Stoch Analytics

VM-22 Advanced ALM

Reflecting Liability Information in VM-22 ALM

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v 1.0

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Introduction

- Most articles relating to VM-22 discuss the implications and challenges faced by Insurers
- All of them highlight the importance of Asset modeling and ALM, yet very few go deeper than a sentence or two on the topic
- While VM-21 and VM-22 are 'close cousins' there are structural differences between variable and non-variable annuities which place far more importance on ALM for VM-22

	Variable Annuities	Non-variable annuities
Funds	Mostly separate account funds where returns accrue to policyholders	Mostly general account, earnings used to fund features and as a profit source
Cashflows	Both fee inflows and benefit outflows	Mainly outflows with limited inflows aside from investment earnings

- This results in a reserving model which is very sensitive to investment income and duration mismatches. The CTE framework severely punishes inefficiency as only poor outcomes count.
- Our analysis will focus largely on products sensitive to economic drivers and therefore falling into the SR (Stochastic Reserve) requirement
- This analysis was not intended to perfectly model the nuances of VM-22 but instead illustrate the impact of duration matching within the SR

Modeling Framework

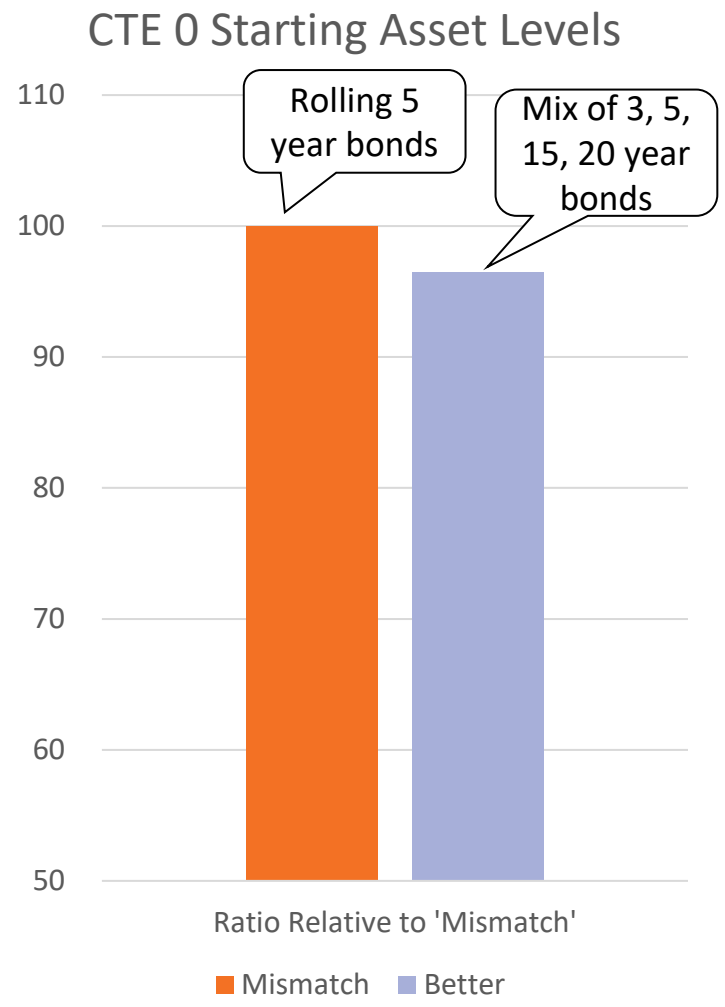
Liability Portfolio

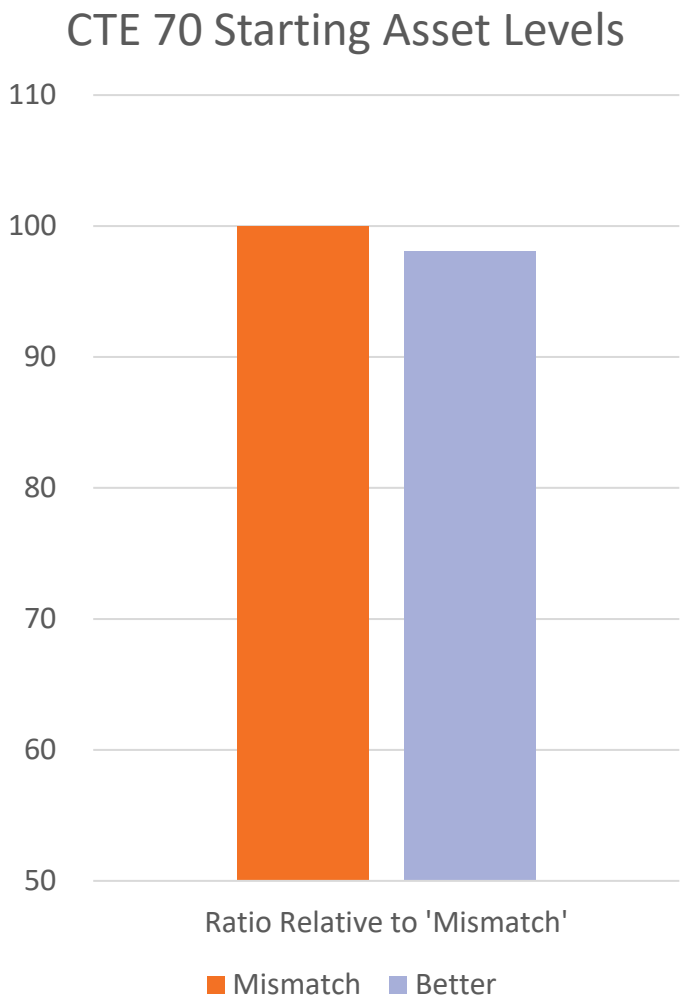
- Representative set of Fixed Indexed Annuities
- DBs – ROPs and Rollups
- GLWBs with bonus rate and doubler
- Various P2P crediting strategies with some binaries
- Multiple underlying indices
- Option budgeting set as a % of AV
- 1000 stochastic scenarios
- 50 years monthly timestep

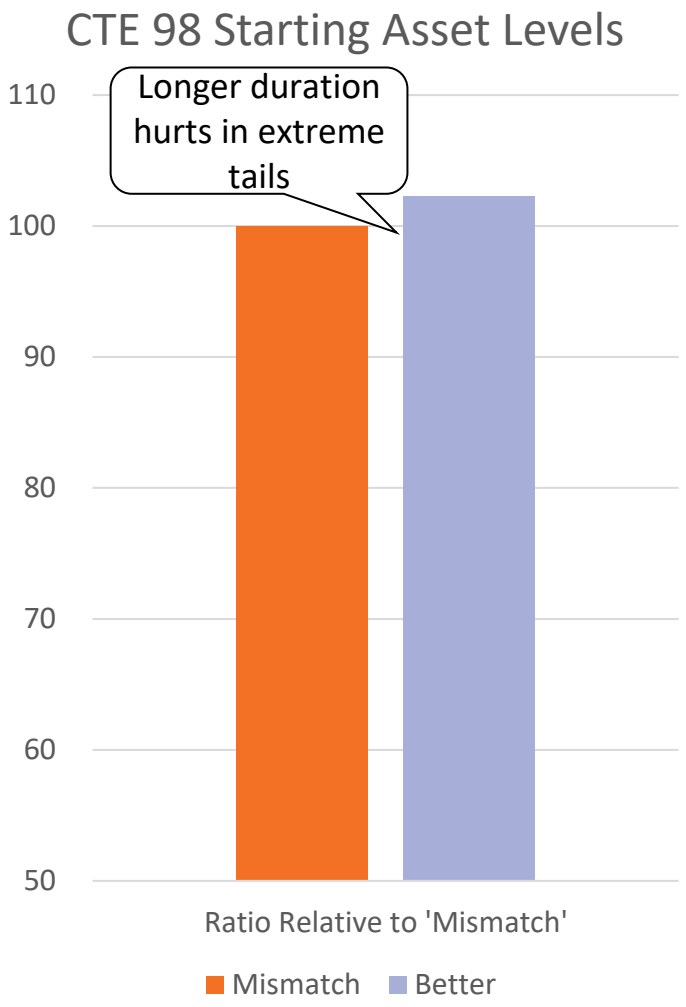
VM-22

- Our analysis was based on the Direct Iteration Method (DIM)
  - Solves for amount of assets required to ensure no year end surplus deficiencies
  - DIM exhibits an intuitive and observable set of assets and outcomes
  - Useful when we expand further into duration matching strategies
- We initially focus on a single PBR rating class (AA) to ensure analysis remains apples-to-apples
  - Can be relaxed to include reinvestment guardrail once initial hypothesis has been validated

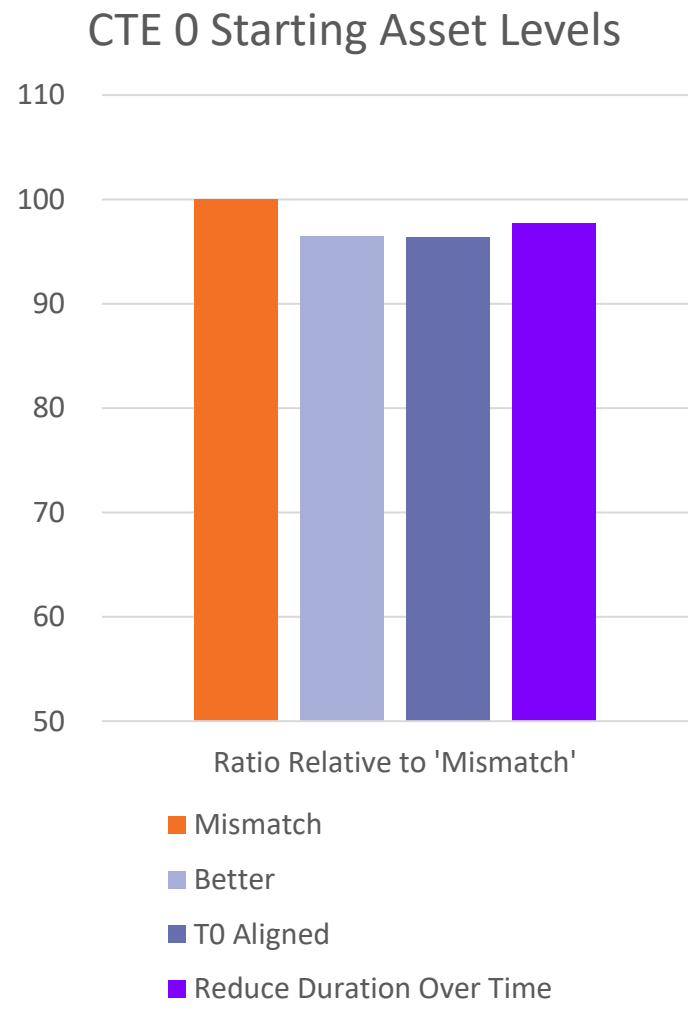
An intentionally mismatched portfolio performs poorly on average as VM-22 discards “lucky” scenarios and selects “unlucky” scenarios

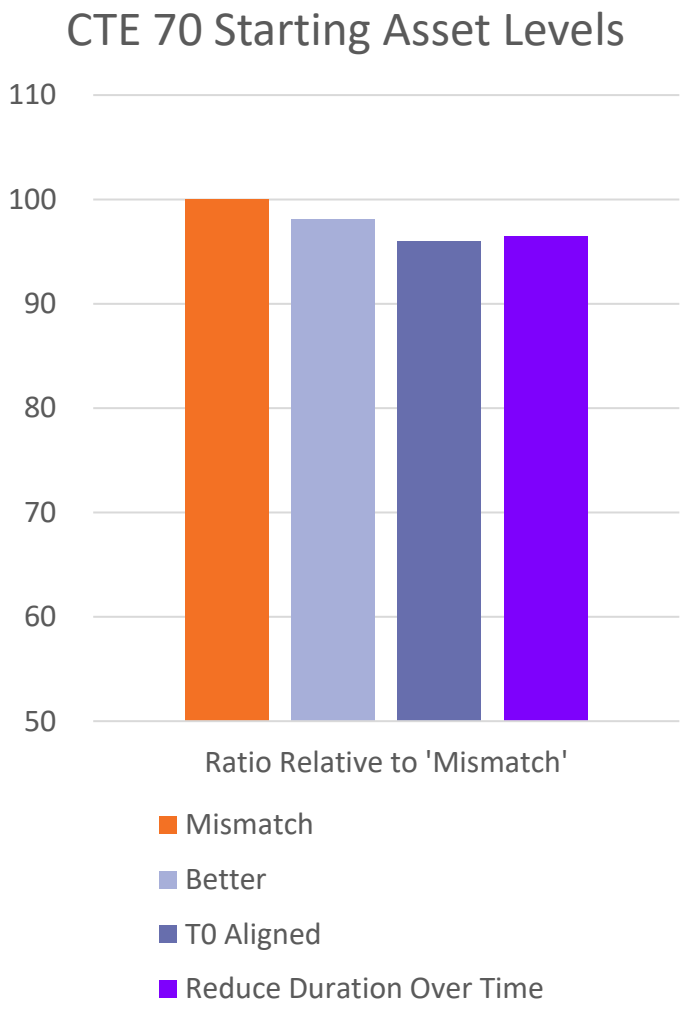


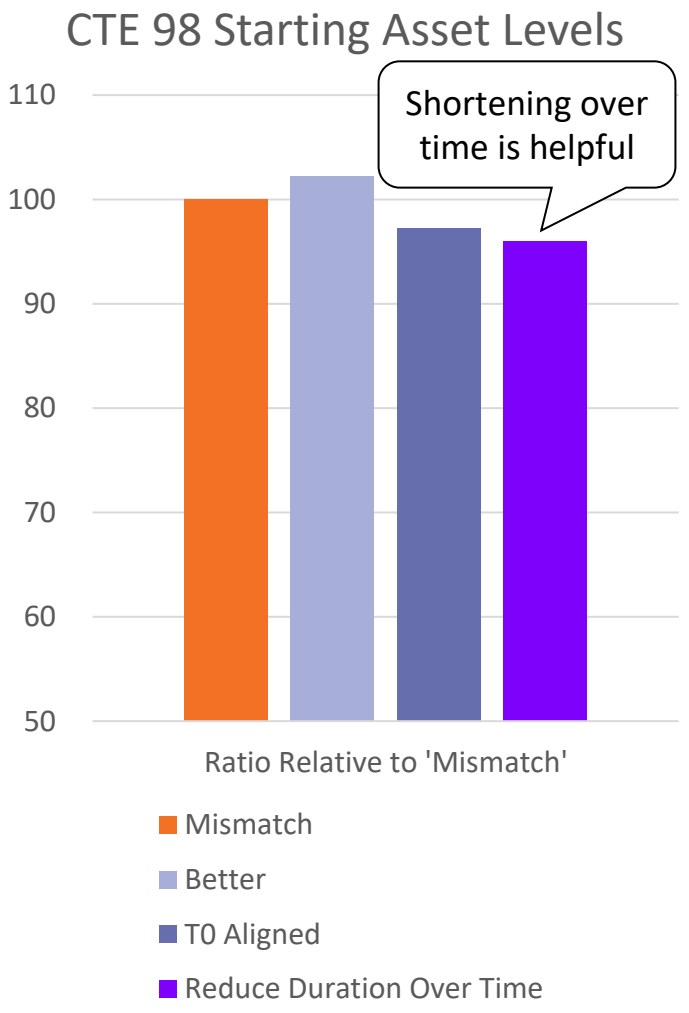




Improving the initial duration match and shortening the portfolio over time also show some improvement

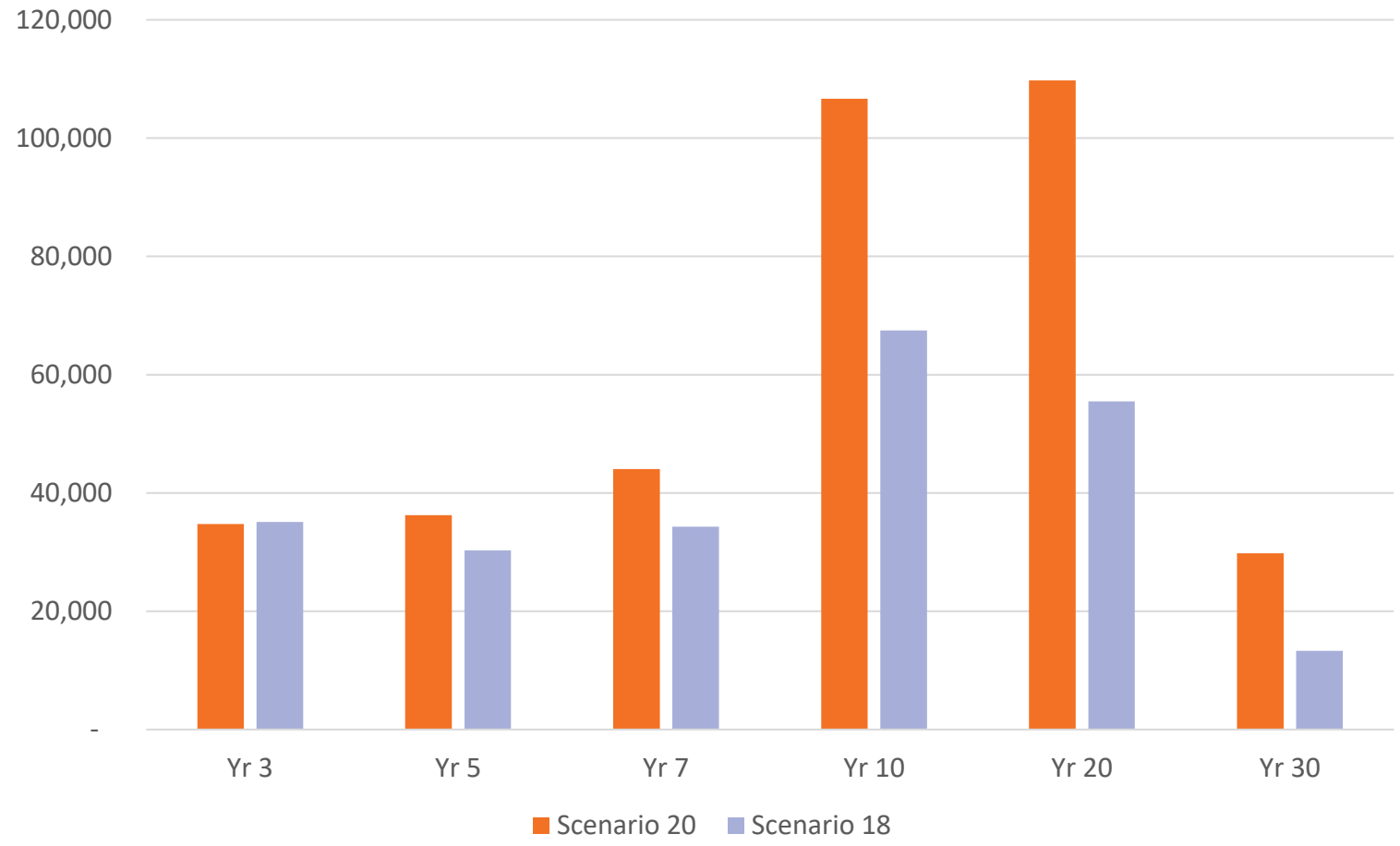






In a stochastic environment, the liability profile is a moving target across time and scenarios

Liability Key Rate DV01 – Key Rate Durations after 10 years
Scenarios 18 and 20



- Portfolios exhibit similar short term DV01
- Scenario 20 exhibits significantly higher DV01
- Scenario 18 should weight towards shorter assets
- Scenario 20 should weight towards longer assets

Even using a time varying reinvestment portfolio, the liability profile will almost certainly be mismatched at future points

- In the real world, we would re-run our liability models and rebalance our asset portfolio

- If we only incorporate limited liability information, we will fall out of balance quickly
  - Some scenarios will have accelerated liability cashflows relative to others
  - % of AV free partial withdrawals
  - Guarantee features

- A large degree of separation between scenarios will arise strictly from economic factors
  - Index returns
  - Rate curve level and shape
  - Implied volatilities

- Some modeling assumptions may introduce even more path dependency
  - Dynamic Lapses and Withdrawals
  - Option budgeting linked to interest rates or portfolio earned rates

Introducing dynamic rebalancing along scenarios

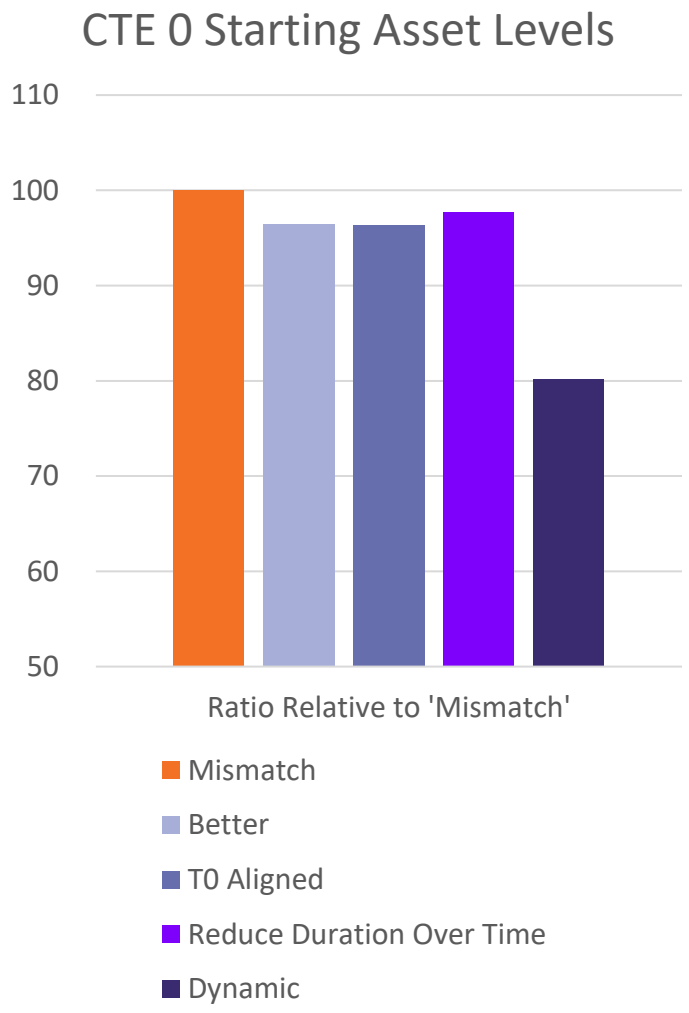
- Need to be able to produce Liability and Assets KRDs along scenarios
  – Lots of nested projections
- Requires assets to be sufficiently segmented so that we can reduce or increase asset KRDs to better match liability KRDs
  – Still need to abide by VM-22 reinvestment guardrails
- Need a good optimizer
  – Sell assets where KRDs are overexposed and buy assets where KRDs are underexposed
  – Incorporate constraints
  – Ideally, optimizing portfolio composition and limiting/minimizing churn

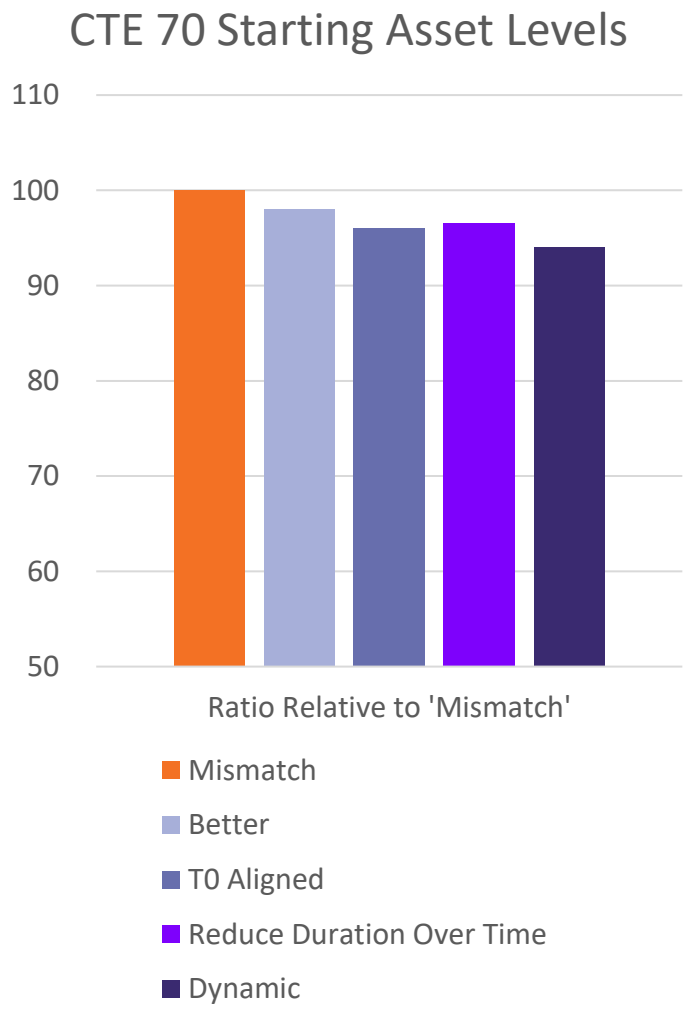
- Not impossible – but very demanding from a systems perspective

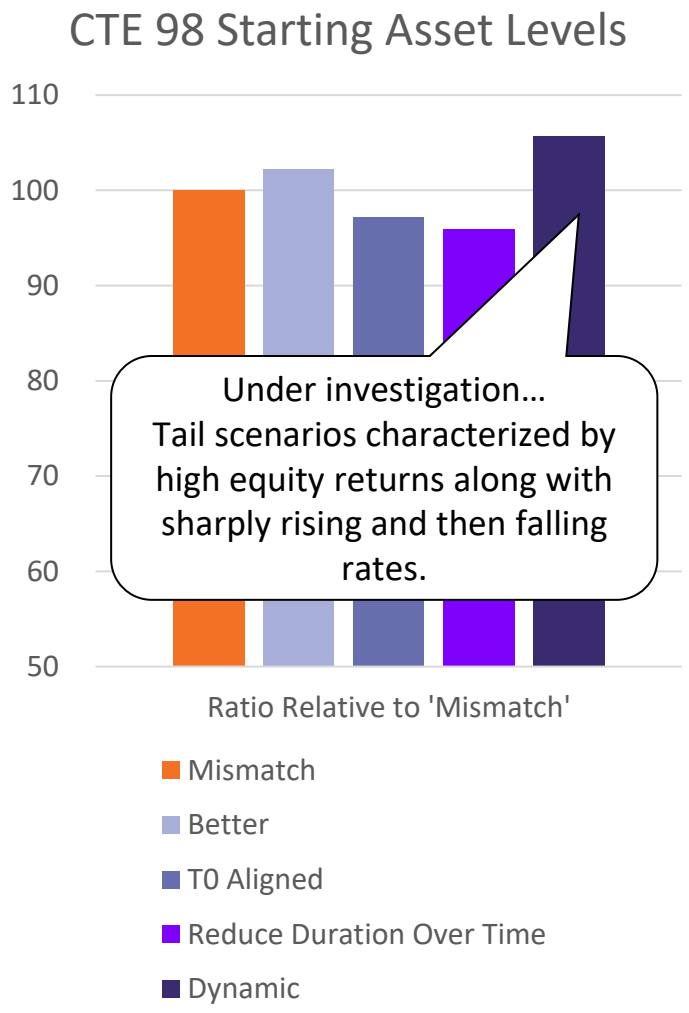
This initial analysis focuses primarily on KRD rebalancing while minimizing portfolio turnover.

Future analysis will evolve the objective function towards optimizing asset selection while preserving duration targets within a range.

Dynamically rebalancing to projected KRDs improves CTE 0 and CTE 70 but requires further optimization for extreme tail outcomes







What does it take to get there?

Asset and Liability economic frameworks aligned	• Ideally utilize the same sensitivity and projection framework for liability and asset projections and sensitivities.
Superior Nested Projection Capabilities	• Need to be able to handle forward projections and calculate KRDs of liabilities, assets and available reinvestment assets
High Performance Projection Engine	• High volume of PBR scenarios combined with nested and shocked scenarios creates significant runtime challenge. Shortcuts/simplifications may backfire in some scenarios.
Sophisticated ALM Toolkit	• Ability to ingest variety of source data and apply rebalancing rules subject to a variety of constraints. Combine explicit solve for starting assets with optimized rebalancing.

- Every portfolio will exhibit a different profile and behavior
  - Underlying product mix, choices around assumptions, model configuration , etc, etc.
- Lots of room for potential improvement by introducing a more sophisticated initial asset profile and further refining optimization objectives during rebalancing

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