# Asset Mispricing

Kurt F. Lewis (FRB)
Francis A. Longstaff (UCLA)
Lubomir Petrasek (FRB)

January 6, 2018

# Paper Objective

- Law of one price: assets with identical payoffs should trade at the same price.
- Recently, this paradigm has been challenged by examples of asset prices that appear to diverge from their fundamental values.
  - On-/off-the run spread (Krishnamurthy, 2002)
  - TIPS-Treasury spread (Fleckenstein, Longstaff and Lustig, 2014)
  - Agency-Treasury bond spread (Longstaff, 2004)
  - Bond-CDS basis (Bai and Collin-Dufresne, 2013)
  - Deviations from CIP (Du, Tepper, Verdelhan, 2017)...
- Growing theoretical literature:
  - Intermediary capital
  - Funding liquidity
  - Slow-moving capital
  - Liquidity frictions

# Contribution

We use a unique sample of *corporate bonds guaranteed by the full faith and credit of the U.S.* to comprehensively test the empirical implications of these theories

- The guaranteed bonds have the same cash flows and credit risk as U.S. Treasury bonds
  - Price deviations from Treasury bonds constitute a violation of the law of one price
- For these bonds, we have information on:
  - intermediary funding costs and haircuts
  - dealer networks and inventory positions
  - trading and positions of non-delear financial institutions
- Panel data set ideally suited to examine the time-series and cross-section implications of the theoretical models

# Theoretical Models (1)

A number of theoretical models have proposed different types of frictions that could results in mispricing:

1. Intermediary capital
   - The capital constraints of financial intermediaries
     - Examples: Xiong, 2001; Kyle and Xiong, 2001; He and Krishnamurthy, 2013; Kondor and Vayanos, 2015
2. Funding liquidity
   - Disruptions in the ability of market participants to obtain funding
     - Examples: Chowdhry and Nanda, 1998; Gromb and Vayanos, 2002; Brunnermeier and Pedersen, 2009; Gârleanu and Pedersen, 2011

# Theoretical Models (2)

Mispricing caused by:

3. Slow-moving capital
   - Slow movement of capital to trading opportunities due to search frictions or investor inattention
     - Examples: Duffie, Gârleanu, and Pedersen, 2005,2007; Mitchell, Pedersen, and Pulvino, 2007; Duffie, 2010; Vayanos and Weill, 2008
4. Liquidity effects
   - The impact of illiquidity on asset prices
     - Examples: Amihud and Mendelson, 1986; Vayanos,1998; Vayanos and Vila, 1999; Liu and Longstaff, 2004, Acharya and Pedersen, 2005; Chen, Cui, He, and Milbradt, 2017

# Empirical Implications (1)

1. Commonality in Mispricing
   - Both the intermediary capital and funding liquidity literatures imply that mispricing is correlated across bonds.
     - Correlations are larger when intermediary capital is constrained.
     - Correlations are larger between bonds that share the same primary dealer.
     - Correlations are larger between bonds that share the same dealer network.
2. Determinants of Mispricing (time-series)
   - Intermediary capital
   - Dealer inventory positions
   - Margins and funding spreads faced by intermediaries
   - Customer volume and interdealer volume

# Empirical Implications (2)

3. Feedback Effects
   - An increase in mispricing is followed by:
     - A decrease in intermediary capital
     - An increase in margins
     - An increase in funding spreads
     - An increase or decrease in inventories
     - An increase in customer and interdealer trading activity
4. Determinants of Mispricing (cross-section)
   - In the cross-cection, mispricing is related to:
     - Margins
     - Intermediary capital costs
     - Size of dealer network
     - Dealer inventory holdings
     - Customer and dealer trading
     - Bond liquidity

# The FDIC Debt Guarantee Program

We analyze a sample of corporate bonds issued under the FDIC's Debt Guarantee Program.

- The program was introduced in October 2008 as part of the Temporary Liquidity Guarantee Program (TLGP).
- Financial institutions issued debt in their own name, but backed by the *full faith and credit of the United States.*
- The guarantee was for *timely payment of principal and interest.*
- In case of default, the FDIC was required to make scheduled payments of principal and interest pursuant to the terms of the original debt instrument through maturity.
- The guarantee covered newly issued senior unsecured straight debt issued between November 2008 and October 2009, and expired on December 31, 2012.

# Data

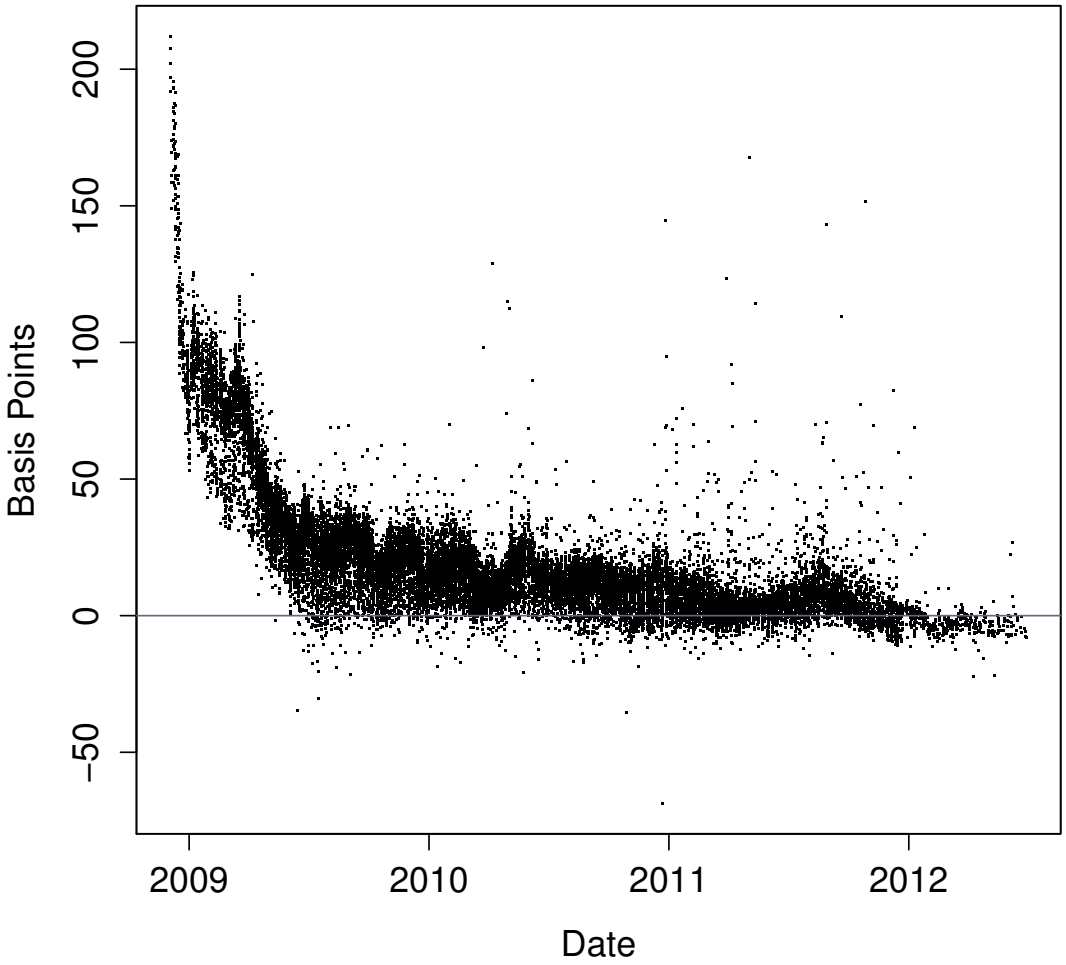
- Bond Pricing Data:
  - Full (non-public) version of TRACE
  - The inventory of each dealer is inferred from TRACE order flow
  - Bond characteristics from FISD
- Dealer Data:
  - We identify the primary dealer for each bond
    - The primary dealer is the dealer with the largest inventory holdings at the end of each month
    - The 12 primary dealers account for 82% of the total inventory holdings of samle bonds
  - Repo margins for primary dealers from FRBNY
  - Dealer CDS spreads from Markit
- Other data
  - Institutional holdings from eMAXX
  - Funding spreads from Bloomberg

# Measure of Mispricing

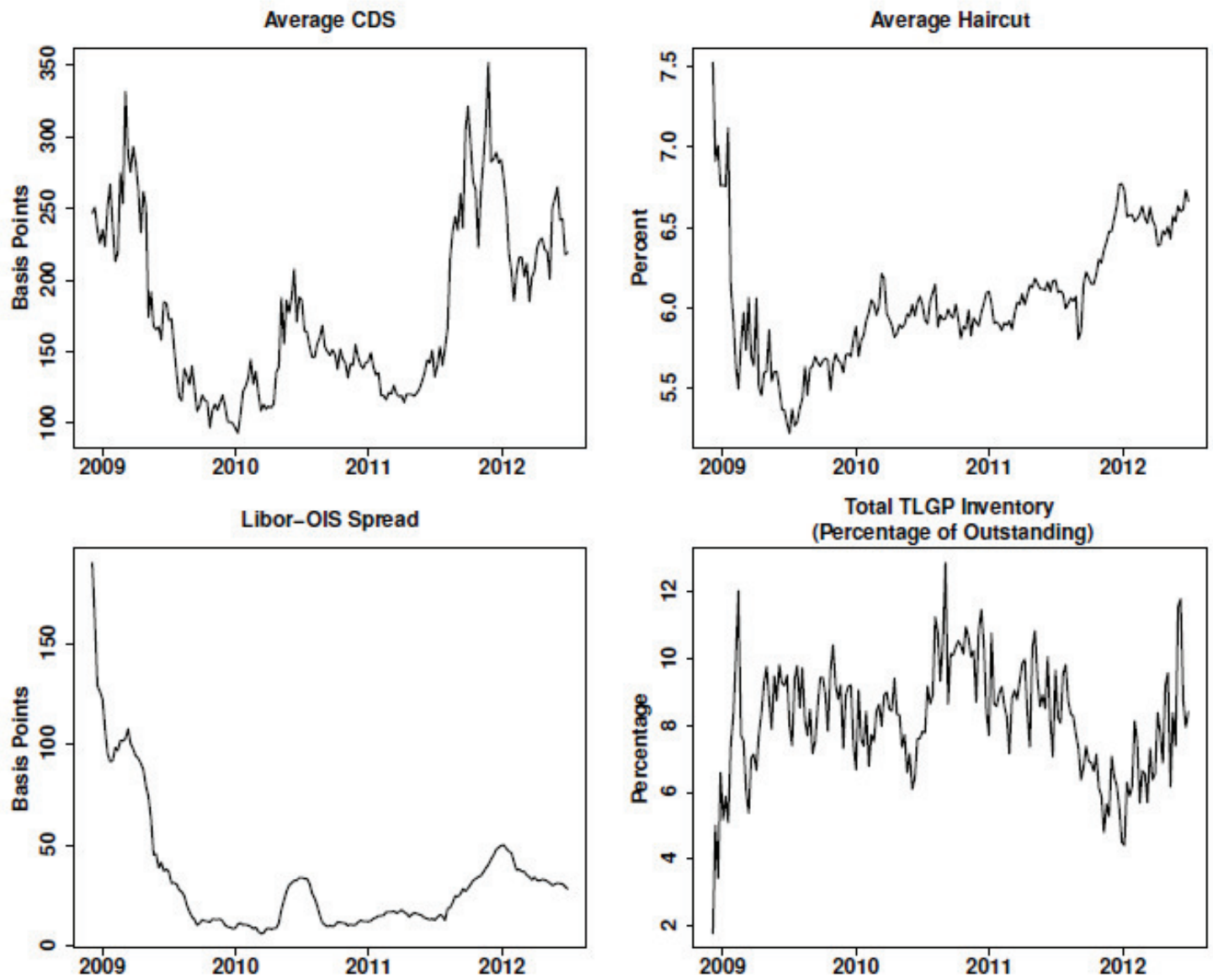
We measure mispricing by comparing the yields on guaranteed bonds with comparable Treasury yields.

1. The yield spread
   - Spread over Treasury bonds with identical coupon and maturity
   - Spot curve constructed from off-the-run, fixed coupon Treasury securities with residual maturities of 90 days or more (Gurkaynak, Sack and Wright, 2006)
2. The state income tax adjustment
   - Adjustment follows Elton, Gruber, Agrawal and Mann (2001): $c\tau_s(1-\tau)$
   - The average size of the state income tax effect is 3.8 pbs

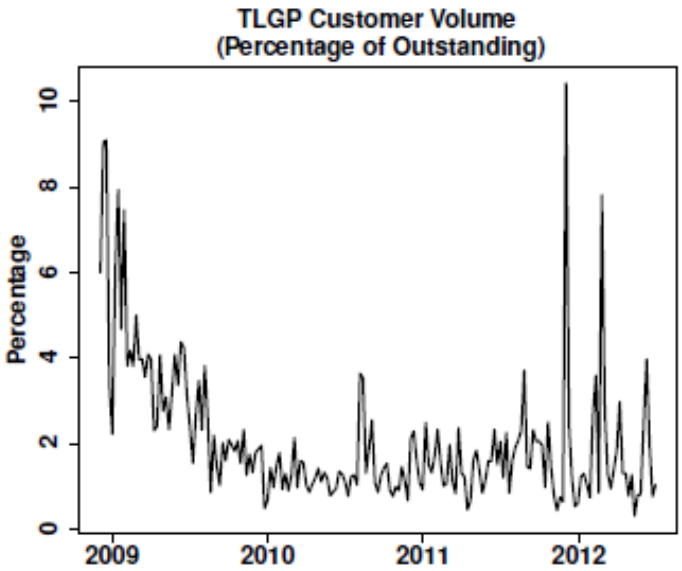
# Mispricing of Individual Bonds

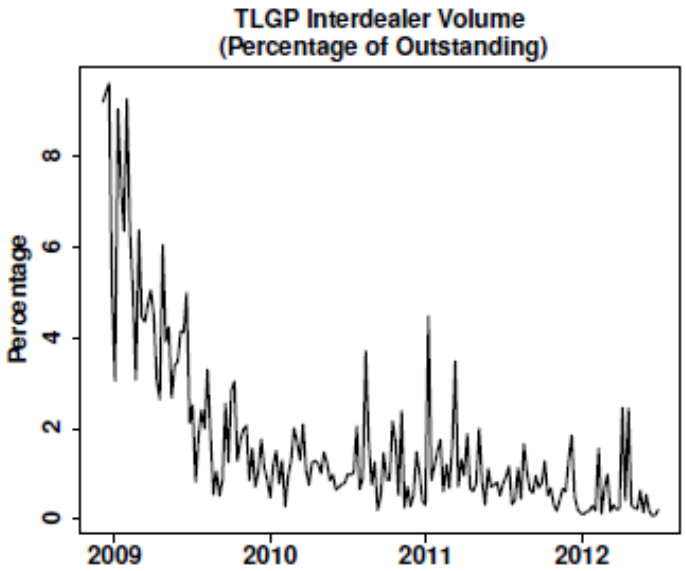


# Time Series of Explanatory Variables (1)

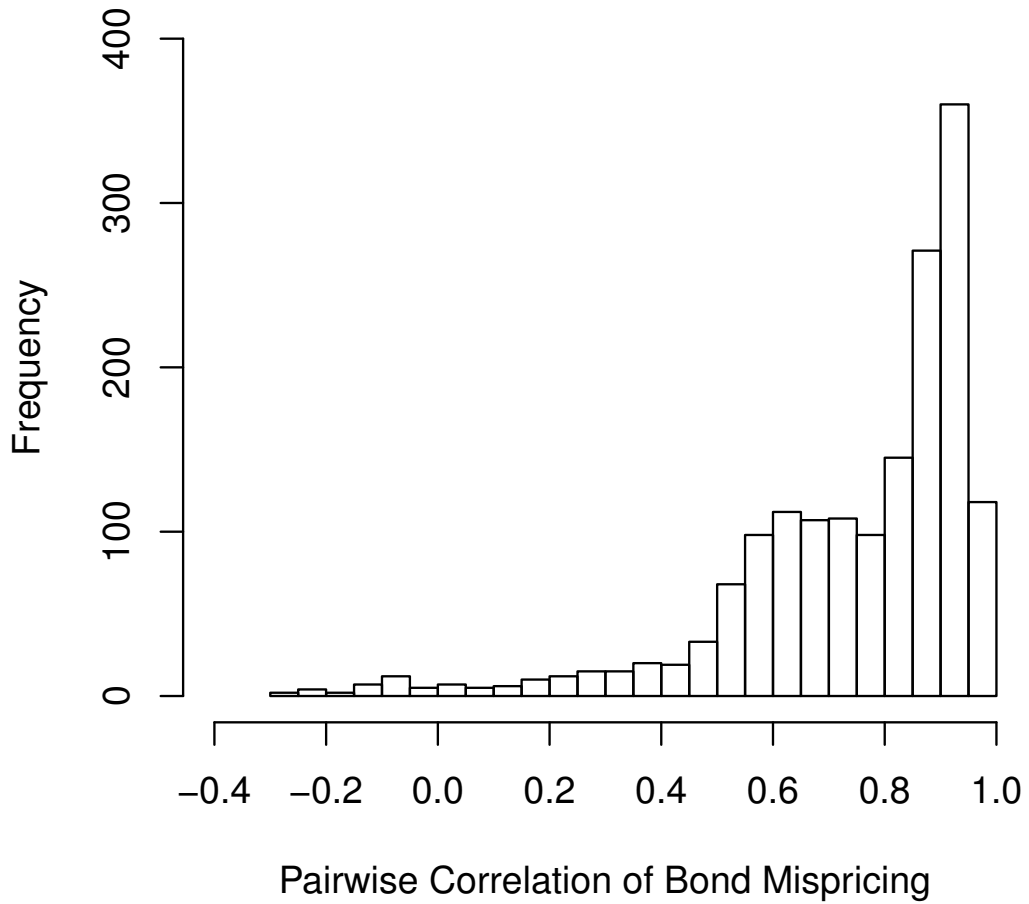


# Time Series of Explanatory Variables (2)



# Is There Commonality in Mispricing? (1)



# Is There Commonality in Mispricing? (2)

| Principal Component | Percentage | Cumulative |
|---|---|---|
| 1 | 57.10 | 57.10 |
| 2 | 14.26 | 71.36 |
| 3 | 7.20 | 78.56 |
| 4 | 4.42 | 82.98 |
| 5 | 3.62 | 86.60 |
| 6 | 2.04 | 88.64 |
| 7 | 1.39 | 90.03 |

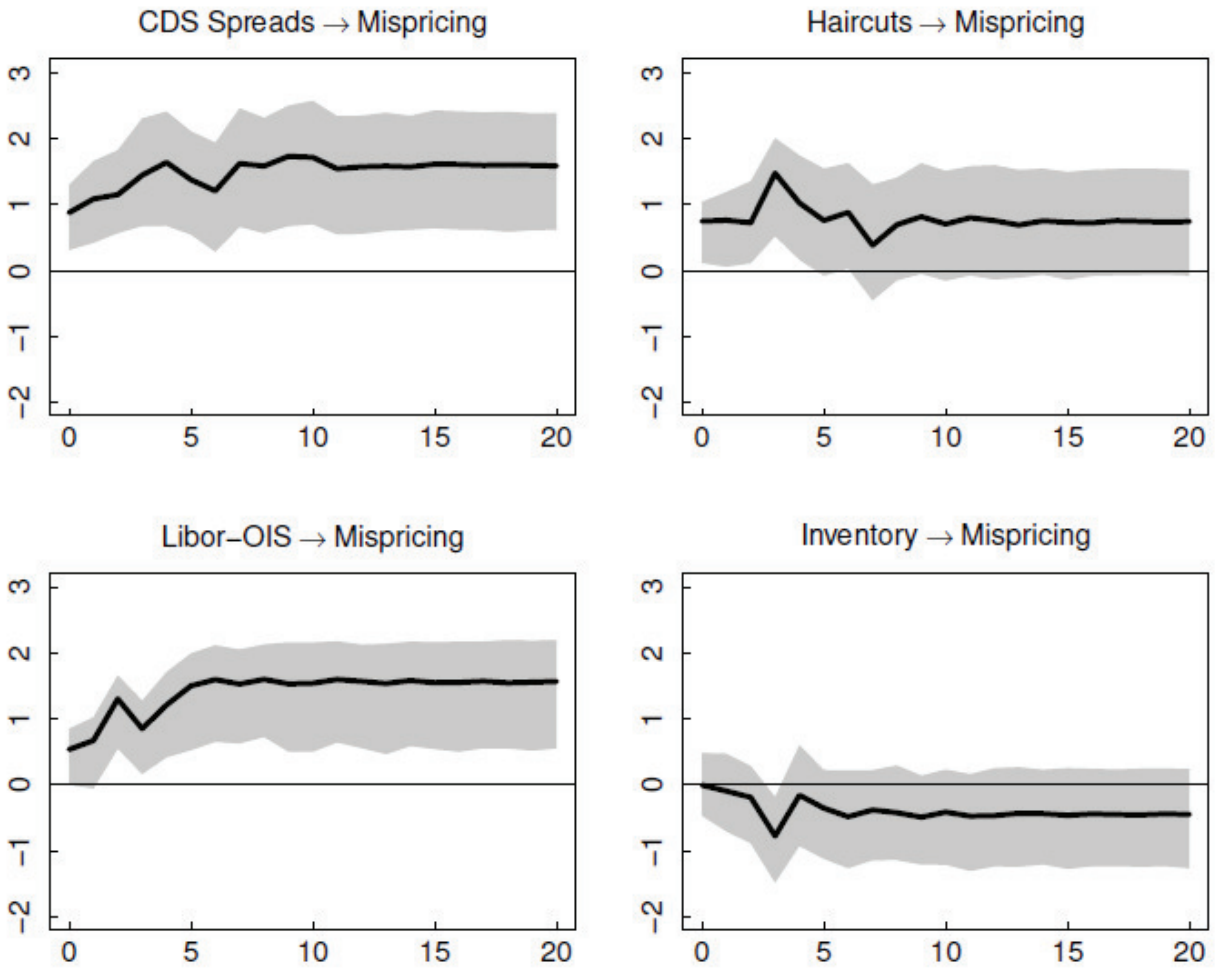
# What Drives Average Mispricing? (1)

Time-series regressions of weekly changes in average mispricing on explanatory variables.

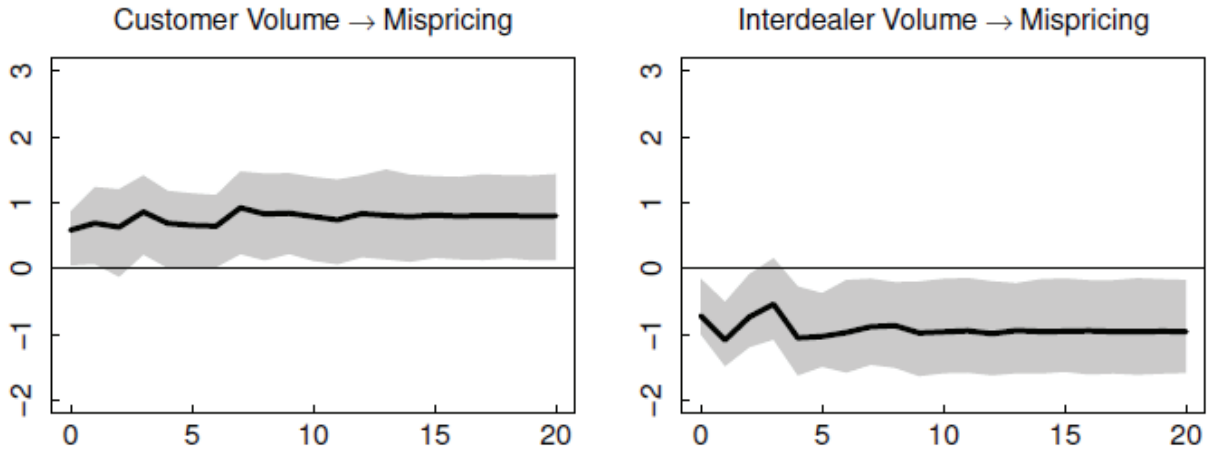
1. Changes in CDS Spread (+)
2. Changes in Haircut (+)
3. Changes in LIBOR-OIS (+)
4. Changes in Inventory (–)
5. Changes in Customer Volume (+)
6. Changes in Interdealer Volume (–)

Vector-autoregressions of weekly changes in mispricing and the same variables confirm these results.

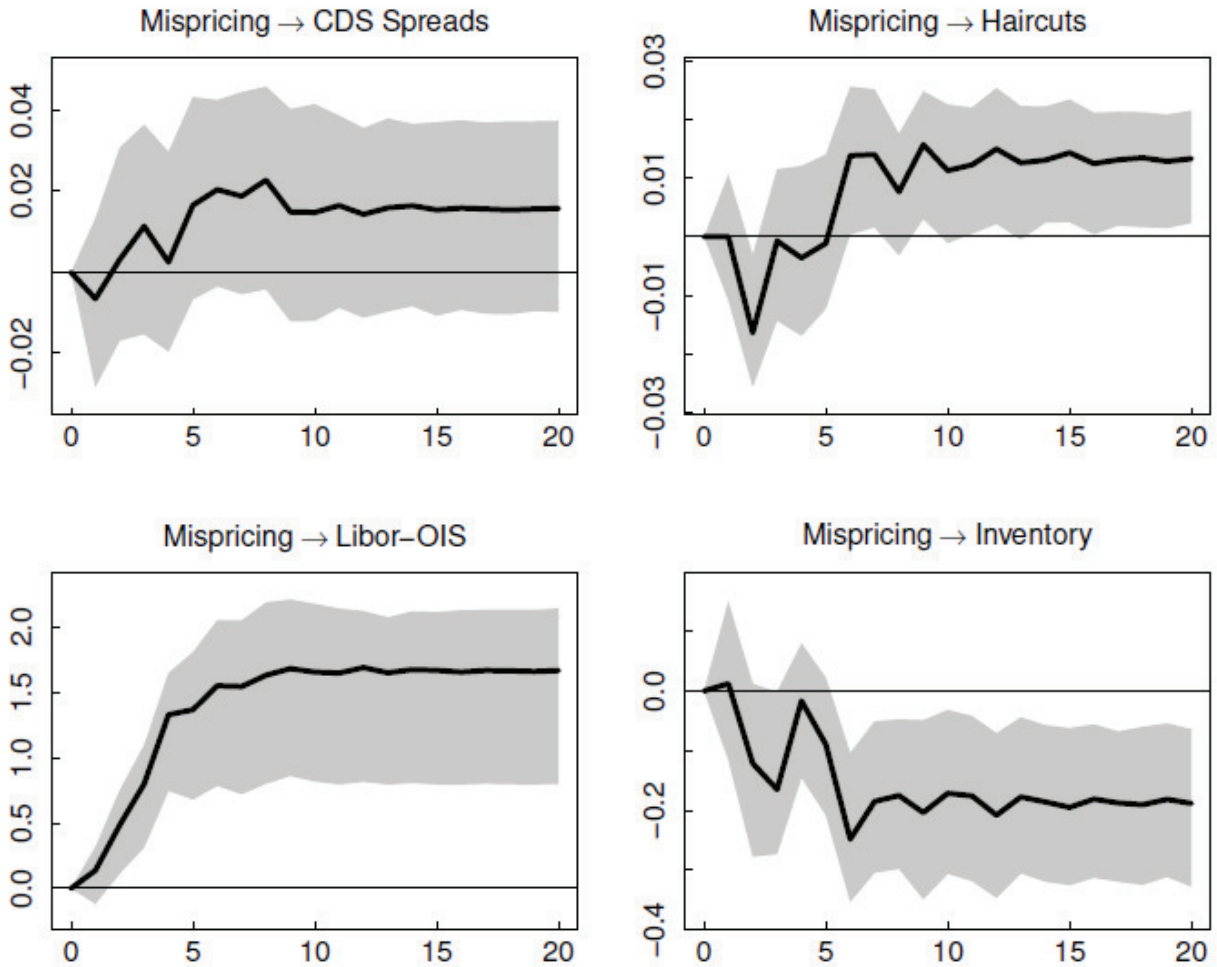
# What Drives Average Mispricing? (2)



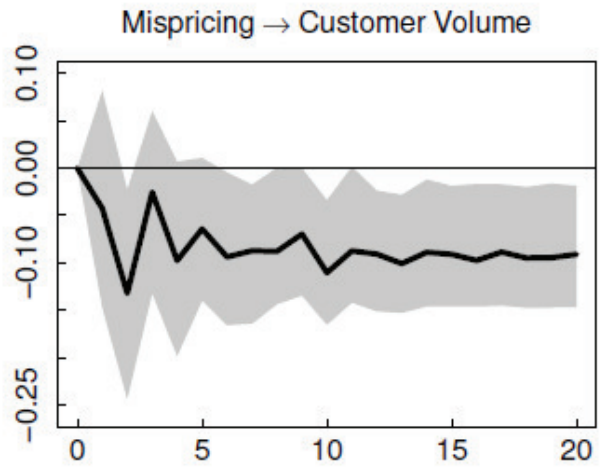
# What Drives Average Mispricing? (3)

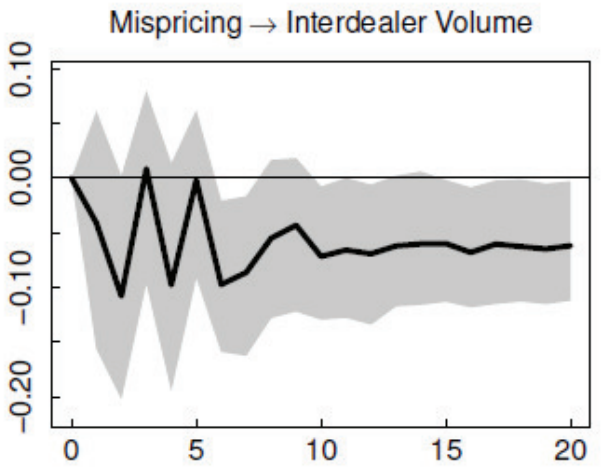


# Is Mispricing Destabilizing? (1)



# Is Mispricing Destabilizing? (2)



# What Explains the Cross-Section?

| Variable | Coeff. | $t$-stat | Coeff. | $t$-stat | Coeff. | $t$-stat | Coeff. | $t$-stat | Coeff. | $t$-stat |
|---|---|---|---|---|---|---|---|---|---|---|
| Time to Maturity | 10.286 | 9.33** | 10.260 | 9.44** | 9.639 | 8.10** | 9.349 | 7.49** | 9.036 | 7.47** |
| Coupon Rate | −0.001 | 0.00 | 0.129 | 0.23 | 0.274 | 0.59 | 0.465 | 0.84 | 0.047 | 0.11 |
| Issuer CDS Spread | | | 0.009 | 1.42 | −0.002 | −0.28 | −0.000 | −0.07 | 0.000 | 0.07 |
| Underwriter CDS Spread | | | | | 0.021 | 3.48** | 0.014 | 2.27** | 0.014 | 2.13** |
| Prime Dealer CDS Spread | | | | | 0.010 | 2.02** | 0.011 | 2.36** | 0.011 | 2.37** |
| Underwriter Haircut | | | | | 0.039 | 0.11 | 0.051 | 0.11 | 0.006 | 0.01 |
| Prime Dealer Haircut | | | | | 0.543 | 2.08** | 0.500 | 2.20** | 0.528 | 2.28** |
| Number of Dealers | | | | | | | −0.070 | −1.67* | −0.061 | −1.72* |
| Number of Investors | | | | | | | 0.011 | 0.56 | 0.033 | 1.60 |
| Inventory | | | | | | | −0.122 | −5.90** | −0.130 | −5.90** |
| Institutional Holdings | | | | | | | −0.003 | −0.08 | −0.032 | −0.71 |
| Log Size of Issue | | | | | | | | | −1.711 | −2.62** |
| Log Customer Volume | | | | | | | | | 0.996 | 2.74** |
| Log Interdealer Volume | | | | | | | | | −0.141 | −0.79 |
| Bid-Ask Spread | | | | | | | | | 0.044 | 0.79 |
| Amihud Measure | | | | | | | | | −0.498 | −1.50 |
| Medium-Term Note | | | | | | | | | 0.002 | 0.00 |
| Time Fixed Effects | | Yes | | Yes | | Yes | | Yes | | Yes |
| Issuer Fixed Effects | | No | | No | | No | | No | | No |
| Adjusted $R^2$ | | 0.552 | | 0.601 | | 0.630 | | 0.654 | | 0.686 |
| Number of Observations | | 1646 | | 1646 | | 1646 | | 1646 | | 1646 |

# Findings (1)

1. Commonality in Mispricing
   - Support for the intermediary capital and funding liquidity literatures.
   - Mispricing has more to do with the state of the financial sector than with asset-specific characteristics.
     - Correlations are larger when intermediary capital is constrained.
     - Correlations are larger between bonds that share the same primary dealer.
     - Correlations are larger between bonds that share the same dealer network.
2. Determinants of Mispricing
   - Primary dealer capital position/CDS spread
   - Margins and funding spreads faced by intermediaries
   - Size of dealer networks
   - Dealer inventory positions
   - Customer volume and interdealer volume
   - Limited support for bond-specific characteristics and liquidity

# Findings (2)

3. Feedback Effects
   - An increase in mispricing is followed by:
     - An increase in margins
     - An increase in funding spreads
     - A possible increase in CDS spreads (some evidence)
     - A possible decrease in dealer inventory (some evidence)
4. Economic Mechanisms
   - A decrease in dealer capital is followed by:
     - An increase in funding spreads
     - Find no evidence of an increase in haircuts
     - A decrease in dealer inventory
   - An increase in haircuts is followed by:
     - A decrease in dealer inventory