Are Lemon's Sold First? Dynamic Signaling in the Mortgage Market

Online Appendix

Manuel Adelino, Kristopher Gerardi and Barney Hartman-Glaser

This appendix supplements the empirical analysis and provides an additional proof for the model used in the calibration exercise in "Are Lemons Sold First? Dynamic Signaling in the Mortgage Market" by Adelino, Gerardi, and Hartman-Glaser.

A.1. Variable Definitions

ARM: An indicator variable that takes the value of 1 if the mortgage has an adjustable rate and 0 if it has a fixed rate.
Balance: The natural logarithm of the principal balance of the loan at origination.
Balloon: An indicator variable that takes the value of 1 if the mortgage is characterized by a balloon payment at the end of its term and 0 if it is a fully amortizing mortgage.
Condo: An indicator variable that takes the value of 1 if the property is a condominium or a townhouse and 0 otherwise.
FICO: The credit score of the borrower at origination. All models include both the continuous FICO variable and a set of indicator variables corresponding to 5 FICO intervals: FICO < 580, $580 \leq$FICO < 620, $620 \leq$FICO < 660, $660 \leq$FICO < 700, and FICO ≥ 700.
House Prices: County-level house price indices from CoreLogic. We include both price level in the county in the month of origination and the cumulative growth in prices from the month of mortgage origination calculated over the default horizon.
Interest-Only: An indicator variable that takes the value of 1 if the loan requires interest-only payments for a specified period of time and 0 otherwise.
Jumbo: An indicator variable that takes the value of 1 if the loan amount at origination exceeds the conforming loan limit set by statute that limits the size of mortgages eligible to be insured by the GSEs (during the vast majority of our sample period, the limit was $417,000 for mortgages on single-family properties) and 0 otherwise.
Loan-to-Value (cumulative): The loan-to-value ratio at origination computed using information on the first and second liens. All models include both the continuous LTV variable and a set of indicator variables corresponding to 5 LTV intervals: LTV < 70, $70 \leq$ LTV < 80, $80 <$ LTV < 90, $90 \leq$LTV< 100, and LTV ≥ 100. An indicator variable for the LTV ratios exactly equal to 80 is also included as a proxy for unreported second liens.
Low Documentation: An indicator variable that takes the value of 1 if the borrower's income and assets are not fully documented in the underwriting process and 0 if they are fully documented.
Month to Sale: The number of months after the date of origination in which a loan is sold to a PLS issuer or acquired by one of the GSEs. In the McDash data set, the variable is based on a field that is updated monthly and shows the current holder of the loan. In the CoreLogic LoanPerformance database, the variable is based on the length of time between the month of origination and the month in which the corresponding PLS security is issued.

Multi-family: An indicator variable that takes the value of 1 if the property is a 2–4-family house and 0 otherwise.
Negative Amortization: An indicator variable that takes the value of 1 if the loan requires payments of less than interest and principal for a specified period of time and 0 otherwise.
Prepayment Penalty: An indicator variable that takes the value of 1 if the mortgage contains a prepayment penalty and 0 otherwise.
Primary Residence: An indicator variable that takes the value of 1 if the property is the primary residence of the borrower and a value of 0 if the property is either an investment or a second home.
Purchase Loan: An indicator variable that takes the value of 1 if the loan is used to purchase property and 0 otherwise.
Refinance (traditional): An indicator variable that takes the value of 1 if the loan is used to refinance previous mortgage debt without converting any equity into cash and 0 otherwise.
Refinance (cashout): An indicator variable that takes the value of 1 if the loan is used to refinance previous mortgage debt with a portion of the equity converted to cash and 0 otherwise.
Single Family: An indicator variable that takes the value of 1 if the property is a detached single-family home and 0 otherwise.
Term: The maturity length of the mortgage in months.
Unemployment: County-level unemployment rates from the Bureau of Labor Services (BLS). We include both the rates in the county in the month of origination and the cumulative growth in the unemployment rate from the month of mortgage origination calculated over the default horizon.

A.2. Further Detail on Data Sets

A.2.1. Lender Processing Services (McDash)

Our primary data set is sourced from Lender Processing Services (McDash). We adopt standard sample restrictions in our analysis of the McDash data. We consider only first lien mortgages originated in the 2002–2007 period that were sold to PLS issuers or to the GSEs, so we eliminate loans kept in the portfolios of mortgage originators and never sold. In addition, a small number of loans in the data set were sold to the Federal Home Loan Banks (FHLBs), which we also eliminate from the sample. We only retain loans originated in the 50 United States and restrict the sample to loans that enter the data set in either the same month of origination or in the month following origination. We also address outliers in the data by winsorizing the distributions of credit scores, original loan balances, LTV ratios at origination, and interest rates at origination at the 1st and 99th percentiles of each distribution. We also explored trimming these variables instead of winsorizing and found that this change had little effect on the results.

A.2.2. Corelogic

The second mortgage data set used is sourced from Corelogic. In addition to the differences noted in the main text, the timing for when a loan enters each data set is also different across the McDash and CL data sets. In McDash, we observe most loans from the month of origination, and we can directly observe the month in which they are sold out of banks' portfolios to PLS issuers or the GSEs. In CL, however, we compute time to sale as the difference between the date of issuance of the mortgage-backed security in which the loan is included and the reported month of origination of the mortgage. Loans enter the CL data set on the issue date, so we do not observe the performance history of loans before they are securitized.

A.2.2.1. Lender Identity in Corelogic

There is some uncertainty about whether the originator field in the CoreLogic database actually corresponds to the lender of record (i.e., the institution that underwrote and originated the loan) or to what is sometimes referred to as the "aggregator" or "seller," which is the institution responsible for purchasing loans from various lenders to fill the PLS mortgage pools and then selling those loans to the issuer (Stanton et al. (2014)). This is a potentially important distinction because it could be more likely that private information is obtained by the lender of record because it has more interaction with the mortgage borrower.

To verify that the originator field in CoreLogic corresponds to the lender of record, we match our CoreLogic mortgage data to a database of public mortgage filings that contains the identity of the lender of record. This database covers the universe of all residential mortgages in the state of Massachusetts during our sample period and comes from county deed registries that record information on property transactions. We compare the lender of record with the originator listed in the CoreLogic database for the sample of matched Massachusetts mortgages. We find that for 83% of the matched sample, the lender of record matched the CoreLogic originator field. The remaining 17% are either cases in which CoreLogic is reporting an entity other than the lender of record (most likely the aggregator) or cases that are bad matches (there is the potential for significant matching errors because we are not able to perform a precise match using loan account numbers or social security numbers). Thus, we view the 17% figure as an upper bound on the severity of the potential for misidentifying the true originator in the CoreLogic data.

A.2.3. Bloomberg

Pricing data is sourced from Bloomberg. The data fields consist of security identifiers (including CUSIP and ticker), issuer name, issuance date, the identification of the loan pool that the security has claims on, the spread over one-month LIBOR at origination, and the weighted average life as advertised in the prospectus.

A.3. Robustness of the Month to Sale Threshold Value

In this section we conduct a sensitivity analysis of our choice of nine months for the maximum threshold between origination and sale. Imposing a threshold is important for our analysis for three reasons. First, we want to ensure that the loans in our estimation sample were originated with the intention of being sold. The distributions of months to sale in Tables 1 and 2 clearly show that the vast majority of loans are sold relatively quickly. More than 94% of all loans (including loans sold to PLS issuers and the GSEs) are sold within 6 months of origination. We are concerned that loans sold more than a year (or several years) after origination may be different in ways that are unobservable to us. Second, there was a fairly robust market for loans that were in delinquency early in their lives, but that were then rehabilitated at some point and sold. These loans were sold on a separate secondary market, which the industry referred to as "scratch and dent." We are unable to explicitly identify "scratch and dent" (S&D) loans in our McDash and CoreLogic data sets, but believe that many of the loans in the right-tail of the months to sale distribution may have been sold on the S&D market. MBS issuers and investors would have known that these were previously problematic loans, and including these loans in our sample would contaminate our empirical tests. A final reason for imposing a sale threshold is that it is necessary for implementing our sample selection correction discussed in Section 2.1.

While a months to sale threshold is necessary in our context, the choice of nine months is somewhat arbitrary. Thus, we display results below for our baseline specifications using longer thresholds. We consider 12-month and 24-month thresholds in both the CoreLogic and McDash data sets, and a 36-month threshold in our McDash data set. In CoreLogic, we do not observe loans seasoned more than 26 months, so the 24-month threshold includes essentially all loans. In contrast, we do see loans in our McDash data set that are sold more than two years after origination and that we suspect are S&D loans. Thus, when we consider longer horizons in the McDash data set we attempt to identify and eliminate them in a manner described in further detail below. CoreLogic, in contrast, contains loans sold exclusively in the subprime and Alt-A segments, and since S&D loans were typically pooled together for explicit S&D securities (not included in CoreLogic), we do not believe that S&D is an important issue for our analysis using this data set.[1]

Tables A.1 and A.2 below show the baseline results for the linear specification of months to sale in the CoreLogic data set using a months to sale threshold of 12 months and 24 months, respectively. The tables are exact counterparts to Table **??** in the main text. The top panels show the effect of including lender and lender-by-year-quarter fixed effects while the bottom panels show the effect of including issuer and issuer-by-year-quarter fixed effects for the sample of all PLS loans and the sample of Alt-A and subprime loans. The results are very similar to those displayed in Table **??**, which assume a 9-month threshold. Figure A.2 shows results for the non-parametric months to sale specification for the Alt-A and subprime PLS samples assuming a 24-month threshold. This is the exact counterpart to Figure 2 in the main text. We group all loans sold between 12 and 24 months after origination into the same category due to the small number of loans sold after 12 months. The patterns for both the Alt-A and subprime samples are very similar to those in Figure 2.

Table A.3 displays results for the linear specification of months to sale in the McDash sample of private-label loans for the longer thresholds. These results are directly comparable to those reported in Panel A of Table 5 in the main text. The top panel of Table A.3 displays results for a 12-month threshold for both the 36-month and 60-month default horizons and for our 60+ DQ and 90+ DQ default definitions. The results are consistent with those in Table 5. The bottom panel of the table shows results for 24-month and 36-month thresholds, where we focus on the 60+ DQ default definition and the 60 month default horizon. We focus on the 60-month horizon to ensure that we have a reasonable length of time to measure default for loans that are sold between 24 and 36 months after origination. As we discussed briefly above, we are especially concerned about the presence of S&D loans in the McDash sample. Since many of these loans default before being sold, it is probably the case that they would be more likely to default after being sold compared to a loan that did not default before sale. Inclusion of S&D loans would thus contaminate our test and likely bias us against finding better ex-post performance for loans sold later. Since we track loans in McDash from origination we can identify loans that default before they are sold. Thus, in an attempt to purge the sample of S&D loans, we eliminate any mortgage that defaults before sale for the analysis using longer sale thresholds (24 and 36 months).[2] In the bottom panel of Table

[1] The fact that we do not see as many highly seasoned loans in CoreLogic supports this position.

[2] The vast majority of loans sold within a year of origination in our McDash data set do not default before they are sold. However, the fraction of loans that default before sale increases fairly dramatically for loans sold after a year. For example, about one-quarter of loans sold between 24 and 36 months defaulted before sale in our McDash sample.

A.3 we show results for the longer thresholds with and without this S&D correction. It is clear that the correction does have a significant effect on the results and confirms our intuition that the presence of S&D loans among the sample of loans sold long after origination produces an upward bias in our estimate of the relationship between time-to-sale and default.

Table A.1
Baseline Parametric Results for the Sample of CoreLogic PLS Loans: 12-month Sale Threshold

Panel A: Including Originator Fixed Effects

	Default Definition: 60+ DQ over 36 Months								
	All PLS			**Alt-A**			**Subprime**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Months to Sale	-0.0031	-0.0024	-0.0013	-0.0070	-0.0061	-0.0060	-0.0014	-0.0010	0.0010
	(3.40)	(2.76)	(1.09)	(6.62)	(4.73)	(5.18)	(1.60)	(1.19)	(1.13)
# Loans	7,911,165	7,908,898	7,906,364	1,916,628	1,915,876	1,914,573	5,994,537	5,992,733	5,990,980
Adjusted R^2	0.21	0.21	0.22	0.25	0.26	0.27	0.19	0.19	0.20
Orig YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issue YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender FE	N	Y	Y	N	Y	Y	N	Y	Y
Lender x Orig-YQ FE	N	N	Y	N	N	Y	N	N	Y
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y

Panel B: Including Issuer Fixed Effects

	Default Definition: 60+ DQ over 36 Months								
	All PLS			**Alt-A**			**Subprime**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Months to Sale	-0.0033	-0.0025	-0.0014	-0.0063	-0.0046	-0.0054	-0.0022	-0.0004	0.0012
	(3.34)	(2.97)	(1.35)	(5.30)	(4.59)	(4.44)	(2.53)	(0.52)	(1.37)
# Loans	7,770,236	7,770,236	7,767,706	1,870,072	1,870,071	1,868,782	5,899,872	5,899,872	5,898,121
Adjusted R^2	0.21	0.22	0.22	0.26	0.27	0.27	0.19	0.19	0.20
Orig YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issue YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender x Orig-YQ FE	N	N	Y	N	N	Y	N	N	Y
Issuer FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issuer x Issue -YQ FE	N	Y	Y	N	Y	Y	N	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y

This table displays results from the estimation of Equation 5 (in the main text) on PLS loans in the CoreLogic data set originated in the 2002–2007 period. The dependent variable is an indicator variable for loans that default over a 36-month horizon. Default is defined as a loan that is 60+ days delinquent. Months to sale is defined as the number of months that elapse between origination and sale to a PLS issuer. All regressions include origination year-quarter fixed effects, state fixed effects, year-quarter of sale fixed effects, and the detailed list of covariates described in the text. The first row for each variable shows the regression coefficient and the second row shows the t-statistic. The standard errors are heteroskedasticity-robust and are clustered by state-quarter (of origination).

Table A.2
Baseline Parametric Results for the Sample of CoreLogic PLS Loans: 24-month Sale Threshold

Panel A: Including Originator Fixed Effects

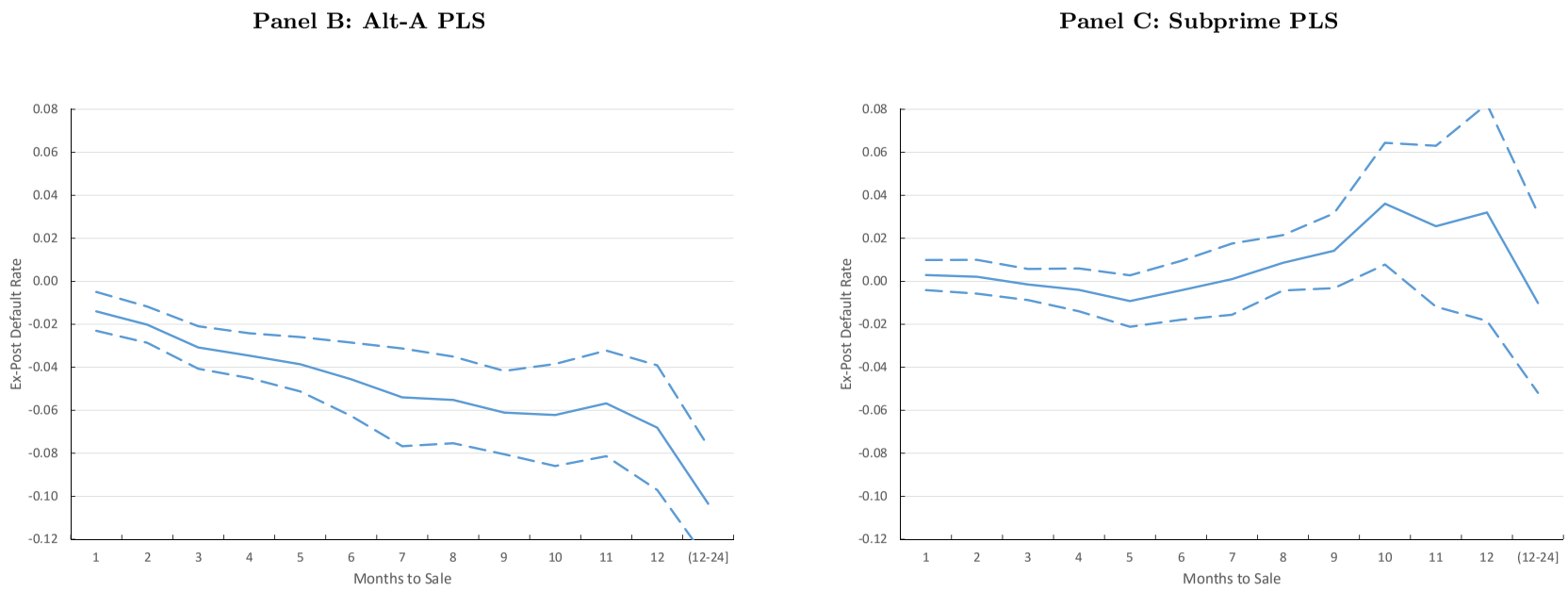
	Default Definition: 60+ DQ over 36 Months								
	All PLS			**Alt-A**			**Subprime**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Months to Sale	-0.0027	-0.0016	-0.0007	-0.0064	-0.0052	-0.0053	-0.0014	-0.0004	0.0014
	-2.77	-1.65	-0.59	-5.55	-3.71	-3.81	-1.25	-0.34	1.13
# Loans	7,989,106	7,986,805	7,984,021	1,938,373	1,937,617	1,936,208	6,050,732	6,048,891	6,046,946
Adjusted R^2	0.22	0.22	0.23	0.28	0.29	0.29	0.20	0.21	0.21
Orig YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issue YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender FE	N	Y	Y	N	Y	Y	N	Y	Y
Lender x Orig-YQ FE	N	N	Y	N	N	Y	N	N	Y
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y

Panel B: Including Issuer Fixed Effects

	Default Definition: 60+ DQ over 36 Months								
	All PLS			**Alt-A**			**Subprime**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Months to Sale	-0.0018	-0.0009	0.0001	-0.0047	-0.0039	-0.0045	-0.0008	0.0013	0.0028
	-1.66	-0.98	0.09	-3.51	-2.94	-3.88	-0.64	1.46	2.96
# Loans	7,834,853	7,834,853	7,832,072	1,889,307	1,889,306	1,887,908	5,945,246	5,945,246	5,943,302
Adjusted R^2	0.22	0.23	0.23	0.29	0.29	0.29	0.21	0.21	0.21
Orig YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issue YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Lender x Orig-YQ FE	N	N	Y	N	N	Y	N	N	Y
Issuer FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issuer x Issue -YQ FE	N	Y	Y	N	Y	Y	N	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y

This table displays results from the estimation of Equation 5 (in the main text) on PLS loans in the CoreLogic data set originated in the 2002–2007 period. The dependent variable is an indicator variable for loans that default over a 36-month horizon. Default is defined as a loan that is 60+ days delinquent. Months to sale is defined as the number of months that elapse between origination and sale to a PLS issuer. All regressions include origination year-quarter fixed effects, state fixed effects, year-quarter of sale fixed effects, and the detailed list of covariates described in the text. The first row for each variable shows the regression coefficient and the second row shows the t-statistic. The standard errors are heteroskedasticity-robust and are clustered by state-quarter (of origination).

Fig. A.1. CoreLogic PLS Results: 24-Month Sale Threshold



Notes: This figure displays results from the estimation of the non-parametric version of Equation **??** for PLS loans in CoreLogic. Panel A corresponds to Alt-A PLS loans and panel B corresponds to subprime loans. Default is defined as a loan that becomes 60 days delinquent over a 36-month horizon measured from origination. Months to sale is defined as the number of months that elapse between origination and sale to a PLS issuer. The dotted lines show 90% confidence intervals.

Table A.3
McDash Private-Label Results: Higher Sale Thresholds

Panel A: 12-Month Sale Threshold

Default Horizon:	36 Months		60 Months	
Default Definition:	60+ DQ	90+ DQ	60+ DQ	90+ DQ
Months to Sale	-0.0067	-0.0072	-0.0068	-0.0078
	(8.40)	(9.43)	(9.46)	(11.23)
# Loans	5,811,639	5,811,639	5,811,639	5,811,639
Adjusted R^2	0.24	0.22	0.26	0.25
Orig Qtr FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
Sale Qtr FE	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y

Panel B: Higher Sale Thresholds

Default Horizon:	60 Months			
Default Definition:	60+ DQ			
Sale Threshold:	24 Months		36 Months	
Scratch & Dent Correction	No	Yes	No	Yes
Months to Sale	-0.0028	-0.0076	-0.0021	-0.0059
	(4.31)	(12.39)	(4.09)	(11.05)
# Loans	5,879,757	5,860,471	5,910,105	5,885,068
Adjusted R^2	0.26	0.26	0.26	0.26
Orig Qtr FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
Sale Qtr FE	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y

A.4. Robustness to the Inclusion of Debt-to-Income Ratios in the Covariate Set

In this section we conduct a sensitivity analysis to the inclusion of the debt-to-income (DTI) ratio as a control variable in our empirical analysis. We chose to leave the DTI ratio out of the covariate set in the baseline specifications reported in the main text for two reasons. First, the variable has poor coverage as it is missing for approximately 50 percent of the loans in our McDash sample and approximately 35 percent in our CoreLogic sample of Alt-A mortgages.[3] Thus, including it in our set of control variables results in a loss of a significant fraction of our sample of loans. Second, the variable includes information on the "front-end" DTI ratio (only mortgage debt divided by income at origination) for some loans, but for other loans it includes information on the "back-end" DTI ratio (all outstanding debt, including mortgage, credit card, auto, education debts, divided by income at origination). Unfortunately, McDash does not provide us with the necessary information to distinguish between the two different types of DTI ratios, which results in significant measurement error.[4]

In Table A.4 below we display estimation results of our primary McDash specifications in which we include the DTI ratio in the covariate set. Despite losing approximately half of the sample, the results are broadly similar to those reported in Tables **??** and **??** in the main text.

In Table A.5 below we display estimation results of our primary CoreLogic specifications in which we include the DTI ratio in the covariate set. The results are broadly similar to those reported in Table **??** in the main text.

[3] It is better populated in our sample of CoreLogic subprime loans (about 90 percent).

[4] We are slightly more confident that the variable reflects the "front-end" DTI ratio in the CoreLogic data set.

Table A.4
The Effect of Including Debt-to-Income Ratios: PLS Loans in McDash

Panel A: Parametric Results

Default Horizon:	36 Months		60 Months	
Default Definition:	60+ DQ	90+ DQ	60+ DQ	90+ DQ
Months to Sale	-0.0076	-0.0078	-0.0117	-0.0122
	(6.82)	(7.21)	(7.35)	(7.84)
# Loans	2,968,692	2,968,692	2,968,692	2,968,692
Adjusted R^2	0.24	0.23	0.25	0.25
Orig Qtr FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
Sale Qtr FE	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y

Panel B: Non-Parametric Results

Default Horizon:	36 Months		60 Months	
Default Definition:	60+ DQ	90+ DQ	60+ DQ	90+ DQ
Months to Sale = 2	-0.0079	-0.0068	-0.0148	-0.0133
	(3.26)	(2.88)	(4.24)	(3.87)
Months to Sale = 3	-0.0222	-0.0215	-0.0339	-0.0326
	(6.56)	(6.73)	(6.15)	(6.23)
Months to Sale = 4	-0.0404	-0.0406	-0.0595	-0.0611
	(10.51)	(11.87)	(9.32)	(10.36)
Months to Sale = 5	-0.0383	-0.0377	-0.0578	-0.0589
	(7.27)	(7.49)	(8.22)	(8.52)
Months to Sale = 6	-0.0379	-0.0385	-0.0629	-0.0675
	(5.77)	(6.28)	(7.50)	(8.27)
Months to Sale = 7	-0.0207	-0.0236	-0.0461	-0.0509
	(2.92)	(3.38)	(4.62)	(5.13)
Months to Sale = 8	-0.0255	-0.0295	-0.0411	-0.0469
	(2.31)	(2.89)	(3.38)	(4.00)
Months to Sale = 9	-0.041	-0.0461	-0.0429	-0.0521
	(2.32)	(2.72)	(2.99)	(3.69)
# Loans	2,968,692	2,968,692	2,968,692	2,968,692
Adjusted R^2	0.24	0.23	0.25	0.25
Orig Qtr FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
Sale Qtr FE	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y

This table displays results from the estimation of Equation **??** on PLS loans in the McDash data set originated in the 2002–2007 period. The specifications are identical to those in Table **??** with the addition of the debt-to-income ratio in the covariate set. The first row for each variable shows the regression coefficient and the second row shows the t-statistic. The standard errors are heteroskedasticity-robust and are clustered by state-quarter (of origination).

Table A.5
The Effect of Including Debt-to-Income Ratios: PLS Loans in CoreLogic

Panel A: Including Originator Fixed Effects

	Default Definition: 60+ DQ over 36 Months								
	All PLS			**Alt-A**			**Subprime**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Months to Sale	-0.0034	-0.0027	-0.0012	-0.0066	-0.007	-0.0053	-0.0023	-0.0013	0.0005
	(3.33)	(3.04)	(1.22)	(5.12)	(4.85)	(5.00)	(2.52)	(1.55)	(0.51)
# Loans	6,470,565	6,469,485	6,467,766	1,196,111	1,195,640	1,194,611	5,274,454	5,273,683	5,272,583
Adjusted R^2	0.2	0.21	0.21	0.25	0.25	0.26	0.19	0.19	0.2
Orig YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issue YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Originator FE	N	Y	Y	N	Y	Y	N	Y	Y
Originator x Orig-YQ FE	N	N	Y	N	N	Y	N	N	Y
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y

Panel B: Including Issuer Fixed Effects

	Default Definition: 60+ DQ over 36 Months								
	All PLS			**Alt-A**			**Subprime**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Months to Sale	-0.0044	-0.0020	-0.0015	-0.0072	-0.0052	-0.0047	-0.0028	-0.0003	0.0006
	(8.29)	(4.15)	(3.79)	(4.03)	(4.22)	(3.83)	(2.91)	(0.22)	(0.55)
# Loans	6,354,517	6,354,517	6,352,805	1,158,779	1,158,779	1,157,760	5,195,576	5,195,575	5,194,476
Adjusted R^2	0.21	0.21	0.21	0.25	0.26	0.26	0.19	0.20	0.20
Orig YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issue YQ FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Originator FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Originator x Orig-YQ FE	N	N	Y	N	N	Y	N	N	Y
Issuer FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issuer x Issue -YQ FE	N	Y	Y	N	Y	Y	N	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y

This table displays results from the estimation of Equation **??** on PLS loans in the CoreLogic data set originated in the 2002–2007 period. The specifications are identical to those in Table **??** with the addition of the debt-to-income ratio in the covariate set. The first row for each variable shows the regression coefficient and the second row shows the t-statistic. The standard errors are heteroskedasticity-robust and are clustered by state-quarter (of origination).

A.5. Pricing Analysis – Detail on Including Lower Rated Securities

Table A.6 shows the effect of including lower-rated securities in our pricing analysis. The table is structured identically to Table 13 in the main text, with the top panel containing estimation results when we include only a linear term for average seasoning and the bottom panel containing results from a quadratic specification. The results are broadly consistent with those in Table 13. The negative relationship between pool-level seasoning and yield spreads is stronger for the sample of Alt-A pools (columns (4)–(6)), but is weaker for the full sample of PLS pools. Figures A.2 and A.3 display the predicted security spreads as a function of the average pool-level seasoning calculated using the estimation results in column (6) in Panels A and B of Table A.6, respectively. Figure A.3 is extremely similar to Figure 5 in the main text. Average yield spreads associated with pools with average seasoning of 4–5 months are about 40 basis points lower than those associated with pools with very little seasoning.

Table A.6
Pricing Analysis Results

Panel A: Linear Specification

Dependent Variable: Pool-level Average Yield Spread

	All Securities			Alt-A Securities			Subprime Securities		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Seasoning	-0.001	-0.003	-0.002	-0.041***	-0.034**	-0.034**	0.006**	0.004	0.004
	(0.004)	(0.004)	(0.005)	(0.014)	(0.015)	(0.015)	(0.003)	(0.004)	(0.004)
Pool Covariates	N	Y	Y	N	Y	Y	N	Y	Y
Issue Qtr FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issuer FE	N	N	Y	N	N	Y	N	N	Y
Observations	2,254	2,254	2,247	453	453	453	1,799	1,795	1,795
Adjusted R^2	0.35	0.44	0.56	0.10	0.18	0.18	0.53	0.67	0.67

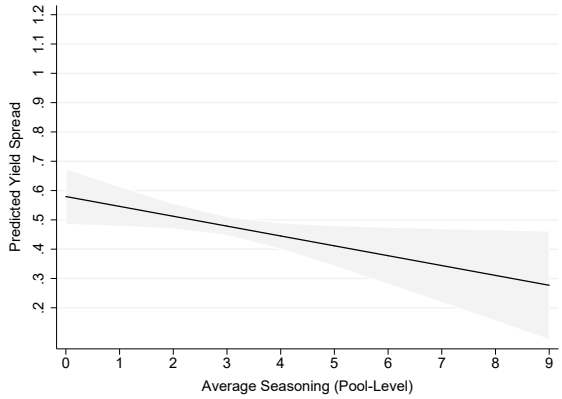
Panel B: Non-Linear Specification

Dependent Variable: Pool-level Average Yield Spread

	All Securities			Alt-A Securities			Subprime Securities		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Seasoning	-0.037**	-0.031**	-0.014	-0.185***	-0.177***	-0.177***	0.003	-0.012	-0.005
	(0.016)	(0.015)	(0.017)	(0.043)	(0.053)	(0.053)	(0.011)	(0.011)	(0.014)
$Seasoning^2$	0.005**	0.004*	0.002	0.019***	0.019***	0.019***	0.001	0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.005)	(0.007)	(0.007)	(0.001)	(0.001)	(0.002)
Pool Covariates	N	Y	Y	N	Y	Y	N	Y	Y
Issue Qtr FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issuer FE	N	N	Y	N	N	Y	N	N	Y
Observations	2,254	2,254	2,247	453	453	453	1,799	1,799	1,795
Adjusted R-squared	0.35	0.44	0.56	0.13	0.20	0.20	0.53	0.61	0.67

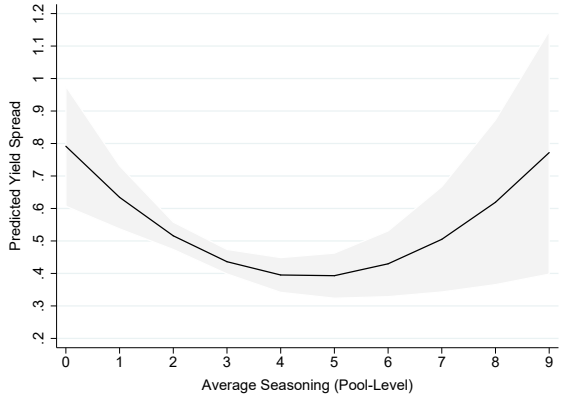
This table displays results from the estimation of Equation (7) in the main text. The sample includes triple-A and lower-rated, floating rate subprime, and Alt-A securities issued between January 2002 and December 2007. The dependent variable is the weighted average spread over the 1-month LIBOR of all securities with claims on cash flows for a given mortgage pool. Seasoning is the average age (# months) of all mortgages in a pool at the time of issuance. All regressions include month-of-issue fixed effects. The set of pool-level covariates corresponds to the variables included in Table A.5, which are all pool-level averages. The first row for each variable shows the regression coefficient and the second row shows the t-statistic. The standard errors are heteroskedasticity-robust and are clustered at the deal-level. *** p <0.01, ** p <0.05, * p<0.1.

Fig. A.2. Predicted Yield Spread as Function of Seasoning



Notes: This figure displays the predicted security spreads (over the 1-month LIBOR) as a function of the average pool-level seasoning calculated using estimation results from the specification reported in column (6) in panel B of Table A.6. The shaded area corresponds to 95% confidence intervals calculated using the delta method.

Fig. A.3. Predicted Yield Spread as Function of Seasoning



Notes: This figure displays the predicted security spreads (over the 1-month LIBOR) as a function of the average pool-level seasoning calculated using estimation results from the specification reported in column (6) in panel B of Table A.6. The shaded area corresponds to 95% confidence intervals calculated using the delta method.

A.6. Early Prepayment Analysis

While default is clearly undesirable from the perspective of an MBS investor, the risk of early prepayment is another potentially negative outcome for mortgage investors. Residential mortgages contain a prepayment option that allows the borrower to fully repay the outstanding principal balance of the loan before it reaches full maturity. Early prepayment risk was an important consideration for investors in the period before the housing bust and financial crisis, especially given the low levels of default rates that prevailed during that period.

It is well established in the mortgage literature that interest rate movements largely drive the prepayment behavior of borrowers with fixed-rate mortgages. In contrast, the prepayment of adjustable-rate mortgages is typically driven by life events that are unrelated to interest rate movements, such as new housing purchases driven by employment changes or changes in household size due to the birth of a child or death of a family member. In the PLS market, however, in addition to responses to life events, prepayments of adjustable-rate mortgages were often driven by specific contractual features. In particular, the prepayment behavior of 2/28 and 3/27 hybrid ARMS, the most common types of PLS ARMs (accounting for about 75% of the market), was highly correlated with the duration of the period in which the interest rate was frozen: two years for the 2/28s and 3 years for the 3/27s. After the initial period, the interest rate would reset to a new level and track a market interest rate (such as the 6-month LIBOR or the 10-year Treasury rate). Because the interest rate typically reset to a higher level, many borrowers prepaid either right at or shortly after the reset period. In addition, many ARMs in the PLS market contained prepayment penalties that expired at the same time of the interest rate reset, providing further incentive for borrowers to wait until the reset date to exercise their prepayment options.[5]

We focus on the sample of 2/28 and 3/27 ARMs that did not default and define a negative outcome to be an ARM that was prepaid several months before the interest rate reset month.[6] We consider two cutoffs, six and nine months before the reset date, in defining our early prepayment indicator variables, as the most common type of prepayment penalty associated with these mortgages was six months of interest on 80% of the principal amount prepaid. An ARM that carried this prepayment penalty and prepaid more than six months before the reset date would generate lower cash flows for investors than a loan that prepaid at the reset date, and prepayment can thus be considered as a negative outcome for a PLS investor.

Table A.7 contains the results of the early prepayment analysis. Panel A displays results for parametric (quadratic) specifications, while Panel B displays results for the non-parametric specifications. We show results pertaining to various corrections for the potential "mechanical" selection issue discussed in Section **??** above. Specifically, we exclude from the sample loans that prepay within three, six, and nine months from origination. Just as in the case of default, however, this may be an "over-correction" to the extent that investors may be especially concerned with prepayments within the first year or so after origination, and such a restriction could eliminate the true signaling effect rather than simply correct the sample selection bias.

Table A.7 clearly shows a negative relation between time to sale and early prepayment risk. As months to sale increase, the likelihood of early prepayment decreases in a relatively monotonic

[5]For an excellent reference on the PLS market in general and for empirical analyses on the prepayment and default behavior of various types of PLS loans in particular, see **?**. See **?** for a detailed discussion of the composition of loans in the Alt-A and subprime PLS markets.

[6]We eliminate defaults from our analysis to isolate voluntary prepayment risk.

manner. Focusing on the first two columns in the table (no correction), PLS loans sold six months after origination are approximately 6–7% less likely to prepay early compared to loans sold immediately, while loans sold nine months after origination are about 10–11% less likely to prepay early. The negative relation remains significant when we exclude prepayments that occur in the first few months after origination, but the non-parametric specification shows that the relation flattens for five months in columns (5) through (8).

In general, results on the correlation between time to sale and early prepayment are consistent with the default analysis and support the mechanism of using sales delays to signal quality. While PLS investors were likely concerned about significant credit risk in the case of a large downturn (which, of course, occurred), prepayment risk is present in both good and bad economic conditions, and it was thus an important consideration for mortgage investors. In addition, while our results suggest that asymmetric information on default risk did not play an important role in the subprime PLS market, asymmetric information on prepayment risk may have been important as the vast majority of 2/28 and 3/27 hybrid-ARMs were placed in subprime securities.[7] These findings are consistent with **?**, who find evidence of adverse selection with respect to prepayment risk but not default risk in the PLS market.

[7] In our CL sample, approximately 96% of 2/28s and 79% of 3/27s were in subprime securities.

Table A.7
Early Prepayment Results

Panel A: Parametric Specification

Correction:	None		≤ 3 months		≤ 6 months		≤ 9 months	
Reset Month - Prepay Month	≥ 6 Months	≥ 9 Months	≥ 6 Months	≥ 9 Months	≥ 6 Months	≥ 9 Months	≥ 6 Months	≥ 9 Months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Months to Sale	-0.0129	-0.0152	-0.0089	-0.0105	-0.0111	-0.0131	-0.0144	-0.0169
	(6.20)	(6.28)	(4.11)	(4.15)	(4.76)	(4.75)	(5.66)	(5.57)
Months to Sale ^{2}	0.0007	0.0009	0.0004	0.0005	0.0012	0.0015	0.0019	0.0023
	(2.56)	(2.83)	(1.36)	(1.58)	(3.75)	(4.03)	(5.07)	(5.36)
# Loans	4,024,361	4,024,361	3,968,227	3,968,227	3,701,607	3,701,607	3,302,260	3,302,260
Adjusted R^2	0.13	0.13	0.13	0.13	0.12	0.11	0.10	0.08
Orig Qtr FE	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y
Sale Qtr FE	Y	Y	Y	Y	Y	Y	Y	Y
Originator FE	Y	Y	Y	Y	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y

Panel B: Non-parametric Specification

Correction:	None		≤ 3 months		≤ 6 months		≤ 9 months	
Reset Month - Prepay Month	≥ 6 Months	≥ 9 Months	≥ 6 Months	≥ 9 Months	≥ 6 Months	≥ 9 Months	≥ 6 Months	≥ 9 Months
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Months to Sale = 1	-0.024	-0.027	-0.023	-0.025	-0.024	-0.027	-0.025	-0.028
	(4.90)	(4.87)	(4.41)	(4.34)	(4.51)	(4.39)	(4.07)	(3.87)
Months to Sale = 2	-0.033	-0.038	-0.028	-0.032	-0.030	-0.034	-0.031	-0.035
	(6.90)	(6.88)	(5.70)	(5.63)	(5.81)	(5.69)	(5.17)	(4.98)
Months to Sale = 3	-0.039	-0.045	-0.030	-0.035	-0.032	-0.037	-0.034	-0.039
	(7.09)	(7.07)	(5.19)	(5.13)	(5.36)	(5.25)	(5.13)	(4.89)
Months to Sale = 4	-0.043	-0.049	-0.034	-0.038	-0.029	-0.033	-0.030	-0.033
	(7.24)	(7.48)	(5.36)	(5.47)	(4.51)	(4.53)	(4.50)	(4.38)
Months to Sale = 5	-0.049	-0.056	-0.040	-0.045	-0.026	-0.028	-0.028	-0.030
	(9.32)	(9.35)	(7.06)	(7.02)	(4.43)	(4.21)	(4.69)	(4.26)
Months to Sale = 6	-0.059	-0.066	-0.049	-0.055	-0.024	-0.024	-0.027	-0.027
	(8.59)	(8.93)	(6.93)	(7.15)	(3.03)	(2.88)	(3.24)	(3.02)
Months to Sale = 7	-0.064	-0.072	-0.054	-0.060	-0.027	-0.028	-0.014	-0.012
	(7.97)	(7.83)	(6.65)	(6.54)	(3.22)	(3.01)	(1.50)	(1.14)
Months to Sale = 8	-0.082	-0.090	-0.073	-0.078	-0.046	-0.047	-0.017	-0.011
	(10.65)	(11.38)	(8.99)	(9.56)	(5.57)	(5.63)	(1.91)	(1.22)
Months to Sale = 9	-0.096	-0.108	-0.085	-0.097	-0.059	-0.065	-0.011	-0.008
	(9.67)	(9.07)	(8.58)	(8.00)	(5.84)	(5.44)	(1.01)	(0.58)
# Loans	4,024,361	4,024,361	3,968,227	3,968,227	3,701,607	3,701,607	3,302,260	3,302,260
Adjusted R^2	0.13	0.13	0.13	0.13	0.12	0.11	0.10	0.08
Orig Qtr FE	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y
Sale Qtr FE	Y	Y	Y	Y	Y	Y	Y	Y
Originator FE	Y	Y	Y	Y	Y	Y	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y

This table displays results from the estimation of Equation **??** on adjustable-rate PLS loans in the CoreLogic data set originated in the 2002–2007 period. The dependent variable is an indicator variable for loans that prepay more than three months or six months before the month in which the interest rate resets from a fixed rate to an adjustable rate. All loans that are prepaid within three months of origination are eliminated from the sample. Months to sale is defined as the number of months that elapse between origination and sale to a PLS issuer. All regressions include origination year-quarter fixed effects, state fixed effects, year-quarter of sale fixed effects, originator fixed effects, and the detailed list of covariates described in the text. The first row for each variable shows the regression coefficient and the second row shows the t-statistic. The standard errors are heteroskedasticity-robust and are clustered by year-quarter of origination.

A.7. Additional Summary Statistics and Tests

Table A.8 below displays summary statistics for the sample of triple-A securities included in the pricing analysis discussed in Section **??** in the main text.

Table A.9 displays the full set of estimation results (for all covariates) corresponding to the specification reported in Column (1), Panel A of Table **??** in the main text.

Finally, Table A.10 displays results from the estimation of Equation **??** on Alt-A and Subprime PLS loans in the CoreLogic data set that do not default within 10 months of origination. The specifications are identical to those in Table **??** in the main text.

Table A.8
Pricing Analysis Summary Statistics

	Mean	Standard Dev.	Minimum	25th Perc.	Median	75th Perc.	Maximum
Yield Spread	0.28	0.23	0.04	0.16	0.23	0.32	2.09
Months to Sale	3.3	1.4	0.3	2.2	3.1	4.2	9.0
# Loans	2,355	1,833	55	1,108	1,911	3,078	18,190
Log Loan Balance	12.2	0.4	11.0	11.9	12.1	12.4	14.9
FICO	640	43	413	609	624	682	764
FICO < 580	0.20	0.15	0.00	0.01	0.22	0.31	0.87
$580 \leq$ FICO < 620	0.19	0.12	0	0.05	0.22	0.27	0.67
$620 \leq$ FICO < 660	0.23	0.08	0	0.19	0.24	0.28	0.68
$660 \leq$ FICO < 700	0.18	0.09	0.01	0.11	0.15	0.25	0.72
FICO ≥ 700	0.20	0.21	0	0.06	0.10	0.35	0.92
CLTV	84	6	39	80	84	88	102
CLTV < 70	0.13	0.08	0	0.08	0.12	0.17	0.87
$70 \leq$ CLTV < 80	0.15	0.07	0	0.10	0.14	0.19	0.49
$80 \leq$ CLTV < 90	0.28	0.13	0	0.20	0.27	0.36	0.92
$90 \leq$ CLTV < 100	0.24	0.10	0	0.18	0.23	0.29	0.97
CLTV ≥ 100	0.20	0.20	0	0.02	0.16	0.32	0.96
LTV $= 80$	0.16	0.12	0	0.08	0.12	0.20	0.91
Term	359	15	120	356	359	360	480
Purchase Loan	0.42	0.20	0	0.27	0.40	0.57	1
Cashout Refinance	0.48	0.19	0	0.33	0.50	0.62	1
Primary Residence	0.87	0.13	0	0.85	0.91	0.95	1
Single-Family Property	0.73	0.11	0	0.68	0.75	0.80	0.99
Condominium	0.08	0.04	0	0.05	0.07	0.09	0.36
ARM	0.83	0.18	0	0.76	0.85	1	1
Interest-Only	0.21	0.28	0	0	0.10	0.26	1
Negative Amortization	0.10	0.30	0	0	0	0	1
Low Documentation	0.47	0.23	0	0.31	0.41	0.61	1
Balloon	0.08	0.15	0	0	0	0.05	1
Jumbo	0.19	0.24	0	0	0.10	0.27	1
Prepayment Penalty	0.69	0.21	0	0.65	0.74	0.81	1
Fraction in CA	0.26	0.17	0	0.13	0.23	0.34	1
Unemployment Rate	5.14	0.61	1.73	4.66	5.06	5.63	6.83
Predicted WAL	2.59	0.61	0	2.23	2.52	2.90	6.61
Subordination	0.86	0.14	0	0.81	0.85	0.91	2.65
# Securities				3,532			

Notes: This table displays summary statistics for the variables included in the pricing analysis presented in section **??**. All mortgage characteristics correspond to averages that are calculated at the pool-level in the sample of CoreLogic loans, which includes mortgages backing subprime and Alt-A triple-A floating rate securities issued between January 2002 and December 2007. Yield Spread is the weighted average spread over the 1-month LIBOR of all triple-A securities with claims on cash flows for a given mortgage pool. Seasoning is the average age (# months) of all mortgages in a pool at the time of issuance. Predicted WAL is a model-based calculation of the expected weighted average life. Subordination is calculated as the ratio of the total face value of all triple-A securities associated with the deal to the sum of the remaining principal balances of all of the loans in the deal in the month of issuance.

Table A.9
Coefficient Estimates for Control Variables

Dependent Variable: Indicator for 60+ DQ within 36 months of origination		
	Coefficient	*t-statistic*
Months to Sale	-0.0094	(10.75)
Primary Residence (d)	-0.0012	(0.49)
Prepayment Penalty (d)	0.0687	(7.70)
ARM (d)	0.0281	(2.24)
Balloon Payment (d)	0.0890	(4.74)
Low Documentation (d)	0.0515	(9.74)
Missing Documentation (d)	0.0119	(1.80)
B or C Grade Mortgage (d)	0.1091	(9.38)
Single Family Property (d)	-0.0010	(0.69)
Missing Property Type (d)	0.0302	(7.12)
Interest-Only (d)	0.0130	(1.44)
Purchase Loan (d)	0.0015	(0.22)
Refinance (cash-out) (d)	0.0141	(3.04)
Missing Loan Type (d)	0.0141	(3.04)
Term	0.0001	(2.81)
LTV	0.0010	(3.96)
Missing LTV (d)	0.1632	(4.23)
$70 \leq$ LTV < 80 (d)	0.0352	(4.19)
LTV $= 80$ (d)	0.0257	(7.33)
$80 <$ LTV < 90 (d)	0.0443	(4.75)
$900 \leq$ LTV < 100 (d)	0.0608	(5.72)
LTV ≥ 100 (d)	0.0459	(4.04)
FICO	-0.0011	(8.59)
Missing FICO (d)	-0.8955	(8.54)
FICO < 580 (d)	-0.0614	(3.22)
$580 \leq$ FICO < 620 (d)	-0.0482	(4.53)
$620 \leq$ FICO < 660 (d)	-0.0149	(5.86)
$660 \leq$ FICO < 700 (d)	-0.0128	(2.72)
Interest Rate (at origination)	0.0110	(6.53)
Jumbo (d)	0.0217	(2.55)
Unemployment Rate (at origination)	0.0041	(7.63)
Cumulative Change in Unemployment Rate (36 months)	0.0244	(5.75)
House Price Level (at origination)	0.0016	(12.36)
Cumulative Change in House Prices (36 months)	-0.1583	(7.65)
# Loans	5,747,722	
Adjusted R^2	0.24	
Orig Qtr FE	Y	
State FE	Y	
Sale Qtr FE	Y	
Originator FE	N	

This table displays the coefficients for all variables included as controls in the regression shown in the first column of Panel A, Table **??** in the paper (Baseline parametric results for the sample of PLS Loans in McDash). The dependent variable is an indicator variable for loans that default over a 36-month horizon. Default is defined as a loan that is 60+ days delinquent. Months to sale is defined as the number of months that elapse between origination and sale to a PLS issuer. All regressions include origination year-quarter fixed effects, state fixed effects, and year-quarter of sale fixed effects. The standard errors are heteroskedasticity-robust and are clustered by year-quarter of origination.

Table A.10
Correcting for Potential Selection Bias: Alt-A and Subprime PLS Loans

Panel A: Effect of Lender Fixed Effects

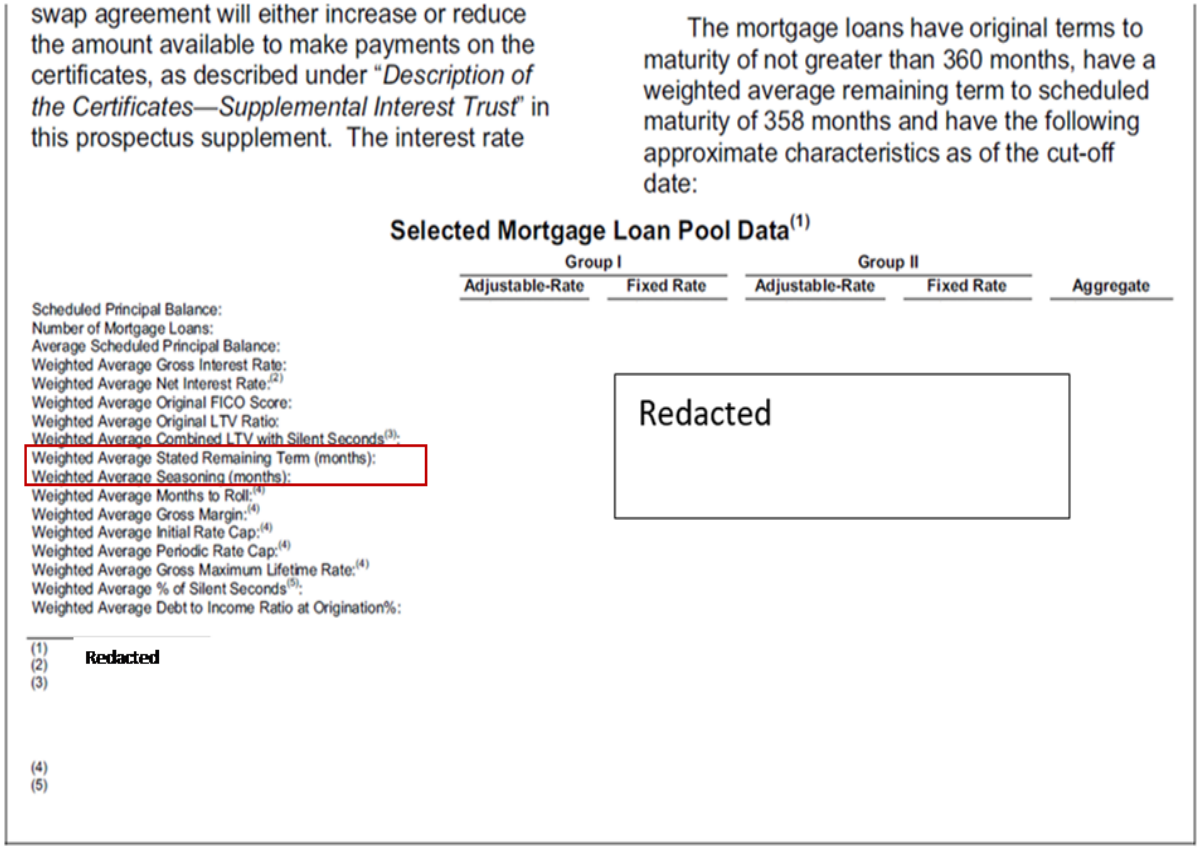
	Default Definition: 60+ DQ over 36 Months					
	Alt-A			**Subprime**		
Months to Sale	-0.0054	-0.0042	-0.0035	0.0020	0.0026	0.0039
	(7.62)	(6.86)	(6.92)	(4.83)	(5.72)	(8.60)
# Loans	1,848,602	1,847,871	1,846,633	5,426,811	5,425,136	5,423,582
Adjusted R^2	0.24	0.25	0.26	0.17	0.18	0.18
Orig YQ FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y
Issue YQ FE	Y	Y	Y	Y	Y	Y
Lender FE	N	Y	Y	N	Y	Y
Lender x Orig-YQ FE	N	N	Y	N	N	Y
Other Controls	Y	Y	Y	Y	Y	Y

Panel B: Effect of Issuer Fixed Effects

	Default Definition: 60+ DQ over 36 Months					
	Alt-A			**Subprime**		
Months to Sale	-0.0040	-0.0023	-0.0026	0.0020	0.0040	0.0043
	(7.37)	(4.41)	(5.09)	(4.00)	(7.82)	(8.03)
# Loans	1,803,941	1,803,940	1,802,714	5,344,226	5,344,226	5,342,673
Adjusted R^2	0.25	0.26	0.26	0.18	0.18	0.18
Orig YQ FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y
Issue YQ FE	Y	Y	Y	Y	Y	Y
Lender FE	Y	Y	Y	Y	Y	Y
Lender x Orig-YQ FE	N	N	Y	N	N	Y
Issuer FE	Y	Y	Y	Y	Y	Y
Issuer x Issue -YQ FE	N	Y	Y	N	Y	Y
Other Controls	Y	Y	Y	Y	Y	Y

This table displays the results from the estimation of Equation **??** on Alt-A and Subprime PLS loans in the CoreLogic data set that do not default within 10 months of origination. The specifications are identical to those in Table **??** in the text. The dependent variable is an indicator variable for loans that default over a 36-month horizon. Default is defined as a loan that is 60+ days delinquent. Months to sale is defined as the number of months that elapse between origination and sale to a PLS issuer. All regressions include origination year-quarter fixed effects, state fixed effects, year-quarter of sale fixed effects, and the detailed list of covariates described in the text. The first row for each variable shows the regression coefficient and the second row shows the t-statistic. The standard errors are heteroskedasticity-robust and are clustered by year-quarter of origination.

Fig. A.4. Example of Prospectus: Summary Mortgage Data Table



swap agreement will either increase or reduce the amount available to make payments on the certificates, as described under "*Description of the Certificates—Supplemental Interest Trust*" in this prospectus supplement. The interest rate

The mortgage loans have original terms to maturity of not greater than 360 months, have a weighted average remaining term to scheduled maturity of 358 months and have the following approximate characteristics as of the cut-off date:

Selected Mortgage Loan Pool Data[1]

	Group I		Group II		
	Adjustable-Rate	Fixed Rate	Adjustable-Rate	Fixed Rate	Aggregate
Scheduled Principal Balance:					
Number of Mortgage Loans:					
Average Scheduled Principal Balance:					
Weighted Average Gross Interest Rate:					
Weighted Average Net Interest Rate:[2]					
Weighted Average Original FICO Score:					
Weighted Average Original LTV Ratio:					
Weighted Average Combined LTV with Silent Seconds[3]:					
Weighted Average Stated Remaining Term (months):					
Weighted Average Seasoning (months):					
Weighted Average Months to Roll:[4]					
Weighted Average Gross Margin:[4]					
Weighted Average Initial Rate Cap:[4]					
Weighted Average Periodic Rate Cap:[4]					
Weighted Average Gross Maximum Lifetime Rate:[4]					
Weighted Average % of Silent Seconds[5]:					
Weighted Average Debt to Income Ratio at Origination%:					

Redacted

(1) **Redacted**
(2)
(3)
(4)
(5)

S-11

A.8. Solving the model with additional random delay in trade

In this appendix, we show that the equilibrium strategies and prices are unaffected by random delay in trade as specified in Section 5. In that section, we assume the selling protocol for a mortgage is as follows. The originator chooses to list a mortgage for sale at some publically observable date t. Once the originator lists the mortgage for sale, there is a random interval of time ν between the listing date and the date of sale distributed as an exponential random variable with parameter η. At the date of sale, buyers Bertrand compete for the asset all with common knowledge of the listing date t. We also assume that if the mortgage defaults, a lump sum recovery of αB_0 is paid to the holder of the mortgage. Given an originator of type λ, a listing date t, and a price p, the originators value is

$$U(\lambda, t, p) = \frac{(r_m + \alpha\lambda)B_0}{\gamma + \lambda}\left(1 - \frac{\eta e^{-(\gamma+\lambda)t}}{\gamma + \lambda + \eta}\right) + \frac{\eta e^{-(\gamma+\lambda)t} p}{\gamma + \lambda + \eta}.$$

Note that prices here will depend on the listing date and not the actual sale date. Thus, the first-order condition for listing date is now

$$(r_m + \alpha\lambda)B_0 - (\gamma + \lambda)P^*(t) + \frac{d}{dt}P^*(t) = 0$$

but for any separating equilibrium

$$P^*(T(\lambda)) = \frac{(r_m + \alpha\lambda)B_0}{r + \lambda},$$

which in turns gives the following ODE for the price of a mortgage listed for sale at time t

$$\frac{d}{dt}P^*(t) = (\gamma - r)P^*(t).$$

We restrict attention to equilibria in which the worst type does not delay, which in turn implies the following initial condition

$$P^*(0) = p_h = \frac{(r_m + \alpha\lambda_H)B_0}{r + \lambda_H}.$$

This ODE has the following solution

$$P^*(t) = p_h e^{(\gamma - r)t}.$$

Note this solution is the same as the equilibrium given in Proposition 1 up to the difference in p_h that results from including some recovery. As such, the equilibrium strategy for the originator is unaffected by publicly observable random delay.