

## The Behavior of Stock Prices on the Shanghai Securities Exchange: Implications for the Stock Market Reform in China

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This paper examines the daily stock price behavior of the 175 individual stocks traded on the Shanghai Securities Exchange for the period of August 1992 through August 1995. We find that stock prices on the exchange tend to move in step with each other. We argue that the market does not appear to efficiently allocate capital resources to their best use. In addition, we find that stock prices on the exchange mostly follow a random walk – serial correlations of stock prices are mostly statistically insignificant. The paper concludes with some policy suggestions to make the market more efficient.

### Introduction

Economic growth depends greatly on the level of capital and the efficiency with which it is used. One of the main functions of capital markets is to efficiently allocate capital to its best users. In many developed economies, the stock market is an important part of its capital market. In an “allocatively” efficient stock market, more efficient companies should command higher stock prices. Consequently, these companies should be able to attract investors much more easily than do companies that are poorly run. Therefore, scarce capital resources will be directed to efficiently-run companies, a situation that is conducive for faster economic growth.

Finance theories suggest that changes in the stock price can be attributed to two factors: 1) changes in pervasive economy-wide factors and 2) events that are specific to the firm itself<sup>1</sup>. In a well-developed stock market such as the United States, firm-specific information has substantial influence upon stock prices. For example, Roll (1988) finds that changes in market-wide factors can explain only about 30% of cross-sectional variations in stock returns with *monthly* data. Robin (1993) documents that the market portfolio can only explain approximately 7% of the cross-sectional variations with *daily* data. That is, in the U.S. stock prices seem to be mainly driven by firm-specific information. Therefore, the U.S. stock market seems to discriminate firms in allocating scarce capital resources.

In addition to the concept of “allocative” efficiency, there is another definition of efficiency that is important to the stock market - “informational” efficiency. An “informationally” efficient stock market is one in which the stock price reflects all available information about a firm’s business prospects<sup>2</sup>.

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<sup>1</sup> This dichotomy is clear from either the Capital Asset Pricing Model (CAPM) or the Arbitrage Pricing Theory (APT).

<sup>2</sup> There are three general forms of market efficiency. The most stringent form of market efficiency requires that the stock price reflect both private and public information pertinent to the firm - the strong-form of market efficiency. The semi-strong form of efficiency requires that the stock price reflect all publicly available information about the firm (annual reports, newspaper articles, historical prices, etc.). Finally, the

In this paper, we examine the behavior of stock prices on the Shanghai Securities Exchange(SSE) from August, 1992 through August, 1995<sup>3</sup>. We find two major results: Most of the cross-sectional variations in individual stock returns are explained by a single market-wide factor, the market index. Firm-specific information accounts for only about 30% of the variations in daily stock returns. This is almost the opposite of the findings on the U.S. stock market as mentioned earlier. Our results seem to suggest that investors in the Shanghai stock market did not sufficiently differentiate individual stocks; therefore the market may not be “allocatively” efficient for the time period studied. Secondly, we cannot reject the hypothesis that stock prices of most firms on the SSE follow a random walk, meaning that investors cannot consistently predict changes in future stock prices based on past price changes. Therefore, the market is “informationally” efficient *in the weak form*.

The paper is organized as follows: Section 2 provides an overview of the Shanghai Securities Exchange, followed by an examination of the relative importance of economy-wide factors in explaining cross-sectional stock returns. Section 4 conducts tests of “informational” market efficiency and section 5 concludes the paper, and discusses some policy issues as to what needs be done to improve the Chinese stock market.

### An Overview

The Shanghai Securities Exchange was established in December 1990. As of August 31 1995, 175 companies are listed on the exchange with “A” shares and 39 companies with “B” shares.

“A” shares are the shares that are available to domestic investors, and they are denominated in the Chinese currency, Renminbi (RMB), subscribed for and traded in RMB by domestic investors. “A” shares can be further classified into four categories according to the ownership: State holdings (held by the government or its agencies), legal-person holdings (held by other companies), internal holdings (held by employees), and individual holdings (held by the public). Currently, shares held by the general public are the only shares that can be traded on the exchange, although some selective trading of the internal and legal-person shares is very active in an over-the-counter market.

The second class of shares is the “B” shares -- denominated in RMB, but subscribed for and traded in either the U.S. \$ or the Hong Kong \$ by foreign investors. The U.S. \$ B shares are traded on the SSE and the HK\$ B shares are traded on the Shenzhen Stock Exchange. In this paper, we concentrate our analysis on the class of “A” shares only.

The Shanghai Securities Exchange (SSE) Index of “A” shares (hereafter the market index) is a market value-weighted average of eight “A” shares (base value = 100 on December 19, 1990). Figure 1 plots the SSE Index from August 1992 through August 1995. Figure 2 plots the daily returns of the market index for the same period. Like many emerging stock markets, the Shanghai market index is extremely volatile. Starting at 1031.55 on August 3, 1992, the index fell to 401.44 on November 20, 1992 before it reached an all-time high of 1536.82 on February

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weak form of efficiency requires the stock price to reflect information contained in all the past stock prices of the firm. For more detailed discussions of market efficiency, please see Fama (1970).

<sup>3</sup> As China continues to enjoy fast economic growth, international investors are anxious to participate in the economy. However, there is not much research on the Chinese stock market due to the lack of data.

15, 1993. That is, the index soared by 383% in less than three months! It then kept declining with a few rebounds until reaching a minimum of 333.92 on July 29, 1994. On the next trading day, August 1, 1994, the announcement of a moratorium on new shares to be listed on the exchange sent the index skyrocketing to 455.5 - a jump of 29% from the previous trading day! For the remaining time period, the index fluctuates mainly between 600 and 800.

**Figure 1: Daily Close for the SSE Index for the Period of August 1992 through August 1995**



**Figure 2: Daily Returns for the SSE Index from August 1992 through August 1995**

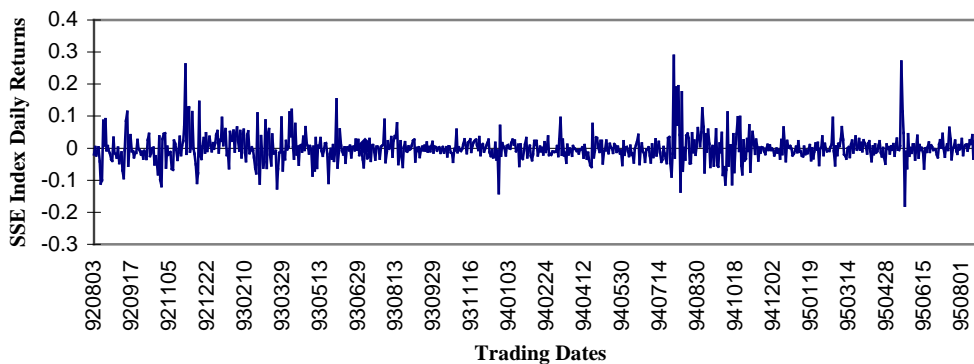


Table 1 is a summary of key descriptive statistics on the 175 “A” shares. It is not surprising that average daily returns are not statistically different from zero. Given the extreme volatile stock market behavior noted above, it is not surprising either that both the skewness and kurtosis measures for most shares are different from the values expected under a normal distribution<sup>4</sup>. The mean skewness is 0.995 with a median of 1.1285 and a 1<sup>st</sup> quartile of 0.372. Thus an overwhelming majority of the 175 shares have positive skewness, indicating that the return distributions have asymmetric tails extending to positive returns. In addition, the kurtosis measure for the 175 shares has a minimum value of 4.746, meaning that daily returns for all the

<sup>4</sup> A normal distribution has a skewness of 0 and a kurtosis of 3.

shares are *more peaked* around the mean than is the case under a normal distribution. The Kolomogorov statistic for testing normality and the p-value of the statistic are presented in the last two rows in Table 1. As expected, we reject the normality condition for all the individual shares. Although not reported in Table 1, the normality assumption is also strongly rejected for daily returns on the SSE market index.

**Table 1: Summary Descriptive Statistics on the 175 Shares listed on the Shanghai Securities Exchange for the period of August 1995 through August 1995**

|                                | Mean    | Median  | Max    | Min    | 1 <sup>st</sup><br>quartile | 3 <sup>rd</sup><br>quartile |
|--------------------------------|---------|---------|--------|--------|-----------------------------|-----------------------------|
| <b>Average daily returns</b>   | -0.0006 | -0.0001 | 0.014  | -0.003 | -0.001                      | 0.000                       |
| <b>Max daily returns</b>       | 0.346   | 0.3395  | 0.706  | 0.224  | 0.299                       | 0.367                       |
| <b>Min daily returns</b>       | -0.297  | -0.261  | -0.499 | -0.072 | -0.394                      | -0.211                      |
| <b>Skewness</b>                | 0.995   | 1.1285  | 3.679  | -1.098 | 0.372                       | 1.537                       |
| <b>Kurtosis</b>                | 12.811  | 11.222  | 36.185 | 4.746  | 9.098                       | 15.969                      |
| <b>Kolomogorov stat</b>        | 0.859   | 0.865   | 0.944  | 0.642  | 0.842                       | 0.887                       |
| <b>p-value for Kolomogorov</b> | 0.000   | 0.000   | 0.000  | 0.000  | 0.000                       | 0.000                       |

### 3. Allocative Efficiency

In this section, we seek to determine how efficient the Shanghai stock market is in allocating capital resources. As noted before, a key function of the price mechanism is to allocate scarce resources (capital, labor, land, etc.) to their best uses. Among the firms listed on the exchange, it is probably safe to assume some are run more efficiently than others. In fact, many of the listed companies have experienced financial trouble of one sort or another. In an “allocatively” efficient stock market, returns on a company’s stock should be mainly affected by the company’s economic performance. Of course, the performance of the market (economy) should also have some influence on the company’s stock returns. To determine the relative importance of company-specific events, we employ the widely used market model developed by Sharpe (1964) and Lintner (1965). The returns generating function specified by the market model is as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

where  $R_{it}$  is the rate of return of the  $i^{\text{th}}$  stock at time  $t$  and  $R_{mt}$  is the return of the market portfolio at time  $t$ . Please note that the “A” shares SSE index is used as the market portfolio. One can think of the market portfolio as a proxy for economy-wide factors that potentially affect all the shares on the exchange. The power of the market model can be measured by the average value of R-squares found in the regressions for all the shares. The higher the average R-squared,

the more powerful the market model and the more important the economy-wide factors in explaining cross-sectional variations in stock returns.

A brief summary of the market model regression results is presented in Table 2. One striking feature of the regression results is that individual firms' stock returns follow the market returns extremely well. First of all, the average adjusted R-squared is 0.698 with a median of 0.701, and the 95% confidence interval of the adjusted R-squared is between 0.684 and 0.712. These findings suggest that the single market index can explain, on average, about 70% of cross-sectional variations in individual *daily* stock returns! As a comparison, the average R-squared for the U.S. stock market is about 7% as reported by Robin (1993). Secondly, the estimated  $\beta$ 's are highly concentrated around the value of 1 ( $\beta$  for the market index is 1 by definition). 95% of the  $\beta$ 's is between 1.06 and 1.086. This suggests that nearly all the "A" shares have the same systematic risk as the market itself. These results combined suggest that *each* individual share closely mimic the market index.

**Table 2: Summary Statistics of the Market Model Regressions**

|                               | <b>Mean</b> | <b>Std. Dev.</b> | <b>Median</b> | <b>Max</b> | <b>Min</b> |
|-------------------------------|-------------|------------------|---------------|------------|------------|
| <b>Adjusted R<sup>2</sup></b> | 0.698       | 0.094            | 0.701         | 0.870      | 0.301      |
| <b>Beta</b>                   | 1.078       | 0.122            | 1.080         | 1.873      | 0.568      |

The findings above have some implications for potential investors. For example, an investor in the SSE does not have to be as careful in choosing what stocks to invest as one does in a more mature market, because any stock on the SSE mimics the market portfolio really well. One may also conclude that firm-specific information does not play as a big role for shares listed on the SSE as it does for shares in the U.S. That is, it seems that the driving force of share prices on the SSE is economy-wide factors as captured by the market portfolio. In this kind of stock market, investors tend to focus their attention on the market rather than the company --investors seek to outwit the crowd rather than assess business prospects of a company.

However, in order for the stock market to efficiently allocate capital, firm-specific information must play a much bigger role. It is very hard to justify that all firms on the SSE are so similar in their economic performance that their stocks follow each other so closely. The stock market is unable to discriminate efficiently-run firms from ill-run ones, as our evidence so far suggests that the price of any stock closely co-varies with all other shares (the market portfolio).

### **Informational efficiency**

Next we want to test whether the SSE is "informationally" efficient in the weak-form: can stock price changes in the past be used to predict tomorrow's changes? In a weakly efficient stock market, price changes should follow a random walk. A random walk implies that stock prices have no memory, thus the past cannot be used to make predictions about future changes. We use regression techniques to determine serial correlation in the successive changes in stock prices. Serial correlations close to zero would mean that changes in stock prices follow a random

walk, whereas large values of serial correlation indicate that the past can be used to predict the future. For each individual share and the market index, we run the following regression:

$$R_{i,t} = \alpha_i + \sum_{k=1}^5 \rho_{ik} R_{i,t-k} + \delta_{it}$$

where  $R_{i,t}$  is share  $i$ 's return at time  $t$ ,  $\rho_{ik}$  is share  $i$ 's serial correlation coefficient with  $k^{\text{th}}$ -day lagged returns.

**Table 3: Summary Descriptive Statistics on the Absolute Values of Serial Coefficients and Their T-statistics.**

|                         | 1-day lagged returns |        | 2-day lagged returns |        | 3-day lagged returns |        | 4-day lagged returns |        | 5-day lagged returns |        |
|-------------------------|----------------------|--------|----------------------|--------|----------------------|--------|----------------------|--------|----------------------|--------|
|                         | $\rho$               | t-stat | $\rho$               | t-stat | $\rho$               | t-stat | $\rho$               | t-stat | $\rho$               | t-stat |
| <b>Mean</b>             | 0.037                | 0.758  | 0.040                | 0.821  | 0.034                | 0.659  | 0.027                | 0.571  | 0.034                | 0.702  |
| <b>Median</b>           | 0.026                | 0.564  | 0.031                | 0.602  | 0.023                | 0.495  | 0.021                | 0.481  | 0.029                | 0.61   |
| <b>Max</b>              | 0.177                | 3.288  | 0.194                | 3.931  | 0.417                | 5.275  | 0.171                | 1.93   | 0.116                | 2.516  |
| <b>Min</b>              | 0                    | 0.01   | 0                    | 0.02   | 0                    | 0.009  | 0                    | 0.003  | 0                    | 0.003  |
| <b>1<sup>st</sup> Q</b> | 0.012                | 0.273  | 0.012                | 0.286  | 0.009                | 0.205  | 0.01                 | 0.196  | 0.013                | 0.299  |
| <b>3<sup>rd</sup> Q</b> | 0.049                | 1.057  | 0.054                | 1.207  | 0.041                | 0.854  | 0.037                | 0.752  | 0.051                | 1.047  |

Table 3 above reports a summary on serial correlation coefficients on 1-day to 5-day lagged returns of all the shares. As indicated by the value of the 3<sup>rd</sup> quartile in the last row of the table, most of the serial correlation coefficients ( $\rho$ 's) are small – about 75% of the  $\rho$ 's are less than 0.05 in magnitude. Consequently, most  $\rho$ 's are statistically insignificant at the 5% level. The results indicate that for nearly all the shares, successive stock price changes are not serially correlated. Hence, the returns on most shares seem to follow a random walk. This finding may have some implications for investors in the market, most of whom hold the view that they can make a quick buck based on the pattern of the recent past stock price changes. Our evidence suggests, however, that an investor cannot use the past to correctly predict tomorrow's price changes on a consistent basis.

We conducted the same analysis for the SSE market index and found similar results as reported above – none of the lagged returns is serially correlated to the current return.

### Conclusion and discussions

Using all the "A" shares traded on the Shanghai Securities Exchange for the period of August 1992 through August 1995, we find that the market is extremely volatile and none of the share's returns is normally distributed. In addition, it seems that share returns are driven mainly by economy-wide political and economic events, and little by firm-specific information. We also find that the SSE is weakly efficient in sense that historical pattern of stock prices is of little help for predicting future price changes.

These findings provide some directions for future reform on the stock market. First of all, there has to be more and better financial disclosure of listed companies' business operations.

Currently, the general public does not seem to have much trust in financial reports released by companies – accounting practices and auditing procedures are very much non-standard, resulting in management manipulations with financial disclosure. Our finding that stock prices move in step could be a result of the lack of trust in corporate financial disclosure. With little disclosure credibility the stock market will continue to be driven by macro-economic and political events, and perhaps, even by rumors. For the market to be “allocatively” efficient, it is imperative that all relevant information about a company be truthfully disclosed in a timely manner to all potential investors. With increased firm-specific information, the market will better differentiate individual firms and will better reward (punish) them accordingly.

Second, we note that stock market “investors” in China buy and sell frequently and they hardly hold onto a particular stock for any meaningfully long period of time. One of the reasons that investors behave this way may be that the stock market has not been a viable long-run investment alternative in the recent past. Compared to rates of return that other investments are offering, one has to wonder why would anybody put any money in the stock market at all. For example, investing in government treasury bonds in the recent years has been really attractive without bearing any default risk. Even putting money into fixed-term, guaranteed, investment certificates offered banks offer more attractive returns, again without much risk. In order for the stock market to become a viable investment tool, it has to offer high enough rates of return to compensate investors for bearing extra risk. One way to generate more interest in the stock market is to control the interest rates in the economy. For example, a low interest-rates environment is typically associated with booming stock markets.

Thirdly, compared to mature stock markets, the Chinese stock market seems to lack institutional investors. There are at least two reasons that a larger body of institutional investors is desirable: First, larger institutional investors can commit more resources to analyze both macro-level events and company-specific events. As a result, they are more informed, enabling them to form more efficient investment portfolios and command better trade-off between risk and return. Moreover, large institutional investors have more resources and incentives to monitor companies. Companies would become more responsive to the demand by larger institutional investors who can choose to dump shares of companies that are poorly run, causing share prices to drop. This increased monitoring from the stock market will force companies to be more efficient in their business operations.

Finally, the government must start allowing trading of the other classes of shares, namely, the legal-person shares, the internal (employee) shares, and the state shares. The market depth can be substantially enhanced if these shares are tradable. This will increase market liquidity, which also improves market efficiency. The current “dual” tradable and non-tradable system creates a lot of problems. Not the least of which is the illegal trading of the non-tradable shares. This black market will cease to exist once all shares are allowed to be publicly traded at a “fair” market price, and the resulting increase in the supply of shares can only lead to more efficient stock prices.

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