Modeling Asset and Liability Balances

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Matthew Peter Nagowski
Administrative Vice President
Treasury Division, M&T Bank

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Understanding what's important®

The M&T Story

- Founded (and still headquartered) in Buffalo, NY in 1856 as 'Manufacturers and Traders Bank' to help fund the area's rapidly expanding industry and economy

- One of the 20 largest banks in the U.S. with $85.1 billion in assets ($64.0 billion in loans, $67.1 B in deposits as of December 2013), 16,000 employees, 700 branches, and $80 billion in assets under management, serving 2 million household and 220,000 business clients; footprint across the Mid-Atlantic

- Management focus is a constant commitment to customers, employees, communities, and shareholders; measures success by long-term returns, not by short term metrics or size or volume

- **One of only three peer banks to report a profit in every quarter during the recession and the only peer bank not to cut its dividend through the crisis**

- #1 SBA lender in Baltimore, Buffalo, Philadelphia, Rochester, and Washington

- Average employee tenure is 10.6 years vs. industry average of 4.8

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Key requirements for modeling the balance sheet

- Need to balance executive management's appetite for models and forecasts informed by own institutional history with a key stress testing axiom that past performance (e.g. flight to quality) should not dictate forecasted behaviors

- To achieve key business line and finance/capital management buy-in, models must be directly translatable to the way a bank manages its business (key distinction and benefit vis-à-vis regulatory models)

- Embed consistent linkages across all balance sheet and PPNR models

- Inherent problems of endogeneity underlines the need for sensitivity analysis and expert judgment
  - Classic credit supply issue on the asset side, deposit pricing/balance mix on the deposit side
  - Often models are no better then informing ex-posts correlations, and not emerging ex-ante causations, but they do come with the benefit of transparency and consistency (as well as illuminating aforementioned ex-post relationships)

- Supplementary models or quantitative overlays for stressed liquidity scenarios are extremely useful, although rich datasets are difficult to come

Approaches for modeling assets and liabilities

- A product lifecycle approach allows for the most dynamic, transparent, and linked methodology to think about balance sheet dynamics for loans and deposits on the level at which a bank actually manages its balance sheet
  - On the asset side, this ideally means loan origination models that can feed into credit models, which allow for total portfolio balances to be forecasted as a function of prepayments, non-accruals, and charge-offs on both existing (legacy) and newly originated loans, all a concurrent function of both interest rate and macroeconomic factors
  - On the liability side, this means interlinked deposit pricing, origination, and attrition (balance run-off models) that can be driven by both interest rate and macroeconomic factors
- High-level industry balance models can serve as a key benchmarking tool
  - Models informed by industry behavior (either using aggregate or panel data), can help to inform balance sheet directionality and market share analysis; due to limitations of industry data, they often need to be built at a much higher product level roll-up
- Discretionary/expert judgment approach to investment portfolio, wholesale funding, and RWA methodological assumptions best suited for simple balance sheets

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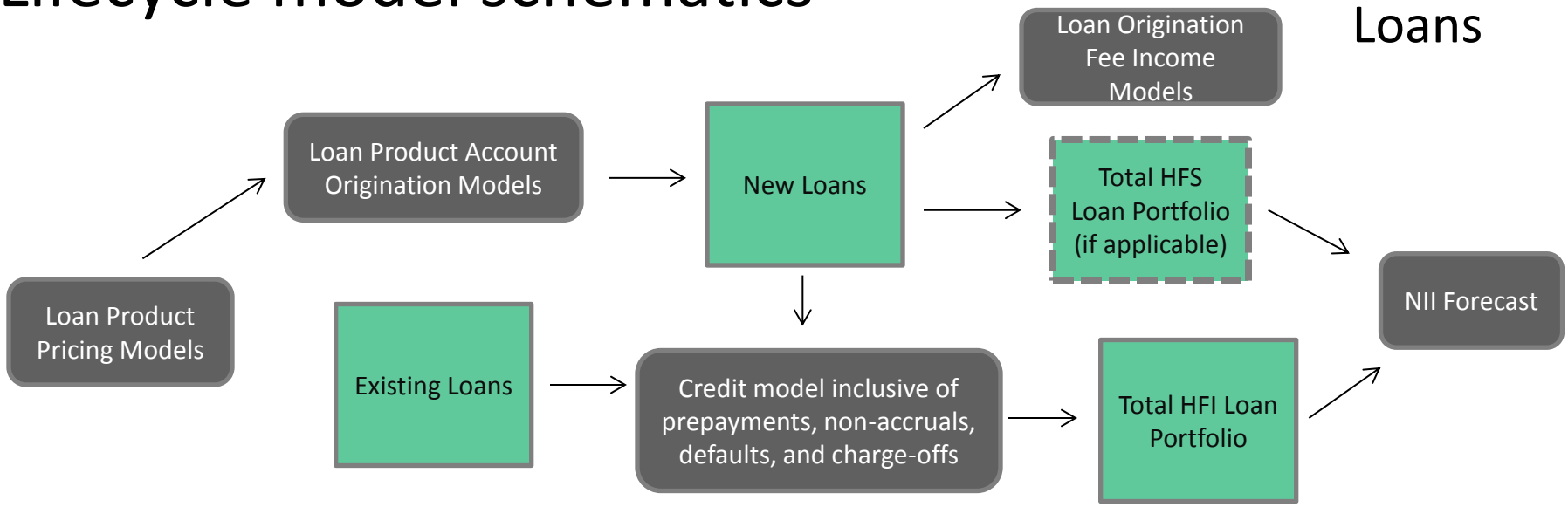
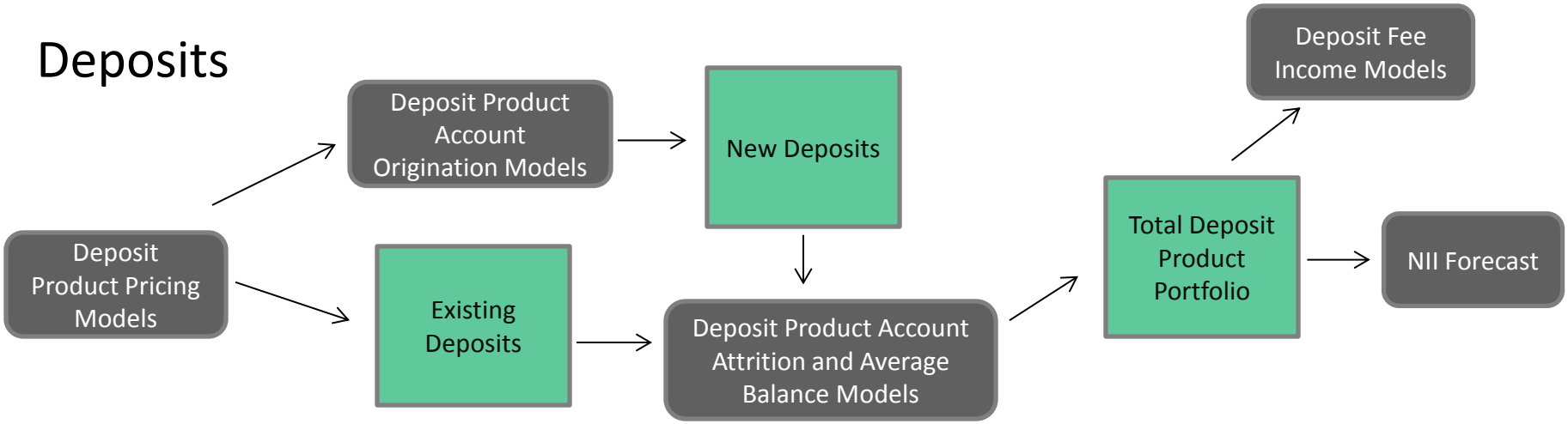
Lifecycle model schematics





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Mediation as tool for challenge and discovery

- With a product-level lifecycle model approach, results can be easily reviewed and challenged by business line managers at a level at which they actually manage their products
  - Require/encourage business lines to submit alternative 'expert-judgment' forecasts for context and comparison

- Balance sheet models (and the information they contain) become a valuable information tool for portfolio management and risk assessment
  - Often allow product managers to see their products in a new light

- Risk modelers should be comfortable with the fact that their baseline forecasts may often be less accurate than the business; where the model's true value lies is its ability to quantify a portfolio's sensitivity to macroeconomic stress
  - Baseline expert judgment forecasts allow for much easier incorporation of exogenous management events or governmental policy decisions

- Approach allows for lifecycle models, benchmark models, and expert judgment process to all inform final submission (as well as day-to-day management)
  - Must ensure a tightly managed process or else mediation will become overly bureaucratic

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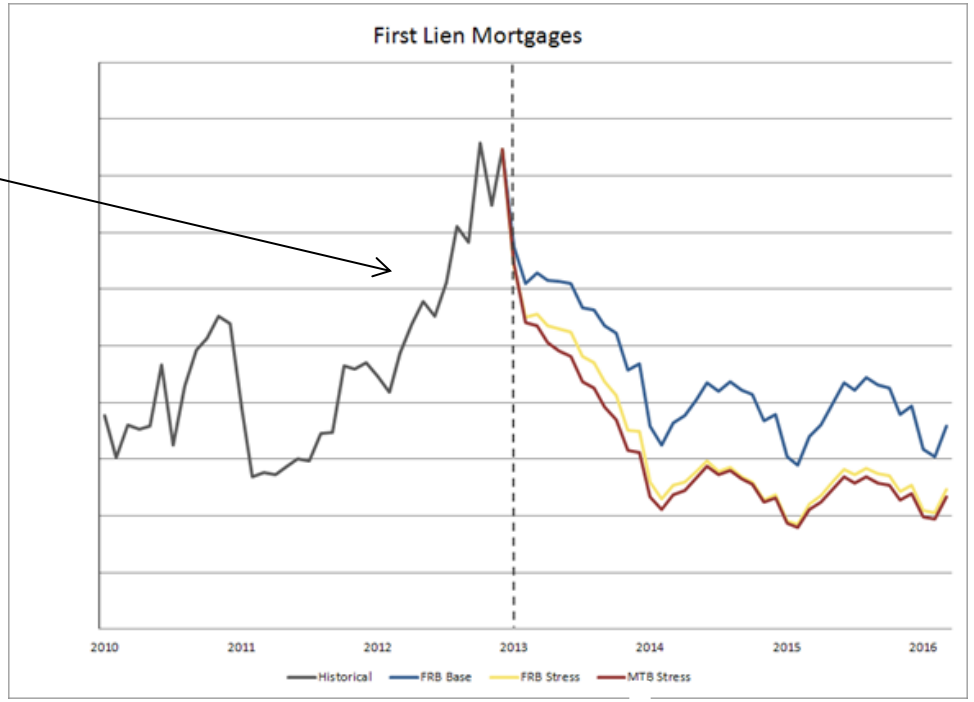
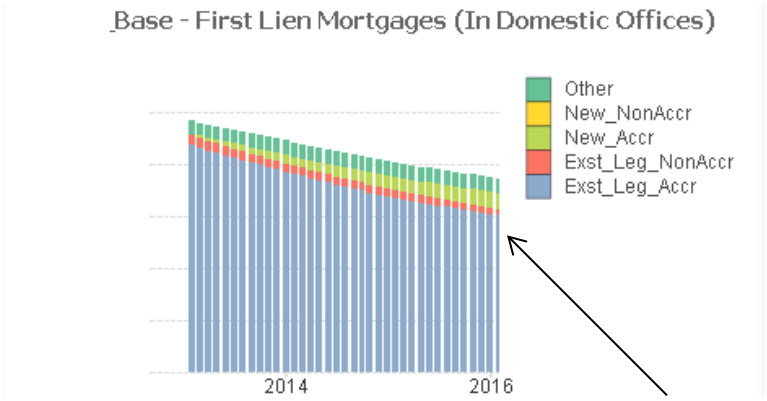
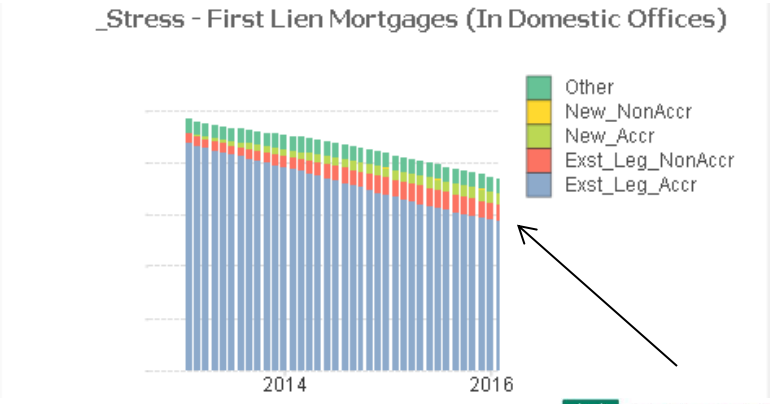
Example: Loan originations (First Lien Mortgages)

- Mortgage originations may be forecasted as function of macroeconomic variables (e.g. mortgage rate, house price index, unemployment rate)
- Originations can then be fed either into saleable or investment portfolios, with associated origination fee income, gain on sale, and servicing fee income models
- Within Held For Investment whole loan portfolios, new originations can be layered on top of existing portfolio run-off as part of credit estimation process, with dynamic prepayments, non-accruals, and charge-offs







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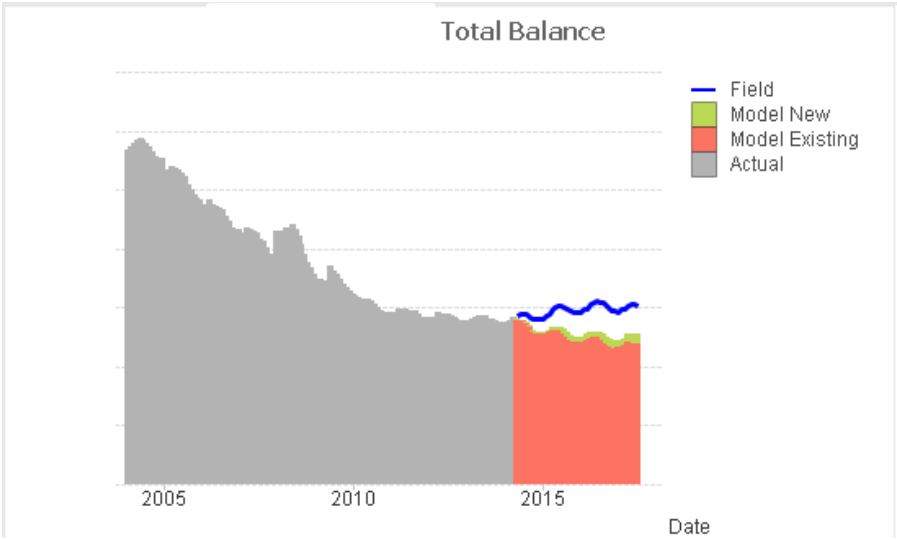
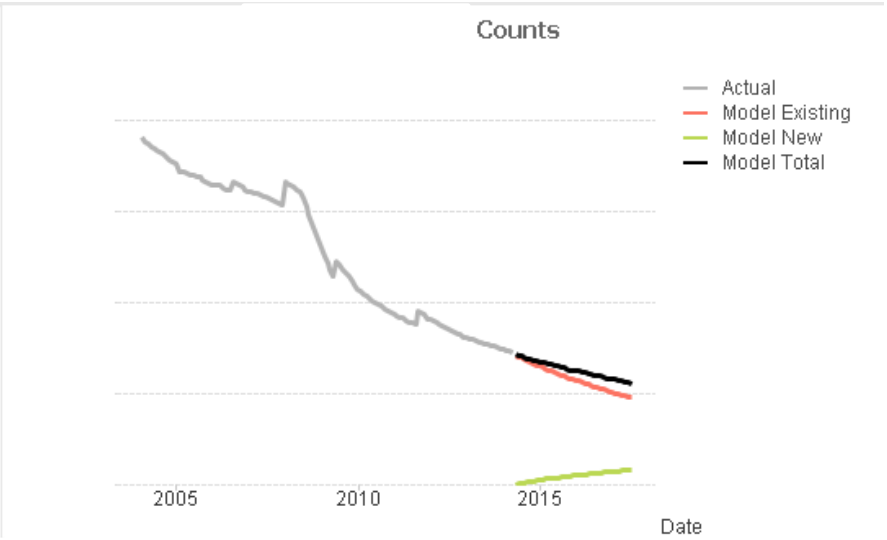
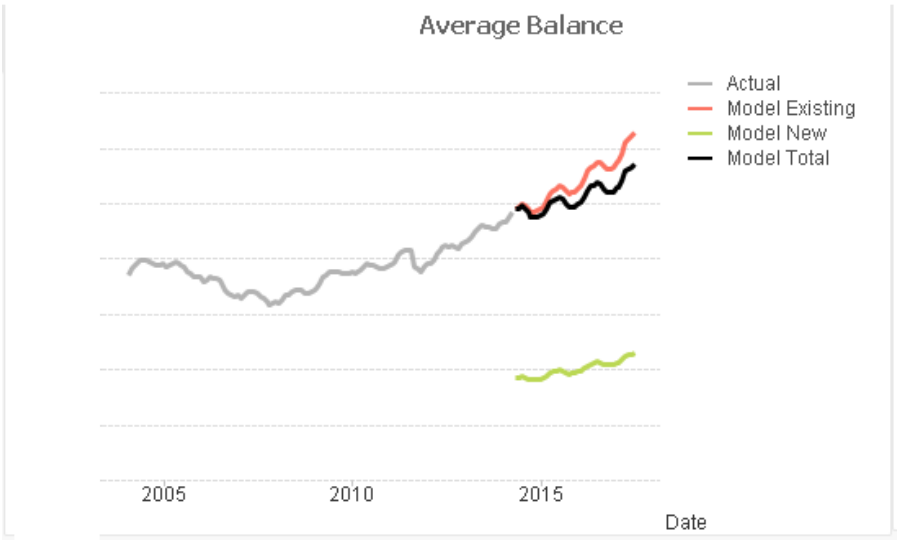
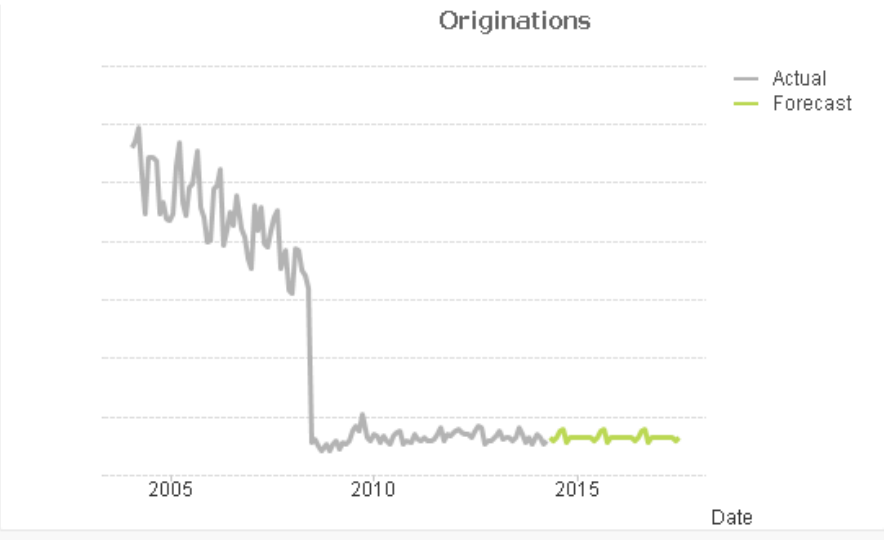
Example: Deposit mediation of retail savings product









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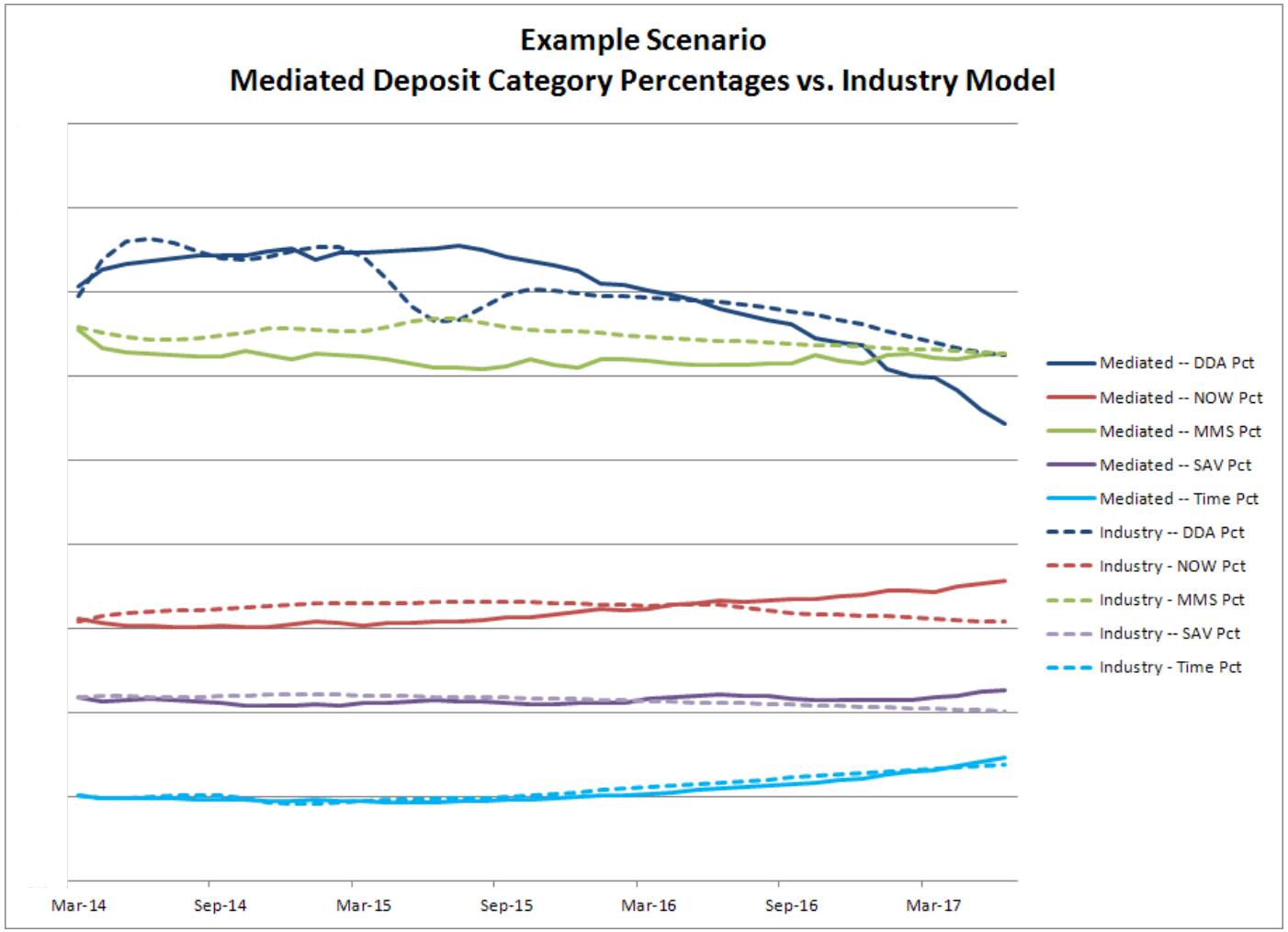
Illustrative Example: Deposit benchmarking



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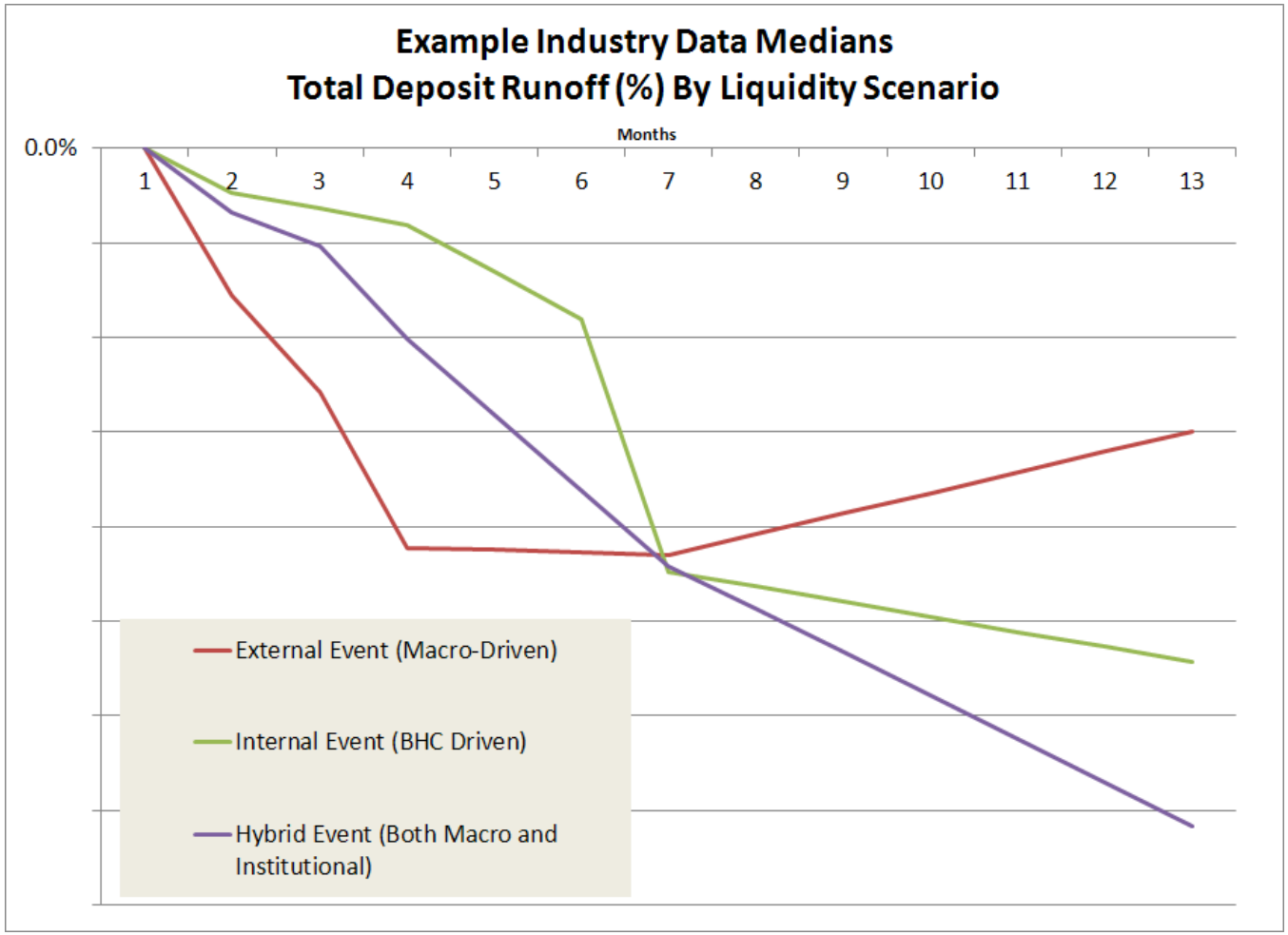
Illustrative Example: Stressed liquidity event

Stressed liquidity scenario deposit outflows (or commitment draws) may be overlayed on top of modeled balance sheet to reflect liquidity stress



Source: M&T Bank research based on SNL data of BHC deposits

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Technical Considerations and Future Advances

- Model tractability and complexity are of significant interest
  - Extensive coordination is required with credit and NII modelers to ensure compatibility of downstream models
  - Ensure models are transparent to business line and stakeholders in capital management for proper effective challenge
  - Rule of thumb: Never make a model more complex than what can be explained either to a *smart* executive or a *well-educated* junior analyst
    - Origination models can often be satisfied with OLS or ARIMA; attrition models with logistic regression, and average balance models with exponential linear regression
- Need to balance model validation's concerns for statistical robustness with economic intuition and sensitivity, especially given often limited historical series
- Consider "meta-model" mediation approaches that agglomerate results from multiple models (or expert judgment forecasts); *the average of multiple forecasts/models is often shown to have more predictive accuracy*
- Coordinate and balance model development with emerging risk management needs (e.g. LCR, NSFR, FTP, economic capital, new customer acquisition, etc.)
- Data, data, data