The Liquidity Effect in Stock Markets Evidence from Taiwan

George Yungchih Wang, Kuang-Wen Chang, Chunwei Lu, and Lydia Wen-Hsi Hsu

***Abstract*—-** In stock market, various concepts of stocks, or so-called investment styles, have been raised by fund managers to catch the attention of investors. Style investing was referred to as investing stocks with similar company characteristics to form a style portfolio in order to obtain excess returns. Since liquidity in stock trading was important information for investors to obtain for investment decision-making, this study examined whether there existed a liquidity effect in stock markets by applying the style portfolio approach to test statistical significance of short-run and long-run excess returns among several liquidity-related style portfolios. With the data of Taiwan publicly-listed companies, three findings were concluded: First, the high liquid stocks were found to have a higher cumulative return of 193.40% relative to the benchmark portfolio, the market, for the period of 1999-2008. Second, when we integrated the stock liquidity into company characteristic and firm size to form two dimensional style portfolios, the returns of those were significantly higher than the returns of one dimensional style portfolios, such as liquidity, value, and small-cap stocks. Third, the returns of the liquidity-related portfolios were also significant in different market conditions. The study therefore concluded that the liquidity effect was a significant investment style in stock market.

***Keywords*—**investment style, style investing, style portfolio approach, liquidity effect

I. Introduction

SINCE the concept of investment style was first raised by Farrell (1974), style investing had been used by mutual fund managers to form investment portfolios in order to gain profits from the stock market. Investment style was referred to as gathering stocks with the same company characteristics to form style portfolios and make investments in the stock market. This concept was, in essence, in agreement with the various stock concept groupings existing in the current Taiwanese market such as China concept stocks and Apple concept stocks. Common style portfolios could include value stocks, growth stocks, small-cap stocks, defensive stocks and so on. Style investing aimed to target an investment at a group of stocks with specific characteristics so that the chosen stocks would outperform the overall market in bullish markets and decline slower compared with the market index in bearish markets; thus, investors can earn excess returns (ER) and maximize investment returns.

Style investing had not only been used by many professional investment corporations as a way of making investment decisions but it had also become the research focus in the financial literature. The style investing approach, which based itself on modern portfolio theory, had injected a new way of thinking into traditional financial theory, the efficient market hypothesis. In an efficient stock market, required returns of stocks theoretically should be equal to expected returns, but empirical evidence had revealed that an efficient market could not be immediately achieved and thus it leaves room for excess returns. Building on this idea, style investing had been a popular investment rule for some time. In particular, the style investing approach was intended to form a stock portfolio, also known as a style portfolio, with similar company characteristics by constantly rebalancing the portfolio, in order to ensure that constituent stocks were of the same style, thereby outperforming the market and gaining long-term accumulated returns.

The concept of style investing was not brand-new in stock market. Graham et al. (1934) introduced the concept of value investing in the 1930s in their famous book, Security Analysis. Graham not only successfully regained more than 70% of his loss in the Great Depression by utilizing the value investing approach but also subsequently created enormous wealth with this method for which he was acclaimed as “the father of value investing” on Wall Street. Furthermore, Babson (1962) proposed the concept of growth investing. In accordance with this concept, he established a fund company that created tremendous wealth for its clients, and was currently managing an asset base of over 20 billion U.S. dollars.

Traditional research on style investing had tended to utilize company characteristics (value stocks and growth stocks), company size (big-cap stocks and small-cap stocks), and other factors as the major style determinants. This study intended to explore the impact of a new investment style, liquidity, on performance of style portfolios. The liquidity style was applied as a single style as well as an additional dimension to traditional investment styles. Research on the importance of liquidity had drawn much attention in recent years but no consistent findings had been concluded. For example, Amihud (2002) maintained that liquidity significantly affects stock returns, especially in the stock market where there was a

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so-called "illiquidity premium." This meant less liquid stocks, because of their higher liquidity risks, had positive abnormal returns. Bodie et al. (2005) shared a similar view, claiming that ignored companies, because of less attention from the market, had low trading volumes, but were more likely to generate abnormal returns because of price imbalances. By contrast, Chan et al. (2008) found that not only do less liquid stocks generate abnormal returns but that highly liquid stocks deliver abnormal returns as well.

With the application of style investing and the data from Taiwan's stock market, this study aimed to explore a new investment style, liquidity. Specifically, we used liquidity as a new measure to form style portfolios, based on which the significance of short-run excess returns and long-run cumulative returns, respectively, were both tested by conducting the pair-wise *t* testing.

In addition to this introduction section, the rest of the paper was broken down into four sections: Section 2 further reviewed related literature on liquidity. Section 3 outlined research design and methodology. Section 4 provided empirical results of the study. Lastly, the conclusion was given in Section 5.

II. Literature Review

Half a century ago, Graham and Babson raised the concepts of value and growth respectively; however, since neither of these people were academics, these concepts attracted no academic attention. In the meantime, academics were focusing on the capital market theory. For example, Sharpe (1964) and Lintner (1965) proposed the capital asset pricing model (CAPM), which explained the positive correlation between stock returns and systematic risks. Ross (1976) developed the arbitrage pricing theory (APT), which applied multi-systematic factors, such as inflation rate, industrial production, the slope of the term structure of interest rates, and the yield spreads between investment-grade bonds and junk bonds, to describe the behavior of capital market. It was not until Fama and French's (1992) study that the impact of individual company's factors on returns was introduced into the model.

In regard to style investment, earlier research was initiated by Farrell (1974), who divided S&P100 companies into four groupings, namely growth stocks, stable stocks, cyclical stocks, and oil stocks, in accordance with the three factors of market, industry, and company, in order to analyze their performance differences. Sharpe (1978) formally used style to name the stock-picking method of investment portfolios. Later, Sharpe (1992) created the well-known style analysis approach, which assumes that style factors affect returns. Sharpe then developed 12 types of investment portfolios according to these investment styles and found that style factors did affect investment portfolios' performances. The studies by Brown and Goetzmann (1997) and Gallo and Lockwood (1997) on style analysis disclosed that mutual funds with specific styles generate better performance than did single funds.

Earlier research was inclined to construct style portfolios using a single investment style such as company characteristic and firm size to test the correlation between styles and returns. Later, scholars began attempting to form binary investment styles by integrating two different factors, as known as two-dimensional style portfolios, into the style investing approach. For example, Sharpe (1992) studied both the size effect and the value effect by classifying stocks into big-cap value stocks, big-cap growth stocks, and mid-cap and small-cap stocks. Christopherson (1995) set up a classification system based on the eigenvalues of the funds' componential stocks and divided the sample funds into four different investment styles. Gallo and Lockwood (1997) established four mutual funds of different styles, namely big-cap growth stocks, small-cap growth stocks, big-cap value stocks, and small-cap value stocks, and tested the returns of each type of fund, the results showing significance. Ahmed and Nanda (2001) extended Fama and French's (1992) three-factor model to a multi-index models and proposed that a trading strategy featuring multiple styles could generate excess returns.

Recent research on styles had extended its scope and added some new elements. For instance, Teo and Woo (2004) studied the kinetic energy performance of style portfolios; Massa and Zhang (2009) found that applying style analysis to business mergers could improve the acquirer's value and future performance; and Gallo et al. (2008) studied systematic approaches to integrating different styles in an attempt to improve the performances of investment portfolios.

Earlier research on stock liquidity was conducted from the perspective of liquidity risk by exploring its impact on stock returns. For instance, Amihud and Mendelson (1986, 1989) claimed that stock liquidity affects liquidity risk, trading costs, and less liquid stocks because of its higher liquidity risks and trading costs, and that this may deliver premiums to investors as a compensation for the risks and costs they have to bear. Amihud (2002) used the cross-sectional method to examine stock liquidity's effect on returns and found that the illiquidity premium existed in the stock market, i.e., less liquid stocks would generate positive abnormal returns. This was known as the liquidity effect. Goyenko (2006) also believed that the illiquidity premium could be found in equities as well as bonds.

Some studies argued that liquidity might affect stock volatility, leading to an impact on stock returns. For example, Jones et al. (1994) used the number of transactions to represent stock liquidity and discovered that volatility and the number of transactions were positively associated. Ding and Lau (2001) used data from the Singapore stock market and found that trading frequency not only positively influenced price fluctuations but also affected stock returns. In regard to the operational definition of liquidity, in addition to the previous trading frequency, other studies, such as Lee and Swaminathan (2000), Amihud (2002), Wongchoti and Pyun (2005), and Chan et al. (2008), had used trading volume or standardized trading volume (turnover ratio, TR) to measure liquidity.

III. Methodology

This study focused on exploring whether the liquidity effect

is present in Taiwan's stock market and whether it was an illiquidity premium or high liquidity premium. Hence, this study aimed to form style portfolios based on clear operational definitions and test the statistical significances of short-run excess returns and long-run accumulated returns after the liquidity factor was introduced into style portfolios. The statistical significance could provide a foundation for proving the liquity effect, which would help investors and fund managers develop a new investment style.

In this study, there were fourteen style portfolios under consideration based on company size, stock liquidity, or both. For single dimension style portfolios, six single style portfolios were considered: value stocks (denoted by V), growth stocks (G), big-cap stocks (B), small-cap stocks (S), highly liquid stocks (H), and less liquid stocks (L). In addition, eight two dimensional style portfolios were analyzed: highly liquid value stocks (HV), less liquid value stocks (LV), highly liquid growth stocks (HG), less liquid growth stocks (LG), highly liquid big-cap stocks (HB), less liquid big-cap stocks (LB), highly liquid small-cap stocks (HS), and less liquid small-cap stocks (LS). The market portfolio (M) was used as the benchmark portfolio to test statistical significance.

A. Data

The research period for this study was from 1999 to 2008 during which time Taiwan's stock market experienced all three market conditions, namely bullish markets, bearish markets, and corrections. It was assumed that we had made an investment into 15 style portfolios (i.e., six one-dimensional style portfolios, eight two-dimensional style portfolios, and the market portfolio) on January 1, 1999 in Taiwan's stock market and re-balanced the investment portfolios once a quarter in accordance with the adjustment mechanism for the constituent stocks of style portfolios until the end of December 2008. Then, quarterly returns and accumulated returns during the sample period were derived and made a comparison with those of the benchmark portfolio.

This study followed the style portfolio approach, which could be divided into the following stages: collecting sample data, establishing the style portfolios, defining the sample period, calculating returns, developing hypotheses, and testing statistical significance.

Of all the research procedures, the important part was to form style portfolios based on the three dimensions of company characteristics, company size, and stock liquidity. The major method to do this was to rate the three dimensions according to their operational definitions in order to calculate the average scores of single dimensions and those of the binary dimensions and then sort them by average scores. In regard to the formation of style portfolios, this study adopted Fama and French's (1992) approach and used the concept of quintile. However, since there were too many shares to be selected from the quarterly investment pool (around 800–1000 companies), we selected the companies ranking within the 10% range from the top and the bottom to form the style portfolios and adjusted the constituent stocks in accordance with real-time data on a quarterly basis in order to highlight company characteristics. In order to highlight the company characteristics of the style portfolios, the proportion that each stock accounts for in an investment was weighted. The concepts of the style portfolios were indicted in Figure 1.

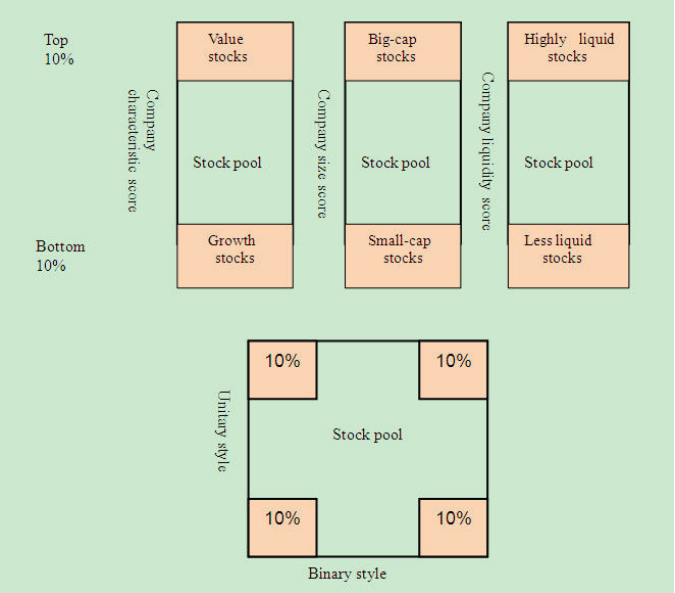

Figure 1 The Formation of Style Portfolios

B. Style Portfolios

The adjustment (or rebalancing) mechanism for the style portfolios used in this study should ensure that each is held for the same length of time. This to ensure that there was sufficient time to reflect the returns and to consider the availability of financial data to make sure that the portfolio was in line with its original style features. In other words, if we adjusted the constituent stocks at too long intervals, the preset style properties might be damaged; if they are adjusted at too short intervals, then companies' financial data might be incomplete, thus rendering the adjustment useless. Therefore, the constituent stocks of the style portfolios were rebalanced every quarter. To be specific, we made adjustments at the end of March, June, September, and December each year, and after each adjustment, the constituent stocks of the portfolios remained unchanged in the ensuing three months. This study conducted 40 adjustments of the constituent stocks of the portfolios during the research period altogether.

As mentioned earlier, the style portfolios were constructed according to company characteristic, firm size, and liquidity. For the value/growth style, the value portfolio was constructed based on the lowest percentile ranking of price-to-book ratio (PBR), price-to-earnings ratio (PER), price-to-sales ratio (PSR), asset growth (AG), equity growth (EG), and sales growth (SG). On the other hand, the growth portfolio was formed based on the highest percentile ranking of price-to-book ratio (PBR),

price-to-earnings ratio (PER), price-to-sales ratio (PSR), asset growth (AG), equity growth (EG), and sales growth (SG). Each portfolio consisted of top 30 stocks in the ranking.

The method of percentile ranking was first to rank and transfer the operational variables into percentile scores. Then, the scores of all the measures were averaged within each style. Thirty stocks are gathers to form style portfolios. To make sure company characteristics were significantly expressed in a specific style portfolio, portfolio weights were computed in a particular way, to be discussed in the later section.

For the size style, the large and small capitalization stocks were measured from the sum of percentile ranking of total assets, equity, and the number of employees. For the liquidity style, the high and low liquidity portfolios were formed according to turnover ratio, i.e., trading volume scaled by shares outstanding.

For the two-dimensional styles, the sum of percentile ranking of two dimensions was computed. Top 30 stocks in the ranking were selected to construct the two-dimensional style portfolios.

The market portfolio was used as the benchmark, which was calculated from the TAIEX Total Return Index (TAIEX-TRI) on Taiwan Stock Exchange (TAIEX). Compared with the traditional TAIEX Index, the Total Return Index was considered to be better representative of the market, in that not only the returns on capital gain were computed but also cash dividends.

C. Return Measures

In the study, we use several return measures, which are discussed below:

(1) Stock returns

$$R_{j,t} = \frac{P_{j,t} - P_{j,t-1} + Div_{j,t}}{P_{j,t-1}} \quad (1)$$

where *Ri,t* stands for the stock returns of the i-th stock in the t-th period; stands for cash dividend of the i-th stock in the t-th period.

(2) Portfolio returns

$$R_{p,t} = \sum_{i=1}^{n} W_{i,t} R_{i,t} \quad (2)$$

where *Rp,t* stands for the returns of the investment portfolio p in the t-th period; n stands for the number of constituent stocks in the style portfolios.

To highlight company characteristics in style portfolios, when rebalancing the portfolio, the portfolio weights were computed on the basis of the ranking of a particular investment style. Suppose there were n stocks in a style portfolio, then after ranking all the stocks according to style characteristic, the weight of the i-th stock was calculated as follows:

$$W_i = \frac{n - i + 1}{\sum_{j=1}^{n} j} \quad (3)$$

(3) Excess returns

In order to measure the short-term performance of style portfolios and take into consideration the systemic risk factors of them, we used the difference of the realized return and the required return from the CAPM to compute excess returns (ER). ER was denoted as follows:

$$ER_{p,t} = R_{p,t} - \left[R_{f,t} + \hat{\beta}_p \left(R_{m,t} - R_{f,t} \right) \right] \quad (4)$$

where $\hat{\beta}_p$ stands for the estimated value of the β coefficient of investment portfolio *p* in the research period.

(4) Accumulated returns

Accumulated returns (AR) represent returns generated on the initial $1 investment in a style portfolio for the period from time 0 to *t*. ARs reflected long-term performance of style investment. The AR in the t-th period was calculated by the following formula:

$$AR_{p,t} = \prod_{t=1}^{\tau} \left(1 + R_{P,t} \right) - 1 \quad (5)$$

D. Hypothesis Testing

Short-term returns were based on ER and used to test the statistical significance of style portfolios. For a style portfolio of interest, the null and alternative hypotheses were illustrated as below:

$H1A_0$: $ER_V \leq 0$

$H1A_1$: $ER_V > 0$

Long-term returns were based on accumulated returns and used to test whether the AR of value stocks remarkably outperform that of the benchmark portfolio (the market portfolio). Its null and alternative hypotheses were expressed as follows:

$H1B_0$: $AR_V \leq AR_M$

$H1B_1$: $AR_V > AR_M$

Since there were 14 style portfolios, there were 14 hypotheses, each of which included two sub-hypotheses to test both ER and AR, respectively. For clarity, the hypothesis testing of the 14 style portfolios were exhibited in Table 1.

Table 1 The Research Hypotheses

Hypothesis	Sub-hypothesis	Null hypothesis H_0	Alternative hypothesis H_1
H1	H1A	$ER_V \le 0$	$ER_V > 0$
	H1B	$AR_V \le AR_M$	$AR_V \ge AR_M$
H2	H2A	$ER_G \le 0$	$ER_G > 0$
	H2B	$AR_G \le AR_M$	$AR_G \ge AR_M$
H3	H3A	$ER_B \le 0$	$ER_B > 0$
	H3B	$AR_B \le AR_M$	$AR_B \ge AR_M$
H4	H4A	$ER_S \le 0$	$ER_S > 0$
	H4B	$AR_S \le AR_M$	$AR_S \ge AR_M$
H5	H5A	$ER_H \le 0$	$ER_H > 0$
	H5B	$AR_H \le AR_M$	$AR_H \ge AR_M$
H6	H6A	$ER_L \le 0$	$ER_L > 0$
	H6B	$AR_L \le AR_M$	$AR_L \ge AR_M$
H7	H7A	$ER_{HV} \le 0$	$ER_{HV} > 0$
	H7B	$AR_{HV} \le AR_M$	$AR_{HV} \ge AR_M$
H8	H8A	$ER_{LV} \le 0$	$ER_{LV} > 0$
	H8B	$AR_{LV} \le AR_M$	$AR_{LV} \ge AR_M$
H9	H9A	$ER_{HG} \le 0$	$ER_{HG} > 0$
	H9B	$AR_{HG} \le AR_M$	$AR_{HG} \ge AR_M$
H10	H10A	$ER_{LG} \le 0$	$ER_{LG} > 0$
	H10B	$AR_{LG} \le AR_M$	$AR_{LG} \ge AR_M$
H11	H11A	$ER_{HB} \le 0$	$ER_{HB} > 0$
	H11B	$AR_{HB} \le AR_M$	$AR_{HB} \ge AR_M$
H12	H12A	$ER_{LB} \le 0$	$ER_{LB} > 0$
	H12B	$AR_{LB} \le AR_M$	$AR_{LB} \ge AR_M$
H13	H13A	$ER_{HS} \le 0$	$ER_{HS} > 0$
	H13B	$AR_{HS} \le AR_M$	$AR_{HS} \ge AR_M$

IV. Empirical Results

A. Descriptive Statistics

The descriptive statistics of these portfolios were shown in Table 2. Figures 2 to 5 demonstrated the performances of the style portfolios and the market portfolio during the research period. Figure 2 showed a comparison of the AR of value stocks, growth stocks, highly liquid stocks, less liquid stocks, and the market portfolio. Figure 3 compared the AR of big-cap stocks, small-cap stocks, highly liquid stocks, less liquid stocks, and the market portfolio. Figure 4 compared the AR of one-dimensional style portfolios (the combination of stock liquidity and company characteristics) and the market portfolio. Figure 5 made a comparison between one-dimensional style portfolios (the combination of stock liquidity and company size combined) and the market portfolio in terms of AR.

Table 2 Descriptive statistics

Style	Return	Mean	Median	S.D.	Max	Min
V	QR	0.0451	0.0490	0.1096	0.3040	-0.1510
	AR	1.2236	0.7330	1.0419	3.7010	0.1150
G	QR	0.0062	0.0330	0.1192	0.2780	-0.2530
	AR	-0.0505	-0.0580	0.2270	0.4260	-0.3530
B	QR	-0.0023	0.0134	0.0979	0.2601	-0.2329
	AR	-0.0820	-0.0989	0.1566	0.2485	-0.3071
S	QR	0.0108	-0.0003	0.1008	0.2419	-0.2395
	AR	0.1772	0.0671	0.2884	0.9423	-0.1822
H	QR	0.0369	0.0662	0.1358	0.3258	-0.3134
	AR	1.0818	0.4629	1.2351	4.2227	-0.1127
L	QR	-0.0099	-0.0101	0.0815	0.2250	-0.1899
	AR	-0.2399	-0.2694	0.1020	0.0436	-0.4253
HV	QR	0.0628	0.0905	0.1375	0.3390	-0.2960
	AR	3.3614	1.7000	3.3919	11.491	0.1440
LV	QR	0.0131	0.0030	0.1230	0.4460	-0.1680
	AR	0.4297	0.4515	0.1987	0.7370	-0.0940
HG	QR	0.0261	0.0705	0.1349	0.2880	-0.2890
	AR	0.4316	0.1970	0.6253	2.0810	-0.2370
LG	QR	0.0065	-0.0030	0.1373	0.5570	-0.2380
	AR	0.0948	0.0410	0.2004	0.7310	-0.1680
HB	QR	0.0274	0.0635	0.1422	0.3787	-0.2687
	AR	0.5983	0.2380	0.7340	2.3410	-0.2338
LB	QR	-0.0098	-0.0021	0.0750	0.2210	-0.1594
	AR	-0.2603	-0.3104	0.1147	0.0510	-0.4117
HS	QR	0.0685	0.0579	0.1504	0.3745	-0.3396
	AR	3.9795	1.7173	4.3179	15.051	0.2272
LS	QR	-0.0040	-0.0094	0.0775	0.1981	-0.1868
	AR	-0.1150	-0.1370	0.0886	0.0574	-0.3229
M	QR	0.0126	0.0239	0.1604	0.5448	-0.2440
	AR	0.2080	0.1704	0.3273	1.0012	-0.3703

Note: V denotes value stocks, G growth stocks, B big-cap stocks, S small-cap stocks, H highly liquid stocks, L less liquid stocks, and M market portfolio.

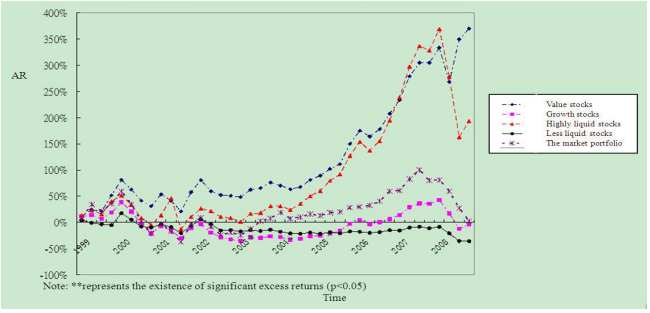

Figure 2 ARs of Single Style Portfolios (V, G, H, L,and M)

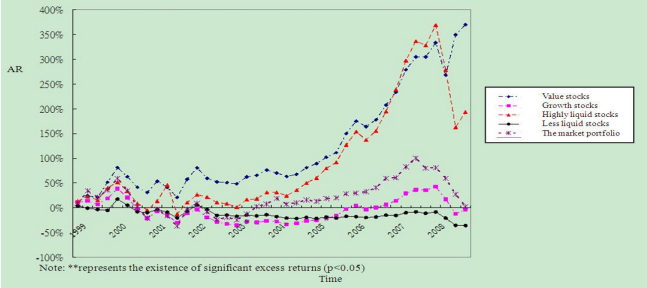

Figure 3 ARs of Single Style Portfolios (B, S, H, L, and M)

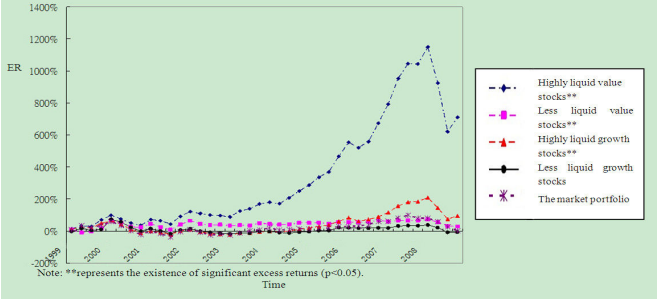

Figure 4 ARs of Two-Dimensional Style Portfolios (HV, LV, HG, LG and M)

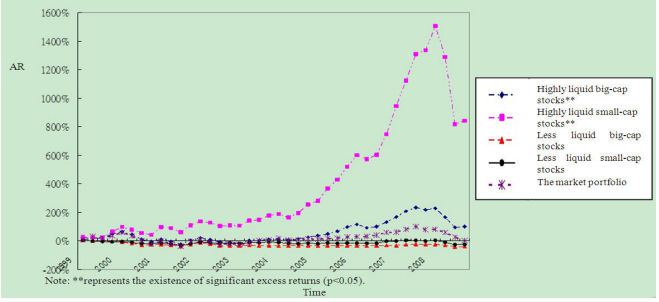

Figure 5 ARs of Two-Dimensional Style Portfolios (HB, LB, HS, LS and M)

Summarized from Figure 2-5, both the one and two dimensional style portfolios connected with high liquidity outperformed the market portfolio in terms of ARs. However, the liquidity effect was yet to be confirmed until statistical tests were conducted.

B. Hypothesis Testing

This study went a step further to conduct a test of significance of the AR of the style portfolios. Meanwhile, a pair-wise t-test on long-term performance was conducted with the market portfolio as the benchmark portfolio. In order to examine whether style portfolios significantly outperformed the market portfolio, the statistical test must be one-tailed and showing a positive t value. The results of the statistical test of this study were displayed in Table 3.

Table 3 The Results of Hypothesis Testing

Style	Portfolio	Hypothesis		Mean returns	Standard deviation	*t* value	Hypothesis
Single Style	V	H1	H1A	0.0451	0.1096	2.3349**	supported
			H1B	1.2236	1.0419	7.8562**	
	G	H2	H2A	0.0062	0.1192	0.1694	
			H2B	-0.0505	0.2270	-3.3784	
	B	H3	H3A	-0.0023	0.0979	-0.3905	
			H3B	-0.0820	0.1566	-4.5554	
	S	H4	H4A	0.0108	0.1008	0.4255	Partially
			H4B	0.1772	0.2884	4.5393**	supported
	H	H5	H5A	0.0356	0.1284	2.9151**	supported
			H5B	0.9291	1.0797	6.0365**	
	L	H6	H6A	-0.0080	0.0808	-0.6630	
			H6B	-0.1276	0.1041	-4.1138	
2-D Style	HV	H7	H7A	0.0628	0.1375	4.0041**	supported
			H7B	3.3613	3.3918	6.4564**	
	LV	H8	H8A	0.0131	0.1230	0.4979	Partially
			H8B	0.4297	0.1987	10.671**	supported
	HG	H9	H9A	0.0261	0.1349	1.4695*	
			H9B	0.4316	0.6253	5.4924**	supported
	LG	H10	H10A	0.0065	0.1373	0.1637	Partially
			H10B	0.0948	0.2004	3.9215**	supported
	HB	H11	H11A	0.0274	0.1422	1.7439**	
			H11B	0.5983	0.7340	6.2282**	supported
	LG	H12	H12A	-0.0098	0.0750	-0.6811	
			H12B	-0.2603	0.1147	-8.3771	
	HS	H13	H13A	0.0685	0.1504	3.7293**	
			H13B	3.9795	4.3179	5.9649**	supported
	LS	H14	H14A	-0.0040	0.0775	-0.4106	

Note: * $p < 0.10$; ** $p < 0.05$

Table 3 suggests that, in respect of the one-dimentional style portfolios, V stocks and H stocks showed a positive significance, with the ERs being 4.51% and 3.56% and the t values being 22.3349 ($p < 0.05$) and 2.0151 ($p < 0.05$), respectively. The ARs of these two types of stocks were

122.36% and 92.91% with their t values being 7.8562 ($p < 0.05$) and 6.0365 ($p < 0.05$), respectively, meaning that the V and H stocks in terms of their AR significantly outperformed those of the market portfolio (1.04%). The results found that value stocks and highly liquid stocks indicated positively significant both in the short-run and in the long-run. On the other hand, the small-cap stocks beat the market portfolio in terms of AR with a mean of 17.72% and a t value of 4.5393 ($p < 0.05$), which demonstrated that the size effect was significant only in the long-run.

Among the one-dimensional style portfolios, the ER of high liquidity-related stocks, namely HS stocks, HV stocks, HB stocks, and HG stocks, were 6.85%, 6.28%, 2.74%, and 2.61%, with their *t* values 3.7293 ($p < 0.05$), 4.0041 ($p < 0.05$), 1.7439 ($p < 0.05$), and 1.4695 ($p < 0.05$), respectively, all showing positive significance. In terms of AR, those of the four stocks came to 397.95%, 336.13%, 59.83%, and 43.16%, respectively, with their respective t values being 5.9649 ($p < 0.05$), 6.4564 ($p < 0.05$), 6.2282 ($p < 0.05$), and 5.4924 ($p < 0.05$). All these results outperformed the AR of the market portfolio (1.04%), which revealed that the liquidity effect was significant not only in the one-dimensional style portfolios, but also in liquidity-related two-dimensional style portfolios

The ARs were especially significant when liquidity was combined with the small-cap stocks and the value stocks. Hence, if the liquidity effect was integrated into the size effect and the value effect, ER would show greater returns. For instance, the ER of the market portfolio was 1.04% and those of highly liquid small-cap stocks and highly liquid value stocks were 397.95% and 336.13%. This meant that investing $100 in the market only generated a return of $1.04 after 10 years, while highly liquid small-cap stocks and highly liquid value stocks garnered profits of $397.95 and $336.13, respectively when the same amount of money was invested 10 years ago..

In order to obtain a better picture of the performance of the style portfolios, all 15 portfolios were ordered according to the ranking of the ARs and the excess return returns over the benchmark portfolio, i.e., the market, exhibited in Table 4. According to Table 4, among the top six portfolios, highly liquid small-cap, highly liquid value, value, highly liquid, highly liquid big-cap, and highly liquid growth stocks, five of them were related to high liquidity except the value stocks. It was demonstrated that the liquidity effect was significant both in the short-run and in the long-run. Therefore, this finding was consistent with that of Lee and Swaminathan (2000), in which the stocks of high TRs would reflect the characteristics of glamour stocks, leading to a stronger price momentum in the short-run and longer persistence in returns in the long-run.

In summary, the liquidity effect and the value effect were significant in Taiwan's stock market both in the short-run and in the long-run. Secondly, the ER reached a higher level when liquidity was combined into the size effect and the value effect. In short, this study found that liquidity could be significant and thus become a new investment style for stock selection.

Table 4 The ARs and Excess Return over the Market

Ranking	Portfolio	AR	ER
1	HS	841.47%**	869.94%
2	HV	710.50%**	738.97%
3	V	370.10%**	398.57%
4	H	193.40%**	221.87%
5	HB	100.14%**	128.61%
6	HG	95.10%**	123.57%
7	LV	28.80%**	57.27%
8	S	25.99%**	54.46%
9	G	-3.80%	24.33%
10	LG	-7.10%**	21.37%
11	LS	-24.19%	< 0
12	B	-24.69%	< 0
13	M	-28.47%	< 0
14	L	-36.20%	< 0
15	LB	-39.64%	< 0

** denotes $p < 0.05$; * denotes $p < 0.10$.

V. Conclusion

This study investigated whether the liquidity effect existed in Taiwan's stock market by involving publicly listed companies in Taiwan from 1999 to 2008 as the study sample. One-dimensional style portfolios with stock liquidity as the core and binary style portfolios combining stock liquidity with company characteristics and company size were then established before a comparison of returns among these style portfolios was conducted to ascertain whether there were anomalies regarding AR occurring in the market.

The results showed that the liquidity effect occurred in Taiwan's stock market both in the short-term and in the long-term when no distinction was made between bullish markets and bearish markets. In the 10-year research period, highly liquid stocks produced significant AR compared with the market portfolio. When the liquidity effect was integrated with size effect and value effect, those high liquidity-related style portfolios mentioned in this study, i.e. highly liquid value

stocks, highly liquid growth stocks, highly liquid small-cap stocks, and highly liquid big-cap stocks, showed more significant ERs both in the short-term and in the long-term. Among them, highly liquid small-cap stocks and highly liquid value stocks produced the highest accumulated ER of 869.94% and 738.97%, respectively.

In comparison to the literature on liquidity, this study found that the stock-picking rule favoring highly liquid stocks with high stock TRs had more significant ER than did stocks with low TRs. It can thus be inferred that highly liquid stocks are likely to show performances corresponding to Lee and Swaminathan's (2000) findings, which claimed that stocks with high TRs reflect the characteristics of glamour stocks, which have a stronger momentum or energy in the short-term and show more persistence in returns in the long-term, and thus deliver significant single-quarter returns and AR. This point coincides with the well-known securities analyst Granville Joe's viewpoint, "volume precedes price", i.e., trading volume provides the basis for price momentum.

Much of the literature on style investing had studied the style investing effect using regression analysis. In contrast, an analysis of investment performance returns by adopting the style investing approach was conducted in the study. The style investment approach was shown to be consistent with the concept of style analysis adopted by professional investment corporations. Furthermore, we contributed to establish a set of simple and clear-cut stock selecting rules based on style classifications, based on which investors and professionals may conveniently formulate easy-to-follow investment strategies.

REFERENCES

[1] Amihud, Y., "Illiquidity and Stock Returns: Cross-Section and Time-Series Effects," Journal of Financial Markets 5, 31–56, 2002.

[2] Amihud, Y. and H. Mendelson, "Asset Pricing and the Bid-Ask Spread," Journal of Financial Economics, 17, 223–249, 1986.

[3] Amihud, Y. and H. Mendelson, "The Effect of Beta, Bid-Ask Spread, Residual Risk, and Size on Stock Returns," Journal of Finance, 2, 479–486, 1989.

[4] Ahmed, P. and S. Nanda "Style Investing: Incorporating Growth Characteristics in Value Stocks", Journal of Portfolio Management, 27, 3, 47–59, 2001.

[5] Babson, R. W., "Growth Stocks Discussed by Roger Babson," Times Daily, Section 2, Oct. 4, 1962.

[6] Bodie, Z., A. Kane, and A. J. Marcus, Investments, 6th ed., McGraw-Hill: New York, 2005.

[7] Brown, S. J. and W. N. Goetzmann, "Mutual Fund Styles," Journal of Financial Economics, 43, 3, 373–399, 1997.

[8] Chan, J. S. P., D. Hong, Marti G. Subrahmanyam, "A Tale of Two Prices: Liquidity and Asset Prices in Multiple Markets," Journal of Banking & Finance, 32, 947–960, 2008.

[9] Christopherson, J. A. "Equity Style Classifications," Journal of Portfolio Management, 21, 3, 32–44, 1995.

[10] Ding, D. K. and S. T. Lau, "An Analysis of Transactions Data for the Stock Exchange of Singapore: Patterns, Absolute Price Change, Trade Size and Number of Transactions," Journal of Business Finance & Accounting, 28, 151–174, 2001.

[11] Fama, E. F. and K. R. French, "The Cross-Section of Expected Stock Returns," Journal of Finance, 47, 427–465, 1992.

[12] Farrell, J. L., "Analyzing Covariation of Returns to Determine Homogeneous Stock Groupings," Journal of Business, 47, 2, 186–208, 1974.

[13] Gallo, J. G and L. Lockwood, "Benefits of Proper Style Classification of Equity Portfolio Managers," Journal of Portfolio Management, 23, 3; 47–56, 1997.

[14] Gallo, J. G., C. Phengpis and P. E. Swanson, "Institutional Flows and Equity Style Diversification," Applied Financial Economics, 18, 1441–1450, 2008.

[15] Goyenko, R., "Liquidity and Asset Pricing," PhD Thesis, Indiana University, 2006.

[16] Graham, B., D. L. Dodd, S. Cottle, and C. Tatham, Jr., Security Analysis, McGraw Hill, New York, 1934.

[17] Jones, C, G. Kaul, and M. Lipson, "Transactions, Volume, and Volatility," Review of Financial Studies, 7, 4, 631–651, 1994.

[18] Lee, M. C. C. and B. Swaminathan, "Price Momentum and Trading Volume," Journal of Finance, 55, 2017–2069, 2000.

[19] Lintner, J., "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets," Review of Economics and Statistics, 47, 13–37, 1965.

[20] Massa, M. and L. Zhang, "Cosmetic Mergers: The Effect of Style Investing on the Market for Corporate Control," Journal of Financial Economics, 93, 400–427, 2009.

[21] Ross, S. A., "The Arbitrage Theory of Capital Asset Pricing," Journal of Economic Theory, 13, 341–360, 1976.

[22] Sharpe, W. F. "Capital Asset Prices: A Theory of Market Equilibrium under Conditional of Risk," Journal of Finance, 19, 425–442, 1964.

[23] Sharpe, W. F. "Major Investment Styles," Journal of Portfolio Management, 4, 2, 68–80, 1978.

[24] Sharpe, W. F., "Asset Allocation: Management Style and Performance Measurement," Journal of Portfolio Management, 18, 2, 7–19, 1992.

[25] Teo, M. and S. Woo "Style Effects in the Cross-Section of Stock Returns," Journal of Financial Economics, 74, 2, 367–398, 2004.

[26] Wongchoti, U. and C. S. Pyun, "Risk-Adjusted Long-Term Contrarian Profits: Evidence from Non-S&P 500 High-Volume Stocks," Financial Review, 40, 335–359, 2005.