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Exploring the dynamic model of the returns from value stocks and growth stocks using time series mining

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ABSTRACT

This study considered that value stocks and growth stocks are 2-dimensional concepts. We defined the book-to-market ratio as the value factor and the return on equity as the growth factor. We used these 2 factors to divide stocks into 4 types: high-value, low-value, high-growth, and low-growth stocks. Furthermore, we explored the change in stock prices and stock returns for these 4 categories before and after the formation of investment portfolios. We also established a dynamic model showing the returns from value stocks and growth stocks, called the exponential decay model. Finally, we used Taiwan Stock Exchange data to examine effectiveness of the model during the period from 1995 to 2009. The results are as follows: first, high-value stocks and low-value stocks exhibit a significantly over-reacting phenomenon. Second, high-growth stocks and low-growth stocks exhibit an obviously under-reacting phenomenon. Third, in each current quarter, high-value stocks exhibit the lowest returns; however, in the subsequent quarter, they have the highest returns, and then demonstrate a slow declining trend in the following quarters. These results showed that the stock market can exhibit a dramatic response to extraordinary information and proved that the stock market requires considerable time to correct themselves from an excessive reaction, thus high-value stocks exhibited a higher return. Fourth, in each current quarter, high-growth stocks had the highest return, followed by a rapidly decreasing trend in the following quarters. The $t+3$ quarter returns were lower than those of low-growth stocks. This result demonstrated that the stock market does not exhibit an adequate reaction, but still remains rather efficient for routine financial information. Finally, regardless of value stocks or growth stocks, exponential decay models could accurately match with the data.

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1. Introduction

The efficient market hypothesis (EMH) asserts that stock prices should reflect all known information about a stock. However, many empirical studies have proven that the efficient market hypothesis may be imperfect (Holthausen & Larker, 1992; Hong, Lim, & Stein, 2000; Piotroski, 2000). For example, Banz (1981) proposed the size effect, which proved that smaller firms have a higher average of risk adjusted returns than larger firms do. Rosenberg, Reid, and Lanstein (1985) proposed the value effect, which showed that value stocks have higher returns than growth stocks do. De Bondt and Thaler (1985) proposed the overreact effect, which suggests that the portfolios of prior losers outperform those of prior winners over the long term. Jegadeesh and Titman (1993), in turn, proposed the momentum effect, which proved that stocks in a prior winner's portfolio indicate a substantially higher return, in the short term, than those in the prior loser's portfolio. Among these effects, the value effect is discussed the most.

Fama and French (1992, 1995) showed that the book value to market value ratio (B/M) is able to capture cross-sectional variations within average stock returns for U.S. stocks. They also used the B/M ratio to show that value stocks delivered higher returns than growth stocks did in markets worldwide (Fama & French, 1998). In addition, Fama and French (1993) combined market risk premium, size, and B/M ratio to establish a three-factor model to explain the excess returns of common stocks. They defined stocks with high B/M or earnings-to-price ratios as value stocks and stocks with low ratios as growth stocks. They provided evidence showing that value stocks deliver higher returns than growth stocks do. Despite Fama and French's work, no authoritative definition of value stocks exists. Stocks with relatively high book value-to-price, earnings-to-price, or sales-to-price ratios are often

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defined as value stocks, whereas those with relatively low ratios are labelled as growth stocks. These definitions assigned a negative relationship between the two; in other words, high-value stocks must be lower-growth stocks and vice versa.

In recent years, an increasing number of researchers have adopted a view that value and growth represent two distinct stock characteristics (Asness, Friedman, Liew, & Krail, 2000; Bourguignon & de Jong, 2003; Brush, 2007; Nanda & Ahmed, 2001; Yeh & Hsu, 2011). Their studies showed that although most high-value stocks are low-growth stocks, and high-growth stocks are low-value stocks. However, there are still some high-value stocks are high-growth stocks, and high-growth stocks are high-value stocks. Hence, they defined the B/M ratio or the earnings-to-price ratio as the value factor, and the earnings growth rate, or the return on equity (ROE), as the growth factor. Therefore, we used value factor and growth factor to divide stocks into four types, as illustrated in Table 1.

Stockholders buy shares which represent part ownership of a company. Stockholders' two main rights include (1) the right to what assets remain after a liquidation, and (2) the right to dividends if they are declared. Therefore, there are two main fundamental analysis approaches to equity valuation, the asset approach and the earning approach.

The value factor indicates whether a stock is undervalued. Since the book value is the measurement of net asset of a company, it is a reasonable foundation to evaluate the price of stock. Therefore, B/M, the book value per share divided by the stock price, is a reasonable factor to measure whether a stock is undervalued. Stocks with a relatively high B/M are defined as value stocks.

Besides, the growth factor indicates whether a stock is provided with high growth potential. Since ROE (return on equity), the earning value per share divided by the book value per share, is the key profitability performance index of a company, and core of the sustainable growth rate, it is a reasonable factor to measure the growth potential of a stock. Stocks with a relatively high ROE are defined as growth stocks.

Several empirical studies have indicated that high-growth stocks (higher ROE) have higher returns than low-growth stocks (lower ROE) do. This is referred to as the growth stock effect (Bourguignon & de Jong, 2003; Brush, 2007). Nanda and Ahmed (2001) further proved that the returns of stocks with both high-value and high-growth characteristics are higher than those of stocks with only high-value or high-growth characteristics.

Various interpretations exist for the higher returns of high-value stocks, and can be divided into the risk premium and pricing misspecification theories. Fama and French, as the representative scholars, insisted that the EMH is correct. The EMH states that one cannot consistently achieve returns in excess of average market returns on a risk-adjusted basis, given all publicly available information at any given time. These scholars suggested that undiversified risks result in excess returns. However, behavioural finance insists that investor behaviour is not always rational and risk-averse, and proves that irrational investor behaviour causes the anomaly in stock returns.

Risk premium theory was derived from two modern financial theories: the EMH and the capital asset pricing model (CAPM). The EMH is comprised of three assumptions. First, when investors are rational, they can rationally assess the value of assets that lead to an effective market. Second, particular investors are not rational, but with random trading, the stock price does not lead to a misspecification. In addition, the stock market has a large number of rational arbitrageurs, ensuring that asset prices return to their basic values. Third, even if irrational traders buy a stock that depends on a non-fundamental value, their wealth gradually decreases, and these traders can no longer survive in the stock market (Fama, 1970).

The investor pricing misspecification theory is based on financial psychology. For example, Lakonishok, Shleifer, and Vishny (1994) believed that the value investment strategy is a contrarian of naive strategies. Naive investors typically believe that stock growth will continue into the future, or assume that a trend in stock prices will last for a long period. They also overreact to good and bad news.

Barberis, Shleifer, and Vishny (1998) indicated that the stock market often overreacts to a series of extraordinary good news or bad news. In other words, the stock prices go up because of overreacting to good news, and are higher than the reasonable prices which information implied by. Conversely, stock prices fall because overreacting to bad news, and are lower than the reasonable prices which information implied by (Fig. 1). Subsequently, a revision of the stock prices caused by overreaction results in the lowest stock returns for over performing stocks, or the highest stock returns for underperforming stocks (Fig. 2). Since stocks are often subjected to bad news, they frequently exhibit undervalue phenomenon and become value stocks. These value stocks have lower market values and higher B/M ratios, thus resulting in a higher rate of return through a revision of stock prices.

Empirical studies have shown that higher-ROE stocks have higher stock returns. One of the explanations for the growth stock effect is under-reaction. Barberis et al. (1998) indicated that the stock market often under-reacts on earnings which are company's

Table 1
Two-dimensional viewpoint of value stocks and growth stocks.

	Low-value	High-value
High-growth	High-growth & low-value stocks	High-growth & high-value stocks
Low-growth	Low-growth & low-value stocks	Low-growth & high-value stocks

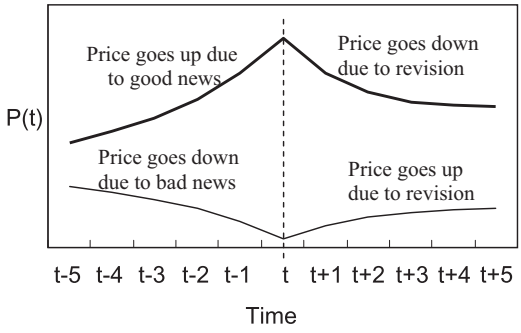

Fig. 1. The phenomenon of stock prices overreaction.

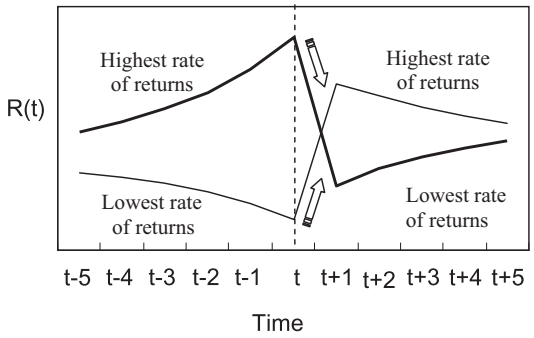

Fig. 2. The sharp change of stock returns under price overreaction.

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