The IPO Underpricing and Market Liquidity after Reform on Chi-Next Board

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ABSTRACT: This essay examines market liquidity and underpricing of initial public offerings (IPOs) in the wake of the Chi-Next board's financial reform in June 2020. The results show that IPO underpricing has grown and market liquidity has improved since the reform. The channel by which the reform affects IPO underpricing and market liquidity can be explained by investor sentiment. The impact of the reform on underpricing and market liquidity can also be explained by other firm-level characteristics, such as leverage and firm life cycle.

KEYWORDS: Investor sentiment; IPO underpricing; IPO reform; Market liquidity
JEL Code: G10, G32,G41

1. INTRODUCTION

The stock market has benefited greatly from financial reforms, such as stock market liberalization with the elimination of restrictions on capital inflows and outflows(Henry, 2000), cost of equity capital reduction because of risk sharing(Bekaert and Harvey 2000, 2003), enhancement of stock market competition(Shi, 2005), a boom in stock price and higher return (Barberis and Huang, 2008; Beltratti et al., 2016), improvement of market efficiency(Li and Zhang, 2011), and improvement of information efficiency and market integration(Yao et.al., 2014). Since its inception, the Chinese stock market has gone through numerous financial reforms. A number of concerns are addressed by financial reforms in the Chinese stock market, including the establishment of the small and medium enterprise board, the suspensions and resumption of initial public offerings(IPO), the redesign of the registration process, and others. In this paper, I will investigate the effect of registration system reform specifically. The People's Republic of China's Securities Law was approved in December 2019 and the registration-based IPO system was completely implemented after considerable revising and coordinating. In April 2020, the reform committee proposed the Reform of Growth enterprise market(GEM) and pilot the overall implementation plan of the registration system. With this adjustment, the registration pilot will be enlarged and knowledge gained through the Science and Technology Innovation Board reform will be gathered. The reform intends to accomplish the Chi-Next board's objective of incorporating high-tech companies while fostering distinguishing qualities. The rules, regulations, and other normative documents were updated two months later by the Shengzhen Stock Exchange (SZSE) and the China Securities Regulatory Commission (CSRC). In the same month, the new regulations went into force for IPOs, refinancings, mergers, and other stock market operations.

I observe that IPO underpricing is a popular phenomenon in capital markets all around the world (e.g. Brennan and Frank, 1997; Keloharju, 1993; Ibbotson, 1975). Additionally, the Chinese market exhibits much more serious underpricing of IPOs. A study by Chan, Wang, and Wei(2004) on 570 A-share and 39 B-share shows that the average underpricing for A-share is 178%, while 11.6% for B-share. IPO valuation is an indicator of whether the market performs well or poorly (Aggarwal et al., 2009). Therefore, my first task is to find whether the registration-based IPO reform in Chi-Next can enhance IPO valuation and market transparency. This section will advance our knowledge of the immediate impact of financial reform on the effectiveness of IPO pricing and market transparency.

Second, I study the mechanism through which the registration-based IPO procedure can influence IPO underpricing and market transparency. Theories for IPO underpricing typically concentrate on information asymmetry(Rock, 1986; Ritter, 1984; Habit and Ljungqvist, 2001); institutional explanations(Ibbotson, 1975; Tinic, 1988), ownership and control(Brennan and Franks, 1997; Zingales,1995), behavioral factors(Welch, 1992; Ljungqvist and Wilhelm, 2005; Loughran and Ritter, 2002). The contribution of this part is to connect a theory to explain the IPO underpricing in the Chi-Next market and identify a channel and analyze the effect of IPO registration reform on this channel and the following effect of this channel on IPO underpricing and market transparency. In this manner, we can alter this mechanism in an effort to raise the IPO valuation and improve market transparency.

Third, based on the aforementioned conclusions, I'll try to identify specific company features that will either increase or lessen the reform's impact. Numerous factors, such as ownership dispersion(Booth and Chua, 1996); lawsuit(Lowry and Shu, 2002), investment bank relationship(Schenone, 2004), investor protection(Boulton et al., 2010), leverage(Su, 2004), and board size(Darmadi and Guanwan, 2013) have all been investigated for their potential to have an impact on a company's IPO underpricing. This section helps to our comprehension of how corporations with various characteristics would display various IPO underpricing following IPO registration change.

The remainder of this paper is organized as follows. In section II, I present the related literature review. In second III, data and hypotheses are stated. In section IV, I will present the empirical results and robust test results. Section V concludes.

2. LITERATURE REVIEW

This section reviews the literature on stock market reforms, IPO underpricing, market transparency, factors like sentiment, firm debt, and life cycle.

2.1 Reform and underpricing

Generally, reform in the financial market can affect IPO valuation. Akyol et al. (2014) examine how the adoption of corporate governance codes by Member States of the European Union(EU) affected IPO underpricing on EU markets. The results show that IPO underpricing declined after the adoption of corporate governance codes. An early study by Cheung et al. (2009) on the Chinese market demonstrates that after the reform, which eliminated listing limits, fixed issue price determination, and increased market participation in IPO pricing, IPO underpricing gradually decreased, notably for firms with fixed P/E ratios. Khurshed et al.(2018) study that the split-share structure reform in 2005 and find out it significantly reduces the size of IPO underpricing since that year. While non-state-owned-enterprises(non-SOEs) IPOs exhibit less underpricing than state-owned-enterprises(SOEs) with comparable levels of underpricing prior to the reform; SOEs controlled by the central government are less underpricing after the reform. After switching from the state control IPO system to the sponsorship IPO system, the IPO underpricing improves a lot. Chen et al.(2022) document a significant reduction in the IPO underpricing with global board reform. Such effects are amplified for IPOs with greater disclosure, IPOs in countries with better shareholder protection, and stringent financial reporting regulations. I therefore research how financial change in the stock market affects IPO underpricing and valuation because there is a direct correlation between financial reform and IPO underpricing.

2.2 Reform and market liquidity

Numerous studies have also demonstrated that market transparency and liquidity generally increased following the financial reform. Jain and Rezaee (2006) analyze market liquidity before and after the passage of the Sarbanes-Oxley Act of 2002 and find out that regulations aimed at restoring investor confidence improve market liquidity. Tadesse(2005) focuses on how regulation, such as SEC's 'trade reporting' rules of 1992 and SEC's 'order handling' in 1997, affects small and medium-sized enterprises, and discovers that the policy encourages the efficiency of markets in delivering information. Outside the USA, Baamir(2008) finds that strict disclosure legislation can improves market transparency in the Saudi Stock market, thereby proposing some reforms, like stricter disciplinary actions against abuse, tighter oversight, and some adjustments in disclosure. Gerace et al.(2015) find that during the period of reform of the share-split structure in China, the call auction market shows higher-level transparency. Aksu and Espahbodi(2016) find out that after the adoption of IFRS, the market transparency gets a notable improvement in the Istanbul stock exchange.

2.3 Sentiment

In order to understand IPO underpricing globally, sentiment analysis is frequently used. Derrien(2005)finds that investor sentiment is positively related to French IPO underpricing during the period 1999 to 2001. Cornelli et al.(2006) examine the effect of market-wide and firm-level investor sentiment on post-IPO prices in 12 European countries and only discover a positive relation between firm-level investor sentiment and underpricing. Dorn(2009) studies the market sentiment and IPO issue in the German market and finds an impact of market sentiment on IPO underpricing. Lin et al.(2005) examine the relationship between IPO underpricing and market sentiment on the Australian Stock Exchange and confirm a positive effect of market sentiment on underpricing. For Chinese stock market, Guo et al.(2010) find that IPO underpricing is related to market sentiment.Wang and Yao(2021) focus on Shanghai Stock Exchange and find that there is a positive relation between the investor sentiment and IPO underpricing. Zou et al.(2020) also find the effect of irrational behavior of retail investors on the IPO underpricing in China's small and medium-sized enterprise board.

When referring to market sentiment and IPO underpricing, there are a lot of measures to define and calculate the market sentiment. For example, Lee et al.(1991) use the closed fund discount to proxy the market sentiment. Derrien (2005) uses the oversubscription of a fraction of the IPO reserved for individual investors as a proxy for investor sentiment. Cornelli et al.(2006) use the pre-IPO market price as a proxy for firm-level investor sentiment and the return on the market index as a proxy for market-wide investor sentiment. Principle Component Analysis, a more well-liked technique, takes into account multiple variables. For example, Baker and Wurgler(2006, 2007) construct sentiment by incorporating six proxies, including the average

closed-end fund discount, NYSE share turnover, the number and average first-day returns on IPOs, the equity share in new issues, the dividend premium, and a composite index based on the first principle component. Chen et al. (2014) and Han and Li (2017) use the same methodology to build the sentiment index for the Chinese market by factoring in the market PE ratio, the number of new accounts opened by retail investors, and market-wide abnormal turnover ratios.

The sentiment is also documented to have an impact on market liquidity. Liu(2015) uses the Amihud measure to calculate the market liquidity, as well as the BW index developed by Baker and Wurgler(2006) to measure investor sentiment and find out a positive relationship between market liquidity and sentiment. According to Debata et al. (2021), there is a correlation between investor sentiment and market liquidity in 12 emerging stock markets.

2.4 Debt

It has been established that leverage has an impact on IPO underpricing. According to Su (2004), who used data from 348 non-financial firm IPO information, underpricing is positively connected with pre-IPO leverage, which serves as a proxy for ex-ante information asymmetry. However, as leverage tends to signal a higher-quality firm, Gauvin and Power(2019) find that a firm with higher leverage is less underpriced. It is obvious that there is no clear relationship between the leverage and underpricing.

2.5 Life cycle

Few studies are focusing on IPO underpricing and firm life cycle. Habib and Hasan(2019) state that IPOs are rather unique and cannot capture the entire spectrum of the firm life cycle. Katti and Phani(2016) state that it is not clear to identify the optimal time of IPO during a firm life cycle. Maug(2001) offers a theory of initial public offerings based on dynamic firm-specific information throughout the life cycle . Therefore, it is intriguing to look into whether the life cycle may have an effect on the underpricing.

3. DATA AND HYPOTHESES

I collect my data, including the firm IPO information, firm-level information, and information for constructing sentiment index from CSMAR and Wind database. My sample spans the years between October 2009 and October 2021 for the Chinese Chi-Next market.

Table 1. Descriptive Statistics

This table presents descriptive statistics for 1,045 observations on the Chi-Next board from 2009/10 to 2021/10 drawn from the CSMAR database. Panel A presents IPO information in Chi-NEXT. The variable *underpricing* is defined as the first-day return, which is measured as the percentage change of the difference between the offering price and the first-day price. *Ln(asset)* is the logarithm of the firm's total assets at the beginning of the issue year. *Ln(offering shares)* is the logarithm of the firm's shares offered in this IPO. *B/M* is the ratio of a firm's book value to market value, which is collected based on the most recent announcement date following an IPO. *The trading ratio* is the proportion of a company's publicly traded shares to its total number of shares at the time of its IPO. *Ln(Firm age)* is measured as the natural logarithm of the number of days since the founding of the firm. *Board number* the number of board members at the time of IPO. Panel B presents the firm-level information. *P/E* is the price-to-earnings per share. *B/M* is the ratio of a firm's book value to market value for each year. *Ln(asset)* is the logarithm of a firm's total assets by the end of each year. *Ln(trading volume)* is the natural logarithm of the stock's monthly total trading volume. Panel C reports the summary statistics for market-level information that is used to construct the sentiment index, including the market-wide PE ratio(P/E), the market-wide abnormal turnover ratio(turnover), the number of new shares opened by retail investors(new account), the growth of industrial production (computed using the most current value), growth of money supply in terms of M1 (measured by subtracting the M1 at month t by the M1 at of counterpart calendar month in the prior year and then scaled by the latter M1B), the exchange rate of RMB per US dollar (measured at the end of month t), and short-term interest rates (determined by the weighted average of the 30-day National Interbank Offered Rate over the previous three months).

Panel A IPO information

	Mean	Median	Min	Max	S.D	Obs
Underpricing(%)	83.39	44.00	-16.67	1942.58	133.13	1057
Ln(asset)(million)	19.97	19.94	16.55	25.08	0.81	1052
Ln(offering shares)(million)	17.00	16.90	15.98	20.11	0.50	1055
B/M	0.59	0.61	0.13	0.96	0.15	1045
Trading ratio	0.22	0.25	0.07	0.28	0.04	1054
Ln(firm age)	8.29	8.39	5.19	9.44	0.61	1055

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Board number	8.18	9	5	15	1.44	1055

Panel B Firm-level information

	Mean	Median	Min	Max	S.D	Obs
P/E	89.51	63.95	15.26	672.67	0.78	948
B/M	0.53	0.54	0.14	0.92	0.14	985
Ln(asset)(million)	21.18	12.11	19.69	25.95	0.69	1025
Ln(trading volume)(million)	18.04	18.05	15.95	20.35	0.67	1023

Panel C Sentiment

	Mean	Median	Min	Max	S.D	Obs	period
P/E	62.02	62.55	33.36	110.93	16.84	130	2009/10-2020/12
Turnover	0.68	0.61	0.31	1.97	0.29	130	2009/10-2020/12
New account(million)	1.88	1.56	0.20	8.78	1.61	130	2009/10-2020/12
Industry growth	7.89	6.9	-25.87	21.3	4.90	130	2010/04-2020/12
M1 growth	10.44	8.6	0	31.25	7.17	130	2010/04-2020/12
Exchange rate	6.53	6.52	6.10	7.13	0.30	130	2010/04-2020/12
Interbank interest rate	3.78	3.77	1.64	6.79	1.05	130	2010/04-2020/12

Table 1 presents the summary statistics for IPO information, firm-level information, and the information that is used to construct the sentiment index. Panel A presents IPO information for firms listed in Chi-Next. The variable underpricing is defined as the first-day return, which is measured as the percentage change of the difference between the offering price and the first-day price. The average underpricing is 83.39%. The control variables include asset, offering shares, B/M, trading ratio, firm age, and the number of board members. Ln(asset) is the logarithm of the firm's total assets at the beginning of the issue year and is 19.97million on average. Ln(offering shares)is the logarithm of a firm's IPO offering shares and the average number is 17 million. B/M is the ratio of a firm's book value to market value, which is collected based on the most recent announcement date following an IPO. The ratio is 0.59 on average. The trading ratio is the proportion of a company's publicly traded shares to its total number of shares at the time of its IPO and is 0.22 on average. Ln(firm age) is defined as the number of days since the founding of the firm. The average age of the firms in my sample is 8.29. Besides that, the average number of board members at the time of IPO is 8.18.

Panel B provides the summary statistics for firm-level information that is used to estimate market transparency. Monthly P/E, B/M, asset, and trading volume following the IPO are collected monthly. P/E is the price-to-earnings per share. B/M is the ratio of

a firm's book value to market value. Ln(asset) is the logarithm of a firm's total assets by the end of each year. Ln(trading volume) is the natural logarithm of the stock's monthly total trading volume. The average P/E, B/M, Ln(asset), and Ln(trading volume) is 89.51, 0.53, 21.18 million, and 18.04 million, respectively. Market transparency is measured as stock illiquidity (Amihud), stock liquidity(P-S), and stock turnover, respectively. Following Amihud(2002), stock illiquidity is measured as the average daily ratio of the absolute stock return to the trading volume. Following Pastor and Stambaugh(2003), stock liquidity(p-s) is estimated by applying the following regression: $r_{i,d+1,t}^{e} = \theta_{i,d,t} + \theta_{i,t}r_{i,d,t} + \gamma_{i,t}\text{sign}(r_{i,d,t}^{e})v_{i,d,t} + \varepsilon_{i,d+1,t}$, where $r_{i,d,t}$ is the stock return for stock

i on day d in month t, $r_{i,d,t}^{e} = r_{i,d,t} - r_{m,d,t}$, $r_{m,d,t}$ is the return on the benchmark market return; and $v_{i,d,t}$ is the trading volume. Following Beck and Levine(2004), turnover is defined as the value of a share's trading divided by the total value of listed shares. The monthly value for market transparency is measured in this paper.

Panel C presents the summary statistics for market-level information that is used to construct the sentiment index. Following Baker and Wurgler (2006, 2007), I construct a sentiment index by employing principal component analysis(PCA). Here, three variables are used(Chen et al.,2014; Han and Li, 2017): the market-wide PE ratio(P/E), the market-wide abnormal turnover ratio(turnover), and the number of new shares opened by retail investors(new account). The abnormal return is measured by dividing the mean of the previous 20-day daily turnover by the mean of the prior 250-day daily turnover. The sentiment index is then created in two steps. I scale three variables using the previous six-month moving average in the initial stage. To address the potential impact of unrelated macroeconomic issues on sentiment, I orthogonalize the variables by regressing each one on a set of four variables. The final residue consists only of sentimental elements. The four macroeconomic factors are the growth of industrial production, the growth of the money supply as measured by M1B, the exchange rate between the RMB and the US dollar, and the short-term interest rate. The growth of industrial production is computed using the most current value, the growth in the money supply is calculated by dividing the M1 at month t by the M1 at the corresponding calendar month in the previous year and scaling the result by the latter M1B, the exchange rate of RMB per US dollar is measured at the end of month t, and short-term interest rate is determined by the weighted average of the 30-day National Interbank Offered Rate over the previous three months. In the subsequent phase, I conduct PCA using the residual and create a linear combination of the three residual variables.

4. EMPIRICAL EVIDENCE
In this section, I develop my hypotheses regarding IPO underpricing, market liquidity, investor sentiment, debt ratio, and firm life cycle in the Chinese Chi-Next board.

4.1 Reform and underpricing
Based on the explanation of information asymmetry, studies by Cheung et al.(2009), Khurshed et al.(2018), and Chen et al.(2022) show that IPO underpricing declined after the financial market reform. Another explanation concentrating on behavioral factors, suggests that investor sentiment can encourage more market irrationality as a result of reform and may lead to more underpricing. Therefore, my first job is to find whether underpricing rises or falls as a result of the reform.

Table 2. Univariate Comparisons between Pre- and Post-IPO Reform Groups in ChiNext Board
This table presents descriptive statistics for *underpricing* for two subsample*s* and it is a further description of Table 1. A. The sample *is* divided into two sub-periods based on the financial reform in June 2020. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. I also include both T-test and Wilcoxon z-test.

	Pre-IPO reform	Post-IPO reform	T-test	Wilcoxon-Test
Underpricing(%)	40.08	234.07	-24.81***	-19.23***
Ln(asset)(million)	19.81	20.58	-13.92***	-13.65***
Ln(offering shares)(million)	16.94	17.19	-6.90***	-6.51***
B/M	0.58	0.62	-3.48***	-2.76***
Trading ratio	0.22	0.22	0.30	0.94
Ln(firm age)	8.19	8.62	-9.78***	-10.59
Board number	8.23	8.00	2.21**	2.38**

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The univariate comparison between pre- and post-reform on the Chi-Next board is presented in Table 2. The companies in the first group are those that are already publicly traded as of June 2020. The second group includes the businesses that are launching initial share offerings following the change. The results show that for the first group, the average IPO underpricing is 40.08 percent, while for the second group, it is 234.07 percent. The difference is significantly greater for the second group according to t- and Wilcoxon z-tests. Based on both t- and Wilcoxon z-tests, the second group had considerably larger values for other factors such as asset, offering shares, book-to-market ratio, and firm age. While the number of board members is significantly lower for the second group, the trading ratio is insignificantly different between the two groups.

Based on the univariate results, I further test the results using multivariate analysis to detect the relationship between the reform and the IPO underpricing when controlling for firm characteristics. The dummy variable reform is 1 if the firms offer new shares after reform, and 0 otherwise. The variable underpricing is the first-day return of the IPO, which is the percentage change of the difference between the offering price and the first-day closing price. Control variables include: Ln(asset) is the logarithm of the firm's total assets at the beginning of the issue year. Ln(offering shares) is the logarithm of a firm's shares offered in this IPO; B/M is the ratio of a firm's book value to market value, which is collected based on the most recent announcement date following an IPO. The trading ratio is the ratio of a firm's number of publicly traded shares to the total number of shares at the time of IPO. Ln(Firm age) is measured as the natural logarithm of the number of days since the founding of the firm. Board number the number of board members at the time of IPO. Year and industry effects are controlled and standard errors are clustered by company too. Table 3 shows that the coefficient of reform is 138.92 and significantly positive, suggesting that reform can increase underpricing.

Table 3. Multivariate Regression on Underpricing

This table presents the results of underpricing for firms listed on the Chi-Next board. The dependent variable is the firm's IPO underpricing. Dummy variable *reform* is 1 if the firms offer new shares after IPO reform, and 0 otherwise. The variable *underpricing* is the first-day return of the IPO, which is the percentage change of the difference between the offering price and the first-day closing price. Control variables include: *Ln(asset)* is the logarithm of the firm's total assets at the beginning of the issue year. *Ln(offering shares)* is the logarithm of the firm's shares offered in this IPO. *B/M* is the ratio of a firm's book value to market value, which is collected based on the most recent announcement date following an IPO. The *trading ratio* is the proportion of a company's publicly traded shares to its total number of shares at the time of its IPO. *Ln(Firm age)* is measured as the natural logarithm of the number of days since the founding of the firm. *Board number* is the number of board members at the time of IPO. Year and industry effects are controlled and standard errors are clustered by company. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. Robust standard errors are presented in parentheses.

Variables	Coefficient
Reform	138.92***
	(21.41)
Ln(asset)	-16.04
	(10.87)
Ln(offering shares)	32.25***
	(10.99)
B/M	-204.50***
	(276.77)
Trading ratio	-753.75***
	(276.77)
Ln(firm age)	11.87***
	(3.94)
Board number	-0.82
	(3.16)
Year effect	Yes
Industry effect	Yes
Observations	1,043
R-squared	0.48

4.2 Reform and market liquidity

Based on studies on reform and market liquidity(e.g. Jain and Rezaee, 2006; Gerace et al., 2015), my second job is trying to find out how reform affects market transparency and market liquidity. Some reform aiming at improving information disclosure is able to improve market transparency and liquidity. In Table 4, panel A presents the univariate comparison of market liquidity between two groups. I use Amihud illiquidity, P-S liquidity, and turnover to measure the market liquidity. Based on both t- and Wilcoxon

z-tests, the results indicate that Amihud is 1.57 for the first group and 1.07 for the second group, with the first group having a considerably higher value. Based on both t- and Wilcoxon z-tests, P-S liquidity and turnover are significantly higher for the second group. The statistics mentioned above demonstrate how much market liquidity improved following reform. In a similar vein, I expand upon my test by utilizing multivariate analysis to examine market liquidity and reform. Three proxies--Amihud illiquidity, P-S liquidity, and turnover--serve as the dependent variables. The independent variable is dummy variable reform. In panel B, I concentrate on the entire sample. The coefficients of the three variables are significantly positive for P-S liquidity and turnover, while significantly negative for Amihud illiquidity. Results once more demonstrate that market liquidity significantly increased following reform in June 2020. In panel C, I estimate the three variables for firms only listed before the reform. By focusing on the first group, the difference between liquidity before reform and after reform is more pronounced. The results once more demonstrate that the P-S liquidity and turnover coefficients are both significantly positive, while the Amihud illiquidity coefficient is strongly negative.

Table 4. Impact of Reform on Market Transparency

This table presents results on the market transparency before and after IPO reform. Stock illiquidity(Amihud) and stock liquidity(P-S) are used to measure the monthly liquidity of certain stocks based on Amihud (2002) and Pastor& Stambaugh (2003), respectively. Panel A presents the univariate comparison of market transparency. Panel B presents the regression result of reform on market transparency for all observations and Panel C only focuses on the firms that are listed before the IPO reform. Dummy variable *reform* is 1 if the firms offer new shares after IPO reform, and 0 otherwise. Control variables include the *P/E* ratio, which is lagged value of monthly P/E; *B/M* is the lagged value of the ratio of a firm's book value to market value; *Ln(asset)* is the lagged value of the natural logarithm of the firm's total assets by the end of each year; *Ln(trading volume)* is the lagged value of the logarithm of the stock's monthly trading volume. Year and industry effects are controlled and standard errors are clustered by company. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. Robust standard errors are presented in parentheses.

Panel A Univariate comparison of market transparency

	Pre-IPO reform	Post-IPO reform	T-test	Wilcoxon-Test
Illiquidity(Amihud)	1.57	1.07	0.68	55.71***
Liquidity(P-S)	-0.000024	-0.000016	-2.01**	-5.35***
Turnover	85.98	99.12	-15.18***	-17.78***

Panel B Multivariate test of market transparency for all firms

	Illiquidity(Amihud)		Liquidity(P-S)		Turnover
Reform	-0.01***	Reform*$10e^4$	0.25***	Reform	7.43***
	(0.00)		(0.03)		(1.97)
P/E$10e^4$	0.11***	P/E*$10e^7$	-0.06	P/E*$10e^4$	-32.75
	(0.03)		(0.04)		(29.87)
B/M	0.07***	B/M*$10e^4$	-0.40***	B/M	81.74***
	(0.00)		(0.06)		(4.70)
Ln(asset)	-0.01***	Ln(asset)*$10e^4$	0.07***	Ln(asset)	-44.37***
	(0.00)		(0.01)		(1.56)
Ln(trading volume)	-0.02***	Ln(trading volume)*$10e^4$	0.07***	Ln(trading volume)	24.09***
	(0.00)		(0.01)		(0.78)

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Year effect	Yes	Year effect	Yes	Year effect	Yes
Industry effect	Yes	Industry effect	Yes	Industry effect	Yes
Observations	53,539	Observations	45,500	Observations	53539
R-squared	0.15	R-squared	0.01	R-squared	0.22

Panel C Multivariate test of market transparency for only pre-reform firms

	Illiquidity(Amihud)		Liquidity(P-S)		Turnover
Reform	-0.01***	Reform*$10e^4$	0.25***	Reform	7.06***
	(0.00)		(0.03)		(1.98)
P/E$*10e^4$	0.11***	*P/E*$*10e^7$	-0.06	*P/E*$*10e^4$	-28.64
	(0.02)		(0.04)		(29.53)
B/M	0.07***	*B/M*$*10e^4$	-0.38***	*B/M*	76.62***
	(0.00)		(0.06)		(4.66)
Ln(asset)	-0.01***	*Ln(asset)*$*10e^4$	0.07***	*Ln(asset)*	-43.66***
	(0.00)		(0.01)		(1.56)
Ln(trading volume)	-0.02***	*Ln(trading volume)*$*10e^4$	0.07***	*Ln(trading volume)*	24.55
	(0.00)		(0.01)		(0.79)
Year effect	Yes	Year effect	Yes	Year effect	Yes
Industry effect	Yes	Industry effect	Yes	Industry effect	Yes
Observations	52768	Observations	44885	Observations	52768
R-squared	0.15	R-squared	0.01	R-squared	0.23

4.3 Mechanism

Then, we have a question regarding the mechanism through which reform can affect underpricing and market liquidity. Improved Information asymmetry seems to be at conflict with the higher underpricing following the reform. Therefore, I estimate the effect of sentiment on underpricing. In the first step, I create the investors sentiment based on studies by Baker and Wurgler(2006, 2007) and Chen et al.(2014) and employ the PCA by combining the market PE ratio(PE), the number of new accounts opened by retail investors(AC), and market-wide abnormal turnover ratios(TO). The final sentiment index is constructed as follows:
sentiment=0.5235AC+0.5868TO+0.6177PE

To evaluate the impact of sentiment on underpricing, I use the regression on underpricing and reform first in the second phase. In Table 5, Panel A presents the univariate comparison of sentiment between two groups. The result reveals that the sentiment is -0.0052 for the first group and 0.1061 for the second group, and the difference is significantly higher for the second group based on t- and Wilcoxon z-tests. Panel B detects whether sentiment can account for a higher underpricing. First, I calculate the average sentiment for two groups and use the difference between the two averages as the independent variable to examine the effect of sentiment on underpricing. The coefficient is significantly positive, suggesting that the increase in sentiment indeed is able to explain the increase in underpricing. Second, I use the lag value of sentiment as the independent variable to detect the effect on underpricing. I also include a cross variable that is constructed by multiplying reform by sentiment. The coefficient of the cross variable is significantly positive, suggesting that sentiment can play a more important role in explaining higher underpricing after the reform than before the reform. The findings are consistent with the notion that reform might enhance the impact of sentiment on underpricing.

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Panel C presents the results of sentiment on market liquidity for two groups. The difference in average sentiment for the two groups is an independent variable. The findings indicate that the coefficients are significantly positive for P-S liquidity and turnover and significantly negative for illiquidity. This implies that market liquidity improved with increased stock market participation induced by higher investor sentiment following the IPO reform. When I only focus on the first sample and detect the market liquidity for the entire period, the results in Panel D are similar.

Table 5. Impact of Sentiment on Underpricing and Market Transparency

This table presents the results of sentiment on underpricing and market transparency for pre- and post-IPO reform groups. Sentiment is measured following the principal component analysis(PCA)developed by Baker and Wurgler (2006, 2007), employing three variables that are commonly applied in the Chinese stock market. The variables include new retail account(AC), market-wide abnormal turnover ratio(TO), and market PE(PE). Due to the data availability, the period only covers from April 2010 to Dec 2020. The sentiment equation is as follows: sentiment=0.5235AC+0.5868TO+0.6177PE. Panel A presents the univariate comparison of sentiment between the pre-and post reform group. *T*-test and Wilcoxon *z*-test are included. In Panel B, I use the difference between average sentiment pre- and post-reform (*ΔSentiment)* to detect why underpricing changes significantly after IPO reform. I also use the lagged value of sentiment(lsentiment). The cross term of reform dummy and *lsentiment* is also included. Control variables include *Ln(asset)*, which is the logarithm of the firm's total assets at the beginning of the issue year; *Ln(offering shares)* is the logarithm of the firm's shares offered in this IPO; *B/M* is the ratio of a firm's book value to market value, which is collected based on the most recent announcement date following an IPO; *Trading ratio* is the ratio of a firm's number of publicly traded shares to the total number of shares at the time of IPO; *Ln(Firm age)* is measured as the natural logarithm of the number of days since the founding of the firm; *Board number* is the number of board member at the time of IPO. Panel C detects the sentiment's effect on market transparency for all firms and panel D only includes observations that are listed before IPO reform. Control variables include the *P/E* ratio, which is lagged value of monthly P/E; *B/M* is the lagged value of the ratio of a firm's book value to market value for each year; *Ln(asset)* is the lagged value of the natural logarithm of the firm's total assets by the end of each year; *Ln(trading volume)* is the lagged value of the logarithm of the stock's monthly trading volume. Year and industry effects are controlled and standard errors are clustered by company. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. Robust standard errors are presented in parentheses.

Panel A Univariate comparisons of sentiment

	Pre-IPO reform	Post-IPO reform	T-test	Wilcoxon-Test
lsentiment	-0.0052	0.1061	-0.67	-0.82

Panel B Sentiment on underpricing

variables	Underpricing	Underpricing
ΔSentiment	1248.16***	
	(192.40)	
lsentiment		-9.51***
		(3.35)
Reform		117.42***
		(15.94)
*Reform*lsentiment*		185.95***
		(51.16)

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Ln(asset)	-16.04	-4.85
	(10.87)	(4.70)
Ln(offering shares)	32.25***	5.51
	(10.99)	(6.58)
B/M	-204.50***	-76.98***
	(43.99)	(29.67)
Trading ratio	-753.75**	-232.22
	(276.77)	(172.59)
Ln(firm age)	11.87***	7.01*
	(3.94)	(4.04)
Board number	-0.82	-0.04
	(3.16)	(1.35)
Year effect	Yes	Yes
Industry effect	Yes	Yes
Observations	1043	821
R-squared	0.48	0.48

Panel C Sentiment on market liquidity for all firms

	Illiquidity(Amihud)	Liquidity(P-S)	Turnover
ΔSentiment	-0.11***	0.00***	66.78***
	(0.02)	(0.00)	(17.74)
lsentiment	0.01*	0.00***	-9.90***
	(0.01)	(0.00)	(0.98)
Reform	-0.01***	0.00***	0.84

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		(0.00)		(0.00)		(1.92)
Reform*lsentiment		-0.01*		-0.00***		34.21***
		(0.01)		(0.00)		(3.47)
P/E*10e^4	0.00***	0.00***	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B/M	0.07***	0.07***	-0.00***	-0.00***	81.74	85.53***
	(0.00)	(0.00)	(0.00)	(0.00)	(4.70)	(5.02)
Ln(asset)	-0.01***	-0.01***	0.00***	0.00***	-44.37***	-46.73***
	(0.00)	(0.00)	(0.00)	(0.00)	(1.56)	(1.66)
Ln(trading volume)	-0.02***	-0.02***	0.00***	0.00***	24.09***	24.84***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.78)	(0.84)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53539	47452	45500	40973	53539	47452
R-squared	0.15	0.15	0.01	0.01	0.22	0.23

Panel D Sentiment on market liquidity for only pre-reform firms

	Illiquidity(Amihud)		Liquidity(P-S)		Turnover	
ΔSentiment	-0.10***		0.00***		63.43***	
	(0.02)		(0.00)		(17.78)	
lsentiment		0.01*		0.00***		-9.90***
		(0.01)		(0.00)		(0.98)
Reform		-0.01***		0.00***		0.84
		(0.00)		(0.00)		(1.92)
Reform*lsentiment		-0.01*		-0.00***		34.21***
		(0.01)		(0.00)		(3.47)
P/E*10e^4	0.00***	0.00***	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
B/M	0.07***	0.07***	-0.00***	-0.00***	76.62	85.53***
	(0.00)	(0.00)	(0.00)	(0.00)	(4.66)	(5.02)
Ln(asset)	-0.01***	-0.01***	0.00***	0.00***	-44.66***	-46.73***

	(0.00)	(0.00)	(0.00)	(0.00)	(1.56)	(1.66)
Ln(trading volume)	-0.02***	-0.02***	0.00***	0.00***	24.55***	24.84***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.79)	(0.84)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52768	47452	44885	40973	52768	47452
R-squared	0.15	0.15	0.01	0.01	0.22	0.23

4.4 leverage, underpricing, and reform

In this section, I estimate whether the debt can influence underpricing. Debt is defined as the ratio of total debt to the total asset. Control variables include ln(asset), ln(offering shares), B/M, trading ratio, ln(firm age), and the number of board members. Table 6 presents the results. Prior to the reform, the results show that debt does not significantly affect underpricing. But following the reform, debt is positively related to underpricing, which suggests that due to the positive signals from the reform, fanatical investors may become more interested in investing in companies with greater debt to earn a potential higher return, which might result in higher underpricing. This demonstrates that how reform can increase the impact of leverage on underpricing.

Table 6. The Effect of Debt on Underpricing

This table shows the effect of debt on underpricing The dependent variable is the firm's IPO underpricing. The variable *underpricing* is the first-day return of the IPO, which is the percentage change of the difference between the offering price and the first-day closing price. Control variables include *Ln(asset)*, which is the logarithm of the firm's total assets at the beginning of the issue year; *Ln(offering shares)* is the logarithm of the firm's shares offered in this IPO; *B/M* is the ratio of a firm's book value to market value, which is collected based on the most recent announcement date following an IPO; *Trading ratio* is the ratio of a firm's number of publicly traded shares to the total number of shares at the time of IPO; *Ln(Firm age)* is measured as the natural logarithm of the number of days since the founding of the firm; *Board number* is the number of board member at the time of IPO. *Debt* is the ratio of total debt to the total asset. Year and industry effects are controlled and standard errors are clustered by company. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. Robust standard errors are presented in parentheses.

Variables	Before reform	After reform
Ln(asset)	-2.18	-40.73
	(1.68)	(30.88)
Ln(offering shares)	1.31	57.85*
	(2.46)	(29.87)
B/M	-35.74***	-902.05***
	(7.26)	(173.40)
Trading ratio	-86.40***	-2065.08***
	(32.89)	(774.60)
Ln(firm age)	3.51*	35.16
	(1.83)	(28.10)
Board number	-0.28	-5.95

	(0.61)	(13.04)
Debt	0.05	3.33***
	(0.05)	(3.83)
Year effect	Yes	Yes
Industry effect	Yes	Yes
Observations	798	218
R-squared	0.34	0.39

4.5 Life cycle, underpricing, and reform

Based on the definition of the life cycle, I classify the firms into four phases: start-up, growth, maturity, and decline. Firms with negative operating cash flow, negative investing cash flow, and positive financing cash flow are defined as start-up firms; firms with positive operating cash flow, negative investing cash flow, and positive financing cash flow are classified as growing firms; firms with positive operating and investing cash flow, and negative financing cash flow are classified as mature firms; while for firms with negative operating and financing cash flow and positive investing cash flow are classified as firms at decline phase. The independent variable is the life cycle, a dummy variable, which is 1 for start-up, 2 for growth, 3 for maturity, and 4 for decline. Years and industry effects are controlled. Table 7 shows that the life cycle is negatively related to underpricing, particularly for firms following the reform. It implies that early-stage businesses have a higher underpriced. Additionally, prior to the reform, the outcomes are not significant. It suggests that although early-stage companies may be riskier, the fanatic sentiment following the reform spurred increased investment in risk initiatives with an expectation of larger return, finally resulting a higher underpricing.

Table7. The Effect of Firm Life Cycle

This table shows the effect of the firm life cycle on underpricing. The dependent variable is the firm's IPO underpricing. The variable *underpricing* is the first-day return of the IPO, which is the percentage change of the difference between the offering price and the first-day closing price. Control variables include *Ln(asset)*, which is the logarithm of the firm's total assets at the beginning of the issue year; *Ln(offering shares)* is the logarithm of the firm's shares offered in this IPO; *B/M* is the ratio of a firm's book value to market value, which is collected based on the most recent announcement date following an IPO; *Trading ratio* is the ratio of a firm's number of publicly traded shares to the total number of shares at the time of IPO; *Ln(Firm age)* is measured as the natural logarithm of the number of days since the founding of the firm; *Board number* is the number of board member at the time of IPO. *Cycle* is defined based on operating cash flow, investing cash flow, and financing cash flow. Firms with negative operating cash flow, negative investing cash flow, and positive financing cash flow are embryonic firms. Firms with positive operating cash flow, negative investing cash flow, and positive financing cash flow are at the growth stage. Firms with positive operating cash flow, positive investing cash flow, and negative financing cash flow are at the mature stage. Firms with negative operating cash flow, positive investing cash flow, and negative financing cash flow are in the decline stage. The dummy variable *cycle* is 1 for the embryonic stage, 2 for the growth stage, 3 for the mature stage, and 4 for the decline stage. Year and industry effects are controlled and standard errors are clustered by company. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. Robust standard errors are presented in parentheses.

Variables	Whole period	Before reform	After reform
Ln(asset)	5.42	2.57	6.01
	(17.43)	(2.35)	(48.38)
Ln(offering shares)	14.97	-2.49	43.36
	(20.37)	(3.07)	(51.46)
B/M	-397.37***	-72.35***	-994.49***
	(104.50)	(19.56)	(275.48)

Trading ratio	-509.69	-31.46	-942.38
	(315.25)	(42.71)	(851.46)
Ln(firm age)	16.09***	6.34***	60.95
	(5.34)	(2.12)	(43.84)
Board number	2.41	-0.38	-2.17
	(2.92)	(1.05)	(11.86)
Cycle	-10.98**	0.04	-31.13*
	(5.23)	(1.57)	(17.11)
Reform	114.34***		
	(29.75)		
Year effect	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes
Observations	482	370	112
R-squared	0.51	0.44	0.39

4.6 Robust tests

Even though the results discussed above demonstrate that reform can impact IPO underpricing, an endogenous issue may arise when a corporation is more underpriced due to the nature of the organization's operations. Therefore, I apply the propensity score matching procedure. The variables used for matching include Ln(asset), Ln(offering shares), B/M, and trading ratio when testing the effect of reform on underpricing. I match each observation in the treated group with the control group and estimate the average effect on the treated(TREATED). Panel A in Table 9 presents the results for TREATED, and the TREATED is positive and significant at 1%, indicating again that the reform can significantly increase the IPO underpricing. For Panel B, The variables used for matching include P/E, B/M, and Ln(asset) when testing the effect of underpricing on market transparency. The results show that TREATED is significantly negative for Amihud and significantly positive for P-S and turnover. This once more indicates that the reform can improve market transparency.

Table 8. Propensity Score Matching

This table illustrates the effect of the reform by employing the propensity score matching procedure. The variables used for matching include *Ln(asset), Ln(offering shares), B/M, and trading ratio* when testing the effect of reform on underpricing(Panel A). The variables used for matching include *P/E, B/M, and Ln(asset)* when testing the effect of underpricing on market transparency(Panel B). ***,**,and * indicates statistical significance of 1%,5%,and 10%. The standard errors are shown in parentheses below the coefficient estimates.

Panel A The effect of reform on underpricing

	underpricing
TREATED	202.79***
(Pre vs post-IPO reform groups)	(14.94)
Number of observation	1043

Panel B The effect of reform on market transparency

	Illiquidity(Amihud)	Liquidity(P-S)	Turnover
TREATED	-0.06***	0.00***	15.18***
(Pre vs post-IPO reform groups)	(0.0086)	(0.00)	(2.00)
Number of observation	53539	45500	53539

5. CONCLUSION

In this paper, I attmpte to analyze the 2020/06 reform on the Chi-Next board. Although some studies suggest that reform can improve the market and can lessen the IPO underpricing, the evidence from my study indicates that market liquidity significantly improved after the change, but IPO underpricing significantly increased. My next task is to identify a way via which that reform can have an impact on underpricing. I find that the sentiment can explain the larger underpricing following the reform, which is in contrast to the information asymmetry hypothesis, which claims that enhanced information asymmetry can also improve the IPO underpricing. After the reform, the investor becomes more optimistic about the market, and such enthusiasm attracts more people to participate in the market and push the market activity to a new level, raising irrationality and noise trading in the market, and finally leading to a higher underpricing. Because of the increased investor sentiment following the reform and the increased number of participants, the market is now more transparent.

Other variables including leverage and the firm cycle can also explain IPO underpricing and market liquidity. Debt is found to be positively correlated with underpricing after the reform, and early-stage companies' shows a higher underpricing after the reform. Favorable information conveyed through the reform increases market sentiment and encourage greater riskier investment. Firms with a higher level of debt and at the early-stage are more likely to be riskier and in a danger, which becomes the target of fanatic and irrational actions. Consequently, we see a higher underpricing.

The robust tests using the propensity score matching again demonstrate the impact of reform on underpricing and market liquidity. My upcoming research will concentrate on how reform affects IPO performance as well as how the Chi-Next board's influence spreads to the A-share SSE board.

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