

Online Appendix

Measuring the Time-Varying Market Efficiency in the Prewar and Wartime Japanese Stock Market, 1924–1943

Abstract: This note provides detailed explanations for the main document. In particular, we discuss the following topics: (1) significance of the stock price index calculated in [Hirayama \(2018\)](#) and (2) the characteristics of short-term clearing transactions in the prewar Japanese stock market.

Keywords: Efficient Market Hypothesis; Adaptive Market Hypothesis; GLS-Based Time-Varying Model Approach; Price Control Policy; War Risk Premium.

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A.1 The Significance of Constructing the EQPI

Prewar Japan adopted a capital system in which purchasers of company stock issuances paid the par value of their shares in instalments rather than in full (Part-Paid Stock System). This reduced the burden on shareholders to make payments and promoted smooth capital concentration. In principle, new capital increase by issuing new shares was possible once the entire par value (most of them are 50 yen) was paid. The former shares were called ‘old shares’ (fully paid stock) and the latter shares were called ‘new shares’ (partially paid stock). Under this system, a single company could issue several types of stocks (i.e. stocks that could be traded as different types of stocks) at the same time. As for shares issued by the TSE (Tokyo Stock Exchange), which had a large trading volume, old shares with a fully paid face value and unpaid new shares were simultaneously listed on the exchange.¹ Hereafter, we refer to these as ‘old’ and ‘new’ shares, respectively. The TSE not only functioned as an exchange that listed shares of many companies, but also listed its own shares on the exchange.

This system of paying for stocks in instalments made calculating stock performance more complicated. We must make three adjustments: correction of ex-right, correction of additional payments, and correction of dividends. [Hirayama \(2017\)](#) makes these adjustments for two types of stocks on the TSE, which were representative of the market from the Meiji period to the prewar and wartime periods. Owing to these adjustments, three types of indexes are calculated: a price index (PI) linked to the stock price, an adjusted price index (API) with an adjustment of the ex-rights (old shares) and additional payments (new shares), and a TRI with an adjustment of dividend rights (old and new shares).

While this method enables us to perform calculations with long-term data and offers an indicator of the degree of stock market activity, it is still difficult to identify the performance of the heavy and chemical industries, which rapidly expanded during the war. Hence, it cannot be considered a suitable indicator of the stock prices of major Japanese companies. Meanwhile, [Hirayama \(2018\)](#) provides the monthly EQPI from June 1924 to August 1945. The EQPI is a market index of listed stocks on TSE’s short-term clearing futures transactions (a type of future quotations) in stocks weighted by market capitalisation (26 issues were listed at the same time, for a total of 38 issues).² Since September 1943, these issues have been linked to their spot price → spot transaction price. Notably, Hirayama performs calculations with reference to stock quotes specified

¹Note that Tokyo stock exchanges were listed companies until 1943.

²The shares (fully-paid stocks) represent the following 24 issues: Dalian Stock Commodity Exchange, Manchuria Heavy Industries, Nippon Oil, Ensui Sugar Refining, Tokyo Electric Light, Nichiro Fisheries, Kanegafuchi Spinning, Meiji Sugar Manufacturing, Oji Paper, Nisshin Cotton Spinning, Mitsubishi Mining, Nippon Kokan, Nippon Electric Power, Hokkaido Colliery & Steamship, Dainippon Jinzo Hiryo, Nippon Yusen Kaisha, Mitsubishi Heavy Industries, Showa Fertilizer, Nippon Mining, Hitachi Seisakusho, Nippon Electrical Industries, Nippon Soda, Kokura Steel Manufacturing, and Rasa Industries. The new shares (partially paid stocks) represent the following 14 issues: Tokyo Stock Exchange (New), Kanegafuchi Spinning (New), Nippon Yusen Kaisha (New), Dainippon Sugar Manufacturing (New), Asano Cement (New), Fuji Paper (New), Dainippon Beer (New), South Manchuria Railway (New), South Manchuria Railway (Second New), Osaka Stock Exchange (New), Teikoku Jinzo-Kenshi Kaisha (New), Toyo Rayon (New), Nippon Mining (New), and Nippon Suisan (New).

in [Tokyo Stock Exchange \(1928\)](#) and *Monthly Statistical Reports* (Tokyo/Japan Stock Exchange) and from December 1944 onward, the *Nihon Sangyo Keizai* (forerunner of the Nihon Keizai Shimbun).

A.2 The Characteristics of Short-Term Clearing Transactions

After June 1924, short-term clearing futures transactions played a central role in the stock transactions on the TSE, and most of them were ultimately settled by deferring stock and cash transfers. According to [Mukai \(1934\)](#), stock financing was conducted through deferral, rather than cash delivery, in the case of short-term clearing futures transactions. At that time, the financial and stock markets were clearly separated and the flow of funds was divided.

Therefore, settlement agencies, such as Tokabu Daiko, performed the ‘function of a special financial institution’ and made cash and share settlements, which differed from the flow of funds through broker loans in the U.S.³ This agency for short-term clearing transactions collectively raised funds and lent stocks for deferral of exchange brokers (traders), which has been a unique situation globally.

TSE’s new shares (market capitalisation ratio: 42.3%) and Kanegafuchi Spinning’s new shares (market capitalisation ratio: 57.7%) were traded when the TSE facilitated short-term clearing futures transactions in June 1924. With the gradual listing of various shares, the market capitalisation ratios of the TSE’s and Kanegafuchi Spinning’s new shares fell to around 10% toward the end of the 1920s and below 5% in the mid-1930s. In the context of short-term clearing futures transactions based on a capitalisation-weighted average, the combined ratio of these two speculative stocks declined to about 10%, while the ratio of industrial stocks increased.

However, the trading volume ratio of the TSE’s new shares to short-term clearing futures transactions remained at a high level, rarely falling below 50% until 1933; it then reached an all-time high of 89.4% in November 1929. Thereafter, the trading volume ratio of the TSE’s new shares declined to around 30% in May 1934. The relative position of the TSE’s new shares as a benchmark stock might have declined partly owing to active discussions on stock exchange reforms. Meanwhile, in March 1937, when Japan entered a quasi-wartime regime, the TSE recorded its highest trading volume in history. As a result, its volume increased to 74.9% in December 1938.

Although the combined trading volume of Kanegafuchi Spinning’s and the TSE’s new shares was below 50% until December 1942, in 1938, Kanegafuchi Spinning’s new shares were delisted from the exchange at a full payment of par value; in 1939, they were relisted for a capital increase to shareholders. In December 1942, the government decided to delist TSE’s new shares. In March 1943, TSE’s new shares were delisted for short- and long-term clearing futures transactions, followed by spot transactions in April 1943.

Additionally, as an increase in stock trading volume was linked to the exchange’s performance, two types of stocks issued by the TSE attracted attention when this volume

³See [Mukai \(1934, p.154\)](#).

increased: new shares (unpaid shares with par value) and old shares (fully paid shares with par value). TSE's old shares were not subjected to active short-term clearing futures transactions, and speculative trading focused on TSE's new shares.

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