Current Expected Credit Loss (CECL)

Project Scope & Methodology

Project Scope

Project Objective (Application of data analysis techniques along with building of risk model)

Understanding CECL	Data Familiarity	Identifying better prediction model

Product

30 years fixed rate mortgage loans

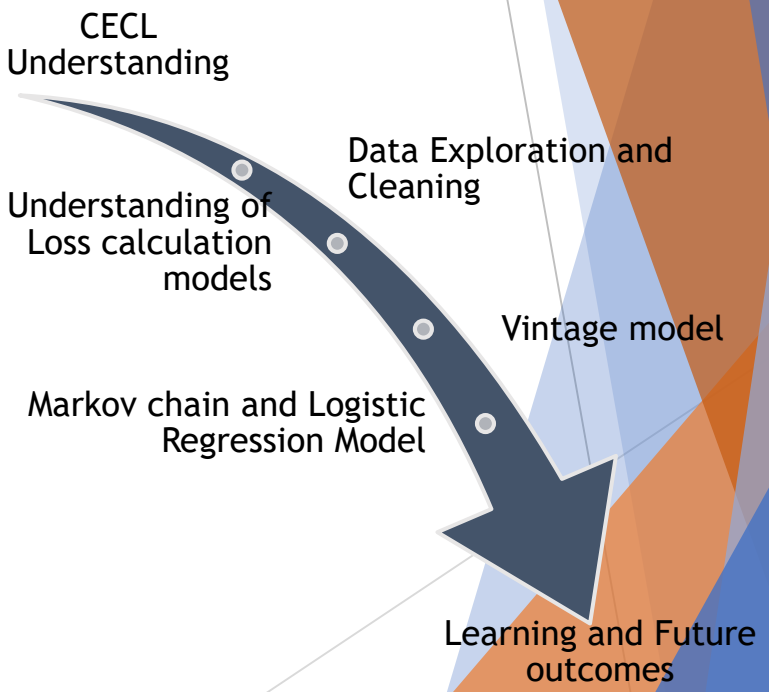
Data

2001-2008,Fannie Mae (Acquisition Data, Performance data)	Unemployment rate data

Tools

R, Python	Excel

Project Methodology



Why and What is CECL?

- Minimum cash reserve to maintain liquidity and fulfill commitment
- Prevent Situations like 2008 financial crisis

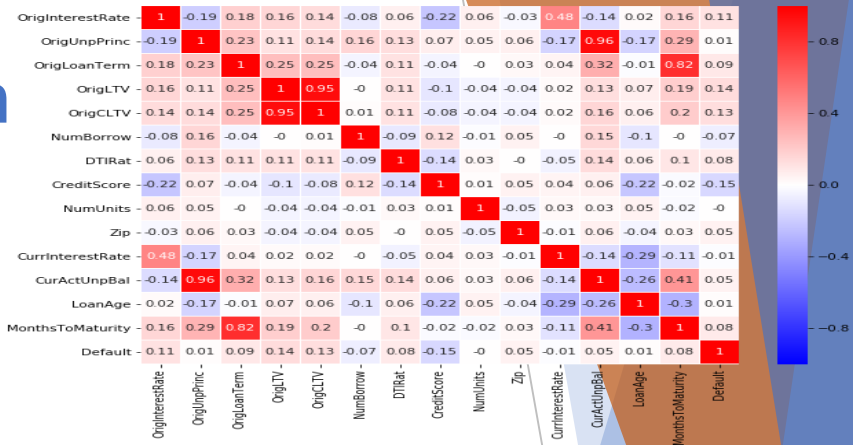
Issued by FASB	June 16th,2016
Purpose:	Estimate Expected loss over life of loan
Deadline	15th December 2019 for SEC filers 15th December 2020 for others

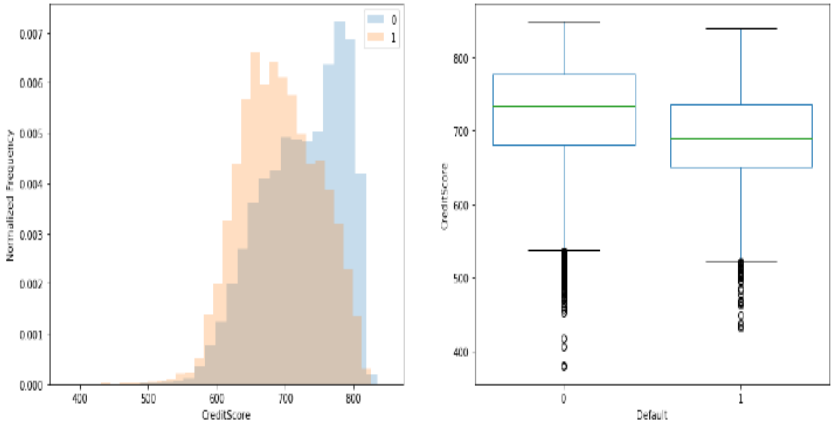
Key Distinguishing Parameters	Current GAAP	CECL
Loss Timing recognition	When incurred or probable	**Doesn't wait for loss to happen**
Loss Amount recognition	Already incurred loss amount	**Current estimate of cashflows not expected to be collected**
Data used to determine loss	Past data and current conditions	**Reasonable and supportable future forecast along with past data and current conditions**

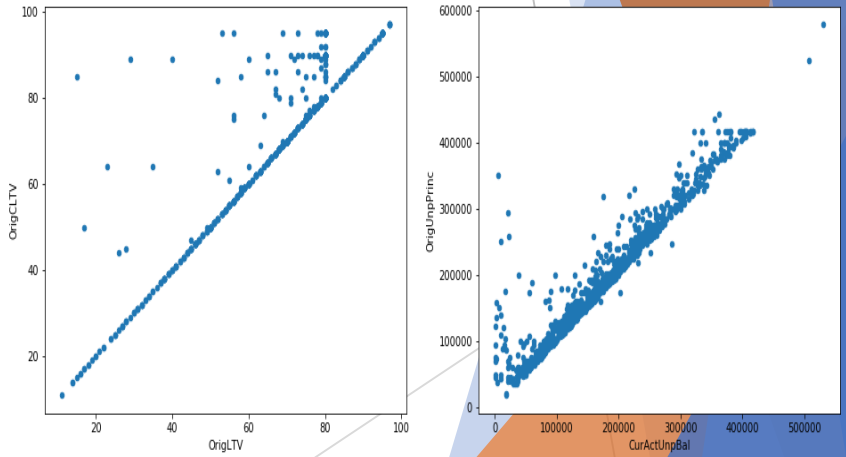
CECL Understanding → Data Exploration and Cleaning → Understanding of Loss calculation models → Vintage model → Markov chain and Logistic Regression Model → Learning and Future outcomes

Data Cleaning and Exploration

- Data Merging of Acquisition and Performance datasets using the LoanID
- Dropping columns with many null values (MorInsPerc, CoCreditScore, MortInsType)







CECL Understanding | Data Exploration and Cleaning | Understanding of Loss calculation models | Vintage model | Markov chain and Logistic Regression Model | Learning and Future outcomes

Model Comparison

Moving Average

Average value of last n(12) months

Time Series

Pros: Capture the economic cycle

Cons: Missed Credit Cycle

Roll Rates

Rolling forward - from month to next and till the delinquency.

Pros: Capture the economic cycle

Cons: Missed the Credit Cycle

Vintage Model

Time series of each vintage

Identifying Default rate, Attribution Attrition Rate, etc.

Pros: Captures both economic cycle and Credit life cycle

State Transition

Another version of roll rates model with scenarios in consideration

Multi-nominal regression

Pros: More Actionable

Cons: Not accurate over vintage model

Discrete Time Survival

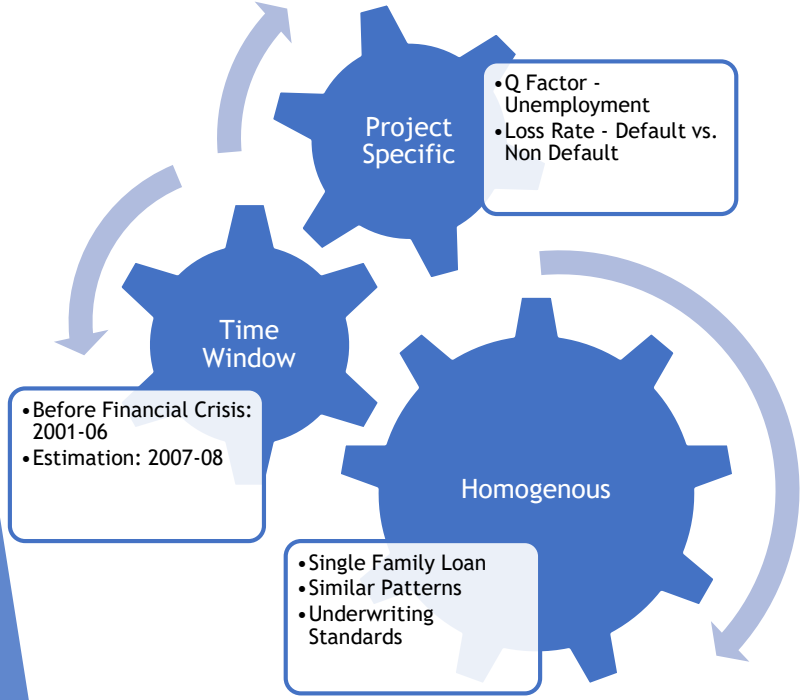
Monthly data

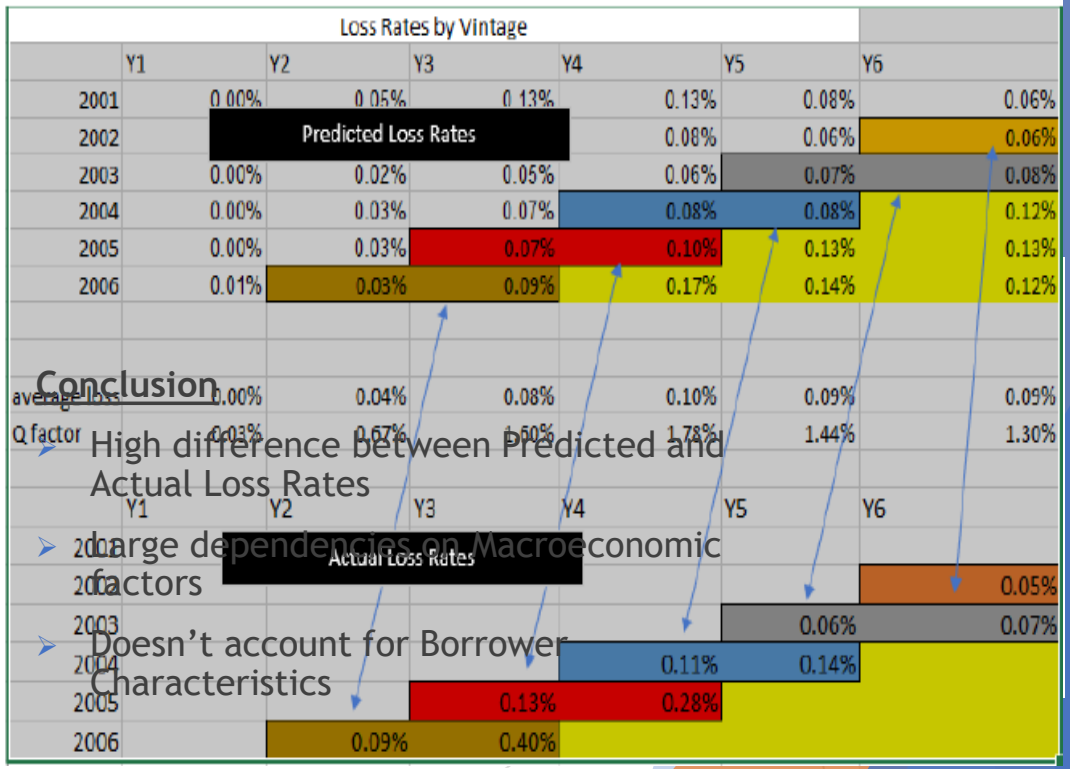
Uses Vintage Model to capture Lifecycle and environment variation

CECL Understanding → Data Exploration and Cleaning → Understanding of Loss calculation models → Vintage model → Markov chain and Logistic Regression Model → Learning and Future outcomes

Vintage Model

- Measures Losses on the origination date based upon on the historical performance of loans with similar characteristics





Conclusion

- High difference between Predicted and Actual Loss Rates
- large dependencies on Macroeconomic factors
- Doesn't account for Borrower Characteristics

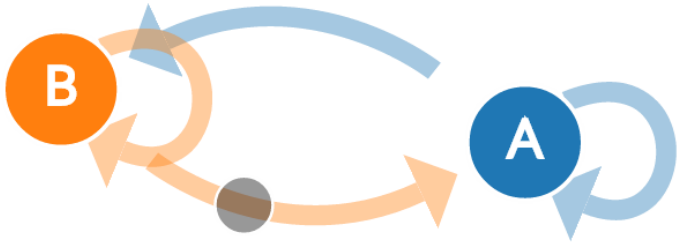
CECL Understanding | Data Exploration and Cleaning | Understanding of Loss calculation models | Vintage model | Markov chain and Logistic Regression Model | Learning and Future outcomes

Default Probability Estimation

Markov Chain Model

6 Statuses

- -1 prepaid
- 0 on performance
- 1 not performing for 30 days
- 2 not performing for 60 days
- 3 not performing for 90 days
- 4 not performing more than 90 days



Transition Probability & Logistic regression

- Y is the transition of delinquency status:
- X is Macro Economic Variables and credit score:
- Unemployment rate, house price index, CPI 3-month treasury rate and FICO score

	-1	0	1	2	3	4
-1	1					
0	0.1742	0.2782	0.5477			
1		0.6072	0	0.3928		
2			0.1592	0	0.8408	
3				0.1075	0	0.8925
4						1

Results & Future Outlook

Results

- State Transition Model appears to be most accurate model
- Calculations for all account is a better way for company to estimate its risk reserve.
- Important to account for economic and credit cycle

Key Learnings

- Exposure to CECL
- Data Analysis and Visualization
- Model selection is key to CECL as this will define the Loss Reserve
- Increase in variables increases accuracy but with errors

Future Outlook

- Modelling to account for floating rate type mortgage loans and credit card loans
- Lag consideration for economic variables
- Re-run with last 5 years dataset


Thank You
Q&A