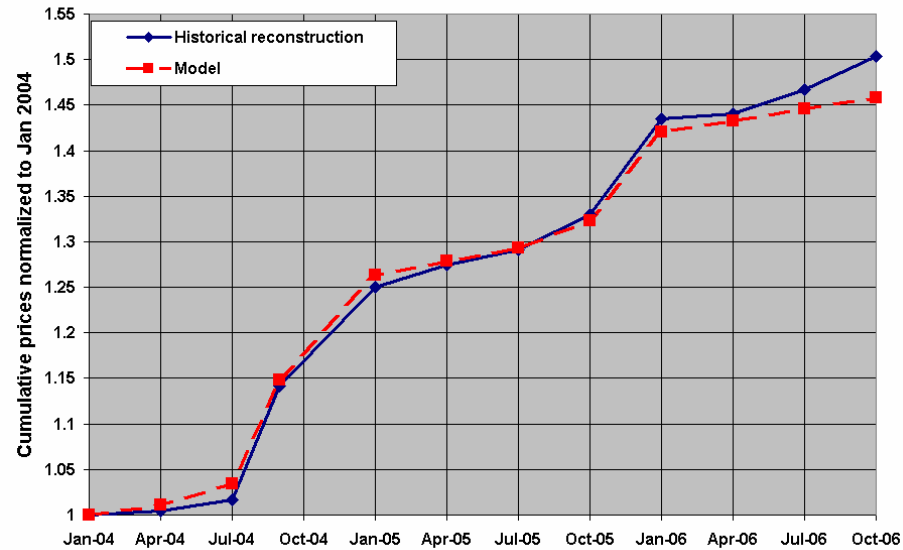
C_i increases when p_i increases as more workers shift toward the construction sector

■ Incentive to move to the most affected countries

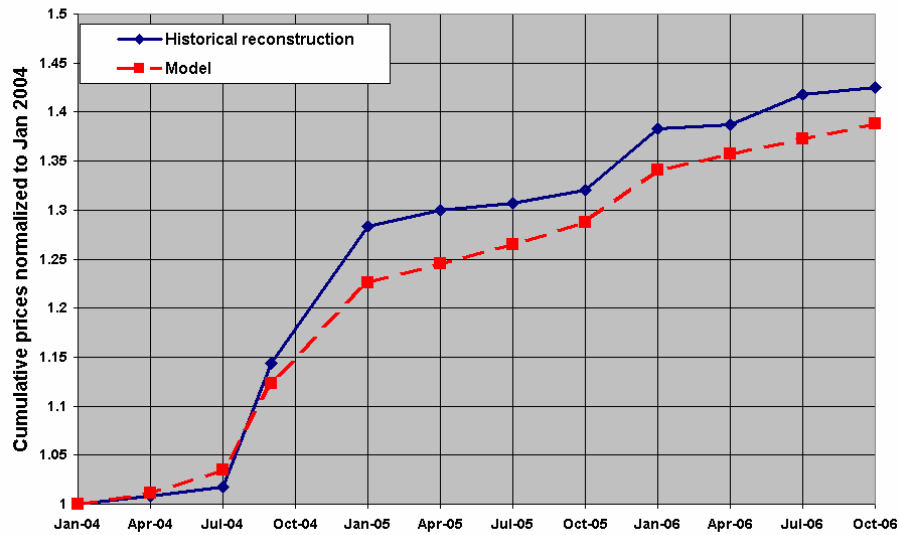
If $p_j > (p_i + d_{ij} * c_{ij})$, then workers move from county i to county j

Price Changes

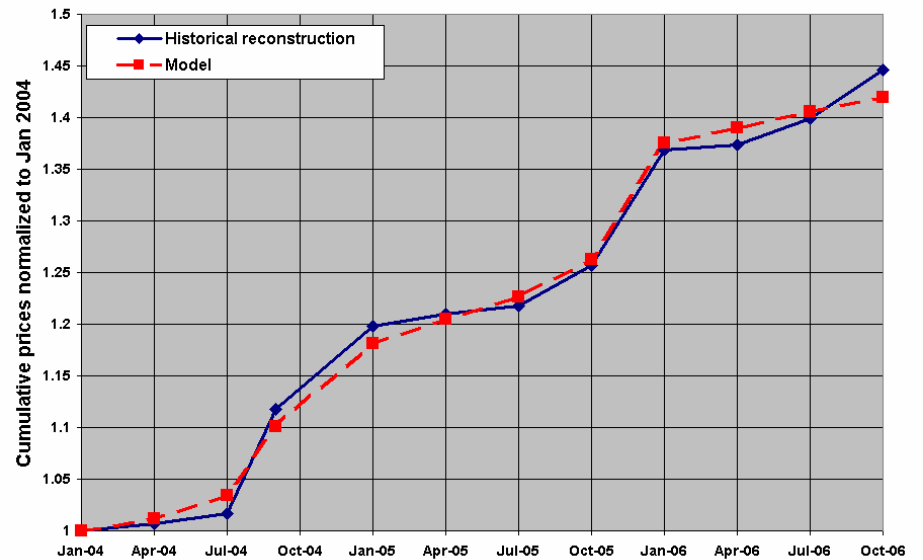
All Florida using weights on Loss and exposure



Orlando

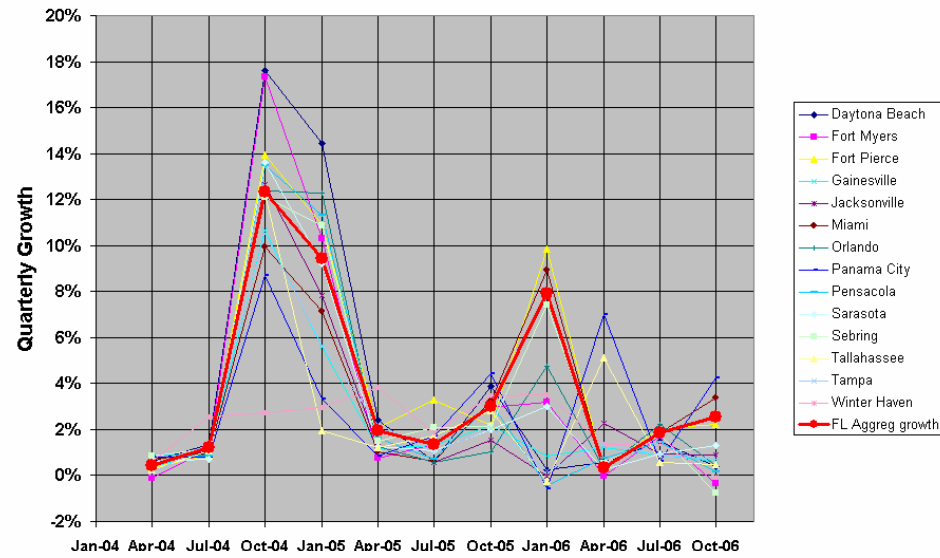


Miami

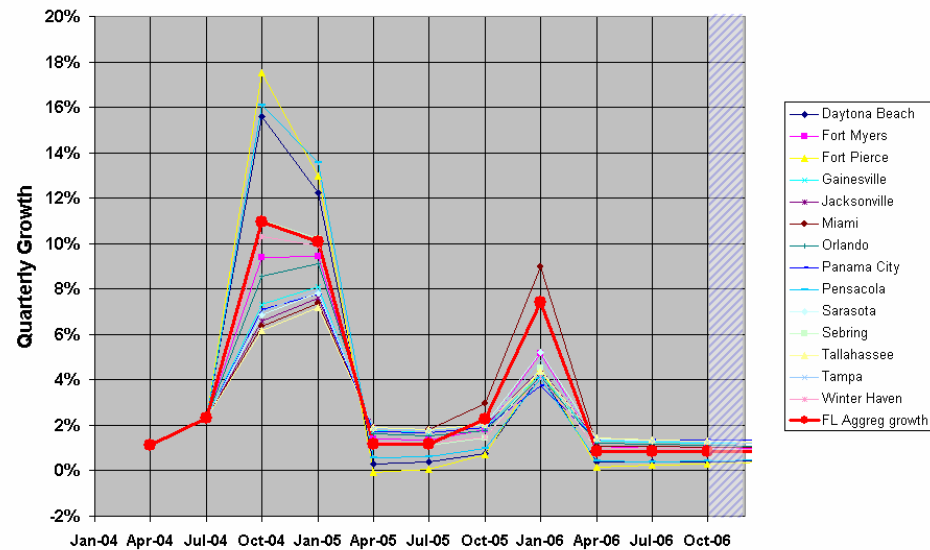


Price Growth Changes

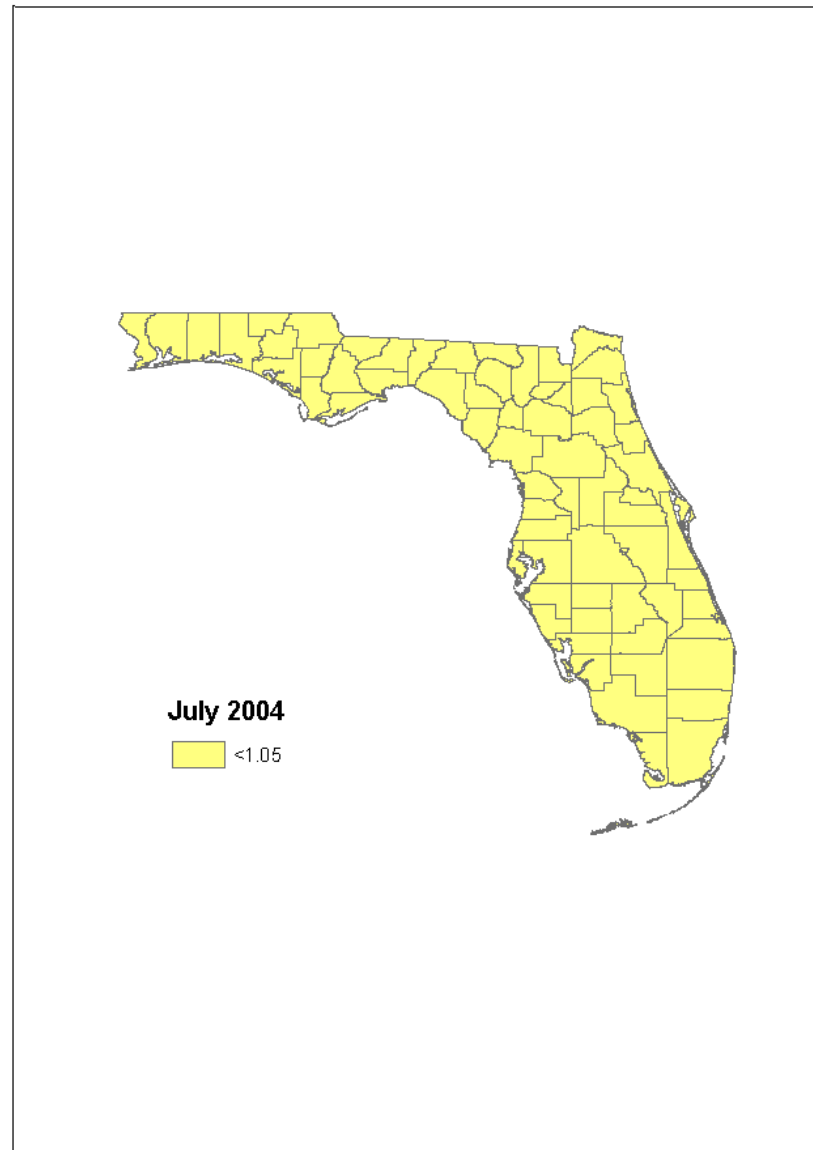
Growths calculated from Historical Price Reconstruction



Growths calculated from the model



Sample Results – Price Changes after removing inflation and normalized to January 2004



Summary

- Impact of economic demand surge can be 'non negligible'
- Detailed data from 2004 and 2005 U.S. hurricane seasons are used for testing economic modeling of demand surge
- A simple economic model focusing on the construction sector is developed (as presented here)
- Next Steps:
 - Investigate impacts of initial economic conditions
 - Applications to other regions
 - Integration within a probabilistic loss assessment model
 - Develop a model that accounts for all sectors