



International Association for the  
Study of Insurance Economics

# Études et Dossiers

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Extract from

## Études et Dossiers No. 317

**2<sup>nd</sup> International Longevity Risk and  
Capital Market Solutions Symposium**

**24 April 2006, Chicago**

August 2006

Working Paper Series of  
The Geneva Association

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Layout & Distribution: Valeria Kozakova

# Securitization of Life Insurance Assets and Liabilities

J. David Cummins

## Outline

- Introduction to Life Insurance Securitization
- A Changing Business Model
- Life Insurance Securitizations:  
Review and Analysis
- Mortality and Longevity Bonds
- Conclusions

## I. Life Insurance Securitization: Introduction

### Elements of Securitization

*“Securitization provides a mechanism whereby contingent and deterministically scheduled cash flow streams arising out of a transaction can be unbundled and traded as separate financial instruments that appeal to different classes of investors.”*

### Why Securitization Creates Value For Insurers

- With growth of insurance markets and increasing risk, insurers need additional risk-bearing capacity
- Capacity of the reinsurance market to bear risk is often inadequate
- Raising new external capital can be expensive
  - It may be cheaper in the long-run to transfer risk to capital markets rather than raising equity
  - “Renting capital versus buying capital”

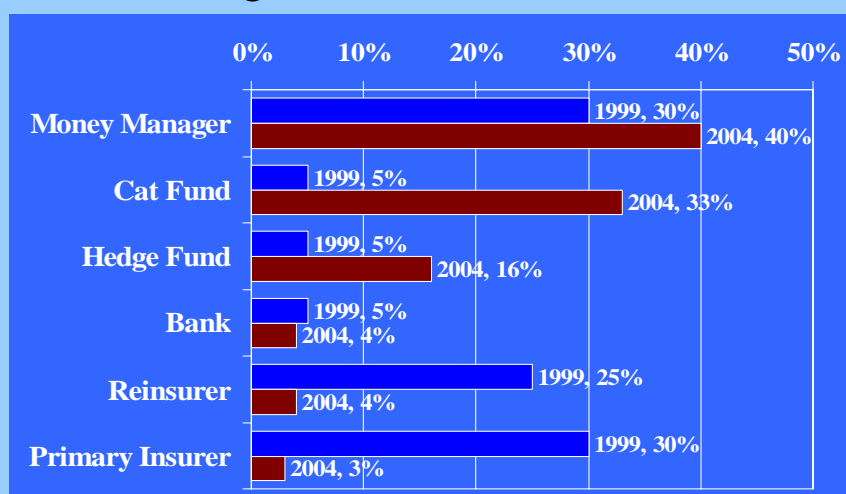
### Why Securitization Creates Value For Investors

- Investors are seeking securities that are valuable for diversification
  - Low correlation with traditional investments
  - Many types of insurance risk are very valuable diversifying assets
  - Investors may be willing to assume this risk for less than the cost of raising new equity
- Investors aggressively seek new sources of yield

## Why Securitization Creates Value

- Traditionally, investing in insurance risks was possible primarily by buying insurer stocks
- Securitization creates value by creating “pure play” or primitive securities that are removed from the usual firm-wide risks facing insurers
  - Enable investors to improve portfolio efficiency
  - To the extent transparency is achieved, costs of informational asymmetries are reduced
  - Thus, pure costs of securitized risk transfer may be < cost of capital of an insurer

## Investor Appetite for Insurance Risk Is Increasing: CAT Bonds 1999 vs. 2004



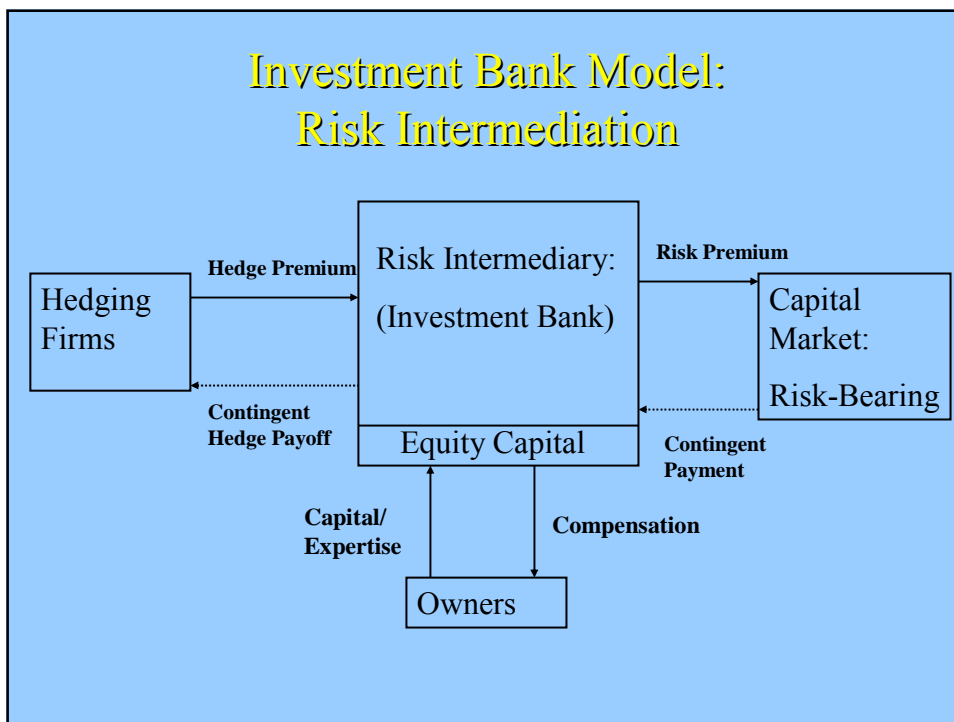
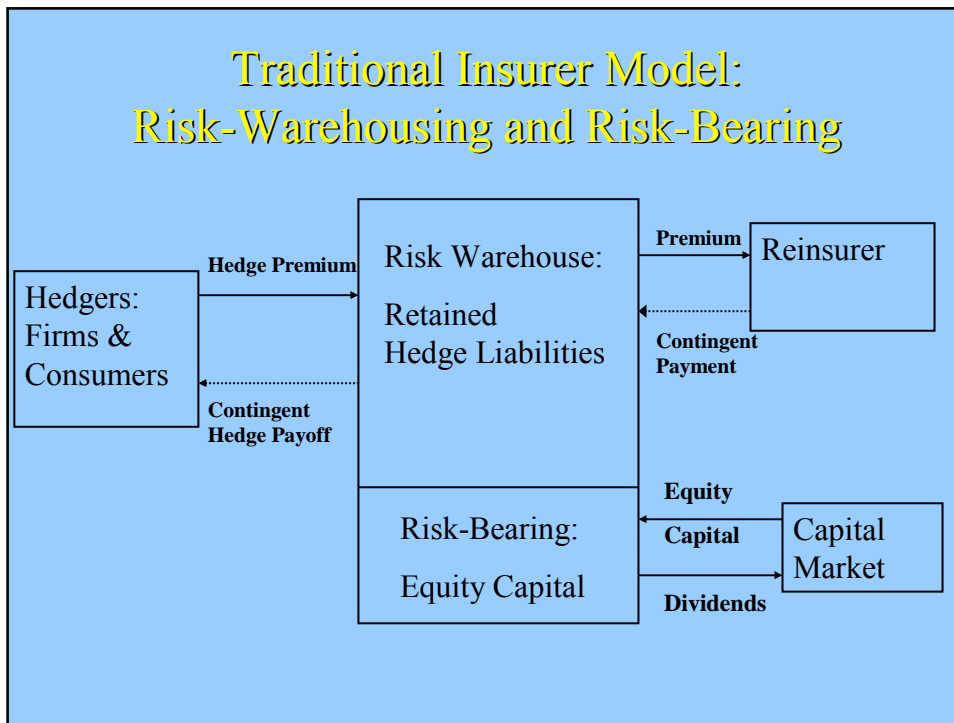
## II. A Changing Business Model

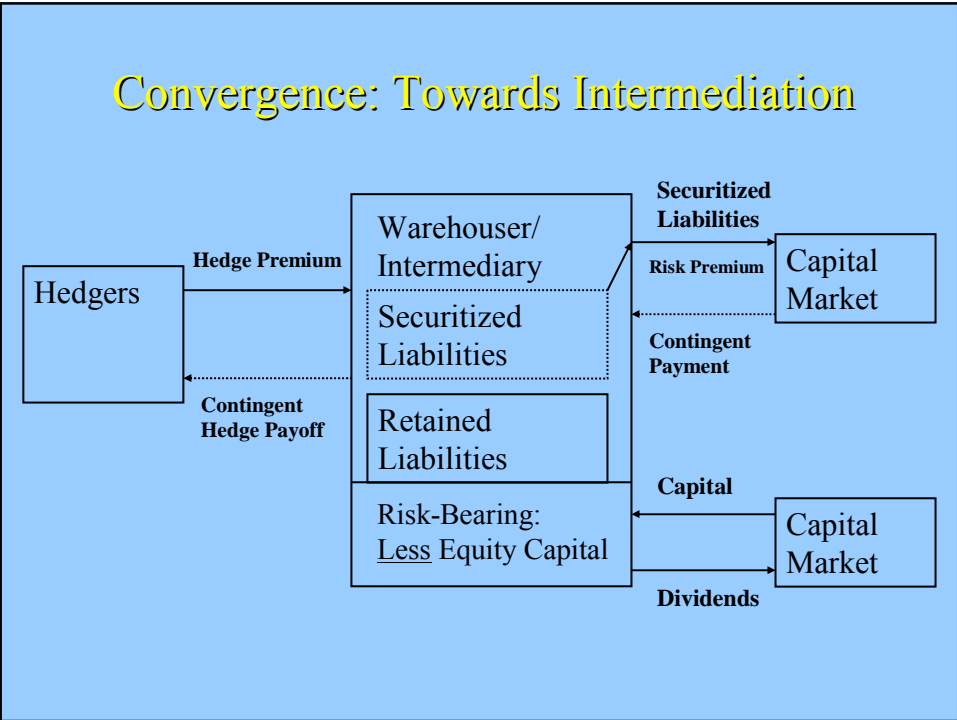
### A Changing Business Model: Warehousing vs. Intermediation

- Traditional roles: investment banking and insurance/reinsurance:

“Insurers warehouse risks, banks intermediate.”

- Warehousing vs. intermediation – are significant changes likely?





### III. Life Insurance Securitizations

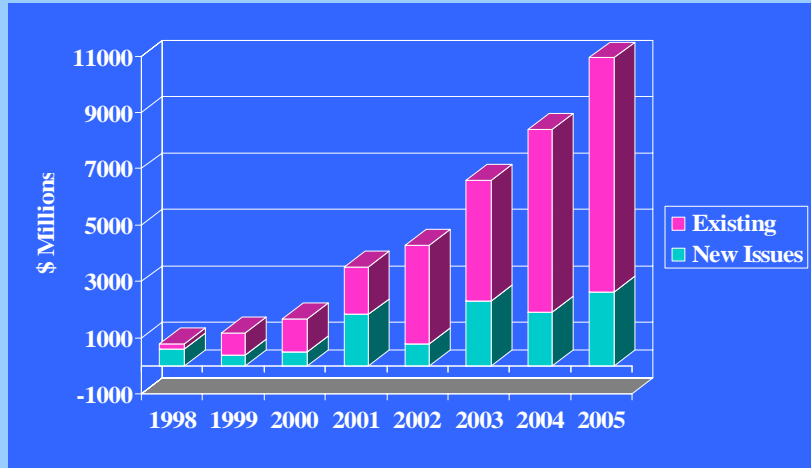
### Life Insurance Securitizations: Motivating Factors

- Selling life insurance and annuities generates significant “acquisition cost” expenses, which are amortized over the policy lifetime
  - Can create surplus (regulatory capital) strain
  - Securitization enables insurer to realize present value of profits immediately, i.e., to recover “embedded value”
- Securitizing other assets and cash inflows to enhance liquidity and achieve other goals

### Life Insurance Securitizations: Motivating Factors II

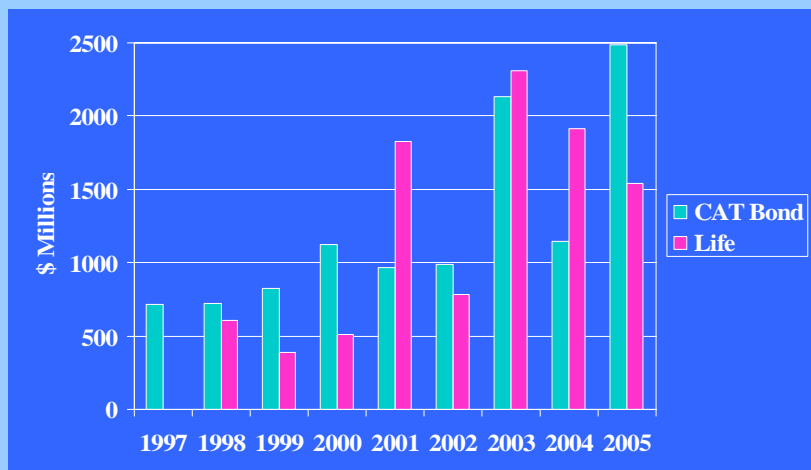
- Regulatory rules regarding reserves can increase liabilities and reduce insurer regulatory capital
  - Securitization provides a way to move some of the liabilities off-balance-sheet
- Demutualizations can be facilitated using securitization
- Hedging of mortality and longevity risk

### Life Bonds Outstanding: 1998-2005



Source: Swiss Re. Existing at end of 2005 estimated.

### Life Bonds vs. CAT Bonds: New Issues



Source: Swiss Re.

### Recent Life Insurance Securitizations

- Genworth I (2003) \$1.15 billion
  - Regulation XXX reserve funding
- Banner Life (2004) \$600 million
  - Regulation XXX reserve funding
- Genworth II (2004) \$850 million
  - Regulation XXX reserve funding
- Friends Provident (2004) £380
  - Value in force
- Swiss Re (2005) \$362 million
  - Mortality index bond

### Recent Life Insurance Securitizations

- Swiss Re (2005) Queensgate Special Purpose
  - Securitized \$245 million of future cash flows from 5 closed blocks of LI policies
  - 3 tranches maturing December 31, 2024
  - Principal and interest will be paid by future profits emerging from the blocks
  - Repayment risk from
    - » Mortality
    - » Lapsation
    - » Investment performance and reinvestment risk

## Life Insurance Securitizations: Summary

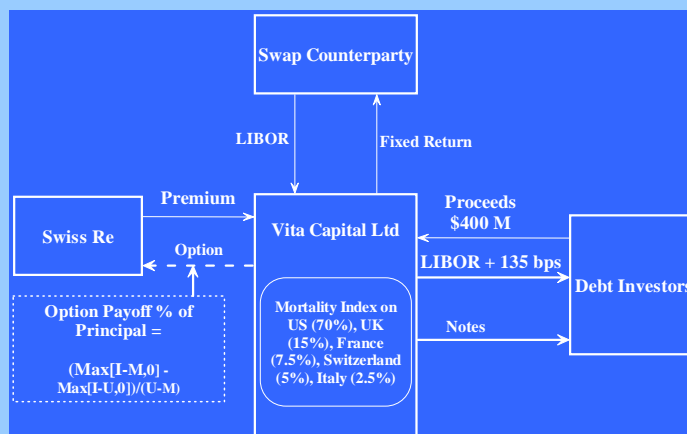
- Life securitizations
  - At least \$10 billion to date
  - Have been growing
- Most life securitizations are in three categories
  - Closed block securitizations
  - Embedded value securitizations
  - Reserve funding securitizations
- Few pure life risk securitizations so far

## IV. Mortality and Longevity Bonds

## Mortality Index Bonds: Vita I

- In December 2003, Swiss Re issued the first known mortality index bond
- Vita Capital, Ltd., SPV, issued \$250 M in mortality index notes, maturing 1/1/2007
- Premium = 135 basis points over LIBOR
- Basket mortality index = weighted average of mortality in US and 4 European nations
  - No cause of death exclusions so covers spikes from any cause including terrorism, pandemics, and war
- Option trigger = 130% of 2002 mortality rate

## Mortality Index Bond: Vita Capital I



M = 130% of actual deaths in 2002, U = 150%.

### Vita Capital I Payoff

- The payoff on Vita Capital I is structured as a call option spread
- Option payoff (% of principal) =

$$\text{Payoff} = 400 \frac{\text{Max}[I - M, 0] - \text{Max}[I - U, 0]}{U - M}$$

- where M = lower strike (130%)  
U = upper strike (150%)

### Mortality Index Bonds: Vita II

- In April 2005, Swiss Re issued the second mortality index bond
- Vita Capital II, Ltd., shelf program for up to \$2 B in mortality index notes, maturing 1/1/2007
- \$362 million in bonds issued initially
- General population mortality index based on US, UK, Germany, Japan, and Canada
- Bond payment triggered if index exceeds trigger in two consecutive years during bond term

## Mortality Index Bonds: Vita II

- Program consist of 4 tranches, triggering at different levels of baseline mortality
  - Class A: 145 % None issued
  - Class B: 120% \$62 million issued
  - Class C: 115% \$200 million issued
  - Class D: 110% \$100 million issued
- Spreads: Class B = 90 basis points  
Class C = 140 basis points  
Class D = 190 basis points

## Case Study: Vita Capital I & II

	Vita	Vita II		
		Class B	Class C	Class D
<b>Issuer:</b>	Vita Capital I Ltd.	Vita Capital II		
<b>Principal Amount:</b>	\$400 million	\$62 million	\$200 million	\$100 million
<b>Coupon:</b>	3mL + 135 bps	3mL + 90 bps	3mL + 140 bps	3mL + 190 bps
<b>Public Ratings:</b>	A3 / A+	A-	BBB+	BBB-
<b>Maturity:</b>	July 1, 2007	Jan 1, 2010	Jan 1, 2010	Jan 1, 2010
<b>Expected Mortality Level Attachment</b>	130%	120%	115%	110%
<b>Expected Mortality Level Exhaustion</b>	150%	130%	120%	115%

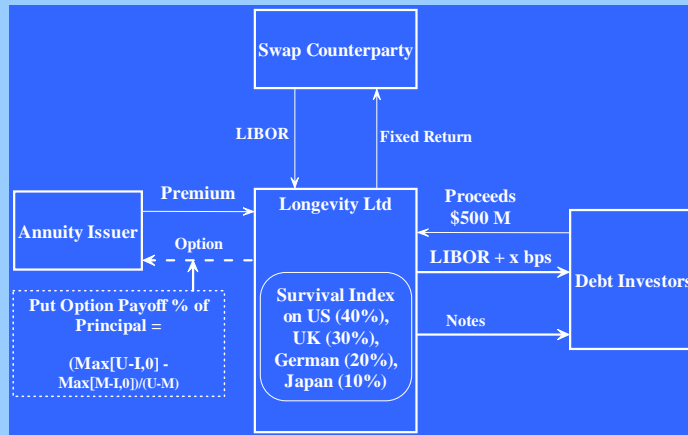
## Securitizing Longevity Risk

- In principle, longevity risk also can be securitized
- Longevity risk = risk that mortality rates of annuitants will be lower than projected, leading insurers to pay more than expected to annuitants
- Experience with longevity risk
  - Many imaginative proposals
  - One unsuccessful attempt

## Securitizing Longevity Risk II

- Perhaps the simplest way to securitize longevity risk would be to parallel the Vita Capital model
- Payoff would be a put option spread, i.e., the bond would pay off if the survival index falls below the strike price
- Principal would be withdrawn from the SPV to help the insurer make annuity payments

## Longevity Index Bond: Put Option Spread



M = 130% of actual deaths in 2002, U = 150%.

## Longevity Bond Payoff

- The payoff on the longevity bond would be structured as a put option spread
- Option payoff (% of principal) in year t =

$$\text{Payoff}_t = \text{Principal} * \frac{\text{Max}[U_t - I, 0] - \text{Max}[M - I, 0]}{U - M}$$

- where M = lower strike (50%)
- U = ( original) upper strike (90%)
- $U_t = \text{upper strike, year } t = \text{Min}[U, I_{t-1}]$

## Longevity Bond Payoff II

- To be effective, longevity bonds would run for multiple years (e.g., 20 or 25)
- The bond payoff would be calculated once per year (e.g., at year-end)
- Once the index falls below the upper strike, the upper strike would reset to the index value
- The revised upper strike for year  $t$ :

$$U_t = \text{Max}[U - \sum_{i=1}^t P_i, M]$$

- Once  $U_t$  reaches  $M$ , the bond terminates

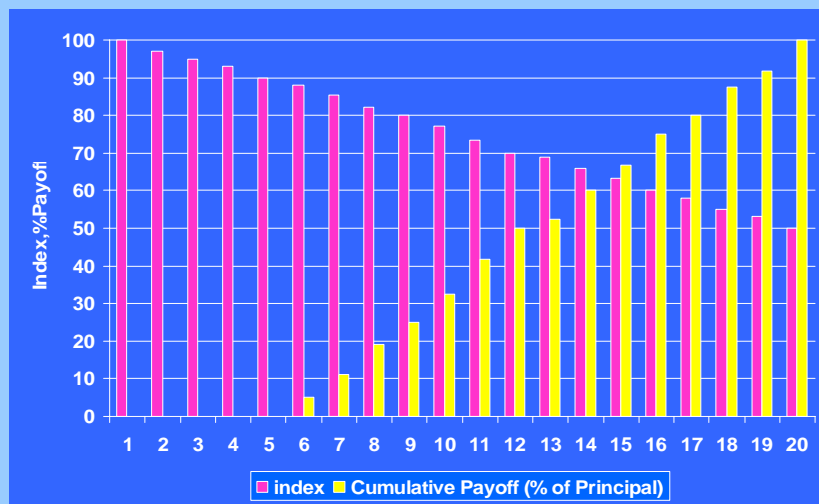
## Longevity Bond: Example

- 20 year maturity
- Based on longevity index, with payoff to hedger annually
- Upper strike = 90% of index, resetting to index if index < 90%
- Lower strike = 50% of index
- Principal = \$100
- Coupon based on remaining principal = (Libor + spread)\*Principal balance

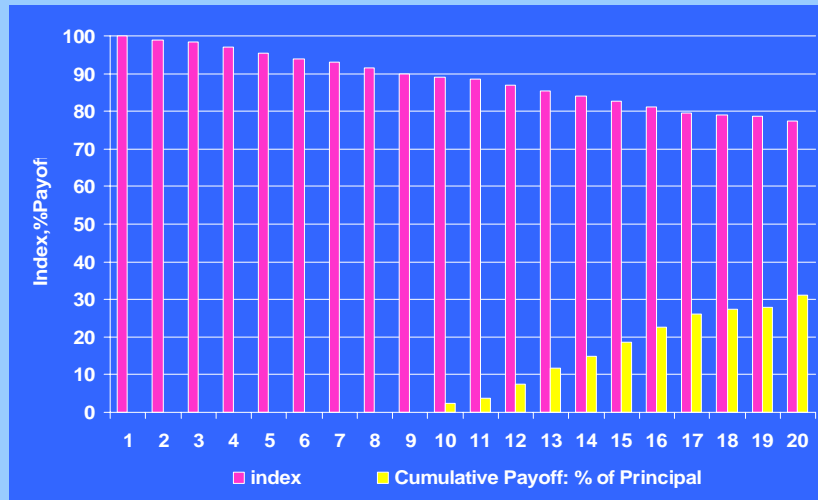
### Longevity Bond: Example

Year	Index	Payoff
1	100	$100 * [\text{Max}[90-100,0] - \text{Max}[50-100,0]] / 40 = 0$
2	95	$100 * [\text{Max}[90-95,0] - \text{Max}[50-95,0]] / 40 = 0$
3	90	$100 * [\text{Max}[90-90,0] - \text{Max}[50-90,0]] / 40 = 0$
4	87	$100 * [\text{Max}[90-87,0] - \text{Max}[50-87,0]] / 40 = 7.5$
5	83	$100 * [\text{Max}[87-83,0] - \text{Max}[50-83,0]] / 40 = 10$

### 20-Year Longevity Bond: Payoff Assume Index Reaches Lower Strike



## 20-Year Longevity Bond: Payoff Index Finishes Above M



## Longevity Bond: Other Features

- Could be designed as “forward starting,” i.e., option feature would be activated 5 or 10 years in the future based on index at that time
- Could be designed as a “tontine”
  - Payoff = % of remaining principal rather than original principal
  - Bond would terminate at some specified future date rather than being a perpetuity

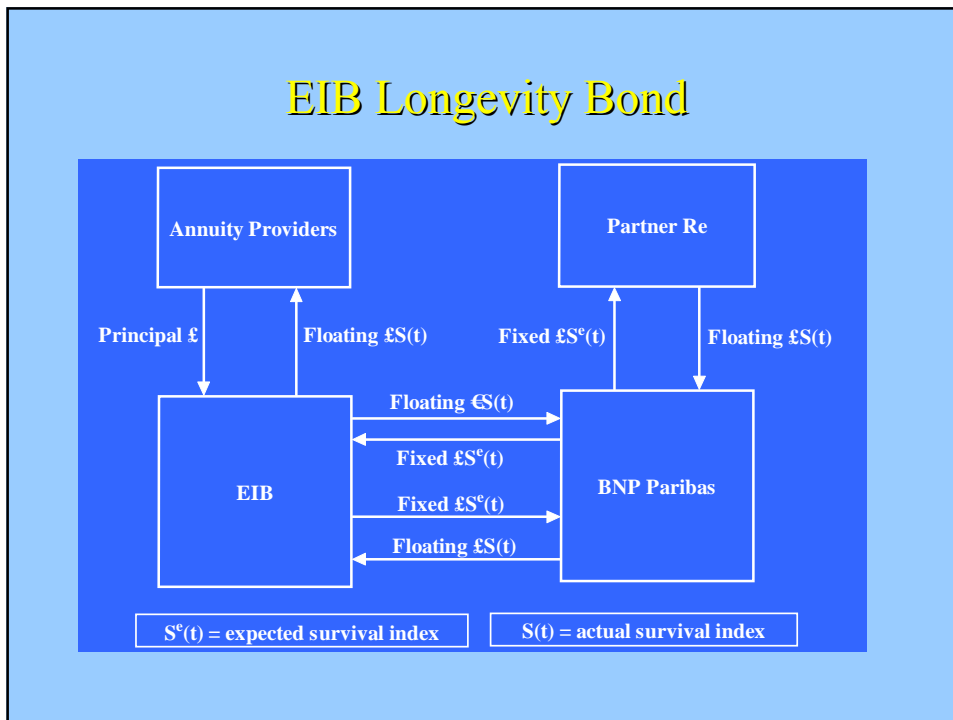
### The EIB/BNP Paribas/Partner Re Longevity Bond

- An interesting experiment in longevity bonds was attempted by the European Investment Bank (EIB) with BNP Paribas and Partner Re
  - Announced November 2004
  - Withdrawn late 2005 – insufficient demand
- Targeted pension plans/other annuity providers
- Bond is instructive because of its design features

### The EIB Longevity Bond

- Face value = £540 million
- Maturity = 25 years
- An annuity (amortizing) bond with floating coupons tied to a survivor index based on realized mortality rates of English and Welsh males aged 65 in 2002
- Investors pay in £540 million up front
  - Receive £50 million \* Survivor index
  - Per year for 25 years

## EIB Longevity Bond



## EIB Longevity Bond: Advantages

- Enable annuity providers to hedge exposure to reduced mortality among annuitants
- Based on a reliable, publicly available survival index
- Investors have direct credit exposure only to EIB, rated AAA

### EIB Longevity Bond: Disadvantages

- The hedgers (annuity providers) rather than capital markets provide the principal
  - Hedgers need substantial capital for the deal
  - By contrast, in Vita-style transactions, hedger pays only an annual premium
- Mortality risk transferred to a reinsurer
  - Deal does not access capital markets
  - Deal creates no new risk-bearing capacity

### EIB Longevity Bond: Disadvantages II

- Exposes hedger to direct credit risk of EIB and indirect credit risk of BNP and Partner
  - Vita-style deal is fully collateralized
- Substantial cash transfer potentially changes the capital structure of the hedger
  - Vita-style deal is OBS
- Deal is complex, but perhaps not unusually so for capital market products (e.g., CMOs)

### EIB Bonds: Lessons to Be Learned

- Bonds are more likely to be successful if they do not require a large capital contribution by the hedger but rather a premium payment
- Asset backed securities are more likely to succeed because they reduce credit risk and exposure to agency costs of counterparty
- Bonds are more likely to be successful if they access broader capital markets
- Simplicity and transparency are important

### V. Conclusions

## Conclusions:

### Life Insurance Securitizations

- Securitization can enhance both insurance market and capital market efficiency by moving assets and liabilities off-balance sheet
  - Insurance markets
    - » More efficient to transfer risks to capital markets rather than “warehouse” risks
    - » Insurers concentrate on core competencies – origination and underwriting
  - Capital markets: More securitized instruments can improve efficiency of investment portfolios by providing primitive or “pure play” securities

## Conclusions:

### Life Securitizations to Date

- The bulk of life insurance securitizations to date have had the objective of capitalizing acquisition costs
  - Permit more rapid growth
  - Satisfy regulatory requirements
- Some significant transactions also have been motivated by recovery of embedded value
- Some transactions have generated liquidity but not financing
- Recent reserve funding securitizations provide direct alternative to reinsurance & have financing features
- Few pure risk securitizations to date

### Conclusions: Mortality and Longevity Bonds

- Swiss Re's Vita Capital bonds provide a model for both mortality and longevity bonds
- Success will require accessing broader capital markets
- Bonds that represent "pure plays" in specific risks rather than mixing interest rate and credit risk are more likely to succeed
- Simplicity and transparency are essential

### Conclusions: The Future

- Vast amounts of assets and liabilities remain "on balance sheet" in the insurance industry
- To realize full potential for securitization
  - Overcome informational opacities
  - Develop "basket" transactions through reinsurers
  - Develop better indices for index linked products
  - Reduce regulatory obstacles
  - Educate insurers and investors

## Conclusions: The Future II

- Important to reduce costs of informational asymmetries
  - May require insurers to sacrifice some “private information”
  - Costs can be mitigated by structuring
    - » Informationally sensitive tranches that appeal to investors with information advantages
    - » Informationally insensitive tranches for less well informed investors
- Development of a public market needed to achieve full potential

## Reserve Funding Securitization: Discussion 3

- Insurer pays a fixed premium per period for the SPV reinsurance coverage – “buys a mortality experience option”
- Investors are paid a floating rate based on safe securities in SPV plus a risk premium
  - Repayment of principal in contingent on the mortality experience of the reinsured policies

### Reserve Funding Securitization: Discussion 4

- Cost-benefit analysis – transaction will be undertaken if  
Premium + transactions cost < Cost of letter of credit or conventional reinsurance
- Because SPV is off-balance-sheet, there are no adverse capital structure implications for the insurer
- LOCs are “one-year solution to multi-year problem” whereas reserve funding SPV can be for multi-years

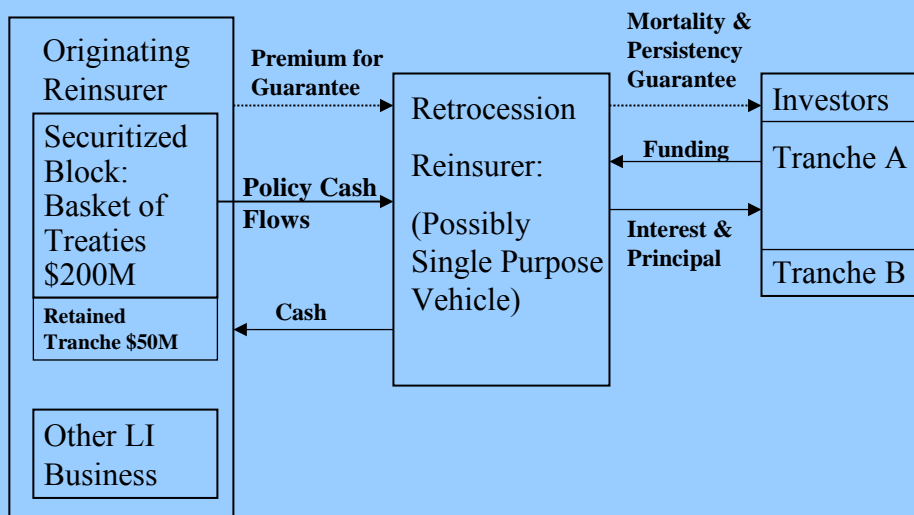
### Securitization To Capture Embedded Value

- *Embedded value (EV)* – the discounted value of future profits on in-force life insurance business (free cash flow)
- EV is generated because of up-front costs of issuing insurance, which are amortized over the life of the policy

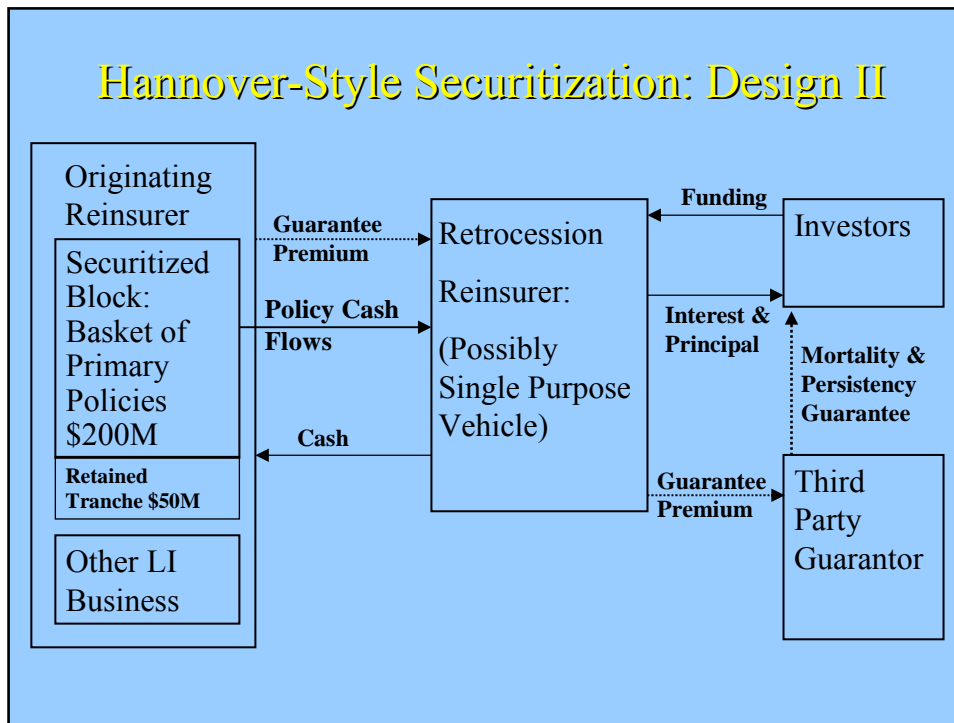
## Embedded Value Securitizations

- Embedded value life insurance securitizations (e.g., Hannover Re)
  - Insurer originates a block of policies and sells the block to investors through a securitization structure
  - Enables insurer to realize profits from the policy block immediately rather than over time
  - Improves regulatory leverage ratios and potentially provides lower cost financing

### “Hannover Re Style” Acquisition Cost Securitization



## Hannover-Style Securitization: Design II



## Hannover-Style Securitization: Comments

- Issuer transfers mortality and persistency risk to the retrocessionaire or 3<sup>rd</sup> party guarantor
  - External credit enhancement
  - Investors bear credit risk of guarantor
- Issuer swaps policy net cash flow for recovery of acquisition costs
- Motivated primarily by restrictive regulatory accounting and by fast growth of Hannover

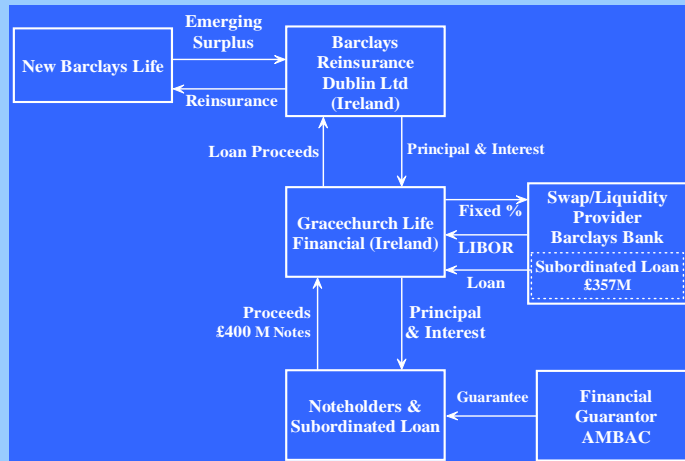
### Advantages of Securitizing Through Reinsurer

- Reinsurer can pool risks from various primary companies providing diversification
- Reinsurer is better rated than many underlying primaries so can arrange better terms for the securitization
- Dealing with one rather than many reinsurers provides economies of scale for capital providers

### Embedded Value Securitization New Barclays Life

- New Barclays Life securitized the emerging surplus from a closed block consisting of policies from 2 predecessor companies
- Objectives
  - Reduce contingent loan exposure of Barclays Bank to its life insurance subsidiary
  - Obtain regulatory capital relief
  - Tax advantages

## Gracechurch Financial Embedded Value Securitization



## Barclays Securitization

- Barclays made £357 M subordinated loan to Gracechurch Life to protect noteholders in case of deteriorating experience on the closed block policies
- Purchased credit insurance from AMBAC
- Notes rated Aaa by Moody's

## Securitization vs. Alternatives

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>■ Costs of securitization<ul style="list-style-type: none"><li>➢ Premium spread (x bps)</li><li>➢ Costs of setting up SPV<ul style="list-style-type: none"><li>» Legal</li><li>» Actuarial</li><li>» Accounting</li><li>» Investment banking fees</li></ul></li><li>➢ Swap premium</li><li>➢ Costs of 3<sup>rd</sup> party guarantee (if any)</li><li>➢ Securities sales costs</li></ul></li></ul> | <ul style="list-style-type: none"><li>■ Costs of alternatives<ul style="list-style-type: none"><li>➢ Fee for letter of credit</li><li>➢ Premium to reinsurer</li><li>➢ Fees of reinsurance brokers/bankers</li><li>➢ Costs of managing the risks on-balance-sheet</li></ul></li></ul> |
|--|---|

## Life Insurance Securitizations Associated With Demutualizations

- Several demutualizing insurers have executed closed block transactions that securitize the cash flows from specified blocks of policies
- Prudential, the largest life insurer in the US, demutualized in December 2001
- Prudential's was a "whole business securitization" whereby the entire operating business is securitized with cash flows directed to investors

## The Prudential Demutualization II

- In Prudential's main transaction, it distributed 456 million shares to policyholders with 110 million offered in the IPO
- Most policyholders received choice of cash or stock
- Prudential raised \$3 billion in IPO in "class A" stock
- "Old" insurance business is isolated in a "closed block," financed by debt and equity that will receive the net cash flows as the policies in the closed block are run-off

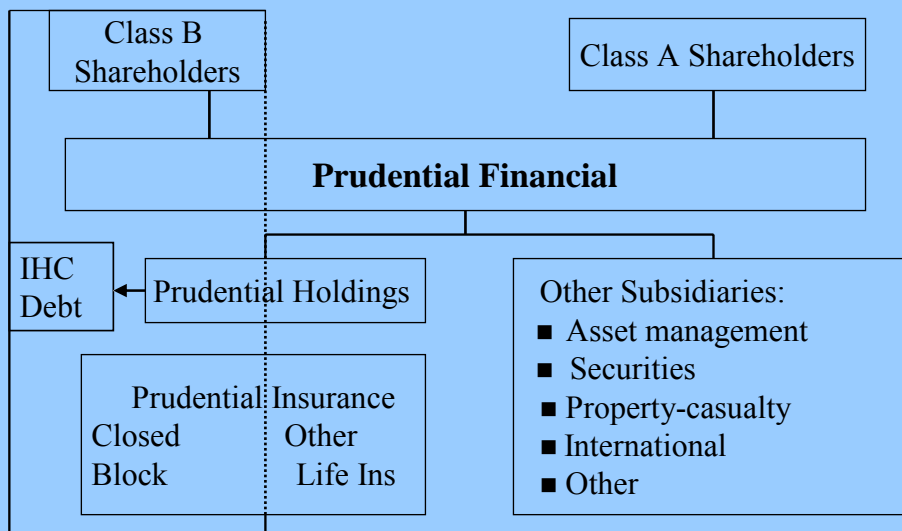
## The Prudential Demutualization III

- Motivation for the closed block
  - Isolate "old" insurance business from new financial services operations
  - Capture the "embedded value" in the closed block for use elsewhere in Prudential Financial
  - Objectives accomplished by
    - » Selling bonds backed by the embedded value
    - » Residual equity interest in the block to class B shareholders, entitled to the residual cash flows after debt is retired

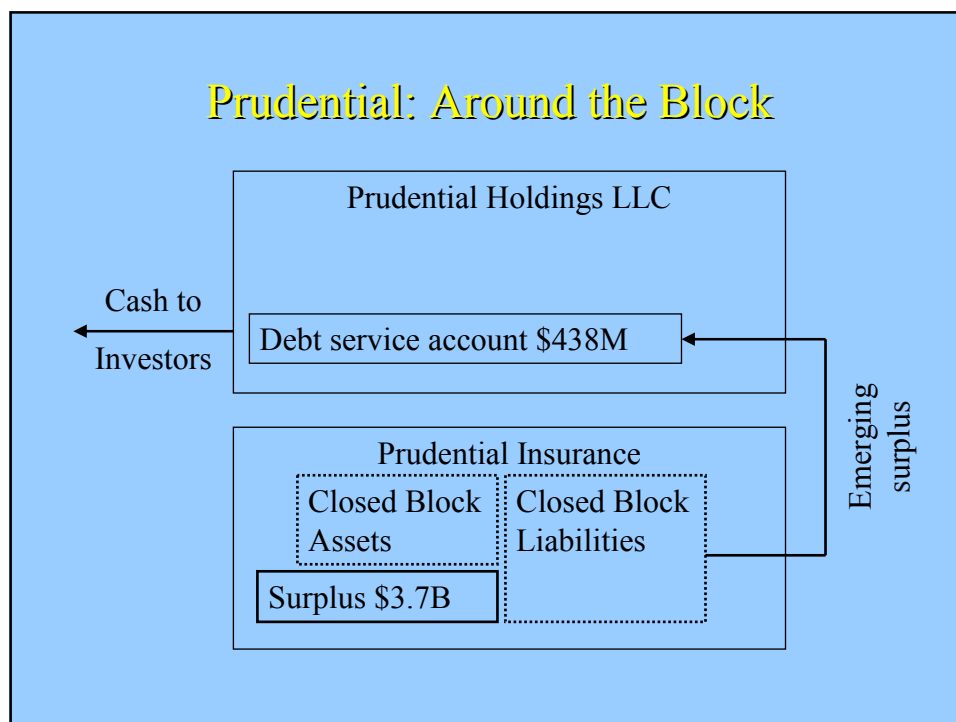
### The Prudential Demutualization IV

- Prudential Holdings, LLC formed to hold the closed block business, financed by
  - \$1.75B in debt securities
  - \$175 million of “class B” stock entitled to the residual cash flows of the closed block
- The closed block had initial
  - Assets = \$48.7 B
  - Liabilities = \$50.8 B
  - Equity = \$3.7B
  - Assets < liabilities due to statutory valuation rules

### Prudential Financial: After Restructuring



Source: Millette, et al. (2002).



### The Prudential Securitization: Comments

- The closed block provides dividends and other payments to policyholders – no new policies are added and the block is run off to zero
- Block liabilities exceed assets due to regulatory liability valuation rules
- Surplus is added to the block to meet regulatory capital requirements
  - Surplus is released as the block is run off
  - The PV of surplus is the EV of the block

## The Prudential Securitization II

- Debt service coverage account is established with 25% of the proceeds of the debt issuance (\$438 M)
  - Provides credit enhancement for debtholders
  - Unused balance reverts to Prudential Financial
- Other security also provided to debtholders, e.g., 3<sup>rd</sup> party financial guarantee insurance policy
- Equity interest in the block sold to class B shareholders in Prudential's IPO
- A wide range of debt covenants and other restrictions further protect debtholders

## Why Securitization Creates Value For Insurer

- Holding equity in a financial institution is costly due to
  - Agency costs
  - Regulatory costs
  - Operational risks
  - Mismanagement risks
  - Insolvency risk
  - Informational asymmetries between managers and investors (opacity of insurance institutions)
- Securitized risk transfer mitigates these costs

## Why Securitization Creates Value For Investors II

- However, returns on insurer stocks driven by
  - Underwriting risks (mortality, accident rates)
  - Investment risks
  - Regulatory risks
  - Agency costs and mismanagement risks
- “Pure plays” on insurance risks not possible

## Elements of Securitization

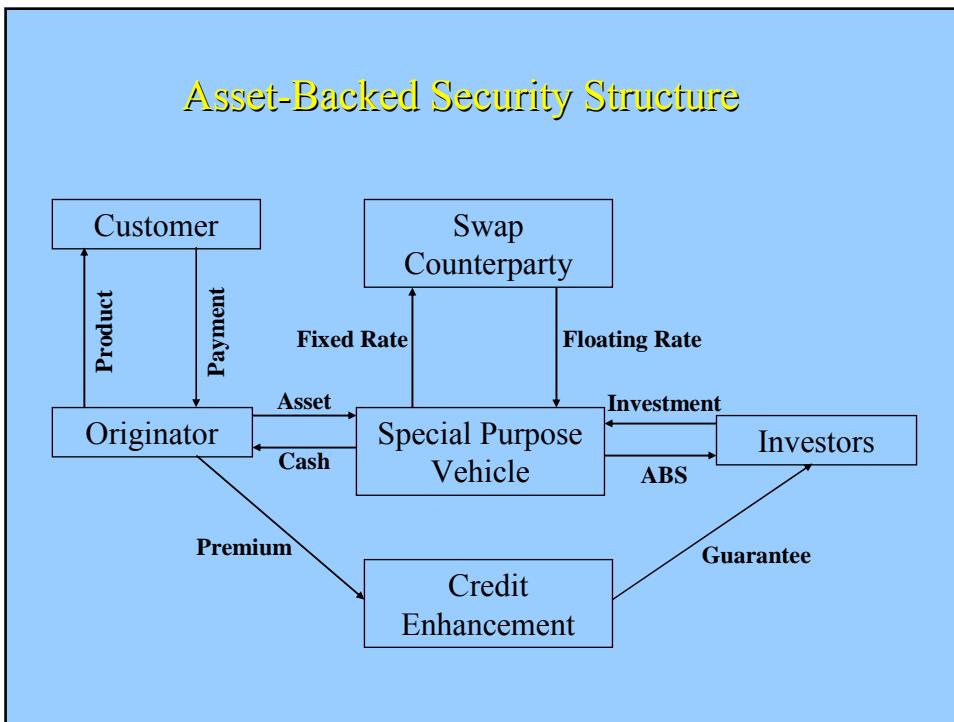
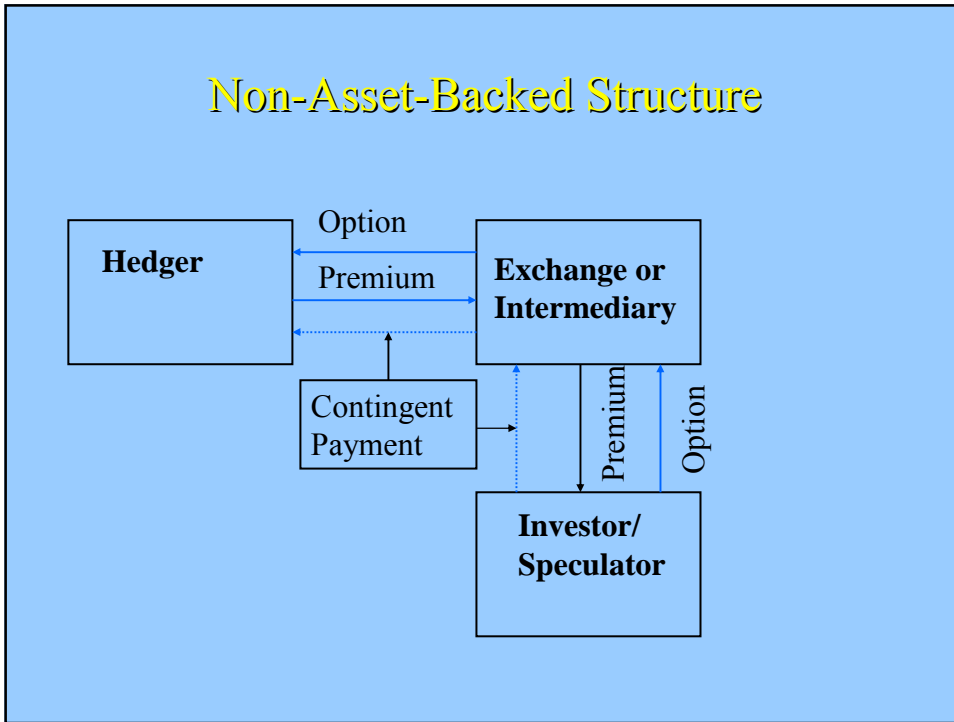
- Repackage cash flows traditionally held on balance sheet, improving market liquidity
- Parties trade cash flow streams to
  - Manage and diversify risk
  - Take advantage of arbitrage opportunities
- Virtually any asset or liability and their underlying cash flows are potential candidates for securitization

### Models of New Financial Products

- Non-asset-backed structure – exchange traded and OTC products such as options
  - Transactions costs and liquidity advantages
  - Creates counter-party credit risk
- Asset-backed structure – collateralized using a single-purpose trust
  - Credit risk low
  - Creates inefficiencies such as transactions costs

### Insurance Securitization Models

- Some non-asset-backed insurance linked securities have been issued
  - CBOT “CAT” options
  - CAT-E-Puts
- However, most insurance-linked securitizations have involved asset-backed securities
  - Reduce counter-party credit risk
  - Permit a “pure play” in the securitized risk



## Why Use a Special Purpose Vehicle?

- The SPV is a “passive financial intermediary” that exists to
  - Insulate investors from sponsor’s credit risk
  - Provide transparent servicing of asset/liability
  - Structure tranches of debt to appeal to different classes of investors
  - Insulate investors from agency costs of issuer, creating a “pure play” security
  - Provide tax and accounting benefits to sponsor

## Asset-Backed vs. Non-Asset-Backed

- The structure of a financial product is determined by several factors including
  - Informational asymmetries about the optioned event
  - Opacity of the sponsor
    - » Credit quality
    - » Agency conflicts & other friction costs
  - The magnitude of the optioned risk
- That is, the structure is created to optimally resolve informational and incentive problems

## Sources of Demand for Securitization

- “Efficient demand,” demand that would exist in the absence of severe market imperfections
- “Inefficient demand,” driven by “RATs” – Regulatory, Accounting and Tax factors



## Efficient Demand for New Instruments

- Securitize on-balance-sheet assets and liabilities
  - Reduce funding costs by
    - » Enhancing credit quality
    - » Creating new securities with appeal to different investors
  - Access wider capital markets
- Hedge insurance risk
  - Catastrophic property risk
  - Mortality risk
  - Longevity risk

### “RATs” Demand for New Instruments

- Tax motives – minimization of taxes due to convexity of tax schedules and “loop-holes”
- Regulatory motives – compliance with regulatory rules such as reserving and risk-based capital
- Accounting motives – securitizing life insurer deferred acquisition expenses to improve regulatory balance sheets
- “Cleansing” financial statements prior to entering the mergers & acquisitions market

### Recent Life Insurance Securitizations

- Queensgate Innovations
  - First life transaction that contains BBB and below tranches
  - Transfers more risk: 87% of present value of future cash flows covered by the transaction
  - Previous transactions, e.g., Prudential (US) had significantly lower loan-to-value ratios
- The downside – Queensgate is not a “pure play” in insurance risk but also contains interest rate risk

## Recent Life Insurance Securitizations

- Prudential (US) demutualization (2001)
  - “Closed block” embedded value securitization  
→ \$1.75 billion in insurance-linked bonds
- Swiss Re (2003)
  - Mortality index bond → \$250 million
- First Colony Life (2003)
  - Reserve funding securitization → \$300 million
- New Barclays Life (2003)
  - Embedded value securitization → £400 million

## Why The Swap?

- Enable Vita Capital to pay floating rate (LIBOR) to the bondholders, reducing interest rate risk
- Cover the risk of loss of principal on bonds held by Vita Capital to enable Vita to pay
  - Bondholders full value on maturity
  - Swiss Re full value if triggering event occurs