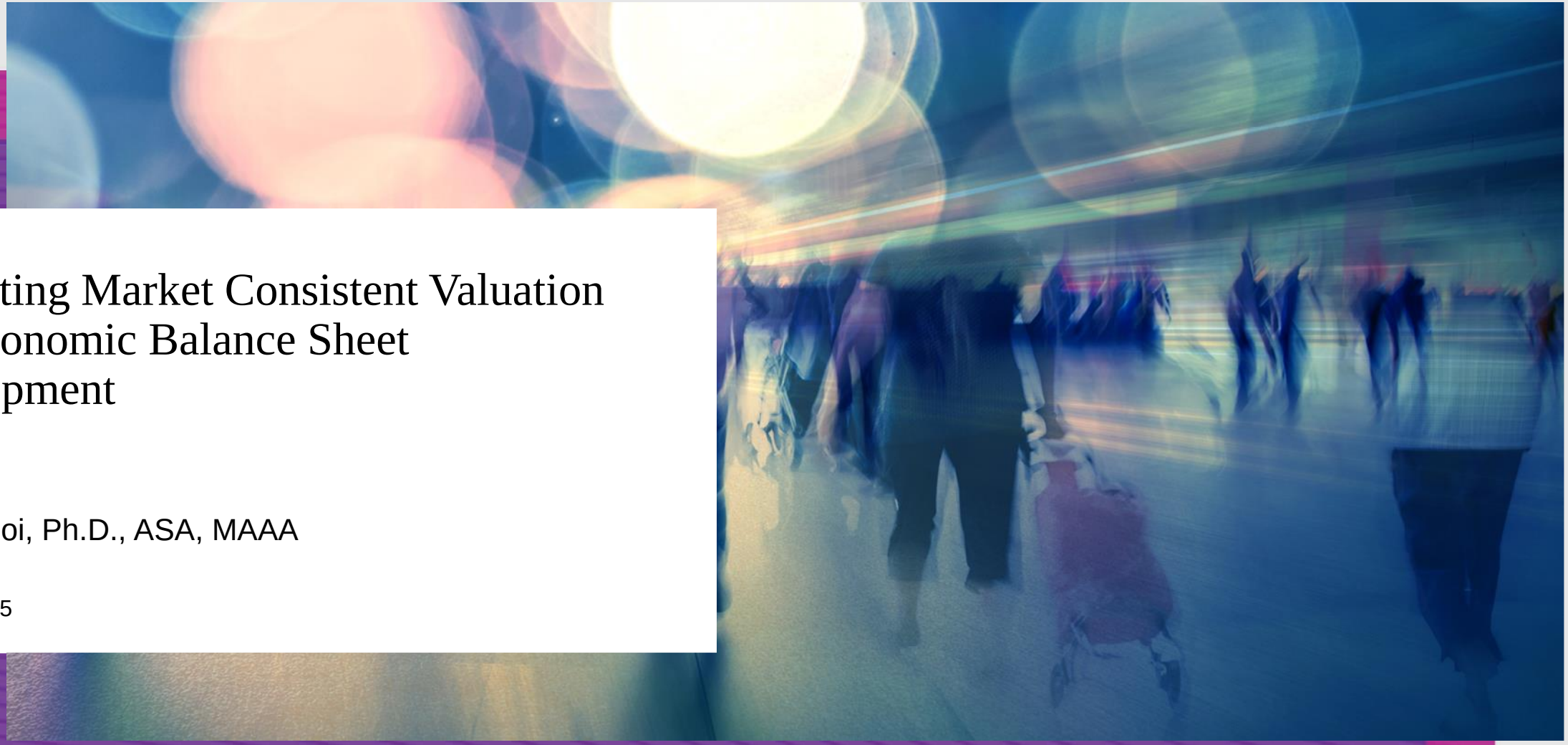

Integrating Market Consistent Valuation into Economic Balance Sheet Development

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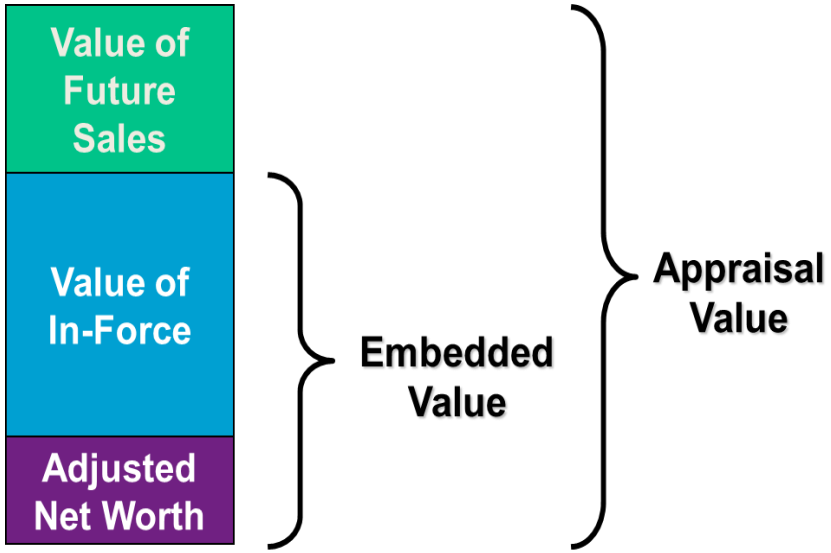
Agenda

1. Overview of Market Consistent Embedded Value (MCEV)
2. Developing “Own” Spreads and Stochastic Scenarios
3. Applying MCEV in Economic Balance Sheets

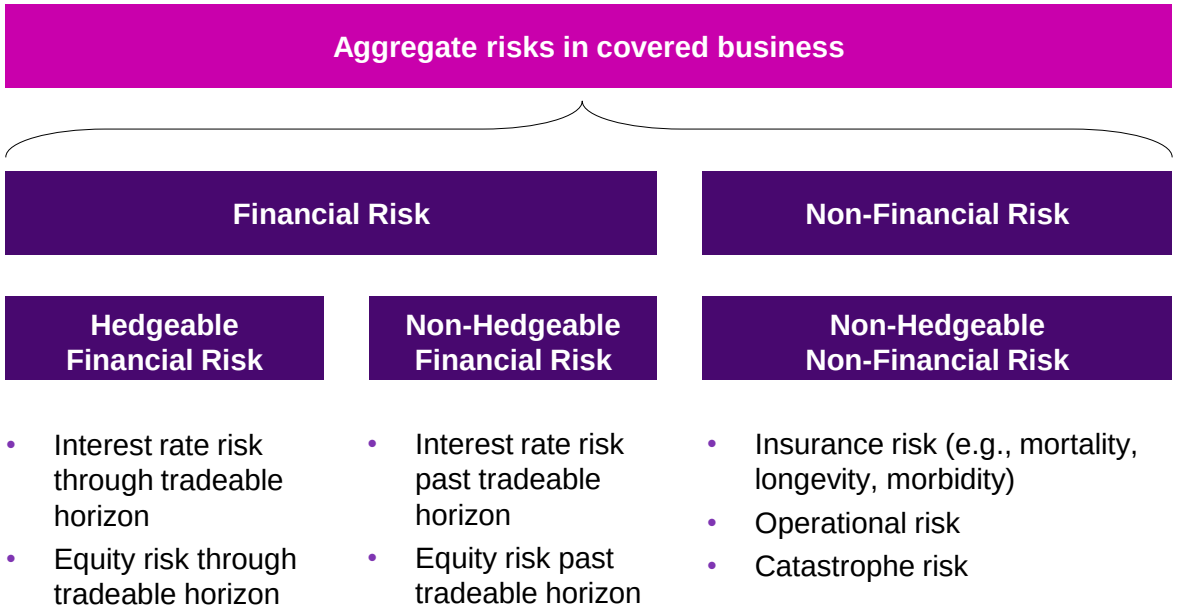
Overview of Market Consistent Embedded Value (MCEV)

What is the value of the firm?



- Firm value (Appraisal value) = Embedded Value + Franchise Value
  - This is true of all firms (not just life insurers)
- Value of Future New Business (aka Franchise Value) is the value of the firm attributable to *future sales*
- Embedded value (EV) is the value of the firm attributable to sales that *have already occurred*
  - Adjusted Net Worth (ANW): Value of initial investment plus retained profits
  - Value of In-Force (VIF): Value of future profits which is a present value of statutory book profits after tax, less cost of target surplus
- EV can be used to measure the “economic” performance of a life insurer over time

Value derived from taking risk



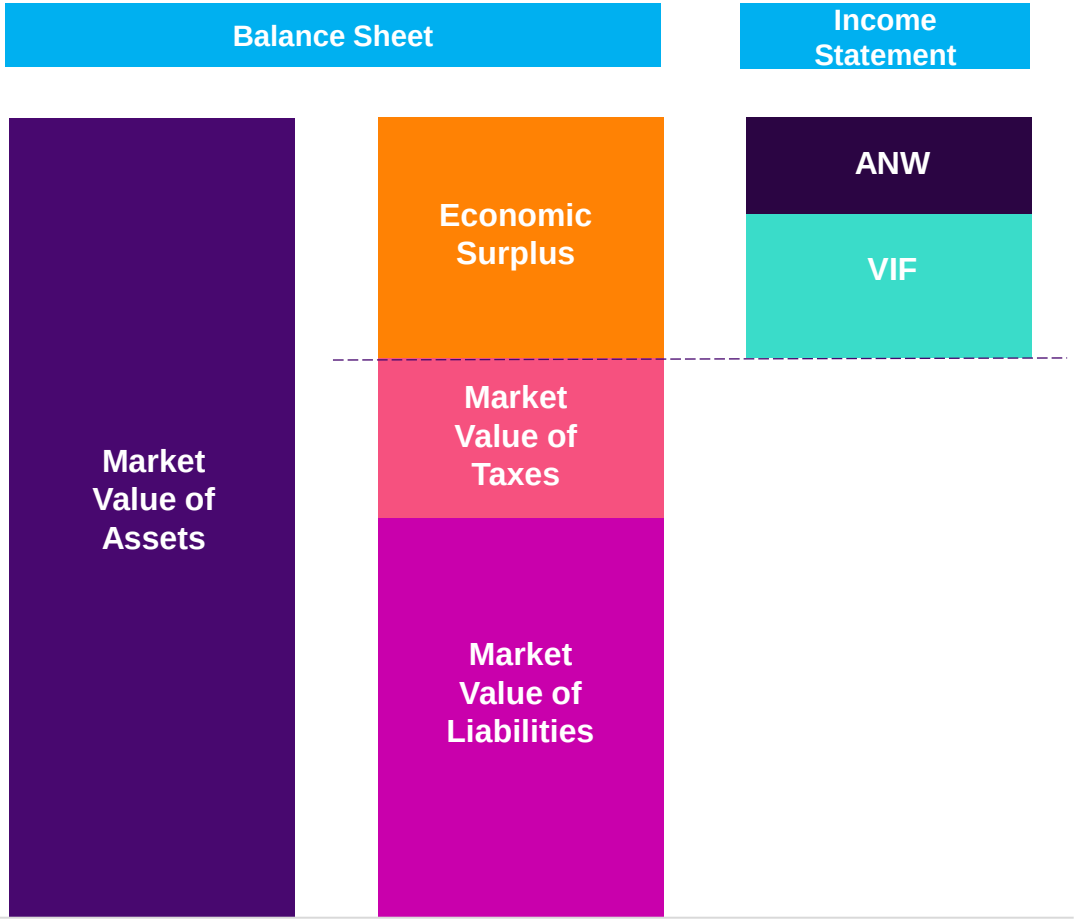
- Valuation should account for aggregate risks in the business
- Contracts have long duration, so need to consider time value of money
- Regulatory regime (and common sense) require capital to protect against downside risk
- Multiple ways to value risky cash flows
  - Discount rate adjustment
  - Certainty-equivalent
  - Option techniques

Key Questions in Risk Allowance

Issue	"Traditional" EV	"Market-Consistent" EV
Risk discount rate	Adjusted to account for all risks at company level (e.g., via WACC)	Reflects hedgeable risks (via market view)
Embedded options and guarantees	Implicitly accounted for in RDR	Explicitly accounted for via TVOG (note any intrinsic value is in baseline)
Cost of capital	Reflects drag on required return (RDR)	Reflects both frictional costs (taxation) and separate cost of non-hedgeable risks

- How is the risk discount rate determined?
- How are embedded options and guarantees reflected?
- What is the cost of capital for non-hedgeable risks?

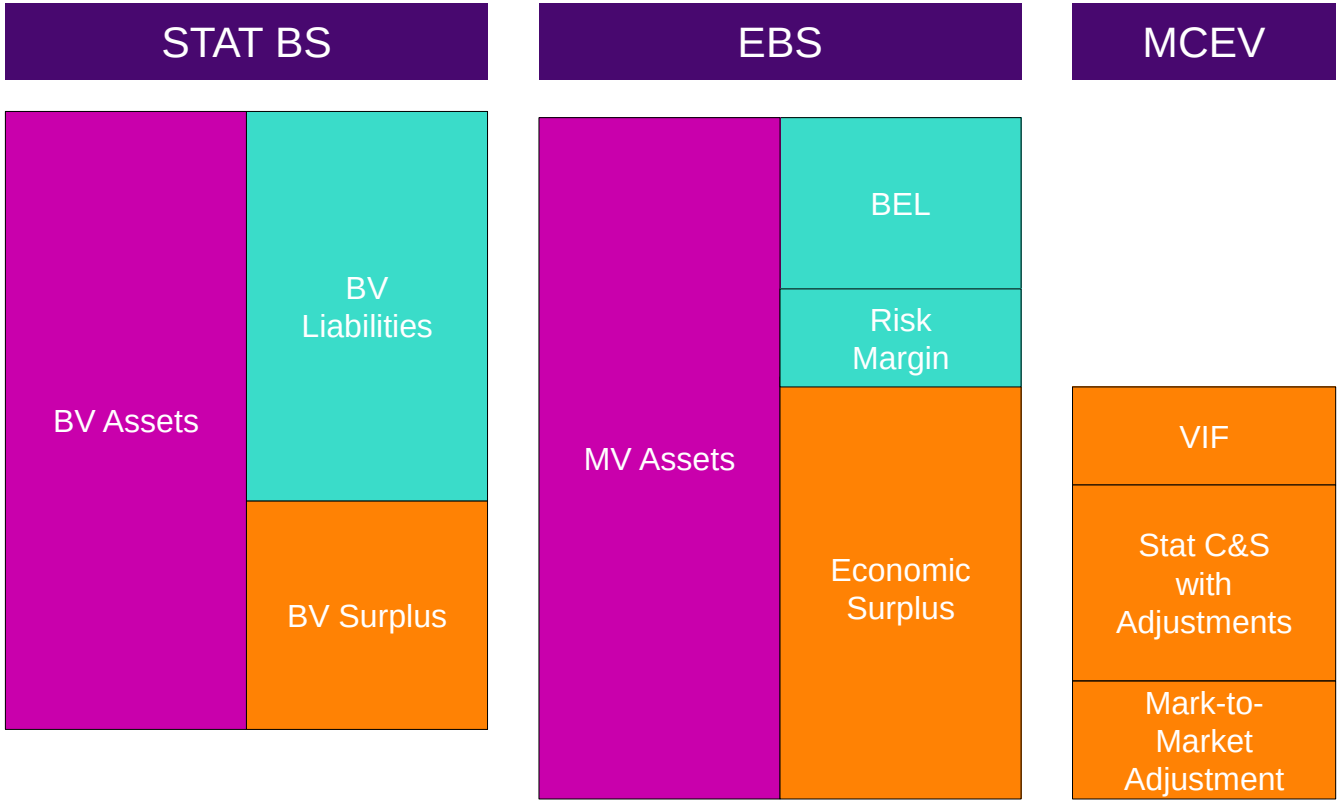
Balance Sheet vs. Income Statement Method



- Income Statement approach
  - Calculate VIF = present value of future profits after tax
  - Adjustments for TVOG and cost of capital as appropriate
- Balance Sheet approach
  - MCEV = MVA – MVL - MVT
  - MVL is based on PV cash flows, with adjustment for TVOG and a risk margin
  - VIF calculated as MCEV – ANW
- Under market-consistent conditions, two approaches will give same answer

Adjusted Net Worth

- Adjusted Net Worth (ANW) is the realizable (market) value of capital and surplus
- Always Balance Sheet oriented
  - Begin by allocating balance sheet items to VIF
- Residual balance sheet entries are marked to market and tax-effected
- Typical adjustments to US statutory basis include setting AVR = 0 and adding a value for non-admitted assets and reinsurance on unauthorized companies



Present Value of Future Profits

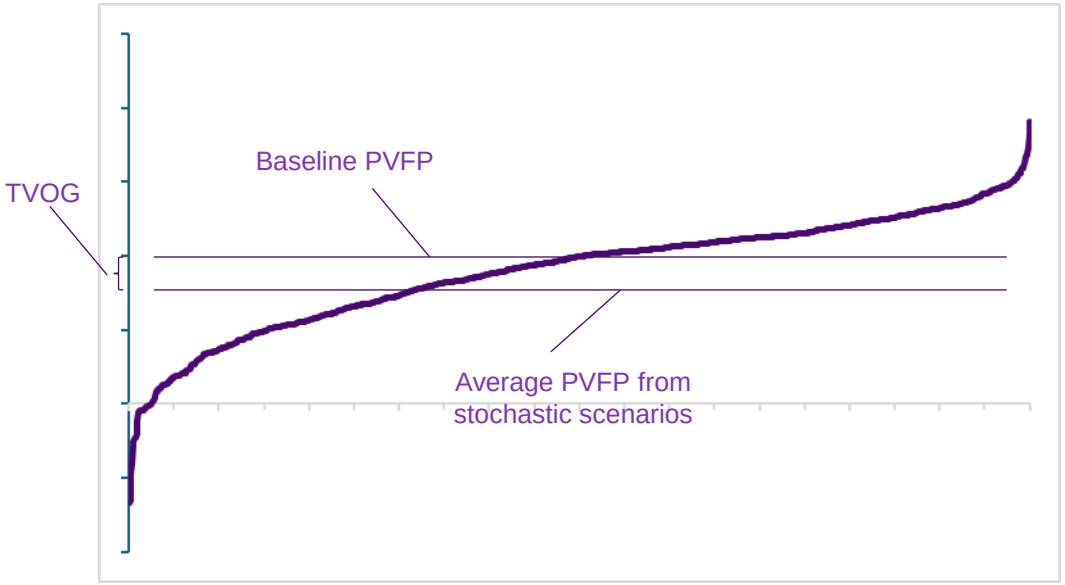
- Present Value of Future Profits (PVFP) is the present value of after-tax cash flows from the inforce covered business and the assets backing the associated liabilities

- It can be derived from either balance sheet or income statement view

Income Statement	Balance Sheet
▪ Project profits ▪ Requires cash flows + investment income and reserve changes ▪ Requires an accounting basis (to define profit)	▪ Project liability cash flows ▪ Requires premium, benefits, expenses ▪ Requires an allocation of starting assets

Time Value of Options and Guarantees

EXAMPLE



- Time Value of Options and Guarantees (TVOG) represents the difference between the market-consistent price of the guarantee and the intrinsic value
- Intrinsic value is captured in the baseline run
- Time value arises from asymmetric payoff
- Common guarantees include:
  - VA GMxB
  - UL with no-lapse guarantees
  - Fixed products with guranteed interest rate floors

Cost of Capital

- In “standard” MCEV, the cost of capital reflects two items:
  - The frictional cost of holding required capital (i.e., the cost to the shareholder of being forced to restrict capital distribution)
  - The cost of non-hedgeable risk (i.e., an allowance for risks not covered elsewhere in the valuation)

- Non-hedgeable risk typically considered as consistent with C2 and C4 risk under US RBC

- The cost of non-hedgeable risk is typically calculated using a cost-of-capital approach
  - Begin by developing an appropriate capital measure allocable to non-hedgeable risk at valuation date
  - Develop a method for projecting future required capital
  - Develop a cost of capital rate
  - Apply rate to projected capital to determine a projected annual capital charge
  - Discount this charge at appropriate reference rates

- CoC is included in Risk Margin in the economic balance sheet
  - Margin Over Current Estimate (MOCE) under ICS – CoC method with 5% CoC rate, discounted at ICS risk free rates or Percentile method
  - Risk margin under Solvency II and BSCR – CoC method with 6% CoC rate, discounted at risk free rates

“Own” Spread Development and Scenario Generation

Developing the “Own” Spread (ICS Framework)

- Market adjusted discount rates are based on risk free rates plus “Own” Spread
  - “Own” spread is supposed to include illiquidity premium and other risk adjustment, if applicable
  - Methodology can vary by different accounting/capital regime

- ICS uses a three-bucket approach to calculate “Own” Spread (net of default)
  - Liabilities are classified with Top, Middle, and General buckets
  - Top bucket spread is calculated using the market spread of the assets backing a company’s liabilities
  - Middle and General bucket spread is prescribed by IAIS
  - A “modulation factor” is applied in the middle bucket to adjust for the credit spread to better align spread with actual risk
  - Application ratios are applied for each bucket spread (e.g. 100% for Top, 90% for Middle, and 80% for General)
  - Spread is risk corrected and can have a term structure

Stochastic Scenario Generation

- Stochastic scenarios required for TVOG calculation

- Calibration requirements for market-adjusted scenarios
  - Average of scenarios should calibrate to reference rate curves (i.e., risk free curve + spread)
  - Scenarios should be arbitrage free
  - Scenarios should replicate observed asset prices
  - Correlations across asset returns should calibrate to target correlations

- Scenario generation and validation
  - Parameters are calibrated using risk free rates and implied volatilities of swaption and equity options
  - Then, the scenarios are generated using the reference rate curve
  - Martingale test is conducted to validate the risk neutrality of the scenarios

Practical Considerations of MCEV in the Economic Balance Sheet Development

Other Considerations in MCEV

- Management options should reflect consistency with the assumed economic conditions
  - Key management options include credited rates and other NGEs
- Policyholder behavior should similarly reflect consistency with assumed economic conditions
  - Key policyholder options include surrender, lapse, feature utilization
- Generally, behavior modeling should be agnostic to scenario source
  - Any given scenario could occur in either a real-world or risk-neutral context
- However, core principles should apply
  - Within a scenario, economic conditions are global (i.e., competitors are experiencing the same conditions) – potential implications for competitor rates
  - Written product features remain intact (i.e., guarantees continue in effect) – behavior functions that refer to internal policy guarantees should continue to do so
- Critical to review model output under differing market conditions for reasonableness

Applications of EBS

- Alignment between statutory and market-consistent views can be challenging, but EBS insights can be applied in several areas:
  - Strategic Asset Allocation (SAA): Aligning assets with market-consistent liabilities
  - Capital management: Assessing capital adequacy (e.g. ICS ratio) and optimizing capital structure
  - Pricing and profitability: Using economic metrics (e.g. CoC and TVOG) for new business decisions
  - Risk management: Setting risk appetite and understanding risk drivers

Questions?