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## Investment bank reputation in primary and secondary market makings

### Abstract

Market share of investment bank is an indicator of investment bank reputation. This paper empirically examines the effect of several factors on the market share of investment banks as book managers in initial public offerings (IPOs) in Taiwan market. IPO failures have a negative effect on the ability of investment banks to compete in future underwriting business. The reputable investment bank dummy has a significant impact on changes in market share. Warrants issued by reputable and less-reputable investment banks are examined by GARCH model. The volatility of warrants issued by reputable investment banks is not always lower than those issued by less-reputable investment banks. The authors attribute the results to the difference of investment banking system between Taiwan and the U.S. In Taiwanese investment banking system, after market support or price stabilization is less active. Investment banks with good reputation find it difficult to signal their accumulated capitals through secondary market making.

**Keywords:** investment bank reputation, primary market making, secondary market making, IPO, warrant issues, GARCH.

**JEL Classification:** G01, G14, G21.

### Introduction

Loughran and Ritter (1995) argue that investing in new equity issues decreases investor wealth in the long run. During the five years after the issue, investors have received average returns of only 5 percent per year for companies going public and only 7 percent per year for companies with a seasoned equity offering. Investors seem to be a systematically loser in the new issues market, which is commonly referred as a “new issues puzzle”<sup>1</sup>.

On the other hand, numerous studies documented that, on average, initial public offerings are underpriced. Beatty and Ritter (1986) argue that an issuing firm, which will go public only once, cannot make a credible commitment by itself that the offering price is below the expected market price once it starts trading. Instead, an issuing firm must hire an investment banker to take the firm public. An investment banker is in a position to enforce the underpricing equilibrium because it will be involved in many initial public offerings over time. They argue that any investment bank that “cheats” on the underpricing equilibrium by persistently underpricing either by too little or by too much, will be penalized by market. Empirical evidence supports their proposition that underwriters whose offerings have average initial returns that are not commensurate with their uncertainty of an offering’s value lose subsequent market share. The subsequent market share could be taken as an indicator for investment bank’s reputation.

New issues underwritten by investment bank syndicates are consistent with corporate objective of maximization of shareholders’ wealth. Investment bank syndicates hold a position of synthetic put that is a combination of long stock and selling a call. Syndicates underwrite stock on the one hand and sell a free call to potential investor. The reason why investment banks are capable of underwriting new issues and earning premium is the diversification, hedging, scale of economy and marketing abilities they inherited.

The credibility of investment banks as information producers has been an important issue in finance. An investment bank marketing equity in a firm has an incentive to represent the firm’s projects as worthy of investment, even if it has expended limited resources in investigating these projects. The problem is further complicated by the fact that even stringent evaluation procedures are subject to error, and intermediaries can make “honest”, making it difficult to distinguish between intermediaries acting in good faith and those acting in their own interest to the detriment of investors. Investment banks’ credibility therefore depends on their equity-marketing history. It is believed that investment banks with greater reputation capital are more effective in reducing the impact of information asymmetry in the equity market.

In this study, we intend to examine the relation between investment bank reputation and primary and secondary market making abilities in IPO and warrants markets. We examine the effect of IPO return and one-year return, industry specialization, IPO failures, and reputable book manager dummy on investment bank IPO market share. For the entire IPO market, the coefficients are insignificant. This seems reasonable to exclude the IPO offerings that the book managers have no IPO offering in the succeeding year because in Taiwan IPO market, 39.78% of the

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<sup>1</sup> Lyandres et al. (2008) document that an investment factor, long in low-investment stocks and short in high-investment stocks, helps explain the new issues puzzle. Adding the investment factor into standard factor regressions reduces the IPO underperformance by 80%. The reason is that issuers invest more than nonissuers, and the investment factor earns a significantly positive average return of 0.57% per month.

observations are with 100% market share change, that is the book managers have no IPO offering in the succeeding year.

IPO failures have a negative effect on the ability of investment banks to compete in future underwriting business. Since withdrawals are costly for issuers, banks experienced with past failures lose market share. This finding is consistent with the result that withdrawals will damage the investment bank's reputation (Dunbar, 1998; Hanley and Hoberg, 2012). Reputable book manager dummy is significantly negative for all IPOs, small IPOs, and large IPOs. The empirical findings also show that investment banks with great market shares find it difficult to increase market share in the succeeding year because the market share was relatively large. Although by examining in high/low-volume IPO market, we find the coefficients of the independent variables are still insignificant.

The better the reputation of the investment bank, the lower is the variance of possible firm values, i.e. uncertainty about true value of the firms it markets, which is proposed by Johnson and Miller (1988). Based on this concept, we investigate the relation between warrants volatility and investment bank reputation. We argue that investment banks with good reputation keep good performance not only in primary IPO market but also in secondary market making. Economy of accumulated capital and sophisticated secondary market making skills help them to achieve price stabilization and good reputation status.

A GARCH(1,1)-M model is employed to examine the volatility of warrants issued by reputable and less-reputable investment banks. The empirical results do not support our prior belief that warrants issued by reputable investment banks have small volatility under controlling the characteristics of warrants pair. We attribute the results to the difference of investment banking system in Taiwan, where after market support or price stabilization is restricted in some extent. Investment banks with good reputation find it difficult to signal their accumulated capitals and secondary market making abilities.

The objective of this study is to investigate investment bank reputation through its primary market making and secondary market making. IPOs and warrant issues are two observable activities associated with investment reputation. We examine some reputation variables and second moment volatility to explore the relation. The rest of this paper is organized as follows. In section 1, hypotheses related to investment bank reputation are developed. Data and empirical methodology are discussed in

Section 2. Empirical evidences are presented in Section 3. The final section concludes.

## 1. Literature review

**1.1. Investment bank reputation in primary market making.** Potential investors in an initial public offering take into consideration of information asymmetry commonly referred as a lemons problem (Akerlof, 1970): since insiders have better information regarding the true value of their firm, they have an incentive to overprice offered securities. Due to potential opportunistic behavior by insiders, underwriters can be implied to certify that issue price is consistent with inside information to ameliorate the lemons problem (Booth and Smith, 1986; Lee and Masulis, 2011). Firm value can be increased if bonding investments are made to certify the new issue price, and that the net benefit from certification can be greater if issuing firms are able to introduce a specialist, e.g. an investment banker who has made the requisite bonding investment.

Beatty and Ritter (1986) argued that there is a positive relation between the ex ante uncertainty about an initial public offering's value and its expected initial return. Ex ante uncertainty is the uncertainty about an offering's value once it puts on market. An implication of their finding is that, if the level of ex ante uncertainty is endogenous, an issuing firm has an incentive to reduce this uncertainty by voluntarily disclosing information. The mechanism by which this underpricing equilibrium was enforced is via the investment banking industry. Investment bankers pricing off the line in one subperiod do in fact lose market share in the subsequent subperiod, although the relation is a noisy one.

IPOs are not correctly valued in the early aftermarket. Issuing firms substantially underperformed a sample of matching firms from the closing price on the first day of public trading up to 3 years. The patterns are consistent with an IPO market: First of all, investors are periodically overoptimistic about the earnings potential of growth ventures. Secondly, firms take advantage of these so-called "windows of opportunity". The finding that IPOs underperform, on average, implies that the costs of raising external equity capital are not inordinately high for these firms.

IPOs show poor long-run performance (Loughran and Ritter, 1995). The average annual returns for IPO firms show underperformance comparing to investing an equal amount at the same time in a non-issuing firm with approximately the same market capitalization, and holding it for an identical period. The possible explanation is that firms take advantage of transitory windows of opportunity by issuing equity when they are substantially overvalued.

Chemmanur and Fulghieri (1994) developed a theoretical model of reputation acquisition by investment banks in an asymmetrically informed financial market. The ability of financial intermediaries to acquire a reputation for veracity mitigates the moral hazard problem in information production. Consequently, reputation acquisition plays a crucial role in enabling intermediaries such as investment banks to act as credible information producers. A bank's reputation evolves based on its ability to accurately screen for good performers. Taking a firm public that actually has good prospects enhances reputation, whereas taking a firm public that does not hurts reputation. Empirically, firms with good prospects should have positive abnormal long-run performance, and those firms with poor prospects should have negative abnormal long-run performance. Thus, being associated with an offering that has positive long-run performance should enhance reputation, and being associated with an offering having negative long-run performance should damage reputation.

Underwriter reputation plays an even more important role in firm-commitment IPOs than in best-efforts IPOs. Information spillover from clustering issues results in lower IPO underpricing (Booth and Chua, 1996; Tian and Megginson, 2011). Information spillovers arise when several IPOs occur in the same industry over a reasonably short period of time. These information spillovers lower the cost and improve the precision of IPO valuation (Mauer and Senbet, 1992). Concentrating underwriting efforts in a particular industry should, therefore, increase a bank's market share, since pricing of offerings is likely to be improved. Industry specialization is also likely to be an optimal strategy for smaller, less well-established investment banks that would find it difficult to establish a team of analysts and bankers with expertise in several industries. Concentration in a particular industry is also risky, however, since the industry makeup of firms going public changes over time. Larger, established investment banks, therefore, are likely to attempt to market offerings in several industries to ensure a more stable market presence. Mauer and Senbet (1992) supported that IPO industry classification explains a significant portion of the variability in underpricing after controlling for access and risk factors, and the abnormally high initial return.

Dunbar (2000) finds that a significant fraction of IPOs are withdrawn after they are filed with the SEC in the U.S. The possibility of failure has severe repercussions for issuers. Dunbar (2000) finds that failed offerings rarely return to the public marketplace. Less than 8% of issues that have previously failed ever are completed, and these successful IPOs generally occur several years after the failed initial attempt. With-

drawals should damage investment bank reputation since future issuers are less likely to use investment banks associated with past failures. Consistent with this expectation, Dunbar (2000) finds that investment banks demand greater fees in offerings that they believe are more likely to be withdrawn.

We put emphasis on the relation between investment bank reputation, with a proxy of market shares, and primary market making activity of investment bank. In an IPO process, there are four standard procedures, including initialization by investment bank, mutually understanding, document preparation and execution. Investment bank reputation is the most important consideration by issuing company in mutual understanding process, where issuing firm gives credit to reputable investment bank with proven records in previous primary market makings.

**1.2. Investment bank reputation in secondary market making.** A warrant is usually documented as a security that is freely transferable, settled through some recognized clearing system, and often listed on a particular stock exchange. Many investors think of equity warrants as securities issued by companies on their own shares. Companies may issue warrants as a sweetener to a debt issue or gratis in a stock split or re-capitalization. They represent a way for the company to raise more equity at a higher price in the future. Company debt warrants similarly allow investors to purchase more of that company's shares.

The issuer of warrants, however, need not be related to the underlying commodity. Any legal entity could conceivably sell call options giving the purchaser the right to buy any unrelated underlying security. For example, a bank could sell warrants giving investors the right to buy shares in an unrelated company. The bank cannot create shares to deliver if warrants are exercised, whereas the company could create such shares by issuing new equity and diluting other shareholders. The bank must therefore hedge its warrant issue by purchasing shares of the company to deliver upon demand. In this way, the bank has created a synthetic warrant on the company. Since warrants are financial agreements giving the buyer the right, not the obligation, when investors exercise their rights, the issuers cannot resist. As a result, the reputation of the issuer plays an important part as a warrant is issued.

Copeland (2000) presents and tests a model of the volatility of individual companies' stocks, using implied volatilities derived from the option prices. The results suggest that duration, the proportion of fixed-rate debt, and leverage are significantly related to implied volatility. Time series tests confirm an expected drop in volatility shortly after the earnings announcement and in most cases a positive relationship between the volatility of the stock and the volatility of interest rates.



We intend to observe investment reputation through their secondary market making ability. Investment bank with good reputation tends to show its reputation capital in price stabilization. Based upon its huge capital asset, reputable investment bank launches secondary market making by dealing, brokering, speculation and arbitraging. Secondary market making ability enables investment bank to support its primary market making in pricing and after-market support. Their warrant issues expected to be less volatile than those with bad reputation investment banks. We have a prior belief that reputation capital, market share, primary market making and secondary market making are integrated in the sense that investment bank accumulates through daily investment banking activities.

## 2. Data and methodology

**2.1. Primary market making – IPO market.** The sample includes all successful equity IPOs from 1995 through 1999 in Taiwan Stock Exchange. In this study, we set up a dataset of book manager of the offering, the gross domestic proceeds raised in the offering and the offering price. After-market prices and return data are obtained from the Taiwan Economic Journal (TEJ) database. The IPO return is defined as:

$$IR = \frac{(P - P_0)}{P_0} \cdot 100, \quad (1)$$

where  $P$  is the closing price that did not hit the price ceiling or floor after the first day of trading.  $P_0$  is

the underwriting price. The one-year return for each issuing firm is defined as its buy-and-hold return from the closing price of the first-day of trading to the closing price of the one-year end of the IPO.

For each year, the market share for each bank in a given year is defined as the sum of the gross proceeds divided by the sum of the gross proceeds raised in all IPOs for the year. All unique investment banks that act as book managers should have at least one successful IPO in that year.

Table 1 provides descriptive statistics on IPOs. The table reports basic statistics, including number of offerings, number of unique book managers, mean book manager market share, the Herfindahl index, mean IPO return, total gross proceeds raised and mean offering size. The Herfindahl index is a measure of market concentration.

$$HI = \sum_{i=1}^n (100 \frac{V_i}{V})^2, \quad (2)$$

where  $V_i$  is the gross proceeds raised by each bank in a given year, and  $V$  is the total proceeds raised in that year. The U.S. Department of Justice classifies industries as highly concentrated if this index is greater than 1800, and are not concentrated if the index is less than 1000. According to the definition, Taiwanese underwriting industry is highly concentrated in the sample period.

Table 1. Descriptive statistics on the initial public offering market in Taiwan

Year	No. of IPOs	Number of book managers	Mean market share of book manager (%)	Herfindahl index of book manager	Mean IPO return (%)	Total gross proceeds raised (B NT\$)	Mean IPO gross proceeds (M NT\$)
1995	29	11	9.09	1973.20	13.93	16.4835	568.40
1996	35	13	7.69	2278.65	21.90	38.8870	1111.06
1997	17	9	11.11	2127.04	13.76	25.7503	1514.72
1998	24	10	10.00	2815.28	22.32	26.5918	1107.99
1999	15	9	11.11	1840.91	32.26	7.1396	475.97

The Industry specialization for the investment bank is defined as  $\sum_{i=1}^n (100 \frac{v_i}{v})^2$ , where  $v_i$  is the gross proceeds raised by the bank in a single industry, and  $v$  is the total proceeds raised by the bank. Individual industries are identified using the first 2-digit code of the IPO firms in Taiwan Stock Exchange.

IPO failure is defined as when the closing price at the first day is lower than the offering price. We put the percentage of failure offerings for that investment bank as the sum of proceeds in failure offerings divided by total proceeds underwritten by the bank. In the sample period, there were 16 failure offerings included in our samples. The last variable is a dummy variable, the reputable book manager dummy, is included which takes on the value 1 if

the market share of the book manager in the market segment examined is greater than 10%.

A criticism, initially raised by Tinic (1988), is that market share changes may arise due to changes in the IPO market over time. The reduction in market share would not necessarily be due to mistakes made in offerings in the initial year. To account for this possibility, alternative definitions of the market for IPOs could be considered. Previous studies (Carter and Manaster, 1990) suggest different market segments based on offering size, a commonly used risk proxy. Specifically, this study examined the market share of investment banks in small offerings, comprising those less than NT\$500 million, separate from large offerings, comprising those greater than NT\$500 million.

Table 2 presents the distribution of annual market share measures for the full sample of IPOs, and the large and small market segments. The mean annual Herfindahl index is 2207.02 for the market of all IPOs, 1855.53 for the market of small IPOs, and 2703.5 for the market of large IPOs. This evidence suggests that Taiwan IPO market is highly concentrated.

Table 2. Distribution of annual book manager market share measures for initial public offerings

	All IPOs	Small IPOs	Large IPOs
Mean number of IPOs per year	24	12.2	12
Mean book manager per year	10.4	8	6.8
Percentage book manager market share per year	9.8	14	15.39
Mean annual Herfindahl index	2207.02	1855.53	2703.5
Change in percentage market share from initial to following year	-27.02	-47.84	-8.01

Market share regression analyses use the IPO return, one-year performance, Herfindahl index, and failure

proportion in all offerings that an investment bank underwrites in the initial year as explanatory variables. We drop samples with no offerings where all of these variables are available.

## 2.2. Secondary market making – warrant market.

In order to observe secondary market making ability of investment bank, we examine their reputation based on price stabilization ability, which is implied by volatility of warrant issues. The first issuing of warrant in Taiwan was in January 1997. Until October 2000, there were 212 warrants issued by investment banks listing on Taiwan Stock Exchange. These were all American warrants. This study matched all the warrants listed in the Taiwan Stock Exchange between January 1997 and November 2000. Six pairs of warrants of the same underlying security and similar duration are in the samples, presented in Table 3. In order to examine the relationship between investment reputation and volatility of warrant issues, we used daily returns of the selected warrants listing on the Taiwan Stock Exchange Corporation between January 1997 and November 2000.

Table 3. Six matched pairs of warrants

	Name of warrant	Issuer	Underlying securities	Duration
1	0501 Grand Cathay01 <sup>a</sup>	Grand Cathay Securities	Yageo	1997/9/4~1998/9/3
	0505 Core Pacific01	Core Pacific Securities	Yageo	1998/1/5~1999/1/4
2	0506 Taiwan International01 <sup>a</sup>	Taiwan International Securities	CMC	1998/1/8~1999/1/7
	0509 Polaris04	Polaris Securities	CMC	1998/2/21~1999/2/20
3	0546 Core Pacific04 <sup>a</sup>	Core Pacific Securities	Walsin Lihwa	1999/11/25~2000/11/24
	0544 Polaris10	Polaris Securities	Walsin Lihwa	1999/11/24~2000/11/23
4	0538 Grand Cathay10 <sup>a</sup>	Grand Cathay Securities	United Micro Electronics	1999/11/1~2000/10/31
	0547 Polaris11	Polaris Securities	United Micro Electronics	1999/11/30~2000/11/29
5	0531 Core Pacific02 <sup>a</sup>	Core Pacific Securities	Taiwan Semiconductor Manufacturing	1999/9/18~2001/3/17
	0548 China02	China Securities	Taiwan Semiconductor Manufacturing	1999/12/1~2000/11/30
6	0541 Yuan Ta06 <sup>a</sup>	Yuan Ta Securities	ACER Sertec, Inc.	1999/11/6~2000/11/5
	0550 President02	President Securities	ACER Sertec, Inc.	1999/12/2~2000/12/1

Note: <sup>a</sup> Warrants issued by reputable investment banks.

Observations are obtained by taking the difference of the logarithms of every consecutive day's closing price,  $\ln\left(\frac{P_{t+1}}{P_t}\right)$ , where  $P_{t+1}$  is the closing price at

$t+1$  and  $P_t$  is the closing price at  $t$ . Figure 1 plots the daily return series of the 6th pair. In the return series, we find a clustering of fluctuations. Large changes tend to be followed by large changes and so are the small ones. It shows the typical property of financial series.

A GARCH-M (GARCH in mean) model is an extension of GARCH by adding the conditional variance as an explanatory variable in the mean equation. This model is used to link the risk and return in the bond market proposed by Engle, Lilien and Robins (1987). If the evolution of the variance of the market return can be reasonably approximated by GARCH, then the GARCH-M model provides a unified framework to estimate the volatility and the time-varying risk premium in the stock market. A GARCH(1,1)-M model is then employed in this study to examine warrant volatility.

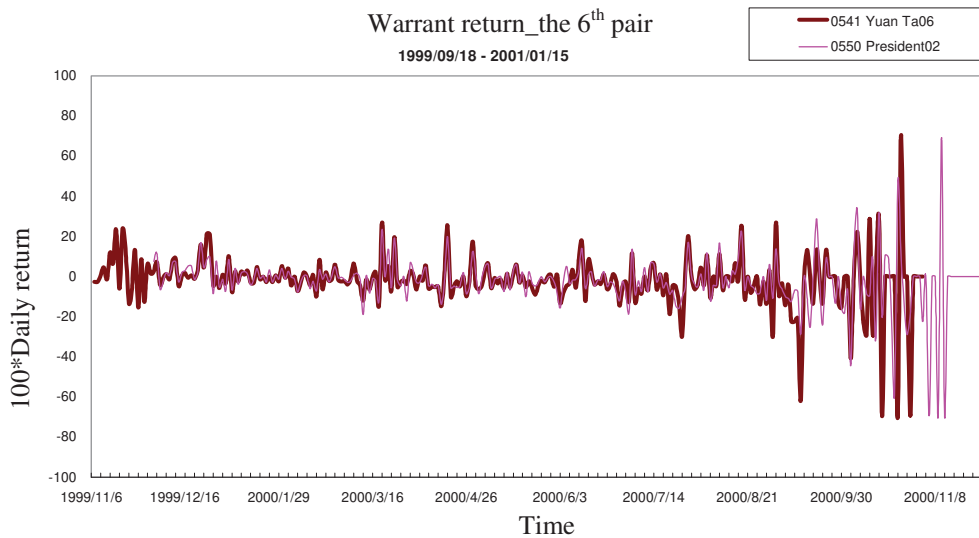


Fig. 1. Plots of warrant return by 6th pair

$$\begin{aligned}
 R_t &= r_f + \delta V_t + e_t, \\
 V_t &= \alpha_0 + \alpha e_{t-1}^2 + \beta V_{t-1}, \\
 e_t &\sim N(0, V_t),
 \end{aligned}
 \quad (3)$$

where  $R_t$  is the rate of return in time  $t$ ,  $V_t$  is conditional variance of return in time  $t$ ,  $e_t$  is the error term. The advantage of this model is that the parameters of interest can be jointly estimated. In particular, the index of relative risk aversion,  $\delta$ , is obtained as well as the persistence parameter  $\alpha + \beta$  by a maximum-likelihood technique.

### 3. Empirical results

**3.1. Investment bank reputation and primary market making in IPO market.** Market share is a proxy of investment bank reputation. To measure the impact

of the quantitative factors on market share, we regress change of market share on IPO return, one-year IPO performance, industry specialization of offerings underwritten by a book manager in the initial year, percentage failure, and reputable investment bank dummy. Descriptive statistics of the independent variables in market share analysis are presented in Table 4.

The second column shows investment banks with a market share greater than 10% in a year. This group of banks, which this study refers to as reputable banks, is under further analyses. The mean IPO return is 18.63% for all banks, and 18.51% for reputable banks. One-year performance is 14.36% for the full sample, and 11.72% for reputable banks. The mean percentage of failure IPOs is 0.19% for both the full sample and the reputable banks.

Table 4. IPO market descriptive statistics

	All IPOs		Small IPOs		Large IPOs	
	All banks	Reputable banks	All banks	Reputable banks	All banks	Reputable banks
Mean IPOs return	18.63 (23.92)	18.51 (25.82)	16.25 (21.90)	17.28 (18.99)	20.92 (25.72)	22.79 (30.20)
Mean 1-year return	14.36 (37.57)	11.72 (28.82)	13.58 (40.03)	20.73 (38.16)	15.10 (35.45)	7.03 (21.08)
Percentage failure	0.19 (0.29)	0.19 (0.24)	0.23 (0.34)	0.19 (0.25)	0.11 (0.23)	0.13 (0.17)
Number	98	49	48	30	50	30

Note: t-statistics is reported in parentheses.

The third and fourth columns of Table 4 report similar statistics in the market for small offerings. IPO return is slightly lower in this market. One-year performance is higher for IPOs by reputable banks. The fifth and sixth columns of Table 4 report similar statistics in large offering. The mean IPO return is higher in this market. One-year performance is lower for IPOs by reputable banks. Initial market share regression analyses reported in Table 5 examine changes in market share based on the entire sample of IPOs. Independent

variables as IPO return, one-year return, industrial specialization, percentage failure, and reputable investment bank dummy are included in this regression. A dummy variable takes the value of 1 if the investment bank has an established reputation in that it has a market share greater than 10% in the initial year, and zero otherwise. It matches Pareto principle that is typified by the “80/20 rule”, arguing that 80% of the output comes from 20% of the input. The 10% standard helps to screen 2-3 reputable investment banks in a

given year. The second column in Table 5 shows the regression results of small initial public offerings. We note that the coefficient on the reputation dummy is significantly negative.

The regression results of large IPOs are similar to those found in the market for all IPOs. The coefficients on the variables are insignificant. Since the coefficients in the initial regression model are insignificant, we exclude the IPO offerings that the book managers have no IPO offering in the succeeding year, i.e. we exclude the IPO offerings of the change in market share of -100%.

Table 5. Regression results of change in book manager market share

	All IPOs	Small IPOs	Large IPOs
IPO return	-0.5483	-0.7181	-0.8796
	(-0.9580)	(-0.7302)	(-0.9517)
One-year return	-0.0383	0.6571	-0.2874
	(-0.1075)	(1.2265)	(-0.4072)
Industrial specialization	31.3495	60.3901	-34.4510
	(0.6070)	(0.8130)	(-0.3589)
Percentage failure	-38.4483	-57.7872	62.2730
	(-0.8245)	(-0.9039)	(0.5784)
Reputable book manager dummy	19.1672	-89.9088**	15.3578
	(0.6935)	(-2.0603)	(0.2898)
Number of observations	98	48	50
R <sup>2</sup>	(0.0213)	(0.1440)	(0.0473)

Note: t-statistics is reported in parentheses. \*\*\*, \*\*, and \* denote significant at 1%, 5%, and 10% level.

The result was shown in Table 6. The coefficient on reputable book manager dummy is significant negative, indicating that it is difficult for reputable investment banks to expand their market shares. The percentage of failure offerings has a significant negative effect on total market share. This finding suggests that an IPO failure has a negative impact on the ability of investment banks to compete for future business.

Table 6. Regression results of change in book manager market share on mean offering characteristics without-100% market share change

	All IPOs	Small IPOs	Large IPOs
IPO return	-0.8431	0.3860	-0.9361
	(-1.1982)	(0.3024)	(-0.8959)
One-year return	-0.1533	1.2551*	-0.2106
	(-0.2358)	(1.7320)	(-0.1712)
Industrial specialization	93.2258	75.8400	-22.3866
	(1.3127)	(0.9171)	(-0.1695)
Percentage failure	-139.3333**	-64.5535	-18.1885
	(-2.1672)	(-0.8571)	(-0.1322)
Reputable book manager dummy	-116.9064***	-267.8624***	-215.3200***
	(-2.8956)	(-5.0704)	(-2.4604)
Number of observations	60	28	33
R <sup>2</sup>	0.2226	0.5982	0.2321

Note: t-statistics is reported in parentheses. \*\*\*, \*\*, and \* denote significant at 1%, 5%, and 10% level.

Columns 2 and 3 show empirical results of small and large IPOs, respectively. The percentage of failure offerings has a negative effect, although statistically insignificant, on market share both in the market for small and large IPOs. The coefficient of reputable book manager dummy is significant and negative both in small IPOs market and large IPOs market. The empirical results are consistent with our findings in all IPO market. The coefficient on the one-year return is significantly positive in the market for small IPO. Positive one-year performance is regarded as evidence of effective investment bank screening (Chemmanur and Fulghieri, 1994; Shivdasani and Song, 2011) or successful aftermarket support. We replicate the regressions in Table 5 for two sub-periods, high-volume and low-volume IPO markets. High-volume IPO markets are defined as two-year periods in which the annual number and value of IPOs in the second year exceeds the mean annual number and value of IPOs in the sample period. The variables have an even more significant effect on market share changes in high-volume IPO markets. However, the independent variables are insignificant in both high-volume and low-volume markets except the significant coefficient of reputable book manager dummy in high-volume market.

**3.2. Investment bank reputation and secondary market making in warrants market.** In order to investigate investment bank reputation in secondary market making, we study on warrant volatility. We expect lower warrant volatility from reputable bank. Table 7 summarizes the empirical results. First of all, we find GARCH effect for the full sample warrants. Coefficients of previous period conditional variance and squared error term are significant. All sample warrants have positive log likelihood and are converged by iterations.

We plot the comparable index price to show the pattern of price for each warrant in that pair.

Table 7. GARCH(1,1)-M model iteration results

	Name of warrant	Iteration times	Value of log likelihood
1	0501 Grand Cathay01 <sup>a</sup>	32	284.26
	0505 Core Pacific01	151	320.74
2	0506 Taiwan international01	26	318.31
	0509 Polaris04	101	245.69
3	0546 Core Pacific04	23	259.86
	0544 Polaris10	67	275.20
4	0538 Grand Cathay10	39	296.80
	0547 Polaris11	9	271.89
5	0531 Core Pacific02	27	420.33
	0548 China02	5	257.91
6	0541 Yuan Ta06	11	231.87
	0550 President02	15	247.70



Index price is used to condition the effect of the absolute scale of the price in pairs. Due to the comparable warrants in every pair are not of the same issuing date, we take the issuing date of the latter-issued warrant as the base date for that pair. The comparable plot of the 6<sup>th</sup> pair in existing period for both warrants was shown in Figure 2.

Since volatility is not an observable variable, the GARCH model uses the conditional variance as the measure of volatility. Table 8 summarizes the estimations of the variance in conditional mean in

the GARCH(1,1)-M model for the sample warrants. Compared the estimates of variance in conditional mean for all sample pairs, the reputable investment banks in the 2<sup>nd</sup> and 3<sup>rd</sup> pairs had less variance than less reputable investment banks. However, in the 1<sup>st</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> pairs, less reputable investment banks had less variance than reputable banks. The result cannot support our assumption that the warrant issued by reputable investment banks has less volatility than that issued by less reputable investment banks.



Fig. 2. Comparable plots of warrant index prices by 6<sup>th</sup> pair

Table 8. Estimates of variance in conditional mean of GARCH(1,1)-M model

	Name of warrant	Value	Std. err.	T-stat
1	0501 Grand Cathay01 <sup>a</sup>	0.106192E-02	0.199623E-03	5.320
	0505 Core Pacific01	0.298786E-03	0.992026E-04	3.012
2	0506 Taiwan international01	0.105450E-02	0.486715E-03	2.167
	0509 Polaris04	0.128027E-02	0.350017E-03	3.658
3	0546 Core Pacific04	0.398660E-03	0.128426E-03	3.104
	0544 Polaris10	0.838746E-03	0.178216E-03	4.706
4	0538 Grand Cathay10	0.415060E-03	0.114879E-03	3.613
	0547 Polaris11	0.230195E-03	0.747504E-04	3.080
5	0531 Core Pacific02	0.553132E-03	0.107689E-03	5.136
	0548 China02	0.903351E-04	0.511262E-04	1.767
6	0541 Yuan Ta06	0.361993E-03	0.132083E-03	2.741
	0550 President02	0.165874E-03	0.752737E-04	2.204

The possible explanation is that price stabilization activity is less active in Taiwan and investment banks finds it difficult to carry out secondary market making to signal accumulated capital and reputation.

## Conclusion

In this study, we examine the effect of IPO return and one-year return, industry specialization, IPO failures, and reputable book manager dummy on investment bank IPO market share. For the entire market of IPOs, the coefficients are insignificant. This seems reasonable to exclude the IPO offerings that the book managers have no IPO offering in the

succeeding year because in Taiwan IPO market, 39.78% of the observations are with -100% market share change, that is the book managers have no IPO offering in the succeeding year.

IPO failures have a negative effect on the ability of investment banks to compete in future underwriting business. Since withdrawals are costly for issuers, banks experienced with past failures lose market share. This finding is consistent with the result that withdrawals will damage the investment bank's reputation (Dunbar, 2000). Reputable book manager dummy is significant negative for all IPOs, small IPOs, and large IPOs. In our study, the empirical

findings show that investment banks with great market share find it difficult to increase market share in the succeeding year because the market share has been already relatively large. Although by examining in high/low-volume IPO market, we find the coefficients of the independent variables are still insignificant.

We also employ a GARCH(1,1)-M model to examine the volatility of warrants issued by reputable

and less-reputable investment banks. The empirical results do not support the assumption that warrants issued by reputable investment banks have small volatility. We attribute the results to the uniqueness of investment banking system in Taiwan, where after market support or price stabilization is less active. Investment banks with good reputation find it difficult to signal reputation by accumulated capital and secondary market making abilities.

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