

Selection, Leverage, and Default in the Mortgage Market

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This paper:

1. Measure the relationship of initial leverage and current home equity on defaults
2. Measure the relationship of payment shocks on defaults
3. Quantify the effect of LTV caps (macroprudential) on credit allocation and welfare.

Selection, Leverage and Defaults

Main results:

1. Initial leverage (adverse selection/ hidden information) explain between 30-40% of defaults, current home equity (moral hazard/ hidden actions) explain 60-70% of defaults on the absence of payment shocks.
2. Payment shocks account for just under 50% of default variation
3. LTV cap reduce the effect of moral hazard but increase the adverse selection distortions, externalities from defaults need to be on the order of 313,000 per default to be welfare neutral

Main Comments

1. Interpretation of the contribution
2. Empirical strategy and identifying assumption:
 - Option-ARM
 - 5 years ARM (skip)
3. Weak instruments

Active research on moral hazard and adverse selection on credit markets

Karlan and Zinman (2009), Hertzberg, Liberman and Paravisini (2018), just to name a few

Implication for macro-prudential regulation

- Smart use of equilibrium on competitive markets with adverse selection (Azevedo and Gottlieb, 2017)
- Tractable model with broader implication

Comments: Macro prudential regulations in Europe

Table A.1 Implementation of macro-prudential policies targeting housing market imbalances and (excessive) lending in foreign currency¹⁾

	Capital measures		Provisioning measures	Liquidity measures		Creditworthiness of borrowers		Restrictions on mortgage lending
	Counter-cyclical capital requirements	Risk-weights measures		Reserve requirements ³⁾	Foreign currency liquidity requirement	Loan-to-value ratio	Debt-to-income/Debt service-to-income ratio	
Belgium		X						
Bulgaria		X	X	X,•				
Croatia	X	•	X,•	X,•	•			X
Denmark						X		
Estonia		X		X,•				
Greece							X	
Hungary				X,•		X,•	•	•
Ireland		X						
Latvia				X,•		X		
Lithuania				X,•		X		
Netherlands						X		
Norway	X	X				X		
Poland		•		X,•		X,•	X,•	
Romania	• ²⁾		X,•	X,•		X	X,•	
Slovakia				X,•		X		
Slovenia				X,•				
Spain		X	X					
Sweden		X				X		
Switzerland	X	X						

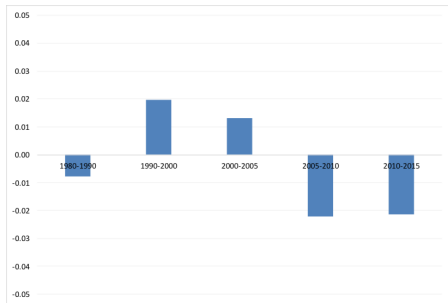
Sources: Vandenbussche et al., op. cit.; Shim et al., op. cit.; and national authorities.

Notes: 1) A dot (•) indicates a measure related to foreign currency. 2) Refers to a maximum ratio of foreign loans to own funds. 3) The dot for Croatia refers to mortgage, consumer and corporate loans. The dot for Poland refers to mortgage loans only.

Source: ECB report 2014

Comments: Interpretation of the contribution

Homeownership Rates



HO Rates by Income Q



Source: Adelino, Schoar and Severino (2018)

Suggestions: Interpretation of the contribution

1. Sensitivity of the results to parameters

- What if zero moral hazard? What if zero adverse selection?
- What is the range of the estimates? How narrow are the prediction?

2. Role of assumptions

- What if they relax zero profit condition for the banks? How does it change the results
- Uniform distribution of behavioral borrowers? What if mimic the distribution of originations?

3. Benchmark findings to existing empirical results

Campbell et al 2010, a foreclosure at a distance of 0.05 miles lowers the price of a house by about 1 percent point.

4. Connect mortgage design literature more directly

- Guren, Krishnamurthy, and McQuade. 2018, Campbell, Cocco and Clara, 2017, among others

Comments: Empirical strategy and identifying assumption

Option ARM, payment shock channel is muted. The empirical specification is:

$$D_{i,t+1} = \alpha \mathbf{E}_{it} + \gamma \mathbf{L}_i + x_i' \beta + \omega_{m(i)} + \delta_{index,i} + MSA_i + u_{it}$$
$$E_{it} = f_t(m_i, index_i) + x_i' \pi_t + \lambda_{m(i)} + \mu_{index(i)} + MSA_i + e_{it}$$

IV Strategy: Instrument by cohort x index type the current LTV of individuals

Assumption: Changes in index values per cohort only correlated with defaults through the current LTV or negative equity

Comments: Empirical strategy and identifying assumption

$$D_{i,t+1} = \alpha \mathbf{E}_{it} + \gamma \mathbf{L}_i + x_i' \beta + \omega_{m(i)} + \delta_{index,i} + MSA_i + u_{it}$$

$$E_{it} = f_t(m_i, index_i) + x_i' \pi_t + \lambda_{m(i)} + \mu_{index(i)} + MSA_i + e_{it}$$

Panel B: OLS and IV Regressions at 24 Months Including Current Loan-to-Value

	Baseline	OLS	IV	Baseline	OLS	IV
Original Loan-to-Value	0.586*** (0.046)	-0.059 (0.056)	-0.241 (0.234)	0.721*** (0.026)	0.244*** (0.053)	0.229*** (0.050)
Current Loan-to-Value		0.573*** (0.029)	0.735*** (0.212)		0.402*** (0.037)	0.415*** (0.041)
Mean of Dep. Var	0.264	0.264	0.264	0.264	0.264	0.264
N	265134	265134	265134	265134	265134	265134
Origination Month FEs	Yes	Yes	Yes	Yes	Yes	Yes
Index FEs	Yes	Yes	Yes	Yes	Yes	Yes
MSA FEs	No	No	No	Yes	Yes	Yes
Full Controls	No	No	No	Yes	Yes	Yes

Naive Adverse Selection coef 0.721, “Correct” Adverse Selection coef 0.229

Moral Hazard accounts for $1 - 0.229/0.721 = 68\%$ of defaults and **“Adverse Selection”** for **32%**

Comments: Empirical strategy and identifying assumption

$$D_{i,t+1} = \alpha \mathbf{E}_{it} + \gamma \mathbf{L}_i + x_i' \beta + \omega_{m(i)} + \delta_{index,i} + MSA_i + u_{it}$$
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Two main suggestions:

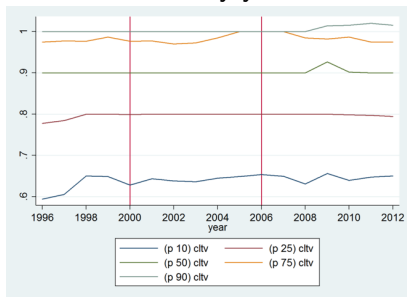
1. L_i LTV at origination is not the entire leverage at origination
2. Exclusion restriction of the instrument for \mathbf{E}_{it}

Comments: LTV at origination

CLTV is the a more accurate measure of leverage at origination

- If classical measurement error then leads to attenuation bias, misperception of effect of adverse selection

CLTV by year



CLTV by house price level in 2000



Source: Dataquick Sample Period 2000-2006

Suggestion

1. Use other data sources to understand the correlation between LTV and CLTV to understand the bias

Comments: Exclusion Restriction

Need to argue that changes in index are only affecting default through negative equity and no other characteristics

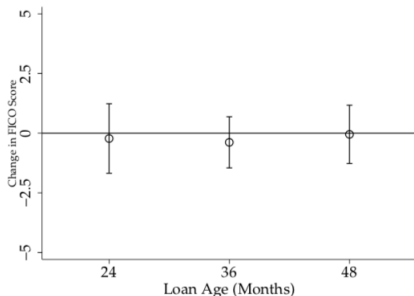
	Panel A: Option ARM Sample			
	Treasury		LIBOR	
	Mean	SD	Mean	SD
FICO Score	706.1	45.9	713.8	45.1
Original Balance	370.5	264.4	346.1	282.1
Loan for Purchase	0.33		0.42	
No/Low Documentation	0.79		0.77	
Primary Residence	0.77		0.68	
Condo, Co-op or Multifamily	0.14		0.16	
Prepayment Penalty	0.99		0.94	
Margin	3.21	0.53	2.85	0.51
Original LTV	76.6	8.40	77.0	8.30

Source: Table 2 on the paper

Differences in Loan for Purchase (33% vs 42%), Primary Residence (77% vs 68%), etc

Comments: Exclusion Restriction

Using univariate instrument (simulated) the authors argue that instrument is uncorrelated with credit score, but what about other outcomes?



Suggestion: show a table where you split on high and low “simulated instrument” and show that there are not statistical differences for all variables on table 2.

Comments: Exclusion Restriction

Option ARM contract are special usually offer 4 payment options

- 15 year term payment (Principal and interest)
- 30 year term payment (Principal and interest)
- Interest-only payment (Usually available first 10 years)
- Minimum monthly payment (Negative amortization payment)

If individuals are not using minimum payment always, then it is not moral hazard only, E_i is also affected by selection

Suggestion: Authors are assuming that not change on payment only on balance

They can show that individuals are indeed only making the minimum payment on the data

Comments: Weak Instruments

With weak instruments 2SLS is biased towards OLS.

Panel B: OLS and IV Regressions at 24 Months Including Current Loan-to-Value

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The bias will tend to be worse when there are many over-identifying restrictions (many instruments compared to endogenous regressors).

Other issues: Just identified IV is approximately unbiased (or less biased) even with weak instruments (although it is not possible to see this from the bias formula).

Estimated standard errors of 2SLS and IV estimators may be too small

Suggestion: Weak Instruments

There are alternative estimators, which have better small sample properties than 2SLS with weak instruments.

One such estimator is **LIML (limited information maximum likelihood)**.

LIML is generally much better, although conventional LIML standard errors are too small.

A simple to implement proportional adjustment to the LIML standard errors based on the Bekker many-instrument asymptotics (Imbens and Wooldridge, NBER Summer Lecture 2007)

1. Make sample comparable

- Most of the analysis on survival sample
- It will be great to see the summary stats for that sample

2. Identification comments apply to 5/1 ARM sample

- Show balance test on observables for the instrument
- Empirical specific that mimics Option ARM (original LTV and current LTV)

Conclusion

Interesting paper that aims to answer an important question

A lot to like on it.

Empirics, need to provide more evidence of identifying assumptions

Model, will be useful to understand how narrow or broad potential estimates are.

Thank you!