

# Mortgage Modification and Strategic Behavior: Evidence from a Legal Settlement with Countrywide

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## **Online Appendix**

Table A1: Summary Statistics for Non-Subprime FRMs.

	Countrywide		Control Group	
Number of Loans	130,033		301,568	
	<i>BlackBox Variables</i>			
	mean	sd	mean	sd
Initial CLTV	88.7	9.36	87.3	9.67
Initial Interest Rate	6.73	0.95	6.40	0.52
Origination FICO	709.3	51.7	719.4	48.3
Origination Balance	323	216	313	200
Low/No Doc	0.66	0.47	0.67	0.47
Refi	0.21	0.41	0.17	0.37
Cash out Refi	0.23	0.42	0.30	0.46
	<i>Equifax Variables</i>			
	mean	sd	mean	sd
Current CLTV	106.9	25.0	108.0	24.2
Current Vantage	798.8	122.1	809.5	109.1
2 <sup>nd</sup> Lien Balance	53.9	33.0	53.5	30.7
Has Junior Lien	0.40	0.49	0.46	0.50
Credit Utilization	0.31	0.30	0.33	0.31

Notes: This table presents summary statistics for non-subprime fixed-rate mortgages (FRMs) serviced by Countrywide and the Control Group in the Matched Sample as of September 2008. The summary statistics include characteristics of these loans at origination and as of September 2008, the month before public announcement of the Settlement on October 6, 2008. CLTV and interest rates are reported in percentage terms; loan balances are in thousands of dollars.

Table A2: 2/28 ARMs Default Specification - The Role of Control Variables

	(1)	(2)	(3)	(4)	(5)	(6)
	Matched Sample	Matched Sample	Matched Sample	Matched Sample	Matched Sample	Matched Sample
Countrywide × Oct-Dec 2007	0.0000 (0.0000)	-0.0003 (0.0006)	-0.0003 (0.0004)	-0.0004 (0.0006)	-0.0000 (0.0000)	0.0002 (0.0005)
Countrywide × Jan-Mar 2008	0.0009 (0.0006)	0.0005 (0.0006)	0.0003 (0.0006)	0.0001 (0.0005)	0.0001 (0.0004)	-0.0000 (0.0000)
Countrywide × Apr-Jun 2008	0.0004 (0.0005)	0.0003 (0.0005)	-0.0000 (0.0000)	-0.0004 (0.0005)	0.0001 (0.0005)	-0.0013** (0.0006)
Countrywide × Jul-Sep 2008	0.0065*** (0.0007)	0.0064*** (0.0007)	0.0056*** (0.0007)	0.0046*** (0.0007)	0.0039*** (0.0007)	0.0014** (0.0007)
<b>Countrywide × Oct-Dec 2008</b>	<b>0.0160***</b> <b>(0.0008)</b>	<b>0.0160***</b> <b>(0.0008)</b>	<b>0.0150***</b> <b>(0.0008)</b>	<b>0.0140***</b> <b>(0.0008)</b>	<b>0.0120***</b> <b>(0.0008)</b>	<b>0.0071***</b> <b>(0.0008)</b>
Countrywide × Jan-Feb 2009	0.0090*** (0.0009)	0.0093*** (0.0009)	0.0084*** (0.0009)	0.0071*** (0.0009)	0.0049*** (0.0009)	-0.0007 (0.0008)
Countrywide	-0.0002 (0.0003)	0.0009 (0.0004)	0.0019*** (0.0004)	0.0028*** (0.0004)	0.0031*** (0.0005)	0.0027*** (0.0005)
Origination Quarter	Yes	Yes	Yes	Yes	Yes	Yes
Blackbox FICO Controls	No	Yes	Yes	Yes	Yes	Yes
Blackbox CLTV Controls and Balance	No	No	Yes	Yes	Yes	Yes
Blackbox FICO and CLTV Time Interactions	No	No	No	Yes	Yes	Yes
Blackbox Interest Rate Controls	No	No	No	No	Yes	Yes
Reset Controls	No	No	No	No	No	Yes
Blackbox Documentation and Refi Controls	No	No	No	No	No	No
Blackbox Payment Controls	No	No	No	No	No	No
MSA Controls	No	No	No	No	No	No
Vantage Controls	No	No	No	No	No	No
Equifax CLTV Controls	No	No	No	No	No	No
Other Equifax Controls	No	No	No	No	No	No
N. of Observations	6261055	6261055	6261055	6261055	6261055	6261055
Avg. Share Countrywide	0.18	0.18	0.18	0.18	0.18	0.18
Avg. Countrywide 2008Q3 Delinquency	0.048	0.048	0.048	0.048	0.048	0.048
Countrywide × (Q3 2008 - Q4 2008)	0.0095	0.0096	0.0094	0.0094	0.0081	0.0057
Wald Test (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: This table reports estimates of probit specification (1) using data on Hybrid 2/28 ARMs. The dependent variable takes the value of one when a loan becomes sixty days past due in a given month, conditional upon being current sixty days earlier, and is equal to zero otherwise. Column (1) estimates the model using the Matched Sample and includes only time dummies, a Countrywide dummy that equals one if the loan is serviced by Countrywide, and interactions between the Countrywide and time dummies. The excluded category is July-September 2007, the first quarter of our analysis period. Columns (2) through (12) progressively add a set of controls from the BlackBox and Equifax databases. A variation of this exercise when we first control for current CLTV and current Vantage (computed with use of Equifax data) shows the importance of these controls in accounting for default patterns. Coefficients reported are marginal effects from a probit regression; standard errors are in parentheses; standard errors are clustered at the loan ID; \*\*, \*  $p < 0.05$ , \*\*\*  $p < 0.01$ .



Table A3: 2/28 ARMs Default Specification - Standard Errors Clustered at MSA Level

	(1)	(2)	(3)	(4)
	Base Sample	Base Sample	Matched Sample	Matched Sample
Countrywide × Oct-Dec 2007	-0.0012** (0.0005)	-0.0005 (0.0004)	0.0002 (0.0003)	0.0004 (0.0004)
Countrywide × Jan-Mar 2008	-0.0003 (0.0005)	-0.0008 (0.0004)	-0.0002 (0.0004)	0.0002 (0.0005)
Countrywide × Apr-Jun 2008	-0.0004 (0.0006)	-0.0022*** (0.0005)	-0.0018 *** (0.0006)	-0.0014 ** (0.0006)
Countrywide × Jul-Sep 2008	0.0056*** (0.0008)	-0.0003 (0.0005)	0.0001 (0.0003)	0.0006 (0.0005)
<b>Countrywide × Oct-Dec 2008</b>	<b>0.0160***</b> <b>(0.0010)</b>	<b>0.0052***</b> <b>(0.0006)</b>	<b>0.0048***</b> <b>(0.0007)</b>	<b>0.0054***</b> <b>(0.0007)</b>
Countrywide × Jan-Feb 2009	0.0092*** (0.0010)	0.0001 (0.0006)	-0.0005 (0.0008)	0.0005 (0.0008)
Countrywide	-0.0002 (0.0003)	0.0016*** (0.0004)	0.0017*** (0.0005)	0.0018*** (0.0004)
Origination Quarter	No	Yes	Yes	Yes
BlackBox Control	No	Yes	Yes	Yes
MSA Control	No	Yes	Yes	Yes
Reset Control	No	Yes	Yes	Yes
Equifax Control	No	No	No	Yes
N. of Observations	9448457	9448457	6261055	6261055
Avg. Share Countrywide	0.15	0.15	0.18	0.18
Avg. Countrywide Delinquency 2008Q3	0.049	0.049	0.048	0.048
Countrywide × (Q4 2008 - Q3 2008)	0.0104	0.0055	0.0047	0.0048
Wald Test (p-value)	0.0000	0.0000	0.0000	0.0000

Notes: This table is analogous to Table 2 except that standard errors are clustered at the Metropolitan Statistical Area (MSA) corresponding to the location of the property backing the loan (in Table 2, they were clustered at the loan ID). Coefficients reported are marginal effects from a probit regression; standard errors are in parentheses; \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

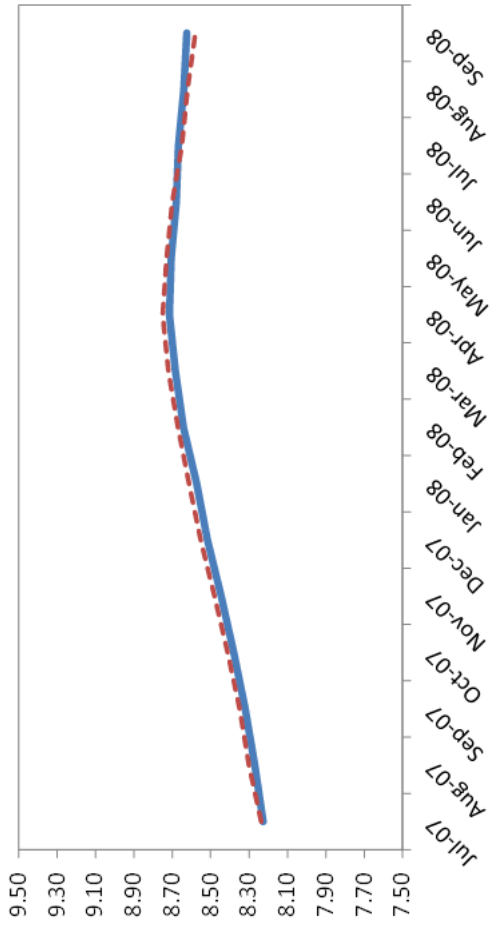
Table A4: 2/28 ARMS Default Specification by Current Credit Utilization and CLTV - Standard Errors Clustered at MSA Level

	(1) >5 Months	(2) 1-5 Months	(3) 0-1 Months	(4) CLTV < 100	(5) 100 ≤ CLTV < 120	(6) 120 ≤ CLTV	(7) >5 Months & CLTV > 100
Countrywide × Oct-Dec 2007	-0.0004 (0.0008)	0.0008 (0.0010)	-0.0001 (0.0005)	0.0011** (0.0005)	-0.0011 (0.0010)	-0.0059 (0.0035)	-0.0026 (0.0019)
Countrywide × Jan-Mar 2008	0.0012 (0.0008)	0.0008 (0.0009)	-0.0001 (0.0005)	0.0013** (0.0006)	-0.0008 (0.0009)	-0.0054 (0.0030)	-0.0006 (0.0015)
Countrywide × Apr-Jun 2008	0.0003 (0.00088)	-0.0014 (0.0009)	-0.0014 (0.0010)	-0.0009 (0.0008)	-0.0032*** (0.0009)	-0.0055 (0.0034)	-0.0024 (0.0016)
Countrywide × Jul-Sep 2008	0.0011 (0.0010)	0.0018 (0.0011)	0.0015 (0.0013)	0.0009 (0.0008)	-0.0011 (0.0011)	0.0007 (0.0033)	-0.0011 (0.0017)
<b>Countrywide × Oct-Dec 2008</b>	<b>0.0054***</b> (0.0011)	<b>0.0052***</b> (0.0015)	<b>0.0063***</b> (0.0011)	<b>0.0050***</b> (0.0012)	<b>0.0038***</b> (0.0011)	<b>0.0076</b> (0.0043)	<b>0.0049**</b> (0.0021)
Countrywide × Jan-Feb 2009	0.0002 (0.0008)	0.0009 (0.0012)	0.0015 (0.0016)	0.0049*** (0.0011)	-0.00040 (0.0014)	-0.0029 (0.0037)	-0.0028 (0.0016)
Countrywide	-0.0001 (0.0006)	0.0011 (0.0007)	0.0025*** (0.0009)	0.0005 (0.0004)	0.0040*** (0.0010)	0.0078** (0.0036)	0.0025 (0.0017)
Origination Quarter	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BlackBox Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reset Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Equifax Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of Observations	1210922	1639789	1748890	1994158	1715891	1067641	611797
Avg. Share Countrywide	0.18	0.19	0.18	0.16	0.18	0.19	0.20
Avg. Countrywide Delinquency 2008Q3	0.030	0.041	0.052	0.031	0.039	0.078	0.040
Countrywide × (Q4 2008 - Q3 2008)	0.0043	.0034	0.0048	0.0041	0.0049	0.0069	0.006
Wald Test (p-value)	0.0000	0.0034	0.0000	0.0012	0.0000	0.0006	0.0004

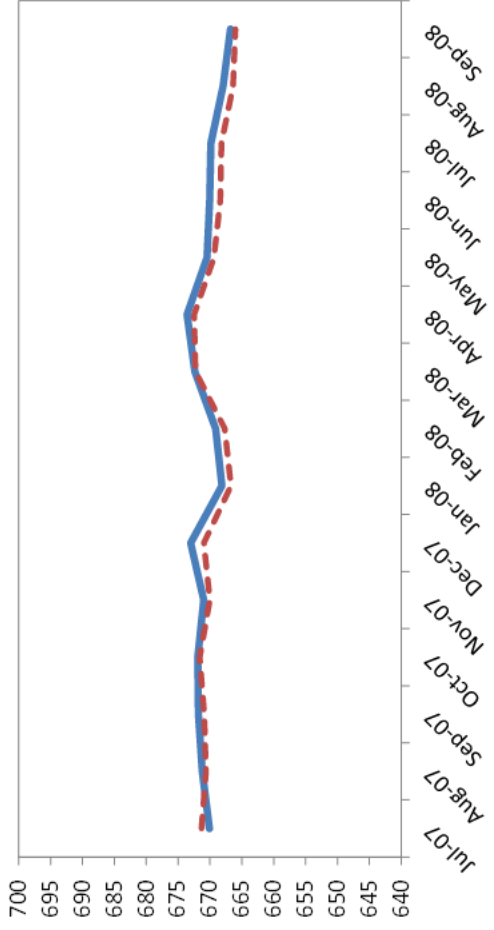
Notes: This table is analogous to Table 3 except that standard errors are clustered at the Metropolitan Statistical Area (MSA) corresponding to the location of the property backing the loan (in Table 3, they were clustered at the loan ID). Coefficients reported are marginal effects from a probit regression; standard errors are in parentheses; \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Figure A1: Comparability of Countrywide and Control Group - Evolution of Observables

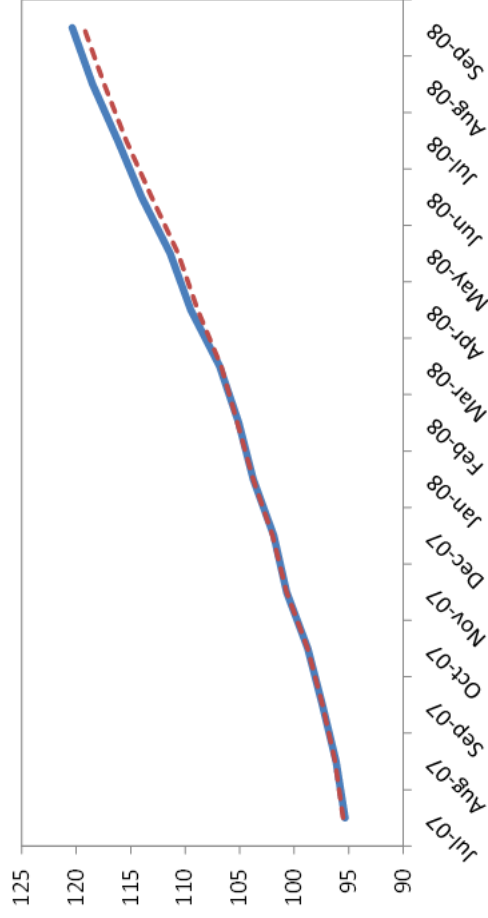
(a) Current Interest Rates



(b) Current Vantage

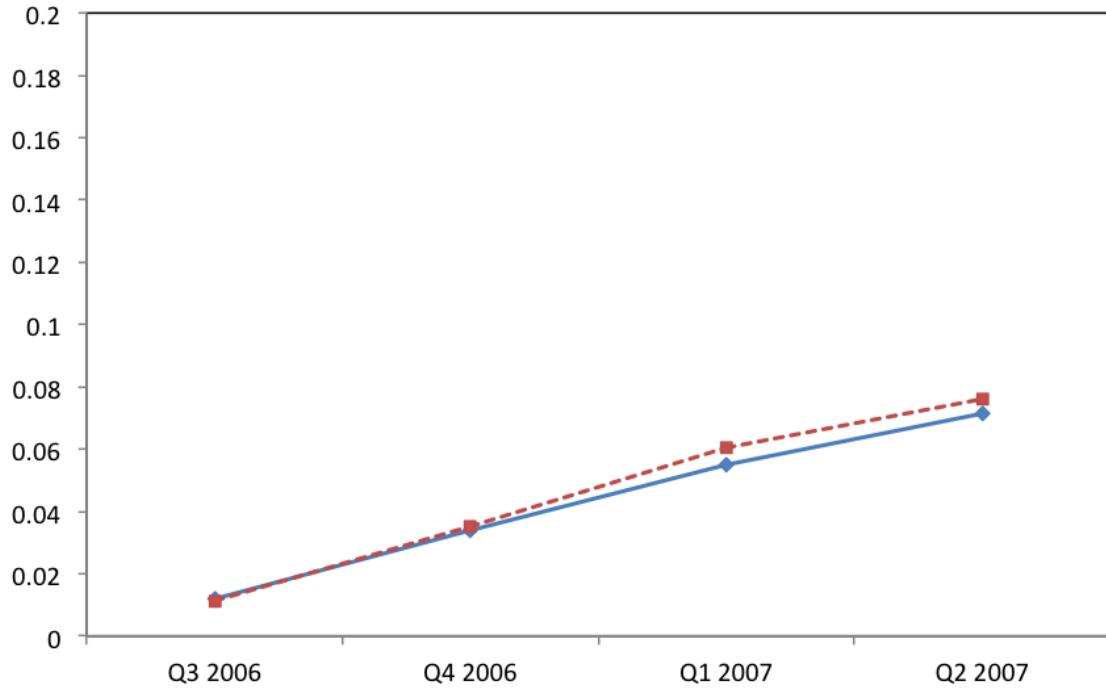


(c) Current CLTV



Notes: This figure shows the monthly evolution of current mortgage interest rate (panel (a)), current Vantage credit score of borrowers (panel (b)), and current CLTV (panel (c)) for 2/28 ARMs in the Matched Sample prior to the Settlement Announcement. The solid line shows monthly averages for Countrywide loans while the dashed line shows the corresponding values for mortgages in the Control Group.

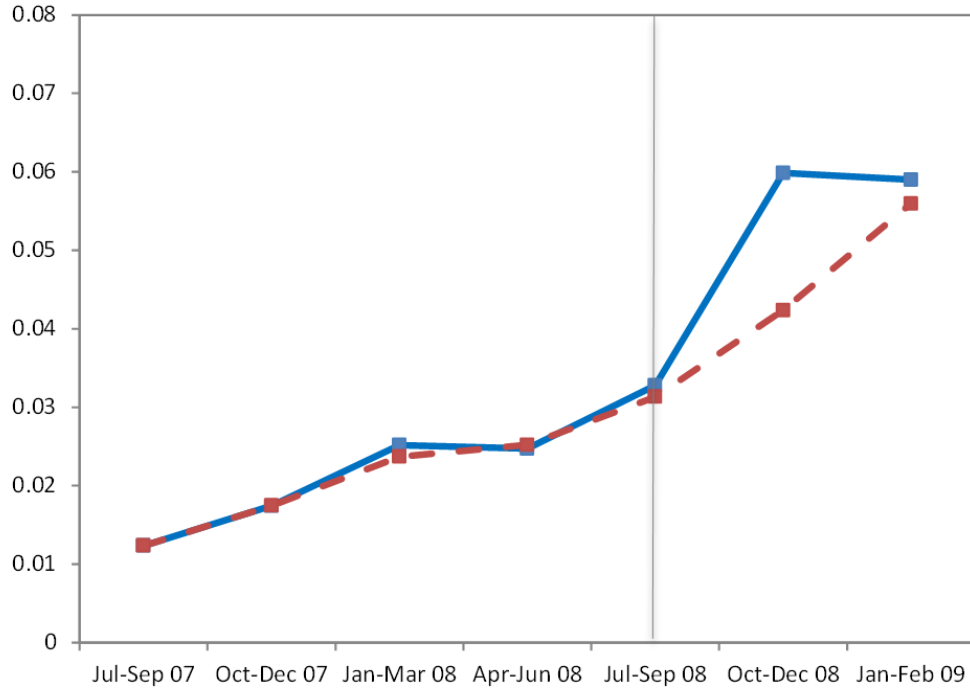
Figure A2: 2/28 ARMs Pre-estimation Default Patterns - Countrywide and Control Group



Notes: This figure presents the quarterly cumulative default rates for Countrywide and Control Group 2/28 ARM loans from mid 2006 through mid 2007 (just before our analysis period begins). The denominator equals the total stock of loans that had been originated up to that quarter; the numerator is the total number of loans that have ever defaulted from mid 2006 through that quarter. A loan is counted as in default if its status is 60 days past due on payments or worse. Foreclosed loans are counted as having defaulted while loans that have prepaid are counted as being current. The straight line shows the default rate for Countrywide loans; the dashed line shows the corresponding rate for mortgages in the Control Group.

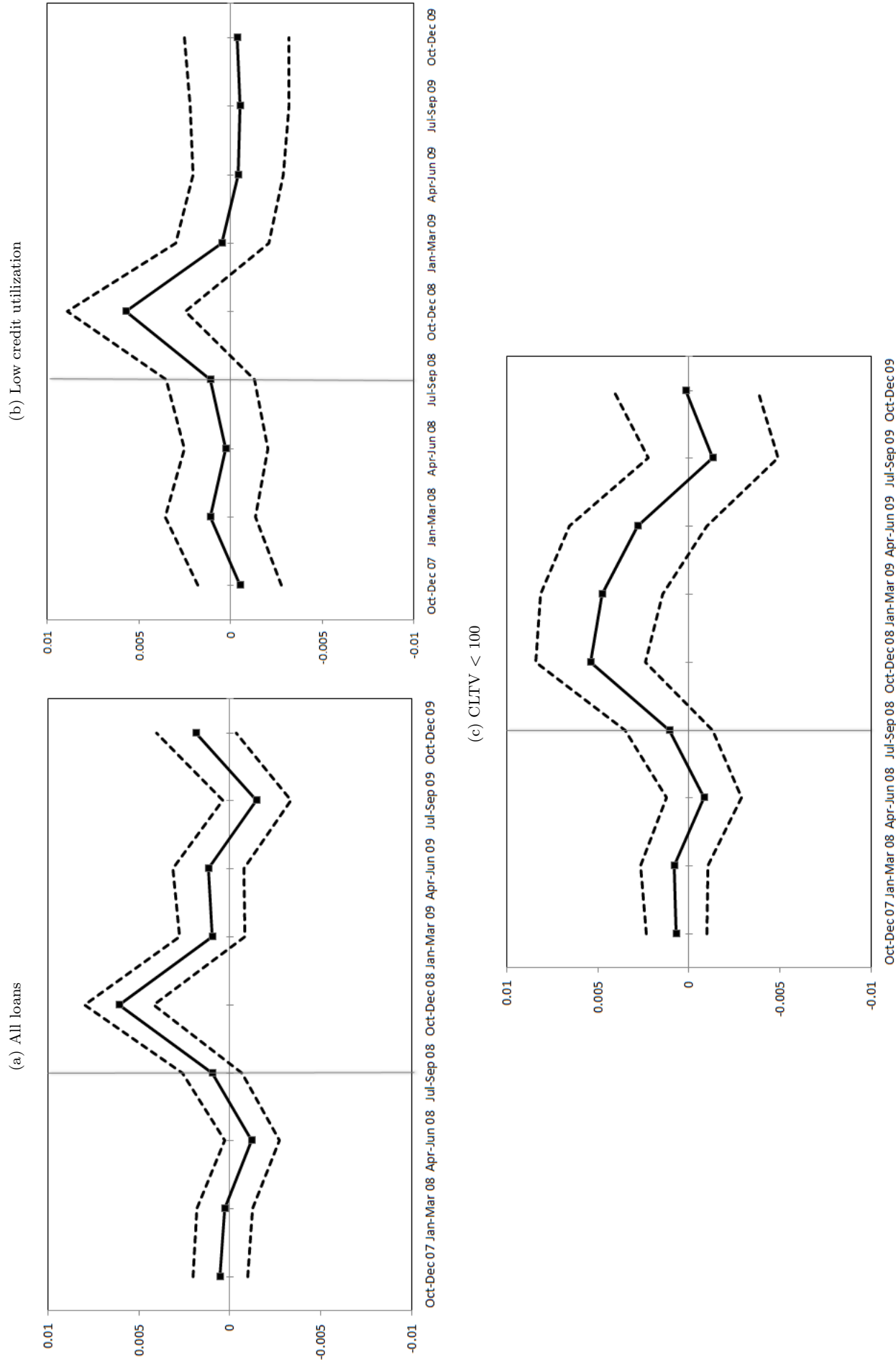


Figure A3: Evolution of Default Rates for 2/28 ARMs - More Homogenous Sample



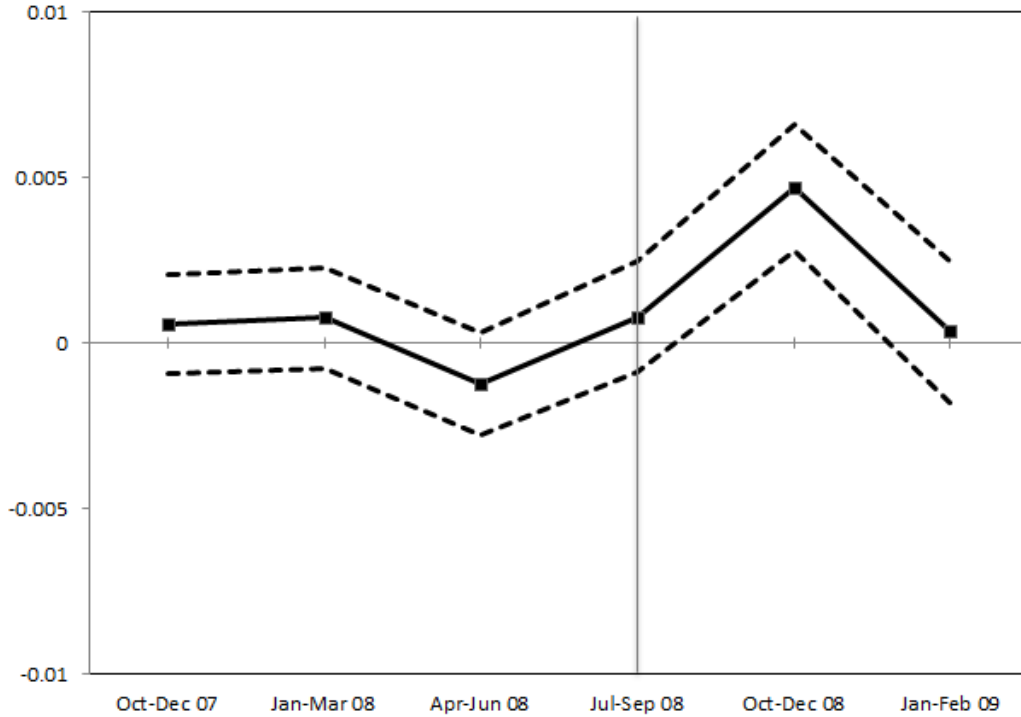
Notes: This figure plots the average monthly rollover rate (the 60-day delinquency rate among borrowers who were current two months before) during each of the five quarters preceding the Settlement announcement, the quarter just after the announcement (Oct-Dec 2008), and the Jan-Feb 2009 period in a more homogenous sample of Countrywide and Control Group of loans. This sample is obtained by considering Countrywide and Control Group loans with CLTVs, interest rates, and credit scores that are within one standard deviation of the Countrywide mean during each month of the pre-Settlement period. The straight line shows the rollover rate for Countrywide loans while the dashed line shows the corresponding rate for mortgages in the Control Group.

Figure A4: 2/28 ARM Default Specification Extended Sample



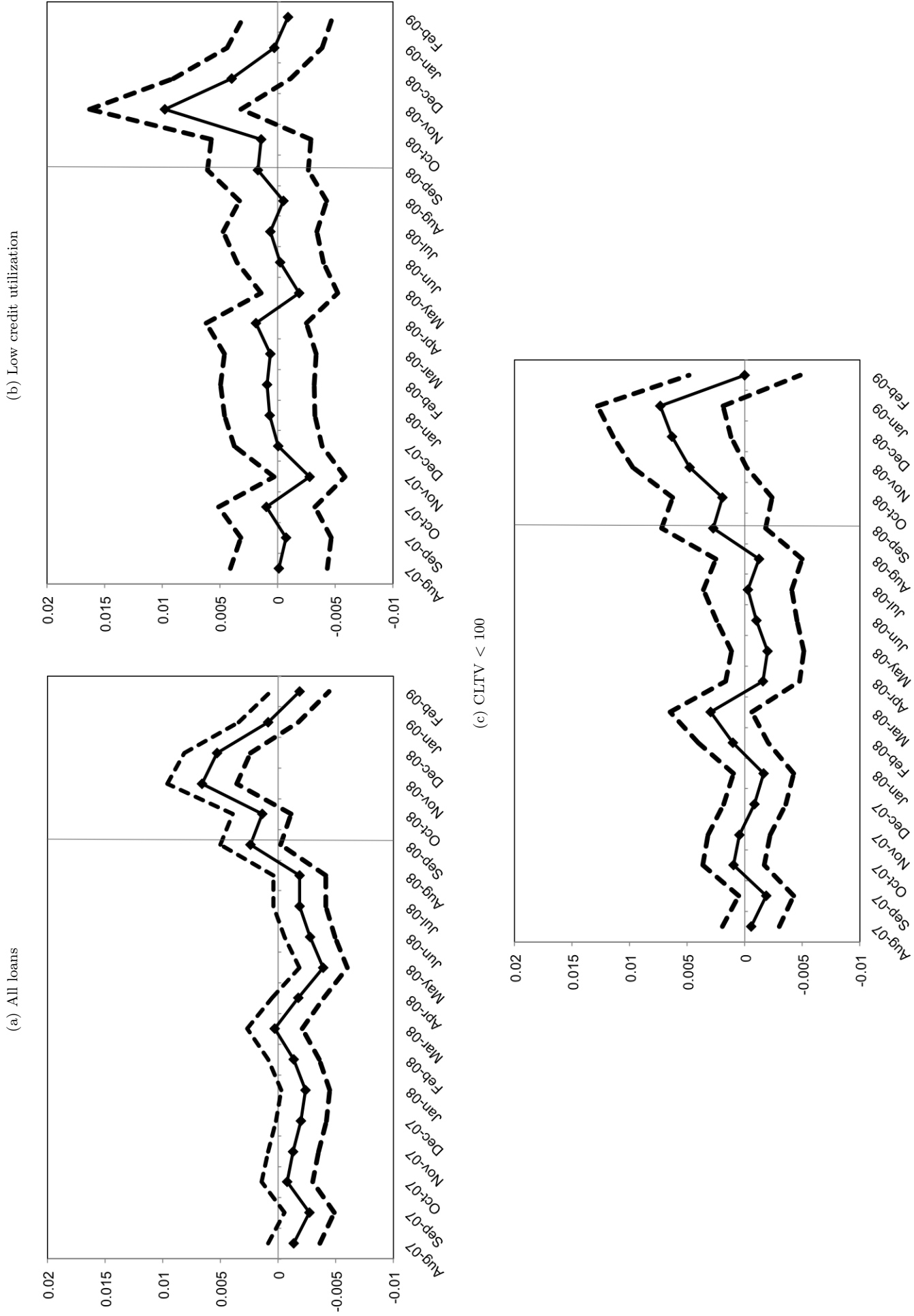
Notes: This figure plots estimates of probit specification (1) in an extended Matched Sample (until December 2009). The controls consist of the full set of Blackbox and Equifax controls used in Column (4) of Table 2. The displayed coefficients are marginal estimates of the interactions between the Countrywide and quarterly time dummies. The excluded category is the July-September 2007 period. The dashed lines show 99% confidence intervals around these estimates. Standard errors are clustered at the loan ID. Panel (a) shows the results for all loans, while panel (b) and panel (c) show the respective results for borrowers with low credit utilization and for loans with  $CLTV < 100$ .

Figure A5: 2/28 ARMs Hazard Model for Default Rate



Notes: This figure plots estimates of a discrete-time hazard model in the Matched Sample. We implement this model using a multiperiod probit specification in which the dependent variable equals 1 if the loan is 60 days delinquent during that month and equal to zero otherwise. Once a loan becomes 60 days delinquent, it drops out of our analysis. This model has similar controls as our baseline model but it does not condition on loans being current 2 months prior. It also includes controls for loan age and age squared to account for duration dependence. The displayed coefficients are the estimates of a change between Countrywide and Control Group default rates over time. The excluded category is the July-September 2007 period. The dashed lines show 99% confidence intervals around these estimates. Standard errors are clustered at the loan ID.

Figure A6: 2/28 ARMs Default Specification - Monthly Effects



Notes: This figure plots estimates of probit specification (1), but with monthly time dummies instead of quarterly time dummies. We use the Matched Sample and the full set of Blackbox and Equifax controls used in Column (4) of Table 2. The displayed coefficients are marginal probit estimates of the interactions between the Countrywide and time dummies. The excluded category is the July-September 2007 period. The dashed lines show 99% confidence intervals around these estimates. Standard errors clustered at the loan ID. Panel (a) shows the results for all loans, while panel (b) and panel (c) show the respective results for borrowers with low credit utilization and for loans with  $CLTV < 100$ .