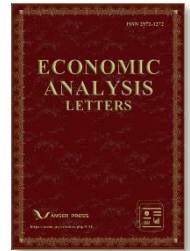




# Economic Analysis Letters

Homepage: <https://anser.press/index.php/EAL>



## Analysis of Stock Market Information Leakage by RDD

Jianing Zhu <sup>a</sup>, Cunyi Yang <sup>b,\*</sup>

<sup>a</sup> Paul Merage School of Business, University of California, Irvine, USA

<sup>b</sup> Lingnan College, Sun Yat-Sen University, Guangzhou, China

---

### ABSTRACT

Information leakage in the stock market has been widely proven. Information disclosure is sometimes uneven, and there is significant information asymmetry between ordinary investors and professional institutional investors. In this paper, Regression Discontinuity design (RDD) model is first employed to analyze the information leakage issues. Based on the daily closing stock prices of 15 capital service listed companies, we analyze the difference between the market reaction time and the disclosure time of two stamp tax policies. We found that the sample policies information may leaked to the market about two days earlier. This paper provides a new method analyzing information leakage.

### KEYWORDS

Information leakage; Stock market; Market reaction; RDD

---

\*Corresponding author: Cunyi Yang

E-mail address: [yangcy.sysuln@gmail.com](mailto:yangcy.sysuln@gmail.com)

ISSN 2972-3272

doi: 10.58567/eal01010005

This is an open-access article distributed under a CC BY license  
(Creative Commons Attribution 4.0 International License)



Received 11 August 2022; Accepted 13 September 2022; Available online 15 September 2022

## 1. Introduction

The leakage of stock information is one of the typical problems in the securities market, which is not conducive to the allocation of market resources and the market efficiency, but also harms the interests of small and medium-sized investors. In the long run, the leakage of stock information will greatly hinder the healthy development of the capital market. Due to the characteristics of information leakage, such as strong expertise of the subject of leakage and difficulty in investigation and evidence collection, it is difficult to identify the existence and the time point of information leakage.

Information leakage in the stock market is the focus of scholars' research and has been widely proved. (Miller et al. (2008) argued that emerging economies' stock markets positively value international strategic alliances (ISAs). However, information leakages due to weak regulatory environments siphon off the "good news" before the ISA announcement date. Aitken et al. (2018) showed that greater AT is associated with increased transactional efficiency and reduced information leakage in top quintile stocks. For less liquid stocks, manipulation at the close declines. Kim (2019) showed that pre-disclosure abnormal returns were generated in off-hours block trading. In contrast, on disclosure days, the returns for off-hours block trading were significantly lower than those for off-market trading. The network of relationships between brokers and institutional investors shapes information diffusion in the stock market. Central brokers gather information by executing informed trades, which is then leaked to their best clients (Di Maggio et al., 2019).

A specific study was conducted by Kurov et al. (2019). They studied the stock index and treasury bond futures before and after the release of 30 US macroeconomic announcements. In the 20 announcements affecting the market, nine showed that there were a large number of informed transactions before the official release time. About 30 minutes before the release time, the price starts to move in the "right" direction. The average price change before the announcement accounted for about 40% of the total price adjustment. It means that some traders have mastered private information about macroeconomic fundamentals.

The research object of this paper is similar to that of Kurov et al. They selected the US macroeconomic announcement as the research event, and we selected China's two stamp tax adjustment policies as the event to analyze the difference between the market reaction time and the official disclosure time of policies. This paper doesn't aim to criticize the information leakage of the stock market or analyze the exact leakage time, but to recommend the Regression Discontinuity design (RDD) method to the research field of information leakage due to its good function of eliminating the trend of the price data.

The rest of this paper is structured as follows: The second part is the research design. The third part is the empirical results. The fourth part uses comparative events for additional analysis, and the fifth part is the conclusion.

## 2. Research Design

The basic event selected in this paper is "the stamp tax on securities transactions will be reduced to one thousandth since April 24". The details are as follows: With the approval of the State Council, the Ministry of Finance and the State Administration of Taxation decided to adjust the stamp tax rate on securities (stock) transactions from the current 3‰ to 1‰ since April 24, 2008. That is, for the certificate of transfer of A shares and B shares written in the form of purchase, sale, inheritance and donation, the parties to the certificate shall pay the stamp tax on securities (stocks) transaction at the rate of 1‰. Through network search, it can be found that the earliest release time was after the market closed on April 23, 2008. The sample is the daily closing prices of 15 capital services listed companies.

RDD is generally considered as a quasi-natural experiment (Cattaneo and Titiunik, 2022). It can be effectively used to analyze the causal relationship between events and results, and has realistic constraints. RDD can solve the

endogenous problem of parameter estimation without random experiments, so as to truly determine the causal relationship between information leakage and stock market reaction. In short, in this paper, RDD can help us eliminate the growth trend of the stock market, thus stripping out the impact of information leakage on the stock market. By looking for the time point of abnormal growth of the stock market, we can identify information leakage (There is a premise that no other important events occurred in the inspection interval).

Based on the research of Lee & Lemieux (2010), we construct the following model:

$$CP_{it} = \alpha_0 + \alpha_1 * event_{it} + \alpha_2 * f(Y_{it}) + \alpha * X_t + \pi_i + \varepsilon_{it} \quad (1)$$

$$event_{it} = \begin{cases} 1, & Y_{it} \geq 0 \\ 0, & Y_{it} < 0 \end{cases}$$

In Formula (1),  $f(Y_{it})$  is the polynomial adjustment function of the executive variable.  $CP_{it}$  is the sample stock price. The  $event_{it}$  stands for the assumed time point of information leakage, that is, when the time is after the set trading day, the value is 1; otherwise, the value is 0.  $X_t$  is the covariate that affects the daily stock yield, including the exchange rate between RMB and USD and the Shibor inter-bank one-year lending rate.  $\pi_i$  represents the fixed effect of individual enterprise.  $\varepsilon_{it}$  is the error term.

On the polynomial problem of time  $t$ , although higher polynomials are usually used in the literature of early RDD, Gelman and Imbens (2019) showed that the use of lower order polynomials often has better regression results, and can reduce the order of polynomial functions used for control when the time bandwidth is small (Angrist and Pischke, 2009). Based on the sample and test in this paper, it is found that the event effects of third-order polynomials in all dimensions are not significant, so only first-order and second-order polynomials are regressed.

### 3. Empirical Results

#### 3.1. RDD regression results

RDD is different from the least squares estimation in regular regressions. On the one hand, the RDD estimation has no strict requirements on the endogeneity of the variable itself, and only needs to assume that the individual cannot accurately control the variable assignment. On the other hand, its research design is closer to random controlled experiments, and the estimation results are more reliable (Lee and Lemieux, 2010). During RDD estimation, we firstly observe whether event causes breakpoint changes in core variables. In the past, scatterplot is usually used for observation, but there are two problems: One is that it is not intuitive when there are too many samples, and the another is that the jumping phenomenon in actual analysis may not be clear enough. Therefore, we use the fitting method to fit the left and right of the breakpoint respectively, and speculates whether the jump phenomenon occurs by observing the difference between the fitting lines on both sides (Calonico et al., 2015). According to the set model, the fitting results are shown in Figure 1. "Y-1" stands for the analysis results based on the assumption that the leakage time is the trading day before the official announcement time, and "Y-2" means that the information was leaked two days ago.

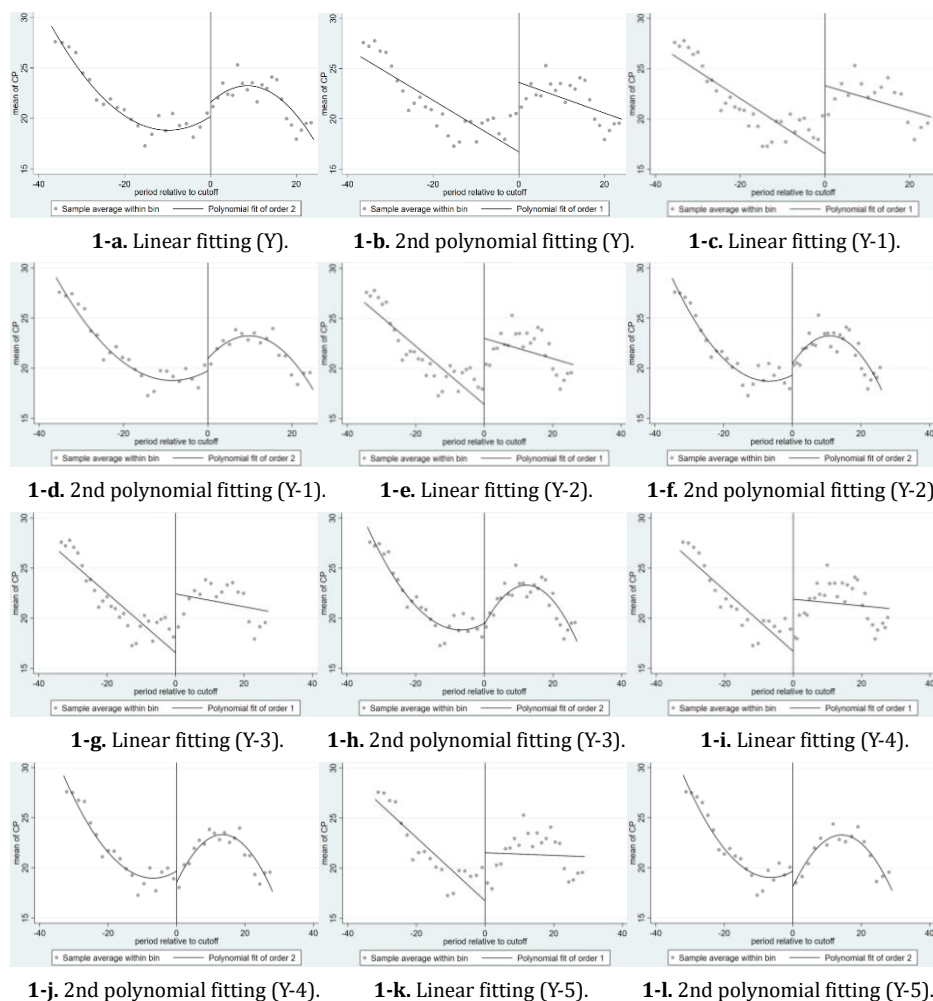


Figure 1. Fitting results.

It can be seen from Figure 1 that there are some differences between the jump of linear fitting and second-order polynomial fitting of dependent variables. By observing the second-order fitting, it can be found that there has been an obvious upward jump about the first two trading days before the official information disclosure. Table 1 reports the actual regression results of RDD considering control variables.

Table 1. RDD results of benchmark event.

Items		Y-5	Y-4	Y-3	Y-2	Y-1	Y
Daily closing price	First order polynomial	-0.535 (0.252)	-0.082 (0.878)	0.826 (0.176)	1.184* (0.078)	2.091*** (0.004)	2.454*** (0.001)
	Second order polynomial	-2.635 (0.000)	-1.646** (0.025)	-0.048 (0.955)	0.108 (0.912)	1.365 (0.202)	1.730* (0.097)
Control variable		Yes	Yes	Yes	Yes	Yes	Yes
FE		Yes	Yes	Yes	Yes	Yes	Yes

Notes: \*, \*\*, \*\*\* denote significant levels of 10%, 5% and 1% respectively, and the values in brackets are P-values.

It can be seen from first order polynomial results in Table 2 that the daily closing price has shown an obvious upward jump about two trading days before the official information disclosure. It can be judged that the time of early information leakage may be about two trading days. In addition, the robustness of bandwidth selection, algorithm robustness and the validity of RDD results are also tested, not shown in the text due to length limitation.

### 3.2. Additional analysis

One test may not fully reflect the effectiveness of our conclusion, so we add a comparative event for additional analysis. In the morning of May 30, 2007, the Ministry of Finance and the State Administration of Taxation announced that the stamp tax on securities transactions would be adjusted from 1‰ to 3‰ since that day, with the main purpose of suppressing the stock market foam. For the above event, the same RDD method (First order polynomial) was used for analysis, and the results are shown in Table 2.

**Table 2.** RDD Results of comparative event.

Items	Y-5	Y-4	Y-3	Y-2	Y-1	Y
Daily closing price	-2.093 (0.205)	2.074 (0.106)	0.652 (0.514)	-2.185** (0.016)	-3.945*** (0.001)	-5.382*** (0.000)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: \*, \*\*, \*\*\* denote significant levels of 10%, 5% and 1% respectively, and the values in brackets are P-values.

It can be seen from Table 2 that the daily closing price has shown an obvious downward jump about two trading days before the information disclosure, and it can be judged that the time of early information leakage may be about two trading days.

## 4. Conclusion

In general, we used the RDD method to examine the possible early information leakage of the two stamp tax policies more than a decade ago. In fact, with the continuous development of digital technology and financial supervision ability, the relevant departments of the stock market have already set a strong anti-information leakage system in China. Illegal activities many years ago can now even be tracked and investigated continuously.

This paper aims to provide a recommendation with a possible method, that is, to use good quasi-natural experiments to identify information leakage issues.

## Funding Statement

This research received no external funding.

## Declaration of Competing Interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

## References

- Aitken, M.J., Aspris, A., Foley, S., and Harris, F.H.D.B. (2018). Market Fairness: The Poor Country Cousin of Market Efficiency. *Journal of Business Ethics* 147, 5-23, <https://doi.org/10.1007/s10551-015-2964-y>
- Angrist, J.D., and Pischke, J.-S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton university press.
- Calonico, S., Cattaneo, M.D., and Titiunik, R. (2015). Optimal Data-Driven Regression Discontinuity Plots. *Journal of the American Statistical Association* 110, 1753-1769, <https://doi.org/10.1080/01621459.2015.1017578>
- Cattaneo, M.D., and Titiunik, R. (2022). Regression Discontinuity Designs. *Annual Review of Economics* 14, 821-851, <https://doi.org/10.1146/annurev-economics-051520-021409>
- Di Maggio, M., Franzoni, F., Kermani, A., and Sommovilla, C. (2019). The relevance of broker networks for information diffusion in the stock market. *Journal of Financial Economics* 134, 419-446, <https://doi.org/10.1016/j.jfineco.2019.04.002>
- Gelman, A., and Imbens, G. (2019). Why high-order polynomials should not be used in regression discontinuity designs. *Journal of Business & Economic Statistics* 37, 447-456, <https://doi.org/10.1080/07350015.2017.1366909>
- Kim, T.-Y. (2019). Effect of pre-disclosure information leakage by block traders. *Journal of Risk Finance* 20, 470-483,

<https://doi.org/10.1108/jrf-09-2018-0134>

- Kurov, A., Sancetta, A., Strasser, G., and Wolfe, M.H. (2019). Price Drift Before US Macroeconomic News: Private Information about Public Announcements? *Journal of Financial and Quantitative Analysis* 54, 449-479, <https://doi.org/10.1017/s0022109018000625>
- Lee, D.S., and Lemieux, T. (2010). Regression Discontinuity Designs in Economics. *Journal of Economic Literature* 48, <https://doi.org/10.1257/jel.48.2.281>
- Miller, S.R., Li, D., Eden, L., and Hitt, M.A. (2008). Insider trading and the valuation of international strategic alliances in emerging stock markets. *Journal of International Business Studies* 39, 102-117, <https://doi.org/10.1057/palgrave.jibs.8400322>