Property Insurance & Climate Risk

Topic Presentation
ENV-724

Dec. 2, 2020
Climate Economics
Adam R. Swietek

The New York Times

Florida Sees Signals of a Climate-Driven Housing Crisis

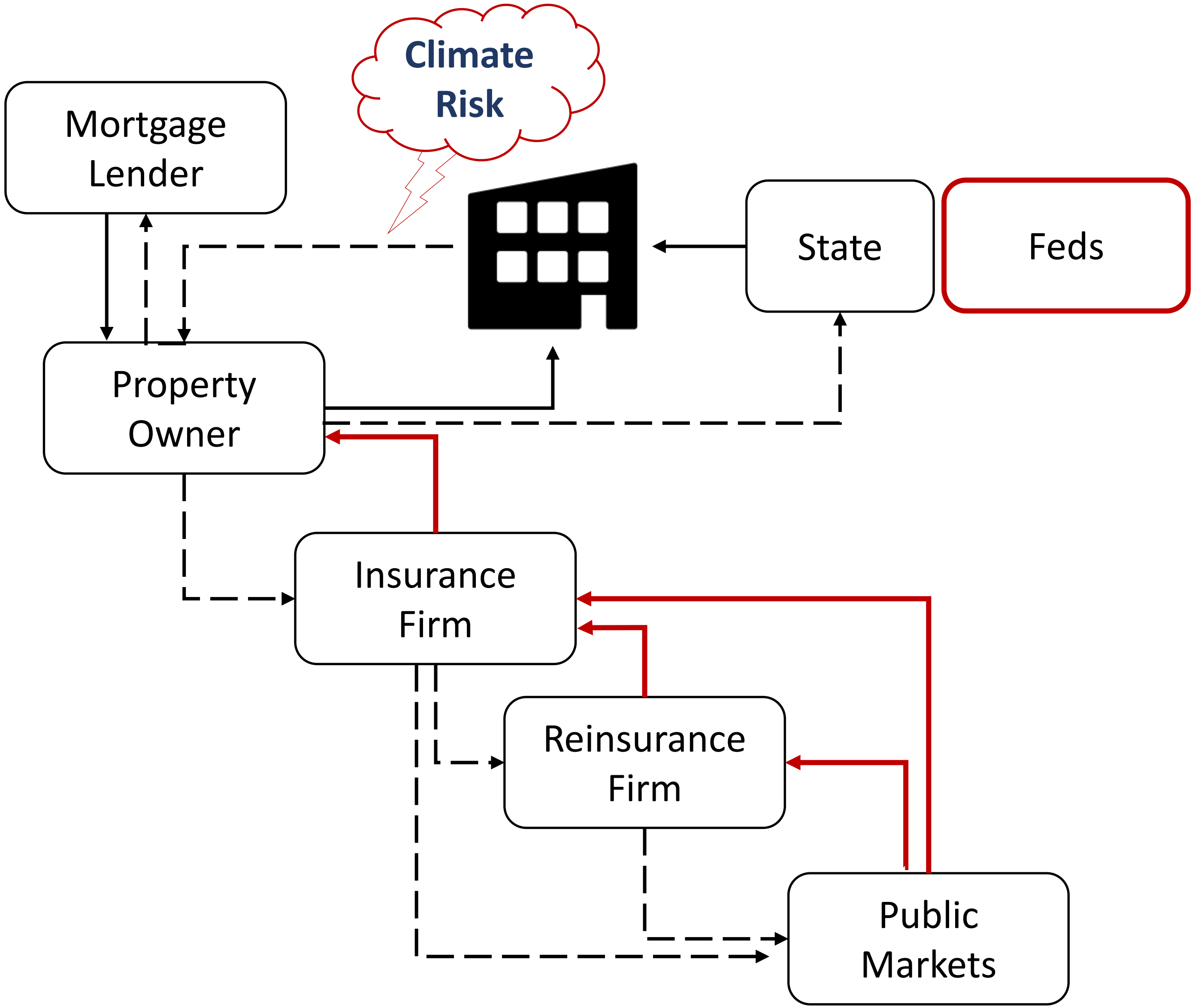
Oct 12, 2020

POLITICO

SPECIAL REPORT

How climate change could spark the next home mortgage disaster

Nov 28, 2020



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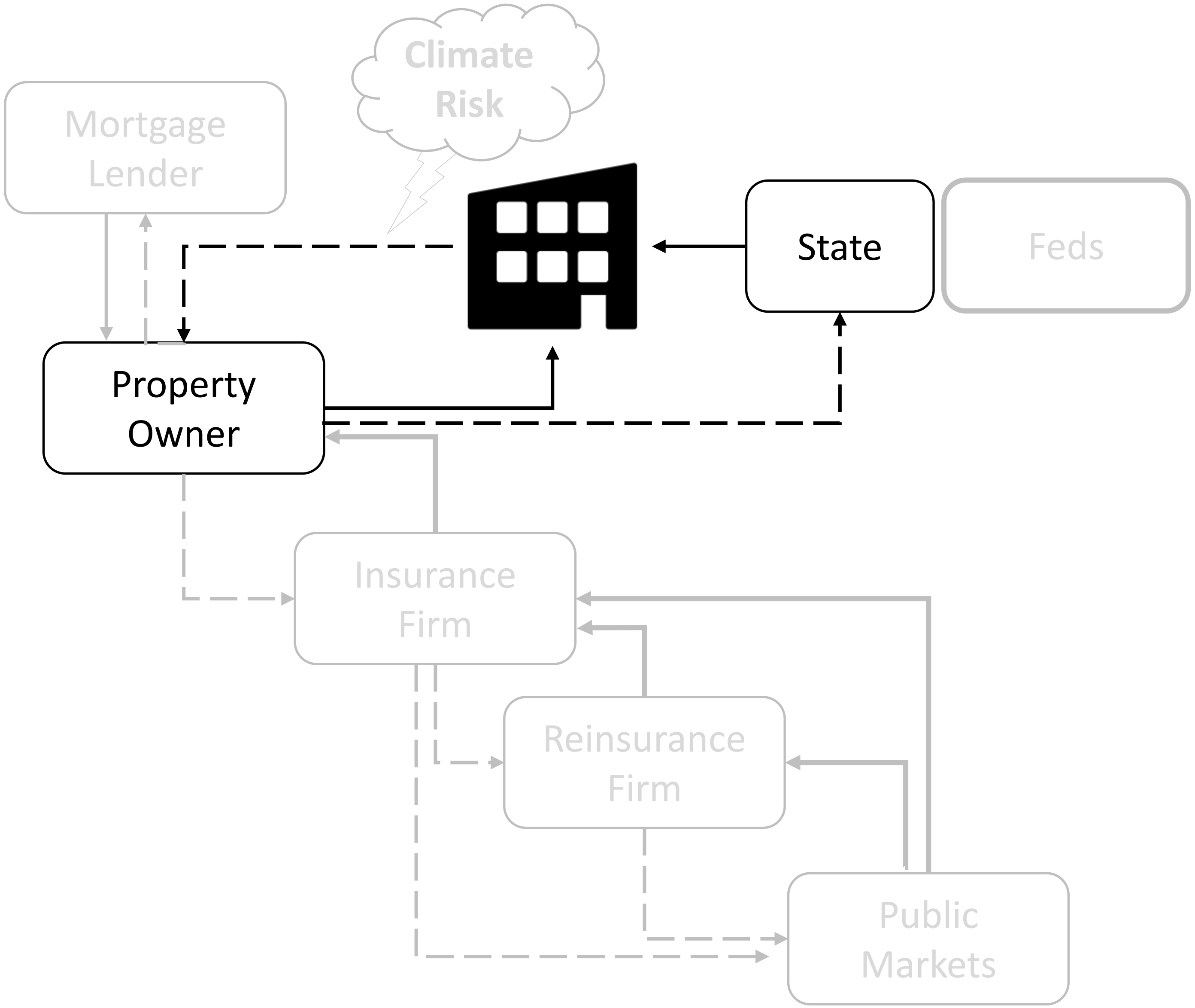
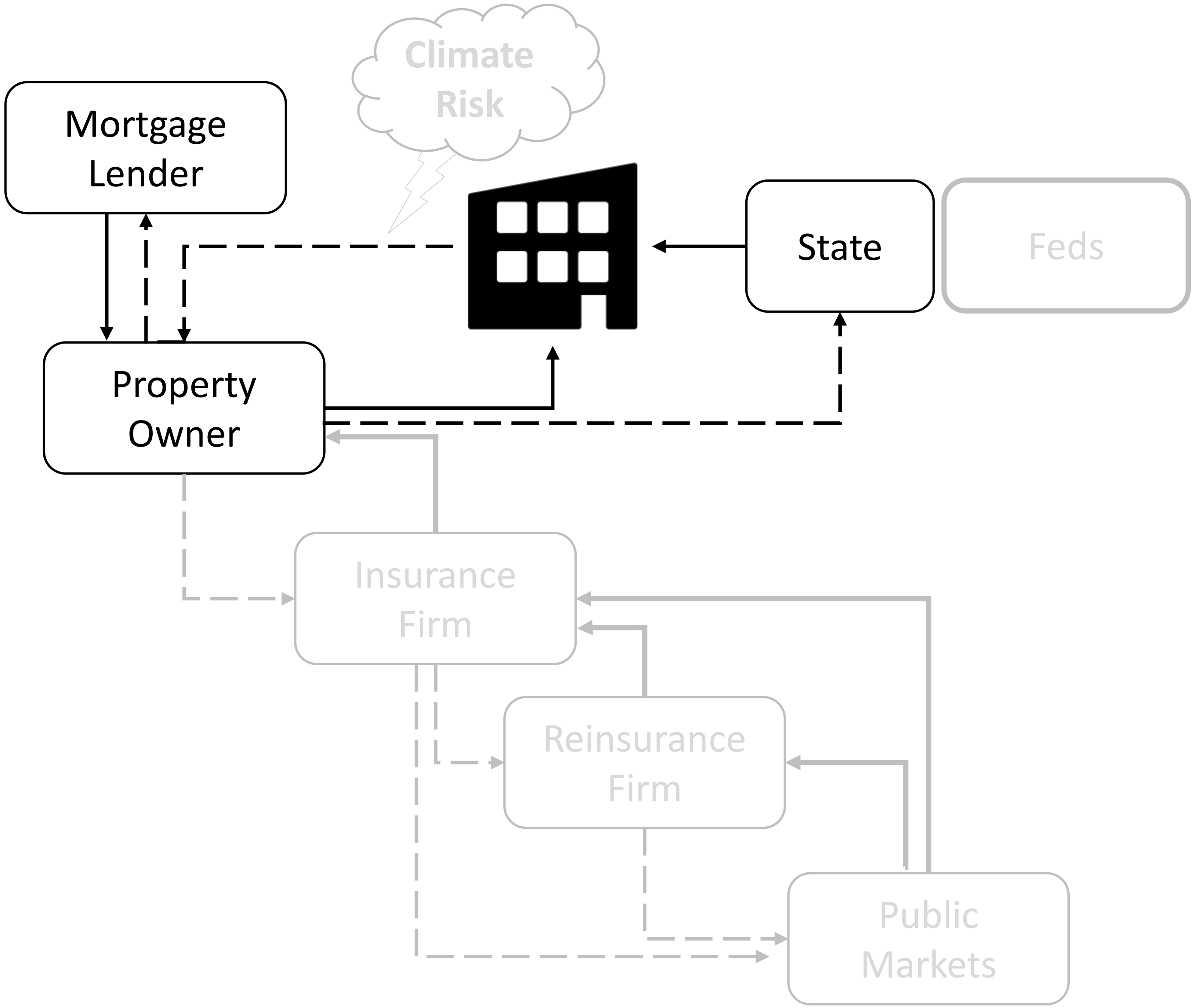


Property Owners

- Single Entity of corporate entity with legal ownership of property
- Invest in property at beginning of holding period
- Receive Income for the duration of the holding period

State

- Provides maintains infrastructure services
- Collects property tax



Issue: Liquidity

Mortgage Lender

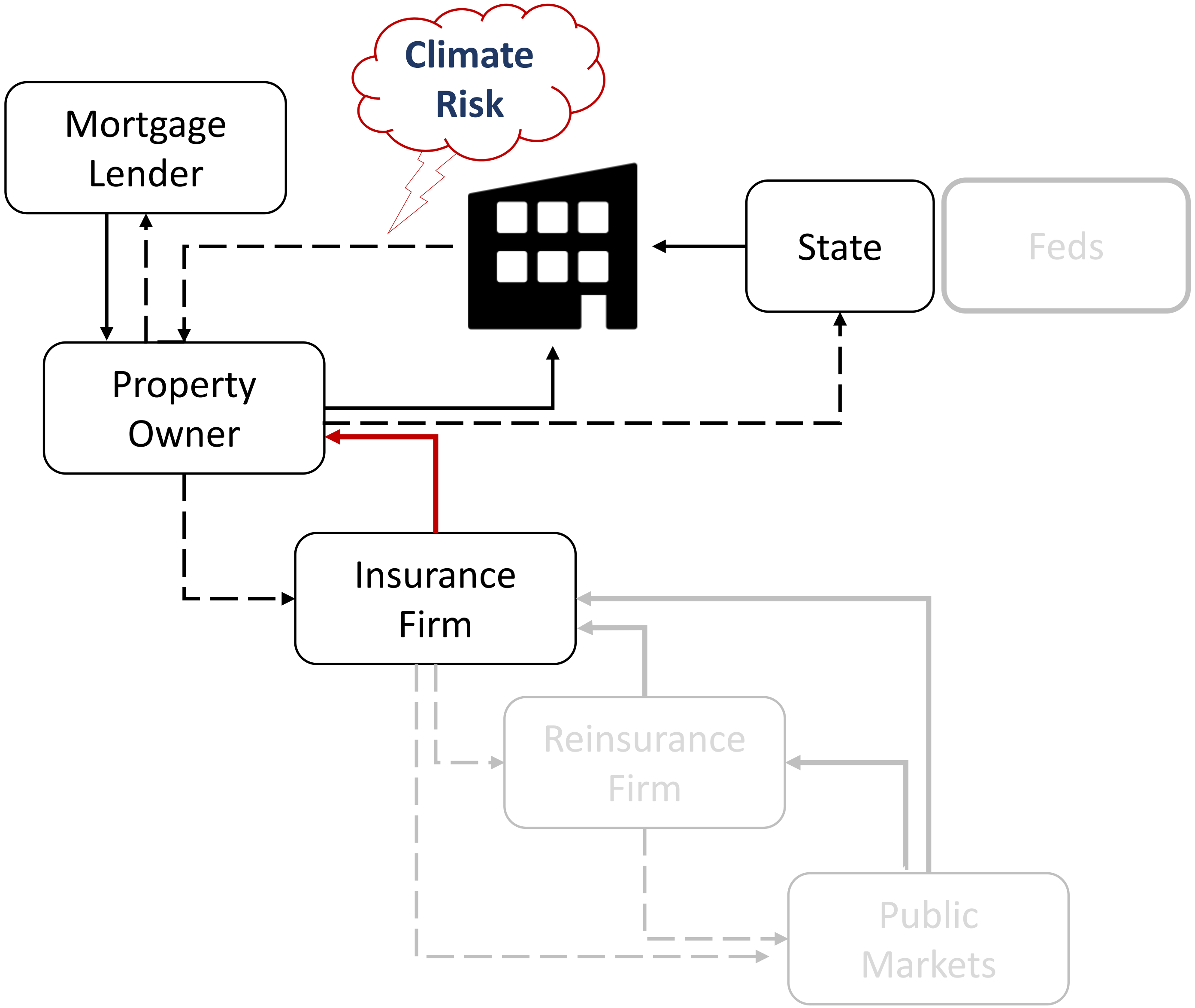
- Provide credit to fund purchase
- Have a claim on the property
- Receive principle + interest payments

Need

- Underwrite the ability to repay the loan

Tools

- Evaluate at Property Owner's credit history
- Appraise the 'Value' of the Property
  - *AVM - Wüest Partner*



Issue: Physical Risk

Insurance Firm

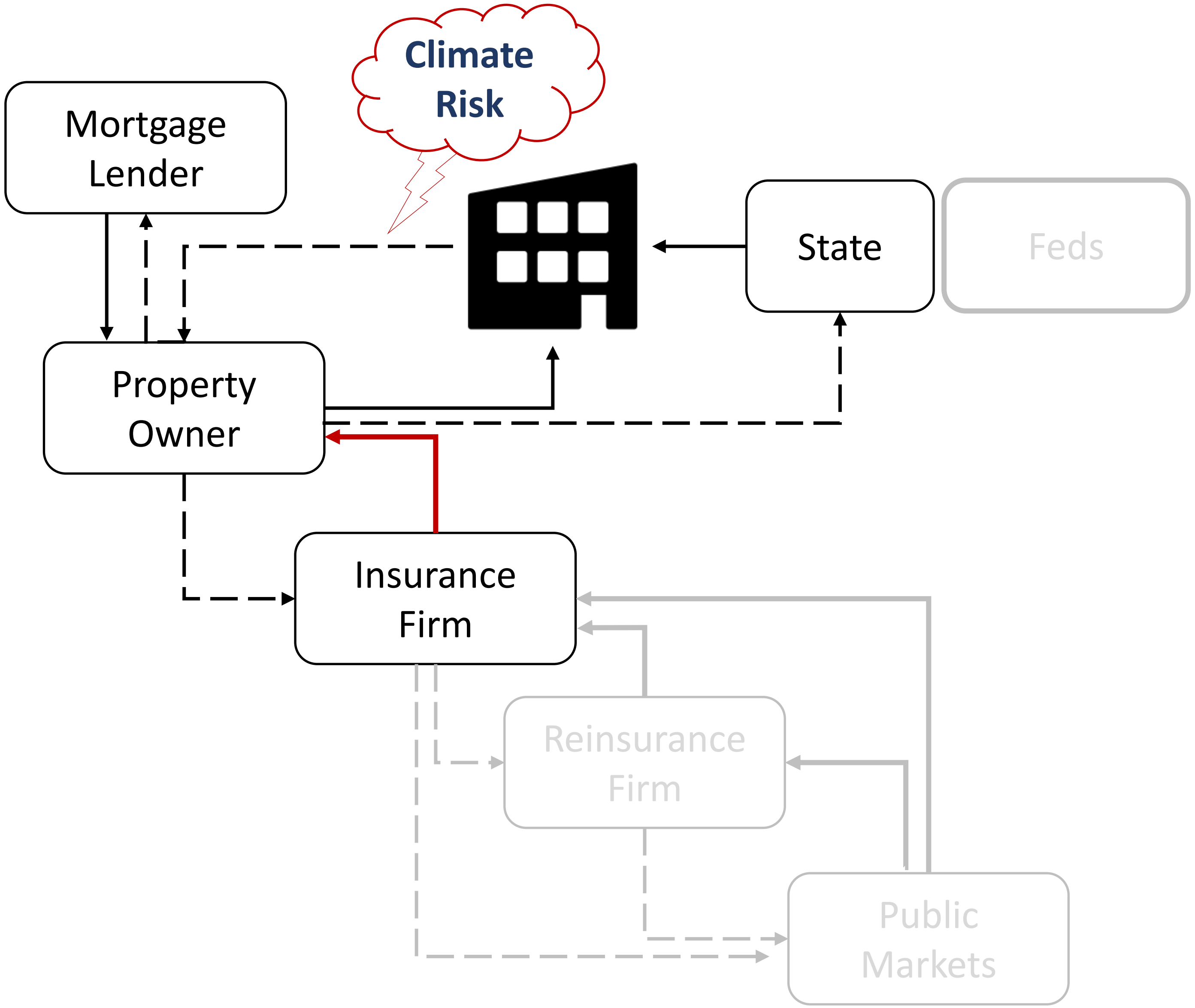
- Provide policy coverage for certain 'trigger' events
- Receive insurance premiums (per annum)

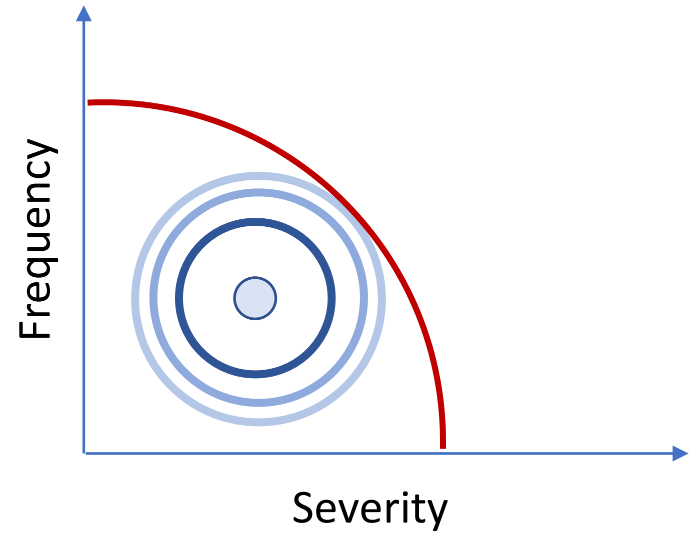
Need

- Assess the expected payout
- Determine appropriate premium

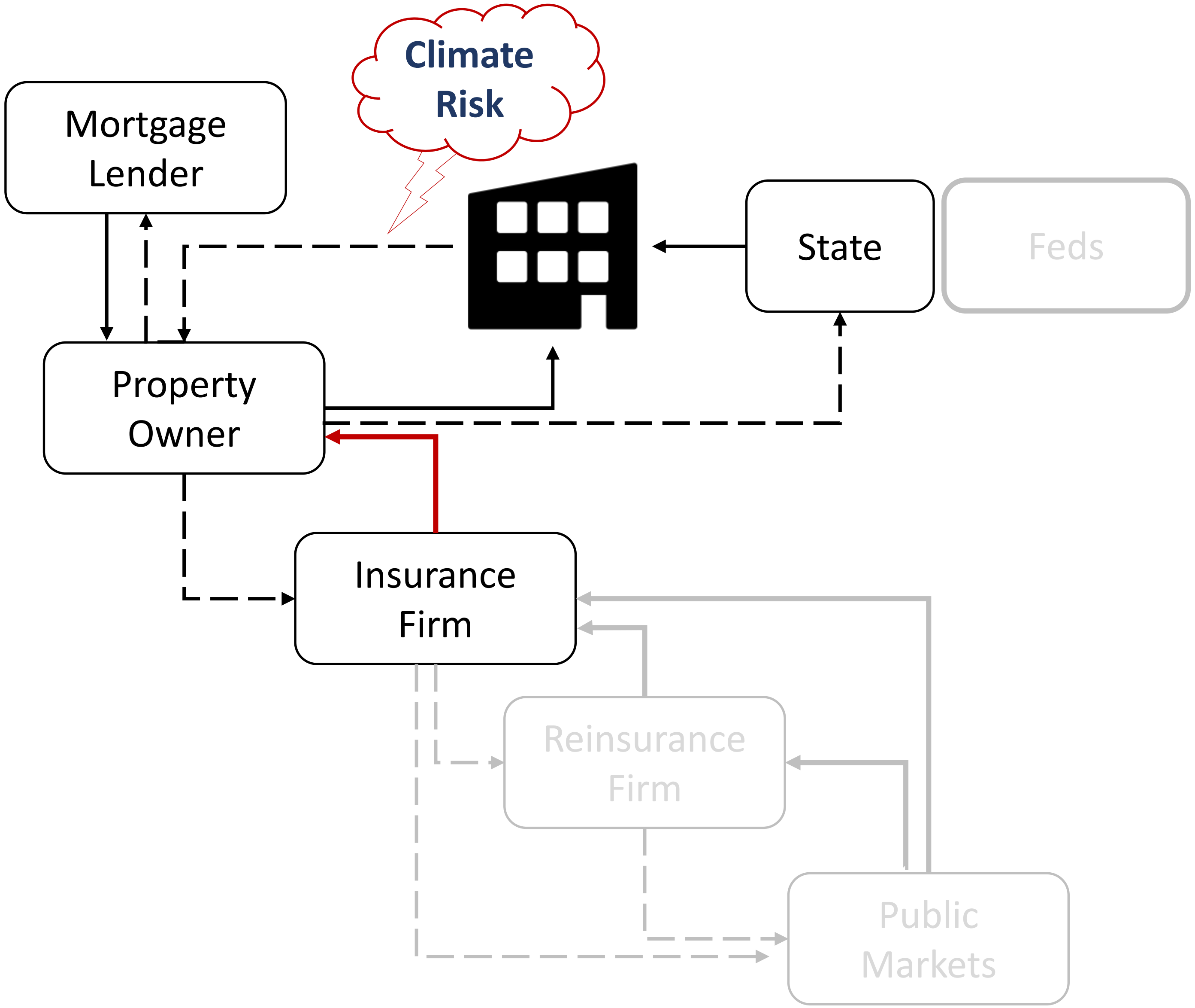
Tools

- Evaluate historical insurance claims
- Measure the frequency and severity of potential impacts

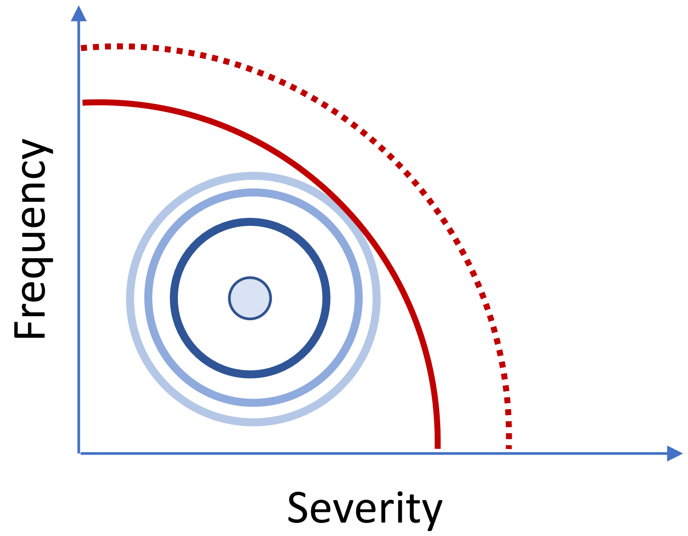




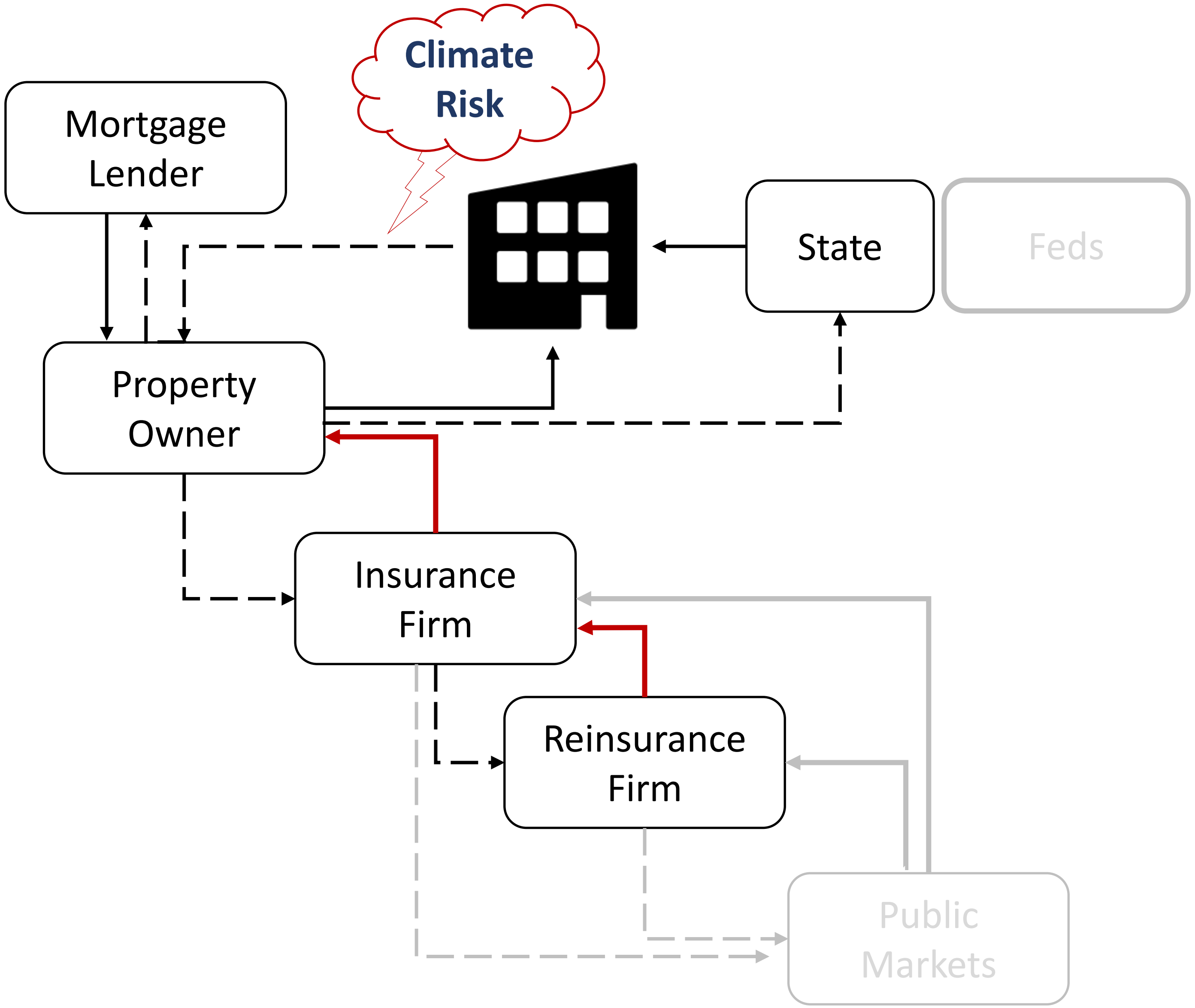
Insurance is designed for thin distributions



Issue: Catastrophic Risk



Insurance is designed for thin distributions. Insurance Firms cap their exposure by purchasing insurance of their own.



Issue: Catastrophic Risk

Reinsurance Firm

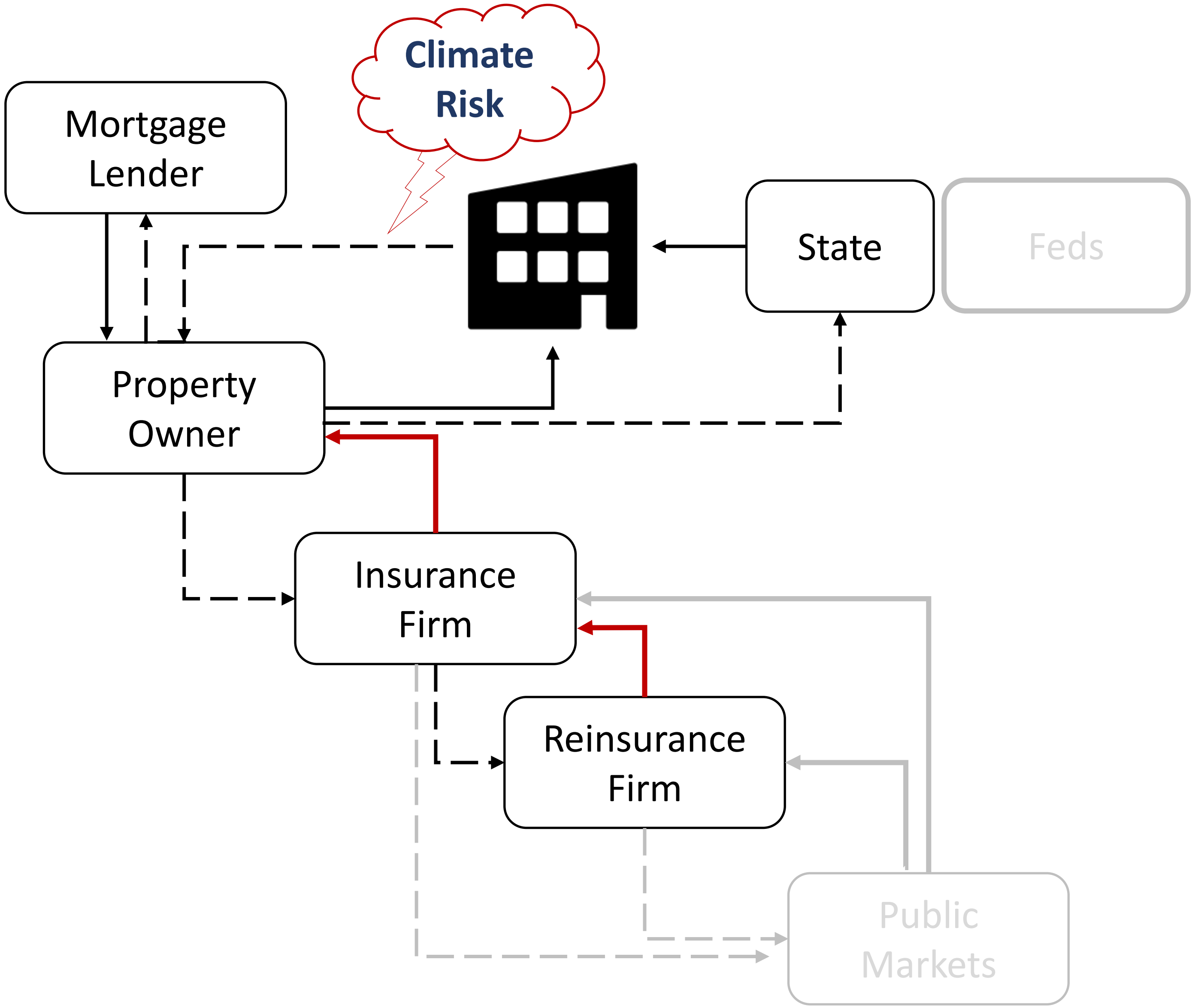
- Provide policy coverage to insurance firm to cover losses above a certain point
- Receive portion of insurance premiums from property owners

Need

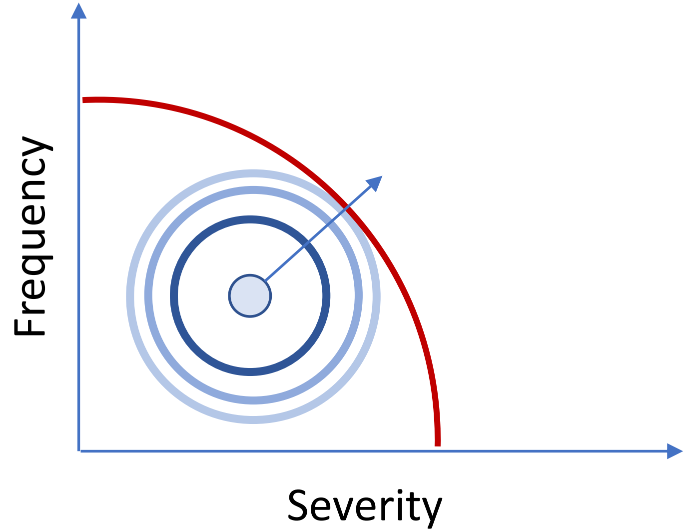
- Assess the expected payout
- Determine appropriate premium

Tools

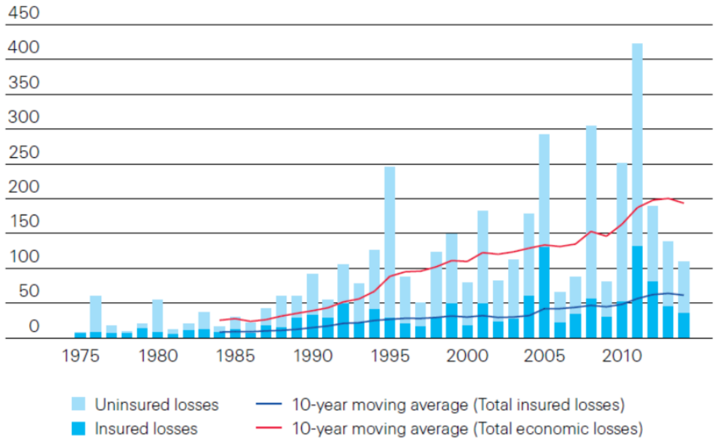
- Evaluate historical insurance claims
- Measure the frequency and severity of potential impacts



Issue: Insurance is designed for thin-distributions



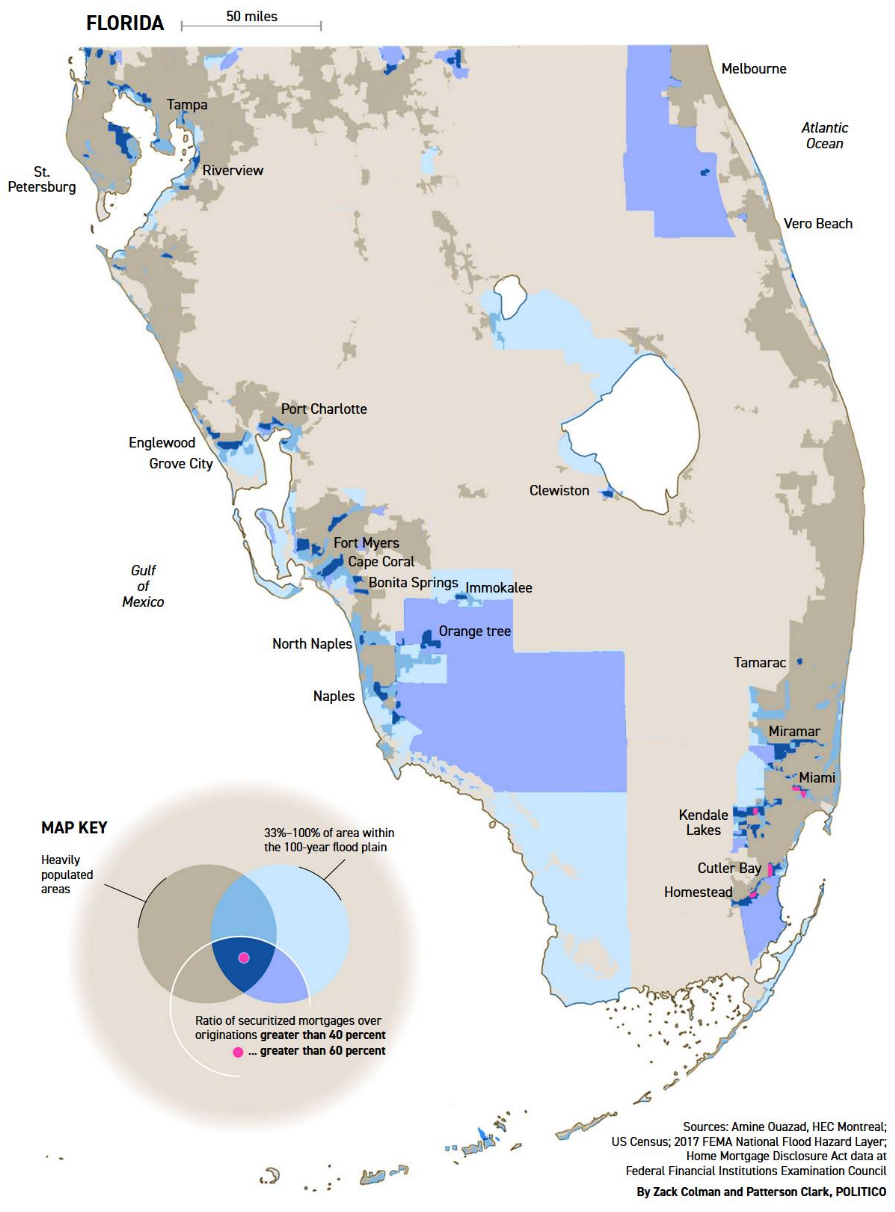
Natural Catastrophes Losses: Insured vs Uninsured losses, 1975–2014 (in 2014 dollars, $ billions)

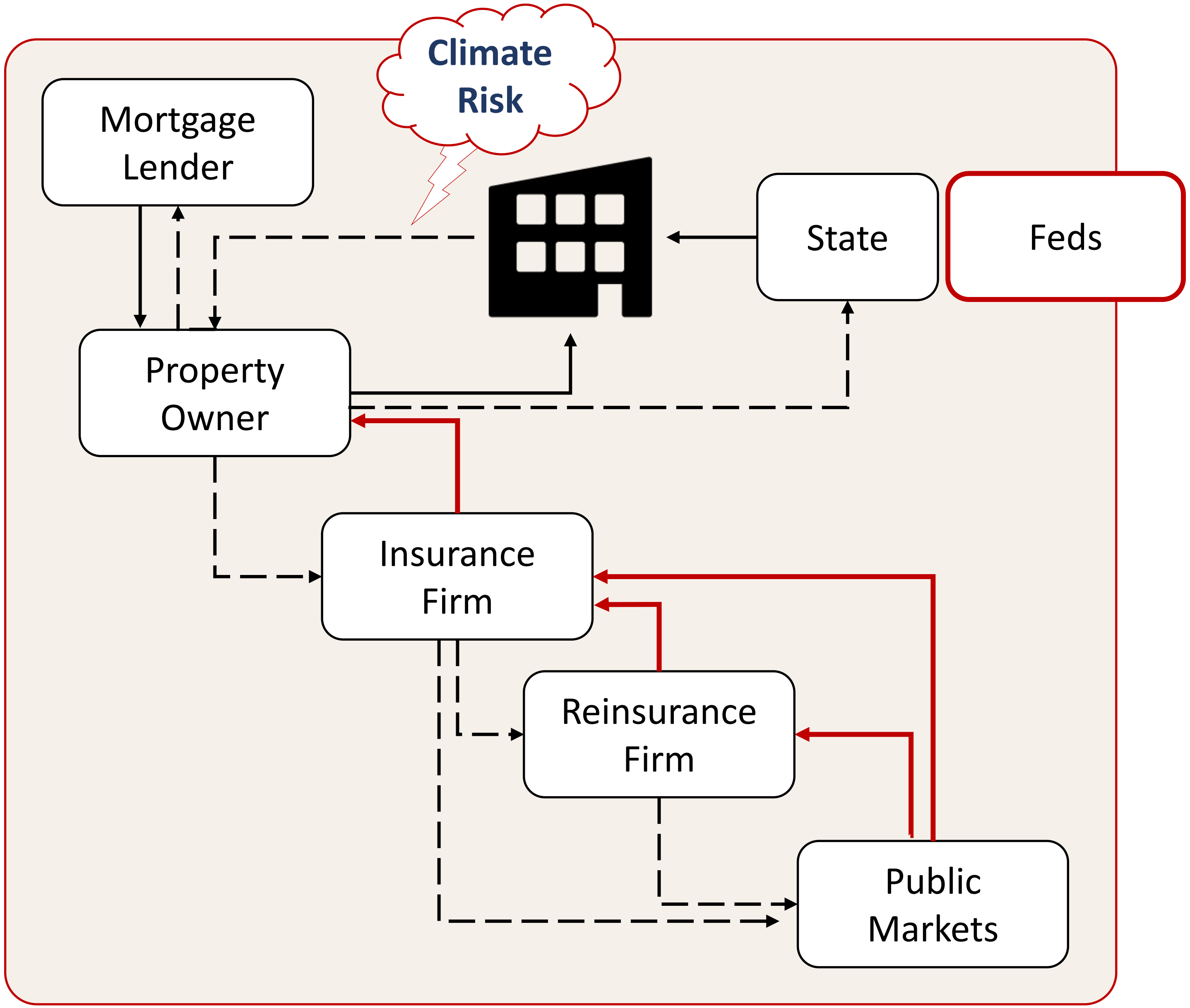


Source: Swiss Re, Underinsurance of Property Risks: Closing the Gap, 2015.

“ In areas where **flood insurance is required for federally backed homes**— known as the 100-year floodplain — **taxpayers are more insulated from mortgage losses** if homeowners are current on their insurance.

But federal flood maps are outdated. That means many homes are vulnerable without being required to maintain flood insurance**, leaving taxpayers on the hook for mortgage defaults.**”





Feds – rely on stability of property market

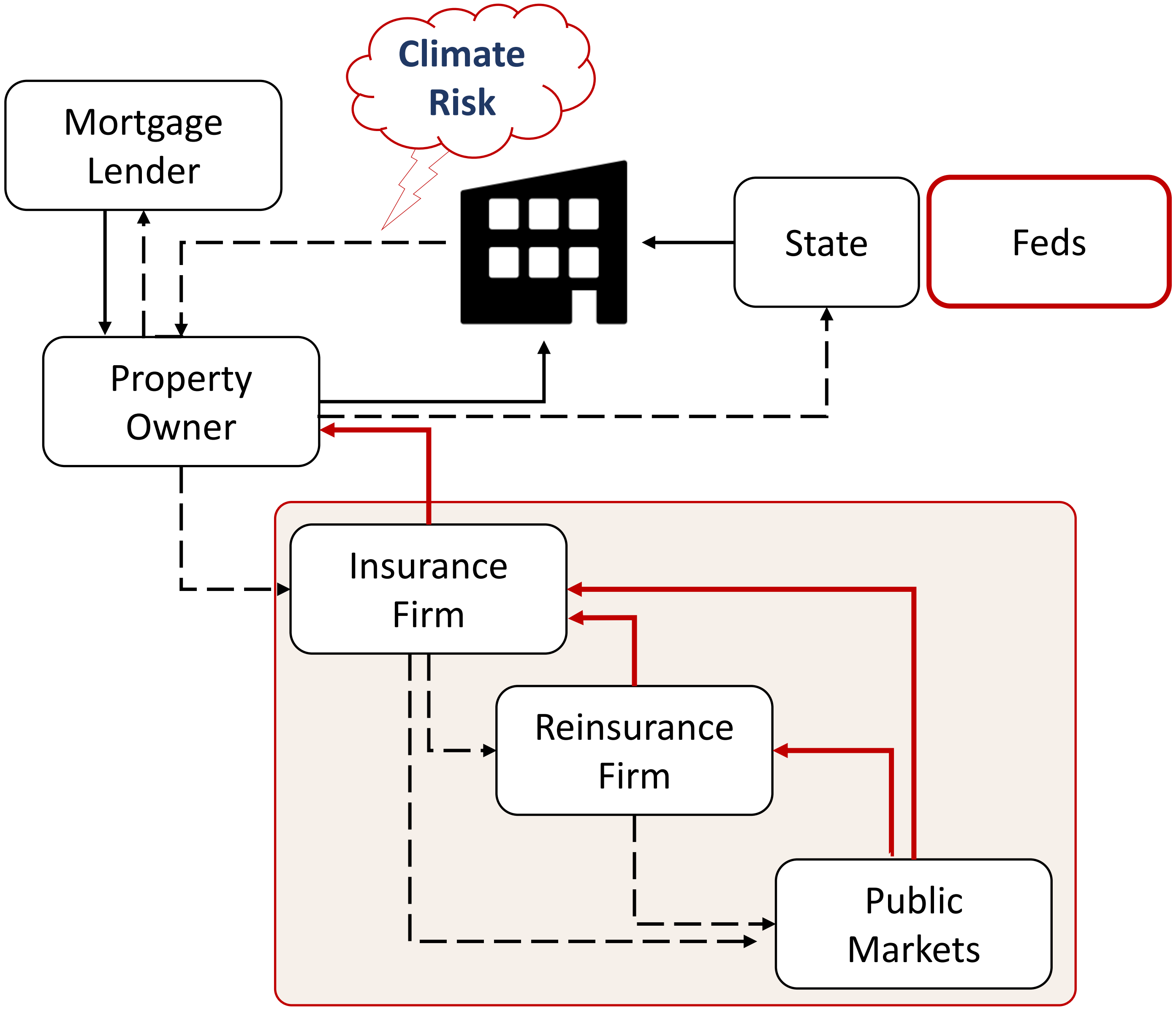
- Mortgage Insurance
  - FHFA
- Secondary Mortgage Market
  - **GSE : Fannie Mae, Freddie Mac**
- Insurance Protection Program
  - *NFIP*
- Disaster Response
  - *FEMA*

Challenges:

- *Mortgage Discrimination is illegal*
- *Regional Risk Variance not factored in.*

Results

- *Mispriced Insurance Premiums help to subsidize property market at the expense of non-exposed communities*



Need for instruments and tools that mitigate the impact of CC

- Risk-based Pricing
- Incentivize Risk Reduction
- Finance Risk Reduction
- Micro-insurance
- Green-Loans
- *Climate-index based insurance product*

Insurance/Reinsurance

- Issue securities to public markets
- **Insurance-Linked Securities**

Public Markets

- Purchase securities
- Receive fixed income
- Benefit from '*uncorrelated*' risk

Insurance Linked Securities (ILS)
crowd-source reinsurance coverage

Types

- Embedded Value
- Extreme Mortality
- Life Settlements
- Longevity
- Reserve Funding
- Fully Collateralized Reinsurance
- **Catastrophe Bonds**

CAT bonds

Coverage for natural disasters

pay high interest rates and diversify an investor's portfolio because natural disasters occur randomly, and are not correlated with other economic risk.

Yield	5-8 %
Term	3-8 yr

Triggers	*Indemnity*	Issuer's actual losses ($)
	Modeled Loss	Issuer's projected losses ($)
	Indexed to industry loss	Industry's actual losses ($)
	Parametric	Natural hazard severity (windspeed)
	Parametric Index	Hybrid of Parametric/Modeled

Risk/Peril

Earthquakes	Multi-Peril	Mortgage Insurance
Flooding	Typhoon	
Hurricane	Extreme Mortality	

Insurance Linked Securities (ILS)

crowd-source reinsurance coverage

Side Car

- Quota Share Agreement
- Allows insurer to free up capital by taking on investors

Catastrophe Equity Puts (CAT-E-Puts)

- option to issue preferred stock at a pre-agreed price on trigger event.

Catastrophe Risk Swaps

- Agreement between two firms to exchange
- Allows insurer to free up capital by taking on investors

Industry loss warranties(ILW)

- dual-trigger reinsurance
- retention trigger based on the incurred losses of the insurer
- warranty trigger based on an industry-wide loss index

Insurance Linked Securities (ILS) – Catastrophe Bonds

<u>WB Pandemic Bond</u>

Two bonds worth a total of **$450 million**

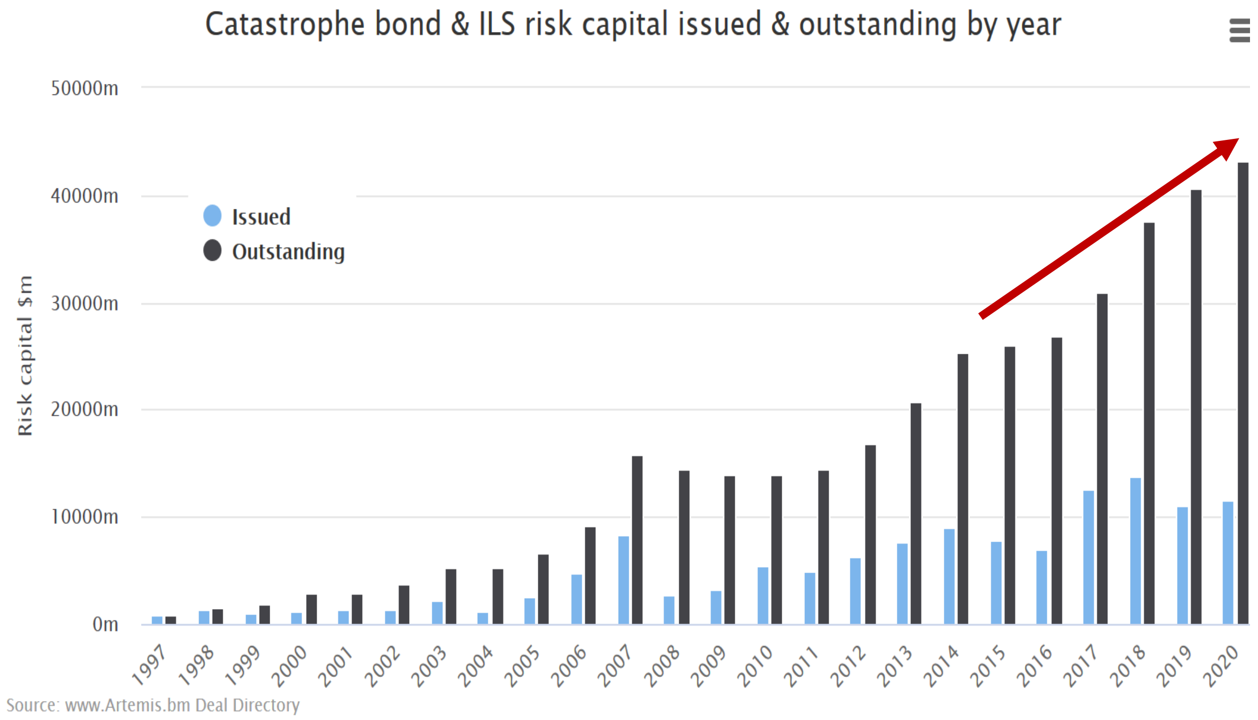
Class A : 6.5% + 6-month LIBOR

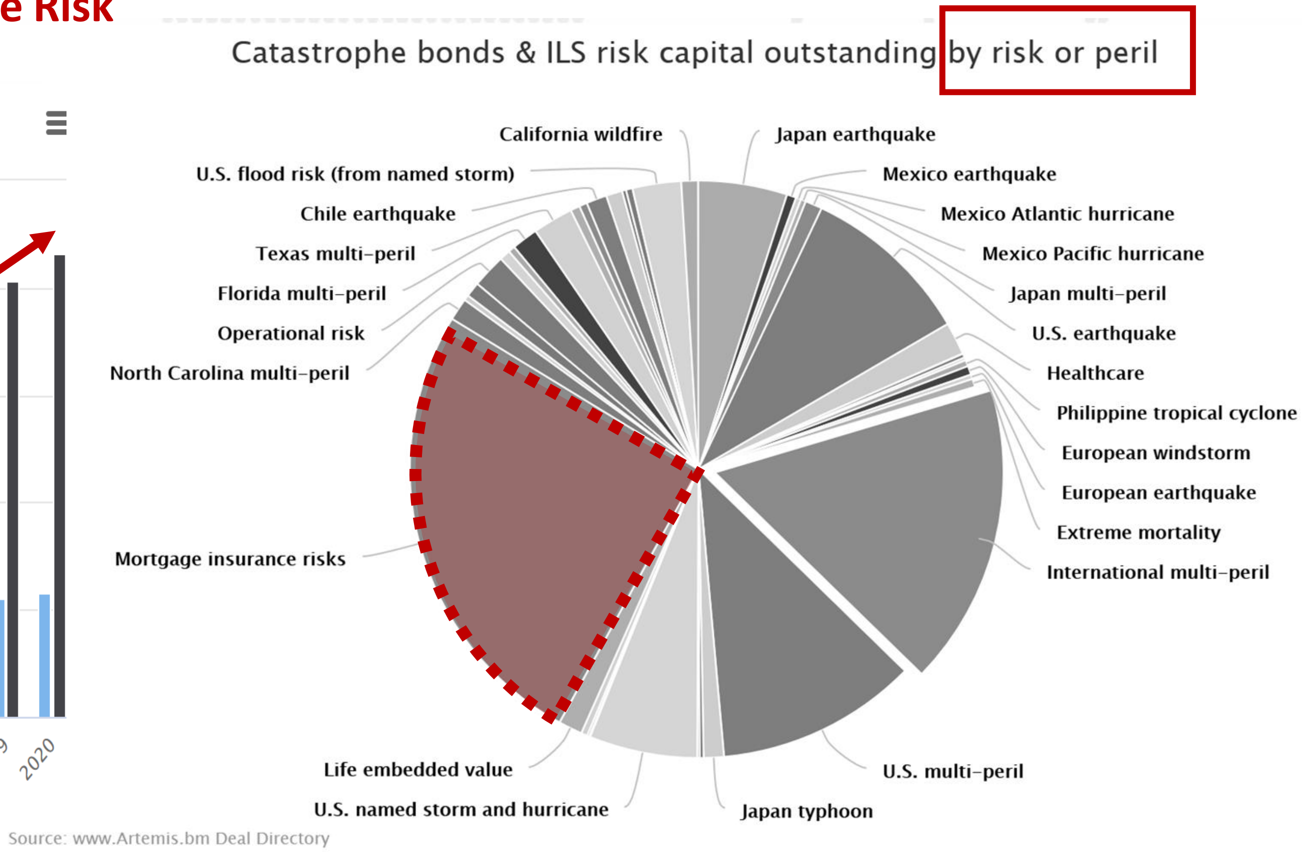
- $225 million bonds and $50 million derivatives covering Flu and Coronavirus

Class B : 11.10% + 6-month LIBOR

- $95 million bonds and $55 million swaps covering Filovirus, Coronavirus, Lassa Fever, Rift Valley Fever and Crimean Congo Hemorrhagic Feve

Insurance Linked Securities (ILS) – Mortgage Insurance Risk





~ **$11 billion** of outstanding MILN. "**117% CAGR over four years.** "

- **Enables low down payment** borrowers for homeowners
- While protecting lenders and investors against losses related to a borrower's default

Swiss Re issues first-of-its-kind bond to cover mortgage risk from earthquakes

The transaction is the first catastrophe bond with this specific use-case since the market's inception.

By **Danielle Ling** | January 15, 2020 at 12:00 AM

" $225 million parametric catastrophe bond …designed to cover mortgage default risk caused by earthquakes in California, Oregon, Washington, and South Carolina."

"underscores the potential of the capital markets in helping to reduce the hedging gap and build resilience against uninsured risks prevalent in the U.S. mortgage markets."

Green Bonds

A more productive use of capital?

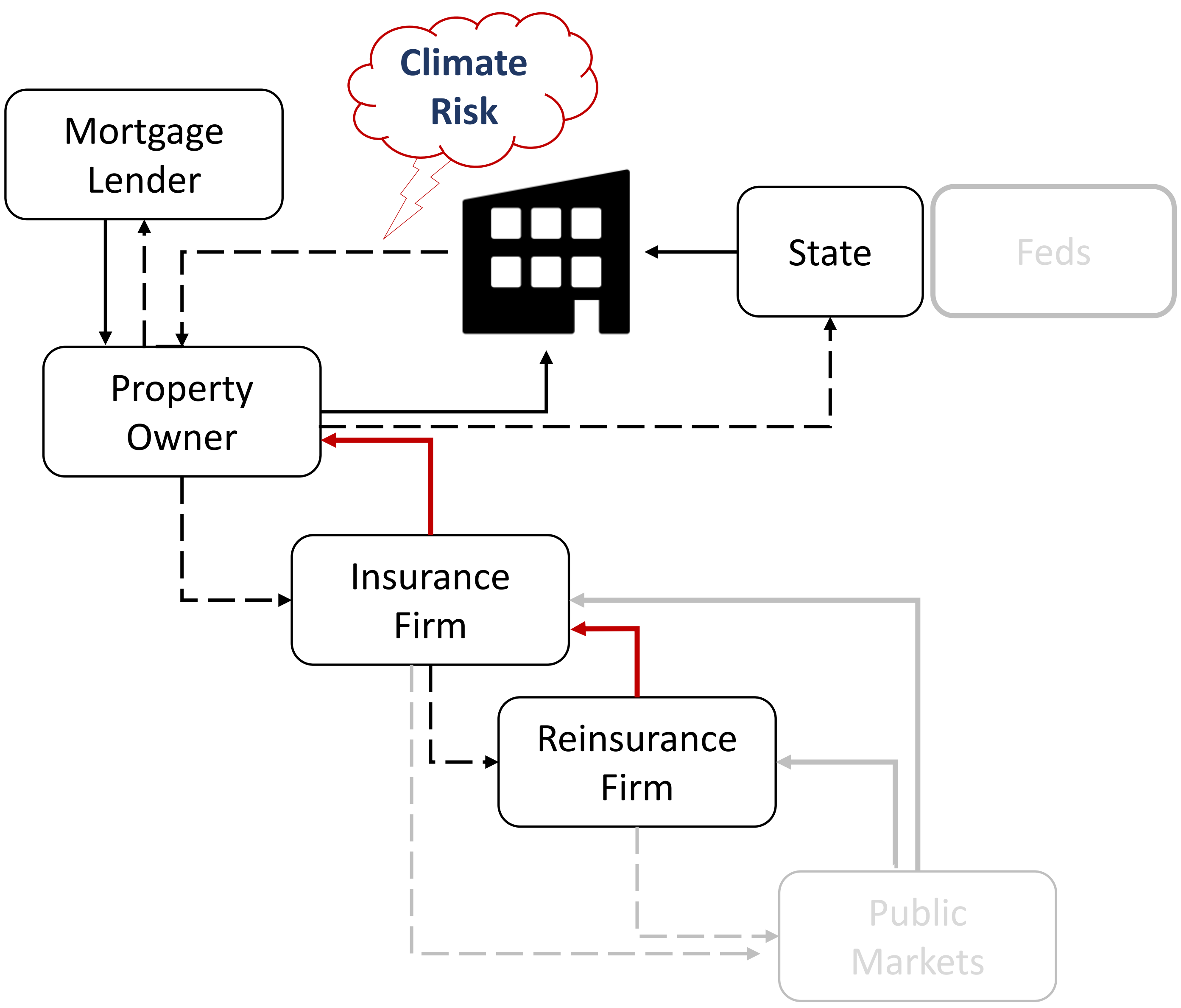
Types of green bonds

Type	***Proceeds raised by bond sale are***	***Debt recourse***	***Example***
"Use of Proceeds" Bond	Earmarked for green projects	Recourse to the issuer: same credit rating applies as issuer's other bonds	EIB "Climate Awareness Bond" (backed by EIB); Barclays Green Bond
"Use of Proceeds" Revenue Bond or ABS	Earmarked for or refinances green projects	Revenue streams from the issuers though fees, taxes etc are collateral for the debt	Hawaii State (backed by fee on electricity bills of the state utilities)
Project Bond	Ring-fenced for the specific underlying green project(s)	Recourse is only to the project's assets and balance sheet	Invenergy Wind Farm (backed by Invenergy Campo Palomas wind farm)
Securitisation (ABS) Bond	Refinance portfolios of green projects or proceeds are earmarked for green projects	Recourse is to a group of projects that have been grouped together (e.g. solar leases or green mortgages)	Tesla Energy (backed by residential solar leases); Obvion (backed by green mortgages)
Covered Bond	Earmarked for eligible projects included in the covered pool	Recourse to the issuer and, if the issuer is unable to repay the bond, to the covered pool	Berlin Hyp green Pfandbrief; Sparebank 1 Bolligkredit green covered bond
Loan	Earmarked for eligible projects or secured on eligible assets	Full recourse to the borrower(s) in the case of unsecured loans. Recourse to the collateral in the case of secured loans, but may also feature limited recourse to the borrower(s).	MEP Werke, Ivanhoe Cambridge and Natixis Assurances (DUO), OVG
Other debt instruments	Earmarked for eligible projects		Convertible Bonds or Notes, Schuldschein, Commercial Paper, Sukuk, Debentures

Thank you!

Extra

Home Sale Volume by SLR Exposure
Home Sale Volume
Normalized by 2001-2012 Average
2
1.5
1
.5
2000
2005
2010
2015
2020
year
Florida
More SLR Exposed
Less SLR Exposed



Issue: Climate Change

Insurance/Reinsurance

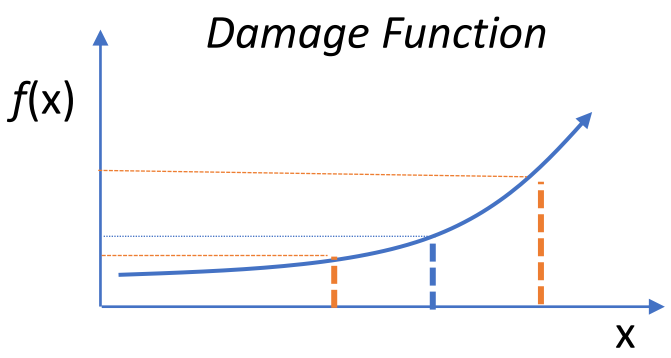
- Reprice Insurance Premium

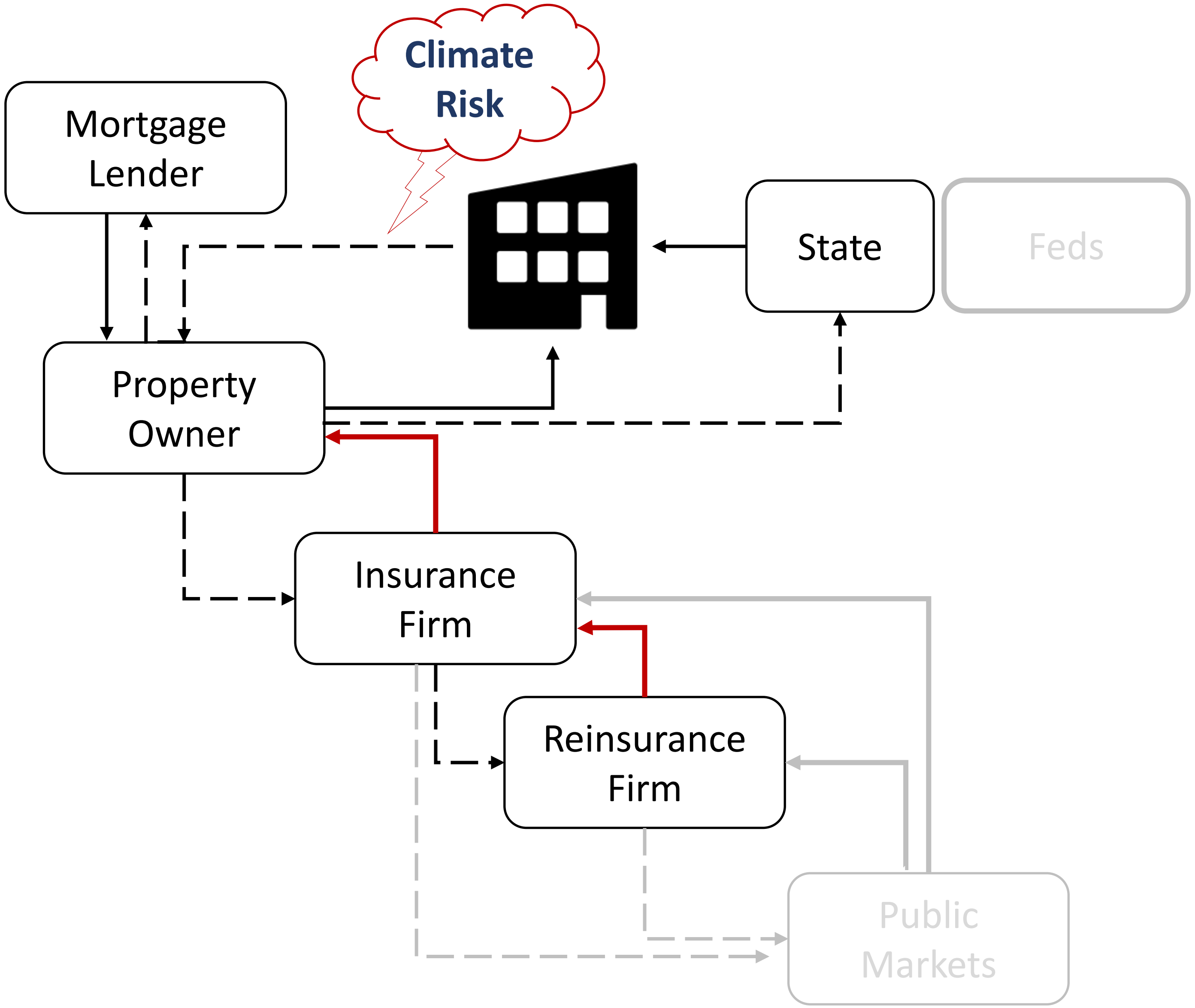
Tools

- Climate Service Technologies
- Satellite / Geospatial Data

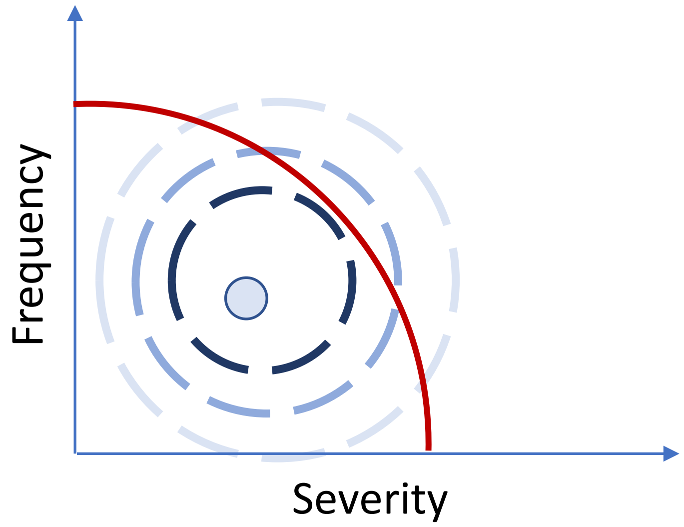
Challenge

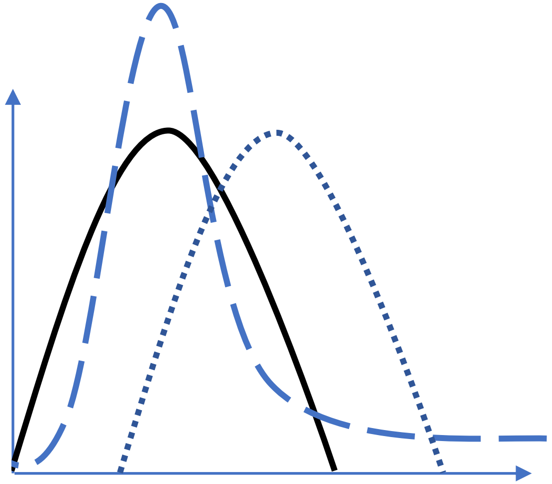
- How accurate can you really get?
- Projections are still highly uncertain

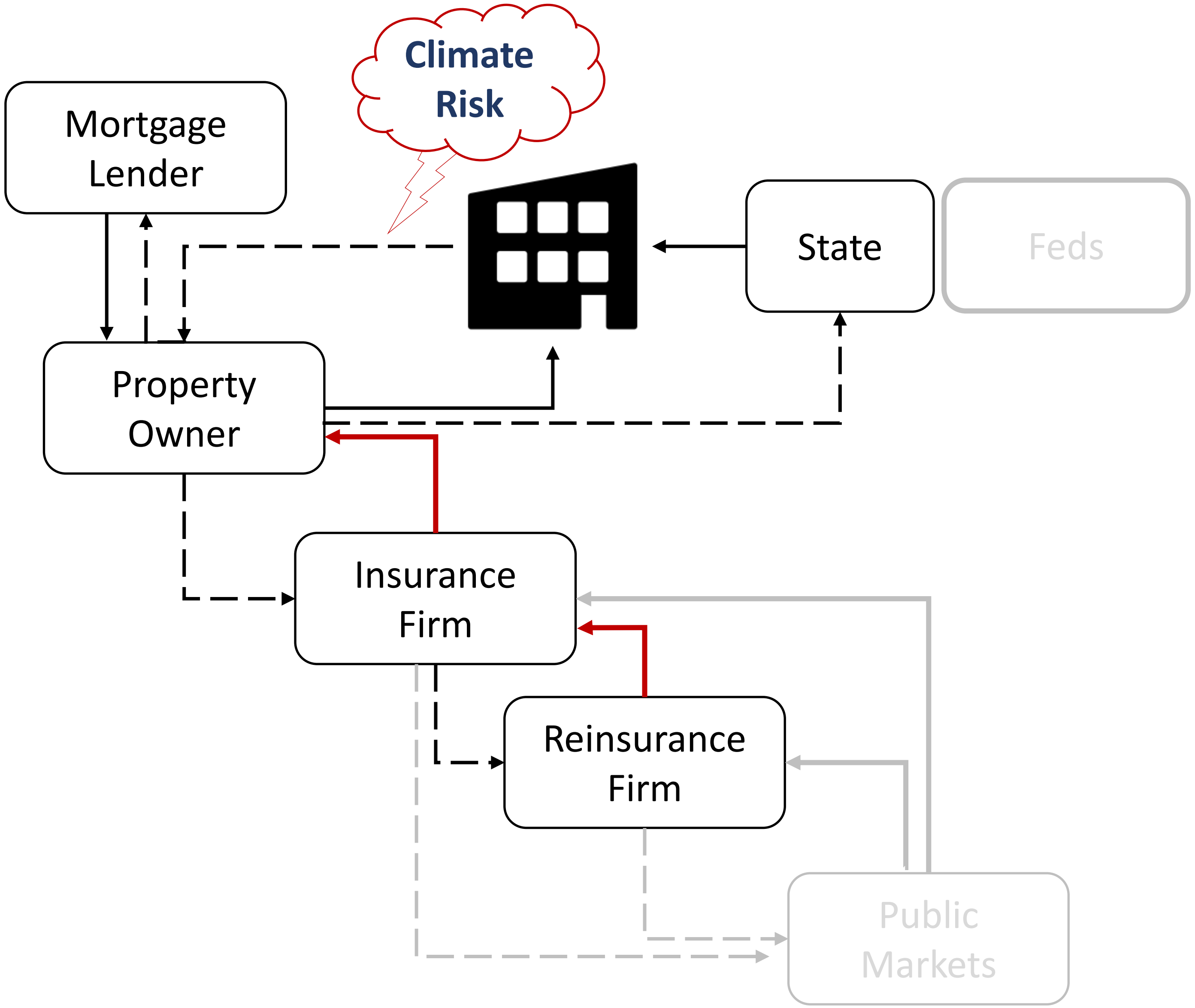




Issue: Climate Change Increasing severity and frequency of trigger events. Do we have the wrong distribution?







Issue: Expected Value, Sample Mean in Thin vs Fat-tailed Distributions

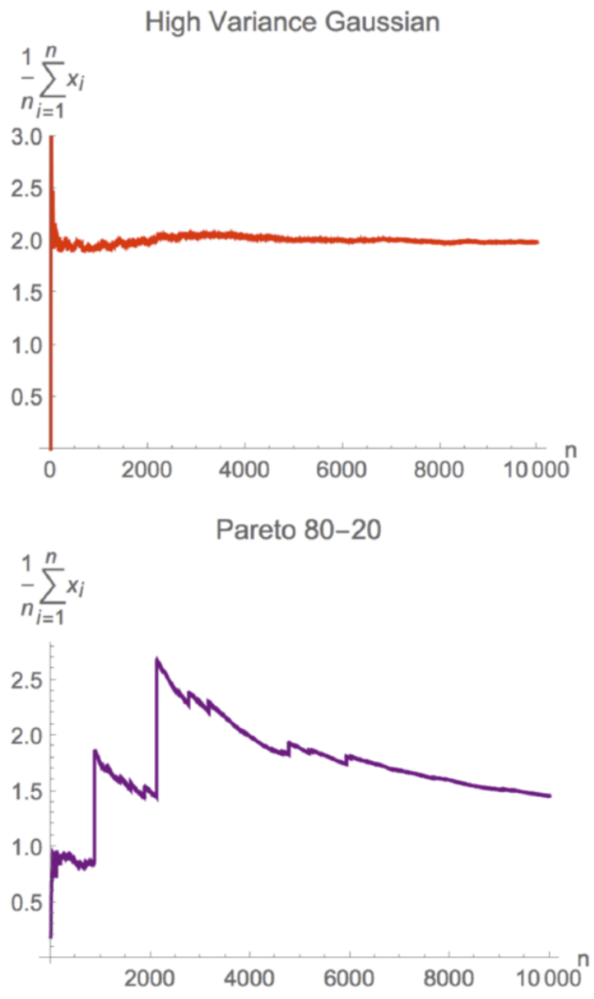


Figure 2.2: *The law of large numbers, that is how long it takes for the sample mean to stabilize, works much more slowly in Extremistan (here a Pareto distribution with 1.13 tail exponent, corresponding to the "Pareto 80-20". Both have the same mean deviation. Note that the same applies to other forms of sampling, such as portfolio theory.*