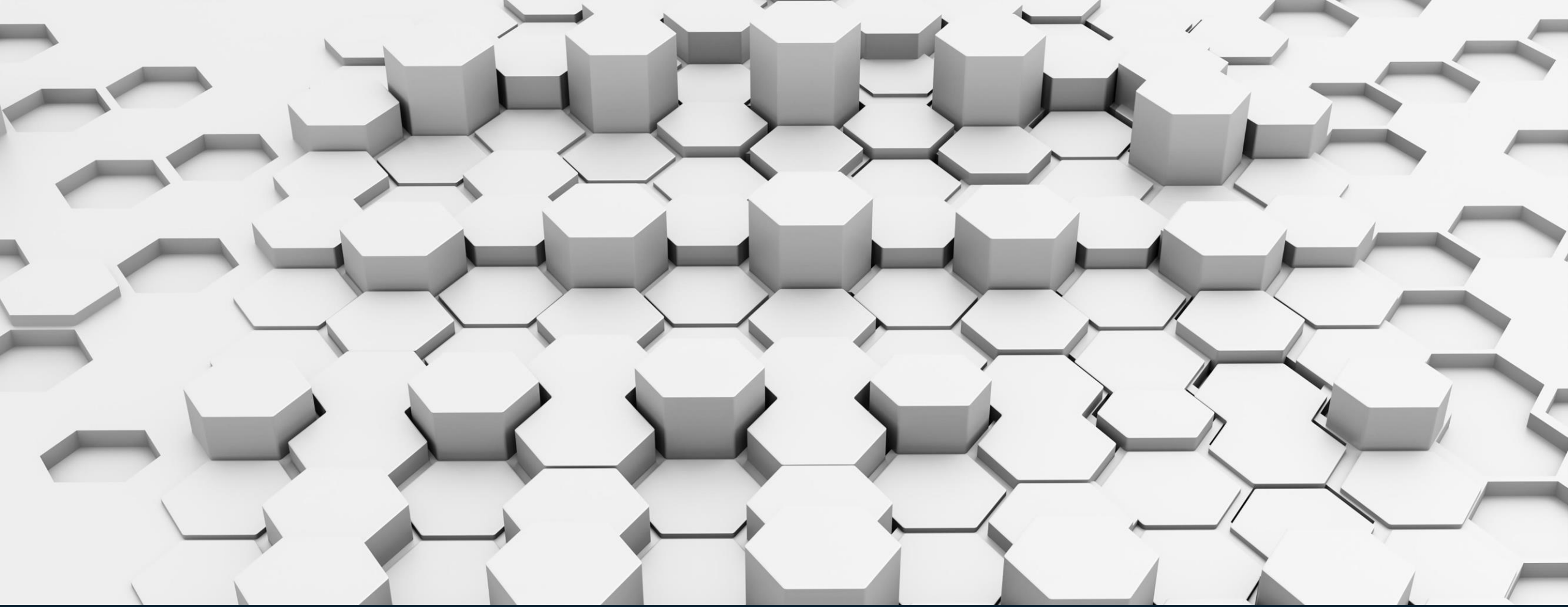




Estimating Credit Spreads in the South African Market

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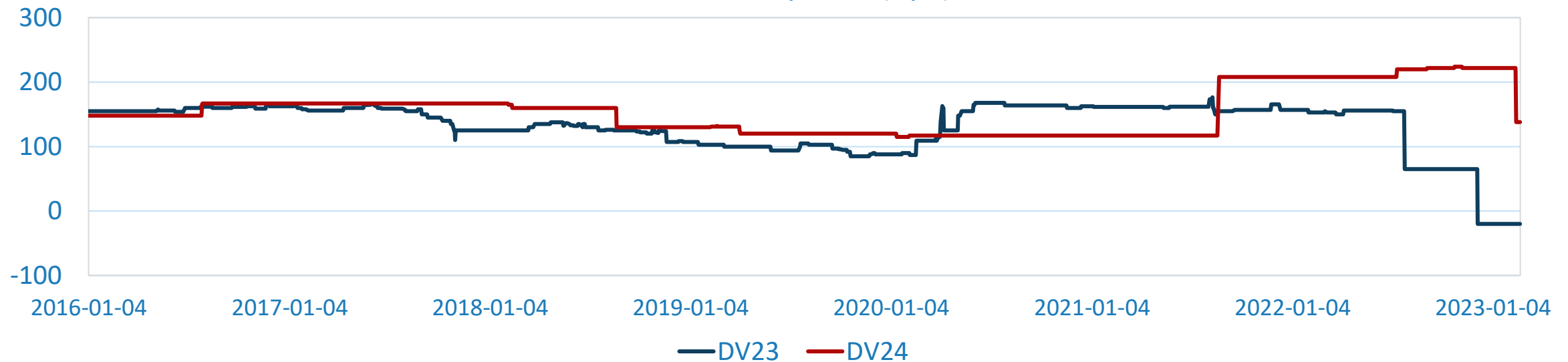
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The Problem with SA's Corporate Bond Market

- Credit market (spreads) should provide information on credit quality
- Illiquid – stale prices (especially fixed rate)
- No corporate CDS market
- JSE's pricing methodology obscures information

JSE credit spread (bps)





The Problem with SA's Corporate Bond Market

- Credit market (spreads) should provide information on credit quality
- Illiquid – stale prices (especially fixed rate)
- No corporate CDS market
- JSE's pricing methodology obscures information
 - Companion bond spreads
 - Credit risk not reflected accurately
 - Last Value Carried Forward (LVCF)
 - Prices don't reflect recent information
 - Spread volatility underestimated

Bond	Coupon rate	Coupon frequency	Maturity
ABS3	8.45%	2	3 April 2011
R153	13.00%	2	31 August 2010



The Solution

- We want:
 1. Spreads that accurately reflect risk over government bond curve
 2. Incorporate recent information into prices

1. Nominal spreads instead of companion bonds

$$p^{corp} = \sum_t C_t e^{-\tau_t \cdot ytm^{corp}} = \sum_t C_t e^{-\tau_t \cdot (ytm^{rf} + s^N)}$$

2. Model-based estimates of spreads

- Aim to leverage more frequently available data to estimate prices



Credit Spread Models

- Structural models, e.g. Merton (1974)
 - Black-Scholes framework
 - Firm asset value V_t follows GBM

$$\mathbb{P}[\text{default}] = \mathbb{P}[V_T < K] = N(-d_2)$$

$$d_2 = \frac{\ln\left(\frac{V_0}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}} - \sigma\sqrt{T}$$

- Drawbacks: highly simplified, underestimates spreads (Jargic, 2017)
 - “Credit spread puzzle”
 - Only risk factor is volatility of asset value



Credit Spread Models

- Reduced-form models, e.g. Hull & White (2000)
 - Model probability of default with a hazard rate model

$$P(t, T) = \mathbb{E}^{\mathbb{Q}} \left[e^{-\int_t^T (r_s + \lambda_s) ds} \cdot (1 - LGD \cdot \mathbb{I}_{\{\tau < T\}}) \right]$$

- Also subject to credit spread puzzle
 - Berndt (2015) points to illiquidity and market frictions
 - Factors driving the CSP are particularly relevant in SA
 - Illiquidity
 - Other risk factors
 - For now we want a simple, unbiased model
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Credit Spread Models

- Linear factor models, e.g. Clift (2020)
 - Assume credit spreads are driven by accounting- and/or market-based factors

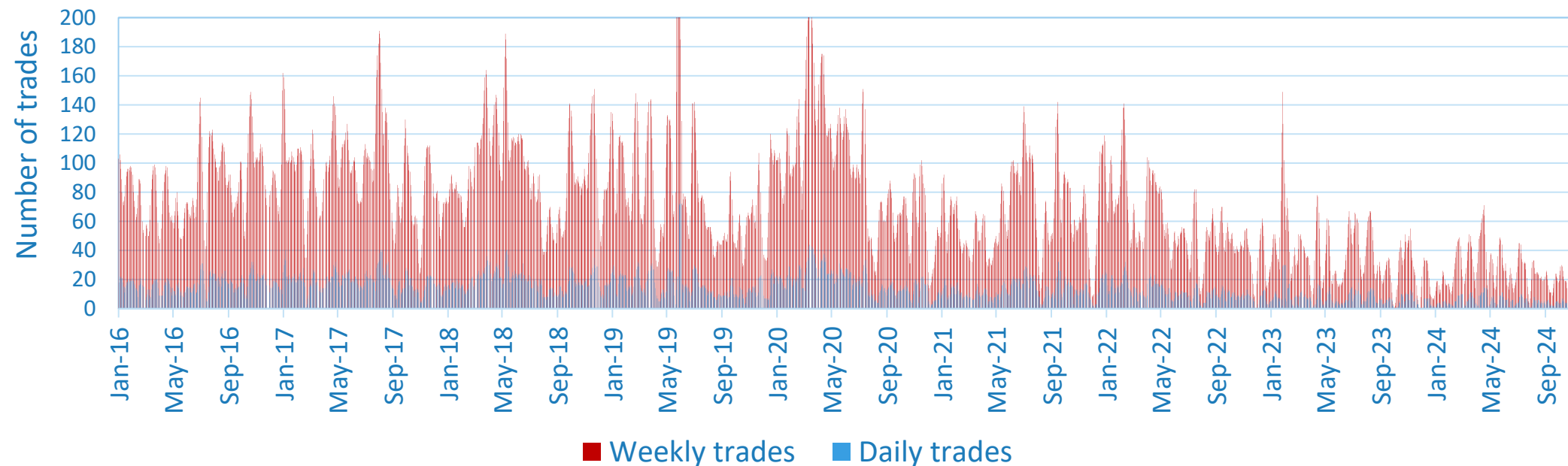
$$s = X\beta + \epsilon$$

- Important factors in SA market:
 - Price volatility
 - Sector and guarantee class average spreads
 - Time to maturity
 - Full-sample $R^2 \approx 50\%$
 - Simplicity, lack of bias is appealing
 - Other approaches: Martin (2020), Xu (2022)
-



Our Approach

- Clift's work points to the value of cross-sectional information
 - Class averages
 - Time to maturity
- We try fitting curves to traded spreads in a window of trade days





Our Approach

- Fitting parametric curves to traded spreads
 - Recalculate JSE spreads as nominal spreads on trade dates
 - Normalise using duration times spread (DTS) – Ben Dor et al. (2007)
 - Fit Nelson-Siegel-Svensson (NSS) curves to DTS
 - OLS regressions
 - Time and liquidity weights
 - Shrinkage on curve parameters

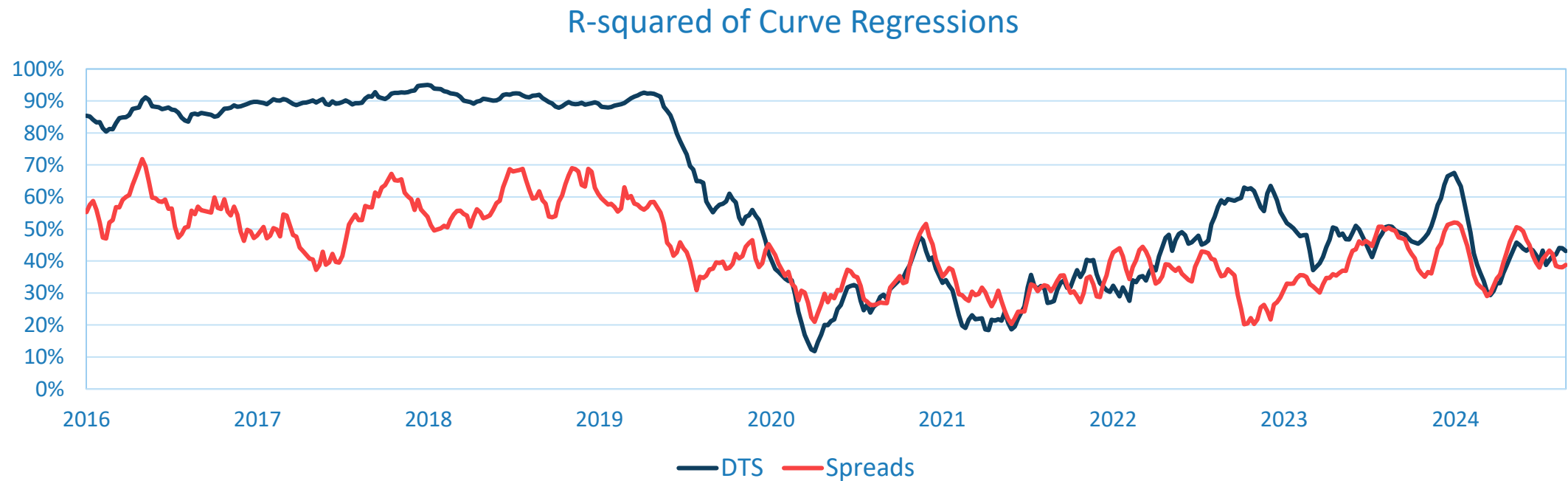
$$DTS(\tau) = \beta_0 \left(1 - \frac{1 - e^{-\lambda_1 \tau}}{\lambda_1 \tau} \right) + \beta_1 \left(\frac{1 - e^{-\lambda_1 \tau}}{\lambda_1 \tau} - e^{-\lambda_1 \tau} \right) + \beta_2 \left(\frac{1 - e^{-\lambda_2 \tau}}{\lambda_2 \tau} - e^{-\lambda_2 \tau} \right)$$

- Back out spreads from DTS



Our Approach

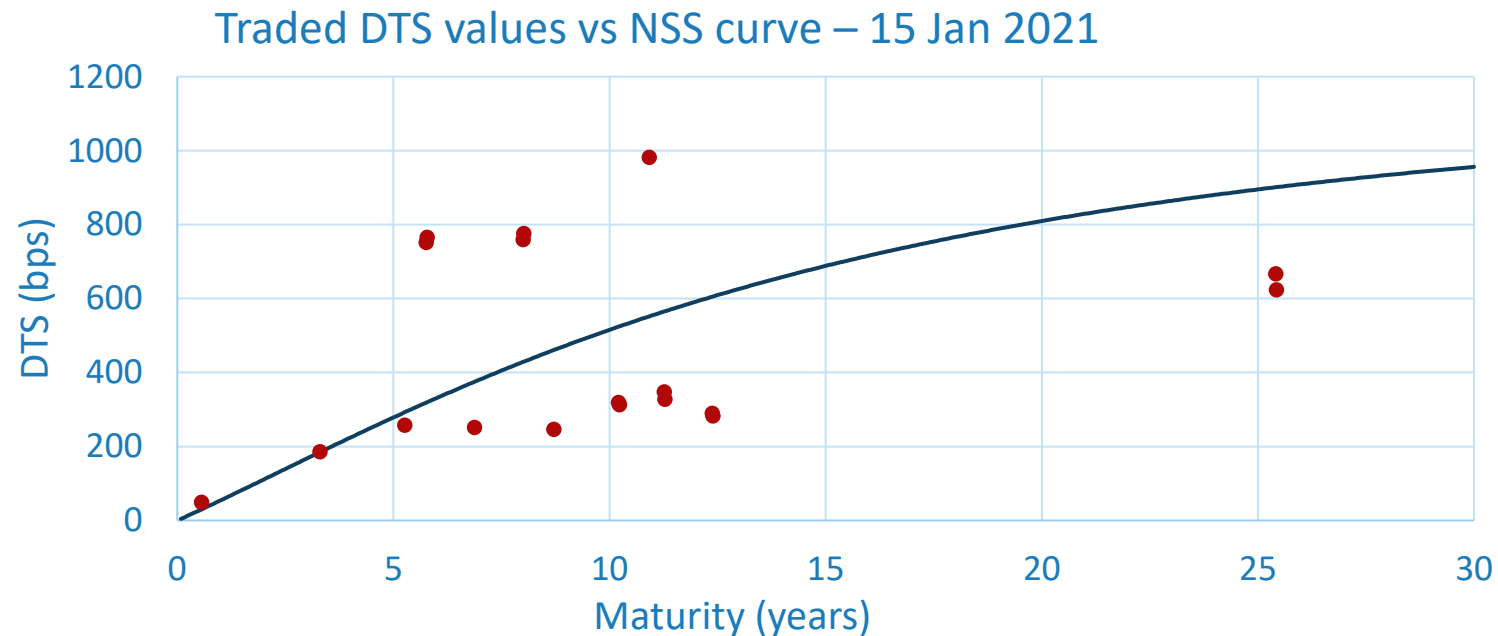
- Results on vanilla fixed rate bonds (least liquid)
 - Minimum of 20 trades or 5 trade days





Our Approach

- Results on vanilla fixed rate bonds (least liquid)
 - Minimum of 20 trades or 5 trade days
- Fall in R^2 driven by increased dispersion in spreads
 - Still appears to be a reasonable estimate of fair value

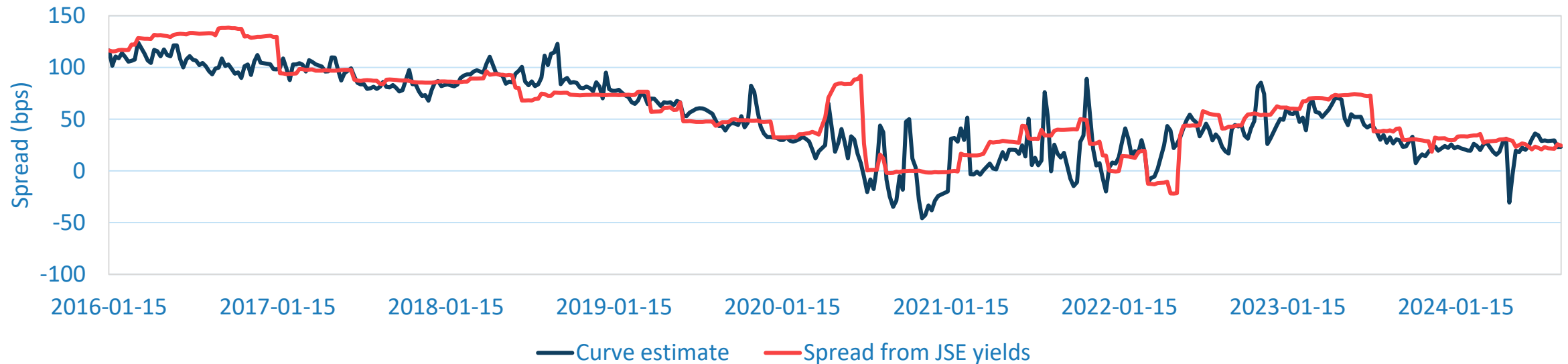




Our Approach

- Spreads exhibit desired features:
 - Predict large price moves – incorporating information from market
 - Give a reasonable estimate of spread volatility
 - Provides a decent fair value estimate

Spread time series - ABS7





Conclusion

- Credit spread estimation via curves
 - Recalculate spreads – nominal spreads
 - Normalise spreads – DTS
 - Flexible parametric curves
 - Weighted OLS regressions with shrinkage
 - Simple and unbiased, improved R^2 over LFM
 - Resultant spreads are promising
 - Reasonable estimate of spread volatility
 - Defensible fair value estimate
 - Potential for price prediction
-



Ongoing Research

- Drivers of dispersion in spreads
 - Relationship between credit curve and government curve
 - Systematic adjustments for issuers
 - More sophisticated models for estimating survival curves vs “risk-free” curves
 - Stripping out risk premia
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Thank you. Questions?
