Fannie Mae Multifamily Green Bonds

Is there a green premium?

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Abstract

Fannie Mae is one of the largest suppliers of both green and non-green multifamily housing bonds. Fannie Mae provides data for these bonds on their DUS disclose website. We study whether there is a "green premium" on green loans in the dollar amount of these loans and their note rate. We also try to find whether "greenness" within green loans also yields a premium, where greenness refers to higher energy star scores and lower Energy Use Intensity. We find that the there is a statistically significant premium seen in both the dollar amount of loans and the note rate for green loans versus non-green loans. However, we do not see a significant premium when we look within green loans.

Introduction

The Federal National Mortgage Association, otherwise known as Fannie Mae is a government-backed agency that deals in the Secondary Mortgage Market for both multifamily and single family homes. Since the previous decade, Fannie Mae has begun dealing in 'Green Bonds'. These are bonds securitized by loans used to make green energy and water investments, green building certification, and provide green energy to multifamily apartment buildings. Fannie Mae was the single largest issuer of Green Bonds in the world(by dollar amount) in 2019 but they have not been closely studied.

One particular area that needs to be studied is about how these green loans have been priced and whether these prices create incentives towards building more green properties over non-green ones.

Literature

1. A literature review conducted finds that Green buildings are associated with higher property values and rents which is referred to as a green premium.[1]
2. An-Pivo(2018) examines multifamily properties in the CMBS market to examine whether there is a green premia to the debt side of the multifamily market in regards to default risk.[2]

Main Objectives

1. Determine the size of the multifamily green MBS market fostered by Fannie Mae
2. Determine the Metropolitan Statistical Areas that have the most properties financed by green loans
3. Calculate whether a green premium exists for mortgages issued in terms of Unpaid Balance at issuance and the Note Rate.
4. Calculate whether the green premium varies within green loans based on their "greenness" as measured by decreasing Energy Use Intensity(EUI) and increasing Energy Star scores.

Methodology

We used data provided by Fannie Mae from their DUS disclose website. This gives us a large amount of loan characteristics as well the green characteristics data for the various properties. For summarizing and analyzing the results, we used StataSE 16. Even though a variety of different financial products were present, we focussed on DUS. We also focused on green loans issued from 2016 to July, 2020 since Fannie Mae did not issue a substantial amount of green loans before that time.

We used multivariate regressions to determine correlations of note rate and Unpaid Balance at Issuance to green indicators and also control for other variables

Regressions

We controlled for the following variables:

1. Property Value: It makes sense that a property that is valued higher would also need a higher loan amount to build that property.
2. Total Units of the Property: A property unit works similarly to measure the size of a property since it measures the total number of individuals and households that can be supported in the building
3. LTV: LTV reflects the risk the lender takes by taking out a loan which correlates to loan amounts and interest rates
4. Average Income in the MSA: It is possible that buildings in lower income MSAs are more likely to take out loans for energy-inefficient buildings

We used the following linear regression model:

$$Y_{logUPB|NoteRate} = \beta_{Green(dummy)}X_1 + \beta_{log(propertyvalue)}X_2 + \beta_{PropertyUnits}X_3 + \beta_{LTV}X_4 + \beta_{log(AverageIncome)}X_5 + D_{IssuanceDate(MY)} + D_{PropertyBuildDate(Y)} + D_{MSA}$$

$$Y_{logUPB|NoteRate} = \beta_{EUI}X_1 + \beta_{log(propertyvalue)}X_2 + \beta_{PropertyUnits}X_3 + \beta_{LTV}X_4 + \beta_{log(AverageIncome)}X_5 + D_{IssuanceDate(MY)} + D_{propertyBuildDate(Y)} + D_{MSA}$$

$$Y_{logUPB|NoteRate} = \beta_{EnergyStar}X_1 + \beta_{log(propertyvalue)}X_2 + \beta_{PropertyUnits}X_3 + \beta_{LTV}X_4 + \beta_{log(AverageIncome)}X_5 + D_{IssuanceDate(MY)} + D_{PropertBuildDate(Y)} + D_{MSA}$$

Results: Size and Geographical Distribution

Year	UPB (in billions)	Number of loans	Market Share
2016	3.21	95.00	0.08
2017	24.4	1039.00	0.50
2018	19.2	1087.00	0.35
2019	22.8	1021.00	0.37
2020	2.62	95.00	0.09
Total	72.1	3337.00	

Table 1: Total Size of the market in terms of dollar amount and number of loans along with the market share compared to non-green loans

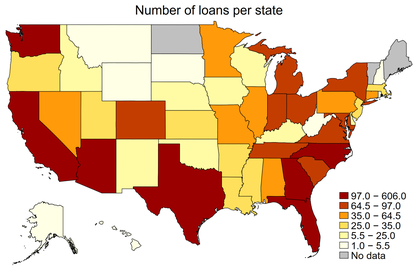

Figure 1: Map of the number of loans provided for properties from 2016 to July 2020

MSA	Total UPB (in billions)	Total Number of loans	Average UPB (in millions)
Dallas-Fort Worth-Arlington, TX	4.85	277.00	17.52
Atlanta-Sandy Springs-Roswell, GA	3.53	163.00	21.66
Los Angeles-Long Beach-Anaheim, CA	4.28	138.00	31.00
Houston-The Woodlands-Sugar Land, TX	2.61	125.00	20.89
Seattle-Tacoma-Bellevue, WA	2.05	87.00	23.59
Phoenix-Mesa-Scottsdale, AZ	1.84	73.00	25.21
Denver-Aurora-Lakewood, CO	1.82	62.00	29.42
Chicago-Naperville-Elgin, IL-IN-WI	1.89	56.00	33.73
Tampa-St. Petersburg-Clearwater, FL	1.15	50.00	23.08
Riverside-San Bernardino-Ontario, CA	1.06	46.00	23.11

Table 2: Top 10 MSAs with the most loans issued from 2016 to July 2020

Results: The Green Premium

Green	Average UPB (in millions)	Average Note Rate	Average Property Value (in millions)	LTV	Average Property Total Units
N	13.95	4.28	29.52	65.56	174.48
Y	21.95	4.20	33.32	68.83	219.83

Table 3: Average loan and property characteristics of loans for green properties vs non-green properties

Correlations suggest that higher Energy Star scores and lower Energy Usage lead to better credit outcomes. However, we must control for other variables.

Coefficient	log(UPB)			Note Rate		
Green(D)	0.278***			-0.222***		
	(0.0184)			(0.0151)		
High Energy Use Intensity		-0.00760			0.0133	
		(0.00824)			(0.0123)	
High Energy Star Score			0.0126			-0.0130
			(0.00861)			(0.0142)
Observations	11605	2712	2713	11605	2712	2713
R-squared	0.834	0.965	0.965	0.598	0.801	0.801

Clustered Standard errors(on location dummy) in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Regression Table for the relevant coefficients

Conclusions

- We find after controlling for other variables that a green loan has approximately 0.25% more dollar amount lent and that the note rate is -0.22% on the loan.
- There is an insignificant coefficient for the dollar amount lent and the note rate for loans lent for properties that are above the median in Energy Use Intensity and with high Energy Star scores.
- We do not yet find a green premium due to these characteristics, but this warrants further investigation

References

1. An, Xudong, and Gary Pivo. "Green Buildings in Commercial Mortgage-Backed Securities: The Effects of LEED and Energy Star Certification on Default Risk and Loan Terms." Real Estate Economics, vol. 48, no. 1, 2018, pp. 7–42., doi:10.1111/1540-6229.12228.
2. Guin, Benjamin, and Perttu Korhonen. "Does Energy Efficiency Predict Mortgage Performance?" SSRN Electronic Journal, 2020, doi:10.2139/ssrn.3532373.