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THE CAPITAL INVESTMENT INCREASES AND STOCK RETURNS

Jung Fang Liu[1] --- Nicholas Rueilin Lee[2†] --- Yih-Bey Lin[3] --- Zang-Po Hong[4]

[1]*Department of Public Finance, Ling Tung University, Taiwan*

[2,3,4]*Department of Finance, Chaoyang University of Technology, Taiwan*

ABSTRACT

This paper applies free cash flow and information asymmetry hypotheses to investigate whether managers pursuit their private benefits by using capital investment expenditure (hereafter CI) increases or not, and to explore whether managers decrease CI as more dividend payments under information asymmetry hypothesis. Consequently, the present study investigates the effect of CI increases on abnormal stock returns of Taiwanese listed firms. The empirical results show that during full period and the post financial tsunami period, the effects of an increase in CI on stocks returns are positive, and the CI-spread is negative. This supports the hypothesis of information asymmetry. However, in the electronics industry during the entire study period and the post financial tsunami period, the expenditure of low CI tends to support free cash flow hypothesis but that of high CI supports the hypothesis of information asymmetry.

Keywords: Capital investment, Stock return, Free cash flow hypothesis, Information asymmetry.

JEL Classification: G31, G34, C33.

Contribution/ Originality

The paper's primary contribution is that during full period and the post financial tsunami period, the effects of an increase in capital investment expenditure (CI) on stocks returns are positive, and the CI-spread is negative.

1. INTRODUCTION

Firms engage in capital investment (CI) to increase firm values by elevating their economic scale and technological levels and employing diversification strategies. It leads to attain competitive advantages, reduce operational risks, and generate more profits. Studies have shown

† Corresponding author
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that when the CI of a firm increases, its stock prices yield substantially positive abnormal returns. Thus, increasing CI is likely to increase firm value (Mcconnell and Muscarella, 1985). However, from the perspective of stockholders, firms should return excess capital to stockholders and raise funds in the capital market under supervision when firms need capital. Excess capital may lead managers to make wrong decisions. It would result in the poor operating performance of a firm. Whether an increase in CI raises firm value or reduces the operational performance of firms is worthy of discussion.

The free cash flow hypothesis (Jensen, 1986) states that when the free cash flow of a firm increases, the managers are more likely to exhibit over-investment and capital abuse; in a firm where the free cash flow is high and the growth opportunity is low, a great conflict of interest exists between managers and stockholders. The information asymmetry hypothesis (Miller and Rock, 1985) indicates that if a firm distributes stock dividends that exceed levels of market expectations, the firm's stock price increases; however, the market will eventually reflect the actual value of under-investment, resulting in stock price decline. It implies under-investment problems.

From the perspective of the information asymmetry hypothesis, increasing CI can elevate the economic scale and technological level of firms, thereby increasing firm value. However, when the problems related the free cash flow hypothesis occur, increasing CI reduces firm value. Therefore, increasing CI does not necessarily increase firm value. Whether the CI policies and actual behaviors of listed firms in Taiwan favor the perspective of the information asymmetry hypothesis or encounter problems mentioned in the free cash flow hypothesis substantially influences firm value and the interest of investors; thus, further exploration is warranted.

The objective of this study is to investigate whether the managers of listed firms in Taiwan employ CI to gain private benefits and reduce the future stock returns of firms, or increase the stock dividends distributed in an information asymmetry environment to enhance the market evaluations on their firms and improve the managers' perceived operational performance. To achieve this objective, we use the free cash flow and information asymmetry hypotheses to verify whether stock returns fluctuate with the abnormal increase of CI. Regarding the research methods, we consider listed firms in Taiwan and adopt the Fama-French 3-factor and Carhart 4-factor models to verify the relationship between abnormal CI increases and future stock returns. Additionally, we use a panel data approach to conduct robustness tests.

The empirical results show that the overall sample exhibits positive abnormal returns during the entire research period and the post-financial crisis period. The CI spread shows negative abnormal returns.

The overall sample supports the information asymmetry hypothesis. By contrast, the electronic industry samples during the entire research period and post-financial crisis period show that firms with low and high CI support the free cash flow and information asymmetry hypotheses, respectively.For rests of this study, we review prior literatures in the second section. The third section describes data and methodology while the fourth section provides empirical results. Finally, we conclude.

2. LITERATURE REVIEW

2.1. Capital Investment

Numerous relevant studies have shown that increasing CI positively influences stock returns (Woolridge and Snow, 1990; Chung *et al.*, 1998). However, other studies have presented different arguments. Chung *et al.* (1998) indicates that when high-technology firms lack valuable investment opportunities, the firms claim that increasing CI negatively affects stock prices. When low-technology firms possess investment opportunities, the firms claim that increasing CI increases stock prices. Therefore, the individual factors of firms are more impacts on abnormal returns than industry factors. Cheng (2001) indicates that on the day of CI announcement, stock prices of electronic and non-electronic firms exhibit considerable and positive price movements. However, electronic firms have more notable abnormal returns than non-electronic firms. Thus, whether the influence of CI on stock returns is positive or negative requires further examination.

2.2. Free Cash Flow

Jensen and Meckling (1976) indicate that because of factors such as the conflict of interest and information asymmetry between owners and managers, managers will invest capital in investment projects with a net present value below zero to pursue private benefits and maintain their positions when the firm's free cash flow is abundant. This reduces the long-term profits of the firm. Jensen (1986) proposes the free cash flow hypothesis to explain that when the firm distributes excess free cash flow to stockholders, the firm's capital decreases. When the firm holds excess capital but lack favorable investment opportunities, stocks repurchases and/or dividends payments can prevent unnecessary investment and the problem of agency costs to increase the firm value. Jensen (1986) also **notes** that firms with high free cash flow and low development opportunities have substantial agency costs between managers and stockholders. Raising a loan can effectively reduce the agency problems of free cash flow. Additionally, Titman *et al.* (2004) indicate that CI declaration caused abnormal returns in future stocks. Grullon and Michaely (2004) also indicate that a firm in the growth stage has the following characteristics: positive net present value, high CI, low cash flow, and high earnings growth. However, after the firm grows into a certain level, the profit begins to decrease, so does the CI. During this stage, the firm may have considerable free cash flow.

2.3. Information Asymmetry

Modigliani and Miller (1963) indicate that in the efficient-market hypothesis, all participants in the market hold completely disclosed and shared information. However, managers always possess more information regarding firms than external investors do; thus, information asymmetry exists. Leland and Pyle (1977) argue that when equity financing reduces the shareholding ratio of managers, the stock prices of firms may exhibit negative responses. Ross (1977) reports that loan-raising behaviors of firms completely transfer firm inside information to external investors. If the nature of a firm is excellent, little information asymmetry exists and the debt ratio increases. Miller and Rock (1985) indicate that when a firm declares an investment project with a positive net

present value, external investors may consider that the firm's earnings are growing and future cash flow will increase. Based on the perspective of information asymmetry, Myers and Majluf (1984) consider that a firm's managers possess more information regarding the firm than external investors do. If a firm issues new shares to raise capital for investment projects, the firm's stock price may be underestimated. To maximize the benefits of original stockholders, managers tend to relinquish advantaged investment projects, which reduce firm value and cause deadweight losses.

In summary, based on the information asymmetry hypothesis, managers conduct under-investment by distributing additional stock dividends to satisfy stockholders or potential investors. It implies positive influence of a CI increase on the firm's stock returns. However, according to the free cash flow hypothesis, over-investment exerts negative declaration effects on firm financing. Thus, increasing CI may negatively affect the stock returns of firms. This study explores whether the information asymmetry hypothesis or the free cash flow hypothesis applies to listed firms in Taiwan when engaging in CI activities. Determining this argument is critical for exploring the effects of increasing CI on stock returns.

3. METHODOLOGY

This study uses listed firms with abnormal increases in CIs during 2002 to 2011 in Taiwan. The samples are divided into five CI portfolios. Subsequently, we use the Fama-French 3-factor and Carhart 4-factor models to explore the relationship between abnormal expenditures of CI and future stock returns of the firms. In addition, we use size, book-to-market equity ratio (BM), and momentum to verify the effects of increased CIs on firm value. Lastly, we use the panel data approach to conduct robustness tests.

3.1. Data Source and Sample Construction

We examine whether abnormal CI increase is negatively correlated with stock returns. The research data used in this study are mostly obtained from the Taiwan Economic Journal database. Because the financial, insurance, and banking industries involve stocks that possess characteristics different from other types of stocks, such as high leverage, high control, and low liquidity, firms from these industries are excluded in this study. The risk-free interest rate used in this study is based on the 1-month deposit interest rate at Bank of Taiwan as a proxy variable. The market equity (ME) of a firm is defined as the stock market prices multiplied by the shares outstanding. The market size (SZ) of year t is calculated as the ME value at the end of June in year t. The BM in year t is the ratio of book value of equity at the end of accounting year t-1 divided by the ME at the end of December in year t-1. The abnormal CI in year t (CI_t) is calculated as follows:

$$\Delta CI_t = [CI_t - (CI_{t-1} + CI_{t-2} + CI_{t-3})/3]/ [(CI_{t-1} + CI_{t-2} + CI_{t-3})/3] \quad (1)$$

where ΔCI_t is the abnormal returns of capital expenditures in period t (%) and CI_{t-i} is the CI in period t-i.

3.2. Measurement of Abnormal Returns in Capital Investment Increase

The conventional capital asset pricing model indicates that the expected returns of stocks have a substantially positive relationship with market risk β, which is the only variable that can explain the expected returns of individual stocks or investment portfolios. Fama and French (1992; 1993) suggest that stock returns are not only influenced by market factors, but also by size and BM factors. In addition, recent studies have reported that **momentum** is able to explain stock returns. Thus, we separately use Fama-French 3-factor and Carhart 4-factor models to conduct empirical tests based on the following settings:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_{SMB} R_{SMB,t} + \beta_{HML} R_{HMLt} + \beta_{Mkt}(R_{M,t} - R_{f,t}) + \varepsilon_{p,t} \quad (2)$$

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_{SMB} R_{SMB,t} + \beta_{HML} R_{HMLt} + \beta_{MOM} R_{MOM,t} + \beta_{Mkt}(R_{M,t} - R_{f,t}) + \varepsilon_{p,t} \quad (3)$$

where $R_{p,t}$ represents the rate of return of the abnormal CI portfolio in month t; $R_{f,t}$ is the risk-free interest rate; $R_{M,t}$ is the monthly rate of returns of the Taiwan Stock Exchange weighted index in month t; SMB_t refers to the returns of small-sized firm investment portfolios (excluding large-sized firm investment portfolios) in month t; HML_t is the return of high BM investment portfolios (excluding low BM investment portfolios) in month t; MOM_t is the return of winner portfolios (excluding loser portfolios) in month t; and α_p is the intercept term used to measure the abnormal returns of investment portfolios.

4. EMPIRICAL RESULTS

4.1. Descriptive Statistics

To explore the difference between industries, an overall sample and an electronic industry sample are analyzed respectively. The overall sample comprises 43,740 annual observation values (from 405 firms) and the electronic industry sample comprised 13,392 annual observation values (from 124 firms). Table 1 reports descriptive statistics of CI portfolios relating abnormal returns. Panel A is distributed for all abnormal return of sample in five groups of CI portfolios and portfolios spread. Panel B is distributed for all abnormal return of electronic industry sample in five groups of CI portfolios and portfolios spread.

Panel A in Table 1 shows that the five CI portfolios in the overall sample exhibit significantly positive average abnormal returns, indicating that firms' abnormal returns increase as CI increases. The stock returns of the portfolios with the lowest and highest CI expenditures (Portfolios 1 and 5) show significantly negative spread (at the 10% level of significance). This result indicates that underinvestment exists and increasing CI can increase firm value. In other words, in firms with abnormally increased CIs, the information asymmetry hypothesis is supported. Panel B in Table 1 shows that the average abnormal returns of the five CI portfolios in the electronic industry are significantly positive, indicating that the abnormal return of the firms increases as CI increases. However, the stock returns of the portfolios with the lowest and highest CI expenditures (Portfolios 1 and 5) show insignificantly negative spread.

Table-1. Descriptive statistics of CI portfolios relating abnormal returns

Panel A Overall samples							
CI portfolios	Mean（%）	Standard error（%）	median（%）	kurtosis	skew	minimum（%）	maximum（%）
(1) (the lowest)	1.2884***	13.6207	0.1396	12.6841	1.7030	-52.7100	182.4251
(2)	1.5065***	13.5852	0.3377	8.3926	1.3925	-62.4757	166.8144
(3)	1.3688***	13.7229	0.2236	8.1138	1.4612	-50.7645	148.0750
(4)	1.6151***	13.8559	0.3667	12.7497	1.7305	-57.0377	178.5562
(5) (the highest)	1.5897***	13.5874	0.3247	6.4120	1.2265	-51.5431	144.0176
CI-spread (1)-(5)	-0.3014*	0.2057					
Panel B Electronic samples							
CI portfolios	Mean（%）	Standard error（%）	median（%）	kurtosis	skew	minimum（%）	maximum（%）
(1) (the lowest)	0.9949***	13.4138	0.1256	3.7254	0.7833	-51.4446	94.5342
(2)	1.3490***	13.5799	0.3892	4.2063	0.9873	-43.4382	98.3422
(3)	0.5913***	13.6774	-0.2255	6.2759	1.1908	-50.7645	126.775
(4)	0.9943***	13.4337	-0.1333	2.5756	0.8295	-45.1400	75.3831
(5) (the highest)	1.2231***	13.8723	0.0552	3.7919	0.9165	-50.4383	97.8808
CI-spread (two groups)	-0.2282	0.3753					

All kinds of classification for portfolios depend on CI increasing degree from July in t year to June in t+1 year. The CI is arranged with rising according to t-1 year. CI-spread (1)-(5) refer that stock return of the lowest CI (the 1st group) minus stock return of the highest CI (the 5th group). Panel A is distributed for all abnormal return of sample in five groups of CI portfolios and portfolios spread. Panel B is distributed for all abnormal return of electronic industry sample in five groups of CI portfolios and portfolios spread. Basically summary statistics include the monthly abnormal average return, standard error, median, kurtosis, skew, minimum, and maximum. "*", "**" and "***" are expressed as 10%, 5% and 1% of significant levels, respectively.

4.2. Analysis of Abnormal Capital Investment Increase and Abnormal Stock Returns

According to the descriptive statistics results of the previous section, CI portfolios possess significantly positive excess returns. In this section, the Fama-French 3-factor and Carhart 4-factor models are used to further investigate. Table 2 illustrates the influences of CI portfolios on the stock returns.

Panel A in Table 2 shows that during the entire research period (2002–2011), when the intercept terms of the overall sample is positive after three factors are controlled, where the abnormal returns of CI portfolios 2, 4, and 5 are significantly positive, increased CI has a positive influence on the stock returns of firms. The spread of the CI portfolio is significantly negative at the 5% level of significance. The CI portfolios in the overall sample do not correspond to the free cash flow hypothesis. In other words, the overall sample portfolios tend to support the information asymmetry hypothesis. However, during the post-financial crisis period (2008–2011), most of the intercept terms of the overall sample (excluding Portfolio 4) are insignificant after three factors are controlled. The evidence of the CI portfolios in the overall sample fails to support the free cash flow or the information asymmetry hypotheses. The empirical results of the 4-factor model are similar to those of the 3-factor model.

Panel B in Table 2 shows that regardless of the application of the 3-factor or 4-factor model, the majority of the intercept terms in the electronic industry sample are not significant during both the entire research period (2002–2011) and the post-financial crisis period (2008–2011). The **spreads** between CI portfolios are not significant. This result indicates that the CI increase of the listed electronic firms in Taiwan does not significantly influence the stock returns. No evidence supports for the free cash flow and information asymmetry hypotheses. Subsequently, the panel data approach is used to conduct robustness tests to complement the empirical data.

Table-2. The influences of CI portfolios on the stock returns

Panel A Overall samples				
CI portfolios	During whole research (2002.7~2011.6)		After financial crisis (2008.7~2011.6)	
	3-factor intercept term	4-factor intercept term	3-factor intercept term	4-factor intercept term
(1) (the lowest)	0.0251	0.0216	0.3382	0.3061
(2)	0.3174 *	0.3221 *	0.4271	0.3736
(3)	0.1053	0.1040	0.1065	0.0539
(4)	0.3901 **	0.3923 **	0.5885 *	0.5192 *
(5) (the highest)	0.3817 **	0.3806 **	0.3607	0.3534
CI-spread	-0.3565**	-0.3590**	-0.0225	-0.0474
Panel B Electronic samples				
CI portfolios	During whole research (2002.7~2011.6)		After financial crisis (2008.7~2011.6)	
	3-factor intercept term	4-factor intercept term	3-factor intercept term	4-factor intercept term
(1) (the lowest)	-0.2001	-0.1901	-0.4049	-0.4257
(2)	0.1520	0.1714	0.6754	0.5767
(3)	-0.5595	-0.5379*	-0.8876	-0.9945
(4)	-0.1400	-0.1201	0.0432	-0.0395
(5) (the highest)	0.0897	0.1006	0.1952	0.1585
CI-spread	-0.2898	-0.2907	-0.6001	-0.5842

Fama and French 3- factor model and Carhart 4- factor model are set up as follows respectively.

$R_{p,t} - R_{f,t} = \alpha_p + \beta_{SMB}R_{SMB,t} + \beta_{HML}R_{HMLt} + \beta_{Mkt}(R_{M,t} - R_{f,t}) + \varepsilon_{p,t}$ (3-factor model)

$R_{p,t} - R_{f,t} = \alpha_p + \beta_{SMB}R_{SMB,t} + \beta_{HML}R_{HMLt} + \beta_{MOM}R_{MOM,t} + \beta_{Mkt}(R_{M,t} - R_{f,t}) + \varepsilon_{p,t}$ (4-factor model)

Among them, where $R_{p,t}$ represents the rate of return of the abnormal CI portfolio in month t; $R_{f,t}$ is the risk-free interest rate; $R_{M,t}$ is the monthly rate of returns of the Taiwan Stock Exchange weighted index in month t; SMB_t refers to the returns of small-sized firm investment portfolios (excluding large-sized firm investment portfolios) in month t; HML_t is the return of high BM investment portfolios (excluding low BM investment portfolios) in month t; MOM_t is the return of winner portfolios (excluding loser portfolios) in month t; and α_p is the intercept term used to measure the abnormal returns of investment portfolios. Portfolios are on the categorized return of the size of CI increasing degree. CI-spread (1)-(5) refers that stock return of the lowest CI (the 1st group) minus stock return of the highest CI (the 5th group). It was from 2002 to 2012 during the sample. "*" , "**" and "***" are expressed as 10%, 5% and 1% of significant levels, respectively

4.3. Robustness Test

We use the F-test and Lagrange multiplier (LM) test to select the optimal empirical model for each CI portfolio. Table 3 reports optimal panel data model is chosen. We use the F-test to determine which fixed effect and ordinary least squares (OLS) estimator to select. Null hypothesis is not rejected for all portfolios, indicating that the OLS method is superior to the fixed effect. Subsequently, we use the LM test to identify which of the random effect model and OLS estimators to select.

Panel A in Table 3 shows the test results of the optimal model. Except for Portfolio 1, no portfolio rejects the null hypothesis, suggesting that the OLS method is superior to the random effect model. The results show that with Portfolio 1 in the random effect model, the other portfolios are of OLS models. Panel B shows identical results to those of Panel A. The results show that with Portfolio 1 in the random effect model, the other portfolios are of OLS models.

Panels C and D show the test results of the optimal models for the electronic firm sample. The Portfolios 1 and 2 in Panel C and all the portfolios in Panel D do not reject the null hypothesis in the F-test and LM test. Thus, the OLS model is selected. Other portfolios reject the null hypothesis in the LM test but not in the F-test; thus, the random effect model is selected.

Table-3. Optimal panel data model is chosen

group	1	2	3	4	5	CI spread
Panel A Overall samples 2002~2011						
F-test	0.71	1.18	0.98	0.76	0.78	0.82
LM-test	3.48*	1.09	0.04	2.46	2.21	1.46
Applicable model	Random effect	OLS	OLS	OLS	OLS	OLS
Panel B Overall samples 2008~2011						
F-test	0.64	1.01	0.76	0.92	0.76	0.75
LM-test	5.55*	0.00	2.37	0.34	2.54	2.64
Applicable model	Random effect	OLS	OLS	OLS	OLS	OLS
Panel C Electronic samples 2002~2011						
F-test	0.73	0.86	0.38	0.89	0.30	0.44
LM-test	1.09	0.36	4.98*	0.25	6.1*	4.07*
Applicable model	OLS	OLS	Random effect	OLS	Random effect	Random effect
Panel D Electronic samples 2008~2011						
F-test	0.57	1.23	0.59	0.87	0.71	0.36
LM-test	2.54	0.42	2.37	0.34	1.19	5.17*
Applicable model	OLS	OLS	OLS	OLS	OLS	Random effect

Note: "*" , "**" and "***" are expressed as 10%, 5% and 1% of significant levels, respectively.

Furthermore, we conduct empirical analysis based on the previously selected optimal models. Table 4 reports empirical results (Panel Data approach) on the stock returns in CI portfolios**.**

Panel A in Table 4 shows that the CI portfolio intercept terms of the overall sample exhibit positive abnormal returns before and after the 2008 financial crisis. The CI spread portfolios exhibiting negative abnormal returns are significant after the financial crisis (2008–2011). In addition, Panel B in Table 4 shows that during the overall research period (2002–2011), the CI

portfolios of the electronic industry sample exhibit negative abnormal returns in Portfolios 1, 3 and 4; the CI is significantly negative. After the financial crisis (2008–2011), the CI Portfolios 3 in the electronic industry sample show significantly negative abnormal returns at the significant level of 5%, however, the spread of CIs are negative, yet not significant. This result shows that using panel data to conduct robustness tests facilitates identifying that the CI portfolios in the overall sample support the information asymmetry hypothesis, whereas the **low CI** expenditure portfolios in the electronic industry sample are more likely to support the free cash flow hypothesis.

Table-4. Empirical results (Panel Data approach) on the stock returns in CI portfolios

Panel A Overall samples				
CI portfolios	During whole research (2002.7~2011.6)		After financial crisis (2008.7~2011.6)	
	3-factor intercept term	4-factor intercept term	3-factor intercept term	4-factor intercept term
(1) (the lowest)	0.3380	0.0220	0.0250	0.3060
(2)	0.427 *	0.3220	0.317**	0.374*
(3)	0.1070	0.1040	0.1050	0.0540
(4)	0.588 **	0.392 ***	0.390***	0.519**
(5) (the highest)	0.361*	0.3810	0.382***	0.353*
CI-spread	-0.0230	-0.359**	-0.357**	-0.0470
Panel B Electronic samples				
CI portfolios	During whole research (2002.7~2011.6)		After financial crisis (2008.7~2011.6)	
	3-factor intercept term	4-factor intercept term	3-factor intercept term	4-factor intercept term
(1) (the lowest)	-0.2000	-0.1900	-0.4050	-0.4260
(2)	0.1520	0.1710	0.675*	0.5770
(3)	-0.5590	-0.538**	-0.888**	-0.994**
(4)	-0.1400	-0.1200	0.0430	-0.0390
(5) (the highest)	1.0410	0.1049***	0.1950	0.1580
CI-spread	-1.198***	-1.197***	-0.6460	-0.6230

Fama and French 3-factor model and Carhart 4-factor model are set up as follows separately.

$R_{p,t} - R_{f,t} = \alpha_p + \beta_{SMB} R_{SMB,t} + \beta_{HML} R_{HML,t} + \beta_{Mkt}(R_{M,t} - R_{f,t}) + \varepsilon_{p,t}$ (3-factor model)

$R_{p,t} - R_{f,t} = \alpha_p + \beta_{SMB} R_{SMB,t} + \beta_{HML} R_{HML,t} + \beta_{MOM} R_{MOM,t} + \beta_{Mkt}(R_{M,t} - R_{f,t}) + \varepsilon_{p,t}$ (4-factor model)

Among them, where $R_{p,t}$ represents the rate of return of the abnormal CI portfolio in month t; $R_{f,t}$ is the risk-free interest rate; $R_{M,t}$ is the monthly rate of returns of the Taiwan Stock Exchange weighted index in month t; SMB_t refers to the returns of small-sized firm investment portfolios (excluding large-sized firm investment portfolios) in month t; HML_t is the return of high BM investment portfolios (excluding low BM investment portfolios) in month t; MOM_t is the return of winner portfolios (excluding loser portfolios) in month t; and α_p is the intercept term used to measure the abnormal returns of investment portfolios. Portfolios depend on the categorized return of the size of CI increasing degree. CI-spread (1)-(5) refers that stock return of the lowest CI (the 1st group) minus stock return of the highest CI (the 5th group). It was from 2002 to 2012 during the sample. "*" , "**" and "***" are expressed as 10%, 5% and 1% of significant levels, respectively.

Based on the test results of the Carhart 4-factor model using panel data approach in Panels A and B in Table 4, for the positive abnormal returns of CI portfolios in the overall sample and the significantly negative abnormal returns in the CI spread portfolios, they show that the CI portfolios

in the overall sample support the information asymmetry hypothesis. In the electronic industry sample, before and after the 2008 financial crisis, the negative abnormal returns of the CI Portfolios 1, 3 and 4 and the significantly negative abnormal returns in the CI spread portfolios show that the low-CI portfolios support the free cash flow hypothesis. This indicates that firms with **low CI** expenditures tend to have low stock returns when the CI increase is high.

5. CONCLUSION

To verify the free cash flow and information asymmetry hypotheses, we explore the effects of CI increases on the stock returns of firms. We consider listed firms in Taiwan and the overall sample and the electronic industry sample are examined respectively. The Fama-French 3-factor and Carhart 4-factor models are employed to verify the relationship between CI increases and future stock returns. The empirical results show that the overall sample exhibits positive abnormal returns during the entire research period and the post-financial crisis period. The CI spread shows negative abnormal returns. The overall sample supports the information asymmetry hypothesis. By contrast, the electronic industry samples during the entire research period and post-financial crisis period show that firms with low and high CI respectively support the free cash flow and information asymmetry hypotheses.

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