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Layout & Distribution: Valeria Kozakova

# Longevity/Mortality Index Trading: From Theory to Practice

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## Introduction

- ▶ **Mortality is a risk that is generally stable but subject to rare spikes**
  - Reliable data exists for at least a decade in most OECD countries (more in the US)
  - Mortality in the US has generally improved over the past several years
  
- ▶ **Insurers and reinsurers have historically traded “in-the-money” mortality**
  - “Closed block” and insurance company acquisitions
  - Mortality levels based on specific pricing
  - Current tightening of the reinsurance and retro markets has forced insurers and reinsurers to consider capital market alternatives
  
- ▶ **Insurers are seeking to lay off catastrophe mortality risk to investors**
  - Catastrophic reinsurance markets have seen some dislocation with bird flu concerns
  - Swiss Re successfully distributed two “Vita” transactions (2003, 2005)
  - Other forms of exposure to mortality risk are available to investors through XXX securitizations and life settlement transactions, for example

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## Pricing Model for US Mortality Bonds Executed to Date


▶ **Pricing for mortality bonds issued against an index has been more predictable than pricing on embedded value securitizations, most likely owing to greater clarity about expected losses**

Transaction Name	Overall Annualized Expected Loss (Relative)	Spread over LIBOR (Relative)
Vita II-B	Low	Low
Vita I	Low	Low-Mid
Vita II-C	Low-Mid	Low-Mid
Queens-A	Mid	Mid
Vita II-D	Mid-High	Mid-High
Queens-B	High	High

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Credit Suisse Longevity Index

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### Credit Suisse Longevity Index<sup>SM</sup>

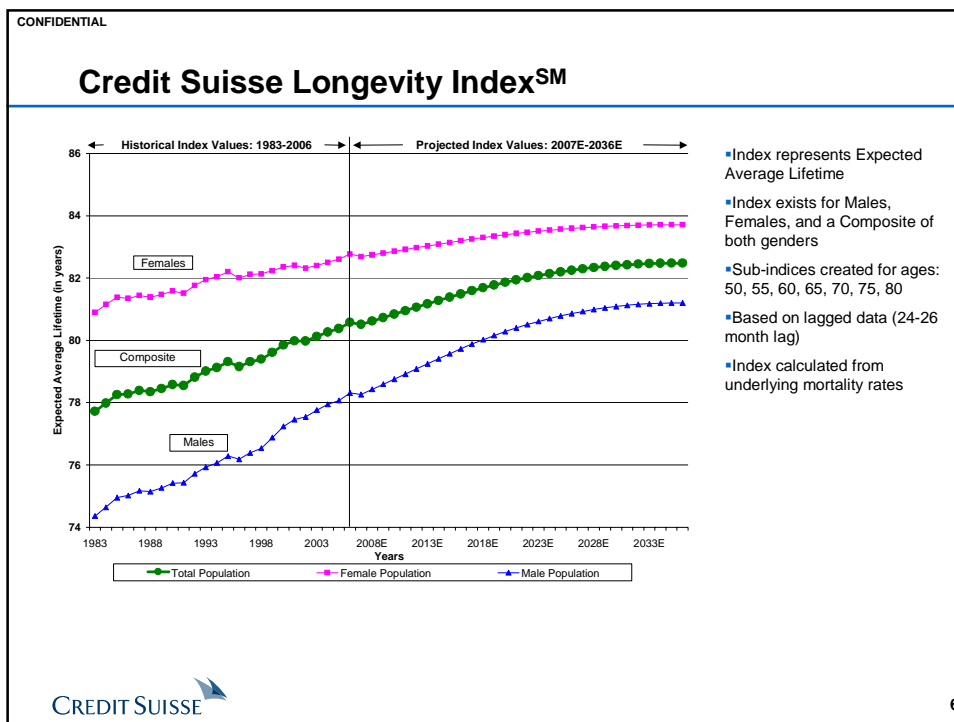
- ▶ Objective, transparent, and consistent source of Expected Average Lifetime and mortality rate data based on publicly available statistics
- ▶ Index values, underlying mortality rates or cumulative survival rates serve as a basis to settle longevity and mortality based transactions
- ▶ Government published national death statistics
- ▶ Calculation Agent for the Index is Milliman, a global actuarial firm
- ▶ Provides both historical and projected Index Values and underlying mortality rates
- ▶ Released annually on Credit Suisse's website and Bloomberg News Service
- ▶ Available at [www.csfb.com/institutional/longevityindex](http://www.csfb.com/institutional/longevityindex) or on Bloomberg terminals: LIFF GO

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- ### Potential Uses of the Credit Suisse Longevity Index<sup>SM</sup>
- Hedge mortality risks and longevity risks**
    - Insurers enter into transactions that provide opposite risk profile of insured book
    - Purchaser retains basis risk between insured and general population
    - Catastrophe mortality bonds
  - Take view on direction of longevity/mortality experience**
    - Investors buy instruments where the total return is tied to longevity/mortality
    - Gain "synthetic" exposure to longevity/mortality
    - Offers uncorrelated asset performance
  - Monetize embedded mortality/longevity gains**
    - Insurers receive payments today for expected gains from improved mortality
    - Pension plan sponsors (annuity writers) receive value today for expected longevity gains
    - Investors can buy the expected mortality/longevity upside
    - Such "gains" determined with reference to Longevity Index<sup>SM</sup>
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**Case Study I:  
"In-the-money" Transactions**

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### Structural Overview of Current Products

- ▶ Credit Suisse had developed Longevity and Mortality Structured Instruments - Notes and Swaps
- ▶ Longevity Structured Instruments
  - Settle on cumulative survival rates
- ▶ Mortality Structured Instruments
  - Settle on mortality rates
- ▶ Longevity and Mortality Instruments are not simply inverses of each other
  - Investors can take long or short positions in either note
- ▶ The table below outlines the position needed in each note for a desired outcome


Note selection	INVESTOR'S DESIRED OUTCOME:	
	Position to take for gain on longevity	Position to take for gain on mortality
<b>Longevity Notes and Swaps:</b> Settle on cumulative survival rates (CSRs)	<b>Long</b> Want CSRs to be higher than expected	<b>Short</b> Want CSRs to be lower than expected
<b>Mortality Notes and Swaps:</b> Settle on mortality rates	<b>Short</b> Want mortality rates to be lower than expected	<b>Long</b> Want mortality rates to be higher than expected

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## Case Study II: "Out-of-the-money" Transaction



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## US Mortality is Stable

US Mortality Rate as % of Average of Prior 10 Years, 1900-2002

Year	Mortality Rate as % of Average
1910	90%
1914	90%
1918	100%
1919	130%
1922	85%
1926	90%
1930	95%
1934	95%
1938	100%
1942	95%
1946	95%
1950	95%
1954	95%
1958	100%
1962	100%
1966	100%
1970	100%
1974	95%
1978	95%
1982	95%
1986	100%
1990	100%
1994	100%
1998	100%
2002	100%

Source: US Center for Disease Control and Credit Suisse

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## Catastrophic Mortality Risk

**Objectives**

- ▶ Hedge against a catastrophic event such as a flu pandemic
- ▶ Respond to increased rating agency focus on enterprise risk management

**Solutions**

- ▶ Reinsurance
  - Expensive at about 5 - 10% rate on line (Premium/Exposure)
  - Excludes all major perils
  - Limited capacity
- ▶ Capital Markets Solution
  - Investors compensated for accepting low probability, highly diversified risk
    - High mortality attachment points (e.g. 110-120% of base mortality)
    - Millions of lives across multiple geographies
  - Spreads are wide relative to comparable credit expected losses

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**Data Sources:**

U.S. Department of Health and Human Services (U.S. DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS): Deaths by Single Years of Age, Race, and Sex: United States, 1980-2002

U.S. Census Bureau: National Population Estimates, Monthly Postcensal (2000-2002) and Intercensal (1980-1999) Resident Population, by single year of age, sex, race, and Hispanic origin

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