

ACE ERM Errata
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Study Guide

When the first printing of the study guide was released, the text *Hedging for Liabilities in Life Insurance Companies (ERM-413-17)* was not included. Please see the proceeding pages of this errata for a summary of that text.

Flash Cards

The above study note was nearly all redundant information; therefore, no extra flash cards were created.

Audio CDs

The audio CDs were not impacted.

Hedging for Liabilities in Life Insurance Companies (ERM-413-17)

Key Concept: Overview of hedging

1) Introduction

- a) EIAs
 - i) Fixed indexed annuities (FIA) are also called equity indexed annuities (EIA)
 - ii) An EIA is a combination of a fixed and variable product. A customer can get a minimum guarantee while participating in equity performance.
 - iii) Insurers will use derivatives to hedge the risk of EIAs
 - iv) EIAs can also come with a living benefit rider
 - v) An EIA can be viewed as having an embedded option
- b) Variable annuities (VAs)
 - i) These products commonly come with various riders: GMDB, GMAB, GMWB, GLWB
 - ii) While the definitions of these riders vary in the industry, the author provides the following general definitions:
 - (1) GMDB – guarantees a minimum death benefit
 - (2) GMAB – guarantees a minimum accumulation value at a certain point in the future
 - (3) GMIB – guarantees a minimum periodic payment when the annuitization option is elected
 - (4) GMWB – guarantees a minimum periodic withdrawal at a certain point in the future
 - (5) GLWB – guarantees a minimum periodic withdrawal for the lifetime of a policyholder
 - iii) All of these guarantees function like options \bar{a} when the account value is low, the option is in the money

2) Mathematical Foundation of Hedging

- a) Given that EIA and VAs have embedded options, insurance companies will hedge this risk
- b) One option is a direct approach (example – purchase a put option to hedge risk of a GMAB)
 - i) While this approach is intuitive, it has many drawbacks:
 - (1) Hedging instrument may not be liquid
 - (2) The strike price or index may not be available (creates basis risk)
 - (3) Long maturity options may not be available
 - (4) Options may be too expensive
- c) Dynamic Hedging
 - i) In lieu of a direct approach, an insurer can employ dynamic hedging where they purchase derivatives to replicate embedded options
 - ii) Two valuation techniques include Black Scholes and Monte Carlo modeling
 - iii) Monte Carlo modeling (while computationally intensive) tends to be more practical
 - iv) Overall goal of dynamic hedging is to match the “greeks of the liabilities”:
 - (1) Delta – sensitivity with respect to the underlying asset
 - (2) Rho – sensitivity with respect to interest rates
 - (3) Vega – sensitivity with respect to volatility
 - (4) Theta – sensitivity with respect to time
- d) Fund Mapping
 - i) This is a process by which the policyholder investment funds are mapped back to hedgeable indices
 - ii) Derivatives will be purchased based on broad based indices (S&P, NASDAQ, etc.) but the policyholder investment funds may not exactly match
 - iii) This mismatch creates basis risk

- 3) Hedging Instruments
 - a) Considerations when selecting hedging instruments:
 - i) Targeted exposure – the index of the derivative and the policyholder investment fund are often similar, but different
 - ii) Liquidity – dynamic hedging requires periodic rebalancing
 - iii) Credit quality – hedging will introduce counterparty credit risk
 - iv) Pricing – hedging comes at a cost!
 - v) Availability – sometimes over-the-counter options are not available or very costly
 - b) Pros and cons of different hedging instruments
 - i) Reinsurance
 - (1) Transfers some or all risks – offers precise coverage
 - (2) Not liquid, subject to counterparty credit risk
 - ii) Actual or proxy underlying assets
 - (1) Allows for direct hedging, but transaction costs tend to be high
 - iii) Over-the-counter instruments
 - (1) Flexible tool for hedging
 - (2) Limited availability, higher trading costs and subject to counterparty credit risk
 - iv) Exchange traded derivatives
 - (1) Standardized instruments, highly liquid, low credit risk, widely available
 - (2) Commonly used in dynamic hedging programs
 - (3) Since they are not customized, there will likely be basis risk

- 4) Hedging Methodologies
 - a) Macro Hedge
 - i) Goal is to eliminate risk of an insurance company as a whole
 - ii) Assumes that a company has different lines of business
 - iii) May involve the use of selling products with offsetting risks (like immediate annuities and life insurance)
 - b) Static Hedge → commonly uses over-the-counter derivatives that are purchased and held
 - c) Dynamic Hedging → commonly uses exchange traded derivatives that are bought and sold to match the greeks of the liabilities. Periodic rebalancing is necessary.
 - d) Semi-static → core hedge portfolio is static and then dynamically hedge the remaining risk

 - e) Figure 4 and Figure 5 and Figure 6 → this is a simple example that shows how to calculate a delta and then purchase enough derivatives to mitigate risk
 - f) Figure 7 → shows that the hedge portfolio offsets the risk of the liabilities

- 5) Hedge Effectiveness
 - a) The financial crisis of 2008 is a case study of good/bad hedge effectiveness
 - b) Some VA writers' hedge portfolios did well, while some did not
 - c) Common issues that cause lower/less hedge effectiveness: insensitive rebalancing threshold, basis risk, unhedged exposures, timing issues

- 6) Future Development of Hedging → the importance of hedging is only growing! One should expect continued development and change in this industry.