

Energy and Loan Performance Data Project

Stakeholder Feedback Webinar


November 22, 2013



The Eric & Wendy Schmidt
Data Science for Social Good
Summer Fellowship 2013



Agenda

- Introduction to Project Team
 - Project Goals and Overview
 - Presentation of Data, Analyses, and Dashboard
 - Feedback and Questions
- 

Project Team

- EDF Investor Confidence Project
 - Standards for Energy Efficiency Project Development and Measurement
 - National network of Financial and Origination Allies
 - www.EEperformance.org
- Clean Energy Finance Center
- University of Chicago
 - Data Science for Social Good Fellowship
 - Matt Gee, Fellowship Organizer & Team Lead
 - Alex Fedell
 - Julie Cooper




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EDF Investor Confidence Project

- **Our Mission** is to enable a market for investment in quality energy efficiency projects by reducing transaction costs and engineering overhead, while increasing the reliability and consistency of savings.
- **History**
 - EDF focus on barriers to capital participation in energy efficiency
 - Three year foundation funded consensus effort
 - Broad participation from investors, engineers, programs, energy service companies, and building owners
- **Key Goals**
 - Increase Deal Flow
 - Manage Performance Risk
 - Create Actionable Data
- **www.EEperformance.org**

Data Project Snap Shot

- 1) Collect and aggregate energy efficiency loan and energy performance data from different residential and commercial lending programs.
 - 2) Create publicly available database and dashboard.
 - 3) Develop energy efficiency loan data specification.
 - Standardized fields and definitions
 - In collaboration with Lawrence Berkeley Lab and SEE Action Network Financing Workgroup
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Data Project Goals

- Long-term goal:
 - Create standardized infrastructure for the collection, aggregation, and analysis of EE loan and energy performance data to support the scaling of EE finance
- Project goals:
 - State of the Union on EE Loan and Performance Data
 - Identify EE loan data user needs
 - Provide access publicly to currently available EE loan data
 - Develop a standard EE loan data specification that meets the needs of data users
 - Identify important gaps
 - Gaps in how data are currently collected, analyzed, and shared/reported
 - Starting point for detailed conversation about data requirements and standardization

Project Partners

- Funders and Collaborators
 - Citigroup Foundation
 - U.S. DOE, Dept. of Energy Efficiency & Renewable Energy
 - Lawrence Berkeley National Labs
 - Data Providers
 - Pennsylvania Treasury (Keystone HELP)
 - New York State Energy Research & Development Authority
 - Clean Energy Works Oregon
 - Greater Cincinnati Energy Alliance
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What data have we collected and analyzed?

- All are residential loans
 - Almost no commercial loan data publicly available
- 4 programs - 12,000 loans total
 - 17% are on-bill, 83% are off-bill
 - Personally identifiable information (PII) removed
- Data is not yet “investment grade”
 - No time-series data collected yet
 - Greater level of detail/granularity needed
 - More loan volume and diversity (e.g., geographic) needed
- Data field categories (total of 95 fields)
 - 1) Borrower and property information
 - 2) Loan information
 - 3) Project information
 - 4) Energy savings information (quite limited)


Data Users

- Lenders and investors
 - Banks, credit unions, CDFIs, originators & servicers, rating agencies, others
 - Policymakers
 - Public utility commissions, local/state/federal agencies, legislators, advocates, others
 - Program administrators
 - Local/state/federal agencies, utilities, green banks, others
 - Other stakeholders
 - Product and service providers, consultants/advisory groups, building owners, others
- 


Related Data Efforts

- U.S. Department of Energy
 - SEE Action Network Financing Workgroup: conducting an EE loan data scoping study
 - Building Performance Database
 - Building Energy Data Exchange Specification (BEDES)
 - Solar Access to Public Capital (NREL)
 - California EE loan data efforts
 - Developing infrastructure to collect, store, protect and analyze EE loan data
 - Support EE financing pilots
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What Questions Can the Data Help Answer ?

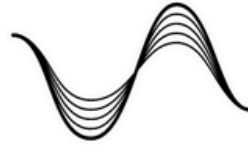
- What are some of the defining characteristics of EE loans, and how do they compare across loan programs?
 - How does EE loan performance compare to that of other asset classes, such as auto, credit cards, solar loan/lease, or time-shares?
 - Will EE loan performance deteriorate somewhat in the future as lending expands beyond “first adopters?”
 - Is there a correlation between energy savings and loan performance?
- 

What Questions Can the Data Help Answer ? (continued)

- With acceptance of protocols, will lenders use energy savings in the underwriting process?
 - Will methods to secure loans (e.g., OBR, PACE) make a significant difference in loan volume and terms?
 - Do certain characteristics of loan products result in greater levels of energy efficiency?
 - Do certain characteristics of loan products matter more for secondary markets?
- 

Project Plan Going Forward


Milestone	Deliverable
Interview data users and obtain feedback on database/dashboard (EDF/LBNL)	<u>January 2014</u>
Publish database and dashboard (EDF)	<u>February</u>
Publish EE data specification (EDF/LBNL)	<u>May</u>
Publish Issues & Recommendations report (LBNL)	<u>June</u>




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Overview

- What We've Done
 - Main Findings
 - Loan Performance Data: Ideal vs. Reality
 - Data Preview
 - Underwriting Differences
 - Characterizing Performance
 - Suggestive Relationships
 - Data Dashboard
 - Next Steps
- 

What We've Done


- Standardize Format
 - Documentation
 - Understand Underwriting Differences
 - Performance Analysis
 - Explore Unique Predictors
 - Identify Gaps
- 

Commitment to Open Data & Analysis


- **Data** Available Through Google Fusion Tables
- **Documentation & Analysis** Available on Github.com
- **Visualization** Available through Chartio.com Dashboard



Main Findings

- Program structure and incentives matter
 - EE loans in portfolio have relatively low charge off rates and relatively high pre-payment rates
 - Some suggestive evidence on unique predictors of performance
 - Higher frequency data over more years are needed to answer critical stakeholder questions
 - Need pre- and post-retrofit energy use data linked with loan data
- 

Main Challenges

- No standard products: differences in underwriting and terms make comparisons across programs difficult
 - No standard data collection: differences in fields collected by programs make cross-program analysis difficult
 - Short histories and very low charge-off rates limit the power of the analysis
 - No standard for and little emphasis on tracking project performance
- 

11,947 Loans



PENNSYLVANIA
TREASURY
Earn. Learn. Invest.

7,216 Loans

nyserda
Energy. Innovation. Solutions.

3,446 Loans



1,166 Loans



119 Loans

Total Loan Volume: \$103,649,269



PENNSYLVANIA
TREASURY
Earn. Learn. Invest.

\$54,837,059

nyszerda
Energy. Innovation. Solutions.

\$32,845,566

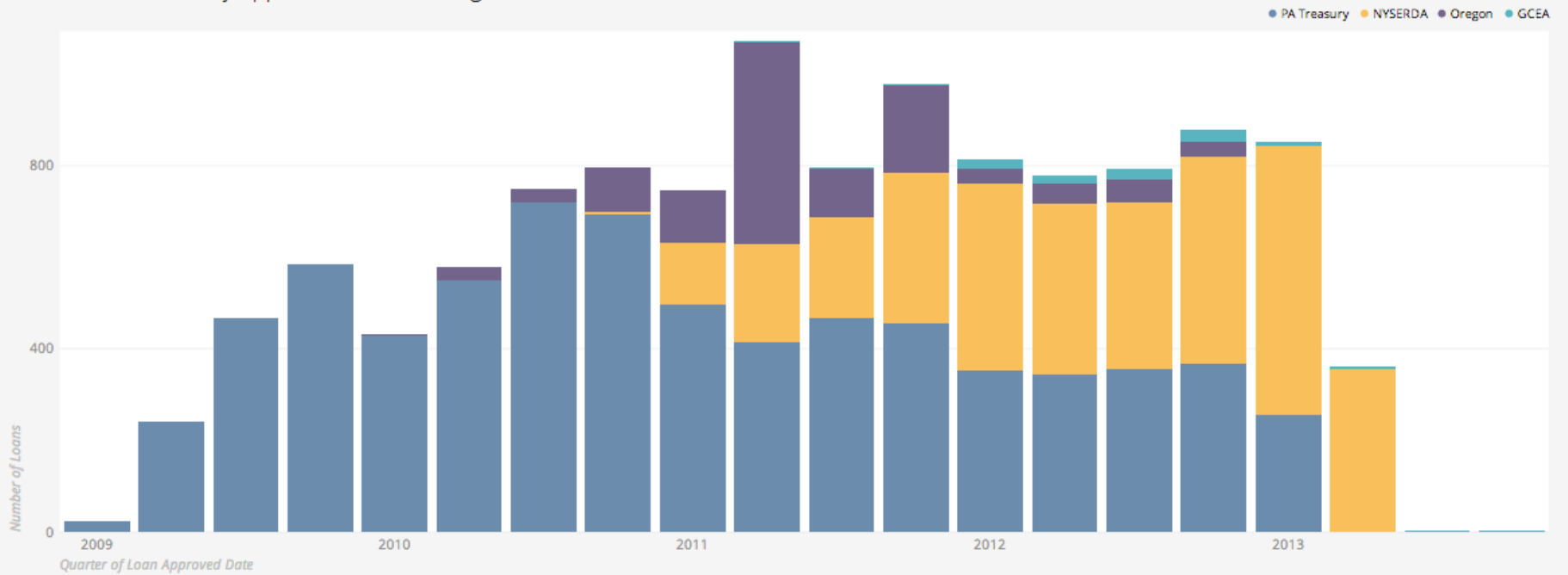


\$14,911,852



\$1,054,812

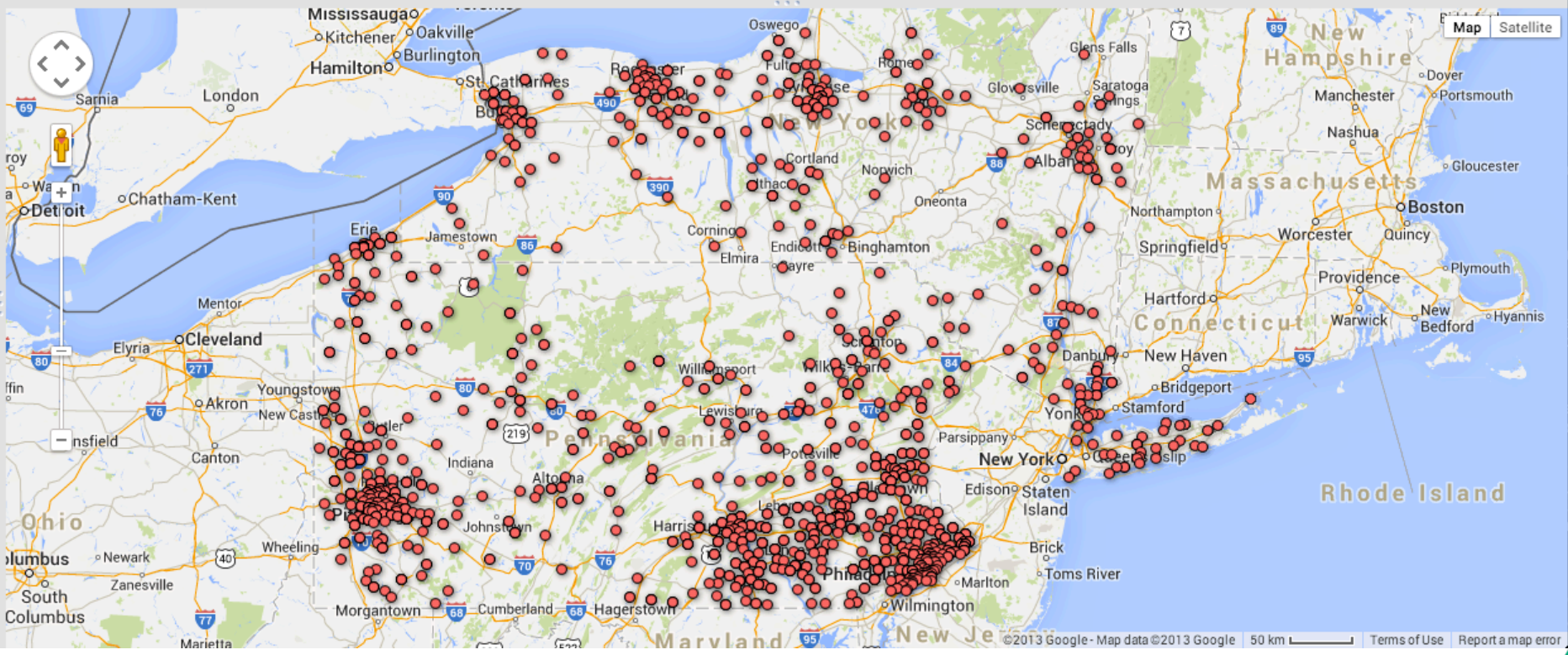
Number of Loans By Approval Date and Program



Combined dataset from energy efficiency loan programs collected by the Investor Confidence Project.
[Environmental Defense Fund](#) - Edited at 12:55 PM
User: mattgee@gmail.com
[Share](#)

File Edit Tools Help
[Raw Loan Data](#) [Summary of Key Fields](#) [Where Are These Loans?](#)

Filter No filters applied Saved **11,947 rows**



Standard Loan Performance Data

Static Features

- Borrower Characteristics
- Loan Characteristics
- Project Characteristics

datasou	loanid	loanam	loanappr	loanint	loan	credit
Oregon	EP-11	17905	3/11/11	5.99	12	616
GCEA	W35PI	1200	8/7/12	6.99	12	816
Oregon	EP-11	18231	12/20/10	5.99	13	698
Oregon	EP-11	3157	3/24/11	5.99	24	805
GCEA	4FDE5	1769	3/20/12	3.99	24	812
GCEA	LNRA5	2980	11/1/12	6.99	24	689
Oregon	EP-12	3461	5/16/11	5.99	25	779
Oregon	EP-12	1310	5/2/11	5.99	26	728
Oregon	EP-12	2414	4/26/11	5.99	26	809
PA Treas	2284	3250	7/8/09	6.99	36	760
PA Treas	46340	4418	7/19/11	7.99	36	800
PA Treas	77547	6620	1/25/13	7.99	36	760
PA Treas	24532	6200	12/21/09	6.99	36	780
PA Treas	34601	1795	11/30/10	6.99	36	680
PA Treas	69008	7050	8/17/12	8.99	36	760
PA Treas	49894	4680	12/6/11	7.99	36	780
PA Treas	26480	2620	3/29/10	6.99	36	680
PA Treas	1878	2586	5/14/09	5.99	36	800
PA Treas	1839	5000	5/15/09	5.99	36	800
PA Treas	35500	4000	4/10/11	6.99	36	740

Dynamic Features

- Monthly payment history
- Outstanding Balance
- Loss mitigation

datasou	loanid	Jan-2009_pm	Feb-2009_pm	March-2009-F	April_2009-pn
Oregon	EP-11	Current	Current	Current	Current
GCEA	W35PI	Current	Current	Current	Current
Oregon	EP-11	Current	Current	Current	Current
Oregon	EP-11	Current	Current	Current	Current
GCEA	4FDE5	Current	Current	Current	Current
GCEA	LNRA5	Current	Current	Current	Current
Oregon	EP-12	Current	Current	Current	Current
Oregon	EP-12	Outstanding	Current	Outstanding	Outstanding
Oregon	EP-12	Current	Current	Current	Current
PA Treas	2284	Current	Current	Current	Current
PA Treas	46340	Current	Current	Current	Current
PA Treas	77547	Current	Outstanding	Current	Current
PA Treas	24532	Current	Current	Current	Current
PA Treas	34601	Current	Current	Current	Current
PA Treas	69008	Current	Current	Current	Current
PA Treas	49894	Current	Current	Current	Current
PA Treas	26480	Current	Current	Current	Current
PA Treas	1878	Current	Current	Current	Current
PA Treas	1839	Current	Current	Current	Current
PA Treas	35522	Current	Outstanding	Current	Current
PA Treas	9280	Current	Current	Current	Current
PA Treas	46760	Current	Current	Current	Current
PA Treas	39271	Current	Current	Current	Current
PA Treas	69019	Current	Current	Current	Current
PA Treas	46499	Current	Current	Current	Current
PA Treas	32049	Outstanding	Outstanding	Outstanding	Outstanding
PA Treas	36003	Current	Current	Current	Current

You can't always get what you want

Static Features

- Borrower Characteristics
- Loan Characteristics
- Project Characteristics

datasou	loanid	loanam	loanappr	loanint	loan	credit	a
Oregon	EP-11:	17905	3/11/11	5.99	12	616	
GCEA	W35PI	1200	8/7/12	6.99	12	816	
Oregon	EP-11:	18231	12/20/10	5.99	13	698	
Oregon	EP-11:	3157	3/24/11	5.99	24	805	
GCEA	4FDE5	1769	3/20/12	3.99	24	812	
GCEA	LNRA5	2980	11/1/12	6.99	24	689	
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Oregon	EP-12:	1310	5/2/11	5.99	26	728	
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PA Treas	77547	6620	1/25/13	7.99	36	760	
PA Treas	24532	6200	12/21/09	6.99	36	780	
PA Treas	34601	1795	11/30/10	6.99	36	680	
PA Treas	69008	7050	8/17/12	8.99	36	760	
PA Treas	49894	4680	12/6/11	7.99	36	780	
PA Treas	26480	2620	3/29/10	6.99	36	680	
PA Treas	1878	2586	5/14/09	5.99	36	800	
PA Treas	1839	5000	5/15/09	5.99	36	800	
PA Treas	35522	4888	4/10/11	6.99	36	740	


Dynamic Features

- Monthly payment history
- Outstanding Balance
- Amortization



loanid	Jan-2009_pm	Feb-2009_pm	March-2009-F	April 2
	Current	Current	Current	Current
PA Treas	Current	Current	Current	Current
Oregon EP-	Current	Current	Current	Current
Oregon EP-	Current	Current	Current	Current
GCEA 4FDE5	Current	Current	Current	Current
GCEA LNRA5	Current	Current	Current	Current
Oregon EP-12	Current	Current	Current	Current
Oregon EP-12	Outstand	Current	Outstanding	Outstanding
Oregon EP-12	Current	Current	Current	Current
PA Treas 2284	Current	Current	Current	Current
PA Treas 46340	Current	Current	Current	Current
PA Treas 77547	Current	Outstand	Current	Current
PA Treas 24532	Current	Current	Current	Current
PA Treas 34601	Current	Current	Current	Current
PA Treas 69008	Current	Current	Current	Current
PA Treas 49894	Current	Current	Current	Current
PA Treas 26480	Current	Current	Current	Current
PA Treas 1878	Current	Current	Current	Current
PA Treas 1839	Current	Current	Current	Current
PA Treas 35522	Current	Outstanding	Current	Current
PA Treas 4888	Current	Current	Current	Current
PA Treas 740	Current	Current	Current	Current
PA Treas 760	Current	Current	Current	Current
PA Treas 800	Current	Current	Current	Current
PA Treas 800	Current	Current	Current	Current
PA Treas 800	Current	Current	Current	Current
PA Treas 760	Current	Current	Current	Outstanding
PA Treas 680	Current	Current	Current	Outstanding

Combined Data Overview: What We've Got

- Information About Borrower and Property
 - Information About the Loan
 - Limited Information on Payments
 - Limited Information About the Project
 - No Information About Energy Usage
- 

Information About the Borrower and Property

Data Field	Oregon	NYSERDA	PA Treasury	GCEA
Credit Score	X	X	X	X
Zip	X	X	X	X
State	X	X	X	X
DTI		X	X	X
City	X	X		X
Borrowers Annual Income	X	X		X
County	X	X		X
Year Constructed	X		X	X
Floorspace	X		X	X
Building Type	X			X
Number of occupants	X		X	

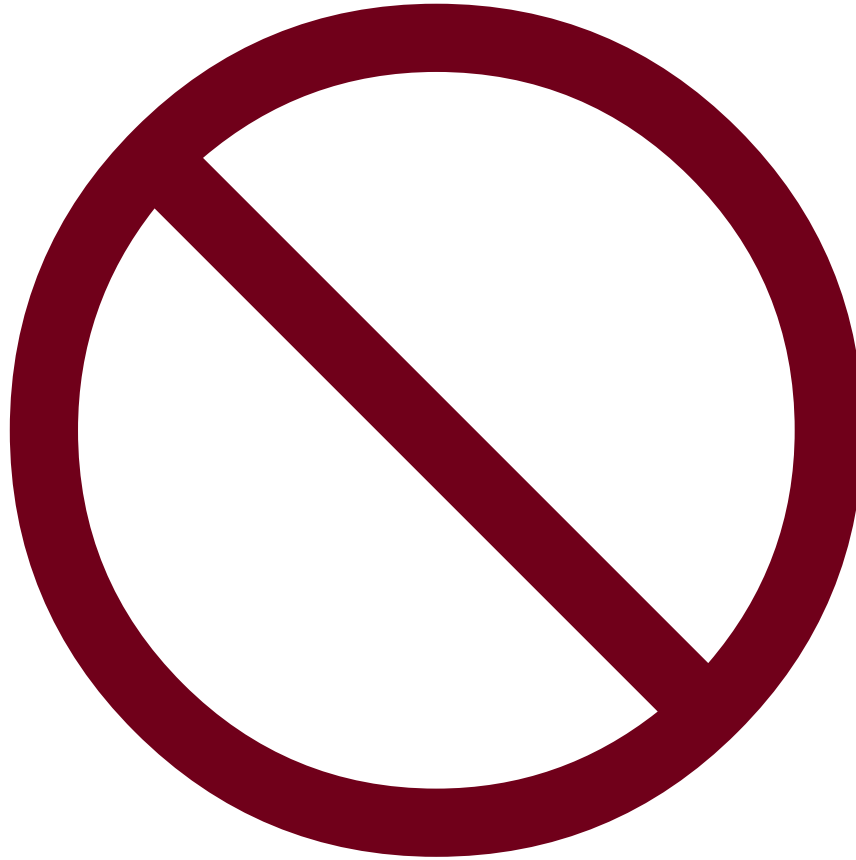
Information About the Loan

Data Field	Oregon	NYSERDA	PA Treasury	GCEA
Loan Amount	X	X	X	X
Loan Interest Rate	X	X	X	X
Original Loan Term	X	X	X	X
Loan Approval Date	X	X	X	X
Current Principal Balance	X	X	X	
Loan Status	X	X	X	
Days Past Due	X	X	X	
Next Principal Due Date	X	X	X	
Next Interest Due Date	X	X	X	
Last Payment Date	X	X	X	
Last Payment Amount	X	X		
# Payments Made	X	X		
Loan Product	X			X
Open Date	X	X		
Charge Off Amount		X	X	
Regular Payment Due Amount		X	X	
Lender Name		X		X


Information About the Project

Data Field	Oregon	NYSERDA	PA Treasury	GCEA
Project Work Done	x		x	x
Total Invoiced Cost	x			x

Information About Energy Savings



What Stakeholders Want to See

- Underwriting Criteria
 - Delinquency
 - Defaults
 - Prepayment
 - Losses
- 

Combined Dataset Summary Statistics

Data Field	Range	Median	Mean	# of Loans
Loan Amount	\$701-\$30,000	\$7,500	\$8,675	11,947
Loan Term	12-257	120	123	11,947
Loan Interest	0.99%-12%	5.99%	5.6%	11,947
Credit Score	509-926	755	744	11,929
DTI	0-0.9848	0.345	0.337	10,774
Annual Income	0-\$725,000	\$65,000	\$77,460	4,724

Summary Statistics by Program

- Loan Amounts:

Data Set	Range	Median	Mean	# of Loans
Oregon	\$1,000-\$30,000	\$11,689	\$12,788	1,166
NYSERDA	\$701-\$25,000	\$8,439	\$9,531	3,446
PA Treasury	\$1,000-\$15,000	\$7,032	\$7,599	7,216
GCEA	\$1,000-\$21,000	\$7,538	\$8,863	112

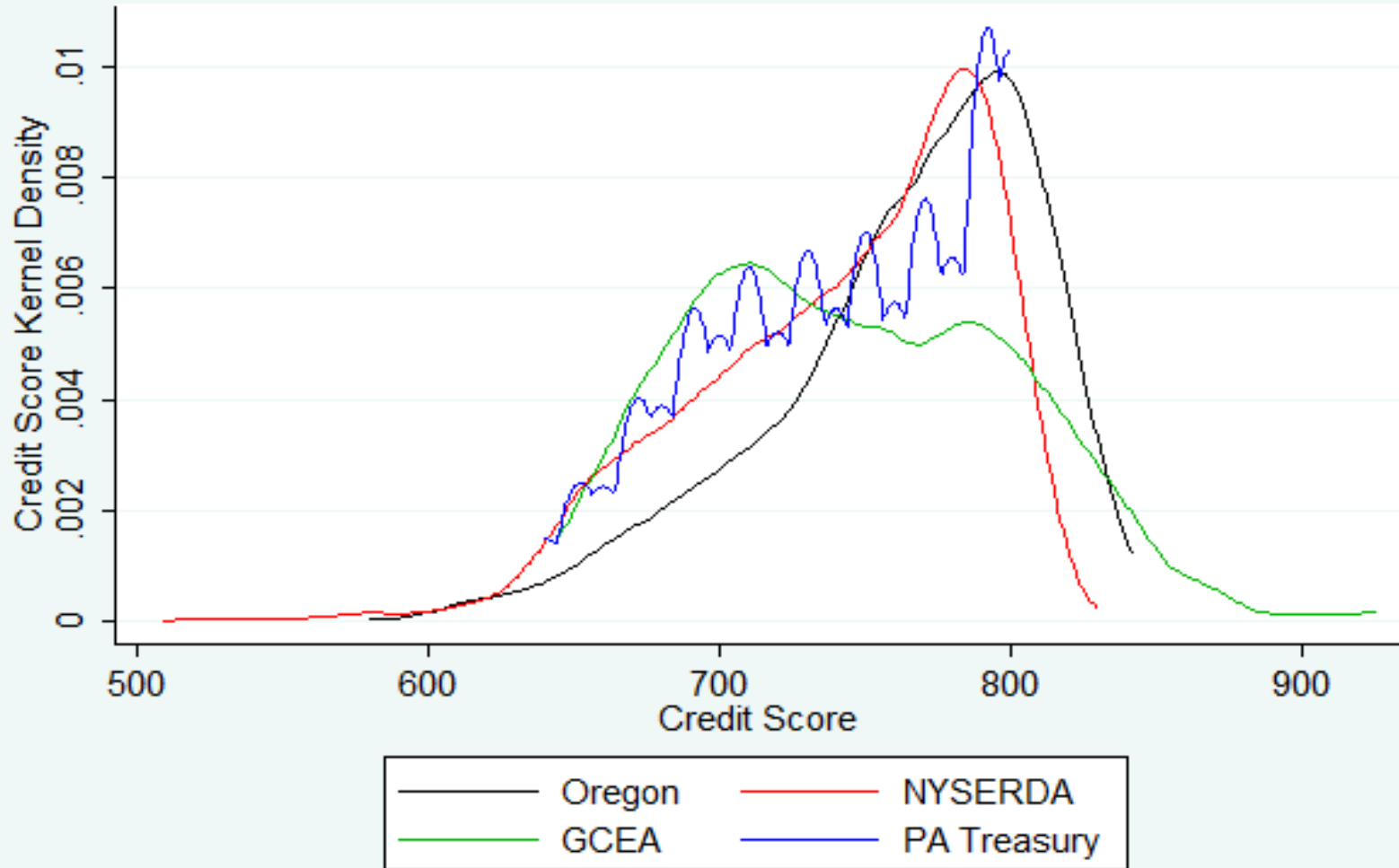
Summary Statistics by Program

- Borrowers Credit Scores:

Data Set	Range	Median	Mean	# of Obs
Oregon	580-842	773	763	1,166
NYSERDA	509-830	752	740	3,454
PA Treasury	640-800	740	742	7,216
GCEA	645-926	734	745	111

Summary Statistics by Program

Density Plot of Credit Scores by Program



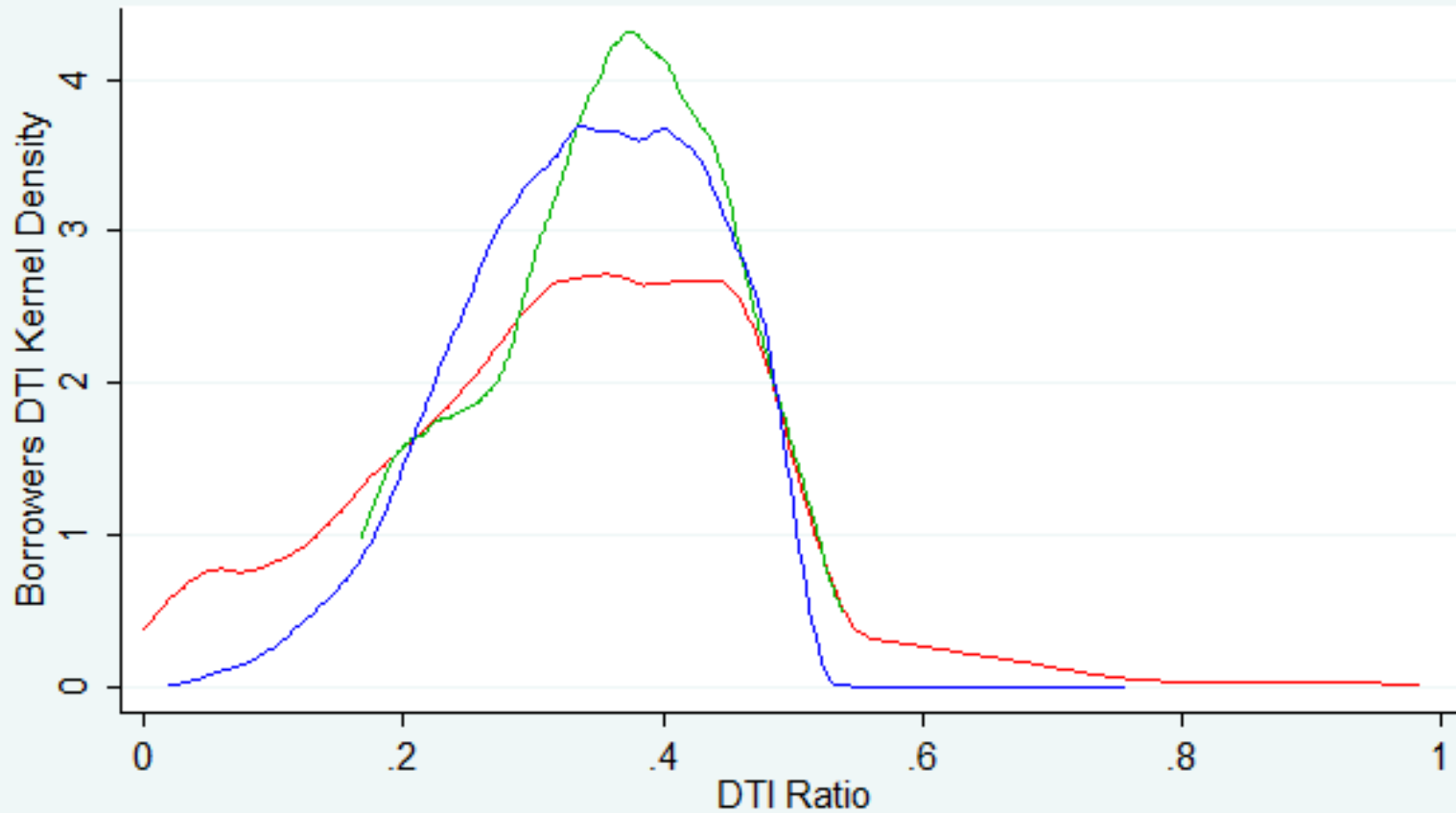
Summary Statistics by Program

- Borrowers DTI:


Data Set	Range	Median	Mean	# of Loans
Oregon				
NYSERDA	0-0.9848	0.339	0.331	3,446
PA Treasury	0.01-0.75	0.3468	0.340	7,216
GCEA	0.16-0.54	0.361	0.357	112

Summary Statistics by Program

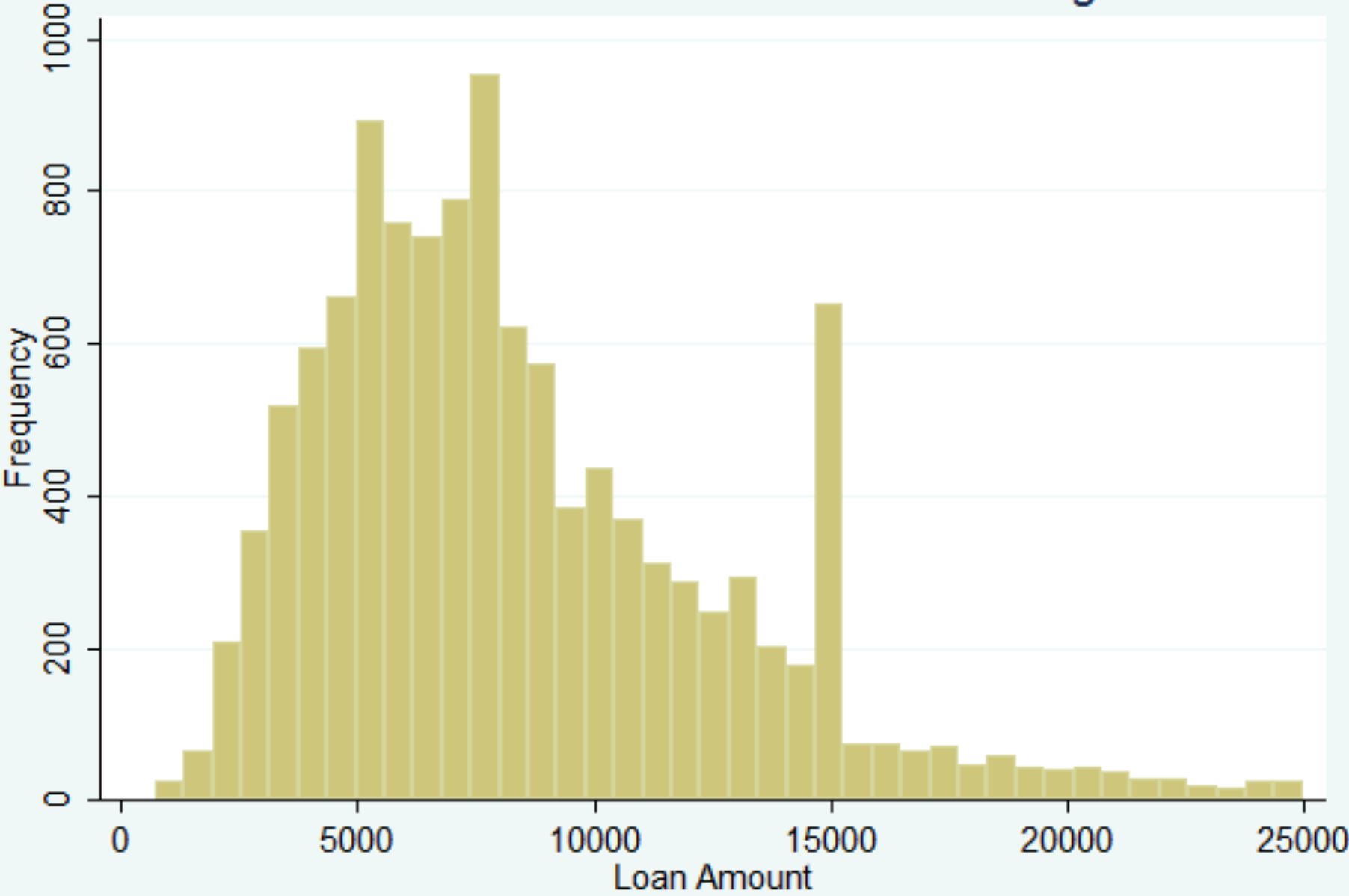
Density Plot of Borrowers DTI by Program




Analysis of Loan Amounts

- Combined Dataset
 - 11,947 Loans
 - Range: \$701-\$30,000
 - Mean: \$8,675, Median: \$7,500
 - Total Amount Lent: \$103,649,269
- 

Combined Dataset Loan Amount Histogram



Analysis of Charge Offs

- 11,828 Loans
 - 106 (0.89%) Charged Off, We Have Date and Amount Data For 103
 - Charged Off Amounts Range from \$901-\$25,000
 - Median: \$5,824 Mean: \$6,182
 - Total Principal Lost: \$642,917
- 


Analysis of Charge Offs by Program

Data Set	% Charged	# Charged	Range of Charged Off Amounts	Median Amount	Mean Amount
Oregon	0.17%	2	N/A	N/A	N/A
NYSERDA	0.4%	13	\$1,368-\$25,000	\$6,495	\$7,426
PA Treasury	1.26%	91	\$903-\$15,000	\$5,695	\$6,004
GCEA	N/A	N/A	N/A	N/A	N/A

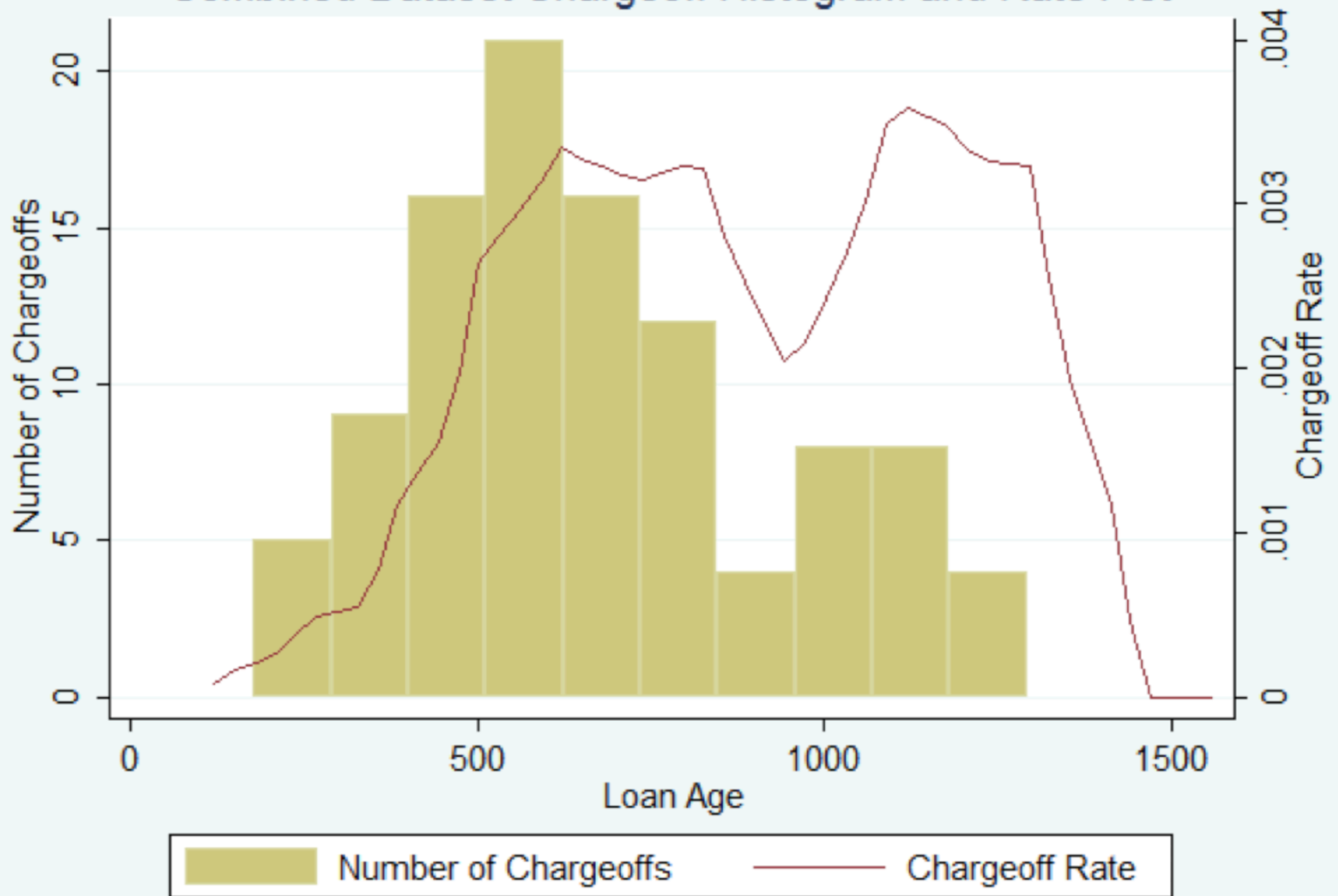
Analysis of Charge Offs by Loan Term

Data Set	% Charged	# Charged	Range of Charged Off Amounts	Median Amount	Mean Amount
36-Month	0.68%	7	\$903-\$6,524	\$2,908	\$3,430
60-Month	1.02%	24	\$2,074-\$8,340	\$3,263	\$3,747
120-Month	1.32%	66	\$2,741-\$14,897	\$6,430	\$7,026
180-Month	0.31%	7	\$1,368-\$25,000	\$7,669	\$9,320
240-Month	0.18%	2	N/A	N/A	N/A

Charge Off Rates Over Time

- Rate of Charge Off increases as loans age to around 2 years then plateaus
 - Measured rate is significantly less meaningful above 3 years because of small sample size
- 

Combined Dataset Chargeoff Histogram and Rate Plot



Prepayment Analysis

- 11,828 Loans
- 2,040 (17.24%) Prepaid


Prepayment Rate by Program

Loan Program	# of Loans	# of Early Payoffs	Early Payoff Rate
PA Treasury	7216	1622	22.4%
NYSERDA	3446	100	2.9%
Oregon	1166	318	27.3%


Prepayment Rate by Loan Term

Loan Term in Months	# of Loans	# of early payoffs	Early Payoff Rate
36	1043	668	64.0%
60	2371	503	21.2%
120	5080	568	11.2%
180	2275	40	1.8%
240	1123	303	26.8%


Losses Analysis

- 11,947 Loans
 - \$103,649,269 loaned out
 - \$34,294,175 in expected interest payments
 - \$137,943,444 expected to be paid back
- 

Combined Dataset Losses Analysis

- 103 Charge Offs
 - \$642,917 in lost principal, \$163,175 in lost interest
 - \$806,092 in total losses, which is 0.58% of the total expected payback
- 

Combined Dataset Losses Analysis

- 2,040 Prepayments
 - \$301,910 in lost interest, which is 0.22% of the total expected payback
 - \$1,108,002 in total losses, which is 0.8% of the total expected payback
- 


Losses by Program

Program	Principal Losses from Chargeoffs	Interest Losses from Chargeoffs	Total Losses from Chargeoffs	Interest Losses from Payoffs	Total Losses	Total Losses as a Percent
Oregon	N/A	N/A	N/A	\$20,158	\$20,158	N/A
NYSERDA	\$96,453	\$22,435	\$118,888	\$2,739	\$121,627	0.29%
PA Treas.	\$546,373	\$140,739	\$687,112	\$279,011	\$966,123	1.37%

Losses by Loan Term

Loan Term	Principal Losses from Chargeoffs	Interest Losses from Chargeoffs	Total Losses from Chargeoffs	Interest Losses from Payoffs	Total Losses	Total Losses as a Percent
36-Month	\$24,014	\$1,432	\$25,446	\$112,142	\$137,588	2.41%
60-Month	\$89,942	\$8,581	\$98,523	\$99,010	\$197,533	1.1%
120-Month	\$463,717	\$135,561	\$599,278	\$70,222	\$695,500	1.2%
180-Month	\$65,241	\$17,600	\$82,841	\$375	\$83,216	0.27%
240-Month	N/A	N/A		\$19,203	\$19,203	N/A

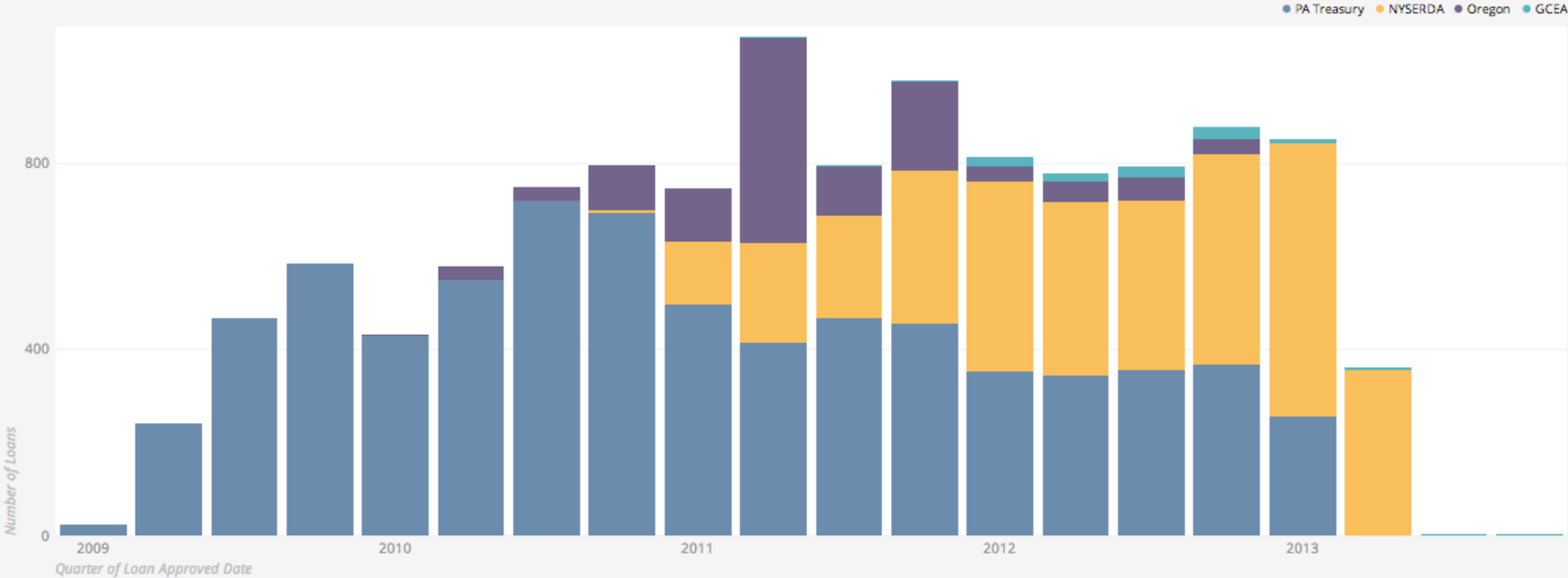
Delinquency Analysis

- As of 7/31/2013, the combined dataset 30-day delinquency rate was 1.9%
 - Without time-series data, a more meaningful delinquency analysis was not possible
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Online Dashboard Demo

Energy Efficiency Loan Data Dashboard


Number of Loans By Approval Date and Program




What's Special About EE Loans?

- On-bill vs Off-bill
 - Energy savings & loan performance
 - Whole home vs single measure
 - Cost effectiveness criteria
- 


Gaps in Data

- Shared core of loan & borrower characteristics
 - Monthly or quarterly payment data
 - Portfolios with longer payment history
 - Project characteristics
 - Energy performance data
- 


Gaps in Knowledge

- Driving demand: an information problem?
 - Pricing mismatch?
 - Loan performance and energy performance
 - On-bill vs off-bill
- 

Future Direction

- Documentation and data standard
 - More data
 - Fannie Mae EE Loan Data?
 - Energy performance and loan performance
 - Single measure vs whole home
 - Better comparisons groups
 - Opportunities for demand-side transparency
- 

Feedback and Questions

- What additional questions should we be considering?
 - Are there key stakeholders we are missing?
 - Are there pockets of Commercial Loan Data? Where?
 - How important is, or will be, the correlation of energy performance and loan performance?
 - Where would you like to see this project go in the future?
 - Anything else is on your mind!
- 

Energy and Loan Performance Data Project

For More Information:

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