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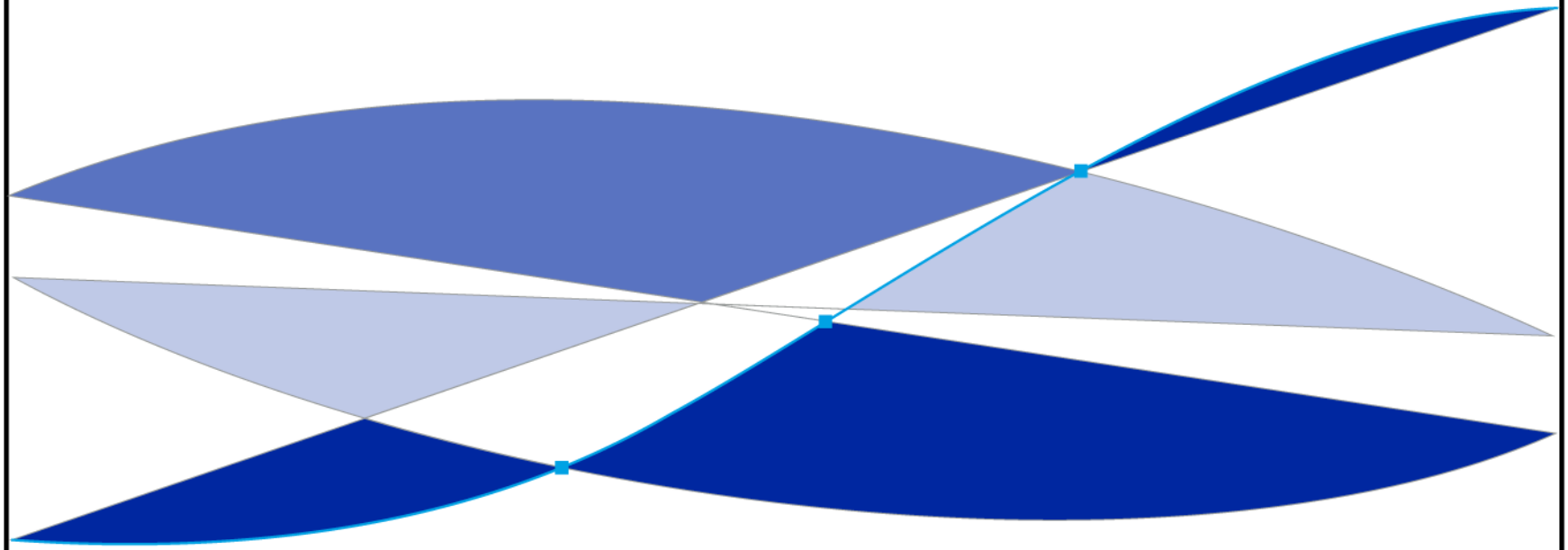
Navigating Cash Loan and LCDS Markets



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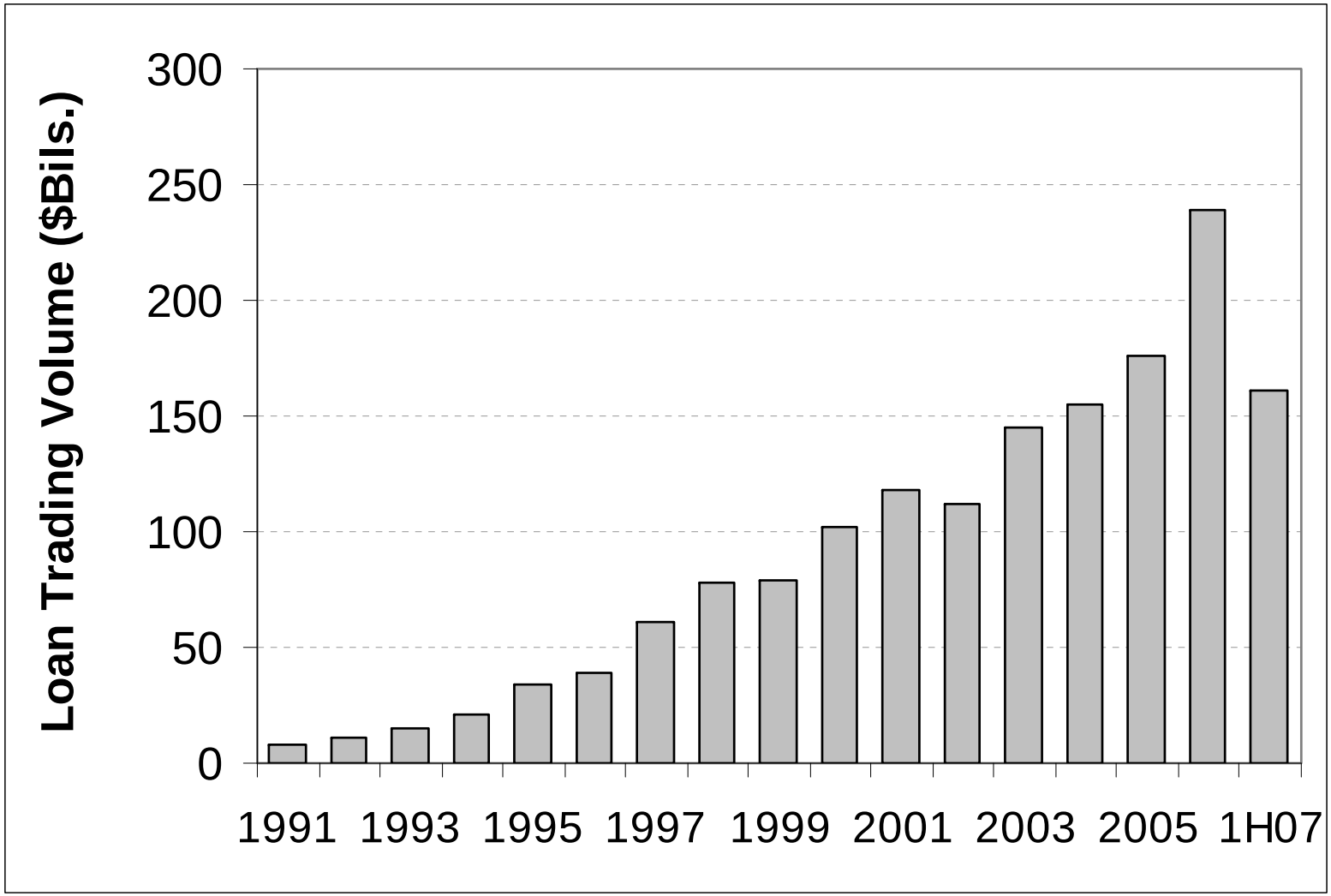
Trading Volume in the U.S. Syndicated Loan Market



Agenda

1. Prepayment Option and Lattice Valuation
2. Prepayment Pattern and Expected Life
3. Option Adjusted Spread and Par Spread
4. How Cancelable are LCDS Contracts?
5. Duration and Convexity
6. Summary

1 Prepayment Option and Lattice Valuation Methodology

Prepayment Option and Credit Spread

- Most Loans are prepayable, often with friction. Investors want to obtain a pure credit spread measure on loans.

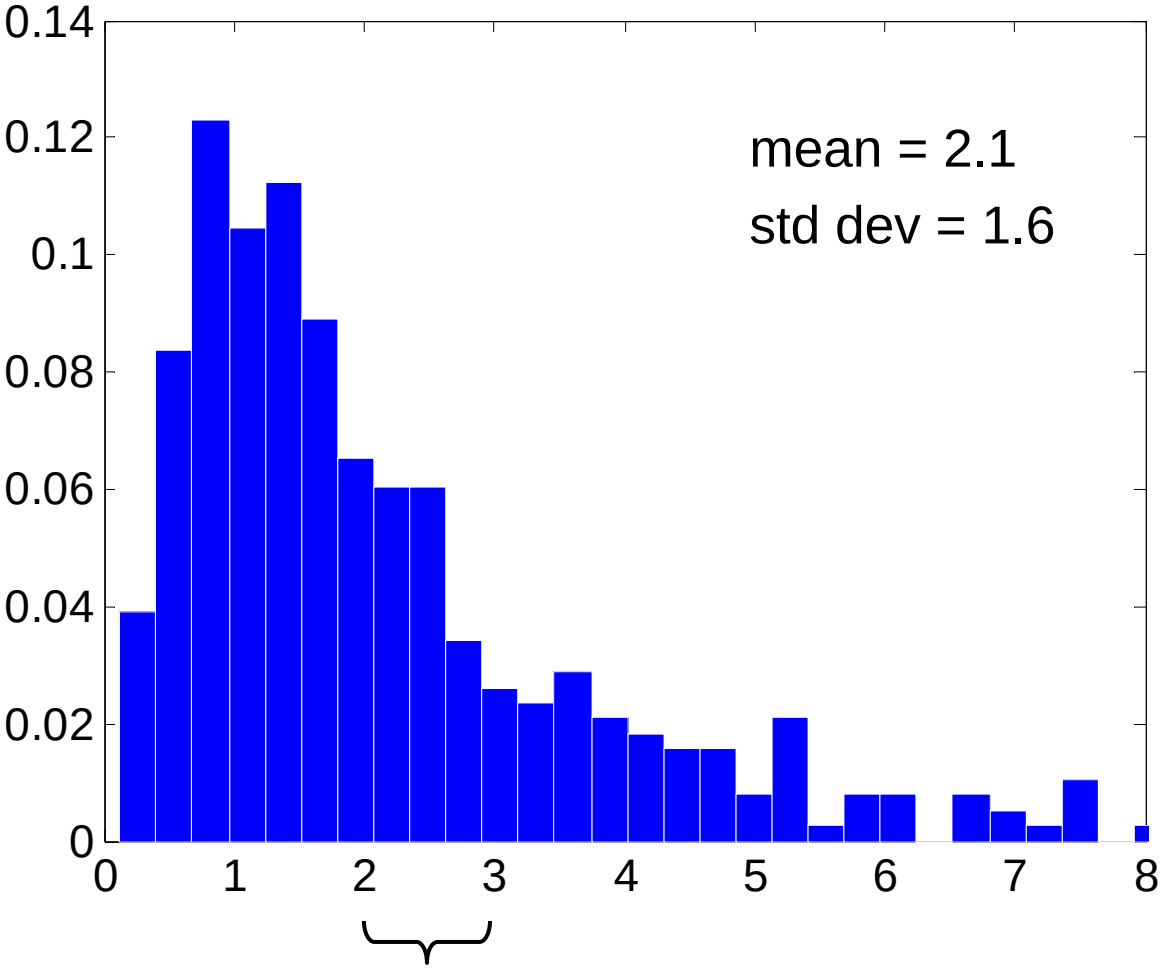
- Loan traders often take a back-of-envelope approach by assuming or estimating a shortened loan maturity between 2 to 3 years, say 2.5 years.

- They then try to back out the credit spread based on market price:

$$Market\ Price = \sum_{t>0}^{2.5} \frac{CF_t}{\left(1 + r_t^{RiskFree} + s\right)^t}$$

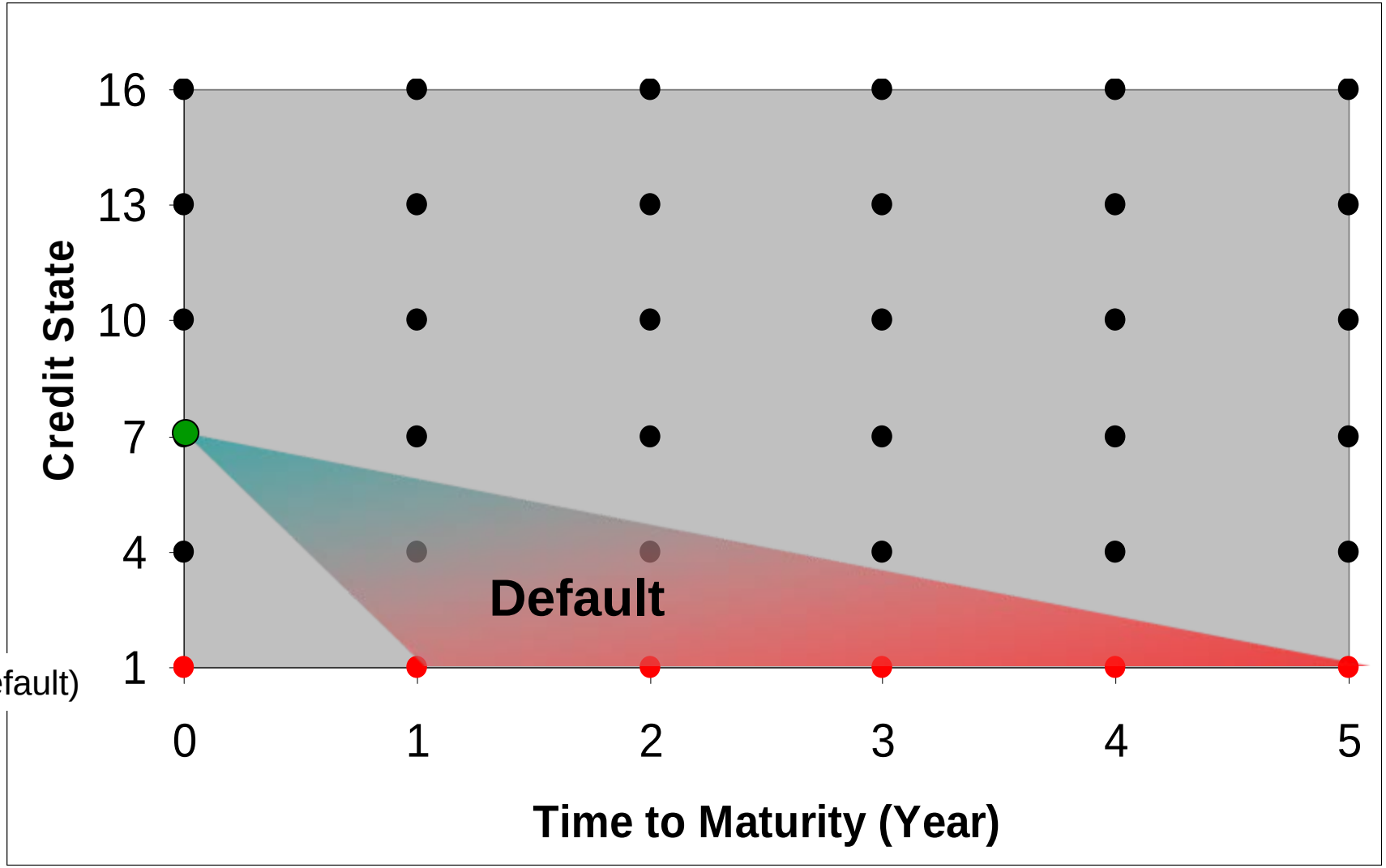
- Problems with this simplistic approach…

Actual Time from Origination to Prepayment

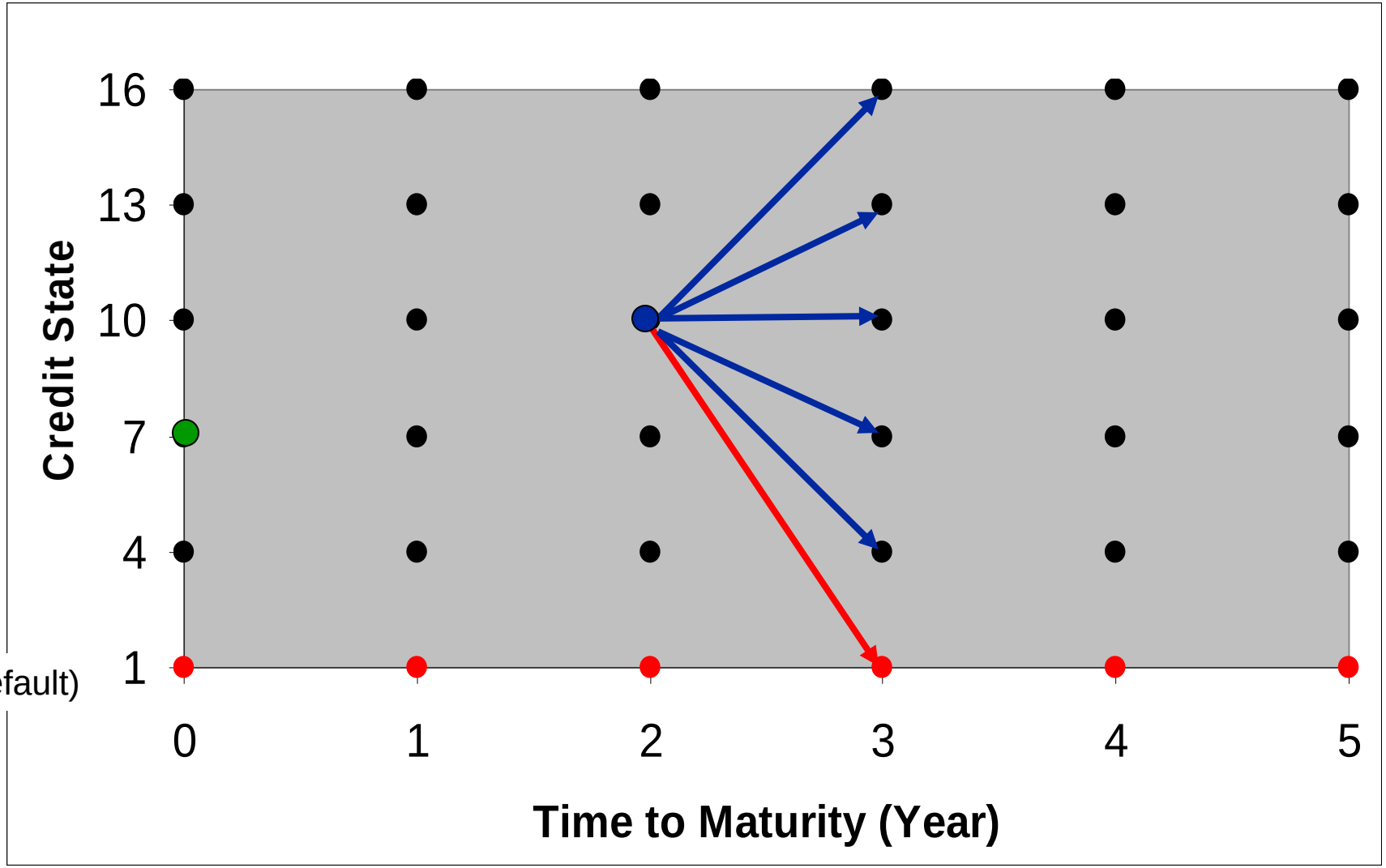


$$\Pr\left\{2 \le t_{pp} \le 3 \,|\, \text{Prepay}\right\} = 17.3\%$$

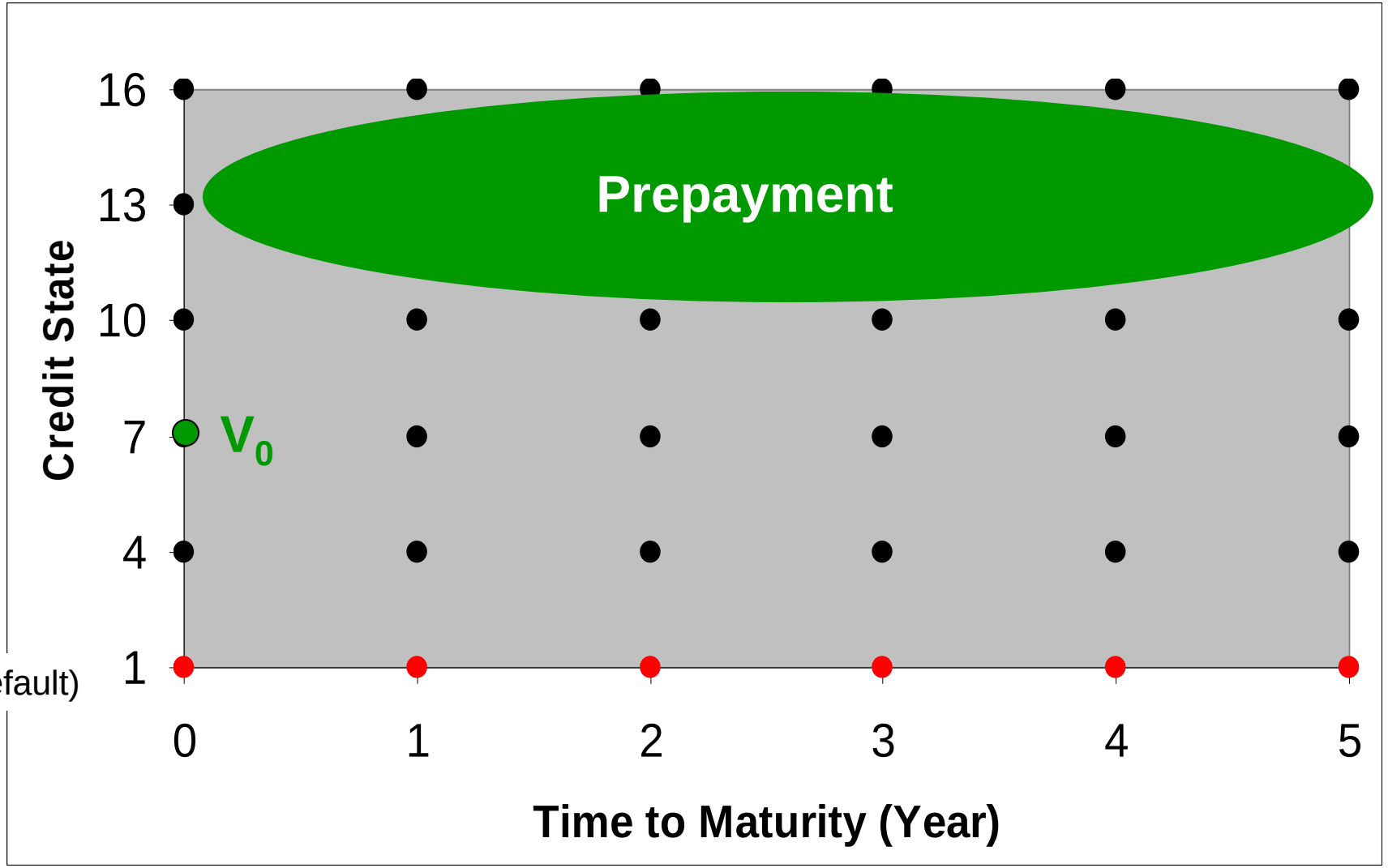
Moody's KMV Lattice Valuation Model



Credit Migration



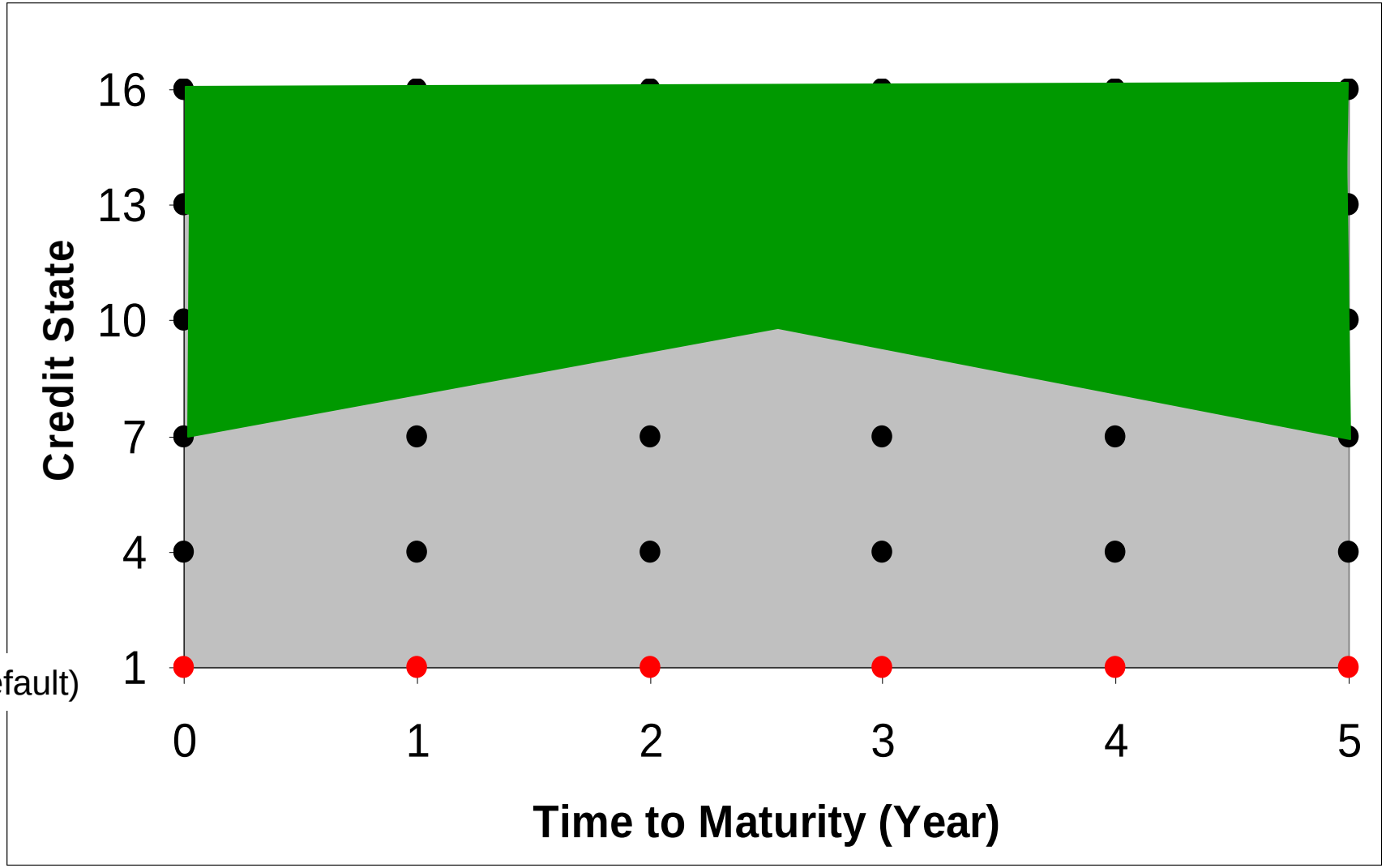
Results From Lattice Valuation



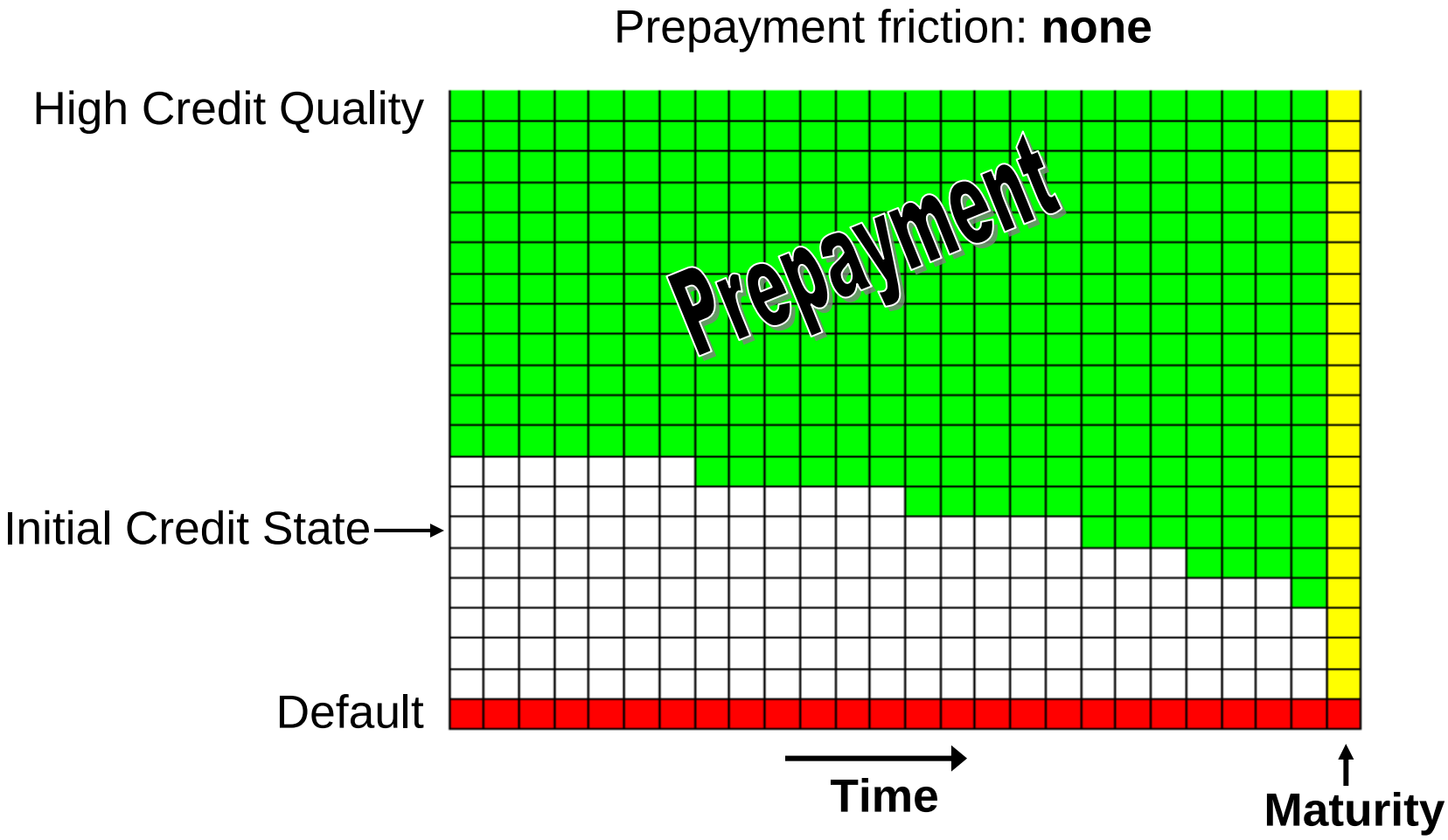
2

Prepayment Pattern and Expected Life

Pattern?

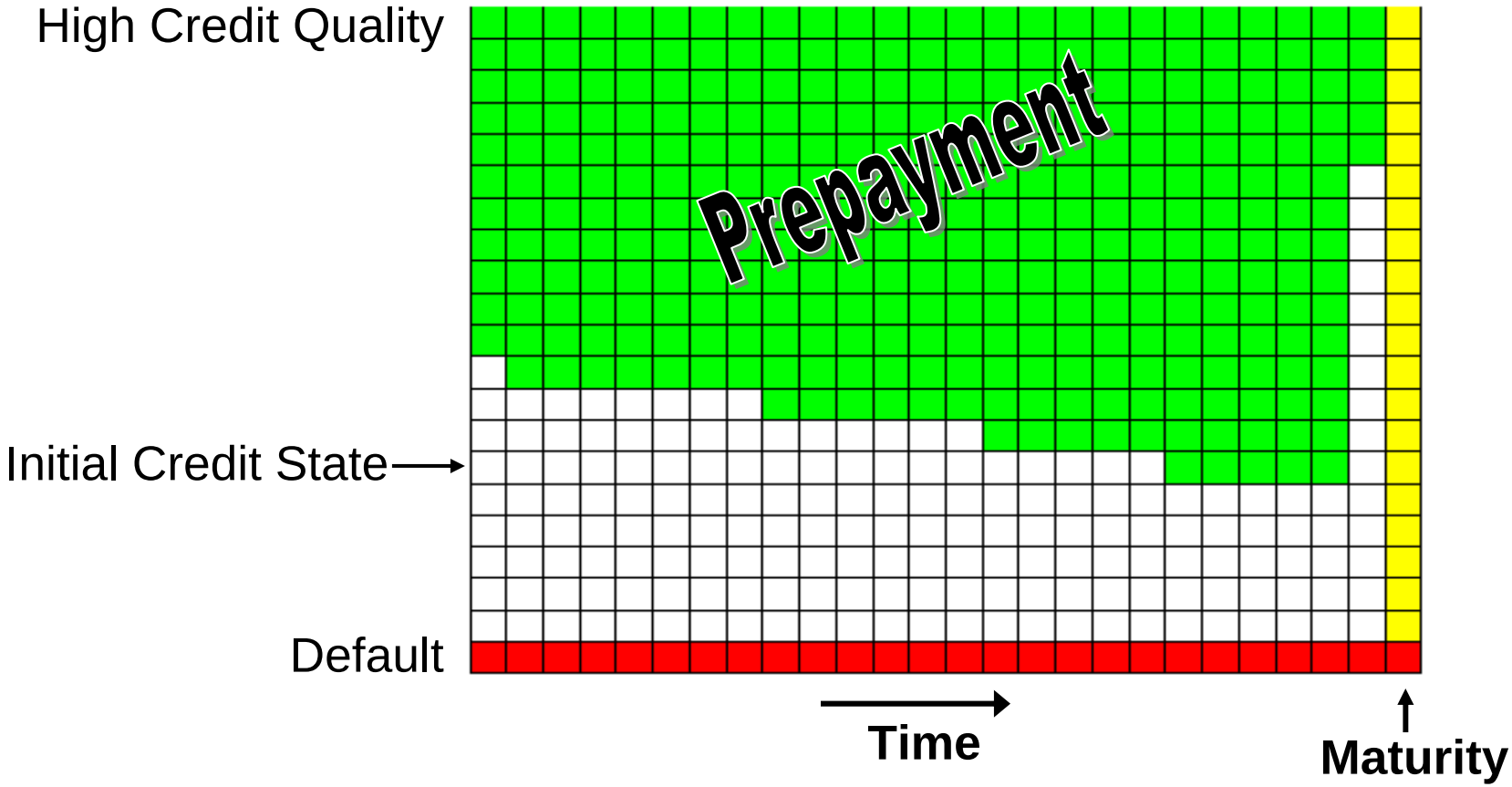


Prepayment Decision over time

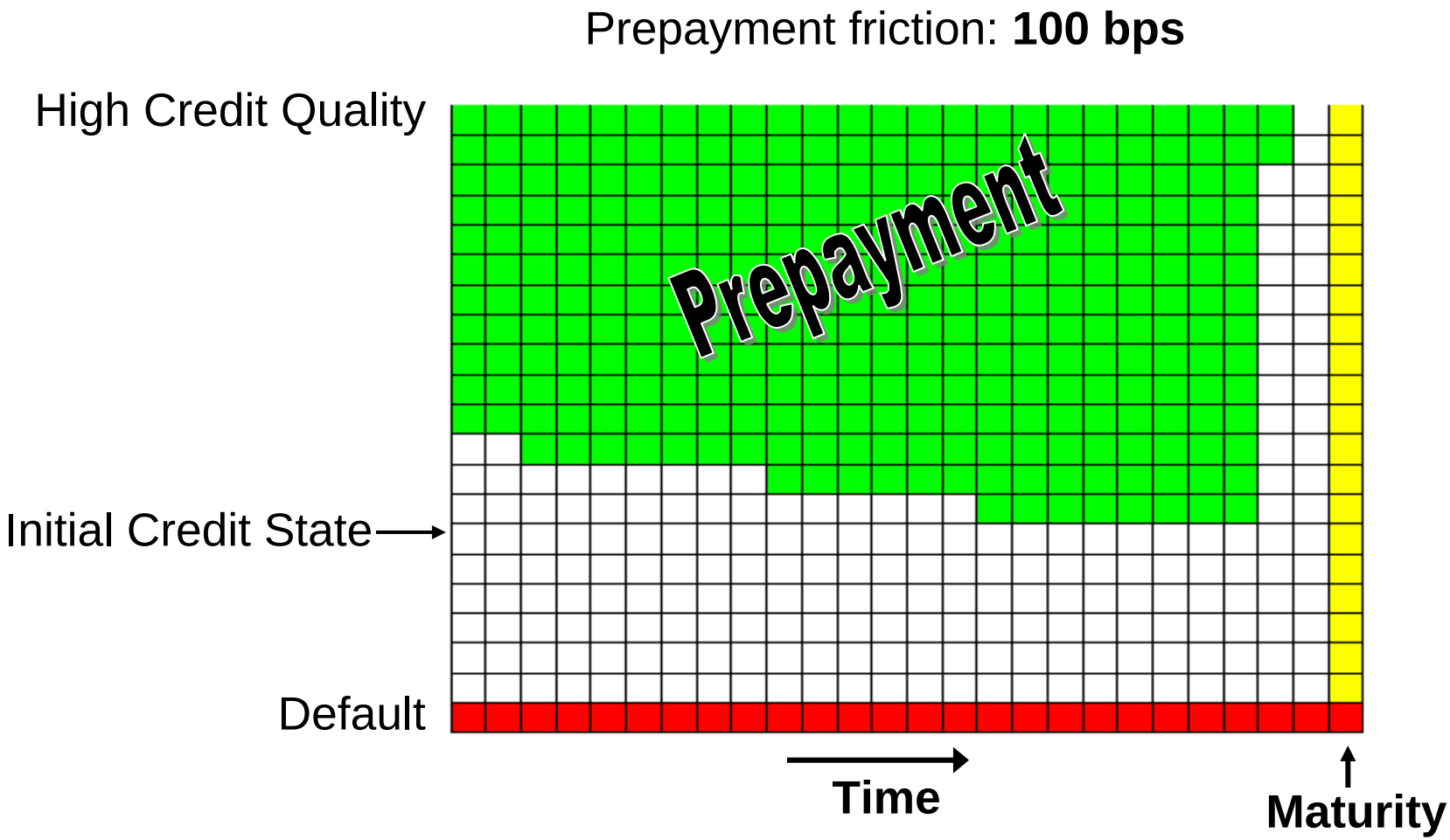


Prepayment Decision over time

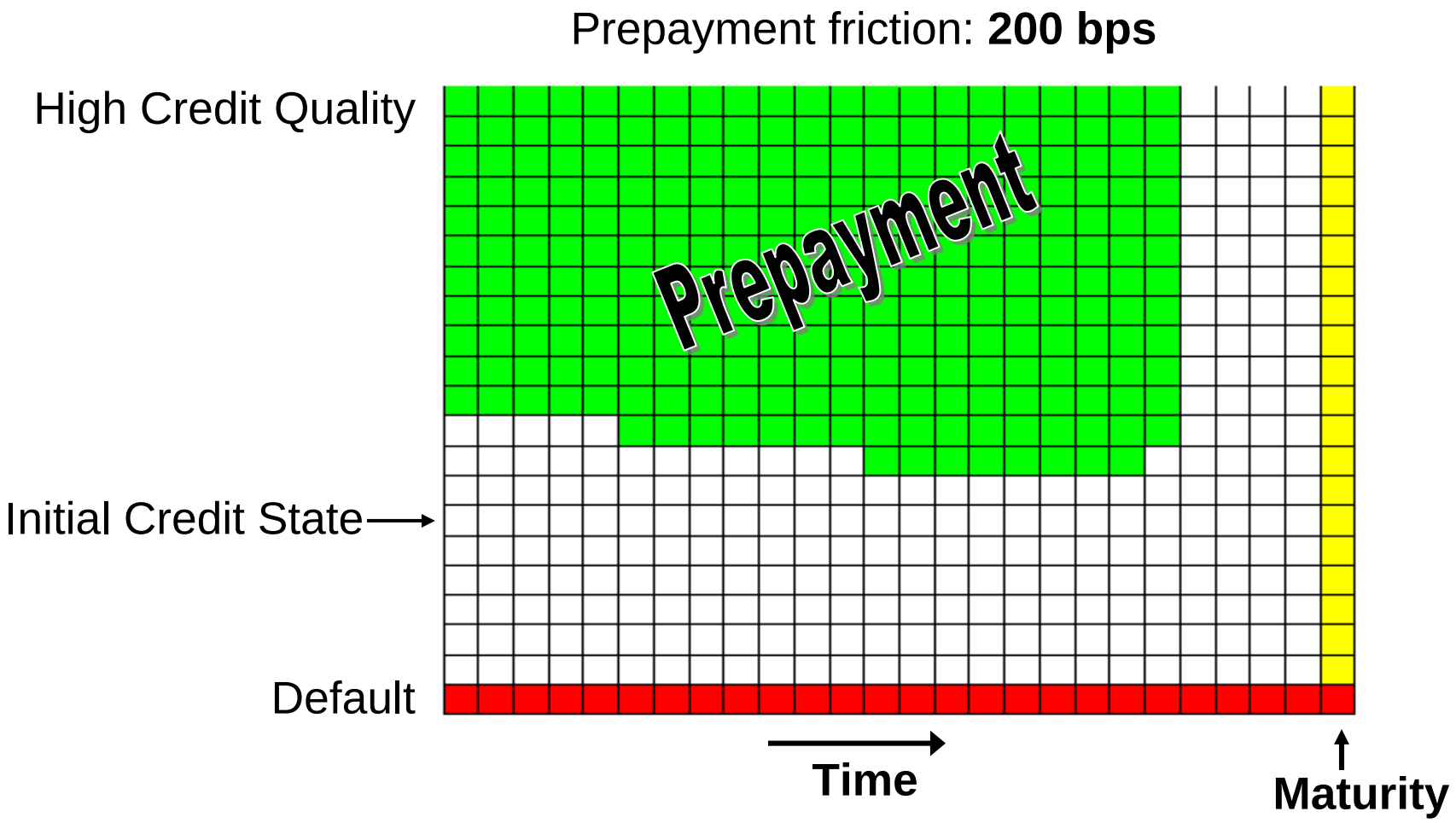
Prepayment friction: **50 bps**



Prepayment Decision over time

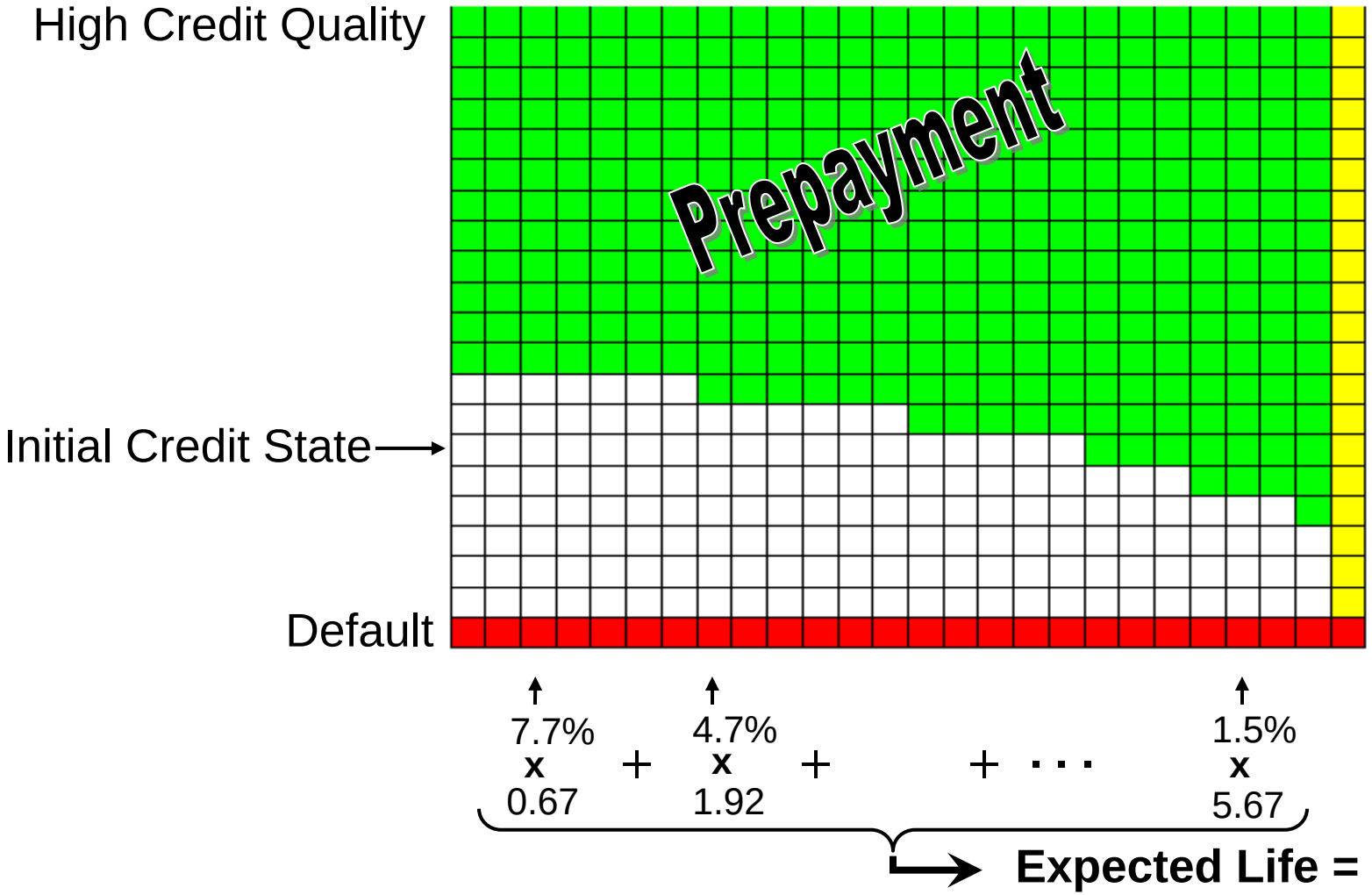


Prepayment Decision over time



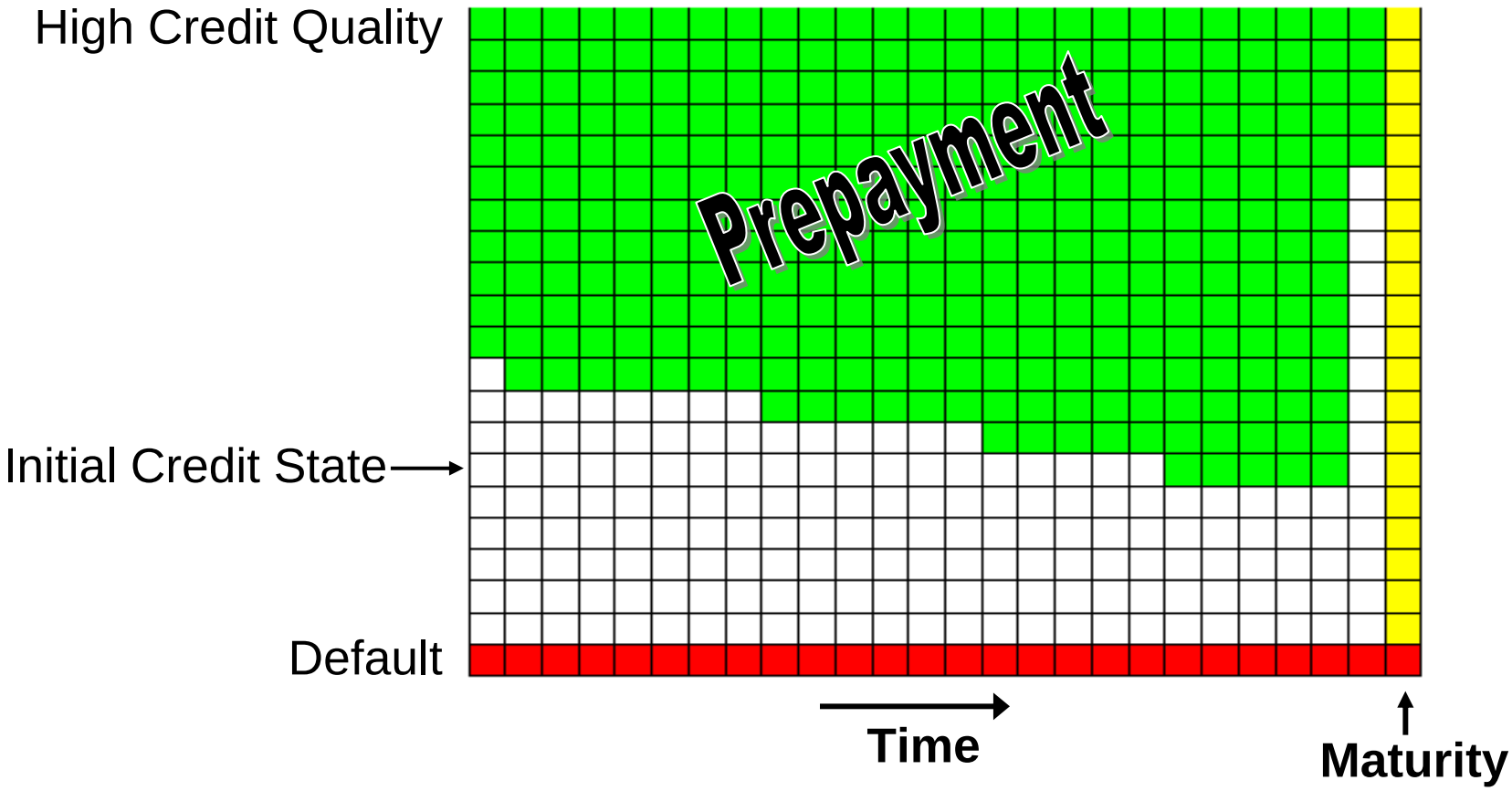
Early Termination Probabilities

Prepayment friction: **none**



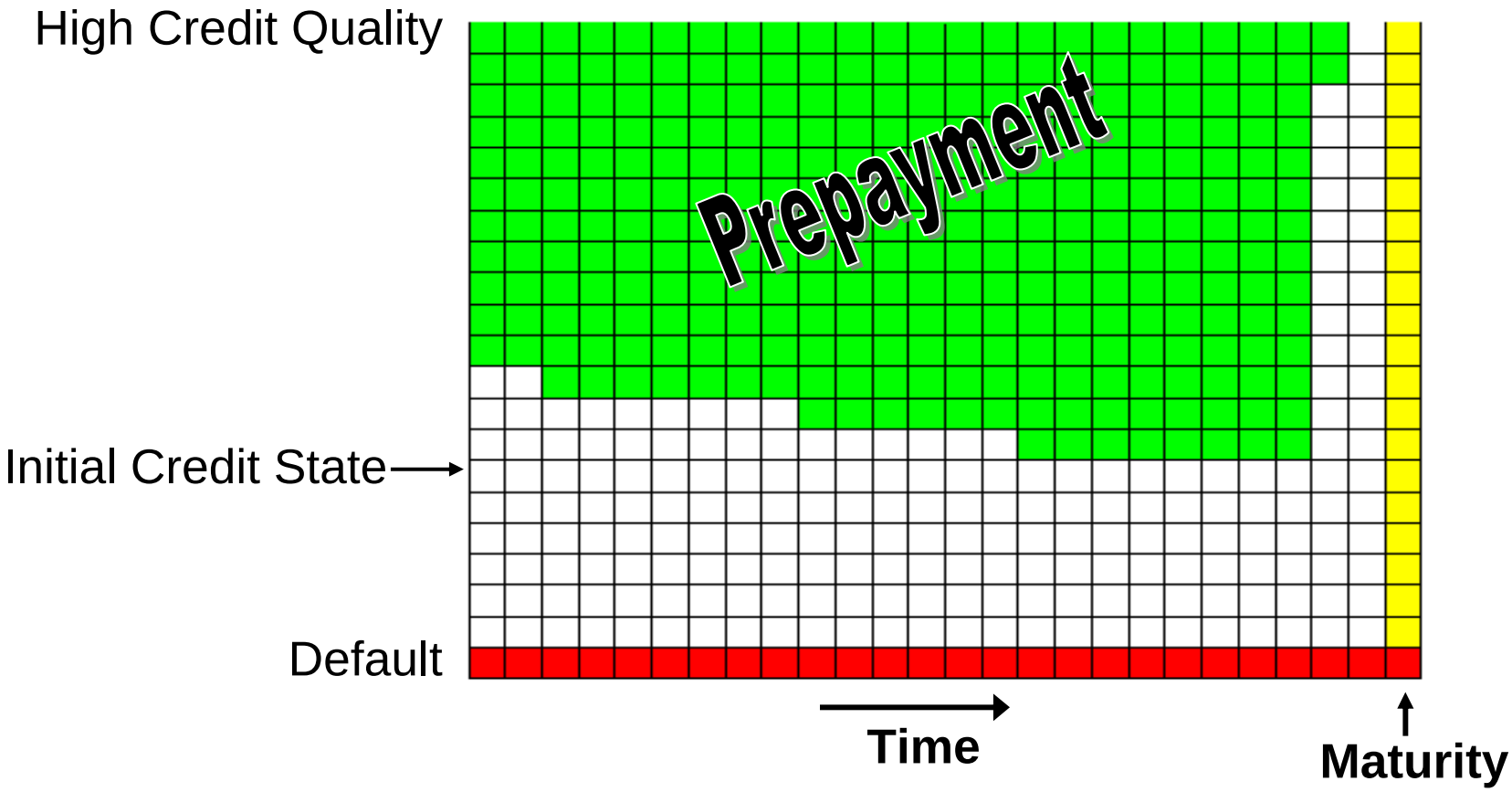
Expected Life

Prepayment friction: **50 bps,** **Expected Life = 2.9 years**



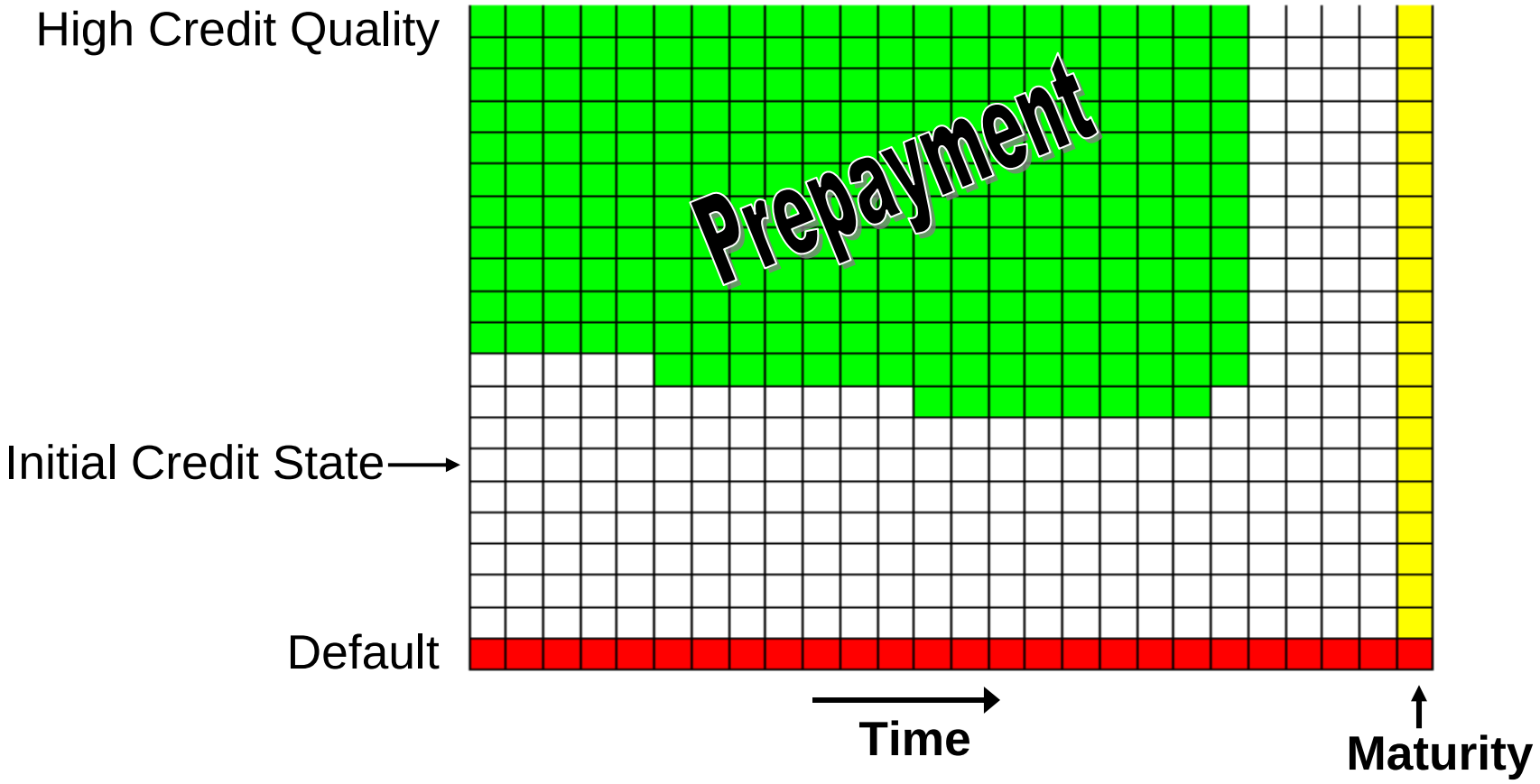
Expected Life

Prepayment friction: **100 bps,** **Expected Life = 3.0 years**



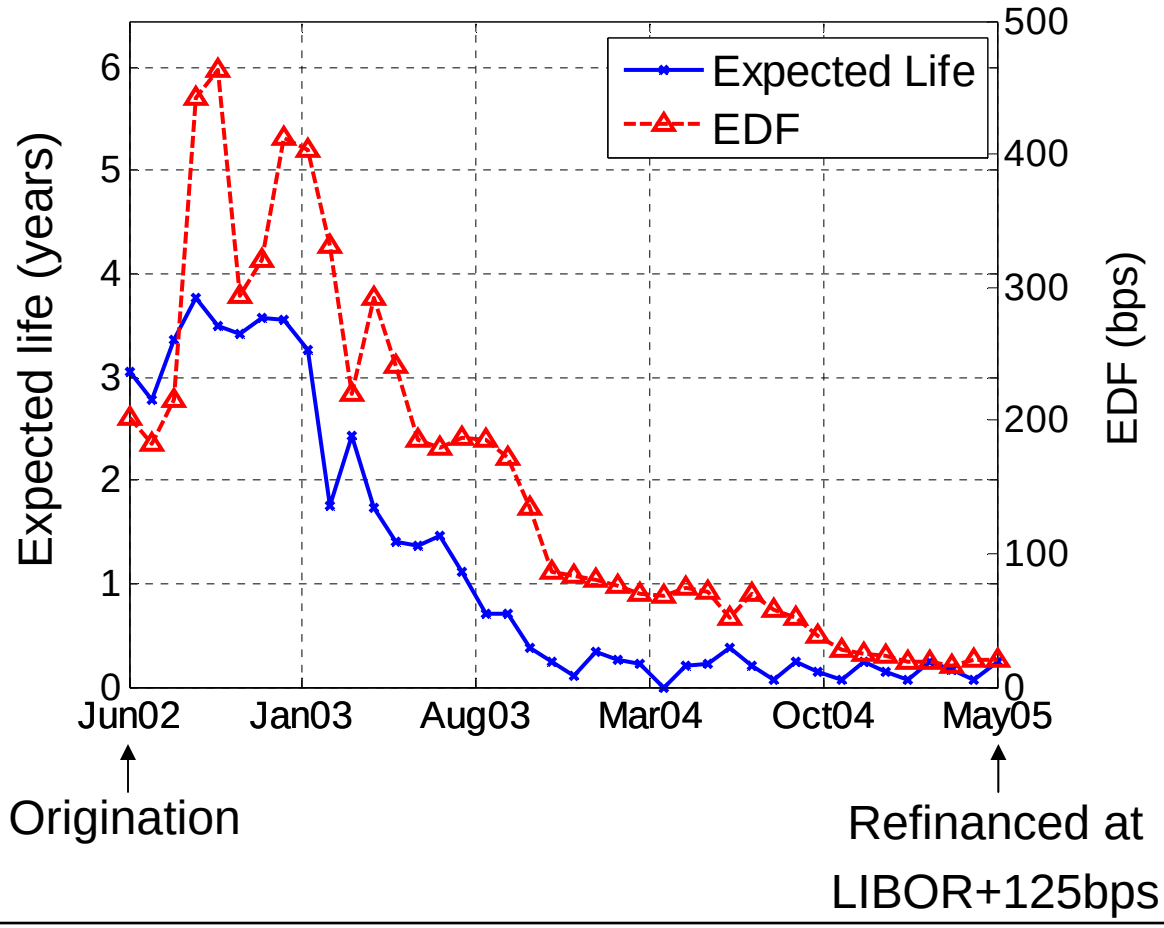
Prepayment Decision over time

Prepayment friction: **200 bps,** **Expected Life = 3.4 years**



Expected Life Example

- Silgan Holdings Inc, bullet term loan, B1 senior unsecured
- 6.5yr tenor @ LIBOR+200bps



3

Option Adjusted Spread and Par Spread

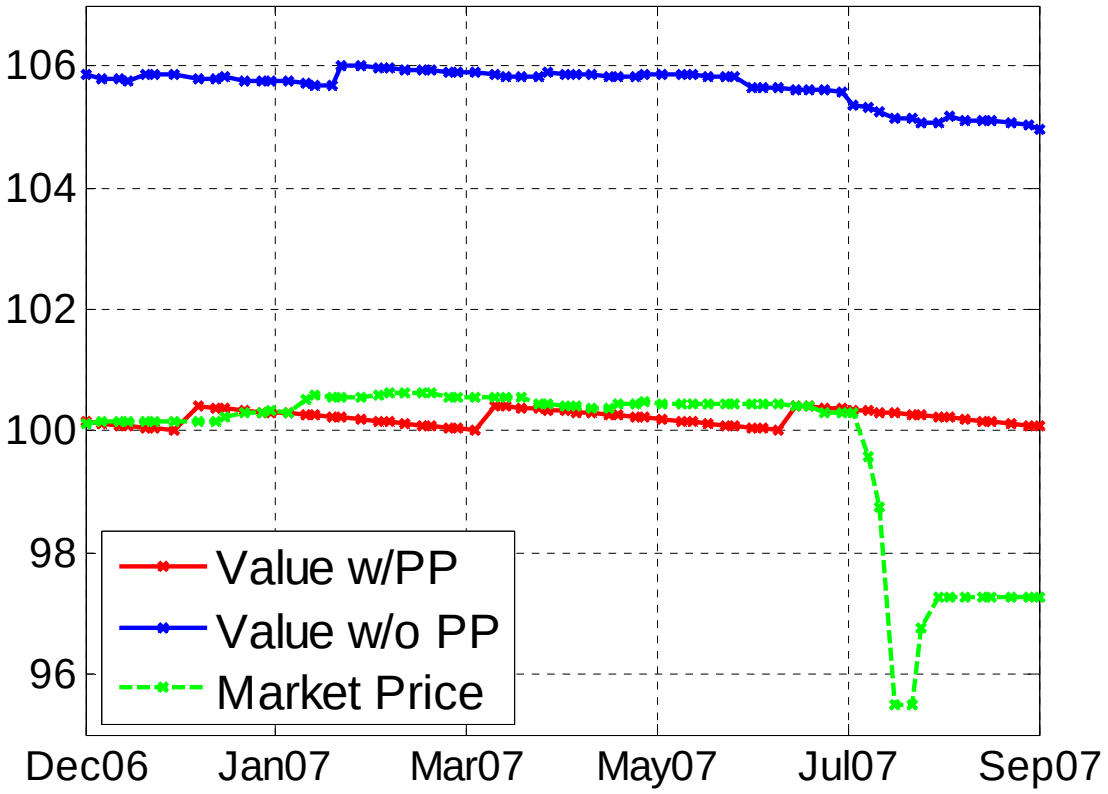
Loan OAS

- Option Value = $V_{no\text{-}pp} - V_{pp}$.
- Option Adjusted Price (OAP) = Market Price + Option Value

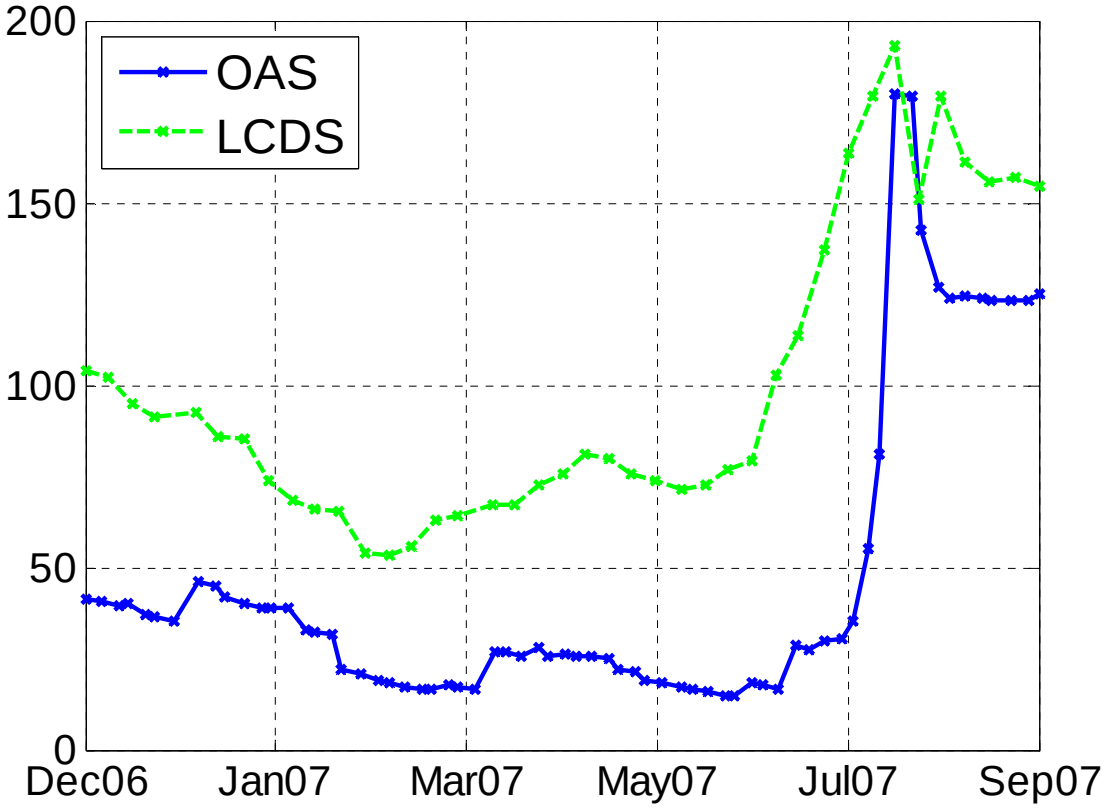
$$OAP = \sum_{i=1}^{T_M} \frac{CF_{t_i}}{(1 + r_{t_i}^{risk-free} + OAS)^{t_i}}$$

Option Value Example

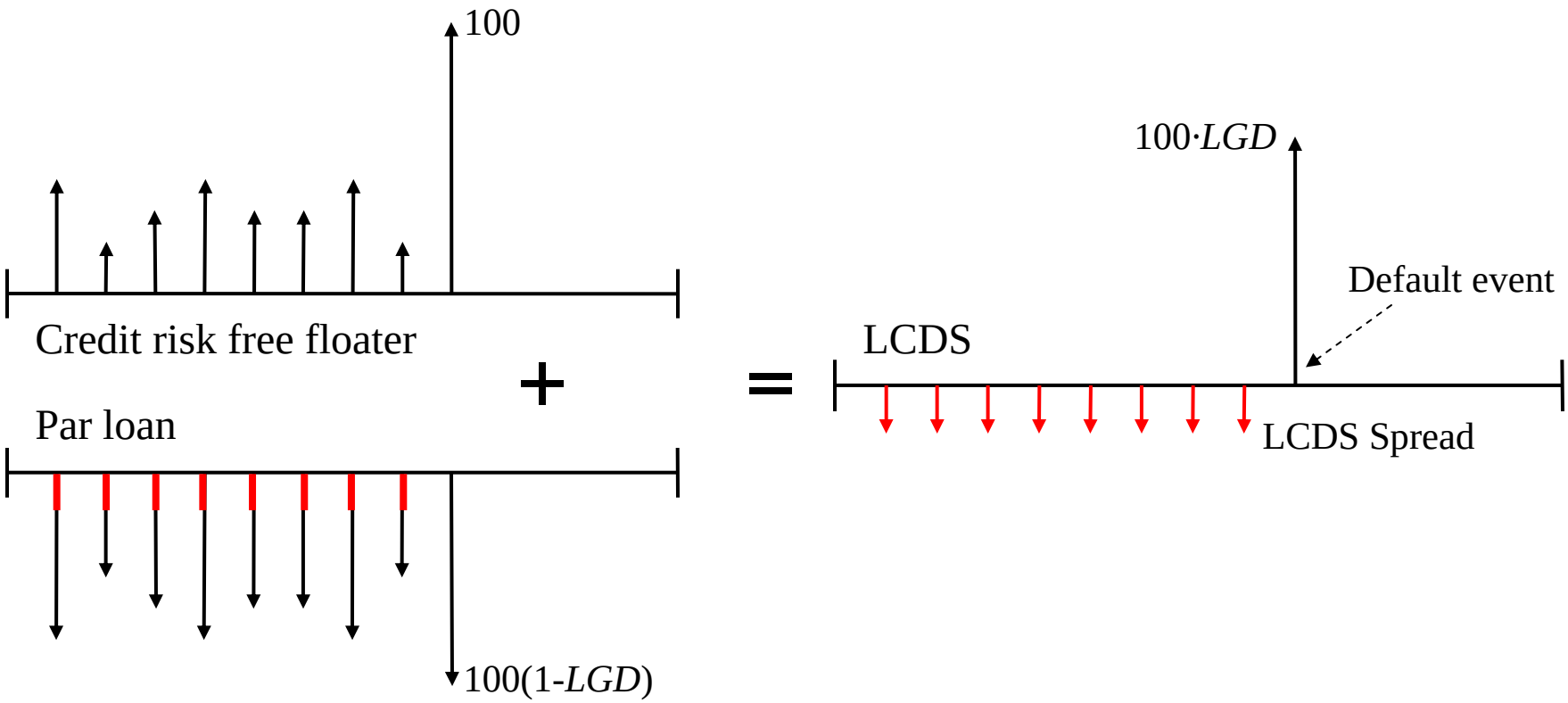
- Boyd Gaming Co, bullet term loan
- Originated 5/20/2004, 7yr tenor @ LIBOR+175bps
- Prepayment friction: no penalty, 100bps cost



Loan OAS vs LCDS Spread



Is loan OAS comparable to LCDS spread?

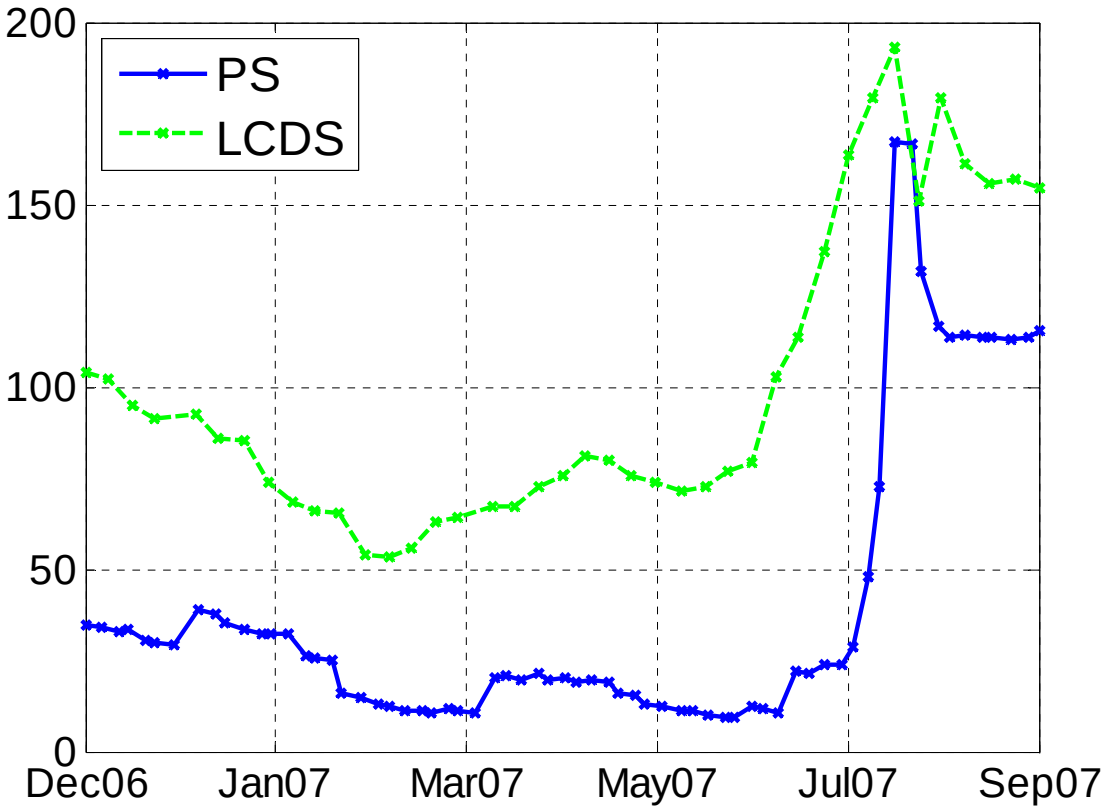


Loan Par Spread (PS)

- The par spread (PS) is defined to be the implied contractual spread of a (hypothetical) non-prepayable loan trading at par that has the same credit risk as the observed loan (same OAS).

$$1 = \sum_{i=1}^{t_{M-1}} \frac{\left(r_{t_{i-1},t_i}^{zero-EDF} + PS\right)\cdot\left(t_i - t_{i-1}\right)}{\left(1 + r_{t_i}^{zero-EDF} + OAS\right)^{t_i}} + \frac{1 + \left(r_{t_{M-1},t_M}^{zero-EDF} + PS\right)\cdot\left(t_M - t_{M-1}\right)}{\left(1 + r_{t_M}^{zero-EDF} + OAS\right)^{t_M}}$$

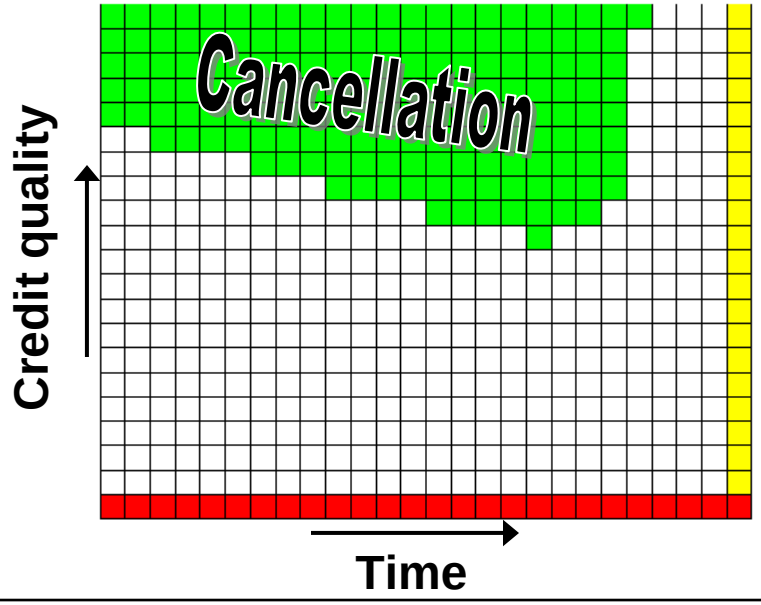
PS vs LCDS Spread



4 How Cancelable are LCDS Contracts?

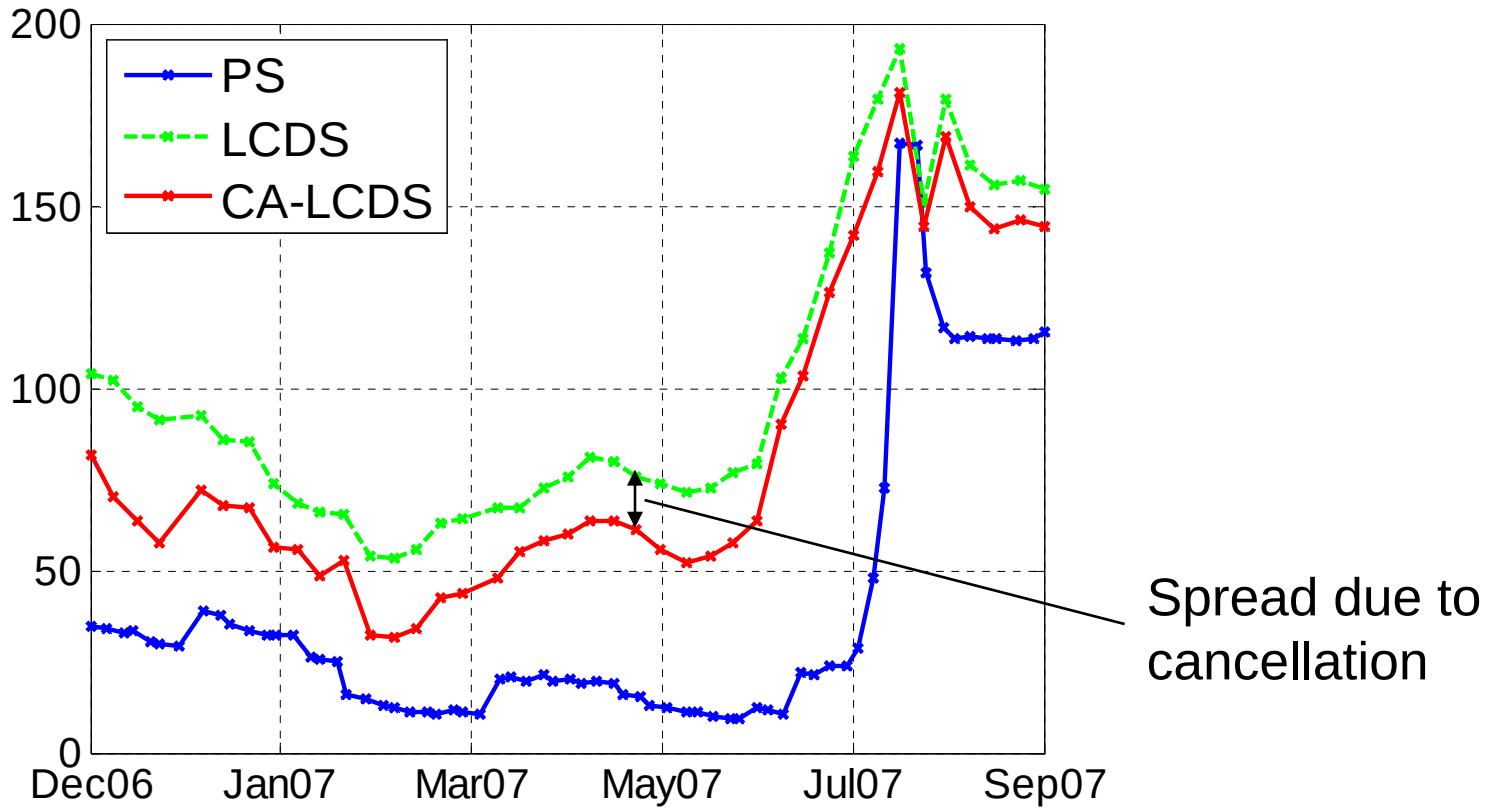
Modeling Pay-off of the Entire Loan Class

- An LCDS contract is cancelable when the entire class of underlying loans has extinguished.
- A likely scenario for LCDS cancellation to occur is when a borrower transitions from the (high-yield) loan market to the (investment-grade) bond market.
- We apply the lattice model to extract prepayment structure of a loan with an investment-grade contractual spread.



Cancellation-Adjusted LCDS

- We use the cancellation decision matrix to calculate the model LCDS spread with cancellation so that the dollar value is 0
- We can also calculate the par LCDS spread without cancellation



5

Duration and Convexity

Effective Spread and EDF Duration

$$D_{Spread} = -\frac{1}{V}\left(\frac{\partial V}{\partial S}\right)$$

$$D_{EDF} = -\frac{1}{V}\left(\frac{\partial V}{\partial EDF}\right)$$

Spread and PD (EDF) PV01

$$PV01_{Spread} = -\left(\frac{\partial V}{\partial S}\right)$$

$$PV01_{EDF} = -\left(\frac{\partial V}{\partial EDF}\right)$$

Spread and EDF Convexity

$$C_{spread} = 0.5 \cdot \frac{1}{V}\left(\frac{\partial^2 V}{\partial S^2}\right)$$

$$C_{EDF} = 0.5 \cdot \frac{1}{V}\left(\frac{\partial^2 V}{\partial S^2}\right)$$

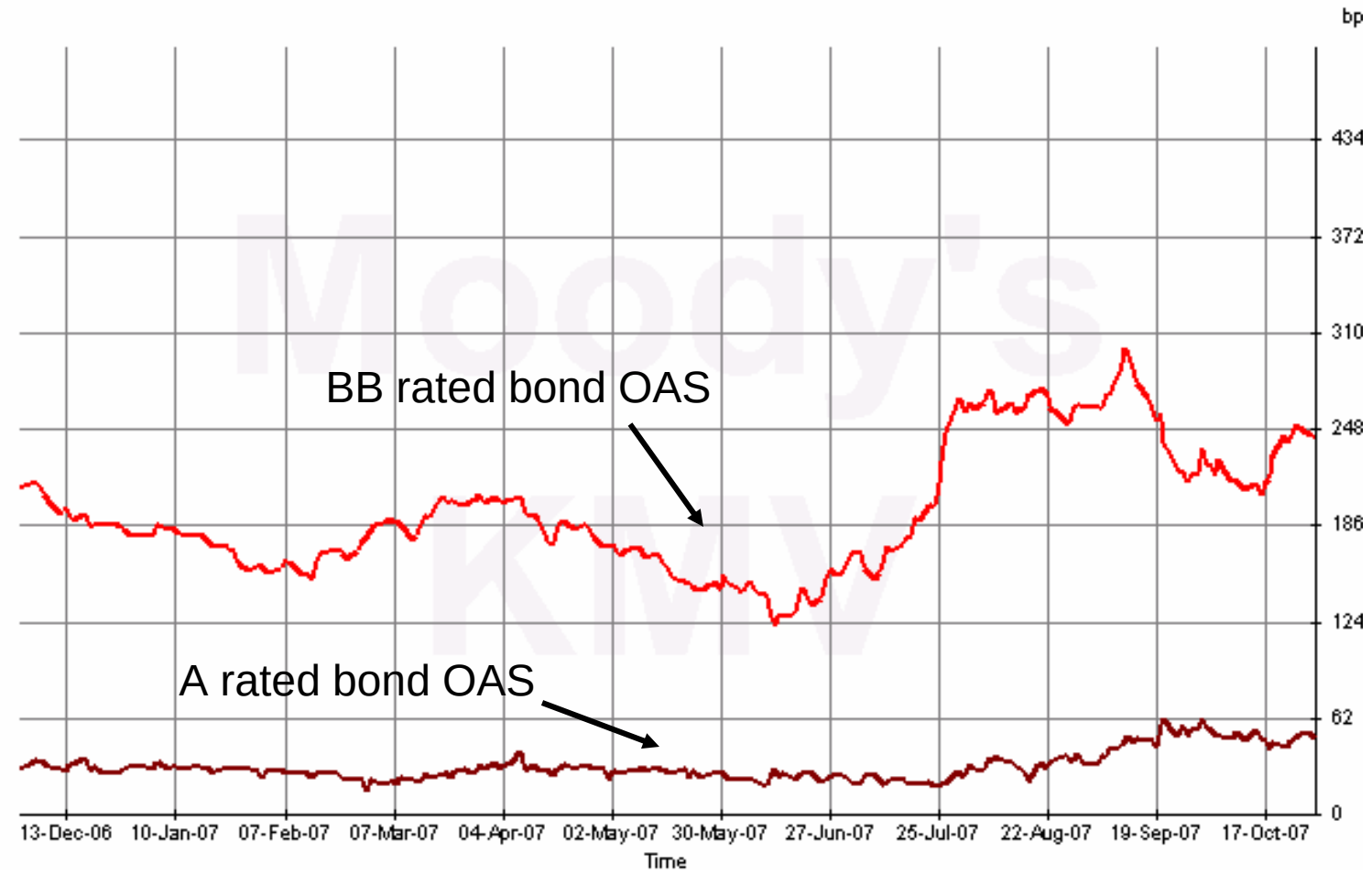
6 Summary

Summary

- Embedded options in loans and lattice valuation
- Prepayment patterns over time and early termination probability
- Expected life
- Option adjusted spread and par spread
- LCDS spread vs. OAS and par spread
- Cancellation options of LCDS

Boyd Gaming Co. Bond CDS Spreads

Investment-Grade vs. High-Yield Bond OAS



Source: Reuters EJV