Can the Greater Fool Theory Explain Chinese Stock Market Bubbles in 2007 and 2015?

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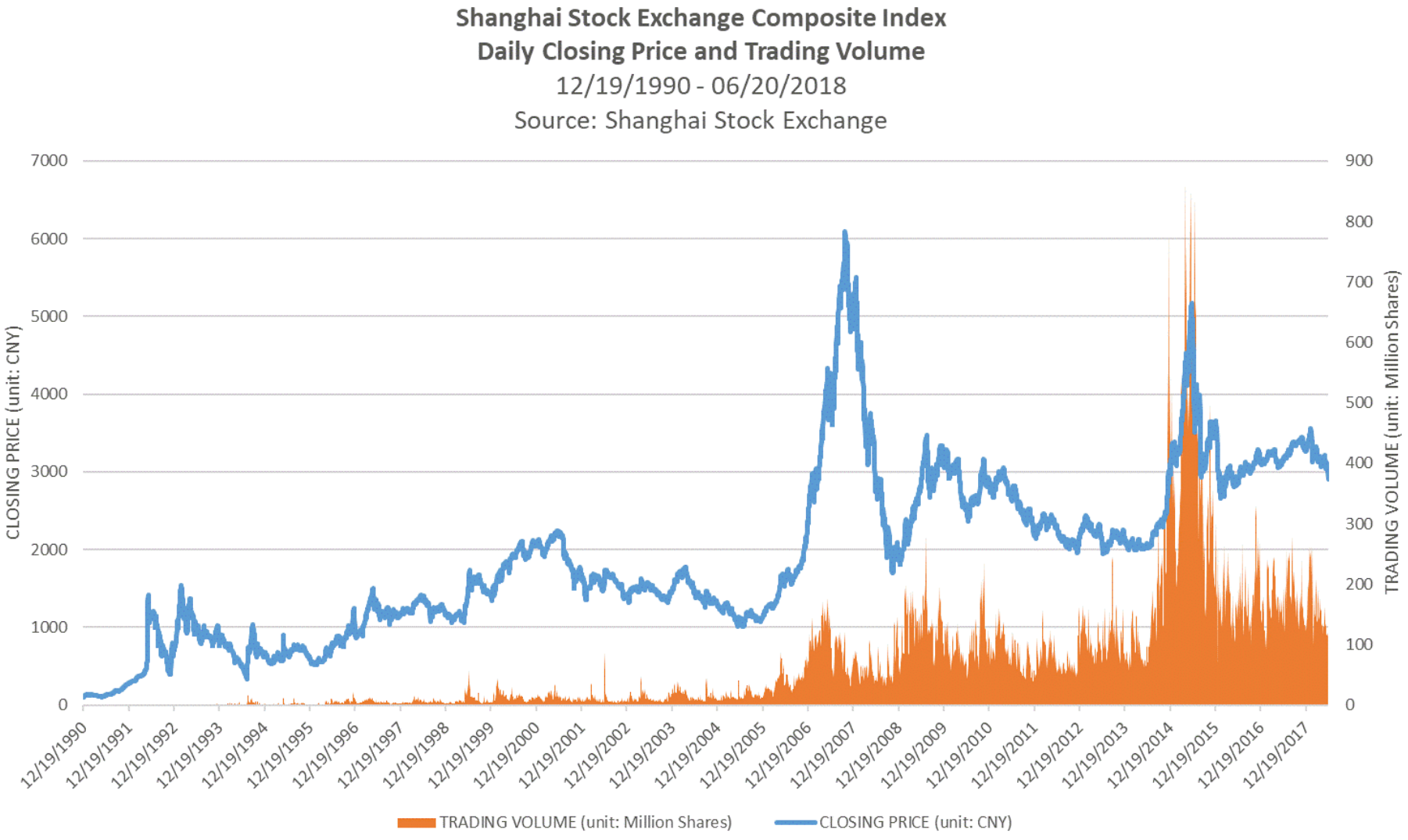
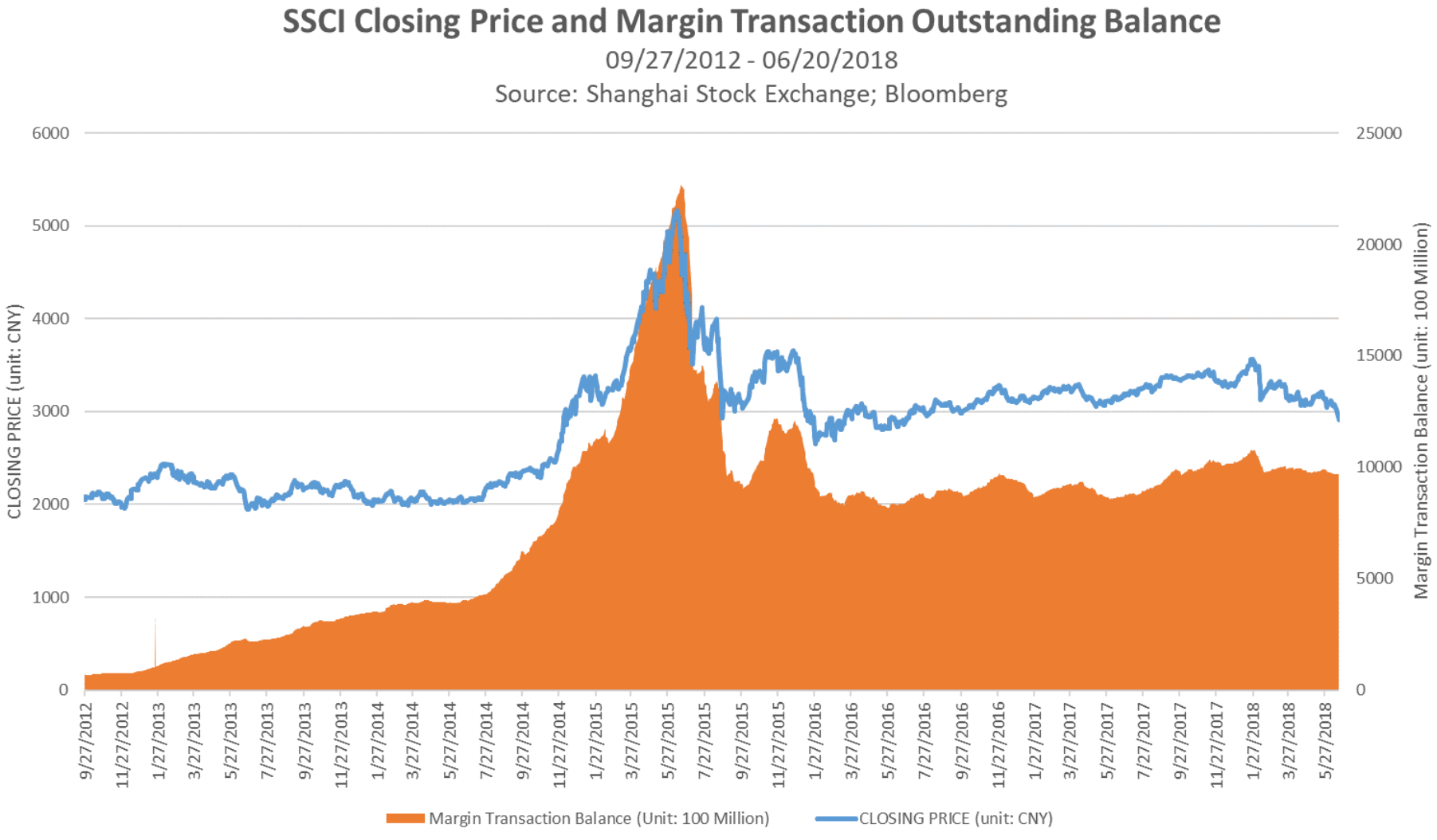
Chinese Stock Market Bubbles in 2007 and 2015



Leverage v.s. Stock Market Price in 2015



What is the Greater Fool Theory?

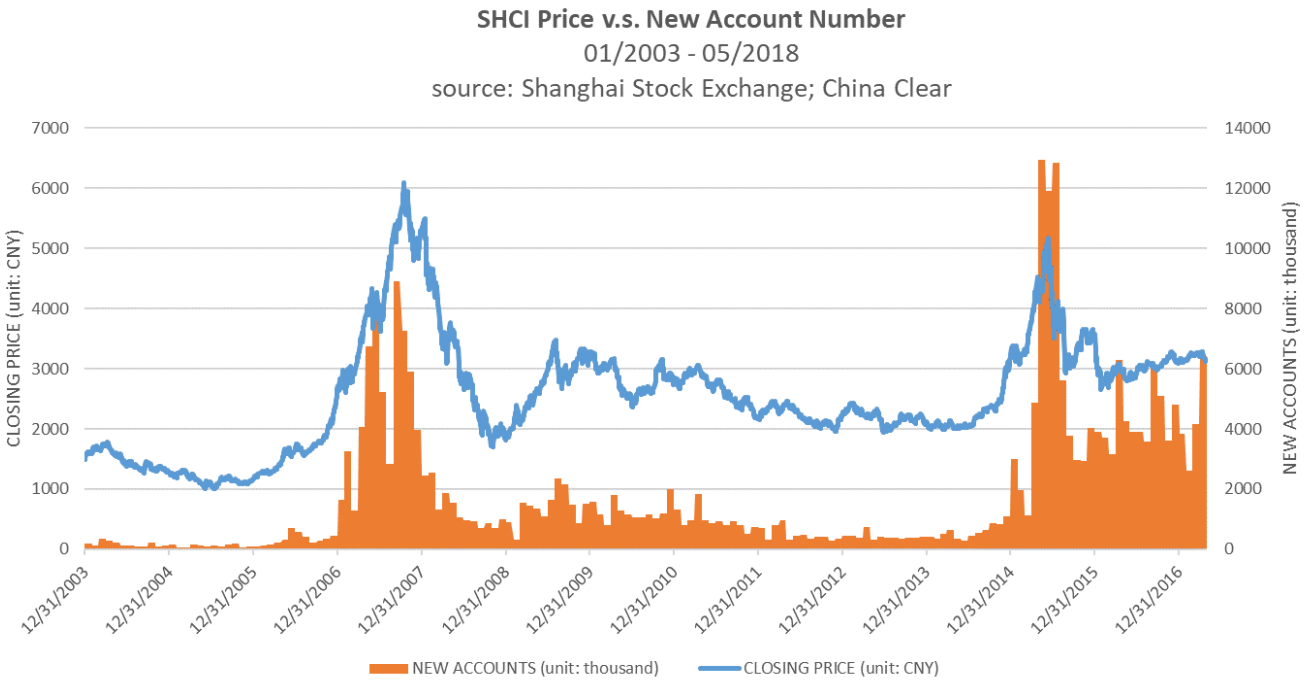
"Insiders [who] destabilize by driving the price up and up, selling out at the top to the outsiders who buy at the top and sell out at the bottom...[T]he professional insiders initially destabilize by exaggerating the upswings and the falls, while the outsider amateurs who buy high and sell low are...the victim of euphoria, which infects them late in the day."

— *Charles Kindleberger (1978)*

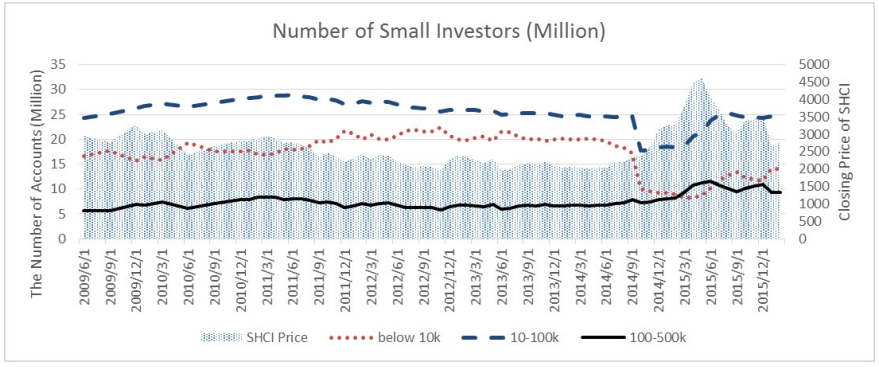
- **The Greater Fool Theory**:
  - Overheated asset markets
  - naïve and inexperienced investors were attracted
  - widely believed that the prices are far higher than those expected by fundamentals
  - investors bought assets hoping to sell at higher prices to "greater fools"
- Although widely discussed among investors, this theory is never directly measured...due to a lack of data?

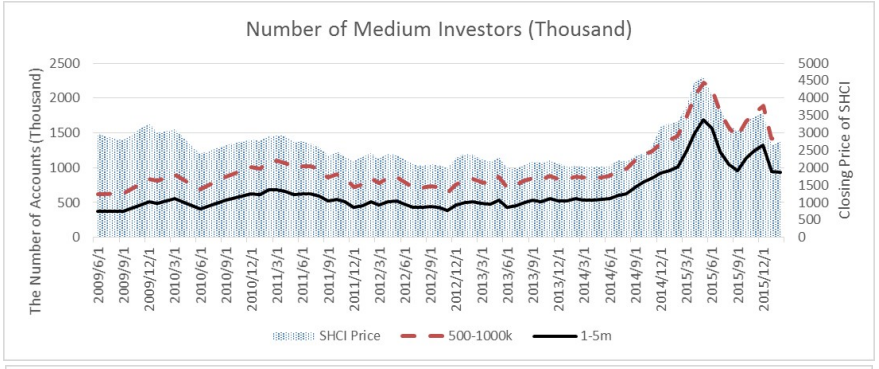
Unique Data: Number of New Brokerage Accounts

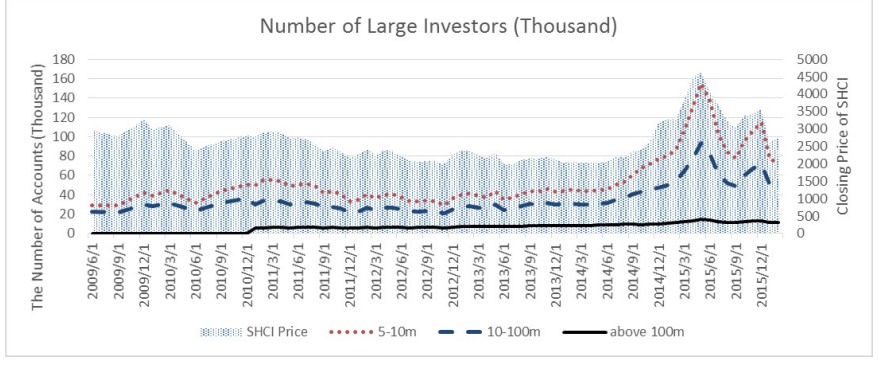
- From monthly reports of China Securities Depository and Clearing Corporation Limited (ChinaClear).
- Jan. 2003 - June 2015: the number of accounts for trading A shares, B shares and closed mutual funds.
- April 2015 - present: the number of Yimatong accounts which can trade A shares, B shares and closed mutual funds.



Composition of Accounts: Different Behaviors for Accounts with Different Sizes







- small investor: balance $<$ CNY 500,000 (USD 70,000)
- medium investor: CNY 500,000 - 5,000,000
- large investor: $>$ CNY 5,000,000
- more than 96.5% of accounts are of small investors

Is New Account an indicator of bubble?

An article from Zero Hedge Blog

"Charles Schwab, the investment brokerage firm, announced that the number of new brokerage accounts soared 44% during the first quarter of 2017...the fastest pace the company has seen in 17 years...anyone remember what happened 17 years ago? Oh right. The Dot-com bubble burst. "

Related Works

- Xiong and Yu (2011) examine a bubble in China's warrants market during 2005-2008.
  - During the zero fundamental periods calculated by Black-Scholes models, the out-of-money warrants were traded heavily at substantially higher prices.
  - Bubble size is positively correlated with trading volume and return volatility.
  - Yet they were puzzled why this bubble lasted 3 years.
- Gong et.al. (2016) confirm that new investors initiated and sustained a bubble of BaoGang call warrant in 2005-06.
- An experimental paper Xie and Zhang (2012) also support the effect of new investors in bubble formation.
- Bayer et.al. (2016) also provides empirical evidences of the contagion among neighborhoods in a housing bubble.

Research Questions

- What is the function of new investors in bubble formation in China?
- Whether newly opened brokerage account number is an indicator of bubble? Can it be used to predict returns?

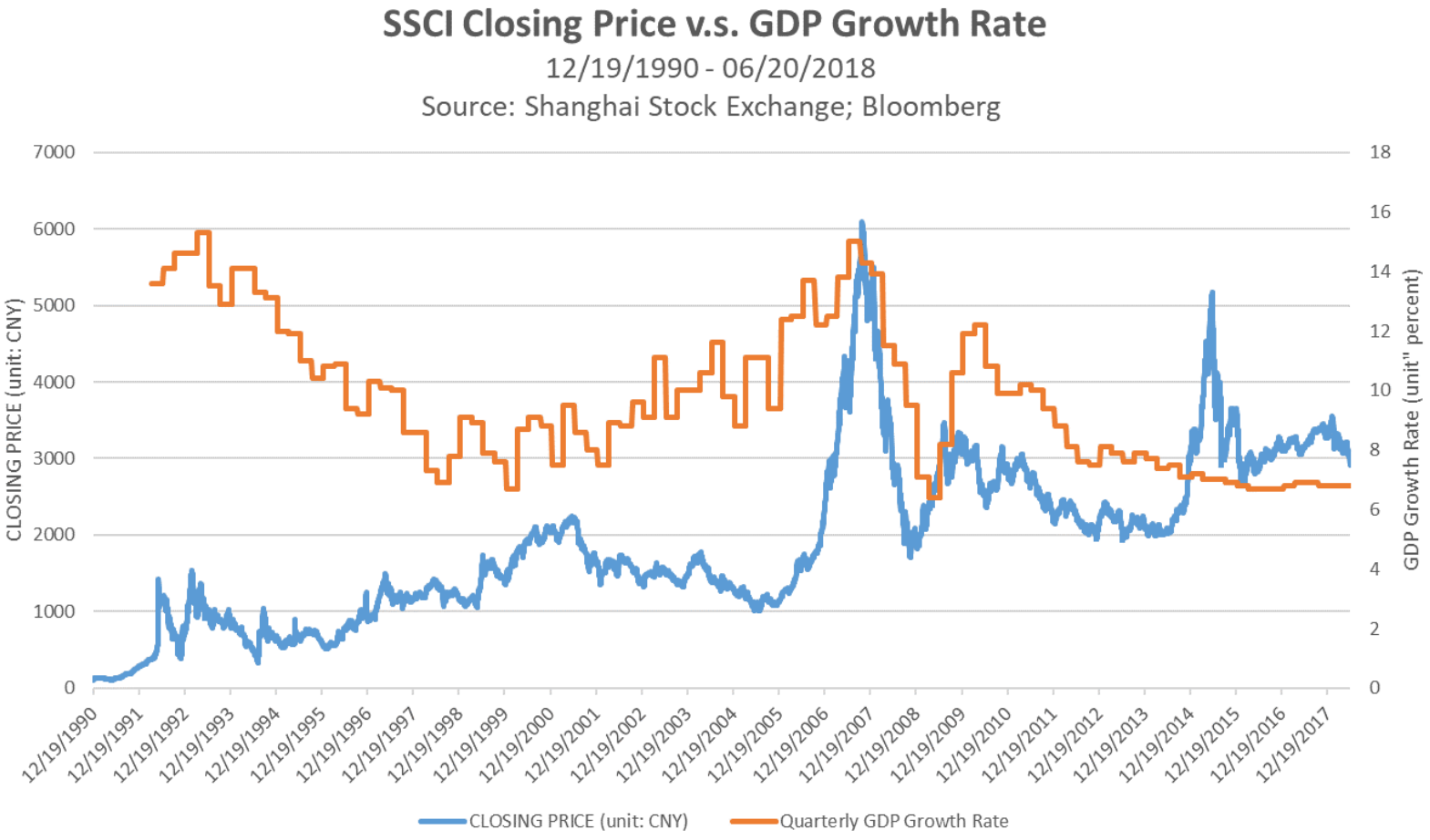
Preliminary Results Preview

- New investors were attracted by previous prices and trading volume;
- During the bubble formation period, new investors were more affected by others' trading activities;
- The impact of new investors on stock market bubble happened instantaneously, so it cannot be used for prediction;
- New investors contributed to stock prices through trading intensively;
- During the bubble formation period, trading volume worked via attracting new investors;
- Their trading activities can explain 40% to 55% of variation of stock prices.

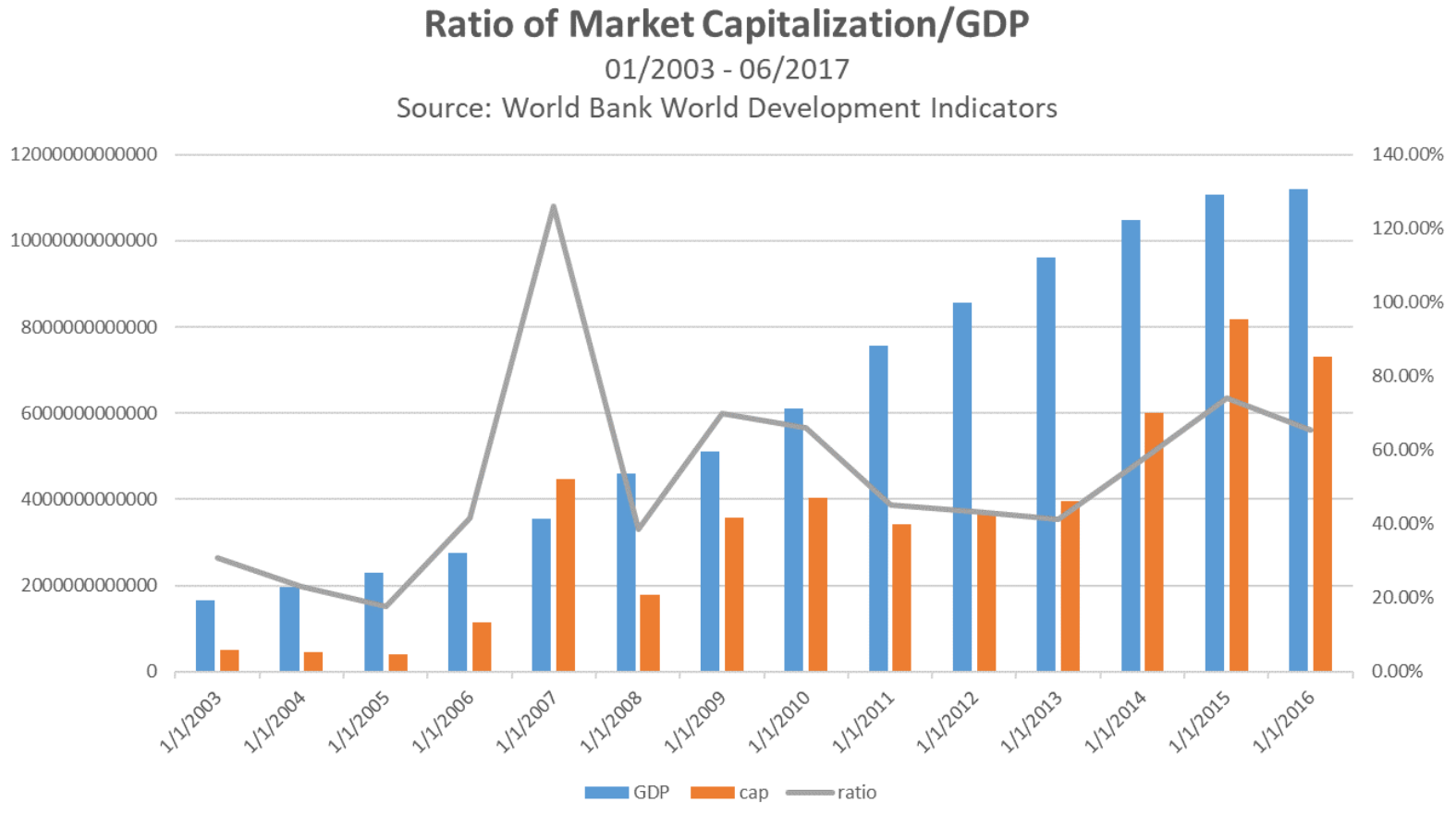
A Brief Literature Review on Asset Bubbles

- Asset market bubbles cast doubt on **Efficient Market Hypothesis** and neoclassical theory. Bubbles might be caused by:
  - **investors irrational sentiments**, such as animal spirits, overconfidence, and biases, which lead to herd behavior, momentum trading, trend chasing, and positive-feedback effects (Shiller 1981, DeLong et.al. 1990, Daniel et.al.1998, etc.)
  - **institutional limits**, such as short-sale constraints, a high cost to arbitrage and lack of coordination (Shleifer and Vishny 1990, Hong and Stein 2003 and 2007, etc.)
- However, how to define and measure bubbles?
  - Bubbles usually refer to asset prices consistently higher than fundamental values.
  - But it is hard to agree on fundamental values.
  - Economics experiments can avoid this problem, yet most experimental papers focus on a fixed set of participants (e.g. Glaser and Weber 2007).

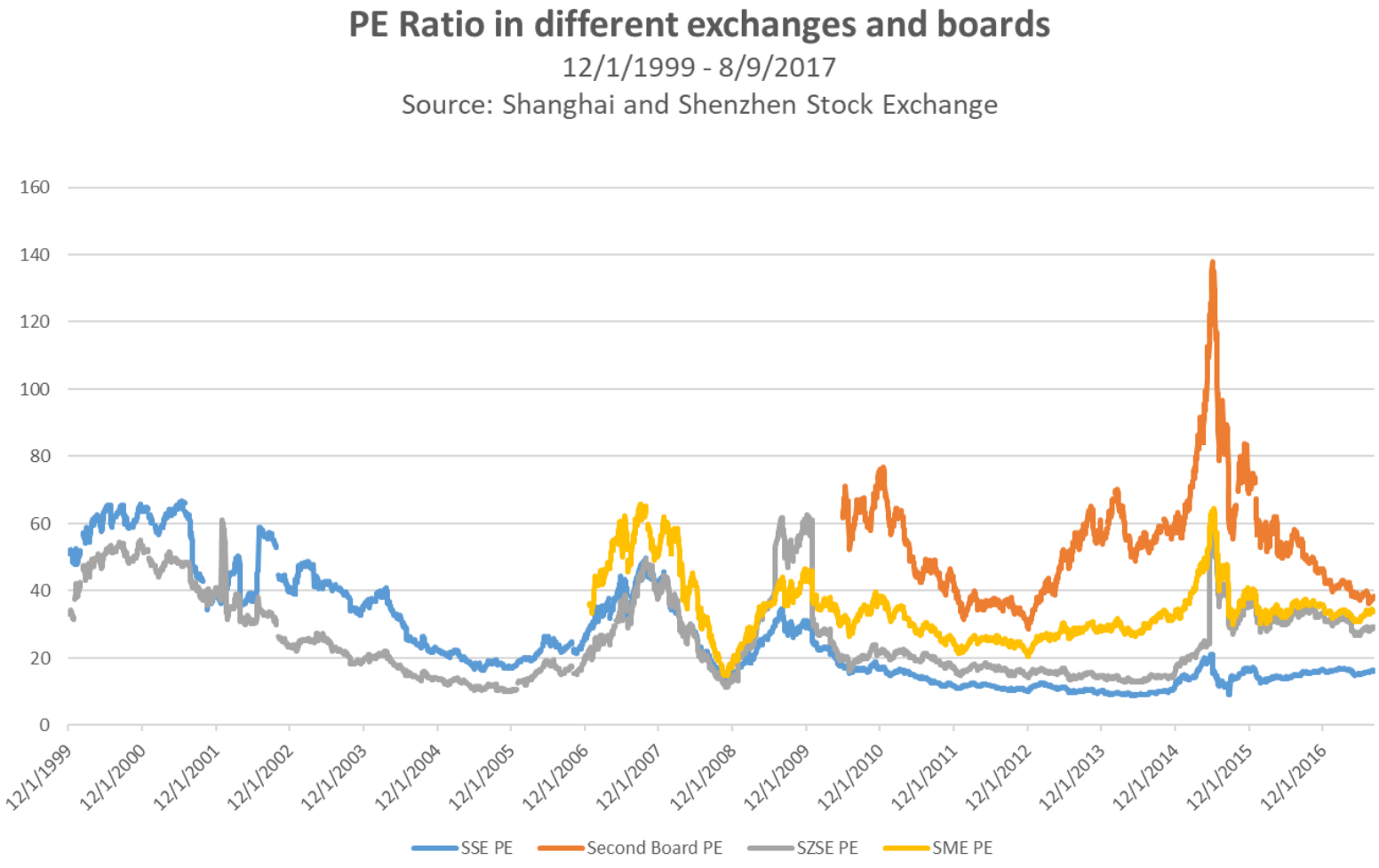
GDP Growth Rate v.s. Stock Market Price



GDP v.s. Stock Market Capitalization



PE Ratio in Different Exchanges and Boards



Granger Causality

$$X_{1,t} = \sum_{j=1}^{p} A_{11,j} X_{1,t-j} + \sum_{j=1}^{p} A_{12,j} X_{2,t-j} + e_{1,t} \qquad (1)$$

- For the entire period:

  Stock Returns $\rightarrow$ New Accounts $\leftarrow$ Turnover Rate

- For bubble periods:

  Stock Returns $\rightarrow$ New Accounts $\leftarrow$ Turnover Rate

- For bubble formation periods:

  Stock Returns -X- New Accounts $\leftarrow$ Turnover Rate

- Significant instantaneous causality relationship.

Methodology of Residual Orthogonalization

- Swanson and Granger (1997)introduce a method to disentangle the instantaneous causality relationships between the interested variables.
- The basic idea:

$$\rho(A, B|C) = 0$$

$$\Rightarrow$$

$$A - C - B$$

- Three steps to test structural models of the errors in vector auto-regressions.

Partial Correlations

1st step: Construct a VAR model and get residuals, and then calculate partial correlations.
2nd step: Construct tests with the null hypothesis of zero partial correlation and then specify recursive structural models by considering economic senses.

- For the entire period: $\rho(N_t, P_t|T_t)=0$

  New Accounts $\rightarrow$ Turnover Rate $\rightarrow$ Stock Returns

- For bubble periods: $\rho(N_t, P_t|T_t)=0$

  New Accounts $\rightarrow$ Turnover Rate $\rightarrow$ Stock Returns

- For bubble formation periods: $\rho(T_t, P_t|N_t)=0$

  Turnover Rate $\rightarrow$ New Accounts $\rightarrow$ Stock Returns

Structural Models

3rd step: Estimate the structural models.

For the entire period:

Model 1 (N=173)	ν_{1t}	ν_{2t}	ν_{3t}	R-squares
$N_t = \nu_{1t}$	-	-	-	-
$T_t = \beta_{21}\nu_{1t} + \nu_{2t}$	0.292***	-	-	12.18%
$P_t = \beta_{31}\nu_{1t} + \beta_{32}\nu_{2t} + \nu_{3t}$	0.067***	0.126***	-	40.01%

For bubble periods:

Model 2 (N=66)	ν_{4t}	ν_{5t}	ν_{6t}	R-squares
$N_t = \nu_{4t}$	-	-	-	-
$T_t = \beta_{51}\nu_{4t} + \nu_{5t}$	1.315***	-	-	15.71%
$P_t = \beta_{61}\nu_{4t} + \beta_{62}\nu_{5t} + \nu_{6t}$	0.071***	0.143***	-	40.88%

For the bubble formation period:

Model 3 (N=46)	ν_{1t}	ν_{2t}	ν_{3t}	R-squares
$T_t = \nu_{1t}$	-	-	-	-
$N_t = \beta_{21}\nu_{1t} + \nu_{2t}$	0.762*	-	-	11.56%
$P_t = \beta_{31}\nu_{1t} + \beta_{32}\nu_{2t} + \nu_{3t}$	0.22***	0.181***	-	55.44%

Structural Models

By iteration and plugging in the estimators, the structural system of errors can be written as:

For the entire period:

$$P_t = 0.03N_t + 0.126T_t + \nu_{3t} \tag{2}$$

For bubble periods:

$$P_t = 0.026N_t + 0.143T_t + \nu_{3t} \tag{3}$$

For the bubble formation period:

$$P_t = 0.181N_t + 0.082T_t + \nu_{3t} \tag{4}$$

Conclusions

- Inexperienced and new investors were attracted by soaring stock prices and the frenzied trading activities of other investors, especially the latter during bubble formation.
- In normal times, new investors contributed to stock prices through trading more; during the bubble formation, new investors mattered more.
- Although the new accounts cannot predict future returns, the continuous and enormous inflow of new investors could be a good indicator of asset bubbles.