Online Appendices for “The Effect of Regulatory Oversight on Nonbank Mortgage Subsidiaries”[[1]](#footnote-1)

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**Appendix A – Prime and Subprime Analysis**

This document is an appendix to “[The Effect of Regulatory Oversight on Nonbank Mortgage Subsidiaries](https://rdcu.be/cR1aA)” (henceforth “the main paper”), published in the *Journal of Real Estate Finance and Economics*. In the main paper, we analyze the performance and pricing of mortgages originated between 2000 and 2015 in Maryland and Virginia by independent nonbank originators (INBs) and by nonbank subsidiaries of depository institutions and bank holding companies (subsidiary nonbanks, or SNBs). In this appendix, we provide results from analyses that we summarize briefly in footnotes in the main paper but do not include there due to space considerations. For the motivation of our research, a discussion of the regulatory background associated with nonbank mortgage origination, and details of our dataset construction and empirical methodology, please see the main paper.

*Determination of Treatment Date for Prime and Subprime Mortgage Subsamples*

Figures A1 and A2 show the results of the same analyses as Figures 6 and 7 from the main paper, respectively, only for our subsample of prime mortgages only. (Note that the vertical scales differ across the figures to accommodate the varying confidence intervals.) The patterns in Figures A1 and A2 closely match those in Figures 6 and 7, which is expected given that prime mortgages constitute approximately ninety percent of our full sample. Figures A3 and A4 do the same for our subsample of subprime loans only, and there are notable changes from Figures 6 and 7. The confidence intervals are much wider later in the sample period than earlier, especially in Figure A3, consistent with the dramatic decline in the number of subprime originations following the financial crisis. (Panel C of Table 2 from the main paper indicates that less than eight percent of our subprime mortgage sample was originated after the 2009 policy change.) With respect to the probability of default, the decline in the differences in interaction term coefficient estimates occurs later in Figure A3 than in Figure 6. With respect to the probability of prepayment, the coefficient estimate differences increase immediately following the 2009 policy event in Figure A4, and are often statistically significant.

*Additional Empirical Performance Results for the Full Mortgage Sample*

In Table A1, we restrict the sample by including only lenders that originated at least one loan in each year of progressively larger ranges before and after the policy treatment. (For brevity, we omit specifications that do not include the interaction of *Subsidiary* and *Post*.) In the default results, the results are substantively unchanged from Table 5 from the main paper. As in Tables 4 and 5 from the main paper, the difference between the joint effect on the probability of default of a post-policy SNB mortgage is lower than the effect of a post-policy INB mortgage. Those differences are statistically significant at the one percent level in every model in Table A1, implying that even in our most restricted sample, the probability of default for SNB originations fell relative to the probability of default for INB originations after the policy change.[[2]](#footnote-2) This is consistent with subsidiary nonbanks tightening their lending practices relatively more than INBs after the SNBs fell under Federal Reserve consumer compliance supervision.

The Table A1 prepayment results are also similar to those in Table 5, with similar signs and significances for *Subsidiary*, *Post*, and their interaction in all models except the first one. The probability of prepayment was significantly lower for SNB originations than INB originations in the pre-policy period. In the post-policy period, the probability of prepayment rose faster for SNB originations than for INB originations, such that there was no significant difference in the probability of prepayment across originators in any of the models in Table A1.[[3]](#footnote-3)

To correct for potential bias resulting from our having more months of performance data for mortgages originated earlier in our sample period, we performed additional specifications in which we restrict the number of monthly observations for each mortgage. Table A2 presents the results from regressions using only the first one, two, three, and four years of each mortgage’s performance data, respectively. The coefficient estimate for *Subsidiary* is not significantly associated with the probability of default in any of the models, but that for *Post* is, indicating a post-policy decrease in the probability of default. The interaction term is significant at least at the five percent level in all models, and the magnitudes (in absolute value) of the interaction term coefficient estimates are greater than in most of the other tables’ models. The prepayment results in Table A2 are mixed, with *Subsidiary*, *Post*, and their interaction showing inconsistent signs and significance levels across the models. Capping the number of months of performance data analyzed therefore magnifies the reduction in the probability of default among SNB originations relative to INB originations after the policy treatment but yields ambiguous results for the probability of prepayment.[[4]](#footnote-4)

*Additional Empirical Pricing Results for the Full Mortgage Sample*

Table A3 shows results for 2SLS models of mortgage pricing with the sample restricted to mortgages originated by nonbank originators that originated at least one loan in the pre-policy period and in the post-policy period, similar to Table 5 from the main paper. The results for *InitialRate* change markedly, with neither *Subsidiary* nor its interaction with *Post* being statistically significant. In Table A3, there was no significant difference in the initial interest rates of SNB originations and INB originations, either before or after the policy change. The results for *LTV* in Table A3 are substantively identical to the results in Table 8, with the exception of *OwnerOcc* losing significance.

Table A4 further restricts the sample to nonbank originators that were active in each year of a variety of ranges, similar to Table A1. In contrast to both Table 8 and Table A3, Table A4 indicates that the interest rates on SNB originations were statistically significantly lower than INB origination interest rates before the policy change but rose farther than INB origination interest rates after the policy change. Table A4 is consistent with Tables 8 and A3 in indicating that following the policy change there was no significant difference between the interest rates of SNB and INB originations.[[5]](#footnote-5) The *LTV* results in Table A4 also show substantial changes from those in Tables 8 and A3. The magnitudes of the *Subsidiary* and *Post* coefficient estimates more than double, and the sign on the interaction terms switches to positive. Tallying the effects from Table A4 indicates that SNB origination LTV ratios on average were 2.5-3.1 percentage points below INB origination LTV ratios before the policy change, and the gap narrowed to 1.6-1.9 percentage points after the policy change. The post-policy LTV ratio differences are significant at the one percent level in all models. While the pre-policy differences in *InitialRate* and the pre- and post-policy differences in *LTV* are generally statistically significant, we should reiterate that the magnitudes of the effects are such that their economic significances are likely not substantial.[[6]](#footnote-6)

*Additional Empirical Performance Results for Prime and Subprime Mortgage Subsamples*

Tables A5-A7 repeat the analyses from Table 5 from the main paper and Tables A1 and A2 here, only using prime mortgages. Table A5 presents the results of regressions similar to those in Table 5, in which the sample is restricted to mortgages originated by lenders that originated at least one mortgage before the policy and at least one mortgage after the policy change. Table A6 presents the results of regressions similar to those in Table A1, in which the samples are restricted based on how active each lender was during various ranges of origination years. Table A7 does the same for regressions similar to those in Table A2, which restricts the sample’s performance history observations to different numbers of years following origination. The signs and significances of the coefficient estimates for the other explanatory variables are all extremely similar to those in Tables 5, A1, and A2. The results for the probability of default in Tables A5-A7 indicate that even as the sample gets more restricted and the significances of *Subsidiary* and *Post* decline, their interaction remains negative and statistically significant. These results match those found for the full sample, in which the probability of default for SNB originations fell relative to the probability of default for INB originations following the 2009 policy change. Also as in the full sample results, the prime mortgage results for the probability of prepayment are mixed, with the coefficient estimate for the interaction term being sometimes positive, sometimes negative, and sometimes not statistically significant.

Tables A8-A10 show results from the same regressions as Tables A5-A7, only for subprime mortgages. *Subsidiary* is not significantly related to the probability of default in any of the models in Tables A8-A10. *Post* is sometimes weakly significant, suggesting an overall decline in the probability of default after 2009, particularly among those nonbank lenders that originated loans for several years both before and after 2009 (models 3-5 of Table A9). The interaction term of *Subsidiary* and *Post* is only occasionally significantly related to the probability of default. Even though *Subsidiary* and the interaction term are not often significant, the probability of default is significantly lower for SNB originations than INB originations in the post-policy period for some specifications.[[7]](#footnote-7) In the prepayment results, the coefficient estimate of the interaction term is positive and statistically significant in most specifications. *Subsidiary* and *Post* themselves are generally not significantly related to the probability of prepayment. (The extreme coefficient estimate for *Post* in model 1 of Table A10 appears to be an aberration driven by the small number of subprime prepayments that occurred in the first twelve months of their performance histories.) The other coefficient estimates in Tables A8-A10 are mostly similar to those in Table 7 from the main paper. Exceptions include *RelLoanSize* and *Condo* losing significance with respect to the probability of default, and *FICO* and *HPI* losing significance with respect to the probability of prepayment. These exceptions are concentrated in Tables A8 and A9.

*Additional Empirical Pricing Results for Prime and Subprime Mortgage Subsamples*

Table A11 summarizes the prime mortgage pricing results from regressions similar to those in Table A3, in which the sample is restricted to mortgages originated by lenders that originated at least one mortgage before the policy and at least one mortgage after the policy change. Table A12 presents the results of regressions in which the samples are restricted based on how active each lender was during various ranges of origination years, similar to those in Table A4. These results match those for the full sample, with the signs of *Subsidiary* and *Subsidiary\*Post* flipping in the *InitialRate* equation as they do in Table A4, and the post-policy difference in LTV ratios between SNB and INB originations being statistically significant at the one percent level in all models.

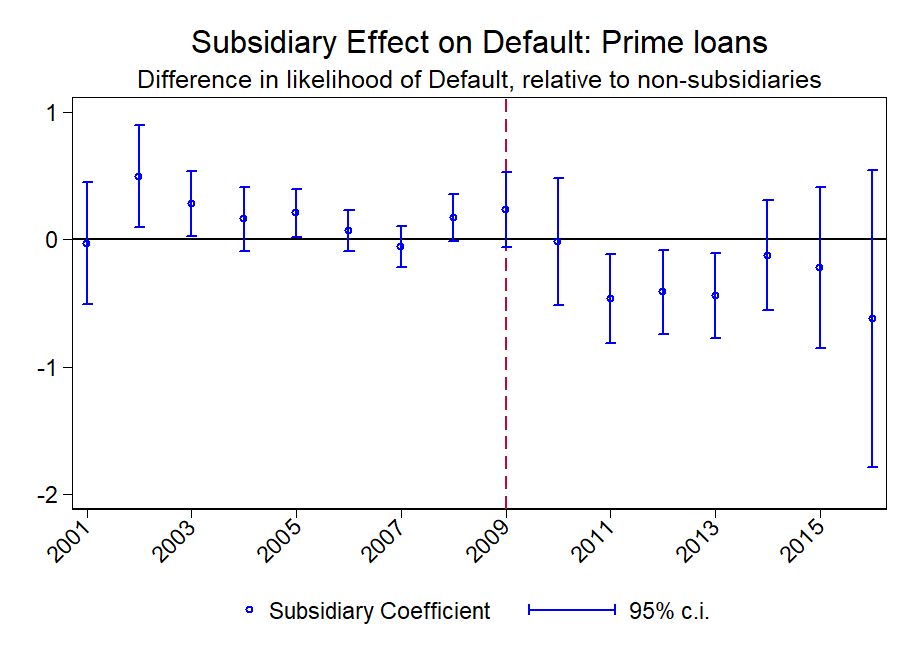
Tables A13 and A14 provides the results from regressions similar to those in Tables A11 and A12, only for our subprime mortgage subsample. The *InitialRate* equation results are similar to those in Table 10 from the main paper (which presents the results of the unrestricted subprime pricing regressions), except that *Subsidiary* is consistently statistically significant, indicating that SNB subprime originations had initial interest rates roughly fifteen to twenty basis points lower than INB subprime originations before the 2009 policy event. As in Table 10, Tables A13 and A14 indicate that interest rates rose for both SNB and INB subprime mortgages after the policy change, but that interest rates rose farther for SNB originations, such that SNB subprime interest rates were 25-30 basis points higher in the post-policy period, a difference that is statistically significant in each model. The *LTV* equation results in Tables A13 and A14 are similar to those in Table 10, except that the interaction term loses significance in the models in which the sample is more restricted.

*Robustness Checks for Prime and Subprime Mortgage Subsamples*

Table A15 shows the results for the same robustness checks as Table 11 from the main paper for our prime mortgage sample. The pattern of results across all four panels closely mirrors that of Table 11. Table A16 shows robustness checks results for our subprime mortgage sample. There are sporadic changes in statistical significance in the models, but overall the results are consistent with main subprime results in model 1 of each panel. The strongest exception is model 2 of Panel C, which indicates that the interest rates on SNB subprime originations were significantly higher than those on INB subprime originations in the pre-policy period, and were significantly lower in the post-policy period. Both of these findings contradict the main findings in model 1 and in the other Panel C models.

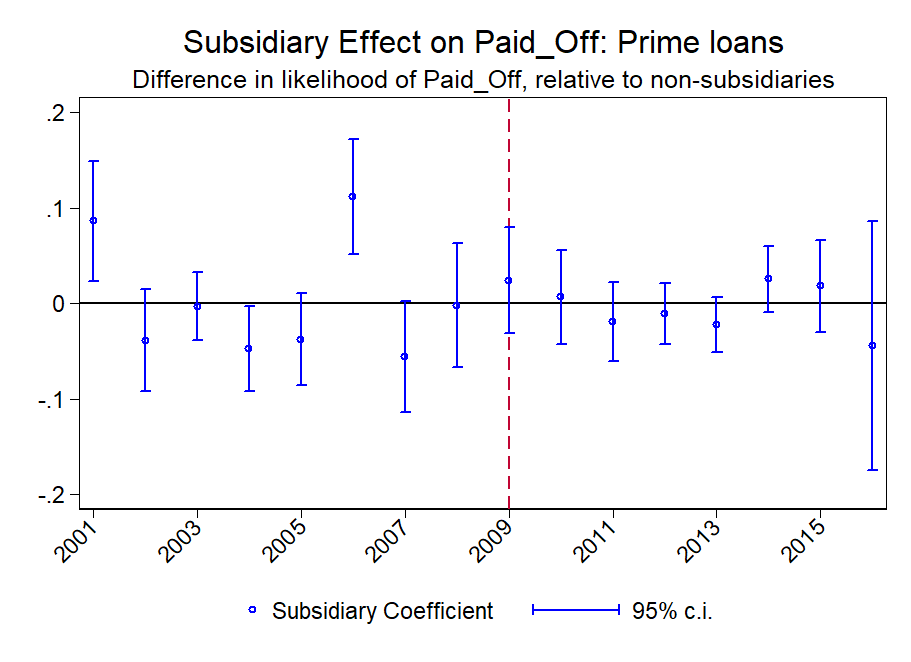
**Figure A1**

Estimates by vintage year of the difference between the probability of default of subsidiary nonbank (SNB) originations relative to independent nonbank (INB) originations for our prime mortgage subsample. Estimates are derived from multinomial logit regressions similar to those in Table 4, except *Post* and its interaction with *Subsidiary* are replaced by interactions of *Subsidiary* with vintage year indicator variables. See footnote 32 in the main paper for how we define vintage year indicator variables for Figures A1-A4. The dotted line at 2009 coincides with the Federal Reserve policy change subjecting SNBs, but not INBs, to consumer compliance supervision. The bars indicate the 95 percent confidence interval for each *Subsidiary* \* vintage year interaction term coefficient estimate.

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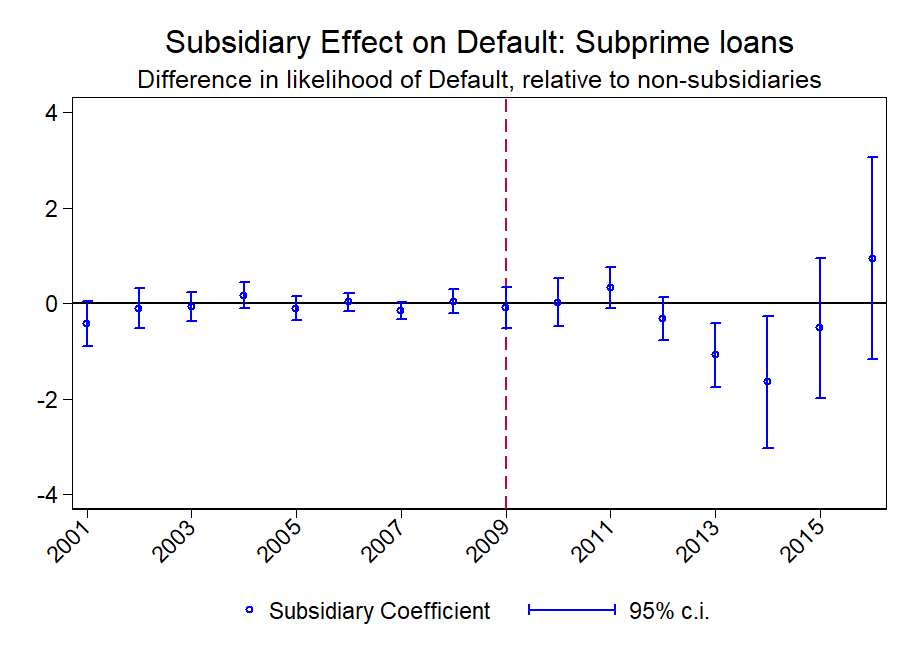
**Figure A2**

Estimates by vintage year of the difference between the probability of prepayment of subsidiary nonbank (SNB) originations relative to independent nonbank (INB) originations for our prime mortgage subsample. Estimates are derived from multinomial logit regressions similar to those in Table 4, except *Post* and its interaction with *Subsidiary* are replaced by interactions of *Subsidiary* with vintage year indicator variables. See footnote 32 in the main paper for how we define vintage year indicator variables for Figures A1-A4. The dotted line at 2009 coincides with the Federal Reserve policy change subjecting SNBs, but not INBs, to consumer compliance supervision. The bars indicate the 95 percent confidence interval for each *Subsidiary* \* vintage year interaction term coefficient estimate.

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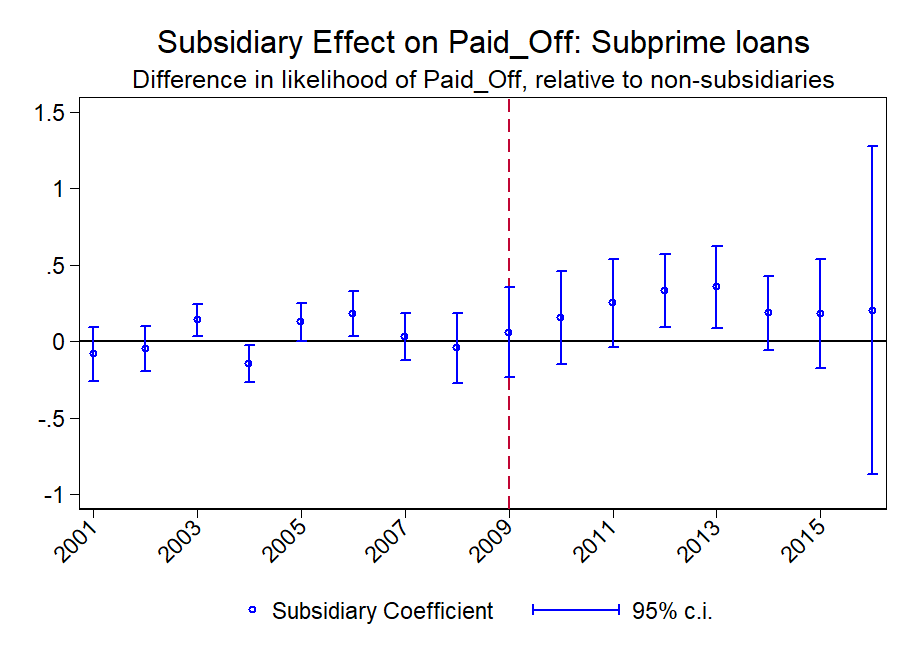
**Figure A3**

Estimates by vintage year of the difference between the probability of default of subsidiary nonbank (SNB) originations relative to independent nonbank (INB) originations for our subprime mortgage subsample. Estimates are derived from multinomial logit regressions similar to those in Table 4, except *Post* and its interaction with *Subsidiary* are replaced by interactions of *Subsidiary* with vintage year indicator variables. See footnote 32 in the main paper for how we define vintage year indicator variables for Figures A1-A4. The dotted line at 2009 coincides with the Federal Reserve policy change subjecting SNBs, but not INBs, to consumer compliance supervision. The bars indicate the 95 percent confidence interval for each *Subsidiary* \* vintage year interaction term coefficient estimate.

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**Figure A4**

Estimates by vintage year of the difference between the probability of prepayment of subsidiary nonbank (SNB) originations relative to independent nonbank (INB) originations for our subprime mortgage subsample. Estimates are derived from multinomial logit regressions similar to those in Table 4, except *Post* and its interaction with *Subsidiary* are replaced by interactions of *Subsidiary* with vintage year indicator variables. See footnote 32 in the main paper for how we define vintage year indicator variables for Figures A1-A4. The dotted line at 2009 coincides with the Federal Reserve policy change subjecting SNBs, but not INBs, to consumer compliance supervision. The bars indicate the 95 percent confidence interval for each *Subsidiary* \* vintage year interaction term coefficient estimate.

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**Table A1**

Multinomial logit regressions based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only mortgages originated by lenders that originated at least one mortgage in each of the ranges of years listed. *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *CLTV* is the current loan balance divided by the current home value, where current home value is estimated as (1 + house price appreciation since origination) multiplied by the loan amount at origination divided by LTV at origination. House price appreciation for CLTV is measured by the CoreLogic Solutions county-level monthly house price index. *LoanAge* is the number of months since origination. *RefiPenalty* is the change in the PMMS rate since origination. *InterestGap* is the difference between the mortgage interest rate at origination and the PMMS rate for the origination month. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *Unemployment* is the monthly percentage change in the state-level unemployment rate. *HPI* is the percent change in quarterly FHFA state-level house price index since origination. *Condo* is an indicator variable equaling one if the property is a condominium or townhouse and equaling zero if the property is a single family residence. Each coefficient estimate represents the effect on the probability of default or prepayment, relative to the probability of the mortgage remaining current, of a one-unit change in the corresponding variable. Vintage year indicators and a constant term are included in each specification. Standard errors, clustered by loan, appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Probability of default | | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 | |
|  | (1) | (2) | (3) | (4) | (5) | |
| *Subsidiary* | .0503 | .0588 | .0451 | .0113 | .0467 | |
|  | (.053) | (.0537) | (.0702) | (.0725) | (.0775) | |
| *Post* | -.501\*\*\* | -.650\*\*\* | -.616\*\* | -.588\*\* | -.669\*\* | |
|  | (.180) | (.234) | (.243) | (.244) | (.271) | |
| *Subsidiary \* Post* | -.485\*\*\* | -.495\*\*\* | -.448\*\*\* | -.363\*\*\* | -.433\*\*\* | |
|  | (.0899) | (.0963) | (.107) | (.110) | (.116) | |
| *FICO* | -.0166\*\*\* | -.0161\*\*\* | -.0178\*\*\* | -.0178\*\*\* | -.0179\*\*\* | |
|  | (.000403) | (.000413) | (.000522) | (.000543) | (.000568) | |
| *CLTV* | .00151\*\*\* | .00147\*\*\* | .00134\*\*\* | .00129\*\*\* | .00127\*\*\* | |
|  | (.000395) | (.000387) | (.000366) | (.000364) | (.000360) | |
| *LoanAge* | .0444\*\*\* | .0439\*\*\* | .0482\*\*\* | .0479\*\*\* | .0469\*\*\* | |
|  | (.00253) | (.00265) | (.00303) | (.00313) | (.00321) | |
| *LoanAge^2* | -.000232\*\*\* | -.000228\*\*\* | -.000254\*\*\* | -.000254\*\*\* | -.000249\*\*\* | |
|  | (.0000246) | (.0000255) | (.0000291) | (.0000298) | (.0000305) | |
| *RefiPenalty* | .877\*\*\* | .904\*\*\* | .997\*\*\* | .895\*\*\* | .763\*\*\* | |
|  | (.219) | (.230) | (.257) | (.265) | (.273) | |
| *InterestGap* | .375\*\*\* | .391\*\*\* | .315\*\*\* | .295\*\*\* | .293\*\*\* | |
|  | (.0477) | (.0485) | (.0609) | (.0614) | (.0648) | |
| *RelLoanSize* | .0308 | .0446 | -.0121 | -.00334 | -.0361 | |
|  | (.0576) | (.0604) | (.0725) | (.0746) | (.0786) | |
| *Unemployment* | .0547\*\*\* | .0591\*\*\* | .0435\*\*\* | .0464\*\*\* | .0465\*\*\* | |
|  | (.00812) | (.00834) | (.0103) | (.0106) | (.0109) | |
| *HPI* | -.0110\*\*\* | -.0119\*\*\* | -.0112\*\*\* | -.0102\*\*\* | -.00967\*\*\* | |
|  | (.00236) | (.00243) | (.00267) | (.00267) | (.00271) | |
| *Condo* | -.120\*\*\* | -.102\*\* | -.173\*\*\* | -.140\*\*\* | -.147\*\*\* | |
|  | (.0426) | (.0447) | (.0522) | (.0537) | (.0557) | |
|  | Probability of prepayment | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 | |
|  | (1) | (2) | (3) | (4) | (5) | |
| *Subsidiary* | -.0254 | -.0303\* | -.0830\*\*\* | -.0866\*\*\* | -.106\*\*\* | |
|  | (.0167) | (.0172) | (.0202) | (.0206) | (.0216) | |
| *Post* | .105\*\*\* | .0967\*\*\* | .0830\*\* | .0822\*\* | .116\*\*\* | |
|  | (.0292) | (.0332) | (.0355) | (.0365) | (.0387) | |
| *Subsidiary \* Post* | .0219 | .0462\*\* | .0946\*\*\* | .0921\*\*\* | .112\*\*\* | |
|  | (.0193) | (.0200) | (.0228) | (.0231) | (.0242) | |
| *FICO* | .00130\*\*\* | .00123\*\*\* | .00125\*\*\* | .00122\*\*\* | .00115\*\*\* | |
|  | (.000107) | (.000112) | (.000120) | (.000123) | (.000126) | |
| *CLTV* | -.0103\*\*\* | -.0105\*\*\* | -.0102\*\*\* | -.0103\*\*\* | -.0102\*\*\* | |
|  | (.000359) | (.000385) | (.000431) | (.000433) | (.000457) | |
| *LoanAge* | .0433\*\*\* | .0432\*\*\* | .0467\*\*\* | .0468\*\*\* | .0462\*\*\* | |
|  | (.000501) | (.000534) | (.000595) | (.000612) | (.000629) | |
| *LoanAge^2* | -.000276\*\*\* | -.000279\*\*\* | -.000304\*\*\* | -.000307\*\*\* | -.000304\*\*\* | |
|  | (4.21e-06) | (4.48e-06) | (5.03e-06) | (5.20e-06) | (5.32e-06) | |
| *RefiPenalty* | -1.600\*\*\* | -1.610\*\*\* | -1.522\*\*\* | -1.540\*\*\* | -1.544\*\*\* | |
|  | (.0472) | (.0502) | (.0528) | (.0539) | (.0557) | |
| *InterestGap* | .373\*\*\* | .369\*\*\* | .373\*\*\* | .376\*\*\* | .381\*\*\* | |
|  | (.0124) | (.0129) | (.0140) | (.0143) | (.0146) | |
| *RelLoanSize* | .388\*\*\* | .384\*\*\* | .384\*\*\* | .381\*\*\* | .380\*\*\* | |
|  | (.0118) | (.0126) | (.0134) | (.0136) | (.0139) | |
| *Unemployment* | -.0262\*\*\* | -.0282\*\*\* | -.0297\*\*\* | -.0302\*\*\* | -.0338\*\*\* | |
|  | (.00258) | (.00268) | (.00293) | (.00298) | (.00305) | |
| *HPI* | -.0113\*\*\* | -.0114\*\*\* | -.0129\*\*\* | -.0131\*\*\* | -.0133\*\*\* | |
|  | (.000556) | (.000574) | (.000606) | (.000613) | (.000617) | |
| *Condo* | -.102\*\*\* | -.0900\*\*\* | -.0934\*\*\* | -.0938\*\*\* | -.0948\*\*\* | |
|  | (.00981) | (.0105) | (.0111) | (.0114) | (.0117) | |
|  |  |  |  |  |  | |
| Observations | 2,546,937 | 2,269,753 | 1,976,463 | 1,890,188 | 1,790,327 | |
| Clusters | 64,768 | 58,070 | 50,806 | 48,785 | 46,118 | |
| Pseudo R2 | 0.056 | 0.055 | 0.055 | 0.055 | 0.054 | |

**Table A2**

Multinomial logit regressions based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only the first one, two, three, or four years of each mortgage’s performance observations. *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *CLTV* is the current loan balance divided by the current home value, where current home value is estimated as (1 + house price appreciation since origination) multiplied by the loan amount at origination divided by LTV at origination. House price appreciation for CLTV is measured by the CoreLogic Solutions county-level monthly house price index. *LoanAge* is the number of months since origination. *RefiPenalty* is the change in the PMMS rate since origination. *InterestGap* is the difference between the mortgage interest rate at origination and the PMMS rate for the origination month. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *Unemployment* is the monthly percentage change in the state-level unemployment rate. *HPI* is the percent change in quarterly FHFA state-level house price index since origination. *Condo* is an indicator variable equaling one if the property is a condominium or townhouse and equaling zero if the property is a single family residence. Each coefficient estimate represents the effect on the probability of default or prepayment, relative to the probability of the mortgage remaining current, of a one-unit change in the corresponding variable. Vintage year indicators and a constant term are included in each specification. Standard errors, clustered by loan, appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Probability of default | | | |
|  | One year | Two years | Three years | Four years |
|  | (1) | (2) | (3) | (4) |
| *Subsidiary* | .000768 | .0119 | .00287 | .00309 |
|  | (.0775) | (.0506) | (.0422) | (.0379) |
| *Post* | -.954 | -.870\*\* | -.819\*\*\* | -.583\*\*\* |
|  | (.749) | (.346) | (.277) | (.221) |
| *Subsidiary \* Post* | -.491\*\* | -.640\*\*\* | -.498\*\*\* | -.532\*\*\* |
|  | (.224) | (.131) | (.101) | (.0888) |
| *FICO* | -.0180\*\*\* | -.0175\*\*\* | -.0167\*\*\* | -.0162\*\*\* |
|  | (.000568) | (.000381) | (.000322) | (.000300) |
| *CLTV* | .00249\*\*\* | .00277\*\*\* | .00271\*\*\* | .00254\*\*\* |
|  | (.000445) | (.000526) | (.000532) | (.000540) |
| *LoanAge* | .682\*\*\* | .264\*\*\* | .171\*\*\* | .117\*\*\* |
|  | (.0406) | (.0126) | (.00686) | (.00443) |
| *LoanAge^2* | -.0356\*\*\* | -.00690\*\*\* | -.00324\*\*\* | -.00168\*\*\* |
|  | (.00299) | (.000469) | (.000180) | (.0000903) |
| *RefiPenalty* | -.920\* | -1.052\*\*\* | -.761\*\*\* | -.636\*\*\* |
|  | (.520) | (.286) | (.230) | (.205) |
| *InterestGap* | .657\*\*\* | .595\*\*\* | .562\*\*\* | .553\*\*\* |
|  | (.0423) | (.0339) | (.0306) | (.0298) |
| *RelLoanSize* | .227\*\* | .135\*\* | .105\*\* | .0823\* |
|  | (.0970) | (.0600) | (.0503) | (.0460) |
| *Unemployment* | -.00819 | .000382 | .0214\*\*\* | .0373\*\*\* |
|  | (.0167) | (.00939) | (.00711) | (.00602) |
| *HPI* | -.0241\*\* | -.00726\* | -.0112\*\*\* | -.0105\*\*\* |
|  | (.0116) | (.00403) | (.00254) | (.00196) |
| *Condo* | -.0386 | -.178\*\*\* | -.164\*\*\* | -.179\*\*\* |
|  | (.0763) | (.0482) | (.0393) | (.0352) |
|  | Probability of prepayment | | | |
|  | One year | Two years | Three years | Four years |
|  | (1) | (2) | (3) | (4) |
| *Subsidiary* | -.0379\*\* | -.0262\*\* | .00642 | .0125 |
|  | (.0178) | (.0114) | (.0101) | (.00963) |
| *Post* | -.00476 | .0228 | .173\*\*\* | .0929\*\*\* |
|  | (.157) | (.0863) | (.0477) | (.0357) |
| *Subsidiary \* Post* | .110\*\*\* | .0109 | -.0328\* | -.0305\*\* |
|  | (.0354) | (.0214) | (.0170) | (.0150) |
| *FICO* | .00237\*\*\* | .00108\*\*\* | .000777\*\*\* | .000630\*\*\* |
|  | (.000162) | (.000101) | (.0000862) | (.0000795) |
| *CLTV* | -.00909\*\*\* | -.00729\*\*\* | -.00777\*\*\* | -.00870\*\*\* |
|  | (.000642) | (.000410) | (.000324) | (.000283) |
| *LoanAge* | .453\*\*\* | .248\*\*\* | .160\*\*\* | .116\*\*\* |
|  | (.0104) | (.00331) | (.00177) | (.00119) |
| *LoanAge^2* | -.0206\*\*\* | -.00705\*\*\* | -.00331\*\*\* | -.00189\*\*\* |
|  | (.000712) | (.000117) | (.0000443) | (.0000234) |
| *RefiPenalty* | -5.033\*\*\* | -5.457\*\*\* | -4.651\*\*\* | -3.888\*\*\* |
|  | (.141) | (.0733) | (.0548) | (.0460) |
| *InterestGap* | .874\*\*\* | .706\*\*\* | .617\*\*\* | .572\*\*\* |
|  | (.0182) | (.0134) | (.0117) | (.0103) |
| *RelLoanSize* | .605\*\*\* | .539\*\*\* | .484\*\*\* | .458\*\*\* |
|  | (.0186) | (.0122) | (.0105) | (.00964) |
| *Unemployment* | .00363 | .00378 | -.00167 | -.00922\*\*\* |
|  | (.00505) | (.00308) | (.00245) | (.00213) |
| *HPI* | .0236\*\*\* | .00650\*\*\* | -.00390\*\*\* | -.00905\*\*\* |
|  | (.00270) | (.000991) | (.000567) | (.000414) |
| *Condo* | -.0202 | -.0455\*\*\* | -.0570\*\*\* | -.0609\*\*\* |
|  | (.0169) | (.0106) | (.00896) | (.00815) |
|  |  |  |  |  |
| Observations | 1,667,535 | 2,822,382 | 3,636,506 | 4,219,889 |
| Clusters | 136,494 | 136,494 | 136,494 | 136,494 |
| Pseudo R2 | 0.107 | 0.097 | 0.082 | 0.071 |

**Table A3**

Two-stage least squares regressions based on loan-level observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only mortgages originated by lenders that originated at least one mortgage before the policy change and at least one mortgage after the policy change. *InitialRate* is the mortgage interest rate at origination. *LTV* is the mortgage loan-to-value ratio at origination. *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *OwnerOcc* equals 1 if the mortgage is associated with an owner-occupied property, 0 otherwise. *Term30* equals 1 if the mortgage has a thirty-year maturity and equals 0 if the mortgage has a fifteen-year maturity. *Prime* is the monthly average bank prime lending rate at the time of origination from the Federal Reserve. *CensusAge15-34* is the percentage of residents in the borrower’s census tract between the ages of 15 and 34 years old. *CensusAge35-54*, *CensusAge55-69*, and *CensusAge70plus* are defined similarly for other age ranges. *Value$1-$2* is the percentage of owner-occupied residences in the borrower’s census tract valued between $100,000 and $200,000. *Value$2-$3*, *Value$3-$5*, and *Value$5plus* are defined similarly for other price ranges. Vintage year indicators and a constant term are included in each specification. Standard errors appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Dependent variable: *InitialRate* | | |  | Dependent variable: *LTV* | | |
|  |  | (1) | (2) | (3) |  | (4) | (5) | (6) |
| *Subsidiary* |  |  | -.00265 | -.00155 |  |  | -1.566\*\*\* | -1.361\*\*\* |
|  |  |  | (.00342) | (.00424) |  |  | (.130) | (.160) |
| *Post* |  |  | .0459\*\*\* | .0468\*\*\* |  |  | -1.299\*\* | -1.125\*\* |
|  |  |  | (.0146) | (.0148) |  |  | (.550) | (.556) |
| *Subsidiary \* Post* |  |  |  | -.00308 |  |  |  | -.577\*\* |
|  |  |  |  | (.00708) |  |  |  | (.266) |
| *LTV* |  | .0133\*\*\* | .0133\*\*\* | .0133\*\*\* |  |  |  |  |
|  |  | (.000396) | (.000395) | (.000395) |  |  |  |  |
| *InitialRate* |  |  |  |  |  | -5.598\*\*\* | -5.250\*\*\* | -5.294\*\*\* |
|  |  |  |  |  |  | (1.232) | (1.223) | (1.224) |
| *FICO* |  | -.00128\*\*\* | -.00127\*\*\* | -.00127\*\*\* |  | -.0755\*\*\* | -.0746\*\*\* | -.0746\*\*\* |
|  |  | (.0000446) | (.0000445) | (.0000445) |  | (.00283) | (.00281) | (.00281) |
| *RelLoanSize* |  | -.210\*\*\* | -.210\*\*\* | -.210\*\*\* |  | 8.161\*\*\* | 8.192\*\*\* | 8.198\*\*\* |
|  |  | (.00482) | (.00482) | (.00482) |  | (.204) | (.203) | (.203) |
| *OwnerOcc* |  | -.274\*\*\* | -.274\*\*\* | -.274\*\*\* |  | -.273 | -.217 | -.229 |
|  |  | (.00452) | (.00452) | (.00452) |  | (.355) | (.353) | (.353) |
| *Term30* |  | .516\*\*\* | .516\*\*\* | .516\*\*\* |  | 16.71\*\*\* | 16.44\*\*\* | 16.45\*\*\* |
|  |  | (.00932) | (.00931) | (.00930) |  | (.902) | (.895) | (.895) |
| *Prime* |  | .139\*\*\* | .139\*\*\* | .139\*\*\* |  |  |  |  |
|  |  | (.00425) | (.00426) | (.00426) |  |  |  |  |
| *CensusAge15-34* |  |  |  |  |  | .105\*\*\* | .104\*\*\* | .104\*\*\* |
|  |  |  |  |  |  | (.0144) | (.0143) | (.0143) |
| *CensusAge35-54* |  |  |  |  |  | .104\*\*\* | .104\*\*\* | .104\*\*\* |
|  |  |  |  |  |  | (.0251) | (.0250) | (.0250) |
| *CensusAge55-69* |  |  |  |  |  | -.130\*\*\* | -.130\*\*\* | -.130\*\*\* |
|  |  |  |  |  |  | (.0188) | (.0187) | (.0187) |
| *CensusAge70plus* |  |  |  |  |  | -.0679\*\*\* | -.0681\*\*\* | -.0682\*\*\* |
|  |  |  |  |  |  | (.0180) | (.0180) | (.0180) |
| *Value$1-$2* |  |  |  |  |  | -.0706\*\*\* | -.0681\*\*\* | -.0682\*\*\* |
|  |  |  |  |  |  | (.00948) | (.00943) | (.00944) |
| *Value$2-$3* |  |  |  |  |  | -.152\*\*\* | -.152\*\*\* | -.152\*\*\* |
|  |  |  |  |  |  | (.00891) | (.00888) | (.00888) |
| *Value$3-$5* |  |  |  |  |  | -.132\*\*\* | -.131\*\*\* | -.131\*\*\* |
|  |  |  |  |  |  | (.00937) | (.00933) | (.00933) |
| *Value$5plus* |  |  |  |  |  | -.267\*\*\* | -.266\*\*\* | -.266\*\*\* |
|  |  |  |  |  |  | (.00911) | (.00907) | (.00907) |
|  |  |  |  |  |  |  |  |  |
| Observations |  | 89,249 | 89,249 | 89,249 |  | 89,249 | 89,249 | 89,249 |
| R2 |  | 0.802 | 0.802 | 0.802 |  | 0.095 | 0.1 | 0.099 |

**Table A4**

Two-stage least squares regressions based on loan-level observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only mortgages originated by lenders that originated at least one mortgage in each of the ranges of years listed. *InitialRate* is the mortgage interest rate at origination. *LTV* is the mortgage loan-to-value ratio at origination. *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *OwnerOcc* equals 1 if the mortgage is associated with an owner-occupied property, 0 otherwise. *Term30* equals 1 if the mortgage has a thirty-year maturity and equals 0 if the mortgage has a fifteen-year maturity. *Prime* is the monthly average bank prime lending rate at the time of origination from the Federal Reserve. *CensusAge15-34* is the percentage of residents in the borrower’s census tract between the ages of 15 and 34 years old. *CensusAge35-54*, *CensusAge55-69*, and *CensusAge70plus* are defined similarly for other age ranges. *Value$1-$2* is the percentage of owner-occupied residences in the borrower’s census tract valued between $100,000 and $200,000. *Value$2-$3*, *Value$3-$5*, and *Value$5plus* are defined similarly for other price ranges. Vintage year indicators and a constant term are included in each specification. Standard errors appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Dependent variable: *InitialRate* | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 |
|  | (1) | (2) | (3) | (4) | (5) |
| *Subsidiary* | -.0740\*\*\* | -.0657\*\*\* | -.0681\*\*\* | -.0744\*\*\* | -.103\*\*\* |
|  | (.00657) | (.00642) | (.00775) | (.00794) | (.00835) |
| *Post* | .0237 | .0398\*\* | .0584\*\*\* | .0553\*\*\* | .0549\*\*\* |
|  | (.0153) | (.0166) | (.0176) | (.0182) | (.0193) |
| *Subsidiary \* Post* | .0772\*\*\* | .0752\*\*\* | .0732\*\*\* | .0801\*\*\* | .107\*\*\* |
|  | (.00877) | (.00866) | (.00974) | (.00997) | (.0104) |
| *LTV* | .0123\*\*\* | .0132\*\*\* | .0136\*\*\* | .0135\*\*\* | .0135\*\*\* |
|  | (.000483) | (.000476) | (.000525) | (.000533) | (.000550) |
| *FICO* | -.00154\*\*\* | -.00153\*\*\* | -.00131\*\*\* | -.00139\*\*\* | -.00138\*\*\* |
|  | (.0000548) | (.0000543) | (.0000592) | (.0000597) | (.0000617) |
| *RelLoanSize* | -.184\*\*\* | -.196\*\*\* | -.188\*\*\* | -.186\*\*\* | -.189\*\*\* |
|  | (.00574) | (.00578) | (.00617) | (.00627) | (.00651) |
| *OwnerOcc* | -.257\*\*\* | -.261\*\*\* | -.252\*\*\* | -.251\*\*\* | -.248\*\*\* |
|  | (.00571) | (.00567) | (.00611) | (.00620) | (.00636) |
| *Term30* | .539\*\*\* | .528\*\*\* | .541\*\*\* | .550\*\*\* | .549\*\*\* |
|  | (.0111) | (.0109) | (.0119) | (.0121) | (.0125) |
| *Prime* | .151\*\*\* | .151\*\*\* | .163\*\*\* | .163\*\*\* | .170\*\*\* |
|  | (.00574) | (.00559) | (.00621) | (.00633) | (.00653) |
|  |  |  |  |  |  |
| Observations | 59,164 | 53,120 | 45,968 | 44,178 | 41,704 |
| R2 | 0.803 | 0.831 | 0.838 | 0.84 | 0.842 |
|  | Dependent variable: *LTV* | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 |
|  | (1) | (2) | (3) | (4) | (5) |
| *Subsidiary* | -2.499\*\*\* | -3.136\*\*\* | -3.119\*\*\* | -3.049\*\*\* | -2.852\*\*\* |
|  | (.305) | (.220) | (.265) | (.275) | (.297) |
| *Post* | -1.885\*\*\* | -2.684\*\*\* | -2.658\*\*\* | -2.353\*\*\* | -2.609\*\*\* |
|  | (.641) | (.515) | (.553) | (.574) | (.606) |
| *Subsidiary \* Post* | .563 | 1.338\*\*\* | 1.356\*\*\* | 1.470\*\*\* | 1.164\*\*\* |
|  | (.382) | (.282) | (.319) | (.329) | (.350) |
| *InitialRate* | -3.732\*\* | -4.066\*\*\* | -5.171\*\*\* | -5.207\*\*\* | -4.956\*\*\* |
|  | (1.653) | (1.201) | (1.269) | (1.292) | (1.262) |
| *FICO* | -.0712\*\*\* | -.0732\*\*\* | -.0746\*\*\* | -.0734\*\*\* | -.0738\*\*\* |
|  | (.00405) | (.00302) | (.00299) | (.00310) | (.00306) |
| *RelLoanSize* | 8.411\*\*\* | 8.688\*\*\* | 8.495\*\*\* | 8.493\*\*\* | 8.616\*\*\* |
|  | (.257) | (.190) | (.201) | (.205) | (.210) |
| *OwnerOcc* | .617 | .722\*\* | .694\*\* | .611\* | .544 |
|  | (.450) | (.329) | (.341) | (.348) | (.344) |
| *Term30* | 15.68\*\*\* | 15.74\*\*\* | 16.93\*\*\* | 16.84\*\*\* | 16.60\*\*\* |
|  | (1.226) | (.892) | (.972) | (.995) | (.976) |
| *CensusAge15-34* | .0972\*\*\* | .0967\*\*\* | .0939\*\*\* | .0937\*\*\* | .0979\*\*\* |
|  | (.0189) | (.0139) | (.0151) | (.0154) | (.0158) |
| *CensusAge35-54* | .131\*\*\* | .0968\*\*\* | .0942\*\*\* | .0955\*\*\* | .0887\*\*\* |
|  | (.0333) | (.0245) | (.0269) | (.0275) | (.0283) |
| *CensusAge55-69* | -.120\*\*\* | -.116\*\*\* | -.117\*\*\* | -.119\*\*\* | -.125\*\*\* |
|  | (.0244) | (.0179) | (.0193) | (.0197) | (.0202) |
| *CensusAge70plus* | -.0618\*\* | -.0721\*\*\* | -.0654\*\*\* | -.0659\*\*\* | -.0626\*\*\* |
|  | (.0242) | (.0178) | (.0195) | (.0199) | (.0204) |
| *Value$1-$2* | -.0662\*\*\* | -.0624\*\*\* | -.0737\*\*\* | -.0764\*\*\* | -.0768\*\*\* |
|  | (.0149) | (.0108) | (.0122) | (.0124) | (.0125) |
| *Value$2-$3* | -.153\*\*\* | -.150\*\*\* | -.156\*\*\* | -.160\*\*\* | -.161\*\*\* |
|  | (.0145) | (.0106) | (.0117) | (.0119) | (.0120) |
| *Value$3-$5* | -.119\*\*\* | -.124\*\*\* | -.136\*\*\* | -.139\*\*\* | -.138\*\*\* |
|  | (.0152) | (.0111) | (.0124) | (.0127) | (.0127) |
| *Value$5plus* | -.260\*\*\* | -.260\*\*\* | -.265\*\*\* | -.268\*\*\* | -.266\*\*\* |
|  | (.0145) | (.0106) | (.0119) | (.0122) | (.0121) |
|  |  |  |  |  |  |
| Observations | 59,164 | 53,120 | 45,968 | 44,178 | 41,704 |
| R2 | 0.097 | 0.182 | 0.157 | 0.151 | 0.157 |

**Table A5**

Multinomial logit regressions based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only prime mortgages (defined as those originated to borrowers with a FICO score greater than 660). The sample is restricted to only mortgages originated by lenders that originated at least one mortgage before the policy change and at least one mortgage after the policy change (as in Table 5). *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *CLTV* is the current loan balance divided by the current home value, where current home value is estimated as (1 + house price appreciation since origination) multiplied by the loan amount at origination divided by LTV at origination. House price appreciation for *CLTV* is measured by the CoreLogic Solutions county-level monthly house price index. *LoanAge* is the number of months since origination. *RefiPenalty* is the change in the PMMS rate since origination. *InterestGap* is the difference between the mortgage interest rate at origination and the PMMS rate for the origination month. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *Unemployment* is the monthly percentage change in the state-level unemployment rate. *HPI* is the percent change in quarterly FHFA state-level house price index since origination. *Condo* is an indicator variable equaling one if the property is a condominium or townhouse and equaling zero if the property is a single family residence. Each coefficient estimate represents the effect on the probability of default or prepayment, relative to the probability of the mortgage remaining current, of a one-unit change in the corresponding variable. Vintage year indicators and a constant term are included in each specification. Standard errors, clustered by loan, appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Probability of default | | |  | Probability of prepayment | | |
|  |  | (1) | (2) | (3) |  | (4) | (5) | (6) |
| *Subsidiary* |  |  | -.00929 | .0838\* |  |  | -.0235\*\*\* | -.0303\*\* |
|  |  |  | (.0406) | (.0467) |  |  | (.00768) | (.0121) |
| *Post* |  |  | -.603\*\*\* | -.482\*\* |  |  | .0867\*\*\* | .0824\*\*\* |
|  |  |  | (.219) | (.220) |  |  | (.0266) | (.0269) |
| *Subsidiary \* Post* |  |  |  | -.448\*\*\* |  |  |  | .0149 |
|  |  |  |  | (.0964) |  |  |  | (.0149) |
| *FICO* |  | -.0175\*\*\* | -.0175\*\*\* | -.0174\*\*\* |  | .000913\*\*\* | .000907\*\*\* | .000904\*\*\* |
|  |  | (.000479) | (.000479) | (.000479) |  | (.000102) | (.000102) | (.000102) |
| *CLTV* |  | .00153\*\*\* | .00153\*\*\* | .00154\*\*\* |  | -.00967\*\*\* | -.00969\*\*\* | -.00968\*\*\* |
|  |  | (.000398) | (.000397) | (.000397) |  | (.000298) | (.000298) | (.000298) |
| *LoanAge* |  | .0465\*\*\* | .0465\*\*\* | .0465\*\*\* |  | .0362\*\*\* | .0362\*\*\* | .0362\*\*\* |
|  |  | (.00240) | (.00240) | (.00241) |  | (.000396) | (.000397) | (.000397) |
| *LoanAge^2* |  | -.000225\*\*\* | -.000225\*\*\* | -.000225\*\*\* |  | -.000226\*\*\* | -.000226\*\*\* | -.000226\*\*\* |
|  |  | (.0000208) | (.0000208) | (.0000208) |  | (3.09e-06) | (3.09e-06) | (3.09e-06) |
| *RefiPenalty* |  | .357 | .348 | .335 |  | -1.520\*\*\* | -1.519\*\*\* | -1.519\*\*\* |
|  |  | (.228) | (.228) | (.228) |  | (.0410) | (.0410) | (.0410) |
| *InterestGap* |  | .713\*\*\* | .716\*\*\* | .722\*\*\* |  | .398\*\*\* | .396\*\*\* | .396\*\*\* |
|  |  | (.0417) | (.0421) | (.0422) |  | (.0106) | (.0106) | (.0106) |
| *RelLoanSize* |  | .113\*\* | .112\*\* | .120\*\* |  | .390\*\*\* | .390\*\*\* | .389\*\*\* |
|  |  | (.0524) | (.0525) | (.0525) |  | (.0102) | (.0102) | (.0102) |
| *Unemployment* |  | .0673\*\*\* | .0670\*\*\* | .0670\*\*\* |  | -.0291\*\*\* | -.0290\*\*\* | -.0290\*\*\* |
|  |  | (.00819) | (.00818) | (.00819) |  | (.00207) | (.00207) | (.00207) |
| *HPI* |  | -.0158\*\*\* | -.0155\*\*\* | -.0155\*\*\* |  | -.0114\*\*\* | -.0114\*\*\* | -.0114\*\*\* |
|  |  | (.00239) | (.00238) | (.00238) |  | (.000417) | (.000417) | (.000417) |
| *Condo* |  | -.162\*\*\* | -.161\*\*\* | -.159\*\*\* |  | -.0838\*\*\* | -.0851\*\*\* | -.0848\*\*\* |
|  |  | (.0414) | (.0415) | (.0413) |  | (.00823) | (.00824) | (.00825) |
|  |  |  |  |  |  |  |  |  |
| Observations |  | 3,543,285 | 3,543,285 | 3,543,285 |  | 3,543,285 | 3,543,285 | 3,543,285 |
| Loans |  | 87,917 | 87,917 | 87,917 |  | 87,917 | 87,917 | 87,917 |
| Pseudo R2 |  | 0.047 | 0.047 | 0.047 |  | 0.047 | 0.047 | 0.047 |

**Table A6**

Multinomial logit regressions based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only prime mortgages (defined as those originated to borrowers with a FICO score greater than 660). The sample is restricted to only mortgages originated by lenders that originated at least one mortgage in each of the ranges of years listed (as in Table A1). *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *CLTV* is the current loan balance divided by the current home value, where current home value is estimated as (1 + house price appreciation since origination) multiplied by the loan amount at origination divided by LTV at origination. House price appreciation for *CLTV* is measured by the CoreLogic Solutions county-level monthly house price index. *LoanAge* is the number of months since origination. *RefiPenalty* is the change in the PMMS rate since origination. *InterestGap* is the difference between the mortgage interest rate at origination and the PMMS rate for the origination month. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *Unemployment* is the monthly percentage change in the state-level unemployment rate. *HPI* is the percent change in quarterly FHFA state-level house price index since origination. *Condo* is an indicator variable equaling one if the property is a condominium or townhouse and equaling zero if the property is a single family residence. Each coefficient estimate represents the effect on the probability of default or prepayment, relative to the probability of the mortgage remaining current, of a one-unit change in the corresponding variable. Vintage year indicators and a constant term are included in each specification. Standard errors, clustered by loan, appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Probability of default | | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 | |
|  | (1) | (2) | (3) | (4) | (5) | |
| *Subsidiary* | .119\* | .136\*\* | .0338 | .00988 | -.00597 | |
|  | (.0632) | (.0649) | (.0845) | (.0876) | (.0945) | |
| *Post* | -.509\*\* | -.422 | -.360 | -.315 | -.448 | |
|  | (.230) | (.263) | (.266) | (.267) | (.302) | |
| *Subsidiary \* Post* | -.489\*\*\* | -.502\*\*\* | -.390\*\*\* | -.339\*\* | -.363\*\* | |
|  | (.111) | (.117) | (.130) | (.133) | (.141) | |
| *FICO* | -.0191\*\*\* | -.0189\*\*\* | -.0209\*\*\* | -.0210\*\*\* | -.0211\*\*\* | |
|  | (.000620) | (.000650) | (.000763) | (.000782) | (.000819) | |
| *CLTV* | .00137\*\*\* | .00133\*\*\* | .00119\*\*\* | .00115\*\*\* | .00113\*\*\* | |
|  | (.000367) | (.000363) | (.000352) | (.000351) | (.000348) | |
| *LoanAge* | .0479\*\*\* | .0473\*\*\* | .0541\*\*\* | .0542\*\*\* | .0530\*\*\* | |
|  | (.00307) | (.00323) | (.00373) | (.00385) | (.00393) | |
| *LoanAge^2* | -.000228\*\*\* | -.000225\*\*\* | -.000260\*\*\* | -.000260\*\*\* | -.000252\*\*\* | |
|  | (.0000283) | (.0000297) | (.0000347) | (.0000356) | (.0000360) | |
| *RefiPenalty* | .929\*\*\* | .945\*\*\* | 1.235\*\*\* | 1.192\*\*\* | 1.101\*\*\* | |
|  | (.274) | (.287) | (.322) | (.330) | (.341) | |
| *InterestGap* | .596\*\*\* | .608\*\*\* | .506\*\*\* | .489\*\*\* | .459\*\*\* | |
|  | (.0524) | (.0542) | (.0591) | (.0600) | (.0620) | |
| *RelLoanSize* | .0867 | .106 | .0354 | .0516 | -.0124 | |
|  | (.0664) | (.0695) | (.0820) | (.0850) | (.0902) | |
| *Unemployment* | .0612\*\*\* | .0654\*\*\* | .0406\*\*\* | .0472\*\*\* | .0487\*\*\* | |
|  | (.0111) | (.0114) | (.0145) | (.0149) | (.0155) | |
| *HPI* | -.0126\*\*\* | -.0143\*\*\* | -.0148\*\*\* | -.0141\*\*\* | -.0136\*\*\* | |
|  | (.00315) | (.00329) | (.00363) | (.00368) | (.00374) | |
| *Condo* | -.149\*\*\* | -.117\*\* | -.208\*\*\* | -.182\*\*\* | -.214\*\*\* | |
|  | (.0533) | (.0557) | (.0649) | (.0666) | (.0700) | |
|  | Probability of prepayment | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 | |
|  | (1) | (2) | (3) | (4) | (5) | |
| *Subsidiary* | -.0241 | -.0300\* | -.0836\*\*\* | -.0865\*\*\* | -.107\*\*\* | |
|  | (.0175) | (.0181) | (.0212) | (.0215) | (.0226) | |
| *Post* | .113\*\*\* | .0996\*\*\* | .0831\*\* | .0833\*\* | .117\*\*\* | |
|  | (.0299) | (.0339) | (.0362) | (.0373) | (.0395) | |
| *Subsidiary \* Post* | .00831 | .0343 | .0841\*\*\* | .0825\*\*\* | .102\*\*\* | |
|  | (.0201) | (.0208) | (.0237) | (.0241) | (.0252) | |
| *FICO* | .00143\*\*\* | .00140\*\*\* | .00132\*\*\* | .00131\*\*\* | .00126\*\*\* | |
|  | (.000125) | (.000132) | (.000141) | (.000143) | (.000148) | |
| *CLTV* | -.00948\*\*\* | -.00967\*\*\* | -.00938\*\*\* | -.00948\*\*\* | -.00932\*\*\* | |
|  | (.000373) | (.000401) | (.000447) | (.000450) | (.000475) | |
| *LoanAge* | .0457\*\*\* | .0458\*\*\* | .0493\*\*\* | .0494\*\*\* | .0490\*\*\* | |
|  | (.000522) | (.000558) | (.000620) | (.000639) | (.000657) | |
| *LoanAge^2* | -.000287\*\*\* | -.000292\*\*\* | -.000317\*\*\* | -.000320\*\*\* | -.000318\*\*\* | |
|  | (4.38e-06) | (4.68e-06) | (5.24e-06) | (5.42e-06) | (5.55e-06) | |
| *RefiPenalty* | -1.649\*\*\* | -1.661\*\*\* | -1.581\*\*\* | -1.599\*\*\* | -1.606\*\*\* | |
|  | (.0481) | (.0511) | (.0539) | (.0550) | (.0568) | |
| *InterestGap* | .356\*\*\* | .352\*\*\* | .360\*\*\* | .365\*\*\* | .368\*\*\* | |
|  | (.0130) | (.0136) | (.0148) | (.0151) | (.0155) | |
| *RelLoanSize* | .381\*\*\* | .378\*\*\* | .374\*\*\* | .371\*\*\* | .370\*\*\* | |
|  | (.0121) | (.0129) | (.0137) | (.0139) | (.0142) | |
| *Unemployment* | -.0192\*\*\* | -.0214\*\*\* | -.0225\*\*\* | -.0229\*\*\* | -.0269\*\*\* | |
|  | (.00269) | (.00280) | (.00305) | (.00310) | (.00318) | |
| *HPI* | -.0129\*\*\* | -.0131\*\*\* | -.0147\*\*\* | -.0149\*\*\* | -.0151\*\*\* | |
|  | (.000589) | (.000609) | (.000643) | (.000651) | (.000656) | |
| *Condo* | -.111\*\*\* | -.0988\*\*\* | -.103\*\*\* | -.104\*\*\* | -.105\*\*\* | |
|  | (.0100) | (.0107) | (.0114) | (.0116) | (.0120) | |
|  |  |  |  |  |  | |
| Observations | 2,371,446 | 2,108,278 | 1,843,444 | 1,764,947 | 1,669,246 | |
| Clusters | 59,950 | 53,646 | 47,205 | 45,385 | 42,818 | |
| Pseudo R2 | 0.054 | 0.054 | 0.053 | 0.053 | 0.052 | |

**Table A7**

Multinomial logit regressions based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only prime mortgages (defined as those originated to borrowers with a FICO score greater than 660). The sample is restricted to only the first one, two, three, or four years of each mortgage’s performance (as in Table A2). *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *CLTV* is the current loan balance divided by the current home value, where current home value is estimated as (1 + house price appreciation since origination) multiplied by the loan amount at origination divided by LTV at origination. House price appreciation for *CLTV* is measured by the CoreLogic Solutions county-level monthly house price index. *LoanAge* is the number of months since origination. *RefiPenalty* is the change in the PMMS rate since origination. *InterestGap* is the difference between the mortgage interest rate at origination and the PMMS rate for the origination month. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *Unemployment* is the monthly percentage change in the state-level unemployment rate. *HPI* is the percent change in quarterly FHFA state-level house price index since origination. *Condo* is an indicator variable equaling one if the property is a condominium or townhouse and equaling zero if the property is a single family residence. Each coefficient estimate represents the effect on the probability of default or prepayment, relative to the probability of the mortgage remaining current, of a one-unit change in the corresponding variable. Vintage year indicators and a constant term are included in each specification. Standard errors, clustered by loan, appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Probability of default | | | |
|  | One year | Two years | Three years | Four years |
|  | (1) | (2) | (3) | (4) |
| *Subsidiary* | .172 | .0925 | .0949\* | .0779 |
|  | (.128) | (.0735) | (.0569) | (.0489) |
| *Post* | -.526 | -.639 | -.732\* | -.648\*\* |
|  | (1.102) | (.482) | (.379) | (.324) |
| *Subsidiary \* Post* | -.694\*\* | -.600\*\*\* | -.452\*\*\* | -.478\*\*\* |
|  | (.305) | (.170) | (.129) | (.111) |
| *FICO* | -.0220\*\*\* | -.0208\*\*\* | -.0199\*\*\* | -.0194\*\*\* |
|  | (.00151) | (.000832) | (.000618) | (.000528) |
| *CLTV* | .00242\*\*\* | .00266\*\*\* | .00262\*\*\* | .00243\*\*\* |
|  | (.000408) | (.000433) | (.000446) | (.000465) |
| *LoanAge* | .644\*\*\* | .256\*\*\* | .176\*\*\* | .126\*\*\* |
|  | (.0632) | (.0196) | (.0103) | (.00637) |
| *LoanAge^2* | -.0325\*\*\* | -.00623\*\*\* | -.00309\*\*\* | -.00167\*\*\* |
|  | (.00467) | (.000704) | (.000256) | (.000125) |
| *RefiPenalty* | -1.383\* | -1.735\*\*\* | -1.189\*\*\* | -.950\*\*\* |
|  | (.771) | (.405) | (.315) | (.273) |
| *InterestGap* | 1.087\*\*\* | 1.011\*\*\* | .910\*\*\* | .869\*\*\* |
|  | (.124) | (.0782) | (.0537) | (.0457) |
| *RelLoanSize* | .345\*\* | .216\*\* | .162\*\* | .135\*\* |
|  | (.142) | (.0839) | (.0650) | (.0575) |
| *Unemployment* | .0199 | .0158 | .0372\*\*\* | .0523\*\*\* |
|  | (.0242) | (.0137) | (.0101) | (.00833) |
| *HPI* | -.00219 | -.00878 | -.0152\*\*\* | -.0120\*\*\* |
|  | (.0191) | (.00632) | (.00378) | (.00286) |
| *Condo* | .103 | -.161\*\* | -.166\*\*\* | -.184\*\*\* |
|  | (.114) | (.0668) | (.0517) | (.0446) |
|  | Probability of prepayment | | | |
|  | One year | Two years | Three years | Four years |
|  | (1) | (2) | (3) | (4) |
| *Subsidiary* | -.0481\*\* | -.0264\*\* | .0119 | .0164 |
|  | (.0192) | (.0122) | (.0109) | (.0103) |
| *Post* | -.0250 | .0118 | .172\*\*\* | .0987\*\*\* |
|  | (.158) | (.0867) | (.0482) | (.0364) |
| *Subsidiary \* Post* | .106\*\*\* | -.00100 | -.0497\*\*\* | -.0462\*\*\* |
|  | (.0364) | (.0220) | (.0177) | (.0156) |
| *FICO* | .00271\*\*\* | .00113\*\*\* | .000781\*\*\* | .000618\*\*\* |
|  | (.000214) | (.000132) | (.000111) | (.000101) |
| *CLTV* | -.0101\*\*\* | -.00782\*\*\* | -.00793\*\*\* | -.00857\*\*\* |
|  | (.000654) | (.000415) | (.000331) | (.000291) |
| *LoanAge* | .452\*\*\* | .241\*\*\* | .158\*\*\* | .116\*\*\* |
|  | (.0110) | (.00347) | (.00185) | (.00124) |
| *LoanAge^2* | -.0207\*\*\* | -.00676\*\*\* | -.00320\*\*\* | -.00184\*\*\* |
|  | (.000753) | (.000123) | (.0000462) | (.0000243) |
| *RefiPenalty* | -5.359\*\*\* | -5.678\*\*\* | -4.779\*\*\* | -3.974\*\*\* |
|  | (.152) | (.0768) | (.0567) | (.0475) |
| *InterestGap* | 1.001\*\*\* | .790\*\*\* | .671\*\*\* | .609\*\*\* |
|  | (.0201) | (.0122) | (.0105) | (.00974) |
| *RelLoanSize* | .629\*\*\* | .552\*\*\* | .495\*\*\* | .465\*\*\* |
|  | (.0196) | (.0128) | (.0109) | (.0100) |
| *Unemployment* | .00287 | .00638\* | .00281 | -.00302 |
|  | (.00534) | (.00327) | (.00261) | (.00226) |
| *HPI* | .0226\*\*\* | .00471\*\*\* | -.00602\*\*\* | -.0108\*\*\* |
|  | (.00290) | (.00106) | (.000599) | (.000437) |
| *Condo* | -.0462\*\*\* | -.0660\*\*\* | -.0741\*\*\* | -.0755\*\*\* |
|  | (.0179) | (.0111) | (.00937) | (.00849) |
|  |  |  |  |  |
| Observations | 1,504,889 | 2,561,652 | 3,312,983 | 3,853,779 |
| Clusters | 122,681 | 122,681 | 122,681 | 122,681 |
| Pseudo R2 | 0.105 | 0.095 | 0.079 | 0.069 |

**Table A8**

Multinomial logit regressions based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only subprime mortgages (defined as those originated to borrowers with a FICO score of 660 or less). The sample is restricted to only mortgages originated by lenders that originated at least one mortgage before the policy change and at least one mortgage after the policy change (as in Table 5). *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *CLTV* is the current loan balance divided by the current home value, where current home value is estimated as (1 + house price appreciation since origination) multiplied by the loan amount at origination divided by LTV at origination. House price appreciation for *CLTV* is measured by the CoreLogic Solutions county-level monthly house price index. *LoanAge* is the number of months since origination. *RefiPenalty* is the change in the PMMS rate since origination. *InterestGap* is the difference between the mortgage interest rate at origination and the PMMS rate for the origination month. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *Unemployment* is the monthly percentage change in the state-level unemployment rate. *HPI* is the percent change in quarterly FHFA state-level house price index since origination. *Condo* is an indicator variable equaling one if the property is a condominium or townhouse and equaling zero if the property is a single family residence. Each coefficient estimate represents the effect on the probability of default or prepayment, relative to the probability of the mortgage remaining current, of a one-unit change in the corresponding variable. Vintage year indicators and a constant term are included in each specification. Standard errors, clustered by loan, appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Probability of default | | |  | Probability of prepayment | | |
|  |  | (1) | (2) | (3) |  | (4) | (5) | (6) |
| *Subsidiary* |  |  | -.0556 | -.0356 |  |  | .0603\* | .0337 |
|  |  |  | (.0490) | (.0533) |  |  | (.0319) | (.0349) |
| *Post* |  |  | -.465 | -.433 |  |  | .215 | .165 |
|  |  |  | (.297) | (.298) |  |  | (.161) | (.158) |
| *Subsidiary \* Post* |  |  |  | -.133 |  |  |  | .235\*\*\* |
|  |  |  |  | (.134) |  |  |  | (.0712) |
| *FICO* |  | -.00947\*\*\* | -.00943\*\*\* | -.00942\*\*\* |  | .000664 | .000587 | .000602 |
|  |  | (.000882) | (.000885) | (.000884) |  | (.000592) | (.000591) | (.000591) |
| *CLTV* |  | .0133\*\*\* | .0132\*\*\* | .0132\*\*\* |  | -.0156\*\*\* | -.0155\*\*\* | -.0153\*\*\* |
|  |  | (.00416) | (.00412) | (.00410) |  | (.00109) | (.00109) | (.00109) |
| *LoanAge* |  | .0323\*\*\* | .0324\*\*\* | .0323\*\*\* |  | .0116\*\*\* | .0116\*\*\* | .0116\*\*\* |
|  |  | (.00354) | (.00354) | (.00354) |  | (.00155) | (.00154) | (.00154) |
| *LoanAge^2* |  | -.000195\*\*\* | -.000196\*\*\* | -.000196\*\*\* |  | -.0000921\*\*\* | -.0000918\*\*\* | -.0000917\*\*\* |
|  |  | (.0000374) | (.0000375) | (.0000374) |  | (.0000106) | (.0000106) | (.0000106) |
| *RefiPenalty* |  | .397 | .400 | .388 |  | -1.215\*\*\* | -1.220\*\*\* | -1.208\*\*\* |
|  |  | (.291) | (.291) | (.292) |  | (.203) | (.203) | (.203) |
| *InterestGap* |  | .406\*\*\* | .403\*\*\* | .405\*\*\* |  | .404\*\*\* | .408\*\*\* | .404\*\*\* |
|  |  | (.0509) | (.0509) | (.0511) |  | (.0276) | (.0276) | (.0277) |
| *RelLoanSize* |  | .173\*\* | .176\*\* | .177\*\* |  | .318\*\*\* | .317\*\*\* | .315\*\*\* |
|  |  | (.0798) | (.0799) | (.0800) |  | (.0472) | (.0472) | (.0472) |
| *Unemployment* |  | .0532\*\*\* | .0531\*\*\* | .0532\*\*\* |  | -.0695\*\*\* | -.0696\*\*\* | -.0697\*\*\* |
|  |  | (.00922) | (.00921) | (.00921) |  | (.00712) | (.00711) | (.00711) |
| *HPI* |  | .00516 | .00516 | .00517 |  | -.000386 | -.000338 | -.000304 |
|  |  | (.00364) | (.00361) | (.00360) |  | (.00138) | (.00138) | (.00138) |
| *Condo* |  | -.0120 | -.0152 | -.0136 |  | -.0671\* | -.0619\* | -.0635\* |
|  |  | (.0529) | (.0532) | (.0532) |  | (.0358) | (.0358) | (.0358) |
|  |  |  |  |  |  |  |  |  |
| Observations |  | 300,200 | 300,200 | 300,200 |  | 300,200 | 300,200 | 300,200 |
| Loans |  | 8,494 | 8,494 | 8,494 |  | 8,494 | 8,494 | 8,494 |
| Pseudo R2 |  | 0.043 | 0.044 | 0.044 |  | 0.043 | 0.044 | 0.044 |

**Table A9**

Multinomial logit regressions based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only subprime mortgages (defined as those originated to borrowers with a FICO score of 660 or less). The sample is restricted to only mortgages originated by lenders that originated at least one mortgage in each of the ranges of years listed (as in Table A1). *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *CLTV* is the current loan balance divided by the current home value, where current home value is estimated as (1 + house price appreciation since origination) multiplied by the loan amount at origination divided by LTV at origination. House price appreciation for *CLTV* is measured by the CoreLogic Solutions county-level monthly house price index. *LoanAge* is the number of months since origination. *RefiPenalty* is the change in the PMMS rate since origination. *InterestGap* is the difference between the mortgage interest rate at origination and the PMMS rate for the origination month. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *Unemployment* is the monthly percentage change in the state-level unemployment rate. *HPI* is the percent change in quarterly FHFA state-level house price index since origination. *Condo* is an indicator variable equaling one if the property is a condominium or townhouse and equaling zero if the property is a single family residence. Each coefficient estimate represents the effect on the probability of default or prepayment, relative to the probability of the mortgage remaining current, of a one-unit change in the corresponding variable. Vintage year indicators and a constant term are included in each specification. Standard errors, clustered by loan, appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Probability of default | | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 | |
|  | (1) | (2) | (3) | (4) | (5) | |
| *Subsidiary* | .0119 | .0122 | .0291 | -.0210 | .0443 | |
|  | (.0763) | (.0776) | (.103) | (.106) | (.111) | |
| *Post* | -.346 | -.881 | -1.306\* | -1.310\* | -1.098\* | |
|  | (.302) | (.562) | (.687) | (.687) | (.662) | |
| *Subsidiary \* Post* | -.165 | -.197 | -.197 | -.120 | -.212 | |
|  | (.148) | (.167) | (.181) | (.188) | (.194) | |
| *FICO* | -.00956\*\*\* | -.00934\*\*\* | -.00941\*\*\* | -.00939\*\*\* | -.00947\*\*\* | |
|  | (.00110) | (.00113) | (.00137) | (.00140) | (.00142) | |
| *CLTV* | .0117\*\*\* | .0114\*\*\* | .0101\*\*\* | .00982\*\*\* | .00944\*\*\* | |
|  | (.00388) | (.00351) | (.00255) | (.00247) | (.00229) | |
| *LoanAge* | .0393\*\*\* | .0381\*\*\* | .0391\*\*\* | .0380\*\*\* | .0375\*\*\* | |
|  | (.00477) | (.00490) | (.00533) | (.00551) | (.00563) | |
| *LoanAge^2* | -.000260\*\*\* | -.000245\*\*\* | -.000254\*\*\* | -.000252\*\*\* | -.000254\*\*\* | |
|  | (.0000534) | (.0000536) | (.0000570) | (.0000585) | (.0000597) | |
| *RefiPenalty* | .821\*\* | .836\*\* | .582 | .389 | .188 | |
|  | (.349) | (.373) | (.410) | (.424) | (.430) | |
| *InterestGap* | .315\*\*\* | .324\*\*\* | .290\*\*\* | .266\*\*\* | .285\*\*\* | |
|  | (.0543) | (.0551) | (.0643) | (.0651) | (.0688) | |
| *RelLoanSize* | .113 | .105 | .0661 | .0843 | .0960 | |
|  | (.0949) | (.101) | (.115) | (.118) | (.120) | |
| *Unemployment* | .0519\*\*\* | .0573\*\*\* | .0510\*\*\* | .0495\*\*\* | .0474\*\*\* | |
|  | (.0120) | (.0122) | (.0146) | (.0150) | (.0153) | |
| *HPI* | .00218 | .00175 | .00216 | .00273 | .00301 | |
|  | (.00430) | (.00418) | (.00408) | (.00406) | (.00405) | |
| *Condo* | -.0766 | -.0898 | -.138\* | -.0867 | -.0588 | |
|  | (.0651) | (.0687) | (.0776) | (.0805) | (.0820) | |
|  | Probability of prepayment | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 | |
|  | (1) | (2) | (3) | (4) | (5) | |
| *Subsidiary* | .0993\* | .102\* | .0506 | .0489 | .0366 | |
|  | (.0565) | (.0569) | (.0705) | (.0713) | (.0737) | |
| *Post* | .179 | .223 | .219 | .156 | .128 | |
|  | (.192) | (.261) | (.286) | (.298) | (.323) | |
| *Subsidiary \* Post* | .146 | .163\* | .191\* | .173 | .198\* | |
|  | (.0900) | (.0953) | (.105) | (.108) | (.111) | |
| *FICO* | .000930 | .000919 | .000877 | .000897 | .000975 | |
|  | (.000821) | (.000828) | (.000918) | (.000925) | (.000930) | |
| *CLTV* | -.0192\*\*\* | -.0184\*\*\* | -.0195\*\*\* | -.0194\*\*\* | -.0191\*\*\* | |
|  | (.00152) | (.00160) | (.00188) | (.00195) | (.00202) | |
| *LoanAge* | .0201\*\*\* | .0183\*\*\* | .0200\*\*\* | .0191\*\*\* | .0181\*\*\* | |
|  | (.00209) | (.00216) | (.00236) | (.00241) | (.00244) | |
| *LoanAge^2* | -.000143\*\*\* | -.000133\*\*\* | -.000139\*\*\* | -.000134\*\*\* | -.000128\*\*\* | |
|  | (.0000154) | (.0000156) | (.0000173) | (.0000175) | (.0000176) | |
| *RefiPenalty* | -.720\*\*\* | -.767\*\*\* | -.449 | -.472 | -.458 | |
|  | (.262) | (.276) | (.290) | (.300) | (.305) | |
| *InterestGap* | .382\*\*\* | .371\*\*\* | .352\*\*\* | .354\*\*\* | .357\*\*\* | |
|  | (.0349) | (.0353) | (.0391) | (.0395) | (.0402) | |
| *RelLoanSize* | .330\*\*\* | .317\*\*\* | .380\*\*\* | .390\*\*\* | .398\*\*\* | |
|  | (.0657) | (.0683) | (.0756) | (.0763) | (.0776) | |
| *Unemployment* | -.0760\*\*\* | -.0731\*\*\* | -.0897\*\*\* | -.0908\*\*\* | -.0874\*\*\* | |
|  | (.00965) | (.00984) | (.0112) | (.0113) | (.0115) | |
| *HPI* | -.00253 | -.00196 | -.00313 | -.00306 | -.00270 | |
|  | (.00193) | (.00201) | (.00215) | (.00218) | (.00220) | |
| *Condo* | -.0579 | -.0663 | -.0521 | -.0439 | -.0470 | |
|  | (.0492) | (.0512) | (.0561) | (.0574) | (.0586) | |
|  |  |  |  |  |  | |
| Observations | 175,491 | 161,475 | 133,019 | 125,241 | 121,081 | |
| Clusters | 4,818 | 4,424 | 3,601 | 3,400 | 3,300 | |
| Pseudo R2 | 0.048 | 0.047 | 0.048 | 0.047 | 0.047 | |

**Table A10**

Multinomial logit regressions based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only subprime mortgages (defined as those originated to borrowers with a FICO score of 660 or less). The sample is restricted to only the first one, two, three, or four years of each mortgage’s performance (as in Table A2). *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *CLTV* is the current loan balance divided by the current home value, where current home value is estimated as (1 + house price appreciation since origination) multiplied by the loan amount at origination divided by LTV at origination. House price appreciation for *CLTV* is measured by the CoreLogic Solutions county-level monthly house price index. *LoanAge* is the number of months since origination. *RefiPenalty* is the change in the PMMS rate since origination. *InterestGap* is the difference between the mortgage interest rate at origination and the PMMS rate for the origination month. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *Unemployment* is the monthly percentage change in the state-level unemployment rate. *HPI* is the percent change in quarterly FHFA state-level house price index since origination. *Condo* is an indicator variable equaling one if the property is a condominium or townhouse and equaling zero if the property is a single family residence. Each coefficient estimate represents the effect on the probability of default or prepayment, relative to the probability of the mortgage remaining current, of a one-unit change in the corresponding variable. Vintage year indicators and a constant term are included in each specification. Standard errors, clustered by loan, appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Probability of default | | | |
|  | One year | Two years | Three years | Four years |
|  | (1) | (2) | (3) | (4) |
| *Subsidiary* | -.0552 | -.0103 | -.0592 | -.0645 |
|  | (.0955) | (.0632) | (.0547) | (.0505) |
| *Post* | -1.028 | -.947\* | -.828\*\* | -.421 |
|  | (1.051) | (.496) | (.405) | (.296) |
| *Subsidiary \* Post* | .0281 | -.405\* | -.259 | -.298\*\* |
|  | (.336) | (.209) | (.163) | (.151) |
| *FICO* | -.0126\*\*\* | -.0108\*\*\* | -.00978\*\*\* | -.00937\*\*\* |
|  | (.00122) | (.000916) | (.000823) | (.000796) |
| *CLTV* | .00692\*\*\* | .00778\*\*\* | .00795\*\*\* | .00795\*\*\* |
|  | (.00104) | (.00117) | (.00119) | (.00121) |
| *LoanAge* | .715\*\*\* | .272\*\*\* | .171\*\*\* | .114\*\*\* |
|  | (.0529) | (.0164) | (.00950) | (.00635) |
| *LoanAge^2* | -.0380\*\*\* | -.00759\*\*\* | -.00362\*\*\* | -.00189\*\*\* |
|  | (.00389) | (.000631) | (.000260) | (.000137) |
| *RefiPenalty* | -.465 | -.485 | -.429 | -.347 |
|  | (.698) | (.388) | (.323) | (.297) |
| *InterestGap* | .551\*\*\* | .497\*\*\* | .478\*\*\* | .465\*\*\* |
|  | (.0462) | (.0368) | (.0339) | (.0333) |
| *RelLoanSize* | .181 | .180\*\* | .194\*\* | .178\*\* |
|  | (.135) | (.0874) | (.0762) | (.0715) |
| *Unemployment* | -.0288 | -.00501 | .0144 | .0277\*\*\* |
|  | (.0224) | (.0128) | (.00996) | (.00857) |
| *HPI* | -.0334\*\* | .00167 | .000228 | -.00129 |
|  | (.0144) | (.00530) | (.00349) | (.00271) |
| *Condo* | -.120 | -.153\*\* | -.126\*\* | -.141\*\*\* |
|  | (.0990) | (.0638) | (.0540) | (.0503) |
|  | Probability of prepayment | | | |
|  | One year | Two years | Three years | Four years |
|  | (1) | (2) | (3) | (4) |
| *Subsidiary* | .0492 | .00398 | -.00252 | .0147 |
|  | (.0491) | (.0318) | (.0285) | (.0276) |
| *Post* | -12.31\*\*\* | -.358 | -.0676 | .110 |
|  | (1.018) | (1.123) | (.504) | (.277) |
| *Subsidiary \* Post* | .882\*\*\* | .475\*\*\* | .367\*\*\* | .350\*\*\* |
|  | (.292) | (.160) | (.117) | (.0907) |
| *FICO* | .00150\* | .000887 | .000889\* | .000864\* |
|  | (.000861) | (.000579) | (.000515) | (.000490) |
| *CLTV* | -.00631\*\* | -.00407\*\* | -.00506\*\*\* | -.00784\*\*\* |
|  | (.00269) | (.00174) | (.00142) | (.00128) |
| *LoanAge* | .450\*\*\* | .309\*\*\* | .185\*\*\* | .126\*\*\* |
|  | (.0324) | (.0111) | (.00602) | (.00421) |
| *LoanAge^2* | -.0179\*\*\* | -.00970\*\*\* | -.00468\*\*\* | -.00269\*\*\* |
|  | (.00218) | (.000398) | (.000161) | (.0000931) |
| *RefiPenalty* | -2.637\*\*\* | -3.399\*\*\* | -3.080\*\*\* | -2.767\*\*\* |
|  | (.422) | (.240) | (.201) | (.181) |
| *InterestGap* | .498\*\*\* | .425\*\*\* | .395\*\*\* | .390\*\*\* |
|  | (.0320) | (.0263) | (.0255) | (.0238) |
| *RelLoanSize* | .436\*\*\* | .429\*\*\* | .337\*\*\* | .336\*\*\* |
|  | (.0657) | (.0419) | (.0381) | (.0366) |
| *Unemployment* | .00955 | -.00889 | -.0168\*\* | -.0280\*\*\* |
|  | (.0155) | (.00926) | (.00762) | (.00684) |
| *HPI* | .0226\*\*\* | .0227\*\*\* | .0185\*\*\* | .0102\*\*\* |
|  | (.00797) | (.00316) | (.00201) | (.00155) |
| *Condo* | .201\*\*\* | .124\*\*\* | .0895\*\*\* | .0726\*\* |
|  | (.0529) | (.0344) | (.0306) | (.0294) |
|  |  |  |  |  |
| Observations | 162,646 | 260,730 | 323,523 | 366,110 |
| Clusters | 13,813 | 13,813 | 13,813 | 13,813 |
| Pseudo R2 | 0.102 | 0.093 | 0.082 | 0.072 |

**Table A11**

Two-stage least squares regressions based on loan-level observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only prime mortgages (defined as those originated to borrowers with a FICO score greater than 660). The sample is restricted to only mortgages originated by lenders that originated at least one mortgage before the policy change and at least one mortgage after the policy change (as in Table A3). *InitialRate* is the mortgage interest rate at origination. *LTV* is the mortgage loan-to-value ratio at origination. *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *OwnerOcc* equals 1 if the mortgage is associated with an owner-occupied property, 0 otherwise. *Term30* equals 1 if the mortgage has a thirty-year maturity and equals 0 if the mortgage has a fifteen-year maturity. *Prime* is the monthly average bank prime lending rate at the time of origination from the Federal Reserve. *CensusAge15-34* is the percentage of residents in the borrower’s census tract between the ages of 15 and 34 years old. *CensusAge35-54*, *CensusAge55-69*, and *CensusAge70plus* are defined similarly for other age ranges. *Value$1-$2* is the percentage of owner-occupied residences in the borrower’s census tract valued between $100,000 and $200,000. *Value$2-$3*, *Value$3-$5*, and *Value$5plus* are defined similarly for other price ranges. Vintage year indicators and a constant term are included in each specification. Standard errors appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Dependent variable: *InitialRate* | | |  | Dependent variable: *LTV* | | |
|  |  | (1) | (2) | (3) |  | (4) | (5) | (6) |
| *Subsidiary* |  |  | .00805\*\* | .0227\*\*\* |  |  | -1.500\*\*\* | -1.296\*\*\* |
|  |  |  | (.00342) | (.00432) |  |  | (.137) | (.174) |
| *Post* |  |  | .0330\*\* | .0445\*\*\* |  |  | -.618 | -.457 |
|  |  |  | (.0141) | (.0143) |  |  | (.570) | (.578) |
| *Subsidiary \* Post* |  |  |  | -.0385\*\*\* |  |  |  | -.535\* |
|  |  |  |  | (.00697) |  |  |  | (.286) |
| *LTV* |  | .0126\*\*\* | .0126\*\*\* | .0126\*\*\* |  |  |  |  |
|  |  | (.000402) | (.000400) | (.000400) |  |  |  |  |
| *InitialRate* |  |  |  |  |  | -6.062\*\*\* | -5.750\*\*\* | -5.792\*\*\* |
|  |  |  |  |  |  | (1.357) | (1.351) | (1.356) |
| *FICO* |  | -.000814\*\*\* | -.000813\*\*\* | -.000805\*\*\* |  | -.0750\*\*\* | -.0746\*\*\* | -.0746\*\*\* |
|  |  | (.0000525) | (.0000524) | (.0000524) |  | (.00275) | (.00274) | (.00274) |
| *RelLoanSize* |  | -.198\*\*\* | -.197\*\*\* | -.197\*\*\* |  | 7.970\*\*\* | 7.995\*\*\* | 8.002\*\*\* |
|  |  | (.00478) | (.00478) | (.00478) |  | (.217) | (.217) | (.216) |
| *OwnerOcc* |  | -.282\*\*\* | -.282\*\*\* | -.282\*\*\* |  | -.680\* | -.626 | -.639 |
|  |  | (.00447) | (.00447) | (.00447) |  | (.401) | (.399) | (.400) |
| *Term30* |  | .530\*\*\* | .530\*\*\* | .530\*\*\* |  | 17.00\*\*\* | 16.75\*\*\* | 16.77\*\*\* |
|  |  | (.00916) | (.00914) | (.00913) |  | (.992) | (.988) | (.990) |
| *Prime* |  | .137\*\*\* | .137\*\*\* | .137\*\*\* |  |  |  |  |
|  |  | (.00431) | (.00431) | (.00431) |  |  |  |  |
| *CensusAge15-34* |  |  |  |  |  | .111\*\*\* | .110\*\*\* | .110\*\*\* |
|  |  |  |  |  |  | (.0152) | (.0152) | (.0152) |
| *CensusAge35-54* |  |  |  |  |  | .110\*\*\* | .109\*\*\* | .109\*\*\* |
|  |  |  |  |  |  | (.0268) | (.0268) | (.0268) |
| *CensusAge55-69* |  |  |  |  |  | -.129\*\*\* | -.130\*\*\* | -.130\*\*\* |
|  |  |  |  |  |  | (.0199) | (.0198) | (.0198) |
| *CensusAge70plus* |  |  |  |  |  | -.0579\*\*\* | -.0578\*\*\* | -.0579\*\*\* |
|  |  |  |  |  |  | (.0192) | (.0191) | (.0191) |
| *Value$1-$2* |  |  |  |  |  | -.0744\*\*\* | -.0723\*\*\* | -.0724\*\*\* |
|  |  |  |  |  |  | (.0105) | (.0105) | (.0105) |
| *Value$2-$3* |  |  |  |  |  | -.157\*\*\* | -.157\*\*\* | -.157\*\*\* |
|  |  |  |  |  |  | (.00971) | (.00969) | (.00968) |
| *Value$3-$5* |  |  |  |  |  | -.129\*\*\* | -.128\*\*\* | -.128\*\*\* |
|  |  |  |  |  |  | (.0102) | (.0102) | (.0102) |
| *Value$5plus* |  |  |  |  |  | -.265\*\*\* | -.264\*\*\* | -.265\*\*\* |
|  |  |  |  |  |  | (.00993) | (.00990) | (.00990) |
|  |  |  |  |  |  |  |  |  |
| Observations |  | 81,000 | 81,000 | 81,000 |  | 81,000 | 81,000 | 81,000 |
| R2 |  | 0.814 | 0.814 | 0.815 |  | 0.075 | 0.08 | 0.079 |

**Table A12**

Two-stage least squares regressions based on loan-level observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only prime mortgages (defined as those originated to borrowers with a FICO score greater than 660). The sample is restricted to only mortgages originated by lenders that originated at least one mortgage in each of the ranges of years listed (as in Table A4). *InitialRate* is the mortgage interest rate at origination. *LTV* is the mortgage loan-to-value ratio at origination. *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *OwnerOcc* equals 1 if the mortgage is associated with an owner-occupied property, 0 otherwise. *Term30* equals 1 if the mortgage has a thirty-year maturity and equals 0 if the mortgage has a fifteen-year maturity. *Prime* is the monthly average bank prime lending rate at the time of origination from the Federal Reserve. *CensusAge15-34* is the percentage of residents in the borrower’s census tract between the ages of 15 and 34 years old. *CensusAge35-54*, *CensusAge55-69*, and *CensusAge70plus* are defined similarly for other age ranges. *Value$1-$2* is the percentage of owner-occupied residences in the borrower’s census tract valued between $100,000 and $200,000. *Value$2-$3*, *Value$3-$5*, and *Value$5plus* are defined similarly for other price ranges. Vintage year indicators and a constant term are included in each specification. Standard errors appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Dependent variable: *InitialRate* | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 |
|  | (1) | (2) | (3) | (4) | (5) |
| *Subsidiary* | -.0567\*\*\* | -.0463\*\*\* | -.0371\*\*\* | -.0425\*\*\* | -.0711\*\*\* |
|  | (.00655) | (.00637) | (.00770) | (.00789) | (.00830) |
| *Post* | .0194 | .0308\* | .0524\*\*\* | .0499\*\*\* | .0471\*\* |
|  | (.0146) | (.0157) | (.0167) | (.0173) | (.0183) |
| *Subsidiary \* Post* | .0464\*\*\* | .0427\*\*\* | .0299\*\*\* | .0377\*\*\* | .0639\*\*\* |
|  | (.00857) | (.00841) | (.00952) | (.00974) | (.0102) |
| *LTV* | .0112\*\*\* | .0121\*\*\* | .0127\*\*\* | .0125\*\*\* | .0123\*\*\* |
|  | (.000477) | (.000469) | (.000517) | (.000524) | (.000539) |
| *FICO* | -.000947\*\*\* | -.000855\*\*\* | -.000709\*\*\* | -.000747\*\*\* | -.000709\*\*\* |
|  | (.0000621) | (.0000621) | (.0000675) | (.0000683) | (.0000708) |
| *RelLoanSize* | -.169\*\*\* | -.180\*\*\* | -.173\*\*\* | -.171\*\*\* | -.172\*\*\* |
|  | (.00555) | (.00557) | (.00596) | (.00605) | (.00627) |
| *OwnerOcc* | -.265\*\*\* | -.268\*\*\* | -.258\*\*\* | -.258\*\*\* | -.255\*\*\* |
|  | (.00553) | (.00547) | (.00592) | (.00600) | (.00615) |
| *Term30* | .558\*\*\* | .549\*\*\* | .561\*\*\* | .571\*\*\* | .571\*\*\* |
|  | (.0107) | (.0104) | (.0115) | (.0116) | (.0120) |
| *Prime* | .146\*\*\* | .146\*\*\* | .158\*\*\* | .158\*\*\* | .164\*\*\* |
|  | (.00571) | (.00553) | (.00616) | (.00628) | (.00646) |
|  |  |  |  |  |  |
| Observations | 54,551 | 48,869 | 42,532 | 40,920 | 38,540 |
| R2 | 0.815 | 0.843 | 0.848 | 0.85 | 0.853 |
|  | Dependent variable: *LTV* | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 |
|  | (1) | (2) | (3) | (4) | (5) |
| *Subsidiary* | -2.515\*\*\* | -3.205\*\*\* | -3.119\*\*\* | -3.021\*\*\* | -2.858\*\*\* |
|  | (.319) | (.224) | (.266) | (.275) | (.298) |
| *Post* | -1.244\* | -1.891\*\*\* | -1.788\*\*\* | -1.469\*\* | -1.669\*\*\* |
|  | (.666) | (.520) | (.558) | (.579) | (.611) |
| *Subsidiary \* Post* | .683\* | 1.475\*\*\* | 1.431\*\*\* | 1.481\*\*\* | 1.219\*\*\* |
|  | (.396) | (.283) | (.320) | (.330) | (.349) |
| *InitialRate* | -4.340\*\* | -4.685\*\*\* | -5.442\*\*\* | -5.463\*\*\* | -5.128\*\*\* |
|  | (1.854) | (1.318) | (1.374) | (1.402) | (1.370) |
| *FICO* | -.0695\*\*\* | -.0733\*\*\* | -.0747\*\*\* | -.0736\*\*\* | -.0743\*\*\* |
|  | (.00375) | (.00268) | (.00273) | (.00280) | (.00277) |
| *RelLoanSize* | 8.184\*\*\* | 8.473\*\*\* | 8.343\*\*\* | 8.341\*\*\* | 8.467\*\*\* |
|  | (.274) | (.197) | (.207) | (.211) | (.215) |
| *OwnerOcc* | .311 | .401 | .446 | .373 | .322 |
|  | (.514) | (.367) | (.374) | (.382) | (.378) |
| *Term30* | 16.07\*\*\* | 16.14\*\*\* | 17.16\*\*\* | 17.07\*\*\* | 16.80\*\*\* |
|  | (1.370) | (.977) | (1.053) | (1.081) | (1.061) |
| *CensusAge15-34* | .102\*\*\* | .100\*\*\* | .0997\*\*\* | .0983\*\*\* | .101\*\*\* |
|  | (.0198) | (.0142) | (.0154) | (.0157) | (.0161) |
| *CensusAge35-54* | .133\*\*\* | .0954\*\*\* | .0942\*\*\* | .0939\*\*\* | .0845\*\*\* |
|  | (.0354) | (.0254) | (.0277) | (.0283) | (.0291) |
| *CensusAge55-69* | -.120\*\*\* | -.116\*\*\* | -.115\*\*\* | -.117\*\*\* | -.124\*\*\* |
|  | (.0257) | (.0184) | (.0198) | (.0202) | (.0207) |
| *CensusAge70plus* | -.0544\*\* | -.0678\*\*\* | -.0617\*\*\* | -.0632\*\*\* | -.0607\*\*\* |
|  | (.0255) | (.0184) | (.0200) | (.0204) | (.0210) |
| *Value$1-$2* | -.0712\*\*\* | -.0676\*\*\* | -.0713\*\*\* | -.0732\*\*\* | -.0738\*\*\* |
|  | (.0164) | (.0115) | (.0128) | (.0131) | (.0132) |
| *Value$2-$3* | -.158\*\*\* | -.155\*\*\* | -.156\*\*\* | -.159\*\*\* | -.159\*\*\* |
|  | (.0153) | (.0108) | (.0119) | (.0122) | (.0123) |
| *Value$3-$5* | -.118\*\*\* | -.123\*\*\* | -.129\*\*\* | -.131\*\*\* | -.130\*\*\* |
|  | (.0161) | (.0114) | (.0126) | (.0129) | (.0129) |
| *Value$5plus* | -.259\*\*\* | -.259\*\*\* | -.259\*\*\* | -.262\*\*\* | -.259\*\*\* |
|  | (.0155) | (.0110) | (.0123) | (.0125) | (.0125) |
|  |  |  |  |  |  |
| Observations | 54,551 | 48,869 | 42,532 | 40,920 | 38,540 |
| R2 | 0.08 | 0.159 | 0.139 | 0.135 | 0.141 |

**Table A13**

Two-stage least squares regressions based on loan-level observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only subprime mortgages (defined as those originated to borrowers with a FICO score of 660 or less). The sample is restricted to only mortgages originated by lenders that originated at least one mortgage before the policy change and at least one mortgage after the policy change (as in Table A3). *InitialRate* is the mortgage interest rate at origination. *LTV* is the mortgage loan-to-value ratio at origination. *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *OwnerOcc* equals 1 if the mortgage is associated with an owner-occupied property, 0 otherwise. *Term30* equals 1 if the mortgage has a thirty-year maturity and equals 0 if the mortgage has a fifteen-year maturity. *Prime* is the monthly average bank prime lending rate at the time of origination from the Federal Reserve. *CensusAge15-34* is the percentage of residents in the borrower’s census tract between the ages of 15 and 34 years old. *CensusAge35-54*, *CensusAge55-69*, and *CensusAge70plus* are defined similarly for other age ranges. *Value$1-$2* is the percentage of owner-occupied residences in the borrower’s census tract valued between $100,000 and $200,000. *Value$2-$3*, *Value$3-$5*, and *Value$5plus* are defined similarly for other price ranges. Vintage year indicators and a constant term are included in each specification. Standard errors appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Dependent variable: *InitialRate* | | |  | Dependent variable: *LTV* | | |
|  |  | (1) | (2) | (3) |  | (4) | (5) | (6) |
| *Subsidiary* |  |  | -.0874\*\*\* | -.125\*\*\* |  |  | -1.959\*\*\* | -1.450\*\*\* |
|  |  |  | (.0149) | (.0156) |  |  | (.446) | (.502) |
| *Post* |  |  | .491\*\*\* | .420\*\*\* |  |  | -18.54\*\*\* | -17.43\*\*\* |
|  |  |  | (.111) | (.111) |  |  | (2.353) | (2.355) |
| *Subsidiary \* Post* |  |  |  | .364\*\*\* |  |  |  | -5.023\*\*\* |
|  |  |  |  | (.0486) |  |  |  | (1.205) |
| *LTV* |  | .0212\*\*\* | .0215\*\*\* | .0219\*\*\* |  |  |  |  |
|  |  | (.00158) | (.00158) | (.00159) |  |  |  |  |
| *InitialRate* |  |  |  |  |  | -1.052 | -.390 | -.540 |
|  |  |  |  |  |  | (2.620) | (2.490) | (2.471) |
| *FICO* |  | -.00640\*\*\* | -.00632\*\*\* | -.00629\*\*\* |  | .0141 | .0205 | .0191 |
|  |  | (.000249) | (.000249) | (.000249) |  | (.0167) | (.0156) | (.0154) |
| *RelLoanSize* |  | -.396\*\*\* | -.400\*\*\* | -.403\*\*\* |  | 10.60\*\*\* | 10.74\*\*\* | 10.71\*\*\* |
|  |  | (.0238) | (.0238) | (.0239) |  | (.601) | (.586) | (.583) |
| *OwnerOcc* |  | -.247\*\*\* | -.251\*\*\* | -.253\*\*\* |  | 3.062\*\*\* | 3.171\*\*\* | 3.144\*\*\* |
|  |  | (.0225) | (.0225) | (.0225) |  | (.669) | (.655) | (.653) |
| *Term30* |  | .382\*\*\* | .391\*\*\* | .393\*\*\* |  | 14.87\*\*\* | 14.09\*\*\* | 14.08\*\*\* |
|  |  | (.0578) | (.0576) | (.0576) |  | (2.175) | (2.104) | (2.104) |
| *Prime* |  | .139\*\*\* | .143\*\*\* | .145\*\*\* |  |  |  |  |
|  |  | (.0163) | (.0163) | (.0163) |  |  |  |  |
| *CensusAge15-34* |  |  |  |  |  | .0107 | .0150 | .0171 |
|  |  |  |  |  |  | (.0436) | (.0431) | (.0431) |
| *CensusAge35-54* |  |  |  |  |  | .00190 | .00801 | .00719 |
|  |  |  |  |  |  | (.0638) | (.0631) | (.0631) |
| *CensusAge55-69* |  |  |  |  |  | -.149\*\*\* | -.134\*\* | -.144\*\*\* |
|  |  |  |  |  |  | (.0544) | (.0537) | (.0535) |
| *CensusAge70plus* |  |  |  |  |  | -.176\*\*\* | -.178\*\*\* | -.177\*\*\* |
|  |  |  |  |  |  | (.0505) | (.0501) | (.0501) |
| *Value$1-$2* |  |  |  |  |  | -.0456\*\* | -.0415\*\* | -.0418\*\* |
|  |  |  |  |  |  | (.0193) | (.0188) | (.0188) |
| *Value$2-$3* |  |  |  |  |  | -.0975\*\*\* | -.0968\*\*\* | -.0977\*\*\* |
|  |  |  |  |  |  | (.0196) | (.0192) | (.0191) |
| *Value$3-$5* |  |  |  |  |  | -.139\*\*\* | -.136\*\*\* | -.137\*\*\* |
|  |  |  |  |  |  | (.0200) | (.0194) | (.0194) |
| *Value$5plus* |  |  |  |  |  | -.291\*\*\* | -.284\*\*\* | -.281\*\*\* |
|  |  |  |  |  |  | (.0251) | (.0243) | (.0246) |
|  |  |  |  |  |  |  |  |  |
| Observations |  | 8,249 | 8,249 | 8,249 |  | 8,249 | 8,249 | 8,249 |
| R2 |  | 0.580 | 0.582 | 0.581 |  | 0.158 | 0.176 | 0.177 |

**Table A14**

Two-stage least squares regressions based on loan-level observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The sample is restricted to only subprime mortgages (defined as those originated to borrowers with a FICO score of 660 or less). The sample is restricted to only mortgages originated by lenders that originated at least one mortgage in each of the ranges of years listed (as in Table A4). *InitialRate* is the mortgage interest rate at origination. *LTV* is the mortgage loan-to-value ratio at origination. *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. *FICO* is the borrower’s FICO score at origination. *RelLoanSize* is the loan amount at origination divided by the average loan amount for originations in the same vintage year and county. *OwnerOcc* equals 1 if the mortgage is associated with an owner-occupied property, 0 otherwise. *Term30* equals 1 if the mortgage has a thirty-year maturity and equals 0 if the mortgage has a fifteen-year maturity. *Prime* is the monthly average bank prime lending rate at the time of origination from the Federal Reserve. *CensusAge15-34* is the percentage of residents in the borrower’s census tract between the ages of 15 and 34 years old. *CensusAge35-54*, *CensusAge55-69*, and *CensusAge70plus* are defined similarly for other age ranges. *Value$1-$2* is the percentage of owner-occupied residences in the borrower’s census tract valued between $100,000 and $200,000. *Value$2-$3*, *Value$3-$5*, and *Value$5plus* are defined similarly for other price ranges. Vintage year indicators and a constant term are included in each specification. Standard errors appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Dependent variable: *InitialRate* | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 |
|  | (1) | (2) | (3) | (4) | (5) |
| *Subsidiary* | -.160\*\*\* | -.158\*\*\* | -.213\*\*\* | -.224\*\*\* | -.223\*\*\* |
|  | (.0277) | (.0289) | (.0372) | (.0380) | (.0402) |
| *Post* | .464\*\*\* | .837\*\*\* | .914\*\*\* | .903\*\*\* | 1.085\*\*\* |
|  | (.126) | (.178) | (.190) | (.200) | (.219) |
| *Subsidiary \* Post* | .467\*\*\* | .458\*\*\* | .507\*\*\* | .489\*\*\* | .532\*\*\* |
|  | (.0585) | (.0645) | (.0694) | (.0715) | (.0753) |
| *LTV* | .0269\*\*\* | .0285\*\*\* | .0301\*\*\* | .0298\*\*\* | .0329\*\*\* |
|  | (.00222) | (.00235) | (.00279) | (.00289) | (.00309) |
| *FICO* | -.00655\*\*\* | -.00688\*\*\* | -.00653\*\*\* | -.00658\*\*\* | -.00668\*\*\* |
|  | (.000349) | (.000363) | (.000421) | (.000427) | (.000441) |
| *RelLoanSize* | -.484\*\*\* | -.501\*\*\* | -.516\*\*\* | -.519\*\*\* | -.565\*\*\* |
|  | (.0352) | (.0370) | (.0421) | (.0429) | (.0454) |
| *OwnerOcc* | -.217\*\*\* | -.245\*\*\* | -.264\*\*\* | -.256\*\*\* | -.269\*\*\* |
|  | (.0321) | (.0343) | (.0386) | (.0388) | (.0402) |
| *Term30* | .344\*\*\* | .268\*\*\* | .252\*\* | .267\*\*\* | .235\*\* |
|  | (.0822) | (.0895) | (.0997) | (.101) | (.107) |
| *Prime* | .178\*\*\* | .182\*\*\* | .205\*\*\* | .214\*\*\* | .231\*\*\* |
|  | (.0247) | (.0258) | (.0294) | (.0299) | (.0315) |
|  |  |  |  |  |  |
| Observations | 4,613 | 4,251 | 3,436 | 3,258 | 3,164 |
| R2 | 0.622 | 0.605 | 0.627 | 0.620 | 0.600 |
|  | Dependent variable: *LTV* | | | | |
|  | 2008-2010 | 2007-2011 | 2006-2012 | 2005-2013 | 2004-2014 |
|  | (1) | (2) | (3) | (4) | (5) |
| *Subsidiary* | -1.954\*\* | -2.261\*\*\* | -2.856\*\* | -3.092\*\*\* | -3.044\*\* |
|  | (.806) | (.848) | (1.147) | (1.181) | (1.194) |
| *Post* | -16.27\*\*\* | -25.44\*\*\* | -26.12\*\*\* | -26.74\*\*\* | -29.00\*\*\* |
|  | (2.541) | (3.500) | (3.692) | (3.907) | (4.140) |
| *Subsidiary \* Post* | -4.122\*\*\* | -2.427 | -1.127 | .322 | -.0301 |
|  | (1.542) | (1.705) | (1.984) | (2.061) | (2.120) |
| *InitialRate* | .250 | -.249 | -3.370 | -3.741 | -4.176 |
|  | (2.880) | (2.971) | (3.337) | (3.290) | (3.229) |
| *FICO* | .0204 | .0204 | -.000676 | -.00373 | -.00590 |
|  | (.0186) | (.0198) | (.0216) | (.0216) | (.0215) |
| *RelLoanSize* | 11.75\*\*\* | 11.68\*\*\* | 11.07\*\*\* | 10.96\*\*\* | 11.07\*\*\* |
|  | (.740) | (.773) | (.905) | (.928) | (.945) |
| *OwnerOcc* | 2.431\*\*\* | 2.794\*\*\* | 2.683\*\*\* | 2.476\*\* | 2.354\*\* |
|  | (.792) | (.846) | (.970) | (.972) | (.981) |
| *Term30* | 13.41\*\*\* | 14.21\*\*\* | 14.81\*\*\* | 14.72\*\*\* | 14.26\*\*\* |
|  | (2.668) | (2.699) | (2.971) | (2.976) | (2.976) |
| *CensusAge15-34* | -.0109 | .0124 | -.0459 | -.0380 | -.0200 |
|  | (.0602) | (.0640) | (.0734) | (.0752) | (.0766) |
| *CensusAge35-54* | .0248 | .0336 | .00450 | .0133 | .0314 |
|  | (.0876) | (.0927) | (.108) | (.112) | (.115) |
| *CensusAge55-69* | -.152\*\* | -.161\*\* | -.200\*\* | -.195\*\* | -.192\*\* |
|  | (.0727) | (.0778) | (.0869) | (.0889) | (.0906) |
| *CensusAge70plus* | -.153\*\* | -.122\* | -.123 | -.125 | -.118 |
|  | (.0692) | (.0731) | (.0825) | (.0856) | (.0864) |
| *Value$1-$2* | -.0469\* | -.0462\* | -.0869\*\* | -.0920\*\*\* | -.0939\*\*\* |
|  | (.0266) | (.0273) | (.0341) | (.0343) | (.0346) |
| *Value$2-$3* | -.0895\*\*\* | -.0973\*\*\* | -.130\*\*\* | -.134\*\*\* | -.144\*\*\* |
|  | (.0310) | (.0320) | (.0356) | (.0359) | (.0359) |
| *Value$3-$5* | -.126\*\*\* | -.127\*\*\* | -.181\*\*\* | -.185\*\*\* | -.194\*\*\* |
|  | (.0315) | (.0331) | (.0413) | (.0412) | (.0413) |
| *Value$5plus* | -.303\*\*\* | -.306\*\*\* | -.332\*\*\* | -.333\*\*\* | -.326\*\*\* |
|  | (.0338) | (.0352) | (.0414) | (.0409) | (.0425) |
|  |  |  |  |  |  |
| Observations | 4,613 | 4,251 | 3,436 | 3,258 | 3,164 |
| R2 | 0.188 | 0.184 | 0.135 | 0.120 | 0.107 |

**Table A15**

Robustness checks of the main results for our full sample from Tables 6 and 9. Panels A and B present results for key variables from multinomial logit regressions similar to those in Table 6, based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. Panels C and D present results for key variables from two-stage least squares regressions similar to those in Table9, based on loan-level observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The samples represented in all panels are restricted to only prime mortgages (defined as those originated to borrowers with a FICO score greater than 660). *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. In column 1, *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. All regression specifications include the same explanatory variables as in Tables 6 (for Panels A and B) and 9 (for Panels C and D), omitted here for brevity. (Full results are available from the authors upon request.) Vintage year indicators and a constant term are included in each specification. Standard errors (clustered by loan in Panels A and B) appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively. Model 1 in Panels A and B and in Panels C and D show results from Tables 6 and9, respectively. Models 2 through 5 redefine *Post* to represent alternative policy treatment dates. Model 6 restricts the sample to loans originated after 2002. Models 7 and 8 use balanced subsamples created using a propensity score and through omitting randomly selected observations in each vintage year, respectively. Model 9 omits loans that exit the sample due to a servicer transfer. Model 10 restricts the sample to loans owned by a government-sponsored enterprise at any point during the sample period.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Panel A** |  |  | |  |  |  |  |  |  |  |  |
|  |  | |
|  | Table6, model 3 | 2004 policy treatment | | 2007 policy treatment | 2010 policy treatment | 2011 policy treatment | 2000-02 omitted | Propensity score | Random | Transfers omitted | GSE-owned |
|  | (1) | (2) | | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Subsidiary* | .127\*\*\* | .244\*\*\* | | .104\*\* | .127\*\*\* | .110\*\*\* | .114\*\*\* | -.0226 | .132\*\*\* | .101\*\*\* | .134\*\*\* |
|  | (.0382) | (.0902) | | (.0432) | (.0379) | (.0371) | (.0395) | (.0448) | (.0409) | (.0388) | (.0415) |
| *Post* | -.478\*\* | 1.070\*\*\* | | .286\*\*\* | .652\*\* | .642\*\*\* | -.454\*\* | -.511\* | -.318 | -.540\*\* | -.608\*\* |
|  | (.219) | (.222) | | (.0783) | (.286) | (.164) | (.219) | (.295) | (.276) | (.219) | (.238) |
| *Subsidiary* | -.465\*\*\* | -.220\*\* | | -.120\* | -.494\*\*\* | -.469\*\*\* | -.455\*\*\* | -.515\*\*\* | -.461\*\*\* | -.493\*\*\* | -.465\*\*\* |
| *\* Post* | (.0907) | (.0976) | | (.0716) | (.0931) | (.102) | (.0912) | (.104) | (.0954) | (.0909) | (.0945) |
| **Panel B** |  |  | |  |  |  |  |  |  |  |  |
|  |  | |
|  | Table 9, model 6 | 2004 policy treatment | | 2007 policy treatment | 2010 policy treatment | 2011 policy treatment | 2000-02 omitted | Propensity score | Random | Transfers omitted | GSE-owned |
|  | (1) | (2) | | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Subsidiary* | -.00176 | -.0108 | | -.000615 | -.00185 | -.00470 | -.0203\* | .142\*\*\* | -.0000121 | -.0246\*\*\* | .0426\*\*\* |
|  | (.00894) | (.0132) | | (.00981) | (.00867) | (.00807) | (.0106) | (.00991) | (.00914) | (.00899) | (.00971) |
| *Post* | .0884\*\*\* | .183\*\*\* | | .148\*\*\* | -.00929 | -.0521\*\* | .0348 | .147\*\*\* | .0795\*\* | .0676\*\*\* | .121\*\*\* |
|  | (.0255) | (.0290) | | (.0294) | (.0266) | (.0213) | (.0283) | (.0334) | (.0329) | (.0249) | (.0265) |
| *Subsidiary* | -.00604 | .0109 | | -.00525 | -.00593 | .00265 | .00686 | -.141\*\*\* | -.00332 | -.0129 | -.0472\*\*\* |
| *\* Post* | (.0120) | (.0149) | | (.0125) | (.0120) | (.0118) | (.0137) | (.0138) | (.0125) | (.0119) | (.0129) |
| **Panel C** |  |  | |  |  |  |  |  |  |  |  |
|  |  | |
|  | Table9, model 3 | 2004 policy treatment | | 2007 policy treatment | 2010 policy treatment | 2011 policy treatment | 2000-02 omitted | Propensity score | Random | Transfers omitted | GSE-owned |
|  | (1) | (2) | | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Subsidiary* | .0322\*\*\* | .0457\*\*\* | | .0402\*\*\* | .0316\*\*\* | .0296\*\*\* | .0385\*\*\* | .0212\*\*\* | .0352\*\*\* | .0350\*\*\* | .0166\*\*\* |
|  | (.00346) | (.00488) | | (.00373) | (.00338) | (.00321) | (.00425) | (.00386) | (.00364) | (.00358) | (.00355) |
| *Post* | .0453\*\*\* | -2.805\*\*\* | | .286\*\*\* | -.394\*\*\* | -.457\*\*\* | .0487\*\*\* | .0449\*\* | .0309 | .0478\*\*\* | .0367\*\*\* |
|  | (.0146) | (.0245) | | (.0111) | (.0142) | (.0115) | (.0150) | (.0188) | (.0195) | (.0147) | (.0138) |
| *Subsidiary* | -.0430\*\*\* | -.0400\*\*\* | | -.0469\*\*\* | -.0448\*\*\* | -.0667\*\*\* | -.0491\*\*\* | -.0309\*\*\* | -.0436\*\*\* | -.0543\*\*\* | -.0246\*\*\* |
| *\* Post* | (.00650) | (.00609) | | (.00601) | (.00668) | (.00763) | (.00704) | (.00695) | (.00707) | (.00662) | (.00636) |
| **Panel D** |  |  | |  |  |  |  |  |  |  |  |
|  |  | |
|  | Table9, model 6 | 2004 policy treatment | | 2007 policy treatment | 2010 policy treatment | 2011 policy treatment | 2000-02 omitted | Propensity score | Random | Transfers omitted | GSE-owned |
|  | (1) | (2) | | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Subsidiary* | -1.228\*\*\* | -1.469\*\*\* | | -1.143\*\*\* | -1.257\*\*\* | -1.439\*\*\* | -1.254\*\*\* | -1.142\*\*\* | -1.178\*\*\* | -1.293\*\*\* | -1.347\*\*\* |
|  | (.127) | (.179) | | (.137) | (.124) | (.118) | (.169) | (.148) | (.134) | (.131) | (.138) |
| *Post* | -.508 | -5.112 | | 3.45\*\*\* | -.926 | -1.158\* | -.204 | -.534 | .474 | -.561 | -.554 |
|  | (.535) | (3.408) | | (.459) | (.642) | (.600) | (.596) | (.723) | (.716) | (.538) | (.543) |
| *Subsidiary* | -.494\*\* | .158 | | -.517\*\* | -.435\* | .376 | -.705\*\* | -.835\*\*\* | -.720\*\*\* | -.234 | -.757\*\*\* |
| *\* Post* | (.241) | (.225) | | (.223) | (.249) | (.286) | (.299) | (.274) | (.264) | (.247) | (.251) |

**Table A16**

Robustness checks of the main results for our full sample from Tables 7 and 10. Panels A and B present results for key variables from multinomial logit regressions similar to those in Table 7, based on monthly observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. Panels C and D present results for key variables from two-stage least squares regressions similar to those in Table 10, based on loan-level observations of first-lien, conventional, amortizing (non-balloon, non-interest only), fixed-rate mortgages for purchases of single-family residences or condominiums in Maryland and Virginia originated by nonbank originators between 2000 and 2015. The samples represented in all panels are restricted to only subprime mortgages (defined as those originated to borrowers with a FICO score of 660 or less). *Subsidiary* equals 1 if the originator is a subsidiary nonbank, 0 if the originator is an independent nonbank. In column 1, *Post* equals 1 if the mortgage was originated after the September 14, 2009 Federal Reserve policy change, 0 otherwise. All regression specifications include the same explanatory variables as in Tables 7 (for Panels A and B) and 10 (for Panels C and D), omitted here for brevity. (Full results are available from the authors upon request.) Vintage year indicators and a constant term are included in each specification. Standard errors (clustered by loan in Panels A and B) appear in parentheses. Levels of significance are indicated by \*, \*\*, and \*\*\* for 10%, 5%, and 1%, respectively. Model 1 in Panels A and B and in Panels C and D show results from Tables 7 and 10, respectively. Models 2 through 5 redefine *Post* to represent alternative policy treatment dates. Model 6 restricts the sample to loans originated after 2002. Models 7 and 8 use balanced subsamples created using a propensity score and through omitting randomly selected observations in each vintage year, respectively. Model 9 omits loans that exit the sample due to a servicer transfer. Model 10 restricts the sample to loans owned by a government-sponsored enterprise at any point during the sample period.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Panel A** |  |  |  |  |  |  |  |  |  |  |
|  | Probability of default | | | | | | | | | |
|  | Table7, model 3 | 2004 policy treatment | 2007 policy treatment | 2010 policy treatment | 2011 policy treatment | 2000-02 omitted | Propensity score | Random | Transfers omitted | GSE-owned |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Subsidiary* | -.0494 | -.0217 | -.0317 | -.0497 | -.0352 | -.0339 | -.108\*\* | -.0259 | -.0439 | .0113 |
|  | (.0446) | (.106) | (.0495) | (.0443) | (.0434) | (.0466) | (.0527) | (.0483) | (.0452) | (.0477) |
| *Post* | -.438 | 1.289\*\*\* | .0969 | .110 | .298 | -.429 | -.741 | -.279 | -.685\*\* | -.428 |
|  | (.292) | (.360) | (.0912) | (.277) | (.184) | (.291) | (.497) | (.366) | (.290) | (.293) |
| *Subsidiary* | -.177 | -.0561 | -.126 | -.185 | -.520\*\*\* | -.186 | -.0925 | -.205 | -.439\*\*\* | -.239\* |
| *\* Post* | (.125) | (.116) | (.0916) | (.132) | (.169) | (.125) | (.145) | (.132) | (.124) | (.129) |
| **Panel B** |  |  |  |  |  |  |  |  |  |  |
|  | Probability of prepayment | | | | | | | | | |
|  | Table 7, model 6 | 2004 policy treatment | 2007 policy treatment | 2010 policy treatment | 2011 policy treatment | 2000-02 omitted | Propensity score | Random | Transfers omitted | GSE-owned |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Subsidiary* | .0309 | .0270 | .0345 | .0306 | .0349 | .0295 | .142\*\*\* | .0358 | .0277 | .0777\*\*\* |
|  | (.0257) | (.0375) | (.0268) | (.0255) | (.0253) | (.0317) | (.0276) | (.0260) | (.0257) | (.0274) |
| *Post* | .192 | .276\* | .116 | -.445\*\*\* | .00616 | .224 | .310\* | -.0442 | .0123 | .182 |
|  | (.149) | (.152) | (.0831) | (.164) | (.133) | (.146) | (.173) | (.201) | (.136) | (.153) |
| *Subsidiary* | .249\*\*\* | .0412 | .114\*\* | .264\*\*\* | .271\*\*\* | .258\*\*\* | .202\*\* | .270\*\*\* | .0751 | .184\*\*\* |
| *\* Post* | (.0639) | (.0488) | (.0559) | (.0674) | (.0725) | (.0670) | (.0801) | (.0690) | (.0607) | (.0664) |
| **Panel C** |  |  |  |  |  |  |  |  |  |  |
|  | Dependent variable: *InitialRate* | | | | | | | | | |
|  | Table 10, model 3 | 2004 policy treatment | 2007 policy treatment | 2010 policy treatment | 2011 policy treatment | 2000-02 omitted | Propensity score | Random | Transfers omitted | GSE-owned |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Subsidiary* | -.0150 | .164\*\*\* | -.0145 | -.0175 | -.0102 | -.0584\*\*\* | .00843 | -.0157 | -.00608 | -.0286\*\* |
|  | (.0127) | (.0187) | (.0132) | (.0126) | (.0125) | (.0147) | (.0141) | (.0130) | (.0131) | (.0119) |
| *Post* | .457\*\*\* | -2.435\*\*\* | .348\*\*\* | -.971\*\*\* | -.679\*\*\* | .446\*\*\* | .195 | .285\* | .405\*\*\* | .483\*\*\* |
|  | (.115) | (.128) | (.0349) | (.109) | (.0800) | (.115) | (.167) | (.149) | (.115) | (.101) |
| *Subsidiary* | .266\*\*\* | -.285\*\*\* | .139\*\*\* | .277\*\*\* | .305\*\*\* | .314\*\*\* | .310\*\*\* | .280\*\*\* | .240\*\*\* | .298\*\*\* |
| *\* Post* | (.0487) | (.0243) | (.0339) | (.0515) | (.0626) | (.0493) | (.0519) | (.0507) | (.0509) | (.0433) |
| **Panel D** |  |  |  |  |  |  |  |  |  |  |
|  | Dependent variable: *LTV* | | | | | | | | | |
|  | Table 10, model 6 | 2004 policy treatment | 2007 policy treatment | 2010 policy treatment | 2011 policy treatment | 2000-02 omitted | Propensity score | Random | Transfers omitted | GSE-owned |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Subsidiary* | -1.828\*\*\* | -2.934\*\*\* | -1.867\*\*\* | -1.738\*\*\* | -1.957\*\*\* | -1.747\*\*\* | -2.119\*\*\* | -1.802\*\*\* | -2.193\*\*\* | -1.756\*\*\* |
|  | (.269) | (.424) | (.278) | (.269) | (.265) | (.544) | (.274) | (.276) | (.279) | (.303) |
| *Post* | -17.46\*\*\* | -1.319 | -.0247 | 15.55\*\*\* | 2.392 | -17.49\*\*\* | -9.45\*\*\* | -13.39\*\*\* | -13.77\*\*\* | -17.65\*\*\* |
|  | (2.264) | (6.608) | (.825) | (2.439) | (1.968) | (2.290) | (3.369) | (2.998) | (2.330) | (2.282) |
| *Subsidiary* | -4.719\*\*\* | 1.463\*\* | -1.756\*\* | -5.494\*\*\* | -3.997\*\*\* | -5.035\*\*\* | -5.197\*\*\* | -5.193\*\*\* | -3.257\*\*\* | -4.778\*\*\* |
| *\* Post* | (1.013) | (.702) | (.704) | (1.065) | (1.322) | (1.340) | (1.070) | (1.054) | (1.080) | (1.059) |

**Appendix B – Summary of Regulatory Events**

This document is an appendix to “The Effect of Regulatory Oversight on Nonbank Mortgage Subsidiaries,” (henceforth “the main paper”), in which we analyze the performance and pricing of mortgages originated between 2000 and 2015 in Maryland and Virginia by independent nonbank originators (INBs) and by nonbank subsidiaries of depository institutions and bank holding companies (subsidiary nonbanks, or SNBs). We focus on the 2009 Federal Reserve Board regulation enacted by Consumer Affairs Letter 09-08, which subjects the nonbank mortgage subsidiaries of bank holding companies to regular, ongoing consumer compliance oversight. However, a number of other state and federal policies where enacted during the 2000-2015 period that altered the mortgage market, directly or indirectly, for both bank and nonbank mortgage originators.

A comprehensive accounting of the dates and coverage of capital, liquidity, and mortgage rules enacted between 2011 and 2014 is presented in Figure 3 of Morris-Levenson, Sarama, and Ungerer (2017). While capital rules may indirectly affect nonbanks by changing the mortgage market behavior of banks, we would not anticipate any effect on the pricing or performance of mortgages originated by subsidiary nonbanks relative to originations by independent nonbanks, as captured by our difference-in-differences specification. Similarly, the liquidity coverage ratio, proposed in 2013 and finalized in 2014, may have increased nonbanks’ share of the mortgage market by creating more liquidity and demand for securitized mortgages (Gete and Reher, 2020), but did not likely influence relative outcomes based on nonbanks’ ownership structure. Two policies identified by Morris-Levenson et al. affected nonbanks directly: the qualified residential mortgages (QRM) rule and the risk retention rule, each of which was proposed in 2011 and finalized in 2014. Table B1 presents a timeline of all other policies identified from the literature, with reference to the relevant study and a brief summary of the study’s findings.

Additionally, Bostic et al. (2008) provide a state-level index of the strictness of anti-predatory lending laws, as of 2004-2005. Maryland was assigned a strictness rating on its coverage, restrictions, and enforcement of mortgage regulations of 3.01, 3.23, and 3.97, respectively. Virginia’s ratings were 1.81, 0.00, and 2.57. The combined effect of Maryland’s 2002 prepayment penalty restrictions (and Virginia’s lack thereof) and the difference between the two states’ overall level of lending restrictions should be captured by the state fixed effects in each of our specifications, as well as our robustness tests that omit mortgages originated prior to 2003.

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**Table B1**

Federal and state (Maryland or Virginia) mortgage regulations enacted or proposed during our sample period, 2000-2015. For each regulatory change, we briefly describe the effect of the change and (where available) cite recent research analyzing that effect.

|  |  |  |  |
| --- | --- | --- | --- |
| Date | Policy | Effect | Study |
| Late 2002 | Restrictions on prepayment penalties for residential mortgages in Maryland | Increases mortgage prepayment rates in Maryland | Steinbuks (2015) |
| January 2004 | Expand HMDA requirements | Requires lenders to report the lien, HOEPA status, and (for some mortgages) pricing information on originations | N/A |
| January 2004 | Pre-emption of state anti-predatory lending laws for nationally-chartered banks | Increases the origination of loans with prepayment penalties by national banks in states with anti-predatory lending laws; some evidence of increases in risky lending by competing lenders in counties with large national bank presence | Di Maggio, Kermani, and Korgaonkar (2019) |
| October 2005 | Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005 | Positive shock to creditor protection, leading to greater issuance of risky mortgages | Ganduri (2020) |
| 2008 | Increase legal risk due of lawsuits targeted at bank mortgage lenders for origination of poor quality loans made prior to and during the financial crisis. | With other regulatory changes, creates regulatory burden resulting in pullback in bank mortgage lending and increase in non-bank mortgage originations to partially fill the gap. | Buchak, Matvos,  Piskorski, and Seru (2018) |
| May 2011 (proposal), January 2013 (enactment) | Qualifying mortgage rule | Requires that residential mortgage securitizers retain at least 5% of the risk of the underlying assets | Morris-Levenson, Sarama, and Ungerer (2017) |
| March 2011 | First annual Federal Reserve capital review | Increases capital cost of originating, and holding jumbo mortgages, leading to increase in non-bank share | Morris-Levenson, Sarama, and Ungerer (2017) |
| July 2011 | Consumer Financial Protection Bureau begins operations | Stricter oversight of mortgage activity; no evidence of bank and non-bank lender regulatory arbitrage. | Fuster, Plosser, and Vickery, (2018) |
| July 2011 | Office of Thrift Supervision ends operations | Thrifts brought under the oversight of OCC, which is widely considered to be stricter | Some evidence for OCC being stricter in Granja and Luez (2017) |
| July 2013 (final proposal), January 2015 (enactment) | Basel III rule on risk-weighting of mortgage servicing rights | Between announcement and origination, many banks reduced the sale of mortgage servicing rates relative to tier 1 capital | Hendricks, Neilson, Shakespeare, and Williams (2019) |
| September 2013 (final proposal), September 2014 (enactment) | Liquidity coverage ratio rule | Lower risk weight for GNMA MBS, lowering regulatory cost of FHA lending and therefore lowering funding costs for nonbanks who lack deposit funding | Gete and Reher (2020) |

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2. In Table 4, the difference between the joint effect on the probability of default of a post-policy SNB mortgage (–0.9208) and the effect of a post-policy INB mortgage (–0.486) is –0.4348. In Table 5, the difference is –0.4448. In Table A1, the difference ranges from –0.4362 to –0.3517. [↑](#footnote-ref-2)
3. In Table 4, the difference between the joint effect on the probability of prepayment of a post-policy SNB mortgage (0.0887) and the effect of a post-policy INB mortgage (0.0843) is 0.00436. In Table 5, the difference is –0.0029. In Table A1, the difference ranges from –0.0035 to 0.0159. [↑](#footnote-ref-3)
4. In Table A2, the difference between the joint effect on the probability of default of a post-policy SNB mortgage and the effect of a post-policy INB mortgage ranges from –0.6281 to –0.4902. The difference for the probability of prepayment ranges from –0.0264 to 0.0721. [↑](#footnote-ref-4)
5. Across Tables 8, A3, and A4, the difference in *InitialRate* between SNB originations and INB originations in the post-policy period range from –0.5 basis points to 0.1 basis points, and the difference is not statistically significant in any of the models in those tables. [↑](#footnote-ref-5)
6. For perspective on the magnitudes of the results in Tables 8, A3, and A4, note that Table 2 indicates that the sample standard deviations of *InitialRate* and *LTV* are 109 basis points and 18.18 percentage points, respectively. [↑](#footnote-ref-6)
7. The difference between the joint effect on the probability of default of a post-policy SNB mortgage and the effect of a post-policy INB mortgage in Table 7 of the main paper is -0.2264 and is significant at the ten percent level. In Tables A8-A10, the difference ranges from -0.4153 to -0.1410, and is statistically significant in models 2-4 of Table A10. [↑](#footnote-ref-7)