

# Bonds, Stocks, and Sources of Mispricing

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# Motivation

- Asset pricing theories → risk is correctly priced by **rational agents** in **frictionless markets**
  - But models are rejected, market anomalies
- **Investor Irrationality** can lead to mispricing – **MACRO**
  - Baker and Wurgler (2006): high **sentiment** causes overvaluation
  - Stambaugh, Yu, Yuan (2012): anomalies due to overvaluation
- **Financial Distress** can also lead to mispricing – **FIRM-LEVEL**
  - Avramov, Chordia, Jostova, Philipov (2013) [**ACJP**]: anomalies due to short positions in distressed stocks

# Main Contributions

- Reconcile the **Macro** and **Micro** drivers of **Overpricing**
- Identify investor pricing errors in **bonds** and **equities**
  - Benefits from studying bonds – mainly an institution market, assess lottery type preferences, do shareholders extract value from bondholders in bankruptcy
- Investors **underestimate implications of financial distress during high sentiment periods**
  - Anomalies disappear beyond periods of high sentiment & distress
  - Additional dimension to sentiment related mispricing
  - Additional dimension to distress related mispricing

# Data: Bonds

- Individual US corporate bond data from **Lehman, DataStream and TRACE** from **Jan 1986-Dec 2016**
  - Average of **10,585** fixed coupon bonds per month
  - Monthly returns, issue date, maturity, duration, rating, coupon, amount outstanding, payment dates
- Firm-level bond ratings and returns are **equally-weighted** averages of individual bonds
  - Individual bonds matched to publicly traded firms on CRSP
  - Total of 3,147 firms, average of **847 per month**

# Data: Stocks

- All US common stocks (shrcd 10 & 11) over 372 months, **Jan 1986 – Dec 2016**
  - Use delisting returns, eliminate penny stocks
  - S&P Long-term domestic issuer credit rating – Compustat & RatingsXpress at **bond and firm level**
  - S&P ratings transformed into numerical scores
  - AAA=1, AA+=2, AA=3, AA-=4, ... CC=20, C=21, D=22
- Average of **717** firms per month with bond and stock data
  - Large rated firms with publicly traded bonds
  - **70% (91%)** of sample above **50<sup>th</sup> (20<sup>th</sup>)** NYSE percentile
  - Average of **65%** of CRSP market cap

# Overpricing Measure

- Follows **Stambaugh, Yu and Yuan (2012) [SYY]**
  - Each month, firms sorted into deciles based on anomalies
  - Overpricing measure is firm's average decile ranking (10 = most overpriced, 1 = most underpriced)
- Set of anomalies is from those studied in **SYY and ACJP**
  - Price and earnings momentum, IVOL, earnings forecast dispersion, asset growth, investments, accruals, gross profitability, return on assets, net operating assets and two variables for net issuance
  - Excludes credit risk variables (failure probability, Z-, O- score, rating) as we study the interaction between distress and overpricing
- Robust to using original SYY variables

# Aggregate Variables

- Sentiment

- Baker and Wurgler (2006) monthly sentiment index  $SENT_{m,t-1}^{\perp}$
- We examine returns following
  - High Sentiment  $SENT_{m,t-1}^{\perp} > 0$
  - Low Sentiment  $SENT_{m,t-1}^{\perp} < 0$

- Factors for risk adjustment

- Fama and French (2015) – MKT, SMB, HML, RMW, CMA for stocks
- Fama and French (2013) – MKT, SMB, HML, DEF, TERM for bonds

Characteristic	S&P issuer credit rating quintile (C1=best rated, C5=worst rated)				
	C1	C2	C3	C4	C5
<i>Equity or Firm-level Data</i>					
Issuer letter rating	A+	BBB	BBB	BB	B
Issuer numeric rating	4.90	7.51	9.28	11.63	14.50
Market capitalization (\$bln)	30.05	8.38	4.63	2.81	1.35
Book-to-market ratio	0.64	0.86	0.85	0.90	1.18
Idiosyncratic volatility (% per month)	1.13	1.25	1.43	1.82	2.72
Amihud illiquidity ( $\times 100$ )	0.58	0.65	1.17	4.79	19.01
Institutional ownership (% of shares outst.)	55.62	58.50	60.45	60.27	50.63
Number of institutional owners	450.01	270.36	208.41	151.11	96.36
Coverage (# of analysts)	19.09	14.97	13.21	10.88	7.61
Dispersion in analyst forecasts	0.05	0.08	0.13	0.26	0.58
SUE	1.00	0.53	0.47	0.33	0.03
Fraction SUE $\leq 0$	0.29	0.36	0.36	0.40	0.45
Overpricing measure	4.79	5.17	5.36	5.68	6.12
Fraction overpriced ( $\geq 5.5$ )	0.24	0.39	0.46	0.59	0.74
Stock return (% per month)	1.08	1.11	1.18	1.16	0.68
CAPM alpha (% per month)	0.25	0.29	0.27	0.14	-0.54
5-factor alpha (% per month)	-0.04	-0.02	-0.08	-0.24	-0.67

Characteristic	S&P issuer credit rating quintile (C1=best rated, C5=worst rated)				
	C1	C2	C3	C4	C5
<i>Equity or Firm-level Data</i>					
Issuer letter rating	A+	BBB	BBB	BB	B
Issuer numeric rating	4.90	7.51	9.28	11.63	14.50
Average bond rating	5.10	7.52	9.40	12.31	15.03
Number of bond issues per firm	11.05	6.98	5.43	3.65	2.60
Amount outstanding (\$millions/issue)	296.47	217.98	209.84	212.89	205.16
Age (years)	5.78	5.32	5.22	4.46	4.12
Time to maturity (years)	7.04	7.07	6.35	5.22	4.63
Duration (years)	6.52	6.26	5.87	5.16	4.36
STD of monthly returns (%)	1.94	2.09	2.41	3.02	4.55
Bond return (% per month)	0.62	0.64	0.68	0.71	0.58
CAPM alpha (% per month)	0.32	0.34	0.33	0.34	0.16
5-factor alpha (% per month)	0.30	0.32	0.30	0.28	0.11

	Bonds			Stocks		
	All	IG	NIG	All	IG	NIG
P1	0.66 (10.14)	0.63 (9.12)	0.92 (12.84)	1.28 (5.62)	1.20 (5.49)	1.90 (4.68)
P2	0.68 (10.84)	0.66 (9.56)	0.79 (10.91)	1.28 (5.48)	1.19 (5.45)	1.71 (4.07)
P3	0.63 (9.99)	0.62 (9.04)	0.74 (9.14)	1.18 (4.87)	1.15 (5.11)	1.36 (3.40)
P4	0.65 (10.56)	0.63 (9.13)	0.80 (9.05)	1.27 (4.99)	1.16 (4.90)	1.48 (3.71)
P5	0.66 (9.58)	0.64 (8.66)	0.75 (6.31)	1.12 (4.06)	1.03 (4.43)	1.00 (2.18)
P6	0.67 (10.09)	0.65 (8.98)	0.75 (8.24)	1.18 (4.30)	1.13 (4.82)	1.18 (2.73)
P7	0.60 (8.81)	0.63 (8.45)	0.54 (5.52)	0.99 (3.35)	0.97 (4.10)	1.34 (2.87)
P8	0.56 (8.02)	0.61 (8.06)	0.55 (5.17)	0.82 (2.80)	0.90 (3.86)	0.94 (2.10)
P9	0.48 (5.74)	0.61 (7.98)	0.50 (4.41)	0.66 (2.03)	0.74 (2.92)	0.92 (1.94)
P10	0.35 (3.45)	0.60 (7.13)	0.30 (2.29)	0.32 (0.78)	0.89 (2.96)	0.01 (0.01)
P10-P1	-0.31 (-3.47)	-0.03 (-0.54)	-0.62 (-5.39)	-0.96 (-2.95)	-0.31 (-1.32)	-1.89 (-4.26)

Sort on	Sort on Overpricing							
	Low	Medium	High	High–Low	Low	Medium	High	High–Low

**Panel A: Raw returns**

<i>A.1. Bond returns</i>					<i>A.2. Excluding downgrades</i>				
C1	0.64 (8.43)	0.64 (8.47)	0.63 (7.70)	-0.01 (-0.39)	0.65 (8.46)	0.65 (8.58)	0.64 (7.76)	-0.01 (-0.32)	
C2	0.68 (10.08)	0.68 (9.52)	0.62 (8.25)	-0.07 (-2.32)	0.69 (10.23)	0.71 (9.75)	0.67 (8.99)	-0.02 (-0.64)	
C3	0.83 (12.60)	0.79 (10.04)	0.56 (5.79)	-0.27 (-4.41)	0.83 (13.19)	0.86 (11.86)	0.79 (9.57)	-0.04 (-0.96)	
C3–C1	0.19 (2.71)	0.15 (1.85)	-0.07 (-0.66)	-0.26 (-4.12)	0.18 (2.70)	0.21 (2.82)	0.15 (1.75)	-0.03 (-0.66)	

<i>A.3. Stock returns</i>					<i>A.4. Excluding downgrades</i>				
C1	1.12 (5.39)	1.11 (5.11)	1.05 (4.42)	-0.07 (-0.46)	1.20 (5.86)	1.26 (5.91)	1.27 (5.33)	0.07 (0.39)	
C2	1.20 (4.90)	1.14 (4.62)	0.81 (3.05)	-0.40 (-2.85)	1.31 (5.40)	1.28 (5.33)	1.18 (4.69)	-0.13 (-0.86)	
C3	1.50 (4.79)	1.17 (3.43)	0.54 (1.39)	-0.96 (-4.21)	1.60 (5.11)	1.43 (4.56)	1.26 (3.59)	-0.34 (-1.38)	
C3–C1	0.38 (1.90)	0.06 (0.31)	-0.50 (-2.07)	-0.89 (-3.71)	0.40 (1.91)	0.17 (0.91)	-0.01 (-0.05)	-0.41 (-1.40)	

## Panel B: 5-factor portfolio alphas

### B.1. Bond returns

C1	0.32 (4.39)	0.32 (4.40)	0.31 (3.87)	-0.01 (-0.44)
C2	0.33 (5.09)	0.33 (4.79)	0.27 (3.73)	-0.06 (-2.23)
C3	0.43 (7.50)	0.33 (5.18)	0.11 (1.40)	-0.31 (-5.47)

C3-C1	0.11 (1.68)	0.01 (0.11)	-0.19 (-2.25)	-0.30 (-5.18)
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### B.2. Excluding downgrades

	0.33 (4.43)	0.34 (4.50)	0.33 (4.04)	-0.00 (-0.03)
	0.34 (5.26)	0.36 (5.20)	0.32 (4.47)	-0.02 (-0.71)
	0.43 (7.89)	0.42 (6.94)	0.36 (5.17)	-0.08 (-1.77)

	0.11 (1.73)	0.08 (1.28)	0.03 (0.44)	-0.08 (-1.58)
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### B.3. Stock returns

C1	0.01 (0.09)	-0.01 (-0.09)	0.03 (0.19)	0.02 (0.13)
C2	-0.03 (-0.34)	-0.04 (-0.38)	-0.31 (-2.40)	-0.28 (-2.05)
C3	0.09 (0.63)	-0.33 (-2.51)	-0.70 (-3.46)	-0.80 (-3.86)

C3-C1	0.08 (0.57)	-0.32 (-2.39)	-0.73 (-3.46)	-0.82 (-3.67)
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### B.4. Excluding downgrades

	0.12 (1.43)	0.18 (1.72)	0.26 (1.64)	0.15 (0.86)
	0.12 (1.28)	0.11 (0.99)	0.02 (0.13)	-0.10 (-0.73)
	0.18 (1.13)	0.03 (0.21)	0.03 (0.14)	-0.15 (-0.82)

	0.06 (0.38)	-0.15 (-1.03)	-0.24 (-1.23)	-0.30 (-1.37)
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## Panel C: Characteristic-adjusted returns

### *C.1. Bond returns*

C1	0.01 (0.43)	0.00 (0.00)	-0.02 (-0.90)	-0.03 (-1.18)
C2	<b>0.06</b> <b>(2.69)</b>	<b>0.05</b> <b>(2.48)</b>	-0.02 (-0.59)	-0.08 (-2.85)
C3	0.23 (4.52)	0.20 (3.24)	-0.05 (-0.65)	-0.28 (-4.73)
C3-C1	<b>0.22</b> <b>(3.76)</b>	<b>0.20</b> <b>(2.90)</b>	-0.03 (-0.39)	-0.26 (-4.15)

### *C.2. Excluding downgrades*

	0.01 (0.38)	0.00 (0.16)	-0.02 (-0.87)	-0.03 (-1.03)
	0.05 (2.37)	0.06 (3.24)	0.02 (0.65)	-0.03 (-1.46)
	0.22 (4.52)	0.25 (4.46)	0.15 (2.45)	-0.07 (-1.48)
	<b>0.21</b> <b>(3.72)</b>	<b>0.24</b> <b>(3.93)</b>	<b>0.17</b> <b>(2.47)</b>	-0.04 (-0.71)

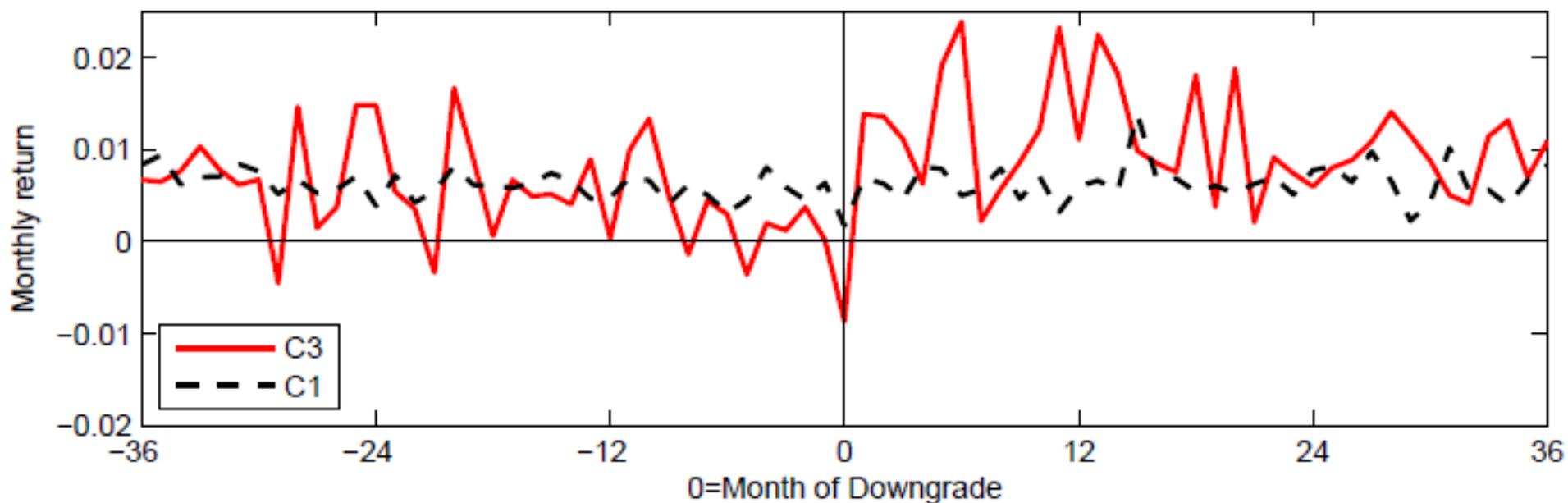
### *C.3. Stock returns*

C1	0.17 (1.94)	0.12 (1.27)	0.08 (0.63)	-0.09 (-0.63)
C2	0.13 (1.60)	0.07 (1.00)	-0.23 (-2.22)	-0.35 (-2.66)
C3	0.25 (1.88)	0.03 (0.29)	-0.59 (-3.69)	-0.84 (-3.82)
C3-C1	0.08 (0.52)	-0.09 (-0.64)	<b>-0.67</b> <b>-3.21</b>	-0.75 (-3.17)

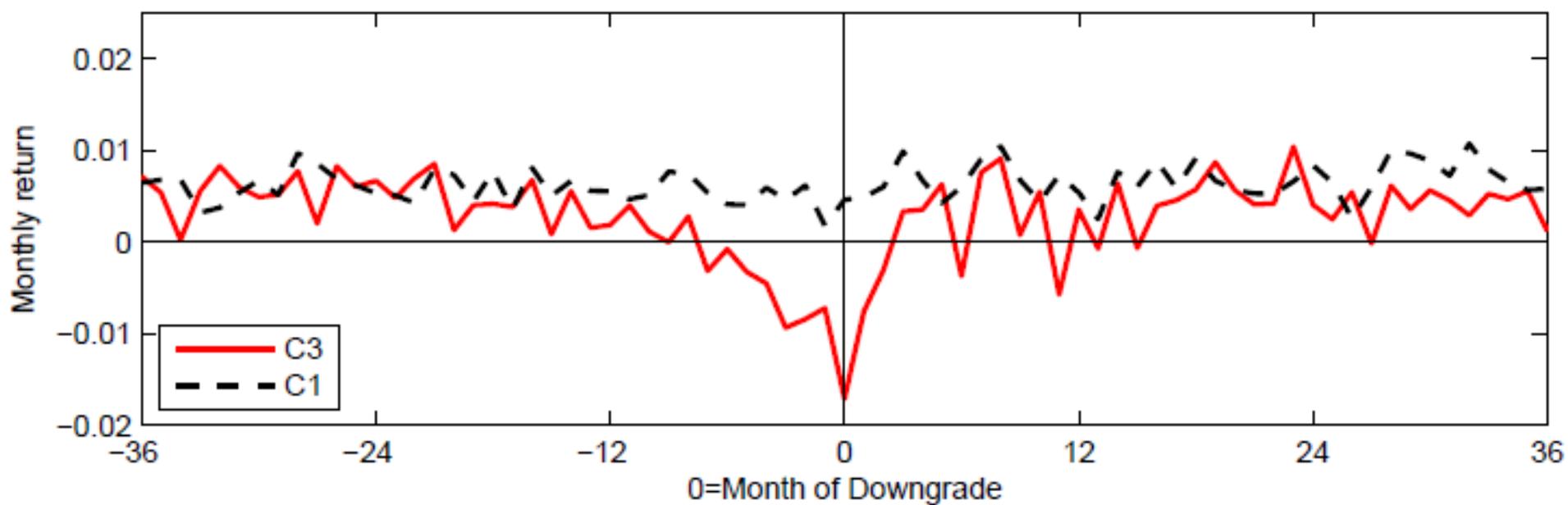
### *C.4. Excluding downgrades*

	0.12 (1.36)	0.08 (0.74)	0.09 (0.60)	-0.03 (-0.17)
	0.05 (0.59)	0.00 (0.01)	-0.09 (-0.84)	-0.14 (-1.00)
	0.09 (0.63)	-0.01 (-0.10)	-0.19 (-1.33)	-0.28 (-1.42)
	-0.03 (-0.20)	-0.09 (-0.59)	-0.28 (-1.40)	-0.25 (-1.10)

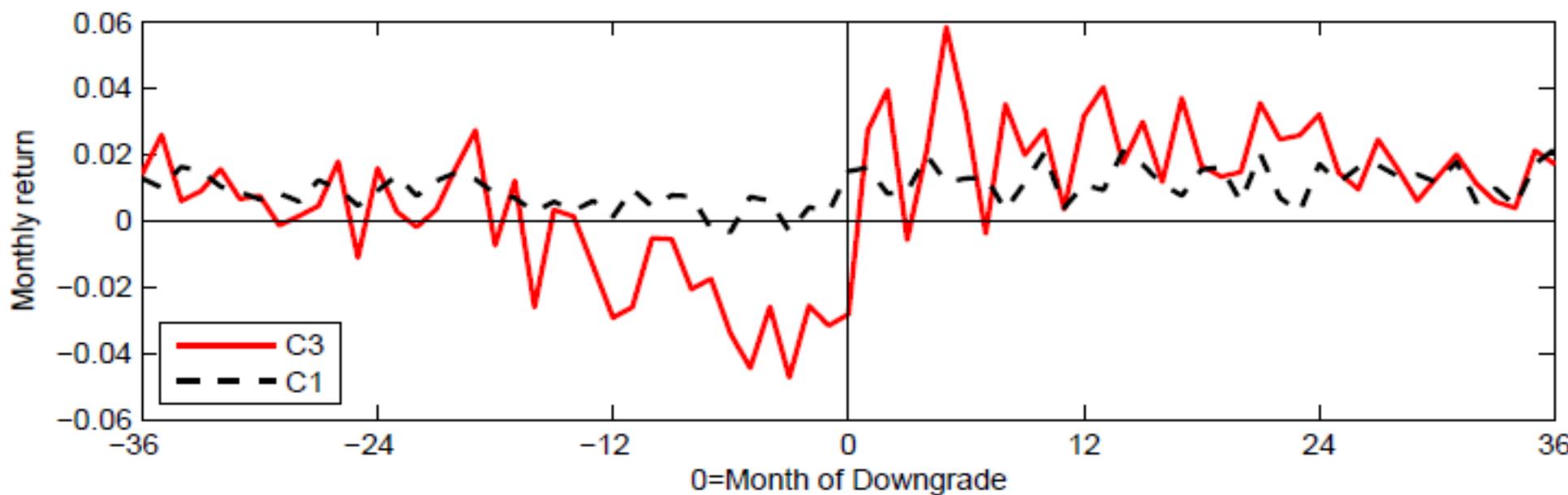
Plot B: Impact of issuer downgrades on bond returns of underpriced firms



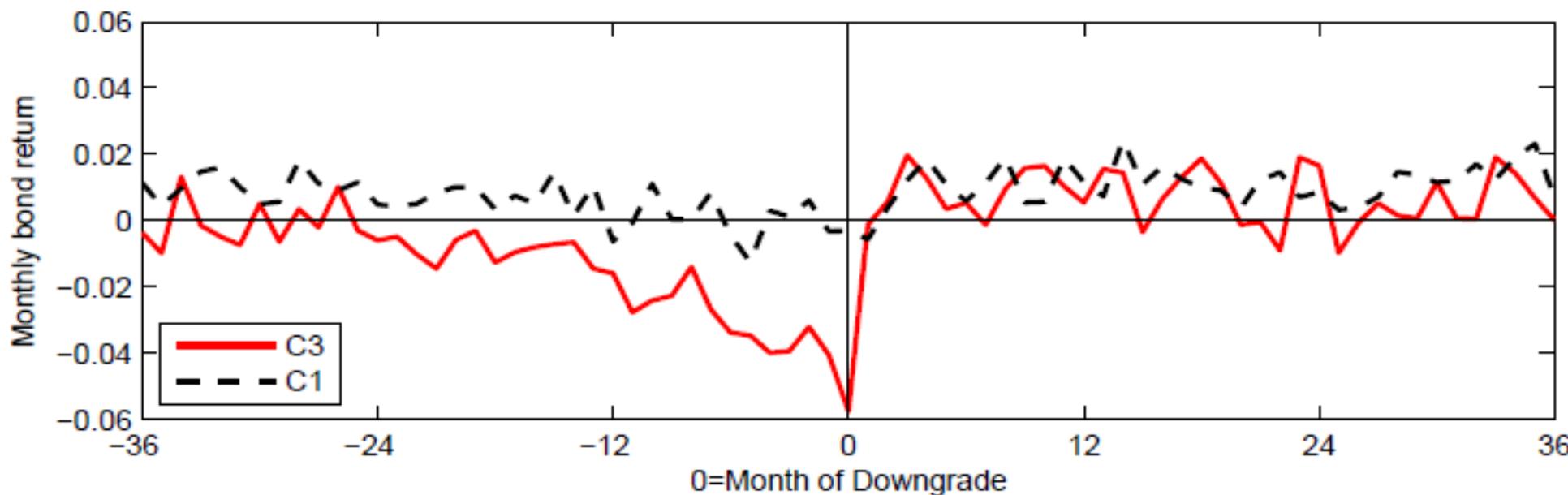
Plot C: Impact of issuer downgrades on bond returns of overpriced firms



Plot E: Impact of issuer downgrades on stock returns of underpriced firms



Plot F: Impact of issuer downgrades on stock returns of overpriced firms



Sort on	Sort on Overpricing							
Credit Risk	Low	Medium	High	High–Low	Low	Medium	High	High–Low

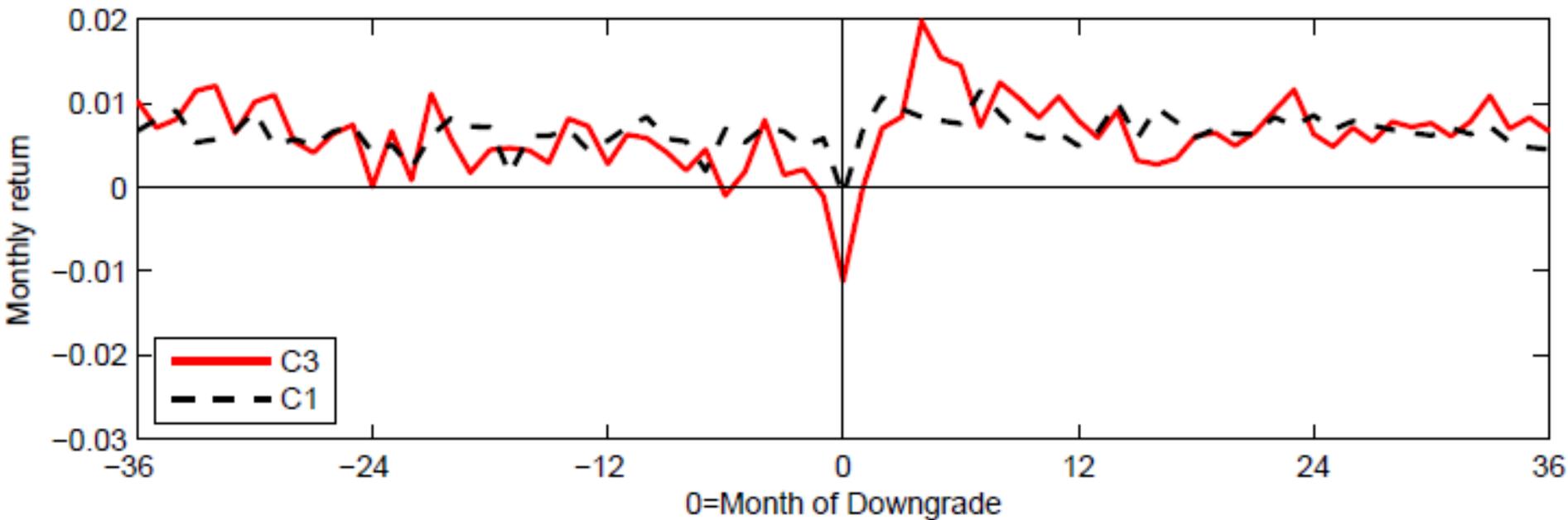
**Panel D: Raw Returns: LOW SENTIMENT (Monthly  $\text{SENT}_{t-1}^\perp < 0$ )**

<i>D.1. Bond returns</i>					<i>D.2. Excluding downgrades</i>			
C1	0.54 (3.81)	0.59 (4.30)	0.55 (3.48)	0.01 (0.27)	0.55 (3.88)	0.61 (4.35)	0.57 (3.65)	0.02 (0.33)
C2	0.64 (5.38)	0.70 (5.13)	0.66 (4.71)	0.02 (0.43)	0.62 (5.36)	0.70 (5.19)	0.67 (4.73)	0.05 (0.86)
C3	0.89 (6.36)	0.94 (5.68)	0.81 (3.82)	-0.08 (-0.66)	0.87 (6.46)	0.94 (6.24)	0.87 (4.80)	-0.01 (-0.06)
C3–C1	0.36 (2.36)	0.34 (2.05)	0.26 (1.26)	-0.09 (-0.76)	0.32 (2.17)	0.33 (2.26)	0.30 (1.62)	-0.02 (-0.22)
<i>D.3. Stock returns</i>					<i>D.4. Excluding downgrades</i>			
C1	1.17 (3.11)	1.25 (3.06)	1.09 (2.43)	-0.08 (-0.36)	1.25 (3.38)	1.34 (3.45)	1.32 (3.04)	0.07 (0.26)
C2	1.15 (2.43)	1.32 (2.69)	1.12 (2.17)	-0.03 (-0.12)	1.25 (2.77)	1.47 (3.23)	1.25 (2.71)	0.00 (0.02)
C3	1.51 (2.41)	1.56 (2.12)	1.19 (1.40)	-0.32 (-0.65)	1.65 (2.70)	1.56 (2.52)	1.53 (2.17)	-0.12 (-0.32)
C3–C1	0.34 (0.86)	0.32 (0.70)	0.11 (0.19)	-0.23 (-0.50)	0.39 (0.98)	0.22 (0.59)	0.20 (0.46)	-0.19 (-0.49)

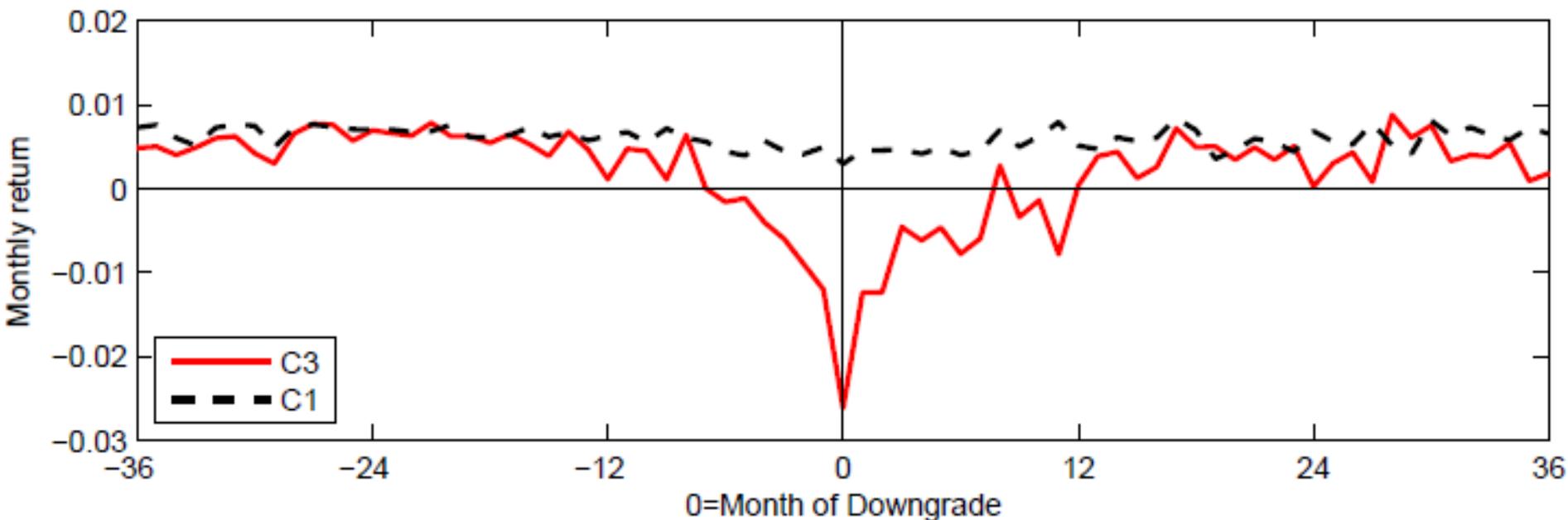
Panel E: Raw Returns: **HIGH SENTIMENT** (Monthly  $\text{SENT}_{t-1}^{\perp} > 0$ )

<i>E.1. Bond returns</i>					<i>E.2. Excluding downgrades</i>				
C1	0.69 (7.75)	0.65 (7.36)	0.67 (7.14)	-0.02 (-0.67)	0.69 (7.75)	0.68 (7.48)	0.67 (7.05)	-0.02 (-0.57)	
C2	0.71 (8.56)	0.68 (8.10)	0.59 (6.80)	-0.11 (-3.48)	0.72 (8.74)	0.71 (8.33)	0.67 (7.72)	-0.05 (-1.65)	
C3	0.78 (11.36)	0.71 (8.42)	0.44 (4.31)	-0.34 (-4.82)	0.81 (12.28)	0.83 (10.45)	0.75 (8.92)	-0.06 (-1.20)	
C3-C1	0.09 (1.23)	0.05 (0.59)	-0.23 (-2.35)	-0.32 (-4.27)	0.12 (1.65)	0.15 (1.77)	0.08 (0.85)	-0.04 (-0.67)	
<i>E.3. Stock returns</i>					<i>E.4. Excluding downgrades</i>				
C1	1.09 (4.41)	1.04 (4.09)	1.03 (3.71)	-0.07 (-0.32)	1.17 (4.79)	1.21 (4.80)	1.24 (4.39)	0.07 (0.29)	
C2	1.23 (4.36)	1.05 (3.78)	0.66 (2.18)	-0.57 (-3.32)	1.34 (4.69)	1.18 (4.23)	1.14 (3.83)	-0.19 (-1.03)	
C3	1.50 (4.27)	0.98 (2.71)	0.19 (0.45)	-1.31 (-5.36)	1.57 (4.42)	1.36 (3.86)	1.12 (2.88)	-0.45 (-1.57)	
C3-C1	0.41 (1.76)	-0.06 (-0.27)	-0.84 (-2.84)	-1.25 (-4.52)	0.40 (1.67)	0.14 (0.70)	-0.12 (-0.42)	-0.52 (-1.41)	

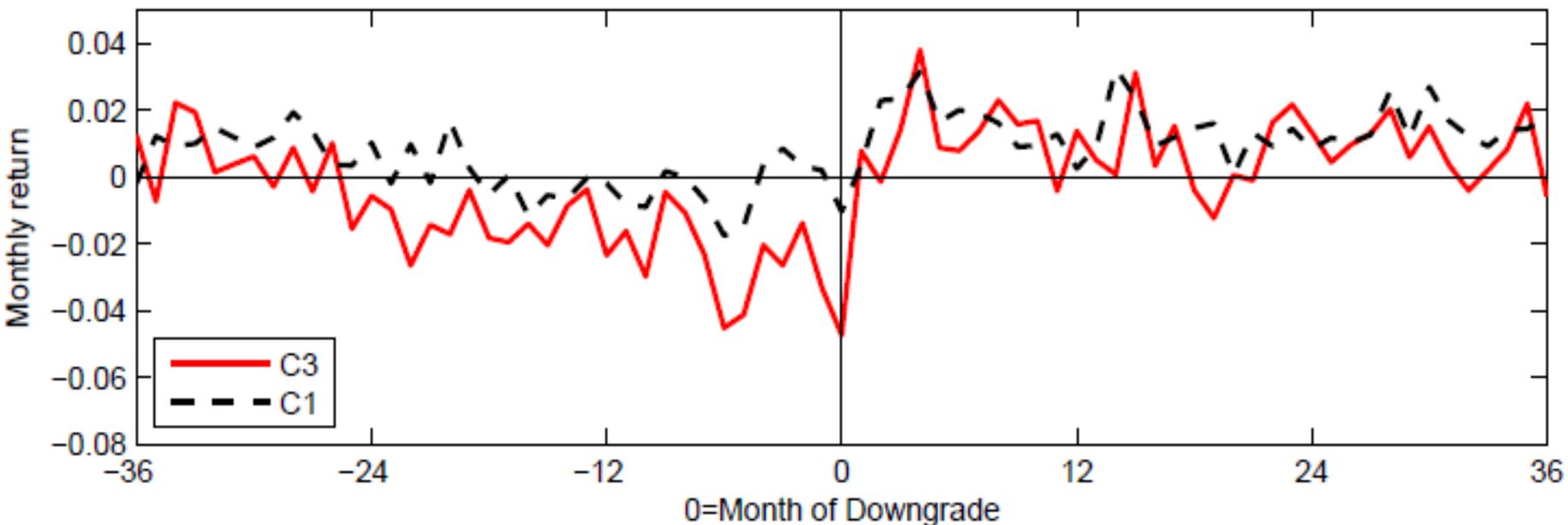
Plot A: Impact of downgrades on bond returns in low sentiment ( $SENT_{t-1}^{\downarrow} < 0$ )



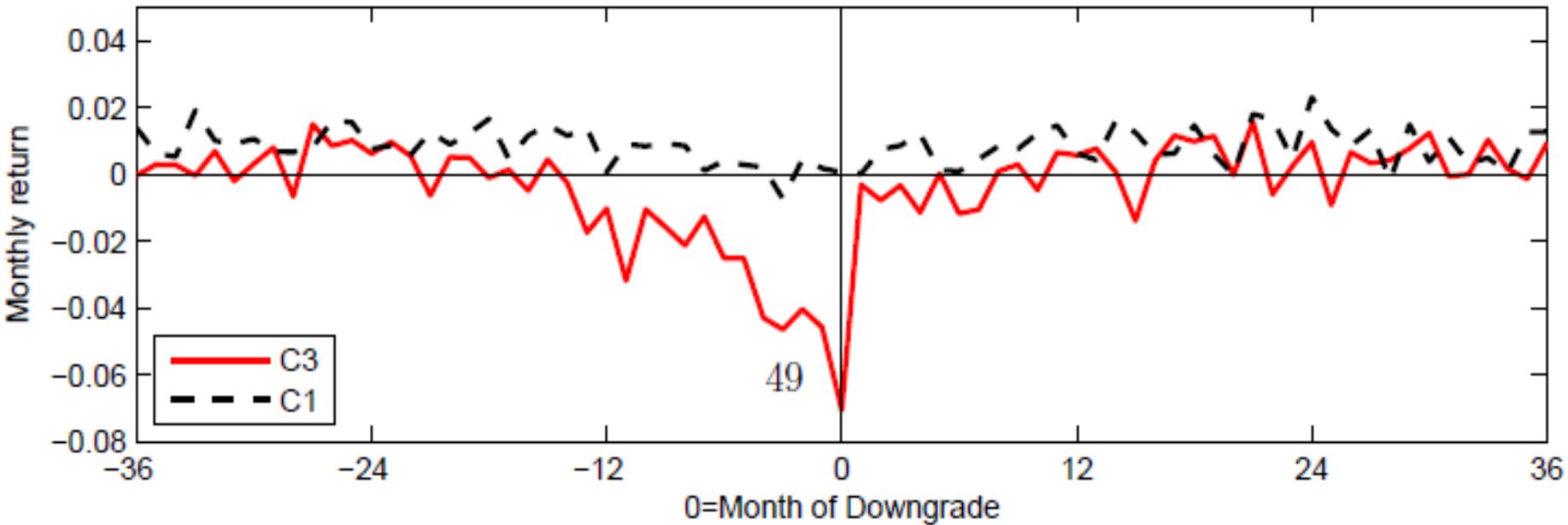
Plot B: Impact of downgrades on bond returns in high sentiment ( $SENT_{t-1}^{\downarrow} > 0$ )



Plot C: Impact of downgrades on stock returns in low sentiment ( $SENT_{t-1}^{\perp} < 0$ )



Plot D: Impact of downgrades on stock returns in high sentiment ( $SENT_{t-1}^{\perp} > 0$ )



# Results

- Overpricing obtains in
  - High credit risk stocks
  - Firms in financial distress
  - During high sentiment periods
- Can we further characterize these stocks?

Sort on	Sort on Overpricing							
Credit Risk	Low	Medium	High	High–Low	Low	Medium	High	High–Low
<b>Panel A: Low dispersion half</b>								
<i>A.1. Bond returns</i>					<i>A.2. Excluding downgrades</i>			
C1	0.64 (8.38)	0.62 (8.26)	0.63 (7.93)	-0.02 (-0.75)	0.65 (8.37)	0.63 (8.32)	0.63 (7.82)	-0.01 (-0.29)
C2	0.67 (9.38)	0.66 (9.21)	0.63 (8.24)	-0.03 (-1.27)	0.68 (9.57)	0.66 (9.06)	0.65 (8.38)	-0.03 (-0.91)
C3	0.75 (11.76)	0.71 (10.07)	0.75 (10.01)	0.00 (0.10)	0.78 (12.88)	0.75 (10.47)	0.80 (10.49)	0.02 (0.44)
C3–C1	0.11 (1.81)	0.10 (1.79)	0.12 (1.82)	0.01 (0.19)	0.13 (2.39)	0.14 (2.40)	0.17 (2.48)	0.04 (0.66)
<i>A.3. Stock returns</i>					<i>A.4. Excluding downgrades</i>			
C1	1.04 (5.01)	1.07 (5.00)	1.01 (4.87)	-0.05 (-0.33)	1.11 (5.37)	1.19 (5.47)	1.15 (5.63)	0.05 (0.28)
C2	1.26 (5.35)	1.18 (5.10)	0.94 (4.09)	-0.32 (-1.63)	1.35 (5.71)	1.26 (5.40)	1.17 (5.14)	-0.18 (-1.08)
C3	1.30 (4.58)	1.28 (4.95)	1.00 (3.58)	-0.29 (-1.59)	1.43 (4.87)	1.37 (5.39)	1.18 (4.60)	-0.23 (-1.21)
C3–C1	0.26 (1.31)	0.21 (1.40)	0.03 (0.17)	-0.26 (-1.15)	0.31 (1.50)	0.18 (1.14)	0.07 (0.33)	-0.30 (-1.30)

## Panel B: High dispersion half

<i>B.1. Bond returns</i>					<i>B.2. Excluding downgrades</i>			
C1	0.63 (8.84)	0.62 (8.25)	0.62 (7.33)	-0.01 (-0.15)	0.65 (8.98)	0.65 (8.75)	0.68 (7.97)	0.03 (0.67)
C2	0.73 (10.48)	0.71 (8.69)	0.66 (7.64)	-0.06 (-1.23)	0.75 (11.01)	0.75 (9.89)	0.72 (9.27)	-0.03 (-0.76)
C3	0.89 (9.91)	0.79 (7.84)	0.52 (3.89)	-0.37 (-3.84)	0.89 (11.08)	0.87 (9.55)	0.80 (8.00)	-0.09 (-1.33)
C3-C1	0.27 (2.87)	0.17 (1.65)	-0.09 (-0.72)	-0.36 (-3.92)	0.24 (2.76)	0.22 (2.30)	0.13 (1.29)	-0.11 (-1.52)
<i>B.3. Stock returns</i>					<i>B.4. Excluding downgrades</i>			
C1	1.25 (4.81)	1.01 (3.75)	1.00 (3.56)	-0.23 (-1.17)	1.52 (6.38)	1.31 (5.18)	1.55 (5.73)	0.05 (0.20)
C2	1.19 (3.85)	1.20 (3.52)	0.90 (2.52)	-0.29 (-1.24)	1.80 (6.43)	1.78 (6.41)	1.86 (6.03)	0.03 (0.12)
C3	1.66 (4.04)	1.12 (2.65)	0.20 (0.43)	-1.42 (-4.66)	2.65 (7.41)	2.40 (7.38)	2.27 (6.54)	-0.38 (-1.41)
C3-C1	0.41 (1.62)	0.11 (0.41)	-0.79 (-2.47)	-1.19 (-3.71)	1.10 (4.43)	1.09 (4.83)	0.73 (2.61)	-0.41 (-1.26)

Sort on	Sort on Overpricing							
	Low	Medium	High	High–Low	Low	Medium	High	High–Low

**Panel C: Low idiosyncratic volatility half**

<i>C.1. Bond returns</i>					<i>C.2. Excluding downgrades</i>			
C1	0.66 ( <b>8.29</b> )	0.60 ( <b>8.40</b> )	0.61 ( <b>7.83</b> )	-0.04 (-1.20)	0.66 ( <b>8.12</b> )	0.61 ( <b>8.42</b> )	0.62 ( <b>7.83</b> )	-0.02 (-0.55)
C2	0.65 ( <b>9.30</b> )	0.65 ( <b>8.58</b> )	0.65 ( <b>8.30</b> )	0.00 (0.03)	0.67 ( <b>9.59</b> )	0.66 ( <b>8.69</b> )	0.66 ( <b>8.32</b> )	-0.01 (-0.26)
C3	0.72 ( <b>11.01</b> )	0.68 ( <b>10.17</b> )	0.67 ( <b>9.52</b> )	-0.05 (-1.71)	0.75 ( <b>11.64</b> )	0.71 ( <b>10.62</b> )	0.72 ( <b>10.18</b> )	-0.03 (-1.04)
C3–C1	0.06 (1.18)	0.07 (1.68)	0.06 (1.06)	-0.01 (-0.16)	0.09 (1.67)	0.10 ( <b>2.33</b> )	0.10 (1.81)	-0.01 (-0.11)
<i>C.3. Stock returns</i>					<i>C.4. Excluding downgrades</i>			
C1	1.03 ( <b>4.94</b> )	1.01 ( <b>4.69</b> )	1.28 ( <b>6.37</b> )	0.25 (1.58)	1.13 ( <b>5.39</b> )	1.17 ( <b>5.43</b> )	1.32 ( <b>6.40</b> )	0.22 (1.24)
C2	1.22 ( <b>5.40</b> )	1.11 ( <b>4.86</b> )	1.03 ( <b>4.83</b> )	-0.19 (-1.32)	1.31 ( <b>5.76</b> )	1.26 ( <b>5.49</b> )	1.10 ( <b>5.21</b> )	-0.20 (-1.37)
C3	1.23 ( <b>4.80</b> )	1.23 ( <b>5.09</b> )	0.89 ( <b>3.62</b> )	-0.34 (-1.75)	1.37 ( <b>5.39</b> )	1.29 ( <b>5.66</b> )	1.09 ( <b>4.56</b> )	-0.28 (-1.69)
C3–C1	0.20 (0.81)	0.22 (1.09)	-0.40 (-1.72)	-0.59 (- <b>2.07</b> )	0.25 (1.04)	0.14 (0.72)	-0.24 (-0.89)	-0.54 (-1.74)

## Panel D: High idiosyncratic volatility half

### D.1. Bond returns

C1	0.65 (8.74)	0.63 (8.54)	0.60 (7.13)	-0.04 (-0.72)
C2	0.75 (11.38)	0.66 (8.33)	0.68 (7.84)	-0.07 (-1.37)
C3	0.96 (11.44)	0.83 (7.28)	0.51 (3.80)	-0.45 (-4.54)
C3-C1	0.32 (3.63)	0.20 (1.80)	-0.05 (-0.40)	-0.39 (-3.79)

### D.2. Excluding downgrades

	0.69 (9.63)	0.67 (9.17)	0.74 (8.69)	0.07 (1.47)
	0.79 (12.23)	0.78 (11.25)	0.77 (9.93)	-0.02 (-0.51)
	1.00 (14.08)	1.05 (11.73)	0.94 (11.07)	-0.06 (-0.93)
	0.32 (3.86)	0.39 (4.24)	0.21 (2.25)	-0.15 (-2.01)

### D.3. Stock returns

C1	1.13 (4.21)	0.95 (3.12)	0.92 (2.60)	-0.20 (-0.76)
C2	1.36 (4.30)	1.32 (3.70)	0.68 (1.78)	-0.69 (-2.92)
C3	1.67 (4.06)	1.20 (2.65)	0.29 (0.62)	-1.35 (-4.29)
C3-C1	0.54 (2.12)	0.23 (0.77)	-0.74 (-2.55)	-1.25 (-3.66)

### D.4. Excluding downgrades

	1.19 (4.59)	1.27 (4.19)	1.69 (4.49)	0.51 (1.73)
	1.69 (5.35)	1.60 (4.72)	1.48 (4.25)	-0.22 (-0.82)
	1.89 (4.88)	1.78 (4.65)	1.47 (3.69)	-0.41 (-1.40)
	0.70 (2.65)	0.49 (1.83)	-0.11 (-0.36)	-0.96 (-2.54)

Sort on	Sort on Overpricing							
	Low	Medium	High	High–Low	Low	Medium	High	High–Low

**Panel E: Low Amihud's illiquidity half**

<i>E.1. Bond returns</i>					<i>E.2. Excluding downgrades</i>			
C1	0.65 (8.54)	0.59 (8.20)	0.63 (8.31)	-0.02 (-0.65)	0.65 (8.49)	0.61 (8.36)	0.63 (8.23)	-0.02 (-0.56)
C2	0.67 (9.21)	0.65 (8.73)	0.59 (7.44)	-0.08 (-2.17)	0.67 (9.18)	0.68 (8.90)	0.61 (7.19)	-0.06 (-1.22)
C3	0.76 (11.67)	0.71 (9.95)	0.64 (8.31)	-0.11 (-2.26)	0.77 (11.88)	0.76 (11.06)	0.68 (8.74)	-0.08 (-1.56)
C3–C1	0.10 (1.90)	0.12 (2.39)	0.02 (0.27)	-0.08 (-1.49)	0.10 (1.90)	0.15 (3.17)	0.06 (0.91)	-0.05 (-0.83)
<i>E.3. Stock returns</i>					<i>E.4. Excluding downgrades</i>			
C1	1.07 (5.15)	1.05 (4.82)	1.04 (4.00)	-0.03 (-0.17)	1.14 (5.53)	1.12 (5.18)	1.13 (4.10)	0.01 (0.05)
C2	1.22 (5.18)	1.13 (4.64)	0.74 (2.86)	-0.48 (-2.93)	1.31 (5.51)	1.32 (5.50)	1.16 (4.39)	-0.15 (-0.83)
C3	1.18 (4.34)	1.05 (4.03)	0.60 (1.99)	-0.56 (-2.73)	1.25 (4.57)	1.17 (4.68)	0.94 (3.21)	-0.30 (-1.54)
C3–C1	0.11 (0.58)	-0.00 (-0.02)	-0.44 (-2.26)	-0.55 (-2.41)	0.11 (0.54)	0.05 (0.38)	-0.19 (-0.87)	-0.29 (-1.18)

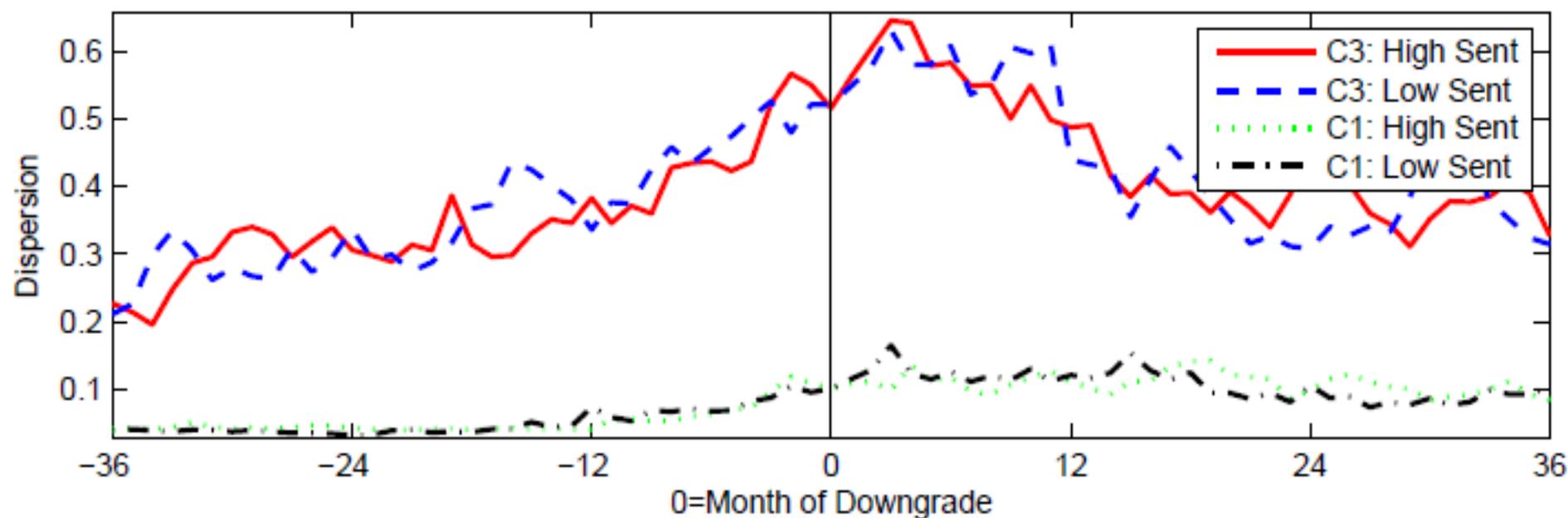
## Panel F: High Amihuds illiquidity half

<i>F.1. Bond returns</i>					<i>F.2. Excluding downgrades</i>			
C1	0.67 (9.83)	0.68 (8.73)	0.70 (8.89)	0.03 (1.03)	0.68 (10.04)	0.70 (8.95)	0.70 (8.79)	0.04 (1.02)
C2	0.75 (10.14)	0.72 (9.64)	0.64 (6.55)	-0.11 (-1.62)	0.80 (11.07)	0.76 (10.43)	0.72 (8.00)	-0.08 (-1.53)
C3	0.87 (11.64)	0.91 (8.14)	0.51 (3.78)	-0.36 (-3.44)	0.86 (12.31)	0.96 (10.10)	0.83 (8.83)	-0.03 (-0.42)
C3-C1	0.21 (2.44)	0.24 (2.00)	-0.18 (-1.31)	-0.40 (-3.71)	0.20 (2.43)	0.26 (2.53)	0.15 (1.44)	-0.05 (-0.63)
<i>F.3. Stock returns</i>					<i>F.4. Excluding downgrades</i>			
C1	1.26 (5.18)	1.10 (4.71)	1.32 (5.18)	0.04 (0.24)	1.35 (5.61)	1.17 (4.96)	1.43 (5.97)	0.12 (0.62)
C2	1.45 (4.53)	1.24 (3.69)	0.86 (2.23)	-0.54 (-2.22)	1.76 (5.72)	1.53 (4.87)	1.40 (4.19)	-0.22 (-1.02)
C3	1.64 (4.23)	1.35 (3.04)	0.33 (0.72)	-1.29 (-3.96)	1.81 (4.88)	1.68 (4.23)	1.29 (3.23)	-0.52 (-1.61)
C3-C1	0.39 (1.49)	0.25 (0.78)	-1.03 (-2.90)	-1.38 (-3.88)	0.48 (1.87)	0.52 (1.69)	-0.16 (-0.49)	-0.69 (-1.95)

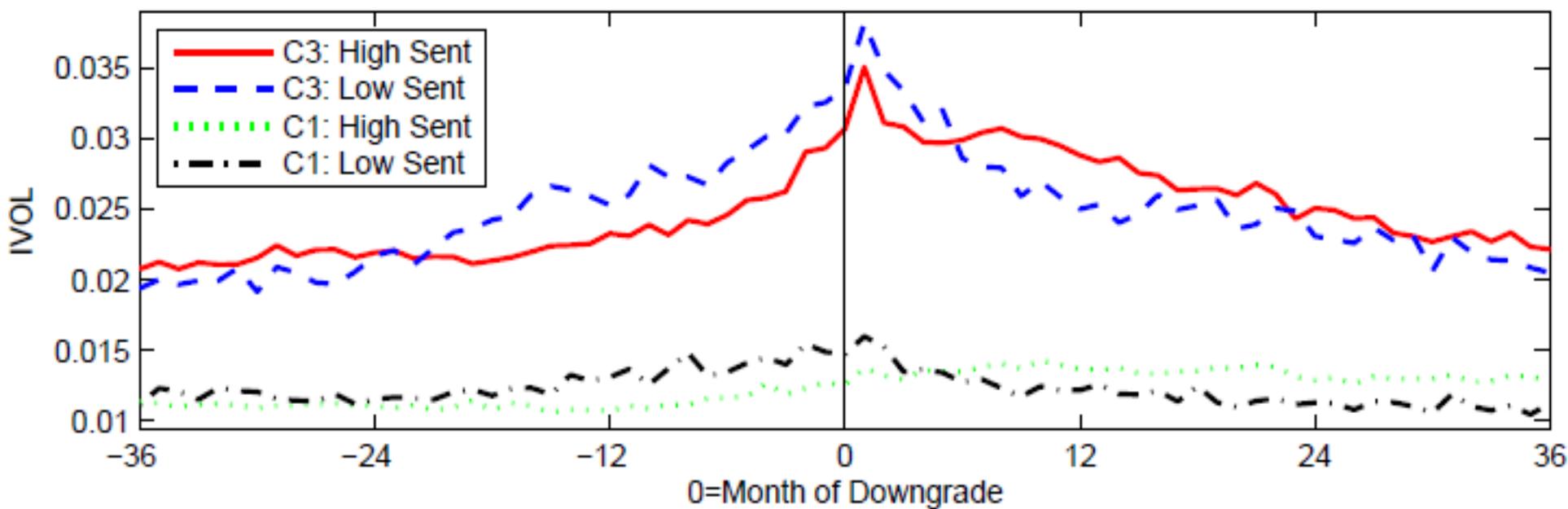
# Uncertainty and Trading Frictions

- Overpricing obtains in distressed firms that are **harder to value and trade**
- Are trading frictions and uncertainty higher during high sentiment periods
- No, but they **increase dramatically around financial distress in both high and low sentiment periods**

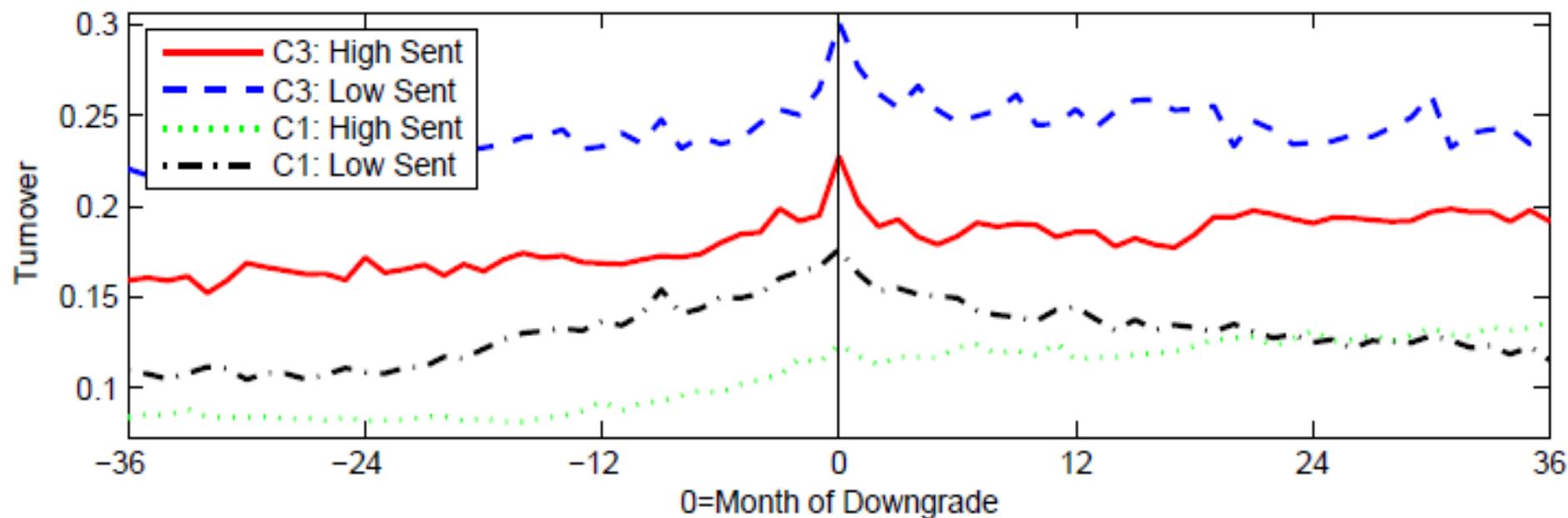
Plot A: Impact of downgrades on analyst dispersion in high and low sentiment



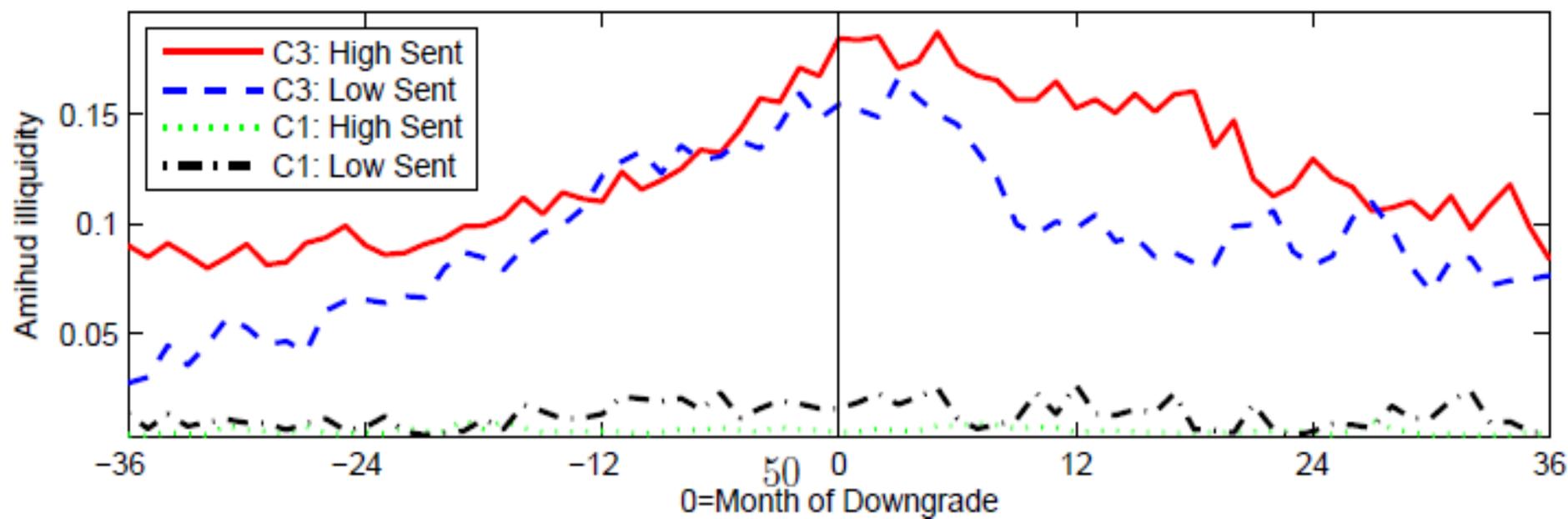
Plot B: Impact of downgrades on idiosyncratic volatility in high and low sentiment



Plot C: Impact of downgrades on turnover in high and low sentiment



Plot D: Impact of downgrades on Amihud's illiquidity in high and low sentiment



# What is Driving the Differences in Distress Periods Returns

- **Uncertainty and trading frictions around distress are similar** following high and low sentiment periods
- Yet investors appear to **price distress differently** in high versus low sentiment periods
- So what is driving this **difference in returns** around distress following high and low sentiment?
  - Is the **frequency of distress** higher following high sentiment?
  - Is the **impact of financial distress** stronger?

Sort on	Sort on Overpricing							
Credit Risk	Low	Medium	High	High–Low	Low	Medium	High	High–Low
<b>Panel A: Downgrade frequency over next month (%)</b>								
<i>A.1. Low sentiment</i>				<i>A.2. High sentiment</i>				
C1	0.41 (5.75)	0.85 (6.12)	1.17 (3.98)	0.76 (2.47)	0.55 (7.84)	0.73 (7.09)	1.46 (5.16)	0.91 (3.15)
C2	0.79 (6.26)	1.04 (5.44)	1.51 (7.12)	0.71 (3.05)	0.78 (8.59)	1.14 (7.54)	1.25 (10.33)	0.47 (3.11)
C3	0.83 (4.11)	1.54 (8.80)	2.49 (11.42)	1.66 (5.89)	0.80 (6.52)	1.45 (11.15)	2.52 (17.73)	1.71 (9.44)
C3–C1	0.42 (1.92)	0.69 (3.29)	1.31 (4.05)	0.89 (2.33)	0.26 (1.80)	0.72 (4.36)	1.06 (3.50)	0.80 (2.31)
<b>Panel B: Downgrade frequency over next 12 months (%)</b>								
<i>B.1. Low sentiment</i>				<i>B.2. High sentiment</i>				
C1	5.70 (14.04)	9.00 (17.30)	13.38 (13.67)	7.68 (7.34)	4.86 (21.38)	7.95 (22.24)	11.94 (15.78)	7.08 (8.38)
C2	8.85 (16.94)	12.27 (18.17)	13.82 (20.32)	4.97 (8.93)	8.62 (25.59)	10.93 (30.20)	10.49 (24.55)	1.87 (3.76)
C3	12.21 (15.70)	16.81 (21.89)	21.46 (27.91)	9.25 (9.67)	10.65 (23.98)	15.16 (35.58)	18.27 (36.44)	7.61 (13.78)
C3–C1	6.51 (8.51)	7.81 (10.58)	8.08 (8.10)	1.57 (1.40)	5.80 (11.70)	7.22 (15.59)	6.33 (7.86)	0.53 (0.59)
<b>Panel C: Average size of downgrade (notches)</b>								
<i>C.1. Low sentiment</i>				<i>C.2. High sentiment</i>				
C1	1.17	1.13	1.08		1.30	1.12	1.08	
C2	1.12	1.31	1.11		1.37	1.27	1.14	
C3	1.82	1.47	1.46		1.41	1.59	1.40	

Sort on	Sort on Overpricing							
Credit Risk	Low	Medium	High	High–Low	Low	Medium	High	High–Low

**Panel D: Bond return in distress period (%)**

<i>D.1. Low sentiment</i>	<i>D.2. High sentiment</i>							
C1	0.62 (4.57)	0.69 (4.85)	0.66 (4.09)	0.07 (0.94)	0.58 (6.52)	0.52 (5.91)	0.59 (6.23)	0.03 (0.71)
C2	0.74 (4.10)	0.73 (4.54)	0.78 (4.90)	-0.00 (-0.01)	0.63 (5.53)	0.57 (6.84)	0.44 (4.39)	-0.19 (-1.79)
C3	0.98 (4.30)	0.92 (3.88)	0.77 (2.91)	-0.14 (-0.64)	0.78 (4.63)	0.58 (4.71)	0.32 (2.00)	-0.44 (-2.40)
C3–C1	0.43 (1.72)	0.24 (0.95)	0.13 (0.50)	-0.26 (-1.06)	0.20 (1.11)	0.07 (0.53)	-0.29 (-2.11)	-0.47 (-2.48)

**Panel E: Stock return in distress period (%)**

<i>E.1. Low sentiment</i>	<i>E.2. High sentiment</i>							
C1	0.83 (1.73)	0.69 (1.22)	1.16 (2.07)	0.16 (0.41)	0.58 (1.76)	0.58 (1.83)	0.65 (1.86)	0.09 (0.27)
C2	0.92 (1.44)	0.57 (0.83)	1.20 (1.57)	0.17 (0.33)	0.79 (2.24)	0.53 (1.54)	-0.21 (-0.51)	-0.96 (-2.77)
C3	1.19 (1.19)	1.13 (1.04)	0.53 (0.49)	-0.36 (-0.36)	0.72 (1.26)	0.16 (0.34)	-0.79 (-1.58)	-1.44 (-2.86)
C3–C1	0.08 (0.10)	0.43 (0.54)	-0.76 (-0.93)	-0.53 (-0.49)	0.21 (0.42)	-0.33 (-0.86)	-1.48 (-3.55)	-1.49 (-2.74)

# Takeaway

- Excessive optimism with respect to the impact of distress during high sentiment periods
- Correction of this optimism following high sentiment periods leads to the return patterns as prices move towards fundamentals

Specification	All months					Low Sentiment					High Sentiment				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
<b>Panel A: Risk-adjusted stock returns</b>															
Constant	-0.00 (-0.05)	-0.00 (-0.05)	0.24 <b>(4.47)</b>	0.25 <b>(4.60)</b>	0.92 <b>(2.27)</b>	0.14 (1.18)	0.14 (1.18)	0.24 <b>(2.55)</b>	0.25 <b>(2.58)</b>	0.28 (0.38)	-0.08 (-1.31)	-0.08 (-1.31)	0.24 <b>(3.67)</b>	0.25 <b>(3.80)</b>	1.25 <b>(2.58)</b>
Underpricing	0.14 (1.40)	0.14 (1.40)	0.06 (0.59)	0.05 (0.53)	0.18 (1.79)	0.01 (0.08)	0.01 (0.08)	-0.04 (-0.27)	-0.04 (-0.29)	0.13 (0.82)	0.21 (1.60)	0.21 (1.60)	0.11 (0.83)	0.10 (0.77)	0.20 (1.60)
Overpricing	-0.53 <b>(-3.15)</b>	0.05 (0.29)	-0.20 (-1.16)	-0.38 <b>(-2.40)</b>	-0.16 (-1.02)	-0.22 (-0.72)	0.09 (0.30)	-0.01 (-0.04)	-0.14 (-0.48)	-0.21 (-0.74)	-0.69 <b>(-3.41)</b>	0.03 (0.14)	-0.29 (-1.41)	-0.51 <b>(-2.65)</b>	-0.14 (-0.73)
Overpricing×Distress		-1.37 <b>(-5.44)</b>	-0.48 <b>(-2.11)</b>		-0.58 <b>(-2.52)</b>		-0.85 <b>(-2.07)</b>	-0.45 <b>(-1.27)</b>		-0.35 (-0.98)		-1.63 <b>(-5.16)</b>	-0.50 (-1.70)		-0.70 <b>(-2.35)</b>
Distress			-0.88 <b>(-8.80)</b>	-0.92 <b>(-9.05)</b>	-0.80 <b>(-8.90)</b>			-0.40 <b>(-2.09)</b>	-0.44 <b>(-2.24)</b>	-0.37 <b>(-2.05)</b>			-1.12 <b>(-9.99)</b>	-1.17 <b>(-10.18)</b>	-1.01 <b>(-10.48)</b>
Amihud					-0.00 (-0.00)					-1.69 (-1.05)					0.86 (0.42)
Turnover					0.34 (0.53)					0.31 (0.27)					0.36 (0.47)
Rating					-0.01 (-0.45)					0.03 (0.89)					-0.03 (-1.29)
Leverage					-0.31 (-1.21)					-0.49 (-1.16)					-0.22 (-0.68)
R <sub>t-1</sub>					-2.24 <b>(-4.17)</b>					-2.90 <b>(-3.53)</b>					-1.90 <b>(-2.74)</b>
Log(Size)					-0.06 (-1.82)					-0.03 (-0.60)					-0.07 (-1.79)
Log(BM)					0.11 <b>(2.41)</b>					0.11 (1.35)					0.11 <b>(1.99)</b>

Specification	All months					Low Sentiment					High Sentiment				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
<b>Panel B: Risk-adjusted bond returns</b>															
Constant	0.25 (4.52)	0.25 (4.52)	0.32 (5.84)	0.33 (5.94)	0.26 (3.08)	0.33 (2.96)	0.33 (2.96)	0.37 (3.41)	0.37 (3.41)	0.35 (2.11)	0.21 (3.43)	0.21 (3.43)	0.29 (4.77)	0.30 (4.91)	0.21 (2.24)
Underpricing	0.06 (2.28)	0.06 (2.28)	0.04 (1.38)	0.03 (1.28)	0.02 (1.15)	0.03 (0.49)	0.03 (0.49)	0.01 (0.19)	0.01 (0.15)	0.03 (0.98)	0.08 (2.62)	0.08 (2.62)	0.05 (1.61)	0.05 (1.52)	0.02 (0.73)
Overpricing	-0.18 (-3.26)	0.05 (1.38)	-0.02 (-0.40)	-0.14 (-2.64)	0.04 (1.19)	-0.07 (-0.66)	0.06 (0.71)	0.02 (0.22)	-0.04 (-0.40)	0.08 (1.34)	-0.24 (-3.59)	0.05 (1.23)	-0.04 (-0.80)	-0.19 (-3.00)	0.02 (0.44)
Overpricing×Distress		-0.50 (-5.40)	-0.26 (-3.14)		-0.22 (-3.06)		-0.29 (-1.82)	-0.16 (-1.13)		-0.13 (-1.20)		-0.61 (-5.37)	-0.32 (-3.03)		-0.26 (-2.86)
Distress			-0.24 (-8.21)	-0.26 (-8.48)	-0.18 (-8.60)			-0.13 (-2.14)	-0.15 (-2.33)	-0.12 (-2.93)			-0.29 (-9.65)	-0.32 (-9.70)	-0.21 (-9.05)
Age (years)					-0.01 (-1.23)					0.01 (1.40)					-0.01 (-1.91)
Bond rating					-0.01 (-1.39)					-0.01 (-0.83)					-0.01 (-1.11)
Bond duration					0.01 (1.57)					-0.00 (-0.06)					0.02 (1.85)
Amount outstanding					-0.00 (-0.06)					0.03 (0.26)					-0.02 (-0.23)
Leverage					0.02 (0.33)					0.03 (0.27)					0.01 (0.20)
$R_{t-1}^b$					4.65 (3.82)					4.32 (2.22)					4.82 (3.11)
$R_{t-7:t-2}^b$					1.09 (2.95)					0.55 (1.09)					1.36 (2.76)

# Robustness

- The results are robust to
  - **Stambaugh, Yu and Yuan (2012)** original set of 11 anomalies used to create the overpricing measure
  - Using **Baker and Wurgler (2006) annual sentiment index** instead of the monthly sentiment index
  - Using alternative credit risk proxies: **Z-score, failure probability**

# Potential Explanations: Risk

- Could the anomaly based profits represent compensation for non-diversifiable risk?
  - Risk and characteristic adjustment alleviate these concerns
  - Also, lower returns imply a negative risk premium
- Could these stocks offer a hedge against consumption risk?
  - High credit risk stocks have higher betas
  - Downgrades not less likely or less severe during recessions
  - Downgrades are idiosyncratic

# Potential Explanations: Trading Frictions

- Overpricing emerges in distressed stocks that are harder to value and trade
- Investor disagreement and trading frictions increase around distress but **similarly** so following high and low sentiment periods
- But
- Investors price distress **differently** in high versus low sentiment periods
- **Limits to arbitrage may cause mispricing to persist**

# Potential Explanations: Wealth Transfer

- Distressed stocks could be rationally overvalued due to **violations of absolute priority** during distress
  - Garlappi, Shu, and Yan (2008)
  - Garlappi and Yan (2011)
- BUT
- Bonds of distressed firms also earn negative returns, i.e., the **bonds are also overpriced**
- **Cross-sectional bond-stock correlations are highest for most overpriced, low rated firms during distress**

# Bond-Stock Correlations

Sort on	Sort on Overpricing							
	Low	Medium	High	High–Low	Low	Medium	High	High–Low

## Panel A: LOW Monthly sentiment

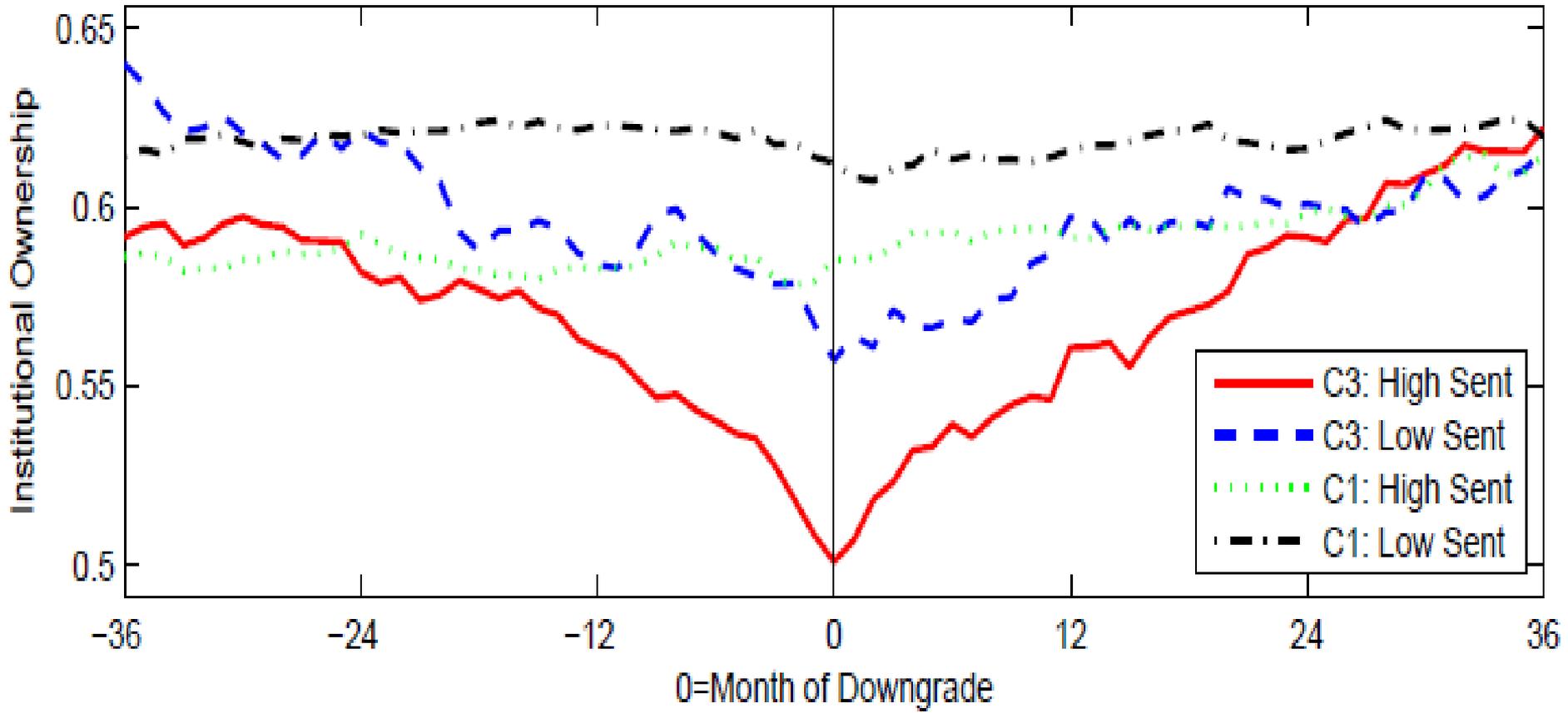
	<i>A.1. All observations</i>				<i>A.2. Excluding financial distress</i>			
C1	11.65 (8.39)	10.65 (5.03)	14.21 (5.46)	2.88 (1.04)	12.21 (8.61)	12.94 (6.35)	11.73 (4.24)	0.38 (0.13)
C2	15.09 (8.14)	18.41 (8.55)	19.27 (8.52)	4.18 (1.54)	11.88 (5.84)	18.36 (8.38)	19.06 (8.57)	7.18 (2.47)
C3	21.35 (7.26)	26.99 (13.70)	31.38 (16.34)	10.08 (3.44)	20.45 (6.98)	25.58 (12.47)	28.14 (15.07)	7.81 (2.62)
C3–C1	9.42 (2.87)	17.34 (8.53)	18.34 (6.17)	8.10 (1.95)	8.22 (2.56)	14.45 (6.07)	19.00 (6.10)	8.23 (1.97)

## Panel B: HIGH Monthly sentiment

	<i>B.1. All observations</i>				<i>B.2. Excluding financial distress</i>			
C1	11.84 (9.89)	6.24 (3.83)	9.01 (4.12)	–1.89 (–0.76)	12.41 (10.04)	5.33 (3.13)	6.89 (3.02)	–4.74 (–1.91)
C2	12.12 (9.05)	12.22 (8.40)	13.14 (7.94)	1.25 (0.65)	12.10 (8.47)	11.34 (7.39)	8.80 (5.16)	–3.78 (–1.86)
C3	17.62 (10.83)	25.87 (15.81)	27.96 (17.77)	10.56 (5.36)	18.27 (10.77)	23.41 (13.19)	24.15 (14.85)	6.11 (3.08)
C3–C1	5.81 (3.00)	19.61 (9.59)	20.10 (7.91)	11.61 (3.54)	5.85 (2.86)	17.58 (8.01)	20.49 (7.96)	10.02 (3.30)

# Potential Explanations: Preference for Lotteries

- Retail investors prefer stocks with lottery like characteristics: low price, high IVOL, positive skewness
  - Kumar (2009), Bailey, Kumar, and Ng (2011), Coelho, John, Kumar, Taffler (2014)
- Investors may accept low returns in hope of windfall if firm survives distress or is acquired at a premium
- Retail investors do buy shares of low rated firms around distress
- But while stocks offer unlimited upside bonds have a bounded upside (coupon+principal) and yet same overpricing characterizes bonds of “lottery-type” firms



# Potential Explanations: Institutional Trading

- Do institutions trade rationally and eliminate mispricing?
- No! While institutions do sell distressed shares following high sentiment, they still hold a large fraction of the shares
- **Bond markets are dominated by institutions** but evidence points to same behavioral biases
- **(Some) institutions appear to be susceptible to behavioral biases that lead to mispricing**

# Potential Explanations: Behavioral Biases

- **Mispricing appears only following high sentiment** – which points to behavioral biases
- A specific behavioral bias
  - **Excessive optimism wrt impact of financial distress**
- No other biases as mispricing absent outside of distress even following high sentiment periods
- Excessive optimism in both equity and bond markets
  - Retail and (some) institutions are susceptible to behavioral biases

# Conclusion

- **Behavioral biases** seem to be driving mispricing
  - Mispricing obtains only during **high sentiment** periods
- Sentiment driven investors are **excessively optimistic wrt the impact of financial distress** in bonds and stocks
  - Impacts both retail investors and (some) institutions
  - Uncertainty and trading frictions increase dramatically around distress in both high and low sentiment periods but **mispricing obtains only during high sentiment periods**