Rev Quant Finan Acc
DOI 10.1007/s11156-013-0419-z

ORIGINAL RESEARCH

Stock manipulation and its effects: pump and dump versus stabilization

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Abstract This study examines the manipulation of stock prices in Taiwan stock markets. Using a new set of hand-collected data, we examine the characteristics and patterns of manipulated stocks and their effects on the market. Our results show that manipulated firms tend to be small and to have poor corporate governance. Most manipulation cases involve a "pump-and-dump" trading strategy and stabilization operations. Pump-and-dump manipulations lead to high temporary price impacts, increased volatility, large trading volumes, short-term price continuation, and long-term price reversals during the manipulation period. They therefore have an important impact on market efficiency. In stabilization cases, the manipulation has no impact on market performance, except that the price drop and abnormal returns of the post-manipulation period are significantly lower than during the pre-manipulation period. Firm fundamentals are important in deciding the price impacts of stock manipulation. Compared with manipulated firms with positive fundamentals, the manipulation of firms with negative fundamentals has a more detrimental effect on market efficiency.

Keywords Stock manipulation · Market performance · Pump and dump · Stabilization

JEL Classification G14 · G15 · G18

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Published online: 24 November 2013

1 Introduction

Concerns over the manipulation of securities prices have been growing for the last several years (e.g., van Bommel 2003; Comerton-Forde and Putnins 2011; Gao and Oler 2012; Chow et al. 2013; Qi et al. 2013). The fact that markets can be manipulated is an important issue for both trading regulation and market efficiency. Securities regulators generally prohibit market manipulation because it distorts prices, hampers price discovery, and creates deadweight losses. Some of the most compelling studies focus on modeling manipulation behavior and the empirical implications of manipulation (e.g., Vila 1989; Allen and Gale 1992; Allen and Gorton 1992; Jarrow 1992; Bagnoli and Lipman 1996). In recent years, more attention has been paid to empirical studies of manipulation (Mei et al. 2004; Jiang et al. 2005; Khwaja and Mian 2005; Merrick et al. 2005; Aggarwal and Wu 2006; Allen et al. 2006; Huang and Chan 2011). This study extends this line of the literature by examining the behavior of stock manipulation and its market impact in the context of the Taiwan stock markets.

The purpose of this study is to examine the characteristics of manipulated stocks and their effects on market prices, liquidity, volatility, and efficiency. Kyle and Viswanathan (2008) argue that an understanding of the effects on both pricing accuracy and liquidity is required to determine whether a particular trading strategy is unambiguously socially harmful and should be illegal. We collect data on prosecuted cases of manipulation of the Taiwan stock markets from August 1, 1991, to August 30, 2010. In particular, we examine two schemes of manipulation operations, "pump and dump" and stabilization, and compare their effects on the market. Since the effects of manipulation on the market can also be influenced by regulation changes and the firm fundamentals of the manipulated stocks, we also explore the effects of these factors on the price behavior of manipulated stocks around the manipulation period.

Allen and Gale (1992) classify manipulation into three types: action based, information based, and trade based. Action-based manipulation involves actions that change the actual or perceived value of the underlying asset. Bagnoli and Lipman (1996) investigate action-based manipulation using takeover bids. In their model, a manipulator acquires stocks in a firm and then announces a takeover bid. This leads to a price run-up in the firm's stock. The manipulator is then able to sell the stock at a higher price.

Information-based manipulation involves releasing false information or spreading misleading rumors. The operation of "trading pools" in the United States during the 1920s is an example of such information-based manipulation. Benabou and Laroque (1992) consider information-based manipulation and show that if a person has privileged information about a stock and his or her statements are considered credible by investors, that person can profitably manipulate the stock price by making misleading announcements and then trading.

Trade-based manipulation, which is much more difficult to detect, occurs when an individual attempts to manipulate a stock by simply buying and then selling it, without taking any publicly observable actions to alter the value of the firm or releasing false information to change the price. Allen and Gale's (1992) model shows that such manipulation is possible in a rational expectations framework. The manipulator can achieve a positive profit under certain conditions because a pooling equilibrium exists in which the investors are uncertain whether a large trader who buys shares is a manipulator or an informed trader.

Mei et al. (2004) propose a model for another type of trade-based manipulation in which smart money takes advantage of investors' behavioral biases to manipulate stock prices.

The authors consider three types of traders: behavior-driven investors who are loss averse (dispositional effect), arbitrageurs, and manipulators who are large investors and thus price setters rather than price takers. The authors show that, due to investors' behavioral biases and the limits of arbitrage, manipulators can profit from a pump-and-dump trading strategy, accumulating a speculative asset while pushing its price up and then selling it at a higher price.

Most stock market manipulation studies are theoretical, with quantitative model solutions; there are few empirical studies. Aggarwal and Wu (2006) collect data on stock market manipulation cases pursued by the U.S. Securities and Exchange Commission from January 1990 to October 2001. The authors find that prices, trading volumes, and volatility rose during the alleged manipulations, followed by a price fall, suggesting that profitable manipulation could have occurred. Jiang et al. (2005) use a new data set to examine the pre- and post-pool characteristics of stocks subject to pools by the New York Stock Exchange (NYSE) in 1928 and 1929. The authors find that the pool stocks were comparable in size with their associated industry portfolios but more volatile and liquid, on average, than other companies in their industry. During the period of pool activity, the pool stocks experienced both abnormally high trading volumes and abnormally high returns, though both effects were small. Allen et al. (2006) investigate price and trading behavior around several well-known stock market and commodity corners between 1863 and 1980. The authors find strong evidence that large investors and corporate insiders possess sufficient market power to manipulate prices. They also find that the presence of large investors makes it risky for would-be short sellers to trade against the mispricing. Comerton-Forde and Putnins (2011) examine the effect of closing price manipulation on prices and various trading characteristics, using a sample of prosecuted manipulation cases. The authors find that closing price manipulation has a significantly detrimental effect on price accuracy.

In this study, we use a unique data set of prosecuted manipulation cases to study the characteristics of manipulated stocks and stock manipulation behavior. The manipulation cases are further classified into pump-and-dump and stabilization subsamples. Their effects on the market are examined and compared. In addition, the effect of stock manipulation on the market can also vary with firm fundamentals. To explore the possible contribution of firm fundamentals to the price impact of stock manipulation, we further divide our manipulation sample into positive-earnings per share (EPS) and negative-EPS subsamples according to the EPS in the year prior to manipulation.

Aggarwal and Wu (2006) also analyze manipulation by using prosecuted cases but our study differs from theirs in three ways. First, they examine manipulation in the developed market of the United States, while our study examines manipulation in a volatile emerging market where individual investors, who are more easily manipulated, represent more than 60 % of all investors. In addition, compared to developed markets, emerging markets are characterized by weak investor protection and are subject to much less stringent securities regulations and rules. Thus, our findings may have different implications for trading regulation and investment policy. Khwaja and Mian (2005) also examine manipulation in an emerging stock market in Pakistan. However, these authors focus on manipulation by collusive brokers, whereas our study examines all prosecuted cases of manipulation.

Second, our study examines and compares two different schemes of manipulation: pump-and-dump manipulation and stabilization operations. Since the purposes of these two types of manipulation scheme differ, their effects on the market may also differ. Third and most importantly, by examining different manipulation schemes in an emerging market, we find that the characteristics of manipulation and manipulators differ from those in the

developed market, as described in Aggarwal and Wu (2006). Moreover, there are large differences in the effects of manipulation on the market between pump-and-dump and stabilization manipulation. While pump-and-dump manipulation has detrimental effects on price accuracy and market performance, stabilization manipulation seems to cause no harm to the market.

Like other studies using prosecuted manipulation cases, this study suffers from several limitations in our sample. First, we have data only for prosecuted manipulation cases and therefore are missing cases where manipulation took place but was not observed or prosecuted. Our sample of prosecuted manipulation cases is therefore not a random sample of all manipulations and our empirical results should be viewed as describing the characteristics of prosecuted manipulations. In addition, we are not able to characterize manipulation intended to deflate prices, because no such manipulation exists in our sample period.

The remainder of this article proceeds as follows: In Sect. 2, we discuss anti-manipulation regulation. Section 3 describes the data and methodology. The empirical results are presented in Sect. 4. Section 5 provides a summary and conclusions.

2 Anti-manipulation regulation in Taiwan

Taiwan's Securities and Exchange Act,[1] administered by the Taiwan Financial Supervisory Commission (FSC), was enacted on April 30, 1968. However, it was not until the Amendment of 1988 that this regulation began to govern market manipulation. Article 155 of the Amendment prohibits the following:

1. To order or report a trade on a security exchange and to fail to perform settlement after the transaction is made, where such action is sufficient to affect the market order.
2. To trade on a security exchange that involves no change in the beneficial ownership thereof. [This rule, the so-called wash sale rule, was repealed in June 2000.]
3. To conspire with other parties in a scheme such that the first party buys or sells designated securities at an agreed price, while the second party sells or buys from the first party in the same transaction, with the intent to inflate or deflate the trading prices of said securities.
4. To continuously buy at high prices or sell at low prices designated securities for one's own account or under the names of other parties with the intent to inflate or deflate the trading prices on said securities traded on the security exchange.
5. To continuously order or report a series of trades under one's own account or under the names of other parties, and to complete the corresponding transactions with the intent of creating an impression on the security exchange of brisk trading in a particular security.
6. To spread rumors or false information with the intent to influence the trading prices of designated securities traded on the security exchange.
7. To perform, directly or indirectly, any other manipulative acts to influence the trading prices of securities traded on the security exchange.

The Taiwan Stock Exchange (TWSE) can initiate an investigation to determine whether laws and rules prohibiting market manipulation have been violated and can also utilize its inspection authority to review books and records possibly relating to violations. The

[1] See http://law.moj.gov.tw/Eng/LawClass/LawSearchNo.aspx?PC=G0400001&DF=&SNo=155.

authority to investigate is included in the Regulation Governing Implementation of the Stock Market Surveillance System, Article 7, which states,

The TWSE shall investigate and pursue all forms of abnormal trading and establish a complete file of relevant information for purpose of verification. The TWSE shall also report those, if any, suspected of violating laws and administrative orders or submit an investigative report of such violations to the competent authority.

Information about possible market manipulation cases can come from a variety of sources, including general surveillance on prices and volume activity and trading member or client complaints about illegal activity. After the TWSE staff examines the trading records and determines that manipulation has occurred, they can refer the manipulation case to the criminal authority. After further investigation and with evidence of manipulation, the criminal authority has the responsibility for prosecuting such offenses. The manipulation sample in this study is based on the prosecution's evidence. Manipulation cases are announced only after prosecution, which is usually 2 or 3 years after the manipulation period.

Compared with countries such as the United States or Japan, Taiwan's most important shortcomings in anti-manipulation law are the elimination of the stabilizing price provision in the draft code of the Securities Exchange Act, Article 155-5,[2] and the elimination of the wash sale provision, Article 155-2. Both provisions are regarded as important indicators of intended manipulation in countries such as the United States and Japan. The absence of these two provisions has made it difficult to prosecute suspected violators and many court cases are thus forced to reach a verdict of not guilty. While most manipulation cases pursued by the FSC involve wash sales or stabilization operations, the prosecutions are for violating Article 155-4 or other provisions of the Securities and Exchange Act.[3] To examine the effect of regulation change during 2000, we divide our sample into pre-2000 and post-2000 subsamples to determine whether there is a linkage between the regulation change and the price behavior of manipulated stocks around the manipulation period.

3 Data

3.1 Data description

This study uses a new data set to provide more systematic evidence on stock market manipulation. We collected data on stock market manipulation cases prosecuted by market regulators from August 1, 1991, to August 30, 2010. Specifically, we collected all FSC litigation releases containing the keywords *stock manipulation* or *Article 155 of the Securities and Exchange Act*. We then constructed a database of all these manipulation cases. Additional information about the cases was collected from other legal databases, such as LAWBANK[4] and the Law and Regulation Retrieving System of the Judicial Yuan

[2] Article 155-5 prohibits the following:
To effect either alone or with more other persons any series of transactions for the purchase and/or sale of any security without the permission of government rules or regulations for the purpose of pegging, fixing, or stabilizing the price on said securities traded on the security exchange.

[3] Overall, of the 118 prosecuted cases in our study, 77 % were judged guilty in the first sentence.

[4] The LAWBANK database contains information about all the laws, regulations, and civil and criminal cases brought forward by the Judicial Yuan of Taiwan, from 1911 to the present.

of Taiwan. There are 118 cases in total. The manipulated stocks and the corresponding manipulation period are listed in the "Appendix".

Table 1 shows descriptive statistics of the manipulation cases: 55.93 % of the manipulators are insiders; the remaining 44.07 % are large individual speculators. This contrasts with the finding of Aggarwal and Wu (2006), that almost all manipulators are potentially informed parties (insiders, brokers, underwriters, etc.). This finding demonstrates an important feature of manipulations in Taiwan: Many manipulation cases are driven by large individual outsiders.

Table 1 also shows that nearly all manipulation cases (96.61 %) are trade based, the remainder (3.39 %) being information based; there are no action-based manipulations during the study period. In addition, inflating a stock price (pump and dump) is the most common type of manipulation (90.68 %), while stabilization[5] accounts for 9.32 %, with no deflating ("poop-and-scoop") scheme in our sample. Finally, 66.95 % of all manipulation cases occur on the TWSE and 33.05 % of cases occur in the over-the-counter (OTC) market. This finding is also contrary to previous research (Aggarwal and Wu 2006), which finds most manipulation cases occur in relatively inefficient markets, such as OTC markets and regional exchanges. This discrepancy may be explained by the fact that Taiwan's OTC market is small relative to the TWSE, having been established only in 1994.

For the manipulated stocks, we collected daily stock prices, trading volumes, and capitalization data from the Taiwan Economic Journal (TEJ) database.[6] Prices are adjusted to account for dividends and splits. We define the manipulation period as the number of days between the start and end of the manipulation day, which are shown in the indictments of the manipulation cases. The mean (median) manipulation period is 92 (45) days, which is shorter than that for Aggarwal and Wu (2006) and Mei et al. (2004). To examine the effects of manipulation on markets, we specify the pre- and post-manipulation periods as 100 days before and 100 days after the manipulation period.[7]

For each manipulated stock, we also create an industry-matched portfolio as a benchmark against which to compare the impact of the manipulation on markets. The control portfolio is selected from the same exchange in a manner similar to Huang and Stoll (1996). Each controlled portfolio consists of 10 stocks. If there are no more than 10 stocks in the same industry as the manipulated stock, we choose five stocks as the controlled portfolio. Matched stocks are selected as those with the lowest loss function scores:

$$\sum_{j=1}^{5}\left(\frac{x_j^M - x_j^N}{(x_j^M + x_j^N)/2}\right)^2, \tag{1}$$

where superscripts M and N refer to manipulated and non-manipulated stocks (all the other stocks in the same industry as the manipulated stock on the corresponding exchange), respectively, and x_j represents five stock characteristics: size, return, turnover, book-to-market ratio, and market beta. These characteristics are calculated over the 12-month period prior to the manipulation year of the manipulated stock. The purpose of the matching criterion is to ensure that matched stocks have similar pricing characteristics.

[5] Stabilization is a form of manipulation with the intent of pegging, fixing, or stabilizing the price on any security traded on the security exchange. Such manipulations are usually carried out by corporate insiders.

[6] The TEJ database is the largest financial database in Taiwan. It contains complete financial and market data for all securities traded on the TWSE and OTC in Taiwan.

[7] Manipulation cases are announced only after prosecution, which is usually 2 or 3 years after the manipulation period and therefore does not overlap with this study's post-manipulation period.

Table 1 Descriptive characteristics of manipulation cases

Characteristic	Number of cases	Percentage of total
Manipulator		
Insider	66	55.93
Non-insider	52	44.07
Type of manipulation		
Action based	0	0
Information based	4	3.39
Trade based	114	96.61
Direction of manipulation		
Pump and dump	107	90.68
Poop and scoop	0	0
Stabilization	11	9.32
Market		
TWSE	79	66.95
OTC	39	33.05

The characteristics of manipulators and manipulation schemes are shown for the 118 manipulated stocks in our sample. Insider denotes corporate executives, directors, and large shareholders with 10 % or more ownership in the manipulated stock

3.2 Characteristics of manipulated stocks

Table 2 lists summary statistics for the manipulated stocks, control portfolios, and all stocks in the TWSE prior to manipulation. The mean market capitalization value for the manipulated sample is NT $4.83 billion, far smaller than the mean capitalization of all stocks in the market (NT $19.03 billion). This finding is consistent with that of Aggarwal and Wu (2006), who indicate that manipulation is most probable in smaller stocks. The mean return, turnover, and volatility for the manipulated sample are 0.0222 %, 1.2639 %, and 0.0203, respectively. The mean turnover and volatility of the manipulated sample are similar to those of the control portfolios, but slightly higher than those of the market. The market-to-book and beta of the manipulated sample are 2.26, and 0.72, respectively, similar to the control portfolios.

The previous literature finds that stocks that are vulnerable to manipulation tend to have poorer investor protection or corporate governance and specific shareholder structures or board memberships (Beasley 1996; Farber 2005). Huang et al. (2012) find that CEO duality and institutional ownership are significantly correlated with illegal insider trading in Taiwan. They also find that firms with less financial reporting credibility have a higher probability of illegal insider trading. To shed more light on distinguishing the manipulated group from the control, this study also compares the corporate governance variables of the manipulated stocks with these control portfolios. The data are collected from the TEJ database.

Table 3 shows the results. Overall, there is no significant difference in the variables for board size and institutional ownership. However, the manipulated sample has a higher ratio of CEO duality and higher turnover of top management. In addition, there is a higher frequency of restatements of financial reports in the manipulated sample. This finding indicates that manipulated stocks in Taiwan are likely to be those with poorer corporate governance and less financial reporting credibility.

3.3 Market performance of manipulated stocks

How do manipulated stocks perform relative to their benchmark? Table 4 reports test statistics of abnormal returns, abnormal turnovers, and abnormal volatility for the whole

Table 2 Summary statistics of manipulated stocks, control portfolios, and the stock market as a whole prior to manipulation

	Manipulated sample	Control portfolio	All stocks in the TWSE
Market cap. (in billions)			
Mean	NT $4.832	NT $7.639	NT $19.032
SD	NT $7.246	NT $14.104	NT $3.910
Median	NT $2.705	NT $4.780	NT $19.458
Return (%)			
Mean	0.0222	0.0282	0.0418
SD	0.2044	0.1713	0.0899
Median	0.0035	0.0681	0.0415
Turnover (%)			
Mean	1.2639	1.1938	0.8397
SD	1.2684	0.7891	0.2761
Median	1.0310	1.0128	0.8257
Volatility			
Mean	0.0203	0.0197	0.0089
SD	0.0054	0.0046	0.0034
Median	0.0197	0.0191	0.0084
Market to book			
Mean	2.26	2.06	2.25
SD	1.49	1.05	0.74
Median	1.91	1.80	1.84
Beta			
Mean	0.72	0.84	–
SD	0.33	0.22	–
Median	0.69	0.82	–

The sample mean, standard deviation, and median for firm size (market capitalization), daily returns, turnover, volatility of daily returns, market-to-book ratio, and market beta for the manipulated stocks, control portfolios, and all stocks in the TWSE are computed over the 12-month period prior to the manipulation year. For each measure, we calculate a time-series average separately for each manipulated stock and each control portfolio and then calculate descriptive statistics for the cross section of manipulated stocks and control portfolios. Here volatility is measured via Parkinson's (1980) method

sample as well as for the other subsamples. The abnormal return of manipulated stock i on day t, $AR_{i,t}$, is defined as

$$AR_{i,t} = R_{i,t} - benchmark_{Ri,t}, \tag{2}$$

where $R_{i,t}$ is the return on manipulated stock i on day t and $benchmark_{Ri,t}$ is the return on the control portfolio of manipulated stock i on day t. Abnormal turnover and abnormal volatility are similarly defined. In calculating volatility, Parkinson's (1980) measure is used as a proxy for volatility, calculated as

$$PK_{i,t} \approx \sqrt{0.361\left[\ln\left(S_{i,t}^{High}\right) - \ln\left(S_{i,t}^{Low}\right)\right]^2}, \tag{3}$$

where $S_{i,t}^{High}$ and $S_{i,t}^{Low}$ are the highest and lowest prices, respectively, of stock i on day t.

Table 3 Characteristics of manipulated stocks

	Manipulated sample	Control portfolio	Difference manipulated − control
Board size			
Mean	6.2902	6.4973	−0.2071
SD (*t* value)	1.9197	1.0278	(0.84)
Institutional ownership (%)			
Mean	28.9632	30.9865	−2.0233
SD (*t* value)	20.2657	10.0731	(0.79)
CEO duality			
Mean	0.4951	0.3492	0.1459**
SD (*t* value)	0.4919	0.1915	(2.44)
Chairman turnover			
Mean	0.3368	0.2603	0.0764
SD (*t* value)	0.5974	0.2275	(1.06)
CEO turnover			
Mean	0.6568	0.4457	0.211**
SD (*t* value)	0.7878	0.2581	(2.25)
Restatements			
Mean	0.2521	0.0687	0.1834**
SD (*t* value)	0.7069	0.1269	(2.25)

The variable *Board Size* is the number of directors on the board; *Institutional Ownership* is the proportion of shares owned by institutional investors; CEO *Duality* is a dummy variable that equals one when the chairman and CEO positions are held by the same person; *Chairman Turnover* and *CEO Turnover* are the frequency of board chairman and CEO turnover, respectively; and *Restatements* is the frequency of financial statement restatements

*, **, *** Significance at the 10, 5, and 1 % levels, respectively, in *t* tests

3.3.1 Market performance of pump-and-dump and stabilization subsamples

As shown in Panel A of Table 4, the mean abnormal return during the manipulation period is significantly higher than during the pre- and post-manipulation periods for the whole sample and for the pump-and-dump[8] subsample, but not for the stabilization subsample. The abnormal return during the post-manipulation period is even lower than during the pre-manipulation period. This finding indicates that manipulation operations distort prices, especially in pump-and-dump cases.

The abnormal turnover is significantly higher in the manipulation period than in the pre-manipulation period for the whole sample and for the pump-and-dump subsample. During the post-manipulation period, the average abnormal turnover is still quite high. There is a similar pattern for the average abnormal volatility[9]; in the manipulation period it is significantly higher than that in the pre-manipulation period for the whole sample and for the pump-and-dump subsample. Further, abnormal volatility in the post-manipulation period is significantly higher than in the pre-manipulation period for the pump-and-dump

[8] We also conduct an analysis that eliminates the four information-based manipulation cases; the results, not shown here for brevity, are similar to those for the original sample. The results are available upon request.

[9] We also calculate the Garman–Klass (1980) volatility measure and produce qualitatively similar results.

Table 4 Test statistics on the relative performance of the manipulated stocks over various periods

Period and variables	Pump and dump (observations: 107)	Stabilization (observations: 11)	Whole sample (observations: 118)
Panel A: Direction of manipulation			
Abnormal return			
$AR_{man} - AR_{pre}$			
Mean (%)	0.5048***	0.0023	0.4580***
(t value)	(6.10)	(0.01)	(5.77)
Median (%)	$0.3337^{\#\#\#}$	−0.1529	$0.3439^{\#\#\#}$
$AR_{post} - AR_{pre}$			
Mean (%)	−0.3506***	−1.6729*	−0.4739***
(t value)	(−3.89)	(−1.87)	(−4.04)
Median (%)	$-0.2530^{\#\#\#}$	$-0.3236^{\#\#}$	$-0.2325^{\#\#\#}$
Abnormal turnover			
$AT_{man} - AT_{pre}$			
Mean (%)	1.1603***	0.2485	1.0753***
(t value)	(6.34)	(0.92)	(4.87)
Median (%)	$0.8908^{\#\#\#}$	−0.0550	$0.8443^{\#\#\#}$
$AT_{post} - AT_{pre}$			
Mean (%)	0.2802*	−0.4977*	0.2076
(t value)	(1.72)	(−2.11)	(1.15)
Median (%)	$0.1393^{\#\#}$	$-0.1954^{\#\#}$	0.1908
Abnormal volatility			
$AV_{man} - AV_{pre}$			
Mean (%)	0.0023***	−0.0005	0.0021***
(t value)	(5.06)	(−0.42)	(3.33)
Median (%)	$0.0022^{\#\#\#}$	−0.0005	$0.0010^{\#\#\#}$
$AV_{post} - AV_{pre}$			
Mean (%)	0.0011**	−0.0034	0.0007
(t value)	(2.22)	(−1.45)	(1.06)
Median (%)	$0.0008^{\#\#}$	−0.0024	0.0004
Period and variables	Pre-2000 (observations: 50)	Post-2000 (observations: 68)	Differences (post − pre)
Panel B: Regulation change during 2000			
Abnormal return			
$AR_{man} - AR_{pre}$			
Mean (%)	0.3823***	0.5136***	0.1312
(t value)	(4.10)	(4.38)	(0.83)
Median (%)	$0.2319^{\#\#\#}$	$0.3495^{\#\#\#}$	0.1176
$AR_{post} - AR_{pre}$			
Mean (%)	−0.5352***	−0.4287**	0.1065
(t value)	(−3.50)	(−2.44)	(0.44)
Median (%)	$-0.2970^{\#\#\#}$	$-0.2218^{\#\#\#}$	$0.0752^{\#}$

Table 4 continued

Period and variables	Pre-2000 (observations: 50)	Post-2000 (observations: 68)	Differences (post − pre)
Abnormal turnover			
$AT_{man} - AT_{pre}$			
Mean (%)	0.7625**	1.3054***	0.5429
(t value)	(2.65)	(6.47)	(1.59)
Median (%)	$0.6374^{\#\#\#}$	$0.8155^{\#\#\#}$	0.1782
$AT_{post} - AT_{pre}$			
Mean (%)	0.0309	0.3376**	0.3066
(t value)	(0.11)	(2.13)	(1.01)
Median (%)	−0.0295	$0.1559^{\#}$	0.1854
Abnormal volatility			
$AV_{man} - AV_{pre}$			
Mean (%)	0.0011*	0.0028***	0.0017*
(t value)	(1.92)	(4.43)	(1.89)
Median (%)	$0.0016^{\#\#}$	$0.0022^{\#\#\#}$	$0.0006^{\#}$
$AT_{post} - AT_{pre}$			
Mean (%)	0.0002	0.0011	0.0009
(t value)	(0.24)	(1.46)	(0.86)
Median (%)	0.0001	$0.0008^{\#}$	0.0007

This table reports test statistics for the abnormal return, turnover, and Parkinson's volatility of the manipulated stocks during the manipulation and post-manipulation periods relative to the pre-manipulation period. The variables AR_{man}, AR_{pre}, and AR_{post} denote the abnormal return during the manipulation, pre-manipulation, and post-manipulation periods, respectively. The variable ATdenotes abnormal turnover and AVdenotes abnormal volatility

*, **, *** Significance at the 10, 5, and 1 % levels, respectively, in t tests

$^{\#}$, $^{\#\#}$, $^{\#\#\#}$ Significant at the 10, 5, and 1 % levels, respectively, in Kruskal–Wallis tests

subsample. For the stabilization subsample, there is generally no significant difference in abnormal return, turnover, or volatility between the manipulation and non-manipulation periods, except that the price drop and abnormal return of the post-manipulation period are lower than for the pre-manipulation period. The abnormal turnover of the post-manipulation period is also lower than for the pre-manipulation period. Since the primary purpose of manipulation is price pegging, it is not surprising that abnormal return and abnormal volatility do not change significantly for the stabilization subsample during the manipulation period.

3.3.2 Effects of regulation change

To examine the effects of removing the wash sale provision in 2000, the manipulation sample is further divided into pre-2000 and post-2000 subsamples. Panel B of Table 4 shows that there is no significant difference in the mean abnormal return and abnormal turnover for the two subsamples. However, the abnormal volatility of the post-2000 subsample is significant higher than that of the pre-2000 subsample for the manipulation period. This finding reflects the fact that since the elimination of the wash sale provision, it has been difficult for regulators to prosecute violators and manipulators may therefore increasingly resort to wash sale transactions, leading to higher abnormal volatility.

4 Market effects

4.1 Price movements surrounding stock manipulation

Allen and Gale (1992) show that manipulators are large investors, that is, price setters rather than price takers. As a deep-pocketed investor, the manipulator pumps up the stock price with a series of buy orders and then dumps the stock, taking advantage of the disposition effect of investors to make a profit. The manipulator's strategic action not only profits the manipulator but also brings about higher volatility, higher trading volume, short-term price continuation, and then price reversal. In this section, we examine the cumulative abnormal returns (CARs) of the manipulated stocks and examine whether there is price reversal after the manipulation period. The CAR of each manipulated stock is computed as the sum of daily abnormal returns starting on day −100.

Figure 1 plots the average CARs (ACARs) of the manipulated stocks for the entire sample, as well as for the pump-and-dump and stabilization subsamples. Since the different manipulated stocks can have quite different period lengths, we standardize the manipulation periods by scaling their lengths such that they are presented over a grid showing different stages of manipulation. For example, m1 corresponds to the beginning of the manipulation period, m5 corresponds to the middle, and m10 corresponds to the end of the manipulation period. The CAR for each manipulated stock is computed from the beginning to the end of the manipulation.

As evident in Fig. 1, the manipulation operations lead to higher CARs during the manipulation period, reaching a peak near the end of the manipulation period. The ACARs are nearly zero on day +100 for the pump-and-dump subsample. For the stabilization subsample, the ACARs are nearly zero on day +22. In general, the ACAR is higher for the pump-and-dump subsample, averaging 28 %. It is also far higher than that of Jiang et al. (2005), who find an ACAR of 4 % for stock pools on the NYSE in 1928 and 1929. However, the ACAR on the TWSE is smaller than that of the emerging market Karachi Stock Exchange, Pakistan's main stock exchange, where the ACAR is 50–90 % (Khwaja and Mian 2005). The ACAR of the stabilization subsample is even lower, about 20 %.

Figure 2 plots the ACARs of the manipulated stocks for the entire sample, as well as for the positive- and negative-EPS subsamples. For the positive-EPS subsample, the ACAR is generally higher than for the negative-EPS subsample. For the post-manipulation period, the ACAR is nearly zero on day +100 for the positive-EPS subsample. For the negative-EPS subsample, it drops to −5 % on day +100. This finding indicates that firm fundamentals affect the price movements of manipulated stocks.

4.2 Effects on market prices

To analyze the price impacts of manipulation trades and to examine whether there is information content in the manipulation, this study follows the methodology of Kraus and Stoll (1972) and Madhavan and Cheng (1997). We distinguish between the permanent and temporary components of price changes surrounding stock manipulation. The permanent component represents the change in the market's perception of a security's value due to manipulation trades, while the temporary price impact captures the price pressure of manipulation trades.

Keim and Madhavan (1996) argue that, because of information leakage, the usual definition of the permanent effect of price changes can understate the true revision in beliefs as a result of the trade. This leakage can be reflected in the pre-trade price, possibly

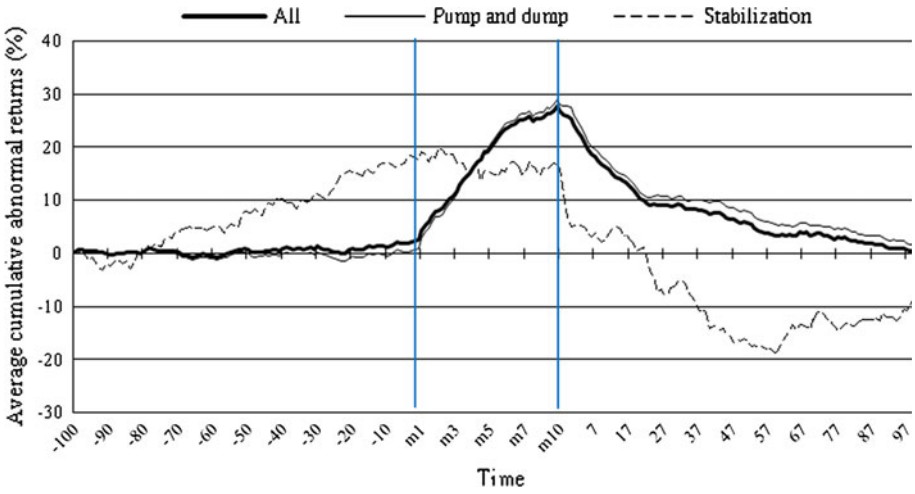

Fig. 1 Price movements surrounding stock manipulation. The ACARs for the whole sample, as well as for the pump-and-dump and stabilization subsamples, are shown from 100 days before the manipulation period to 100 days after the manipulation period. The two *vertical gray lines* represent the beginning and end of the manipulation period. The ACARs of the manipulation period are presented over a grid showing different stages of the manipulation. For example, *m1* corresponds to the beginning of the manipulation period, *m5* corresponds to the middle, and *m10* corresponds to the end of the manipulation period

biasing the measure. Accordingly, our permanent component also includes the leakage effect.

For a typical pump-and-dump manipulation, where the price during the manipulation period is above that of both the pre- and post-manipulation periods, the temporary component is positive. The opposite is the case for a typical poop-and-scoop manipulation. We define the leakage effect as the logarithmic return measured from the 6th day before the manipulation to the day prior to the manipulation; that is, $Leak_{-6} = \ln(P_{-1}) - \ln(P_{-6})$, where P_{-6} denotes the stock price on day t_{-6} and P_{-1} is the previous day's closing price. The temporary price impact is defined as the logarithmic return from the 100th day after the manipulation to the manipulation period[10]; that is, $Temp_{100} = \ln(P_0) - \ln(P_{100})$, where P_{100} denotes the stock price on day t_{100} and P_0 denotes the maximum stock price during the manipulation period.

The permanent price impact is defined as the logarithmic return from the 6th day before the manipulation to the 100th day after the manipulation, that is, $Perm_{100} = \ln(P_{100}) - \ln(P_{-6})$. The total effect is the total price impact, that is, $Total_{100} = Temp_{100} + Perm_{100}$. All price impacts are adjusted for the price movements of the control portfolios by subtracting their returns.

4.2.1 Pump-and-dump versus stabilization manipulation

Panel A of Table 5 reports the results of the price impact for the whole sample, as well as for the pump-and-dump and stabilization subsamples. This table shows the estimated

[10] Because the average manipulation period is 92 days, we choose 100 days to measure temporary price impacts for comparison. In addition, Fig. 1 shows that it takes nearly 100 days for the market to absorb a manipulation event.

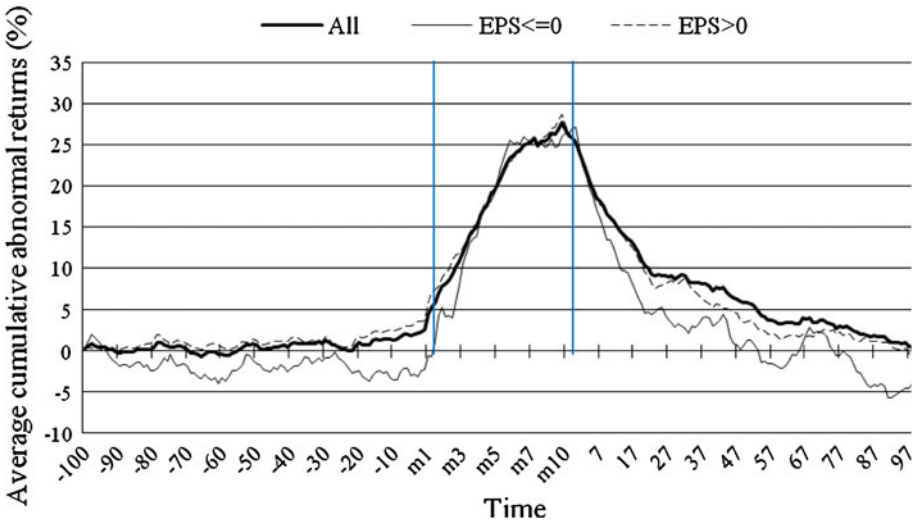

Fig. 2 Price movements surrounding stock manipulation. The ACARs for the whole sample, as well as for the positive-EPS and negative-EPS subsamples, are shown from 100 days before the manipulation period to 100 days after the manipulation period. The two *vertical gray lines* represent the beginning and end of the manipulation period. The ACARs of the manipulation period are presented over a grid showing different stages of the manipulation. For example, *m1* corresponds to the beginning of the manipulation period, *m5* corresponds to the middle, and *m10* corresponds to the end of the manipulation period

means (standard errors) and medians of the temporary and permanent price impacts. The temporary impacts are positive and significant for the whole sample and for the pump-and-dump subsample. There appears to be a large, temporary price impact associated with manipulation trading. The mean price impacts for the temporary effect are 23.14 and 24.19 % for the whole sample and the pump-and-dump subsample, respectively. This result implies that pump-and-dump manipulation detracts from an efficient market. For the stabilization subsample, however, manipulations have no significant price effect on the market.

To detect the possible influence of information leakage prior to manipulation on the measurement of the permanent impact, we include the effect of leakage in the permanent impact. Table 5 shows the leakage effect is insignificant for both types of manipulation, implying that there is no information leakage before manipulation. The permanent price impacts are also insignificantly different from zero for both types of manipulation. This finding implies that the price impact of stock manipulation is only temporary and without information content, which is consistent with published arguments (e.g., Mei et al. 2004) about manipulation.

The total price effects are positive and highly significant for the whole sample and for the pump-and-dump subsample, indicating that pump-and-dump manipulation impacts market prices. However, there is no effect on prices with respect to stabilization.

4.2.2 Pre- versus post-2000

Panel B of Table 5 shows the results of the price impacts for the pre- and post-2000 subsamples. Basically, there is no significant difference between the two subsamples. The price impacts of the two subsamples are also similar to that of the whole sample.

Table 5 Impacts on market prices

Variables	Pump and dump (observations: 107)	Stabilization (observations: 11)	Whole sample (observations: 118)
Panel A: Direction of manipulation			
Temporary effect (%)			
Mean	24.1946***	12.8481	23.1368***
SD	46.9469	31.3875	45.7381
Median	19.7089###	8.1473	18.6728###
Leakage effect (%)			
Mean	0.2779	1.5569	0.3972
SD	7.8452	4.6130	7.5973
Median	0.4723	1.5722	0.5744
Permanent effect (%)			
Mean	0.3736	−22.3979	−1.7492
SD	53.6594	53.9748	53.8687
Median	1.1250	−4.0569	−0.1536
Total price effect (%)			
Mean	24.5681***	−9.5497	21.3877***
SD	39.3683	37. 9492	40.3295
Median	17.5037###	3.3146	14.7439###

Variables	Pre-2000 (observations: 50)	Post-2000 (observations: 68)	Differences (post − pre)
Panel B: Regulation change during 2000			
Temporary effect (%):			
Mean	29.5838***	18.3664***	−11.1873
SD (t value)	46.5410	44.8908	(−1.32)
Median	18.1868###	19.6372###	1.4504
Leakage effect (%)			
Mean	0.9763	−0.0287	−1.0050
SD (t value)	7.8873	7.4069	(−0.71)
Median	0.5594	0.5744	0.0150
Permanent effect (%)			
Mean	−6.8736	2.0188	8.8923
SD (t value)	53.3976	54.2963	(0.89)
Median	2.4193	−2.0232	−4.4425
Total price effect (%)			
Mean	22.7102***	20.4152***	−2.2950
SD (t value)	42.7157	38.7758	(−0.30)
Median	15.4121###	14.1162###	−1.2959

Table 5 continued

Variables	Negative-EPS (observations: 29)	Positive-EPS (observations: 89)	Differences (negative-EPS − positive-EPS)
Panel C: Firm fundamentals			
Temporary effect (%)			
Mean	32.5468***	20.6142***	11.9326
SD (*t* value)	47.4964	45.4791	(1.20)
Median	29.3885###	18.1085###	11.2800
Leakage effect (%)			
Mean	−0.2329	0.6270	−0.8599
SD (*t* value)	8.8822	7.1675	(0.52)
Median	−1.2030	0.7356	−1.9386
Permanent effect (%)			
Mean	−4.1877	−1.0872	−3.1005
SD (*t* value)	55.0844	54.3826	(0.26)
Median	−7.2654	0.7656	−8.0310
Total price effect (%)			
Mean	28.3591***	19.5270***	8.8321
SD (*t* value)	49.8208	37.3100	(1.00)
Median	22.1118###	14.3725###	7.7393

This table reports the returns surrounding manipulation trading on the Taiwan stock markets from August 1, 1991, to August 30, 2010. The 118 cases of manipulation sample are further divided into pump-and-dump, stabilization, pre-2000, post-2000, positive-EPS, and negative-EPS subsamples. The temporary effect is defined as the logarithmic return from the 100th day after the manipulation period to the maximum price during the manipulation period. The leakage effect is the logarithmic return measured from the 6th day before the manipulation period to the day before the manipulation period. The permanent effect is defined as the logarithmic return from the 6th day before the manipulation period to the 100th day after the manipulation period. The total price effect is calculated as the temporary effect plus the permanent effect. All price effects are adjusted for the price movements of the control portfolios

*, **, *** Significant at the 10, 5, and 1 % levels, respectively, in *t* tests

#, ##, ### Significant at the 10, 5, and 1 % levels, respectively, in Kruskal–Wallis tests

4.2.3 Positive versus negative EPS

Panel C shows the results of price impacts for the positive- and negative-EPS subsamples. The temporary impacts and total price impacts are positive and significant for both subsamples. Although the temporary impact for the negative-EPS subsample is higher than that for the positive-EPS subsample (32.55 vs. 20.61 %), it is not significant.

The total price effects are positive and significant for both subsamples, which is also similar for the whole sample, indicating that manipulation impacts market prices.

4.3 Effects on market efficiency

To examine the impact of manipulation on market efficiency, this study follows the methodology of Amihud et al. (1997). These authors describe a relative return dispersion (RRD) measure that can be computed using a market model's residuals. This market model simply regresses a company's stock returns on the returns of a market portfolio, using the equation

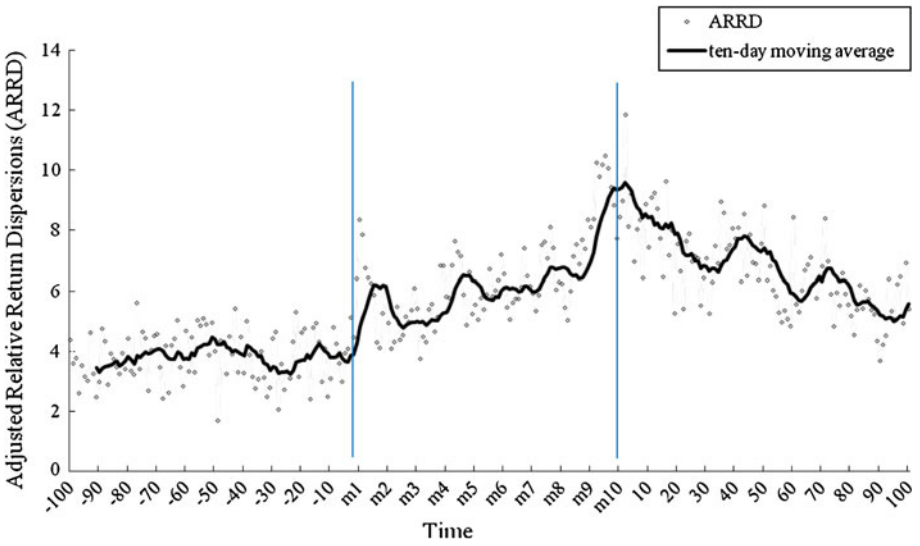

Fig. 3 ARRDs. This figure shows the ARRDs from 100 days before the manipulation period to 100 days after the manipulation period for the whole sample. The *line* shows the 10-day moving average of the ARRD series. The two *vertical gray lines* represent the beginning and end of the manipulation period

$$R_{it} = \alpha_i + \beta_i RM_t + \varepsilon_{it}, \tag{4}$$

where R_{it} is the return of stock i on day t, RM_t is market return proxied by the daily return of the TWSE index, and ε_{it} is the market model residual. The market model is estimated separately over three periods: pre-manipulation, manipulation, and post-manipulation. For the pre-manipulation period, the market model is estimated from 100 days (t_{-100}) before the manipulation period to 1 day (t_{-1}) before the manipulation period. For the post-manipulation period, the model is estimated from days t_{+1} through t_{+100}.

With the market model run on daily data, the RRD statistic is calculated for day t as

$$RRD_t = \sum_{j=1}^{J} \varepsilon_{jt}^2 / J, \tag{5}$$

where RRD_t is the RRD for the entire sample of securities on day t, ε_{jt}^2 is the squared market model residual for security j on day t, and J is the number of securities. All RRD values of the manipulated stocks are adjusted for changes in the benchmark by subtracting the RRD values of the control portfolios. The mean adjusted RRDs (ARRDs) over the three periods are compared. Systematic differences in RRDs among the three periods indicate differences in efficiency.

The behavior of RRD_s adjusted for benchmarks (ARRDs), shown in Fig. 3, is consistent with less efficiency during the manipulation and post-manipulation periods. The averages of $ARRD_s$ in the pre-manipulation, manipulation, and post-manipulation periods are 3.8748, 6.2858, and 6.5608, respectively.

4.3.1 Pump-and-dump versus stabilization manipulation

For both subsamples, Panel A of Table 6 shows that the $ARRD_s$ values are positive and significant for the manipulation period as well as for the pre- and post-manipulation

Table 6 ARRDs during stock manipulation

Period	Pump and dump (observations: 107)	Stabilization (observations: 11)	Whole sample (observations: 118)
Panel A: Direction of manipulation			
Pre-manipulation period			
Mean	4.0148***	2.5132**	3.8748***
SD	3.0221	3.1518	3.0522
Median	3.2444$^{\#\#\#}$	1.9859$^{\#\#}$	3.1507$^{\#\#\#}$
Manipulation period			
Mean	6.6471***	2.7714***	6.2858***
SD	5.0373	2.8284	4.9953
Median	5.8928$^{\#\#\#}$	2.0034$^{\#\#}$	5.6828$^{\#\#\#}$
Post-manipulation period			
Mean	6.9064***	3.1985**	6.5608***
SD	6.1707	3.5787	6.0633
Median	4.5945$^{\#\#\#}$	1.7937$^{\#\#}$	4.4569$^{\#\#\#}$
Differences in manipulation period and pre-manipulation period			
Mean	2.6324***	0.2582	2.4110***
(*t* value)	(4.64)	(0.20)	(4.47)
Median	2.6483$^{\#\#\#}$	0.0175	2.5320$^{\#\#\#}$
Differences in post-manipulation period and pre-manipulation period			
Mean	2.8917***	0.6853	2.6860***
(*t* value)	(4.35)	(0.48)	(4.30)
Median	1.3500$^{\#\#\#}$	−0.1922	1.3062$^{\#\#\#}$
Period	Pre-2000 (observations: 50)	Post-2000 (observations: 68)	Differences (post − pre)
Panel B: Regulation change during 2000			
Pre-manipulation period			
Mean	3.2016***	4.3698***	1.1681**
SD (*t* value)	2.6463	3.2496	(2.08)
Median	2.8761$^{\#\#\#}$	3.4423$^{\#\#\#}$	0.5663$^{\#}$
Manipulation period			
Mean	5.1988***	7.0851***	1.8863**
SD (*t* value)	5.5192	4.4459	(2.05)
Median	4.6785$^{\#\#\#}$	6.5931$^{\#\#\#}$	1.9146$^{\#\#\#}$
Post-manipulation period			
Mean	5.4255***	7.3955***	1.9700*
SD (*t* value)	4.8253	6.7456	(1.76)
Median	4.2227$^{\#\#\#}$	4.9330$^{\#\#\#}$	0.7103$^{\#}$
Differences in manipulation period and pre-manipulation period			
Mean	1.9972**	2.7154***	0.7182

Table 6 continued

Period	Pre-2000 (observations: 50)	Post-2000 (observations: 68)	Differences (post − pre)
(*t* value)	(2.31)	(4.07)	(0.88)
Median	1.8024$^{\#\#}$	3.1508$^{\#\#\#}$	1.5076
Differences in post-manipulation period and pre-manipulation period			
Mean	2.2239***	3.0257***	0.8018
(*t* value)	(2.86)	(3.33)	(0.69)
Median	1.3466$^{\#\#\#}$	1.4907$^{\#\#\#}$	0.2573

Period	Negative-EPS (observations: 29)	Positive-EPS (observations: 89)	Differences (negative-EPS – positive-EPS)
Panel C: Firm fundamentals			
Pre-manipulation period			
Mean	5.3272***	3.4404***	1.8869***
SD (*t* value)	3.5508	2.7755	(2.92)
Median	4.7928$^{\#\#\#}$	2.9662$^{\#\#\#}$	1.8266$^{\#\#}$
Manipulation period			
Mean	8.8997***	5.5078***	3.3919***
SD (*t* value)	6.2328	4.3083	(3.23)
Median	7.4208$^{\#\#\#}$	5.0549$^{\#\#\#}$	2.3659$^{\#\#\#}$
Post-manipulation period			
Mean	10.3733***	5.4002***	4.9731***
SD (*t* value)	8.1781	4.7457	(3.99)
Median	7.4946$^{\#\#\#}$	4.2199$^{\#\#\#}$	3.2747$^{\#\#\#}$
Differences in manipulation period and pre-manipulation period			
Mean	3.5725***	2.0675***	1.5050
(*t* value)	(2.64)	(3.78)	(1.58)
Median	2.6280$^{\#\#}$	2.0887$^{\#\#\#}$	1.9558
Differences in post-manipulation period and pre-manipulation period			
Mean	5.0461***	1.9598***	3.0862**
(*t* value)	(2.99)	(3.34)	(2.31)
Median	2.7018$^{\#\#}$	1.2537$^{\#\#\#}$	1.1762

This table reports the sample mean, standard deviation, and median of ARRDs during the pre-manipulation, manipulation, and post-manipulation periods from August 1, 1991, to August 30, 2010. The sample is further divided into pump-and-dump, stabilization, pre-2000, post-2000, positive-EPS, and negative-EPS subsamples

*, **, *** Significant at the 10, 5, and 1 % levels, respectively, in *t* tests

$^{\#}$, $^{\#\#}$, $^{\#\#\#}$ Significant at the 10, 5, and 1 % levels, respectively, in Kruskal–Wallis tests

periods. This indicates that manipulated stocks are more inefficient than their matched portfolios. The $ARRD_s$ values of the manipulation and post-manipulation periods are significantly larger than for the pre-manipulation period for the whole sample and the pump-and-dump subsample, but not for the stabilization subsample. This finding indicates that stock manipulation has a negative impact on market efficiency only for the pump-and-dump subsample. There seems to be no harm from manipulation with respect to stabilization.

4.3.2 Pre- versus post-2000

Panel B of Table 6 shows the results of the $ARRD_s$ values for the pre- and post-2000 subsamples. Overall, the $ARRD_s$ values are positive and significant for both subsamples and also similar to that of the whole sample. On average, the $ARRD_s$ values are higher for the post-2000 subsample than for the pre-2000 subsample, suggesting since the elimination of the wash sale provision in 2000, market efficiency has further deteriorated through stock price manipulation.

4.3.3 Positive versus negative EPS

Panel C shows the $ARRD_s$ results for the positive- and negative-EPS subsamples. The $ARRD_s$ values are all positive and significant for both subsamples. However, the $ARRD_s$ values of the negative-EPS subsample are significantly higher than for the positive-EPS subsample for all periods. Moreover, market efficiency deteriorates further in the post-manipulation period for the negative-EPS subsample and the difference in $ARRD_s$ between the post-manipulation and pre-manipulation periods is significantly higher for the negative-EPS subsample. This suggests that the social costs of stock manipulation are much heavier for firms with negative fundamentals.

5 Conclusions

Stock manipulation is an important issue for market efficiency. Although it is a growing concern in many emerging stock markets, studies on the impact of stock price manipulation on market quality are scant. This paper examines the characteristics of manipulated stocks and their effects on the market, using a data set of manipulation cases prosecuted in Taiwan from 1991 to 2010. We find that almost half of these manipulators are outside large speculators, in contrast with the results of Aggarwal and Wu (2006), who find that almost all manipulators are potentially informed parties (insiders, brokers, underwriters, etc.). This finding demonstrates an important feature of manipulations in Taiwan: Many stocks are manipulated by large individual outsiders.

By comparing the manipulated stocks with control portfolios, we find that the manipulated sample has a higher ratio of CEO duality and higher turnover of top management. There is also a higher frequency of restatements of financial reports in the manipulated sample. This finding indicates that manipulated stocks in Taiwan are likely to be those with poorer corporate governance and less financial reporting credibility.

There is a large difference between the effects of pump-and-dump manipulation and stabilization operations on markets. For the pump-and-dump subsample, stock manipulation brings about volatile returns during both the manipulation and post-manipulation periods. The ACAR reaches nearly 30 %. A large price impact appears to be associated

with manipulation trading; however, it is only temporary. This finding implies that pump-and-dump manipulation has a detrimental effect on price accuracy. Moreover, it worsens market efficiency, especially during the post-manipulation period.

For the stabilization subsample, however, manipulation has no effect on market performance, except that the price drop and abnormal return of the post-manipulation period are lower than for the pre-manipulation period.

Regulation change has an influence on the price behavior of manipulated stocks around the manipulation period. The abnormal volatility of the manipulated stocks is higher after the removal of the wash sale provision in 2000. Moreover, market efficiency has deteriorated further through stock price manipulation since then.

Firm fundamentals are also important in deciding the price impacts of stock manipulation. Compared with manipulated firms with positive fundamentals, the manipulation of firms with negative fundamentals has a more detrimental effect on market efficiency.

Appendix

See Table 7.

Table 7 Manipulated stock sample

Company name	Manipulation period
Aceland Corp.	1999/11/20–2000/4/27
Airlux Electrical Co., Ltd.	2010/7/1–2010/8/30
Ali Corp.	2005/3/8–2005/11/23
Asian Information Technology Inc.	2005/9/2–2005/12/30
Aurotek Corporation	2005/10/3–2006/3/31
AV Tech Corp.	2007/5/1–2007/10/31
Avid Electronics Corp.	2006/12/12–2007/1/11
C.C.P. Contact Probes Co., Ltd.	2004/9/3–2004/10/27
Chia Her Industrial Co., Ltd	2002/6/28–2002/9/30
Chia Her Industrial Co., Ltd	2003/12/30–2004/2/12
Chia Ta World Co., Ltd.	2002/4/29–2002/6/24
China Chemical Pharmaceutical Co., Ltd.	1992/1/2–1993/2/28
China Container Terminal Corp.	1998/7/1–1998/10/26
China Metal Products Co., Ltd.	2007/1/2–2007/4/30
China Wire & Cable Co., Ltd.	1997/11/21–1997/12/20
Chinese Automobile Co., Ltd.	1998/1/5–1998/9/21
Compucase Enterprise Co., Ltd.	2004/11/3–2004/12/30
Compucase Enterprise Co., Ltd.	2004/3/22–2004/4/23
Cx Technology Corp.	2002/7/24–2002/12/31
Dacome International Co., Ltd.	2006/10/2–2007/2/14
Dahin Co., Ltd.	1999/1/2–1999/8/31
Ding Ing Technology Co., Ltd.	1996/9/4–1996/11/13
Evergreen International Storage & Transp	1992/1/2/–1993/2/28
Evertop Wire Cable Corp.	2002/4/15–2002/6/14

Table 7 continued

Company name	Manipulation period
Excelsior Medical Co., Ltd.	2007/1/1–2007/12/30
Falcon Cycle-Parts Co., Ltd.	1996/7/8–1996/8/7
Feya Technologies Co., Ltd.	2002/1/16–2002/3/15
Feya Technologies Co., Ltd.	2002/12/25–2003/9/8
FSP Technology Inc.	2006/1/2–2006/1/18
FSP Technology Inc.	2006/6/8–2006/6/23
FSP Technology Inc.	2006/8/8–2006/9/19
Fu I Ind. Co., Ltd.	1998/5/31–1998/7/4
Hold-Key Electric Wire & Cable Co., Ltd.	2003/9/1–2004/1/31
Honey Hope Honesty Enterprise Co., Ltd.	2004/6/21–2004/8/20
Hong Yi Fiber Ind. Co., Ltd.	1993/10/1–1993/10/30
Horizon Securities Co., Ltd.	2006/9/1–2007/7/31
Horng Technical Enterprise (MFG) Co., Lt	2003/12/1–2004/11/30
Howang Construction Co., Ltd.	2001/3/1–2001/3/28
Hung Fu Construction Co., Ltd.	1998/1/3–1998/9/18
Hung Tu Construction Co., Ltd.	2005/5/31–2006/4/6
Hunt Electronic Co., Ltd.	2007/5/4–2007/7/17
Imperial Hotel Co., Ltd.	1994/2/14–1994/10/4
Jin Shang Chang Development Co., Ltd.	1993/12/4–1993/12/14
Jui Li Enterprise Co., Ltd.	1994/11/30–1995/1/26
Jui Li Enterprise Co., Ltd.	1999/7/30–1999/9/4
K Way Information Corp.	2004/7/21–2006/4/6
Kao Hsing Chang Iron & Steel Corp.	1994/11/14–1995/3/24
KPT Industries Ltd.	1993/4/1–1993/4/23
Kuen Chaang Uppertech Corp.	2005/4/20–2005/5/4
Kuen Chaang Uppertech Corp.	2005/10/18–2005/10/31
Kuoyang Construction Co., Ltd.	1998/3/21–1998/4/22
Kuoyang Construction Co., Ltd.	1998/9/1–1998/11/10
Kwong Fong Ind. Corp.	1993/12/27–1994/1/24
Lee Chi Ent. Co., Ltd.	1999/4/28–1999/7/22
Luxe Electric Co., Ltd.	2006/11/27–2007/1/15
Manz Intech Machines Co., Ltd.	2004/1/13–2004/4/15
Mayer Steel Pipe Corp.	1998/2/18–1998/3/17
Me Ke Long Chemical Ind. Co., Ltd.	2006/12/1–2007/6/30
MetaTech (AP) Inc.	2006/10/24–2006/12/13
Minchali Metal Industry Co., Ltd.	1994/8/23–1994/9/23
Motech Industries Inc.	2005/7/11–2005/10/5
MPI Corpoartion	2003/9/1–2004/3/31
Nak Sealing Technologies Corp.	2004/9/17–2004/10/20
Nan Kang Rubber Tire Co., Ltd.	2003/5/1–2003/8/31
Nan Kang Rubber Tire Co., Ltd.	2006/4/2–2006/5/22
Nan Kang Rubber Tire Co., Ltd.	2007/10/15–2007/11/1
Nan Kang Rubber Tire Co., Ltd.	2008/1/14–2008/1/23

Table 7 continued

Company name	Manipulation period
National Aerospace Fasteners Corp.	2002/11/29–2003/1/28
Newsoft Technology Corp.	2002/2/19–2002/3/20
Nien Made Enterprise Co., Ltd.	1996/4/23–1996/6/1
Pal Wonn (Taiwan) Co., Ltd.	2004/5/5–2004/6/29
Pan Asia Chemical Corp.	2006/4/17–2006/6/26
Pan International Industrial Corp.	1995/1/2–1995/1/31
Pan International Industrial Corp.	1997/10/20–1997/12/10
Power Quotient International Co., Ltd.	2005/1/28–2005/3/15
Promate Electronic Co., Ltd.	2007/7/2–2007/8/31
Protop Technology Co., Ltd.	2004/3/3–2004/4/23
Protop Technology Co., Ltd.	2003/9/9–2003/10/24
Quintain Steel Co., Ltd.	2007/11/12–2008/2/20
Rectron Ltd.	1994/2/1–1994/9/17
Ruentex Development Co., Ltd.	1997/9/24–1997/10/23
Run Long Construction Co., Ltd.	1997/4/1–1997/7/31
Sentronic International Corp.	2007/3/16–2007/10/1
Service & Quality Technology Co., Ltd.	2008/9/30–2008/11/30
Sesoda Corp.	2000/1/4–2000/2/15
Shieh Yih Machinery Industry Co., Ltd.	2004/1/1–2004/2/13
Shih Wei Navigation Co., Ltd.	2007/3/1–2007/12/31
Shin Yen Textile Co., Ltd.	1991/11/1–1993/2/28
Summit Computer Technology Co., Ltd.	2002/12/17–2003/2/20
Sun Home Leather Corp.	1995/4/10–1995/4/25
Sun Home Leather Corp.	1995/5/13–1995/8/3
Sun Race Sturmey-Archer Inc.	2002/10/16–2002/12/13
Sunf Pu Technology Co., Ltd.	2004/3/1–2004/6/30
Sunvic Technology Co., Ltd.	2006/3/15–2006/5/2
Sunvic Technology Co., Ltd.	2006/5/22–2006/7/5
Tah Chung Steel Corp.	1998/1/2–1998/1/31
Taiwan Aries Co., Ltd.	2006/9/18–2006/11/3
Taiwan Fertilizer Co., Ltd.	1999/10/1–1999/10/11
Taiwan Fluorescent Lamp Co., Ltd.	1994/3/1–1994/10/31
Taiwan Pineapple Co., Ltd.	1997/11/1–1998/7/31
Taiyu Products Corp.	1997/5/14–1997/7/8
Taiyu Products Corp.	1997/11/4–1997/11/23
Termtek Computer Co., Ltd.	2005/4/11–2005/6/15
The Leofoo Development Co., Ltd.	1991/8/1–1993/2/28
Tong Hwa Synthetic Fiber Co., Ltd.	1997/11/7–1997/12/6
Tong Lung Metal Ind. Co. Ltd.	1997/10/1–1997/11/8
Tung Kai Technology Engineering Co., Ltd	2006/9/1–2007/1/30
Tycoons Group Ent. Co., Ltd.	1998/2/12–1998/9/4
U-Lead Indstrial Corp.	1998/1/2–1998/1/31
Universal Scientific Industrial Co., Ltd	1997/1/7–1999/1/8

Table 7 continued

Company name	Manipulation period
Universal Vision Biotechnology Co., Ltd.	2007/2/14–2009/7/20
Well Glory Development Co., Ltd.	1998/1/14–1998/3/26
Well Glory Development Co., Ltd.	2004/10/6–2005/1/11
Yeu Hwan Technology Co., Ltd.	2006/11/6–2006/12/29
Yeu Tyan Machinery Mfg. Co., Ltd.	1992/2/19–1992/2/25
Yishin Engineering Co., Ltd.	1999/3/26–1999/5/25
Yuan Yi Agricultural & Livestock Co., Ltd.	1996/3/18–1996/4/16
Zero One Technology Co., Ltd.	2004/11/1–2006/4/6

The list of manipulated stocks and Manipulation period is from Securities and Futures Investors Protection Center (SFIPC)

References

Aggarwal R, Wu G (2006) Stock market manipulations. J Bus 79:1915–1953

Allen F, Gale D (1992) Stock price manipulation. Rev Financ Stud 5:503–529

Allen F, Gorton G (1992) Stock price manipulation, market microstructure and asymmetric information. Eur Econ Rev 36:624–630

Allen F, Litov L, Mei J (2006) Large investors, price manipulation, and limits to arbitrage: an anatomy of market corners. Rev Financ 11:645–693

Amihud Y, Mendelson H, Lauterbach B (1997) Market microstructure and securities values: evidence from the Tel Aviv Stock Exchange. J Financ Econ 45:365–390

Bagnoli M, Lipman BL (1996) Stock price manipulation through takeover bids. RAND J Econ 27:124–147

Beasley MS (1996) An empirical analysis of the relation between the board of director composition and financial statement fraud. Acc Rev 71:443–465

Benabou R, Laroque G (1992) Using privileged information to manipulate markets: insiders, gurus, and credibility. Q J Econ 107:921–958

Chow EH, Hung CW, Liu CS, Shiu CY (2013) Expiration day effects and market manipulation: evidence from Taiwan. Rev Quant Financ Acc 41:441–462

Comerton-Forde C, Putnins T (2011) Measuring closing price manipulation. J Financ Intermed 20:135–158

Farber DB (2005) Restoring trust after fraud: does corporate governance matter? Acc Rev 80:539–561

Gao Y, Oler D (2012) Rumors and pre-announcement trading: why sell target stocks before acquisition announcements? Rev Quant Financ Acc 39:485–508

Garman MB, Klass MJ (1980) On the estimation of security price volatility from historical data. J Bus 53:67–78

Huang YC, Chan SH (2011) A case study of illegal insider trading—the scandal of vultures' insider trading. Rev Pac Basin Financ Markets Pol 14:81–99

Huang R, Stoll H (1996) Dealer versus auction markets: a paired comparison of execution costs on NASDAQ and the NYSE. J Financ Econ 41:313–357

Huang YC, Hou NW, Cheng YJ (2012) Illegal insider trading and corporate governance: evidence from Taiwan. Emerg Markets Financ Trade 48:6–22

Jarrow RA (1992) Market manipulation, bubbles, corners, and short squeezes. J Financ Quant Anal 27:311–336

Jiang G, Mahoney PG, Mei J (2005) Market manipulation: a comprehensive study of stock pools. J Financ Econ 77:147–170

Keim DB, Madhavan A (1996) The upstairs market for large-block transactions: analysis and measurement of price effects. Rev Financ Stud 9:1–36

Khwaja AI, Mian A (2005) Unchecked intermediaries: price manipulation in an emerging stock market. J Financ Econ 78:203–241

Kraus A, Stoll H (1972) Price impacts of block trading on the New York Stock Exchange. J Financ 27:569–588

Kyle A, Viswanathan S (2008) How to define illegal price manipulation. Am Econ Rev 98:274–279

Madhavan A, Cheng M (1997) In search of liquidity: block trades in the upstairs and downstairs markets. Rev Financ Stud 10:175–203
Mei J, Wu G, Zhou C (2004) Behavior based manipulation: theory and prosecution evidence. Working paper, New York University. SSRN Electr J. doi:10.2139/ssrn.457880
Merrick JJ, Naik NY, Yadav PK (2005) Strategic trading behavior and price distortion in a manipulated market: anatomy of a squeeze. J Financ Econ 77:171–218
Parkinson M (1980) The extreme value method for estimating the variance of the rate of return. J Bus 53:61–65
Qi B, Yang R, Tian G (2013) Can media deter management from manipulating earnings? Evidence from China. Rev Quant Financ Acc. doi:10.1007/s11156-013-0353-0
Van Bommel J (2003) Rumors. J Financ 58:1499–1520
Vila JL (1989) Simple games of market manipulation. Econ Lett 29:21–26