House-Price Expectations and the Mortgage Market

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Introduction

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These innovations include subprime lending and "alternative mortgage products" (AMPs), such as interest-only mortgages.

The innovations were viewed as feeding housing demand, helping to cause the bubble in the US.

But another causal link may run in opposite direction.

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So bubble conditions may themselves spur mortgage innovations.

They feed the bubble, but the innovations also set the stage for a surge in defaults once the bubble bursts.

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Effect of price expectations on mortgage market studied in two papers by Calem, Nakamura and me (talk provides overview).

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Complements other work arguing that price expectations, not fundamentals, drove the bubble.

See Coleman, LaCour-Little and Vandell (2008), Dell'Ariccia et al. (2008), Mian and Sufi (2009), Glaeser, Gottlieb and Gyourko (2010), Goetzmann et al. (2011).

Introduction

Theory predicts that favorable shift in price-expectations spurs:

- Reduction in minimum credit score needed to get a mortgage (subprime lending)
- Surge in use of backloaded AMPs (interest-only ARMs and option ARMs, which allow negative amortization).

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Uses past house-price appreciation as a proxy for expectations about future prices.

Subprime model

Two periods, 0 and 1.

House bought at price P_0 at beginning of period 0 with 100% mortgage.

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House bought at price P_0 at beginning of period 0 with 100% mortgage.

Promised repayment of M in period 1.

House price at end of period 1, denoted P, is stochastic.

House-price density is $f(P, \delta)$, with δ a shift factor that moves f to right.

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Borrower defaults when

$$P \leq M - C,$$

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Zero lender profit requires

$$\pi \equiv -P_0 + \eta \left[\int_0^{M-C} Pf(P,\delta)dP + \int_{M-C}^{\infty} Mf(P,\delta)dP \right] = 0.$$

Yields inverse relationship between mortgage payment M and C:

$$\partial M/\partial C < 0.$$

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As house-price density shifts to right, this lower bound on C drops:

$$\frac{\partial \widehat{C}}{\partial \delta} < 0.$$

So favorable shift in house-price density reduces $\widehat{C}$, spurring subprime lending.

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Backloading (M_0 falling and M rising) increases risk of default.

The zero-profit condition is now

$$\pi \equiv -P_0 + M_0 + \eta \left[\int_0^{M-C} Pf(P,\delta)dP + \int_{M-C}^{\infty} Mf(P,\delta)dP \right] = 0.$$

Yields downward-sloping zero-profit locus in (M, M_0) space.

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Tangency gives equilibrium mortgage contract.

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Rightward shift of house-price density increases mortgage backloading:

$$\frac{\partial M}{\partial \delta} > 0, \quad \frac{\partial M_0}{\partial \delta} < 0$$

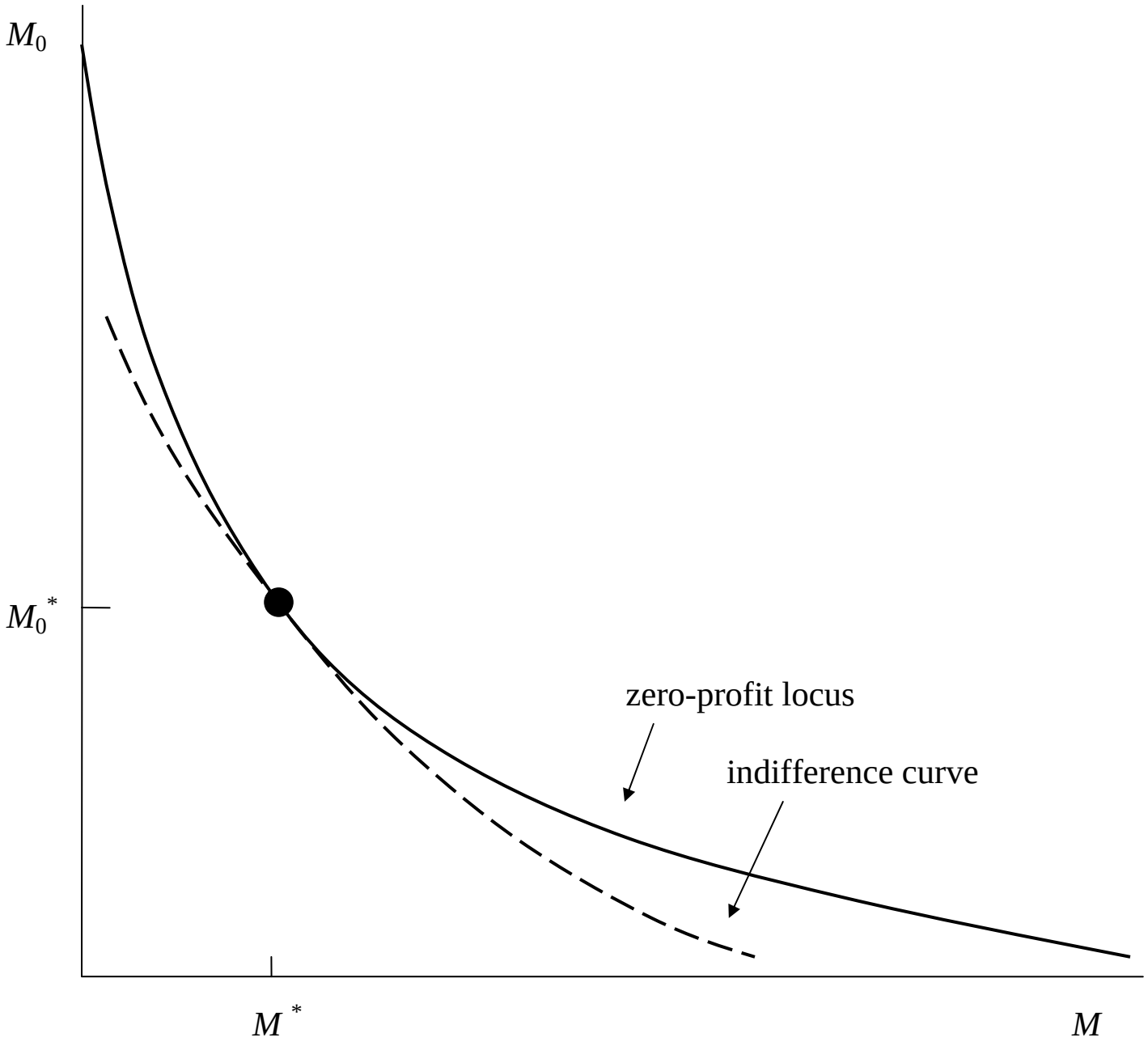

Figure 1: Optimal Mortgage Contract

Subprime empirical work

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Lag partly avoids endogeneity, which is also handled by autoregressive transformation.

Table 2
OLS RISKSCORE regressions by buyer type – 2001Q1–2008Q4.

	Repeat buyers			Refinancers		
	Mean	10th Percentile	25th Percentile	Mean	10th Percentile	25th Percentile
Constant	467.779**	407.462**	437.864	839.825**	654.739**	742.111**
	(4.822)	(10.211)	(8.029)	(13.426)	(25.945)	(22.600)
$HPICHG_{t-4}$	−0.469**	−0.647**	−0.682**	−0.631**	−0.891**	−0.916**
(β_1)	(0.047)	(0.087)	(0.072)	(0.084)	(0.167)	(0.146)
CC_t	0.109**	0.238**	0.176**	0.151**	0.300**	0.268**
	(0.018)	(0.035)	(0.028)	(0.022)	(0.039)	(0.037)
UNR_t	0.002	−0.910	−0.345	0.089	0.376	0.171
	(0.332)	(0.657)	(0.523)	(0.468)	(0.898)	(0.797)
PCI_t	0.275	0.534	0.657*	0.413	1.646**	1.246**
	(0.171)	(0.352)	(0.283)	(0.256)	(0.502)	(0.433)

First-time buyers			Investors		
Mean	10th Percentile	25th Percentile	Mean	10th Percentile	25th Percentile
685.443**	589.630**	613.835**	273.698**	241.608**	263.383**
(7.656)	(10.872)	(10.632)	(3.495)	(7.664)	(5.292)
−0.152**	−0.085	−0.170*	−0.283**	−0.556**	−0.464**
(0.046)	(0.059)	(0.067)	(0.042)	(0.101)	(0.065)
0.048*	0.0163**	0.122**	0.031	0.095	0.067
(0.020)	(0.025)	(0.030)	(0.028)	(0.052)	(0.042)
−0.487	0.060	−0.611	−0.669	−2.754**	−0.781
(0.274)	(0.383)	(0.366)	(0.399)	(0.923)	(0.630)
0.769**	0.508*	1.245**	−0.516*	0.033	−0.465
(0.163)	(0.237)	(0.228)	(0.222)	(0.492)	(0.333)

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Option ARM share is 12%; interest-only ARM share is 8%.

Dependent variable is AMP market share, and key covariate is same *HPICHG* variable.

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LTV also added as covariate to control for unaffordability, which may spur use of AMPs (high prices $\Longrightarrow$ high LTV).

Table 2: Market-Share Regressions

2a. Pooled

	Affordability proxy is median LTV				Affordability proxies are median LTV and percent of loans with 2nd lien			
	All AMP	**IO ARM**	**Option ARM**	**ARM (1-year, 2/28, or 3/27)**	**All AMP**	**IO ARM**	**Option ARM**	**ARM (1-year, 2/28, or 3/27)**
Constant	-3.589** (0.481)	-2.474** (0.363)	-1.114** (0.175)	1.069** (0.181)	-4.144** (0.436)	-2.987** (0.349)	-1.157** (0.226)	0.699** (0.220)
Prior year HPI change	0.322** (0.020)	0.155** (0.012)	0.166** (0.014)	-0.028** (0.007)	0.302** (0.018)	0.140** (0.011)	0.163** (0.013)	-0.041** (0.007)
Log of real per capita personal income	0.274** (0.046)	0.171** (0.035)	0.103** (0.017)	-0.023 (0.017)	0.374** (0.042)	0.243** (0.033)	0.130** (0.022)	0.020 (0.021)
Consumer confidence index	0.0010** (0.0001)	0.0008** (0.0001)	0.0002** (0.0000)	-0.0001 (0.0000)	0.0005** (0.0001)	0.0007** (0.0001)	-0.0001 (0.0001)	0.0001* (0.0001)
Mean FICO Score	0.0003** (0.0001)	0.0005** (0.0001)	-0.0002** (0.0000)	-0.0011** (0.0001)	-0.0000 (0.0001)	0.0003** (0.0001)	-0.0004** (0.0000)	-0.0011** (0.0001)
Median LTV	0.0064** (0.0007)	0.0036** (0.0004)	0.0028** (0.0004)	-0.0006** (0.0001)	0.0004** (0.0007)	0.0019** (0.0003)	0.0013** (0.0002)	-0.0005* (0.0002)
Pct. With 2nd Lien					0.176** (0.026)	0.144** (0.017)	0.032 (0.020)	-0.068** (0.009)
Number of Observations	18547	18547	18547	18547	14840	14840	14840	14840
R-Squared	0.568	0.516	0.469	0.470	0.544	0.475	0.445	0.464

Refinancing subsample

Another way to control for housing unaffordability is to focus on refinancing loans.

Since borrower already owns house, affordability issue isn't present.

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AMP share is slightly lower among refinancing loans (8.37%) than among purchase loans (9.77%).

Table 4: Market-Share Regressions for Refinancing Loans

(*pooled data*)

	Affordability proxy is median LTV				Affordability proxies are median LTV and percent of loans with 2nd lien			
	All AMP	**IO ARM**	**Option ARM**	**ARM (1-year, 2/28, or 3/27)**	**All AMP**	**IO ARM**	**Option ARM**	**ARM (1-year, 2/28, or 3/27)**
Constant	-3.158** (0.492)	-1.912** (0.387)	-1.247** (0.210)	0.453 (0.281)	-4.988** (0.547)	-2.990** (0.419)	-1.997** (0.332)	0.249 (0.331)
Prior year HPI change	0.144** (0.020)	0.106** (0.015)	0.038** (0.010)	-0.010 (0.010)	0.134** (0.018)	0.107** (0.014)	0.028** (0.010)	-0.026* (0.011)
Log of real per capita personal income	0.261** (0.047)	0.149** (0.037)	0.112** (0.020)	0.009 (0.027)	0.455** (0.052)	0.261** (0.040)	0.194** (0.032)	0.028 (0.032)
Consumer confidence index	0.0009** (0.0001)	0.0006** (0.0001)	0.0003** (0.0001)	-0.0001 (0.0001)	0.0007** (0.0001)	0.0006** (0.0001)	0.0001 (0.0001)	0.0000 (0.0001)
Mean FICO Score	0.0002** (0.0001)	0.0029** (0.0001)	-0.0001 (0.0000)	-0.0007** (0.0001)	0.0001 (0.0001)	0.0002** (0.0000)	-0.0001** (0.0000)	-0.0008** (0.0001)
Median LTV	0.0030** (0.0003)	0.0014** (0.0002)	0.0015** (0.0002)	0.0005** (0.0002)	0.0021** (0.0002)	0.0010** (0.0002)	0.0011** (0.0002)	0.0008** (0.0002)
Pct. With 2nd Lien					0.192** (0.028)	0.115** (0.021)	0.077** (0.019)	-0.087** (0.015)
Number of Observations	18483	18483	18483	18483	14781	14781	14781	14781
R-Squared	0.366	0.375	0.247	0.239	0.249	0.281	0.188	0.258

Default performance of AMPs

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Results show worse default performance of AMPs, as posited in model.

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Innovations may fuel a bubble by raising demand.

But bubble in turn spurs innovations, as favorable house-price expectations reduce default concerns.

Lenders are then more will to lend to risky borrowers and offer risky contracts.

Bad consequences for default once bubble bursts.