The Performance of Initial Public Offerings Conditioning on Issue Information: The Case of Taiwan

Anlin Chen*, Roger C. Y. Chen** and Kuei-Ling Pan***

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This study employs the Fama-French three-factor model as well as Jensen’s alpha to measure the long-run performance of IPOs in Taiwan. Our results show that the long-run performance of IPOs based on market adjusted returns or returns adjusted by market model is poor. However, the long-run performance based on Fama-French three-factor model is similar to the normal return pattern of an ordinary asset. Therefore, we conclude that the underperformance of IPOs in Taiwan is attributed to the mis-specification of the measurement model. Furthermore, we also show that the performance of IPOs in Taiwan is significantly driven by young and electronic offerings.

Keywords: Initial public offerings; Long-run performance; Fama-French model; Underpricing; Jensen’s alpha

1. Introduction

Ibbotson [20], Ibbotson, Sindelar and Ritter [22], Ibbotson and Ritter [21] and Chen [7] show that the mean initial returns of IPOs are significantly positive. Most of the previous work attributes the positive mean initial return to the underpricing of IPOs based on the information asymmetry in the issuance market. The positive mean initial return of IPOs implies that if an investor can always be allocated an IPO share, he will make significantly profit in the early aftermarket. Even though IPOs experience high initial returns, Aggarwal and Rivoli [1] examine the one-year holding returns and the one-year aftermarket returns of IPOs and find that IPO long-run returns are significantly positive. Most of the previous work attributes the positive mean initial return to the underpricing of IPOs based on the information asymmetry in the issuance market. The positive mean initial return of IPOs implies that if an investor can always be allocated an IPO share, he will make significantly profit in the early aftermarket. Even though IPOs experience high initial returns, Aggarwal and Rivoli [1] examine the one-year holding returns and the one-year aftermarket returns of IPOs and find that IPO long-run returns are significantly positive.
performance is worse than the market performance. Aggarwal and Rivoli argue that the IPO poor long-run performance may be due to fads or speculative bubbles in the early aftermarket.

Ritter [30] formally documents the long-run performance of IPOs and shows that the underpricing of IPOs appears to be a short-run phenomenon. The average three-year holding period returns of IPOs are lower than the returns of market indices and returns of those firms in the same industry and of the same size. Further, the younger companies and companies that go public in the hot issuance years experience even worse performance than average. Ritter argues that the negative long-run performance of IPOs can be attributed to fads in the IPO market.

Hanley [17] also investigates the two-year holding period return of IPOs and finds poor IPO long-run performance also. She further shows that the negative long-run performance of IPOs cannot be explained by the partial adjustment phenomenon in the IPO market. Moreover, Carter, Dark and Singh [5] document that the underperformance of IPO stocks relative to the market over a three-year holding period is less severe for IPOs underwritten by more prestigious underwriters. For IPOs in Taiwan, Shiah Hou [34] also claims that IPOs experience poor long-run performance, especially for the IPOs issued in the hot market, small-capital IPOs and risky offerings.

Jain and Kini [23] and Mikkelson, Partch and Shah [27] indicate that a significant decline in operating performance is found in the IPO aftermarket. The poor operating performance in the aftermarket is related to the young or start-up ventures. Jain and Kini [23] provide three possible explanations for the decline of operating performance of IPOs after issuance. One explanation is the increase of the agency costs due to the reduction of management ownership after going public. A second reason is the window dressing of accounting number around issuance. A third reason is that the issuers time their issues to coincide with the periods of good performance. Obviously, the poor operating performance should influence the performance of IPO share in the stock market. Toeh, Wong and Rao [37] argue that the discretionary accounting accrual choices explain the poor operating performance and the underperformance for IPO firm in the long run. Toeh et al. argue that the issuers tend to cook the accounting data before issuance. Cooking accounting data leads to investors’ over-optimism about IPO firm’s growth prospect in the future. However, Hung [19] shows that the decline of operating performance of IPOs in Taiwan cannot be attributed to the agency costs or window dressing of accounting data. Instead, the decline of IPO operating performance is attributable to the choice of timing of issuance.
We all know that the asset returns should be associated with their risk characteristics. Previous studies measure the IPO performance based on the CAPM model. CAPM argues that the market portfolio is the only factor underlying the asset returns. Under CAPM, beta risk is the only risk measure for stock returns. Black, Jensen and Scholes [3] show that the beta risk of a firm is linearly and positively related to the stock returns implying that CAPM is valid. Fama and MacBeth [15] also show that the beta as the only risk measure of the stock returns. The results of Fama and MacBeth support the validity of CAPM. Heston, Rouwenhorst and Wessels [18] indicate that the stock return behavior across countries can be attributed to the beta risk of the stocks. Nevertheless, the stock returns within countries are independent of the beta risk.

Banz [2] and Reinganum [28] point out that the portfolios of small firms earn more than those of large firms. This is so called the “size effect”. The existence of size effect implies that there is mis-specification in CAPM. Roll [32] argues that the size effect in asset return is due to the infrequent trading. The infrequency of trading results in under-estimation of beta risk and thus underestimates the stock returns of the small firms. Fant and Peterson [16] further point out that the size effect exists only in January. Malkiel and Xu [26] also argue that size is a better risk measure than beta risk.

Besides size, the book-to-market ratio is considered as another important characteristic for stock returns. Rosenberg, Reid and Lanstein [33] find that the stocks with high book-to-market ratio experience higher returns than those with low book-to-market ratio. However, Fama and French [10] argue that the book-to-market effect would simply mitigate the effect of size but not eliminate the size effect. Chan, Hamao and Lakonishok [6] also show the existence of book-to-market effect in Japan stock market. Fant and Peterson [16] also support the book-to-market effect in stock returns.

Taiwan stock market has attracted the interests of the academicians and investors recently such as Bessembinder and Chan [4], Chen and Tu [8], Lang and Lee [25] and Titman and Wei [36]. Taiwan stock market is considered as the least one on the major Asian stock markets to be affected by the 1997 Asian financial crisis. Basically, Taiwan stock market is dominated by a few firms and the incidence of insider trading is relatively high. The Asian stock markets except Japan are typically characterized as low volume and high volatility. The Taiwan stock market has been the most volatile market in Asia. Hence, some common factors found in US equity market might not exist in Taiwan stock market. Investors should not take all the factors in US equity markets for granted when investing in foreign equity markets. Chen and Tu [8] and Titman and Wei [36] show that market factor, size factor and
book-to-market factor are significant for Taiwan stock market. Thus, this paper re-examines the long-run performance of IPOs with the Fama-French three-factor model to accommodate size and book-to-market directly on stock returns and further examines Taiwan IPO performance conditioning in their issue information.

The remaining of the paper is organized as follows. Section 2 describes the measurement of stock performance. In section 3, we report the data source and the descriptive statistics of the variables in this paper. Empirical results are disclosed in sections 4 and 5. Finally, section 6 concludes.

2. The measurement of stock performance

Asset performance should be measured both by return and by risk. Therefore, the high initial returns of IPOs do not necessarily imply that IPOs are good investment targets because IPOs are typically more risky than the seasoned securities. The poor long-run performance of IPOs could be attributed to an inappropriate measurement model. In this section, we describe the measurement methods employed in this paper which are the raw returns, market adjusted returns, returns adjusted by market model and the returns adjusted by Fama and French three-factor model.

2.1 Raw return

The easiest way to investigate the IPO return behavior is to use the raw returns. The raw returns of an IPO over a certain period is defined as follow.

\[
R_{i,q,s} = \prod_{t=q}^{s} (1 + r_t) - 1 \tag{1}
\]

where \( R_{i,q,s} \) is the holding period return of IPO i from time q to time s; \( r_t \) is the return of IPO i at time t.

Obviously, the holding period return based on raw returns are the investment returns over a certain period ignoring the opportunity cost of investments. Therefore, we need a benchmark to measure the reasonable returns of holding IPO shares.

2.2 Market-adjusted returns

In the market-adjusted return model, the market return is employed as the benchmark return assuming that the expected return of an IPO is equal to that of the market. The market-adjusted return of IPO i at time t is defined as:
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\[ ar_{it} = r_{it} - r_{mt}, \] (2)

where \( r_{mt} \) is the market return at time \( t \).

The average market-adjusted returns for the IPOs at time \( t \) is the equally-weighted average of the benchmark-adjusted return:

\[ AR_t = \frac{1}{n} \sum_{i=1}^{n} ar_{it}, \] (3)

where \( n \) is the number of IPOs in the sample.

The market-adjusted performance of IPOs held for a certain period is the cumulative abnormal return (CAR) over the time, which is the summation of the average of market-adjusted return. \( CAR_{q,s} \) means the cumulative abnormal return from time \( q \) to time \( s \).

\[ CAR_{q,s} = \sum_{t=q}^{s} AR_t. \] (4)

2.3 Returns adjusted by the market model

When we employ the market return as the benchmark, we assume that the systematic risks of IPOs are similar to that of the market. However, Ibbotson [20] and Cotter [9] argue that the IPO firms tend to be more risky at issuance and to be less risky long after issuance. Therefore, it is not reasonable to assume that the beta risks of IPOs are always close to one. Based on the CAPM, we would like to estimate the systematic risks of IPOs and then measure the expected return of IPOs with the estimated beta risks. Typically, the beta risks of assets are estimated by the market model with returns prior to a certain event time. However, for IPO firms, the return data prior to the issuance are not available. Hence, the conventional market model won’t be able to measure the expected return of IPO firms in the early aftermarket.

To deal with the beta risk problem in the early aftermarket for IPO firms, we employ the Jensen’s alpha to measure the performance of IPOs in the aftermarket. The market model is defined as follows:

\[ r_{it} - r_{f,t} = \alpha_i + \beta_i [r_{m,t} - r_{f,t}] + e_i, \] (5)

where \( \alpha_i \) is the intercept term of the regression which is also known as the Jensen’s alpha for IPOs on day \( t \).
\[ \alpha_T = \prod_{t=0}^{T}(1 + \alpha_t). \] (6)

\( \alpha_T \) is the measurement of the average performance of IPOs \( T \) days after issuance based on the market model. Under the market model, we assume that the market return is the only common factor for the returns of individual securities.

### 2.4 Fama-French three-factor model

Fama and French [10, 11, 12, 13, 14] show that the market factor, the size factor and the book-to-market factor are significant factors underlying the stock returns. We argue that the expected returns or the abnormal returns of IPOs measured by the Fama-French three-factor model should be more appropriate than those by the market model.

With the Fama-French three-factor model, we investigate the performance of IPOs in the aftermarket considering the contributions of market factor, size factor and the book-to-market factor. The performance of IPOs under Fama-French model is also measured by the Jensen’s alpha of the following regression.

\[ r_{i,t} - r_{f,t} = \alpha_i + \beta_i[r_{m,t} - r_{f,t}] + s_iSMB_t + h_iHML_t + \epsilon_t, \] (7)

where \( \alpha_i \) is the intercept term of the regression, which is also known as the Jensen’s alpha under the Fama-French model; \( SMB_t \) is the size risk premium on day \( t \); \( HML_t \) is the book-to-market risk.

Basically, the measurement of IPO performance by the Fama-French three-factor model is similar to that of the market model. Both of them apply the Jensen’s alpha as the performance measure for IPOs. Further, the designs of the regression models measure the Jensen’s alpha as the average performance of all the IPOs and allow the coefficients of \( \beta, s, \) and \( h \) to change over time. Therefore, besides measuring the performance of IPOs, we can still observe the patterns of factor loadings of \( \beta, s \) and \( h \) of IPO firms.

### 3. Data source, variable definition and descriptive statistics

Data for this study consists of 96 initial public offerings issued in Taiwan collected from the Status of Securities Listed on Taiwan Stock Exchange over the period from 1992 to 1994. Since this paper focuses on the long-run performance of IPOs, the IPO firms in the sample must exist long enough (3 years) for evaluation. The beneficiary certificates and the stocks requiring
full delivery are excluded from the sample. As a result, the final sample consists of 71 IPO firms issued in 1992, 1993 and 1994.

The age of an IPO firm is defined as the number of years from the establishment date of the firm to the offer date. The establishment date of a firm is reported in the preliminary prospectus of an IPO. The proportion of subscribing orders receiving an allocation of IPO shares\(^1\) is provided by the TEJ (Taiwan Economic Journal) data base. The age of an IPO may be related to the risk level of the firm. Basically, an older IPO firm may have more information revealed to the public before issuance. Therefore, the age of an IPO would influence the pricing of the IPO share, the transaction price in the right aftermarket and thus the initial return. Based on Rock’s winners’ curse model [31], the proportion of subscribing orders receiving an allocation of IPOs share is related to the existence of informed investors and the extent of underpricing of the new issues. Hence, we need the information about the age and the probability of receiving an IPO share to investigate the price behavior of IPOs in the aftermarket.

The daily closing prices of each individual IPO after issuance, the transaction prices of all other securities and the daily return of securities are collected from the AREMOS data base provided by Taiwan Economic Data Center. The 90-day T-bill rate is employed as the proxy for the riskless rate, which is also collected from AREMOS data base. Further, we use the Taiwan Stock Index return as the variable for market return. The data of Taiwan Stock Index return is also provided by the AREMOS.

In this paper, we argue that the performance of IPOs measured by Fama and French three-factor model would be appropriate for IPOs in Taiwan. Therefore, we need to form the market factor, the size factor, and the book-to-market factor to measure the performance of IPO firms. The market factor is simply the market return measured by the Taiwan Stock Index return.

\(\text{SMB}_t\) in (7) is the portfolio of risk premium of size factor. We sort the sample of all stocks traded in Taiwan Stock Exchange based on their market value on a certain day. The stocks whose market value smaller than market value of the 30\(^{\text{th}}\) percentile are classified as the small size group. Stocks with market value larger than 70\(^{\text{th}}\) percentile are defined as the large size group. The market value of stocks can be collected from TEJ database. \(\text{SMB}_t\) is

\(^1\) The proportion of subscribing orders receiving an allocation of IPO shares is defined as \((\text{the number of shares offered}) / (\text{the number of shares subscribed})\).

\(^2\) SMB and HML in this paper are measured slightly differently from those in Fama and French [11]. We measure the size premium and book-to-market premium based on equally weighted portfolios of size and book-to-market, respectively. However, Fama and French measure their SMB and HML through value-weighted portfolios.
measured as the average return of small size stocks minus the average return of large-size stocks on day $t$.

Further, $HML_t$ in (7) is the portfolio of risk premium of book-to-market factor. As $SMB_t$, we sort the sample of all stocks traded in Taiwan Stock Exchange based on their book-to-market ratio on a certain day. The book value on a certain day is measured by the book value of the stock at the fiscal end of the preceding year. The stocks whose book-to-market ratio smaller than the median book-to-market ratio belong to the group of stocks with low book-to-market ratio. The other stocks are classified as the group of stocks with high book-to-market ratio. The book value and market value of a stock are available from AREMOS database. $HML_t$ is measured as the average return of high book-to-market stocks minus the average return of low book-to-market stocks of day $t$.

Typically, we need to calculate the initial return of IPOs to measure the extent of underpricing of IPOs at issuance. Most of the previous research uses the closing price on first trading day to calculate the initial returns of IPOs. However, in Taiwan, stocks are confined price limits. Due to the price limit, the closing price on the first trading day may not be able to reveal all the information about the underpricing of IPOs on that day. That is, even though the IPOs are underpriced definitely, the market won’t be able to reveal the fair pricing of IPOs on the first trading day. Therefore, we employ the first week trading return as the initial return of IPOs to measure the extent of underpricing of IPO firms. The initial return is defined as:

$$R_i = \frac{P_6 - P_0}{P_0},$$

(8)

where $P_6$ is the closing price on the sixth trading day, $P_0$ is the offer price of an IPO.

The initial market returns measure the overall market condition during the first week after issuance. The market return is measured as:

$$R_{m1} = \frac{Market_6 - Market_0}{Market_0},$$

(9)

where $Market_0$ and $Market_6$ are the stock index on the day before issuance and on the sixth day after issuance, respectively.

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3 In Taiwan, stock price is subject to be traded within a range of 7% above and 7% below the closing price on the preceding trading day.

4 There are six trading days a week in Taiwan securities markets.

5 Taiwan Stock Index is a value-weighted index.
In table 1, we provide the descriptive statistics of the IPO characteristics for the full sample of 71 offerings issued in 1992, 1993 and 1994.

**Table 1: Descriptive Statistics**

The descriptive statistics include mean, standard deviation, minimum, median and maximum for the IPO characteristic variables. The sample consists of 71 initial public offerings in Taiwan issued in 1992, 1993 and 1994.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Median</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial return</td>
<td>29.70%</td>
<td>20.04%</td>
<td>-42.44%</td>
<td>32.00%</td>
<td>66.19%</td>
</tr>
<tr>
<td>Initial market return</td>
<td>0.99%</td>
<td>4.80%</td>
<td>-8.22%</td>
<td>1.21%</td>
<td>13.92%</td>
</tr>
<tr>
<td>Proceeds</td>
<td>797.55</td>
<td>1457.66</td>
<td>26.40</td>
<td>387.07</td>
<td>10667.16</td>
</tr>
<tr>
<td>Age</td>
<td>19.94</td>
<td>11.25</td>
<td>4.33</td>
<td>19.28</td>
<td>62.27</td>
</tr>
<tr>
<td>3-year market return</td>
<td>37.16%</td>
<td>14.69%</td>
<td>-0.49%</td>
<td>33.78%</td>
<td>70.07%</td>
</tr>
<tr>
<td>3-year raw return</td>
<td>65.64%</td>
<td>125.68%</td>
<td>-51.43%</td>
<td>28.65%</td>
<td>785.64%</td>
</tr>
<tr>
<td>Initial abnormal return</td>
<td>28.70%</td>
<td>19.43%</td>
<td>-40.54%</td>
<td>30.96%</td>
<td>69.25%</td>
</tr>
<tr>
<td>Proportion of receiving shares</td>
<td>0.7958%</td>
<td>0.3634%</td>
<td>0.2460%</td>
<td>0.8010%</td>
<td>1.8400%</td>
</tr>
</tbody>
</table>

- *Measured from offer price to the 6th closing price.*
- b *Market index return from offer date to six days after issuance.*
- c *Average 3-year beta risk of IPOs after issuance.*
- d *Offer price times number of shares offered, unit: million NT dollars.*
- e *Years from establishment date to offer date.*
- f *Measured by IPO proceeds size.*
- g *Measured by number of IPOs.*
- h *Measured by IPO proceeds size.*
- i *Measured by number of IPOs.*
- j *Market index return from the day before offer date to 3 years after.*
- k *IPO 3-year holding period return from the offer price.*
- l *IPO initial return minus initial market return.*
- m *Number of shares offered divided by the total number of subscribing order.*

Table 1 shows that the mean initial return (weekly return) of IPOs in Taiwan is 29.7% (with median of 32%). These findings are quite different from the previous findings related to IPOs issued in U.S. Ibbotson and Ritter [21] indicate that IPOs in U.S. experience huge initial return, however, with median close to zero. Our findings imply that the IPOs in Taiwan with positive initial returns encounter lower initial returns relative to those in U.S. The mean market return over the first week after issuance is 1%. Thus, the IPO investments earn 28.7% more than the market. The average proceeds of IPOs
in the sample is 797 million NT dollars (medium=387 million), and thus we tend to have IPOs with large proceeds size. Before issuance, Taiwan IPOs have been existed for 19 years on average. That is, IPOs in Taiwan are not newly-born firms and could be well-known to the public at issuance. The three-year holding period return of Taiwan IPOs is 65.64% while average return of the market over the same period is 37.16%. Therefore, if an investor can always receive an IPO share at issuance, he will earn more than the market both over the short run and the long run.

4. The long-run performance starting from the offer date

In this paper, we investigate two kind of IPO long-run performance: 1) the three-year long-run performance starting from the offer date; 2) the three-year long-run performance starting from the 7th day after issuance. Since IPOs are typically underpriced, the long-run performance from the offer price may experience abnormal return. However, not every investor can be allocated an IPO share at issuance. The long-run performance starting from the offer price is only applicable to those who receive IPO shares at issuance. Nevertheless, investors can buy IPO shares in the aftermarket at the market price. Thus, investors will enjoy the long-run performance starting from the 7th day after issuance if they like. The IPO long-run performance measured from the offer date along with that from the 7th day after issuance would help us figure out whether the huge initial returns of IPOs result from market fads or IPO underpricing.

In figure 1, we report the long-run performance of IPOs based on their raw returns, market-adjusted returns, Jensen’s alpha measured by the market model, and Jensen’s alpha measured by Fama-French three-factor model. We can see that the IPO raw returns, market-adjusted returns and returns adjusted by market model peak around 150 days after issuance and then start to decline smoothly. Typically, these results are similar to the findings in Ibbotson [20]. Even though the performance of IPOs may decline 150 days after issuance, IPOs are still good investment targets over a three-year period.

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6 Ritter [30] indicates that the average age of IPOs in U.S. is 6 years old.
7 IPOs in Taiwan are typically over-subscribed.
Figure 1: The long-run performance of IPOs starting from the offer price measured by raw returns, market adjusted returns, returns adjusted by market model and returns adjusted by Fama-French model for the entire sample.

However, we know that the raw returns, market returns and the market-model adjusted returns may not be able to measure the appropriate expected returns of IPOs. Therefore, we further check the IPO performance measured by the Fama-French three-factor model, which further considers the effects of size and book-to-market ratio on asset returns.

Figure 1 also shows that the IPO performance measured by Fama-French model is not always positive. That is, sometimes IPOs are good investments, sometimes they are not. Fama-French model shows that IPO long-run performance fluctuates around zero over time. This kind of performance pattern is typical for an ordinary security under an efficient market. If an asset’s performance is usually positive or negative, we should be able to form an arbitrage portfolio to make profit.

5. The long-run performance starting from the 7th day after issuance

If an IPO is under-subscribed, an investor who subscribes will be able to receive an allocation of IPO shares. However, if the IPO is over-subscribed, the investor will receive his IPO share on a pro-rata basis. That is, the investor may not be able to get an IPO share at the offer price to enjoy the underpricing of IPOs. Moreover, the long-run performance starting from the offer date is measured based on the offer price of IPOs which might be underpriced. To investigate the causes of positive initial return of IPOs, we further calculate the long-run performance starting from the 7th day after issuance. If IPO
initial returns result from underpricing of IPOs, the aftermarket long-run performance should not be negative. Nevertheless, if IPOs initial returns result from market fads, the IPOs will experience poor performance in the long-run aftermarket.

Table 2 and figure 2 report the IPO aftermarket long-run performance starting from the 7th day after issuance.

Table 2: IPO performance after issuance

The performance of IPOs starting from the close price of day 7 after issuance measured by raw returns, market adjusted returns, returns adjusted by market model and returns measured by Fama-French model for the entire sample. ***, ** and * represent the significance levels at 1%, 5% and 10%, respectively.

<table>
<thead>
<tr>
<th>Days after issuance</th>
<th>Raw return(^a)</th>
<th>Market adjusted return(^b)</th>
<th>Market model adjusted return(^c)</th>
<th>Fama-French adjusted return(^d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>9.62***</td>
<td>4.65*</td>
<td>6.31**</td>
<td>3.79</td>
</tr>
<tr>
<td>200</td>
<td>12.28***</td>
<td>4.59*</td>
<td>4.69*</td>
<td>5.85*</td>
</tr>
<tr>
<td>300</td>
<td>5.92**</td>
<td>-6.09**</td>
<td>-4.67*</td>
<td>-7.82**</td>
</tr>
<tr>
<td>400</td>
<td>3.83*</td>
<td>-11.35**</td>
<td>-9.67*</td>
<td>-16.00*</td>
</tr>
<tr>
<td>500</td>
<td>3.49*</td>
<td>-17.73***</td>
<td>-14.11***</td>
<td>-42.67***</td>
</tr>
<tr>
<td>600</td>
<td>4.47*</td>
<td>-19.01***</td>
<td>-15.72***</td>
<td>4.47**</td>
</tr>
<tr>
<td>700</td>
<td>13.82***</td>
<td>-17.95***</td>
<td>-12.91***</td>
<td>-38.90***</td>
</tr>
<tr>
<td>800</td>
<td>17.55***</td>
<td>-19.47***</td>
<td>-12.70**</td>
<td>-35.00***</td>
</tr>
</tbody>
</table>

\(^a\) Raw return is measured by the holding period return.
\(^b\) Market adjusted return is the raw return minus the market return.
\(^c\) Market adjusted return is the Jensen’s \(\alpha\) in the market model.
\(^d\) Fama-French adjusted return is the Jensen’s \(\alpha\) in the Fama-French model.
Figure 2: The long-run performance of IPOs starting from the close price of day 7 after issuance measured by raw returns, market adjusted returns, returns adjusted by market model and returns adjusted by Fama-French model for the entire sample.

Figure 2 shows that IPO raw returns do not decline over the long run. However, IPO market adjusted returns and IPO returns adjusted by market model start to decline 6 months after issuance and experience poor long run performance over a three-year period. The patterns of raw returns, market-adjusted returns and returns adjusted by market model are consistent with the findings in Aggarwal and Rivoli [1] and Ritter [30]. These results imply that IPOs are good investment targets over the short run but not the long run. However, we argue that the poor IPO long-run performance may be due to the mis-measurement of the IPO expected returns. Some important factors such as size effect and book-to-market effect are missing when IPO performance is measured. The Fama-French three-factor model takes the market factor, size-related factor and book-to-market related factor into account when measuring IPO performance. In table 2 and figure 2, we find that the IPO performance measured by Fama-French three-factor model is not consistently poor for a long time period. If an investor keeps IPO shares for one year, he will suffer losses. However, if he keeps the shares for two years, he makes profit.

The Fama-French three-factor model takes more factors into consideration than the market model and thus should be able to measure the IPO expected returns more precisely. Figure 3 reports the long-run performance of IPOs measured by Fama-French model. With the performance measured by Fama-French model, we can see that IPOs do not encounter poor performance over the long run. However, the long-run performance from the offer
date is typically higher than that from the 7th day after issuance. This result implies that IPOs are underpriced at issuance. The effect of market fads or speculative bubbles in the early aftermarket is ambiguous.

Figure 3: The long-run performance of IPOs measured by returns adjusted by Fama-French model for the entire sample starting from the offer price and starting from the close price of day 7 after issuance.

5.1 The long-run performance of IPOs based on industry

We know that the IPO performance measured by Fama-French model shows a random pattern over the long run. In this subsection, we further divide the whole sample into subsamples to investigate IPO performance in more details based on IPO characteristics such as industry, age, the probability of receiving IPO shares at issuance on a pro-rata basis and initial return.

To investigate if IPO long run performance is driven by a certain industry, we divide our sample into subsamples according to the industry characteristic. Bank offerings or financial offerings typically do not perform as usual industry firms and receive more restrictions from the government. Therefore, we classify the sample into a group of bank offerings and non-bank offerings. Furthermore, the electronic industry in Taiwan Securities Exchange is classified as a specific group relative to ordinary industry firms due to its high-profitability and high-risk characteristics. Since there are not many bank offerings and electronic offerings in the sample, we report the long-run performance pattern of overall IPOs, that of non-bank offerings and that of non-electronic offerings in figure 4.

Table 3 and figure 4 indicate that IPO long run performance measured

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8 Ritter [29] shows that IPO returns may be related to certain industries.
by Fama-French model does not obey a particular pattern for the entire sample and sample of non-bank offerings. However, non-electronic offerings experience poorer performance than the average. That is, investors will be better off when investing in electronic offerings even though market factor, size factor and book-to-market factor are taken into account. With the comparison of the performance of entire sample and that of non-electronic offerings, we know that the IPO performance in Taiwan is significantly driven by electronic offerings. Hence, industry is an influential factor in IPO investments.9

![Figure 4: The long-run performance of IPOs measured by returns adjusted by Fama-French model for the entire sample, non-financial IPOs and non-electronic IPOs starting from the close price of day 7 after issuance.](image)

9 This result is consistent with Ritter [29] who argues that specific industry is significant for IPO returns.
Table 3: IPO performance after issuance by industry

The performance of IPOs starting from the close price of day 7 after issuance measured by Fama-French model\(a\) for the entire sample, non-financial offerings and non-electronic offerings. ***, ** and * represent the significance levels at 1%, 5% and 10%, respectively.

<table>
<thead>
<tr>
<th>Days after issuance</th>
<th>Entire sample</th>
<th>Non-financial offerings(b)</th>
<th>Non-electronic offerings(c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>3.79</td>
<td>2.63</td>
<td>5.31</td>
</tr>
<tr>
<td>200</td>
<td>5.85</td>
<td>5.53</td>
<td>0.00</td>
</tr>
<tr>
<td>300</td>
<td>-7.82</td>
<td>-14.58</td>
<td>-21.39</td>
</tr>
<tr>
<td>400</td>
<td>-16.00</td>
<td>-28.88</td>
<td>-16.91</td>
</tr>
<tr>
<td>500</td>
<td>-42.67</td>
<td>-44.46</td>
<td>-65.52(**)</td>
</tr>
<tr>
<td>600</td>
<td>4.47</td>
<td>21.59(**)</td>
<td>-60.72(***)</td>
</tr>
<tr>
<td>700</td>
<td>-38.90</td>
<td>-25.83</td>
<td>-47.62</td>
</tr>
<tr>
<td>800</td>
<td>-35.00</td>
<td>-75.73(**)</td>
<td>-78.14(**)</td>
</tr>
</tbody>
</table>

\(a\) Fama-French adjusted return is the Jensen’s \(\alpha\) in the Fama-French model.
\(b\) ***, ** and * mean significantly difference between financial offerings and non-financial offerings.
\(c\) ***, ** and * mean significantly difference between electronic offerings and non-electronic offerings.

5.2 The long-run performance of IPOs based on age

The age before issuance for an IPO is sometimes referred to the risk level of the firm. Even though we try to control the risk level of an IPO firm by employing Fama and French model to measure the abnormal return of IPOs, there still possibly be some sense of risk not captured by the model. Therefore, we further classify our IPOs sample into subsamples based on the ages of IPO firms. IPOs older than the median age of the sample are classified as a group of older offerings; others are the younger offerings.\(^{10}\) From table 4 and figure 5, we find that younger IPOs experience higher performance than the older IPOs. These results imply that younger offerings are better investment targets.

\(^{10}\) Due to the development of e-commerce in the recent years, most of the young offerings are the electronic offerings.
Table 4: IPO performance after issuance by age

The performance of IPOs starting from the close price of day 7 after issuance measured by Fama-French model\(^a\) for the younger offerings and older offerings. ***, ** and * represent the significance levels at 1%, 5% and 10%, respectively.

<table>
<thead>
<tr>
<th>Days after issuance</th>
<th>Younger offerings(^b)</th>
<th>Older offerings</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1.55</td>
<td>7.03</td>
</tr>
<tr>
<td>200</td>
<td>18.01*</td>
<td>-16.73</td>
</tr>
<tr>
<td>300</td>
<td>7.98*</td>
<td>-19.13</td>
</tr>
<tr>
<td>400</td>
<td>-4.37</td>
<td>-22.28</td>
</tr>
<tr>
<td>500</td>
<td>-32.84*</td>
<td>-56.03</td>
</tr>
<tr>
<td>600</td>
<td>140.40***</td>
<td>-116.28</td>
</tr>
<tr>
<td>700</td>
<td>55.57**</td>
<td>-80.49</td>
</tr>
<tr>
<td>800</td>
<td>-33.84**</td>
<td>-122.16</td>
</tr>
</tbody>
</table>

\(^a\) Fama-French adjusted return is the Jensen’s \(\alpha\) in the Fama-French model.

\(^b\) ***, ** and * mean significantly difference between younger offerings and older offerings.

Figure 5: The long-run performance of IPOs measured by returns adjusted by Fama-French model for the younger IPOs and older IPOs starting from the close price of day 7 after issuance.

5.3 The long-run performance of IPOs based on the possibility of receiving an IPO share

If an IPO is under-subscribed, all the subscribing orders will receive
allocation of IPO shares. In this case, the possibility of receiving an allocation of IPO shares is one. On the other hand, if the IPO is over-subscribed, the subscribing order will receive an allocation based on a pro-rata basis. The more the subscribing orders, the lower the possibility of receiving an allocation. Based on Rock’s [31] model, the possibility is related to the proportion of informed investors in the market and the extent of underpricing of IPOs.

Further, we argue that the possibility of receiving an IPO share is also related to the market fads at issuance. Market fads will induce more investors to subscribe a forthcoming IPO. IPOs with the probability higher than the median of probability of receiving IPO shares are defined as a group of higher possibility; others are the offerings with lower possibility of receiving shares.

Table 5 and figure 6 show the performance patterns of IPOs based on the possibility of receiving IPO shares at issuance. In the early aftermarket, the performance patterns of IPOs with high possibility or low possibility of receiving shares are similar. Nevertheless, IPOs with lower possibility of receiving IPO shares tend to experience higher returns in the early aftermarket. However, over a longer period, IPOs with higher possibility of receiving shares encounter better long-run performance than those with lower possibility of receiving shares. These results imply that market may be over-optimistic or overreact to the IPO underpricing in the early aftermarket.¹¹ No matter how large the possibility of receiving IPO shares, IPOs long-run performance measured by Fama-French does not decline over time to show that IPOs in Taiwan are not necessarily poor investments over a long investment horizon.

¹¹ This is similar to the market feedback hypothesis proposed by Jagadeesh, Weinstein and Welch [24] and the impresario hypothesis by Shiller [35].
Table 5: IPO performance after issuance by the possibility of receiving IPO shares

The performance of IPOs starting from the close price of day 7 after issuance measured by Fama-French model for the offerings with higher possibility of receiving IPO shares and those with lower possibility. ***, ** and * represent the significance levels at 1%, 5% and 10%, respectively.

<table>
<thead>
<tr>
<th>Days after issuance</th>
<th>Higher possibility of receiving IPO shares</th>
<th>Lower possibility of receiving IPO shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>3.67</td>
<td>0.00</td>
</tr>
<tr>
<td>200</td>
<td>22.51**</td>
<td>-11.13</td>
</tr>
<tr>
<td>300</td>
<td>0.00*</td>
<td>-7.53</td>
</tr>
<tr>
<td>400</td>
<td>-12.23</td>
<td>-14.05</td>
</tr>
<tr>
<td>500</td>
<td>-3.10**</td>
<td>-60.01</td>
</tr>
<tr>
<td>600</td>
<td>56.14*</td>
<td>35.99</td>
</tr>
<tr>
<td>700</td>
<td>27.19***</td>
<td>-142.18</td>
</tr>
<tr>
<td>800</td>
<td>-40.24***</td>
<td>-117.13</td>
</tr>
</tbody>
</table>

* Fama-French adjusted return is the Jensen’s $\alpha$ in the Fama-French model.

** F***, ** and * mean significantly difference between offerings with higher possibility of receiving IPO shares and those with lower possibility.

Figure 6: The long-run performance of IPOs measured by returns adjusted by Fama-French model for the IPOs with different possibility of receiving IPO shares starting from the close price of day 7 after issuance.

5.4 The long-run performance IPOs based on the initial return

We further classify the whole IPO sample into two sub-samples based
on IPO initial return. The initial return is measured from the offer price to the 6th closing price after issuance. Therefore, the IPO initial return consists of IPO underpricing with the market reaction during the first six trading days. The long run performance here is excluded from the initial return. Hence, if IPO price follows a random walk process, the long-run performance should not be related to the initial return with a particular pattern. Table 6 and figure 7 show that the long-run performance of IPOs with high initial return does not always outperform that of IPOs with low initial return. We argue that Taiwan IPOs are typically fair priced over a long investment horizon based on the Fama-French three-factor model.

6. Conclusion

This paper attributes the cause of Taiwan IPO long-run performance anomaly to the measurement of the long-run performance of IPOs through a new benchmark. Previous papers employ the market returns (beta measured by equally weighted market return and value-weighted market return) and returns of matching firms (matched by size and/or industry) to measure the IPO performance. We apply the Fama-French three-factor model to measure Taiwan IPO performance. That is, Taiwan IPO performance is measured by the market factor, size related factor, and book-to-market related factor. We argue that Fama-French model can measure the performance of assets more precisely by introducing appropriate risk factors.

Table 6: IPO performance after issuance by initial returns
The performance of IPOs starting from the close price of day 7 after issuance measured by Fama-French model\textsuperscript{a} for the offerings with higher initial returns and those with lower initial returns. ***, ** and * represent the significance levels at 1%, 5% and 10%, respectively.

<table>
<thead>
<tr>
<th>Days after issuance</th>
<th>Higher initial returns\textsuperscript{b}</th>
<th>Lower initial returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>19.52**</td>
<td>-4.60</td>
</tr>
<tr>
<td>200</td>
<td>0.00*</td>
<td>23.63</td>
</tr>
<tr>
<td>300</td>
<td>3.79**</td>
<td>-23.91</td>
</tr>
<tr>
<td>400</td>
<td>-49.81***</td>
<td>38.40</td>
</tr>
<tr>
<td>500</td>
<td>-50.31*</td>
<td>-30.23</td>
</tr>
<tr>
<td>600</td>
<td>-29.94***</td>
<td>37.21</td>
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<tr>
<td>700</td>
<td>-74.82***</td>
<td>5.00</td>
</tr>
<tr>
<td>800</td>
<td>-140.00***</td>
<td>-20.17</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Fama-French adjusted return is the Jensen’s $\alpha$ in the Fama-French model.
\textsuperscript{b} ***, ** and * mean significantly difference between offerings with higher initial returns and those with lower initial returns.
Figure 7: The long-run performance of IPOs measured by returns adjusted by Fama-French model for IPOs with high and low initial returns starting from the close price of day 7 after issuance.

Our results show that the long-run performance of IPOs in Taiwan based on market return or market-model returns is poor which is consistent with the previous findings. However, the long-run performance based on the Fama-French three-factor model is fluctuating around zero, which is the normal return pattern for an ordinary asset. Under Fama-French model, we further find that younger IPOs, IPOs with higher possibility of receiving IPO shares and IPOs with lower initial returns tend to perform better in the long run.

References


