The Development of Long Term Insurance (LTI) To Address Catastrophe Insurance Market Failure

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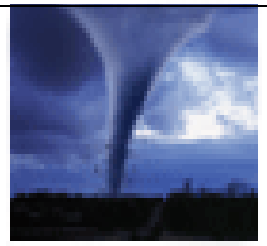
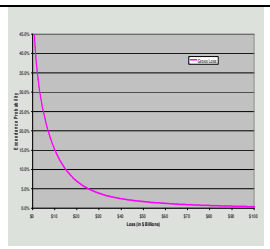


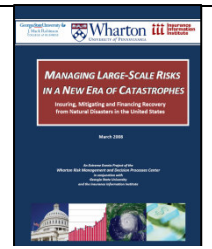

Outline of Talk

Wharton
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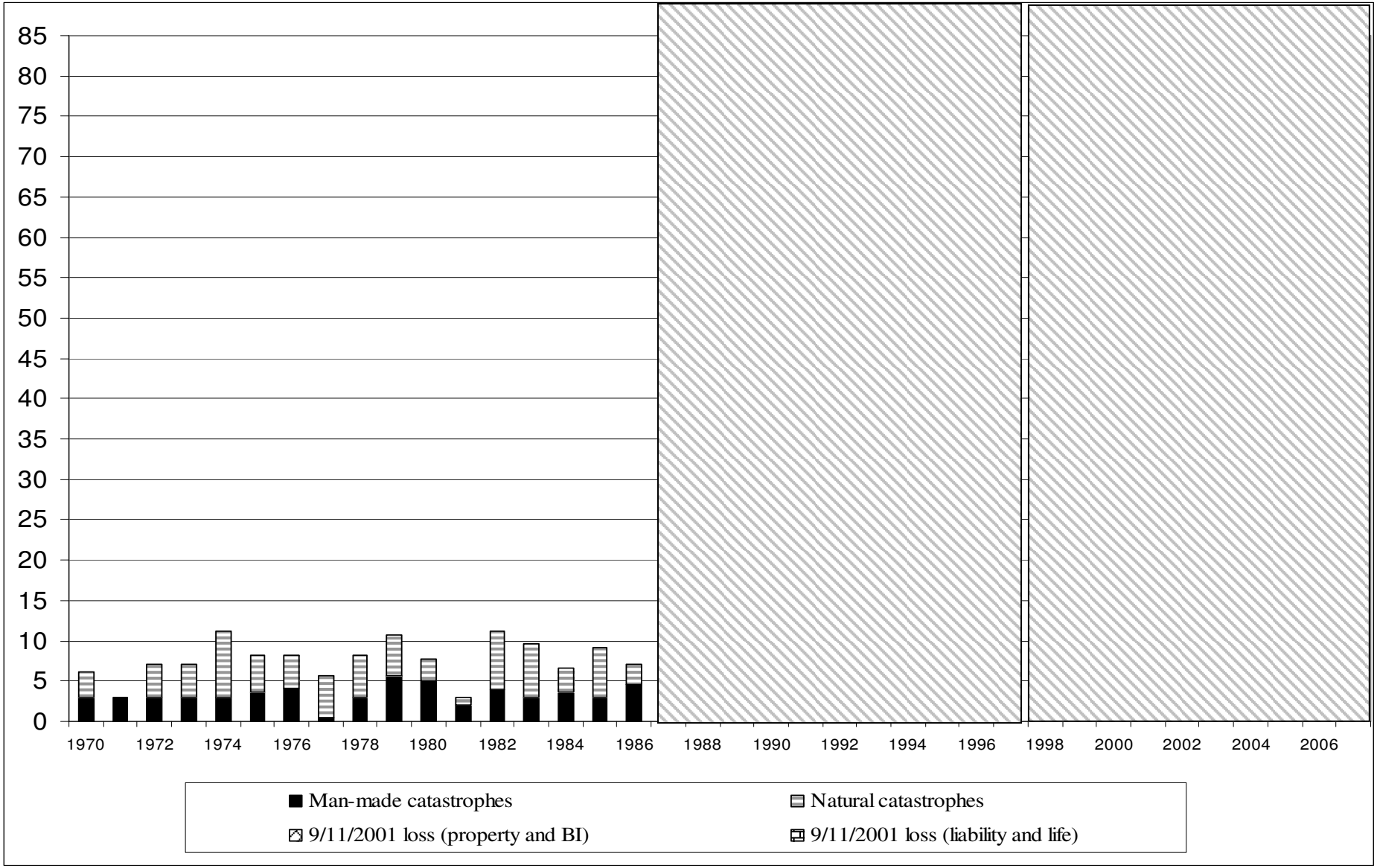
1. **Motivation for the paper: Cause for concern**

2. **Benchmark for LTI: Lessons from mortgage markets**

3. **Applying concepts from LT mortgages to LT insurance**

Worldwide Evolution of Catastrophe *Insured* Losses, 1970-2007



(Property and business interruption (BI); in U.S.$ billon indexed to 2007)

Sources: Wharton Risk Center (2008) - data from Swiss Re and Insurance Information Institute

Well-Known Market Reactions Post-Disaster

(Unregulated) reinsurance prices vary significantly

(Froot and O'Connell,1999; Wharton Risk Center, 2008)

Index =100 (1/1/2005) – 250 (7/1/2006) – 200 (7/1/2007)

Rating agencies impose more stringent stress-test

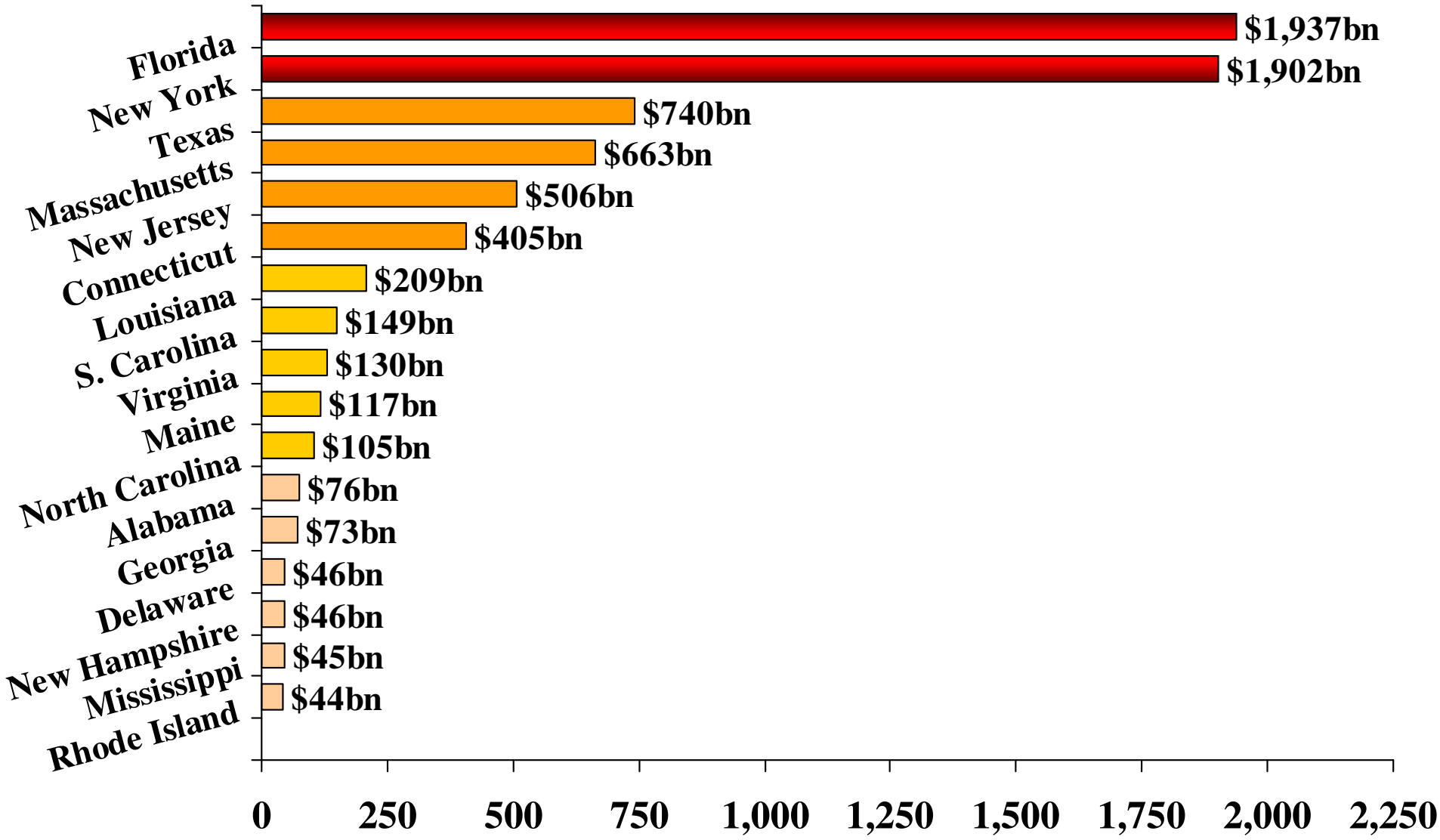
Insurers try to recoup their losses, to reflect their new risk estimate and the new cost of capital

Insurance regulators try to keep these rates low

Premiums have increased significantly

+ 35% in Florida between 2005 and 2007 (on average), with some regions doubled, or even tripled

Total Value of Insured Coastal Exposure Increases



Source: Data from AIR Worldwide (as of 2004; residential and commercial)

The Other Challenge: Lack of Interest in Mitigation

A survey of 1,100 adults living along the Atlantic and Gulf Coasts undertaken in May 2006 – 5 months after hurricanes Katrina, Rita and Wilma – revealed that:

- **83% of the responders had taken no steps to fortify their home.**
- **68% had no hurricane survival kit.**
- **60% had no family disaster plan**.

Abby Goodnough, *New York Times*, May 31, 2006

Why Homeowners Don't Adopt Mitigation Measures

Behavioral

- Myopia (short truncated time horizons)
- Misperception of risk
  - It won't happen to me
  - 1/1000 chance rather than 1/100 chance of hurricane
  - Misperception of reduction in loss
- Expectation of disaster relief

Institutional Realities

- Budget constraints---can't afford $1,500 investment
- Insurer may not give me discount next year or cancel policy
- Move in 2-3 years.

Nature of Long-term Insurance

Problems with a one-year policy

- Availability of insurance post-disasters is unknown to homeowners
- Insurers cannot secure their policyholders to diversify risk over time
- Costs associated with annual renewals
- Lack of interest in cost-effective protection measures
- Hard for insurers to provide enough financial incentives for their homeowners to invest substantially in mitigation

=> Market inefficiency

Possible solution: *5*-10-20 year policies tied to mortgage

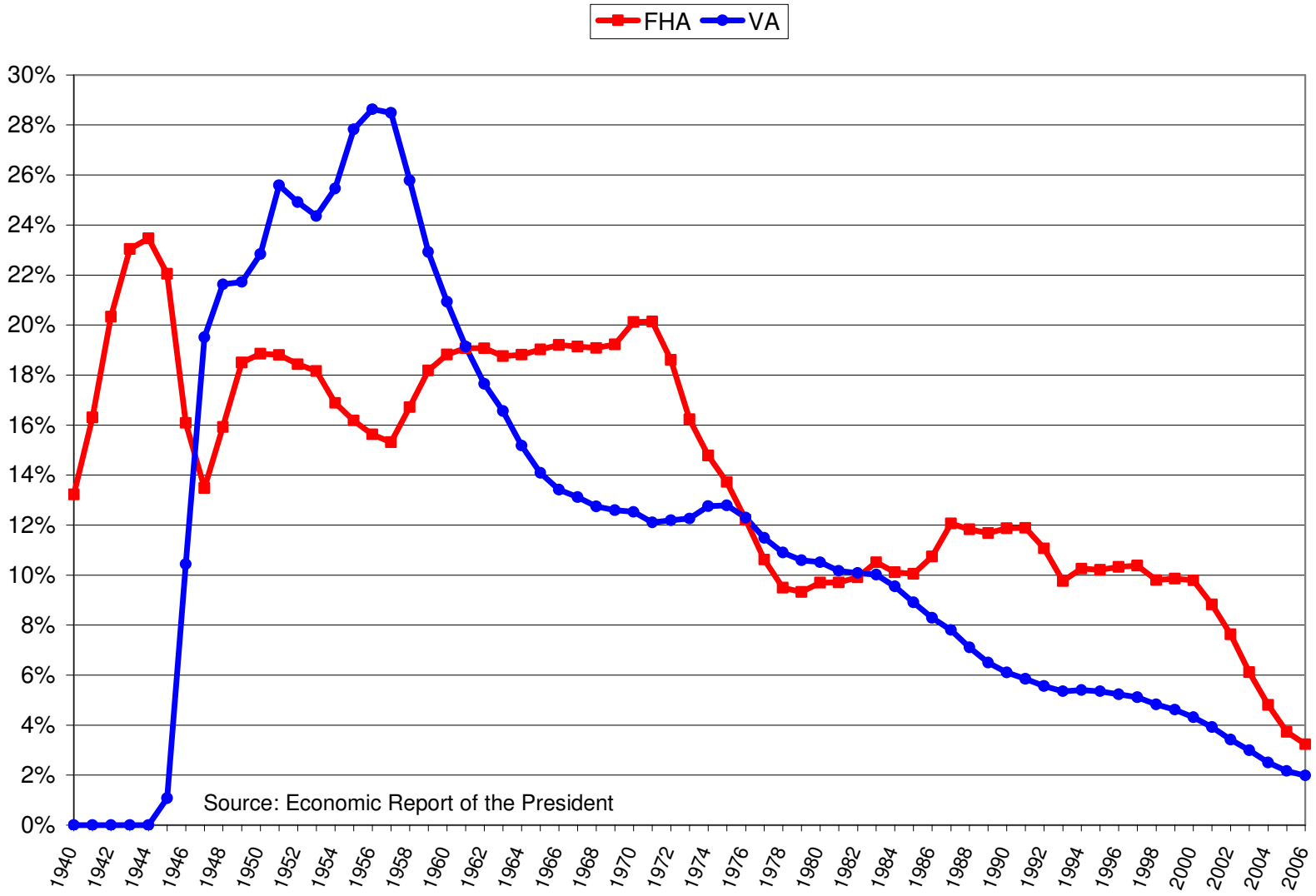
- Fixed rate or adjustable rate policies similar to mortgage contracts
- Provide insurance stability to homeowners
- Allow the insurers to diversify risks over time
- Can encourage adoption of cost-effective mitigation measures for low probability events
- Reduce the need for federal relief

2. Benchmark for LTI: Lessons from Mortgage Markets

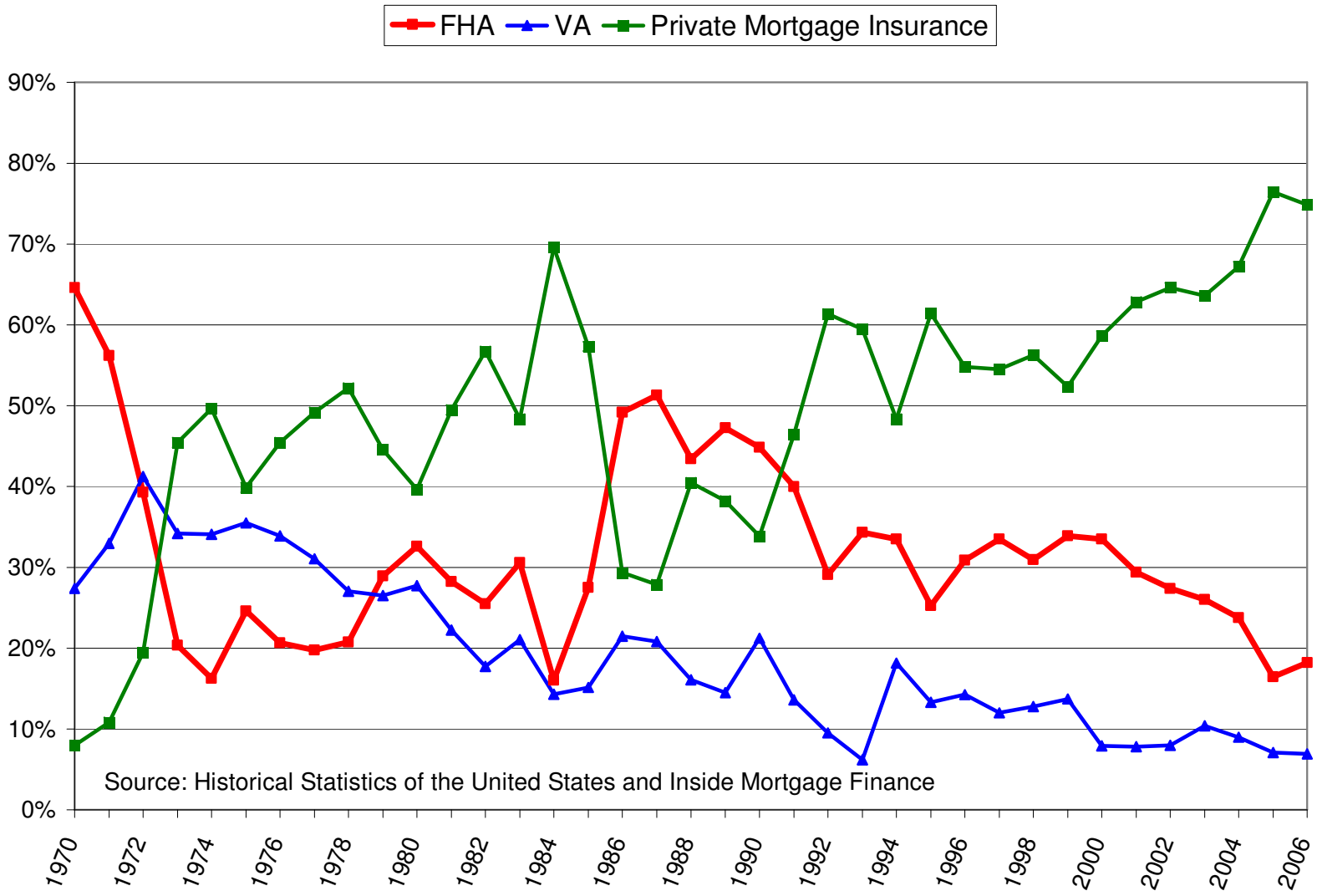
- U.S. mortgage market has evolved from short-term (1 year) to long-term (40 year) contracts.
  Issues solved are similar to LT insurance.

- Key innovation was FHA fixed-rate, LT, loan.
  - Government action, as ST loans failed in Depression.
  - Designed as insurance, required actuarial premiums.
  - Loan format became de facto industry-wide standard.
  - Spawned private mortgage insurers and GNMA MBS.
  - Now new life as solution to subprime mortgage crisis.

FHA and VA Mortgages Outstanding as Share of Total Outstanding Mortgages



Privately Insured Mortgages Are Now Almost 80% of All New Insured Mortgages

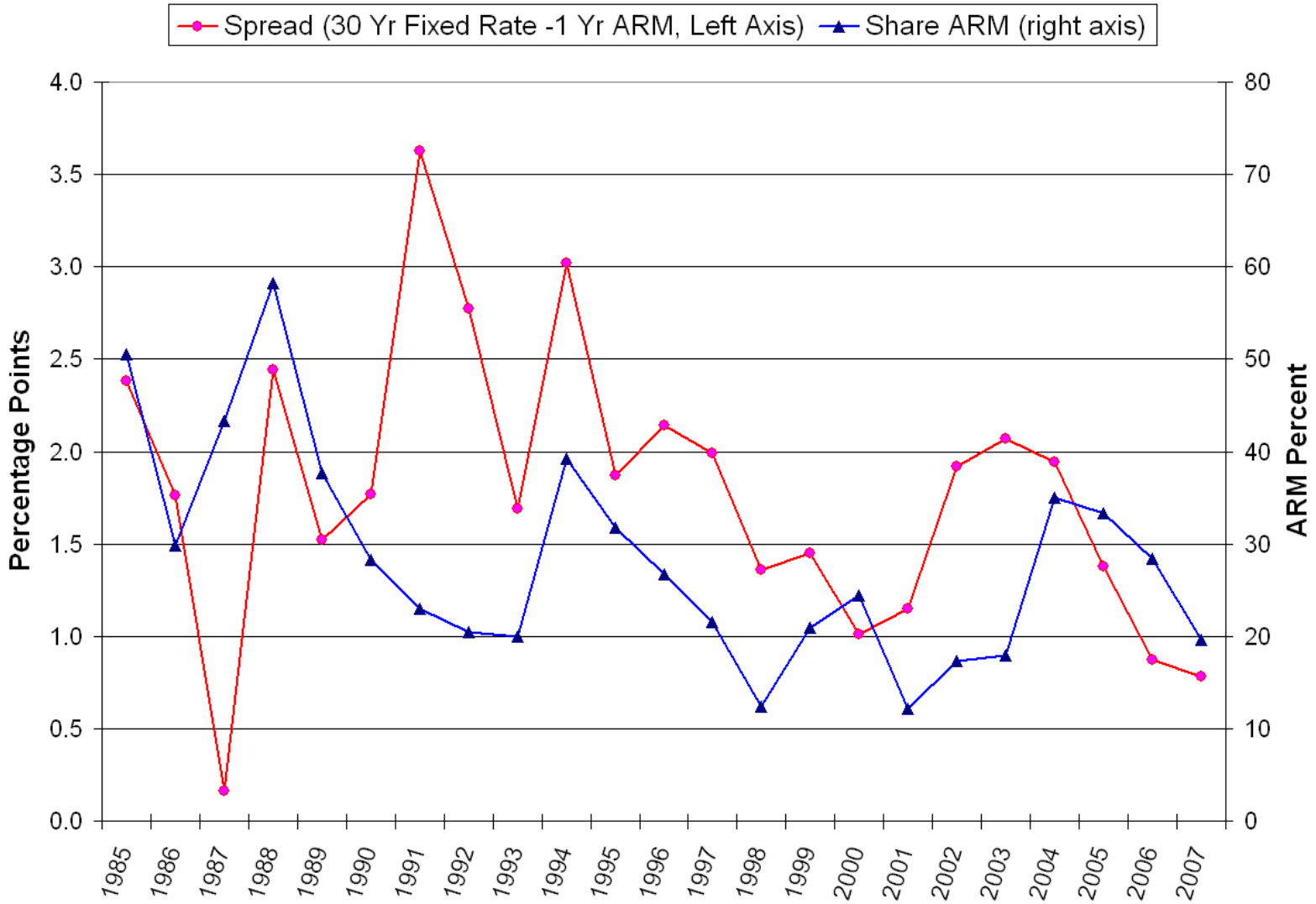


Fixed Rate Mortgages (FRMs) and Adjustable Rate Mortgages (ARMs)

- FRMs face sale and prepayment issues.
  - Most FRMs are "due on sale," allow prepayment.
  - Commercial mortgages require borrowers to compensate lenders ("yield maintenance").
- ARMs require additional consumer protections:
  - Caps on annual & lifetime rate changes.
  - Caps on annual changes in payments.
- Subprime mortgage contract design also provided cash flow and credit risk insurance.

  Other LT contracts include GPM, PLAM, SAM.

FRM – ARM Rate Spread (red, left axis) and ARM Share of New Mortgages (blue)



Risk Indexes and Capital Costs

- ARMs:
  - ARMs often kept in lender's portfolio, funded with deposits of comparable maturity.
  - First ARMs used COFI index, but now 1-Year Treasury rate: independent and transparent.
- FRMs:
  - Most are securitized to transfer rate/credit risk.
  - Tranching allocates rate/credit risk to the most informed or risk-tolerant investors.
  - Private and GNMA/GSEs each about 50% share.
  - Subprime, etc,. show risky loans are securitized.

3. A Two Period Model – Assumptions

Competitive Market

Homogenous Insurers and Insured

Premiums Reflect Risk

Insurers Maximize Expected Profits

Homeowners Maximize Expected Utility

Notation---Risk of Disaster

D insured damage if disaster occurs

p_1 probability of D in period 1

p_{2H} high probability of a disaster in period 2

p_{2L} low probability of a disaster in period 2

a weight placed by experts in period 1 on likelihood of p_{2L} in period 2

Notation – Insurers and Homeowners Costs

Insurer

- M upfront cost to insurer of marketing a policy
- A administrative cost of marketing a policy
- λ cost of capital held by the insurer to cover potential damage

Homeowner

- *b* likelihood of the insurer canceling homeowner's policy at end of period 1
- S_1 search cost to consumer for a new policy if insurer cancels policy at the end of period 1
- S_2 search cost in period 2 if consumer decides to cancel LT policy; $S_1 > S_2$

Nature of LT Insurance Contract

Insurers charge a premium [(Z(LT)] that reflects the following costs and risks of disaster:

$$Z(LT) = \tfrac{1}{2}.\{M + 2A + (1+\lambda)\,[p1\ D + a\ p_{2L}\ D + (1-a)\ p_{2H}\ D]$$

The homeowner has the right to cancel her policy at the end of period 1 but incurs a penalty cost (C) to cover the insured's administrative cost and cost of capital incurred in period 1

When Do Consumers Prefer LTI Over Two 1-Year-Period Contracts?

High likelihood of insurer canceling policy at end of period 1 (i.e. high *b)*.

Low penalty cost (C) to consumer for defaulting on an LT policy

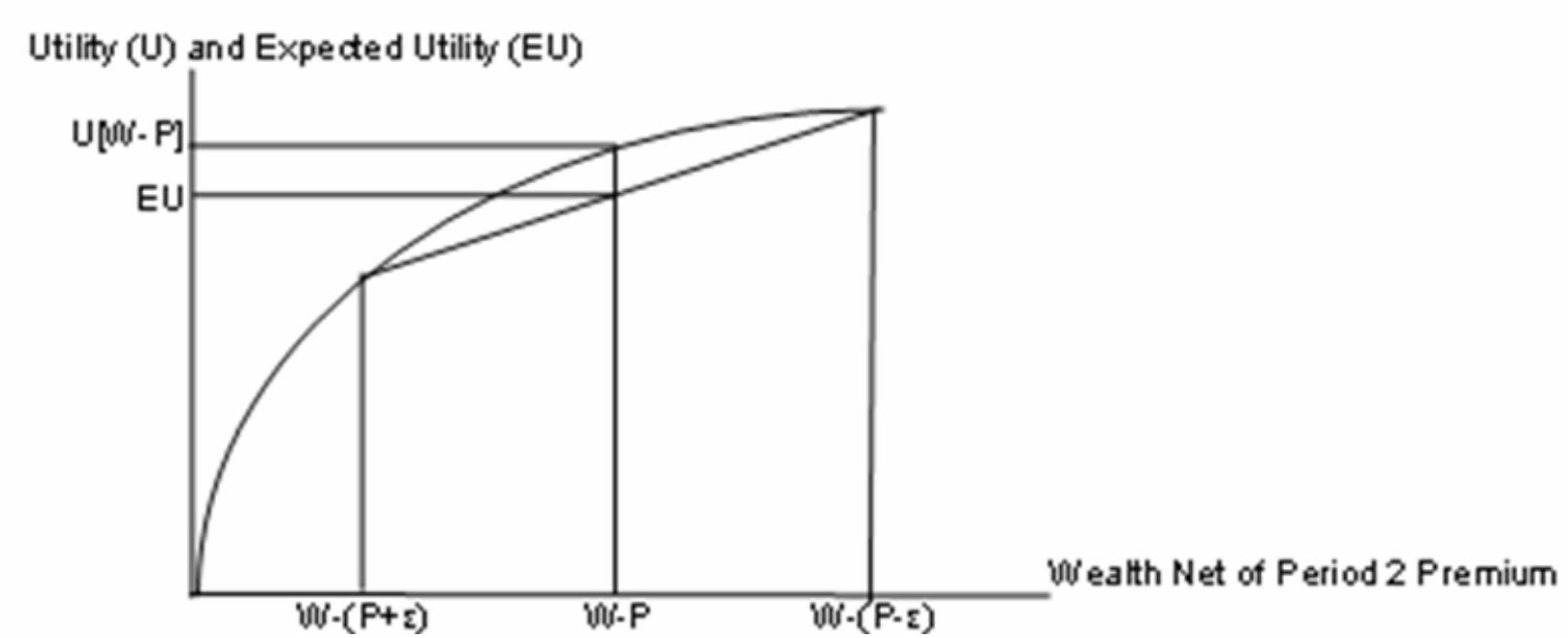
High search cost for a new policy if insurer cancels existing policy (i.e. high S_1) or consumer decided to look for cheaper policy (i.e. high S_2)

Risk averse homeowners

Desire by homeowner for stability and peace of mind by knowing they are fully protected against damage in periods 1 and 2

Benefits of Fixed Price Insurance Contracts

Consumers with multi- period horizon prefer a fixed-price (P) contract to an adjustable price (P + ε, P – ε) contract



Open Questions for Designing LTI Contracts

Nature of Contract

Fixed Price Contract for full term of policy (e.g. 20 years)

Adjustable Premium Contract

- Guaranteed renewal for full term of policy
- Annual premium reset based on simple and transparent index

Protection Against Catastrophic Losses

- Need for cat bonds and securitization to protect insurers against increases in risk
- Government guarantee on ability to pay claims

Transparent Information on the Contract

Institutional Details
Questions for Future Research

How would insurers deal with significant changes in risk estimates over time?

What types of risk transfer instruments would have to emerge to protect insurers against catastrophic losses and changes in risk estimates over time?

What steps should be taken to protect homeowners against possible insolvency of insurers providing LTI?

What role would the public sector play in providing protection against catastrophic losses?