

# Rethinking the Role of Index Insurance

## *Accessing Markets for the Poor*

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FARMd  
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Special Thanks to GlobalAgRisk Team!

# GlobalAgRisk, Inc.



- Mission

*Improve access to financial services and the value chain for the rural poor through innovative approaches for transferring weather risk*

- Activities
  - Research and development tied to University of Kentucky research program
  - Technical capacity building
  - Educational outreach
- Supported by
  - Multinational donors
  - Governments
  - Nongovernment organizations
- Select Country Work
  - **Peru – El Niño/Flood**
  - **Mongolia – Livestock**
  - **Vietnam – Flood/Drought**
  - **Indonesia – Earthquakes**
  - Mali – Drought
  - Morocco – Drought
  - Mexico – Drought
  - Romania – Drought
  - Ethiopia – Drought

# My disclosure

- GlobalAgRisk support
  - Bill and Melinda Gates Foundation
  - Ford Foundation
  - Gov't of Mongolia via Swiss Trust Fund
  - UNDP
  - GiZ
  - Risk Management Agency of USDA
    - Actuary and Underwriting Reviews

# State of Knowledge Reports from GlobalAgRisk

Supported by Bill and Melinda Gates Foundation

Innovation in Catastrophic Weather Insurance to Improve the Livelihoods of Rural Households

- March 2010
  - “Data Requirements for the Design of Weather Index Insurance.”
- March 2011
  - “Market Development for Weather Index Insurance Key Considerations for Sustainability and Scale Up.”
- Under Revision:
  - “Legal Considerations for Index Insurance”
- Forthcoming:
  - Bringing all of the work together in a single volume

# Designing Sustainable and Scalable Weather Index Insurance Programs Is Challenging

- Products must be developed in context
  - Costly (technical support, capacity building, R&D)
  - Not easily replicable
- Basis risk
  - Tradeoff between transaction costs and basis risk
- Limited or no data to develop products
- High delivery costs
- Small transactions/Small market volume
- Nascent legal and regulatory systems

# How to Improve Access to Catastrophic Weather Insurance? Our Experience Suggests . . .

- Index insurance is best suited for catastrophic and consequential losses
- Index insurance that addresses weather risk of firms that serve the poor (risk aggregators) presents a feasible avenue for market growth; build a sustainable market first and then move to micro products
- Household products must find innovative delivery mechanisms to improve product affordability and offer value to clients (insurance-linked products)
- Solutions that involve public-private partnerships must clearly delineate the role for markets and the role for government
  - Understanding cognitive failure for extreme risk can help
  - Risk layering – Putting catastrophic insurance into a broader conceptual framework

# Market Development Process

## *Important – Reach Scale Quickly*

- To reach scale quickly, target risk aggregators first
- Introducing products with potential for significant scale engages the interest of key stakeholders (e.g., insurer, insurance regulator, global reinsurer) to provide input and services that are appropriate for longer-term sustainability
- Pilot projects that sell a few hundred policies to small households (small insured value) are often viewed as experimental and are less likely to receive the same attention

# Risk Aggregator Products Are Less Costly to Develop and Implement than Household Products

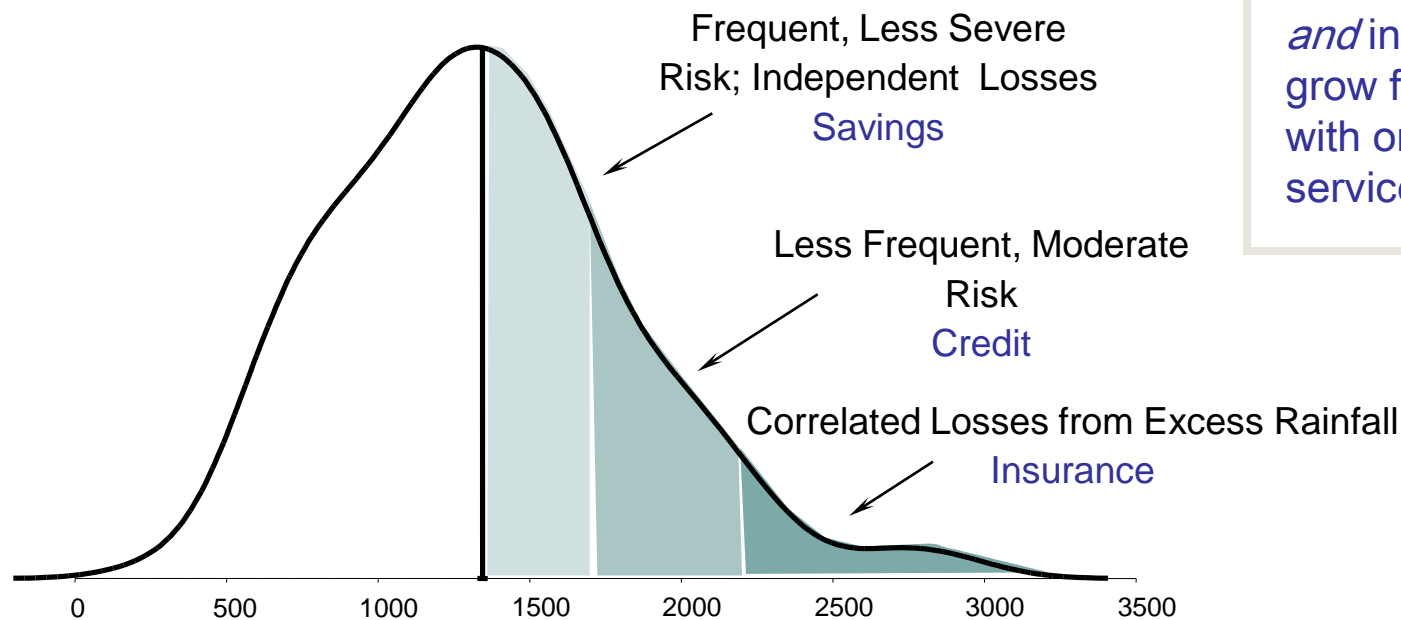
- Risk aggregator products face lower basis risk
  - Risk aggregators effectively diversify much of the idiosyncratic risks born by their clients
  - Data constraints are less binding for risk aggregator products
- It is more cost effective for the insurer to establish a partnership with a risk aggregator than to market and distribute products to small holders
- Risk aggregators are more likely to understand hedging and basis risk



# Financial Services and Correlated Weather Risk

Financial services are complementary — A blend of savings, credit, and insurance is likely most effective for risk management

- Savings and credit best for small to moderate losses
- Insurance is best for catastrophic losses



Economies with banking *and* insurance markets grow faster than those with only banking services

Insurance is expensive — Focus must be catastrophic risk

# El Niño Insurance for Flood *Innovation in Northern Peru*

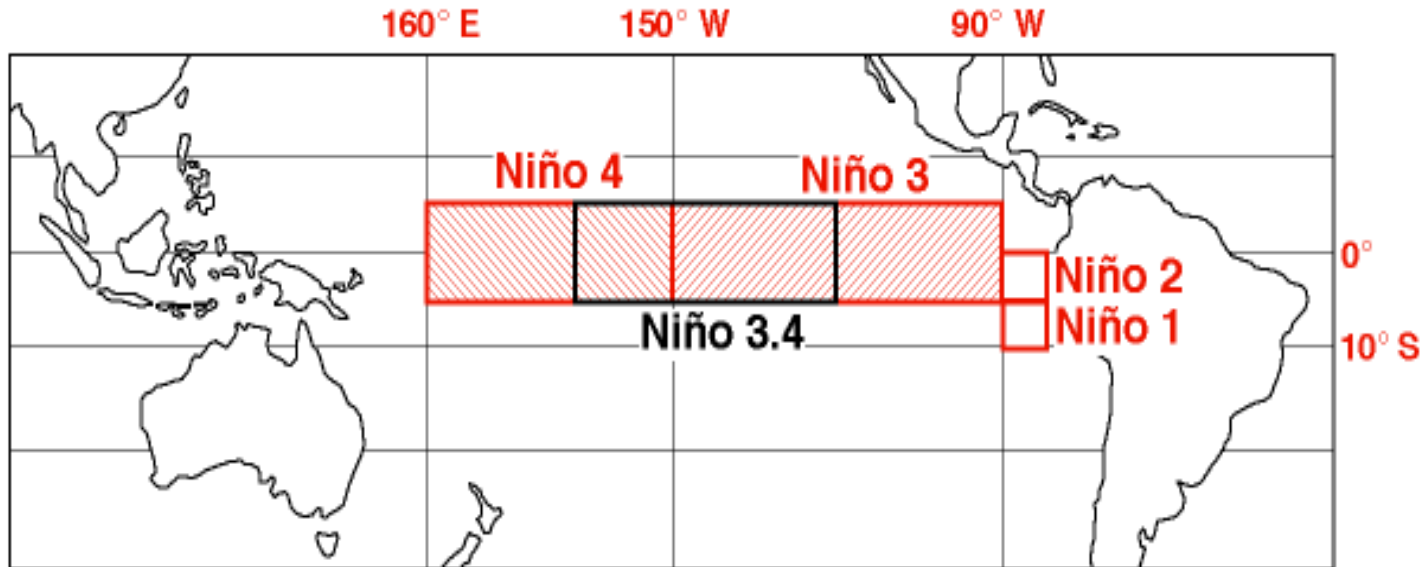


# Piura and other areas in the North *Severely affected by 1998 El Niño*



- ▶ Extreme rains (Jan – Apr 1998)
  - ▶ 40x normal rainfall
- ▶ Severe floods
  - ▶ 41x normal river volume
- Widespread losses
  - Many disrupted markets
  - Agricultural production, ↓ 1/3
  - Public infrastructure losses
  - Cash-flow, debt repayment problems
  - Health problems
- Total losses in Piura estimated at USD 200 million

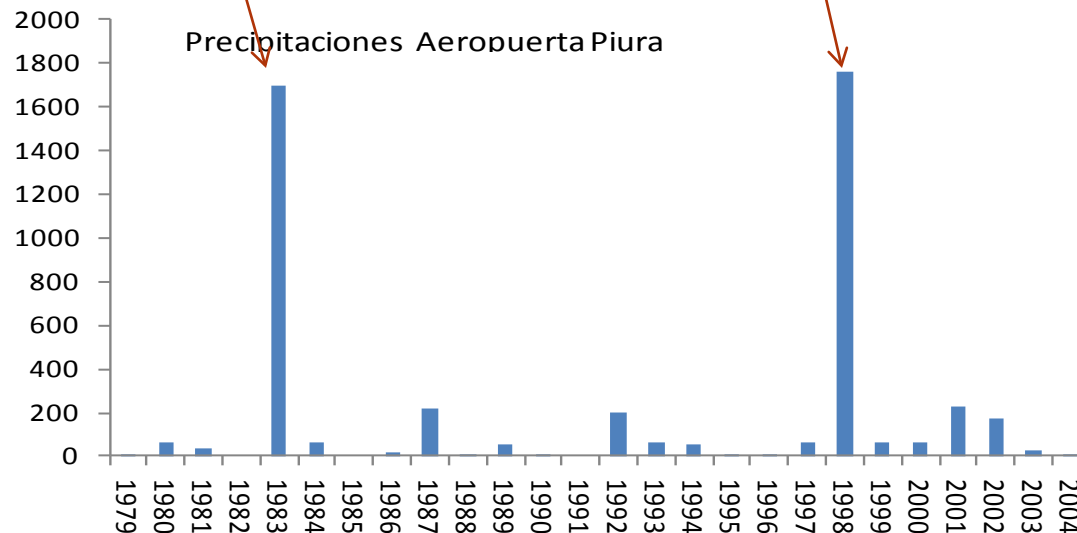
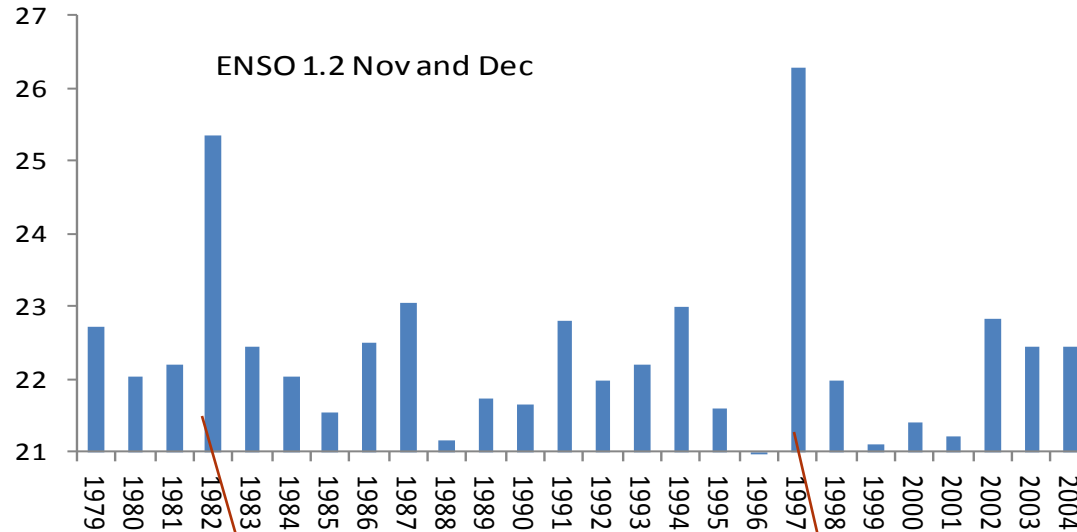
# Contract is Written Using NOAA Data

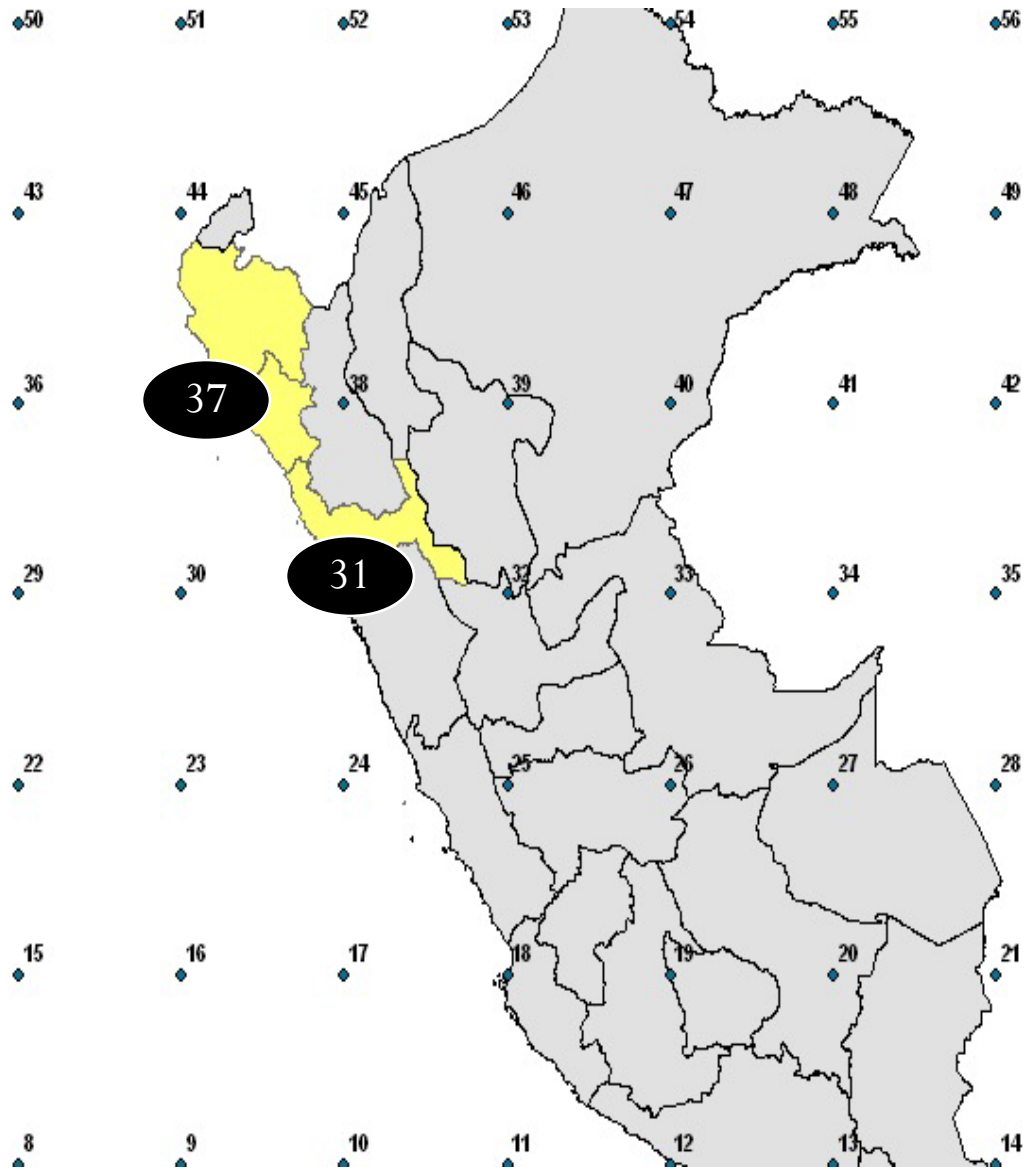


- Niño estimates are derived from satellite data, observations of buoys and readings of the temperature on the surface and at deeper levels.
- The data are publicly available monthly from NOAA (The U.S. National Oceanic and Atmospheric Administration)
- <http://www.cdc.noaa.gov/Correlation/nina1.data>

# Strong El Niño in 1982-83 and 1997-98

2 extreme events in the last 32 years





# Correlation Matrix for top 10 percentile El Niños

Correlation Matrix				
	South	North	ENSO1.	ENSO3
South	100%	90%	92%	89%
North		100%	90%	90%
ENSO1.2			100%	100%
ENSO3				100%

## Using Information from Nino 3 in November

- Contract pays *Before* the disaster
- Written as a contingent claims contract
- Payout rates with a contract that starts paying at 26.5 and pays 100% at 29 degrees
  - 1997 – 82%
  - 1983 – 45%
  - 1972 – 24%



## Example of a Payout from the 1997 Event

- Nino 1.2 (Nov-Dec) temperature = 26.28° C

$$\frac{26.28 - 24}{27 - 24} = 76\% \text{ tipo de pago}$$

$$\text{Pago del Seguro} = \text{Monto Asegurado} * \frac{\text{Índice ENSO} - \text{Índice Dispirador Minimo}}{\text{Índice Disparador Maximo} - \text{Índice Dispirador Minimo}}$$

Minimum payment = 5%

The insured selects the sum insured

Sum insured = 10,000,000 Soles

1998 payment = 76% x 10,000,000 = 760,000 Soles

# Primary Goal:

## Improve Access to and Terms of Loans

- Capacity building with
  - Financial institutions
  - Peruvian banking regulator
  - Peruvian credit rating agencies
  - Sources of social capital flows into Peruvian Institutions

### Case to be made

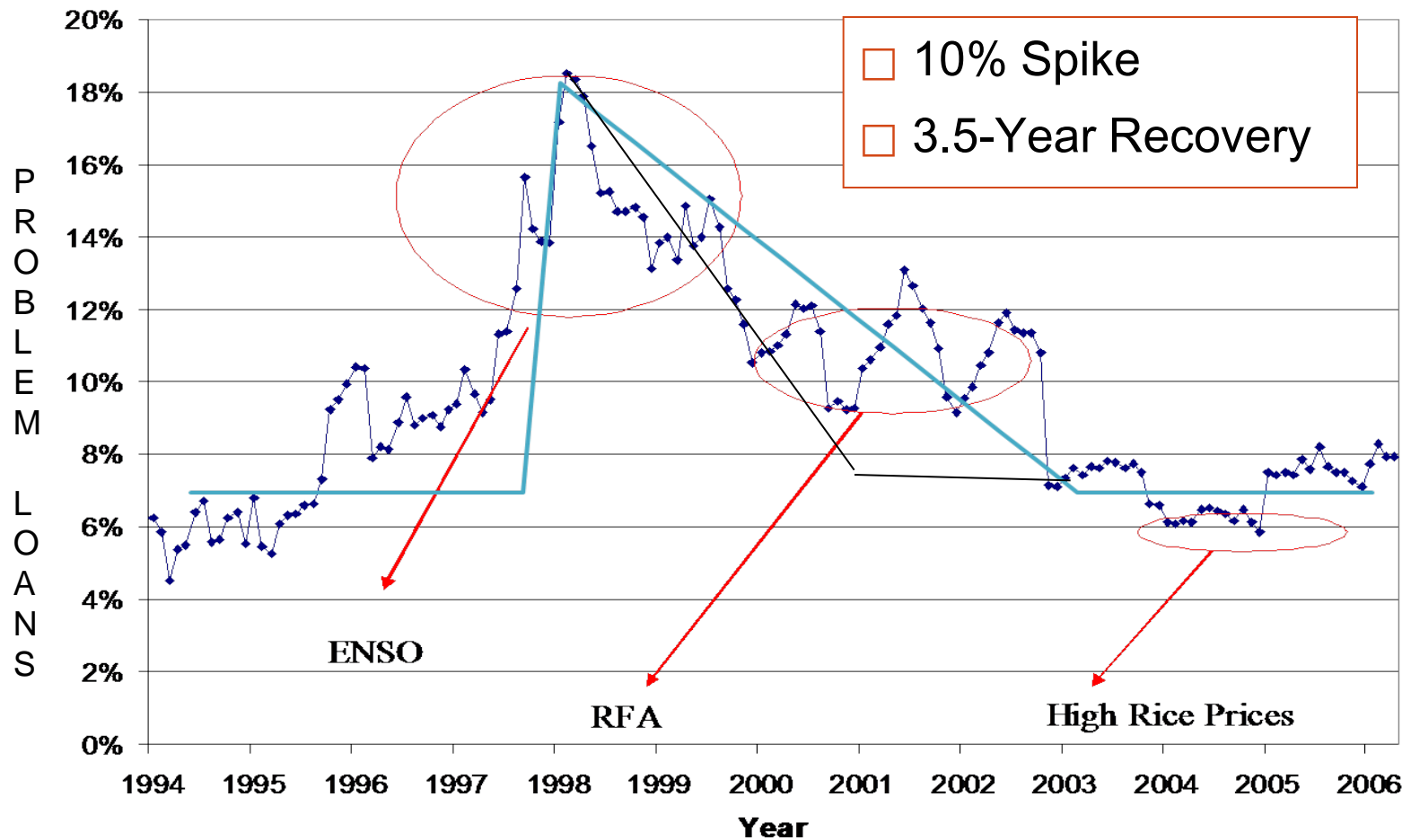
- 1) Strengthen the resiliency of the financial institution
- 2) Financial institution can be ready to lend when the community needs capital the most – post disaster

# Risk Aggregator Strategy

## *Natural Disaster Effects on Banking*

- Loan portfolio — Systemic repayment problems for borrowers, problems can remain for years
- Deposits — Depositors withdraw funds
- Costs increase — Costs of funds (e.g., Interbank loans), administrative costs
- Resulting problems
  - Liquidity
  - Profitability
  - Capital Adequacy
- Lending institutions have many ways of managing these risks (e.g., Provisions, restructuring loans, etc.)

# 1997-1998 El Niño Spike and Recovery



With this event every 1 in 15 years, 300 basis points must be added

# Default Risk Significantly Affects Interest Rates!

$$\pi = p(1+i)L - (1+r)L \qquad i = \frac{1+r}{p} - 1$$

$\pi$  – Expected profits

$p$  – Exogenous probability of non-default

$i$  – Interest rate

$r$  – Lender's opportunity costs

$L$  – Amount of funds loaned

Example (No default risk)

$$r = 10\%$$

$$p = 100\%$$

$$i = \frac{1 + 0.10}{1} - 1 = 0.10$$

Example (10% default risk)

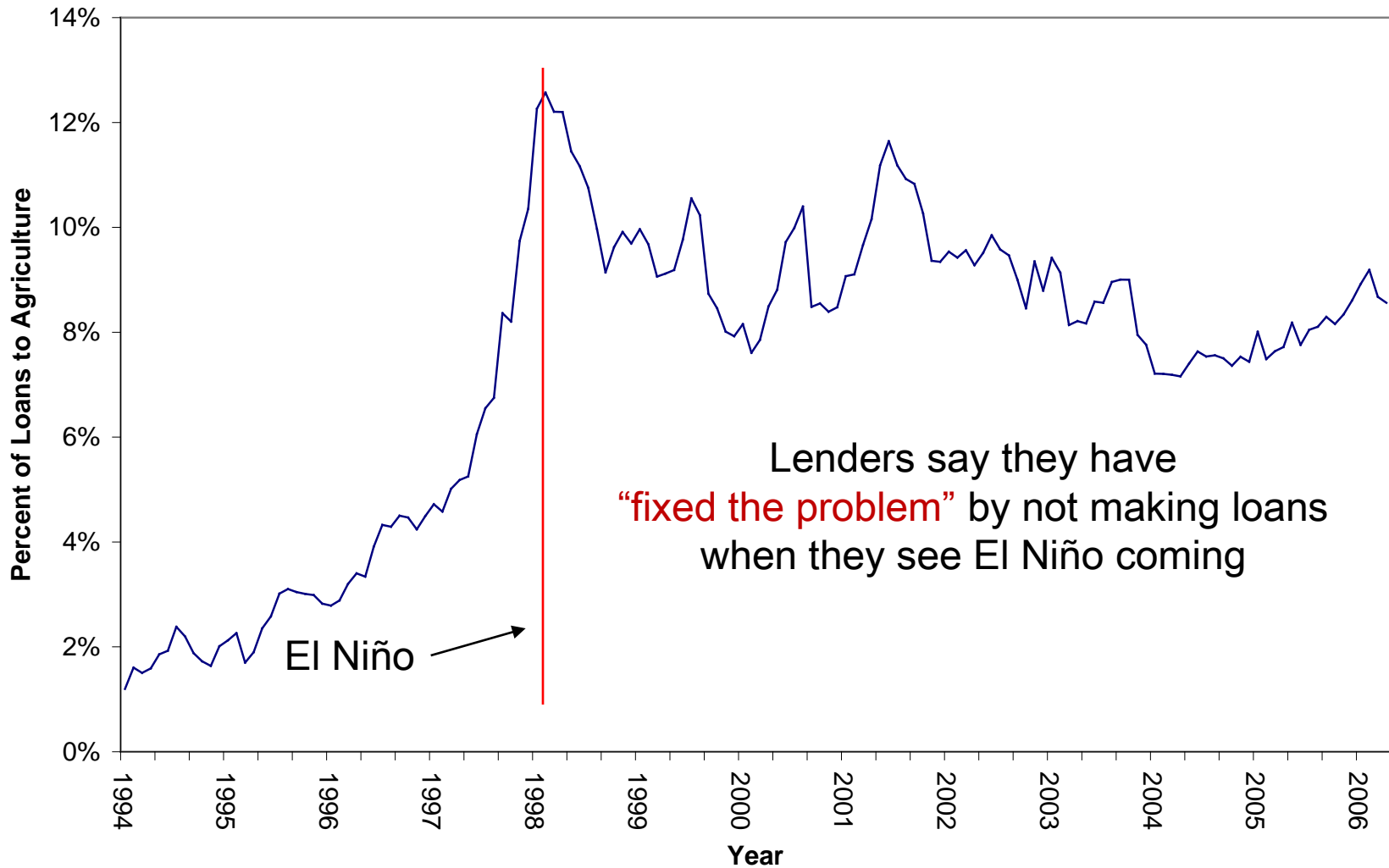
$$r = 10\%$$

$$p = 90\%$$

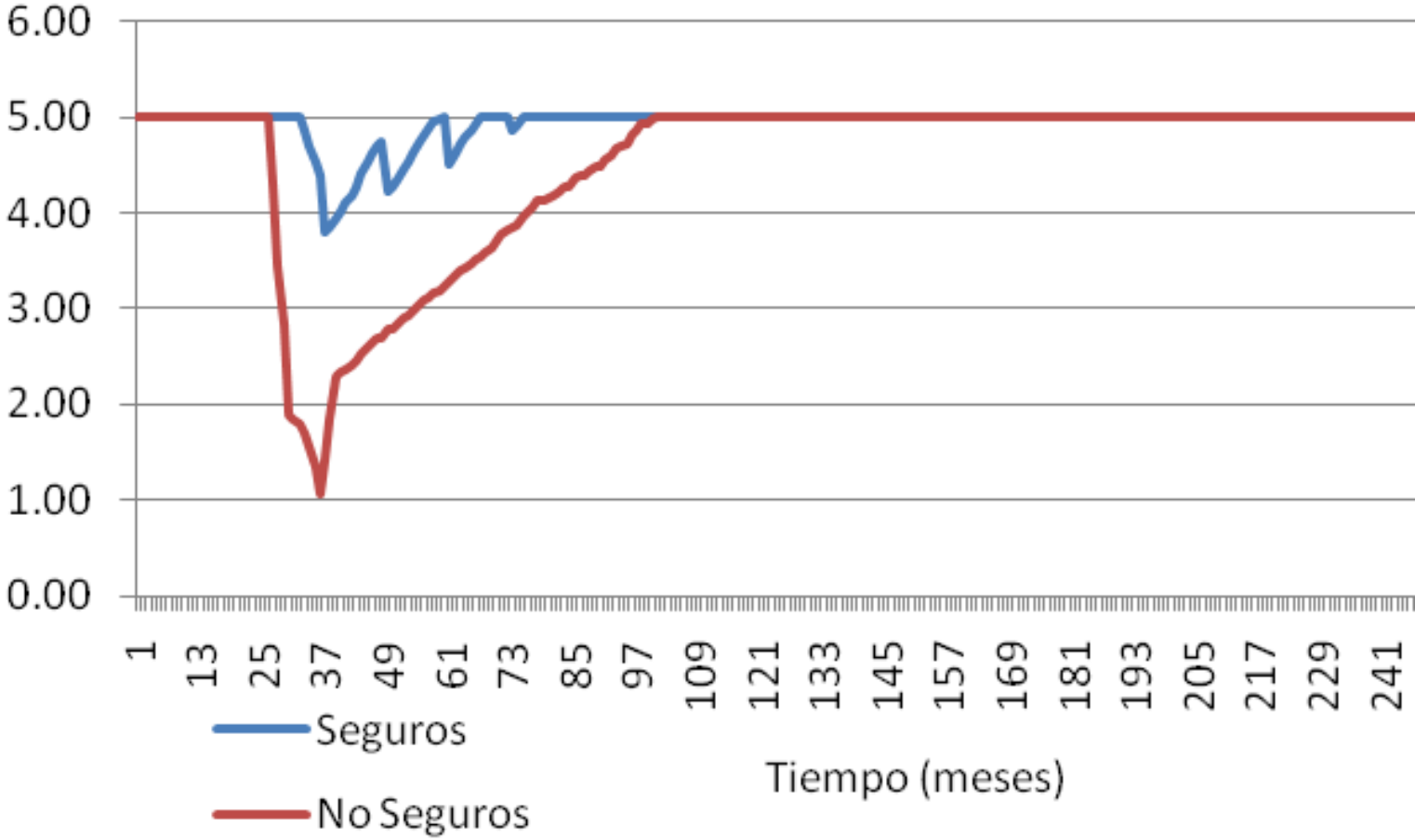
$$i = \frac{1 + 0.10}{0.90} - 1 = 0.22$$

El Nino may add 300 basis points to interest rates

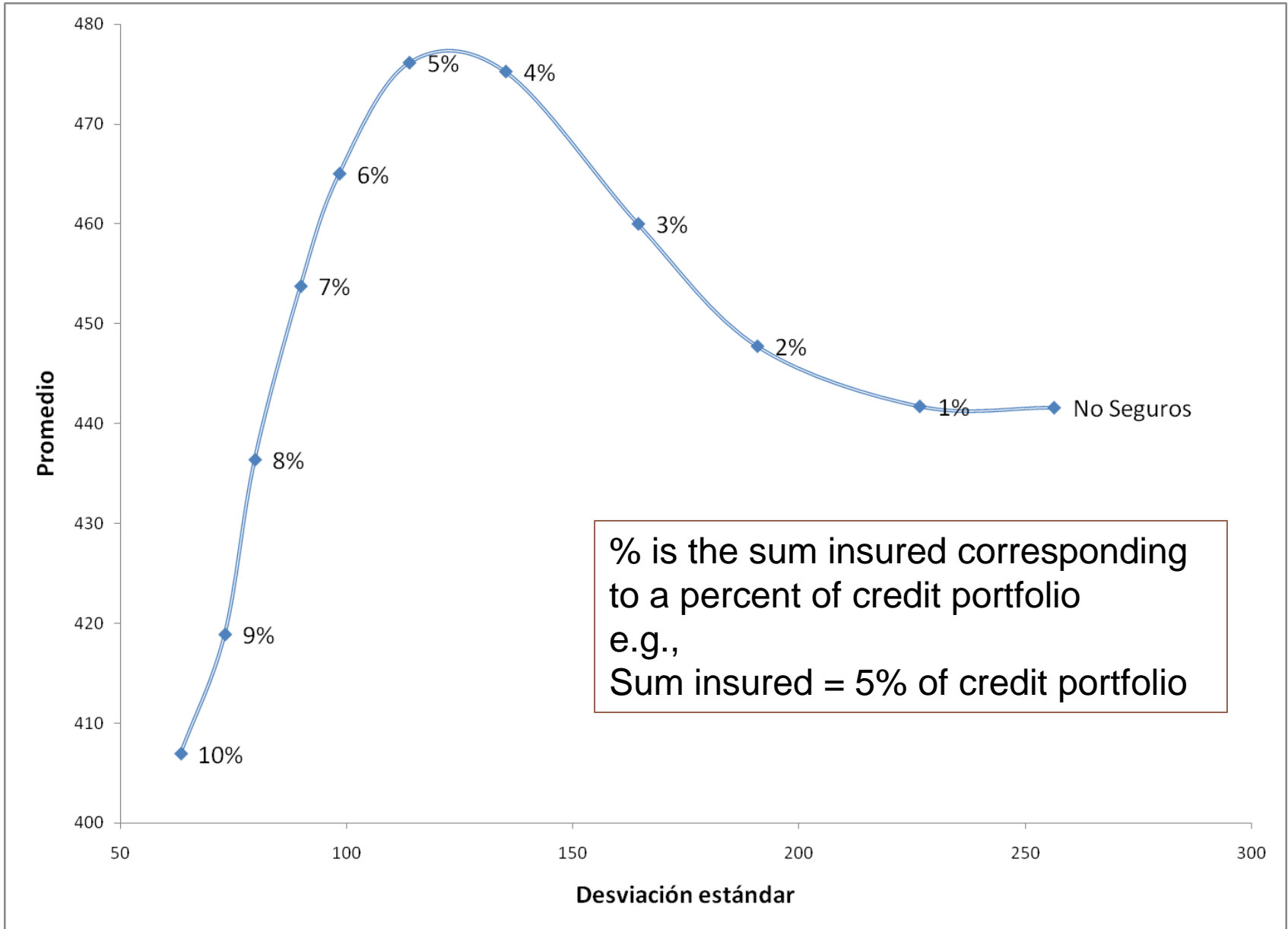
# Historical Pattern of Agricultural Lending in Piura 1994-2006



# El Niño Reduces Capital Adequacy and the Ability to Leverage and Make Profits



# Comparison of Sum Insureds using Monte Carlo





# Risk Assessment Includes Evaluating Current Risk Management Strategies

- Potential strategies for managing these risks and their costs
- Liquidity → Hold higher portion of assets in cash
  - **Effect** — Reduces investment in productive assets
- Profitability → Avoid exposed regions and sectors
  - **Effect** — Limits growth opportunities, especially for untapped markets
- Capital adequacy → Leverage a lower amount of equity to provide a “cushion” for the risk
  - **Effect** — Limits growth

# Some comments on subsidies

- The subsidy question for farmers is unavoidable
- Subsidy as a percent of premium creates bad incentives
- Requirement in a world of rent seeking
  - Separate the roles
    - Commercial vs Social

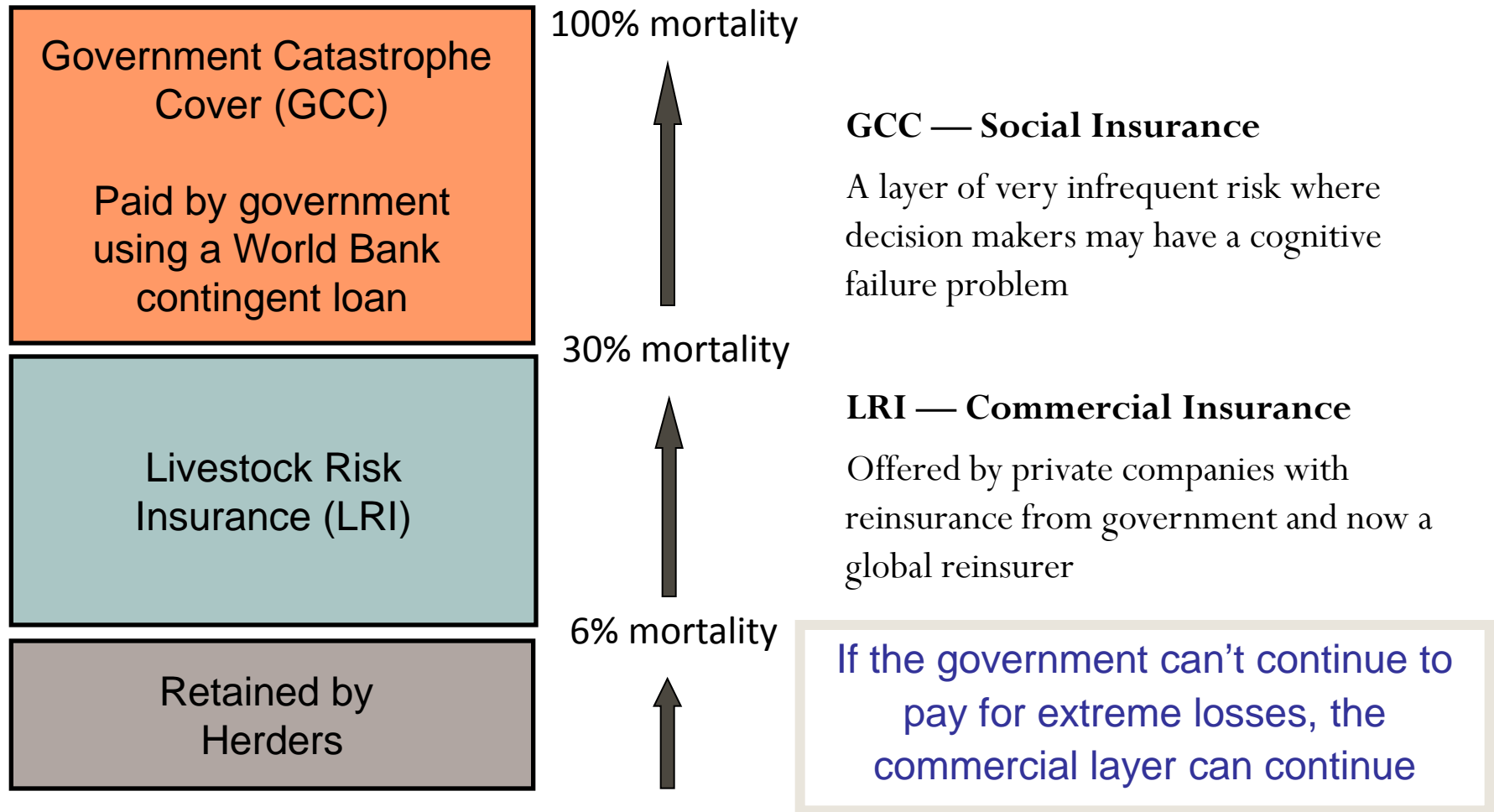


# Mongolia — Massive Deaths of Animals

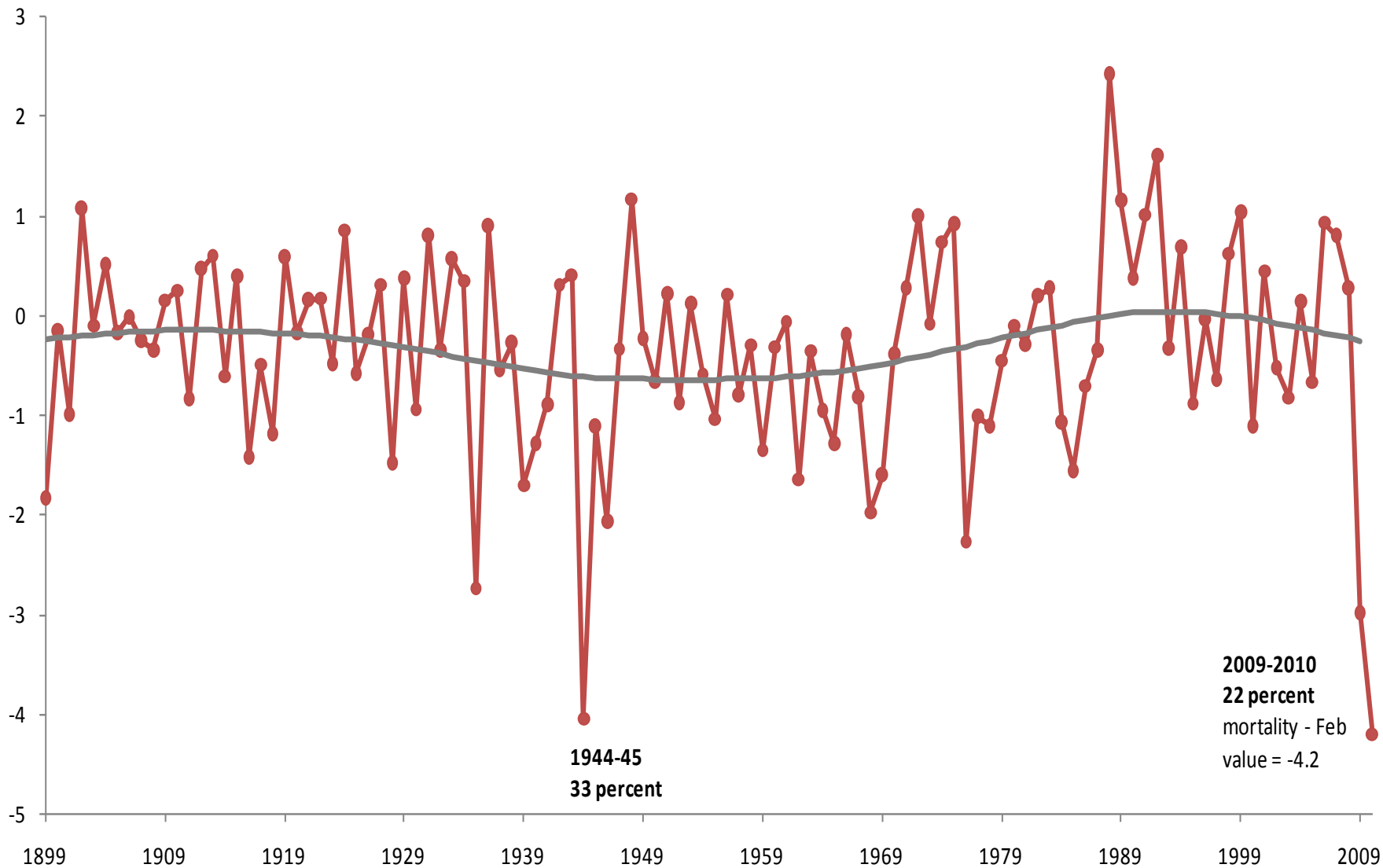
- Mongolia: 45 million animals at the start of 2010
- Sheep, goats, cattle and yak, horses, camel
- Value of animals = US \$2 Billion
- Some 11 million animals were lost in 2001–2002 due to *dzud* (harsh winter weather).. 9.7 million were lost in early 2010!
- Animal husbandry in Mongolia is 20+% of the GDP and over 85% of all agriculture
- Census is done every year — Mortality data are available by soum (county) from 1970 onwards

# Index-based Livestock Insurance – Risk Layering

## A New Model for Public-Private Partnerships



# Climate Drivers Mater: Arctic Oscillation



# Underwriting Matters

- Index insurance can indeed address many of the adverse selection and moral hazard problems associated with traditional forms of insurance
- However, sitting sales closing dates still matters and the insured can adversely select using weather forecast information!

# Scale Matters

- None of our efforts will succeed unless we design products that capture the attention of the regulator and the market from the outset
- Start with biggest risk targeted to risk aggregators
  - Rural lenders
  - Value Chain
  - Farmer Associations

Carefully move to micro products with concept of livelihoods insurance for consequential losses suffered by small households; challenges will remain for demand and delivery



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