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台灣股票市場 Tobin's q 效應及其與

規模、益本比效應關係之研究

The Tobin's q Effect and it's Relationship with Firm

Size and E/P Ratio in Taiwan Stock Market

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臺灣股票市場 Tobin's q 效應及其與公司規模、益本比效應關係之研究

摘要

　　本論文目的在瞭解臺灣股票市場中，Tobin's q 效應及其與規模、益本比各因子間的關係。採用 AREMOS 統計資料庫之上市公司財務資料及股價，研究期間自民國七十七年一月至八十四年底，使用資本資產定價模式之投資組合績效研究法，以 T 及 Hotelling F 檢定顯著性，以 Spearman Rank 分析三因子間等級相關性。研究結果發現：(1)最小 q 值投資組合比最大 q 值投資組合月異常報酬多 1.531%，且總報酬率及風險調整後報酬率都顯示小 q 公司有較佳的績效。(2)規模效應在這段期間中穩定地存在，最小公司規模投資組合比最大公司規模投資組合月異常報酬多 2.20%。(3)以益本比大小排列形成之投資組合與異常報酬間並未顯示出明確的正比或反比的關係。(4)控制益本比後，q 效應更加顯著，控制公司規模後，q 效應減弱但顯著。(5)控制 Tobin's q 之後，規模效應穩定存在但減弱，而益本比效應呈反向關係。研究因子間等級相關的結果，公司規模及 Tobin's q 顯著的正相關，但兩效應互相獨立。低益本比公司具有低 Tobin's q 可能性較強，但低 Tobin's q 公司為低益本比並不明顯，其間關係有賴進一步之研究。

關鍵字：Tobin's q 效應，規模效應，益本比效應

The Tobin's q Effect and its Relationship with Firm Size and E/P Ratio in Taiwan Stock Market

Abstract

The purpose of this study is to explore the Tobin's q effect for stock returns in Taiwan, and its relationship with size effect and E/P ratio effect. Financial data are collected from the AREMOS database to calculate firm size, E/P ratio and Tobin's q ratio for each sample firm selected from Taiwan Stock Exchange from January 1988 to December 1995. Performance evaluation is analyzed using CAPM for each portfolio formed based on different choice variable. We find that there is Tobin's q effect for stock returns in Taiwan, i.e., low q firms earn higher abnormal returns. On average, our samples indicate that stocks with low q ratio outperform stocks with high q ratio by 1.531 % per month. During the studied period, we also confirm the size effect and find no E/P effect before controlling for other variables. Tobin's q effect is not altered after controlling for size effect, E/P effect or both. Actually, Tobin's q effect is enhanced if E/P ratios in the portfolios are averaged. There are signs of inverse relationship between stock return and E/P ratio if Tobin's q effect is controlled. The size effect is very robust, not affected by other factors. There is evidence that firm size and Tobin's q have some interactions. But both effects are independent of each other. Meanwhile, Tobin's q and E/P ratio are positively correlated for lowest E/P portfolio, and negatively correlated for higher E/P portfolios. Yet no such correlation is observed for portfolios ranked by Tobin's q. Further analysis is required to fully understand their interaction.

Keywords: Tobin's q effect, size effect, e/p ratio effect

The Tobin's q Effect and its Relationship with Firm Size and E/P Ratio in Taiwan Stock Market

1.   Introduction

In the last decade, financial economists have investigated a number of peculiar market anomaly. The size effect (Banz,1981) and the E/P effect (Basu,1977) have been discussed extensively in the literature. Further analyses about their interactions are provided by Keim (1990), Reignum (1981,1992), Basu (1983), among others. Recently Badrinath and Kini (1994) find that, on average, stocks with low Tobin's q ratio outperform stocks with high Tobin's q ratio. Tobin's q is the ratio of the market value of a firm to the replacement cost of its asset. It has been employed to explain a number of diverse corporate phenomena, such as investment decision, managerial performance and tender offer gain, etc. (Jose, Nichols and Stevens (1986), Lang, Stulz and Walkling (1989), Smith and Watts (1992)).

Interestingly, however, despite its influence over many important financial issues, Tobin's q for firms in Taiwan is seldom related to their stock returns. The purpose of this study is to explore Tobin's q effect for the stock returns in Taiwan, and its relationship with size effect and E/P ratio effect.

There have been many studies about the size effect and E/P effect for stock returns in Taiwan. The results are far from conclusive. Tsai(蔡明正,1988), Lee(李俊龍,1990) and Hwang(黃昭祥,1992) all find evidence for size effect in Taiwan stock market. But Wu (吳建瑩,1988), Lin(林伶如,1990), Hwang(黃錫和,1993) and Chen(陳建良,1994) claim that there is no size effect. Most of the studies for E/P ratio effect in Taiwan do not support its existence. (Hsieh(謝繼茂,1979), Chen(陳尚群,1989), Wang(王明仁, 1989), Lin(林伶如,1990), Fong(方淑莉,1990), Liu(劉美蘭,1991), Hwang(黃錫和,1993), Young & Lin (楊朝成,林成如,1993), Chen(陳建良,1994)). Yet Chou and Johnson (1990) do find E/P effect in their samples, and Huang(黃昭祥,1992) suggests an opposite E/P effect in his study. Finally, Hsiao(蕭翠玥,1988) finds that there is size effect after controlling for E/P, and there is E/P effect after controlling for firm size.

In this paper, we examine the Tobin's q effect, the size effect and the E/P effect for stock returns in Taiwan from January 1988 to December 1995. The results show that there are Tobin's q effect and size effect during this period. Low q firms or small size firms earn significant higher abnormal returns. However, portfolio return is not related to its E/P ratio during this period.

Using Basu's randomization technique, we further analyze the interactions between firm

size, E/P ratio and Tobin's q. It is found that q effect is more significant after controlling for E/P ratio. It is weaker, but still significant, after controlling for firm size. On the other hand, if Tobin's q is controlled, the size effect seems less significant, and stock returns become inversely related to E/P ratios. Finally, we conduct the rank correlation analysis to explore the causes of these complicated interactions between each variable.

The rest of the paper is organized as follows. The next section explains the data and methodology. All the empirical findings are discussed in section 3. The final section concludes.

2. Data and Methodology

Firms with complete financial records are selected from Taiwan Stock Exchange if they are listed during the period from January 1988 to December 1995. The financial companies are excluded due to different financial structure. The number of sample firms selected in each year is described in Table 1.

Table 1:   Sample Numbers

year	1988	1989	1990	1991	1992	1993	1994	1995
listed firms	163	181	199	221	256	285	313	347
sample firms	103	140	156	173	191	226	250	272
—% of listed—	(63%)	(77%)	(78%)	(78%)	(75%)	(79%)	(80%)	(78%)

Financial data are collected from the AREMOS database to calculate firm size, E/P ratio and Tobin's q ratio for each sample firm. Firm size is determined by the total value of outstanding common stocks. E/P is earnings per share divided by the market share price. We use Chung and Pratt (1994) formula to calculate the Tobin's q ratio, i.e.,

$$q = (MVE+PS+DEBT)/TA$$

where MVE: the product of a firm's share price and the number of outstanding common shares,

PS: the liquidity value of firm's outstanding preferred stock,

DEBT: the value of firm's short term liabilities net of its short term assets, plus the book value of its long term debt,

TA: the book value of firm's total asset.

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This approximate formula differs from a more commonly used Lindenberg and Ross (1981) formula. It implicitly assumes that the replacement values of a firm's plant, equipment, and inventories are equal to their book values. Chung and Prutt find that calculated q values from their formula and those from Lindenberg and Ross formula are highly correlated.

Firms are ranked in ascending order on the basis of the relevant choice variable (Tobin's q, size or E/P) and grouped into four equally sized portfolios. Portfolio decision is made each year and return is calculated assuming each firm is equally weighted. The performance of the portfolio is measured applying CAPM. The estimated equation is

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + \varepsilon_{pt} \text{, } t=1,\ldots96$$

where R_{pt} return on portfolio p in month t, p =1   2   3   4.
   R_{mt} return on market portfolio for month t,
   R_{ft} return on the riskless asset for month t,
   α_p estimated abnormal return for portfolio p,
   β_p estimated systematic risk for portfolio p,
   ε_{pt} error terms.

We take bank's one-month CD rate as proxy for riskless rate, and Taiwan Stock Exchange Index is used to calculate the market returns. α_p represents the abnormal return for portfolio p after adjusting for systematic risk β_p. Its significance is based on t-statistic. Hotelling F-statistic is calculated to test the significance of the abnormal returns across four portfolios. Medians of the three choice variables, and the returns per unit total risk are also reported for comparisons.

In order to control possible influence of one effect on another, we use the randomization technique developed by Basu (1983) to form the portfolios. Firms are first ranked according to one variable (say Tobin's q) and assigned to four groups. Within each q group, firms are ranked again according to the second variable (say firm size), and assigned to next four groups. Then firms in the smallest size group from each of the four q groups are combined into one portfolio, firms from the second smallest size group are combined into the second portfolio, and so on. The result of this process generates four portfolios with increasing firm size and averaged Tobin's q ratio.

To control more than one variable, we extend the randomization technique described above. Firms are first ranked according to one variable (size) and assigned to four groups. In each size group, firms are then ranked by the second variable (Tobin's q) and assigned to four groups again. Finally, each of 16 q groups is divided into four groups based on

firm's E/P ranking. Firms in the smallest E/P group within each q and size group are combined into the smallest E/P portfolio. Firms in the second smallest E/P group within each q and size group are combined into the second smallest E/P portfolio. Each E/P ranked portfolio has size and Tobin's q well dispersed.

3.   Empirical Results

We first examine the Tobin's q effect, the size effect and E/P ratio effect. Next we investigate whether any effect may be affected by the other effects. Finally the interactions among these effects are discussed.

3.1   Tobin's q effect

Table 2 presents results of the performance evaluation for the four portfolios ranked by Tobin's q ratio. The smallest q ratio portfolio earns 1.519 percent (significant at 95%) abnormal return per month while the largest q ratio earns -0.012 percent per month. The difference in monthly abnormal percentage returns between these two portfolios is 1.531 percent (18.37 percent per year). Results in Table 2 suggest that portfolio return and portfolio q ratio are inversely related. The performance comparisons using total risk $(R_p/_p \ (R_p))$ provide similar evidence, that low q portfolios have higher risk adjusted returns. Median q ratios increase with size and decrease with E/P, indicating possible relationship between these effects.

Table 2: Performance Evaluation of Portfolios Formed by Tobin's q Ratio

Portfolio Returns			Coefficients			Medians		
R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1* 3.300	15.665	0.211	1.519a	1.003	0.754	10,693	0.012	0.970
2* 2.737	14.940	0.183	0.970b	0.991	0.892	13,037	0.018	1.455
3* 2.060	14.577	0.141	0.322	0.970	0.813	13,377	0.021	1.879
4* 1.753	14.800	0.118	-0.012	0.990	0.822	11,793	0.019	3.032

$R_M/\sigma(R_M)$=0.131   F=1.913 (Prob.=0.133)

* **1**:smallest q ratio portfolio...f4:lar4est q ratio portfolio
a: significant at 95 percent
b: significant at 90 percent

3.2 The size effect

In Table 3 performance evaluation results based on firm size are reported. The abnormal return for the smallest size portfolio is 1.996 percent per month, much higher than those of the larger size portfolios. $R_p/_p$ (R_p) provides similar evidence. F statistic is significant at 5 percent level that abnormal returns are different from zero for these four portfolios. Therefore, our study confirms the size effect for stock return in Taiwan during this period. Interestingly, as portfolio size increases, the median E/P ratio decreases and the median q ratio seems fairly stable.

Table 3: Performance Evaluation of Portfolios Formed by Firm Size

Portfolio Returns			Coefficients			Medians		
R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1[*] 3.863	17.900	0.216	1.966a	1.092	0.685	2,778	-0.039	1.717
2[*] 2.829	16.322	0.173	0.976	1.059	0.774	5,268	0.018	1.847
3[*] 1.865	14.155	0.132	0.146	0.955	0.836	9,052	0.024	1.998
4[*] 1.363	12.246	0.111	-0.234	0.861	0.906	30,665	0.041	1.848

$R_M/\sigma(R_M)=0.131$ F=3.024 (Prob.=0.034)

3.3 The E/P effect

Table 4 provides the abnormal returns for portfolios with increasing E/P ratios. The lowest E/P portfolio is 1.161 percent per month while those of the higher E/P portfolios are 0.468, 0.480 and 0.668 percent per month respectively. If we exclude the samples with negative E/P ratios, the data become 0.683, 0.596, 0.547 and 0.590 percent per

month for each portfolio (details not reported here). Therefore, we conclude that there is no evidence of E/P effect in Taiwan Stock Exchange during the studied period.

Table 4: Performance Evaluation of Portfolios Based on E/P

Performance Returns			Coefficients			Medians		
R_p	$\sigma(R_p)$	$R_p/$ $\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1[*] 3.077	17.219	0.179	1.161b	1.107	0.760	5,364	-0.078	1.903
2[*] 2.249	15.432	0.146	0.468	1.003	0.776	9,110	0.015	1.967
3[*] 2.181	13.828	0.158	0.480	0.941	0.850	12,273	0.034	1.908
4[*] 2.330	13.425	0.174	0.668	0.910	0.845	20,358	0.066	1.641
$R_M/\sigma(R_M)$=0.131			F=1.656 (Prob.=0.182)					

[*] **1**:smallest E/P ratio portfolio...f4:lar4est E/P ratio portfolio
b: significant at 90 percent

3.4 The q effect and size effect after controlling for E/P

Using the randomization technique discussed in section 2, we first form the q portfolios after randomizing for E/P. The result is shown in Table 5, Panel A. The abnormal returns are decreasing with Tobin's q of the portfolio. F statistic is significant at 10 percent level and the difference in return between two extreme portfolios is increased. Thus the Tobin's q effect is strengthened after controlling for E/P ratio in the portfolio. On the other hand, the size effect is not altered after controlling for E/P ratio.

Table 5: Performance Evaluation of Various Portfolios Controlled for E/P

Performance Returns			Coefficients			Medians		
R_p	$\sigma(R_p)$	$R_p/$	α_p	β_p	R^2	Size (,000)	E/P	q

		$\alpha(R_p)$							

$_p$ A$_p$ For Portfolios Formed Based on Tobin's q, Controlled for E/P

1	3.423	15.817	0.216	1.619a	1.020	0.765	11,828	0.012	0.998
2	2.579	14.904	0.173	0.829	0.979	0.792	11,879	0.014	1.454
3	2.169	14.709	0.147	0.416	0.981	0.818	11,017	0.019	1.876
4	1.782	14.534	0.123	0.031	0.980	0.835	12,417	0.022	2.986

$R_M / \alpha(R_M) = 0.131$ F=2.255 (Prob.=0.087)

(B)   For Portfolios Formed Based on Firm Size, controlled for E/P

1	3.891	17.456	0.223	2.001a	1.088	0.714	3,142	-0.027	1.713
2	2.374	15.167	0.157	0.619	0.982	0.771	5,734	0.020	1.779
3	2.115	14.231	0.149	0.392	0.959	0.833	9,854	0.022	1.890
4	1.599	13.360	0.120	-0.096	0.937	0.902	28,444	0.024	1.950

$R_M / \alpha(R_M) = 0.131$ F=4.008 (Prob.=0.010)

a: significant at 95 percent

3.5 The q effect and E/P effect after controlling for firm size

Table 6 provides the performance evaluation for portfolios ranked by Tobin's q and E/P ratio after controlling for firm size. In Panel A, the abnormal returns are significant for lower q firms, indicating an independent Tobin's q effect not affected by firm size. They are decreasing with Tobin's q in the portfolio, but at a smaller degree compared with data in Table 2. Results in Panel B show no evidence for E/P effect after controlling for firm size.

Table 6: Performance Evaluation of Various Portfolios Controlled for Firm Size

Performance Returns		Coefficients	Medians

	R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q

$_p$ A$_p$ For Portfolios Formed Based on Tobin's q, Controlled for Size

	R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1	3.032	15.350	0.198	1.268b	0.989	0.764	11,477	0.013	1.004
2	2.651	14.707	0.180	0.892b	0.985	0.825	12,738	0.015	1.454
3	2.141	14.784	0.145	0.381	0.987	0.818	12,967	0.024	1.868
4	2.063	14.940	0.138	0.291	0.996	0.815	10,600	0.016	2.984

$R_M/\sigma(R_M)=0.131$ F=1.218 (Prob.=0.308)

$_p$ B$_p$ For Portfolios Formed Based on E/P, Controlled for Firm Size

	R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1	2.376	15.859	0.150	0.523b	1.058	0.818	9,269	-0.076	2.002
2	2.394	14.763	0.162	0.631	0.989	0.825	11,165	0.016	1.940
3	2.248	14.351	0.157	0.531	0.953	0.810	13,109	0.033	1.882
4	2.739	14.542	0.188	1.016	0.958	0.797	13,944	0.060	1.671

$R_M/\sigma(R_M)=0.131$ F=0.605 (Prob.=0.614)

b: significant at 90 percent

3.6 The size effect and E/P effect after controlling for Tobin's q

As indicated in Table 7, Panel A, the size effect from portfolios controlled for Tobin's q is slightly weaker compared with data in Table 3. Meanwhile, the abnormal returns for portfolios ranked by E/P are decreasing, showing signs of opposite E/P effect . This is similar to the result as reported by Huang(黃昭祥,1992).

Table 7: Performance Evaluation of Various Portfolios Controlled for Tobin's q

Performance Returns	Coefficients	Medians

R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q

A. For Portfolios Formed by Firm Size, Controlled for Tobin's q

	R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1	3.690	17.614	0.209	1.809	1.080	0.691	2,793	-0.041	1.836
2	3.001	16.159	0.186	1.151	1.056	0.786	5,389	0.018	1.835
3	2.052	14.478	0.142	0.302	0.979	0.839	9,146	0.021	1.859
4	1.299	12.376	0.105	-0.300	0.862	0.889	29,556	0.040	1.881

$R_M/\sigma(R_M) = 0.131$ \qquad F=2.571 (Prob.=0.059)

B. For Portfolios Formed by E/P, Controlled for Tobin's q

	R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1	3.105	17.043	0.182	1.202b	1.097	0.762	5,636	-0.079	2.002
2	2.366	15.672	0.151	0.569	1.015	0.771	8,862	0.014	1.892
3	2.264	13.891	0.163	0.564	0.941	0.842	11,798	0.033	1.820
4	2.139	13.337	0.160	0.474	0.913	0.860	20,372	0.062	1.789

$R_M/\sigma(R_M) = 0.131$ \qquad F=0.919 (Prob.=0.435)

b: significant at 90 percent

3.7 Randomizing for more than two variables

In this section , we consider each of the three effects after simultaneously controlling for the other two variables. Using the randomization technique discussed in section 2, we have results as reported in Table 8. In panel A, the size effect remains significant. The differential in risk-adjusted returns between the two extreme size portfolios is about the same as in other cases reported earlier. It seems that the size effect is rather robust with respect to the controls for q, E/P or both. While in Panel B, the E/P effect still does not exist. In Panel C, there is q effect at 15 percent significance level by F statistic. It seems that the Tobin's q effect is enhanced when E/P ratio is controlled.

Table 8:. Performance Evaluation of Various Portfolio after Dual Controls

Performance Returns			Coefficients			Medians		
R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q

$_p$ A$_p$ For Portfolios Formed by Firm Size, Controlled for q and E/P

	R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1	3.895	17.414	0.224	2.002b	1.089	0.719	3,192	-0.031	1.799
2	2.743	15.560	0.176	0.954	1.009	0.772	5,446	0.016	1.871
3	2.041	14.336	0.142	0.323	0.954	0.814	8,437	0.022	1.873
4	1.686	13.445	0.125	-0.004	0.932	0.882	22,428	0.023	1.875

$R_M/\sigma(R_M)=0.131$ F=3.884 (Prob.=0.012)

$_p$ B$_p$ For Portfolios Formed by E/P, Controlled for q and Firm Size

	R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1	2.549	16.148	0.158	0.664	1.083	0.827	9,159	-0.077	1.951
2	2.384	15.128	0.157	0.600	1.005	0.805	10,572	0.009	1.947
3	2.360	14.609	0.162	0.627	0.966	0.803	12,746	0.025	1.826
4	2.499	14.040	0.178	0.791a	0.946	0.834	13,241	0.052	1.825

$R_M/\sigma(R_M)=0.131$ F=0.173 (Prob.=0.914)

$_p$ C$_p$ For Portfolios Formed by Tobin's q, Controlled for Firm Size and E/P

	R_p	$\sigma(R_p)$	$R_p/\sigma(R_p)$	α_p	β_p	R^2	Size (,000)	E/P	q
1	3.084	15.699	0.196	1.286a	1.015	0.769	11,609	0.010	1.003
2	2.735	15.211	0.180	0.948a	1.007	0.806	11,859	0.016	1.401
3	2.505	15.178	0.165	0.731	0.997	0.793	11,817	0.014	1.727
4	1.785	14.086	0.127	0.066	0.955	0.843	12,079	0.021	2.670

$R_M/\sigma(R_M)=0.131$ F=1.930 (Prob.=0.130)

a: significant at 95 percent

b: significant at 90 percent

3.8 Interactions between size, E/P and Tobin's q

To further study interactions between Tobin's q and other effects, we calculate Spearman's rank correlation coefficients between firm size and Tobin's q, and between E/P ratio and Tobin's q. Coefficients between firm size and E/P ratio are also listed. As described in Table 9, there is interaction between firm size and Tobin's q. This interaction increases with firm size so that large size firms are likely the high q firms. But high q firms are not as likely the large size firms. This help explain an independent Tobin's q effect as discussed earlier. For portfolios ranked by E/P, Tobin's q and E/P ratio are positively correlated for lowest E/P portfolio and negatively correlated for higher E/P portfolios This causes strong interference on E/P effect by Tobin's q effect in the ranked portfolios, and may partly explain why most E/P effect studies in Taiwan get negative result. On the other hand, no such correlation is observed for portfolios ranked by Tobin's q. It is not clear why q effect is enhanced after E/P ratio is controlled. For firm size and E/P ratio, we find no evidence of interaction.

Table 9:   Spearman's Rank Correlation Coefficients

	Firm Size祥Tobin's q		Firm Size祥E/P ratio		E/P ratio祥Tobin's q	
Portfolio ranking	Portfolios formed by firm size	portfolios formed by Tobin's q	Portfolios formed by firm size	Portfolios formed by E/P	Portfolios formed by E/P	Portfolios formed by Tobin's q
1	0.6317	0.6034	0.4454	0.4490	0.6371	*0.1745
2	0.7150	0.7307	-0.6516	-0.2095	-0.5049	*-0.1014
3	0.8687	0.6377	*-0.1603	-0.2493	-0.6899	-0.4799
4	0.8336	0.5624	-0.7539	-0.6405	-0.3681	-0.3155

* implies not significant

4. Conclusion

The evidence from empirical results of this study supports Tobin's q effect for stock returns in Taiwan from January 1988 to December 1995. Low q firms earn significant

higher abnormal returns. On average, our samples indicate that stocks with low q ratio outperform stocks with high q ratio by 1.531 percent per month. During the same period, we also confirm the size effect and find no E/P effect before controlling for other variables. Tobin's q effect is not altered after controlling for size effect, E/P effect or both. Actually, Tobin's q effect is enhanced if E/P ratios in the portfolios are averaged. There are signs of inverse relationship between stock return and E/P ratio if Tobin's q effect is controlled. The size effect is very robust, not affected by other factors.

The interactions between the size effect, Tobin's q effect and E/P ratio effect seem complex, though. There is evidence that firm size and Tobin's q have some interactions. But both size effect and q effect exist whether controlling for each other or not. The connection between E/P ratio and Tobin's q is more complicated. Tobin's q and E/P ratio are positively correlated for lowest E/P portfolio, and negatively correlated for higher E/P portfolios. Yet no such correlation is observed for portfolios ranked by Tobin's q. This causes interference for studying E/P ratio effect and may be one of the reasons why most studies in Taiwan deny the E/P effect. Further analysis is required to fully understand their interaction as well as the return behavior in our stock market.

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