Disagreement, Attention, Sentiment and IPO underpricing: Evidence from Twitter

By

VACIN LAWATANATRAKUL and PIYACHART PHIROMSWAD
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What we do

- We construct *investor disagreement*, *investor attention and investor sentiment index* using data obtained from Twitter for examining IPO underpricing (664 IPOs in NASDAQ and NYSE during 2012-2014).

- We examine **91,974 tweets** using computerized text classification method.

- We find that investor attention and investor disagreement affect IPO underpricing. We also find interaction effect between disagreement and attention.

- This supports the asymmetric information explanation as well as attention-induced positive price pressure explanation

Motivation 1: Big Data is important

- "By 2020, it's thought that the number of bytes will be 57 times greater than all the grains of sand on the world's beaches." (computerworld.com, December 11th, 2012)

- "The world's most valuable resource is no longer oil, but data" (The Economist, May 6th, 2017)

- In 2017, Facebook has 1.8 billion active users, Instagram has 600 million active users, and Twitter has 300 million active users (smartinsights.com, January 2017)

- We need to turn big data into smart data

Collect ➡ Analyze ➡ Action

Motivation 2: Twitter has a lot of useful information

- As of June 30, 2016, there were 313 million monthly active users and more than 500 million tweets generated daily.

- Twitter allows users to create and publicly share a text message up to 140 characters known as a "tweet."

Example

Fantastic news out of $RTRX, doing the real heavy lifting of building a world-class organization : http://t.co/xFVNkcU2If

- With text messages, not only we can search and count the number of tweets about a specific stock or IPO (i.e. attention), but we can also can extract sentiment and disagreement information as well.
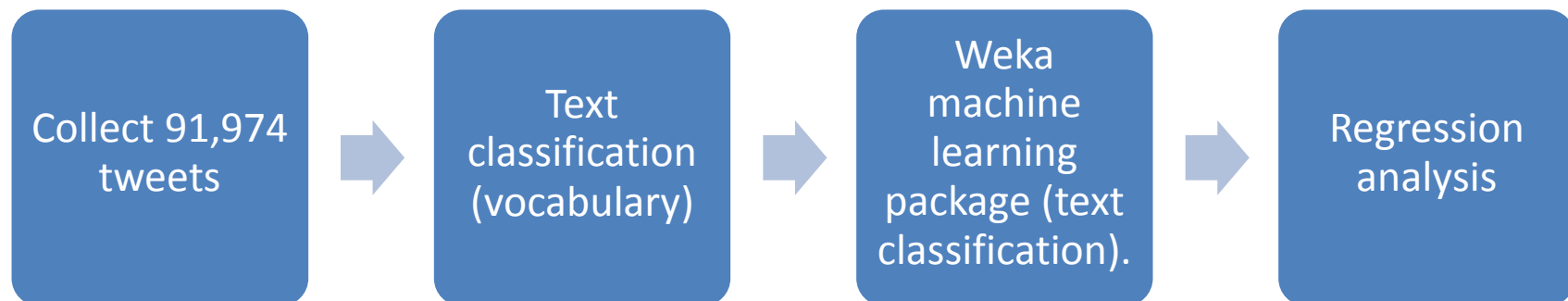
Why Twitter?

Proxies for attention	Direct measure	Cheap/ Feasible	High Frequency	With Content	Single platform across countries
Survey	✔			✔	✔
Media Coverage (the most popular measure)		✔		✔	✔
Google Search Frequency	✔	✔			✔
Popular Webboard (Yahoo! Finance, LiveJournal)	✔	✔	✔	✔	
Twitter	✔	✔	✔	✔	✔

Problems and contributions

- Stoll and Curley (1970), Logue (1973), and Ibbotson (1975) are among the first to document the anomaly that, on average, the price that IPO shares were sold to investors (the offer price) is lower than the price that the shares were subsequently traded (usually the 1st day price).

- Two explanations of IPO underpricing that have been examined extensively in the literature are i) asymmetric information (disagreement) and ii) behavioral explanations (attention and sentiment).

- However, it is **difficult to find a direct measure** of asymmetric information (disagreement) as well as for attention and sentiment.

- We construct **investor disagreement**, **investor attention** *and* **investor sentiment index** using data obtained from Twitter for examining IPO underpricing (664 IPOs in NASDAQ and NYSE during 2012-2014).

How did we do it?

```
┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐   ┌─────────────────┐
│ Collect 91,974  │ → │ Text            │ → │ Weka            │ → │ Regression      │
│ tweets          │   │ classification  │   │ machine         │   │ analysis        │
│                 │   │ (vocabulary)    │   │ learning        │   │                 │
│                 │   │                 │   │ package (text   │   │                 │
│                 │   │                 │   │ classification).│   │                 │
└─────────────────┘   └─────────────────┘   └─────────────────┘   └─────────────────┘
```

- Download 30 days pre-IPO data using symbol (e.g., '$TWTR)
- Using authors constructed computerized JAVA program
- Alternatively can use social media analytic website

- Following the Naïve Bayesian classification of Antweiler and Frank (2004, JF)
- Four classes (Positive; Negative; Neutral; Irrelevant)
- 1000 Tweets for training (78% accurate)

- Weka from Frank et al. (2016)
- Construct attention, sentiment and disagreement indexes

- Examine the effect of these indexes on IPO underpricing and 1st day turnover (volume)

Investor disagreement, investor attention and investor sentiment index

- Attention
  - the number of total tweets about each IPO.

- Sentiment: Positive and negative tweet ratio
  - the number of positive (negative) tweets about an IPO divided by the number of total tweets about the IPO.

- Disagreement
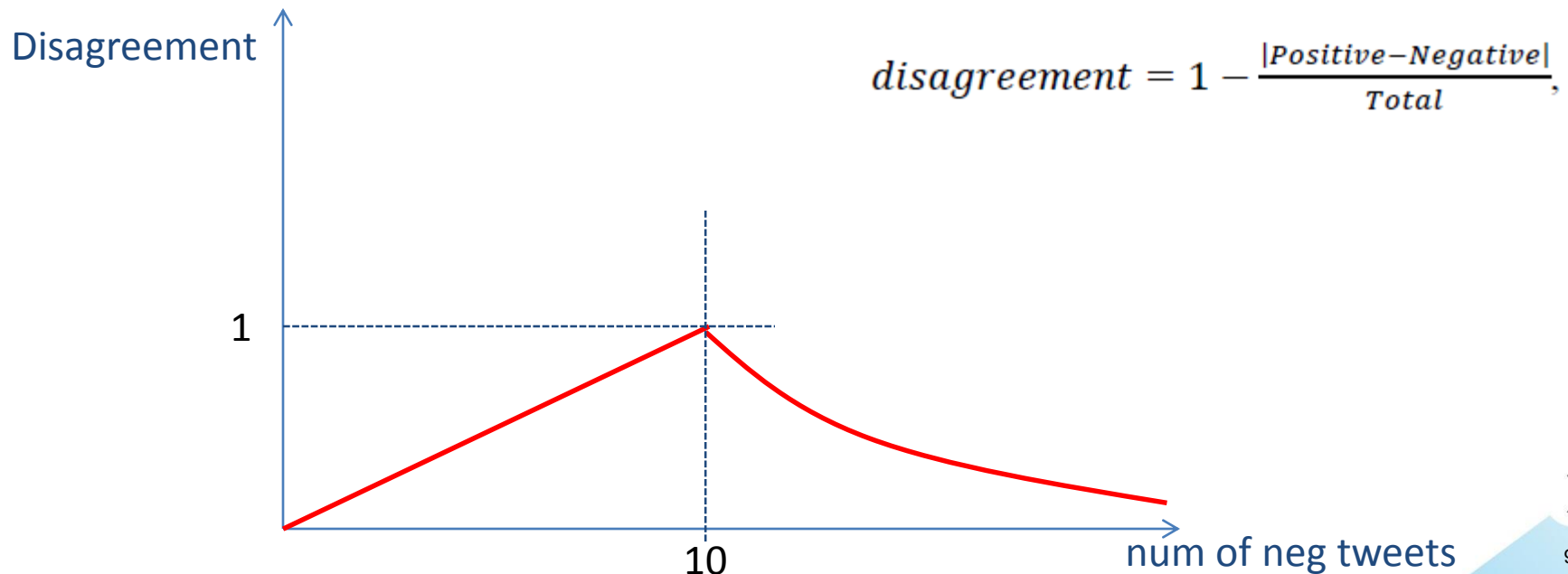
$$disagreement = 1 - \frac{|Positive-Negative|}{Total},$$

$$disagreement = 1 - \frac{|Positive-Negative|+Neutral}{Total}$$

Methodology

- If we fix the number of positive tweets = 10
- But what about
  - Case 1: 10 positive, 10 negative, 0 neutral
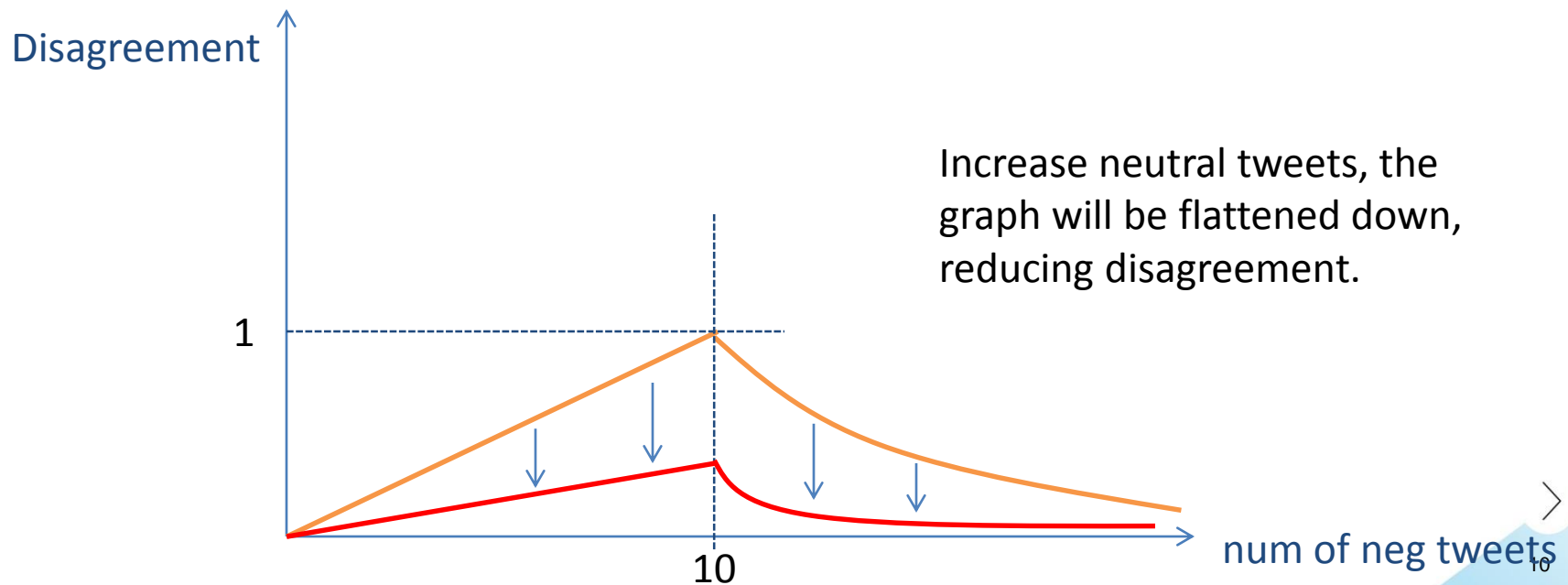 - Case 2: 10 positive, 10 negative, 10000 neutral

$$disagreement = 1 - \frac{|Positive - Negative|}{Total},$$

Methodology

$$disagreement = 1 - \frac{|Positive - Negative|}{Total},$$

$$disagreement = 1 - \frac{|Positive - Negative| + Neutral}{Total}$$

Disagreement

Increase neutral tweets, the graph will be flattened down, reducing disagreement.

1

10

num of neg tweets

Data (examples)

Tweets that were automatically classified as positive

- Fantastic news out of $RTRX, doing the real heavy lifting of building a world-class organization : http://t.co/xFVNkcU2If
- 1k shares at a time RT @ColfaxCapital $RTRX Quietly moving the right way
- As for IPO's this week. Mark 1/24 Thurs/Fri. be an awesome for US! I like $CRCM 5.4mil shares (Low Float) $14-$16 price range! This one WILL
- RT @PPTrades: Excited for tomorrow $DRNA goes public. Don't miss out! $$$$$$ #trading #stocks #moneyhungry #pussypower
- @AjTrader7 Yo...I was offered the $QURE uniQure IPO via Etrade to get in....I saw this was one you like...so I guess you think I should?
- Best biotech IPO ever supposed to price tonight. $RTGN, developers of Rx bleach water, selling 2.2M shares WITH 100% WARRANT COVERAGE!
- RT @RebeccaStropoli: $GRUB prices at $26/share. As a New Yorker who owns neither pot nor pan, I consider myself a fan.
- Fun facts about Sabre: It was spun from American Airlines in 2000 and owns Travelocity and Travelport. http://t.co/so327wZaSk $SABR
- 31.0% increased bullish conversations in $BABA in the past 1 hour.
- $baba overpriced? Yes but the hype is too strong going past 100 fast IMO get all u can

Data (examples)

Tweets that were automatically classified as negative

- $ANET On The Verge Of IPO, Arista Networks Faces Lawsuit From A Billionaire Cofounder http://t.co/Y22v8nL8UU via @forbes
- $IGT on the block, been a tough time for the slots guys, $WMS already down too
- @jimcramer does the fact that $mtbc employs people in Pakistan hurt the ipo? Thank you sir.
- Perks and pitfalls of depending on #JackMa: can he be trusted to act in $BABA shareholders' interest? @johnsfoley answers $100bln+ question.
- $LOCO my guess is... it spikes in 1st 5 min then crashes hard near $15.50 then gradually climbs and closes at $18
- Is this the worst page in an S-1 ever? Gotta be up there. $BNK cc: @BarbarianCap @ReformedBroker http://t.co/84i9KVKQGS
- RT @KitchenNews: Alibaba IPO: Is it too late to get rich with Jack Ma? Craig Stephen says yes, much too late -- http://t.co/GCUwZW3yVc #ali…
- I like Obama more than Ali Ba Ba. $BABA
- Sergio is annoyed. silly analyst questions. $FCAU
- $NEWR Tech companies are notorious to be unprofitable long after they go public. While t http://t.co/BccAr1PdR1... via @TwoMargins

Data (examples)

Tweets that were automatically classified as neutral

- Clean energy spinoff NextEra Energy Partners sets terms for $325 million IPO $NEP... http://t.co/f2GzX5XNwU via http://t.co/VS8RO0UwVJ
- Alibaba IPO launch aimed for week of Sept. 8 http://t.co/aeftjUjZwT $BABA
- Why does a Chinese company have an Arabic name? Is this like Haagen Dazs? $BABA
- I do I get in on $momo ipo!?
- $JUNO Using a share count of 88M for Opus Bio shares + stock options MC ~1.3 -1.6 B @ 15-18 price http://t.co/4HDDbQvOdE
- @JNapodano Just wondering what is your take on $JUNO. What do you think it will open at next Friday?
- $BABA story: http://t.co/5wwzYaxtwf
- @HalftimeReport @ScottWapnerCNBC @jonnajarian Will you talk about the $LOCO IPO that debuts tomorrow? opinions
- Mountain View biotech Versartis increases its #IPO size and price range to 6 million shares at $19-to-$21. $VSAR

Data (examples)

Tweets that were automatically classified as irrelevant

- Ella tiene un piquete que no se compara de los pies a la cabeza se le nota que es $cara..
- PowerShellでfunction cl110 { cmd /c "$env:VS110COMNTOOLS\VSVARS32.BAT" '&&' cl $args }としたらうまくいった感じがする。
- @mattifestation It totally works....Nice touch with IEX $args[0] and Loading Function as an argumentList. :)
- I guess the only place for $BABA subs is selling the LG caps.
- $pencer $ims Ft Lea Violet Chi City Disco http://t.co/PrDNmziqkr
- $request = wp_remote_post($url, $args);
  if ($ssl && is_wp_error($request)) {
  // ログ出力
- @JoshuaGilmer in your register_post_type, you need to add 'taxonomies' => array('sales-person', 'venue') to the $args
- @WallStJesus thanks for $fcau short n sweet $$
- #NewMusic: $pencer $ims feat. Khori ♯ – "HERO" (Prod. Jack Kerwin Beats) http://t.co/GCC6drBAkN [@strayliving @Khori_IV @jackinlebox]
- Please vote our track "$ALLY KU$HER" as song of the month : http://t.co/qamgoqTTxO YOU WONT REGRET IT!!!

Results

- Regressions of which the dependent variables are either IPO underpricing or IPO 1st day turnover.

  - *Dependent variable 1: [(first-day close price - offer price) / offer price] × 100*

  - *Dependent variable 2: (shares traded on the 1st trading day / total shares offered) × 100.*

Results

	2012 (153 IPOs)		2013 (223 IPOs)		2014 (288 IPOs)		2012-2014 (664 IPOs)	
	Average per an IPO	Total	Average per an IPO	Total	Average per an IPO	Total	Average per an IPO	Total
Number of total tweets	134.58	20,591	132.70	29,593	145.10	41,790	138.51	91,974
Number of positive tweets	25.10	3,840	26.66	5,945	24.55	7,069	25.38	16,854
Number of neutral tweets	104.61	16,006	101.44	22,621	115.53	33,272	108.28	71,899
Number of negative tweets	4.87	745	4.61	1,027	5.03	1,449	4.85	3,221

- People tend to tweet a lot more on positive messages than negative messages.
- The majority are neutral tweets.

Results

	2012 (153 IPOs)		2013 (223 IPOs)		2014 (288 IPOs)		2012-2014 (664 IPOs)	
	Average	STD	Average	STD	Average	STD	Average	STD
Positive tweet ratio	0.18	0.18	0.20	0.23	0.17	0.24	0.18	0.22
Neutral tweet ratio	0.78	0.25	0.76	0.19	0.80	0.20	0.78	0.21
Negative tweet ratio	0.03	0.03	0.04	0.05	0.03	0.05	0.03	0.05
Disagreement	0.07	0.08	0.08	0.09	0.05	0.07	0.06	0.08

Results

- Shows the summary statistics of IPO underpricing, and 1st day turnover rate of IPOs in the sample.

	IPO Underpricing (%)				1st Day Turnover (%)			
	2012	**2013**	**2014**	**2012-2014**	**2012**	**2013**	**2014**	**2012-2014**
Min	-18.8	-10.6	-34.9	-34.9	17.8	20.7	19.1	17.8
Max	109.0	122.8	70.6	122.8	177.4	187.8	152.7	187.8
Average	17.8	21.1	13.4	17.7	79.4	77.9	75.3	77.1
STD	32.6	35.7	25.1	30.2	40.6	46.3	37.8	40.9

Consistent with the finding of Ritter & Welch (2002) and Ellis et al., (2000) that even in US., IPO average initial return and turnover are large (1980-2001 average return is 18.8%)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Log(Total tweets)	2.14** (3.07)	2.03** (2.59)					1.25** (2.12)	1.42** (2.06)
Positive tweet ratio			6.87* (1.91)	6.65* (1.85)			5.37 (1.04)	3.66 (1.16)
Negative tweet ratio			4.42* (1.86)	4.44* (1.84)			3.47 (0.53)	-1.85 (-0.85)
Disagreement					12.2** (2.08)	10.1** (2.13)	11.2** (2.07)	9.0** (2.12)
Log(Firm age)		1.61 (1.07)		2.04 (1.22)		2.42 (0.86)		2.61 (0.77)
Issued Size/Market Cap.		8.60** (2.93)		7.80** (2.94)		8.43** (2.91)		8.32** (3.38)
Log(Market Cap.)		1.40 (0.80)		0.98 (0.90)		1.48 (0.89)		1.32 (0.62)
Finance		-14.09 (-1.63)		-14.80 (-1.54)		-14.1* (-1.80)		-14.1* (-1.89)
Tech&IT		9.94 (1.72)		10.14 (1.77)		10.04 (1.52)		10.75 (1.66)
Manufacturing		-5.44 (-0.62)		-4.87 (-0.51)		-5.78 (-0.44)		-5.65 (-0.38)
Retail		16.1** (2.72)		18.3** (2.61)		18.4** (2.62)		19.1** (2.70)
Service		-7.31 (-0.87)		-7.31 (-0.77)		-7.24 (-0.62)		-7.22 (-0.66)
Y2012		3.08 (0.94)		2.85 (0.90)		3.18 (1.09)		3.17 (1.09)
Y2013		-2.09 (-1.03)		-2.04 (-1.02)		-2.06 (-1.03)		-1.79 (-0.98)
Number of IPOs in the same month		0.82* (1.88)		0.98* (1.98)		0.87** (2.07)		0.85** (2.38)
R-squared	0.07	0.15	0.04	0.13	0.07	0.16	0.10	0.21
N	664	664	664	664	664	664	664	664

However, the effects of sentiment on turnover are not robust.

IPO Underpricing as the Dependent Variable

The t-statistics are in parentheses

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Log(Total tweets)	2.67** (2.12)	1.72* (1.96)					0.86** (2.02)	1.02* (1.96)
Positive tweet ratio			13.55* (1.87)	11.96* (1.85)			12.02 (1.74)	11.85 (1.55)
Negative tweet ratio			1.45 (1.06)	1.56 (1.04)			-4.56 (-0.50)	-7.09 (-0.83)
Disagreement					10.1* (1.93)	10.8** (2.08)	9.02** (2.12)	11.6** (2.14)
Log(Firm age)		-2.80* (-1.90)		-2.74* (-1.87)		-2.82* (-1.92)		-2.79 (-1.66)
Issued Size/Market Cap.		4.64** (2.22)		4.32** (2.21)		4.25** (2.27)		4.27** (2.30)
Log(Market Cap.)		-0.92 (-0.80)		-1.08 (-1.40)		-1.16 (-1.22)		-0.95 (-0.70)
Finance		2.00 (0.75)		1.69 (0.74)		1.02 (0.90)		1.34 (0.80)
Tech&IT		10.2** (2.12)		9.90* (1.90)		8.44* (1.88)		8.53* (1.89)
Manufacturing		-0.89 (-0.56)		0.45 (0.40)		0.24 (0.46)		-0.26 (-0.34)
Retail		-1.04 (-1.12)		-2.45 (-1.25)		-2.86 (-1.19)		-3.02 (-1.24)
Service		-0.55 (-0.60)		-0.83 (-0.63)		-1.70 (-0.60)		-1.65 (-0.66)
Y2012		2.12* (1.85)		2.15 (1.70)		2.00 (1.75)		2.04* (1.90)
Y2013		6.05** (2.45)		5.92** (2.40)		5.88** (2.40)		5.82** (2.36)
Number of IPOs in the same month		1.02* (1.90)		0.89 (1.80)		1.05 (1.75)		1.25* (1.95)
R-squared	0.06	0.17	0.06	0.19	0.05	0.19	0.15	0.24
n	664	664	664	664	664	664	664	664

Again, the effects of sentiment are not robust.

1st Day Turnover Rate as the Dependent Variable

Robustness Analysis 1 (Interaction effect)

- To investigate further, we examine the interaction effect of the indexes
  - Sentiment x Attention
  - Disagreement x Attention

1st Day Turnover Rate as the Dependent Variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Log(Total tweets)			1.25* (1.90)	1.02* (1.86)	1.24** (2.02)	1.04* (1.90)
Positive tweet ratio	3.85* (1.85)	3.42 (1.80)			5.07 (1.07)	6.09 (1.03)
Positive tweet ratio x Log(Total tweets)	4.72* (1.92)	4.74* (1.90)			5.80 (1.20)	4.35 (1.12)
Negative tweet ratio	3.62 (1.76)	3.46 (1.52)			-5.41 (-0.87)	-4.88 (-0.82)
Negative tweet ratio x Log(Total tweets)	-4.65 (0.60)	-5.12 (0.74)			6.12 (0.64)	5.98 (0.60)
Disagreement			-2.04 (-1.08)	-1.10 (-0.90)	1.20 (1.12)	2.17 (1.00)
Disagreement x Log(Total tweets)			18.86* (1.94)	17.63* (1.89)	15.48** (2.08)	13.72* (1.95)
Control Variables		Yes		Yes		Yes
R-squared	0.05	0.16	0.10	0.17	0.13	0.23
n	664	664	664	664	664	664

IPO Underpricing as the Dependent Variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Log(Total tweets)			1.06* (1.84)	1.04* (1.86)	0.84** (2.04)	1.12* (1.92)
Positive tweet ratio	8.55* (1.85)	7.85 (1.65)			10.12 (1.54)	9.85 (1.50)
Positive tweet ratio x Log(Total tweets)	2.79* (1.90)	3.24* (1.84)			3.87 (1.27)	3.77 (1.23)
Negative tweet ratio	-1.24 (0.96)	-1.24 (0.94)			-5.56 (-1.10)	-5.09 (-1.13)
Negative tweet ratio x Log(Total tweets)	3.14 (1.82)	3.10* (1.90)			2.84 (0.98)	2.72 (0.96)
Disagreement			-2.14 (-1.62)	-2.08 (-1.70)	-3.90 (-1.50)	-2.68 (-1.54)
Disagreement x Log(Total tweets)			8.80* (1.90)	8.74* (1.87)	7.82** (2.02)	7.75* (1.97)
Control Variables		Yes		Yes		Yes
R-squared	0.07	0.18	0.12	0.23	0.17	0.27
n	664	664	664	664	664	664

Robustness Analysis 2 (Outlier)

- In our sample, there are a few IPOs that have a very large numbers of tweets.

- For example, Alibaba (symbol BABA, IPO in 2014), Twitter (symbol TWTR, IPO in 2013), and Facebook (symbol FB, IPO in 2012), These are top 3 that account for more than 10,000 tweets in our sample (for the total of 91,974 tweets).

- We drop the IPOs that have the number of corresponding tweets at the top 5% level (Cornelli, Goldreich, and Ljungqvist, 2006.)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Log(Total tweets)	2.87** (2.32)	1.85** (2.05)					1.42** (2.10)	1.44* (2.02)
Positive tweet ratio			13.46* (1.90)	11.75* (1.90)			11.82 (1.76)	11.70 (1.50)
Negative tweet ratio			1.42 (1.46)	1.49 (1.33)			-2.50 (-1.20)	-3.19 (-1.13)
Disagreement					9.88* (1.89)	9.81** (2.29)	10.0** (2.00)	10.8* (2.02)
Log(Firm age)		-2.7** (-2.01)		-2.62* (-1.90)		-2.72* (-1.94)		-2.52* (-1.96)
Issued Size/Market Cap.		4.44** (2.24)		4.20** (2.25)		4.28** (2.14)		4.23** (2.32)
Log(Market Cap.)		-0.82 (-0.94)		-1.05 (-1.35)		-1.08 (-1.24)		-0.90 (-0.80)
Finance		2.15 (0.75)		1.32 (0.76)		1.20 (0.89)		1.26 (0.88)
Tech&IT		9.98* (1.92)		9.78* (1.90)		8.40* (1.92)		8.23* (1.98)
Manufacturing		-0.81 (-0.57)		0.44 (0.42)		0.34 (0.40)		-0.22 (-0.36)
Retail		-0.95 (-1.15)		-2.44 (-1.25)		-2.65 (-1.05)		-2.46 (-1.34)
Service		-0.65 (-0.80)		-0.83 (-0.66)		-1.64 (-0.72)		-1.25 (-0.75)
Y2012		2.15* (1.90)		2.12 (1.72)		2.08 (1.75)		1.84* (1.92)
Y2013		5.85** (2.50)		5.70** (2.45)		5.84** (2.42)		5.78** (2.46)

IPO Underpricing as the Dependent Variable

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Log(Total tweets)	2.61** (2.97)	2.43** (2.73)					1.43** (2.20)	1.71** (2.17)
Positive tweet ratio			6.51* (1.91)	6.39* (1.88)			5.04 (1.14)	3.66 (1.10)
Negative tweet ratio			4.47* (1.88)	4.48* (1.85)			3.01 (0.57)	-1.02 (-0.80)
Disagreement					11.0** (2.10)	10.7** (2.01)	11.1** (2.07)	9.5** (2.15)
Log(Firm age)	1.12 (0.80)			2.07 (1.21)		2.34 (0.84)		1.60 (0.70)
Issued Size/Market Cap.	7.61** (2.27)			6.82** (2.82)		7.44** (2.82)		7.33** (2.33)
Log(Market Cap.)	1.41 (0.71)			1.00 (0.90)		1.50 (0.85)		1.30 (0.60)
Finance	-14.18 (-1.69)			-14.88 (-1.54)		-14.1* (-1.80)		-14.1* (-1.89)
Tech&IT	9.80 (1.75)			9.17 (1.80)		9.89 (1.63)		10.20 (1.70)
Manufacturing	-5.84 (-0.61)			-4.89 (-0.61)		-5.70 (-0.40)		-5.63 (-0.39)
Retail	15.0** (2.69)			17.3** (2.60)		17.1** (2.59)		17.9** (2.55)
Service	-7.37 (-0.80)			-7.38 (-0.74)		-7.30 (-0.60)		-7.32 (-0.66)
Y2012	3.90 (1.00)			3.85 (0.95)		3.98 (1.29)		3.95 (1.15)
Y2013	-1.87 (-1.01)			-1.44 (-1.02)		-1.65 (-1.05)		-1.39 (-0.93)

1st Day Turnover Rate as the Dependent Variable

Conclusion

- We construct *investor disagreement*, *investor attention* and *investor sentiment index* using data obtained from Twitter for examining IPO underpricing (664 IPOs in NASDAQ and NYSE during 2012-2014).

- We examine **91,974 tweets** using computerized text classification method.

- We find that investor attention and investor disagreement affect IPO underpricing.

- This supports the asymmetric information explanation as well as attention-induced positive price pressure explanation

My other related works

- Phiromswad, Piyachart. "Measuring monetary policy with empirically grounded identifying restrictions." **Empirical Economics** 46, no. 2 (2014): 681-699.

- Phiromswad, Piyachart. "Measuring monetary policy with empirically grounded restrictions: An application to Thailand." *Journal of Asian Economics* 38 (2015): 104-113.

- Phiromswad, Piyachart, and Takeshi Yagihashi. "Empirical identification of factor models." *Empirical Economics* 51, no. 2 (2016): 621-658.

- Wongboonsin, Kua, and Piyachart Phiromswad. "Searching for empirical linkages between demographic structure and economic growth." *Economic Modelling* 60 (2017): 364-379.

- Work-in-progress: Phiromswad, Piyachart, and Kevin D. Hoover. "Selecting instrumental variables: A graph-theoretic approach."

Appendix

Literature review

- Asymmetric information
  - Bank is better informed (Baron, 1982); Underpricing to increase selling effort
  - Issuer is better informed (Welch, 1989); Underpricing to signal quality
  - The winner's curse; There are uninformed investors and underpricing ensure their participation (Rock, 1986)
  - Compensating better informed investors for revealing information (Benveniste and Spindt, 1989)

Literature review

- Behavioral approach: Attention
  - Many theoretical studies (Merton, 1987; Sims, 2003; Hirshleifer and Teoh, 2003; and Peng and Xiong, 2006) provide a theoretical framework in which individual's limited attention affects asset pricing.
  - Barber and Odean (2008) suggest that increase in investor attention should lead, on average, to positive price pressure.

- Behavioral approach: Sentiment
  - Recent researches insist that investor sentiment is closely related to stock market returns (Kamstra et al., 2000; Hirshleifer and Shumway, 2003; Edmans et al., 2007; and Kaplanski and Levy, 2010).
  - Tetlock (2007) shows that the number of negative words in the Wall Street Journal predicts stock returns at the daily frequency.

Investor Disagreement

- Theoretical literature implies that divergence in beliefs or opinions should lead to a positive risk premium (e.g., Varian (1985, 1989), Abel (1989), David (2008).)
- The theory suggests that disagreement causes trading volume to rise because trading occurs when two market participants assign different values to an asset (Harris and Raviv, 1993; Karpoff, 1986; Antweiler and Frank, 2004)
- Disagreement = more information asymmetry = more trading risk.
- Investors should be compensated for bearing more risks when disagreement arises.
- Also Miller (1977) argues that differences of opinion in the market can lead to higher prices because pessimists sit out of the market and asset prices reflect only the valuation of optimists.