Equity-Based Insurance Guarantees Conference

Nov. 6-7, 2017

Baltimore, MD

Fixed Index Annuity – Hedging and Risk Management

Arsen Arutyunov, Pawel Konieczny

Sponsored by

ANNUITY SYSTEMS INC.

SOCIETY OF ACTUARIES®

Fixed Index Annuity – Hedging and Risk Management

ARSEN ARUTYUNOV, ASA

PAWEL KONIECZNY, PHD, CFA, FRM

Session 2A: 1300 – 1530 hours

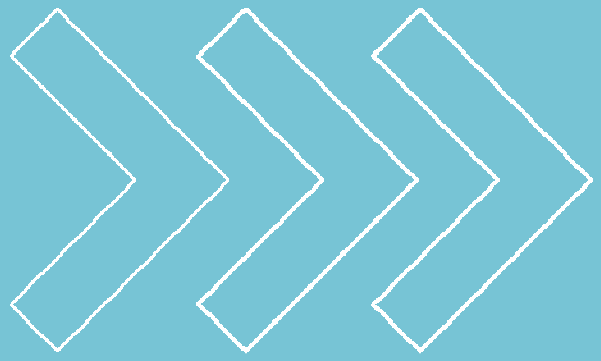
6 November 2017

SOCIETY OF ACTUARIES®

Agenda

- Introduction
- Industry survey
  - Background
  - Common hedging practices
  - Instrument exposure overview
- Closing remarks

INDUSTRY SURVEY

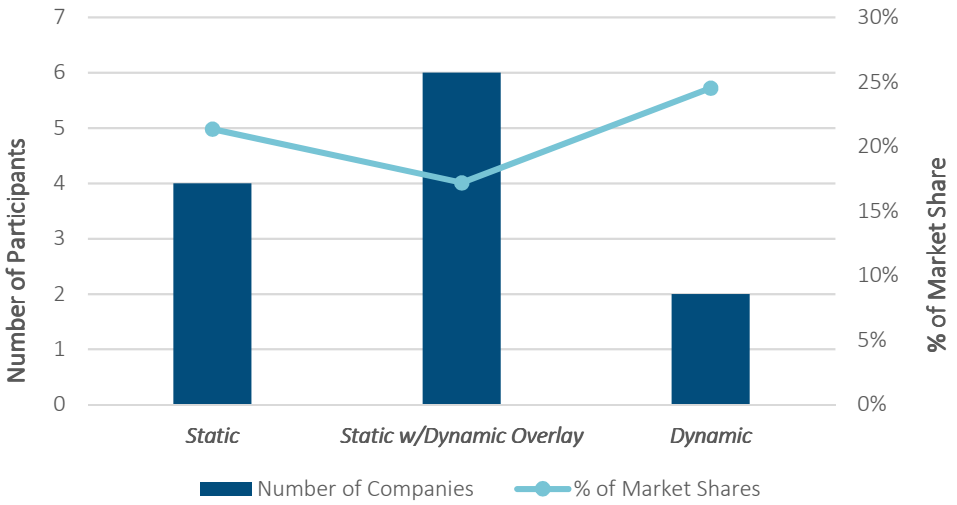


SOCIETY OF ACTUARIES®

SURVEY BACKGROUND

- 12 companies contributed to the industry survey through an interview format, representing 65% of market share on FIA new sales
- Here are some key characteristics of the 12 participants:
  - Most participants are ranked in LIMRAS top-20 list of highest annual FIA premium
  - Most participants considered fixed index annuities (FIA) as their core product
  - All individuals interviewed occupy a managerial role and oversee the hedging operation
- A total of 11 questions were asked around companies' core hedging practice and strategies

CORE HEDGING STRATEGY



Remarks

- The majority of participates deem static hedging with dynamic overlay as their core hedging strategies.
- Of the participants employing static with dynamic overlay strategy, a reported range of 50%-95% of issued account value (i.e. notional) are matched with a derivative of equivalent terms.
- On the contrary, some large FIA writers heavily utilize strictly static or pure dynamic hedging strategies for their FIA business.

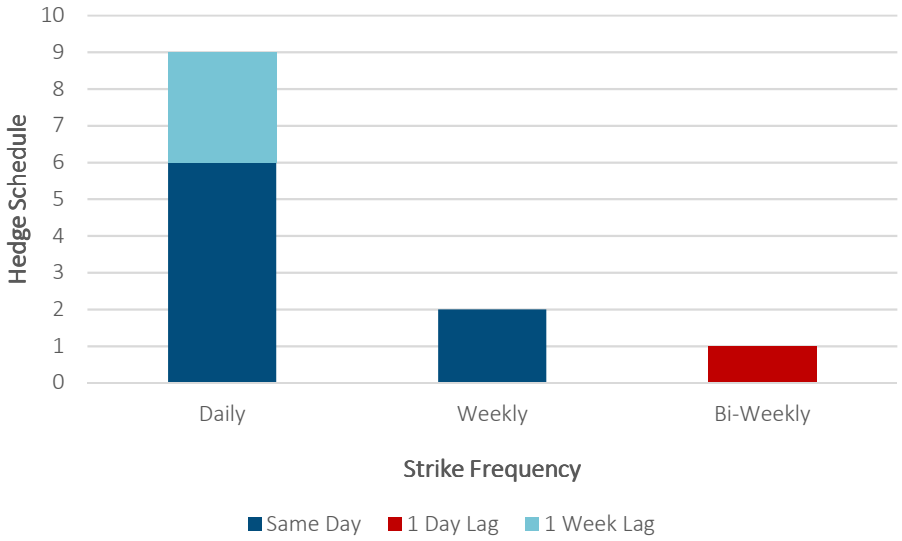
Definitions

Static: Under this strategy, the company will attempt to match the cash flows of issued liabilities (adjusted for expected decrements) with a derivative of equivalent terms.

Static with a Dynamic Overlay (DO): Under this strategy, the company will match all issued liabilities (adjusted for expected decrements) up to a certain % of Account Value. The portfolio of liabilities and hedges is then rebalanced dynamically according to pre-defined Greeks.

Dynamic: Under this strategy, the company will attempt to match the Greek profile of outstanding liabilities with offsetting hedge transactions.

FREQUENCY TO STRIKE AND HEDGE POLICIES



Same day hedge schedule

- Majority of participants hedge on the same day as they strike
- Clients with high daily volumes can employ a same day hedge program to minimize basis risk

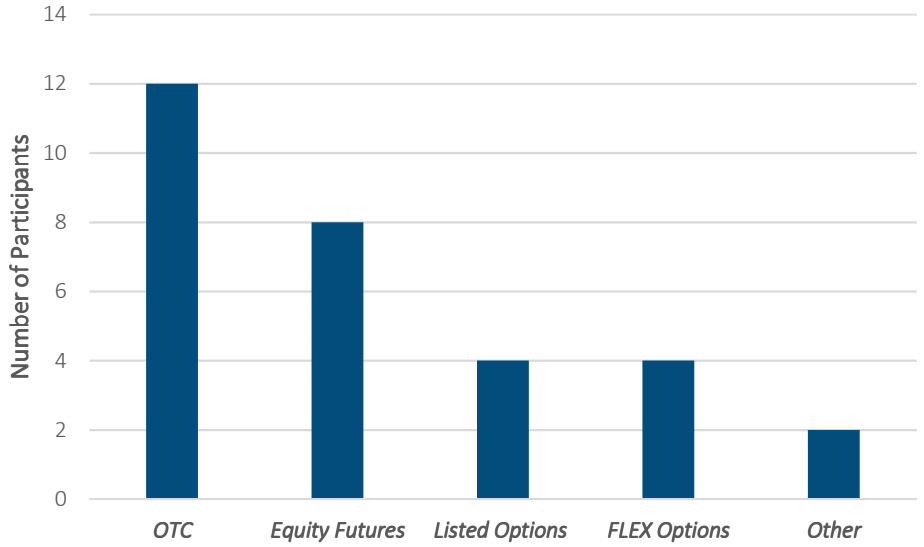
Lagged hedge schedule

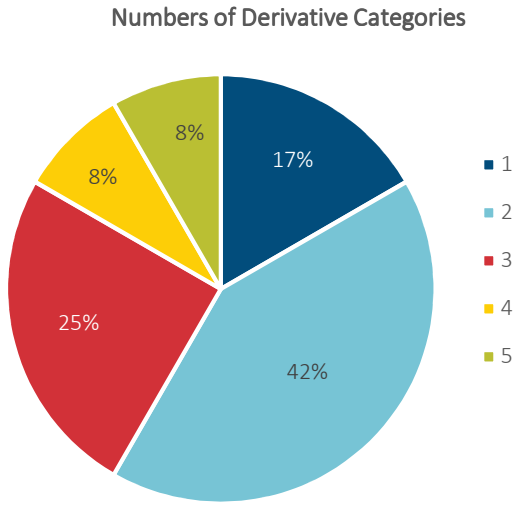
- Participants who do not have a large trade volume will tend to defer trading until enough exposure has been accumulated to justify placing a hedge with a counterparty
- Participants acknowledged that some basis risk exists when employing a lag, but have deemed the risk to be unbiased

Definitions

- Depending on the lag, the company will be exposed to basis risk due to the difference in the policy strike value and the hedge strike value.
- Of the participants who employ a dynamic component as part of their current strategy have admitted that they will rebalance their exposure daily (or depending on predetermined limits). The lag component pertains to the static component of the core hedging strategy.

COMPOSITES OF HEDGE PORTFOLIO



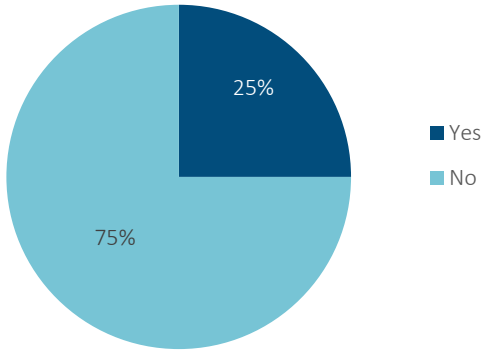


Remarks

- All participants leveraged OTC derivatives as part of their hedging programs
- Participants who have a large dynamic component as part of their strategy mentioned that they utilize listed options to manage their near term exposure
- Equity futures are favored for dynamic hedgers to manage residual exposures

ADJUSTMENTS TO HEDGE TARGETS FOR LIVING BENEFIT RIDERS

Are you incorporating the living benefit premium in the expected decrement value used to derive the hedge value?



Remarks

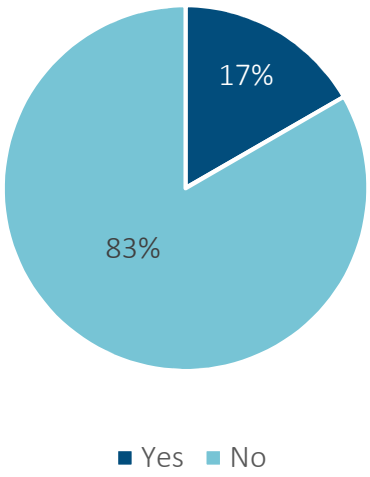
Participants who are making an adjustment cited the following reasons:

- More accurate view of the forward liability.

Participants who are not making an adjustment, mentioned that they are currently not actively monitoring the market risk / sensitivity of the living benefits offered on the base contract.

- Most participants agreed that taking a proactive approach to measuring this exposure is on their "to-do" list

UNHEDGED LIABILITIES



Remarks

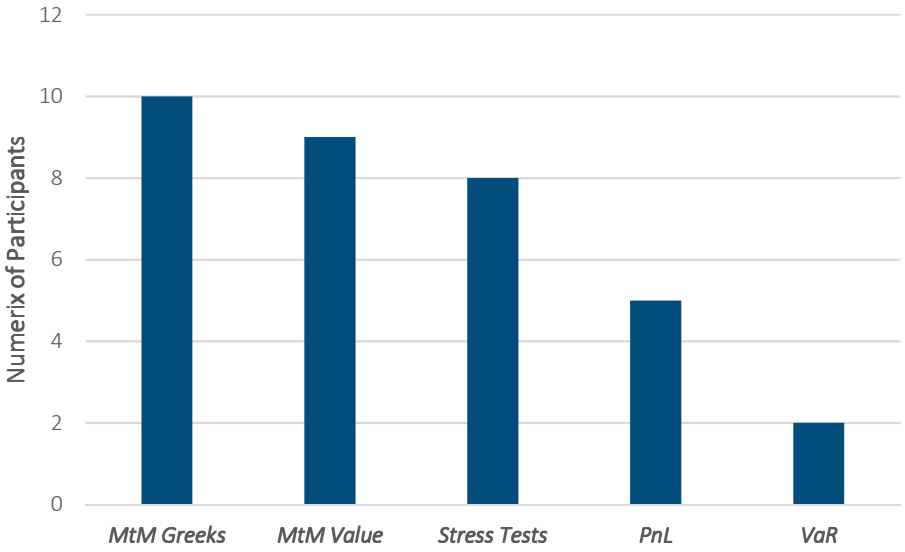
- Common rationale for leaving a particular cohort unhedged was due to cost and low liquidity associated with placing a hedge.
- In all cases when respondents who decided to leave a cohort unhedged mentioned that their companies' macro-hedge program would eventually account for any residual risk left by the outstanding cohort.
- Mark-to-market valuations are done to determine the current exposure of any residual/unhedged risks.
- All participants commented that in instances when hedges cannot be grouped is similar risk, some form of cross-hedging was performed.

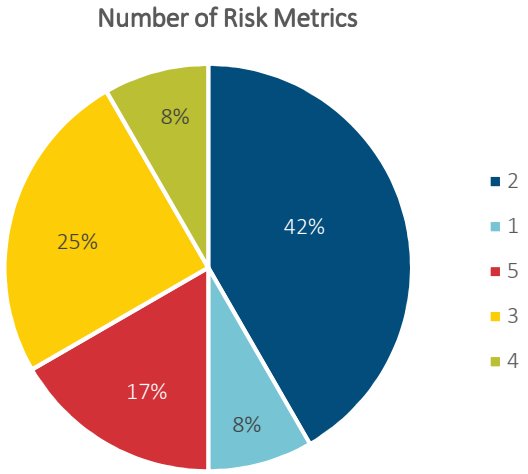
Definitions

Yes: Depending on the materiality of a given liability cohort, the company may leave this cohort or certain risks of the cohort unhedged

No: All liability cohorts are categorized into similar risk groups and hedged

RISK METRICS



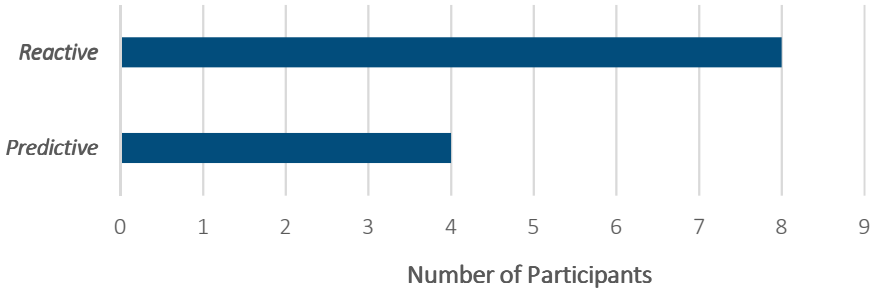


Remarks

- Most common risk metrics observed are: Greek sensitivity and mismatch & mark-to-market value of liabilities and hedges.
- A common focus across all participants on their Greek exposure is inline with the overall trend observed to employ a more dynamic strategy.
- Few participants mentioned that they utilize VaR to measure their tail exposure, and depending if limits are breach will take action to rebalance their position.

OTHER KEY TOPICS SURVEYED

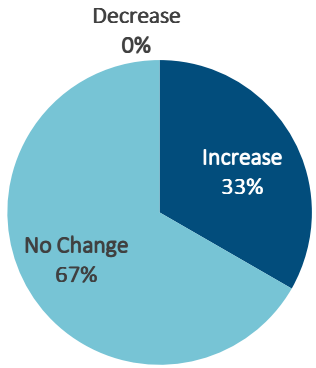
At a high level, which would best describe your current approach for setting CAP and PAR rates on newly issued policies?



Remarks.

- Most respondents employ a reactive approach to set rates based on current prevailing / most recently known dealer quotes.
- Others utilize a proprietary model that will estimate future option prices offered by dealers

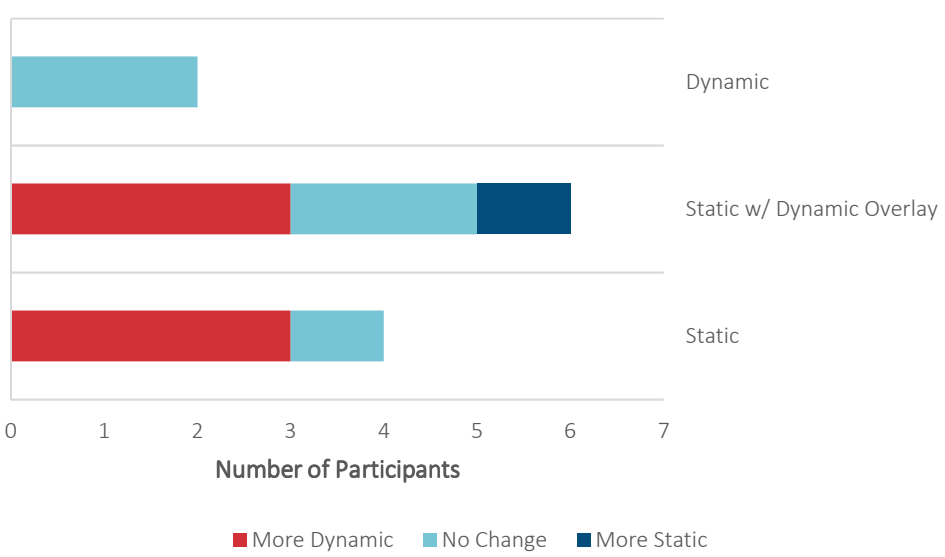
For the foreseeable future, are you looking to increase or decrease your exposure to hybrid indices?



Remarks

- Most participants are satisfied with their current offering of hybrid indices.
- A few participants did respond that they would like to offer more strategies that can add value to their policyholders via a hybrid index.
- No participants seek to decrease offering to hybrid indices.

HEDGING STRATEGY EVOLUTION TREND



Remarks

- Most participants expressed intentions or interests to move onto a more dynamic hedging approach
  - to accommodate evolving product designs
  - to improve hedging efficiency when prevailing dealer rates are deemed to be high
- One participant mentioned that they would like to focus more on managed strategies (e.g. smart beta) as a way of enhancing their portfolio

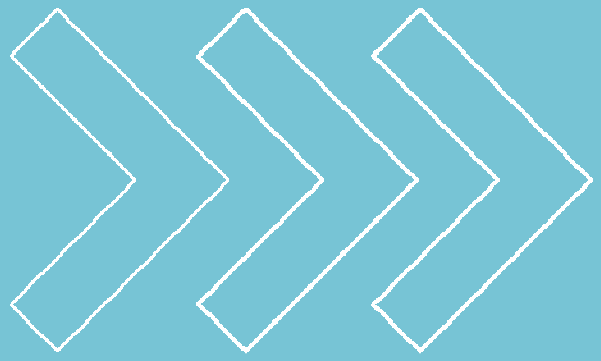
Definitions

Static: Under this strategy, the company will attempt to match the cash flows of issued liabilities (adjusted for expected decrements) with a derivative of equivalent terms.

Static with a Dynamic Overlay: Under this strategy, the company will match all issued liabilities (adjusted for expected decrements) up to a certain % of Account Value. The portfolio of liabilities and hedges is then rebalanced dynamically according to pre-defined Greeks.

Dynamic: Under this strategy, the company will attempt to match the Greek profile of outstanding liabilities with offsetting hedge transactions.

COMMON FIA HEDGE INSTRUMENTS



SOCIETY OF ACTUARIES®

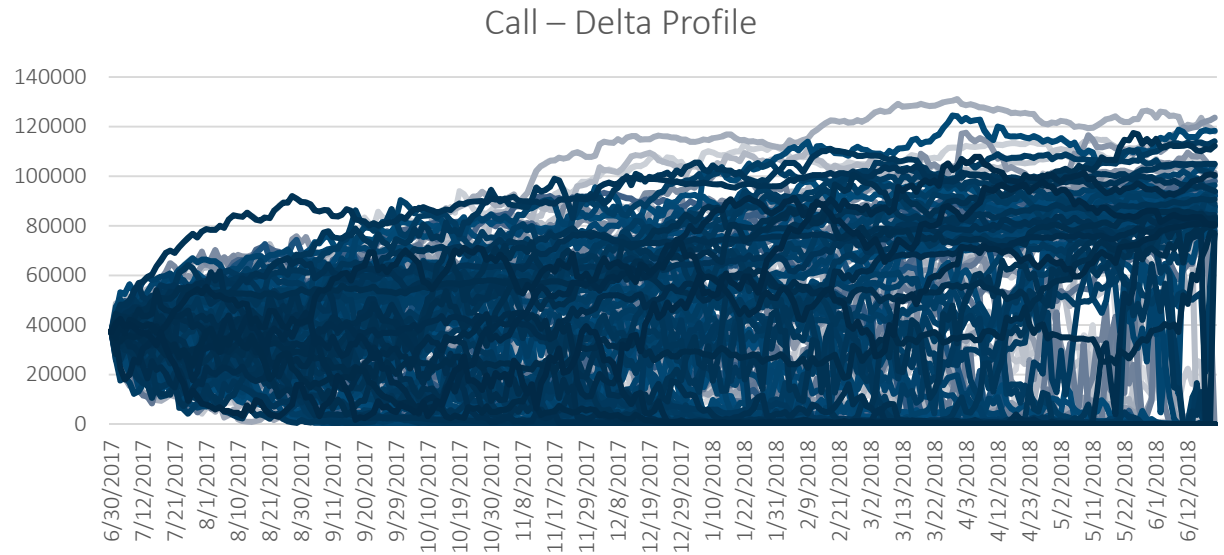
EUROPEAN CALL

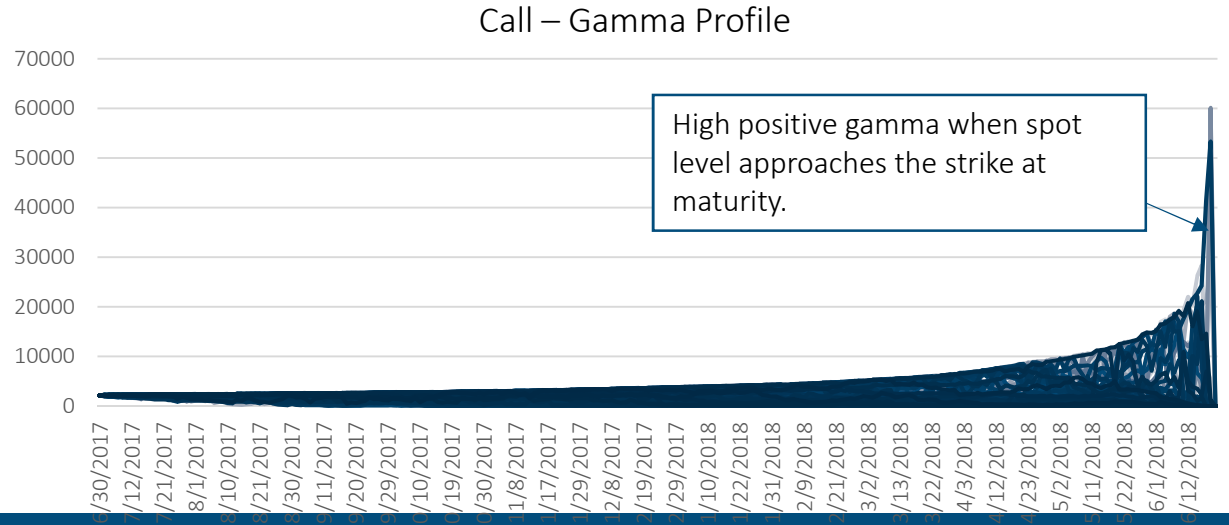
Example

- Payoff definition:
  - $\max(0, St - K)$
- Crediting methodologies hedged
  - Annual Point-to-Point with a participation rate
- Using a generic outer loop with daily time-steps, simulate an ATM European Call option with the following terms:
  - $1,000,000 in Notional
  - 1yr term.
- Plot the Delta and Gamma values across time for all scenarios.

Results

- Delta is strictly positive, and will grow with the underlying.
- Gamma is strictly positive, can become explosive when the option approaches maturity and the spot level is close the strike.





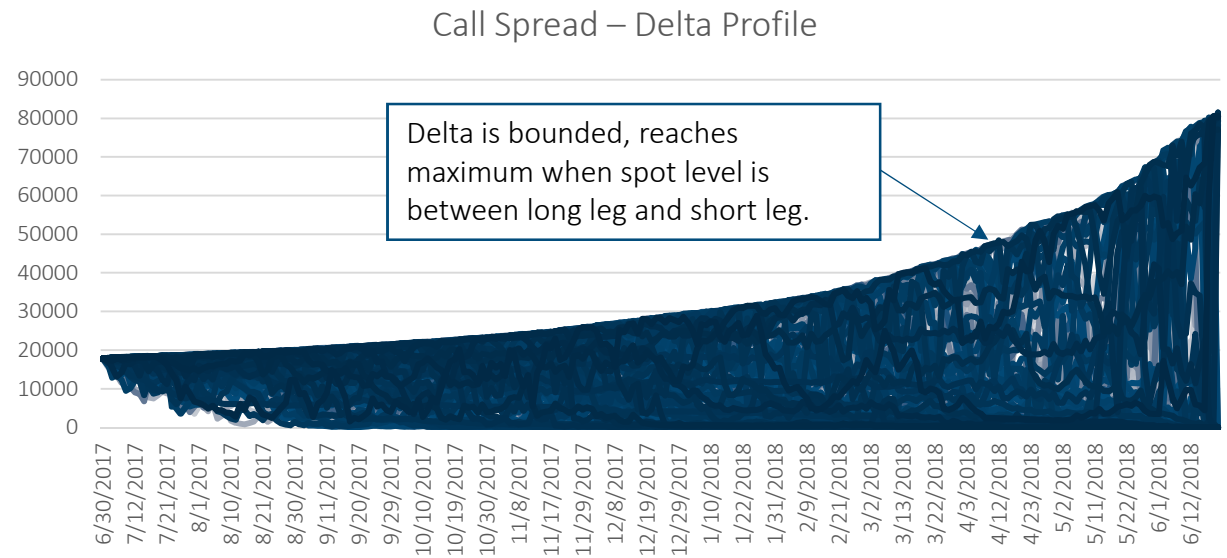
CALL SPREAD

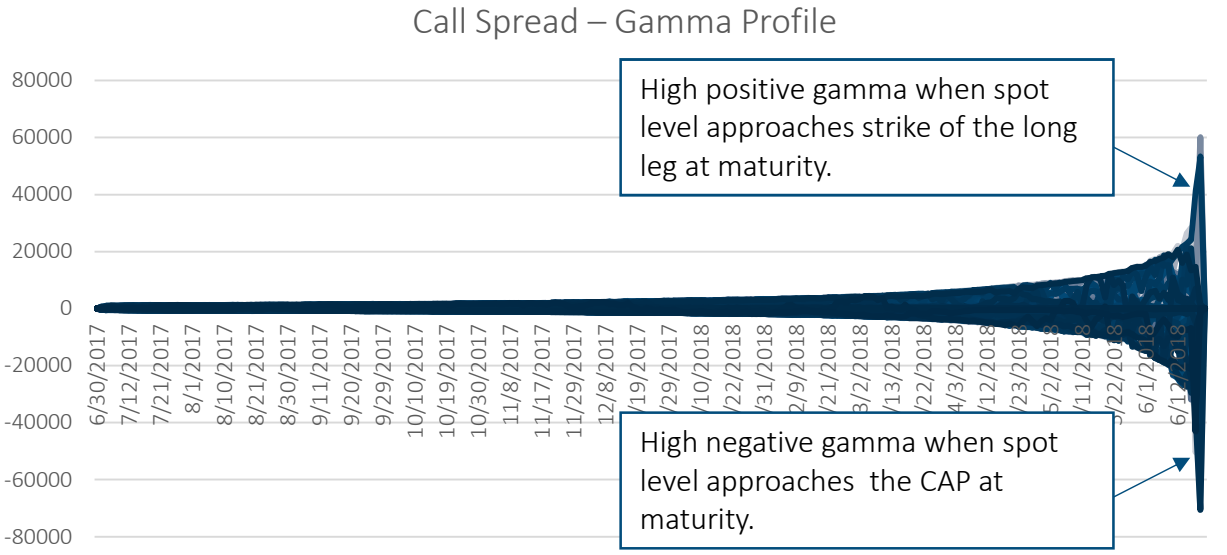
Example

- Payoff definition
  - $\max(0, \min\left(CAP, \frac{St}{S_{t-1}} - 1\right))$
- Crediting methodologies hedged
  - Annual Point-to-Point with a cap rate
- Using a generic outer loop with daily time-steps, simulate a Call Spread with the following terms:
  - 7.25% CAP
  - $1,000,000 in Notional
  - 1yr term
- Plot the Delta and Gamma values across time for all scenarios.

Results

- Call spread delta is again strictly positive, and shows a more subdued Delta profile.
- Call spread gamma can be explosive in both positive and negative directions, which can potentially make hedging more difficult.





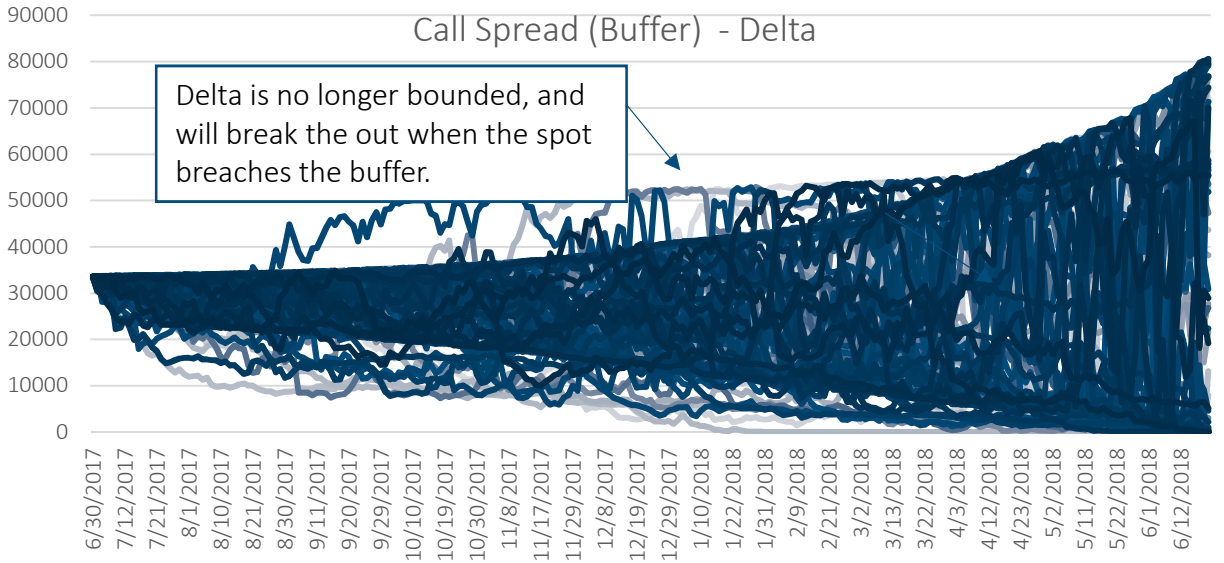
CALL SPREAD with buffer

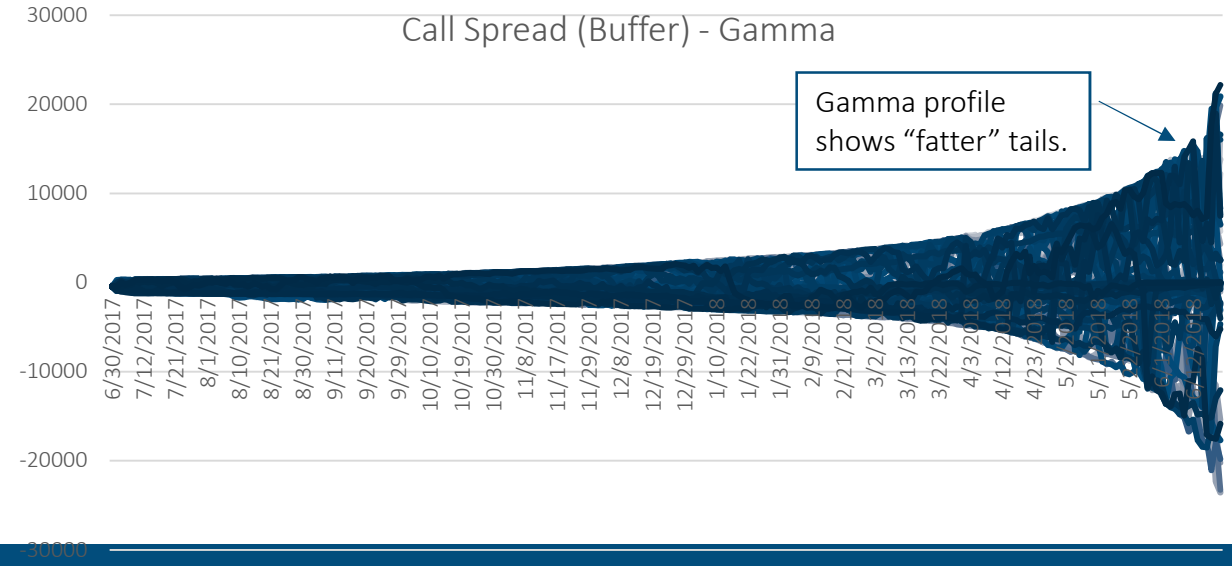
Example

- Payoff definition
  - $\min\left(\frac{St}{S_{t-1}} - 1 + b, c, \max(0, \frac{St}{S_{t-1}} - 1)\right)$
- Crediting methodologies hedged
  - Annual point-to-point with cap rate and buffer (RIA).
- Using a generic outer loop with daily time-steps, simulate a Call Spread with the following terms:
  - 10% CAP
  - 20% Buffer
  - $1,000,000 in Notional
  - 1yr term
- Plot the Delta and Gamma values across time for all scenarios.

Results

- Call spread w/ buffer has a similar delta profile as a regular call spread, but also introduces a "call" like behavior from the short position in the OTM put.
- Gamma can become high when the underlying spot value is close to the buffer, cap, or the strike value of the long call.





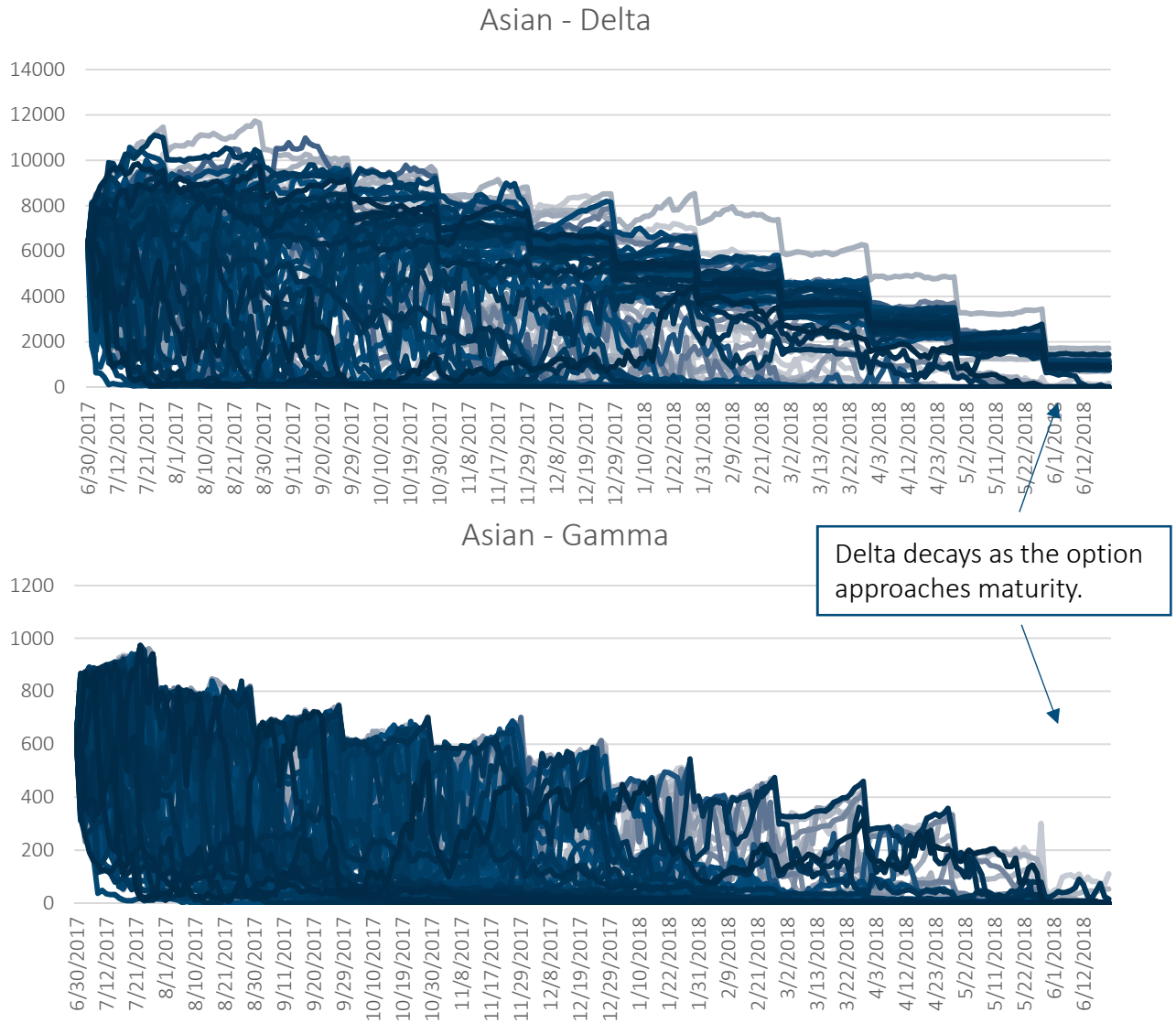
ASIAN OPTION

Example

- Payoff definition:
  - $\max(0, \frac{\sum_i^n s_i}{n} - K)$
- Crediting methodologies hedged
  - Monthly averaging
- Using a generic outer loop with daily time-steps, simulate a Asian option using following terms:
  - $1,000,000 in Notional
  - 1yr term
  - Fixed strike & arithmetic mean
- Plot the Delta and Gamma values across time for all scenarios.

Results

- A natural property of an averaging option is that it's price becomes more certain through passage of time.
- Delta and Gamma profiles both reflect the price stability that this option exhibits leading up to maturity.



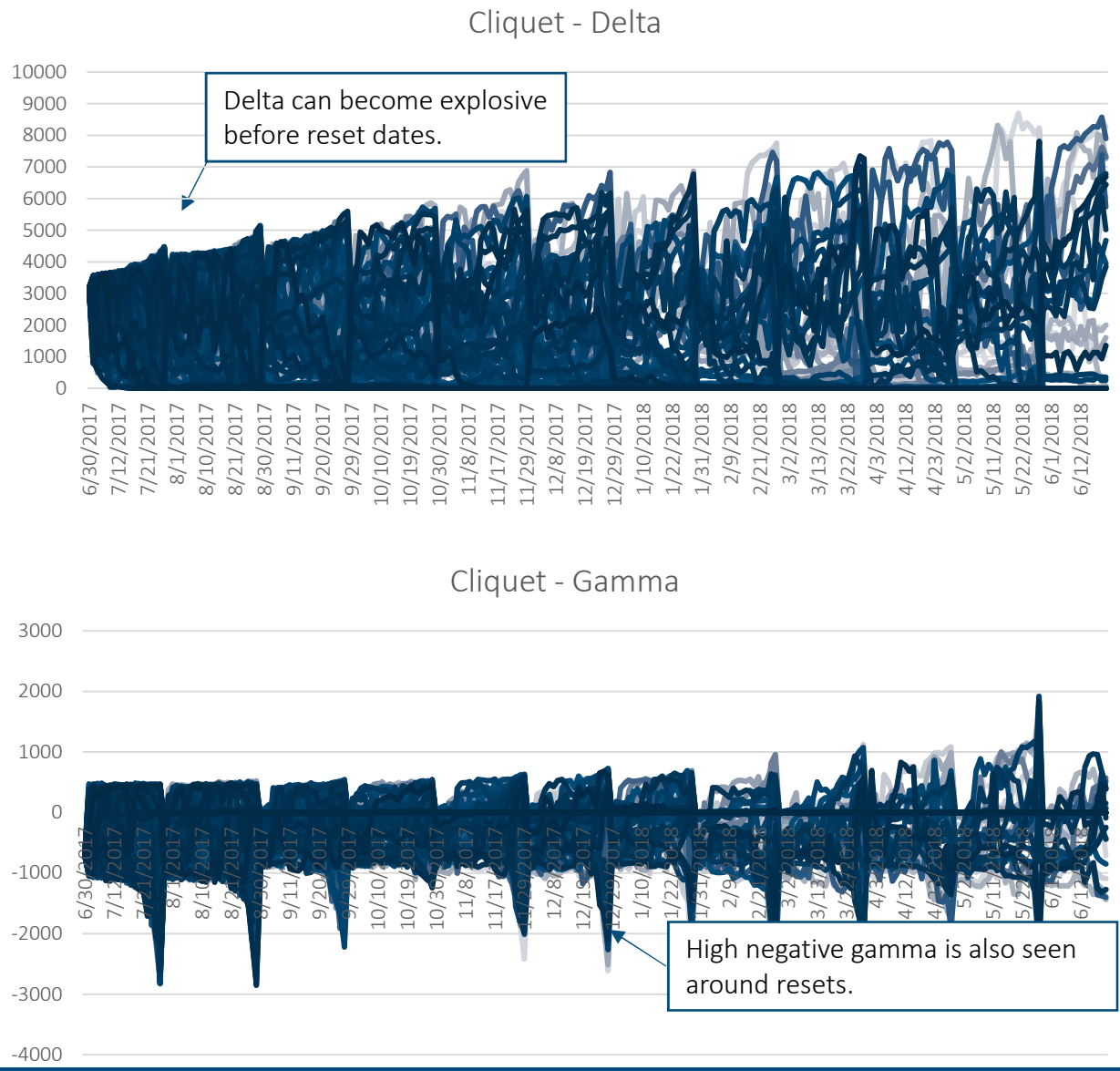
CLIQUET

Example

- Payoff definition
  - $\max(0, \sum_i^n \min(CAP, \frac{St}{S_{t-1}} - 1))$
- Crediting methodologies hedged
  - Monthly sum cap
- Using a generic outer loop with daily time-steps, simulate a Cliquet with the following terms:
  - 2% local CAP
  - 0% global floor
  - $1,000,000 in Notional
  - 1yr term
  - Monthly resets
- Plot the Delta and Gamma values across time for all scenarios.

Results

- Cliquet delta profile shows a similar diffusion as the call spread, with maximum delta value peaking around reset dates.
- Cliquet gamma can be explosive, change signs, which can potentially make hedging more difficult.



Q&A

SOCIETY OF ACTUARIES®