Today’s Agenda

- The basics of mortgage lending from both the borrower and lender’s perspective
- Overview of the operational steps for originating and servicing the loan
- Highlight areas that lend themselves to analytical or model driven solution
- Provide a closer look at the loss mitigation decisions
Looking for a mortgage?
Lender’s View of Loan “Life Cycle”

- Marketing
- Origination
- Billing
- Payment
- Collection
- Loan Paid Off
- OR
- Loan Defaults
- Exit
Decisions Across the Life Cycle

• How attract right customer?
• How spend marketing $$$?
• What offer to make?
• What price covers risk?

• Verification of contact details
• Explore willingness to pay electronically
• And, with automatic withdrawal

Marketing

Origination

Billing

Payment

Collection

Loan Paid Off
OR
Loan Defaults

Exit

Loan Life Cycle

• Credit Policy Review
• Prior experience with customer?
• Is this fraud?
• Validity of property valuation?

• At what point to reach out to customer for missed payment?
• What media to use?
• Is a reminder needed next month?
• Is it time to discuss alternatives paths to payment?
• Should we modify the loan?
• Should we Exit the loan?
• How should we exit the loan?
What is the basis for such decisions?

- Valuation of the Home
- Expectation of Borrower Behavior
- Expectation of Future Home Prices (exit options)
- Expectation of Future Interest Rates (exit options)
- Overall Economic Health- local, regional
Loss Mitigation – The Decision Process

Borrower Stops Paying the Loan

Do we modify the loan?

Do we exit without foreclosing?

Do we foreclose on the house?

After
The Housing Crisis

Home Prices -- Down
Losses -- Up
Risks -- High
US Mortgage Foreclosure Inventory

Source: Mortgage Bankers Association / Haver Analytics
Loss Mitigation – Lifecycle of Defaulted Loan

For the decision to Modify the Loan or exit AND how to exit, what metric can we use?
Loss Mitigation - Decision to Modify or Exit?

What is the question we are answering?

- Is it better to Modify (MOD) or Exit the loan?

How will we measure the impact of our decision?

- Impact on Cash Flow (CF)
- Net Present Value (NPV) of the Change in CF over the remaining months (m) on the loan at a given discount rate ($\delta$)

CF for a performing mod comes from?

- Borrower makes monthly payments of Principle and Interest (PI)

When is a modification successful?

- Lets assume 6 months

What is the source of CF for an non-performing mod?

- Borrower makes some (?) monthly PI payment
  Plus, proceeds from the sale of the house (PR)
  After some months ($r$) in the Exit process

What is probability the mod succeeds?

- Probability of Default (PD)

If Loan Modification is successful, the Cash Flow from Principle and Interest will continue,

$$\text{Performing MOD NPV} = \sum_{t=1}^{m} \frac{PI_t}{(1+\delta)^t} \quad \text{(A)}$$

$$\text{Non-Performing MOD NPV} = \sum_{t=1}^{6} \frac{PI_t}{(1+\delta)^t} + \frac{PR_{r+6}}{(1+\delta)^{r+6}} \quad \text{(B)}$$
Loss Mitigation - Decision to Modify or Exit?

If Loan Modification is successful, the Cash Flow from Principle and Interest will continue,

Performing MOD NPV = \( \sum_{t=1}^{m} \frac{PI_t}{(1+\delta)^t} \) \hspace{1cm} (A)

Non-Performing MOD NPV = \( \sum_{t=1}^{6} \frac{PI_t}{(1+\delta)^t} + \frac{PR_{r+6}}{(1+\delta)^{r+6}} \) \hspace{1cm} (B)

Estimate the Cash Flow of a modified loan as,

YesMOD NPV = \( PD(B) + (1-PD)(A) \) \hspace{1cm} (I)

And when the loan is not modified the Cash Flow can be represented as,

NoMOD NPV = \( \frac{PR_r}{(1+\delta)^r} \) \hspace{1cm} (II)

A loan is modified when (I) > (II)
Loss Mitigation - Decision to foreclose or use alternative?

What is the question we are answering?

- Is it better FORCLOSE or use an ALTERNATIVE Exit strategy?
- TIME – Length of the Exit process

What is the difference between these options?

- a = time in alternative to FCL strategy
- b = time it takes to exit thru FCL

Let’s introduce notation,

If Exit thru Alternative to FCL strategy,

\[
\text{AltFCL NPV} = \frac{PR_a}{(1+\delta)^a}
\] (III)

If Exit through FCL strategy,

\[
\text{FCL NPV} = \frac{PR_b}{(1+\delta)^b}
\] (IV)

A loan EXITS thru FCL when \((IV) > (III)\)
Loss Mitigation
Final Step: Compare the Cash Flows

If (1) > (II) If (1) < (II)
Modify Exit

If (III) > (IV) If (III) < (IV)
Alternative to Foreclosure Foreclosure

\[\text{YesMOD NPV} = PD(B)+(1-PD)(A)\] (I)
\[\text{AltFCL NPV} = \frac{PR_a}{(1+\delta)^a}\] (III)
\[\text{NoMOD NPV} = \frac{PR_i}{(1+\delta)^i}\] (II)
\[\text{FCL NPV} = \frac{PR_b}{(1+\delta)^b}\] (IV)
Key Take Aways

- There are many opportunities to leverage analytical prowess in mortgage operations
- Clearly state the question you are trying to address
- Keep your solution tied to your objective
- Don’t let limited historical data hold you back
- Determine how you will measure your impact
What’s Next?

How do you obtain “Executive Buy-in” for this new idea?

- Link impact to bottom line
- Understand their tolerance for math
- Remember – K.I.S.S.

8th Grade Math is About The Tolerance Level
The Securitization Process

- Mortgage
- Bank
- Mortgage Security
- Borrower
- Servicer
- Investors
Case-Shiller Historical Home Price Index
(Real Prices)

Source: Irrational Exuberance by Robert Shiller
Components of Model Governance Program

1. Register All Models/Inventory
2. Model Validation Program
3. Model Performance Tracking
4. Change Management Process
5. Model Ownership
6. Roles & Responsibilities
7. Documentation
8. Model Usage Definition
9. Model Approval Process
10. Issue Tracking & Resolution
11. Model Governing “Authority”

Policies & Procedures for executing all of this...
Success will be dependent upon....

- Definition of “Model”
- Clarity Around Business Process
- Collaboration among
  - Model Owner
  - Model Users
  - Model Validator
- Transparency
- Executive Sponsorship
- Consequences for Lack of Adherence