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# Insurance-Linked Securities and Cat Bonds

Alternative Risk Transfer  
Solutions and Investments

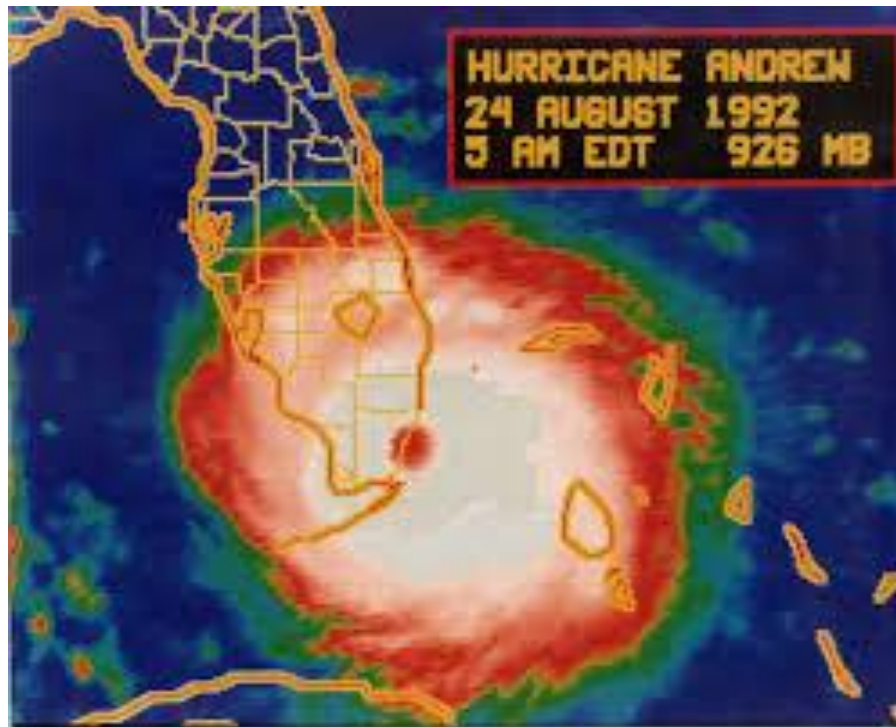
**Israel Association of Actuaries**

June 2019

Dr. Rom Aviv

# The emergence of Alternative Capital

# Hurricane Andrew - 1992



# Hurricane Andrew: Facts and Figures

- Cat 5 hurricane: 922mbar and 280km/hr winds.
- 65 Fatalities
- 25,000 homes destroyed
- 100,000 homes damaged
- Economic Loss in 1992: USD25bn
- Insurance Loss in 1992: USD15.5bn  
(with today's exposure and inflation: USD60bn)

**...16 insurance companies in Florida bankrupted...!**

*(population in Florida in 1992: 13,000,000)*

# Poor Exposure Management

“I can’t tell you how many [insurance] companies told me they were **driving street by street to count how many homes they insured because they didn’t know** – it was a free-for-all...”

Robert Reynolds of Morris & Reynolds Insurance Agency in an Interview in 2017



# Emergence of Models

“Before Andrew, insurers writing in Florida **were not looking closely at their exposure in hurricane prone regions**. It was the first cat 5 hurricane in Florida since the Labor Day Hurricane of 1935, a hiatus that gave everyone who lived there and insurance companies a false sense of security.”

“We had clients using models before Andrew but they didn’t believe the numbers because they were higher than what they thought [storms would cost]...” - Karen Clark, founder of AIR

A 2019 comment:

‘Cyber is the new property’

Niklaus Hilti, Credit-Suisse



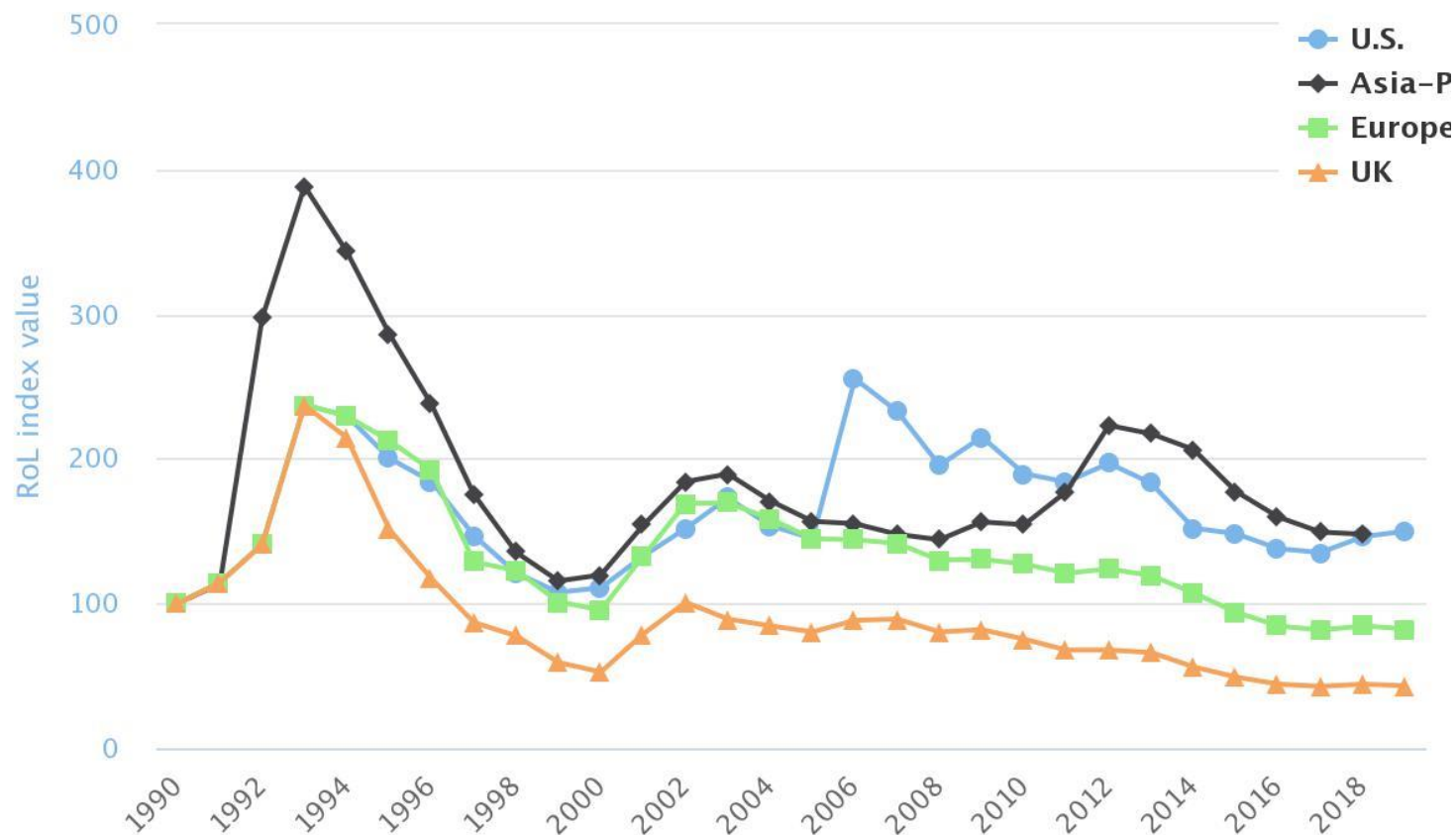
# Andrew's Immediate Consequences: Chaos

- Is pricing Adequate?
- Are hurricane models adequate?
- Is Florida a profitable region?
- Exposure Management?
- Building Codes?
- Deductibles?
- Is regulation protecting consumers?

...Risk management...?!

# Pricing

## Regional Property Catastrophe Rate-On-Line Index



Source: Data from Guy Carpenter, presented by Artemis.bm



# Insufficient Insurance and Reinsurance Capacity

Nationwide insurers wished to exit Florida

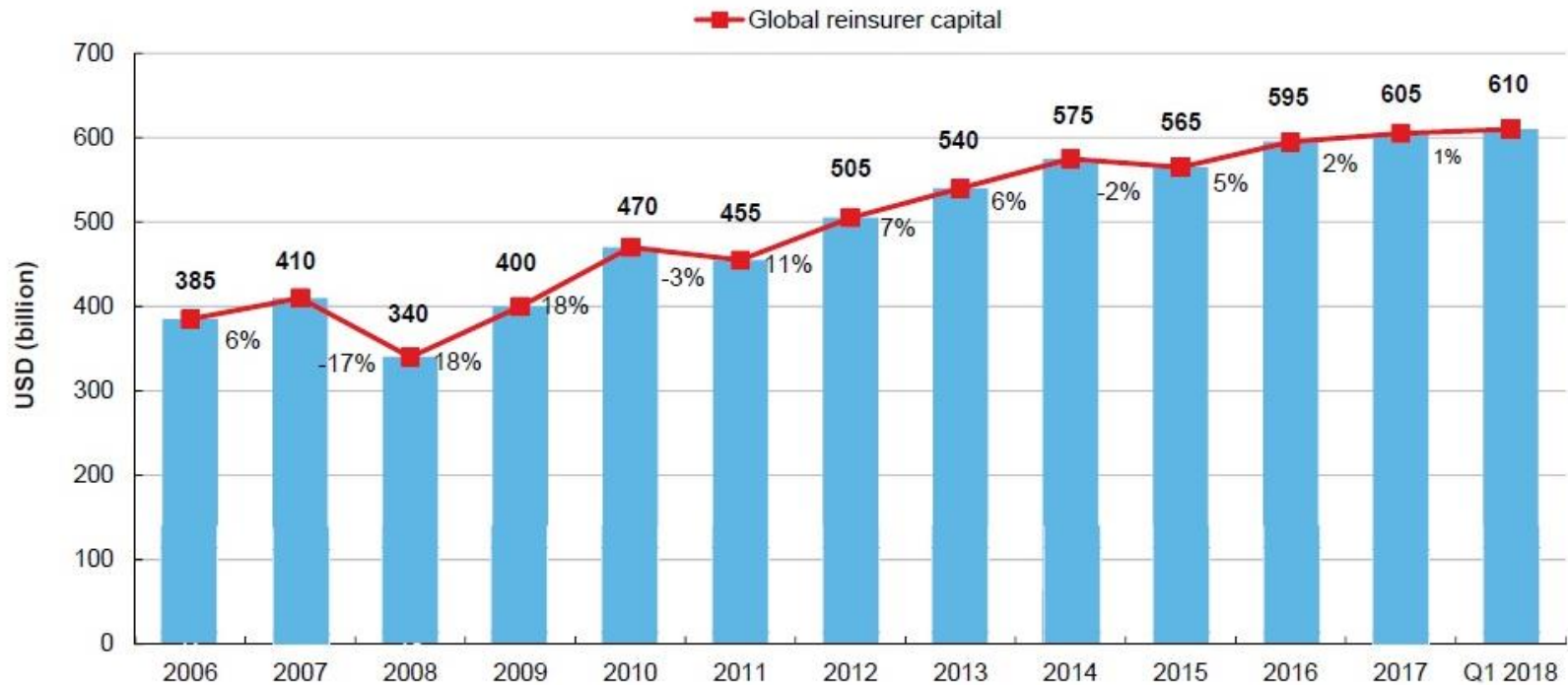
Florida Hurricane Catastrophe Fund (FHCF)

Citizens Insurance Company

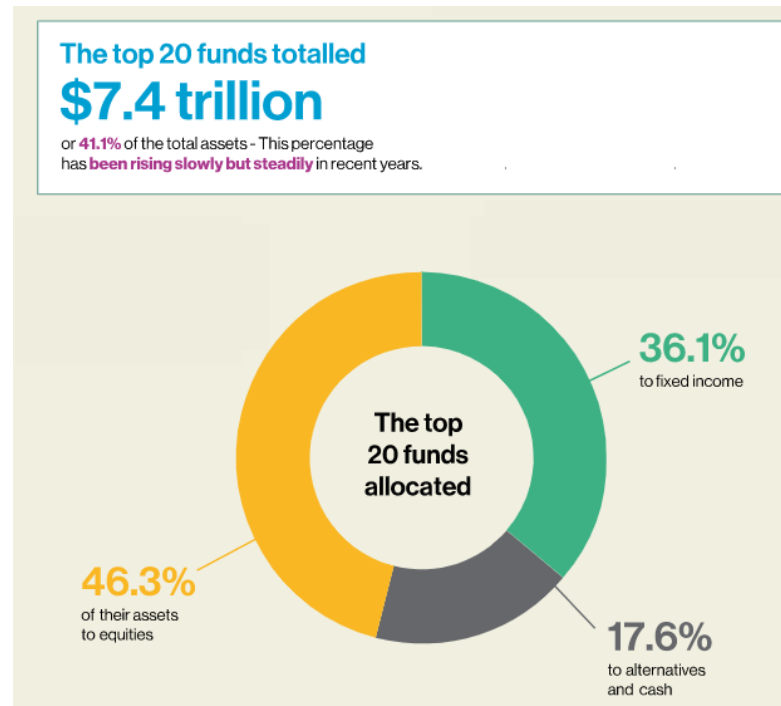
Bermuda reinsurers

**Insurance-Linked-Securities/Cat Bonds/Alternative Capital**

# The reinsurance market is large...



## But, capital markets are (much) larger



PGGM AUM: USD210bn

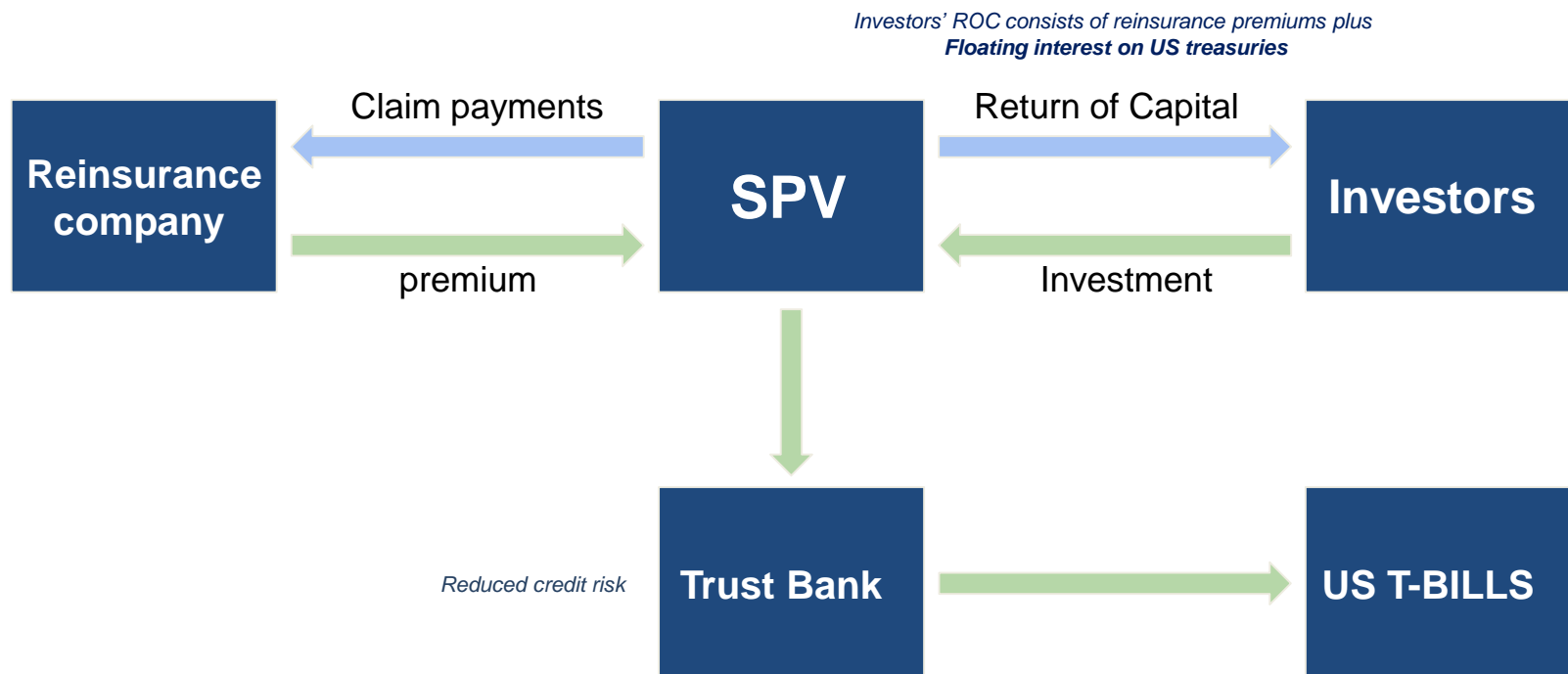
Swiss Re + Munich Re + SCOR + Hannover Re Market Cap < USD100bn

# First ILS Transactions

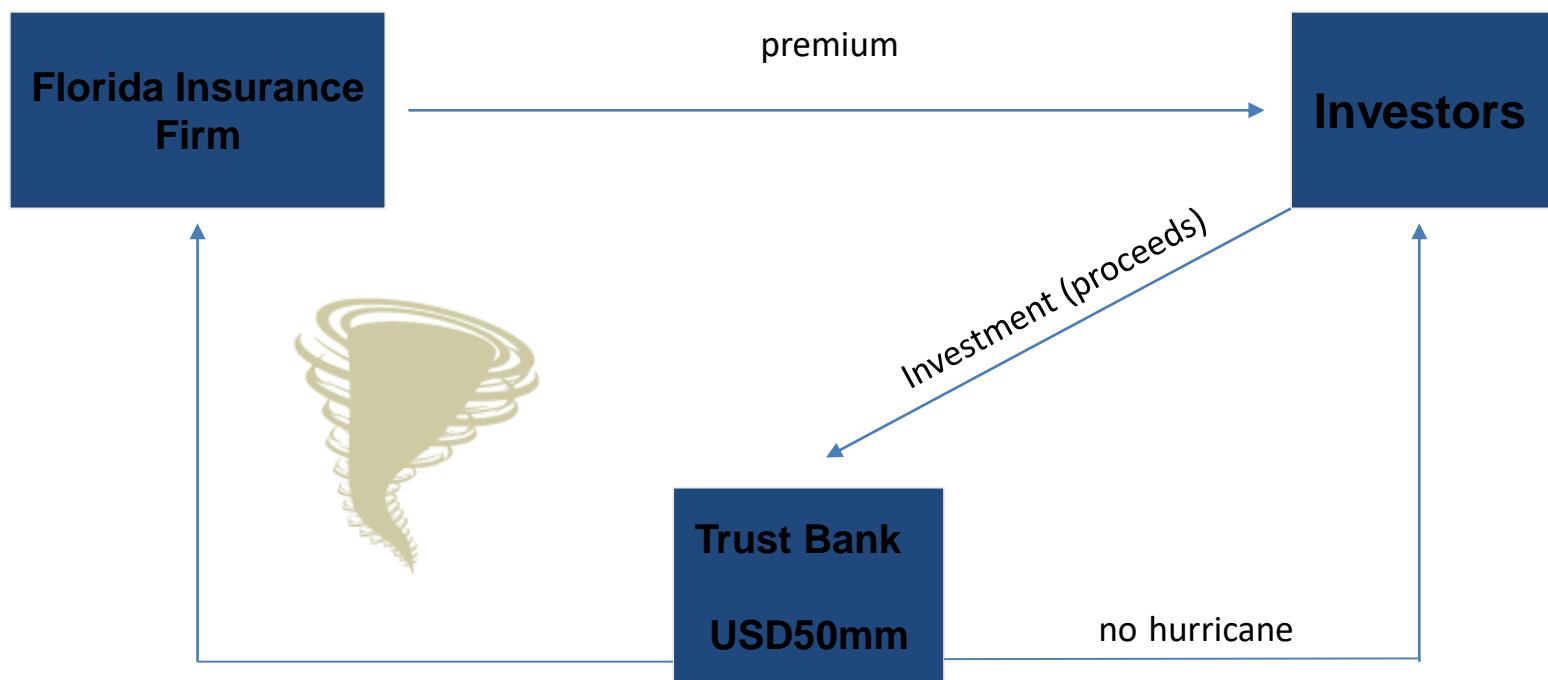
- **KOVER, 1994** by Hannover Re (securitized quota share (QS) reinsurance treaties)
- **St George Re, 1996** by St Paul Re (with the help of Goldman Sachs), structured QS with max exposure per line of business
- **Residential Re, 1997** by USAA, large USD500mm transactions covering hurricane losses with Excess of Loss Tranches

# Alternative Capital Today

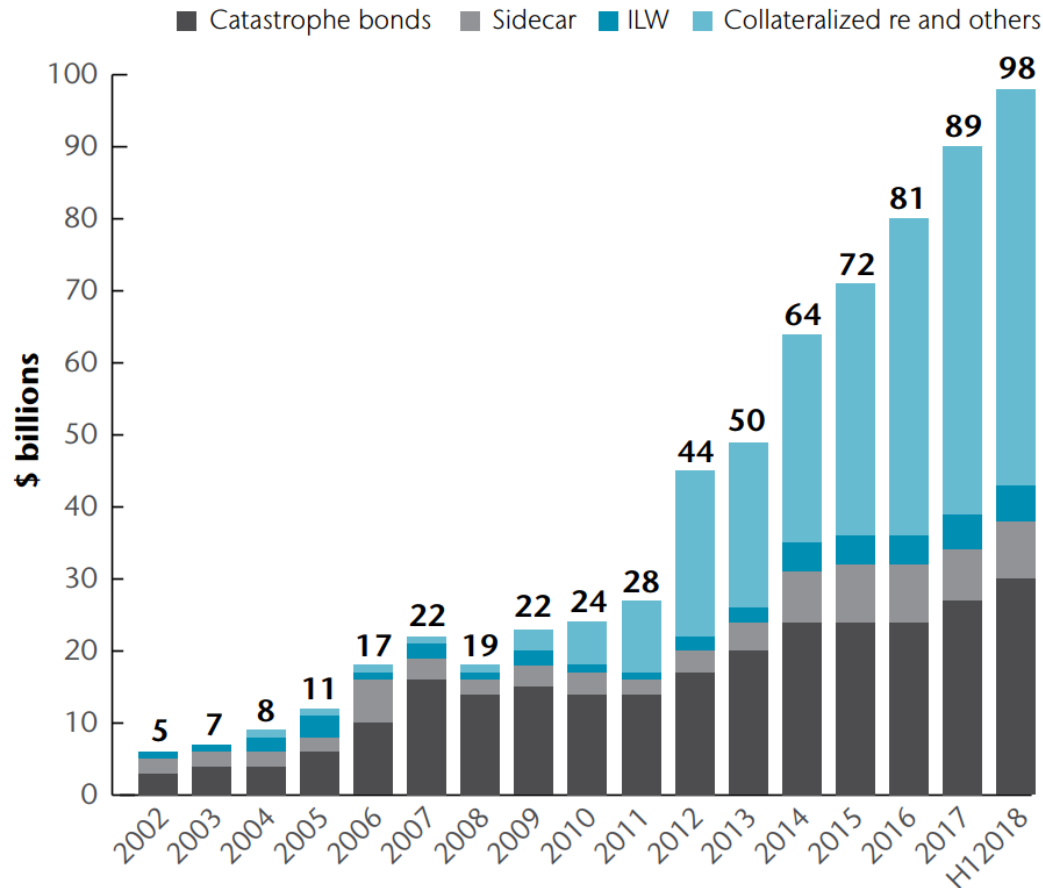
# Transaction Structure: Higher Rating than reinsurance



# Illustrative Example



# Cat Bonds: Market Size





# Why the ILS market is growing so rapidly?

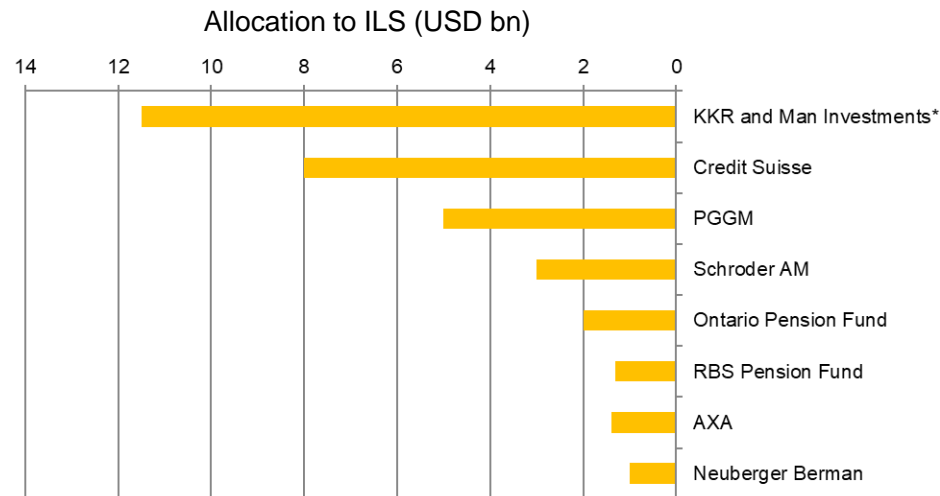
- Higher security/credit quality (AAA).
- Fully collateralized limit (no leverage).
- More secure claim management (POC for many years in).
- Multi-year Protection (3-5 years).
- Flexible structures (terms may change during transaction lifetime).
- Diversification of reinsurers' pool.
- Price Competitive
- No setup costs and broking fees until December 2021.
- Tested and proven since 1994!

## Advantage to Investors

- Low correlation
- Diversified portfolios
- Short duration underlying assets (1-3 years)
- Reduced counterparty and credit risk
- ROC has a US Treasuries floating component
- High alignment of interest with reinsurers
- Compelling target return:  $[7 - 8]\% + \text{US treasuries}$
- Price increase post 2017-2018 Nat Cat losses

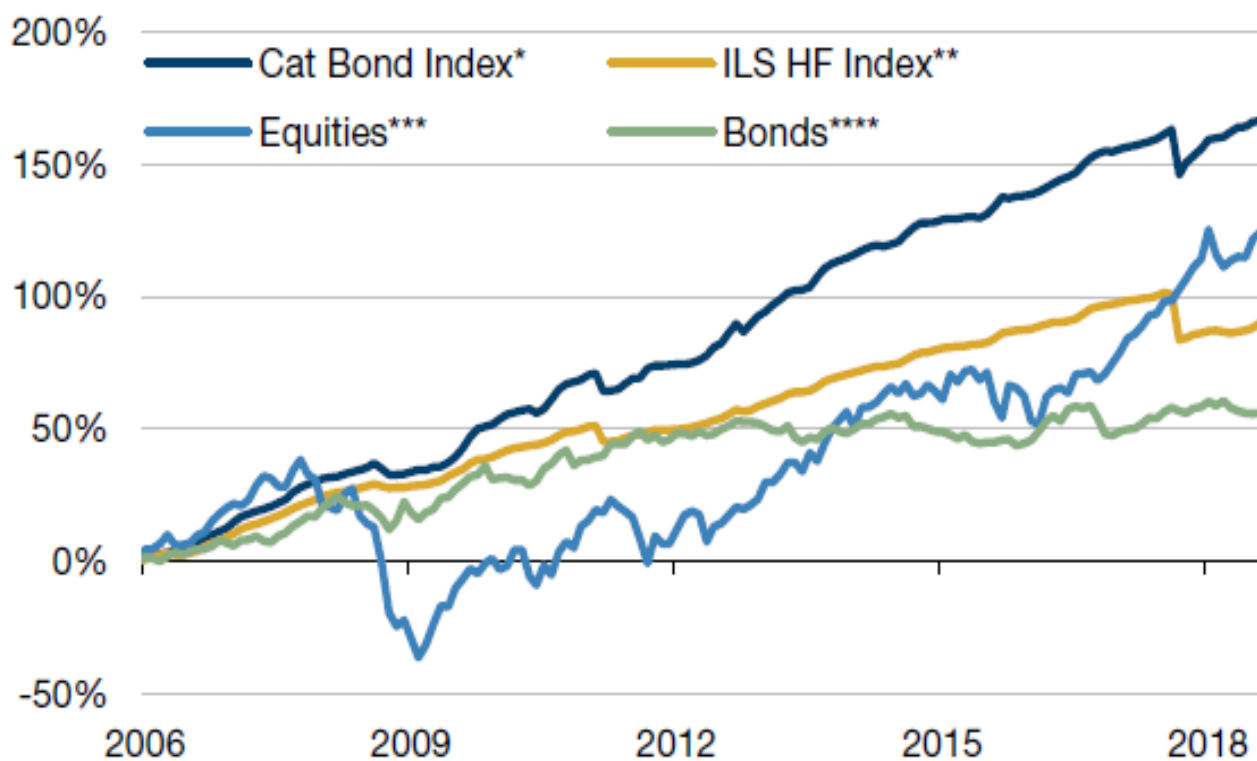
# Notable Investors

**Reinsurance Catastrophe Investments are considered attractive by some of the largest and most sophisticated Institutional Investors**



*\* Investment in ILS via holding in Nephila Capital, sold to Market in 2018*

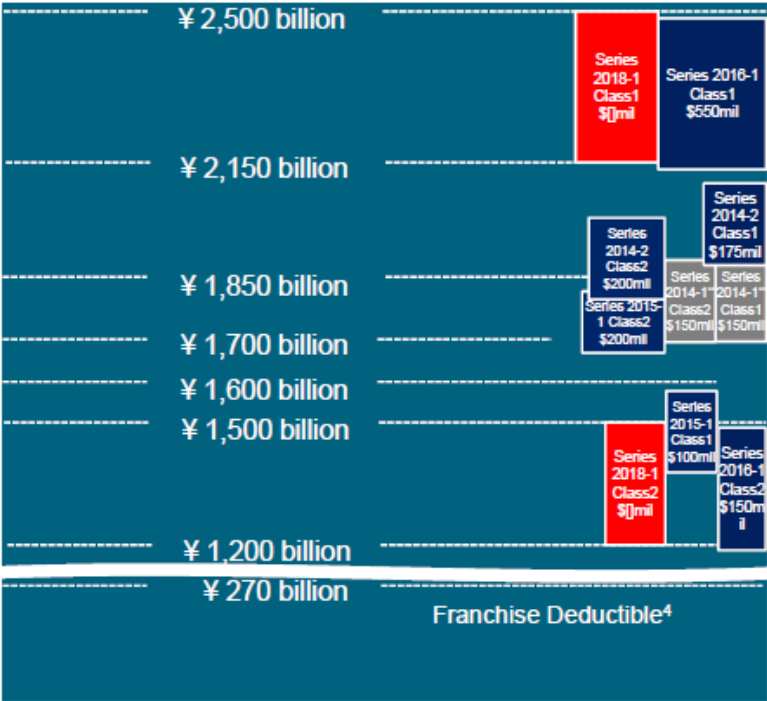
## Historically Proven Low Correlation



# *Catastrophe Risk Transfer Examples*

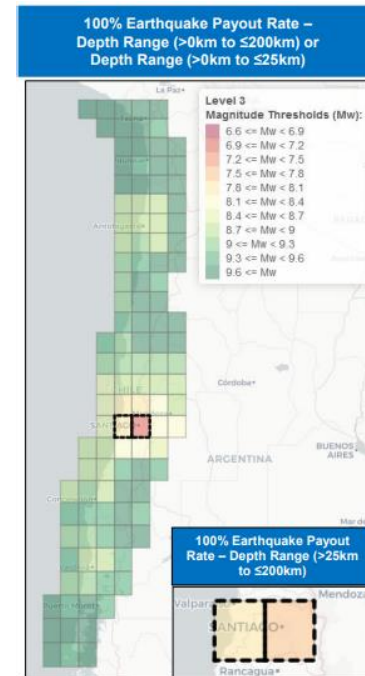
# Example: Nakama Re

Issuance Date:	June 2015
Tenor	3.5 Years
Reinsurance structure	Three Year Aggregate
Attachment Point	JPY 2,150bn
Exhaustion Point	JPY 2,500bn
Covered Peril	Earthquakes
Geography	Japan
Limit	USD500mm
ROL/Coupon	2.00%



# Example: Government of Chile Parametric Bond

Issuance Date:	February 2018
Tenor	3 Years
Reinsurance structure	Parametric Cat in a Box
Trigger	Magnitude of earthquake and depth in pre-defined polygons
Covered Peril	Earthquakes
Geography	Chile
Limit	USD500mm
ROL/Coupon	2.50%



## Parametric Bond Proof of Concept: rapid claim settlement



### Traders expect default on Mexican \$100 mln catastrophe bond on Hurricane Patricia

2 MIN READ

*“...Roman Muraviev, head of catastrophe bonds at fund manager Twelve Capital, said traders had marked the bond as low as 0-10 cents on Friday in expectation of a default...”*

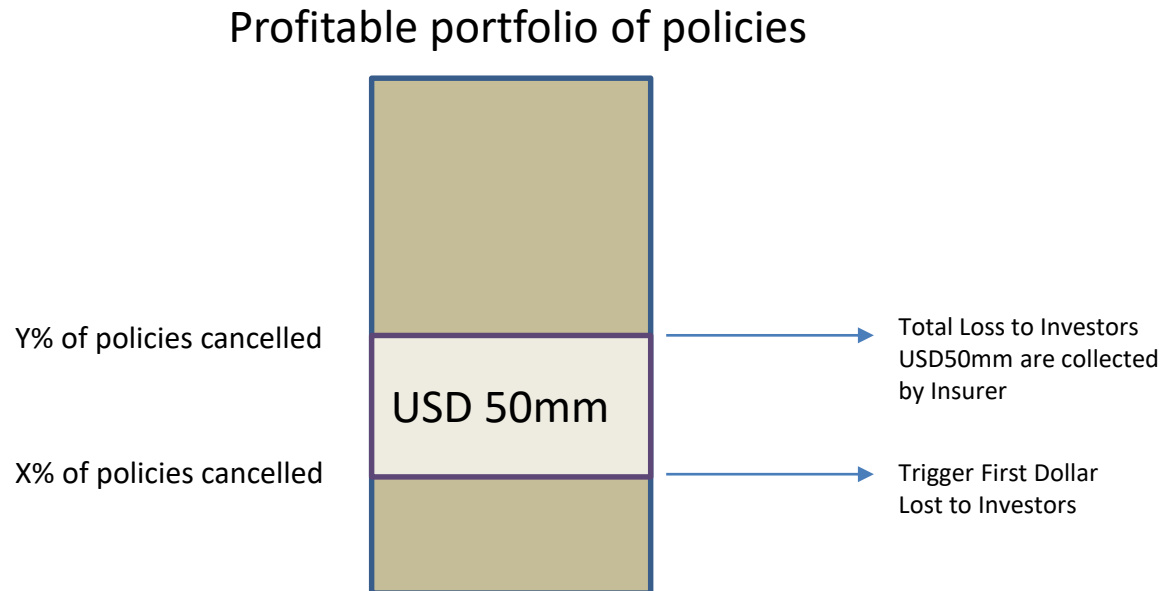
<https://www.reuters.com/article/hurricane-patricia-bond-default-idUSL8N12Q3LO20151026>

In 2017-2018 the ILS Investors paid claims amounting to USD c. USD7-10bn



## *Capital Relief and Solvency II motivated trades*

# Mass Lapse Risk Transfer



Transaction Tenor: 1-5 years

Expected Rating: AAA

Capital relief depends on trigger and exhaustion percentages

*Publicly known examples (2016): ASR Nederland (Netherlands) and Storebrand (Norway)*

## **Further (more complex and dynamic) Solutions:**

Lapse down risk (fewer lapses than expected)

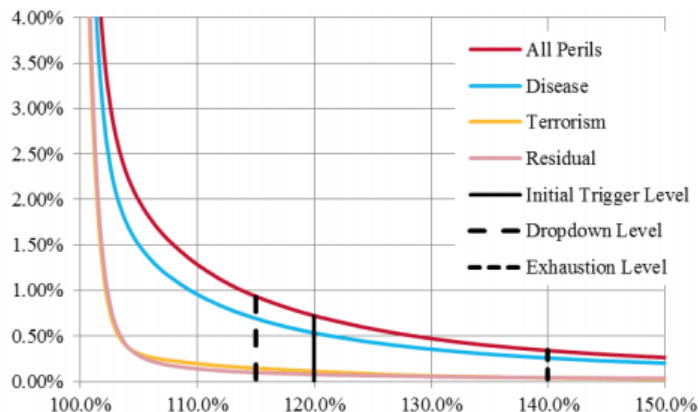
Lapse up risk (more lapses than expected)

# Extreme Mortality Risk Transfer

- Provide protection against extreme mortality events, e.g. pandemics
- Trigger points for payout linked to published mortality indices
- Pay out if mortality based on index on indemnity (e.g. two year rolling average) exceeds trigger point
- Issued in several risk layers
- Tailored to approximate issuer's risk exposure (weighting of index by age-group , gender, country)

## Example: Extreme Mortality Transaction

Exceedance Probability	All Perils	Disease	Terrorism	Residual
0.05%	360.0%	290.0%	134.5%	132.5%
0.10%	220.0%	193.5%	122.5%	114.7%
0.50%	129.0%	121.5%	103.4%	103.5%
1.00%	113.9%	109.5%	102.3%	102.4%
2.00%	105.0%	103.3%	101.5%	101.6%
5.00%	101.4%	101.1%	100.7%	100.7%
10.00%	100.4%	100.2%	100.0%	100.0%



Investors can accommodate broad range of risk hedges:  
Terrorism, Diseases, natural disasters and other

Coupon payment a year: 2.00%

# Longevity

- UK longevity reserves are c. USD1.3trn
- Reinsurance annual capacity for longevity is USD40-50bn
- **New sources of capital are required to tackle the problem**
- Solutions?
  - Indemnity for a block of business with commutation
  - Index transactions (based public mortality updates)
  - Challenge: tenor, tenor and tenor (20 Years).

## ***Transaction Example: a Dutch Insurer***

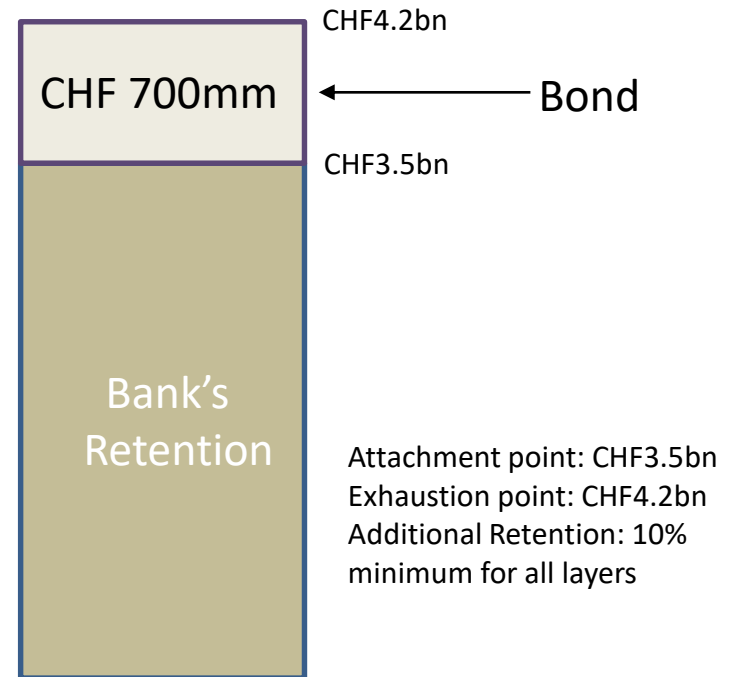
*A 20-year derivative, hedging the insurance company against a longevity increase between an out-of-the-money attachment point and the 1-in-200 years solvency stress level detachment point*

*Exotic examples:  
creativity and flexibility*

# Operational Risk Transfer, 2016 & 2018

## Cover included:

- cyber risk exposures
- fraudulent behavior
- fiduciary issues;
- improper business practices or unauthorized activity;
- accounting errors;
- documentation errors;
- regulatory compliance issues;
- HR issues;
- discrimination in the workplace;
- even personal injury.



Regulatory Arbitrage - Basel III motivated risk transfer

# Swiss Re Dual Trigger, 2013

- Swiss Solvency Test (SST) numbers fall below 135% -> Full Loss
- 1 in 200 YR Hurricane (USD143bn loss) -> Full Loss
- 32 year 7 non-call bond
- Issuance Size: CHF175mm
- Coupon 7.50%



# Cyber: Dear CEO...



*“The PRA expects that all Solvency II firms robustly assess and actively manage their insurance products with specific consideration to non-affirmative cyber risk exposures. This includes all property and casualty (P&C) covers which could give rise to cyber risk exposure from physical and non-physical damage.”*

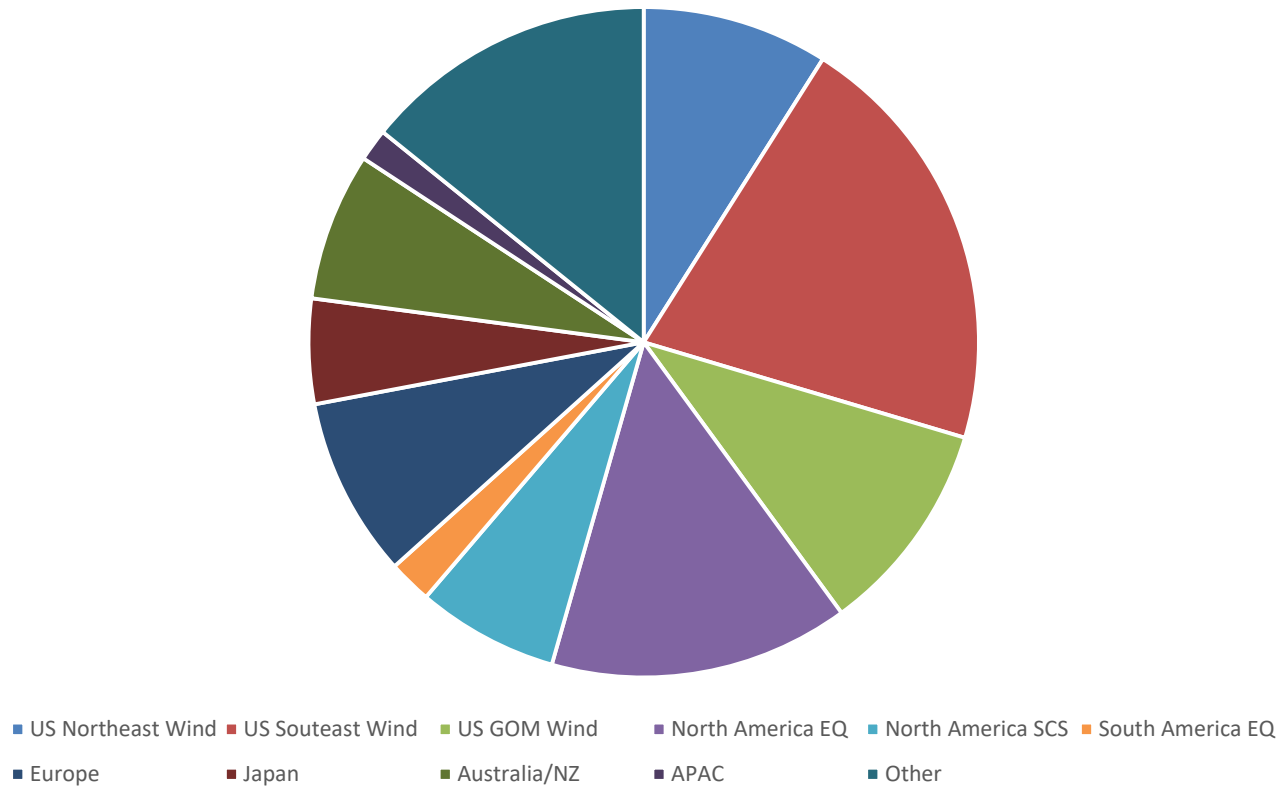
**‘Firms within Property, Marine, Aviation and Transport (MAT), and Miscellaneous lines estimated their exposure to non-affirmative cyber risk on these lines to be anywhere **between zero and the full limits.**’**

**“[] launches cyber industry loss warranty (ILW) product...”**

# *Investment Opportunity for Israeli Insurers*

# Nat Cat ILS portfolio example

## Contribution to Annual Average Loss per Peril



# Uncorrelated Investment Opportunity : Optimal Capital Allocation

- Short maturity (1-3 years)
- Floating US interest (reduced interest rate risk)
- Close to zero correlation both to assets and liabilities
- Look through reporting (if provided)



**Solvency II efficiency:**  
**Potentially compelling ratio of expected return to capital charge.**

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תודה רבה!

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