Moving between opposite short-selling regimes: Are stock characteristics priced differently?

Min Bai*

School of Economics and Finance (Albany), Massey University

Xiao-Ming Li

School of Economics and Finance (Albany), Massey University

Abstract

This paper examines the differences in the price effects of some important stock characteristics between two alternative short-sale regimes - one under which short selling is possible and the other where it is not. Using the uniqueness of HK regulations on short selling, we estimate a panel regression model for those HK stocks which switch between the two regimes. By exploring the interaction between the characteristic variables and the distinct short-sale regimes, we find strong evidence of the differences in their price effects. Our main results are robust across monthly and daily data and across returns and excess returns. The results shed light on the issues regarding how short-sale constraints impact the pricing of stock characteristics.

* Corresponding author: email: M.Bai@massey.ac.nz

1. Introduction

In this paper, we investigate the possible differences in the price effects of some important stock characteristics between two alternative short-sale regimes: One under which short selling is possible and the other where it is not. The effects include three well-documented anomalies - size, book-to-market and liquidity effects. The contributions of, or the motivations for, our study are detailed as follows.

Short selling is a strategy in which an agent sells a security that he/she does not own in order to profit from purchasing it back after its price has fallen. Specifically, the agent borrows the security from a third party and then immediately sells it to the buyer. At a later date, the agent must repay the loan by buying back the security from the market to close the position. If the value of the security has fallen during this period, the agent's profit will be the difference between the sale price and the buyback price (less interest charges and fees). However, the market may move against the agent, so there is a potential for loss. Whether short selling should be allowed is a highly controversial question. Debates on this issue among academics, practitioners and policymakers have been longstanding. Due to the concerns of abusive short selling and price manipulating etc., a majority of stock markets fully or partially prohibit short selling.

Traditional empirical asset pricing models, such as the multifactor model (Fama and French, 1996), do not take into account short-sale constraints pervasive in many security markets in the world. Faced with short-selling restrictions, investors' trading behaviour will be different, which in turn may affect those anomalies well-documented in the asset pricing literature. However, due to data unavailability, especially as far as data at the individual stock level are

concerned, no studies have looked at how short-sale constraints impact the effects of firm characteristics on stock returns. The present paper attempts to fill the void.

Most of previous studies on short-selling restrictions use an indirect measure to proxy for short-sale constraints. One main problem with these studies is that imperfect proxies may introduce some other effects not related to short-selling restrictions. For example, the institutional ownership proxy may be highly correlated with such stock characteristics as firm size. Following Chang et al (2007), we adopt a direct short-sale-constraint measure to test the overvaluation theory of Miller's (1977) and then asset pricing models. The measure is the addition/removing of individual stocks to/from an official list of designated securities that are allowed to be sold short. Chang et al (2007) use this measure as event dates, and examine the abnormal stock returns and the stabilizing/destabilizing problem around the dates. Unlike them, we treat the entire on-list period and the entire off-list period as two alternative regimes. This way, we are able to examine whether and how firms' characteristics are priced differently when their stocks switch between the two regimes.

Focusing on regimes rather than events, we consider panel regression to be a more relevant method than an event study, for our investigation. There are two ways to estimate coefficients: the OLS and the Fama-MacBeth (FM) procedure (Fama and MacBeth, 1973).[1] The FM procedure entails running T cross-sectional regressions and then computing the average of the *T* estimates for the coefficient in question. However, the FM procedure weights each period of data equally even if there is a different number of observations per period, so in an unbalanced panel data set, the coefficient estimates can differ (Petersen, 2009). Since our panel data are unbalanced, we opt for the OLS method for regression.

[1] Either the OLS or the FM estimate of a coefficient is a constant for all cross-section units ($i = 1, 2, \ldots, N$) and all time points ($t = 1, 2, \ldots, T$). Petersen (2009) shows that the means and the standard errors of the OLS and FM estimates are almost identical and the correlation between the two estimates are never less than 0.999 in any of his simulations.

We examine individual stock returns rather than portfolio returns to eschew the data snooping problem. Lo and MacKinlay (1990) demonstrate that using portfolios formed on some characteristics suggested in previous studies to be related to average returns can distort inferences dramatically and lead to rejecting the null hypothesis too often. To prevent the aggravation of this problem caused by sorting to form portfolios, Brennan et al (1998), Chui and Wei (1998) and Mobarek and Mollah (2005) also look at individual stock returns.

The remaining of this paper is structured as follows. The next section conducts literature review and derives testable hypotheses. Section 3 provides briefly background information about the regulations on short sales implemented by the Hong Kong Stock Exchange. Section 4 describes data and methodology used in this paper. Section 5 provides discussions on the results. Section 6 concludes.

2. Short-sale constraints and testable implications

2.1. Reviewing studies on short-sale constraints

Among the questions that interest researchers is how short-sale constraints affect market efficiency and asset prices. Fama (1970) defines that the efficient market is a market where securities prices fully reflect available information. Miller (1977) theorizes that prohibition on short selling will reduce market efficiency. Based on the assumption of heterogeneous expectations among investors, Miller argues that short-sale constraints lead securities to reflect more of the optimistic investors' opinions than of the average potential investors' opinions, resulting in upward biases of securities prices. That is, stock prices will be overvalued as pessimistic investors cannot act on their bearish beliefs and remain out of the market. Jarrow (1980) and Fiqlewski (1981), adopting the CAPM model, document that

homogenous investors can only push securities prices up but heterogeneous investors may either increase or decrease stocks prices. Asquith and Meulbroek (1995) employ short interest to proxy for the level of shares that would be sold short if short-sale constraints were nonexistent. They show that short interest has a statistically significant negative relation with subsequent abnormal returns. Desai et al. (2002), also using short interest data but a portfolio approach, suggest that heavily shorted stocks have significantly negative abnormal returns, implying that short-sale constraints lead to overpricing of stocks.

There are two more recent works worth noting. One is Chang et al's (2007) study of stock price movements following the removal of short-sale constraints in the Hong Kong (HK) stock market. Using an event-study methodology, the authors detect a statistically significant price drop after the lifting of short-sale bans, at the individual stock level. The other is Bris et al. (2007) adopting 46 countries to test the effects of short sales constraints on market efficiency by comparing markets in which short sales are allowed or practices to countries in which they are not. Bris et al. (2007) document those markets with short sales constraints have statistically significant less negative skewness in returns and more efficient price discovery resulting in higher idiosyncratic risk and less price co-movement.

2.2 Developing testable hypotheses

In this section, we develop five hypotheses to test, pertaining to alpha, firm size, book-to-market, illiquidity, and dispersion of opinion.

From the brief literature survey in the preceding section, it is clear that short selling makes stock markets more efficient by allowing all investors' opinions/valuations to be registered in the stock price. When short selling is banned, pessimistic investors who do not own the

stocks remain out of the market, so their valuations are not registered in the stock price. Accordingly, on average stocks are overpriced, and stock prices decline when short-selling prohibition is lifted. In other words, Miller's (1977) overpricing theory has such an implication for the cost of capital (i.e., expected return) as,

Hypothesis 1: The alpha coefficient (the return in excess of the compensations for all risks borne or the risk-compensation-adjusted return) is higher where short selling is not allowed than where it is allowed.

The size effect in stock markets has been extensively studied. Banz (1981) documents that, in the US stock market, stocks with smaller market capitalization are likely to have higher average returns than stocks with larger market capitalizations. Since Banz (1981), more empirical evidence has been generated in line with the size effect – i.e., the negative relation between firm size and stock returns, but counterevidence or no evidence has also been reported.[2] The size effect is interpreted as smaller/larger firms paying higher/lower cost of capital, since the former are often considered to be more financially distressed than the latter. If stocks on the short-sale-permitted list are all large, the size effect should be less significant. However, if firms with larger sizes cannot have their stocks sold short, their stock prices should be more overpriced – i.e., their will pay the higher cost of capital, other things being equal. This is because, if short selling was permitted, the supply of larger firms' stocks would increase more, leading to more fall in the stock prices, than for relatively smaller firms. Thus, our next interest is in testing the hypothesis as stated below.

Hypothesis 2: The effect of firm size on stock returns is more positive where short selling is not possible than where it is possible.

[2] See, for examples, Lamoureux and Sanger (1989), Jegadeesh (1992), Fama and French (1993, 1996, 2000), Herrera and Lockwood (1994), Daniel and Titman (1997), Chui and Wei (1998), Campbell (2000), Davis,, Pastor and Stambaugh (2000), Daniel, Titman and Wei (2001), and Sehgal and Tripathi (2005).

Our third concern is with detecting possible changes in the book-to-market effect across the short-sale-constraint and the short-sale-practice regime. There are two kinds of the book-to-market effects. One is known as the value effect (or premium), referring to a positive relation between stock returns and the book-to-market ratio. The other is called the growth effect, where the relation is negative. Most studies have found the value effect, while some have reported evidence for the growth effect.[3] The book-to-market ratio is also interpreted as a measure of risk (Fama and French, 1993, 1996). So, the higher the ratio, the higher the risk, and the higher should be the (value) premium as a compensation for risk. Some investors, when perceiving such risk, may desire to take negative positions in the stocks which would reduce the demand for, hence the prices of, such stocks. Constraining short sales, however, will prevent them from doing so, thus shifting the overall demand for, hence the prices of, the stocks upward. Accordingly, we hypothesize:

Hypothesis 3: The effect of book-to-market on stock returns is more positive where short selling is forbidden than where it is allowed.

Our fourth goal is to examine whether illiquidity is priced differently under the two opposite short-selling rules. Using the bid-ask spread as an illiquidity measure, Amihud and Mendelson (1986) show that illiquidity is priced. Chordia et al. (2001), Jones (2001), Amihud (2002) and Bekaert et al. (2003) find that illiquidity co-moves with returns and predicts future returns. Illiquidity is perceived by investors as a risk characteristic. A positive illiquidity shock (a rise in illiquidity) predicts high future illiquidity, which raises ex ante expected return by lowering the contemporaneous price/return. Consistent with these rationales, many empirical studies suggest that illiquidity has a negative relation with contemporaneous stock

[3] The value effect has been documented in Stattman (1980), Rosenberg et al (1985), Capual et al (1993), and Chan et al (1991). The growth effect has been documented in Harris and Marston (1994), and Cooper et al (2008).

returns, but a positive relation with future stock returns.[4] Diamond and Verrecchia (1987) predict that an increase in the bid-ask spread hence in illiquidity when short selling is prohibited. The rise in illiquidity reflects the lower supply of stocks for sale, because some investors who want to sell but do not already own stocks cannot participate in the market. Charoenrook and Daouk (2008) confirm that illiquidity is higher in markets where short selling is not possible. We go further to ask whether the change in illiquidity due to the change of the short-selling regime will change the illiquidity effect on stock returns. The decreased supply of stocks due to short-sale constraints should lead to excess demand for them including those with increased illiquidity. This in turn should, *ceteris paribus*, raise their prices/returns. Based on the above reasoning, we formulate a hypothesis as follows.

Hypothesis 4: The effects of lagged and contemporaneous illiquidity on stock returns are less negative (more positive) with short-sale constraints than without.

In Miller's (1977) overpricing theory, an important factor is dispersion of investor opinion: In the presence of short-sale constraints, differences of opinion lead to stock price overvaluation. Boehme et al (2006) explore the valuation effects of the interaction between differences of opinion and short-sale constrains. They provide robust evidence of significant overvaluation for stocks that are subject to both of these two conditions simultaneously. Inspired by their work, we conjecture that

Hypothesis 5: Dispersion of opinion has a higher, positive effect on stock returns when short-selling prohibition is in place than when it is lifted.

[4] See, Amihud et al. (1989), Amihud (2002), Chordia et al. (2001), Jones (2001), Pastor and Stambaugh (2003), Bekaert et al. (2003) and Acharya and Pederson (2005).

3. Regulations on Short Selling in the HK Stock Market

Hong Kong's regulations on short-selling practices make its data unique to better serve our purposes, i.e., to test the above five hypotheses more accurately and directly. To see this, we briefly describe the regulations in this section.

In line with reforming the securities borrowing and lending system, the Hong Kong Stock Exchange (HKSE) introduced, in January 1994, a pilot scheme for regulated short selling. Only stocks that appear on the official list can be sold short. Under the pilot scheme, 17 securities could be sold short, provided that they were above the best current ask price (the so-called "tick rule"). The scheme was revised in March 2006 with the number of designated securities for short selling increasing and the tick rule abolished. The tick rule was resumed on 7 September 1998, upon changes in market conditions. But exempt from the rule were short-selling transactions by stock options market-makers for the purpose of hedging the risk of portfolios resulting from their market-making activities. The number of designated securities for short selling is revised on a quarterly basis. By December 31, 2009, out of 1,404 common stocks traded on the main board, 890 could be sold short.

Table 1 provides information about how individual stocks on the HKSE experience changes in the short-selling rules. The second column (labelled "Change date") indicates the dates on which a revised list of designated securities had stocks added and/or removed for short-selling practice. The third column (labelled "Addition") provides the number of stocks that were added onto the official list and therefore allowed to be sold short from the change date onwards. The fourth column (labelled "Deletion") presents the number of stocks that were deleted from the official list and therefore not allowed to be sold short from the change date onwards. The fifth column (labelled "No. of stocks") gives the total number of designated

stocks that remain on the revised list. The list was first established on January 3, 1994 and had been subsequently revised 80 times by December 31, 2009.

[Insert Table 1 Here]

The main message conveyed by Table 1 is that since 1994, two opposite short-selling regimes have coexisted in the HK stock market. For the ease of exposition, we will refer to them as the short-selling (SS) regime and the no-short-selling (NSS) regime, respectively. When a stock appears on the list, we say it is under the SS regime since its short selling is possible. If a stock is removed from the list, it is under the NSS regime since its short selling is not possible. Some stocks have never appeared on the list, while others have never been removed from the list. This issue will be discussed later. To sum up, the uniqueness of HK regulations on short sales provides us with an ideal laboratory for exploring the differences in asset pricing between the SS and NSS regimes for the stocks that undergo the two regimes.

4. Data and methodology

Based on the designated short-selling list, we can divide all listed stocks into three categories. Category 1 contains stocks that have never been added to the list, meaning that they stayed in the NSS regime only throughout our investigation period. Table 2 shows that there are 514 stocks in total in this category.

[Insert Table 2 Here]

Category 2 comprises stocks that have never removed from the list since their first addition to the list. That is, they were traded under the SS regime only throughout our sample period. Table 3 exhibits that there are 376 stocks in total in this category.

[Insert Table 3 Here]

Category 3 embraces stocks that have undergone both the SS and the NSS regime at least once. When in the SS regime, they can be sold short; and when in the NSS regime, they cannot. As Table 4 demonstrates, there are 514 stocks in total in this category.

[Insert Table 4 Here]

Since our interest is in comparing the two opposite regimes as reflected by the five hypotheses stated above, Category 1 and Category 2 are not relevant because they have never experienced regime changes over time. Stocks in Category 3 switch between the two regimes, so their differences in the return-characteristic relation can be attributed more to regime changes they have experienced. Including Category 1 and Category 2 in our analysis would make it difficult to disentangle the detected differences due to regime changes from those due to other concurrent factors. Such factors could arise from the fact that stocks in Category 1 are not the same stocks in Category 2 and vice versa.

Despite the fact that this paper reports the results for Category 3's stocks only, we collect the required data for all 1,404 stocks. They include closing price, market value, book-to-market ratio, turnover (measured by volume), and the number of shares outstanding on individual stocks. These data were sourced from DataStream. The bid and ask data on individual stocks were downloaded from SIRCA. We use both monthly and daily data to crosscheck the results, and our sample period spans from January 1994 to December 2009. Among them, a total of 66,650 monthly observations, or 1,472,834 daily observations, are available for Category 3's stocks.

To test the five hypotheses, we employ the following multifactor panel model:

$$R_{it} = \left(\alpha + \alpha' SS_t\right) + \gamma_1 SS_t SZ_{it} + \gamma_1' \left(1 - SS_t\right) SZ_{it} + \gamma_2 SS_t BM_{it} + \gamma_2' \left(1 - SS_t\right) BM_{it} + \gamma_3 SS_t ILQ_{it}$$
$$+ \gamma_3' \left(1 - SS_t\right) ILQ_{it} + \gamma_4 SS_t ILQ_{it-1} + \gamma_4' \left(1 - SS_t\right) ILQ_{it-1} + \gamma_5 SS_t DO_{it} + \gamma_5' \left(1 - SS_t\right) DO_{it} + \mu_i + e_{it} \quad (1)$$

R_{it} is stock return (or excess stock return over the risk-free rate), calculated as the log differences of a stock's closing prices. SS_{it} is a dummy variable, equal to 1 if the stock is on the official list (in the SS regime), and to 0 if it is off the list (in the NSS regime). SZ_{it} denotes firm size, calculated as a stock's market value. BM_{it} represents the book-to-market ratio of a stock. ILQ_{it} is illiquidity, measured by a stock's bid-ask spread divided by the midpoint of the spread (see Amihud, 2002). DO_{it} indicates dispersion of opinion, and following Berkman et al (2009) we use a stock's turnover (measured by volume) divided by its number of shares outstanding to proxy DO_{it}. All the above regressors in (1) take the logarithmic form. μ_i denotes the *unobservable* individual stocks' specific effect or the *unexplained* cross-sectional variation.

Every regressor in Equation (1) appears in two interaction terms, one associated with the SS regime (symbolized by SS_t) and the other with the NSS regime (symbolised by 1-SS_t). This enables us to test the differences arising from regime changes. For example, the coefficient γ_1 associated with SS_tSZ_{it} measures the effect of firm size when the stock is under the SS regime, while the coefficient γ_1' associated with (1-SS_t)SZ_{it} measures the effect under the NSS regime. If $\gamma_1' - \gamma_1$ is positive and statistically significant, we will be able to accept *Hypothesis 2*.

5. Empirical results

5.1. Preliminary statistical analysis

By differentiating stocks between those that can be sold short and those that cannot, table 5 reports the mean-difference test results for returns under the two regimes with both monthly and daily data employed. It is clear that stocks under the SS regime have statistically significant lower return/excess return than stocks under the NSS regime. This is because pessimistic investors cannot take short positions when stocks are not allowed to be sold short, thus leading to price overvaluation. This preliminary result is consistent with the Miller's (1977) overpricing theory.

[Insert Table 5 Here]

Before estimating model (1), it is necessary to ensure panel stationarity hence not spurious regression. To this end, we use three statistics to test panel unit root. The first, known as the Im, Pesaran and Shin W-statistic, amounts to a t-test for unit roots in heterogeneous panels (Im, Pesaran and Shin,1997). It allows for individual effects, time trends, and common time effects. The second statistic, known as the ADF Fisher test, is based on the mean of the individual Dickey-Fuller t-statistics of each unit in the panel. This approach assumes that all series are non-stationary under the null hypothesis. Appropriate lag lengths of the dependent variable may be introduced to allow for serial correlation in the errors. The last statistic, known as the PP – Fisher Chi-square test, performs the Phillips-Perron test that a variable has a unit root in panel data. The null hypothesis is that the variable contains a unit root, and the alternative is that the variable was generated by a stationary process. Table 6 shows the panel unit root test results. Probability values appear in parenthesis. The test results show that we are able to decisively reject the null hypothesis that there is a unit root.

[Insert Table 6 Here]

The Huasman (1978) specification test evaluates the significance of an estimator versus an alternative estimator. It helps a model user to see if the employed statistical model conforms to the data. Table 7 reports the Hausman test results. Based on the P-values, we are able to decisively reject the null hypothesis that the random-effect model is preferred. Therefore, we estimate the fixed-effect panel model in this study.

[Insert Table 7 Here]

5.2. Panel regression results

The panel regression results are presented in Table 8 (for monthly data) and Table 9 (for daily data). Each Table contains two panels, one related to the stock return as the dependent variable and the other the excess stock return. Within each table, although the dependent variable used for regression is different, the results are qualitatively similar in terms of the signs of the coefficient estimates.

[Insert Table 8 Here]

[Insert Table 9 Here]

Let us begin by considering alpha – the risk-compensation-adjusted return. Both Table 8 and Table 9 indicate that α is positive and highly significant, while α' is negative but highly significant too. These suggest that, under the NSS regime where short selling is forbidden, the risk-compensation-adjusted return is significantly higher than under the SS regime where short selling is allowed. According to Table 8, the SS regime makes alpha drop by 0.2179 for the stock return and by 0.1890 for the excess stock return. These two figures become 0.0096

and 0.0087 in Table 9 for daily data. We take these observations as strong evidence in support of *Hypothesis 1* which was derived from Miller's (1977) theory that short-sale constraints cause stocks to be overpriced.

Turning to the effect of firm size, we observe differences between Table 8 and Table 9. For monthly data (Table 8), γ_1 is negative in Panel A and Panel B, but significant at the 5% level in the former and insignificant in the latter. For daily data (Table 9), γ_1 is positive but insignificant in both Panel A and Panel B. Thus, the evidence for the size effect is ambiguous and weak. However, as far as $\gamma_1^{'}$ is concerned, the same across both Table 8 and Table 9 is that it is positive and statistically significant at the 1% level. Moreover, $\gamma_1^{'} - \gamma_1 > 0$ is true and highly significant throughout the two tables. These common observations serve our purpose to test and accept *Hypothesis 2*. In other words, we find strong evidence that short-selling restrictions raise the effect of firm size on returns above that under no such restrictions.

Next, we examine the effect of the book-to-market ratio. Again we observe some differences between Table 8 and Table 9. Using monthly data (Table 8), γ_2 is positive but insignificant in Panel A and Panel B, and $\gamma_2^{'}$ is positive and significant at the 1% level. Using daily data (Table 9), γ_2 and $\gamma_2^{'}$ now become negative and significant at the 1% level. Thus, we are unable to make unambiguous claims regarding whether there exist value premiums or growth premiums in the HK stock market. However, two common observations from the two tables (and four panels) are that the estimate of $\gamma_2^{'}$ is greater (less negative) than that of γ_2, and that this positive difference between $\gamma_2^{'}$ and γ_2 is significant at the 10% level for monthly data and at the 5% level or above for daily data. We can therefore claim evidence in favour of *Hypothesis 3*. Some researchers (e.g., Nagel, 2005; and Phalippou, 2007) attribute the value effect to tight short-sale constraints. Our findings are consistent with theirs: Moving from the

no-constraint regime to the constraint regime strengthens the value effect if the γ_2 coefficient is positive, or weakens the growth effect if the γ_2 coefficient is negative.

Pertaining to the effect of contemporaneous illiquidity, a striking result appears in Table 8 and Table 9: All the γ_3 and $\gamma_3^{'}$ coefficient estimates are negative and highly significant for both monthly and daily data and for both the stock return and the excess stock return as the dependent variable. This result is consistent with previous findings that illiquidity has a negative relation with contemporaneous stock returns (See footnote 5). But our interest is not in confirming this result. Rather, we are concerned with *structural change* in the effect due to short-selling regime's change. For this purpose, we take a look at the test results for the difference $\gamma_3^{'} - \gamma_3$. Evidently, all the test results given in the two tables (and four panels) point to one direction: the difference is positive and significant at the 1% level. These test results enable us to accept part of *Hypothesis 4* concerning contemporaneous illiquidity.

As for the effect of lagged illiquidity, similar evidence, albeit less strong, can be obtained from Table 8 and Table 9 with respect to structural change. The test results for the difference $\gamma_4^{'} - \gamma_4$ are consistent in terms of the sign (positive), and is highly significant in three cases but insignificant in one (Panel A of Table 8 for the stock return). However, if excess returns are a more appropriate dependent variable than returns, we can still claim strong evidence in favour of part of *Hypothesis 4* related to lagged illiquidity. Note, the detected positive sign of $\gamma_4^{'}$ is also consistent with the findings by the previous studies cited in footnote 5.

Finally, we discuss the result about dispersion of opinion. The effects of dispersion of opinion under the SS and NSS regimes are captured by γ_5 and $\gamma_5^{'}$ respectively. As can be seen from Table 8 and Table 9, the estimates of the two coefficients are all positive and highly significant. This implies that differences in investor opinion about stocks lead to their price

overvaluation even if the stocks can be sold short. This may be because even though the stocks are allowed to be sold short, actual short selling of them may not be active enough to eliminate the overvaluation. However, such overvaluation becomes even stronger if stocks cannot be sold short. This is evidenced by the test results for $\gamma_5^{'}$ - γ_5. In the two tables and their four panels, the t-values are all positive and significant at a higher than 1% level. Our conjecture as stated in *Hypothesis 5* is therefore supported. By incorporating the interaction between dispersion of opinion and short-sale constraints, we are able to use the HK unique data to confirm Boehme et al's (2006) result but in a comparative way: Stocks subject to both dispersion of opinion and short-selling restriction demonstrate more significant overvaluation than stocks subject to the former condition only.

6. Conclusions

Issues related to short-sale constraints have been challenging academics, policymakers and participators alike. Among them, how short-sale constraints may affect asset pricing and behavioural finance is a focus of many academic studies. Using the unique short-sale regulations in the HK stock market, we join the research endeavours by developing and testing five hypotheses in the area of asset pricing. The uniqueness of the HK regulations enables us to measure short-selling restrictions directly, and to treat short sales being possible and being not possible as two distinct regimes. Our contributions to the literature are embodied in the conclusions as summarised below.

First, we find that stocks have lower risk-compensation adjusted returns when their short selling is possible. This result is not new, as it is consistent with many previous findings. Second, we show that stocks with larger sizes perform even better in terms of their returns if they are not allowed to be sold short than if they are. Third, although it is unclear whether the

value effect or the growth effect prevails in the HK stock market, one thing for sure is that the short-sale-constraint regime will increase the value premiums or decrease the growth premiums. The fourth discovery is that contemporaneous illiquidity has a weaker negative effect, while lagged illiquidity has a stronger positive effect, on stock returns, when stocks move into the regime where the ban on short selling is lifted. The last result is pertinent to dispersion of opinion. A structural break is detected in the effect of dispersion of opinion on stock returns in that the effect rises with short-sale constraints being imposed.

Most of the above results are new and interesting, as they have never been documented in the literature. These results are robust to the extent that they are not sensitive to which return variable is used and what data frequency is adopted.

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Table 1 Designated Securities Eligible for Short Selling

No.	Change date	Addition	Deletion	No. of stocks	No.	Change date	Addition	Deletion	No. of stocks
1	1994-01-03	17		17	41	2005-11-18	11	7	275
2	1996-03-25	96	0	113	42	2006-02-20	10	8	277
3	1997-05-01	129	1	241	43	2006-03-01	2	0	279
4	1998-01-12	69	0	310	44	2006-05-29	23	17	285
5	1998-03-16	15	0	325	45	2006-06-02	2	0	287
6	1998-11-09	19	149	195	46	2006-08-25	38	10	315
7	1999-03-01	7	7	195	47	2006-09-01	1	0	316
8	1999-09-20	3	17	181	48	2006-10-23	1	0	317
9	1999-11-12	1	0	182	49	2006-10-27	1	0	318
10	2000-02-28	24	12	194	50	2006-12-01	55	9	364
11	2000-05-31	7	0	201	51	2007-03-05	30	24	370
12	2000-08-28	32	16	217	52	2007-03-14	1	0	371
13	2001-02-12	15	11	221	53	2007-04-18	2	0	373
14	2001-05-14	6	0	227	54	2007-04-19	5	0	378
15	2001-08-20	9	11	225	55	2007-04-26	4	0	382
16	2001-12-03	17	85	157	56	2007-04-27	1	0	393
17	2002-02-25	7	14	150	57	2007-05-21	30	14	399
18	2002-05-21	11	6	155	58	2007-05-29	1	0	400
19	2002-07-29	24	5	174	59	2007-07-04	1	0	401
20	2002-11-29	6	15	165	60	2007-07-17	1	0	402
21	2003-01-27	5	7	163	61	2007-08-13	134	9	527
22	2003-05-19	18	7	174	62	2007-08-27	1	0	528
23	2003-07-21	1	16	159	63	2007-11-26	64	23	569
24	2003-11-03	36	5	190	64	2007-12-14	3	0	572
25	2004-01-06	1	0	191	65	2008-02-18	33	41	564
26	2004-02-10	29	3	217	66	2008-03-13	1	0	565
27	2004-04-07	1	0	218	67	2008-05-13	22	47	540
28	2004-04-27	26	4	240	68	2008-05-15	1	0	541
29	2004-07-01	1	0	241	69	2008-06-03	5	0	546
30	2004-07-09	1	0	242	70	2008-08-07	10	51	505
31	2004-08-02	8	21	229	71	2008-11-14	6	144	367
32	2004-11-08	9	11	227	72	2009-02-12	25	27	365
33	2005-02-07	15	7	235	73	2009-05-14	13	22	356
34	2005-03-01	2	0	237	74	2009-07-10	1	0	357
35	2005-05-17	37	9	265	75	2009-08-05	49	16	390
36	2005-07-08	1	0	266	76	2009-11-05	58	11	437
37	2005-07-15	1	0	267	77	2009-11-18	1	0	438
38	2005-08-15	14	12	269	78	2009-12-03	1	0	439
39	2005-09-05	1	0	270	79	2009-12-15	1	0	440
40	2005-10-28	1	0	271	80	2009-12-24	1	0	441

Table 2 Stocks never on the official list, 01/01/1994-31/12/2009

HK1002	HK1184	HK1823	HK2358	HK309	HK431	HK572	HK707	HK8025	HK8106	HK8189	HK8272	HK880
HK1003	HK1187	HK1866	HK236	HK310	HK433	HK575	HK713	HK8026	HK8108	HK8190	HK8273	HK889
HK1004	HK1189	HK1868	HK2362	HK3300	HK439	HK582	HK718	HK8028	HK8109	HK8192	HK8279	HK891
HK1005	HK1194	HK189	HK237	HK331	HK444	HK59	HK72	HK8029	HK8111	HK8196	HK8286	HK896
HK1008	HK1195	HK1928	HK2371	HK3344	HK445	HK591	HK721	HK8032	HK8115	HK8197	HK8287	HK897
HK1010	HK1196	HK195	HK2379	HK339	HK458	HK597	HK725	HK8033	HK8116	HK8198	HK829	HK898
HK1013	HK1198	HK1968	HK2383	HK3399	HK459	HK599	HK726	HK8037	HK8118	HK8200	HK8290	HK899
HK102	HK1213	HK2009	HK2389	HK342	HK462	HK60	HK731	HK8041	HK8119	HK8202	HK8292	HK9
HK1026	HK1217	HK2028	HK239	HK352	HK464	HK607	HK736	HK8043	HK812	HK8205	HK8298	HK901
HK1037	HK1218	HK204	HK2398	HK353	HK465	HK609	HK738	HK8046	HK8120	HK8208	HK8299	HK905
HK104	HK122	HK205	HK240	HK354	HK469	HK61	HK745	HK8047	HK8123	HK821	HK8301	HK907
HK1046	HK1220	HK206	HK241	HK356	HK474	HK611	HK746	HK8048	HK8126	HK8210	HK8305	HK912
HK1047	HK1226	HK207	HK244	HK359	HK475	HK612	HK756	HK8049	HK8128	HK8211	HK8306	HK913
HK1060	HK1227	HK209	HK248	HK36	HK479	HK618	HK758	HK8050	HK8129	HK8213	HK8317	HK918
HK1062	HK1229	HK21	HK252	HK360	HK482	HK621	HK759	HK8051	HK8130	HK8217	HK8319	HK922
HK1064	HK1238	HK212	HK253	HK361	HK483	HK629	HK764	HK8053	HK8131	HK822	HK8325	HK925
HK1066	HK125	HK213	HK254	HK364	HK491	HK630	HK766	HK8055	HK8137	HK8220	HK8329	HK927
HK1073	HK131	HK216	HK259	HK365	HK495	HK631	HK768	HK8058	HK814	HK8225	HK8331	HK946
HK108	HK1313	HK2168	HK2601	HK377	HK499	HK638	HK770	HK8060	HK8143	HK8226	HK834	HK947
HK1080	HK1318	HK219	HK262	HK379	HK502	HK642	HK771	HK8061	HK8148	HK8227	HK8340	HK95
HK109	HK132	HK22	HK264	HK380	HK509	HK643	HK775	HK8063	HK8150	HK8228	HK8348	HK950
HK110	HK1328	HK221	HK266	HK3823	HK510	HK645	HK776	HK8065	HK8151	HK8229	HK835	HK952
HK1100	HK139	HK224	HK2668	HK387	HK512	HK646	HK777	HK8066	HK8153	HK8231	HK8351	HK955
HK1116	HK141	HK225	HK2700	HK3886	HK513	HK650	HK789	HK8068	HK8155	HK8233	HK837	HK959
HK1130	HK145	HK228	HK2728	HK39	HK515	HK657	HK79	HK8071	HK8157	HK8235	HK839	HK960
HK1131	HK146	HK2302	HK277	HK3900	HK516	HK660	HK794	HK8075	HK8158	HK8236	HK840	HK963
HK1132	HK149	HK2308	HK278	HK3928	HK527	HK663	HK8003	HK8076	HK8159	HK8239	HK841	HK969
HK1139	HK158	HK2309	HK280	HK3938	HK529	HK668	HK8007	HK8078	HK8163	HK8243	HK845	HK970
HK114	HK162	HK2310	HK287	HK397	HK530	HK676	HK8008	HK8079	HK8165	HK8247	HK846	HK978
HK1140	HK1628	HK2312	HK288	HK398	HK532	HK677	HK8009	HK8080	HK8166	HK8248	HK85	HK982
HK1142	HK1638	HK2317	HK2882	HK403	HK544	HK678	HK801	HK8081	HK8167	HK8249	HK851	HK985
HK1149	HK1666	HK2322	HK2898	HK404	HK547	HK68	HK8010	HK8082	HK8169	HK8250	HK852	HK986
HK1159	HK1668	HK2323	HK29	HK406	HK549	HK684	HK8013	HK8083	HK8171	HK8251	HK856	HK993
HK1160	HK169	HK2324	HK290	HK411	HK550	HK686	HK8015	HK8085	HK8172	HK8253	HK859	HK997
HK1161	HK170	HK2326	HK292	HK413	HK556	HK692	HK8016	HK8086	HK8173	HK8256	HK860	
HK1163	HK1717	HK2327	HK294	HK421	HK558	HK693	HK8017	HK8092	HK8175	HK8258	HK865	
HK117	HK174	HK2330	HK295	HK422	HK559	HK701	HK8019	HK8096	HK8176	HK8259	HK869	
HK1172	HK176	HK2340	HK30	HK426	HK565	HK703	HK802	HK810	HK8182	HK8266	HK872	
HK1173	HK1777	HK2348	HK306	HK428	HK567	HK705	HK8021	HK8100	HK8186	HK827	HK875	
HK1178	HK1808	HK2349	HK307	HK430	HK570	HK706	HK8022	HK8103	HK8188	HK8270	HK876	

Table 3 Stocks always on the official list, 01/01/1994 - 31/12/2009

HK1	HK123	HK1838	HK2337	HK2826	HK3337	HK3933	HK539	HK71	HK8282
HK10	HK1234	HK1862	HK2338	HK2827	HK3339	HK3968	HK54	HK712	HK8288
HK1006	HK13	HK1880	HK2343	HK2831	HK336	HK3983	HK548	HK723	HK83
HK101	HK133	HK1883	HK2355	HK2837	HK3366	HK3988	HK551	HK728	HK832
HK1031	HK1333	HK1886	HK2356	HK285	HK3368	HK3993	HK552	HK732	HK836
HK1033	HK1338	HK1888	HK2357	HK2866	HK337	HK3998	HK555	HK735	HK848
HK1038	HK135	HK1889	HK2368	HK2868	HK3377	HK4	HK569	HK737	HK850
HK1055	HK1361	HK1893	HK2380	HK2878	HK3378	HK41	HK573	HK74	HK857
HK1068	HK1368	HK1898	HK2388	HK2880	HK338	HK410	HK576	HK743	HK868
HK1071	HK1382	HK1899	HK242	HK2883	HK3382	HK425	HK588	HK750	HK883
HK1088	HK1387	HK19	HK247	HK2888	HK3383	HK4331	HK589	HK751	HK886
HK1093	HK1393	HK1919	HK2600	HK2899	HK3389	HK4332	HK596	HK753	HK893
HK1094	HK1398	HK196	HK2626	HK291	HK3393	HK4333	HK598	HK754	HK902
HK1098	HK14	HK1988	HK2628	HK293	HK34	HK4335	HK6	HK762	HK903
HK1099	HK142	HK2	HK267	HK2939	HK340	HK4336	HK604	HK763	HK906
HK11	HK144	HK20	HK268	HK2944	HK345	HK4337	HK62	HK773	HK910
HK1104	HK151	HK2000	HK2688	HK2945	HK346	HK4338	HK626	HK8	HK914
HK1109	HK152	HK2006	HK2698	HK2947	HK347	HK435	HK633	HK800	HK916
HK111	HK159	HK2007	HK27	HK297	HK349	HK4362	HK64	HK8001	HK92
HK1110	HK16	HK2008	HK270	HK2977	HK35	HK4363	HK653	HK803	HK939
HK1111	HK1618	HK2018	HK272	HK3	HK358	HK440	HK656	HK808	HK941
HK1114	HK165	HK2020	HK2722	HK302	HK363	HK45	HK658	HK809	HK943
HK1122	HK168	HK203	HK2727	HK303	HK368	HK467	HK659	HK811	HK96
HK1128	HK1688	HK2038	HK2777	HK308	HK369	HK480	HK66	HK813	HK966
HK1138	HK17	HK2088	HK2778	HK31	HK3808	HK489	HK662	HK8132	HK968
HK1155	HK175	HK215	HK2800	HK313	HK3813	HK493	HK669	HK8138	HK97
HK1168	HK1766	HK217	HK2801	HK316	HK3818	HK494	HK670	HK817	HK980
HK1169	HK177	HK220	HK2803	HK322	HK3833	HK497	HK672	HK818	HK981
HK1171	HK178	HK2288	HK2806	HK323	HK3838	HK498	HK682	HK8180	HK990
HK1177	HK179	HK23	HK2809	HK325	HK384	HK5	HK683	HK819	HK991
HK119	HK1800	HK2314	HK2810	HK330	HK386	HK50	HK688	HK8199	HK992
HK1199	HK1813	HK2318	HK2812	HK3308	HK388	HK503	HK69	HK82	HK995
HK12	HK1818	HK2319	HK2813	HK3311	HK3883	HK506	HK691	HK820	HK996
HK1200	HK182	HK232	HK2814	HK3323	HK3888	HK511	HK694	HK8203	HK999
HK1205	HK1828	HK2328	HK2815	HK3328	HK3898	HK522	HK696	HK823	
HK1211	HK183	HK2331	HK282	HK3331	HK3899	HK525	HK700	HK8241	
HK1212	HK1833	HK2332	HK2820	HK3333	HK390	HK53	HK708	HK825	
HK1224	HK1836	HK2333	HK2825	HK3336	HK392	HK538	HK709	HK8271	

Table 4 Stocks on and off the official list, 01/01/1994 to 31/12/2009

HK7	HK89	HK164	HK245	HK329	HK417	HK543	HK636	HK739	HK933	HK1126	HK1881	HK3918
HK15	HK90	HK166	HK246	HK332	HK418	HK546	HK637	HK747	HK934	HK1129	HK1882	HK3989
HK18	HK91	HK167	HK249	HK333	HK419	HK553	HK639	HK752	HK938	HK1133	HK1991	HK3999
HK24	HK93	HK171	HK250	HK334	HK420	HK554	HK641	HK755	HK945	HK1135	HK1997	HK8002
HK25	HK94	HK172	HK251	HK335	HK423	HK557	HK647	HK757	HK979	HK1136	HK2002	HK8005
HK26	HK98	HK173	HK255	HK341	HK432	HK560	HK648	HK760	HK983	HK1137	HK2005	HK8006
HK28	HK99	HK180	HK256	HK343	HK438	HK563	HK651	HK761	HK984	HK1141	HK2300	HK8011
HK32	HK100	HK181	HK257	HK348	HK448	HK566	HK655	HK765	HK987	HK1164	HK2307	HK8018
HK33	HK103	HK184	HK258	HK350	HK449	HK568	HK661	HK767	HK988	HK1166	HK2313	HK8035
HK37	HK105	HK185	HK260	HK351	HK450	HK571	HK665	HK769	HK989	HK1170	HK2320	HK8045
HK38	HK106	HK186	HK261	HK355	HK451	HK577	HK666	HK806	HK998	HK1174	HK2336	HK8052
HK40	HK107	HK187	HK263	HK357	HK455	HK578	HK667	HK826	HK1000	HK1175	HK2339	HK8056
HK42	HK112	HK188	HK265	HK362	HK456	HK581	HK673	HK828	HK1001	HK1176	HK2341	HK8069
HK43	HK113	HK190	HK269	HK366	HK457	HK583	HK674	HK833	HK1036	HK1180	HK2342	HK8070
HK44	HK115	HK191	HK271	HK367	HK471	HK585	HK675	HK838	HK1041	HK1182	HK2345	HK8088
HK46	HK116	HK193	HK273	HK370	HK472	HK587	HK679	HK855	HK1043	HK1185	HK2366	HK8089
HK47	HK118	HK194	HK274	HK371	HK476	HK590	HK680	HK858	HK1044	HK1186	HK2369	HK8095
HK48	HK120	HK197	HK275	HK372	HK477	HK592	HK681	HK861	HK1045	HK1188	HK2382	HK8102
HK49	HK121	HK198	HK276	HK373	HK478	HK593	HK685	HK862	HK1049	HK1191	HK2387	HK8117
HK51	HK124	HK199	HK279	HK374	HK485	HK595	HK687	HK866	HK1050	HK1192	HK2618	HK8135
HK52	HK126	HK200	HK281	HK375	HK487	HK600	HK689	HK870	HK1051	HK1193	HK2633	HK8136
HK55	HK127	HK201	HK283	HK376	HK488	HK601	HK690	HK874	HK1052	HK1197	HK2662	HK8149
HK56	HK128	HK202	HK286	HK378	HK496	HK602	HK697	HK878	HK1053	HK1201	HK2678	HK8156
HK57	HK129	HK208	HK289	HK381	HK500	HK603	HK698	HK882	HK1058	HK1202	HK2689	HK8161
HK58	HK130	HK210	HK296	HK382	HK501	HK605	HK699	HK885	HK1059	HK1203	HK2788	HK8178
HK63	HK136	HK211	HK298	HK383	HK505	HK606	HK702	HK887	HK1063	HK1207	HK2877	HK8201
HK65	HK137	HK214	HK299	HK385	HK508	HK608	HK704	HK888	HK1065	HK1208	HK2889	HK8206
HK67	HK138	HK218	HK300	HK389	HK517	HK610	HK710	HK894	HK1070	HK1215	HK2917	HK8212
HK70	HK140	HK222	HK304	HK391	HK518	HK613	HK711	HK900	HK1072	HK1221	HK3303	HK8222
HK73	HK143	HK223	HK305	HK393	HK519	HK616	HK715	HK904	HK1076	HK1222	HK3313	HK8230
HK75	HK147	HK226	HK311	HK395	HK521	HK617	HK716	HK908	HK1083	HK1223	HK3318	HK8245
HK76	HK148	HK227	HK315	HK396	HK523	HK619	HK717	HK909	HK1097	HK1225	HK3322	HK8276
HK77	HK150	HK229	HK317	HK399	HK524	HK620	HK719	HK915	HK1105	HK1228	HK3330	HK8277
HK78	HK154	HK230	HK318	HK401	HK526	HK622	HK720	HK917	HK1108	HK1383	HK3335	HK8296
HK80	HK155	HK231	HK319	HK402	HK528	HK623	HK722	HK919	HK1118	HK1386	HK3355	
HK81	HK156	HK233	HK320	HK405	HK531	HK625	HK724	HK921	HK1120	HK1388	HK3398	
HK84	HK157	HK234	HK321	HK408	HK533	HK627	HK727	HK928	HK1121	HK1389	HK3800	
HK86	HK160	HK235	HK326	HK409	HK535	HK628	HK729	HK929	HK1123	HK1399	HK3828	
HK87	HK161	HK238	HK327	HK412	HK536	HK632	HK730	HK930	HK1124	HK1812	HK3868	
HK88	HK163	HK243	HK328	HK416	HK542	HK635	HK733	HK931	HK1125	HK1832	HK3889	

Table 5 Mean-difference test results

Panel A1: Monthly returns					
SS_t	Regime	No. Obs	Mean	StdDev	Std Err
0	NSS	51942	0.00212	0.2117	0.000929
1	SS	14708	-0.0308	0.2109	0.00174
Constrained returns minus not-constrained returns					
SS_t	Method	Variances	d.f.	t-value	P-value|
Diff(0-1)	Pooled	Equal	66648	16.67	0.000
Diff(0-1)	Satterthwaite	Unequal	23747	16.71	0.000
Panel B1: Daily returns					
SS_t	Regime	No. Obs	Mean	StdDev	Std Err
0	NSS	1140594	0.000063	0.046	0.000043
1	SS	332240	-0.00136	0.042	0.000073
Constrained returns minus not-constrained returns					
SS_t	Method	Variances	d.f.	t-value	P-valuet|
Diff(0-1)	Pooled	Equal	1470000	15.97	0.000
Diff(0-1)	Satterthwaite	Unequal	580925	16.72	0.000

Panel A2: Monthly returns(Excess)					
SS_t	Regime	No. Obs	Mean	StdDev	Std Err
0	NSS	51942	0.00744	0.2024	0.000888
1	SS	14708	-0.0247	0.1855	0.00153
Constrained returns minus not-constrained returns					
SS_t	Method	Variances	d.f.	t-value	P-value|
Diff(0-1)	Pooled	Equal	66648	17.31	0.000
Diff(0-1)	Satterthwaite	Unequal	23747	18.17	0.000
Panel B2: Daily returns(Excess)					
SS_t	Regime	No. Obs	Mean	StdDev	Std Err
0	NSS	1140594	0.000317	0.0451	0.000042
1	SS	332240	-0.00109	0.0397	0.000069
Constrained returns minus not-constrained returns					
SS_t	Method	Variances	d.f.	t-value	P-valuet|
Diff(0-1)	Pooled	Equal	1470000	16.22	0.000
Diff(0-1)	Satterthwaite	Unequal	604687	17.40	0.000

Table 6 Panel unit root test results

Panel A: Monthly data			
Series	Im, Pesaran & Shin W-stat	ADF-Fisher Chi-square	PP-Fisher Chi-square
RETURN	-231.966 (0.0000)	33823.7 (0.0000)	33897.5 (0.0000)
ADJSTD RETURN	-248.359 (0.0000)	35113.5 (0.0000)	35268.1 (0.0000)
LNMV	-23.7108 (0.0000)	3171.59 (0.0003)	3751.21(0.0000)
LNBM	-8.33365 (0.0000)	1276.37 (0.0000)	1580.99 (0.0000)
LNILLIQ	-50.4005 (0.0000)	5231.26 (0.0000)	5034.26 (0.0000)
LNDO	-87.0608 (0.0000)	9924.16 (0.0000)	9955.95 (0.0000)
Panel B: Daily data			
Series	Im, Pesaran& Shin W-stat	ADF-Fisher Chi-square	PP-Fisher Chi-square
RETURN	-1336.27 (0.0000)	19598 (0.0000)	19412.2 (0.0000)
ADJSTD RETURN	-36.3702 (0.0000)	3772.13 (0.0000)	3943.62 (0.0000)
LNMV	-4.79831 (0.0000)	1119.45 (0.0003)	1074.83 (0.0000)
LNBM	-16.7452 (0.0000)	1850.76 (0.0000)	1757.84 (0.0000)
LNILLIQ	-531.724 (0.0000)	91817.1 (0.0000)	55304.2 (0.0000)
LNDO	-429.966 (0.0000)	81309.8 (0.0000)	74675.9 (0.0000)

Table 7 Huasman test results

Panel A: Monthly data	
Returns	Excess returns
H_0: Difference in coefficients is not systematic	H_0: Difference in coefficients is not systematic
b = Consistent under H_0 and H_1	b = consistent under H_0 and H_1
B = Inconsistent under H_1, efficient under H_0	B = inconsistent under H_1, efficient under H_0
chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 422.07	chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 426.93
P-value = 0.0000	**P-value = 0.0000**
Panel B: Daily data	
Returns	Excess returns
H_0: Difference in coefficients is not systematic	H_0: Difference in coefficients is not systematic
b = Consistent under H_0 and H_1	b = Consistent under H_0 and H_1
B = Inconsistent under H_1, efficient under H_0	B = Inconsistent under H_1, efficient under H_0
chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 965.85	chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 1091.48
P-value = 0.0000	**P-value = 0.0000**

Table 8 Panel regression results using monthly data

Coefficient	Estimate	t-Statistic	P-value	t-test for difference
Panel A: The dependent variable is stock returns				
α	0.2774	19.490	0.0000	
$\alpha^{'}$	-0.2179	-10.831	0.0000	
γ_1	-0.0060	-2.3880	0.0169	$\gamma_1^{'}-\gamma_1$: t-value = 5.7448
$\gamma_1^{'}$	0.0085	4.3822	0.0000	
γ_2	0.0003	0.1007	0.9198	$\gamma_2^{'}-\gamma_2$: t-value = 1.9169
$\gamma_2^{'}$	0.0054	2.9058	0.0037	
γ_3	-0.1473	-37.967	0.0000	$\gamma_3^{'}-\gamma_3$: t-value =11.669
$\gamma_3^{'}$	-0.0999	-35.896	0.0000	
γ_4	0.1212	45.064	0.0000	$\gamma_4^{'}-\gamma_4$: t-value =1.3488
$\gamma_4^{'}$	0.1232	50.130	0.0000	
γ_5	0.0235	16.723	0.0000	$\gamma_5^{'}-\gamma_5$: t-value =6.4671
$\gamma_5^{'}$	0.0336	36.504	0.0000	
Adjusted-R^2			0.1157	
F-statistic			15.329	
DW			1.9771	
Panel B: The dependent variable is excess stock returns				
α	0.2774	20.334	0.0000	
$\alpha^{'}$	-0.1890	-10.055	0.0000	
γ_1	-0.0021	-0.8993	0.3685	$\gamma_1^{'}-\gamma_1$: t-value = 4.7815
$\gamma_1^{'}$	0.0091	4.9119	0.0000	
γ_2	9.9E-5	0.0390	0.9689	$\gamma_2^{'}-\gamma_2$: t-value = 1.8481
$\gamma_2^{'}$	0.0048	2.6588	0.0078	
γ_3	-0.1129	-31.082	0.0000	$\gamma_3^{'}-\gamma_3$: t-value =8.4928
$\gamma_3^{'}$	-0.0805	-30.194	0.0000	
γ_4	0.1011	39.643	0.0000	$\gamma_4^{'}-\gamma_4$: t-value =4.6194
$\gamma_4^{'}$	0.1075	45.809	0.0000	
γ_5	0.0218	16.462	0.0000	$\gamma_5^{'}-\gamma_5$: t-value =6.7767
$\gamma_5^{'}$	0.0318	36.065	0.0000	
Adjusted-R^2			0.0966	
F-statistic			12.711	
DW			2.0038	

The regression model is

$$R_{it}=\left(\alpha+\alpha^{'}SS_t\right)+\gamma_1 SS_t SZ_{it}+\gamma_1^{'}\left(1-SS_t\right)SZ_{it}+\gamma_2 SS_t BM_{it}+\gamma_2^{'}\left(1-SS_t\right)BM_{it}+\gamma_3 SS_t ILQ_{it}$$
$$+\gamma_3^{'}\left(1-SS_t\right)ILQ_{it}+\gamma_4 SS_t ILQ_{it-1}+\gamma_4^{'}\left(1-SS_t\right)ILQ_{it-1}+\gamma_5 SS_t DO_{it}+\gamma_5^{'}\left(1-SS_t\right)DO_{it}+\mu_i+e_{it}$$

Table 9 Panel regression results using daily data

Coefficient	Estimate	t-Statistic	P-value	t-test for difference
Panel A: The dependent variable is stock returns				
α	0.0272	34.594	0.0000	
$\alpha^{'}$	-0.0088	-8.5881	0.0000	
γ_1	7.4E-5	0.5630	0.5734	$\gamma_1^{'}-\gamma_1$: t-value = 5.7923
$\gamma_1^{'}$	0.0008	7.6568	0.0000	
γ_2	-0.0012	-7.9162	0.0000	$\gamma_2^{'}-\gamma_2$: t-value = 2.7133
$\gamma_2^{'}$	-0.0008	-7.0764	0.0000	
γ_3	-0.0023	-17.105	0.0000	$\gamma_3^{'}-\gamma_3$: t-value =6.2391
$\gamma_3^{'}$	-0.0013	-12.338	0.0000	
γ_4	0.0023	18.717	0.0000	$\gamma_4^{'}-\gamma_4$: t-value =6.7960
$\gamma_4^{'}$	0.0033	34.179	0.0000	
γ_5	0.0029	48.262	0.0000	$\gamma_5^{'}-\gamma_5$: t-value =5.6937
$\gamma_5^{'}$	0.0033	80.561	0.0000	
Adjusted-R^2			0.0145	
F-statistic			27.715	
DW			1.9387	
Panel B: The dependent variable is excess stock returns				
α	0.0278	36.197	0.0000	
$\alpha^{'}$	-0.0079	-8.0999	0.0000	
γ_1	0.0001	0.9322	0.3512	$\gamma_1^{'}-\gamma_1$: t-value = 5.8969
$\gamma_1^{'}$	0.0009	8.0569	0.0000	
γ_2	-0.0011	-7.9098	0.0000	$\gamma_2^{'}-\gamma_2$: t-value = 2.2723
$\gamma_2^{'}$	-0.0008	-7.5500	0.0000	
γ_3	-0.0009	-7.1804	0.0000	$\gamma_3^{'}-\gamma_3$: t-value =2.8261
$\gamma_3^{'}$	-0.0005	-4.7144	0.0000	
γ_4	0.0015	12.319	0.0000	$\gamma_4^{'}-\gamma_4$: t-value =9.3132
$\gamma_4^{'}$	0.0028	29.317	0.0000	
γ_5	0.0027	47.883	0.0000	$\gamma_5^{'}-\gamma_5$: t-value =7.0393
$\gamma_5^{'}$	0.0032	81.309	0.0000	
Adjusted-R^2			0.0136	
F-statistic			26.033	
DW			1.9394	

The regression model is

$$R_{it}=\left(\alpha+\alpha^{'}SS_t\right)+\gamma_1 SS_t SZ_{it}+\gamma_1^{'}\left(1-SS_t\right)SZ_{it}+\gamma_2 SS_t BM_{it}+\gamma_2^{'}\left(1-SS_t\right)BM_{it}+\gamma_3 SS_t ILQ_{it}$$
$$+\gamma_3^{'}\left(1-SS_t\right)ILQ_{it}+\gamma_4 SS_t ILQ_{it-1}+\gamma_4^{'}\left(1-SS_t\right)ILQ_{it-1}+\gamma_5 SS_t DO_{it}+\gamma_5^{'}\left(1-SS_t\right)DO_{it}+\mu_i+e_{it}$$