

Effect of Conviction of Hong Kong Stock Market Misconduct

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Abstract: This study aims to examine the impact of the conviction of stock market misconduct on the Hong Kong stock market. To address the issue of seasonal fluctuation, this study utilized an extended difference-in-difference (DID) framework and implemented a harmonic linear model and Generalized Synthetic Control (GSC) method. Previous studies have reported that stock manipulation is harmful to the stock market and that lawsuits may damage reputation and thereby reduce investments; however, the current study indicates that the effects of conviction might be diverse. For instance, after controlling the seasonal fluctuation, some cases were found to have a positive influence, while others negatively impacted the Hong Kong stock market. Additionally, the results obtained through GSC methodology indicated that convictions might not have a clear long-term impact on the Hong Kong stock market.

1. Introduction

Theoretically, the stock market acts as the engine of the economy by allocating idle capital efficiently into prosperous and vibrant businesses, like a fuel that generates economic benefits. Sometimes, it may fail to function because of stock market misconduct (Pramod & Puja, 2015), which affects market efficiency and creates an unfair market (Gerace et al., 2014; Kong & Wang, 2014; Azad et al., 2014).

When stock market misconduct occurs, the price, liquidity, and volatility of the manipulated stock fluctuate abnormally (Aggarwal & Wu, 2006; Kong & Wang, 2014; Gerace et al., 2014; Kan, 2018), spreading fear and rumours among the investors. Thus, investors may be hasty to sell their stock (Gerace et al., 2014; Kong & Wang, 2014; Azad et al., 2014). Meanwhile, manipulated stocks may face trust issues and financial problems (Kan, 2018). Some stocks might be suspended in the stock market. The long-term consequences of an unfair and ineffective market include a loss of public confidence and the halting of trade (Shah et al., 2019; Aggarwal & Wu, 2006; Kong & Wang, 2014; Gerace et al., 2014; Kan, 2018; Lee et al., 2013; Azad et al., 2014).

Mass panic selling can lead to a financial crash. For example, the Hong Kong stock market experienced a 21-month long crash in 1973 that was triggered by fake shares of Hopewell holdings. Tens of thousands of citizens went bankrupt, and some of them even committed suicide. A similar

crash happened again in 1987. To avoid such disasters in the future, the Hong Kong government took a series of legal measures to regulate the stock market and promote market development (Financial Market Review Report, 1998). For instance, the most recent legislation that addresses share market misconduct is Cap. 571 Securities and Futures Ordinance (SFO), which was introduced in 2003. According to the SFO, market misconduct is defined as insider dealing, false trading, price rigging, stock market manipulation, disclosure of information about prohibited transactions, and disclosure of false or misleading information inducing transactions. The Hong Kong Securities and Futures Commission (HKSF), founded after the 1987 stock market crash, is responsible for maintaining and promoting fairness, efficiency, competitiveness, transparency, and orderliness in the securities and futures industry as well as fighting against crime and misconduct (1997-98 HKSF Annual Report, 1998). Since its establishment, the HKSF has prosecuted 428 stock market misconduct cases with an average of about 14 cases each year.

However, the effects of such prosecution, especially on regulating the stock market has not been empirically evaluated. One issue that serves as a hurdle to research efforts is deciding how to quantify and evaluate the impact of prosecution. To address this problem, this thesis aims to empirically examine the role of criminal convictions in the stock market using 111 convicted cases in Hong Kong.

The rest of this thesis proceeds as follows. Section II provides background information such as the definition of stock market misconduct, the development of stock market misconduct in Hong Kong, and the impact of convictions on the stock market. Section III describes the data sources and analytical methods employed. Section IV presents the results followed by discussion. Section V highlights the findings and limitations of this research and discusses possible future directions. [2].

2. Background

2.1 Stock market misconduct in Hong Kong

Stock market misconduct, also known as stock market manipulation, has been studied extensively despite the lack of a shared definition of what constitutes it (Gerace et al., 2014), as each judicial system defines it in its own way. For example, in the United States, the crime of stock manipulation is defined as “intentional conduct designed to deceive investors by controlling or artificially affecting the market for a security” (U.S. Securities and Exchange Commission, 2008). Researchers tenuously agree that there are at least three forms of stock manipulation: namely, action-based, information-based, and trade-based (Allen & Gale 1992; Li & Wang, 2011; Diaz et al., 2011; Klein et al., 2012; Aggarwal & Wu, 2018). Action-based stock manipulation refers to actions, e.g., offering or reducing extra shares, designed to change the actual or perceived value of the assets, while information-based manipulation relies on false information or rumours to make profits. According to Allen and Gale (1992), trade-based manipulation occurs when a trader attempts to manipulate a stock simply by buying and then selling, without taking publicly observable actions – such as releasing false information – to change the price.

Examples of stock market misconduct in Hong Kong include (1) insider dealing, (2) false trading, (3) price rigging, (4) stock market manipulation, (5) disclosure of information about prohibited transactions, such as information about the price of a corporation’s securities, or the price of dealings in futures contracts, and (6) disclosure of false or misleading information inducing transactions, such as exaggerating the profits in a company’s annual report to lure other investors into buying shares.[1 Detailed regulation can be found at <https://www.mmt.gov.hk/eng/home/home.htm>.]1 As outlined in the Cap. 571, insider dealing refers to any action in which people with inside information about a company trade its shares without risk. False trading describes the behaviour of individuals or groups who intend to lure investors into buying overvalued shares by trading them between each other many

times in order to inflate their true value. Price rigging occurs when individuals try to maintain, increase, reduce, or stabilize a share's price through trading and bid-ask procedures. People who intend to lure investors to commit price rigging offences is also considered to be stock market manipulation.

Many regulations on stock market misconduct have been implemented during the court period and the special court period. Before the 1987 crash, the definition of stock market misconduct in Hong Kong only included insider dealing, which could only be criminalized and tried in a general court. This changed in 1991 when a special court, the Insider Dealing Tribunal (IDT), was established to take over civil proceedings for insider dealing crime. When the new definition of stock market misconduct was enacted in 1997, the IDT was replaced by another special court, the Market Misconduct Tribunal (MMT), to prosecute cases that fell under false trading, price rigging, stock market manipulation, disclosure of information about prohibited transactions, and disclosure of false or misleading information inducing transactions.

2.2 Conviction and the stock market

Previous studies have focused on the effects of specific lawsuits on the stock market – for example, how the stock market responds to different types of litigation, e.g., corporate misconduct (Bhagat et al., 1998; Armour et al., 2017), patent infringement (Raghu et al., 2008; Lee et al., 2013), product liability (Viscusi & Hersh, 1990; Prince & Rubin, 2002), and other litigations (Katz et al., 2017), or whether different types of plaintiffs and defendants, such as in interfirm lawsuits (Hertzel et al., 1993; Zhou & Mu, 2019) versus government litigation (Colonnello & Herpfer, 2016; Katz et al., 2017; Armour et al., 2017), play a role. Studies have shown that lawsuits damage the reputation of firms, and thereby reduce investments and lower firms' stock prices (Lee et al., 2013; Hertzel et al., 1993; Bhagat et al., 1998; Viscusi & Hersh, 1990; Zhou & Mu, 2019; Prince & Rubin, 2002; Raghu et al., 2008). For example, a study reported that firms that were publicly punished by U.K. regulatory authorities lost nine times the amount of fines and compensation on stock shares, a phenomenon sometimes referred to as “reputation loss” (Armour et al., 2017). Meanwhile, lawsuits could also affect the corresponding industry in the stock market (Prince & Rubin, 2002).

However, there are few research efforts spent on the impact of lawsuits on stock market misconduct, or the effect of lawsuits on the overall market instead of shares of the firms that were involved in the lawsuits. Also, the assumptions of the methods used by many previous studies to evaluate market response might not be realistic. For example, a typical methodology is to compare stock returns before and after the lawsuit and then conduct a statistical test for difference (e.g., Armour et al., 2017; Raghu et al., 2008; Zhou & Mu, 2019; Prince & Rubin, 2002; Viscusi & Hersh, 1990; Lee et al., 2013; Katz et al., 2017). However, such a methodology does not control for the influences of other factors, possibly due to a lack of information. Even with some controls, it is still difficult to argue that the issue of unobserved or omitted variables is appropriately addressed. Additionally, model and time window choices for evaluation could also raise extra uncertainties or alternative interpretations, especially when they produce inconsistent results (Armour et al., 2017; Raghu et al., 2008; Zhou & Mu, 2019; Prince & Rubin, 2002).

To fill this gap, this thesis aims to investigate the effects of convictions of market misconduct on the stock market in Hong Kong. To my knowledge, this is the first study to attempt to empirically evaluate the impact of convictions of market misconduct. To address methodological issues, such as lack of appropriate controls and seasonal fluctuations of stock markets, this study employs a generalized linear model with harmonic components and a Generalized Synthetic Control (GSC) method.

3. Methods

3.1 Data and Measurement

This study combines two sets of data – records of daily market capitalization and convictions of market misconduct. The records of daily market capitalization were obtained from seven stock markets in Hong Kong (1997-2019), Dhaka (2004-2020), Ho Chi Minh City (2010-2019), Taiwan (1995-2018), Egypt (2008-2019), Korea (1995-2019), and Colombia (2007-2019). Some of them were directly retrieved from their official websites. Otherwise, information was collected through email inquiries and stock market responses.

There was a total of 111 convictions of stock misconduct from 1997-2019 in Hong Kong. Case information was collected from the Hong Kong Legal Reference System, case reports from IDT (29 cases) and MMT (24 cases), annual reports and news from SFC, and other media outlets such as Apple Daily and Oriental Daily.

Daily market capitalization ratio (MCR), one of three commonly used measures, is used to evaluate the performance of a stock market. MCR describes the value of equities traded on the domestic stock market as a percentage of GDP (Ho & Iyke, 2017). For example, in the quarter ending on September 3, 2019, the total market value of the Hong Kong stock market was 30.5 trillion HKD, and the GDP of Hong Kong for the third quarter was 2.13 trillion HKD. Thus, the MCR was. The other two measures – the total value traded ratio (TVR) and the turnover ratio (TOR) – were not chosen for this study because they are more relevant to the liquidity of a stock market, e.g., how much the stock market and stock managers have earned from transactions, and the efficiency of stock market operations. Ho and Iyke (2017) found that TVR and TOR failed to reflect economic performance in terms of GDP in Hong Kong, whereas MCR and GDP were found to be closely related.

The key independent variable, convictions of market misconduct, is coded as a series of dummy variables to indicate the dates of conviction.

3.2 Analytic Methods

As a continuous measure, linear regression is a natural choice for modelling MCR. However, since the data set accumulates the records over time, caution is needed to deal with the characteristics of a time series, e.g., temporal ordering, irregular variation, seasonality, and so on. For example, MCR shows strong fluctuations over time.

To reduce extra variation and address the potential autoregressive problem, instead of directly modelling MCR, a logarithm of MCR is calculated. Therefore, the dependent variable is actually the log of the ratio between the values of market capitalization on the current day and the day before.

Furthermore, harmonic components are added to control time-related fluctuations. Harmonic components are involved in Fourier transformations. In a Fourier transformation, different periodic time dependent data points are decomposed into the sum of sinusoidal functions. If there are infinitely many different periodic time dependent data sets, it will present a regular rectangular-like function

Where C refers to the constant term, T is the period, a_n and b_n are amplitudes, and n is the time sequence number, so that n is an integer from 1 to T .

Harmonic components can detect and control MCR fluctuations, e.g., weekly, monthly, etc. To determine an appropriate set of a_n and b_n , n is restricted to equally-spaced frequencies, and periodogram ordinate values are calculated as follows:

The value of the periodogram ordinate indicates the importance of the corresponding frequency and can be used to select an n that fits the corresponding sine and cosine functions into the observed data. The model can be written as

Where x represents dummies for convictions of stock misconduct and weekdays, and t is the

measure of time, e.g., day of a week (1 to 7) or month of a year (1 to 12).

Since the information available in MCR records is very limited, the estimated effect of convicted cases is hardly free from other confounding factors, even if it is significant. Therefore, the Generalized Synthetic Control (GSC) method is used to further evaluate the effect of convicted cases. The GSC method is considered to be an extension of difference-in-difference that is used for causal inference in time series data (Xu, 2017). GSC methodology, first proposed by Xu (2017), unifies the synthetic control method (Abadie et al., 2010) with interactive fixed effects (IFE) models (Bai, 2009). By constructing a weighted combination of groups used as controls, GSC offers a flexible and efficient way to estimate the effect of treatment (Xu, 2017). This combination provides a better counterfactual than a single source (Sanso, 2011). As for the GSC method, the weights of the control group are based on the pretreatment treated outcomes. The treated counterfactuals are predicted using cross-sectional correlations between treated and control units. For instance, to evaluate the effect of a conviction in Hong Kong, a hypothetical control group that has did not experience the conviction is constructed by combining the weighted values of log MCR from the other six markets. The weights for each of the six markets are estimated using the available daily log MCR before the time of the conviction. Then, the difference between the Hong Kong market and the counterfactual is evaluated.

To model the log MCR, two separated variable selection processes are conducted. The first selection process is applied to the harmonic components. For instance, given equally spaced time intervals, e.g., by weeks, or by months, the amplitudes that correspond to each equally spaced time interval are evaluated by periodogram ordinate values, and those with large ordinate values are kept in the candidate set, which is further evaluated using variable selection techniques. The second selection process involves the dummy variables of convicted cases. Using the harmonic components as a control, a variable selection procedure produces a set of dummy variables that has strong effects on the log MCR. A small set of dummy variables that address within-week ups and downs is also included in the model.

3.3 Results

Table 1 presents the results of the logarithm of MCR. Two weekday dummies, Monday and Wednesday, are found to be significant in predicting changes of the log of MCR. Previous studies have observed a phenomenon of increased volatility as well as decreased trading and market depth on Mondays (Foster & Viswanathan, 1990; Ulku & Andonov, 2016; Ulku & Madeline, 2018), which may be related to institutional investors who hold back from trading on Mondays (Ulku & Madeline, 2018). Model 1 also reveals positive effects on Wednesday that have not been reported by previous studies. In addition to weekday dummies, Model 1 also includes harmonic components to control periodic fluctuations of the log of MCR. After the first variable selection process, both monthly and weekly peaks can be identified. For example, the significant frequency at 5-coefficient of $\sin(2\pi*5*Month/12)$ on month predicts two peaks in a year: August and October. Similarly, when considering equally spaced time intervals for weeks, large ordinate values show at the 12th, 14th, 24th, and 25th weeks.

Model 2 adds the dummy variables to evaluate the effect of convicted cases on stock misconduct. After the variable selection process, seven convicted cases show significant impact on the log of MCR. Evidently, the direction of effects varies by case. For example, Cases 119, 121, 145, and 147 show positive effects, while Cases 122, 123, and 146 are negatively related to the log of MCR. Table 2 summarizes the information for those cases. Although all of the effects are significant according to their p values, there is little consistent patterning associated with the type of misconduct or parties involved. For instance, convictions of individual investors or brokers for false trading could produce either positive (Case 147) or negative effects (Cases 122 and 123) on the log of MCR. Future studies

are needed to further examine the effects of characteristics of convictions.

Table 1: Results of harmonic regression for log of MCR.

Parameter	Model 1	Model 2
Intercept	99.90(0.03)***	99.89(0.03)***
Monday	0.11(0.05)*	0.11(0.05)*
Wednesday	0.10(0.05)*	0.10(0.05)*
$\sin(2\pi*5*Month/12)$	0.08(0.03)**	0.09(0.03)**
$\cos(2\pi*5*Month/12)$	-0.02(0.03)	-0.03(0.03)
$\sin(2\pi*12*Week/52)$	0.03(0.03)	0.03(0.03)
$\cos(2\pi*12*Week/52)$	-0.07(0.03)*	-0.07(0.03)*
$\sin(2\pi*14*Week/52)$	0.09(0.03)**	0.09(0.03)**
$\cos(2\pi*14*Week/52)$	-0.01(0.03)	-0.01(0.03)
$\sin(2\pi*24*Week/52)$	0.01(0.03)	0.01(0.03)
$\cos(2\pi*24*Week/52)$	-0.09(0.03)**	-0.09(0.03)**
$\sin(2\pi*25*Week/52)$	0.06(0.03)*	0.06(0.03)*
$\cos(2\pi*25*Week/52)$	-0.04(0.03)	-0.04(0.03)
Case 119		0.48(0.22)*
Case 121		0.99(0.35)**
Case 145		0.97(0.33)**
Case 147		1.72(0.97)+
Case 122		-1.21(0.31)***
Case 146		-2.53(1.02)*
Case 123		-0.41(0.18)*
Sigma ²	1.37	1.37
N	4740	4740
-LL	8225.9817	8201.9083
AIC	16479.9634	16445.8166
BIC	16570.4565	16581.5562

Note: +p<0.1, *p<0.05, **p<0.01, ***p<0.001

Table 2: Details of seven convicted cases.

Case ID	Parties involved	Shares	Misconduct
119	Managing director of Morgan Stanley Asia Ltd	CITIC Resources Holdings Ltd	insider dealing
121	Retail investor	Bauhaus International Ltd	false or misleading appearance of trading
145	Asian Capital Resources Ltd and company secretary		misleading information
147	Licensed broker		false trading
122	Securities broker		false trading
123	Investor		false trading
146	Hontex International Holdings Company Ltd		misleading information

Since the purpose of legislation of HKSFC is to regulate the Hong Kong stock market, it is possible that the stock market might not immediately react to a conviction, and the effect of a conviction may take time to appear on the stock market. Therefore, the GSC method was adopted to evaluate the effects of convictions over time. For each of the convictions, records for the 30 days before and 60 days after are kept for analysis to avoid overfit and missing data problems.

Figure 1 and 2 show the results of the seven convicted cases using the method. For each of charts, the solid line represents the observed log of MCR for Hong Kong, while the dashed line shows the

log of MCR for the hypothetical control group synthesized from the logs of MCRs of Dhaka, Ho Chi Minh City, Taiwan, Egypt, Korea, and Colombia. Each of the charts is divided by the time of conviction. Because the GSC method does not allow for control of harmonic components, each of charts shows dramatic up-and-down fluctuations over time (days). There is no clear-cut pattern of change after conviction. For instance, the pattern of the observed log of MCR is not distinguishable from that of the synthesized control group, indicating that the effect of conviction might be negligible during the 90-day period of study. One observable pattern is that for some cases, the actual fluctuation over the period is greater than that of the synthesized control group, e.g., Cases 119 and 145, while for Cases 146 and 147, the synthesized control group shows greater fluctuation compared to that of the observed Hong Kong market.

Table 3 reports the summary statistics for the seven convicted cases over the 90-day period. In addition to means and standard deviations, the ratios of the means and the ratios of the standard deviations between the actual and the synthesized groups have also been calculated. After the convictions, Cases 119, 123, and 145 displayed higher means and variations, while Cases 122, 146, and 147 are associated with lower means and variations, which indicates that the effects of conviction might be highly diverse.

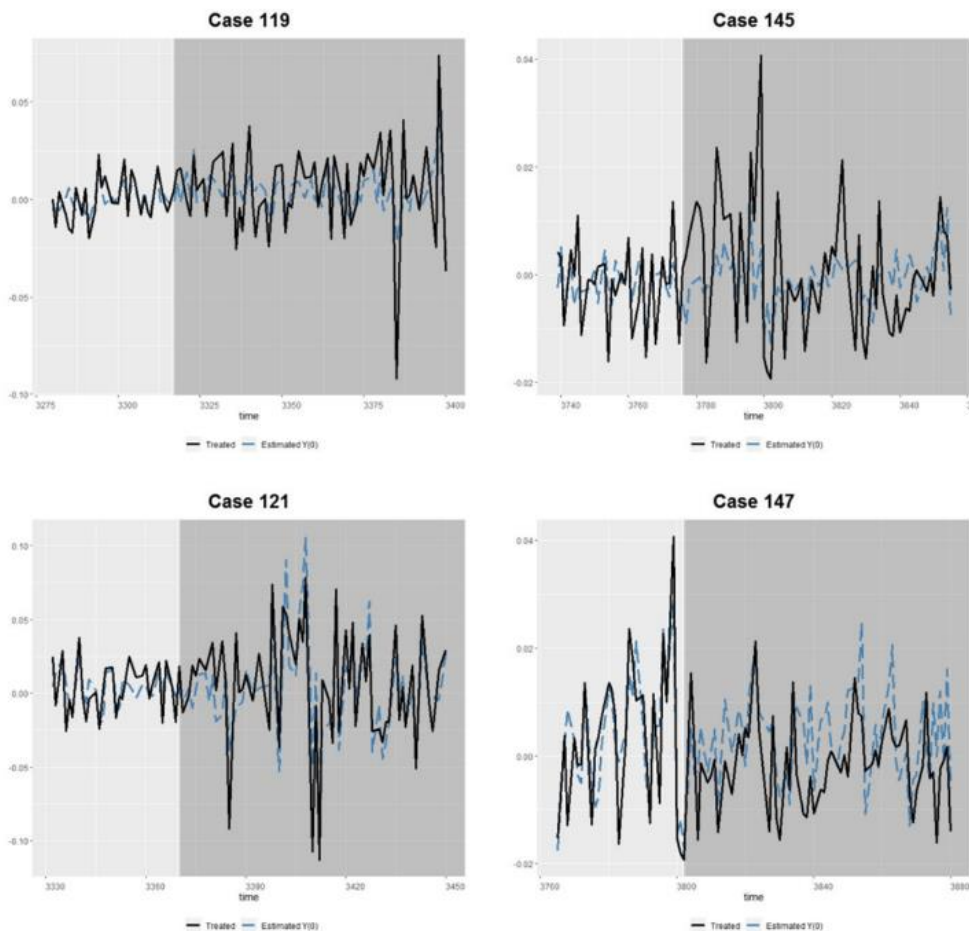


Figure 1: Estimated GSC vs. Hong Kong on log MCR for Cases 119, 121, 145, and 147.

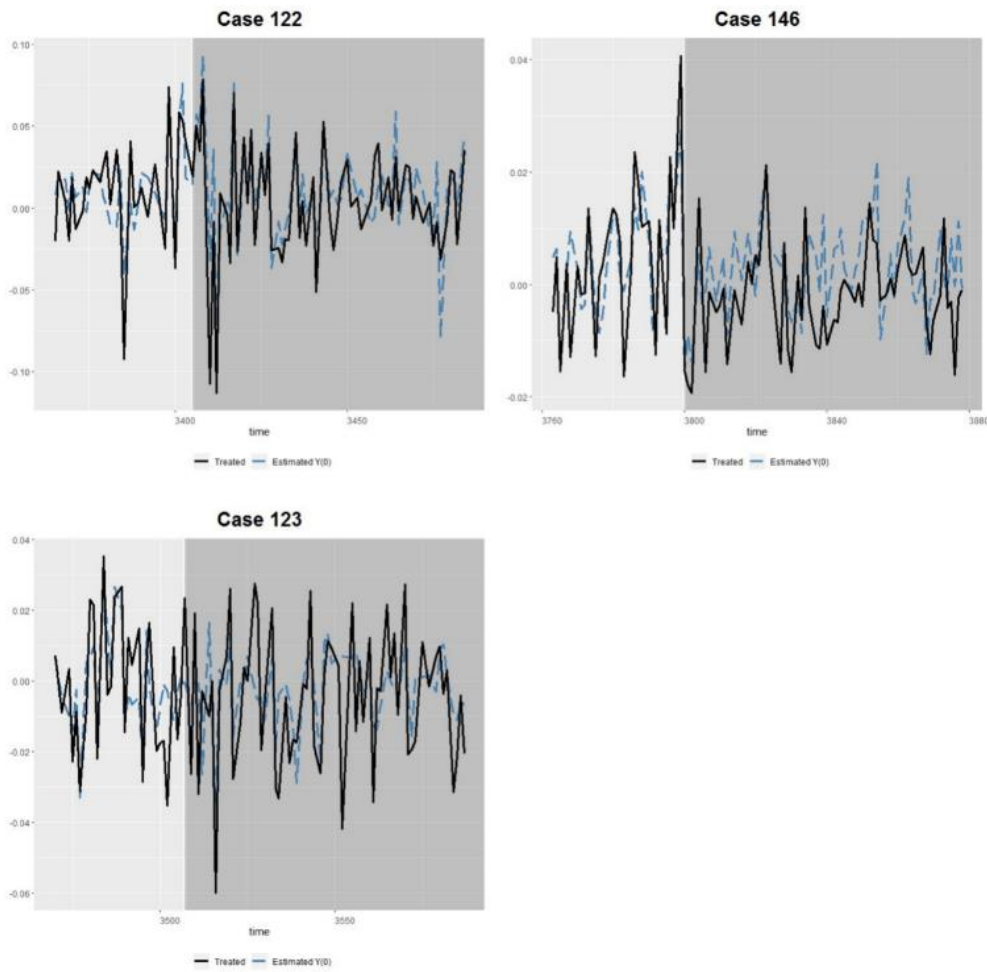


Figure 2: Estimated GSC vs. Hong Kong on log MCR for Cases 122, 146, and 123.

Table 3: Summary of GSC results for seven convicted cases.

Case	Conviction	N	Synthetic control		Hong Kong		Mean ratio	SD ratio
			Mean	SD	Mean	SD		
119	0	30	0.00	0.01	0.00	0.01	1.00	1.63
	1	60	0.00	0.01	0.01	0.02	1.27	2.07
121	0	30	0.00	0.01	0.00	0.02	1.00	1.54
	1	60	0.00	0.04	0.01	0.04	1.54	1.12
122	0	30	0.01	0.02	0.01	0.03	1.00	1.36
	1	60	0.01	0.03	0.00	0.03	0.21	1.14
123	0	30	0.00	0.01	0.00	0.02	1.00	1.42
	1	60	0.00	0.01	0.00	0.02	1.90	1.79
145	0	30	0.00	0.00	0.00	0.01	1.00	1.97
	1	60	0.00	0.00	0.00	0.01	-1.40	2.55
146	0	30	0.00	0.01	0.00	0.01	1.00	1.26
	1	60	0.00	0.01	0.00	0.01	-0.50	1.09
147	0	30	0.00	0.01	0.00	0.01	1.00	1.20
	1	60	0.00	0.01	0.00	0.01	-0.50	0.97

4. Discussion and Conclusions

This paper implemented the harmonic linear model and the GSC method to evaluate the impact of 111 lawsuits and convictions on the Hong Kong stock market. The current study attempted to address the issue of seasonal fluctuation and utilized an extended DID framework. Previous studies have argued that stock manipulation is harmful to stock markets, and lawsuits may damage reputations and therefore reduce investments (Lee et al., 2013; Hertz et al., 1993; Bhagat et al., 1998; Viscusi & Hershey, 1990; Zhou & Mu, 2019; Prince & Rubin, 2002; Raghu et al., 2008). However, the current study indicates that the effects of conviction might vary. For instance, after controlling for seasonal fluctuation, Cases 119, 121, 145, and 147 were found to have positive influences, while Cases 122, 123, and 146 were negatively associated with the log of MCR in Hong Kong. In addition, the results obtained through GSC methods indicated that convictions might not have clear long-term impacts on the Hong Kong stock market. For example, in some cases, variations in the market after the conviction were reduced, such as in Cases 146 and 147, while others resulted in higher variations for the market, e.g., Cases 119 and 145, over a period of 90 days. Therefore, further future studies are needed to elaborate on the effects of specific convictions.

The current study is limited in several respects. Firstly, due to limited information, the harmonic model might not include measures that can reveal the pattern of MCR changes. Although the harmonic component is supposed to address the periodic oscillations, the sinusoidal function incorporated in the model might not be correctly specified. For example, only equally spaced week and month frequencies within 12-month intervals were statistically evaluated, which might not be sufficient or meaningful.

Secondly, although MCR has been widely used to investigate changes in stock markets (Ho and Iyke, 2017; Iqbal et al. 2017; Naik and Padhi 2015), it might not be a good indicator of the effect of convictions. Additionally, using dummy variables of verdict dates to represent convictions might not be the best way to model their effect. An underlying and unverified hypothesis is that players in stock markets are aware of convictions, and the conviction of misconduct is one influential factor when players make their decisions on trading. Previous studies reported that the average length of trial time is 517.4 days (Huang, 2018), and investors may have already incorporated the expected damage costs into the stock price (Prince & Rubin, 2002).

Thirdly, a missing piece of the puzzle regarding the relationship between convictions and market changes in the current study may be measuring expectations or confidence. The stock market is a complex and interrelated system composed of uncoordinated decisions made by both small and large investors. While some basic principles apply, such as supply and demand, as well as equilibrium, expectations of the stability of future investments are crucial influences on market changes. For instance, if investors hold high expectations regarding the increase of a share in value, they are more likely to purchase the share, and vice versa. Although manipulation has existed since the beginnings of the stock market and has been pervasive and chronic ever since (Klein, 2019), it is still unclear whether punishment of misconduct, restoring public confidence in general, or the specific details of a conviction contributes more to market fluctuations. Furthermore, the GSC method does not allow for the control of covariates, which limits its capacity to identify the possible effects of conviction.

By focusing on the income gap between the stock market and society, Godechot (2016) argues that the marketization of financialization leads to inequality. Stock market misconduct might be another sign of the marketization of financialization. For instance, criminals in pursuit of profits treat stocks as their products, and what they produce is an increase in the value of shares beyond their true value. Although the current study did not show a consistent pattern of the effects of convictions on MCR, it was at least able to highlight a few possible directions for future studies. For example, there are considerable time-related fluctuations in a stock market that need to be properly addressed. Without

appropriate methods to deal with fluctuations, the estimated effects might be biased or inefficient. When considering the effect of conviction, it is necessary to incorporate measures on investors' expectations and/or public confidence, and the effects of convictions might be diverse for different groups of investors and in the short or the long term.

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