PACS G010 · D300

1 Introduction

After B. Mandelbrot identified the fractal structure of price fluctuations in asset markets in 1963 [1], statistical physicists have studied the economic mechanism that produces a fractal structure. Power law is an important characteristic in the fractal structure. Some research found that the size distribution of asset price fluctuations follows a power law function [2,3]. The distribution of firm size, based on the income statement items in real economies, also follows a power law function [4–8]. The power law index of firm size is almost 1 over the last 30 years in many capitalistic countries [9,10].

In previous studies, stock price fluctuations attracted more attention than firm size distribution in stock markets, and several models for price dynamics were proposed [11,12]. The PACK and LPPL models simulated the price fluctuations of a stock during bubble periods [13,14]. However, the firm size distribution in stock markets must also be investigated to identify stock market bubbles. The firm size in stock markets is measured by market capitalization: = stock price × number of outstanding shares. Speculative funds flow into the stock market during stock bubble periods. Investors estimate the fluctuations of firms based on annually/quarterly reports and such information as business news/rumors and the quoted stock prices in the market. Investors often follow the market trends that reflect the majority of investors. By only reason that stock price is rising, during bubble periods speculative money is often concentrated on specific stocks with which price is rising. Then their stocks become still more expensive, and acquire more speculative money again. Such mechanism is called herding phenomena for speculative money. As a result, the market capitalization gap among the listed firms in the stock market widens, and the firm sizes in the stock market deviate from those in real economies.

In this paper, we use a dataset compiled by the Thomson Reuters Corporation that covers daily market capitalization and annual income statements of all the listed firms in NASDAQ and SSE from 1990 to 2015. This period includes the 2000 dot-com and 2007 Shanghai bubbles. We focus on the distribution of market capitalization in NASDAQ and the Shanghai stock exchange (SSE) for these bubbles. Kaizoji et al. showed that the upper tail of stock price distribution in the Tokyo stock exchange grew fat during the dot-com bubble period [15,16]. However, if we accurately investigate the firm size in stock markets, not only the price but also the outstanding shares must be taken into consideration because share consolidation and splitting often occurs in the market.

The rest of the paper is organized as follows. Section 2 examines the power law of market capitalization distribution using an expansion of the Castillo and Puig test [10,17–19]. In Section 3 we observe that the power law index fluctuates around one, depending on economic conditions, and tends to become smaller during bubble periods. In Section 4, we find that net assets

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during the dot-com bubble period. This result means that the gap between firm sizes in asset markets and in real economies widened during the bubble period.

Both net assets and net income are greatly reflected in market capitalization for SSE firms. Market capitalization, divided by net income, becomes extremely big when the net income is close to zero. Therefore, the upper tail of the distribution of divided market capitalization sensitively responds to the fluctuation of net income. One future work will propose market capitalization that is adjusted by net assets and net income to investigate the 2007 Shanghai bubble.

Although market capitalization is made public every day, income statements are usually announced only quarterly and annually. This difference in time scale complicates estimating daily gaps between firm sizes in stock markets and real economies. Another future work will nowcast the key items of income statements every day.

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Next, we focus on SSE. Unlike NASDAQ (Fig. 4(b)), its market capitalizations reflect two income statement items: net assets and net income. Because net income is rarely around zero, the market capitalization divided by the net income becomes extremely big at that time. The upper tail of the distribution of divided market capitalization sensitively responds to the fluctuation of net income. Future work will propose market capitalization adjusted by both net assets and net income.

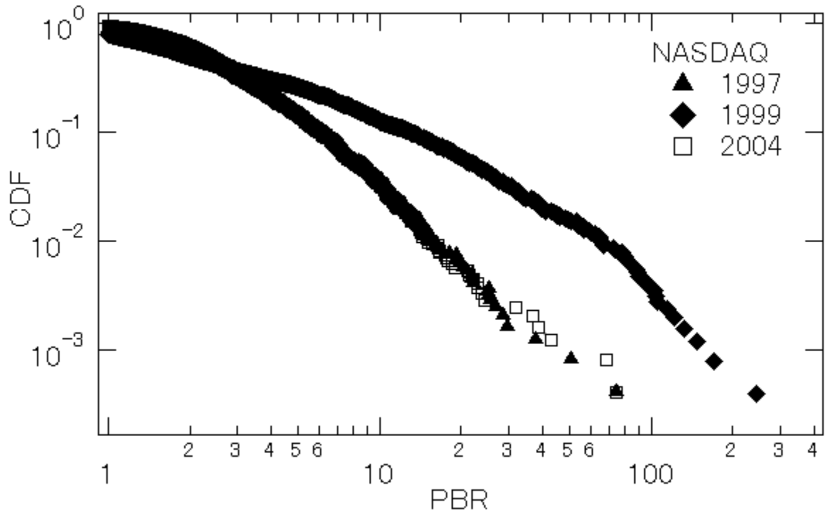

Fig. 5 Cumulative distributions of PBR in NASDAQ in (▲) 1997, (♦) 1999, and (□) 2004.

5 Conclusion

We showed the distributions of market capitalization in NASDAQ and SSE. The upper tails of the distributions follow a power law. The power law index, which fluctuates around one depending on the economic conditions, became small during the 2000 dot-com and 2007 Shanghai bubble periods, suggesting that speculative money was excessively concentrated on specific stocks during such periods.

In economics, a stock bubble is defined by the gap between firm sizes in the stock market and in real economies. We used market capitalization and income statements to estimate the firm sizes in stock markets and real economies. By using the regression coefficient of random forests for market capitalization and income statement items, we found that net assets are most reflected in the market capitalization for NASDAQ firms. For such firms, PBR is defined as market capitalization divided by net assets. The PBR distribution also got fat

Click to get the Electrum Personal Server source code and the Electrum Wallet source code.
A new repo qtum-electrum-new has been built to add qtum-related features to the latest code for Bitcoin electrum.
Dynamic . . . Dai's proposal to raise the stabilization fee is still in the "administrative voting" stage.
Electrum wallets have been hacked in recent days and nearly 250 bitcoins have been stolen, according to blockchain security team Devi Security Labs. This attack, confirmed by Electrum, involves creating a fake version of the wallet to trick users into providing password information. Electrum responded on Twitter that "this is an ongoing phishing attack on Electrum users and advised users to download wallet apps from the official website." Mars Finance reminds users not to install electrum wallets from unknown sources.
Lightweight Bitcoin Wallet Electrum announced that the next version will support Lightning network payments, implemented with Python, an electrum network node where wallet users do not need to run Lightning network nodes themselves to make payments, and electrum's Lightning network nodes have now been merged into the Electrum master branch.
Electrum-LTC is Electrum's community maintenance port, Litecoin's Bitcoin wallet. It is not the official product of Electrum Technolo

gies GmbH, and it is not supported.
Vulnerabilities were found in Electrum and Electrum-LTC. It has been fixed in Electrum-LTC 3.0.5.1. If you are running an earlier version, update your software.
Dynamic . . . Electrum wallets have been hit by massive DoS attacks that have cost millions of dollars.
Dynamic . . . Report: Bitcoin's one-day transaction fee is four times that of BCH and BSV's one-year transaction fee.
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The latest version of Electrum 4.0, the Bitcoin wallet, was released On Wednesday, adding support for the Bitcoin Lightning Network, according to Decrypt. The service can be enabled through Electrum's application or through the command-line interface. In an application, the user must search the Information section to open it. The new version of Electrum also supports "Submarine Swaps", allowing people to return bitcoins on the chain in exchange for a lightning version for a fee.
Fake: github/electrum-wallet/electrum/releases.
Dynamic . . . Electrum and MyEtherWalle users face phishing attacks.
Exclusive . . . TensorFlow 2.0 will turn Eager Execution into the default execution mode, and it's time for you to turn to dynamic computational graphs.


AMBIANCE

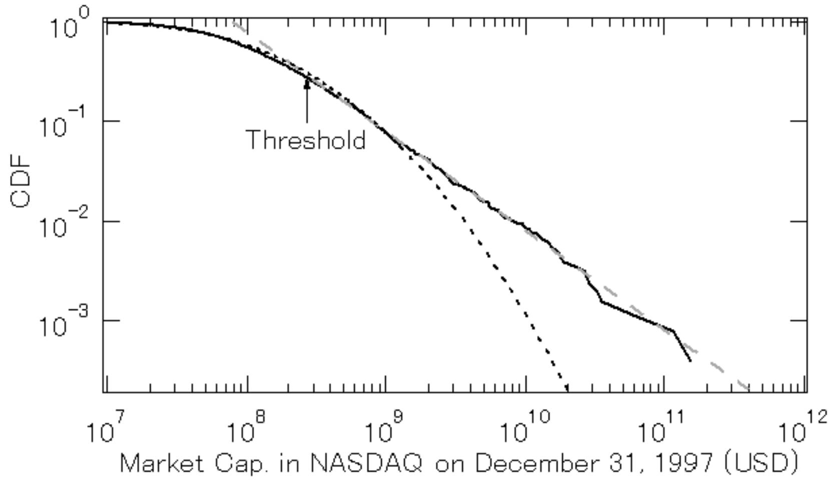

Fig. 1 Cumulative distribution of market capitalization for listed firms in NASDAQ on December 31, 1997. Dashed straight line and curve respectively express a power law distribution as $P_{>}(x) \propto x^{-1}$ and log-normal distribution with standard deviation of market capitalizations. Arrow indicates $x_0 = 2.7 \times 10^8$ dollars in Eq. (1).

the means were respectively about 1.44×10^9 and 3.04×10^9 dollars on March 14, 2011 on the non-bubble periods. The means increased during the bubble periods.

In these bubble cases, only a few firms increased the market capitalization drastically and raised the whole mean of market capitalization for all the listed firms. The black lines in Fig. 2 respectively show the market capitalization distributions for firms listed on the NASDAQ during the 2000 dot-com bubble and on the SSE during the 2007 Shanghai bubble. The gray lines express the distributions on March 14, 2011 during non-bubble periods. The cumulative probability on the vertical axis at which the black line intersects with the gray line is $P_{>}(x = 2 \times 10^9) \approx 0.1$ in the dot-com bubble case. The top 10% market capitalization in 2000 was higher than that in 2011, although the bottom 90% market capitalization in 2000 was lower than that in 2011. Such a characteristic was also observed in the Shanghai bubble case (Fig. 2(b)). The cumulative probability of its crossing point is $P_{>}(x = 1.2 \times 10^{10}) \approx 0.04$. These results suggest that speculative money flowed into a handful of stocks from a majority of stocks in each stock market during the bubble periods.

The concentration of speculative money changes the distribution slope. Fig. 3 shows the NASDAQ composite index, the SSE composite index, and the time series of the power law index in NASDAQ and SSE. The power law index, which fluctuated around one depending on the economic conditions, fell significantly when the increase of each composite index started during the dot-com and 2007 Shanghai bubble periods and remained small until each composite index steadied after the bubble burst.