The Chinese Warrants Bubble

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Introduction

- Asset price bubbles, that is, asset prices that exceed the assets' fundamental value.
- Clear identification of a price bubble is challenging.
  - Peter Garber (2000) proposes market fundamental explanations for three famous bubbles.
    - Dutch tulip mania ($1634 - 37$)
    - Mississippi bubble ($1719 - 20$)
    - South Sea bubble (1720)
  - Lubos Pastor and Pietro Veronesi (2006) challenge the existence of an Internet bubble in the late 1990s.
- Academic literature heavily relies on laboratory settings.

Introduction

- In 2005 – 2008, over a dozen put warrants traded in China went so deep out of the money that they were almost certain to expire worthless.
- This bubble is unique in that the underlying stock prices make warrant fundamentals publicly observable and that warrants have predetermined finite maturities.
- This sample allows us to examine a set of bubble theories.

I. China's Warrants Market

- In 2005, the central government announced a plan to convert its large non-tradable share holdings into tradable shares and eventually float them in the market.
- However, this plan encountered resistance from investors who worried that a dramatic increase in the number of freely tradable shares would depress share prices and cause large losses in their holdings.
- To persuade the public to accept the share reform plan, the government decided to compensate holders of floating shares for their potential losses.
- Seizing this opportunity, the CSRC allowed some firms involved in the share reform to issue warrants as part of their compensation packages to public investors.

I. China's Warrants Market

- Warrants are essentially financial options issued by publicly listed firms.
  - A call warrant gives its holder the right to buy stock from the issuing firm at a predetermined strike price during a prespecified exercise period.
  - A put warrant gives its holder the right to sell stock back to the issuing firm.

II. The Price Bubble in Put Warrants

- In total, 18 put warrants and 37 call warrants had been issued for public trading.
- Our analysis focuses on the 18 put warrants because most of them went deep out of the money during the stock market boom in $2005 - 2007$.
- We purchase data on all of the 18 put warrants from the GTA data company.

II. The Price Bubble in Put Warrants

A. The WuLiang Put Warrant

- On April 3, 2006, WuLiangYe Corporation, a liquor producer in China, issued 313 million shares of put warrants on the SZSE.
- The warrant has a maturity of two years with expiration date of April 2, 2008. Investors are allowed to freely trade the warrant before March 26, 2008. After the last trading day, warrant holders have five business days between March 27, 2008 and April 2, 2008 to exercise the warrant.
- The put warrant was issued in the money with an initial stock price of 7.11 yuan per share and a strike price of 7.96 yuan per share.

II. The Price Bubble in Put Warrants

A. The WuLiang Put Warrant

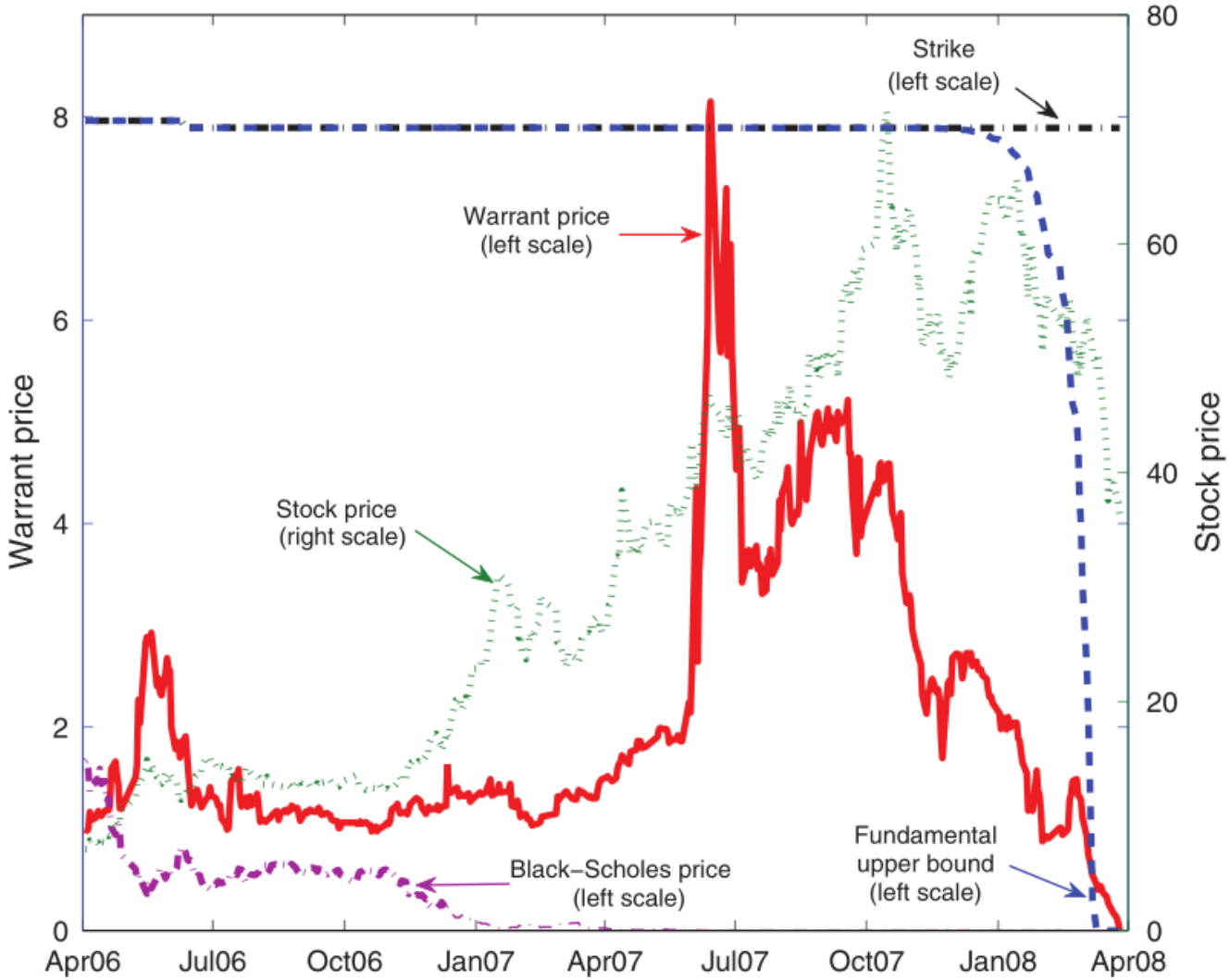

FIGURE 1. PRICES OF WULIANG PUT WARRANT

Was there a bubble in the WuLiang put warrant price?

- To sum up, there is clear evidence that there was a price bubble in the WuLiang put warrant.
- Its price exceeded several reasonable estimates of its fundamental value.
  1. It exceeded the Black-Scholes value by large margins;
  2. It went above the fundamental upper bound implied by the current stock price and the daily stock price drop limit;
  3. It even exceeded the strike price.

II. The Price Bubble in Put Warrants

B. Other Warrants

- CSI 300 shot up from 818 points in June 2005 to an all-time peak of 5,877 points in October 2007.
- All of the 18 put warrants to expire out of the money. Among them, 14 were 20 percent out of the money and 13 were 50 percent out of the money.
- Each of the put warrants had experienced a price bubble similar to that exhibited by the WuLiang put warrant.

II. The Price Bubble in Put Warrants

C. Maturity Effects

How does the approaching of the last trading date affect warrants market dynamics?

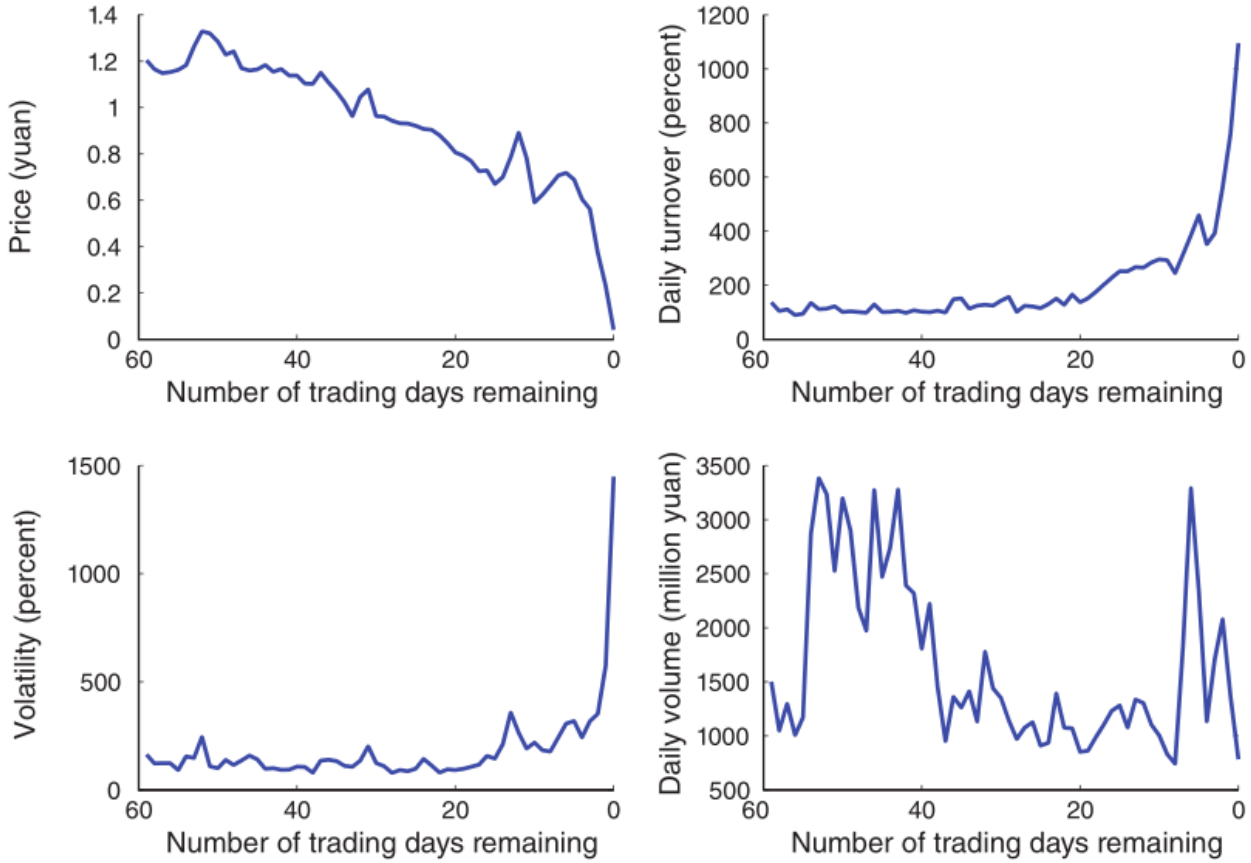

FIGURE 3. WARRANT DYNAMICS IN THE BUBBLE SAMPLE

Last-Day Price Dynamics of WanHua Put Warrant

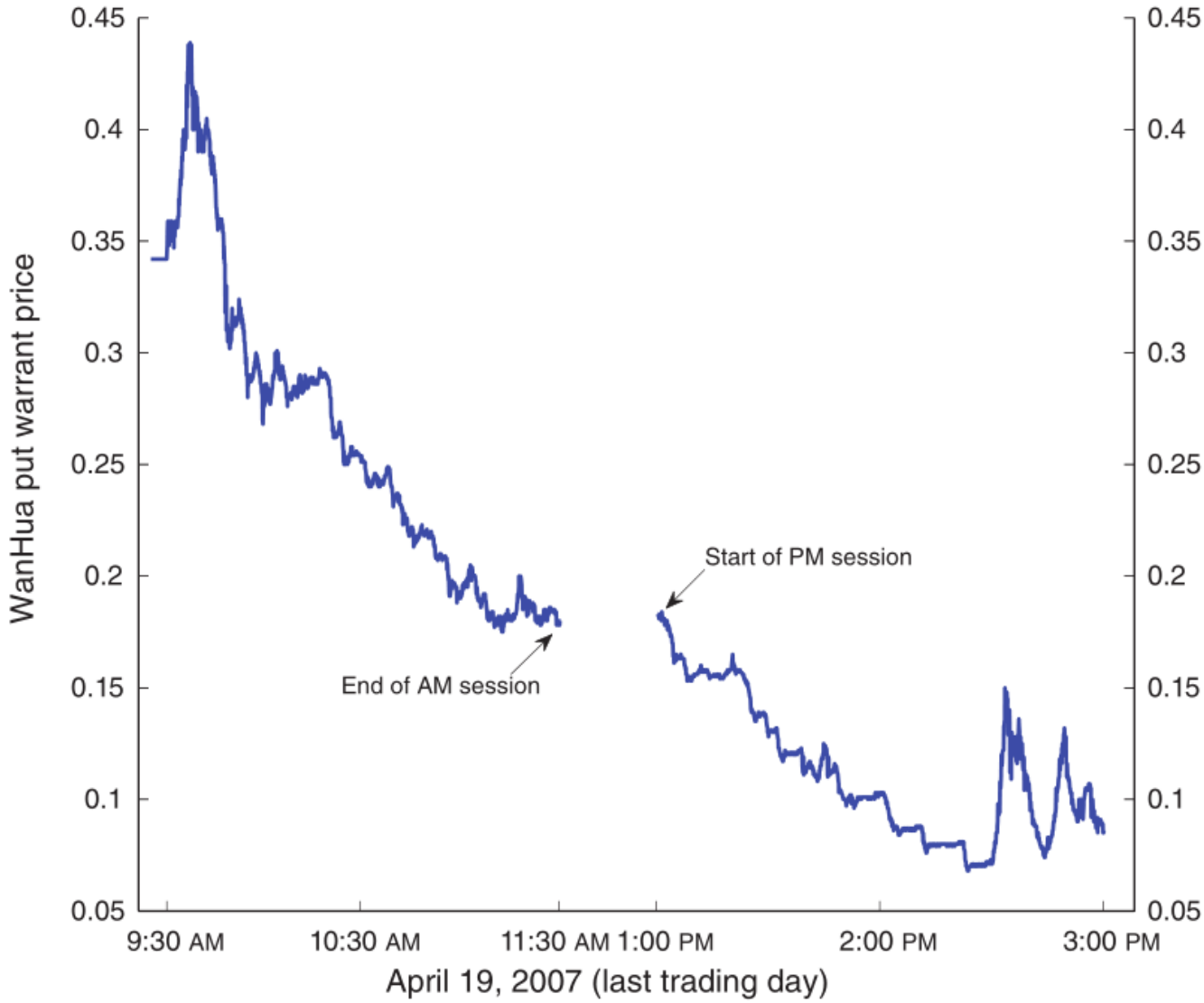

FIGURE 4. LAST-DAY PRICE DYNAMICS OF WANHUA PUT WARRANT

II. The Price Bubble in Put Warrants

C. Maturity Effects

- In summary, there are evident maturity effects in the warrants' zero-fundamental periods.
- As maturity approaches, price gradually declines to zero, accompanied by an increasing trend in return volatility and warrant turnover.
- While we usually think that a bubble will end with a crash, this warrants bubble only deflates gradually.

III. The Economic Mechanisms

What drives the warrant investors to trade so much and pay such inflated prices?

- In this section, we examine several economic mechanisms.
- Instead of focusing on one particular theory, we will analyze a set of bubble theories and discuss implications of this data sample for each of these theories.

What drives the warrants bubble?

A. Hedging Premium

Were the high prices of these put warrants caused by investors' demand to hedge risk in the underlying stocks?

- On average, these put warrants had a small and insignificant return correlation of -0.081 (p-value 0.289) with their underlying stocks during their respective zero-fundamental periods.
- The lack of return correlation makes it unlikely that investors trade these warrants to hedge daily fluctuations of the underlying stocks.

TABLE 2—MARKET DYNAMICS DURING THE ZERO-FUNDAMENTAL PERIOD (*Continued*)

Panel B. Warrant volatility, correlation with stock, skewness, and violation of price bound

	Volatility (percent)		Correlation(stock, put)		Skewness(put ret)		Violation of upper bound	
Name	Average	Maximum	Correlation	*p*-value	Skewness	*p*-value	Days	Average magnitude
WanKe	306	1,139	−0.424	0.090	−1.879	0.001	1	0.001
ShenNeng							0	
WuGang	763	2,297	0.045	0.925	0.931		0	
JiChang	278	414	0.383	0.454	−0.899		0	
YuanShui	397	1,362	−0.166	0.669	−0.292	0.613	0	
HuChang	214	1,309	0.46	0.011	−2.461	0	3	0.319
BaoGang	165	1,019	−0.082	0.704	−2.891	0	5	0.225
WanHua	133	1,772	−0.035	0.777	−2.757	0	9	0.527
GangFan	173	1,438	−0.435	0.023	−3.069	0	2	0.153
HaiEr	100	1,620	−0.021	0.844	−4.945	0	7	0.266
YaGe	122	1,433	0.006	0.967	−3.747	0	11	0.295
MaoTai	316	2,112	−0.142	0.561	−1.452	0.006	7	0.123
JiaFei	300	1,669	0.003	0.983	1.703	0	8	2.564
ZhaoHang	153	1,872	−0.11	0.158	4.861	0	13	0.264
ZhongJi	180	1,150	−0.052	0.587	−0.766	0.002	8	0.216
HuaLing	242	1,384	−0.013	0.938	−1.181	0.003	8	0.256
WuLiang	131	1,475	0.094	0.251	−2.954	0	16	0.261
NanHang	626	1,248	−0.887	0.306	−0.488		6	0.165
Average	271	1,454	−0.081	0.289	−1.311	0.033	5.8	0.403
Average(first 9)	304	1,344	−0.032		−1.665		2.2	0.245
Average(last 9)	241	1,551	−0.125		−0.997		9.3	0.490
Difference	−63	208	−0.093		0.668		7.1	0.245
p-value	0.501	0.357	0.550		0.555		0.000	0.395

What drives the warrants bubble?

B. Rational Bubbles

- Blanchard and Watson (1983) provide an example of rational bubbles in a discrete-time model with **homogenous rational investors** and **infinite periods**.
- In each period, a bubble component in asset prices grows on average at the same rate as the discount rate.
- This mechanism **cannot** explain the warrants bubble because warrants have finite maturities, and rational investors' backward induction should rule out any bubble of this type in the earlier periods.

What drives the warrants bubble?

C. Agency Problems

- In the presence of asymmetric information and contract frictions, managers have incentives to churn and seek risk at the expense of their investors. As a result, assets can trade at prices that do not reflect their fundamentals.
- The fraction of total volume contributed by institutions hit between **1 and 2 percent** for some brief periods in 2006 and then mostly stayed at levels around **0.2 percent**. (Data source: SHSE)
- Given their limited presence in the warrants market, it is **unlikely** that agency problems of institutions are a key driver of the warrants bubble.

What drives the warrants bubble?

D. Gambling Behavior

- Investors may treat warrants like lottery tickets.
  - Gamblers prefer a lottery ticket despite its unfavorable odds because of its **positively skewed payoff**.
- Are warrants lottery tickets?
  - For the daily returns, 14 of the 18 warrants have **negative return skewness** in their zero fundamental periods with an average of -1.311 and a significant p-value of 0.033.
- The lack of evidence of positive skewness **refutes** gambling behavior as an explanation of the warrants bubble.

What drives the warrants bubble?

E. The Resale Option Theory

Harrison and Kreps (1978) propose a theory of asset bubbles based on the joint effects of **short-sales constraints** and **heterogeneous beliefs**.

1. When short sales of assets are constrained and investors hold heterogeneous beliefs about an asset's fundamentals, asset prices are biased toward the optimists' belief.
2. If beliefs fluctuate over time, an optimist is willing to pay more than his already optimistic belief, anticipating the possibility to resell the asset to an even more optimistic investor.
3. This resale option can drive price higher than the most optimistic belief by any investor and thus forms a bubble.

What drives the warrants bubble?

E. The Resale Option Theory

The **resale option theory** captures several important features of China's warrants market.

1. Short-sales constraints are clearly present in China's warrants market, as it is illegal for investors to short warrants.
2. Investors hold different beliefs about the warrant fundamentals because valuing warrants requires beliefs about the future price dynamics of the underlying stocks.
3. The investors' beliefs also fluctuate over time with changes in the stock prices and arrivals of new information.

What drives the warrants bubble?

E. The Resale Option Theory

Scheinkman and Xiong (2003) develop a model in which overconfident investors overweigh their respective favorite signals in inferring an asset's fundamental value, which stimulates speculative trading.

1. The model shows that the more the difference in beliefs fluctuates, the more intensively investors trade with each other, the more they are willing to pay for the option to resell the asset to others.
2. The model predicts that the magnitude of the **price bubble** is **positively** correlated with **trading frequency** and **volatility**.

What drives the warrants bubble?

E. The Resale Option Theory

- **Asset float(number of tradable shares)** has a large effect on the size of bubble. (Hong, Scheinkman, and Xiong(2006))
- A larger float implies that it takes a greater difference between the optimists' and pessimists' beliefs for optimists to drive out pessimists.
- It takes a greater belief divergence in the future for an existing asset holder to resell profitably, which in turn **makes the resale option less valuable today**.

What drives the warrants bubble?

E. The Resale Option Theory

TABLE 5—DETERMINANTS OF SIZE OF THE WARRANTS BUBBLE

	(1)	(2)	(3)	(4)	(5)	(6)
TURNOVER	0.203			0.158		0.105
(*t*-stat)	(8.91)			(5.46)		(3.80)
VOL		21.76		14.12		13.99
(*t*-stat)		(5.38)		(2.97)		(3.05)
FLOAT			−0.302	−0.324		
(*t*-stat)			(12.62)	(12.31)		
FIRMISSUE					−1.302	−1.260
(*t*-stat)					(25.03)	(23.53)
BROKERAGEISSUE					0.496	0.419
(*t*-stat)					(15.84)	(12.60)

What drives the warrants bubble?

F. Noncommon Knowledge of Rationality

- The bubble occurs because traders doubt the rationality of others and speculate that future prices may not track the fundamental value and instead would provide opportunities for trading gains. (Smith, Suchanek, and Williams (1988))
- As warrants are new to Chinese investors, it is reasonable for investors to doubt the rationality of others.
- There is evidence confirming the presence of naïve investors in this market, 13 warrants had irrational exercises by investors at losses, perhaps due to confusion between put and call warrants. The total loss averaged 243 thousand yuan per warrant.

TABLE 3—MARKET DYNAMICS ON THE LAST TRADING DAY AND IRRATIONAL WARRANT EXERCISES

	Intraday price						Exercise	
Name	Close	Average	Maximum	Turnover (percent)	Volume (million)	Volatility (percent)	Exercised (percent)	Loss (000)
WanKe	0.001	0.011	0.019	547	98	1,139	0.08	50
ShenNeng	0.002	0.016	0.033	616	40	1,449	0.01	18
WuGang	0.06	0.172	0.3	1,529	1,240	2,297	0.01	31
JiChang	0.332	0.53	0.68	509	699	414	0.02	58
YuanShui	0.041	0.258	0.598	1,168	1,013	1,362	0.02	107
HuChang	0.015	0.209	0.442	991	1,089	1,309	0.05	38
BaoGang	0.006	0.124	0.27	1,406	1,215	1,019	0.47	111
WanHua	0.087	0.187	0.441	1,438	482	1,772	0.32	114
GangFan	0.01	0.147	0.32	1,316	422	1,438	0.27	73
HaiEr	0.001	0.049	0.11	1,072	340	1,620	0.83	581
YaGe	0.002	0.024	0.059	972	159	1,433	1.18	1,667
MaoTai	0.003	0.017	0.041	801	103	2,112	0.20	141
JiaFei	0.107	0.601	1	1,741	1,250	1,639	0	0
ZhaoHang	0.002	0.069	0.176	968	3,036	1,872	0.02	163
ZhongJi	0.01	0.076	0.107	1,662	469	1,150	0	0
HuaLing	0.01	0.093	0.15	1,306	648	1,340	0	0
WuLiang	0.004	0.054	0.08	1,841	285	1,475	0	0
NanHang	0.003	0.044	0.099	1,261	793	1,248	0	0
Average	0.039	0.149	0.274	1,175	743	1,449	0.19	175
Average(first 9)	0.062	0.184	0.345	1,058	700	1,355	0.14	67
Average(last 9)	0.016	0.114	0.202	1,292	787	1,543	0.25	284
Difference	−0.046	−0.070	−0.142	234	87	188	0.11	217
p-value	0.234	0.397	0.274	0.225	0.802	0.361	0.504	0.257

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- We do not see any evidence of investor learning.

What drives the warrants bubble?

F. Noncommon Knowledge of Rationality

What explains the insignificant effect of investor learning in the warrants bubble during a prolonged period of three years?

- One possibility is that despite the presence of naïve investors in the warrants market, their impact was small. As a result, the learning of naïve investors was inconsequential.
- Another possibility is that the steady inflow of naïve investors to the warrants market was able to sustain the warrants bubble despite the learning of early arrived investors.
- According to a report by the CSRC (2008), the total number of individual brokerage accounts in China had increased from 80 million to 140 million from 2005 to 2007.

What drives the warrants bubble?

G. The Feedback Loop Theory

Shiller (2000) advocates a feedback loop theory of bubbles.

1. Initial price increases caused by certain precipitating factors lead to more price increases as the effects of the initial price increases feedback into yet higher prices through increased investor demand.
2. This second round of price increase feeds back again into a third round, and then into a fourth, and so on.
3. Thus the initial impact of the precipitating factors is amplified into much larger price increases than the factors themselves would have suggested.

What drives the warrants bubble?

G. The Feedback Loop Theory

Does the feedback effect exist in the warrants market?

TABLE 6—FEEDBACK DYNAMICS

	RET				*ΔTURNOVER*			
Sampling frequency	5 minutes	10 minutes	30 minutes	1 hour	5 minutes	10 minutes	30 minutes	1 hour
Lag *RET*	0.137	0.193	−0.036	−0.090	1.148	1.157	0.947	1.298
	(2.42)	(2.94)	(0.36)	(0.68)	(3.48)	(4.59)	(2.84)	(3.98)
Lag *RET+*	−0.103	−0.135	0.154	0.224	−1.390	−1.404	−1.039	−1.822
	(1.28)	(1.39)	(1.26)	(1.50)	(2.13)	(3.74)	(3.57)	(4.83)
Lag *ΔTURNOVER*	0.000	0.001	−0.001	0.002	−0.145	−0.146	−0.154	−0.124
	(0.65)	(0.96)	(0.72)	(0.45)	(9.62)	(9.72)	(11.60)	(8.30)

- Return: Positive feedback effect; No asymmetric feedback;
- Turnover: Mean-reverting effect; Positive feedback effect; Asymmetric feedback.

What drives the warrants bubble?

H. Riding the Bubble

Are there profit opportunities for smart investors to exploit?

TABLE 7—MOMENTUM PROFITS

Return horizon	5 minutes	10 minutes	30 minutes	1 hour	2 hours	1 day
Winner	−0.0005	−0.0001	−0.0013	−0.0026	−0.0033	−0.0058
	(1.89)	(0.14)	(0.76)	(0.96)	(0.69)	(0.68)
Loser	−0.0004	−0.0015	−0.0029	−0.0058	−0.0110	−0.0179
	(1.35)	(2.71)	(2.33)	(2.42)	(2.69)	(2.36)

- The existence of negative momentum profit again highlights the importance of short-sales constraints in driving the warrant price dynamics.
- The absence of positive momentum profit indirectly implies that smart investors might have been actively riding the warrants bubble and, by doing so, have eliminated additional opportunities for such momentum trades.

What drives the warrants bubble?

H. Riding the Bubble

- This result is consistent with the **theory** of Abreu and Brunnermeier (2003) that rational arbitrageurs may choose to ride a bubble instead of attacking it.
- and with the **evidence** presented by Brunnermeier and Nagel (2004) that during the Internet bubble of the late 1990s many hedge funds had been active in riding the bubble.
- Peter Temin and Hans-Joachim Voth (2004) also provide evidence of a well-informed investor riding the South Sea bubble.

IV. Conclusion

This article examines a speculative bubble that occurred in 2005–2008 in China's warrants market and studies a set of bubble theories.

- **Little evidence to support**
  - Investors' hedging need
  - Rational bubbles
  - Agency problems of institutions
  - Investors' gambling behavior
- **Highlights**
  - The joint effects of short-sales constraints and heterogeneous beliefs
  - The inflow of new investors
- **Direct** evidence of positive feedback effects in warrant returns and **indirect** evidence of smart investors riding the bubble.