



# **Price Optimization and the Role of Producer Behavior**

2011 Ratemaking and Product Management Seminar

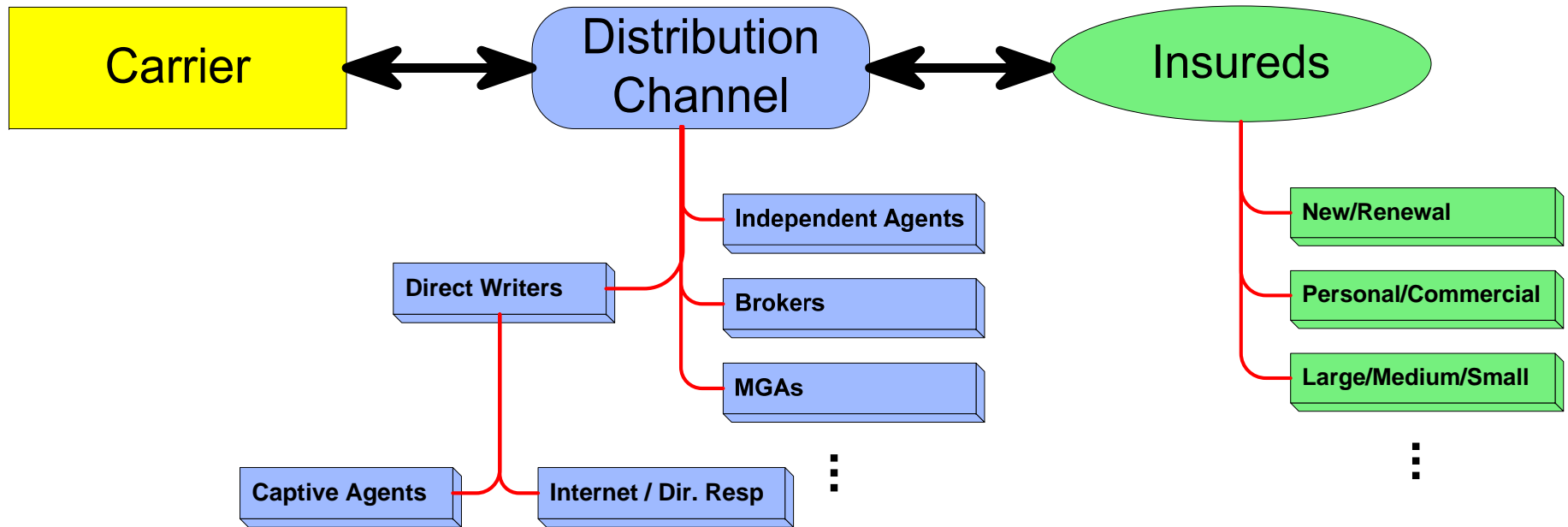
Yuchen Su, FCAS

March 21, 2011

## Disclaimer

The views expressed in this presentation are those of the author and do not necessarily reflect the views of The Travelers Companies, Inc. or any of its subsidiaries. This presentation is for general informational purposes only.

# Price Optimization Strategies Vary by Many Dimensions



## Producer Behavior

### **Independent Agents/Brokers**

- Why do they constantly shop?
- New Business
  - A consultation seller vs. a price seller
- Renewal Business
  - Preemptive shopping
  - Understand insureds' need and be able to deliver
- Relationship with carriers

### **Captive Agents**

- No need to shop for an insured
- New Business
  - Sell the company's brand
  - Utilize own advertisement and the company's marketing effort
- Renewal Business
  - How to sell more coverages?

Producer behavior heavily impacts the decision to shop!

## New Business Considerations for Price Optimization

### Conceptually:

**Expected Profit  $\approx$  Prob. Hit (P, Elas)\*Exp Tenure\*(P - LE)**

- Expected new business UW loss should be amortized over the expected tenure of an insured, along with other acquisition costs
- Expected tenure
  - Internet users or captive agents: Insureds' time value
  - Independent agents: Agents' loyalty to a carrier
- New business price elasticity
- Expected improvement in loss experience
  - A youthful driver in the last years of "youth" is more likely to improve than someone with 20 years of driving experience

## Renewals: Prevent Shopping As Much As Possible

- Why?

- As you will be comparing your renewal price with other carriers' new business prices, which will likely be lower

- How?

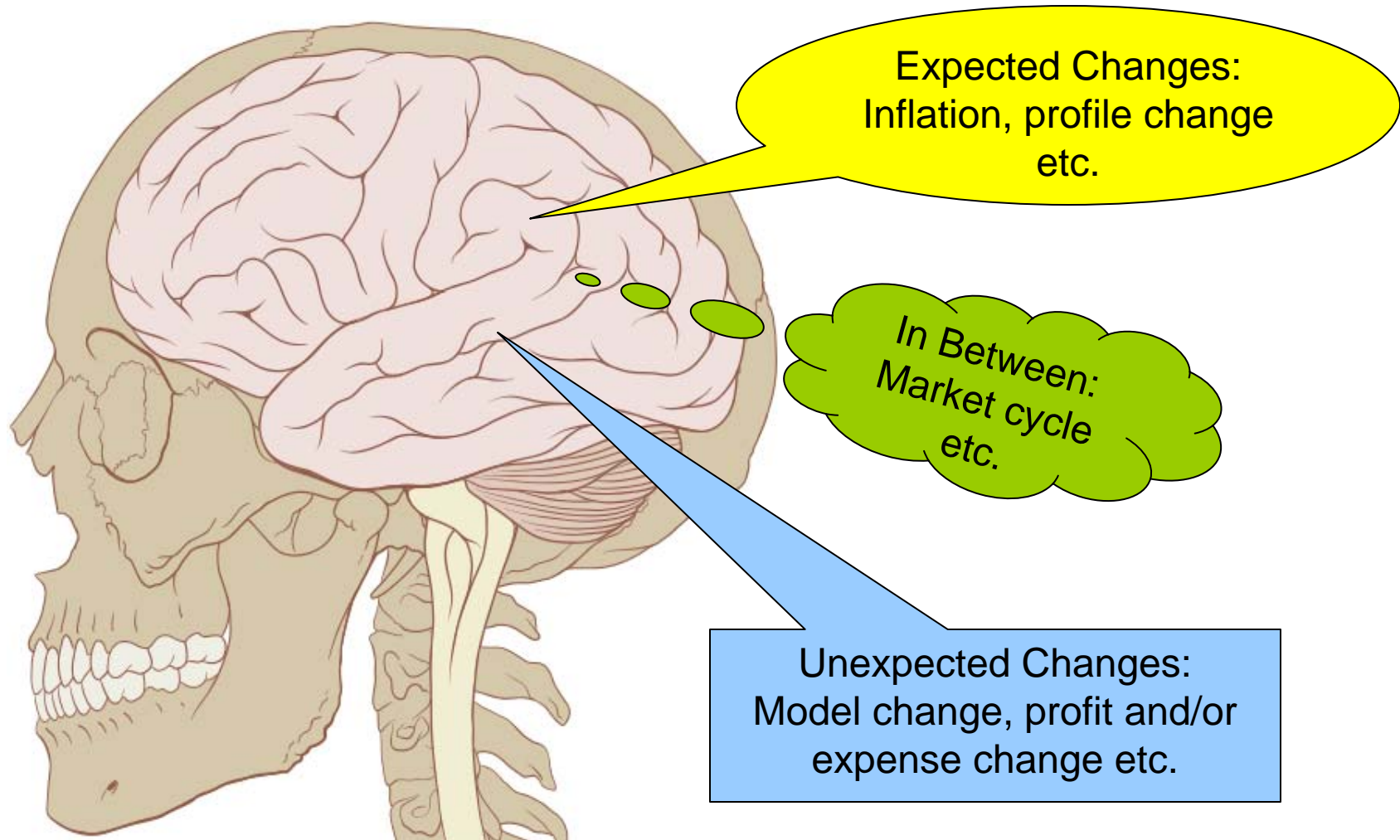
- Operational:

- Provide good services
    - Lock down renewals early

- Pricing:

- Consider price elasticity when making rate decisions
    - Minimize unexpected price changes

# Renewal Disruptions - The Psychological Aspect



## Renewal Considerations for Price Optimization

- Loss Cost

- Minimize the unexpected price changes when building a loss cost model
- Select a model that will result the least unexpected disruption

- Retention

- Tune the unexpected price changes based on price elasticity to maximize your objective, such as the overall profit

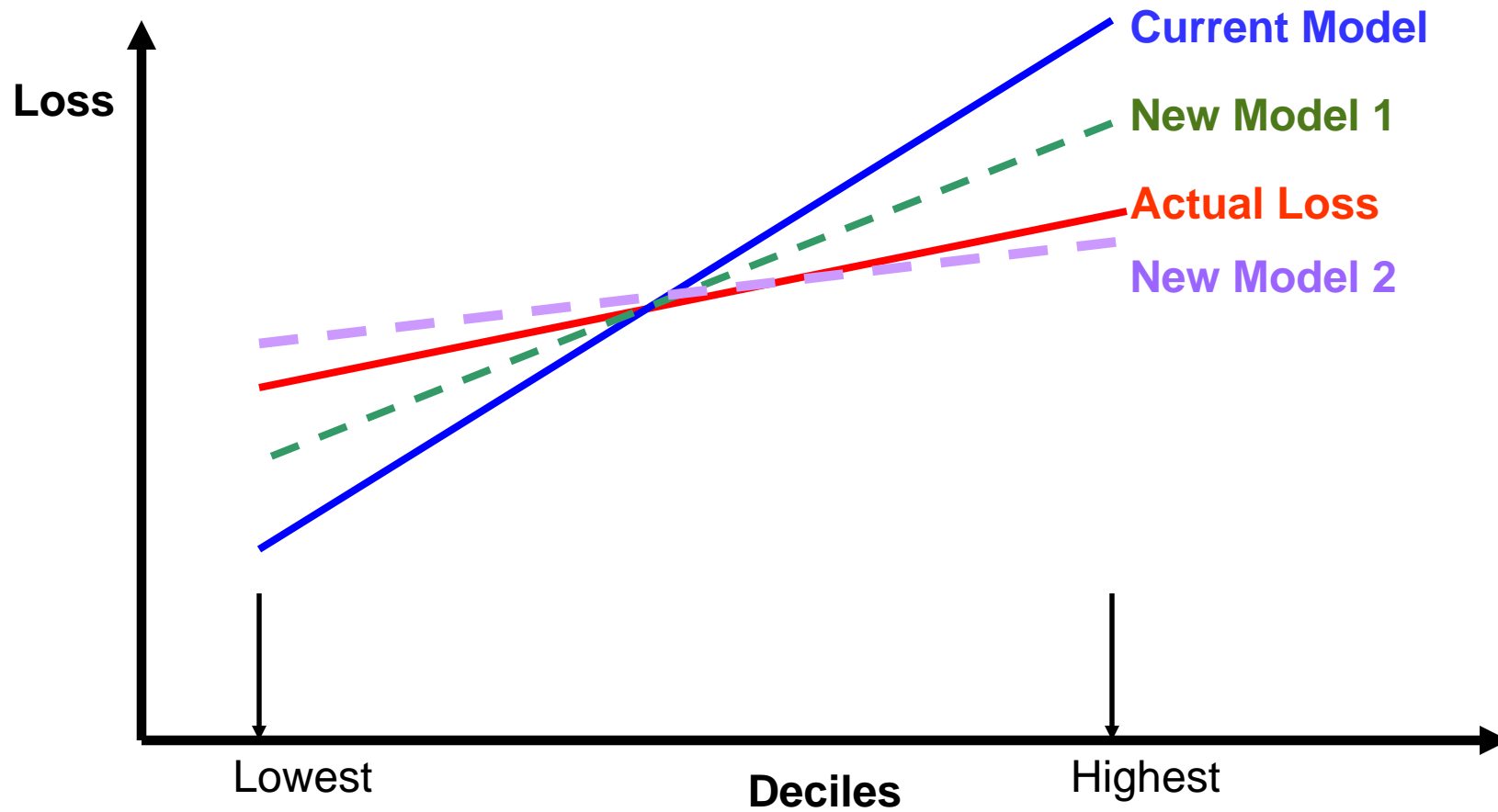


## Renewal Loss Cost Model - How To Minimize the Unexpected Price Changes?

- Explicitly penalize the unexpected changes in your model
  - Find  $\beta$  that will minimize  $\sum w_i (y_i - \hat{y}_i)^2$
  - Subject to  $\lambda * \text{Penalty}(\beta)$
- No need to offer a discount if not expected – does not help much with retention
- Validate the price increase after claim activities, especially for long tenure insureds
  - People expect favorable treatment for loyalty
  - Otherwise, force people to shop

# Renewal Loss Cost Model Selection

Lift Chart: Actual vs. Predicted Loss



## Retention – Tune the Unexpected Price Change

Assume:

- Prob. to Shop =  $\text{logit}^{-1}(a_1 + \beta_1 * \text{Unexpected price change}(\theta) + \dots)$
- Prob. to churn IF shopping  
=  $\text{logit}^{-1}(a_2 + \text{new business elasticity} * \text{Total price}(\theta))$

→→

Predicted Retention( $\theta$ ) =  $(1 - \text{Prob. to Shop}) + \text{Prob. to Shop} * (1 - \text{Prob. to churn IF shopping})$

Predicted Profit

=  $\Sigma(\text{Price change}(\theta) - \text{Needed change}) * \text{Predicted Retention}(\theta)$

Find the  $\theta$  that will maximize the Predicted Profit

# The Price Optimization Process Recap

