Collateral Valuation and Borrower Financial Constraints: Evidence from the Residential Real-Estate Market

Sumit Agarwal
National University of Singapore
Itzhak (Zahi) Ben-David
The Ohio State University, Fisher College of Business
Vincent Yao
Fannie Mae

THE OHIO STATE UNIVERSITY FISHER COLLEGE OF BUSINESS

The views are those of the authors and may not reflect those of Fannie Mae

Motivation

- Collateral is a central feature in many credit contracts
  - E.g., Johnson and Stulz (1985), Berger and Udell (1990), Aghion and Bolton (1992), Hart and Moore (1994,1998), Hart (1995), Tirole (2005), Benmelech and Bergman (2009)
- We don't know much about the valuation process of collateralized assets
- Main question of study: What is the effect of borrower financial constraints on valuations?
  - Evidence that financially-constrained borrowers manipulate transaction prices (Ben-David 2011), stated income (Jiang, Nelson, and Vytlacil 2009), and documented assets (Garmaise 2012) in order to borrow larger loans
- Economic mechanism
  - Borrowers can threaten mortgage broker with shopping and have the mortgage broker shop for valuation for them
  - Borrowers can shop and select loans with highest valuation

Motivation (Cont'd)

- Valuations (appraisals) effectively matter only in refinance transactions
  - In purchase transactions, the lender counts on the lower between valuation and price; Most valuations are at the price (i.e., confirming that the transaction reflects market price)
  - 57.7% of residential mortgages in 2000-2009 are refinance mortgages (Agarwal and Rosen 2012)

- Why do borrowers with financial constraints care about valuation?
  - Cashout: Maximize borrowing from a collateral
  - Rate refi: Minimize mortgage interest (which increases with leverage)

- Empirical challenge: How to measure misvaluation?

Anecdotal Evidence

- Lingo:
  - Borrowers often complain that their **'appraisal came in low'** or **'value was cut'** implying the appraiser is at fault.
  - No one in the mortgage business ever says **'borrower's expectations were too high'** or **'purchase price was unrealistic.'**

- Many articles in the spirit of "**How to Influence an Appraiser.**" E.g., http://EzineArticles.com/3201545:
  - Most appraisers are lazy, so you have to do the work for them
  - Find out if they are willing to use private sales from county records
  - Find your own comps
  - Prepare a complete comp package for them
  - Have your place clean (first impressions are lasting ones)
  - ***Use your network for leverage and influence***

- Customized valuations: www.namethatvalue.com

Blacklisting Appraisers

- Testimonies of Appraisers: 11,000 appraisers complaining about harassment by loan officers and borrowers (http://appraiserspetition.com/index.htm)
  - Pressure comes from commission paid loan officers who often condition future assignments with achieving certain appraisal values
  - Some appraisers say that they were 'black-listed' because they did not deliver the right values
  - "I have lost clients for NOT hitting a number"
  - "Appraisers are like pawns in some financial firm's game. If they don't get what they want, they blacklist you"
  - "Appraisals need to be ordered by someone without a vested interest in the value"
  - "This is the single largest problem that faces the appraisal industry today"

- WaMu-eAppraiseIT Case

Likely Mechanism

From: Jeff Wenzel
To: Jeff
Cc: casali@comcast.net ; approvedappraisers@yahoo.com ; don@dslappraisals.com ; MIDNIGHTAPPRAISAL@sbcglobal.net ; spallone@sbcglobal.net ; jackpfps@sbcglobal.net ; Michael Ustick ; kevdriscoll@earthlink.net ; ripfisterer@hotmail.com ; ncasedi@hotmail.com ; inbox@prestaappraisal.com ; Stephen-Wilson@sbcglobal.net ; contactus@thepinkstongroup.com ; CalPac@sonic.net ; trever@fearrandappraisal.com ; gary@garyholtappraisal.com ; appraiserneil@sbcglobal.net ; CBAPPRAISALS@AAAPPRAISERS.COM ; Bert@PacificVista.net ; orders@pacific-appraisers.com ; info@heschenappraisals.com ; belinda@heisnerappraisals.com ; wappraisals@gmail.com ; TFeldenhei@aol.com ; appraiser@surewest.net ; byuen@sbcglobal.net ; mckinleymichael@comcast.net ; keith@alphavaluation.com ; kfilefrontdesk@hotmail.com ; VALERY5622@aol.com ; john.nelson@appraisersbythebay.com ; chris@cndappraisals.com ; Paul@LightspeedAG.com ; sonja@hillsideappraisal.com ; hartappraisals@sbcglobal.net ; hauselappraisal@aol.com ; darcyappraisals@sbcglobal.net ; info@aceappraisers.com
Sent: Monday, October 01, 2007 11:30 AM
Subject: Appraisal Needed

Hello!
I have a deal I need to get ordered as soon as possible! The address is 3716 Gladstone Dr, Pittsburg CA 94565. Owner is Roberto Gittens. I was hoping you could do a neighborhood lookup and see if we are in the ballpark? Mr Gittens believes the value to be around $460,000. That is the number to do the deal because he is at 100% LTV. Obviously there is no garantees but if its possible, then I can order it. Please let me know!

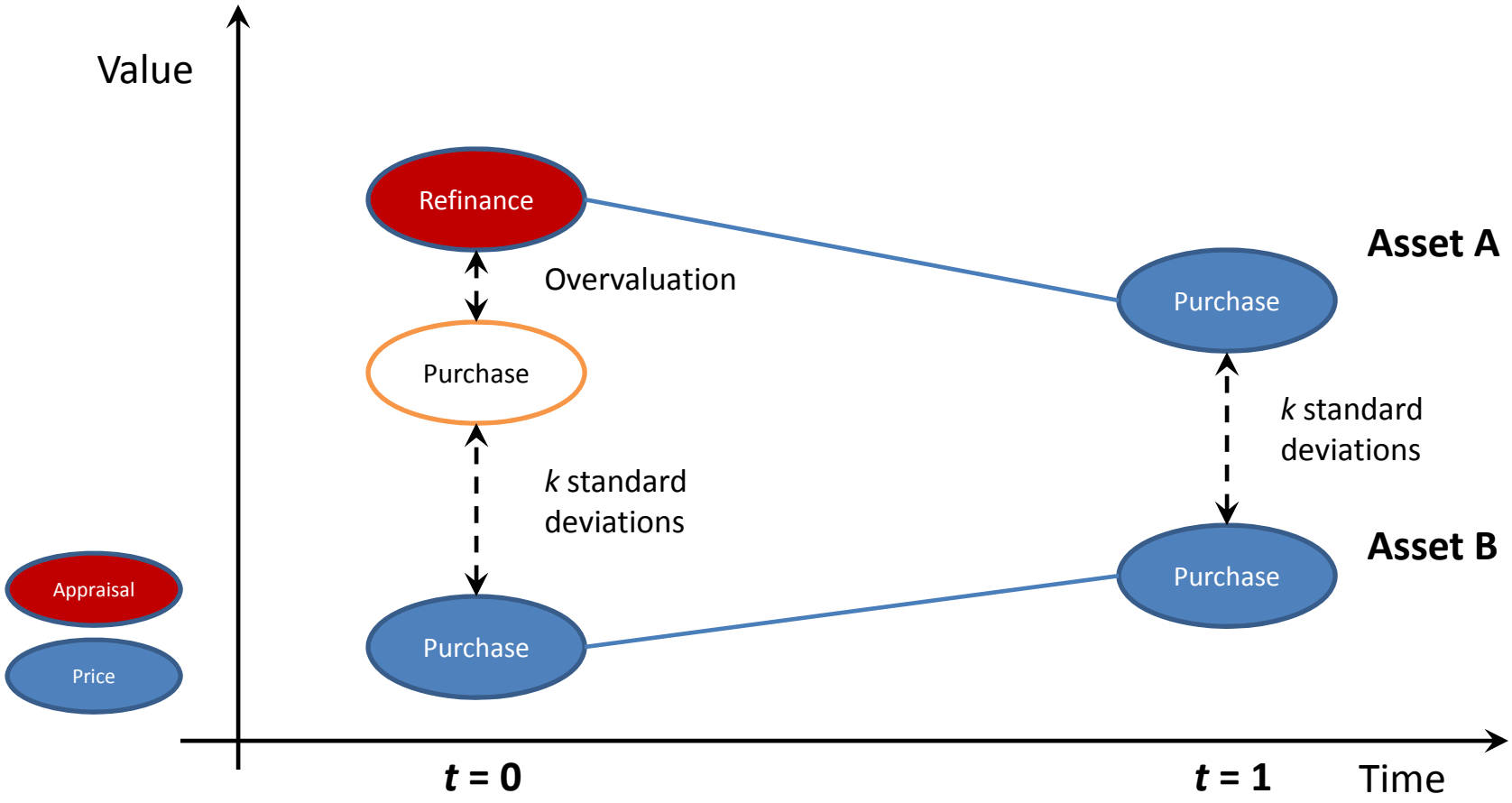
Respectfully,

Jeff Wenzel
Sr. Mortgage Banker
Manhattan Mortgage Group
888.569.1901 x1740(Main)
813.569.1740(Direct)
877.744.6612(Fax)
jwenzel@manhattanmortgagegroup.com

Empirical Methodology

- We assume that prices purchase transactions reflect market prices (= arm's length valuation)
- We test whether valuations in refinance transactions are different than prices of the same asset
- Construct transaction pairs for the same property:
  - Refinance → Purchase
  - Purchase → Purchase
- Compute values as *#standard deviations* from MSA-quarter mean of prices of purchase transactions

Illustration of Methodology



Regression Specification

$$std\ valuation_i\ (t=1) - std\ valuation_i\ (t=0)$$
$$= I(refi)_i + controls + fixed\ effects + e_i$$

- Controls: I(Default), I(Serious delinquency)
  Mortgage characteristics (t = 0): FICO, I(FRM 30), I(FRM 15), I(ARM short term), I(ARM Hybrid), I(No/low doc), I(Owner-occupier), I(Condo), Debt-to-income ratio, CLTV, Excess premium

- Fixed effects:
  - MSA × YYQQ (first transaction)
  - MSA × YYQQ (second transaction)

Data

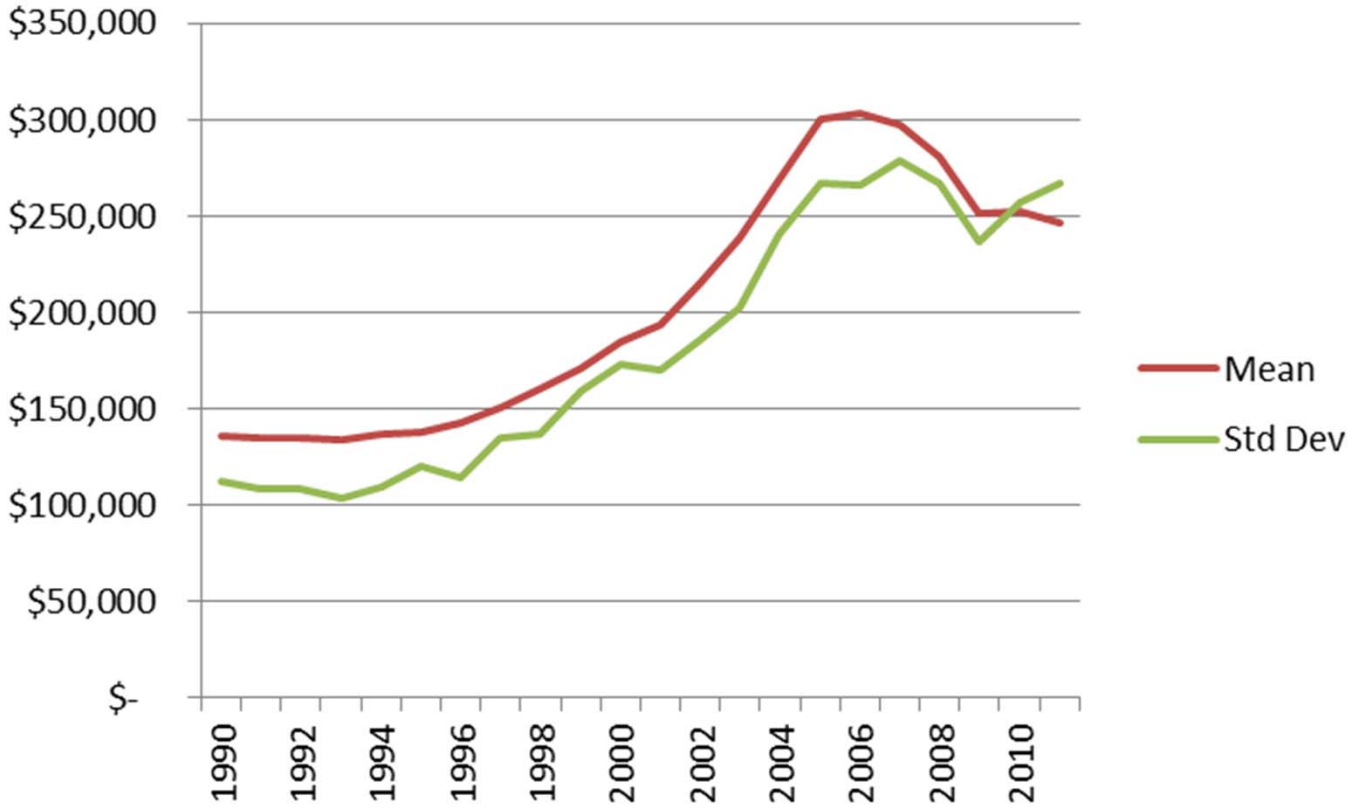
- First transaction: Refinance or purchase
  - Large mortgage insurer's data (includes valuation data)
  - 1990-2011
  - Conforming loans:
    - Prime borrowers (FICO > 620)
    - Mortgage size below GSE jumbo cutoff (currently $417,000)
  - In 49%, mortgages are originated by lenders (retail origination);
    In 51%, mortgages are originated by mortgage brokers or correspondent lenders
- Second transaction: Purchase
  - Public records
- 1.01m pairs of transactions

Average Appraisal Bias of Refinance Transactions

Dependent variable:	Difference in standardized values (%)		
Cash-out refi	-3.50***	-2.92***	-4.08***
	(-33.12)	(-28.14)	(-44.93)
Rate refi	-3.52***	-3.26***	-4.05***
	(-39.44)	(-36.44)	(-48.67)
Defaulted + Serious delinquency indicators	Yes	Yes	Yes
Mortgage controls	No	Yes	Yes
MSA × YYQQ (first transaction) FE	No	No	Yes
MSA × YYQQ (second transaction) FE	No	No	Yes
Observations	1,011,749	1,011,749	1,011,749
Adj R^2	0.068	0.072	0.082

- Refi transactions are overvalued on average by 4.1 × 0.886 = 3.7%

Interpreting the Regression Coefficients



- Average ratio mean[Std dev(Price)$_{MSA}$ / mean(Price)$_{MSA}$] = 0.886

Appraisal Bias and Leverage

Dependent variable:	Difference in standardized values (%)		
Cash-out refi			
× CLTV ≤ 70%	0.06	0.22***	-0.61***
× 70% < CLTV < 80%	0.10	0.01	-2.18***
× CLTV = 80%	-0.35***	-0.39***	-2.86***
× 80% < CLTV ≤ 85%	-0.65***	-0.59***	-2.85***
× 85% < CLTV ≤ 90%	-0.84***	-0.72***	-2.52***
× 90% < CLTV ≤ 95%	-1.39***	-0.78*	-3.24***
× 95% < CLTV	-3.79***	-2.91***	-7.32***
Defaulted + Serious delinquency indicators	Yes	Yes	Yes
Mortgage controls	No	Yes	Yes
MSA × YYQQ (first transaction) FE	No	No	Yes
MSA × YYQQ (second transaction) FE	No	No	Yes
Observations	1,011,749	1,011,749	1,011,749
Adj R^2	0.069	0.076	0.335

- Nearly-monotonic increase of appraisal bias with leverage
- Column (3): appraisal bias is 7.3 × 0.886 = 6.5%
- Similar (slightly weaker) results for rate/term refi

Third-Party Origination

Dependent variable:	Difference in standardized values (%)
Sample restriction (% of loan limit):	All
	(1)
Cash-out refi	-2.82***
	(-26.31)
× Third Party Originator	-2.25***
	(-20.83)
Rate refi	-2.57***
	(-26.17)
× Third Party Originator	-2.85***
	(-28.71)
Observations	1,011,749
Adj R^2	0.335

Full set of controls + fixed effects in all columns

- Third party origination is associated with appraisal bias of about 2.2%

Approaching the Jumbo-Loan Cutoff

Dependent variable:	Difference in standardized values (%)			
Sample restriction (% of loan limit):	0%-85%	85%-95%	95%-98%	98%-100%
	(1)	(2)	(3)	(4)
Cash-out refi	-4.20***	-3.02***	-3.05***	-0.83
	(-45.50)	(-6.77)	(-3.48)	(-0.99)
Rate refi	-4.14***	-3.24***	-2.69**	-2.25**
	(-49.51)	(-7.87)	(-3.11)	(-2.74)
Observations	920,388	47,796	11,282	13,142
Adj R^2	0.088	0.074	0.079	0.053

Full set of controls + fixed effects in all columns

- Loans that are close to the jumbo-loan cutoff have significantly lower appraisal bias
- Near the jumbo-loan cutoff there is little incentive to manipulate valuations, as loan size is capped

Default

- Refinanced mortgages are more likely to default (e.g., Elul et al. 2010)
- Also, leverage is a key determinant of default
- Is it possible that appraisal bias is partly responsible for the high likelihood of default of refinance transactions?

- Test:
  - Calculate the corrected leverage
  - Run horse race of observed leverage and corrected leverage

Default (Cont'd)

Dependent variable:	Defaulted within 12 months (0/1) × 100
	Stage 1 (raw)
	Observed CLTV
70< CLTV <80	0.06***
CLTV = 80	0.12***
80< CLTV <=85	0.16***
85< CLTV <=90	0.23***
90< CLTV <=95	0.30***
95< CLTV <=100	0.62***
100< CLTV <=105	
105< CLTV <=110	
110< CLTV	
Other controls	Yes
MSA × YYQQ	Yes
Observations	1,011,749
Pseudo-R^2	0.140

- Hypothesis: there is information in the recalculated leverage
- Test:
  - Stage 1: Regress default indicator on observed leverage indicators
  - Stage 2: Regress residuals on recalculated leverage indicators
- When replacing the order of the regressions, there is no additional information in the "observed CLTV" over the "recalcualted CLTV"

Mortgage Rates

Dependent variable:	Interest rate (%)
	Stage 1 (raw)
	Observed CLTV
70< CLTV <80	0.05***
CLTV = 80	0.10***
80< CLTV <=85	0.19***
85< CLTV <=90	0.25***
90< CLTV <=95	0.34***
95< CLTV <=100	0.51***
100< CLTV <=105	
105< CLTV <=110	
110< CLTV	
Other controls	Yes
MSA × YYQQ	Yes
Observations	1,011,749
Pseudo-R^2	0.056

- Hypothesis: lenders price inflated appraisals in mortgage rates
- Test:
  - Stage 1: Regress mortgage rate on observed CLTV indicators
  - Stage 2: Regress residuals on recalculated CLTV indicators
- When replacing the order of the regressions, there is no additional information in the "observed CLTV" over the "recalcualted CLTV"

Adverse Selection

- It appears that borrowers put pressure on appraisers and that lenders understand this and undo the effect by charging a premium on highly-leveraged refi transactions
  - Similar to the adverse selection in the insurance market; insurers account for adverse selection by pricing contracts accordingly (e.g., Akerlof 1970, Abbring, Chiappori, and Pinquet 2003, Lewis 2011)

- Why can't the borrowers and lenders just agree on higher leverage?
  - There are regulatory barriers. E.g., GSEs are supposed to help *home ownership*: cannot finance loans by more than 100%. The silent cooperation between borrowers and lenders effectively circumvents the legal framework.
  - Financially-constrained borrowers will always want to inflate the value of the collateral. Hence, even if higher leverage were allowed, then there will be appraisal bias and lenders would account for it by pricing.

Time-Series of the Appraisal Bias

Sample (first transaction):	1990-2000	2001	2002	2003	2004	2005	2006	2007-2011
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cash-out refi	-0.69***	-1.44***	-1.95***	-2.05***	-2.66***	-3.14***	-4.93***	-6.87***
	(-6.31)	(-8.42)	(-12.14)	(-14.18)	(-15.18)	(-17.35)	(-24.16)	(-39.85)
Rate refi	-1.60***	-1.71***	-1.91***	-1.81***	-2.16***	-2.56***	-5.49***	-7.70***
	(-17.67)	(-10.67)	(-13.41)	(-13.93)	(-12.84)	(-12.64)	(-22.07)	(-45.30)
Defaulted + Serious delinquency indicators	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mortgage controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA × YYQQ (first transaction) FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA × YYQQ (second transaction) FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	273,227	86,171	125,523	213,524	87,470	70,844	55,695	99,295
Adj R^2	0.364	0.379	0.375	0.368	0.397	0.439	0.479	0.468

- Appraisal bias increases with bubble

Time-Series of the Appraisal Bias

Dependent variable:	Difference in standardized values (%)		
MSA growth:	Low	Mid	High
	(1)	(2)	(3)
Cash-out refi	-0.58***	-1.42***	-1.81***
	(-4.34)	(-9.58)	(-9.29)
Rate refi	-1.06***	-1.08***	-2.25***
	(-8.89)	(-7.67)	(-13.69)
Defaulted + Serious delinquency indicators	Yes	Yes	Yes
Mortgage controls	Yes	Yes	Yes
MSA × YYQQ (first transaction) FE	Yes	Yes	Yes
MSA × YYQQ (second transaction) FE	Yes	Yes	Yes
Observations	186,051	129,046	125,094
Adj R^2	0.379	0.391	0.409

- Sample is restricted to refi transactions between2001 to 2006; purchase transaction up to 2007
- MSAs are classified to low/mid/high growth according to growth between 2001-2006
- Appraisal bias is higher in bubble cities

Selection of First Transaction? Use Triplets and Control for Past Returns

Dependent variable:	Difference in standardized values (%)		
Sample:		Triplets	
Cash-out refi	-3.12***	-2.30***	
× Third party originator		-1.53***	
× CLTV ≤ 70%			-0.71
× 70% < CLTV < 80%			-1.94**
× CLTV = 80%			-2.15**
× 80% < CLTV ≤ 85%			-2.20*
× 85% < CLTV ≤ 90%			-1.99*
× 90% < CLTV ≤ 95%			-5.93*
× 95% < CLTV			-2.94
Value (t = 1) - Purchase (t = 0)	-0.05***	-0.05***	-0.05***
(Value (t = 1) - Purchase (t = 0)) * I(Refi (t = 1))	-0.04***	-0.03***	-0.04***
Defaulted + Serious delinquency indicators	Yes	Yes	Yes
Mortgage controls	Yes	Yes	Yes
MSA × YYQQ (first transaction) FE	Yes	Yes	Yes
MSA × YYQQ (second transaction) FE	Yes	Yes	Yes
Observations	109,598	109,598	109,598
Adj R^2	0.073	0.075	0.076

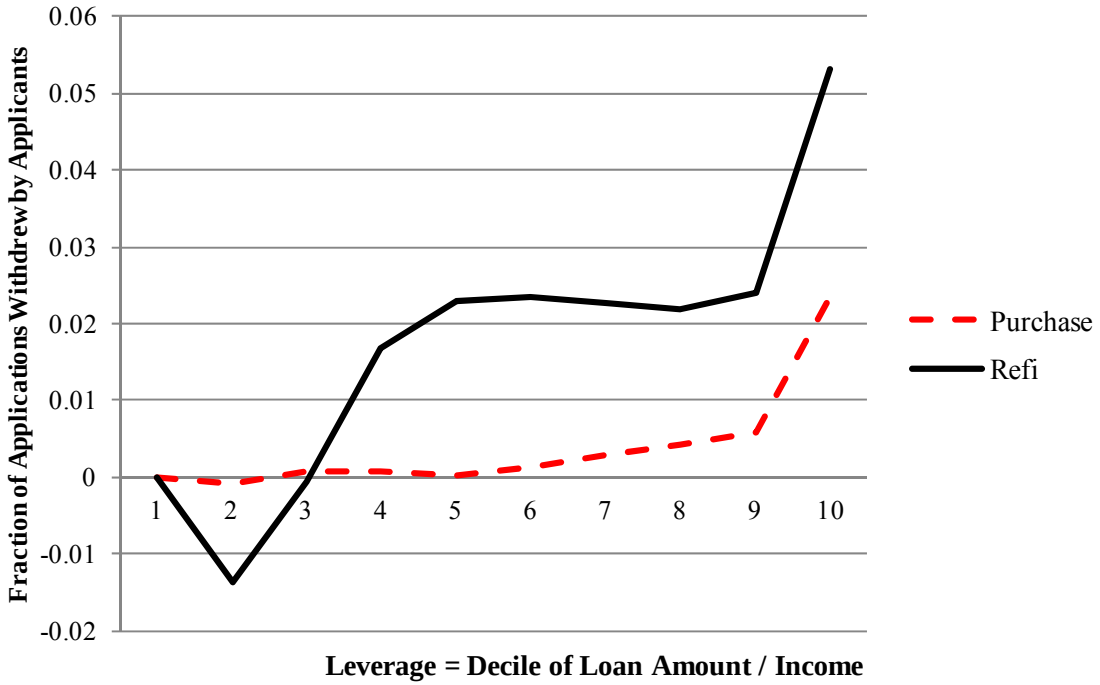
- It is possible that there is selection in the first transaction:
  - E.g., some refi/purchase take place because the value of the property is relatively high
- We can control for pre-first transaction by adding another purchase transaction to the series. Effectively, we have a sample of "triplets".
- The results are similar.

Selection of First Transaction? Use AVMs

Dependent variable:	Difference in standardized values of Appraisal - AVM (%)		
Sample:	All refis		
Cash-out refi	3.86***	3.23***	
× Third Party Originator		1.18***	
× CLTV ≤ 70%			3.01***
× 70% < CLTV < 80%			3.69***
× CLTV = 80%			4.41***
× 80% < CLTV ≤ 85%			4.10***
× 85% < CLTV ≤ 90%			3.73***
× 90% < CLTV ≤ 95%			2.23***
× 95% < CLTV			2.50***
Defaulted + Serious delinquency indicators	Yes	Yes	Yes
Mortgage controls	Yes	Yes	Yes
MSA × YYQQ (first transaction) FE	Yes	Yes	Yes
MSA × YYQQ (second transaction) FE	Yes	Yes	Yes
Observations	441,132	441,132	441,132
Adj R^2	0.028	0.032	0.029

- In order not to condition on future transaction taking place, in the current specification we compare appraisals to automatic valuation model (AVMs)

Withdrawal of Applications by Borrowers



- Threatening loan officers to shop translates to higher withdrawal rate by borrowers. The effect is stronger for refi and for highly-leveraged borrowers
- Data: HMDA; 2006; 31.4m applications
- The likelihood of application withdrawal is significantly higher for refinance, especially for highly-leveraged borrowers

Conclusion

- We use diff-in-diff methodology to measure appraisal bias in residential refinance transactions

- Appraisal bias
  - 3.7% on average
  - Increases with leverage: 6.5% for loans with CLTV > 95%
  - 2.2% for loans originates by third-party originators

- Although appraisal bias affects default, lenders are aware of this, and charge a premium for highly-leveraged refi mortgages
  - Borrowers and lenders circumvent legal restrictions on high-leverage lending

- Appraisal bias appears to be correlated with (contributed to?) the real-estate bubble

Concerns About Specification

- Endogeneity of refinancing
  - Refinance (being a voluntary transaction) is likely to follow price run-up
  - We examine only the difference in valuation between a purchase and an earlier refinance (not the reverse order)

- Endogeneity of selling
  - A refinance will enter the sample only if it is followed by a purchase. A purchase is more likely to take place after price run-up (Genesove and Mayer 2001, Korteweg and Sorensen 2012)
  - This bias will work against finding overvaluation. (It potentially causes poor-performing properties to not be included in the sample.)

- Quality-based selection into the sample
  - The first transaction includes only *prime* mortgages
  - The effects are potentially understated

Methodology (Cont'd)

- Calculate the "adjusted valuation", i.e., valuation (or price) expressed in standard deviation terms

$$\frac{(\qquad\qquad)}{\qquad\qquad\qquad\qquad}$$

- Express the difference between two consecutive transactions:
  - The difference between two consecutive refinance and purchase transactions:

$$(\qquad\qquad) \qquad (\qquad\qquad)$$

  - The difference between two consecutive refinance and purchase transactions:

$$(\qquad\qquad) \qquad (\qquad\qquad)$$

Methodology (Cont'd)

- Difference the two pairs of transactions:

$$\text{[illegible]}[\text{[illegible]}(\text{[illegible]}h\ \text{[illegible]}, \text{[illegible]} = 1) - \text{[illegible]}(\text{[illegible]}, \text{[illegible]} = 0)]$$
$$- \text{[illegible]}[\text{[illegible]}(\text{[illegible]}h\ \text{[illegible]}, \text{[illegible]} = 1) - \text{[illegible]}(\text{[illegible]}h\ \text{[illegible]}, \text{[illegible]} = 0)]$$
$$= -\text{[illegible]}$$

- We <u>do not</u> exclude transactions in which the second transaction is a foreclosure / short-sale. We control for default / serious delinquency

Anecdotal Evidence

- Lingo:
  - Borrowers often complain that their **'appraisal came in low'** or **'value was cut'** implying the appraiser is at fault.
  - No one in the mortgage business ever says **'borrower's expectations were too high'** or **'purchase price was unrealistic.'**

- Many articles in the spirit of "**How to Influence an Appraiser.**" E.g., http://EzineArticles.com/3201545:
  - Most appraisers are lazy, so you have to do the work for them
  - Find out if they are willing to use private sales from county records
  - Find your own comps
  - Prepare a complete comp package for them
  - Have your place clean (first impressions are lasting ones)
  - ***Use your network for leverage and influence***

- Customized valuations: www.namethatvalue.com

Testimonies of Appraisers

- 11,000 appraisers complaining about harassment by loan officers and borrowers (http://appraiserspetition.com/index.htm)
  - Pressure comes from commission paid loan officers who often condition future assignments with achieving certain appraisal values
  - Some appraisers say that they were 'black-listed' because they did not deliver the right values
  - "I have lost clients for NOT hitting a number"
  - "Appraisers are like pawns in some financial firm's game. If they don't get what they want, they blacklist you"
  - "Appraisals need to be ordered by someone without a vested interest in the value"
  - "This is the single largest problem that faces the appraisal industry today"

- Interviews of appraisers
  - "I now have a private appraisal practice, and there still are occasions when a financial firm or loan officer will call me and say: if you can make this deal work, I will have more work for you than you can handle."

WaMu-eAppraiseIT Case

- Washington Mutual and eAppraiseIT (now CoreLogic) (July 2006 to April 2007)
- WaMu puts pressure on its appraiser firm eAppraiseIT to increase valuations
  - Objective: to sell mortgages more easily in the secondary market
- WaMu threatens with transferring business to competitors
  - Threat is realized in N California
- eAppraiseIT accepts WaMu's terms:
  - "Proven Accepted List" of appraisers
  - Appraisers who do not hit the numbers are black-listed

- NY Attorney General Cuomo sues eAppraiseIT (November 1, 2007)
  - Strong price reaction
  - Reached settlement with CoreLogic on September 2012

Concerns About Specification (Cont'd)

- Change in the sample composition
  - If we used only refinance-purchase pairs then change in sample composition could affect the results
  - Since we use also purchase-purchase pairs, this concern is mitigated

- Change in unobservable characteristics
  - E.g., properties that are refinanced are in good condition, but properties that are sold are in bad condition
  - Rate/term refinancing of 2003 are not b/c of good condition; we observe similar appraisal bias