# Defragmenting Markets: Evidence from Agency MBS

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# Motivation

- Despite similar fundamentals for Fannie and Freddie MBS, they were traded on separate forward contracts prior to UMBS/Single Security Initiative.

What we do:

1. Document that trading/liquidity pooled in the Fannie Mae TBA segment
   $\rightarrow$ Estimate effects on transaction costs, asset prices, return of capital etc.

2. Study effects of recent change in market structure — the "Single Security Initiative" — which consolidated Fannie & Freddie MBS into single market in 2019

# Motivation and Background

- Fragmentation is pervasive in financial markets, e.g.,:
  - Stock trading fragmented across various exchanges, alternative trading systems etc.
  - Decentralized bilateral trading in OTC fixed income markets.

- Fragmentation can reduce liquidity due to loss of "thick market" externalities
  - Without interventions, markets may be too fragmented relative to social optimum.

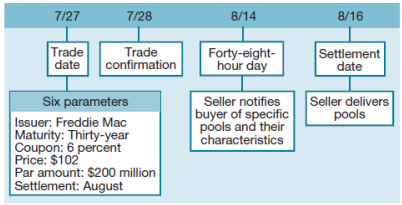
- Empirical research on fragmentation typically focuses on equity markets
  - Batallio (1997); O'Hara and Ye (2011); Amihud et al. (2003) etc.

- We study the agency MBS market, a market with over $9 tr outstanding and large real effects.

# Fannie and Freddie were Traded in Separate Forward Contracts

- Over 90% of agency MBS trading happens in the TBA market, a forward market with monthly settlement.
- In a TBA trade, seller specifies coupon and agency to be delivered, but not exactly which CUSIPs

Timeline of a TBA trade:




Source: Vickery and Wright (2013)

- Fannie & Freddie historically traded in separate TBA contracts (no co-mingling)
  - Even though underlying MBS are fundamentally very similar
  - In June 2019, Fan/Fred combined into new single "Uniform MBS" (UMBS)

# Hypotheses: pre-UMBS period

Test for pooling of liquidity in Fannie TBA contracts (as in Pagano 1989 QJE).

$\rightarrow$ Coordination device: Fannie Mae is older and historically larger.

**Hypotheses:**

1. Both primary and secondary market activity is concentrated in Fannie Mae MBS: (i) higher TBA trading volume, (ii) lower transaction costs, and (iii) higher primary market issuance.

2. Fannie Mae TBAs have higher prices conditional on fundamental value

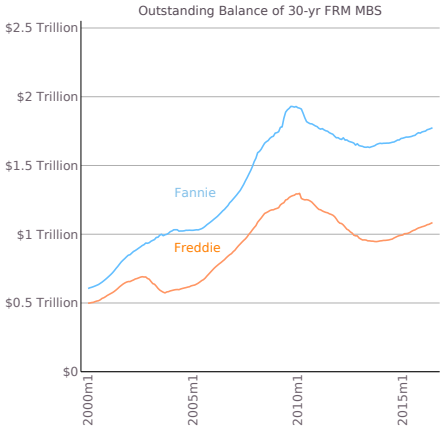
3. Fannie Mae sets higher average guarantee fees.

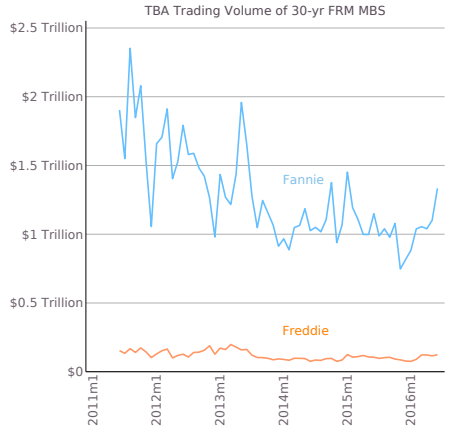
# Data

- **J.P. Morgan Markets:** data on MBS prices, option-adjusted spreads, trading volume, prepayment forecasts.
- **TRACE:** characteristics of individual TBA trades (price, amount, date, coupon, settlement, agency etc.)
  - Supervisory version of TRACE: uncapped trade size + dealer IDs
- **eMBS:** CUSIP-level data on MBS; use to construct series of issuance and outstanding volume, as well as prepayment speeds
- **Fannie/Freddie 10Ks:** data on guarantee fees

Also use standard financial time-series (Aaa & Bbb bond yields, Treasury yields etc.) from JPMM + FRED

# Fannie vs Freddie: Stock of MBS and TBA trading volume




Note: MBS unpaid principal balance (UPB) outstanding and trading volume for TBA-eligible Fannie Mae and Freddie Mac 30-year fixed-rate passthrough MBS pools. TBA trading volume data are for front-month settling MBS but exclude dollar rolls, stip trades, and non-standard TBA contracts. Data: eMBS and FINRA TRACE.

# Estimates: Issuance and trading volume differentials

| | Trading volume | Issuance | Trading vol/UPB | Trading volume | Issuance | Trading vol/UPB |
|---|---|---|---|---|---|---|
| Log difference: | 2.39*** | 0.41*** | 1.88*** | 2.65*** | 0.75*** | 1.98*** |
| (Fannie Mae – | (0.04) | (0.02) | (0.04) | (0.04) | (0.04) | (0.05) |
| Freddie Mac) | | | | | | |
| Implied ratio | 10.91 | 1.51 | 6.55 | 14.15 | 2.12 | 7.24 |
| Observations | 62 | 222 | 62 | 434 | 1323 | 434 |
| Sample | Aggregate | Aggregate | Aggregate | Pooled Cohort | Pooled Cohort | Pooled Cohort |

Note: Columns 1-3 based on time-series data. Columns 4-6 pooled coupon-level data. Sample Period: May 2011 to June 2016 for volume and balance data, and January 1998 to June 2016 for issuance data. CC-2 to CC+6. Trading volume data are for front-month settling MBS. Source: FINRA TRACE and eMBS. HAC robust standard errors clustered by month. Significant at *p<0.10, **p<0.05, ***p<0.01.

# Transaction cost differentials

## Liquidity Gap: Evidence from Transaction-Cost Liquidity Measures

| | Round-trip transaction cost | | Roll bid-ask impact measure | | Amihud price measure | |
|---|---|---|---|---|---|---|
| Freddie Mac | 0.013*** | 0.012*** | 0.037*** | 0.033*** | 0.099*** | 0.093*** |
| | (0.002) | (0.002) | (0.003) | (0.003) | (0.007) | (0.008) |
| *Controls:* | | | | | | |
| MBS return | 1.989* | 2.229** | 2.251 | 1.789 | 9.029* | 9.653* |
| Treasury return | -0.596 | -0.664 | -0.759 | -0.393 | -2.721 | -2.709 |
| Aaa return | 0.439 | 0.443 | -0.435 | -0.635 | 0.298 | 0.072 |
| High-yield return | -0.036 | 0.016 | -0.307 | -0.144 | -1.557 | -1.661 |
| S&P 500 return | 0.068 | 0.069 | -0.120 | -0.140 | -0.083 | -0.099 |
| Sample Mean | 0.016 | 0.016 | 0.064 | 0.064 | 0.081 | 0.081 |
| Observations | 12,950 | 12,950 | 6,976 | 6,976 | 13,962 | 13,962 |
| Coupon FE | Yes | No | No | No | Yes | No |
| Cohort FE | No | Yes | Yes | Yes | No | Yes |

Note: Regressions of Bessembinder-Maxwell-Venkataraman (2013) round-trip transaction cost, the Roll (1984) measure, and the Amihud (2002) measure on a dummy for Freddie Mac TBA contract controlling for five time series variables of index returns and coupon- or cohort-level fixed effects. Sample period: May 2011 to June 2016. Daily series by coupon for front settlement months for each agency, based on transaction-level data on TBA trades. We restrict the sample to CC-2 to CC+6 to ensure that cohorts are reasonably liquid. Source: FINRA TRACE. HAC robust standard errors in parentheses. Significant at *p<0.10, **p<0.05, ***p<0.01.

# Effects on asset prices

- Literature predicts asset prices will be higher in the more liquid market
  - e.g., Amihud & Mendelson (1986), Vayanos & Wang (2007) etc.

- To measure liquidity premium, need to control for differences in fundamental value (due to prepayment risk). Two approaches:
  1. Adjust prices for 10-day difference in payment timing, and saturate regression with cohort $\times$ speed fixed effects
  2. Option-adjusted spread: model-based estimate of fair value

- Further, we study effects of illiquidity on guarantee fee income using 10-K/10-Qs
  - Freddie Mac discounted g-fees to attract/retain business ("market-adjusted-pricing")

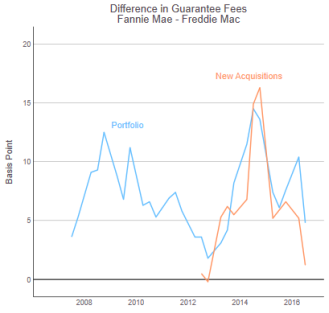
# Prices and option-adjusted spreads (OAS)

| Fannie Mae – Freddie Mac | | | |
|---|---|---|---|
| | (1) Price Gap (% of par) | (2) Libor OAS Gap (bp) | (3) Obs |
| Full Sample | 0.21*** | -5.08*** | 2476 |
| [Jan 1998 to June 2016] | (0.024) | (0.50) | |
| Pre-Crisis | 0.034*** | -2.30*** | 918 |
| [Jan 1998 to July 2007] | (0.010) | (0.33) | |
| Crisis | 0.20*** | -5.31*** | 734 |
| [Aug 2007 to Dec 2011] | (0.023) | (0.62) | |
| Post-Crisis | 0.38*** | -7.85*** | 824 |
| [January 2012 to June 2016] | (0.029) | (0.68) | |
| Sample Mean (Full Sample) | 0.19 | -4.74 | |
| Cohort x Time FE | X | X | |
| Cohort x CPR Interaction | X | X | |

Note: Average Fannie Mae-Freddie Mac difference in price and Libor OAS. Price gap adjusted for the difference in payment delay between the two GSEs. Pooled sample of TBA contracts across coupons $\times$ time. Monthly observations. Sample Period: January 1998 to June 2016. We restrict the sample to CC-2 to CC+6 to ensure that cohorts are reasonably liquid. Front-month settlement. Libor OAS gap is winsorized at the 1% level. Source: J.P. Morgan DataQuery. HAC robust standard errors in parentheses, clustered by month. Significant at *p<0.10, **p<0.05, ***p<0.01.

# Other consequences of fragmentation [details in paper]

- Flight-to-liquidity effects: larger price gap when agency debt risk premium is high
  - 100bp ↑ in agency debt spread → 4bp widening in OAS differential (see paper)
- Lower liquidity leads Freddie Mac guarantee fees to lie 5-10bp below Fannie Mae
  - 5bp g-fee discount → $750m in lost fee income per annum

# The Single Security Initiative

Timeline:

- **2012:** Federal Housing Finance Agency (FHFA) first suggests idea of unifying Fannie Mae and Freddie Mac TBAs into a single security for trading purposes
- **2016** (July 11): Final design for new security announced
- **2019** (March 4): Forward trading for new uniform MBS (UMBS) begins
- **2019** (June 3): Issuance of UMBS begins

UMBS security design:

- Cash flows mimic Fannie Mae: Fannie MBS automatically became UMBS
  - New Freddie MBS are UMBS; legacy bonds can be swapped for UMBS
- UMBS disclosure requirements mimic Freddie Mac.

# Price convergence *ahead* of UMBS implementation

Liquidity difference $(\text{Fan - Fred})_t = a + b \times \text{transition}_t + FE + \text{controls}$

| | Trading Volume and Issuance | | | Adjusted Price and OAS | |
|---|---|---|---|---|---|
| | Log (Volume) | Log (Volume/Balance) | Log (Issuance) | Adjusted Price Gap (% of par) | Libor OAS (bp) |
| 2016/07 to 2017/06 | -0.23*** | -0.19*** | -0.04 | -0.21*** | 4.39*** |
| | (0.04) | (0.04) | (0.05) | (0.04) | (0.90) |
| 2017/07 to 2018/06 | -0.06 | -0.003 | -0.02 | -0.25*** | 4.72*** |
| | (0.08) | (0.08) | (0.06) | (0.05) | (1.05) |
| 2018/07 to 2019/02 | -0.16*** | -0.08** | -0.03 | -0.34*** | 6.63*** |
| | (0.03) | (0.03) | (0.03) | (0.04) | (0.97) |
| Sample Mean | 2.19 | 1.72 | 0.36 | 0.20 | -4.18 |
| Observations | 44 | 44 | 44 | 348 | 348 |
| Cohort FE | | | | X | X |
| Cohort x CPR Diff Interaction | | | | X | X |
| Controls | | | | X | X |

# Other effects of UMBS implementation [details in paper]

**Key concern:** UMBS would *reduce* market quality and liquidity for Fannie Mae

$\rightarrow$ If TBA prices became less reflective of Fannie Mae MBS, TBA market might unravel (shift to trading of individual CUSIPs)

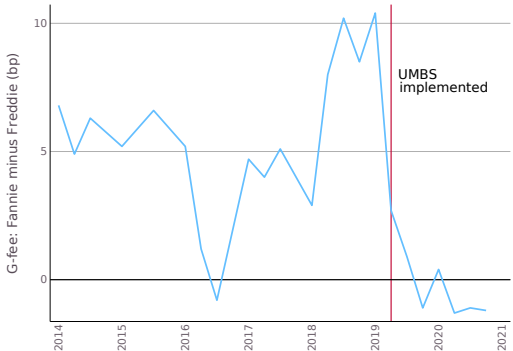
Findings:

- No clear evidence of lower FNMA liquidity (compare to GNMA)
- One reason why: convergence in asset characteristics (limits scope for unravelling)

**Broader effects:** UMBS implementation essentially eliminates Fannie-Freddie differential in guarantee fees

# Guarantee fee differential: pre- vs post-UMBS

- UMBS has allowed Freddie Mac to remove guarantee fee discounts
  - → Reason: Freddie Mac now more competitive, because securities are no longer less liquid than Fannie Mae



# Summing up

Fragmentation in agency MBS market led to:

→ large differences in trading volume and transaction costs

→ liquidity premium in securities prices for Fannie Mae

→ lower fee income for Freddie Mac and weaker competitive position

Results in line with models of liquidity pooling such as Pagano (1989)

Recent public intervention to reform market structure — Uniform MBS — has ameliorated these problems; we find no evidence of significant adverse effects.

→ Prices adjusted *in anticipation* of future liquidity