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

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- With Andreas Fuster (FRB NY) and Stephanie Lo (Harvard and FRB Boston)

Weimer School, Homer Hoyt Institute
January 18, 2015
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
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?
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?
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.”
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.
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!
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.
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
Selling a loan

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

<table>
<thead>
<tr>
<th>Pooling into...</th>
<th>3.0</th>
<th>3.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow to investor</td>
<td>104.69</td>
<td>3.75</td>
</tr>
<tr>
<td>Value to Issuer</td>
<td>104.69</td>
<td>3.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TBA Price at 8:55a</th>
<th>104.69</th>
<th>106.29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note Rate</td>
<td>3.75</td>
<td>3.75</td>
</tr>
<tr>
<td>Base Servicing</td>
<td>-0.25</td>
<td>-0.25</td>
</tr>
<tr>
<td>g-fee</td>
<td>-0.20</td>
<td>-0.20</td>
</tr>
<tr>
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</tr>
<tr>
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<td>+1.2</td>
</tr>
<tr>
<td>Net Proceeds</td>
<td>= 3.0</td>
<td>= 3.5</td>
</tr>
<tr>
<td></td>
<td>107.14</td>
<td>106.74</td>
</tr>
</tbody>
</table>
Introduction
Measurement
Passthrough
Partial Adjustment

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

Lender costs: YSP

- Loan officer sees combinations
  - Note Rate
  - YSP (or SRP)
- Market price of loan
  \[ \text{Market price of loan} = 100 + \text{YSP} \]
  - Note rate = 4.875
  - Investor pays $102.325 for 100 dollars of principal
- 2.325 pays closing costs, commission, etc.
Borrower Opportunity Set

- Rate sheet changes
  - Holding YSP constant, rate went down
  - Holding rate constant, YSP went up
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.
Jobs Friday

- Employment report released at 830
- Rate sheets reflect initial response
- Rates went down through the day
- Lots of positive reprices.
The passthrough problem
Economics of mortgage lending
How do lenders set prices?
This Paper

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...
Return on sales

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

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

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

Daily data going back to 2008.
LoanSifter data

- Characteristics of the loan

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

- Roughly 50 offers for the 3.5 – constant through sample.
Number of rate sheets

- Count varied over time
- Some lenders dropped out
- Retroactively remove.
**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
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
Selling a loan

- Suppose Rate 101 = 3.75%.

<table>
<thead>
<tr>
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<td>= 3.5</td>
<td>= 106.74</td>
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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

\[
P_{MBS} = TBA(r_{coupon}) \\
+ \text{base servicing} \times \text{multiple} \\
+ \text{excess servicing} \times \text{multiple} \\
- \text{AMDC} - \text{LLPA} \quad (1)
\]
LLPAs

Table 1: Adverse Market Delivery Charge *

<table>
<thead>
<tr>
<th>LTV Range</th>
<th>≤ 60.00%</th>
<th>60.01% – 70.00%</th>
<th>70.01% – 75.00%</th>
<th>75.01% – 80.00%</th>
<th>80.01% – 85.00%</th>
<th>85.01% – 90.00%</th>
<th>90.01% – 95.00%</th>
<th>SFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 740</td>
<td>-0.250%</td>
<td>0.000%</td>
<td>0.000%</td>
<td>0.250%</td>
<td>0.250%</td>
<td>0.250%</td>
<td>0.250%</td>
<td>N/A</td>
</tr>
<tr>
<td>720 – 739</td>
<td>-0.250%</td>
<td>0.000%</td>
<td>0.250%</td>
<td>0.250%</td>
<td>0.250%</td>
<td>0.250%</td>
<td>0.250%</td>
<td>N/A</td>
</tr>
<tr>
<td>700 – 719</td>
<td>-0.250%</td>
<td>0.500%</td>
<td>0.750%</td>
<td>1.000%</td>
<td>1.000%</td>
<td>1.000%</td>
<td>1.000%</td>
<td>N/A</td>
</tr>
<tr>
<td>680 – 699</td>
<td>0.000%</td>
<td>0.500%</td>
<td>1.250%</td>
<td>1.750%</td>
<td>1.500%</td>
<td>1.250%</td>
<td>1.250%</td>
<td>N/A</td>
</tr>
<tr>
<td>660 – 679</td>
<td>0.000%</td>
<td>1.000%</td>
<td>2.000%</td>
<td>2.500%</td>
<td>2.750%</td>
<td>2.250%</td>
<td>2.250%</td>
<td>N/A</td>
</tr>
<tr>
<td>640 – 659</td>
<td>0.500%</td>
<td>1.250%</td>
<td>2.500%</td>
<td>3.000%</td>
<td>3.250%</td>
<td>2.750%</td>
<td>2.750%</td>
<td>N/A</td>
</tr>
<tr>
<td>620 – 639</td>
<td>0.500%</td>
<td>1.500%</td>
<td>3.000%</td>
<td>3.000%</td>
<td>3.250%</td>
<td>3.250%</td>
<td>3.250%</td>
<td>N/A</td>
</tr>
<tr>
<td>&lt; 620 (&lt;1)</td>
<td>0.500%</td>
<td>1.500%</td>
<td>3.000%</td>
<td>3.000%</td>
<td>3.250%</td>
<td>3.250%</td>
<td>3.250%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* 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

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

- “Back Month”
- Closing price
- Intraday prices
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× cash flow
  - Excess Servicing 4× cash flow
- MIAC multiples
  - “Market price” of servicing rights.
Measuring Profits: OPUC

- “Originator Profits and Unmeasured Costs”
  - $P_{MBS}$-101
- Huge variation
y-axis: Change in Loans Sifter Price:

\[ P_{LS}^{t+1} - P_{LS} \]

x-axis: Change in MBS Price

\[ P_{MBS}^{t+1} - P_{MBS}^t \]
### First Differences

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

<table>
<thead>
<tr>
<th></th>
<th>Coeff.</th>
<th>(t-stat)</th>
<th>p-val</th>
</tr>
</thead>
<tbody>
<tr>
<td>− FNMA</td>
<td>0.740</td>
<td>(33.4)</td>
<td>0.00</td>
</tr>
<tr>
<td>× Refi Index</td>
<td>-0.037</td>
<td>(-2.1)</td>
<td>0.04</td>
</tr>
<tr>
<td>× MOVE Vol. Index</td>
<td>0.000</td>
<td>(0.0)</td>
<td>0.99</td>
</tr>
<tr>
<td>× Indicator for Fed Action</td>
<td>0.322</td>
<td>(6.0)</td>
<td>0.00</td>
</tr>
<tr>
<td>+ FNMA</td>
<td>0.587</td>
<td>(32.8)</td>
<td>0.00</td>
</tr>
<tr>
<td>× Refi Index</td>
<td>-0.058</td>
<td>(-3.5)</td>
<td>0.00</td>
</tr>
<tr>
<td>× MOVE Vol. Index</td>
<td>-0.037</td>
<td>(-2.3)</td>
<td>0.02</td>
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<tr>
<td>× Indicator for Fed Action</td>
<td>-0.141</td>
<td>(-3.1)</td>
<td>0.00</td>
</tr>
</tbody>
</table>

NOBS 1184
Partial Adjustment Model

- True equilibrium price is $P_{MBS}$ minus profits

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

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

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

How do speeds of adjustment vary?

<table>
<thead>
<tr>
<th>Sample</th>
<th>$\lambda$</th>
<th>Interacted with...</th>
<th>$N$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Refi Index Google Trends Move1m</td>
<td></td>
</tr>
<tr>
<td>Base</td>
<td>0.523</td>
<td>0.444</td>
<td>1141</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.020)</td>
<td></td>
</tr>
<tr>
<td>FICO=680</td>
<td>0.444</td>
<td>0.344</td>
<td>1129</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base</td>
<td>0.627</td>
<td>-0.072</td>
<td>0.154</td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td>(0.023)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample</th>
<th>$\lambda_{\text{above}}$</th>
<th>$\lambda_{\text{below}}$</th>
<th>$N$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>0.635</td>
<td>0.459</td>
<td>1141</td>
</tr>
<tr>
<td></td>
<td>(15.97)</td>
<td>(22.10)</td>
<td></td>
</tr>
</tbody>
</table>
Time of day regressions

- Closing price
- versus intraday

<table>
<thead>
<tr>
<th>Sample</th>
<th>$\lambda$</th>
<th>$N$</th>
</tr>
</thead>
<tbody>
<tr>
<td>9am</td>
<td>0.404</td>
<td>1141</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td></td>
</tr>
<tr>
<td>12pm</td>
<td>0.487</td>
<td>1141</td>
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<td></td>
<td>(0.019)</td>
<td></td>
</tr>
<tr>
<td>3pm</td>
<td>0.524</td>
<td>1141</td>
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<td></td>
<td>(0.016)</td>
<td></td>
</tr>
<tr>
<td>Close</td>
<td>0.533</td>
<td>1141</td>
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<tr>
<td></td>
<td>(0.016)</td>
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<tr>
<td>Timestamp</td>
<td>0.178</td>
<td>263</td>
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<tr>
<td></td>
<td>(0.028)</td>
<td></td>
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<tr>
<td>Close</td>
<td>0.183</td>
<td>264</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td></td>
</tr>
</tbody>
</table>
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
Passthrough in rates

- Full passthrough: 3.59-3.4=19bps
- Actual passthrough: 3.59-3.435=15.5bps
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.
The slide you’ve all been waiting for...

- The end.