The Disappearing High-Volume Return Premium in China's Stock Market

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Abstract

In a dynamic context, an important issue should be whether abnormal volume is useful in improving forecasts of price changes. This study investigates whether or not a high volume return premium exists in the Chinese stock market before and after share split stock reforms. After forming portfolios on the basis of high and low volumes over the period 2001–2013 and then analysing their returns, we find that high-volume stocks do not necessarily perform better than low-volume stocks. In fact, in the later part of our sample, we find that low-volume portfolios generate better returns than high-volume portfolios up to 20 trading days after formation day. Our results suggest that liquidity changes before and after reforms do not have any significant impact on the volume-return relationship, but instead, that supply shocks are the main drivers of the disappearance of the high-volume premium.

Keywords: Volume, Return, Premium, Discount

JEL Classification: G12; G14; G15

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1. Introduction

The trading volume transmits vital information about movements in stock prices. The trading volume is one side of a coin which has stock prices on the other side. While stressing the importance of volume, Blume et al. (1994) present a model that allows traders to learn valuable information about a security by observing past values of both price and volume. A large number of empirical studies have found that the trading volume contains information about the distribution of future returns (see for example Campbell et al., 1993; Conrad et al., 1994; Lee and Swaminathan, 2000; Gervais et al., 2001; and Conolly and Stivers, 2003). Some empirical work has examined the contemporaneous relationship between trading volume and prices, and found that there is a positive correlation between volume and the absolute value of price changes (e.g., Gallant et al., 1992; Karpoff, 1986). In a similar fashion, Lo and Wang (2000) show that the trading volume is linked to expected returns. Technical analysts strongly believe that "it takes volume to make prices move" (Karpoff, 1986). Early studies on the volume-price relationship suggested that there are positive relationships between the absolute value of daily price changes and daily volume for both market indices and individual stocks (see for example Ying, 1966; Westerfield, 1977). Following the establishment of the relationship between volume and price, a body of literature on extreme volume and its predictability emerged. In considering the importance of trading volume, it warrants a separate examination.

Miller (1977) was of the opinion that, out of the entire investing population, only a small proportion of investors normally hold a typical stock, due to diverging opinions. These investors are vastly outnumbered by the non-holders, who can only come in on the buying side (Miller, 1977, p. 1166). Thus, it is hypothesized that anything that increases investor awareness of a stock, such as trading volume, will increase its price. Awareness becomes instrumental in investors taking action, and such actions may lead to a reaction in the market, from a price

perspective. Merton (1987) is of the opinion that an increase in a stock's visibility will tend to be followed by a rise in its price. As was argued by Hirshleifer et al. (2013), investors will "have greater difficulty processing information that is less tangible". Considering volume as an obvious visible candidate, Gervais et al. (2001, hereafter GKM) document a high-volume return premium in the New York Stock Exchange (NYSE). That is, stocks which experience unusually high trading volumes over a day or week tend to appreciate over the following month, and stocks which experience unusually low trading volumes over a day or week tend to depreciate over the next month. Investors' levels of recognition should vary across firms over time, as there are differences across both stocks and market conditions. GKM (2001) and Zhou (2010) both found that the magnitude of the volume premium is generally greater for smaller firms, which may imply that the marginal effects of improved visibility are more potent for smaller firms, consistent with Merton's (1987) investor recognition hypothesis. Miller (1977) suggests that a volume shock increases the probability that an investor will scrutinize a stock thoroughly. If investors have diverging opinions and there are short-sale constraints, then the stock price will tend to move up after attracting investors' attention. If investors infer information from the trading volume, then this information will influence their demands, and therefore feed back into prices and the aggregate trading volume (Schneider, 2009). Lehavy and Sloan (2008) determined that investor recognition could potentially be more important than accounting information, earnings announcements, or investment fundamentals in determining the future expected value of stocks. This high-volume return premium is postulated to be associated with changes in stocks' visibility among investors.

By creating portfolios of the low-trading volume and high-trading volume stocks listed on the Shanghai and Shenzhen stock exchanges from 2001 to 2013, we find, contrary to the previous literature, that Chinese stock markets do not exhibit a high-volume return premium, especially after stock split reforms. We find that high-volume stocks do not outperform low-volume stocks

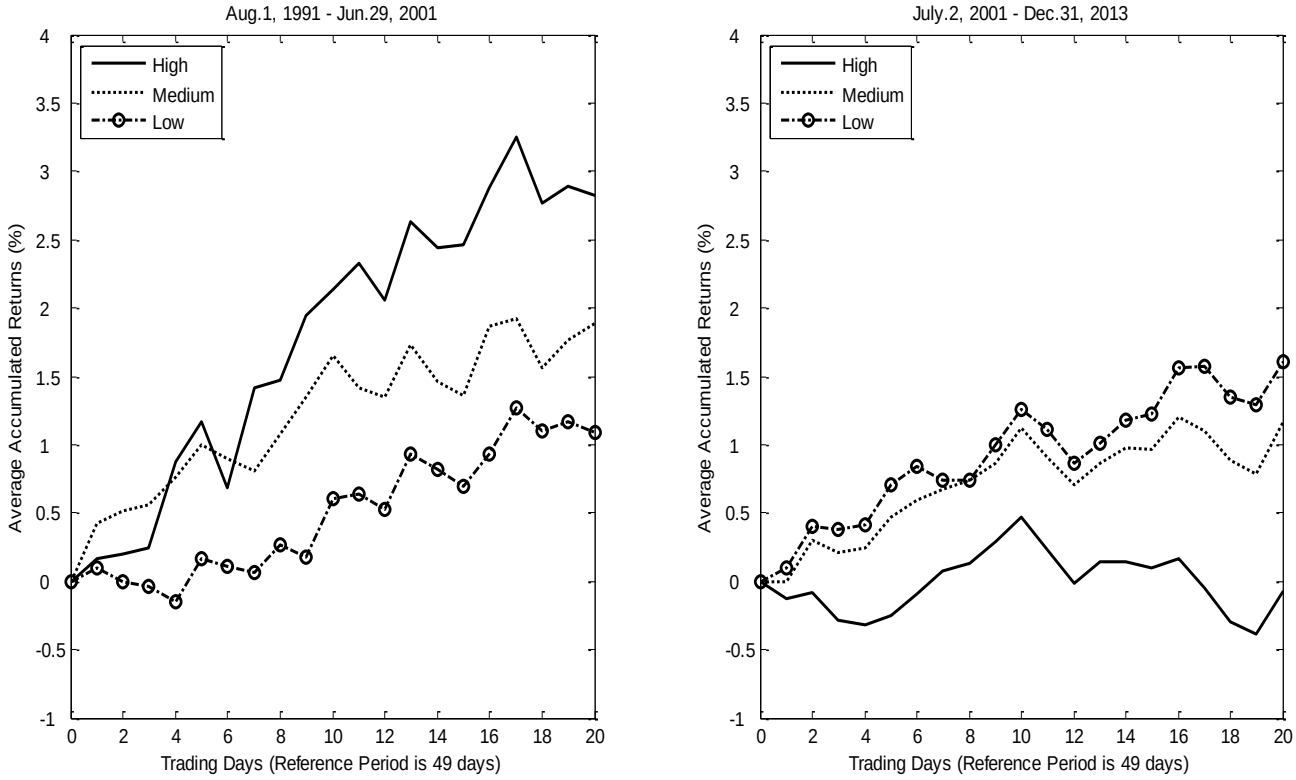
in a significant manner prior to stock split reforms, but that low-volume portfolios actually generate more abnormal returns than high-volume portfolios after such reforms. We conclude that the high-volume return premium is a phenomenon that is sensitive to the composition of the market, the types of investors, and unusual market conditions, such as supply shocks.

Our drive to examine this high/low volume-return relationship has come from one of the major paradigm shifts in the Chinese stock market, namely share split reform. The need for such reform has arisen due to the dominance of non-tradable shares in the stock market over the years, which has been felt to be problematic and restrictive as far as expansion and development are concerned (Li et al., 2011). In a way, this reform has given a green light to the trading of many previously so-called non-tradable stocks (NTS). This action of the Chinese regulatory body has increased the already enormous volume on the Shanghai and Shenzhen bourses. Our motivation stems from the question, can investors or traders implement trading rules that aim to exploit the perceived patterns in the high/low trading volumes of individual stocks or other similar instruments to earn abnormal returns, at least in the short run? It should be noted that the proponents of the efficient market hypothesis do not believe that such patterns can be exploited to gain abnormal returns on a consistent basis.

We are motivated to determine whether the high-volume return premium documented by GKM (2001) exists in China's stock market, and to examine how this phenomenon is different in a market where the market structure and investor base differ from those of the US. In addition to the difference in investor base, even a long-short strategy cannot be employed in China, due to a ban on short selling in Chinese bourses. Our motivation also comes from the fact that, unlike the US market and other developed markets, the Chinese market was dominated predominantly by individual investors over most of our sample period, which is why it is important to know whether the high-volume premium exists in a market with a different investor-base. In a cross-

country analysis, Kaniel et al. (2012, hereafter KOS) has documented that this sort of high-volume return premium is pervasive in almost all developed countries, but not in all emerging-market countries. Specifically, China's stock market exhibits a negative though insignificant average return for a reference return portfolio constructed in the same manner as that of GKM (2001). Therefore, the answer to the question as to why China's stock market does not have a high-volume return premium remains unclear, and warrants further research.

Figure 1 Evolution of the high volume return premium phenomenon. At the end of every 50th trading day during the sample period, stocks with high (low) volume shocks are identified by the criterion of the top (bottom) 10 daily volumes (as measured by the number of shares traded) over the last 50 days, and are weighted equally to form a portfolio. A stock whose trading volume that day is among the middle 30 daily volumes is classified as a medium-volume stock. Two figures are generated using two samples: Aug. 1, 1991–June 29, 2001, and July 2, 2001–Dec. 31, 2013. The first subsample is studied by KOS (2012). The second subsample is the period this paper focuses on.



As Figure 1 shows, in KOS's sample period, the high volume portfolio has a higher average cumulative return than the medium volume portfolio for all holding horizons except 5–6 days.

The positive return obtained by taking a long position on high-volume stocks and shorting low-volume stocks is stamped as a high-volume return premium. However, this phenomenon disappears in the sample period since 2001, where we instead observe the low-volume stocks to have higher cumulative returns than high-volume stocks on average for all holding horizons. This more recent movement motivates us to investigate whether such a phenomenon is persistent in the biggest emerging market, and how a portfolio constructed as per that of GKM would have performed in the most recent decade.

During the period 2005–2008, the Chinese stock market had a historically important reform which aimed to address the important issue of split shares and convert all non-tradable shares into tradable ones, because the split share structure reduced the quality of firms' corporate governance and the efficiency of their performance (Sun and Tong, 2003; Fan et al., 2007; Chen et al., 2008). To encourage financial development and growth, China recognized the need to modernize its capital market by abolishing the split share structure across listed firms. Prior to the split-share structure reform, two-thirds of the A-shares outstanding were non-tradable shares owned mainly by the Chinese government, its affiliates, and legal persons (Liao et al. 2011). The reform aimed to change the ownership structures of the listed firms, with a simultaneous impact on the secondary market. As a result, the investor base of listed firms has changed. If we use this natural experiment as a way to examine the potential factors that may affect the high volume return premium, in this case the investor base, the results, for the first time in the literature, would help us to understand whether investors contribute marginally to the well-known phenomenon of abnormal volume-return premiums, and if so, whether in a positive or negative way. As Tong et al. (2013) indicated, the holders of tradable shares may have suffered from the adverse price impact of a large increase in the supply of tradable shares.

Our findings contribute to the emerging body of literature in relation to the information content of abnormal volumes in several ways. Increasing our understanding of Chinese stock market activities, especially any information contained in the trading activities, provides valuable insights for both domestic and international investors. The Chinese corporate sector offers improved opportunities for diversification by international investors. We find that, when a stock is experiencing a supply shock without fundamental changes, even if it is also experiencing a volume shock, its return, as determined by fundamentals, would decline as shares are "diluted", and the average accumulated return following formation day could be negative. Thus, high-volume stocks do not necessarily perform better than low-volume stocks. Furthermore, when traders who trade in large quantities, such as institutional traders, who are assumed to be more informed than their counterparts, are involved in such trading, the high-volume stocks perform even worse than they would otherwise.

In relation to the natural experiment in China's stock market, it should be noted that ours is not the first attempt to show that volume shocks to stocks attract more attention, and to use this to predict future returns in the Chinese stock market. Zhou (2010) replicates the study by GKM (2001) using data from China's stock market from 1997 to 2005. As an extension to the work of Zhou (2010), we have a long period of data, which enables us to compare the phenomenon before and after the share split stock reform. While examining the effect of the firm size on this relationship, our results suggest that, in the post-reform period, the high volume portfolios of the group of small firms in particular have shown significantly negative returns. When large trades are involved, high-volume portfolios consistently show large negative returns in all of the trading intervals.

The remainder of this paper is organized as follows. Section 2 describes the Chinese institutional set-up. Section 3 reviews the literature. Section 4 discusses the data and the

methodology. Section 5 provides the results and discussion, and finally, Section 6 concludes the paper.

2. Institutional set-up

The Chinese stock market has grown rapidly since the establishment of the Shanghai Stock Exchange in December 1990 and the Shenzhen Stock Exchange in July 1991. The establishment of two exchanges has helped to centralize the stock trading, and has improved the trading activity on Chinese bourses tremendously. The number of companies listed has increased from 10 in 1990 to over 2,000 in 2013. Investing in the Chinese stock market provides international investors with additional ways to diversify their risk. However, research in the Chinese stock market on trading activity and stock returns, and the information content of trading activities, is limited, due to the short history of the market and the lack of a reliable database, particularly for individual stocks.

Initially, when the two stock exchanges were established, approximately two-thirds of the domestically-listed A-shares were not tradable. However, holders of non-tradable shares have exactly the same voting and cash flow rights as holders of tradable shares. At that time, typical holders of non-tradable shares were the state and legal persons, while those of tradable shares were individual domestic and foreign investors, as well as institutional domestic investors. The concentration of control and ownership was maintained primarily through restricted shares, prior to the Split Share Structure Reform. The split share structure of ownership in Chinese listed firms created a gulf of interest between state and private shareholders.

The split share structure reform was introduced in 2005 in order to create a level playing field and to introduce a more market-oriented approach, and the China Securities Regulatory Commission (CSRC) was keen to complete the reform as soon as possible (Firth et al., 2010).

This reform started in April 2005, with the aim of converting all of the non-tradable shares into tradable shares. In such an 'opening-up' situation, a shot in the arm was felt as far as trading volume was concerned. Admittedly, this opening-up led to a kind of supply shock in the secondary market for a given stock, which had the potential to harm the existing holders of tradable shares. The holders of non-tradable shares were therefore required to negotiate and implement a compensation plan with their counterparts before the non-tradable shares could be traded on the stock market. By the end of 2007, the reform had been completed by firms representing over 97% of the Chinese A-share market capitalization at the time, (Li et al., 2011).

3. Literature review

Over the last few years, the notion that the trading volume embodies meaningful information has gathered a significant momentum among market participants, regardless of their persuasion, and a significant body of literature has been developed that investigates the dynamics between trading volume and stock returns. Ying (1966) document the inter-temporal role of trading volume in predicting directional price changes, and further report that trading volume shock can be used to predict the direction of prices. Miller (1977) theorised that, as there are an abundance of stocks in the market, the average investor could not reasonably be expected to have the time to investigate and evaluate all possible securities. However, if changes in the volume of a stock traded increase its visibility and spark investors' interest, then the mere fact of being more visible to investors over the multitude of other stocks in the market would persuade some investors to investigate, evaluate and perhaps purchase the stock, due to the attention it is now receiving. On the trading volume–price relationship, Gallant et al. (1992) reported a positive correlation between volume and absolute price changes, and Karpoff (1986), Campbell et al. (1993) and Llorente et al. (2002) analyzed the dynamic relationship between volume and returns in the cross-section. Mayshar (1983) showed that, with increased attention, prices will be set by those who are more optimistic about the firm's value, as those who are more pessimistic will be

sidelined to a nil holding, at best. Harris and Raviv (1993) and Shalen (1993) find that a high trading volume tends to lead to large subsequent absolute price changes, or high volatility. Barber and Odean (2008) find that a high abnormal trading volume is among the attention-getting events that are associated with net buying activity by investors. This supports the belief that extremely high volumes are associated with the changes in breadth of ownership that underline Merton's *Investor recognition hypothesis*.

GKM (2001) find that stocks with unusually high trading volumes over a day or a week (compared with the stocks' own trading volumes over the last 50 days) tend to outperform stocks with low trading volumes over the following periods, based on cumulative abnormal returns, and they refer to this as the high-volume return premium. The high-volume premium is found to increase as the holding period increases, and these results cast doubt on the efficient market hypothesis. While GKM (2001) chose arbitrary days and weeks over which to estimate abnormal volumes, Garfinkel and Sokobin (2006) extended their findings by documenting a positive correlation between abnormal share trading volumes in the three-day period *around earnings announcements* and abnormal returns over the subsequent 60 trading days. When examining high-volume premiums based on weekly risk-adjusted returns, Huang and Heian (2010) documented a significant average weekly abnormal high-volume premium. KOS (2012) applied this high-volume return premium in a multi-country set-up, including both developed and emerging markets, and found that the high-volume return premium did indeed hold in most of the developed countries, but in few emerging countries. They also used the differences between markets to discover the key determinants of the theory: investor demographics, investor confidence, size of the firm, and the ways markets disseminate information. In a recent study, Tang et al. (2013) reported that stocks of large firms of Australian equity market observed high-volume premium but only for a short horizon.

Lee and Swaminathan (2000) proposed a theory of momentum life cycles (MLC) where trading volume is used as a proxy for investor favouritism and neglect. They argued that high volume winners (low volume losers) are more likely to reverse in the near future, because they tend to be considerably overvalued (undervalued). Conversely, low volume winners (high volume losers) are at the early stage of their momentum, in the sense that their momentum is more likely to persist in the near future. Hou et al. (2009) used trading volumes as a proxy for attention in their study of price momentum and reversal phenomena. They argued that attention could aggravate investors' behavioural biases, such as extrapolative expectations and overconfidence, and finally lead to a price overreaction to information. Thus, they conjectured that price momentum is caused by investors' overreactions, which will be more severe with higher attention levels, i.e., high trading volumes. Highlighting the importance of volume in terms of its predictability, Chordia and Swaminathan (2000) reported that trading volume is a significant determinant of the cross-autocorrelation patterns in stock returns. Along similar lines, Chordia et al. (2001) found a significant cross-sectional relationship between stock returns and the variability of liquidity, where measures of trading activity such as volume and turnover were used as proxies for liquidity. The authors reported that stocks with more volatile liquidities have lower expected returns. Chen et al. (2010) were of the view that one could combine turnover, size, value and momentum in one model in order to predict future returns for individual stocks. In a recent study, Gordon et al. (2014) reported the existence of the premium in Australia, as stocks that experience unusually high volumes over a day significantly outperform stocks that experience unusually low volumes.

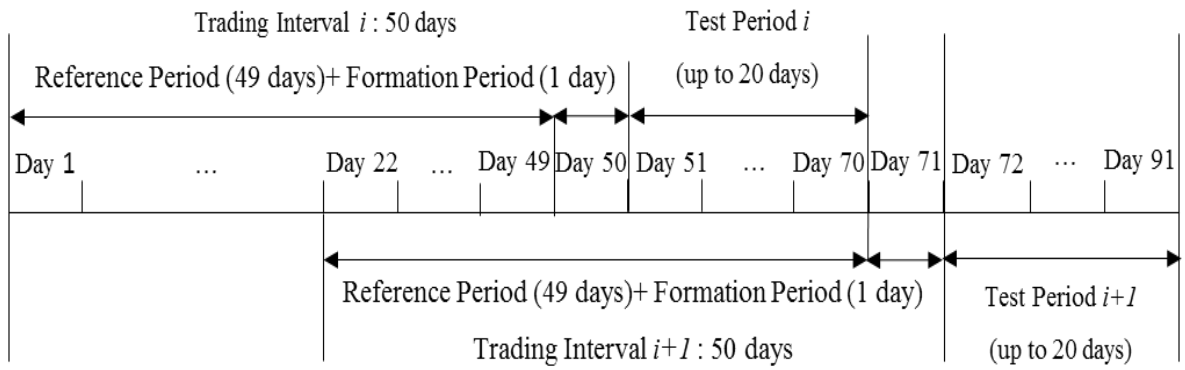
Chen and Xiong (2001) found that the restricted institutional Chinese shares traded at about an 86% discount relative to exchange-traded shares for the same companies. Thus, it pays for investors to hold less liquid securities. On the other hand, Datar et al. (1998) demonstrate that, on average, low turnover stocks earn higher future returns than high turnover stocks. In short, although there is a vast, established body of literature on trading volumes, there is still mixed

evidence on the abnormal volume-return relationship, with the current study being the first to examine the high (low) volume-return relationship comprehensively in the rapidly-emerging economy of China.

4. Data and methodology

Daily trading data from August 1991 to December 2013 are obtained from the Chinese Stock Market and Accounting Research database (CSMAR). Due to the unavailability of data on *large trades* till August 2003, the analysis of large trades is limited to the period from September 2003 to December 2013. We have included all 2169 listed A shares from both the Shanghai and Shenzhen Stock Exchanges, where cross-listing and short-selling are not allowed. All of these stocks have normal trading activities, i.e., the trading status is equal to one in the CSMAR database, which excludes Special Treatment (ST) stocks and those that are experiencing reform. Following KOS (2012), we consider 70-day intervals, which consist of a 49-day reference period, a one-day formation period (also called the formation date) and up to a 20-day test period. In order to make full use of the time series, we overlap our reference periods, but not our test periods. An interval starts 21 days after the end of the previous one. Skipping one day between every two test periods aims to remove the same-day-of-the-week effect. In a given interval, a stock is classified as a high- (low-) volume stock if its trading volume at the formation date is among the top (bottom) 10 daily volumes out of 50 for the first 50 days of that interval. Otherwise, it is classified as a normal volume stock. Our measure of volume is the number of shares traded. We use two different portfolio formation procedures, which are described below: zero investment portfolios and reference return portfolios. After the portfolios have been formed, they are held without any rebalancing over the test period, which consists of the subsequent 1, 2, 3, 4, 5, 10 or 20 trading days. This is illustrated in Figure 2.

Figure 2. Timeframe for portfolio formation and testing.



To fine-tune our sample for the purposes of our analysis, we apply general filtering rules. Specifically, for each interval, we begin by eliminating stocks that have fewer than 40 days' trading in the first 50 days. Next, we discard from an interval those stocks with fewer than 210 days of trading history on both exchanges at the start of an interval. This is because IPOs in China often generate extremely high initial returns and unusually high trading volumes (see Mok and Hui, 1998; and Tian, 2011, for more details). We also take into account the potential effects of the lockup regulation which forces institutional investors to hold subscribed shares until the lockup period has expired, by excluding samples in an interval if there is an unlock event in the past 210 days. Third, stocks for firms which experienced mergers or seasoned equity offerings during the 210 days prior to the formation period are removed from the interval. Lastly, in order to remove any outlier effects from extremely large prices, we eliminate from the trading interval any stocks with prices that were above 49.59RMB, i.e., the threshold of the top 1% of all observations, at any point during the trading interval.

Figure 1 shows the contrast between the KOS (2012) sample and the post-2001 sample, from which we observe that the high-volume return premium disappeared in the most recent decade. Our post-2001 sample contains the majority of the time period that witnessed the share split

reform and its aftermath. Given this information, the reform period in this paper is regarded as being from April 2005 to December 2007. From our full sample, 2001–2013, we take two subsamples: a before-reform subsample (2001/07/02–2005/03/31) and an after-reform subsample (2008/01/02–2013/12/31), in order to perform a comparative analysis.

Firm size is widely known to have an effect on returns, and we also consider the firm size in our analysis. Sales or total operating revenue are considered to be good proxies for the firm size in Chinese companies (e.g., Sun and Tong, 2003). Each remaining stock in each interval that survives our general filtering process is assigned to one of three size groups, depending on the firm's sales decile at the end of the year preceding the formation period: the firms in sales deciles one to three are assigned to the small-firm group, those in deciles four to seven are assigned to the medium-firm group, and those in deciles eight to ten are assigned to the large-firm group. Another key variable that we have taken from CSMAR directly is the daily return with cash dividend reinvested (Dretwd). Turnover is defined as the ratio of the number of shares traded to the total number of tradable shares.

[INSERT Table 1 Descriptive Statistics]

Table 1 presents some descriptive statistics for our daily sample. Panel A shows these statistics across all stocks and intervals for the three size groups. We find that the groups of small and large firms have extreme differences in sales, but that they perform fairly similarly in stock returns; likewise, the difference in turnover is not as vast as in sales. Panels B and C of Table 1 provide us with an indication of the general evolution of these intervals by showing the same statistics before and after the split share reform. The average number of shares traded increases after reform for all size groups. However, if we account for the release of the non-tradable shares during reform and measure liquidity by turnover, we find that turnover has increased more for the group of small firms in the after-reform period relative to the before-

reform period. In addition, all groups of stocks had negative daily returns both before the reform, possibly due to the prevalence of a bearish market at that time (see Liao et al., 2011, p. 1003), and after, because the reform brought more tradable shares into the market, which increased the supply of tradable shares.

If stocks that exhibit unusually high volumes at the formation date have significantly different returns in the following days from those that exhibit unusually low volumes, we could theoretically construct a portfolio to yield positive accumulated returns. In the introduction to this paper, Figure 1 showed that the high-volume return premium began to disappear in 2001. Thus, our z*ero investment portfolio* is constructed at the formation date, exactly opposite to GKM (2001) and KOS (2012), by taking a long position for a total of 1 Yuan in all of the low-volume stocks, and a short position for a total 1 Yuan in all of the high-volume stocks. The stocks in each long and short position are weighted equally and held for the test period without rebalancing. Our zero investment portfolio is expected to bring a positive return.

In contrast to placing the same weight on each interval in our zero investment portfolio, our *reference return portfolio* weights each security equally and is constructed as follows: we build a high- (low-) volume reference return portfolio by investing 1 Yuan long into each stock that has a high (low) volume and offsetting the long position by taking a short position of a Yuan's worth in a reference portfolio, so that the net investment is zero. These portfolios are formed so that each high- (low-) volume security is offset by the reference portfolio. The rationale behind this methodology is to prevent any bias in the return measure if the number of low-volume stocks is substantially smaller or larger than that of high-volume stocks.

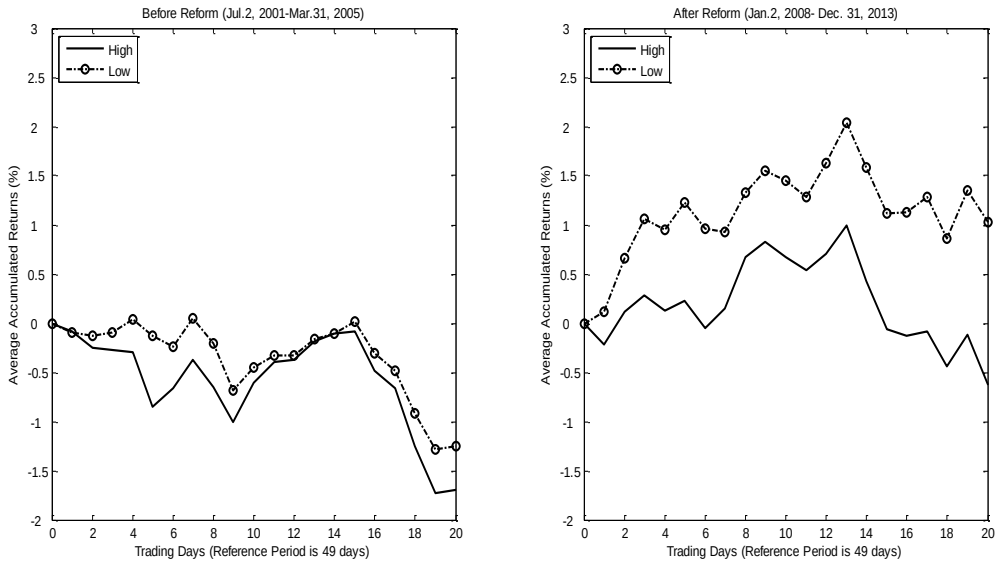
As each long and short position is offset appropriately by a reference portfolio, we can examine the average returns of all of the long and short positions separately, something that is not

possible with the zero investment portfolio. If the phenomenon of a high-volume return premium prevails, the net return from our investment of taking a long position of the reference low-volume stocks and a short position of the reference high-volume stocks is expected to be negative.

5. Results

In order to have a closer look at the evolution of the high-volume return premium, we use two subsamples to draw plots similar to those in Figure 1, to show the comparison of before and after stock split reform. Figure 3 shows how high-volume and low-volume stocks performed before and after split share reform, and helps us to obtain a partial understanding of the insignificant high-volume return premium in the Chinese stock market. As the left graph shows, before reform, the high-volume stocks did not yield significantly higher average accumulated returns than the low-volume ones. After reform, though, as the right graph shows, the difference is more obvious, with the high-volume stocks actually performing much more poorly than the low-volume stocks. It seems that the reverse relationship shown in Figure 1 is contributed largely by the data from the after-reform subsample. After the reform, the natural experiment changed the secondary market dramatically, so that the strategy of exploring the high-volume return premium, constructed as per GKM (2001) and KOS (2012), would yield negative rather than positive returns for holding up to 20 trading days.

Figure 3 Recent evolutions of the high-volume return premium phenomenon. The portfolio is identified and formed in the same way as in Figure 1. Two subsamples are considered in this figure: the before-reform subsample (2001/07/02–2005/03/31) and the after-reform subsample (2008/01/02–2013/12/31).



The high-volume return premium in China has been disappearing over the recent decade, with the reverse relationship being found in the after-reform subsample. This impact of the reform prompts us to examine whether the investor base made any difference to our reverse finding, which we will call the low-volume return premium or high-volume return discount. To explore this question, we adopt two empirical designs that control for the turnover effect and the large trade effect respectively. First, as the reform changes the number of tradable shares, which increases the supply of stocks, the number of shares traded as the measure of volume generally goes up. Thus, volume shock may be blended with the impact of changes in tradable shares. We need to revisit the phenomenon by controlling for the changes of tradable shares, to see whether the disappearing high-volume return premium is driven in part by the supply shock in the secondary market.

Second, institutional traders have shown their presence in the stock market increasingly since the reforms. In fact, as reported by CSRC, by the end of 2008, institutional investors had for the first time become the dominant force in the market, by holding 54.6% of the market

capitalization of all tradable shares in the Chinese domestic markets.[2] Boehmer and Kelley (2009) reported that the presence of institutional traders boosts the market efficiency, and hence, improves the market quality. However, on the other hand, when an institutional trader dominates the market turnover of a certain stock, such aggressive trading may create a "pump and dump" situation (Putniņš, 2012). There is no clear ex-ante picture as to whether the difference in the performances of portfolios before and after the reform is due to the increased institutional stock trading.

5.1. Turnover

Intuitively, if a high-volume stock, which is defined in a clean environment and expected to exhibit a high return after the formation date, experiences a supply shock due to reforms, this potentially large supply of additional shares on the market would be expected to depress the stock price, thus having a negative price impact on the underlying stock (see for example Zhao et al., 2006). In this section, we consider turnover, which is a volume measure that is scaled by tradable shares, and aim to disentangle the effect of the volume shock by controlling for the liquidity changes. We present the results of our analysis in Table 2, which shows the average cumulative returns of the zero investment and reference return portfolios for each of the three size groups over horizons of 1, 2, 3, 4, 5, 10 and 20 trading days after the formation date.

[INSERT Table 2]

Table 2A depicts the results of volume portfolios when considering the before-reform subsample. The zero investment portfolios for both liquid and illiquid stocks yield positive returns for all holding periods, but the returns are only statistically significant for holding for four and five days after portfolio formation. In contrast, the magnitude of returns on reference return portfolios is quite different from those of the zero investment portfolios, as a result of considerable changes in stock composition. The portfolio constructed from stocks with low

[2] http://www.csrc.gov.cn/pub/newsite/zjhjs/zjhnb/200906/P020090630327035004673.pdf, page 19.

realized turnover ratios (illiquid ones) tends to have significantly negative reference returns (–2%) after the formation date, which increases to 4% as the holding horizon reaches 20 days; while liquid stocks have significantly negative reference returns for 1 and 10 days, –2% and –6% respectively, and positive and statistically significant returns over horizons of 2, 3, 4, 5 and 20 days. The reference return of volume portfolio with only liquid stocks has slightly higher cumulative returns than those of the volume portfolio with illiquid stocks for all holding horizons except 10 days. By looking at high-volume and low-volume reference return portfolios separately, we find that the significance of the net return of the reference return portfolio conditioning on a high turnover ratio is due to the corresponding high-volume and low-volume portfolios; while for net returns of the reference return portfolio conditioning on a low turnover ratio (illiquid stocks), we can only observe the significantly positive return of the corresponding low-volume stocks.

We also report similar results in Table 2B using the after-reform subsample. As the market experienced a greater supply of stocks after the reform, the pattern of stock returns is quite different from what we observe in Table 2A. Both the zero investment and reference return portfolios are significantly positive in both the short term (1 to 5 days) and long term (5 to 20 days), with one exception, namely the first day return of the zero investment portfolio, which is positive but not statistically significant. As we observe in Table 2B, depending on the realized turnover ratio, constructing a reference portfolio using liquid stocks yields higher returns than one using illiquid stocks. When we take a look at the high- and low-volume stocks separately, we find that, for illiquid stocks, the main driver of the significantly positive net returns is the negative returns of most of the corresponding high-volume portfolios.

Our main interest lies in the question of whether or not the disappearance of the high-volume return premium is driven partly by the increased supply of tradable stocks in the secondary market. The results show that, after the reform, creating zero investment portfolios yields positive and significant ‘net returns’, irrespective of the different liquidity changes across

stocks. Our results are similar in spirit to those of Huang and Heian (2010), who reported positive returns on portfolios constructed by taking long positions in low-volume stocks and short positions in high-volume stocks. Huang and Heian (2010) also argued that the relatively high turnover before the formation period is a good proxy for cross-sectional differences in the existing visibility, and a stock with a positive volume shock will not necessarily show a stronger return premium if its lagged turnover is already high. Keeping this in mind, our results suggest that, if the high volume return phenomenon is not significant in a market and most of the stocks in such a market have supply shocks without fundamental changes, the reverse phenomenon, i.e., high-volume stocks experience poorer returns than low-volume stocks after the formation date, is very likely to be observed.

5.2. Large trades

Our second round of testing checks whether the investor base explains the disappearance of the high-volume return premium, based on the interactions of the proxies of individual and institutional investors. Although the dataset does not identify the types of traders, we have the share trading volumes of large trades, which are defined as transactions of more than 100,000 shares. We conjecture that these large trades are mostly traded by institutional investors. By comparing two subsamples with and without large trades, we determine whether such large trades play any role in the volume-return relationship that we have found so far. We admit that brokers/dealers do not just trade in large orders, but also utilize extremely small orders for detecting prices and predicting market trends (Campbell et al., 2009); however, given that individual traders do not usually have large amounts of capital to allow large trades every time, the large trades are presumably from institutional traders.

By separating large trades in this way and labelling them as trades initiated by institutional traders, we can say that the trades that do not belong to this category are those initiated by

individual investors. Furthermore, we explore the information on the trade direction of large transactions and classify firms as having either large buy or large sell trades. These are defined as follows: given an interval, the signed volume of large trades of an individual stock, if any, over the five days prior to (including) the formation date is computed and denoted as OIB_*j*. If the total signed volume is positive, we consider the stock to be one with large buy trades; otherwise, it is a stock with large sell trades. The rationale behind this classification has its roots in the argument by Miller (1991), which is also quoted by GKM (2001) to support the visibility hypothesis: "*if traders have diverse opinions about the value of a stock, the traders who end up holding that stock will be the most optimistic about its value. ... if the stock's supply is limited because of constraints on short-selling, the opinions of the pessimistic traders will fail to be incorporated into the stock's prices, which will then only reflect the optimistic opinions of the stockholders.*" In China's stock market, short-selling is prohibited, meaning that only the buyer-initiated transactions reflect the optimistic opinions of investors, while the pessimistic opinions may be at most partially incorporated into the seller-initiated transactions. Thus, by such an argument, the high-volume stocks pertain to those buyer-initiated trades. To make this clearer, the buyer-initiated high-volume stocks have positive cumulative returns following the formation date, and thus, GKM (2001) observed the high-volume return premium. Therefore, it is important to distinguish whether the volume shock at the formation date of a certain stock comes from the buy side or not.

As we know, each transaction always has both buyer and seller sides. On the whole, if institutional traders buy a certain stock, it is more likely that individual traders, as their counterparts, are the sellers of such stock. Hence, the direction of large trades acts as a proxy for institutional traders' positive or negative opinions of the given stock. Figure 4 shows the proportions of stocks with large buy or sell trades over the total numbers of high- or low-volume stocks, respectively. Over time, institutional activities became involved in high-volume stocks more than in low-volume stocks (overall, the black solid and dashed lines are higher than the

grey solid and dashed lines, respectively), and the volume shock may be due in part to these large trades. This confirms that, due to short-selling constraints, institutional traders, being endowed with large capital, trade actively based on their optimistic opinions, and the high-volume stocks may incorporate this information.

[INSERT Table 3]

As CSRC reported, after the stock split reforms, the market started showing a significant presence of institutional traders in the total trading. Liao et al. (2011) found that institutional investors, especially mutual funds, have an information advantage in trading over individual shareholders in the Chinese stock market. The question is how such increased activities of institutional traders contribute to the significant phenomenon that is opposite to the high-volume return premium. With this in mind, we build up a subsample which eliminates those stocks for which large trades were detected in the five days prior to (including) the formation date. This is a cleaner sample to proxy for a portfolio in which individual traders dominate. Table 3 compares the results from the same sample period with and without large trades. Due to data availability issues, we only provide such a comparison for the after-reform subsample, 2008–2013. The comparison confirms our conjecture indirectly. The net returns of both the zero investment and reference return portfolios are generally higher in Panel A than in Panel B, where the latter considers only stocks without large trades. The results suggest that the high-volume stocks perform worse when large trades are involved than otherwise. This may be similar to the "pump and dump" situation (Putniņš, 2012), where investors may have indulged in the trading of large trades, and in particular, buying before the stocks reach their peak, which may be followed by the stocks experiencing free-fall. Another possible reason may be late entries by so-called noise traders. After observing large trades by institutional investors, these retail investors get excited and begin trading when the stock price is already quite high, almost at its short-term peak, whereupon the stocks soon start drifting down afterwards, thus inducing negative returns in the high-volume portfolio.

5.3. Robustness: firm size, short-term stock autocorrelation and momentum

Following GKM, we check the effect of size. We group stocks into different size groups based on their total operating revenues. According to the definition in Section 4, the big (small) firms are those whose total operating revenues in the previous year to the formation date are among the top (bottom) 30% of all listed firms; firms which do not belong to either group are considered medium sized firms. The zero investment portfolios are formed in a similar way as in the previous section. For the reference return portfolios, first, three size-adjusted reference portfolios are constructed, based on the firm size rankings; and, second, we construct a low-volume reference return portfolio by investing 1 Yuan long into each stock that has low volume and offset the long position by shorting a Yuan's worth of a size-adjusted reference portfolio, so that the net investment is zero. Similarly, we construct a high-volume reference return portfolio by investing 1 Yuan long into each stock that has high volume and offsetting the long position by shorting a Yuan's worth of a size-adjusted reference portfolio so that the net investment is zero. To determine whether the high-volume return premium disappeared, we then examine the net returns on a portfolio that takes a 1 Yuan total long position in the low-volume reference return portfolio and a 1 Yuan total short position in the high-volume reference return portfolio. The stocks in each long and short position are weighted equally and held for the test period (1, 2, 3, 4, 5, 10 and 20 days) without rebalancing.

In Table 4A, which reports results from the before-reform sample, the net returns to our zero investment portfolios for both medium- and large-sized firms are insignificantly different from zero before reform, except for the five-day category, while the returns for small-sized firms are significantly positive for two to five days. The results on the reference return portfolios show that the low-volume portfolios generate higher returns than the high-volume portfolios in most

instances, irrespective of the size of the firms, although the most significant results are in the large-firm segment.

In contrast, Table 4B shows the results using the after-reform subsample, and exhibits quite a different picture. Zero investment portfolios on small- and medium-sized firms have significant positive returns for all holding horizons, which can reach 2.42% and 1.48%, respectively, for holding the corresponding portfolio for 20 days. The zero investment portfolio constructed using only large-sized firms exhibits significantly positive returns for holding for more than a week. The reference return portfolios across the three different-sized groups of firms show that the net returns show a statistically significant positive coefficient for all sizes of firms, but careful observation indicates that the high-volume portfolios show negative returns, with the most negative return being shown by the small-size firm group.

[INSERT Table 4A & 4B]

To test whether the disappearing high-volume return premium is due to the effect of volume on the short-term return autocorrelation, we restrict our data samples to "normal" return subsamples. That is, we use only the subsample of stocks whose returns at the formation date are considered to be in the middle 40% relative to the daily returns over the whole trading interval. The results are reported in Panels A and B of Table 5.

In both the before- and after-reform period subsamples, the net returns show positive and statistically significant coefficients, particularly in the case of reference return portfolios. In the post-reform subsample, the high-volume portfolios show more negative returns than in the pre-reform period. In summary, among the stocks that observed normal returns prior to the formation period, low-volume stocks show positive and statistically significant returns for two to five days after the formation date in the pre-reform subsample. On the other hand, in reference portfolios, the high-volume stocks observe negative returns in both the before- and after-reform subsamples. This suggests that the net returns on our portfolios are not the result of

either short-term autocorrelations that may exist in returns or the impact of the trading volume on these autocorrelations. Instead, the fact that the high-volume returns are lower than the low-volume returns reflects the fact that the "normal" returns associated with "unusually" high levels of trading activity tend to be followed by lower returns.

[INSERT Table 5]

Having witnessed the abnormal volume-price relationship, we want to make sure that the stock price behaviour of a particular category (high volume/low volume) is driven by the abnormal volume rather than by previous price movements; thus, we considered medium-term autocorrelation of both high- and low-volume stocks. Although neither the high-volume return premium nor the opposite phenomenon is anything to do with short-term stock autocorrelation, following GKM, we also investigate whether it is related to medium-term interactions. To assess this, we split our high- and low-volume stocks into two momentum subsamples. They are classified based on the returns experienced by each stock during the reference period. Specifically, a stock is classified as a winner (loser) if its reference period return is larger (smaller) than the medium return on all stocks over that period. We also apply the reference return portfolio strategy to each of these subsamples. The average cumulative returns of the test periods for both the zero investment and reference return portfolios are presented in Tables 6A and 6B.

To identify the effects of momentum, we also perform a similar analysis when considering realized returns: past winners and past losers. Comparing Tables 6A and 6B, which report the results from the before- and after-reform subsamples respectively, two things are evident. (1) Although zero investment portfolios based on positive realized returns (past winners) yield negative returns both before and after reform, which is consistent with the high volume return premium, this result is not statistically significant except in the after-reform subsample when

holding for at least two weeks. Meanwhile, the zero investment portfolios of past loser firms yield positive returns for both the before- and after-reform subsamples. This is contrary to the high-volume return premium and consistent with our findings in previous sections. (2) Reference return portfolios after the reform have experienced significantly positive returns, regardless of whether the firms involved are past winners or losers. On the other hand, before the reform, portfolios conditional on negative realized returns have negative net returns following the formation date, and portfolios conditional on positive realized returns have weakly positive net returns. In conclusion, momentum appears to have weak, insignificant effect on zero investment portfolios, but there is no evidence that it has any effect on reference-investment portfolios.

[INSERT Table 6A & 6B]

6. Conclusions

This paper shows that, since 2001, the high-volume return premium has disappeared from China's stock market, with the reverse phenomenon being found instead in the subsample period 2008–2013, after the split-share reform. We document that, by and large, individual stocks with unusually high (low) trading activity levels over periods of a day or a week, as measured by the trading volume during those periods, tend to experience negative (positive) returns over the subsequent days, especially in the after-reform subsample. To investigate the reason for the disappearance of the high-volume premium, we employ two empirical designs that control for the turnover effect and the large trade effect respectively. Using a volume measure that is scaled by tradable shares, we aim to disentangle the effects of volume shocks from those of supply shocks, controlling for the liquidity changes.

There are two factors that have contributed to these recent dynamics. First, the share-split reform initiated by the Chinese government in 2005 aimed to convert all non-tradable shares

into tradable shares. Our results suggest that the liquidity changes around reforms do not have any significant impact on the volume-return relationship, but that supply shocks are the main driver of the volume-return discount. When a stock experiences a supply shock and may be without fundamental support, the traded volume under-adjusts to the increased number of shares outstanding, meaning that even if the stock experiences a volume shock compared to its own recent trading history, the return performance determined by fundamentals would decline and such high-volume stocks would yield lower and even negative returns following the formation date. Hence, it is not surprising to observe that the portfolio that takes a short position of high-volume stocks and a long position of low-volume ones yields positive returns.

In addition, when institutional traders, who are generally more informed than individual traders, invest in large-size trades in a particular stock, this creates its own visibility. Such a visibility encourages individual traders to enter the market, but since the stock is likely to be overpriced already, its returns decline following the formation date. Although our investigation is restricted by a lack of data availability, we show this by comparing the portfolio performances with and without large trades over the after-reform sample. While our starting point in this paper is rooted in the study of China's stock market that was analysed first by KOZ, we have found a different phenomenon in a more recent sample. This paper adds to the literature the findings that the high-volume return premium may not necessarily exist in a market that is more or less populated by individual traders, and, if a stock is experiencing a supply shock, there may be a high-volume return discount instead of a high-volume return premium.

Figure 4 Proportion of Firms with Large Buy or Sell Trades over 5 Days Prior to (Including) the Formation Date in Each Interval

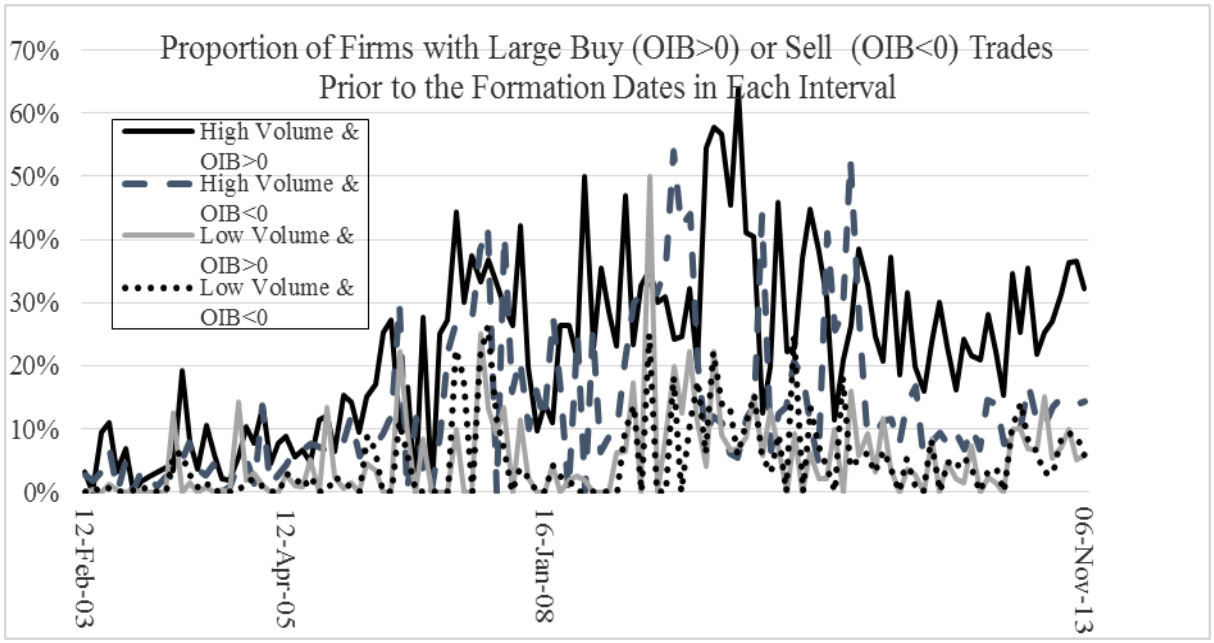


Figure 4 Proportion of Firms with Large Buy or Sell Trades over the Five Days Prior to (Including) the Formation Date in Each Interval. At the end of the 50th day of each interval, following the methodology illustrated in Figure 2, we identify high- and low-volume portfolios. In a given interval, the volume of large trades (if any) for the five days prior to (including) the formation date is summed and classified by the sign of such a total signed volume as Large Buy (OIB > 0) or Large Sell (OIB < 0). All firms which are identified as high-volume stocks and classified in the large buy group are counted, then this number is scaled by the number of high-volume stocks in the interval; all firms that are identified as high-volume stocks and classified in the large sell group are also counted, and this number is scaled by the number of high-volume stocks. The resulting numbers are plotted in solid and dashed black lines respectively. Similarly, we calculate the fractions of large buys and sells in the low-volume group, and plot them in the solid grey line and the dotted line, respectively.

Table 1 Descriptive Statistics of Daily Trading in the Chinese A-Share Market

During our sample period from July 2, 2001, to December 31, 2013, there are a total of 141 overlapping trading intervals that are formed as Figure 2 shows. For each interval, each stock is classified in one of three size groups, according to its sales (total operating revenue) decile at the end of the year preceding the formation period. Firms in sales deciles eight to ten are assigned to the large-firm group, firms in deciles four to seven are assigned to the medium-firm group, and those in deciles one to three are assigned to the small-firm group. Volume is measured by the number of shares traded each day in each stock. The averages and medians in each panel are taken over all of the trading days in all trading intervals in the specified sample period.

		Small firms	Medium firms	Large firms	All firms
Panel A: Overall sample period – 141 intervals (Last formation date: 2013/11/06)					
Avg. # stocks in sample		134	178	134	445
Sales (1 M CNY)	Mean	205.21	713.60	10622.46	3531.98
	Median	200.01	651.08	2934.90	652.41
Avg. # of shares traded (1,000 shares)	Mean	3364	4505	9558	5675
	Median	2146	3003	5413	3197
Turnover (%)	Mean	2.71	2.23	1.80	2.25
	Median	1.95	1.66	1.36	1.64
Daily return (%)	Mean	0.043	0.050	0.048	0.047
	Median	–0.197	–0.174	–0.160	–0.181
Panel B: Before-reform sub-sample (2001/07/02–2005/03/31) – 40 intervals (Last formation date: 2005/02/02)					
Avg. # stocks in sample		159	212	159	531
Sales (1 M CNY)	Mean	125.00	411.89	2467.74	942.49
	Median	126.25	388.64	1338.35	389.04
Avg. # of shares traded (1,000 shares)	Mean	757	954	1736	1130
	Median	407	538	864	560
Turnover (%)	Mean	1.00	0.87	0.91	0.92
	Median	0.63	0.56	0.59	0.58
Daily return (%)	Mean	–0.120	–0.093	–0.062	–0.092
	Median	–0.219	–0.181	–0.156	–0.187
Panel C: After-reform sub-sample (2008/01/02–2013/12/31) – 67 intervals (Last formation date: 2013/12/02)					
Avg. # stocks in sample		143	191	143	476
Sales (1 M CNY)	Mean	271.16	966.13	18321.09	5960.08
	Median	258.55	870.96	4430.46	873.92
Avg. # of shares traded (1,000 shares)	Mean	4963	6716	14986	8667
	Median	3065	4405	8368	4753
Turnover (%)	Mean	3.32	2.62	1.86	2.60
	Median	2.29	1.87	1.36	1.81
Daily return (%)	Mean	–0.002	–0.020	–0.048	–0.023
	Median	–0.290	–0.279	–0.269	–0.284

Table 2A- Before-Reform Subsample (2001–2005)

Average cumulative returns of the zero investment and reference return on volume portfolios

In each trading interval, stocks are grouped according to their trading volumes. The volume is measured by the number of shares traded. The volume classification is based on whether the stock's trading volume at the formation date is among the top 20% (high volume) or bottom 20% (low volume) of the 50 daily volumes over the whole trading interval. The formation strategies for the zero investment and reference return portfolios are defined in Section 3. This table reports tests for seven different holding horizons following the formation date: 1, 2, 3, 4, 5, 10 and 20 trading days. The numbers in parentheses are Newey-West *t*-statistics from tests of whether the average returns are statistically different from zero.

	Panel A: Cross-sectionally liquid stocks (high turnover ratio)													
	Zero investment							Reference return						
	1	2	3	4	5	10	20	1	2	3	4	5	10	20
High volume	–0.08	–0.38	–0.39	–0.38	–1.00	–0.58	–1.92	–0.01	–0.10	–0.08	–0.11	–0.20	0.10	–0.44
								–0.30	–1.62	–1.07	–1.26	–1.98	0.70	–2.53
Low volume	–0.04	–0.07	0.03	0.09	–0.11	–0.56	–1.25	0.01	0.12	0.12	0.21	0.30	0.15	0.27
								0.32	3.02	2.24	3.13	4.14	1.46	1.85
Net returns	0.04	0.31	0.41	0.47	0.90	0.01	0.67	–0.02	0.09	0.05	0.09	0.15	–0.06	0.19
	0.27	1.46	1.75	1.90	3.14	0.03	1.58	–3.20	11.71	5.11	7.09	11.06	–3.30	7.78
	Panel B: Cross-sectionally illiquid stocks (low turnover ratio)													
High volume	–0.11	–0.18	–0.20	–0.26	–0.75	–0.71	–1.58	0.01	0.01	0.01	–0.03	–0.10	–0.09	–0.19
								0.19	0.22	0.19	–0.43	–1.39	–0.86	–1.37
Low volume	0.05	–0.15	–0.01	0.27	0.17	0.10	–0.96	0.02	0.06	0.11	0.18	0.27	0.27	0.20
								0.65	1.62	2.35	3.09	3.87	2.54	1.44
Net returns	0.06	0.03	0.17	0.44	0.77	0.57	0.28	–0.02	–0.02	–0.03	–0.03	–0.01	0.01	0.04
	0.49	0.20	1.05	2.35	3.10	1.77	0.59	–5.07	–4.11	–5.12	–3.94	–0.78	0.93	2.95

Table 2B- After-Reform Subsample (2008–2013)

Average cumulative returns of the zero investment and reference return on volume portfolios

In each trading interval, stocks are grouped according to their trading volumes. The volume is measured by the number of shares traded. The volume classification is based on whether the stock's trading volume at the formation date is among the top 20% (high volume) or bottom 20% (low volume) of the 50 daily volumes over the whole trading interval. The formation strategies for the zero investment and reference return portfolios are defined in Section 3. This table reports tests for seven different holding horizons following the formation date: 1, 2, 3, 4, 5, 10 and 20 trading days. The numbers in parentheses are Newey-West *t*-statistics from tests of whether the average returns are statistically different from zero.

	Panel C: Cross-sectionally liquid stocks (high turnover ratio)													
	Zero investment							Reference return						
	1	2	3	4	5	10	20	1	2	3	4	5	10	20
High volume	–0.15	0.07	0.07	–0.24	–0.23	0.38	–1.32	–0.13	–0.27	–0.42	–0.48	–0.61	–0.80	–0.81
								–2.35	–3.13	–4.43	–4.44	–5.09	–5.16	–3.67
Low volume	0.11	0.64	1.11	0.99	1.24	1.46	1.10	0.04	0.06	0.15	0.13	0.13	0.12	0.19
								1.17	1.39	2.56	1.87	1.77	1.15	1.24
Net returns	0.19	0.47	0.96	1.17	1.39	1.19	2.64	0.09	0.26	0.41	0.45	0.56	0.58	1.01
	0.93	1.79	2.96	3.14	3.37	2.75	4.32	12.22	24.55	32.49	31.48	37.11	27.76	35.73
	Panel D: Cross-sectionally illiquid stocks (low turnover ratio)													
High volume	–0.22	0.21	0.45	0.40	0.60	1.07	0.16	–0.07	–0.15	–0.22	–0.19	–0.35	–0.36	–0.29
								–1.64	–2.21	–2.91	–2.06	–3.67	–2.72	–1.52
Low volume	0.19	0.94	1.22	1.04	1.37	1.86	0.75	0.03	0.06	0.09	0.07	0.11	0.20	0.23
								1.09	1.50	1.91	1.20	1.59	2.07	1.68
Net returns	0.34	0.63	0.74	0.69	0.83	0.99	1.20	0.04	0.10	0.16	0.19	0.20	0.15	0.25
	2.30	2.96	2.98	2.41	2.51	1.96	2.55	8.94	14.84	20.74	21.66	21.16	11.06	13.43

Table 3- After-Reform Subsample (2008–2013), including or excluding Stocks with Large Trades Detected in the five days Prior to Formation date

Average cumulative returns of the zero investment and reference return on volume portfolios

In each trading interval, stocks are grouped according to their trading volumes. The volume classification is based on whether the stock's trading volume at the formation date is among the top 20% (high volume) or bottom 20% (low volume) of the 50 daily volumes over the whole trading interval. We only use the subsample of stocks whose returns at the formation date are classified as normal. Normal returns are considered to be the middle 40%: returns that are not in either the top 30% or the bottom 30% relative to the daily returns over the whole trading interval. The formation strategies for the zero investment and reference return portfolios are defined in Section 3. This table reports tests for seven different holding horizons following the formation date: 1, 2, 3, 4, 5, 10 and 20 trading days. The numbers in parentheses are Newey-West *t*-statistics from tests for whether the average returns are statistically different from zero.

	Zero investment							Reference return						
	Panel A: 2008/01/02–2013/12/31 All stocks													
	1	2	3	4	5	10	20	1	2	3	4	5	10	20
High volume	–0.22	0.11	0.28	0.13	0.23	0.67	–0.63	–0.10	–0.20	–0.32	–0.31	–0.46	–0.55	–0.51
								–2.89	–3.73	–5.06	–4.06	–5.97	–5.27	–3.49
Low volume	0.12	0.67	1.06	0.95	1.23	1.45	1.03	0.03	0.05	0.12	0.09	0.11	0.13	0.17
								1.42	1.79	3.05	1.87	2.05	1.81	1.60
Net returns	0.28	0.47	0.70	0.76	0.92	0.90	1.87	0.08	0.21	0.31	0.33	0.41	0.45	0.78
	2.08	2.12	2.64	2.50	2.75	2.20	3.53	16.84	30.10	36.69	33.71	40.22	32.19	40.95
	Panel B: 2008/01/02–2013/12/31 Stocks without large trades 5 days prior to and at the formation date													
High volume	–0.13	0.15	0.35	0.18	0.43	1.19	0.18	–0.04	–0.17	–0.20	–0.18	–0.29	–0.28	–0.05
								0.87	–2.62	–2.63	–1.95	–3.08	–2.26	–0.27
Low volume	0.11	0.61	1.00	0.90	1.21	1.50	0.92	0.01	0.04	0.07	0.08	0.09	0.03	0.00
								0.64	1.18	1.82	1.60	1.58	0.41	0.00
Net returns	0.18	0.38	0.59	0.67	0.72	0.42	0.94	0.05	0.16	0.19	0.20	0.26	0.25	0.40
	1.09	1.53	1.87	1.86	1.87	0.90	1.73	9.66	21.46	20.73	18.77	22.17	16.02	18.56

Table 4A- Before-Reform Subsample (2001–2005)

Average cumulative returns of the zero and reference volume-size portfolios

In each trading interval, stocks are grouped according to their size and trading volume. Large-, medium-, and small-sized stocks are classified as the top 30%, the middle 40% and the bottom 30%, respectively, based on firms' total market values at end of each trading interval or formation date. The proxy for trading volume is the number of shares traded. The volume classification is based on whether the stock's trading volume at the formation date is among the top 10% (high volume) or bottom 10% (low volume) of the 30 daily volumes over the whole trading interval. The formation strategies for the zero investment and reference return portfolios are defined in Section 3. This table reports tests for seven different holding horizons following the formation date: 1, 2, 3, 4, 5, 10 and 20 trading days. The numbers in parentheses are Newey-West *t*-statistics from tests for whether the average returns are statistically different from zero.

	Zero portfolio							Reference portfolio						
	1	2	3	4	5	10	20	1	2	3	4	5	10	20
	Panel A: Small firms													
High volume	–0.15	–0.48	–0.48	–0.58	–1.20	–0.99	–2.56	–0.02	–0.14	–0.14	–0.22	–0.30	–0.13	–0.55
								–0.42	–1.73	–1.46	–2.03	–2.48	–0.77	–2.77
Low volume	0.01	–0.12	0.03	0.11	–0.16	–0.68	–1.69	0.00	0.09	0.11	0.17	0.32	0.15	0.16
								–0.03	1.82	1.64	2.11	3.50	1.08	0.87
Net returns	0.16	0.37	0.51	0.69	1.04	0.31	0.87	–0.01	0.09	0.09	0.12	0.23	0.05	0.22
	1.14	2.04	2.72	2.75	3.12	0.83	1.65	–0.99	8.31	6.41	7.84	12.33	2.07	7.60
	Panel B: Medium firms													
High volume	–0.04	–0.18	–0.18	–0.24	–0.78	–0.62	–1.60	0.02	–0.01	–0.01	–0.05	–0.13	–0.03	–0.20
								0.44	–0.13	–0.15	–0.70	–1.51	–0.25	–1.14
Low volume	–0.12	–0.19	–0.13	0.08	0.14	0.01	–0.54	–0.01	0.02	0.01	0.08	0.15	0.14	0.19
								–0.27	0.49	0.25	1.21	1.97	1.28	1.31
Net returns	–0.12	–0.05	–0.10	0.13	0.63	0.31	0.55	–0.02	0.00	–0.01	0.03	0.08	0.04	0.16
	–1.19	–0.31	–0.46	0.51	2.90	1.02	1.25	–3.82	–0.53	–1.10	2.37	6.02	2.00	6.64
	Panel C: Large firms													
High volume	–0.10	–0.16	–0.22	–0.09	–0.57	–0.23	–0.91	–0.02	–0.01	0.01	0.03	–0.02	0.09	–0.25
								–0.29	–0.08	0.15	0.33	–0.16	0.63	–1.30
Low volume	–0.11	0.00	0.16	0.31	0.14	–0.30	–1.09	0.05	0.17	0.23	0.31	0.33	0.22	0.21
								1.49	3.23	3.44	3.99	3.93	1.73	1.08
Net returns	–0.06	0.17	0.35	0.34	0.59	–0.10	–0.34	0.00	0.06	0.07	0.08	0.11	–0.07	0.07
	–0.43	0.84	1.58	1.45	2.74	–0.21	–0.72	–0.38	6.31	5.74	6.04	6.94	–3.42	2.34

Table 4B- After-Reform Subsample (2008–2013)

Average cumulative returns of the zero and reference volume-size portfolios

In each trading interval, stocks are grouped according to their size and trading volume. Large-, medium-, and small-sized stocks are classified as the top 30%, the middle 40% and the bottom 30%, respectively, based on firms' total market values at end of each trading interval or formation date. The volume classification is based on whether the stock's turnover at the formation date is among the top 10% (high volume) or bottom 10% (low volume) of the 30 daily turnovers over the whole trading interval. The turnover is defined as the ratio of the value of shares traded to the market value of tradable shares. The formation strategies for the zero investment and reference return portfolios are defined in Section 3. This table reports tests for seven different holding horizons following the formation date: 1, 2, 3, 4, 5, 10 and 20 trading days. The numbers in parentheses are Newey-West *t*-statistics from tests for whether the average returns are statistically different from zero.

	Zero investment							Reference return						
	1	2	3	4	5	10	20	1	2	3	4	5	10	20
	Panel A: Small firms													
High volume	–0.46	–0.15	–0.13	–0.35	–0.48	0.30	–0.85	–0.21	–0.33	–0.53	–0.53	–0.76	–0.90	–0.82
								–3.35	–3.37	–4.66	–3.86	–5.24	–4.72	–3.11
Low volume	0.27	0.82	1.20	1.08	1.38	1.53	1.09	0.06	0.05	0.12	0.11	0.14	0.06	0.18
								1.44	0.81	1.74	1.29	1.45	0.42	0.89
Net returns	0.59	0.79	1.18	1.31	1.73	1.46	2.42	0.16	0.28	0.48	0.50	0.66	0.61	1.00
	3.44	2.62	3.18	2.78	3.24	2.23	2.88	18.57	22.02	31.57	28.22	33.77	22.22	27.34
	Panel B: Medium firms													
High volume	–0.14	0.18	0.34	0.19	0.46	0.73	–0.30	–0.04	–0.11	–0.18	–0.18	–0.29	–0.46	–0.28
								–0.65	–1.30	–1.83	–1.49	–2.34	–2.95	–1.26
Low volume	0.16	0.82	1.18	1.00	1.32	1.18	0.98	0.00	0.05	0.11	0.12	0.11	0.18	0.14
								0.07	1.05	1.96	1.66	1.37	1.61	0.90
Net returns	0.23	0.56	0.76	0.76	0.77	0.55	1.48	0.02	0.19	0.25	0.28	0.31	0.37	0.56
	1.28	2.24	2.70	2.56	2.26	1.18	2.50	2.60	17.31	19.40	18.93	19.16	17.75	19.51
	Panel C: Large firms													
High volume	–0.09	0.26	0.54	0.41	0.53	0.81	–0.69	–0.08	–0.16	–0.25	–0.21	–0.35	–0.27	–0.41
								–1.28	–1.69	–2.29	–1.57	–2.63	–1.36	–1.63
Low volume	0.11	0.78	1.11	1.04	1.31	1.98	0.98	0.05	0.07	0.10	0.01	0.06	0.11	0.12
								1.38	1.41	1.63	0.09	0.71	0.91	0.70
Net returns	0.19	0.47	0.44	0.56	0.67	1.18	1.73	0.10	0.17	0.21	0.20	0.29	0.32	0.71
	0.90	1.78	1.64	1.44	1.59	2.48	3.24	12.77	15.30	15.82	12.70	16.89	13.35	22.52

Table 5-

Average Cumulative Returns of the Zero Investment and Reference Return on Volume Portfolios Based on Normal Return Subsamples

In each trading interval, stocks are grouped according to their trading volume. The volume classification is based on whether the stock's trading volume at the formation date is among the top 20% (high volume) or bottom 20% (low volume) of the 50 daily volumes over the whole trading interval. We only use the subsample of stocks whose returns at the formation date are classified as normal. Normal returns are considered as the middle 40%: returns that are not in either the top 30% or the bottom 30% relative to the daily returns over the whole trading interval. The formation strategies for the zero investment and reference return portfolios are defined in Section 3. This table reports tests for seven different holding horizons following the formation date: 1, 2, 3, 4, 5, 10 and 20 trading days. The numbers in parentheses are Newey-West *t*-statistics from tests for whether the average returns are statistically different from zero.

	Zero investment							Reference return						
	Panel A: Before-reform subsample (2001–2005)													
	1	2	3	4	5	10	20	1	2	3	4	5	10	20
High volume	–0.32	–0.72	–0.75	–0.74	–1.04	–0.92	–1.66	–0.05	–0.23	–0.32	–0.41	–0.49	–0.36	–0.44
								–0.83	–2.56	–3.14	–3.48	–3.46	–1.85	–1.55
Low volume	–0.06	–0.07	0.07	0.17	0.00	–0.53	–1.52	0.00	0.08	0.12	0.14	0.20	0.12	0.16
								–0.13	2.11	2.36	2.39	3.05	1.19	1.18
Net returns	0.04	0.40	0.57	0.77	1.01	0.40	–0.18	0.01	0.10	0.16	0.17	0.21	0.09	0.25
	0.37	2.70	4.80	4.21	4.03	1.21	–0.27	2.01	12.76	16.52	15.09	15.76	5.10	9.47
	Panel B: After-reform subsample (2008–2013)													
High volume	–0.16	0.30	0.40	0.00	0.01	0.48	–0.91	–0.21	–0.40	–0.44	–0.42	–0.50	–0.72	–0.79
								–3.11	–4.35	–4.12	–3.32	–3.55	–3.68	–2.99
Low volume	0.07	0.36	0.62	0.42	0.63	1.38	0.87	0.02	0.06	0.07	0.03	0.04	0.00	0.11
								0.66	1.44	1.46	0.57	0.65	–0.06	0.86
Net returns	0.50	0.41	0.37	0.52	0.74	0.54	0.79	0.06	0.13	0.11	0.09	0.14	0.09	0.31
	2.16	1.24	1.19	1.23	1.87	1.22	1.65	8.97	14.72	10.32	7.11	9.69	4.28	11.69

Table 6A- Before-Reform Subsample (2001–2005)

Average cumulative returns of the zero and reference volume-momentum portfolios

In each trading interval, stocks are grouped according to their momentum and trading volume. Winner (Loser) includes those stocks whose average reference period returns are in the top (bottom) 50% relative to the entire cross-section of reference period returns for all stocks. The proxy for trading volume is the number of shares traded. The volume classification is based on whether the stock's trading volume at the formation date is among the top 10% (high volume) or bottom 10% (low volume) of the 30 daily volumes over the whole trading interval. The formation strategies for the zero investment and reference return portfolios are defined in Section 3. This table reports tests for seven different holding horizons following the formation date: 1, 2, 3, 4, 5, 10 and 20 trading days. The numbers in parentheses are Newey-West *t*-statistics from tests for whether the average returns are statistically different from zero.

	Zero investment							Reference return						
	1	2	3	4	5	10	20	1	2	3	4	5	10	20
	Panel A: Winners													
High volume	0.32	0.48	0.79	1.16	0.93	2.41	4.12	0.02	–0.04	–0.05	–0.09	–0.16	–0.01	–0.34
								0.49	–0.69	–0.80	–1.26	–1.97	–0.06	–2.24
Low volume	0.09	0.27	0.63	1.13	1.25	2.34	3.81	0.00	0.09	0.08	0.16	0.27	0.16	0.18
								0.02	2.20	1.51	2.46	3.76	1.55	1.18
Net returns	–0.18	–0.15	–0.16	–0.07	0.27	–0.18	–0.28	–0.02	0.06	0.04	0.07	0.16	–0.03	0.14
	–1.39	–0.74	–0.71	–0.27	0.65	–0.36	–0.72	–3.89	7.25	4.38	6.47	12.78	–1.94	6.00
	Panel B: Losers													
High volume	–0.47	–0.88	–1.18	–1.52	–2.32	–3.17	–6.64	0.00	–0.02	0.02	0.01	–0.04	0.07	–0.14
								0.10	–0.29	0.34	0.18	–0.43	0.58	–0.93
Low volume	–0.27	–0.52	–0.66	–0.83	–1.31	–2.89	–6.00	0.00	0.06	0.10	0.17	0.22	0.20	0.19
								0.08	1.57	1.97	2.78	3.18	1.99	1.42
Net returns	0.20	0.36	0.52	0.69	1.01	0.29	0.64	–0.02	–0.02	–0.05	–0.08	–0.07	–0.11	–0.07
	1.78	2.89	3.20	3.08	5.73	0.90	2.01	–5.94	–4.63	–7.52	–9.22	–7.16	–9.12	–4.36

Table 6B- After-Reform Subsample (2008–2013)

Average cumulative returns of the zero and reference volume-momentum portfolios

In each trading interval, stocks are grouped according to their momentum and trading volume. Winner (Loser) includes those stocks whose average reference period returns are in the top (bottom) 50% relative to the entire cross-section of reference period returns for all stocks. The volume classification is based on whether the stock's turnover at the formation date is among the top 10% (high volume) or bottom 10% (low volume) of the 30 daily turnovers over the whole trading interval. The turnover is defined as the ratio of the value of shares traded to the market value of tradable shares. The formation strategies for the zero investment and reference return portfolios are defined in Section 3. This table reports tests for seven different holding horizons following the formation date: 1, 2, 3, 4, 5, 10 and 20 trading days. The numbers in parentheses are Newey-West *t*-statistics from tests for whether the average returns are statistically different from zero.

	Zero investment							Reference return						
	1	2	3	4	5	10	20	1	2	3	4	5	10	20
	Panel A: Winners													
High volume	0.38	1.41	2.18	2.56	3.24	5.77	8.09	–0.11	–0.12	–0.22	–0.17	–0.29	–0.41	–0.45
								–2.17	–1.50	–2.41	–1.53	–2.48	–2.68	–2.12
Low volume	0.33	1.21	1.96	2.05	2.67	4.27	7.22	0.01	0.00	0.02	0.00	0.08	0.11	0.16
								0.37	0.04	0.28	0.03	0.97	0.90	0.93
Net returns	–0.13	–0.29	–0.31	–0.57	–0.63	–1.45	–0.77	0.10	0.21	0.29	0.30	0.43	0.42	0.90
	–0.67	–1.29	–1.42	–2.10	–1.72	–3.56	–1.83	12.93	18.33	21.87	19.98	26.57	20.12	30.74
	Panel B: Losers													
High volume	–0.61	–0.73	–1.02	–1.59	–1.89	–2.99	–7.05	–0.09	–0.30	–0.43	–0.48	–0.69	–0.67	–0.58
								–2.02	–4.81	–5.76	–5.09	–7.60	–5.02	–3.08
Low volume	–0.17	0.00	–0.07	–0.43	–0.40	–1.56	–5.79	0.05	0.10	0.18	0.15	0.13	0.09	0.11
								1.92	2.88	3.91	2.71	2.07	1.02	0.88
Net returns	0.39	0.68	0.99	1.27	1.55	1.63	1.74	0.02	0.09	0.16	0.23	0.30	0.28	0.28
	2.61	2.88	3.22	3.59	3.84	3.75	4.57	5.00	14.34	20.45	25.40	30.62	20.62	14.75

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