Investor Sentiment and IPO Market Puzzles: Evidence from Hong Kong Stock Market

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Investor Sentiment and IPO Market Puzzles: Evidence from Hong Kong Stock Market

投資家のセンチメントと IPO 市場のパズル：
香港株式市場の実証結果にもとづいて

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1. Introduction

The capital market is a game between listed companies, underwriters, investors, and regulators and can be divided into primary and secondary markets. The primary market is primarily the place where financial products such as shares are sold to securities firms by institutions raising capital, which is equivalent to the wholesale market; the secondary market is the place where financial products are sold and purchased by institutional and individual investors, which is equivalent to the trading market. The two markets are interdependent and mutually constraining, with the primary market influencing the secondary market's activities and the secondary market's behaviour reacting to the primary market.

An Initial Public Offering (IPO) is the first time a company offers ordinary shares to the public and lists them for trading on the stock market. A company enters the secondary market through an IPO and realizes its financing needs. According to Efficient Market Theory (EMH), the market price of a stock reflects its intrinsic value. In recent years, scholars have identified several anomalies in the IPO market that challenge the efficient market hypothesis---short-run initial return and long-run underperformance. These anomalies as referred to as the New Issue Puzzles.

The short-run initial returns are as follows. In 1969, Reilly and Hatfield conducted their first analysis using a sample of 53 listed companies in the US capital market between 1963 and 1965. They found that the initial return on the first day of listing was 9.6%, much higher than the market benchmark return for the same period. McDonald and Fisher (1972) used a sample of 142 listed companies in the US and found that the average first-day initial return on these new shares was as high as 28.5%. Many scholars have studied IPOs in different countries, with different sample sizes, and over different periods. For example, reviews of Ibbotson (1975), Block & Stanley (1980), Chalk & Peavy (1987), and Miller & Reilly (1987) for the US stock market. Buckland et al. (1981) for the UK stock market. These studies show the IPO short-run initial return phenomenon across several periods and IPO samples in various stock markets, a phenomenon known as one of the New Issue Puzzles.

The long-run underperformance is as follows. Also known as "long-run IPO weakness," this is a phenomenon where the return on a new stock is lower than the average market returns one to three years after listing, starting on the first day of listing. Ritter first looked at and tested this phenomenon in 1991, using a sample of 1,526 companies in the US capital markets as his study, and found that while the new stocks performed well in the short run, they were weak in the long run. In addition to Ritter, other early scholars also studied the long-run performance of IPOs in major markets around the world, and the results indicated that these markets had negative relative returns and were generally characterized by long-run underperformance (Levis,1993; Ljungqvist,1996; Aggarwal et al., 1993). The long-run underperformance has also been described as another New Issue Puzzles.

The IPO market anomaly is a common phenomenon in global financial markets. This will have several adverse effects: many firms are keen to play IPOs, resulting in a large

amount of capital being stranded in the primary market and diminishing the efficiency of market allocation. Once it is determined that there will be no risk in the issuance of new shares and that the enterprises will be able to raise a large amount of hot money as long as they are listed, enterprises will strive to be listed as soon as possible, or even for the sake of being listed. At the same time, the decline in newly listed enterprises' long-term business performance will seriously undermine investors' confidence and prevent valuable financial resources from being allocated effectively and the value of scarce capital from being fully utilized.

How do you study the IPO puzzle? Initially, the primary market price suppression aspect was used to explain the first-day initial return of IPOs and the poor long-run returns of IPOs, i.e., the primary market offer price was lower than the intrinsic value of the stock. This explanation was premised on the assumption that the market was fully efficient. The findings have attributed the creation of IPO market anomalies to rational man and information asymmetry hypotheses, mainly the winner's curse hypothesis (Rock, 1986; Koh & Walter, 1989), the signal-sending hypothesis (Welch, 1989; Allen & Faulhaber, 1989), the IPO ex-ante uncertainty hypothesis (Beatty & Ritter, 1986), the underwriter reputation hypothesis (Booth & Smith, 1986) and the reduced control hypothesis (Brennan & Franks, 1997), among others. But the above hypothesis does not explain well the causes of IPO market anomalies.

However, is the premise of the hypothesis sound, i.e., is the market fully efficient or is the IPO trading price equal to the actual intrinsic value? Based on such doubts, scholars began questioning markets' efficiency. Ritter & Welch (2002) suggested the introduction of relevant theories from behavioural finance to explain these strange financial phenomena. The study of IPO price volatility has been greatly enriched by the involvement of behavioural finance, which explains the price depression in the primary market and the premium in the secondary market as follows: traders are not entirely rational, and noise traders make the IPO close above its intrinsic value on the first day of listing, and in the long run, as information is appropriated and investor sentiment falls back, giving investors a more objective view of the IPO, the price gradually falls back to its proper level. Behavioural finance is an excellent link to the various anomalies of IPOs and is a breakthrough in studying the "IPO puzzle."

Behavioural finance argues that the leading cause of market ineffectiveness is the deviation of stock prices from their intrinsic value due to factors such as investors' sentiment. In response to modern financial theory, behavioural finance replaces the assumption that investors are always rational in making investment decisions, arguing that investors are not always rational because they are prone to various behavioural biases. Such behavioural biases have implications for asset pricing; it implies that mean-variance portfolio theory (Markowitz, 1952) is replaced by behavioural portfolio theory (Shefrin & Statman, 2000). It also implies that traditional asset pricing models, such as the capital asset pricing model (Linter, 1964; Sharpe, 1964), are replaced by behavioural asset pricing models (Statman, 2014). This is because mean-variance portfolio theory and traditional asset pricing models are based on the assertion that expected returns are determined by risk, which is determined only by changes in the fundamental factors. In contrast, in addition to absolute risk, behavioural portfolio

theory and asset pricing models acknowledge the impact of behavioural biases on investors' decisions (Kapoor & Prosad, 2017).

Behavioural finance believes that the leading cause of market ineffectiveness is the deviation of stock prices from their intrinsic value due to factors such as investors' sentiment. The emergence of investor sentiment theory in behavioural finance can better unify and explain the anomalies in the market (Gornelli et al., 2006; Ljungqvist et al., 2006). Investor sentiment refers to an overall sentiment based on one's perception of various information, which includes expectations and judgments about the future of the market and listed companies. Behavioural finance research has shown that investor sentiment is inevitably linked to human judgment and investor behaviour and that investor sentiment influences specific investment decisions, more importantly when these decisions are associated with risk and uncertainty. The existence of optimistic or pessimistic attitudes towards stocks, which in turn leads to fluctuations in stock prices, makes investor sentiment one of the most critical factors in determining the movement of prices and market trends in securities markets. These irrational traders are sentiment investors in behavioural finance (Herve, Zouaoui et al., 2019). These investors' desires and perceived misperceived sentiment influence their preferences for certain stocks (Shefrin & Statman, 1984). As a result, they perceive this preference as basic information in their investment decisions and engage in irrational investment behaviour that they believe will allow them to sustain abnormal returns in the financial markets (Peress & Schmidt, 2017).

The phenomenon of IPO puzzles has been widely studied in the financial literature, and Ritter & Welch (2002) suggest that investor sentiment should help explain IPO puzzles. While scholars have recognized the importance of studying the impact of investor sentiment on IPO puzzles, the limited information available on investor sentiment relative to IPOs has limited the study of investor sentiment on IPO puzzles.

There have been many related prior studies that indicate that investor sentiment is an essential determinant of IPO short-run initial return or long-run underperformance (Ritter & Welch, 2002; Ljungqvist et al.,2004; Derrien, 2005; Cornelli et al., 2006; Cook et al., 2006; Yung et al., 2008; Derrien & Womack, 2008; Dorn, 2009; Jiang & Li, 2013; Najand et al.,2016 and so on).

The IPO market in Hong Kong, the largest international financial centre in Asia, has previously suffered from the same two IPO puzzles described above, which have caused significant losses to individual investors in the Hong Kong IPO market and have seriously undermined the resource allocation function of the IPO market.

In recent years, however, the short-run high initial return and long-run underperformance phenomenon in the Hong Kong IPO market has been significantly mitigated (Dawson & Hiraki,1985; Dawson,1987; McGuinness,1992; Chen et al., 2001; Cheng et al., 2004; Cheng et al.,2006; Vong, 2006; Vong & Zhao,2008; Mcguinness,2009; Jiang & Li, 2013). This has been attributed to the new dual-tranche offer mechanism' for IPOs adopted by the Hong Kong Stock Exchange since 1999, particularly its claw-back provision.

For the first time, Jiang & Li (2013) investigated the relationship between individual investor sentiment and IPO puzzles under a dual-tranche offer mechanism, using the

Hong Kong IPO market as an indirect proxy variable for individual investor sentiment by using individual investor demand at the issuance stage, i.e., the subscription rate of individual investors. They argue that individual investor sentiment at the issuance stage can be transferred from the issuance market to the trading market, leading to IPO prices exceeding the offer price in the short run. However, it does not significantly affect IPO prices in the long run. In other words, individual investor sentiment has a significant positive effect on short-run IPO initial return but no significant effect in the long run. However, their paper needs to investigate the dual-tranche offer mechanism's impact on IPO prices. Therefore, this paper continues to investigate the relationship between individual investor sentiment and the IPO puzzle under the conditions of the dual-tranche offer mechanism, using the Hong Kong IPO market as the object of study and behavioural finance as the theoretical basis, based on the prior research.

As Jiang & Li (2013) mentioned in previous studies, Hong Kong provides a unique institutional background for studying individual investor sentiment and its impact on IPO initial return: First of all, Hong Kong's IPO has a Dual-tranche offer mechanism, a public tranche for individuals investors, and a placing tranche for institutional investors. The public tranche is mainly to meet the subscription needs of individual investors. Individual investors' subscription rates primarily reflect individual investors' subscription needs, so individual investors' subscription rates can be used to measure individual investors' sentiment effectively. In recent years, more and more individual investors in mainland China can directly subscribe to the new IPO of the Hongkong stock market. And these individual investors need more basic financial investment knowledge and skills; most investors like speculation and blindly follow suit. These notable irrational individual investors further enable us to measure individual investors' sentiment in the issuance market and ultimately make Hong Kong an ideal place to study the influence of personal investor sentiment on IPO initial return.

In addition to the effects mentioned above, Cheng et al. (2005) also pointed out that it is essential to pay attention to the needs of individual investors in Hong Kong stock markets because institutional investors in Hong Kong stock markets like to make short-term investments. Many institutional investors will sell their pre-allocated shares on the first day of IPO trading, which will inevitably cause the pressure of IPO price decline. However, as the underwriter of the IPO, it is responsible for maintaining the new IPO price's stability when the recent IPO is listed and traded (Aggarwal, 2000; Ellis et al.,2000). Therefore, underwriters tend to allocate more shares to individual investors to reduce the pressure of falling prices caused by institutional investors' selling. Moreover, the increase in the percentage of individual investors will also expand the ownership base of the IPO (Lee et al.,1996) and improve the underwriters' reputation, which will help the same underwriter obtain more underwriting business and profits in the future. Based on the above advantages, individual investors have gained more and more shares in the process of Hong Kong's IPO.

Thirdly, Hong Kong has extraordinarily transparent and strict regulations on disclosing IPO data. This is another advantage distinguishing Hong Kong from other developed countries in Europe and the United States. According to the Hong Kong Stock Exchange regulations, data such as the subscription rate and subscription share

of individual investors must be made public after the book-building is over.

This paper has two main innovations: 1) In investigating the two main puzzles of IPO and investor sentiment, this paper directly uses a proxy variable for investor sentiment rather than an indirect variable for investor sentiment, as in prior studies. Whether or not indirect variables can replace investor sentiment is always more or less controversial and ultimately impacts the persuasiveness of the results. 2) This paper is the first to investigate the relationship between investor sentiment and the two major IPO puzzles under a dual-tranche offer mechanism. Although some scholars have previously proposed a dual-tranche offer mechanism in their papers (Mcguiness, 2009; Jiang & Li,2013; Chang et al., 2014), they have not clearly articulated what impact the dual-tranche offer mechanism has on the two major IPO puzzles. Therefore, this paper should explain the two major IPO puzzles under the dual-tranche offer mechanism.

2. Dual-tranche offer mechanism in the Hong Kong IPO market

This chapter briefly introduces the dual-tranche offer mechanism in Hong Kong, especially the most critical claw-back provision. Since 1999, most IPOs in Hong Kong have adopted a dual-tranche mechanism. The claw-back provision is mainly to adjust the IPO allocation share between institutional investors and individual investors to ensure that individual investors can increase their subscription shares when the demand of individual investors is high. The placing tranche is limited to institutional investors, while the public tranche is designed to attract individual investors.

In addition, the 18th Application Guideline of the Main Board Listing Rules stipulates that the total number of securities available for public subscription (taking account of any claw-back feature in the case of issues that involve both placement and public subscription tranches) are to be divided equally into pools: pool A and pool B. The securities in pool A should be allocated on an equitable basis to applicants who have applied for securities in the value of HK$5 million or less. The securities in pool B should be allocated on an equitable basis to applicants who have applied for securities with more than HK$5 million and up to the value of pool B. Where one of the pools is undersubscribed, the surplus securities should be transferred to satisfy demand in the other pool and be allocated accordingly. Applications should only be accepted from investors applying for the total number of shares initially allocated to each pool. Multiple applications within either pool or between pools should be rejected. Thus, the demand for public tranches lets us measure individual investor sentiment in the issuance stage.

According to the claw-back provision, where an IPO includes both a placing tranche and a public subscription tranche, the minimum allocation of shares to the subscription tranche shall be as follow: an initial portion of 10% of the shares offered in the IPO; whenever an IPO proves to be famous (high subscription rate), a claw-back provision that increases the number of shares to 30% when the total demand for shares in the subscription tranche is 15 times but less than 50 times the initial allocation; a claw-back provision that increases the number of shares to 40% when the total demand for shares in the subscription tranche is 50 times but less than 100 times the initial allocation; a claw-back provision that increases the number of shares to 50% when the total demand for shares in the subscription tranche is 100 times or more the initial allocation. Shares may be transferred from the subscription tranche to the placing tranche where there is insufficient demand in the subscription tranche to take up the initial distribution.

Many companies in mainland China also choose to make their initial public offerings (IPO) on the Hong Kong Stock Exchange. These Chinese companies are usually listed by issuing H shares, which refer to the shares of Chinese listed companies registered in mainland China and listed in Hong Kong, or red chips, which are for companies registered outside mainland China but with the majority of their business in mainland China.

Figure 1 depicts the general process of an IPO. After the roadshow, the underwriters determine the filling range of offer price, including the upper and lower offer price

limits, based on information gathered from institutional investors and analysts during the roadshow, and generally use the middle of the range as the expected final offer price. Investors will then begin to subscribe within the filling range. Once subscriptions are closed, the underwriters will determine the final offer price based on the results of the investor subscriptions. If the subscription multiple is vast, the underwriters will adjust the offer price upwards from the expected value, known as offer price revision. After that, the shares start to be listed and traded on the stock exchange. The closing price (opening price) on the first trading day is usually higher than the offer price. The percentage increase between the offer price and the closing price (opening price) on the first day of trading is known as IPO underpricing. However, there are instances where the closing price (opening price) falls below the offer price on the first day of trading. One year, two, or three years after that, the IPO price will start to fall or even fall below the closing price (opening price) on the day of the listing (opening price). This is called IPO long-run underperformance.

[Insert Figure 1]

Figure. 2 describes the Hong Kong book-building process for the initial public offering. In general, about three weeks before the listing, the roadshow begins. However, the roadshow is only for institutional investors, and individual investors cannot participate. Then, approximately two weeks before the offering, the prospectus is issued with the price range, and the next day the subscription begins. The subscription generally lasts about three or four days. After the subscription, the underwriter will set the final offer price. And the underwriter will disclose subscription multiples to the public by the Hong Kong Stock Exchange regulations one day before the listing. Suppose the subscription multiple reaches 15 times or more. In that case, the underwriter will transfer more shares from the placing tranche to the public tranche according to the claw-back provision to meet individual investors' needs. Therefore, the demand for a public tranche allows us to gauge investor sentiment in Hong Kong.

[Insert Figure 2]

Following Hong Kong, Taiwan has also introduced a dual-tranche mechanism since October 2006. Figure. 3 describes the Taiwan book-building process for initial public offering. The prospectus will be issued to investors about ten days before the listing. After that, the roadshow and subscription will be carried out simultaneously and end about five days before the listing, and then the final issue price will be determined. Although the Taiwan stock market is also a dual-tranche mechanism, it is very different from Hong Kong, especially in allocating new IPO shares. According to Taiwan's dual-tranche mechanism, the total quantity of shares issued to any single investor is no more than 5% of the offering shares.

[Insert Figure 3]

Figure. 4 describes the United States book-building process for initial public offering. Approximately 20 days before the listing, the issuer's underwriter starts the roadshow, and simultaneously the book-building process begins. The final offer price is priced just one day before the listing. However, until the final issuance price of the IPO is determined, underwriters in the United States will not disclose the last subscription multiple. It is challenging to judge the degree of recognition of individual investors for a new IPO. Moreover, 70% of the shares in the United States are distributed to institutional investors.

[Insert Figure 4]

In summary, compared with the 70% more stable distribution to institutional investors in the United States and any single investor to no more than 5% in Taiwan, Hong Kong's claw-back provision enables us to observe the sentiment of individual investors better.

Based on the reading of relevant literature and the study of relevant theoretical knowledge, this paper investigates the relationship between investor sentiment and the two major IPO puzzles by using behavioural finance theory as the theoretical foundation, building mathematical models and various measurement methods as research tools, and taking the two significant puzzles in the IPO market as the object of study, in conjunction with the unique dual-tranche mechanism of the Hong Kong IPO market. The paper consists of six chapters with the following main research content.

Chapter 1 is an introduction which describes the background and content of this thesis, followed by the reasons for selecting the Hong Kong IPO market as the subject of this study and the contributions of this paper to behavioural finance.

Chapter 2 briefly introduces the dual-tranche offer mechanism in Hong Kong, especially the most critical claw-back provision. In addition, the overall composition of the thesis is briefly described.

Chapter 3 studies the impact of investor sentiment on the two major IPO puzzles. In this chapter, the paper investigates whether investor sentiment in the Hong Kong IPO market impacts the two major IPO puzzles from a market-wide perspective. However, instead of using an indirect proxy variable for investor sentiment, as in previous studies, a direct variable for investor sentiment is used here. In addition, we investigated the relationship between investor sentiment and the volatility of short-run IPO initial returns.

Chapter 4 deals with the impact of investor sentiment on the short-run initial return of IPO and the volatility of IPO initial return under the dual-tranche offer mechanism. This is the first part of the study on investor sentiment and the IPO puzzle under the dual-

tranche offer mechanism.

Chapter 5 deals with the impact of investor sentiment on the long-run underperformance of IPOs under the dual-tranche offer mechanism. This is the second part of the study on investor sentiment and the IPO puzzle under the dual-tranche offer mechanism.

Chapter 6 is the conclusion. The main findings of this paper are summarized, and recommendations are made accordingly. Finally, the research shortcomings of this paper are presented, and the next steps of the research are looked into.

3. Index sentiment and IPO puzzles

3.1 Research related to the IPO puzzles

Derrien (2005) first demonstrates through theoretical analysis and mathematical methods that individual investor sentiment at the offer stage significantly impacts IPO prices, short-run initial return, and long-run underperformance. He argues that due to strict short-selling restrictions in the early stages of IPO listing, trading prices in the early stages of IPO listing are influenced mainly by over-optimistic traders, according to Miller's (1977) classic study. But the question he asks, based on the available empirical results, is why the effect of sentiment on post-IPO trading prices is only partially reflected in offer prices. In other words, why can't issuers use excessive investor optimism to price their IPOs at the highest price that noise traders are willing to pay? The model assumes that underwriters need to be concerned about the post-IPO performance of the IPO and that investor sentiment is not stable and may become relatively pessimistic after the IPO is listed, which may lead to the IPO falling below the offer price in the early stages of the IPO and the underwriters having to provide price support. The optimal choice is, therefore, to choose a more conservative offer price relative to the highest price that noise traders are willing to pay, which will result in a positive initial return on the IPO. However, as this offer price is still higher than its intrinsic value, the long-run underperformance of the IPO will occur as the IPO price converges to its intrinsic value in the long run. This would rationalize the seemingly contradictory phenomena of short-run IPO initial return and long-run underperformance.

On this basis, Derrien (2005) provides the first empirical analysis of the phenomenon associated with IPO prices under “hot” market conditions. He selects a sample of 62 IPOs conducted on the French stock exchange between 1999 and 2001. He finds a positive relationship between investor demand and market conditions. Moreover, high individual investor demand leads to high IPO offer prices, high levels of short-run initial return, and long-run underperformance. And he demonstrates for the first time that individual investor demand for IPO shares is highly variable and closely related to market conditions at the time of the offer. Individual investors behave the same way as noise traders in his model, with individual investor demand and post-sale trading activity depending on noise trader sentiment at the time of offer. He, therefore, uses for the first time the IPO subscription rate at the time of an offer as a proxy variable for individual investor sentiment.

Lundqvist et al.(2006) argue that investor sentiment theory can comprehensively explain IPO puzzles. Still, they also raise a similar question to Derrien (2005): if an issuer is rational and can choose to offer in a hot market, why does he not take full advantage of investor sentiment to increase the offer price and thus reduce the initial return level?

First, and for the first time, they define a hot market. They began by classifying the

demand investors in the IPO market, arguing that two categories of investors make up the IPO market. One category is the individual investor. This category of investors is characterized by a lack of theoretical financial knowledge and investment skills, an inability to make a correct judgment on the intrinsic value of stocks, and a preference for blindly following the trend, and they can quickly develop optimistic or pessimistic "sentiments" about the stock market, especially IPOs. According to Black (1986), sentiment indicates an incorrect judgment of the intrinsic value of an asset because they make noise as relevant information. So, they would label these investors as sentiment or noise investors. In their definition, a "hot" IPO market is characterized by the presence of optimistic investors.

A theoretical analysis by them shows that the optimal choice for an issuer whose goal is to maximize returns in the face of overly optimistic investor demand is to take full advantage of investor sentiment to maximize surpluses. But to achieve this goal, his optimal strategy is to first allocate IPO shares to institutional investors, who will then sell the shares to the gradually emerging sentiment investors. Institutions would limit the supply of shares by holding stocks of IPO shares to maintain their trading price. The initial return is fair compensation for institutions as sentiment demand may end in the following period, and institutions holding IPO shares may experience losses. However, the issuer still receives a portion of the proceeds from sentiment investors, with the offer price being higher than its actual value.

As this theoretical model yields a wealth of empirically testable hypotheses, including IPOs issued in hot markets suffer from long-run underperformance, whether calculated based on first-day trading prices or offer prices; when investor sentiment grows, IPO offerings increase in size, low-quality companies will also go public, and the overall quality of issuers will decline relatively; Underwriters will penalize investors who over-sell their allocated IPO shares in the early stages of the IPO; if investor sentiment is strong, or if institutions have sold out of their IPO stock, or if the hot market has ended, company insiders will get out of the lock-up provision relatively early. They argue that the large body of existing empirical research on IPOs essentially confirms their hypothesis and that their hypothesis can unify the IPO puzzles more reasonably.

As a result, scholars have found that the trading patterns of sentiment traders are related to the general sentiment of the market as a whole (Brown, 1999). The sentiment is defined as an investor's overall attitude towards a particular financial asset or financial market, and the sentiment is not dependent on the flow of essential information (Antoniou et al., 2015). Sentiment traders typically enter markets during periods of high overall market sentiment as they use high optimism to judge entry into financial markets (Shen et al., 2017). Due to the apparent over-reliance on high optimism, incorrect assumptions are made about the distribution of returns on financial securities, all of which lead to mispricing (Miwa, 2016). Sentiment traders are rarely present in financial markets during periods of low sentiment characterized by negative outlooks, as these sentiment traders are reluctant to hold short positions in their portfolios (Uygur & Taş, 2014). As a result, mispricing tends to occur during periods of high sentiment.

Cornelli et al. (2006) study the European grey market employing a mathematical

model and find that investor sentiment can influence investor demand for new shares and significantly impact the latest issue market. They use grey market data on European IPOs and see that when grey market prices are high, which implies that individual investors are optimistic, post-IPO prices are positively correlated with grey market prices. Long-run IPO price is negatively correlated with grey market prices.

In support of the findings of Derrien (2005), Ljunqvist et al. (2006), and Cornelli et al. (2006), Dorn (2009) uses the size of transactions in the book-building process to represent individual investor sentiment and shows that IPOs that individual investors actively purchase in the German grey market are associated with high first-day returns. Poor long-term returns six months after listing.

The academics in the above study on the European IPO market argue that the theoretical and empirical results they have derived are not only present in the European IPO market, but that as long as there are sentiment investors in the IPO market, excessive optimism by sentiment investors will produce the price patterns predicted in their model. Therefore, the same problem exists in North American and Asian markets.

In the US market, Chan (2010), Da et al. (2011), and Chan (2014) find a positive association between investors' sentiment and initial return but a negative relationship to long-run performance. This phenomenon of short-run initial return and long-run underperformance is also in Asian stock markets. Neupane et al. (2014), Song et al. (2014), Chung et al. (2017), Zhao et al. (2018), Tsukioka et al. (2018), and Matsuura et al. (2021) also find that investor sentiment has a positive effect on offer price and initial returns, but has a negative impact on long-run performance.

Not only that, but excessive individual investor sentiment can also lead to increased volatility of stock returns. When individual investor sentiment is too high, mispricing due to the increased incidence of sentiment traders leads to increased volatility of stock returns (Bahloul & Bouri, 2016). According to Devault et al. (2019), sentiment traders shift from stocks in which they invest to stores in which they speculate when individual investor sentiment is too high. Due to herding behaviour, sentiment investors are driven by sentiment, leading to a rapid increase in trading volume, which leads to increased volatility in stock returns (Blasco et al., 2018; Economou et al., 2018; Hudson et al., 2018). As the incidence of sentiment investors in the market increases, mispricing occurs. It is very profitable for rational arbitrageurs to enter the market to take advantage of this mispricing. However, they are constrained by sentiment trader risk and various arbitrage restrictions, such as short-selling restrictions. As a result, pricing bubbles are formed due to sentiment investors' initial return on risk and rational investors' lack of arbitrage activity (Taffler et al., 2017). When sentiment and expectations are reversed, these pricing bubbles burst due to sentiment investors' subsequent massive liquidation of portfolios. This process can cause volatility in financial markets (Shu & Chang, 2015).

As Asia's largest international financial centre, Hong Kong's prime location and tax regime attract companies worldwide to list in Hong Kong annually. Agarwal et al. (2008) first examined the relationship between investor demand and IPO initial returns and long-run performance, using a sample of 256 IPOs on the Hong Kong Main Board from 1993 to 1997. They find that high demand at the IPO issuance stage positively affects

initial returns but negatively impacts long-run performance. Low demand at the IPO issuance stage has precisely the opposite effect. However, in this study, the authors do not explicitly state that demand at the IPO issuance stage is individual investor sentiment. Jiang & Li (2013) first proposed the call of investor sentiment in a related study on the Hong Kong IPO market. They use the subscription rate at the IPO issuance stage as a proxy variable for investor sentiment to investigate the relationship between investor sentiment and IPO prices. Using a sample of 293 IPOs listed on the Hong Kong Main Board market between 2003 and 2009, they found that investor sentiment positively affects short-run initial returns. However, the study on long-run performance is not statistically significant, although it has the expected judgment. In this section, we intend to continue our analysis of the Hong Kong IPO market to examine whether there is a relationship between investor sentiment and IPO puzzles.

However, to date, academics have mostly looked at the impact of the short-run level of IPO initial return and the long-run underperformance from the perspective of individual investor trading. However, IPO returns are heavily influenced by the overall market environment. The primary sources of information on the overall market environment are the more influential stock indices for each country or the news or public social media.

Employing the Baidu Index as the proxy for abnormal investor sentiment, Zhao et al. (2018) examines whether abnormal investor sentiment has predictive power for IPO first-day initial return and long-run underperformance. They find positive correlations between abnormal investor attention and IPO first-day return, which indicates that a higher abnormal investor sentiment before IPO would result in a higher IPO first-day return. However, they find a weak significant correlation between IPO long-run underperformance and abnormal investor attention. Tsukioka et al. (2018) use the messages extracted from Yahoo! Japan Finance message boards as investor sentiment to investigate how investor sentiment affects high initial returns and long-run underperformance of IPO in the Japanese stock market. Selecting 654 IPOs, they find that excellent investor attention and bullish investor sentiment positively affect IPO offer prices and initial returns, leading to subsequent price declines. This suggests that excessive investor optimism can partially explain the IPO puzzles. Matsuura et al. (2021) use Google Search Volume Index (SVI) to measure individual investors' sentiment. Using 520 Japanese IPOs from January 2010 to December 2019, this study reveals that individual investors' sentiment is positively and significantly related to returns and trading volume on the first trading day. Return reversals are found, although individual investors' sentiment has an insignificant influence on IPO returns in the first trading year. However, the above research on investor sentiment is still a proxy variable as an indirect indicator of investor sentiment.

In contrast to these prior studies, this section intends to use a direct indicator of investor sentiment to conduct an investigation. In this section, we want to use the Hong Kong Hang Seng Index sentiment from the authoritative TRMI database as a direct variable indicator of investor sentiment to investigate the impact of Hang Seng Index sentiment on the short-run initial return and long-run underperformance phenomenon in the Hong Kong IPO market. Based on Agarwal et al. (2008) and Jiang & Li (2013),

the period of the data is expanded by selecting a sample of 1,165 IPOs listed on the Hong Kong Stock Exchange from 1999 to 2017. This is our purpose in this section.

In this section, four conclusions are drawn from the empirical analysis: 1) in the Hong Kong IPO market, there is a positive impact of optimistic investor sentiment in the issuance phase on IPO offer prices; 2) optimism investor sentiment in the issuance phase shifts from the issuance market to the circulation market and has a positive impact on IPO initial return; 3) optimism investor sentiment has a positive impact not only on short-run IPO initial return but also on the volatility of IPO initial return. 4) as optimistic investor sentiment slowly fades, IPO long-run returns show an underperformance, meaning that optimistic investor sentiment at the issuance stage has a negative impact on IPO long-run performance. These four results are consistent with the findings of prior studies such as Derrien (2005) and Cornelli et al. (2006), and so on.

Past research findings have supported the overvaluation hypothesis that IPOs are overpriced in the market in the short term after listing due to high investor optimism during the offering phase. At the same time, IPOs will experience a price reversal in the long run due to the disappearance of high investor optimism. Our most significant contribution in this section is the first test of the relationship between the overvaluation hypothesis and the IPO puzzle using a direct variable indicator of investor sentiment. Previous studies have used indirect variables as proxies for investor sentiment, and there are multiple proxies and no unique ones. Whether or not the indirect variables in the prior studies can be used as proxies for investor sentiment is often controversial and, therefore, not convincing. The direct variable indicator of investor sentiment used in this section is more persuasive.

3.2. Hypotheses development

We start with investor sentiment and the relationship with IPO offer price revision. An offer price revision is a well-known phenomenon. Benvensine & Spindt (1989) were the first to apply mathematical methods to demonstrate the existence of this phenomenon from the perspective of information asymmetry. Hanley (1993) proved their theory through empirical analysis. Derrien (2005) and Ljungqvist et al. (2006) were the first to demonstrate the offer price revision phenomenon from the perspective of behavioural finance. They mainly show that IPO offer prices are based on the firm's intrinsic value and information from noisy investors. Underwriters set the final offer price during the offering phase in partial response to the sentiment of noisy investors. Derrien (2005) empirically proves his prediction using the French IPO market as a proxy. Cornelli et al. (2006) found a positive effect of investor sentiment on IPO offer price revision in the European IPO market by using SVI as a proxy variable. Tsukioka et al. (2018) used Yahoo Japan Finance (YJF) message as a proxy variable for investor sentiment. They concluded that investor sentiment at the offer stage positively affects IPO offer prices.

Jiang & Li (2013) also demonstrate a positive relationship between individual investor sentiment and IPO offer price revision in the Hong Kong IPO market by using investor

subscription rate at the offer stage as a proxy variable for individual investor sentiment. These lead to our first hypothesis:

Hypothesis 1. Investor sentiment is positively related to the offer price revision.

Using data from a sample of French IPO markets, Derrien (2005) empirically demonstrates that individual investor sentiment during the offering phase causes higher IPO prices on the first day of trading, leading to high initial returns. Cornelli et al. (2006) use a sample of 486 IPOs in 12 European countries and find empirically that high individual investor sentiment in the European IPO grey market leads to high IPO prices and high levels of initial return on the first day of trading. Building on Derrien (2005) and Cornelli et al. (2006), Dorn (2009) uses trade size transaction in the offer phase of the German IPO market as a proxy variable for individual investor sentiment and finds that individual investor sentiment leads to a significant increase in IPO prices in the circulation market, which ultimately leads to high levels of initial return on the first day of listing.

In addition to the European market, as with Dorn (2009), Chan (2010) also uses trade size as a proxy variable for individual investor sentiment in the US IPO market and finds that IPO prices in the circulation market are heavily influenced by individual investor sentiment. Da et al. (2011) use SVI as a proxy variable for investor sentiment in the US IPO market and find a positive relationship between the level of IPO initial return and individual investor sentiment. Using a sample of 948 IPOs and the Chinese IPO market, Song et al. (2014) find that overvaluation by individual investors can well explain high IPO initial return levels in the Chinese IPO market. Chung et al. (2017) also use individual investors' IPO stock subscription rates of IPOs as their sentiment in the Korean IPO market and find a positive relationship between the level of IPO initial return and individual investor sentiment. Tsukioka et al. (2018) use YJF information as a proxy variable for investor sentiment in the Japanese IPO market and find a positive relationship between investor sentiment and IPO initial return. Matsuura & Yahya (2021), like Da et al. (2011), use SVI as a proxy variable for investor sentiment in the Japanese IPO market and find a positive relationship between the level of IPO initial return and individual investor sentiment.

Agarwal et al. (2008) find that high demand at the IPO issuance stage in the Hong Kong IPO market positively affects initial returns. Jiang & Li (2013) use the subscription rate of individual investors at the offering stage as a proxy variable for investor sentiment and similarly found that the subscription rate of individual investors at the offering stage in the Hong Kong IPO market showed a positive relationship with the level of IPO initial return. These lead to our second hypothesis:

Hypothesis 2. Investor sentiment is positively related to the IPO short-run initial return.

Chan (2014) thinks that individual investor sentiment should also impact the volatility of initial returns. A more significant divergence of opinion between overoptimistic individual investors and more rational institutional investors will lead to greater

volatility in trading prices.

The link between stock volatility and the trading activity of sentiment investors has long been confirmed by models in behavioural finance (Black, 1986; Campbell & Kyle, 1993; De Long et al., 1990). All of these models predict that sentiment investors significantly impact financial markets in terms of returns and volatility. An increase in sentiment trading activity leads to a rise in mispricing, which ultimately increases the volatility of returns and contemporaneous returns. Furthermore, in recent agent-based models (Ghonghadze & Lux, 2016; Hessary & Hadzikadic, 2017; Xiao et al., 2016), sentiment traders are seen as a source of additional volatility in the equity market. This is because mispricing during periods of high sentiment is eventually corrected through price declines and bubble bursts as the sentiment mean reverts. The reluctance of irrational investors to go short and their avoidance of financial markets leads to long periods of high volatility in the market.

The predictions of these models are consistent with the findings of several authors who have studied empirical analyses of the relationship between sentiment and volatility. For example, Chuang et al. (2010) find that changes in investor sentiment, which can be measured by trading volume, significantly impact the volatility of the Taiwan stock. Rahman et al. (2013) also examine the impact of trading by sentiment investors on expected returns and volatility in the Bangladesh stock market. Their results show that investor sentiment changes affect these stocks' returns and volatility. Rahman et al. (2013) show that sentiment significantly impacts conditional volatility in the US, Japan, UK, France, Germany, and Turkey financial markets. Abdelhédi-Zouch et al. (2015) also find that investor sentiment was decisive in amplifying volatility during the subprime financial crisis in the U.S. Naik and Padhi (2016) and Kumari & Mahakud (2016) find that sentiment affects conditional volatility in the Indian market. Ya'cob (2016) finds that sentiment predicts volatility in the Malaysian stock market. These lead to our third hypothesis:

Hypothesis 3. Investor sentiment is positively related to the volatility of IPO initial return.

Investor sentiment affects IPO long-run performance in addition to IPO initial return. In their model, Derrien (2005) finds that the IPO price is higher than its intrinsic value due to the underwriters' use of noisy investors' sentiment. However, once the sentiment of noisy investors disappears, IPO long-run performance will show poor performance, especially for IPOs with high demand from noisy traders. Ljungqvist et al. (2006) present another model that draws similar conclusions under different assumptions. In their model, issuers are assumed to allocate shares to institutional investors for gradual resale to sentiment investors who hold an optimistic view of a famous issue market. Since the offer price must exceed the underlying value to take advantage of the expected gains institutional investors receive from trading with sentiment investors, IPO firms subsequently underperform in the long run. Empirical studies of European IPO markets by Derrien (2005), Cornelli et al. (2006), and Dorn (2009) support the conclusion that solid investor sentiment at the time of issuance can lead to poor long-term IPO performance. In the US IPO market, similar findings have been found by scholars such

as Chan (2010), Da et al. (2011), Chan (2014), and so on. In the Asian IPO market, the same findings have been found by scholars such as Neupane et al. (2014), Song et al. (2014), Chung et al. (2017), Zhao et al. (2018), Tsukioka et al. (2018) and so on.

Agarwal et al. (2008) also find that high demand at the IPO issuance stage in the Hong Kong IPO market has a negative effect on long-run performance. However, Jiang & Li (2013) found that individual investor sentiment during the offering phase of the Hong Kong IPO market was not significantly associated with long-term IPO underperformance. These lead to our fourth hypothesis:

Hypothesis 4. Investor sentiment is negatively related to the IPO long-run performance.

3.3 Methodology and Data

3.3.1 Methodology

The IPO pricing in this section is captured from three perspectives: offer price revision, short-run initial return, volatility, and long-run performance. Following Jiang & Li (2013) and Tsukioka et al. (2018), this section measures the final offer price based on the offer price divided by the midpoint of the initial price range minus one (Hanley, 1993). Derrien (2005) and Ljunqvist et al. (2006) argue that noise trader sentiment can lead to higher pricing and volatility due to noise traders during the offering phase. However, noise-trader sentiment is unstable and may suddenly disappear after the IPO, causing the IPO to fall below the offer price. Hence, underwriters use this time to absorb noise-trader sentiment into the final offer price partially, that is to say, to make a partial revision from the initial expected offer price (midpoint of the initial price range).

$$\text{Revision}=(P_{offer})/P_{mid}-1 \quad (1)$$

Where Revision is the offer price divided by the midpoint of the initial price range, P_{offer} is the IPO final offer price, and P_{mid} is the midpoint.

Initial return is a widely studied IPO puzzle, and its definition is relatively uniform. We use the exact definition as Derrien (2005), Ljunqvist et al. (2006), and Cornelli et al. That is the percentage change between the offer and closing prices on the first day of listing. However, some scholars also define initial return as the percentage between the offer price and the closing price on the fifth day of listing (Chung et al., 2017). Therefore, we adopt both definitions.

$$\text{OTC1st} = (P_{1stclose}/P_{offer}) - 1 \quad (2)$$

$$\text{OTC5th} = (P_{5}\text{thclose}/\text{Poffer}) - 1 \quad (3)$$

Where OTC1st and OTC5th are the IPO initial return on the first day of listing and the

IPO initial return on the third day of listing, $P_{1stclose}$ is the closing price of the IPO on the first day of listing, $P_{5thclose}$ is the closing price of the IPO on the fifth day of listing, P_{offer} is the IPO final offer price.

The fourth dependent variable is the volatility of daily returns from day 1 of listed trading to the period up to day 5. We use the exact definition as Jog & Wang (2002), which is calculated as follows:

$$r_{i,t} = (P_{i,t} - P_{i,t-1})/ P_{i,t-1}, \qquad Var5 = \sum (r_{i,t} - \bar{r})^2/(n-1) \tag{4}$$

Prior research uses event time methods to compute abnormal performance, like the Cumulative Abnormal Returns (CAR) and the Buy-and-Hold Abnormal Returns (BHAR). Conceptually, the BHAR is more suitable for responding to investors' experiences. Still, its date-mixing effect can make the weakness of stocks more visible and give rise to spurious excess returns. Fama (1998) suggests that a long-term analysis should use the CAR rather than the BHAR, with the former corresponding to monthly returns and the latter to annual returns; compared to the latter, the former has a shorter interval and the detection of abnormal returns should be done by choosing the return scale bounded by the model used to estimate expected returns. Moreover, the latter has a very high level of skewed distribution, which impacts statistical inference.

Thus, even though the existence and level of IPO shares' underperformance heavily depend on the performance method used (Moshirian et al., 2010), CAR is the most appropriate from an econometric standpoint as distribution properties and test statistics for CAR are better; hence, consistent with the methodology adopted in Ritter (1991), Chi et al. (2010) and Matsuura & Yahya (2021), CAR is used to measuring abnormal returns $AR_{i,t}$:

$$AR_{i,t}=R_{i,t}-R_{m,t}, \qquad CAR_{i,t}=\sum AR_{i,t} \tag{5}$$

Where $R_{i,t}$ is the return of sharing i during month t, $R_{m,t}$ is the equally weighted benchmark return during month t.

Here we will use the cumulative abnormal returns for the 12 months after listing (CAR12M). Since all of the firms in the sample are listed on the Hong Kong Market, the Hang Seng Index return is used as a benchmark to compute abnormal returns.

3.3.2 Investor sentiment measures

Empirically, investor sentiment is hard to identify, so previous studies use various proxies to gauge investor sentiment: closed-end fund discounts (Lowry, 2003), the absence of block trades (Ofek & Richardson, 2003), subscription rate during book-building (Derrien, 2005), the observed propensity to buy on the IPO day (Dorn, 2009) to identify sentiment. Jiang & Li (2013) also use subscription rates as a proxy variable for investor sentiment.

Furthermore, many scholars have used the volume of investor searches for IPO companies in the better-known search engines in each country as a proxy variable for investor sentiment; Google Search Volume Index (Da et al., 2011; Matsuura & Yahya,

2021), Baidu Index (Zhao et al.,2018), Yahoo! Japan Finance (Tsukioka et al., 2018).

Although we are building on Agarwal et al.(2008) and Jiang & Li (2013) to continue to explore the two major puzzles of the Hong Kong IPO market, in this section, we mainly want to explore the impact of investor sentiment on IPO initial return and long-term underperformance from the overall market perspective, so in this section, we do not use the subscription rate at the issuance stage as an indirect proxy for investor sentiment, nor will we choose an indirect proxy for investor sentiment as scholars such as Da et al. (2011), Zhao et al. (2018) and Tsukioka et al. (2018) do. Here, we will directly select the Hong Kong Hang Seng Index sentiment from the TRMI data as a direct proxy variable for investor sentiment.

Thomson Reuters MarketPsych Indices (TRMI) analyze news and social media in real-time to convert the volume and variety of professional news and the internet into manageable information flows that drive sharper decisions. The indices are delivered as real-time data series that can easily be incorporated into investors' investment and trading decision processes – quantitative or qualitative.

Three key types of the indicator are provided:

- Emotional indicators such as Anger, Fear, and Joy
- Macroeconomic metrics including Earnings Forecast, Interest Rate Forecast, Long vs. Short
- Buzz metrics on the asset level, i.e., Buzz, and on market-moving topics for that asset, such as Litigation, Mergers, and Volatility.

The indicators are updated every minute for companies, sectors, regions, countries, commodities and energy topics, indices, and currencies. They can be translated directly into spreadsheets or charts that can be monitored by traders, risk managers, or analysts – or they can be plugged straight into investor's algorithms for low frequency or longer-term asset allocation or sector rotation decisions.

The indices are marked from either -1 to 1 or 0 to 1, corresponding to bipolar and unipolar index. In practice, those denoted as "unipolar" can, in fact, range below 0, although not below -1. This occurs because unipolar indices reflect the orthogonal nature of many single emotions and topics. A negative comment such as, "I don't enjoy owning this stock" is not emotively equivalent to, "I am pessimistic about the stock's prospects" or "I am angry with the company's management." The initial statement is precisely one of melancholic Joy, which decreases the overall Joy index for that company's assets. When there are many such negative Joy comments for an investment, the Joy index may show negative values. Nonetheless, in practice, unipolar indices are positive over 90% because language typically reflects positive assertions.

TRMIs are also evaluated on three different content sets: news, social media, and the combined content. History on all content dates back to the beginning of 1998.

- NEWS

Reuters news is present in the entire historical news dataset, as are a host of mainstream news sources collected by MarketPsych Data. During 2005, the archive began including Internet news content collected by Moreover Technologies. Moreover,

content is restricted to top international and business news sources, top regional news sources, and leading industry sources.

• SOCIAL MEDIA

The social media collection process is less diverse. It starts in 1998 with content collected by MarketPsych Data. Internet forums and finance-specific tweets compose this space. Starting in late 2008, Moreover Technologies social media content is included. Using popularity ranks measured by incoming links, this generally includes the top 30% of blogs, microblogs, and other social media content.

Not just as described above, the data of TRMI is divided into companies and company groups.

• COMPANY GROUPS ASSETS

Data is reported on 61 assets corresponding to groups of companies assembled according to domicile, market capitalization, and/or business classification. Many of these correspond to grouping in the hierarchical Thomson Reuters Business Classification (TRBC) system. The four levels are economic sector, business sector, industry group, and industry in descending order of hierarchy.

The 61 assets can be characterized in a few ways. Twenty-six are composed of US-based companies, while 17 are for non-US companies and another 18 are global. Twenty-one resemble equity indices and are filtered chiefly by market cap ranks. At the same time, the other 40 are composed according to a combination of TRBC code, domicile, and market cap above USD 100 million. We select the Hong Kong Hang Seng Index in the non-US company group.

• COMPANY GROUPS TRMI INDICES

The 31 TRMI indices for the company groups asset class carry six significant digits past the decimal point.

We use the data in the company groups. We select the index sentiment to gauge the investor sentiment. In this section, we intend to use the average stock index sentiment from the subscription beginning to the subscription end to proxy for investor sentiment.

3.3.3 Regression models

This section controls for a set of other independent variables in examining the influence of investors' sentiment on Hong Kong IPO price. The following regression models are developed in this study to investigate the effect of investors' sentiment on Hong Kong IPO prices.

$$\text{Revision} = \alpha + \beta_1 * \text{Sent} + \beta_2 * \text{HKHSIB3M} + \beta_3 * \text{OA} + \beta_4 * \text{Range} + \beta_5 * \text{Age} + \beta_6 * \text{Size}$$

$$+\beta_7 *PE+\beta_8 *H+\beta_9 *YD +\varepsilon. \quad (6)$$

$$OTC1st =\alpha+\beta_1*Sent+ \beta_2* HKHSIB3M+\beta_3*OA+\beta_4 * Range+\beta_5 * Age+ \beta_6 * Size +\beta_7 *PE+\beta_8 *H+\beta_9 *YD+\beta_{10}* Revision +\varepsilon. \quad (7)$$

$$OTC5th =\alpha+\beta_1*Sent+ \beta_2* HKHSIB3M+\beta_3*OA+\beta_4 * Range+\beta_5 * Age+ \beta_6 * Size +\beta_7 *PE+\beta_8 *H+\beta_9 *YD+\beta_{10}* Revision +\varepsilon. \quad (8)$$

$$Var5 =\alpha+\beta_1*Sent+ \beta_2* HKHSIB3M+\beta_3*OA+\beta_4 * Range+\beta_5 * Age+ \beta_6 * Size +\beta_7 *PE+\beta_8 *H+\beta_9 *YD+\beta_{10}* Revision +\varepsilon. \quad (9)$$

$$CAR12M =\alpha+\beta_1*Sent+ \beta_2* HKHSIB12M+\beta_3*OA+\beta_4 * Range+\beta_5 * Age+ \beta_6 * Size +\beta_7 *PE+\beta_8 *H+\beta_9 *YD+\beta_{10}* Revision +\varepsilon. \quad (10)$$

Sent is the most important independent variable; when Hypothesis 1, Hypothesis 2, and Hypothesis3 are supported, β_1 in Models 6, 7, 8 and 9 should all take significant positive values, while when Hypothesis 4 is supported, β_1 in Models 10 should take a significant negative value.

Where HKHSIB3M is the return of the Hang Seng Index in the three months before listing, HKHSI12 M is the return of the Hang Seng Index after 12 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated; otherwise, it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the establishment's year before a firm's listing. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise.

3.3.4 IPO Data

Here, we collect 1165 IPOs in the Hong Kong stock market from January 1999 to December 2017, including the main board and GEM.

The IPO data: the offer price, the upper and lower limits of the offer price, subscription rate, the date of listing, the closing prices on the first day of listing, the closing prices on the fifth day of listing, the closing price of the Hang Seng Index on the first day of listing and in the three months before recording, the date of incorporation of the company, the size of the company, the industry, whether it is backed by private equity and whether it is an H-share, all obtained from Bloomberg database.

3.3.5 Descriptive statistics

Table 1 provides the summary of descriptive statistics of the variables. The mean of news-social sentiment, news sentiment, and social sentiment are 0.03, 0.04, and 0.05;

their means are all positive. According to the TMRI data definition of index sentiment, when the value taken ranges from 0 to 1, investors are optimistic about the growth prospects of this market. And the average investor subscription multiples at the offering stage was 120.87, which is an enormous average. According to the definition and classification of sentiment investors in the study of Ljunqvist et al. (2006), many sentiment investors are in the IPO market.

The mean of Revision is 0.01, meaning the offer price revision has a mean of 1%. This indicates that underwriters typically increase the offer price after gathering the sentiment information from the book-building process.

The mean initial return on the first day of the listing is 11.27% (12.15%), and the global average initial return is roughly 20%. From here, the Hong Kong IPO market has a relatively low initial return, which is conducive to the capital market's financing and resource allocation functions. Although there is a large number of sentiment investors, its initial return is relatively low, and the reasons behind this will be discussed in Chapter 4. Here, we first test whether investor sentiment positively affects the initial return of IPO in the Hong Kong IPO market, as it does in IPO markets in other countries and regions.

The average volatility from the first to the fifth day of trading was 0.01, meaning that the fluctuations were low. However, individual investor sentiment in the offering market was very high, as evidenced by the individual investor subscription multiples. In general, high individual investor sentiment generally leads to high volatility, which is not very high in the Hong Kong IPO market, for fundamental reasons that we will discuss in detail in Chapter 4.

The mean IPO performance 12 months after the listing is 3.93%. It can be seen here that the long-run performance of IPOs in Hong Kong is positive. Although the long-run performance of Hong Kong IPOs 12 months after the listing has declined considerably compared to the first and fifth day of listing returns, it can still be maintained at a non-negative level. This shows a declining trend compared to the poor long-term performance of the Hong Kong IPO market before 1999. Not only that, many other IPO markets where returns on the first day of listing are very high but show a strong downward trend in returns over 1-3 years, with unusually high volatility. As with initial return, there is a large number of sentiment investors, and its rate of decline has slowed. As in other IPO markets, there has been a different rapid presentation of a long-run underperformance in the short term after the first day of listing. The reasons behind this will be discussed in Chapter 5.

The mean return of the Hang Seng Index in the three months before the listing was 3.34%, and the mean return 12 months after the listing was 3.26%. We judge the Hong Kong IPO market as a hot market in terms of the index and individual investor sentiment. In general, high investor sentiment and overall market conditions are inseparable, and investors will only be optimistic about the stock market if the prevailing market conditions are good. The Hang Seng Index returns for the three months before and 12 months after the IPO reaffirm this judgment.

The mean for OA is 0.42, indicating that 42% of the companies activated the over-allotment option, which is a large percentage. The activation of the over-allotment

option suggests a higher demand from investors during the issuance phase. The definition of the proxy variable for investor sentiment in Derrien's (2005) study indicates a higher investor sentiment during the issuance phase. Again, this also means there is a large number of sentiment investors.

The range has a mean of 0.22, a minimum value of 0, a maximum value of 2, and a dispersion of 200%. From here, it can be seen that the distribution in offer prices is very high, and a high dispersion indicates a high level of uncertainty, which leads to high initial return and poor long-term performance.

The mean age is 4.62, indicating that the issuing companies have been established for a relatively short period and are young companies. The faster the company is selected, the greater the uncertainty. This may also lead to high initial returns and poor long-term performance.

The mean size was 769.57 (HK$ million). The Hong Kong Stock Exchange requires the issuing company to have a combined profit (profit being the total profit) of HK$50 million for the three years before listing, so it is clear from this that the Hong Kong IPO market is relatively large in terms of the size of the issuing company. The larger companies are more mature, have better disclosure systems, and are less susceptible to manipulation, so their uncertainty is lower.

The mean of private equity is 0.15; 15% of total sample companies have PE capital or VC capital support during the IPO process, which accounts for a large proportion. However, PE capital or VC capital may withdraw at any time during the IPO process, indicating that the more significant the ratio of PE capital or VC capital, the more influential the uncertainty and the higher the IPO initial return and underperformance.

The mean of H shares is 0.14, meaning that 14% of the sample comprises a relatively large proportion of H shares. This is because H-shares refer to stocks of Chinese companies domiciled in Mainland China and listed in Hong Kong. The uncertainty caused by the incomplete information disclosure system of the Chinese stock market is also very high.

The mean of YD is 0.12, which indicates that 12% of the issuing companies in the full sample chose to raise capital through an IPO during the financial crisis, representing roughly one-tenth of the overall size. In general, during a financial crisis, individual investors could be even less confident in investing in the market as a whole, leading to a very high level of uncertainty in the IPO process and potentially leading to a higher offer price.

3.3.6 Correlation matrix

Table 2 reports the correlation matrix to observe the correlation and the potential of severe multicollinearity problems among independent variables. As reported, the correlation between the two independent variables was not severe as all correlation coefficients were below 0.90, satisfying the 0.90 thresholds (Asteriou & Hall, 2007).

In addition, from table 2, it can also be seen that the correlation coefficients of the first dependent variable, offer price revision and investor sentiment, are 0.07, 0.05, and 0.08. A weak positive correlation between offer price revisions and investor sentiment can be

seen here, this indicates that the underwriters will take advantage of investor sentiment during the offering phase when deciding on the final offering price. The following dependent variables are IPO initial return (OTC1st and OTC5th) and the volatility of IPO initial return. The coefficients between investor sentiment and initial return are 0.08, 0.09 and 0.05 (0.06, 0.06 and 0.02). The coefficients between investor sentiment and the volatility of initial return are 0.1, 0.1 and 0.05. From here, there is also a weak positive relationship between initial IPO returns and the volatility of initial return and investor sentiment, suggesting that offer price revision only partially reflects investor sentiment at the offering stage. The last dependent variable: IPO long-term performance (CAR12M) and investor sentiment, have correlation coefficients of -0.04, -0.07, and -0.05. A weak negative relationship between long-run IPO performance and investor sentiment can be seen here, suggesting that the high investor sentiment transferred from the issuance market to the circulation market after the IPO, fading away. As can be seen from the above correlation coefficients between the dependent variables and investor sentiment, the values of the correlation coefficients are relatively small for both the positive and negative correlations. This may be mainly because the investor sentiment we use here is the average during the issuance phase. Not only are the correlation coefficients relatively small, but the mean of investor sentiment is also relatively small, as seen in Table 1.

3.4 Empirical results

Here, we are prepared to test whether there is a relationship between investor sentiment and the IPO puzzles. First, we go to verify whether investor sentiment affects offer price revision. Then, we test whether offer prices adequately reflect investor sentiment, that is, whether investor sentiment positively impacts IPO initial return and the volatility of IPO initial return. Finally, we determine whether the transfer of investor sentiment from the issuance market to the circulation market persists over time. In other words, whether investor sentiment at the issuance stage continues to influence IPO prices in the long term.

3.4.1 Investor sentiment and offer price revision

Hypothesis 1 predicts a positive effect of investor sentiment on offer price revision. Here, we use the average index sentiment during the issue phase as a proxy variable for investor sentiment. Not only that, but we also include other control variables that may affect offer price revision.

The regression results are presented in Table 3. Here, the dependent variable is the offer price revision. The leading independent variables are the three investor sentiments, which are also the purpose of our validation. As shown from Model 1, Model 2, and Model 3, the regression coefficients for the three investor sentiments are all positive and significant at the 10%,0.1%, and 1% levels, respectively. This regression result

indicates that investor sentiment significantly and positively affects offer price revision.

According to Derrien (2005), market conditions also affect investor sentiment, so we use the Hong Kong Hang Seng Index returns (HKHSIB3M) for the three months before listing as a proxy for market conditions. The regression coefficients of market conditions are all positive and significant at the 1% levels, as seen in Model 1, Model 2, and Model 3. This also indicates that investor sentiment can influence offer price revision. This regression result is consistent with that of Jiang & Li (2013) and Derrien (2005).

Let us now look at the regression results for the other control variables. From Model 1, Model 2, and Model 3, we can see that the coefficients of the range are all positive and all significant at the 0.1% level. Range positively affects offer price revision because the more effective the content, the greater the uncertainty in the IPO offer price, resulting in a more significant price revision. Its regression results validate the relationship between the two.

From Model 1, Model 2, and Model 3, we can see that the age coefficients are all negative and significant at the 5% levels. There is a negative relationship between age and IPO initial return because the shorter the inception of the issuing company, the greater its uncertainty and the greater the uncertainty of the offer price. The regression results validate the relationship between the two.

From Model 1, Model 2, and Model 3 in Table 3, we can see that the coefficients of PE are all negative and significant at the 1% level. Because PE capital or VC capital may withdraw at any time during the IPO process, indicating that the greater the uncertainty and the higher the IPO offer price. We know there is a negative relationship between the two, and the regression results validate the connection.

We can also see from Model 1, Model 2, and Model 3 in Table 3 that the coefficients of H Share are all positive but insignificant. Although the results of the regression are not significant, we can know that there is a positive relationship between investor sentiment and the level of IPO price revision because both the incompleteness of information disclosure in Mainland China may create a great deal of uncertainty in the IPO offer price, ultimately leading to a greater level of IPO initial return on the first day of listing.

In summary, the regression results in Table 3 provide sufficient evidence that investor sentiment at the issue stage influences offers price revision, supporting the predictions of Hypothesis 1.

3.4.2 Investor sentiment and IPO short-run initial return

Another phenomenon that has attracted scholarly attention about the IPO short-run return is the phenomenon of the hot market, a concept first introduced by Ibbotson & Jaffe (1975) in their article "Hot Markets", published in the Journal of Finance. Since Ibbotson & Jaffe's (1975) elaboration of the "hot market" phenomenon, a significant number of financial economists have found a significant positive correlation between the number of IPOs and the IPO initial return (Ritter, 1984; Ibbotson et al., 1988; Lerner, 1994; Lerner & Tsai, 2000; Pagano, 1998; Loughran & Ritter, 2000; Ulrike, 2001;

Lowry & Schwert, 2002; Takasaki, 2003; Dermers, 2003; Lerner, 2003; Lowry et al.) As can be seen in Figure 5, between 1999 and 2017, high initial returns in the Hong Kong IPO market tended to be accompanied by a high number of offerings.

Not only that, but high initial returns are generally inseparable from market sentiment. As can be seen in Figure 5, except during the subprime crisis (2008 and 2009), overheated market sentiment tends to be accompanied by high initial returns (except in 2011). Since this section focuses on the relationship between investor sentiment and IPO initial return, the next step is to prepare an empirical analysis of the relationship between investor sentiment and IPO initial return through the OLS approach.

Hypothesis 2 predicts a positive effect of investor sentiment on IPO initial return. Here, the dependent variables are OTC1st and OTC5th.

The regression results are presented in Table 4. The regression results for OTC1st are presented in the Panel A of Table 4. The regression results for OTC5th are presented in Panel B of Table 4. Here we also focus on the effect of the three investor sentiments on the IPO initial return. From Panel A of Table 4, we can see that the coefficients of investor sentiment are all positive and significant at the 0.1%, 0.1% and 5% levels, respectively, indicating that investor sentiment has a significant positive effect on IPO initial return. From Panel B of Table 4, we also can see that the coefficients of investor sentiment are all positive and significant at the 0.1%, 0.1% and 1% levels, respectively; it's the same meaning as in Panel A.

The positive regression coefficients indicate that investor sentiment can drive IPO aftermarket prices above the offer price, leading to a high initial return. The significant relationship also suggests that individual investors at the issuance stage can explain IPO initial return through their sentiment towards IPOs. At the same time, this result supports the overvaluation hypothesis that investor optimism will drive IPO prices above intrinsic value to satisfy high IPO demand (Derrien, 2005; Ljunqvist et al., 2006; Baker & Wurgler, 2007; Song et al., 2014). The results obtained here can also support the findings reported by (Cornelli et al., 2006; Da et al., 2011; Derrien, 2005; Dorn, 2009; Tsukioka et al., 2018; Song et al., 2014; Matsuura & Yahya 2021). This regression result is also consistent with Agarwal et al. 2008 and Jiang & Li (2013).

From Pane A of Table 4 and Pane B of Table 4, we can also see that the regression coefficient for market conditions (HKHSIB3M) is all positive, and the coefficients in Panel A are significant at the 0.1% level. This suggests that market conditions can influence investor sentiment and lead to high IPO initial returns (Derrien, 2005).

And from Panel A of Table 4, we can also see that the regression coefficient of over-allotment (OA) is all positive, and both are significant at the 0.1% level. The same results are achieved in Panel B of Table 4. Over-allotment activation indicates high investor demand during the offering phase; in other words, high investor sentiment during the offering phase, which ultimately leads to a high IPO initial return.

In summary, the results of the empirical analysis support the prediction of Hypothesis 2, which means that investor sentiment has a positive effect on IPO initial return.

3.4.3 Investor sentiment and the volatility of IPO initial return.

Hypothesis 3 predicts investor sentiment's positive effect on the IPO initial return volatility. Here, the dependent variable is the volatility of daily returns from day 1 of listed trading to the period up to day 5.

The regression results are presented in Table 5. Here, we are most interested in the three dominant investor sentiments. From Model 1, Model 2 and Model 3 in Table 5, we can see that all three models' coefficients on investor sentiment are positive. The News-Social and News coefficients are significant at the 0.1% level, indicating that investor sentiment has a significant positive effect on the volatility of IPO initial returns. The results obtained here can also support the findings reported by (Chuang et al., 2010; Rahman et al., 2013; Chan, 2014; Abdelhédi-Zouch et al., 2015; Naik & Padhi, 2016; Kumari & Mahakud, 2016; Yacab, 2016; Bahloul & Bouri, 2016). The regression results here also indirectly support the overvaluation hypothesis that investor optimism will drive IPO prices above intrinsic value to satisfy high IPO demand (Derrien, 2005; Ljunqvist et al., 2006; Baker & Wurgler, 2007; Song et al., 2014).

In summary, the results of the empirical analysis support the prediction of Hypothesis 3, which means that investor sentiment has a positive effect on the volatility of IPO initial return.

3.4.4 Investor sentiment and IPO long-run performance

Hypothesis 4 predicts a negative impact of investor sentiment on the long-run performance of IPOs. Here, we use cumulative abnormal returns (CAR) 12 months after listing as the dependent variable (CAR12M).

In the section of Hypothesis 4, we state that the high initial return of IPO will only last for a while because individual investors are mainly irrational and do not invest primarily for the long term but for short-term speculation. And, because these irrational investors need more financial investment knowledge, they cannot make a proper judgment of the intrinsic value of a stock. They can only buy stocks based on their personal preferences or the investment actions of those around them. According to the overvaluation theory, once the effect of individual investors' optimism on share prices disappears, IPO performance reverses in the long run (Derrien, 2005; Ljunqvist et al., 2006; Baker & Wurgler, 2007; Song et al., 2014).

Regression results are reported in Table 6. Here again, we are most interested in the three dominant investor sentiments. As seen in Table 6, the regression coefficients for three investor sentiments are negative, indicating that investor sentiment has a negative effect on IPO performance in the long run; in other words, investor sentiment causes prices to be lower in the long term than in the short time. The three coefficients are all significant at the 0.1% levels, indicating that they are statistically significant. This regression result is consistent with that of Derrien (2005), Ljunqvist et al. (2006), and Baker & Wurgler (2007). This regression result is also compatible with Agarwal et al. (2008) but is not consistent with Jiang & Li (2013).

And the coefficients on over-allotment (OA) are all negative, as seen in Table 6. Also, the coefficient in model 1 is significant at the 5% level, and the coefficient in model 3 is significant at 10%. The negatively significant results suggest that investor optimism does not last long and fades away in the long run, ultimately leading to poor long-term IPO performance.

In summary, the empirical results support the prediction of Hypothesis 4. Investor sentiment leads to lower IPO prices in the long run than higher prices in the short run, ultimately leading to poor IPO performance in the long run.

3.5 Discussion

This chapter investigates investor sentiment in explaining Hong Kong IPO puzzles of initial return and underperformance, using a sample of 1165 IPOs issued from January 1999 to December 2017. Here, for investor sentiment, we mainly use the news index sentiment, social index sentiment, and the combined content of the Hong Kong Hang Seng Index from the TRMI database.

The main contribution of this section is that, for the first time, direct variables of investor sentiment are used to explain the two significant puzzles of IPOs from a market-wide perspective. Whereas previous studies have primarily used proxies for investor sentiment, such as individual subscription rates during the offering phase, trade size transactions, or Google search volume indices (SVI) as proxies for investor sentiment, which have been more or less controversial, this section's approach of using direct variables for investor sentiment directly is more convincing than using indirect proxies.

The main findings of this section are that investor sentiment is significantly positively related to IPO offer price revision, short-run initial return and the volatility of initial return and significantly negatively associated with long-run performance. The first three findings would suggest that individual investor optimism in the issuance market would be transferred from the issuance market to the circulation market, driving the IPO price above intrinsic value in the short term in response to high investor demand for the IPO, ultimately leading to high initial return and volatility. The fourth conclusion suggests that investor optimism in the short time fades in the long term, allowing stock prices to reverse in the long term and ultimately leading to IPO underperformance in the long term.

The first two findings in this section are consistent with those of Agarwal et al. 2008 and Jiang & Li (2013) and with those of scholars such as Derrien (2005) and Ljunqvist et al. (2006). The third finding is new for Jiang & Li (2013), as the relationship between investor sentiment and the volatility of IPO initial returns needed to be verified in their paper. The fourth conclusion in this section is also consistent with the findings of Derrien (2005), Ljunqvist et al. (2006), and Agarwal et al. (2008). And these findings also provide support for the overvaluation hypothesis. However, the fourth conclusion needs to be consistent with the results of Jiang & Li (2013). They conclude that the effect of investor sentiment at the issuance stage on long-term IPO underperformance

is not statistically significant. The different findings may be because we have chosen a different perspective from that of Jiang & Li (2013), who take the perspective of individual investors, while we take the perspective of the market as a whole. In Chapters 4 and 5, we will also use the same proxies of investor sentiment as Jiang & Li (2013) to continue to test the puzzle of the Hong Kong IPO market.

4. Investor sentiment and short-run initial return

4.1 Research related to the IPO short-run initial return

IPO initial return theories can be divided into two categories based on the rational person and information asymmetry hypotheses and those based on behavioural finance.

Scholars attempted to explain IPO initial return in terms of information asymmetry. Under the assumption that the secondary market is rational and efficient, initial return in the primary market is mainly considered regarding information asymmetry. Baron et al. (1982) argue that the intrinsic value and market demand determine the price of an IPO, and the reputation of the underwriter, who has more information than the issuer and tends to depress the price to ensure the success of the issue, called the investment banking model. Rock et al. (1986) propose a winner's curse model between investors and investors and a signalling theory between issuers and investors, which explains the initial return in the primary market for IPOs from the perspective of information asymmetry. However, Ritter (1991) points out that IPOs perform weaker than comparable companies and broad market indices 3-5 years after listing; that is to say, there is long-term weakness. At the same time, the first-day excess returns of IPOs will fluctuate significantly due to different market conditions, a phenomenon that the theory of primary market initial return needs to explain.

Since then, many scholars have attempted to explain IPO initial return from the perspective of behavioural finance, and investor sentiment, particularly, has received considerable attention. While traditional finance is based on the full rationality of investors, behavioural finance theory is based on the limited rationality of investors. In recent years, scholars have gradually used investor sentiment based on behavioural finance theory for modelling or empirical evidence. According to Back et al. (1986), investor sentiment refers to the fact that investors make certain judgments about the cash flows and risks of an asset based on the information available to them, thus forming an assessment of the value of that asset. Therefore, different investors will have foreign judgments and expectations about the same purchase. Delong et al. (1990) first proposed the theory of investor sentiment and developed the related DSSW model. The model suggests that there are rational and noisy investors in the market and that noisy traders are influenced by the sentiment of noisy traders, making the price of IPOs highly volatile. Lakonishok et al. (1994) developed the LSV model, which suggests that first-day high initial return results from investors overreacting to stocks (over-optimism or pessimism) and judging them based on the information disclosed in the IPO. Baberies et al. (1995) further enriched the LSV theory. They proposed the BSV model based on the LSV model, arguing that the leading cause of initial return is the role of investor psychology. There are two main psychologies, one is conservatism, that is, not correcting with changing external conditions, and the other is representation bias, that is, not recognizing the correct understanding of the nature of things, leading to misperceptions. These two psychologies lead to market prices deviating from the stock

prices based on the efficient market assumption. Daniel & Hirshleifer (1998) use the DHS model to verify that investors' overconfidence in assets can lead to price deviations from fundamental positions and that as public information is disclosed and investors return to rationality, the short-term returns on equity returns begin to reverse.

Derrien (2005) builds on numerous previous models and, for the first time in his study, provides mathematical proof of the IPO initial return theory and an empirical analysis of the French IPO market as the subject of his research. He argues that due to the existence of strict short-selling restrictions in the early stages of IPO listing and according to Miller's (1977) classic study, the trading price in the early stages of IPO listing is primarily influenced by over-optimistic traders, leading to a higher price than the offer price in the early stages of IPO listing and thus to high initial return. And for the first time in his study, individual investor demand at the issue stage was used as a proxy variable for individual investor sentiment. It was found that the higher the individual investor demand at the issuance stage, the higher the short-term returns after the IPO.

After Derrien (2005), Ljunqvist et al. (2006) also provide mathematical proof of the IPO initial return theory. They argue that there are institutional investors and sentiment investors in the market. Faced with the over-optimistic demand of sentiment investors, the optimal choice of an issuer whose goal is to maximize returns is to take full advantage of investor sentiment to obtain maximum surplus. To achieve this goal, his optimal strategy is to first allocate IPO shares to institutional investors, who will then sell the shares to emerging sentiment investors. The excessive optimism of the sentiment investors leads to a higher price than the offer price in the early stages of the IPO, which in turn leads to a high initial return. Cornelli et al. (2006) also study the European grey market using a mathematical model and find that investor sentiment can influence investor demand for new shares and significantly impact the new issue market.

So far, evidence has shown that investor sentiment is an essential determinant of IPO initial return (Derrien,2005; Cornelli et al., 2006; Ljungqvist et al., 2006; Cook et al., 2006; Dorn,2009 and so on). These prior studies have reached the same conclusion. For European and American stock markets, individual investor sentiment during the issuance phase positively impacts short-term IPO initial return. Moreover, Ritter (2003) conducted an empirical analysis with 38 Asian countries as samples and confirmed that the IPO initial return level of Asian stock markets was significantly higher than that of European and American stock markets.

The initial return of IPO in Hong Kong is also well-documented by scholars. Hiraki (1985) and Dawson (1987) reached similar conclusions on the Hong Kong stock market from 1978 to 1984. Mcguinness (1992) follows Hiraki (1985) and Dawson (1987) to study the IPO initial return in Hong Kong. His research examined 80 Hong Kong IPOs over 1980—90. The post-listing returns for the IPOs indicate that significant positive initial returns occur during the first day of trading and disappear after that. Chen (2001) continues to reveal Hong Kong's high initial return puzzle by analyzing the underwriter’s price difference and its relationship with the initial return. He pointed out that the underwriter's price difference may represent a clear pricing risk of the initial public offering and is positively related to the IPO initial return, indicating implicit

pricing risk. Cheng (2004) extends the existing work by examining the intraday behaviour of IPOs. This paper examines the intraday patterns of Hong Kong IPOs from 1995 to 1998. The research results show a lot of initial returns in the opening transactions of new stocks. Vong (2006) uses the data of many IPOs in Hong Kong to conduct research and shows that the subscription rate provided contains essential information of its own. In other words, it proves that the well-known relationship between the initial return and the ex-post volatility of return is false, and the volatility is related to the unpredictable component of the subscription rate. Agarwal et al. (2008) employ a data set for IPOs between 1993 and 1997 from the Stock Exchange of Hong Kong. They find that IPOs with high investor demand realize significant initial returns, while IPOs with low investor demand realize negative initial returns.

However, for Hong Kong, Asia's largest international financial centre, its IPO initial return is relatively mild compared with other Asian stock markets. Moreover, since the 1980s, many scholars have conducted empirical analyses on Hong Kong's IPO initial return (Dawson & Hiraki,1985; Dawson,1987; McGuinness,1992; Chen et al., 2001; Cheng et al., 2004; Cheng et al., 2006; Vong, 2006; Vong & Zhao,2008; Mcguinness, 2009), and from these prior studies can be seen that since 1999, Hong Kong's IPO initial return has begun to show a downward trend.

The above findings may be due to a new redistribution mechanism proposed by the Securities and Futures Commission of Hong Kong in 1999, known as the “dual-tranche” offer mechanism. The SEHK recognizes that retail investors are often crowded out of the hot IPO market, so it has been trying to modify and improve the provisions on IPO allocation for a long time. Finally, a new distribution mechanism was issued in 1998. This mechanism has several features, the best known of which is the claw-back provision. The essential function of the claw-back provision is to adjust supply and demand during the issuance phase.

Before Mcguinness (2009)'s research, prior Hong Kong-based studies have dealt predominantly with Initial Public Offerings (IPOs) configured in a single-tranche offer form (see McGuinness (1992); Cheng et al. (2004); Fung et al. (2004); Vong (2006) for the mainboard; and Vong & Zhao (2008) for the Growth Enterprise Market). Mcguinness (2009) is the first time to study Hong Kong's IPO under the dual-tranche mechanism. However, he is mainly based on the theory of information asymmetry. He reveals how a range of ex-ante and ex-post variables contribute to the initial IPO initial return level. After his research, Chang et al. (2014) took Hong Kong, Taiwan, and the United States IPO price discovery as the research object. By comparing Hong Kong and Taiwan under the dual-tranche mechanism with the United States, which is not under the dual-tranche mechanism, they have reached a non-contradictory conclusion with Ljungqvist & Wihelm (2002), that is, the dual-tranche mechanism will lead to inefficiency in the primary IPO market. It can be seen that Mcguinness (2009) believes that the dual-tranche mechanism is conducive to the Hong Kong IPO, but Chang et al. (2014) do not think so.

Jiang & Li (2013), like Derrien (2005), use individual investor demand at the issuance stage, that is to say, the subscription rate of individual investors, as a proxy variable for individual investor sentiment to investigate for the first time the relationship between

individual investor sentiment and IPO prices in the Hong Kong IPO market under a dual-tranche offer mechanism. Jiang & Li (2013) believe that under the dual-tranche offer mechanism, the underwriters will use irrational investors' sentiment to transfer this sentiment from the primary market to the circulation market and further increase the IPO price level.

However, Jiang & Li (2013) do not specify whether the dual-tranche offer mechanism impacted the IPO initial return phenomenon. So, this paper will continue to use the Hong Kong stock market as a sample and study the impact of investor sentiment on IPO initial return. The difference is that this paper will focus on researching whether the effect of investor sentiment on the level of IPO initial return after implementing the dual-tranche offer mechanism will reach the same conclusions as the previous studies (Derrien,2005; Jiang & Li, 2013). Using a dual-tranche offer mechanism will curb short-term IPO initial return, and we will test whether this is correct, which is the purpose of this section of our research.

By selecting a sample of 1107 IPOs from 1999 to 2017, we draw three conclusions in this section: first, for IPOs with a dual-tranche offer mechanism, investor sentiment during the issuance phase has a positive effect on IPO short-run initial return and the volatility of IPO short-run initial return after listing if the claw-back provision is not triggered, which is consistent with the findings of prior studies (Derrien, 2005; Jiang & Li, 2013). Second, individual investor sentiment at the offering stage is too high, leading to the triggering of the claw-back provision. In that case, the claw-back provision can dampen over-optimistic individual investor sentiment at the offering stage and, thus, the short-run IPO initial return after listing. Third, the triggering of the claw-back provision has the effect of suppressing the volatility of the IPO's initial return.

Our study contributes to the literature in this section on investor sentiment and IPO initial return in the following ways: first, by studying a sample of IPOs using a dual-tranche offer mechanism, we identify that when IPOs are popular, the triggering the claw-back provision can regulate the supply and demand of individual investors, enabling individual investors to subscribe to a large extent to the IPOs they want to subscribe to, thus making individual investors who would otherwise be crowded out owners, leading to an expansion of ownership. Second, we confirm that for a sample of IPOs using a dual-tranche offer mechanism, the triggering of supply and demand by individual investors at the issuance stage triggered by the claw-back provision can result in individual investors eventually subscribing to a large extent to the shares they want to invest in, providing a degree of dampening of individual investor sentiment at the issuance stage. Third, the dampening of optimistic individual investor sentiment by the triggering of the claw-back provision could provide some relief from the degree of deviation of IPO prices from intrinsic value caused by optimistic investor sentiment, which in turn will reduce the enormous post-IPO buying pressure on individual investors, and ultimately dampen excessive IPO initial return and the volatility of IPO initial return in the short term after listing.

4.2. Hypotheses development

Derrien (2005) and Ljungqvist et al. (2006) show that when individual investor sentiment is bullish at the offering, individual investors' sentiment leads to favourable IPO pricing. Using data from a sample of French IPO markets, Derrien (2005) empirically demonstrates that individual investor sentiment during the offering phase causes higher IPO prices on the first day of trading.

Most of the previous studies so far have reached the same conclusion: investor sentiment has a positive effect on the short-run initial return of the IPO. Cornelli et al. (2006) use a sample of 486 IPOs in 12 European countries and find empirically that high individual investor sentiment in the European IPO grey market leads to a high IPO initial return. Dorn (2009) uses trade size transactions in the offer phase of the German IPO market as a proxy variable for individual investor sentiment and finds that individual investor sentiment leads to a significant increase in IPO prices in the circulation market and a high IPO initial return. The same conclusion was reached by Chan (2010) and Da et al. (2011) in the US IPO market and Song et al. (2014), Chung et al. (2017), Tsukioka et al. (2018) and Matsuura & Yahya (2021) in the Asian IPO market.

Agarwal et al. (2008) also find that high demand at the IPO issuance stage in the Hong Kong IPO market positively affects initial returns. Jiang & Li (2013) use the subscription rate of individual investors at the offering stage as a proxy variable for investor sentiment and similarly found that the subscription rate of individual investors at the offering stage in the Hong Kong IPO market showed a positive relationship with the level of IPO initial return.

The results of these past studies support the overvaluation hypothesis that IPOs are overpriced in the initial aftermarket due to high investor optimism.

As mentioned, Hong Kong's IPO initial return is relatively mild compared with other Asian stock markets. Moreover, since the 1980s, many scholars have conducted empirical analyses on Hong Kong's IPO initial return (Dawson & Hiraki,1985; Dawson,1987; McGuinness,1992; Chen et al., 2001; Cheng et al., 2004; Cheng et al.,2006; Vong, 2006; Vong & Zhao,2008; Mcguinness,2009), and from these prior studies, it can be seen that since 2001, Hong Kong's IPO initial return has begun to show a downward trend.

The above findings may be due to a new redistribution mechanism proposed by the Securities and Futures Commission of Hong Kong in 1999, known as the “dual-tranche” offer mechanism. This mechanism utilizes several features, especially the claw-back provision that allows for important supply and demand adjustments during the offer period.

Derrien (2005) and Jiang & Li (2013) both use the subscription rate of individual investors at the offering stage as a proxy variable for investor sentiment. The subscription rate is the number of shares applied for individual investors divided by the number of shares allocated for individual investors.

Due to the claw-back system's existence (in other words, there are concerns about noisy trading behaviour based on individual investors' sentiment), individual investors

will be distributed a large number of stocks before listing for supplies for which the claw-back provision is triggered. When the Claw-back provision is triggered, the number of shares allocated to individual investors will increase, and the subscription rate will decrease.

This means that the percentage of individual investors (they have considered noise traders driven by sentiment) who are willing to buy their shares on the listing date is lower than when the claw-back system is not triggered. As a result, it is predicted that individual investor sentiment during the issuance phase is dampened, and price distortions caused by investor sentiment in the short term after listing are also dampened, so we make the following hypothesis:

Hypothesis 5. The triggering of the claw-back provision has the effect of suppressing overheating behaviour of individual investors for popular IPO and suppressing IPO initial return.

Jog & Wang (2009) investigated aftermarket volatility and initial return of the IPOs listed on the Toronto Stock Exchange from 1990- 1999. Their results show an overall positive relationship between IPO underpricing and aftermarket volatility. Lowry et al. (2010) investigated the volatility of IPO initial returns in the US stock market with a selection of 11,734 IPOs. Their results find that the volatility of IPO initial returns has a strong positive correlation with IPO initial returns over the 1965 to 2005 period. Rashid et.al (2013) used a sample of 443 stocks listed in Malaysia from January 2000 to December 2010 as the study sample. Their results show that the initial return and market condition are positively related to the volatility of the IPO initial return. Loughran & McDonald (2013) collected 1887 completed U.S. IPOs from 1997-2000. They find a positive correlation between IPO price revision, initial returns and volatility of initial returns.

In this case, the dampening of over-optimistic individual investor sentiment by triggering the claw-back provision could dampen not only the IPO initial returns to a certain extent, as described above but also the volatility of the IPO initial returns to a certain extent. So, we make the following hypothesis:

Hypothesis 6. The triggering of the claw-back provision has the effect of suppressing overheating behaviour of individual investors for popular IPO and suppressing the volatility of IPO initial returns.

4.3 Methodology and Data

4.3.1 Methodology

There are three dependent variables in this section: OTC1st, OTC5th and Var5, respectively, which are Eqs. 2, 3 and 4 in Chapter 3, are defined in the same way as in Chapter 3.

4.3.2 Investor sentiment measures

For the first time, Derrin (2005) uses subscription rates as a proxy variable for investor sentiment. Jiang & Li (2013) also use the subscription rate for the public as investor sentiment. After these, others use individual investors' demands to proxy for individual investor sentiment. Neupane et al. (2014) and Chung (2017) use it as a proxy for individual investor sentiment in the Indian and Korean stock markets, respectively. Here, to confirm whether the claw-back provision has an inhibitory effect on IPO short-run initial return in the Hong Kong stock market after Jiang & Li (2013), we also use subscription rate for the public as individual investor sentiment: the number of shares applied for individual investors divided by the number of shares allocated for individual investors.

In addition, individual investor sentiment and market sentiment are inseparable and share the same trends. In Chapter 3, we examined the relationship between market sentiment and IPO short-run initial return and long-run performance, respectively. Here we introduce market sentiment as an essential independent variable in the regression model in this chapter. Therefore, verifying the correlation coefficient between market sentiment and individual investor sentiment is necessary. As can be seen from Table 7, the correlation coefficients are all positive. The correlation coefficients between individual investor sentiment and market sentiment are 0.4453, 0.5857, and 0.2667, respectively. The correlation coefficients between individual investor sentiment positively correlate with market sentiment.

4.3.3 Regression models

This section also controls for a set of other independent variables in examining the influence of investors' sentiment on Hong Kong IPO initial return. The following regression models are developed in this study to investigate the influence of investors' sentiment on Hong Kong IPO initial return.

$$OTC1st = \alpha+\beta_1*Sent+\beta_2 * Sent* CB+\beta_3 *CB+\beta_4 * Index\ sentiment+ \beta_5* HKHSIB3M +\beta_6*OA+\beta_7 * Range+\beta_8 * Age+ \beta_9 * Size+\beta_{10} *PE+\beta_{11} *H+\beta_{12} *YD+\beta_{13}* Revision +\varepsilon. \quad (11)$$

$$OTC5th = \alpha + \beta_1 * Sent + \beta_2 * Sent * CB + \beta_3 * CB + \beta_4 * Index\ sentiment + \beta_5 * HKHSIB3M + \beta_6 * OA + \beta_7 * Range + \beta_8 * Age + \beta_9 * Size + \beta_{10} * PE + \beta_{11} * H + \beta_{12} * YD + \beta_{13} * Revision + \varepsilon. \quad (12)$$

$$Var5 = \alpha + \beta_1 * Sent + \beta_2 * Sent * CB + \beta_3 * CB + \beta_4 * Index\ sentiment + \beta_5 * HKHSIB3M + \beta_6 * OA + \beta_7 * Range + \beta_8 * Age + \beta_9 * Size + \beta_{10} * PE + \beta_{11} * H + \beta_{12} * YD + \beta_{13} * Revision + \varepsilon. \quad (13)$$

Sent, Sent *CB and CB are the three most important independent variables here. “Sent” uses the subscription rate of individual investors before the claw-back system is triggered. "CB" is the claw-back provision. It's a category dummy variable; if the claw-back system is triggered, CB is 1 when the subscription rate of individual investors is 15 times or more and less than 50 times, 2 when it is 50 times or more and less than 100 times, and 3 when it is 100 times or more. Sent* CB is a cross-term of both of them. Thus, when supporting hypothesis 5 and hypothesis 6, β_1 is expected to make a significant positive value, β_2 is scheduled to take a significantly negative value, and β_3 is expected to take a significantly negative value.

In addition to the three leading independent variables, there are nine control variables. Index sentiment is Market sentiment from the TRMI database, including News-Social, News and Social, respectively. HKHSIB3M is the return of the Hang Seng Index in the three months before listing. OA is a dummy variable that equals one when the over-allotment option is activated. Otherwise, it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the establishment's year before a firm's listing. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range.

4.3.4 IPO Data

In this section, we have selected a sample of 1107 IPOs that used the dual-tranche” offer mechanism.

4.3.5 Descriptive statistics

Table 8 provides the summary of descriptive statistics of the variables for the DT (dual-tranche) IPO sample.

Table 8 shows that the DT IPO sample has a mean initial return on the first (fifth) listing day of 11.14% (12.31%). Since the average short-run initial return in the global IPO market is around 20%, it is clear from this that the short-term initial return of the DT IPO sample in the Hong Kong IPO market is relatively low. The minimum value of

the initial return on the first listing day for the DT IPO sample was -48.67%, and the maximum value was 335.39%.

Table 8 also shows that the DT IPO sample has a mean volatility of on the first listing day 0.01, from here we can see that the volatility of the initial returns of the DT IPO sample is small.

The mean sent for the DT IPO sample is 127.51, as seen in table 8, indicating that the DT IPO sample at the offering stage was 127.51 times subscribed by individual investors. The over-subscription seen here during the offering phase implies that individual investor sentiment is overly optimistic, and the individual subscription rate for most IPOs will trigger the claw-back provision.

Table 8 also shows the mean of news-social sentiment, news sentiment, and social sentiment are 0.04, 0.04, and 0.06; their means are all positive, which indicates that investors are optimistic about the growth prospects of this market.

From the above analysis, we can see that individual investor sentiment is in an overheated state for the DT IPO sample. Overheated individual investor sentiment generally tends to lead to higher mean and volatility of IPO initial returns. However, the mean and volatility of IPO initial returns of the DT IPO sample are relatively low because the triggering of the claw-back provision has somewhat dampened the overheated investor sentiment during the issuance phase, resulting in a minor deviation of the IPO price from its intrinsic value, which in turn has dampened the mean and volatility of the initial returns in the circulation market.

4.3.6 Correlation matrix

Table 9 reports the correlation matrix for the DT IPO sample also to observe the correlation and the potential of severe multicollinearity problems among independent variables. As reported, the correlation between the two independent variables was not severe as all correlation coefficients were below 0.90, satisfying the 0.90 thresholds (Asteriou & Hall, 2007).

Table 9 also shows that the correlation coefficients between individual investor sentiment and three dependent variables are 0.33, 0.22, and 0.09, respectively, indicating that individual investor sentiment and three dependent variables are positively correlated. The positive correlation coefficients between individual investor sentiment and three dependent variables suggest that offer price revisions are only partial and that offer prices do not fully reflect individual investor sentiment during the issue phase. Not only that, but market sentiment also has a positive correlation with the three dependent variables. The correlation coefficients between News-Social sentiment and the three dependent variables are 0.12, 0.07, and 0.04, and the correlation coefficients between News sentiment and the three dependent variables are 0.12, 0.07, and 0.06, respectively. The correlation coefficients between Social sentiment and the three dependent variables had correlation coefficients of 0.09, 0.03 and 0.02, respectively. A weak positive correlation between the three market sentiments and the three dependent variables can also be seen here.

4.4 Empirical results

In this section, we investigate whether the triggering of the claw-back provision has the effect of suppressing overheating behaviour of individual investors for popular IPO and suppressing short-run initial return and volatility of IPO initial return. Here, to test whether Hypothesis 5 and Hypothesis 6 are supported, we conduct a regression analysis using a DT (dual-tranche) IPO sample with a category dummy variable.

4.4.1 Investor sentiment and IPO short-run initial return

Table 10 shows the regression results for the DT IPO sample. There are two dependent variables here, OTC1st and OTC5th. The two-panel tables in Table 10 include three models each. Model 1 is the model used to test individual investor sentiment and the dependent variables when the claw-back provision is not triggered; that is to say, it is the same model as the prior study, where the most important independent variable is Sent. Models 2 and 3 test whether the claw-back provision is triggered by suppressing excessive individual investor sentiment to the extent that it ultimately dampens the short-run initial return. The most significant variables here are Sent*CB and CB. And the relationship between individual investor sentiment and the dependent variables when the claw-back provision is not triggered, so Sent is also an independent variable that needs to be tested. Hypothesis 5 would be supported if the signs of the coefficients on these three main independent variables were consistent with predictions and significant.

First, we do a regression analysis of the DT-IPO sample without market sentiment. The coefficients of sent are positive and significant at the 0.1% level, as shown in Model 1 of Panel A and Model 1 of Panel B in Table 10. The positive regression coefficient indicates that investor sentiment before the claw-back provision is triggered has caused the IPO to be priced higher than the IPO offer price upon listing. And the significant results suggest that individual investors can explain returns in the short term through their sentiment toward IPOs. This finding can offer support to the finding reported by (Derrien, 2005; Cornelli et al., 2006; Dorn, 2009; Da et al., 2011; Jiang & Li, 2013; Song et al., 2014; Tsukioka et al., 2018; Matsuura & Yahya, 2021). This study can also support the overvaluation hypothesis that investors' optimism will push the price of IPOs higher than intrinsic values responding to the high demand for the IPOs (Derrien, 2005; Ljunqvist et al. (2006); Baker & Wurgler, 2007).

The coefficients on Sent*CB are all negative in Table 10 for Model 2 of Panel A and Model 2 of Panel B. Not only that, the coefficient for Model 2 of Panel A is significant at the 0.1% level, and the coefficient for Model 2 of Panel B is significant at the 1% level. And the Sent coefficients in all two models are positive and significant at the 0.1% level.

The coefficients on CB are negative, as seen from Model 3 of Panel A and Model of Panel B in Table 10. Not only that, the coefficient for Model 3 of Panel A is significant at the 0.1% level, and the coefficient for Model 3 of Panel B is significant at the 5%

level. The coefficients of Sent*CB in all two models are negative and significant at the 0.1% level for Panels A and B. The coefficients on Sent in all two models are positive and significant at the 0.1% level for Panel A and B. The regression coefficients of Sent*CB and CB are both negative, suggesting that if high investor sentiment at the issuance stage triggers the claw-back provision, the claw-back provision will discourage high investor sentiment at the issuance stage, and the significant results suggest that the extent to which IPO prices deviate from intrinsic value due to optimistic investor sentiment has moderated. This ultimately led to a moderation of the IPO price above the offer price in the short term after listing; that is to say, the IPO initial return in the short time after the listing was somewhat curbed.

Secondly, because individual investor sentiment is positively correlated with market sentiment, we have included market sentiment as a separate independent variable in the model for regression analysis. The dependent variables are still OTC1st and OTC5h.

Table 11 presents the results of the regressions with the market sentiment included in the model. Panel A, Panel B, and Panel C are the regression results for News-Social sentiment, News sentiment, and Social sentiment, respectively. This is the same regression result that we obtained in Chapter 3. Here we need to focus not only on the market sentiment but also on the three most important independent variables of Sent, Sent*CB, and CB based on the inclusion of market sentiment.

The coefficients of News-Social sentiment are positive and significant at the 5% and 1% levels, respectively, as seen in Models 1 and 2 of Panel A. Meanwhile, the coefficients of Sent for both models are positive and significant at the 0.1% level, the coefficients of Sent*CB for both models are negative and significant at the 1% level, and the coefficients of CB for both models are negative and significant at the 0.1% and 5% levels, respectively. The coefficients of News sentiment are positive and significant at the 1% and 0.1% levels, respectively, as seen in Models 1 and 2 of Panel B. Meanwhile, the coefficients of Sent in both models are positive and significant at the 0.1% level, the coefficients of Sent*CB in both models are negative and significant at the 1% level, the coefficients of CB in both models are negative and significant at the 0.1% and 5% levels respectively. The coefficients of Social sentiment are positive and significant at the 0.1% and 1% levels, respectively, as seen in Models 1 and 2 of Panel C. Meanwhile, the coefficients of Sent for both models are positive and significant at the 0.1% level, the coefficients of Sent*CB for both models are negative and significant at the 1% level, the coefficients of CB for both models are negative and significant at the 0.1% and 5% levels respectively. As can be seen from the regression results in Table 11, the results for the three independent variables Sent, Sent*CB, and CB remain significant after the further inclusion of market sentiment, as expected from the hypothesis, further suggesting that the trigger of the claw-back provision ultimately has a degree of dampening effect on short-term IPO initial return through the dampening of overoptimistic individual investor sentiment.

In summary, these findings support the predictions of Hypothesis 5, that is to say, the triggering of the claw-back provision has the effect of suppressing overheating behaviour of individual investors for popular IPO and suppressing short-run initial returns.

4.4.2 Investor sentiment and volatility of IPO initial return.

Table 12 presents the results of the regressions with Var 5 as the dependent variable. Panel A and Panel B are the regression results for the DT-IPO sample. The difference between these two panels is that Panel A's model does not include market sentiment, while Panel B's model does.

Table 12 contains three models in each Panel. We first examine Panel A of Table 12, where, as in Table 12, the three most important independent variables in Panel A of Table 12 are Sent, Sent*CB and CB. We then examine Panel B, the regression results of adding market sentiment as a separate independent variable in the model. Our hypothesis 6 is confirmed if the signs of the coefficients on these three main independent variables were consistent with predictions and significant.

The coefficient of Sent is positive and significant at the 0.1% level, as seen in Model 1 of Panel A in Table 12. The significantly positive result indicates a positive correlation between individual investor sentiment and the volatility of IPO short-run initial returns before the claw-back provision is triggered; in other words, over-optimistic individual investor sentiment leads to excessive volatility of IPO short-run initial returns.

The coefficient on Sent*CB is negative, consistent with predictions, and significant at the 0.1% level, as seen in Model 2 of Panel A in Table 12. At the same time, the coefficient on Sent remains positive and significant at the 1% level. The coefficient on CB is also negative, consistent with predictions, and significant at the 0.1% level, as seen in Model 3 of Panel A in Table 12. Meanwhile, the coefficient on Sent is positive and significant at the 10% level, while the coefficient on Sent*CB is still negative and significant at the 5% level. The coefficients on Sent*CB and CB are both negative and significant, suggesting that the triggering of the claw-back provision ultimately has some dampening effect on the volatility of short-run IPO initial returns through the dampening of over-optimistic individual investor sentiment.

Panel B of Table 12 shows the regression results after the inclusion of market sentiment. Model 1 from Panel B of Table 12 shows that the coefficient on News-Social is positive and significant at the 0.1% level. Meanwhile, the coefficient on Sent is positive and significant at the 5% level, while the coefficients on Sent*CB and CB are both negative and significant at the 0.1% level. Model 2 of Panel B in Table 12 shows that the coefficient of news is positive and significant at the 0.1% level. Meanwhile, the Sent, Sent*CB, and CB coefficients have the same sign and significance level as Model 1. Model 3 of Panel B in Table 12 shows that the coefficient on Social is positive and significant at the 10% level. Meanwhile, the coefficients on Sent are positive and significant at the 5% level, while the coefficients on Sent*CB and CB are both negative and significant at the 10% level and 0.1% level, respectively.

As can be seen from the regression results in Panel B of Table 12, the results for the three independent variables Sent, Sent*CB, and CB remain significant after the further inclusion of market sentiment, as expected from the hypothesis, further suggesting that the trigger of the claw-back provision ultimately has a degree of dampening effect on the volatility of IPO short-run initial return through the dampening of excessive individual investor sentiment.

In summary, these findings support the predictions of Hypothesis 6, that is to say, the triggering of the claw-back provision has the effect of suppressing overheating behaviour of individual investors for popular IPO and suppressing the volatility of IPO short-run initial return.

4.5 Discussion

In this section, we investigate the relationship between individual investor sentiment and short-run IPO initial return and the volatility of IPO initial return under the unique dual-tranche offer mechanism of the Hong Kong IPO market, using individual investor demand at the issuance stage, that is to say, subscription rate, as a proxy variable for individual investor sentiment. We select the same sample of 1107 IPOs.

The regression analysis of these samples confirms the most important prediction of this section: that is, for the sample of IPOs with a dual-tranche offer mechanism, if individual investor demand during the issuance phase is too high, that is to say, if individual investor sentiment is too high, the claw-back provision will be triggered. The triggering of the claw-back provision brings down the subscription rate by expanding the supply to individual investors at the issuance stage and can reduce the subscription rate of individual investors. In other words, triggering the claw-back provision can dampen optimistic individual investor sentiment during the issuance phase and reduce the extent to which the IPO price deviates from its intrinsic value due to optimistic investor sentiment. In turn, it can reduce the buying pressure in the secondary market brought about by optimistic investors and ultimately curb the IPO short-run initial return and the volatility of the IPO initial return to a certain extent.

The overvaluation hypothesis suggests that over-optimistic individual investor sentiment at the offering stage can lead to IPOs being overly priced in the initial aftermarket. In contrast, the triggering of claw-back provisions under the dual-tranche offer mechanism can dampen the high investor sentiment caused by a popular IPO. It will ultimately moderate excessive IPO initial return.

5. Investor sentiment and long-run underperformance

5.1 Research related to the IPO's long-run underperformance

Long-run underperformance of IPOs, also known as "weak long-run performance of IPOs," is a phenomenon in which the return of an IPO is lower than the average market return for one to three years after listing, starting with the first-day trading price of the stock.

Behavioural finance provides a good perspective on the weak long-run performance of IPOs, which needs to be explained by efficient market theory.

Investor sentiment plays a vital role in explaining the aftermarket underperformance of IPO shares. The explanation of how the price of financial securities is affected by investor sentiment was initially proposed by Miller (1977). Miller assumes there are short-sale constraints and divergence of opinion among investors about the valuation of the securities. If optimistic investors are bullish on a stock and are willing to invest in that stock, it will cause the stock price to rise; conversely, pessimistic investors are bearish on the stock but cannot express their will in the stock market due to short-selling restrictions. Therefore, in the stock market, optimistic investors control the price of a stock. The longer the stock has been on the market, the more investors have a better understanding of the value of the stock, the less disagreement there is between investors, and the more rational pessimistic, and optimistic investors are. The price of the stock increasingly converges to its intrinsic value.

Building on Miller (1977), Aggarwal & Rivoli (1990) proposed the Fanatical Investor Hypothesis, which argues that during the initial IPO period, the market is often populated by passionate investors who have psychological biases such as overconfidence, resulting in high initial IPO prices and that when their fanaticism fades, the IPO stock price will fall back to its intrinsic value. Rajan & Servaes (1997) also argue that investors are always over-optimistic about IPOs, leading to high initial returns and that the market will lead to an increase in the number of subsequent IPOs, and the greater the forecast bias, the worse the long-term performance of the IPOs will be.

Some studies relate Miller's divergence of opinion hypothesis to investor sentiment in the IPO market. Like IPO underpricing theory, Derrien (2005) first illustrates the long-term underperformance of IPOs through a combination of mathematical proof and empirical analysis. He argues that, according to Miller's (1977) classic study, the initial trading price of an IPO is heavily influenced by over-optimistic traders, resulting in an IPO that trades above the offer price in the early stages of listing. However, he argues that even if there are many noisy investors, the IPO cannot be priced at the highest price that noisy traders are willing to pay because investor sentiment is unstable. It may become relatively pessimistic after the IPO is listed, leading to the IPO falling below the offer price in the early stages of the listing. Therefore, the optimal choice is a more conservative offer price relative to the highest price noise traders are willing to pay.

However, as this offer price is still higher than its intrinsic value, there will be long-term underperformance of the IPO as the IPO price converges to its intrinsic value in the long run. Ljungqvist et al. (2006) similarly demonstrate mathematically that IPOs underperform in the long run.

Following the theoretical analysis, Derrien (2005) also conducted an empirical study using a sample of French IPOs from 1999 to 2001, using individual investor demand for subscriptions as a proxy variable for noise trader sentiment. The data analysis finds that individual investor demand shows a significant negative correlation with the long-term performance of IPO stocks, implying that the more optimistic the investor sentiment at the time of the issue, the greater the IPO overpricing.

In addition to Derrien (2005), several other scholars have studied the European IPO market and found a negative relationship between optimistic individual investor sentiment during the offering phase and long-term IPO performance. Cornelli et al. (2006) use grey market data on European IPOs and find that when grey market prices are high, which implies that individual investors are optimistic, long-run IPO prices negatively correlate with grey market prices. Dorn (2009) uses the size of transactions in the book-building process to represent individual investor sentiment and shows that IPOs actively purchased by individual investors in the German grey market are associated with poor long-term returns six months after listing.

Long-run IPO underperformance is found in the European IPO market, the US IPO market, and the Asian IPO market. Chan (2010), Da et al. (2011), Chan (2014), and Saade (2015) find that the US IPO market also suffers from long-term underperformance caused by optimistic investor sentiment during the offering phase. Neupane et al. (2014), Song et al. (2014), Chung et al. (2017), Zhao et al. (2018), and Tsukioka et al. (2018) find the same conclusions in the Asian IPO market.

Hong Kong is the most important international financial centre in Asia and has provided many Asian and multinational companies with fundraising opportunities. But long-run underperformance was also in Hong Kong stock markets before 1999.

Mcguinness (1993) selects a sample of Hong Kong IPO data between 1980 and 1990 for the first time to examine the phenomenon of long-run IPO underperformance from the perspective of behavioural finance. Measuring excess market returns from the first closing traded price in the stocks to various closing dates within a 12-month post-listing period indicated that favourable returns within the first few months of listing were reversed, leading to a longer-term return decline. The speculative bubble argument was posited as the most plausible explanation for the post-listing return behaviour observed.

Agarwal et al. (2008) examine the relation between pre-offering demand and aftermarket performance of IPO firms in the Hong Kong stock market. They obtain the data from SEHK and the Pacific-Basin Capital Markets (PACAP) Research Center. Their total sample consists of 256 IPOs from 1993 to 1997. Finally, Agarwal et al. (2008) find that IPOs with high investor demand realize significant positive initial returns but negative long-run excess returns, while IPOs with low investor demand realize negative initial returns but positive long-run excess returns. Agarwal et al. (2008)’s result on the relation is consistent with the speculative bubble hypothesis. Investor demand for an IPO is primarily driven by investors' over-optimistic or over-pessimistic reactions to

pre-offering information about an IPO's prospects. High investor demand for an IPO could be due to investor over-optimism about a firm's future. High demand is more likely to create a speculative bubble, temporarily pushing the stock's price above its actual value. However, a speculative bubble would ultimately be corrected, in which case they would observe a relatively high positive short-run return followed by a negative long-run return for the IPO.

Past research findings have supported the overvaluation hypothesis that IPOs are overpriced in the market in the short term after listing due to high investor optimism during the offering phase. At the same time, IPOs will experience a price reversal in the long run due to the disappearance of high investor optimism. In Chapter 4, we investigate the relationship between investor sentiment and IPO underpricing under the dual-tranche mechanism, which is unique to the Hong Kong IPO market. Through empirical analysis, we find that the claw-back provision under the dual-tranche offer mechanism dampens IPO underpricing. Therefore, in this section, we also want to investigate whether the claw-back provision under the dual-tranche offer mechanism also moisturizes the long-run underperformance of IPOs.

Using a sample of 293 IPOs in Hong Kong, Jiang & Li (2013) investigate for the first time the impact of individual investor sentiment on the long-run performance of IPOs under the dual-tranche offer mechanism. They used the subscription rate for the public tranche to proxy for individual investors' sentiment of IPOs listed on mainboard from 2003 to 2009. They prove that the coefficients of sentiment are not significant. This differs from the finding of Agarwal et al. (2008) that subscription rate is negatively related to the long-run performance of Hong Kong IPOs.

Therefore, in this section, we also build on Jiang & Li (2013) to investigate two aspects of the Hong Kong IPO market. First, we investigate whether the impact of investor sentiment on the long-term performance of IPOs before the triggering of claw-back provisions is consistent with prior research. Secondly, we investigate whether the claw-back provision has a dampening effect on long-term IPO performance when the claw-back provision is triggered. This is our purpose in this section.

Using the same period and the same number of IPO samples as in Chapter 4, we also draw two conclusions in this section: first, for IPOs with a dual-tranche offer mechanism, investor sentiment during the issuance phase has a negative effect on IPO long-run performance if the claw-back provision is not triggered, which is consistent with the findings of prior studies (Derrien, 2005), but is not consistent with the results of Jiang & Li (2013). Second, individual investor sentiment at the offering stage is too high, leading to the triggering of the claw-back provision. In that case, the claw-back provision can dampen excessive individual investor sentiment at the offering stage and, thus, the long-run IPO underperformance.

Our study contributes to the literature in this section on investor sentiment and IPO underperformance in the following ways. For example, for the IPO sample without the dual-tranche offer mechanism, the deviation of IPO price from intrinsic value caused by optimistic investor sentiment at the issuance stage gradually returns to intrinsic value after listing as optimistic investor sentiment disappears, leading to long-run IPO underperformance. However, we confirm that for IPOs with a dual-tranche offer

mechanism, the triggering of the claw-back provision will dampen to some extent the deviation of IPO price from intrinsic value caused by optimistic investor sentiment at the issuance stage, which in turn will reduce the selling pressure of individual investors in the long run after listing, and ultimately dampen to some extent the long-run underperformance of the IPO.

5.2. Hypotheses development

Derrien (2005) argues that IPO stocks are, on average overpriced when noise traders are in a bullish mood at the time of the IPO. Furthermore, the degree of overpricing depends on the strength of the bullish sentiment of noise traders. If this variable is reflected in demand from individual investors, then the average price of IPO stocks will be higher when the demand from individual investors is high. Once the effect of noise trader sentiment on IPO prices disappears, issues with high individual investor demand will experience long-term underperformance. Ljungqvist et al. (2006) present another model that draws similar conclusions under different assumptions. In their model, issuers are assumed to allocate shares to institutional investors for gradual resale to sentiment investors with an optimistic view of a widespread issue market. Since the offer price must exceed the underlying value to take advantage of the expected gains institutional investors receive from trading with sentiment investors, IPO firms subsequently underperform in the long run.

Most of the previous studies so far have reached the same conclusion: investor sentiment has a negative effect on the long-run performance of the IPO. Cornelli et al. (2006) and Dorn (2009) also find the same conclusion in the European IPO market. The same decision was reached by Chan (2010) and Da et al. (2011) in the US IPO market and Song et al. (2014), Chung et al. (2017), and Tsukioka et al. (2018) in the Asian IPO market.

Agarwal et al. (2008) also find that high demand at the IPO issuance stage in the Hong Kong IPO market has a negative effect on long-run performance. Jiang & Li (2013) use the subscription rate of individual investors at the offering stage as a proxy variable for investor sentiment. But they prove that the coefficients of sentiment are insignificant. This differs from the finding of Agarwal et al. (2008) that subscription rate is negatively related to the long-run performance of Hong Kong IPOs.

These past studies' findings also support the overvaluation hypothesis that IPOs are overpriced in the market in the short term after listing due to high investor optimism during the offering phase. At the same time, IPOs will experience a price reversal in the long run due to the disappearance of high investor optimism.

However, as explained in 4.2, the unique dual-tranche offer mechanism of the Hong Kong IPO market and the claw-back provisions in this mechanism can dampen optimistic individual investor sentiment at the issuance stage by adjusting the supply and demand of individual investors at the issuance stage. When optimistic investor sentiment is dampened, it not only reduces the deviation of the IPO price from intrinsic value but also reduces the selling pressure due to the fading of optimistic investor sentiment, which ultimately provides a degree of a disincentive to long-run IPO

underperformance. So we make the following hypothesis:

H7: The triggering of the claw-back provision has the effect of suppressing overheating behaviour of individual investors for popular IPO and suppressing long-term underperformance.

5.3 Methodology and Data

5.3.1 Methodology

The dependent variable in this section, the IPO long-run performance, uses Equation 5 from Chapter 3. Here we will use cumulative abnormal returns for 12 months, 24 months, and 36 months after listing.

5.3.2 Investor sentiment measures

The same variables as in Chapter 4 are used for individual investor sentiment in this section.

5.3.3 Regression models

This section also controls for a set of other independent variables in examining the influence of investors' sentiment on Hong Kong IPO long-run underperformance. The following regression models are developed in this study to investigate the influence of investors' sentiment on Hong Kong IPO underperformance.

$$CAR12M = \alpha+\beta_1*Sent+\beta_2 * Sent* CB+\beta_3 *CB+\beta_{4*} Index\ sentiment+\beta_5 *HKHSI12M +\beta_6 *OA+B_7 * Range+ \beta_8*Age+\beta_9*Size+\beta_{10}*PE+\beta_{11}*H+\beta_{12}*YD+\beta_{13}*Revision + \varepsilon \quad (14)$$

$$CAR24M = \alpha+\beta_1*Sent+\beta_2 * Sent* CB+\beta_3 *CB+\beta_{4*} Index\ sentiment+\beta_5 *HKHSI24M +\beta_6 *OA+B_7 * Range+ \beta_8*Age+\beta_9*Size+\beta_{10}*PE+\beta_{11}*H+\beta_{12}*YD+\beta_{13}*Revision + \varepsilon \quad (15)$$

$$CAR36M = \alpha+\beta_1*Sent+\beta_2 * Sent* CB+\beta_3 *CB+\beta_{4*} Index\ sentiment+\beta_5 *HKHSI36M +\beta_6 *OA+B_7 * Range+ \beta_8*Age+\beta_9*Size+\beta_{10}*PE+\beta_{11}*H+\beta_{12}*YD+\beta_{13}*Revision + \varepsilon \quad (16)$$

Sent, Sent *CB and CB are the three most important independent variables here. "Sent" uses the subscription rate of individual investors before the claw-back system is triggered. "CB" is the claw-back provision, a category dummy variable. If the claw-back system is triggered, CB is 1 when the subscription rate of individual investors is 15 times or more and less than 50 times, 2 when it is 50 times or more and less than

100 times, and 3 when it is 100 times or more. Sent* CB is a cross-term of both of them. Thus, when supporting Hypothesis 7, β_1 is expected to make a significant negative value, β_2 is expected to take a significant positive value, and β_3 is expected to take a significantly negative value.

In addition to the three leading independent variables, each model has nine control variables. Index sentiment is Market sentiment from the TRMI database, including News-Social, News, and Social. HKHSI12M returns to the Hang Seng Index after 12 months of listing. HKHSI24M returns to the Hang Seng Index after 24 months of listing. HKHSI36M returns to the Hang Seng Index after 36 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated. Otherwise, it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the establishment's year before a firm's listing. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range.

5.3.4 IPO Data

The IPO data used in this section is the same as in Chapter 4.

5.3.5 Descriptive statistics

Table 8 summaries descriptive statistics of the variables for the DT (dual-tranche) IPO sample. Table 8 shows that the average cumulative abnormal returns for the DT IPO sample are 5.41%, 8.66%, and 5.43% for the 12-month, 24-month, and 36-month post-IPO periods, respectively, all positive. Here we can see that the cumulative abnormal returns of IPOs at 12-month, 24-month and 36-month after trading are much lower than the first day of trading but are still positive. This is in contrast to the negative long-run IPO performance in many other countries.

From table 8, we can see that the mean of individual investor sentiment is 127.51, which means that the market is in an overheated state for the DT IPO sample. The prior study shows that, in general, there is overheated individual investor sentiment during the issue market phase. As individual investors are generally short-run investors, they tend to sell their shares shortly after the IPO, creating significant selling pressure and eventually causing a significant drop in the price of the shares. However, as can be seen here, the long-run performance of the Hong Kong IPO market remains positive, mainly because the trigger of the claw-back provision has somewhat dampened overheated individual investor sentiment, which in turn has not brought about significant selling pressure after the listing transaction, ultimately dampening the significant fall in stock prices to a certain extent.

5.3.6 Correlation matrix

Table 9 reports the correlation matrix for the DT IPO sample. Table 9 shows that the correlation coefficients between individual investor sentiment and long-run IPO performance are -0.23, -0.13, and -0.12, indicating that individual investor sentiment and long-run IPO performance are negatively correlated. The correlation coefficients between individual investor sentiment and IPO long-run performance suggest that the high investor sentiment transferred from the issuance market to the circulation market after the IPO, fading away.

Not only that, but market sentiment also has a weak negative correlation with the three dependent variables. The correlation coefficients between News-Social sentiment and the three dependent variables are -0.04, -0.06, and -0.04, and the correlation coefficients between News sentiment and the three dependent variables are -0.06, -0.07, and -0.04, respectively. The correlation coefficients between Social sentiment and the three dependent variables had correlation coefficients of -0.03, -0.01, and -0.02, respectively.

5.4 Empirical results

In this section, we investigate whether the triggering of the claw-back provision has the effect of suppressing overheating behaviour of individual investors for popular IPO and suppressing long-run underperformance. In this section, to test whether Hypothesis 7 is supported, we still conduct a regression analysis using a DT (dual-tranche) IPO sample with a category dummy variable. In Chapter 3, we investigated the relationship between investor sentiment and long-run IPO performance, using CAR12M as the dependent variable. Here we first investigate whether the triggering of the claw-back provision has a dampening effect on long-run IPO underperformance, again using CAR12M as the dependent variable and the DT-IPO sample. Still, as in Chapter 4, we first do not introduce market sentiment as a separate independent variable into the model. Then, we introduce market sentiment as a particular independent variable into the model, again using the DT-IPO sample, to investigate whether the triggering of the claw-back provision has a dampening effect on long-term IPO underperformance.

Table 13 presents the regression results. Panel A shows the regression results for the DT-IPO sample without the introduction of market sentiment. Panel B shows the DT-IPO sample's regression results with the market sentiment introduction. As in 4.4, the three leading independent variables, Sent, Sent*CB, and CB, are most interesting to us. Hypothesis 7 is supported if the sign of the coefficients on Sent*CB and CB is consistent and significant with our hypothesis predictions. At the same time, the sign and significance of the coefficients on Sent are also of interest to test whether individual investors have a negative impact on the long-run performance of IPOs before the claw-back provision is triggered.

From Model 1, Model 2, and Model 3 in Panel A, we can see that the coefficient sign of Sent is all negative, the same sign as the hypothetical predicted. The negative sign of the coefficient indicates that individual investor sentiment has a negative effect on

IPO long-run performance in the long run; that is to say, investor sentiment makes IPO prices lower in the long run than IPO prices in the short run. Moreover, the regression results of model 1, model 2, and model 3 in Panel A are significant at the 0.1%, 1%, and 0.1% levels, respectively. The significant effects of Sent can indicate that individual investor sentiment can explain IPO underperformance in the long run. This regression result is consistent with that of Derrien (2005), Ljunqvist et al. (2006), Cornelli et al. (2006), and Dorn (2009). This regression result is also consistent with that of Agarwal et al. (2008) but is not consistent with Jiang & Li (2013).

From Model 2, and Model 3 in Panel A, it can be seen that the coefficients of Sent*CB all have a positive sign, the same sign as that predicted by the hypothesis. Moreover, the regression results for Model 2 and Model 3 are all significant at the 5% levels. The sign of the coefficient of CB is negative, as seen in Panel A for Model 3, which is the same as the sign predicted by the hypothesis, and the regression result is significant at the 0.1% level. The significant results in Models 2 and 3 suggest that the triggering of the claw-back provision can dampen optimistic investor sentiment at the issuance stage to some extent, moderating the degree of deviation of IPO prices from intrinsic value brought about by optimistic investor sentiment. Moreover, in the long run, when optimistic investor sentiment fades away, it can moderate the extent to which the long-term price is lower than the short-term price, ultimately dampening long-run IPO underperformance to some time in the long run.

Panel B presents the results of the regressions with the market sentiment included in the model. Model 1, Model 2, and Model 3 of Panel B are the regression results of introducing News-Social, News, and Social, respectively.

The News-Social, News, and Social coefficients are negative and significant at the 5%, 1%, and 10% levels, respectively, as seen in Models 1, 2, and 3 of Panel B. This is the same regression result that we obtained in Chapter 3. Here we need to focus not only on the market sentiment but also on the three most important independent variables of Sent, Sent*CB, and CB based on the inclusion of market sentiment. As seen in Models 1, 2, and 3 of Panel B, the regression coefficients for Sent, Sent*CB and CB remain as expected and significant at the 0.1% and 1% levels, respectively, conditional on the introduction of market sentiment and further suggesting that the trigger of the claw-back provision ultimately has a degree of dampening effect on long-run IPO underperformance through the dampening of overoptimistic individual investor sentiment.

We also did regression analyses using the same methodology as CAR12M, with cumulative abnormal returns 24 months after listing (CAR24M) and cumulative abnormal returns 36 months after listing (CAR36M) as the dependent variables, respectively. Table 14 shows the regression results with CAR24M as the dependent variable, and Table 15 shows the regression results with CAR36M as the dependent variable. As can be seen from Tables 14 and 15, the same regression results were obtained as in Table 13.

In summary, these findings support the predictions of Hypothesis 7, that is to say, the triggering of claw-back provision has the effect of suppressing overheating behaviour of individual investors for popular IPO and suppressing long-run underperformance.

5.5 Discussion

In this section, we use the same 1107 data as in Chapter 4. We investigate the impact of the triggering of the claw-back provision in the dual-tranche offer mechanism on the relationship between investor sentiment and long-run IPO performance. In this section, we continue to use the subscription rate of individual investors at the offering stage as a proxy variable for individual investor sentiment.

Our most significant finding in this section is that the triggering of claw-back provisions, that is to say, the dampening of individual investor sentiment during the issuance phase as in Chapter 4, can dampen not only short-term IPO underpricing to a certain extent but also long-run IPO underperformance to a certain extent. The main reason for this is that the triggering of the claw-back provision will reduce the extent to which the IPO price deviates from its intrinsic value due to optimistic investor sentiment during the issuance phase. When optimistic investor sentiment gradually disappears in the long term, it will reduce the selling pressure caused by optimistic investor sentiment for a long time, which will lead to a certain degree of control over the long-term price decline and, ultimately, the long-run underperformance of the IPO.

Once again, the triggering of the claw-back provision, to the extent that it inhibits long-run IPO underperformance, contrasts sharply with the overvaluation hypothesis. The overvaluation hypothesis suggests that the long-run price reversal of IPOs, brought about by the fading of optimistic investor sentiment at the issuance stage, in the long run, leads to long-run IPO underperformance. However, the dampening of issuance-phase optimism by triggering the claw-back provision would reduce the extent of the long-run price reversal and ultimately provide a disincentive for long-run IPO underperformance.

6 Conclusion

Short-run IPO initial return and long-run underperformance have been the two significant puzzles of IPO that have been the subject of much scholarly attention. With the development of behavioural finance, many studies have shown that investor sentiment plays an important role. This paper investigates the relationship between investor sentiment and the two major IPO puzzles under the unique dual-tranche offer mechanism of the Hong Kong IPO market by taking a sample of 1,165 (1107) IPOs from the Main Board and GEM markets of the Hong Kong Stock Exchange from 1999 to 2017. The paper draws the following conclusions:

(1) Using Hong Kong Hang Seng Index investor sentiment as a direct variable of investor sentiment, we investigate the impact of investor sentiment on short-run IPO initial return and long-run IPO performance and find that investor sentiment has a positive impact on short-run IPO initial return, the volatility of initial return and a negative impact on long-run IPO performance. (2) Using individual investor demand at the issuance stage, i.e., the subscription rate of individual investors, as a proxy variable for individual investor sentiment, it is found that when optimistic investment sentiment exists at the issuance stage, the triggering of the claw-back provision under the dual-tranche mechanism can dampen optimistic investor sentiment to a certain extent, and ultimately dampen IPO short-run initial return to some extent. (3) The triggering of the claw-back provision under the dual-tranche mechanism can dampen the volatility of IPO short-run initial return. (4) Using the cumulative abnormal returns at 12 months, 24 months, and 36 months after listing as a proxy variable for long-run performance, it is found that the triggering of the claw-back provision under the dual-tranche offer mechanism can also dampen IPO long-run underperformance to a certain extent.

Our study contributes to the literature on investor sentiment and the IPO puzzle in the following ways: First, prior research on the impact of investor sentiment on the IPO puzzle essentially endorses the explanation of the overvaluation hypothesis. This paper presents the first study on the Hong Kong IPO market as a direct variable of investor sentiment, and the findings support the overvaluation hypothesis. Second, this paper finds for the first time that the triggering of claw-back provisions under the unique dual-tranche offer mechanism of the Hong Kong IPO market can, to a certain extent, dampen optimistic investor sentiment at the issuance stage and thus reduce to a certain extent the extent to which IPO prices deviate from their intrinsic value as a result of optimistic investor sentiment. Thirdly, this paper finds for the first time that the triggering of claw-back provisions to dampen investor sentiment at the issuance stage can not only reduce short-run post-IPO buying pressure but also reduce selling pressure and long-run price reversals as optimistic investor sentiment fades in the long run.

It is clear from our conclusions that the unique dual-tranche offer mechanism of the Hong Kong IPO market and the claw-back provisions therein can enable the often crowded-out individual investors by regulating supply and demand, which not only discourages optimistic investment sentiment to a certain extent but also broadens the

ownership base and ultimately allows for some short-run IPO initial return and long-run IPO underperformance to be a degree of suppression. This will not only improve investor confidence but also enable the effective allocation of valuable financial resources and the value of scarce capital to be fully utilized, ultimately helping to improve the allocation function and efficiency of market resources and promoting the healthy development of the financial market. Therefore, the Hong Kong IPO market should adhere to the dual-tranche offer mechanism and the claw-back provisions. Other countries and regions should consider adopting resource allocation measures similar to those in the Hong Kong IPO market.

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Figure 1. The book-building process for IPO

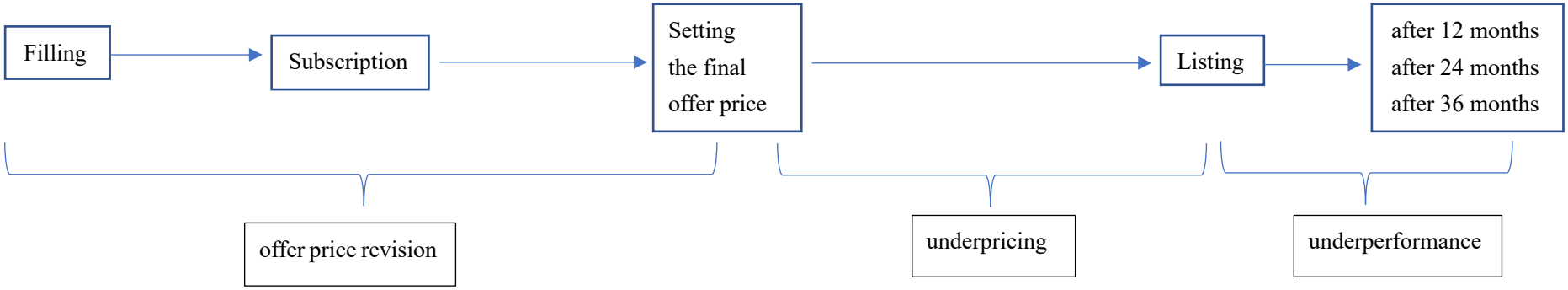

Figure.2 The Hong Kong book-building process for initial public offering

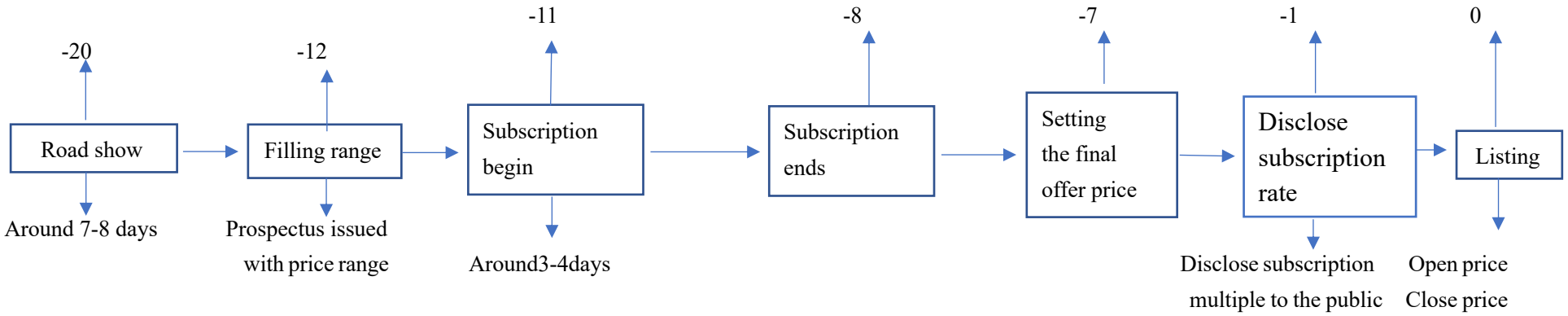

Figure.3 The Taiwan book-building process for initial public offering

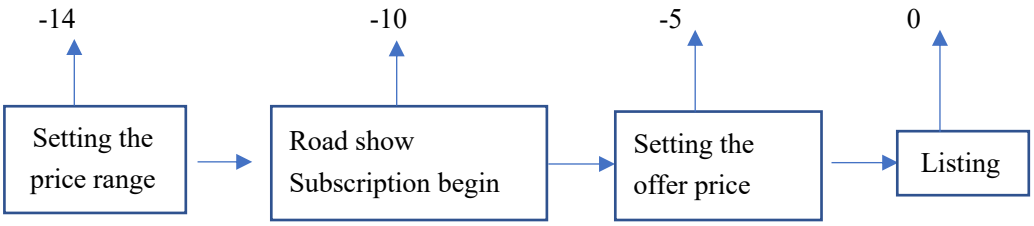

Figure.4 The United Stated book-building process for initial public offering

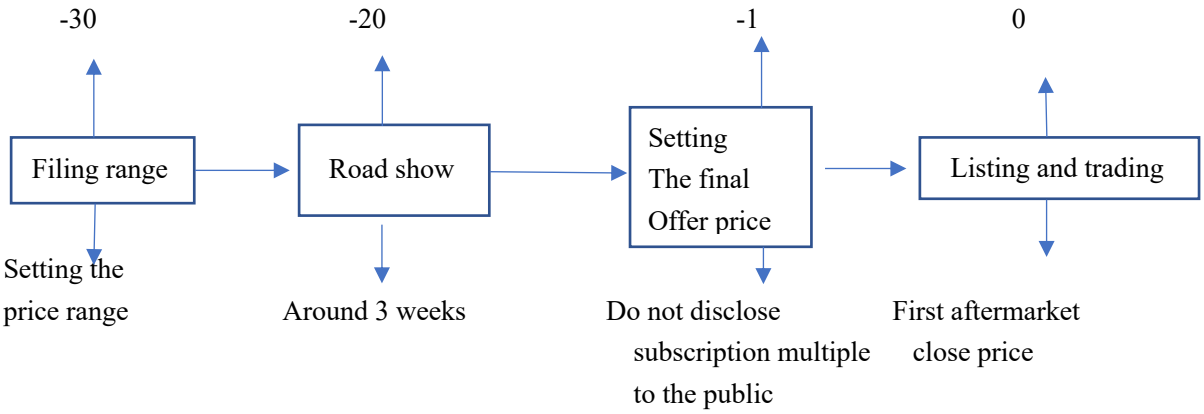

Figure.5 IPO initial return, Number of IPO and Market sentiment

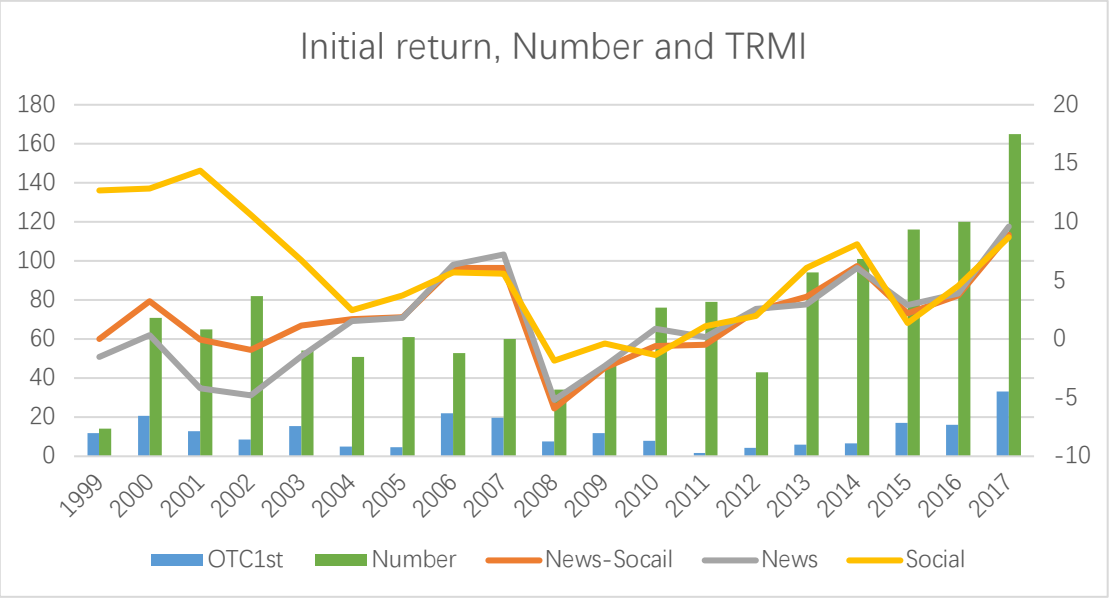

Table 1. Descriptive statistics-1. Revision is the offer price divided by the midpoint of the initial price range. OTC1st the percentage change between the offer price and the closing price on the first day of listing. OTC5th the percentage between the offer price and the closing price on the fifth day of listing. Var5 is the volatility of daily returns from day 1 of listed trading to the period up to day 5. CAR12M is the cumulative average return after 12 months of listing. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. Subrate is the investor subscription rate, which number of shares subscribed by individual investors divided by the numbers of shares assigned to public tranche. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. HKHSI12M is the return of the Hang Seng Index after 12 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the year of the establishment before the listing of a firm. Size is the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise.

vars	n	mean	sd	median	min	max
Revision	1165	0.01	0.12	0.00	-0.48	0.98
OTC1st	1165	11.27	28.46	3.96	-48.67	335.39
OTC5th	1165	12.15	47.23	2.52	-51.69	680.90
Var5	1165	0.01	0.02	0.00	0.00	0.24
CAR12M	1165	3.93	70.84	-2.43	-159.32	543.54
NS-Sent	1165	0.03	0.09	0.04	-0.38	0.28
N-Sent	1165	0.04	0.11	0.04	-0.47	0.41
S-Sent	1165	0.05	0.08	0.05	-0.25	0.40
HKHSIB3M	1165	3.34	9.25	4.17	-37.26	39.07
HKHSI12M	1165	3.26	20.07	4.85	-55.35	58.24
OA	1165	0.42	0.49	0.00	0.00	1.00
Range	1165	0.22	0.19	0.22	0.00	2.00
Age	1165	4.62	8.13	1.38	0.03	48.85
Size	1165	769.57	3938.94	86.85	-8555.17	73744.44
PE	1165	0.15	0.36	0.00	0.00	1.00
H	1165	0.14	0.34	0.00	0.00	1.00
YD	1165	0.12	0.33	0.00	0.00	1.00

Table 2. Correlation matrix-1. Revision is the offer price divided by the midpoint of the initial price range. OTC1st the percentage change between the offer price and the closing price on the first day of listing. OTC5th the percentage between the offer price and the closing price on the fifth day of listing. Var5 is the volatility of daily returns from day 1 of listed trading to the period up to day 5. CAR12M is the cumulative average return after 12 months of listing. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. HKHSI12M is the return of the Hang Seng Index after 12 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the year of the establishment before the listing of a firm. Size is the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Revision	1	1																
OTC1st	2	0.09	1															
OTC5th	3	0.08	0.70	1														
Var5	4	-0.03	0.33	0.39	1													
CAR12M	5	-0.07	-0.08	0.11	0.10	1												
NS-Sent	6	0.07	0.08	0.06	0.10	-0.04	1											
N-Sent	7	0.05	0.09	0.06	0.10	-0.07	0.95	1										
S-Sent	8	0.08	0.05	0.02	0.05	-0.05	0.51	0.32	1									
HKHSIB3M	9	0.10	0.10	0.04	0.00	-0.12	0.27	0.30	0.07	1								
HKHSI12M	10	0.02	0.00	0.02	-0.07	0.04	-0.06	-0.11	0.08	-0.16	1							
OA	11	0.16	0.03	0.05	-0.10	-0.08	0.04	0.04	0.01	0.13	0.04	1						
Range	12	0.38	-0.01	-0.02	0.01	-0.02	0.04	0.05	0.04	-0.01	0.02	0.07	1					
Age	13	0.01	-0.09	-0.04	-0.07	-0.05	0.05	0.05	0.00	-0.03	0.06	0.18	0.02	1				
Size	14	0.01	-0.04	-0.02	-0.05	0.01	-0.01	-0.02	0.01	-0.05	0.08	0.18	-0.02	0.30	1			
PE	15	-0.05	-0.05	-0.03	-0.09	-0.10	0.01	0.02	-0.06	0.10	-0.05	0.24	0.03	0.08	0.04	1		
H	16	-0.03	-0.08	-0.04	-0.09	0.01	0.03	0.03	0.02	-0.01	0.06	0.25	-0.06	0.50	0.34	-0.04	1	
YD	17	0.09	0.01	-0.02	-0.07	-0.08	-0.14	-0.11	-0.23	0.21	-0.17	0.23	0.11	-0.06	0.05	0.17	-0.04	1

Table 3. Investor sentiment and offer price revision. Revision is the offer price divided by the midpoint of the initial price range. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. The t-statistics are in the parentheses. Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

Dependent variable	Revision		
Intercept	-0.018	-0.015	-0.025.
	(-1.420)	(-1.190)	(-1.912)
NS-Sent	0.083.		
	(1.921)		
N-Sent		0.056***	
		(6.716)	
S-Sent			0.132**
			(2.910)
HKHSIB3M	0.001**	0.001**	0.001**
	(2.649)	(3.000)	(3.041)
OA	0.055***	0.019	0.054***
	(6.625)	(0.549)	(6.414)
Range	0.236***	0.238***	0.232***
	(13.121)	(13.200)	(12.880)
Age	-0.012*	-0.011*	-0.011*
	(-2.466)	(-2.401)	(-2.287)
Size	-0.009***	-0.010***	-0.009**
	(-3.428)	(-3.576)	(-3.262)
PE	-0.031**	-0.031**	-0.029**
	(-2.926)	(-2.960)	(-2.777)
H	0.018	0.019	0.017
	(1.409)	(1.479)	(1.314)
YD	0.006	0.003	0.010
	(0.535)	(0.284)	(0.890)
R-squared	0.219	0.216	0.223
Observations	1165	1165	1165

Table 4. Investor sentiment and IPO short-run initial return. OTC1st the percentage change between the offer price and the closing price on the first day of listing. OTC5th the percentage between the offer price and the closing price on the fifth day of listing. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. The t-statistics are in the parentheses. Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

Panel A	Dependent variable	OTC1st	
Intercept	21.495***	21.084***	21.653***
	(24.438)	(23.210)	(26.595)
NS-Sent	14.446***		
	(4.519)		
N-Sent		12.979***	
		(4.846)	
S-Sent			8.091*
			(2.568)
HKHSIB3M	0.142***	0.139***	0.196***
	(5.722)	(5.647)	(7.840)
OA	8.485***	8.314***	8.009***
	(16.376)	(15.343)	(15.303)
Range	-2.949*	-2.075	-1.433
	(-1.972)	(-1.414)	(-1.246)
Age	-2.016***	-1.792***	-1.654***
	(-7.147)	(-6.288)	(-6.279)
Size	-3.034***	-3.003***	-3.182***
	(-16.917)	(-16.671)	(-23.611)
PE	-1.972**	-2.078***	-1.624**
	(-3.171)	(-3.397)	(-2.822)
H	3.691***	3.177***	3.404***
	(4.740)	(4.602)	(4.269)
YD	2.624***	2.594***	2.364**
	(3.798)	(4.615)	(3.132)
Revision	14.437***	13.125***	10.277***
	(6.520)	(6.353)	(4.469)
R-squared	0.422	0.414	0.486
Observations	1165	1165	1165

Panel B	Dependent variable	OTC5h	
Intercept	20.168***	18.583***	19.704***
	(18.541)	(13.922)	(15.499)
NS-Sent	21.680***		
	(6.310)		
N-Sent		18.876***	
		(6.323)	
S-Sent			10.356**
			(3.001)
HKHSIB3M	0.033	0.0002	0.061
	(0.765)	(0.005)	(1.499)
OA	13.789***	12.596***	13.340***
	(27.974)	(16.342)	(18.587)
Range	-9.673***	-6.600**	-8.646***
	(-5.516)	(-3.194)	(-4.082)
Age	-1.104**	-1.292**	-0.923*
	(-2.685)	(-2.865)	(-2.229)
Size	-2.717***	-2.481***	-2.837***
	(-15.984)	(-9.608)	(-12.264)
PE	-2.964***	-3.031***	-2.481***
	(-4.265)	(-4.685)	(-3.597)
H	-0.914	-0.099	0.546
	(-0.818)	(-0.081)	(0.546)
YD	-2.070*	-1.868.	-1.825.
	(-2.150)	(-1.744)	(-1.700)
Revision	15.938***	15.819***	14.432***
	(6.233)	(4.918)	(5.131)
R-squared	0.396	0.389	0.464
Observations	1165	1165	1165

Table 5. Investor sentiment and the volatility of IPO initial return. Var5 is the volatility of daily returns from day 1 of listed trading to the period up to day 5. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. The t-statistics are in the parentheses. Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

Dependent variable	Var5		
Intercept	0.011270***	0.011000***	0.013570***
	(20.555)	(18.786)	(31.087)
NS-Sent	0.009441***		
	(5.672)		
N-Sent		0.011000***	
		(7.970)	
S-Sent			0.000626
			(0.347)
HKHSIB3M	0.000004	0.000016	0.000031*
	(0.267)	(0.956)	(2.553)
OA	-0.000104	0.000094	0.000246
	(-0.290)	(0.257)	(0.715)
Range	0.000723	0.000290	0.000308
	(0.797)	(0.294)	(0.372)
Age	-0.000129	0.000026	-0.000444*
	(-0.784)	(0.160)	(-2.448)
Size	-0.001389***	-0.001353***	-0.001623***
	(-14.700)	(-12.835)	(-18.633)
PE	-0.001910***	-0.002119***	-0.002023***
	(-5.580)	(-6.404)	(-7.014)
H	0.000380	-0.000242	0.000578
	(0.860)	(-0.544)	(1.265)
YD	-0.000111	0.000015	-0.000994***
	(-0.276)	(0.039)	(-3.345)
Revision	-0.003041*	-0.003807**	-0.004496***
	(-2.062)	(-2.670)	(-3.330)
R-squared	0.322	0.308	0.516
Observations	1165	1165	1165

Table 6. Investor sentiment and IPO long-run performance. CAR12M is the cumulative average return after 12 months of listing. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSI12M is the return of the Hang Seng Index after 12 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. The t-statistics are in the parentheses. Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

Dependent variable	CAR12M		
Intercept	18.810***	16.359***	13.087***
	(8.331)	(5.876)	(4.545)
NS-Sent	-31.812***		
	(-3.686)		
N-Sent		-41.691***	
		(-5.426)	
S-Sent			-34.938***
			(-4.717)
HKHSI12M	-0.068.	-0.110**	-0.103**
	(-1.765)	(-2.672)	(-3.094)
OA	-3.257*	-1.274	-2.580.
	(-2.081)	(-0.708)	(-1.767)
Range	3.314	3.819	4.410
	(0.632)	(0.758)	(0.895)
Age	-1.925*	-1.773.	-2.106**
	(-2.177)	(-1.791)	(-2.655)
Size	-0.838.	-0.622	-0.230
	(-1.755)	(-1.161)	(-0.515)
PE	-13.744***	-12.968***	-13.599***
	(-7.076)	(-5.846)	(-6.136)
H	0.789	-0.306	-1.267
	(0.347)	(-0.128)	(-0.670)
YD	-20.567***	-21.264***	-19.161***
	(-7.110)	(-7.831)	(-8.355)
Revision	-33.829***	-30.225***	13.740
	(-3.942)	(-3.565)	(1.286)
R-squared	0.416	0.169	0.195
Observations	1165	1165	1165

Table 7. The Correlation coefficient between TRMI and Subscription rate

Correlation coefficient	News-Social	News	Social
Subscription rate	0.4453	0.5857	0.2667

Table 8. Descriptive statistics-2. OTC1st the percentage change between the offer price and the closing price on the first day of listing. OTC5th the percentage between the offer price and the closing price on the fifth day of listing. Var5 is the volatility of daily returns from day 1 of listed trading to the period up to day 5. CAR12M is the cumulative average return after 12 months of listing. CAR24M is the cumulative average return after 24 months of listing. CAR36M is the cumulative average return after 36 months of listing. Sent is the individual investor sentiment, which number of shares subscribed by individual investors divided by the numbers of shares assigned to public tranche. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. HKHSI12M is the return of the Hang Seng Index after 12 months of listing. HKHSI24M is the return of the Hang Seng Index after 12 months of listing. HKHSI36M is the return of the Hang Seng Index after 12 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the year of the establishment before the listing of a firm. Size is the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range.

vars	n	mean	sd	median	min	max
OTC1st	1107	11.14	28.99	3.40	-48.67	335.39
OTC5th	1107	12.31	48.54	3.02	-51.69	680.90
Var5	1107	0.01	0.02	0.00	0.00	0.19
CAR12M	1107	5.41	71.87	-2.09	-158.45	543.54
CAR24M	1107	8.66	95.53	-4.09	-212.92	946.79
CAR36M	1107	5.43	107.90	-2.49	-266.95	896.12
Sent	1107	127.51	290.90	13.77	0.01	3559.20
NS-Sent	1107	0.04	0.09	0.04	-0.38	0.28
N-Sent	1107	0.04	0.11	0.04	-0.47	0.41
S-Sent	1107	0.06	0.08	0.05	-0.25	0.47
HKHSIB3M	1107	0.03	0.09	0.04	-0.37	0.38
HKHSI12M	1107	0.03	0.20	0.05	-0.55	0.58
HKHSI24M	1107	8.66	95.53	-4.09	-212.92	946.79
HKHSI36M	1107	5.43	107.90	-2.49	-266.95	896.12
OA	1107	0.40	0.49	0.00	0.00	1.00
Range	1107	0.23	0.22	0.22	0.00	2.00
Age	1107	4.86	8.35	1.42	0.03	48.85
Size	1107	732.34	3694.66	92.07	-8555.17	73744.44
PE	1107	0.15	0.36	0.00	0.00	1.00
H	1107	0.15	0.36	0.00	0.00	1.00
YD	1107	0.12	0.32	0.00	0.00	1.00
Revision	1107	0.01	0.13	0.00	-0.36	1.00

Table 9. Correlation matrix-2. OTC1st the percentage change between the offer price and the closing price on the first day of listing. OTC5th the percentage between the offer price and the closing price on the fifth day of listing. Var5 is the volatility of daily returns from day 1 of listed trading to the period up to day 5. CAR12M is the cumulative average return after 12 months of listing. CAR24M is the cumulative average return after 24 months of listing. CAR36M is the cumulative average return after 36 months of listing. Sent is the individual investor sentiment, which number of shares subscribed by individual investors divided by the numbers of shares assigned to public tranche. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. HKHSI12M is the return of the Hang Seng Index after 12 months of listing. HKHSI24M is the return of the Hang Seng Index after 12 months of listing. HKHSI36M is the return of the Hang Seng Index after 12 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the year of the establishment before the listing of a firm. Size is the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range.

		1	2	3	4	5	6	7	8	9	10	11	12.	13	14	15	16	17	18	19	20	21	22
OTC1st	1	1																					
OTC5th	2	0.72	1																				
Var5	3	0.04	0.04	1																			
CAR12M	4	-0.11	0.09	-0.03	1																		
CAR24M	5	-0.11	0.06	-0.03	0.68	1																	
CAR36M	6	-0.09	0.03	0.01	0.56	0.86	1																
Sent	7	0.33	0.22	0.09	-0.23	-0.13	-0.12	1															
NS-Sent	8	0.12	0.07	0.04	-0.04	-0.06	-0.04	0.13	1														
N-Sent	9	0.12	0.07	0.06	-0.06	-0.07	-0.04	0.13	0.94	1													
S-Sent	10	0.09	0.03	0.02	-0.03	-0.01	-0.02	0.04	0.47	0.27	1												
HKHSIB3M	11	0.13	0.05	0.05	-0.13	-0.10	-0.06	0.11	0.29	0.32	0.07	1											
HKHSI12M	12	0.01	0.01	0.07	0.00	0.00	-0.03	0.03	-0.01	-0.06	0.06	-0.13	1										
HKHSI24M	13	-0.11	0.06	-0.03	0.68	1.00	0.86	-0.13	-0.06	-0.07	0.00	-0.10	0.00	1									

HKHSI36M	14	-0.09	0.03	0.01	0.56	0.86	1.00	-0.12	-0.04	-0.04	0.00	-0.06	-0.03	0.86	1								
OA	15	0.06	0.07	0.04	-0.12	-0.09	-0.05	0.16	0.03	0.03	0.02	0.12	0.05	-0.09	-0.05	1							
Range	16	-0.02	-0.02	0.01	-0.02	-0.07	-0.07	0.05	0.04	0.01	0.13	-0.03	0.00	-0.07	-0.07	0.08	1						
Age	17	-0.11	-0.08	-0.05	-0.03	-0.03	-0.01	-0.08	0.05	0.04	0.00	-0.04	0.04	-0.03	-0.01	0.19	0.02	1					
Size	18	-0.04	-0.02	-0.01	-0.01	-0.02	-0.01	-0.06	-0.01	-0.02	0.00	-0.05	0.08	-0.02	-0.01	0.18	-0.03	0.36	1				
PE	19	-0.03	-0.02	0.01	-0.10	-0.09	-0.05	-0.01	-0.02	0.00	-0.07	0.09	-0.05	-0.09	-0.05	0.25	0.00	0.08	0.07	1.00			
H	20	-0.07	-0.05	-0.02	-0.01	-0.04	-0.02	-0.07	0.06	0.05	0.04	0.02	0.08	-0.04	-0.02	0.25	-0.07	0.51	0.33	-0.05	1		
YD	21	-0.02	-0.04	0.06	-0.06	0.02	0.01	0.08	0.02	0.03	-0.06	0.09	0.01	0.02	0.01	0.01	0.02	-0.03	0.08	0.00	-0.01	1	
Revision	22	0.10	0.08	0.09	-0.05	-0.07	-0.08	0.27	0.11	0.07	0.16	0.09	0.03	-0.07	-0.08	0.18	0.50	0.00	0.00	-0.06	-0.04	0.06	1

Table 10. Investor sentiment and IPO short-run initial return-1. OTC1st the percentage change between the offer price and the closing price on the first day of listing. OTC5th the percentage between the offer price and the closing price on the fifth day of listing. Sent is the individual investor sentiment, which number of shares subscribed by individual investors divided by the numbers of shares assigned to public tranche. CB is the claw-back, it's a category dummy variable. If the claw-back system is triggered, CB is 1 when the subscription rate of individual investors is 15 times or more and less than 50 times, 2 when it is 50 times or more and less than 100 times, and 3 when it is 100 times or more. Sent* CB is a cross-term of both of them. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. The t-statistics are in the parentheses. Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

Pane A	Dependent variable	OTC1st	
Intercept	19.243***	16.465***	16.172***
	(7.257)	(5.971)	(5.839)
Sent	0.023***	0.085***	0.105***
	(8.549)	(4.666)	(4.137)
SCB		-0.023***	-0.028***
		(-3.439)	(-3.394)
CB			-2.529***
			(-4.535)
HKHSIB3M	25.792**	20.787*	20.577*
	(3.098)	(2.473)	(2.448)
OA	6.265***	4.985**	5.105**
	(3.523)	(2.758)	(2.820)
Range	0.297	1.912	2.037
	(0.073)	(0.469)	(0.500)
Age	-2.010*	-1.811.	-1.870.
	(-2.029)	(-1.836)	(-1.893)
Size	-2.741***	-2.545***	-1.459
	(-4.913)	(-4.565)	(-1.116)
PE	-1.680	-1.644	-1.700
	(-0.772)	(-0.760)	(-0.786)
H	3.994	3.538	3.703
	(1.547)	(1.376)	(1.438)
YD	-2.656	-4.040.	-4.069.
	(-1.177)	(-1.772)	(-1.785)
Revision	-2.977	-10.730	-11.131
	(-0.418)	(-1.444)	(-1.497)

R-squared	0.147	0.158	0.148
Observations	1107	1107	1107
Pane B	Dependent variable	OTC5th	
Intercept	18.616***	15.033***	14.120**
	(4.303)	(3.337)	(3.125)
Sent	0.022***	0.103***	0.163***
	(4.984)	(3.452)	(3.922)
SCB		-0.029**	-0.047***
		(-2.737)	(-3.434)
CB			-4.469*
			(-2.070)
HKHSIB3M	10.848	4.451	3.720
	(0.811)	(0.329)	(0.275)
OA	10.692***	9.116**	9.426**
	(3.682)	(3.090)	(3.197)
Range	-3.686	-1.421	-1.075
	(-0.563)	(-0.216)	(-0.164)
Age	-1.625	-1.430	-1.611
	(-1.002)	(-0.884)	(-0.996)
Size	-2.570**	-2.316*	-2.249*
	(-2.800)	(-2.521)	(-2.451)
PE	-2.782	-2.773	-3.076
	(-0.793)	(-0.793)	(-0.880)
H	2.879	2.519	3.039
	(0.669)	(0.588)	(0.709)
YD	-5.819	-7.685*	-7.881*
	(-1.567)	(-2.043)	(-2.098)
Revision	0.934	-9.111	-10.121
	(0.081)	(-0.754)	(-0.838)
R-squared	0.068	0.075	0.08
Observations	1107	1107	1107

Table 11. Investor sentiment and IPO short-run initial return-2. OTC1st the percentage change between the offer price and the closing price on the first day of listing. OTC5th the percentage between the offer price and the closing price on the fifth day of listing. Sent is the individual investor sentiment, which number of shares subscribed by individual investors divided by the numbers of shares assigned to public tranche. CB is the claw-back, it's a category dummy variable. If the claw-back system is triggered, CB is 1 when the subscription rate of individual investors is 15 times or more and less than 50 times, 2 when it is 50 times or more and less than 100 times, and 3 when it is 100 times or more. Sent* CB is a cross-term of both of them. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. The t-statistics are in the parentheses. Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

Panel A DT-IPOs (News-Social sentiment)		
Dependent Variable	OTC1st	OTC5th
Intercept	16.183***	14.088**
	(5.507)	(2.943)
Sent	0.105***	0.162***
	(3.976)	(3.758)
SCB	-0.028**	-0.046**
	(-3.233)	(-3.245)
CB	-2.431***	-4.794*
	(-4.168)	(-2.165)
NS-Sent	6.035*	9.326**
	(2.390)	(3.067)
HKHSIB3M	15.040.	-4.761
	(1.663)	(-0.327)
OA	5.020**	9.539**
	(2.676)	(3.132)
Range	1.512	-2.740
	(0.359)	(-0.405)
Age	-2.084*	-1.841
	(-2.047)	(-1.106)
Size	-1.586	-2.085*
	(-1.182)	(-2.174)
PE	-1.312	-3.031
	(-0.587)	(-0.842)
H	3.218	1.899
	(1.190)	(0.421)

YD	-4.289.	-8.184*
	(-1.809)	(-2.104)
Revision	-10.465	-8.377
	(-1.369)	(-0.676)
R-squared	0.168	0.082
Observations	1107	1107
Panel B DT-IPOs (News sentiment)		
Dependent Variable	OTC1st	OTC5th
Intercept	16.246***	14.205**
	(5.550)	(2.979)
Sent	0.104***	0.161***
	(3.959)	(3.739)
SCB	-0.028**	-0.046**
	(-3.217)	(-3.227)
CB	-2.433***	-4.795*
	(-4.179)	(-2.167)
N-Sent	5.009**	10.564***
	(2.913)	(4.095)
HKHSIB3M	14.341	-5.882
	(1.573)	(-0.402)
OA	5.050**	9.596**
	(2.693)	(3.151)
Range	1.439	-2.797
	(0.342)	(-0.413)
Age	-2.079*	-1.843
	(-2.044)	(-1.108)
Size	-1.590	-2.091*
	(-1.185)	(-2.184)
PE	-1.338	-3.075
	(-0.599)	(-0.855)
H	3.185	1.868
	(1.177)	(0.415)
YD	-4.326.	-8.281*
	(-1.825)	(-2.130)
Revision	-10.050	-7.767
	(-1.315)	(-0.627)
R-squared	0.156	0.068
Observations	1107	1107
Panel C DT-IPOs (Social sentiment)		
Dependent Variable	OTC1st	OTC5th
Intercept	15.679***	14.073**
	(5.166)	(2.847)
Sent	0.105***	0.163***
	(4.000)	(3.775)

SCB	-0.028**	-0.046**
	(-3.260)	(-3.265)
CB	-2.405***	-4.650*
	(-4.103)	(-2.097)
S-Sent	10.234***	9.403**
	(3.695)	(3.079)
HKHSIB3M	16.799.	-1.016
	(1.910)	(-0.072)
OA	4.889**	7.900
	(2.601)	(0.514)
Range	1.436	-2.655
	(0.341)	(-0.391)
Age	-2.003*	-1.691
	(-1.971)	(-1.017)
Size	-1.488	-2.126*
	(-1.107)	(-2.203)
PE	-1.193	-2.989
	(-0.533)	(-0.828)
H	3.155	2.021
	(1.164)	(0.447)
YD	-4.182.	-8.076*
	(-1.761)	(-2.069)
Revision	-11.053	-8.527
	(-1.439)	(-0.686)
R-squared	0.146	0.06
Observations	1107	1107

Table 12. **Investor sentiment and the volatility of IPO initial return.** Var5 is the volatility of daily returns from day 1 of listed trading to the period up to day 5. Sent is the individual investor sentiment. CB is the claw-back, it's a category dummy variable. If the claw-back system is triggered, CB is 1 when the subscription rate of individual investors is 15 times or more and less than 50 times, 2 when it is 50 times or more and less than 100 times, and 3 when it is 100 times or more. Sent* CB is a cross-term of both of them. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSIB3M is the return of the Hang Seng Index in the 3 months before listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. The t-statistics are in the parentheses. Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

Panel A DT-IPOs			
Dependent Variable		Var5	
Intercept	0.005385***	0.006260***	0.006564***
	(10.341)	(10.016)	(10.466)
Sent	0.000006***	0.000010**	0.000010.
	(6.557)	(3.033)	(1.911)
SCB		-0.000006***	-0.000267*
		(-4.118)	(-2.183)
CB			-0.001471***
			(-5.619)
HKHSIB3M	0.003394.	0.003265.	0.003226.
	(1.953)	(1.844)	(1.768)
OA	-0.001799***	-0.001246***	-0.001415***
	(-5.237)	(-3.573)	(-4.318)
Range	0.000735	0.000221	0.000018
	(1.189)	(0.242)	(0.020)
Age	0.000069	0.000103	-0.000009
	(0.391)	(0.472)	(-0.041)
Size	-0.000126	-0.000312*	-0.000001
	(-1.174)	(-2.574)	(-0.442)
PE	0.000115	0.000413	-0.000135
	(0.302)	(0.958)	(-0.347)
H	0.000452	0.000604	0.001054*
	(0.961)	(1.085)	(1.990)
YD	-0.002114***	-0.001684***	-0.002382***
	(-6.046)	(-4.303)	(-6.410)
Revision	0.003390**	0.003918*	0.004291**
	(2.644)	(2.577)	(2.832)

R-squared	0.164	0.107	0.159
Observations	1107	1107	1107
Panel B DT-IPOs (TRMI)			
Dependent Variable		Var5	
Intercept	0.005174***	0.005332***	0.005487***
	(8.591)	(8.362)	(8.987)
Sent	0.003605*	0.003472*	0.000011*
	(2.398)	(2.217)	(2.137)
SCB	-0.001290***	-0.001186***	-0.000222.
	(-3.677)	(-3.549)	(-1.809)
CB	-0.001452***	-0.001554***	-0.001632***
	(-5.762)	(-6.233)	(-6.691)
NS-Sent	0.008227***		
	(5.024)		
N-Sent		0.006530***	
		(4.311)	
S-Sent			0.003243.
			(1.656)
HKHSIB3M	-0.000134	0.001152	0.000719
	(-0.076)	(0.606)	(0.433)
OA	0.000001	-0.000001	-0.001440***
	(0.37)	(-0.708)	(-4.34)
Range	-0.000563	-0.000081	0.000689
	(-0.659)	(-0.095)	(0.781)
Age	0.000267	0.000136	-0.000122
	(1.599)	(0.697)	(-0.603)
Size	-0.000178	-0.000172	0.000003
	(-1.459)	(-1.341)	(0.029)
PE	0.000057	0.000107	0.000587.
	(0.147)	(0.271)	(1.917)
H	0.000744	0.000911.	0.001949***
	(1.598)	(1.849)	(4.011)
YD	-0.002372***	-0.002177***	-0.002004***
	(-5.764)	(-4.944)	(-4.565)
Revision	0.000008	0.000007	0.002886*
	(1.614)	(1.261)	(1.995)
R-squared	0.222	0.157	0.209
Observations	1107	1107	1107

Table 13. Investor sentiment and IPO long-run performance-1. CAR12M is the cumulative average return after 12 months of listing. Sent is the individual investor sentiment, which number of shares subscribed by individual investors divided by the numbers of shares assigned to public tranche. CB is the claw-back, it's a category dummy variable. If the claw-back system is triggered, CB is 1 when the subscription rate of individual investors is 15 times or more and less than 50 times, 2 when it is 50 times or more and less than 100 times, and 3 when it is 100 times or more. Sent* CB is a cross-term of both of them. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSI12M is the return of the Hang Seng Index after 12 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. The t-statistics are in the parentheses. Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

Panel A DT-IPOs			
Dependent variable		CAR12M	
Intercept	24.416**	30.356***	25.402***
	(3.117)	(3.666)	(8.416)
Sent	-0.045***	-0.161**	-0.086***
	(-5.497)	(-2.984)	(-3.337)
SCB		0.042*	0.019*
		(2.176)	(2.270)
CB			-4.706***
			(-3.906)
HKHSI12M	3.625	4.011	-0.451
	(0.332)	(0.368)	(-0.113)
OA	-0.404	2.167	3.168*
	(-0.076)	(0.400)	(2.120)
Range	0.442	-3.081	-4.328
	(0.036)	(-0.249)	(-0.862)
Age	-1.586	-1.979	-1.857.
	(-0.542)	(-0.677)	(-1.907)
Size	-1.859	-2.309	-1.858***
	(-1.115)	(-1.377)	(-3.477)
PE	-13.497*	-13.571*	-13.352***
	(-2.087)	(-2.102)	(-6.909)
H	0.557	1.544	0.589
	(0.072)	(0.200)	(0.262)
YD	-6.691	-3.953	-2.903
	(-0.984)	(-0.573)	(-1.255)

Revision	-2.095	13.398	14.620.
	(-0.098)	(0.598)	(1.867)
R-squared	0.043	0.048	0.295
Observations	1107	1107	1107
Panel B DT-IPOs (TRMI)			
Dependent variable		CAR12M	
Intercept	33.471***	32.677***	31.176***
	(15.628)	(11.943)	(9.708)
Sent	-0.130***	-0.114***	-0.120***
	(-5.120)	(-3.873)	(-3.956)
SCB	0.034***	0.028**	0.031**
	(4.008)	(2.910)	(3.034)
CB	-3.790**	-4.071***	-4.202**
	(-3.029)	(-3.375)	(-2.991)
NS-Sent	-18.778*		
	(-2.432)		
N-Sent		-21.924**	
		(-2.767)	
S-Sent			-17.072.
			(-1.895)
HKHSI12M	0.963	-0.909	0.416
	(0.285)	(-0.224)	(0.092)
OA	3.431.	3.191*	3.204
	(1.922)	(2.083)	(1.601)
Range	-9.761*	-7.604	-7.818
	(-2.524)	(-1.577)	(-1.630)
Age	-1.400	-0.665	-1.499
	(-1.437)	(-0.709)	(-1.424)
Size	-2.651***	-2.763***	-2.507***
	(-5.656)	(-6.153)	(-4.163)
PE	-16.790***	-16.849***	-16.597***
	(-9.547)	(-10.223)	(-8.244)
H	1.305	0.581	0.314
	(0.542)	(0.279)	(0.113)
YD	-4.771*	-5.262.	-5.420.
	(-2.058)	(-1.891)	(-1.873)
Revision	23.137**	20.072*	7.980
	(2.897)	(2.282)	(0.798)
R-squared	0.335	0.382	0.388
Observations	1107	1107	1107

Table 14. Investor sentiment and IPO long-run performance-2. CAR24M is the cumulative average return after 24 months of listing. Sent is the individual investor sentiment, which number of shares subscribed by individual investors divided by the numbers of shares assigned to public tranche. CB is the claw-back, it's a category dummy variable. If the claw-back system is triggered, CB is 1 when the subscription rate of individual investors is 15 times or more and less than 50 times, 2 when it is 50 times or more and less than 100 times, and 3 when it is 100 times or more. Sent* CB is a cross-term of both of them. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSI24M is the return of the Hang Seng Index after 24 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. The t-statistics are in the parentheses. Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1.

Panel A DT-IPOs			
Dependent variable		CAR24M	
Intercept	36.753***	44.479***	35.811***
	(3.471)	(3.962)	(8.347)
Sent	-0.042***	-0.191**	-0.085*
	(-3.784)	(-2.584)	(-2.057)
SCB		0.054*	0.024.
		(2.044)	(1.771)
CB			-8.148***
			(-4.412)
HKHSI24M	-7.437	-10.769*	-10.754*
	(-1.565)	(-2.381)	(-2.462)
OA	0.610	3.717	3.647
	(0.233)	(1.597)	(1.452)
Range	-17.823*	-22.682**	-21.572**
	(-2.509)	(-3.171)	(-2.984)
Age	-2.653.	-3.462*	-3.168**
	(-1.830)	(-2.419)	(-2.596)
Size	-0.909	-2.121*	-1.689*
	(-1.045)	(-2.491)	(-1.965)
PE	-19.126***	-18.739***	-19.856***
	(-8.836)	(-8.205)	(-7.043)
H	-10.810**	-8.050*	-8.472**
	(-3.051)	(-2.178)	(-2.581)
YD	9.773**	13.415***	10.312***
	(2.601)	(5.103)	(3.506)

Revision	-14.353	4.693	8.426
	(-1.199)	(0.402)	(0.649)
R-squared	0.276	0.272	0.318
Observations	1107	1107	1107
Panel B DT-IPOs (TRMI)			
Dependent variable		CAR24M	
Intercept	46.390***	45.876***	44.288***
	(9.341)	(9.011)	(8.507)
Sent	-0.124**	-0.120**	-0.130**
	(-2.840)	(-2.710)	(-2.786)
SCB	0.036*	0.035*	0.039*
	(2.497)	(2.363)	(2.493)
CB	-6.512***	-6.404**	-7.016***
	(-3.325)	(-3.208)	(-3.309)
NS-Sent	-36.262**		
	(-3.140)		
N-Sent		-42.247***	
		(-3.733)	
S-Sent			-5.965
			(-0.409)
HKHSI24M	-10.750*	-11.213*	-9.463.
	(-2.186)	(-2.190)	(-1.827)
OA	4.476.	4.386	4.045
	(1.768)	(1.554)	(1.378)
Range	-26.650***	-26.117***	-27.387***
	(-3.922)	(-3.370)	(-3.354)
Age	-2.602.	-2.804.	-2.993*
	(-1.869)	(-1.803)	(-1.970)
Size	-3.149***	-3.025**	-2.746**
	(-3.577)	(-3.214)	(-2.971)
PE	-23.170***	-23.362***	-23.847***
	(-10.024)	(-7.408)	(-6.816)
H	-6.080	-5.902	-6.340
	(-1.433)	(-1.358)	(-1.546)
YD	11.126***	10.196**	10.051**
	(3.753)	(3.110)	(2.860)
Revision	9.464	11.365	12.415
	(0.854)	(0.867)	(0.885)
R-squared	0.316	0.264	0.241
Observations	1107	1107	1107

Table 15. Investor sentiment and IPO long-run performance-3. CAR36M is the cumulative average return after 36 months of listing. Sent is the individual investor sentiment, which number of shares subscribed by individual investors divided by the numbers of shares assigned to public tranche. CB is the claw-back, it's a category dummy variable. If the claw-back system is triggered, CB is 1 when the subscription rate of individual investors is 15 times or more and less than 50 times, 2 when it is 50 times or more and less than 100 times, and 3 when it is 100 times or more. Sent* CB is a cross-term of both of them. NS-Sent is the News-Social index sentiment. N-Sent is the news index sentiment. S-Sent is the social index sentiment. HKHSI36M is the return of the Hang Seng Index after 36 months of listing. OA is a dummy variable that equals one when the over-allotment option is activated otherwise it equals zero. Range is the price range announced in its prospectus divided by the midpoint. Age is the natural log of the year of the establishment before the listing of a firm. Size is the natural log of the total assets of a firm. PE is a dummy variable that equals one if an IPO is invested by private equity and zero otherwise. H is a dummy variable that equals one if an IPO is an H Share offering and zero otherwise. YD is a year dummy variable with one issued during the financial crisis (2008-2009) and zero otherwise. Revision is the offer price divided by the midpoint of the initial price range. The t-statistics are in the parentheses. Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

Panel A DT-IPOs			
Dependent variable		CAR36M	
Intercept	29.694*	31.769***	28.054***
	(2.478)	(6.671)	(5.595)
Sent	-0.041**	-0.179***	-2.798.
	(-3.300)	(-5.169)	(-1.797)
SCB		0.050***	0.038**
		(3.896)	(2.493)
CB			-7.629***
			(-3.778)
HKHSI36M	-24.487***	-25.341***	-25.160***
	(-5.066)	(-5.045)	(-5.489)
OA	-1.427	0.009	0.509
	(-0.684)	(0.003)	(0.171)
Range	-9.721	-9.640	-9.845
	(-1.225)	(-1.247)	(-1.080)
Age	-2.096*	-2.998.	-0.070
	(-2.351)	(-1.827)	(-1.520)
Size	-0.774	-1.469.	-1.058
	(-1.032)	(-1.649)	(-1.174)
PE	-4.333	-3.034	-3.529
	(-1.416)	(-0.916)	(-0.988)
H	-2.811	-0.924	-0.473
	(-1.103)	(-0.244)	(-0.124)
YD	4.989	11.365***	8.630*
	(1.302)	(4.159)	(2.309)

Revision	8.775	28.141*	24.476
	(0.780)	(2.013)	(1.642)
R-squared	0.184	0.171	0.183
Observations	1107	1107	1107
Panel B DT-IPOs (TRMI)			
Dependent variable		CAR36M	
Intercept	41.484***	38.611***	40.177***
	(13.617)	(8.848)	(8.486)
Sent	-0.126**	-0.116*	-0.120**
	(-2.908)	(-2.540)	(-2.684)
SCB	0.034*	0.031*	0.033*
	(2.355)	(2.040)	(2.185)
CB	-5.543**	-5.693**	-6.279**
	(-2.829)	(-2.854)	(-2.960)
NS-Sent	-17.028*		
	(-2.253)		
N-Sent		-16.322*	
		(-2.278)	
S-Sent			-15.545.
			(-1.892)
HKHSI36M	-28.749***	-28.133***	-26.842***
	(-8.479)	(-6.129)	(-5.789)
OA	-0.503	-0.289	1.992
	(-0.176)	(-0.098)	(0.777)
Range	-22.475**	-19.668*	-17.615.
	(-2.745)	(-2.211)	(-1.889)
Age	-3.264*	-2.892.	-3.024.
	(-2.162)	(-1.762)	(-1.934)
Size	-2.148**	-2.008**	-2.288**
	(-2.709)	(-2.613)	(-3.022)
PE	-7.652*	-6.854*	-7.958*
	(-2.185)	(-2.015)	(-2.257)
H	-1.111	-2.281	-1.836
	(-0.378)	(-0.661)	(-0.593)
YD	5.831	5.929	6.310
	(1.415)	(1.434)	(1.473)
Revision	36.236**	31.629*	32.059*
	(2.623)	(2.244)	(2.348)
R-squared	0.239	0.228	0.181
Observations	1107	1107	1107