Passthrough from the Secondary to the Primary Mortgage Market
From TBA to YSP

Paul Willen, Federal Reserve Bank of Boston and NBER

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Weimer School, Homer Hoyt Institute

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Disclaimer

- I am speaking today as a researcher and as a concerned citizen
- not as a representative of:
    - The Boston Fed
    - or the Federal Reserve System

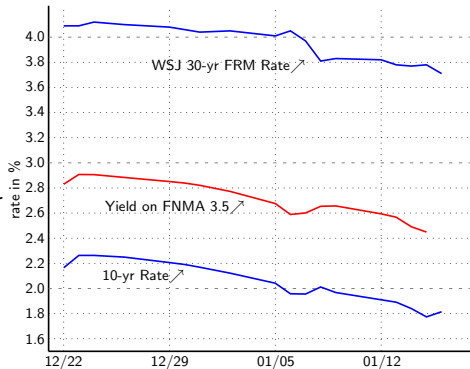- When I say "we", I don't mean Janet and me.

Caveat

- This is still very preliminary work
- Everything I'm about to say could be wrong:

  No one who cannot rejoice in the discovery of his own mistakes deserves to be called a scholar.

  –Donald Foster

Introduction
Measurement
Passthrough
Partial Adjustment

The passthrough problem
Economics of mortgage lending
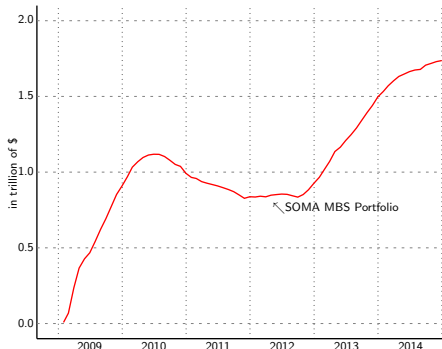How do lenders set prices?
This Paper

The passthrough problem

- Over the last month, interest rates have come down.
- Two related questions:
    - What happens to primary mortgage market rates?
    - What happens to lender profits?
- Do lenders pass on low rates to borrowers?
- Or do they just make money on the spread?

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Why do we care?

- Over the last five years,
- Mortgage rates have been the central instrument of monetary policy
- Fed has purchased $2 trillion dollars of MBS
- With the explicit goal of driving down rates
- Have we just increase profits for lenders?

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Some people think it hasn't worked

From "Banks reap profits on mortgages after QE3," Financial Times, October 1, 2012.

"For banks which are mortgage originators this [QE3] was some of the best news they could possibly have heard, said Steven Abrahams, mortgage strategist at Deutsche. They will continue originating loans and selling them into the market at a significant premium."
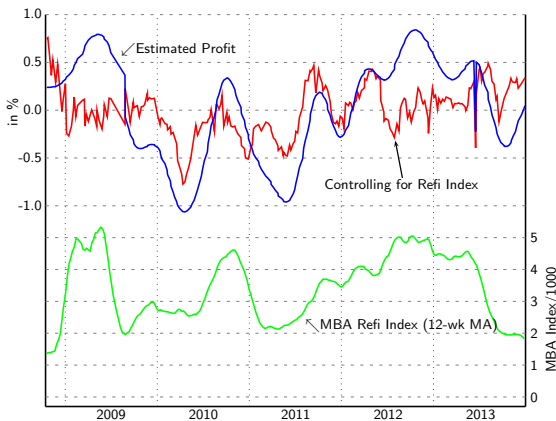
"The interest banks pay on mortgage bonds has dropped from 2.36 per cent on September 12, the day before the Fed announced its programme, to as low as 1.65 per cent last week. It edged up to 1.85 per cent on Monday."

"That means the profit, or spread, banks earn from creating new mortgages for homeowners paying around 3.4 per cent and selling the loans into the secondary market has risen to around 1.6 per cent. That is higher than the 1.44 per cent spread they pocketed before QE3 and significantly greater than the 0.5 per cent they earned on average in the decade between 2000 and 2010."

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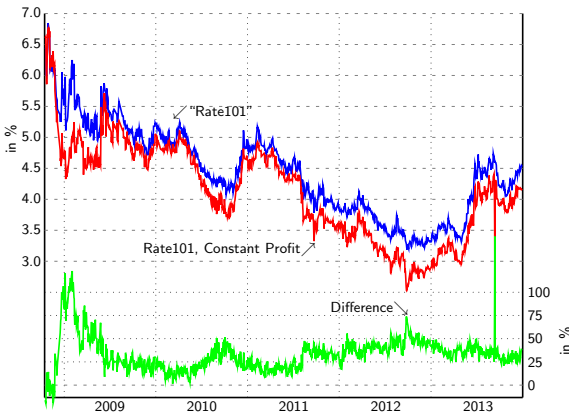Partial Adjustment   This Paper

Is this right

- Profits on a loan are not the one-period spread.
  - Present discounted value of all expected spreads
- How can we value that?
  - Model of prepayment and default
  - Assumptions about how interest rates affect that model
- Very hard to do – a lot of assumptions...
- But there is a simple way:
- Lenders make money by selling loans
  - Market value of future revenues (mortgage payments)
  - Market value of future costs (payments to bond holders)
- In this paper, we use a new dataset that allows us to measure both of those directly.

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Partial Adjustment This Paper

Findings

- "Partial adjustment model"
  - Compute equilibrium primary market price every day
  - Primary market price adjusts 65% of way to equilibrium every day

- Massive variation in equilibrium profits/costs over time.
- Refi Index explains 75% of the variation in profits.
- Capacity very important!

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Counterfactual: Constant Profits

- Assume that lender profits stayed constant at level before crisis.

- Then compute the implied primary market price that would yield the constant level of profit

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Lender income: The TBA Market

- Forward market for mortgages
- Wells Fargo commits to sell MBS
    - End of next month
    - Investor gets 3.0% coupon
    - Plus all principal payments
- WF swaps loans with FNMA for MBS
    - FNMA guarantees loans
- WF delivers MBS for 104.69

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Selling a loan

- Consider making a 30-yr FRM with a 3.75 note rate.

| | Pooling into... | | | |
| | 3.0 | | 3.5 | |
	Flow to investor	Value to Issuer	Flow to investor	Value to Issuer
TBA Price at 8:55a		104.69		106.29
Note Rate	3.75		3.75	
Base Servicing	−0.25	+1.25	−0.25	+1.25
g-fee	−0.20		−0.20	
	= 3.30	= 105.94	= 3.30	= 107.54
Buydown of g-fee	-	-	+0.20	−0.80
	= 3.30	= 105.94	= 3.50	= 106.74
−Note Rate	−3.0		−3.5	
=Excess Servicing	−0.30	+1.2	0	0
Net Proceeds	= 3.0	= 107.14	= 3.5	= 106.74

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Lender costs: YSP

- Loan officer sees combinations
  - Note Rate
  - YSP (or SRP)
- Market price of loan $= 100 + YSP$
  - Note rate=4.875
  - Investor pays 102.325 for 100 dollars of principal
- 2.325 pays closing costs, commission, etc.

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Borrower Opportunity Set
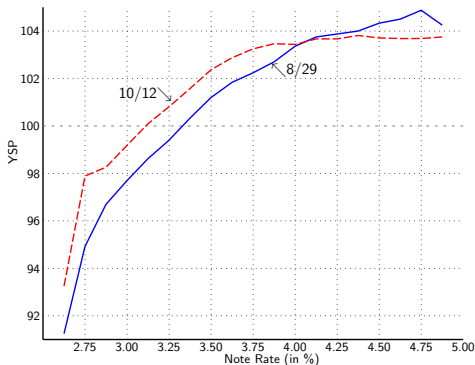
- Rate sheet changes
  - Holding YSP constant, rate went down
  - Holding rate constant, YSP went up

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How do lenders set prices?

- First ratesheet: between 9-11AM
- Reprices if needed
- If MBS prices go up, raise YSPs
- If MBS prices go down, lower YSPs
- "Pipeline control"

When lenders precipitously lower rates by an eighth of a point (especially when moving into the psychologically significant "high 3's"), it tends to create a lot of lock activity. This can easily become more than the lender can handle in terms of personnel or balance sheet. The solution for some lenders is the "pipeline control" negative reprice to stem the flow of inbound locks.

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Jobs Friday
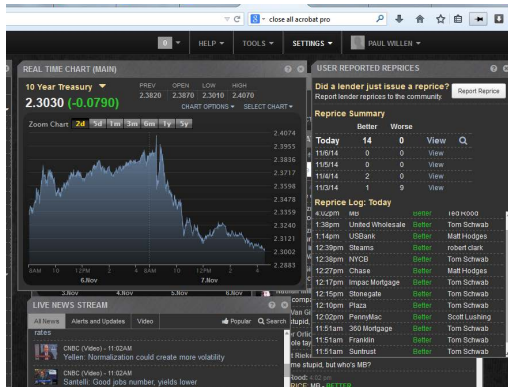
- Employment report released at 830
- Rate sheets reflect initial response
- Rates went down through the day
- Lots of positive reprices.

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Passthrough using yields and rates
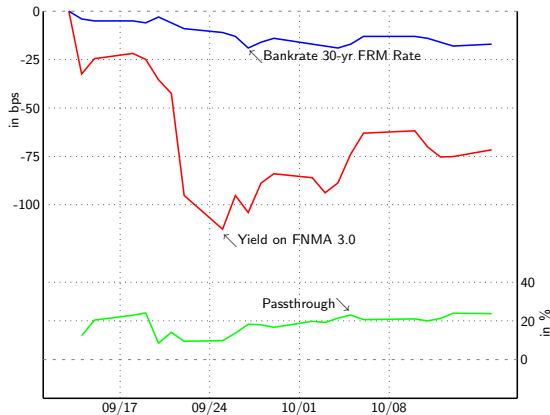
- Fall in yields on FNMA 3.0 MBS.
- Fall in rates on 30-yr FRMs (Bankrate average)
- Less than 25% of the fall in yields passed on to borrowers...

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Return on sales

- Price lender receives from the investors.
- Price they pay the borrower.
- Margin.

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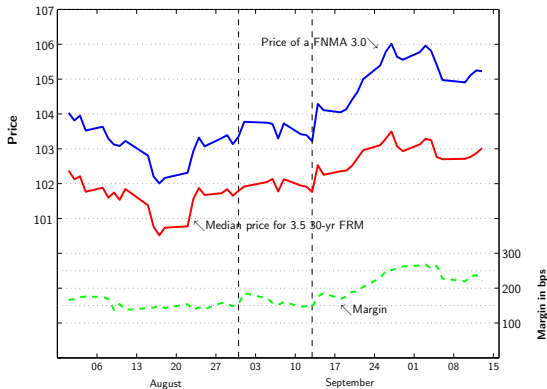
Analysis of passthrough

- Increase in price lender receives.
- Increase in price they pay.
- 60-70% Passthrough so far.

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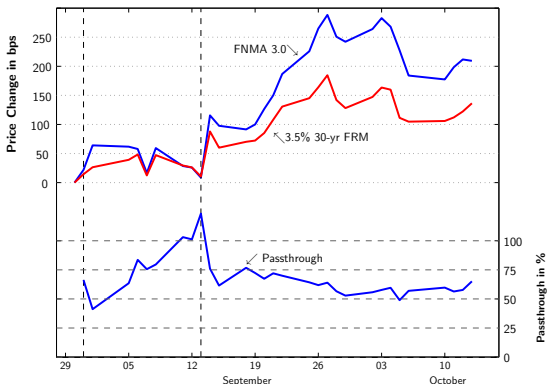
This Paper

- Use LoanSifter/Optimal Blue Data
  - High frequency data
  - Allows us to compare rate-YSP combinations in primary market
  - With rate-price combinations in secondary market

- Measure Passthrough systematically
  - Compare apples to apples
  - Change in points for a given rate.

- Compare Prices with prices
  - Rather than note rates with yields

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Measuring "Costs": LoanSifter/Optimal Blue
Measuring Revenues

LoanSifter/Optimal Blue Data

- We obtained data from LoanSifter, a search engine through which brokers can get mortgage quotes from lenders
- Recently acquired by OptimalBlue.
- Relational database based on lender rate sheets
- Plug in

Loan amount	Loan-to-value ratio (LTV)	Cumulative LTV (all liens)
FICO	Debt-to-income ratio	Documentation type
State	Loan type (fixed, ARM, balloon)	Terms (15 years, 30 years, etc.)
Prepayment penalty	Lock period	Property type
Purpose (purchase, refi)	Owner-occupied or investment	Desired rate *or* desired points

- Daily data going back to 2008

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LoanSifter data

- Characteristics of the loan

Variable	Value	Alternatives
MSA	Los Angeles	
State	CA = State	
Term	30 FRM	FRM 15,30 or ARM 1,3,5,7,10
Loan Amount	$300K	
Loan Type	Conforming	FHA
FICO	750	
LTV	80	
Occupancy	Owner Occupied	Investment
Prepay	0=None	1=1 yr, etc..

- Roughly 50 offers for the 3.5 – constant through sample.

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Number of rate sheets

count of distinct ratesheets and lenders over time
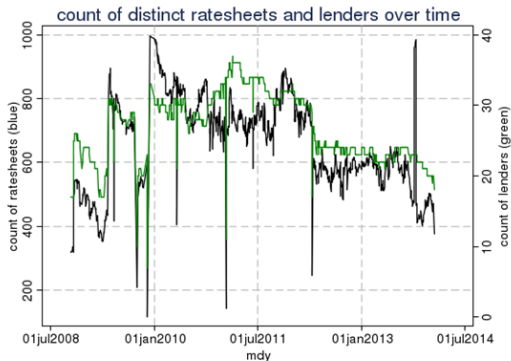
- Count varied over time
- Some lenders dropped out
- Retroactively remove.

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Rate 101

- "Rate 101"
- Rate that generates a YSP of 101
  - Take YSP for each rate
  - Interpolate rate that generates YSP 101
  - For each lender
  - Calculate median across all lenders

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Rate 101 versus other rates
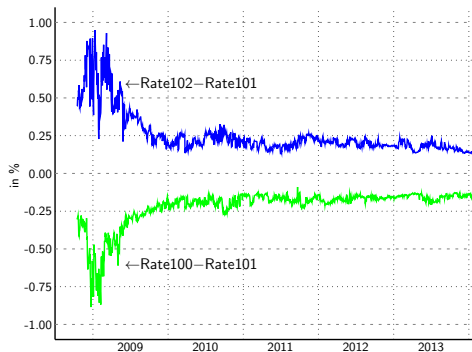
- Difference between rate 101 and rate 100 and 102 changes over time
- Matters a lot
- If you want lender to pay costs, need to go to rate 102.
  - Big increase in rate in 2009

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Selling a loan

- Suppose Rate 101=3.75%.

	Pooling into...			
	3.0		3.5	
	Flow to investor	Value to Issuer	Flow to investor	Value to Issuer
TBA Price at 8:55a		104.69		106.29
Note Rate	3.75		3.75	
Base Servicing	−0.25	+1.25	−0.25	+1.25
g-fee	−0.20		−0.20	
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Measuring Revenues

- Calculate net note rate
  - Note rate minus
  - Base servicing
  - g-fees
- Assume loan sold into lower coupon security: r_{coupon}
- No buy-ups or buy-downs

$$P_{MBS} = TBA(r_{coupon})$$
$$+ \text{base servicing} * \text{multiple}$$
$$+ \text{excess servicing} * \text{multiple}$$
$$- AMDC - LLPA \quad (1)$$

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LLPAs

Table 1: Adverse Market Delivery Charge *	
	0.250%

* Applicable to all mortgages delivered to Fannie Mae, including FHA, VA, RD Section 502 mortgages, HUD Section 184 mortgages, and matured balloon mortgages (refinanced or modified, per *Servicing Guide* requirements) redelivered as FRMs.

Table 2: All Eligible Mortgages (Excluding MCM) – LLPA by Credit Score/LTV Ratio

Representative Credit Score	LTV Range Applicable for all mortgages with terms greater than 15 years							
	≤ 60.00%	60.01 – 70.00%	70.01 – 75.00%	75.01 – 80.00%	80.01 – 85.00%	85.01 – 90.00%	90.01 – 95.00%	SFC
≥ 740	-0.250%	0.000%	0.000%	0.250%	0.250%	0.250%	0.250%	N/A
720 – 739	-0.250%	0.000%	0.250%	0.500%	0.500%	0.500%	0.500%	N/A
700 – 719	-0.250%	0.500%	0.750%	1.000%	1.000%	1.000%	1.000%	N/A
680 – 699	0.000%	0.500%	1.250%	1.750%	1.500%	1.250%	1.250%	N/A
660 – 679	0.000%	1.000%	2.000%	2.500%	2.750%	2.250%	2.250%	N/A
640 – 659	0.500%	1.250%	2.500%	3.000%	3.250%	2.750%	2.750%	N/A
620 – 639	0.500%	1.500%	3.000%	3.000%	3.250%	3.250%	3.250%	N/A
< 620 [1]	0.500%	1.500%	3.000%	3.000%	3.250%	3.250%	3.250%	N/A

(1) A minimum required credit score of 620 applies to all mortgage loans delivered to Fannie Mae in accordance with the *Selling Guide*, exceptions to this requirement are limited to loans in which any borrower has nontraditional credit.

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The Matrix is incorporated by reference into the Fannie Mae *Selling Guide* and supersedes any inconsistent information in the *Selling Guide* or earlier dated version of the Matrix.

- "Loan Level Price Adjustments" (Fannie Mae)
  - "Post-Settlement Delivery Fees" (Freddie Mac)
- Changed over time
- Determined by FHFA
- Perfectly replicated in rate sheets.

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Rate 101 for lower FICO scores 680

- LLPAs meant that FICO 680 needs much higher YSP to get Rate 101
- Early in the sample, that meant much higher rates.

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MBS Prices

- JP Morgan Markets.
  - "Back Month"
  - Closing price
- Intraday prices

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Measuring Multiples

- Servicing revenue is an "IO Strip"
- Coupon Swaps
  - Long an FNMA 4.5
  - Short an FNMA 4
  - Security that pays 0.5 with $\approx$ prepayment properties of 4/4.5
- "Industry Standards"
  - Base Servicing $5\times$ cash flow
  - Excess Servicing $4\times$ cash flow
- MIAC multiples
  - "Market price" of servicing rights.

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Measuring Profits: OPUC
First Differences

Measuring Profits: OPUC
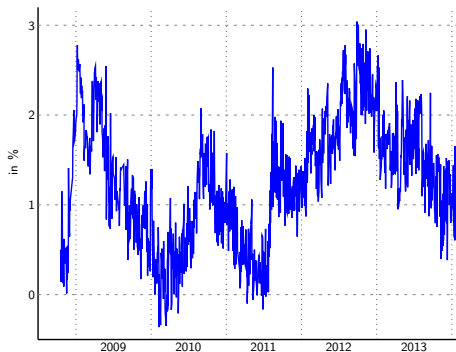
- "Originator Profits and Unmeasured Costs"
  - P_{MBS}-101
- Huge variation

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Measuring Profits: OPUC
First Differences

Scatter plot
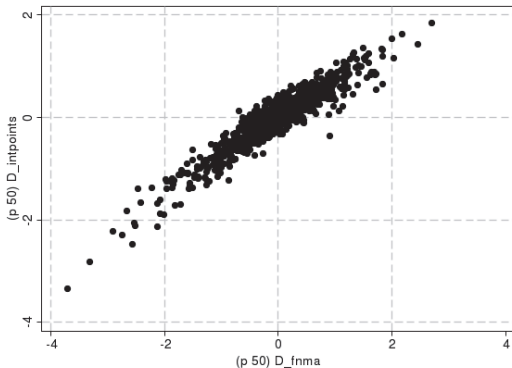
- y-axis: Change in Loans Sifter Price:

$$P_{t+1}^{LS} - P^{LS}$$

- x-axis: Change in MBS Price

$$P_{t+1}^{MBS} - P_t^{MBS}$$

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Measuring Profits: OPUC
First Differences

First Differences

$$P_{t+1}^{LS} - P_t^{LS} - = \alpha + \beta x_t$$
$$+ \gamma^+ Z_t (P_{t+1}^{MBS} - P_t^{MBS})^+ + \gamma^- Z_t (P_{t+1}^{MBS} - P_t^{MBS})^- + \varepsilon \quad (2)$$

	Coeff.	(t-stat)	p-val
− FNMA	0.740	(33.4)	0.00
× Refi Index	-0.037	(-2.1)	0.04
× MOVE Vol. Index	0.000	(0.0)	0.99
× Indicator for Fed Action	0.322	(6.0)	0.00
+ FNMA	0.587	(32.8)	0.00
× Refi Index	-0.058	(-3.5)	0.00
× MOVE Vol. Index	-0.037	(-2.3)	0.02
× Indicator for Fed Action	-0.141	(-3.1)	0.00
NOBS 1184			

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Partial Adjustment Model

- True equilibrium price is P_{MBS} minus profits

$$P_{t+1}^{LS} - P_t^{LS} = \lambda\bigg(\underbrace{P_{t+1}^{MBS} + \gamma}_{\substack{\text{Equilibrium} \\ \text{Price}}} - P_t^{LS}\bigg) + \varepsilon$$

- Neumark and Sharpe (1992) for deposit rates.
- Compare to:

$$P_{t+1}^{LS} - P_t^{LS} - = \alpha + \beta x_t + \gamma(P_{t+1}^{MBS} - P_t^{MBS}) + \varepsilon$$

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Baseline regressions

- How do speeds of adjustment vary?

Sample	λ	Interacted with...			N
		Refi Index	Google Trends	Move1m	
Base	0.523				1141
	(0.016)				
FICO=680	0.444				1129
	(0.020)				
Base	0.627	-0.072	.023	0.154	1141
	(0.015)	(0.023)	(0.020)	(0.011)	

Sample	λ_{above}	λ_{below}	N
Base	0.635	0.459	1141
	(15.97	(22.10))	

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Time of day regressions

- Closing price
- versus intraday

Sample	λ	N
9am	0.404	1141
	(0.022)	
12pm	0.487	1141
	(0.019)	
3pm	0.524	1141
	(0.016)	
Close	0.533	1141
	(0.016)	
Timestamp	0.178	263
	(0.028)	
Close	0.183	264
	(0.028)	

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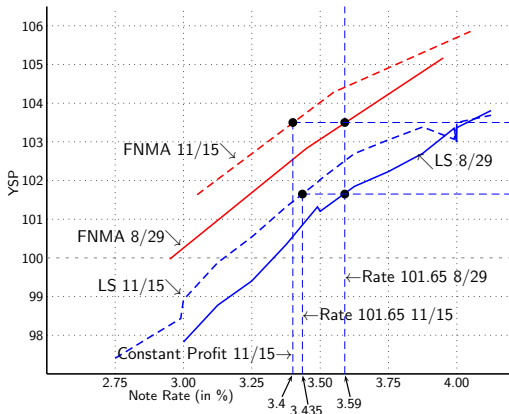
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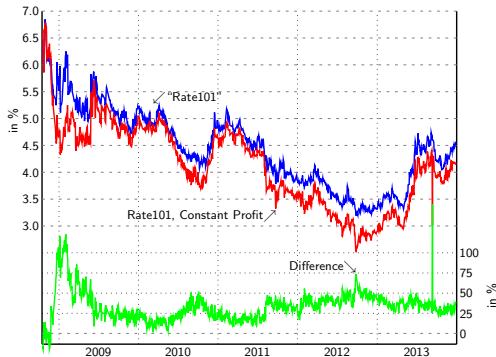# Explaining Equilibrium Profitability
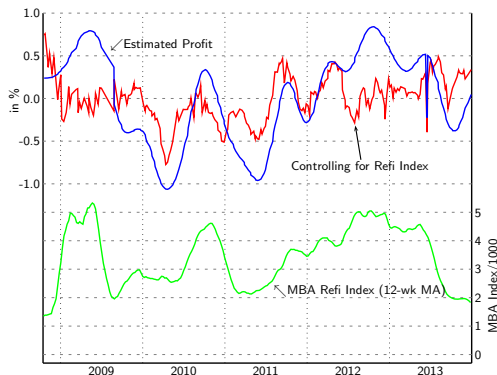
- Increases in profits could reflect
  - Slow adjustment (sticky prices)
  - Or changing costs or profitability of origination
- If we assume constant profits
  - implied speed of adjustment is too slow
- Allow profits to move around with cubic spline
  - High frequency passthrough
  - Most variation in profits due to volumes

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Passthrough in rates

- Full passthrough: 3.59-3.4=19bps
- Actual passthrough: 3.59-3.435=15.5bps

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Counterfactual: Constant Profits

- Assume that lender profits stayed constant at level before crisis.

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The slide you've all been waiting for...

- The end.