財務管理硏究 第二十六券 第一號(2009. 3), 221~263

The Behavior of Stock Prices on Ex-Dividend Day in Korea

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〈abstract〉

This paper studies the behaviour of stock prices on the ex-dividend day in the Korean stock market. Since a majority of listed Korean firms are December firms whose fiscal year end in December and whose ex-dividend day falls on the same calendar day in the year, we use stock prices of Non-December firms to estimate the general stock price movements not related to cash dividends. We estimate excess returns on days around the ex-dividend day. Our major findings are (a) there is no tax clientele effect in Korea, (b) the opening price stock prices fell by the amount of the current cash dividend per share until 2001, but it does not fall as much as the current dividend per share since 2001. Furthermore, in contrast to the U.S. and the Japanese findings, (c) stocks earned negative excess returns on the ex-dividend day until 2001, after which all stocks are earning positive excess returns on the ex-dividend day, and (d) the closing stock price on the ex-dividend day that used to be even higher than the cum-dividend price until 2001 is lower than the opening stock price since 2001. The evidence suggests a structural break has happened around the year 2001.

Keywords : Ex-Dividend, Drop Ratio, Dividend Capture Trading, Tax-Clientele Effect

논문접수일 : 2008년 12월 16일 논문수정일 : 2009년 02월 16일 논문게재확정일 : 2009년 02월 19일

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Ⅰ. Introduction

The behavior of stock prices on the ex-dividend day remains a puzzle both theoretically and empirically. Our theory of the stock price as the discounted sum of future dividends stream implies that the stock price on the ex-dividend day should drop by the amount of the current dividend per share.[1] However, one of the best-documented facts about the ex-day stock price is that it drops less than that.

The usual explanation for this is the *tax hypothesis;* one dollar of dividend is worth less than a dollar of capital gains because capital gains are taxed at a lower rate (Elton and Gruber (1970)). If we note that different investors are faced with different tax differentials and take this argument one step further, we arrive at the *tax clientele effect* of Miller and Modigliani (1961) and Elton and Gruber (1970); investors faced with a lower dividend income tax rate relative to the capital gains tax rate will prefer high dividend yield stocks. Elton and Gruber (1970) present evidence that the tax clientele effect is present in the U.S. stock market.

There are many studies supporting the tax hypothesis. Comparing either different tax regimes(Poterba and Summers (1985), Barclay (1987), and Lasfer (1995)) or stocks that are taxed differently (Michaely and Murgia (1995)), these studies show tax plays a significant role in the ex-dividend day behavior of stock prices.

On the other hand, a comprehensive study by Eades, Heases, and Kim (1984) looks at both taxable and non-taxable distributions and find no significant difference in their ex-day stock price behaviour, casting doubt on the tax-based explanation. In addition, they find positive excess returns before and on the ex-dividend day and negative excess returns following the ex-dividend day whether the distribution is taxable or not. Their study suggests that taxes are not likely to provide a full explanation of the ex-dividend day empirical regularities.[2]

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1) When we take taxes into consideration, there does not seem to be an arrangement as to what the theoretically correct amount of the stock price drop is on the ex-dividend day. Elton and Gruber (1970) think the marginal investors are those who are faced with tax differentials and argue that if short-term traders are the marginal investors, the stock price drop should be equal to the dividend per share. According to Michaely and Vila (1996), a completely different equilibrium will result depending on how the stock price will behave *after* the ex-dividend day.

This paper studies ex-dividend days in Korea between 1994 and 2007. The Korean stock market has the two unique characteristics in the ex-dividend system : clustering and uncertainty. First, a majority of listed Korean firms have their ex-dividend day cluster on the same day. It was the first trading day of the following year until 2001 when it was moved to the second last trading day of the current year. Second, the ex-dividend day arrives before the current cash dividend is determined and announced, so that investors on the ex-dividend day may not know the size of current dividend. Because of these two unique features, the behaviour of the stock prices on the ex-dividend day in Korea can be very different from that of other countries.

The Japanese stock market is similar to the Korean stock market. In Japan, the size of the current cash dividend is yet to be determined and announced on the ex-dividend day, and the ex-dividend day clusters on several days rather than on a single day. Hayashi and Jagannathan (1990) and Kato and Lowenstein (1995) show that in Japan, the ex-dividend price is *higher* than the cum-dividend price. Yet, Hayashi and Jagannathan (1990) argue that once the common movement in market is taken into account,, prices drop by nearly the full amount of dividend. Kato and Lowenstein (1995) show that, contrary to the U.S. findings, days leading up to the ex-dividend day earn statistically significant *negative* excess returns.

Previous Korean studies show results different from those of Japanese studies. Yoon, Kim and Jung (1998), Kim (1997) and Kim and Kim (2004) all show that in Korea before the ex-day was moved in 2001, the opening price on the ex-dividend day is *lower* than, but the closing price is *higher* than the cum-dividend price. Yoon, Kim and Jung (1998) also show that the ex-day opening price drops more than is predicted by the Elton and Gruber model and attribute it to the imperfect information about the size of the current dividend.[3)]

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2) Yet another strand of literature starting with Dubofsy(1982) argues that the market microstructure may have something to do with the ex-day stock price behaviour. Using data from Hong Kong where there is neither capital gains tax nor dividend income tax, Frank and Jagannathan(1988) and Bali and Hite(1988) show that the bid-ask spread and the discrete tick-size may affect the ex-dividned day stock price. In sum, documented empirical regularities are difficult to interpret. A recent comprehensive survey(Lease et.Al(2000)) thus says that the ex-dividend day evidence is inconclusive.

3) To assess the importance of the imperfect information, Kim and Kim(2004) study stocks that announce the size of the current cash dividend before the ex-dividend day and show that opening ex-day price

This paper has two main contributions. The first is methodological. Due to clustering of the ex-dividend day on a single calendar day, the usual market model cannot be used to isolate the part of the stock price drop that is caused purely by the dividend and/or taxes. Therefore, we use stock prices of Non-December firms (which have their fiscal year end in months other than December) to estimate the general stock price movement around the ex-dividend days that are unrelated to dividends. The explicit consideration and estimation of the non-dividend related returns is our first contribution.[4] Our analysis shows once we consider the return the stock could have earned without cash dividend, the stock price drops on the ex-dividend day by the *after*-tax dividend per share before 2001. In other words, before 2001, dividend capture did not earn an excess return even though the opening stock prices appear to drop less than the after-tax dividend per share.

Our second contribution is to document various empirical regularities and point out the marked difference between years before and after 2001. First, we establish that tax clientele effect is not present in the Korean stock market. Second, the stock price drop was equal to the after-tax dividend per share before 2001, but it is less than the after-tax dividend per share since 2001. Third, in conrast to the U.S. and Japanese findings, many Korean stocks earn *negative* excess returns on ex-dividend days before 2001. As documented by previous studies, we also find that closing prices were typically higher than the opening prices on the ex-dividend days before 2001. However, since 2001 the opening prices are higher, so that dividend capture is more profitable if stocks are sold at the opening prices[5] We also find that the imperfect information on the current dividend

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falls by the amount of the announced dividend. They also document a significant increase in trading volume around the ex-dividend day and find it difficult to interpret.

4) Previous studies show that selling at the closing price on the ex-dividend day generates a higher return from dividend capture because the closing price was often even higher than the cum-dividend price. However, part of the higher return may be due to the general movement of the market itself. Some authors suggested that the January effect might have caused closing price to be higher than the cum-dividend price. By deducting the common market movement unrelated to the cash dividend from the gross return, we isolate the return from dividend capture *per se*, and thus do not have to worry about the existence of the January effect. This is an added benefit of this approach.

5) In 2001, two institutional changes occurred in the Korean market. First, the ex-dividend day for December firms is moved to the second last trading day of December. Second, the new comprehensive financial income tax began to be implemented in 2001. While our study points out the marked difference between years before 2001 and years since 2001, we do not suggest which event is more responsible

can explain some of the excess returns on the ex-dividend day.

While there are several marked difference between years before and after 2001, it is not clear what brought about these differences. It is true that year 2001 saw several important institutional changes implemented like the change of the ex-dividend day and the introduction of the comprehensive financial income tax. Furthermore, the recent experience of the Asian financial crisis may have changed investors' behaviour. However, we neither claim to know which factor is responsible for which difference, nor investigate whether the documented differences are evidence of market inefficiency. Investigation of these issues is left for future studies.

This paper is organized as follows. Section Ⅱ summarizes relevant institutional details with emphasis on institutional changes around year 2001. Section Ⅲ describes our sample and descriptive statistics. The theory and the empirical methodology are expounded in Section Ⅳ. Section Ⅴ. presents and interprets empirical results, followed by conclusion in Section Ⅵ.

Ⅱ. Dividend and Taxes in Korea

1. Dividends in Korea

Korean corporations are legally allowed to pay cash dividends up to four times a year.[6] Yet, almost all Korean firms pay cash dividends only once a year at the end of their fiscal year, with a very few firms paying mid-year cash dividends.[7] Majority of Korean companies have their fiscal year end in December(hereafter, December firms) and dividends are usually distributed around March of the following year. A small num-

for the difference.

6) The mid-year cash dividends were introduced in 1994. Since April of 2004, corporations are allowed to pay quarterly dividends. For these and related issues, see the most comprehensive survey of Choi and Kim(2005).

7) Unlike the fiscal year-end cash dividends, the size of the mid-year cash dividends in not subject to the approval of the shareholders and can be unilaterally determined by the board of directors. One of the reasons why few firms distribute mid-year cash dividends is that directors are liable for the unjustifiable cash dividends if the firm's performance at the end of the fiscal year turns out to be too poor to make cash dividend distribution.

ber of firms have their fiscal year end in March, June, September, or in other months (hereafter, non-December firms).

The defining characteristics of the Korean ex-dividend system is that for majority of companies listed on the Korean Exchange(KRX), the ex-dividend day arrives before the current dividend is determined and announced. This is due to the following institutional details. First, all December firms have their ex-dividend day fall on the same day. Before 2001, the common ex-dividend day was the first trading day of the following year. Starting in 2001 the ex-dividend day is moved to the second last trading day of December. Second, unlike firms in the U.S. and elsewhere, the size of the current dividend payout must be approved in the general shareholders' meeting, which typically takes place in March of the following year. Therefore, on the ex-dividend day the size of the current dividend payout is not known for sure even though investors may have some information about it. Note also that there is a time lag of about three months between the ex-dividend day and the day on which the current dividend is paid out.

Shifting the ex-dividend day to the year-end has several implications. First, there are fewer calendar days between the last cum-dividend day and the ex-dividend day. Before 2001, there could be 5 days or more whereas the maximum number of days between the cum-dividend and the ex-dividend day is 3 now. Therefore, after 2001, there is less chance for news unrelated to dividend to affect stock prices on the ex-dividend day. Second, the first trading of the New Year had shorter trading hours than other trading days of the year, whereas the trading hours of the year-end ex-dividend day are the same as other trading days.

The KRX imposes a limit on the daily price change as a percentage of base price.[8] On non-ex days, barring events like stock splits, the base price is set to be the closing price of the previous trading day. For ex-dividend days, the KRX implemented the so-called *measures for ex-dividend* until 1998. Besides informing investors that ex-dividend day has arrived, the measures set the ex-dividend day's base price equal to the closing price of the cum-dividend day minus last year's dividend per share. This in effect assumes that this year's dividend per share will be equal to that of last year.

8) Currently the daily price limit is set to be 15% of the base price. Thus, the price should be between 115% and 85% of the previous trading day's closing price.

The KRX abolished the measures in 1998, and since then used the opening price of the ex-dividend day as the base price for the whole day.[9]

2. Taxes in Korea[10]

In Korea, small investors do not pay capital gains tax on listed stocks if trading is executed in KRX. Only large investors who own more than 3% in number of the outstanding shares or own shares worth more than 10 billion Korean won (KRW) in market value have to pay capital gains tax. In that case, the capital gains tax rate is 10% for small company stocks. For large company stocks, the tax rate is either 20%, or 30%, depending on whether they are held more than or less than one year. Since these large shareholders are unlikely to be the marginal investors, for our purpose, it is perfectly safe to assume that there is no capital gains tax in Korea.

Individual investors receive dividends after paying withholding taxes. Withholding tax rates in our sample period range 14% to 20%. Before 2001, individual investors paid only withholding taxes. Starting January of 2001, the dividend income of an individual investor is subject to the comprehensive financial income tax.[11] If an individual's financial income such as interest and dividend income adds up to more than 40 million KRW, his financial income *in excess of* 40 million KRW is taxed at a rate of 8% to 25% depending on the person's overall income level. If an individual's overall income is low enough to merit a comprehensive financial income tax rate lower than the prevailing withholding tax rate, the person pays only the withholding tax. As a result, for most individual investors, the withholding tax rate represents the lowest possible tax rate on their dividend income.[12]

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9) Kim(2003) analyzes the impact of the elimination of measures for ex-dividend on the stock price behaviour and finds that dividend capture became more profitable after the elimination if stocks are sold at the closing prices of the ex-dividend day.

10) This section relies heavily on private communication with Dr.Kim Jin Soo of Korea Institute of Public Finance and his paper Kim(2004).

11) The comprehensive financial income tax is applied to income generated on and after January 1 of 2001. Thus dividend income for the fiscal year 2000 is subject to the comprehensive tax.

12) There are several exceptions to this. Dividends received before or on the last day of 2008 are taxed at a lower rate if they are from shares held more than one year. The applied withholding tax rate is 5% if the total face value of the stock held by the investor is between 30 million and 100 million

Before 2001, corporations paid corporate income tax on their dividend income without any adjustment for double taxation. Since the corporate income tax rate, which ranged between 30 and 50% in this period, was higher than individual income tax rate, corporations did not have strong incentives to engage in dividend capture until 2001. A measure to correct for the double taxation is put in place in 2001, which allows corporations not to pay taxes on part of their dividend income. Dividend income received from a 100% owned subsidiary in not taxed at all. A dividend income tax rate of 30% is applied if the receiving corporation own less than 30% of the total outstanding shares of the paying corporation. If it owns more than 30%, a higher rate or 50% is applied. To qualify for the tax exemption, corporations should acquire shares more than three months before the fiscal year-end. Therefore, if they are to enjoy the full benefits of dividend capture, corporations need to buy shares before September ends.

On the other hand, institutional investors like asset management companies, finance companies and securities houses did not pay any tax on their dividend income received from listed corporations between 1983 and 2000. The 1999 amendment of the corporate tax code changed this, so that institutional investors paid taxes only on 10% of their dividend income without any restriction on the holding period. The code was amended again in December of 2006, so that institutional investors now pay dividend income tax just like other corporations. Before 2007. therefore, it is the institutional investors who have the strongest incentives to engage in dividend capture activities. Foreign investors whose home country has a tax treaty with Korea are subject to 15% dividend income tax.

<Table 1> summarize our discussion and computes the dividend income tax rate for each group of investors. If marginal investors do not pay any capital gains tax, those who pay less dividend income tax are more likely to engage in dividend capture activities. Throughout our sample period except for the year 2006, institutional investors have the strongest incentive to do so. Individual investors' incentives to capture dividends are limited because they could become subject to the comprehensive financial income tax. So are the incentives of corporations because they need to buy share before the end

KRW. If the total face value is less than 30 million KRW, dividends received up to the last day of year 2008 are not taxed at all.

of September when there is still a lot of uncertainty about the size of the dividend payout.

<Table 1> Dividend Tax Rate for Each Group of Investors

<Table 1> reports tax rates for each group of investors during our sample period. For corporation, it is assumed that they pay taxes on 30% of their dividend income, which is the case if they own less than 50% of total share outstanding. Thus for the year 2000, 19.6% = 28 × (0.7). The adjustment for double began to be implemented in 2000. Institutional investors before 2000 did not pay any tax on their dividend income. Between 2000 and 2005, they paid corporate income tax only on 10% of their dividend income. After 2006, there is no distinction between institutional investors and corporations.

Year	Individual	Corporation		Institutional
	Withholding tax rate	Corporate income tax rate	After adjustment for the double taxation	
1994	16.5%	30.0%	30.0%	0.0%
1995~1997	16.5	28.0	28.0	0.0
1998~1999	22.0	28.0	28.0	0.0
2000	16.5	28.0	19.6	2.8
2001~2003	16.5	27.0	18.9	2.7
2004	16.5	25.0	17.5	2.5
2005	15.4	25.0	17.5	2.5
2006~2007	15.4	25.0	17.5	17.5

Ⅲ. Data and Descriptive Statistics

1. Data

This study focuses on December firms whose fiscal year ends in December while data on non-December firms are used to estimate market movements unrelated to dividends. To be eligible, firms must be listed continuously on the Korea Exchange (KRX) between 1994 and 2007. The final sample stocks are selected by following criteria.

A : Stocks that paid stock dividends are excluded for the year.

B : Firms which were under special circumstances or made special announcements during the event period defined as 5 days before, on and after the ex-dividend day(a total of 11 days) are excluded. Those stocks include (a) stocks that were designated as administrative issues, (b) firms that announced special gains or loss-

es, (c) firms that repurchases stocks or sold repurchased stocks, (d) firms that announced events which could change the number of outstanding shares such as capital increase with or without consideration, stock splits, retirements of stocks, and/or M&A.

C : Stocks whose trading volume was zero at least for one full day during the 11 day event period or the estimation period are excluded.

The final sample consists of 3,337 firm years. We obtain financial statements from KIS-FAS data base and Korea Listed Companies Association, stock price data from KRX data base and DataGuide.

As noted before, starting in year 2001, the ex-dividend day for December firms changes from the first trading day of the following year to the second last trading day of the December. We thus divide the entire sample period into years before and after 2001. The sample period is restricted to 1994 to 2007 so that both of the two sub-sample periods have the same number of years. Our study is further complicated by the fact that the first sub-sample period(i. e., the pre-2001 period) includes the years affected by the Asian financial crisis. We identify four years between 1997 and 2000(inclusive) as the years of financial crisis and report results for these three years separately if there is a significant difference.[13)]

Sample stocks are first classified into stocks that paid dividends and that did not pay dividends for each year. Dividend paying stocks are then divided further into three groups according to their dividend yields(DY) : High, Middle and Low. In computing dividend yields, we use the closing price of the last cum-dividend day. <Table 2> summarizes the number of observations in each period and category.

13) We identify the start of the crisis as the initiation of the IMF stabilization program, which occurred in December of 1997. This is the method followed by Lee and Rhee(2002). The end of the crisis is harder to identify; some may even argue that the full impact of the crisis is still being played out. We choose the year 2000 as the last year of the crisis. There are some reasons for this choice. First, the foreign exchange rates and other relevant economic variables began to show stability around 2000. Second, while 13.5 billion dollars of IMF SRF were repaid in September of 1999, the plan to repay 60 billion dollars of loans from the stand-by agreement ahead of the schedule was announced only in September of 2000. Third, it was in December of 2000 that the Korean president announced the end of the crisis with most of the IMF loans having been repaid.

<Table 2> Number of Observation

<Table 2> summarizes the number of observations in each period and category. Among those which were listed on KRX continuously between 1994 and 2007, only those firms whose fiscal year ends in December are included. A total of 3,337 observations remain after excluding firms (1) which paid stock dividends, (2)which were under special circumstance(e.g., administrative issues) or made special announcements such as stock repurchase or sale of repurchased stocks, capital increase with or without consideration, stock split, retirement of stocks and M&A, and (3) whose trading volume was zero at least for one full day during the event period or the estimated period.

	January Ex-day (1994~2000)	December Ex-day (2001~2007)	Financial Crisis (1997~2000)
	N	N	N
Dividend All	1,029(70.1%)	1,281(68.5%)	509(63.2%)
High	342	426	169
Middle	344	430	170
Low	343	425	170
Non.Div	439(29.9%)	588(31.5%)	296(36.8%)
Sub-Total	1,468	1,869	805
Total		3,337	

Note that only 61.3% of firms paid cash dividends during the crisis years whereas 68.5% of firms did so after the crisis. Since more than 70% of firms paid cash dividends in years between 1994 and 2000, the fraction of firms paying cash dividends before the crisis must have been much higher than 70%.

2. Descriptive Statistics

<Table 3> reports descriptive statistics for the sample. The mean and standard deviation of dividend yield(DY), market capitalization(MV), and dividend per share (DPS) are reported. While the mean DPS is higher in the post-crisis years of 2001 to 2007, its standard deviation is a lot greater than before as well; for the middle DY stocks, the standard deviation becomes more than quadrupled with the average DPS showing a slightly more than 50% increase. While the average DPS is overall lower during the financial crisis, the DY does not show a great drop probably because of the depressed stock prices during the crisis. Also note that the crisis period has the lowest standard deviation in the dividend yields. Dividend yields are the highest in the second half of

the sample period. Among dividend paying firms, low dividend yield firms have greatest market capitalization; their dividend yields are lower because their stock prices are high. Firms paying no dividend tend to be small firms.

<Table 3> also reports descriptive statistics for variables to be used in our analysis later. The systematic risk measured by beta(β) is estimated using the market model for each period excluding the ex-dividend date. Note that there is some variation in the estimated β. Firms had greater β values during the financial crisis, reflecting the importance of overall market movements. There is no clear relationship between the size of dividend and the estimated beta values. The unsystematic risk(UNSYS), as measured by the standard deviation of the residual terms of the market model, is greater during the financial crisis. Note that the firms not paying cash dividends tend to have the greatest unsystematic risk.

As a measure of illiquidity(ILLIQ), we use the Amihud(2002) measure which is defined as

$$ILLIQ_{i,t} = \frac{|r_{i,t} \times 100|}{(TV_{i,t}/1{,}000{,}000)} \quad (1)$$

where $r_{i,t}$ is the return on the stock and $TV_{i,t}$ is its KRW trading volume. Ahigher Amihud measure suggests illiquid stock in the sense that a KRW trading volume can generate a big move in the stock price. Since the Amihud measure becomes very big when the trading volume is small, its distribution could be skewed to the right when there are many thinly trade stocks. To correct for this problem, we use the square root of the measure($\sqrt{ILLIQ}$), which has a smaller standard deviation.

As expected, the market was most illiquid during the financial crisis. <Table 3> shows that firms paying no dividends tend to be the least liquid, and among the dividend paying stocks, the highest dividend yield stocks seem to be least liquid as these are relatively small stocks with rather low stock prices. Overall, stocks become more liquid recently, with the exception of the high dividend yield stocks, which became less liquid over time.

<Table 3> Descriptive Statistics of Samples

<Table 3> reports descriptive statistics for the sample. The full sample period of 1994 to 2007 is divided into three sub-sample periods(1994~2000, 2001~2007, 1997~2000). Stocks are classified into two groups depending on whether cash dividends are paid during the period. Dividend paying stocks are then divided into three sub-groups depending on their dividend yields : High, Middle and Low dividend yield groups. DY and DPS are dividend yield and dividend per share, respectively. MV is the total market value of common stocks. In computing DY and MV, we use the last cum-dividend day's closing price. Beta(β) is estimated using the market model. The variable UNSYS is the unsystematic risk measured as the standard deviation of the residual term of the market model. ILLIQ is the Amihud measure of illiquidity, computed by $|r \times 100|/(TV/1{,}000{,}000)$ where TV is the KRW trading volume. VAR is the return volatility measured by the standard deviation of daily stock return. TURN is the turnover ratio : the ratio of the KRW trading volume to by the market value of the common stock.

Variables	Groups	January Ex-day Avg(SD)		December Ex-day Avg(SD)		Financial Crisis Avg(SD)	
DY	Div.All	0.0317	(0.0231)	0.0362	(0.0257)	0.0418	(0.0275)
	High	0.0505	(0.0270)	0.0598	(0.0273)	0.0683	(0.0269)
	Middle	0.0298	(0.0135)	0.0334	(0.0131)	0.0391	(0.0134)
	Low	0.0149	(0.0080)	0.0155	(0.0087)	0.0181	(0.0095)
	No Div			N/A			
DPS (won)	Div.All	487	(336)	682	(1,074)	493	(422)
	High	568	(367)	717	(1,285)	608	(497)
	Middle	450	(271)	660	(1,053)	412	(315)
	Low	443	(347)	668	(838)	460	(411)
	No Div			N/A			
MV (in billion won)	Div.All	309	(1,705)	988	(5,676)	358	(1,995)
	High	158	(914)	285	(1,475)	89	(207)
	Middle	213	(1,046)	969	(5,466)	199	(850)
	Low	556	(2,591)	1,713	(7,989)	784	(3,304)
	No Div	61	(128)	176	(672)	53	(123)
β	Div.All	0.7833	(0.2866)	0.7557	(0.3501)	0.7721	(0.2441)
	High	0.8165	(0.2906)	0.6728	(0.3132)	0.7856	(0.2137)
	Middle	0.8148	(0.2747)	0.7555	(0.3446)	0.8192	(0.2389)
	Low	0.7335	(0.2871)	0.8389	(0.3710)	0.7116	(0.2655)
	No Div	0.8452	(0.3220)	0.7729	(0.3690)	0.8087	(0.2318)
UNSYS	Div.All	0.0306	(0.0108)	0.0264	(0.0087)	0.0397	(0.0093)
	High	0.0305	(0.0107)	0.0249	(0.0083)	0.0401	(0.0078)
	Middle	0.0308	(0.0113)	0.0268	(0.0091)	0.0403	(0.0097)
	Low	0.0305	(0.0105)	0.0274	(0.0087)	0.0388	(0.0101)
	No Div	0.0398	(0.0148)	0.0390	(0.0132)	0.0491	(0.0127)
ILLIQ	Div.All	0.0742	(0.3660)	0.0909	(0.3345)	0.0863	(0.4441)
	High	0.0791	(0.5172)	0.1546	(0.4596)	0.1003	(0.6766)
	Middle	0.0807	(0.3416)	0.0553	(0.1811)	0.0914	(0.3393)
	Low	0.0628	(0.1371)	0.0630	(0.2945)	0.0674	(0.1483)
	No Div	0.2220	(1.2039)	0.1411	(0.9740)	0.3069	(1.1653)

Variables	Groups	January Ex-day Avg(SD)		December Ex-day Avg(SD)		Financial Crisis Avg(SD)	
$\sqrt{ILLIQ}$	Div.All	0.1172	(0.1228)	0.1137	(0.1388)	0.1203	(0.1336)
	High	0.1142	(0.1463)	0.1533	(0.1671)	0.1191	(0.1709)
	Middle	0.1186	(0.1167)	0.1015	(0.1036)	0.1192	(0.1069)
	Low	0.1189	(0.1016)	0.0863	(0.1300)	0.1228	(0.1148)
	No Div	0.1658	(0.2278)	0.1256	(0.1692)	0.1777	(0.2199)
VAR	Div.All	0.0337	(0.0119)	0.0293	(0.0091)	0.0448	(0.0083)
	High	0.0337	(0.0118)	0.0273	(0.0088)	0.0451	(0.0068)
	Middle	0.0340	(0.0123)	0.0296	(0.0094)	0.0459	(0.0084)
	Low	0.0332	(0.0115)	0.0308	(0.0088)	0.0434	(0.0092)
	No Div	0.0433	(0.0152)	0.0415	(0.0129)	0.0537	(0.0109)
TURN	Div.All	1.1262	(1.0755)	1.0825	(1.5052)	1.4784	(1.3199)
	High	1.0993	(0.8735)	0.9108	(1.3903)	1.4957	(0.9512)
	Middle	1.2185	(1.2405)	1.1991	(1.6350)	1.6563	(1.5371)
	Low	1.0605	(1.0767)	1.1368	(1.4665)	1.2832	(1.3800)
	No Div	1.7898	(1.9325)	3.5204	(4.1986)	2.3112	(2.2082)

The return volatility(VAR) is the standard deviation of daily returns. Again stock returns were most volatile during the financial crisis. Stocks paying no cash dividends exhibit the greatest volatility, which may be due to their high turnover (TURN), which is the KRW trading volume of the stock dividend by its market capitalization (MV).

Ⅳ. Methodology

1. The Model

We follow Eades, Heases, and Kim(1984)'s analysis of the ex-dividend return with taxes. Since there is no capital gains tax in Korea, the after-tax rate of return of a security on an ex-dividend date t is defined as :

$$E(\widetilde{R_t^\tau}) = \frac{E(\widetilde{P_t}) - P_{t-1}}{P_{t-1}} + (1-\tau_d)\frac{PV(D_t)}{P_{t-1}} \tag{2}$$

Here, $\widetilde{R}_t^{\tau}$ is the after-tax return with the superscript τ indicating the after-tax return. P_{t-1} and $\widetilde{P}_t$, respectively, are the cum-dividend price and the ex-dividend price. All expectations are taken with respect to information available at date $t-1$. Since in Korea there is a time lag of about three months between the ex-dividend day and the date of actual payment, we use the present value of the current cash dividend per share D_t discounted at the three month risk-free rate. The dividend income tax rate for the marginal investor is given by τ_d.

The *pre-tax* return of the security on the ex-dividend day t is defined as :

$$E(\widetilde{R}_t) \equiv \frac{E(\widetilde{P}_t) + PV(D_t) - P_{t-1}}{P_{t-1}} \tag{3}$$

Here, we omit the superscript τ to indicate the pre-tax return. Equation (2) can be rewritten to give us the following relationship between the pre-tax and the after-tax return :

$$E(\widetilde{R}_t^{\tau}) = E(\widetilde{R}_t) - \tau_d\left[\frac{PV(D_t)}{P_{t-1}}\right] \tag{4}$$

So far, all the equations are definitions without any empirical content. We now give then empirical content by making assumptions. We assume that *for marginal investors*, the daily *after-tax* returns are independently and identically distributed, so that $E(\widetilde{R}_t^{\tau})$ is constant for all t :

$$E(\widetilde{R}_t^{\tau}) = E(\widetilde{R}_s^{\tau}) \equiv E(\widetilde{R}), \text{ for all } t \text{ and } s \tag{5}$$

This assumption is based on the idea that calendar day should not matter in an efficient market. Since the ex-dividend day should be no different from other days, the expected after-tax return on the ex-dividend day should be equal to the average return on non ex-dividend days. Using this assumption, we can rewrite equation (2) in terms of the *pre-tax* expected return on the ex-dividend day, and get :

$$E(\widetilde{R}_t) = E(\widetilde{R}) + \tau_d \left[\frac{PV(D_t)}{P_{t-1}} \right] \quad (6)$$

Equation (6) now has empirical content. The pre-tax return *on the ex-dividend day* $E(\widetilde{R}_t)$ has two components : (a) the daily return on non ex-dividend days $E(\widetilde{R})$ which represents the daily return *if there were no dividend*, and (b) the amount of the dividend income tax per each KRW of the cum-dividend price. In other words, the pre-tax return on the ex-dividend day is different from the average daily return $E(\widetilde{R})$ on non-ex days by the amount of the dividend income tax per KRW of investment ; it provides for the dividend income tax. Using an estimate of the daily return $E(\widetilde{R})$ on non-ex days, we can test on whether the difference $E(\widetilde{R}_t) - E(\widetilde{R})$ equals (the present value of) the dividend yield multiplied by the marginal investors' tax rate τ_d. Equation (6) forms the basis of our analysis.

2. Estimation of Non Ex-Day Daily Return $E(\widetilde{R})$

To estimate the average daily return $E(\widetilde{R})$ around the ex-dividend day unrelated to cash dividend, we use the returns of non-December firms. We choose not to use the usual market model because clustering of the ex-dividend day implies that the market portfolio will be dominated by December firms and its return around the ex-dividend day would be contaminated by factors related to dividends.[14] Since the theory clearly requires the average daily return on non ex-day, we use Non-December stocks whose returns on December firms' common ex-day are not related to cash dividends.[15]

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14) One could think of using data on stocks that are not paying any cash dividend. We do not use this approach because of the imperfect information about the dividend. Since investors are presumably not sure whether there will be cash dividend or not, returns of stocks that are not going to pay any cash dividend can also be contaminated by the false expectation of investors that some cash dividends may be forthcoming.

15) In fact, this is the procedure followed by most studies on the U.S. stock market. To compute the abnormal return on the ex-dividend day, these studies form a portfolio stocks whose ex-dividend days do not fall on the same day. Then, they compare the return on the stock and the return on the portfolio of non-dividend day stocks. Note that the comparison portfolio constructed in this way in not the market portfolio.

Descriptive statistics on non-December firms are reported in <Table 4>.

<Table 4> Descriptive Statistics on Non-December Firms

<Table 4> represents descriptive statistics for non-December firms. The number of sample in each year is 50, so that there are 350 observation in the periods of 1994 to 2000 and 2001 to 2007. For the financial crisis period, the number of observation is 200. The reference point in time is identical to that of the December firms. For example, the market value is the total number of shares outstanding multiplied by the stock price on the last cum-dividend day of the December firms.

Variables	January Ex-day Avg (SD)		December Ex-day Avg (SD)		Financial Crisis Avg (SD)	
# Dividend paying firms	241		219		131	
DY	0.0310	(0.0421)	0.0487	(0.0463)	0.0459	(0.0521)
DPS(won)	467	(408)	771	(846)	554	(490)
MV(bilwon)	197	(374)	558	(1,189)	220	(468)
β	0.9682	(0.3032)	0.9285	(0.4886)	0.9384	(0.2382)
UNSYS	0.0327	(0.0124)	0.0280	(0.0099)	0.0409	(0.0101)
ILLIQ	0.0651	(0.2446)	0.0447	(0.1588)	0.0873	(0.3141)
$\sqrt{ILLIQ}$	0.1053	(0.0974)	0.0820	(0.0969)	0.1135	(0.1161)
VAR	0.0381	(0.0139)	0.0323	(0.0107)	0.0483	(0.0093)
TURN	1.1990	(1.2124)	1.6774	(3.2991)	1.6286	(1.4069)

On average non-December firms are of size comparable to middle-and high-dividend yield December firms, except for the financial crisis period when they were as big as low-dividend yield December firms.[16] Their average DY and DPS are again similar to those of middle-or high-dividend yield December firms, with their DY showing a greater standard deviation. Since non-December stocks are more liquid, and their beta

16) Among the 50 non-December firms included are 23 firms that are in the financial industry. We include them even though financial firms are conventionally excluded in studies on stock returns. There are several reasons for this inclusion. The first is that if we use a portfolio only of industrial firms, small firms will be over-represented since non-December industrial firms are relatively small. The second is that non-December industrial firms are not so liquid as financial firms of the same category. Among the non-December industrial firms, only 27 firms had their stocks traded on each and every ex-dividend day in the 14 years of our sample period. Third, the average beta value(about 1.2) of non-December financial firms is higher than one and that of the non-December industrial firms(about 0.7) is lower than one, a portfolio composed of both kinds of stocks will reflect the general market movement better than a portfolio of industrial firms alone.

values are much closer to one than average December firms, they make a good proxy for the market-wide return on the ex-dividend day unrelated to cash dividends.

We form a portfolio of Non-December firms. We use the value-weighted average return because it moves more closely with the market than the equal weighted average return on non-ex dividend days.[17] The estimation period is 50 days before and after the ex-dividend day (excluding the ex-dividend day).[18] First, we regress the return of the December firms on the return on the non-December portfolio :

$$\widetilde{R} = \alpha + \beta \times \widetilde{R}_t^{NonDec} + \widetilde{\epsilon}_t \tag{7}$$

If $(\hat{\alpha},\ \hat{\beta})$ is the estimated coefficients, the average daily return unrelated to dividend is estimated by $\hat{R} \equiv \hat{\alpha} + \hat{\beta} \times \widetilde{R}_t^{NonDec}$, and the *pre-tax* excess return EXR on the ex-dividend day is calculated as :

$$EXR_t \equiv \widetilde{R}_t - \hat{R}_t = \widetilde{R}_t - \left(\hat{\alpha} + \hat{\beta} \times \widetilde{R}_t^{NonDec}\right) \tag{8}$$

Note that the pre-tax return $\widetilde{R}_t$, not the after-tax return, is used for December firms. This has an advantage because of not having to identify marginal investors in calculation of EXR_t. If the stock price on the ex-dividend day falls exactly by the after-tax dividend, we should have :

$$EXR_t = \tau_d \left[\frac{PV(D_t)}{P_{t-1}} \right] \tag{9}$$

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17) The correlation coefficients between the non-December return and the market return are 0.7384 in years between 1994 and 2000 and 0.9262 in years between 2001 and 2007 when we use the value weighted average return. The corresponding numbers for the equal weighted average return are 0.6262 and 0.8491, respectively.

18) The estimation period includes 50 days after the ex-dividend day. This is done to take into account the potential presence of the January effect, as is often argued in the literature. If the January effect is present, it will show up days right after the ex-dividend day, and a firm's response to it may be different from its response to other movements of the market. By estimating the coefficients using data from days after the ex-dividend day, we can take into account the potentially different responses of stocks to the January effect.

If the inequality $EXR_t > \tau_d PV(D_t)/P_{t-1}$ holds, marginal investors are earning an (after-tax) excess return, and so are all the other investors. To avoid confusion, we call the pre-tax excess return EXR_t, *the extra return* and its after-tax counterpart simply *the excess return.*

Ⅴ. Empirical Results

1. Tax Clientele Effect

As a first step, we compute the drop ratio(DR), which is the ratio of the ex-dividend day price drop to the dividend per share :

$$DR_t = \frac{P_{t-1} - E(\widetilde{P}_t)}{PV(D_t)} \tag{10}$$

We use both the opening price and the closing price of the ex-dividend day to compute the drop ratio. Equations (2) and (6) can be rewritten as :

$$DR_t \equiv \frac{P_{t-1} - E(\widetilde{P}_t)}{PV(D_t)} = (1-\tau_d) - \left[\frac{E(\widetilde{R})}{PV(D_t)/P_{t-1}}\right] \tag{11}$$

Most early studies(e.g., Elton and Gruber (1970)) proceed by assuming that the daily pre-tax return on non ex-dividend days is zero, or

$$E(\widetilde{R}) = 0 \tag{12}$$

Under this assumption, we have $DR_t = 1 - \tau_d < 1$, so that the stock price on the ex-day should drop less than the present value of the current dividend. Following Elton and Gruber (1970), and maintaining the assumption $E(\widetilde{R}) = 0$, we also compute the implied tax rate that will make the return from dividend capture equal to zero.

$$(1-\hat{\tau}) \equiv \left[\frac{P_{t-1} - E(\widetilde{P}_t)}{PV(D_t)} \right] \tag{13}$$

For the price drop on the ex-dividend day to be consistent with our theory, the implied tax rates of (13) should be close to the tax rates marginal investors are facing.

<Table 5> reports the ratio of the price drop to the dividend per share for each group of stocks and their implied tax rates using the opening and the closing price of the ex-dividend day.

<Table 5> shows that during the first sub-sample period of 1994 to 2000, the opening price drop ratios(DR_o) are less than one as predicted by our theory, with the only exception being low-dividend yield stocks, whose drop ratio is statistically not different from one. In the second sub-sample period of 2001 to 2007, opening price drop ratios become smaller than before, and they are all statistically different from one. Accordingly, the implied tax rates are not very different from the prevailing withholding tax rates in the first sub-sample period whereas they are much higher than the withholding tax rates in the second sub-sample period. The only exception is again the low-dividend yield stocks, which exhibit negative implied tax rates throughout our sample period.

If the tax clientele effect of Miller and Modigliani (1960) and Elton and Gruber (1970) is present, investors faced with a low dividend income tax rate would prefer high-dividend yield stocks. Therefore, the price drop ratios should be increasing in the dividend yield, and the implied tax rates should be decreasing in the dividend yield. However, Table 5 shows that the opening price drop ratios do not show such relationship, and the high-dividend yield stocks never have the highest drop ratio. In the period of 1994 to 2000, the order is completely reversed with the low-dividend yield stocks having the highest drop ratio, which is higher than one. Table 5 suggests that there is no tax clientele effect in Korea.

All the closing price drop ratios (DR_c) are significantly smaller than one. Several closing price drop ratios are negative, and their implied tax rates are higher than 100%. In other words, as noted by previous studies, the closing prices for these stocks on the ex-dividend day are higher than the cum-dividend prices. Therefore, selling stocks at the closing price would generate a higher return than selling them at the opening

price. Note that the closing price drop ratio is strictly increasing, and the implied tax rates $\hat{\tau}_c$, strictly decreasing in the dividend yield. However, since all the implied tax rates $\hat{\tau}_c$ are too high compared to the prevailing tax rates, we cannot interpret this as evidence of tax clientele effect.[19]

<Table 5> Price changes on the Ex-Dividend Day

<Table 5> reports price changes on the ex-dividend day for the three sub-sample periods(1994~2000, 2001~2007, 1997~2000). DR_o(DR_c) is the ratio of the price drop to the present value of the dividend per share where the price used is the opening (closing, resp.) price of the ex-dividend day. The dividend per share is discounted at the 3-month CD rate. The implied tax rate $\hat{\tau}$ are defined as the tax rate at which the present value of after-tax dividend per share is equal to the ex-dividend day drop in the stock price : $(1-\hat{t_h})=(P_{t-1}-P_t^h)/PV(D_t)$, $h=$O, C. Here, the variable $h=$O, C indicates whether the opening or the closing price of the ex-dividend day is used. Drop ratios with *, **, *** different from 1 at the significance level of 10%, 5% and 1% respectively. Implied tax rates with asterisks are different from the withholding tax rate for each period at the corresponding significance levels. Numbers in parentheses are standard errors.

Variable	Groups	January Ex-day (1994~2000)		December Ex-day (2001~2007)		Financial Crisis (1997~2000)	
DR_o	Div.All	0.8634*	(0.0775)	0.4835***	(0.0442)	0.8195	(0.1298)
	High	0.6879***	(0.0489)	0.4595***	(0.0222)	0.7347**	(0.0697)
	Middle	0.8245*	(0.0941)	0.3873***	(0.0433)	0.7336*	(0.1501)
	Low	1.0774	(0.2065)	0.6050***	(0.1238)	0.9898	(0.3522)
DR_c	Div.All	-0.7648***	(0.1063)	0.1867***	(0.0690)	-0.9750***	(0.1726)
	High	0.1175***	(0.0541)	0.5207***	(0.0260)	0.1551***	(0.0775)
	Middle	-0.4941***	(0.0920)	0.2875***	(0.0516)	-0.6636***	(0.1470)
	Low	-1.9160***	(0.2900)	-0.2500***	(0.1979)	-2.4100***	(0.4693)
$\hat{t_o}$(%)	Div.All	10.80	(7.98)	51.14***	(4.47)	15.11	(13.37)
	High	29.04**	(5.05)	53.57***	(2.25)	24.17	(7.21)
	Middle	14.71	(9.70)	60.87***	(4.37)	23.89	(15.46)
	Low	-11.30	(21.27)	38.88*	(12.51)	-2.67	(36.26)
$\hat{t_c}$(%)	Div.All	178.57***	(10.94)	81.10***	(6.97)	199.83***	(17.75)
	High	87.89***	(5.58)	47.38***	(2.63)	83.89***	(7.97)
	Middle	150.47***	(9.44)	70.93***	(5.21)	167.41***	(15.04)
	Low	297.17***	(29.87)	125.20***	(20.21)	347.52***	(48.29)

19) During the financial crisis the implied tax rates based on the opening price are statistically not different from the prevailing withholding tax rates. Yet, this may be due not to the increased dividend capture activity, but to the fact that investors overestimated the size of the current dividend payout in this period.

While <Table 5> suggests the absence of tax clientele effect in Korea, such a conclusion is warranted only when the assumption $E(\tilde{R})=0$ is valid. If there is a general movement of the market unrelated to the dividend, the drop ratio is not going to tell us whether there is tax clientele effect or not.[20] Moreover, since the price drop ratio becomes very large when the dividend is small, statistical inferences based on the price drop ratio alone are not reliable. For example, in years between 1994 and 2000, the implied tax rate for the low-dividend stocks is -11.30%, but it is statically not different from the prevailing withholding tax rate simply because the standard deviation is very high at about 394%.[21]

2. Return from Dividend Capture

A statistically better measure of the ex-dividend price drop is the return from dividend capture.[22] By dividend capture, we mean buying at the closing price of the last cum-dividend day and selling on the ex-dividend day. As such, the return from dividend capture is none other than the after-tax return $E(\widetilde{R_t^{\tau}})$ defined by equation (2), which is rewritten as :

$$E(\widetilde{R_t^{\tau}}) \equiv \frac{E(\tilde{P}_t)+(1-\tau_d)\,PV(D_t)-P_{t-1}}{P_{t-1}} = E(\tilde{R}) \tag{14}$$

If we maintain the assumption $E(\tilde{R})=0$, the equation above becomes $E(\widetilde{R_t^{\tau}})=0$. If

20) The implied tax rate calculated in Table 5 is defined as $(1-\hat{\tau})=DR$. The true implied tax should be the one that equate equation (11) to zero. If the return $E(\tilde{R})$ is positive, the implied tax rate will come out to be higher than the true implied tax rate. Therefore, a rather high implied tax rate may simply reflect a positive market rate of return that has nothing to do with the cash dividends. Later, we will explicitly consider this and confirm that there is no tax clientele effect in Korea.

21) We did not report the standard deviations in Table 5. As one can see from the table, the standard error of the drop ratios is increasing as we move from the high dividend yield stocks to the low dividend yield stocks, with the low dividend yield stocks showing biggest standard errors. This is due to the smallness of their dividends.

22) Since the price drop ratio (DR) is related to the return from dividend capture in the following way : $E(\widetilde{R_t^{\tau}})=[(1-\tau_d)-DR_t]/PV(DY_t)$, where $PV(DY_t)$ is the dividend yield based on the present value of dividend, a drop ratio smaller than $(1-\tau_d)$ implies dividend capture is profitable.

$E(\widetilde{R_t^T}) > 0$, dividend capture is profitable even for individuals probably because not much of dividend capture is actually going on.[23] If other investors with a lower dividend income tax rate are already engaged in dividend capture, $E(\widetilde{R_t^T}) < 0$ is likely to hold.

<Table 6> Return from Dividend Capture

<Table 6> reports the after-tax percentage returns from dividend capture. Dividends are discounted at the three-month CD rate, and the withholding tax rate for individuals is used for the tax rate. The number of observations in each category with the percentages in parenthesis is presented in columns headed by N. The numbers in parenthesis under the return columns are standard errors. Numbers marked with *, **, *** significant at 1%, 5% and 10% level, respectively.

Panel A : Selling at the Opening price

		January Ex-day (1994~2000)		December Ex-day (2001~2007)		Financial Crisis (1997~2000)	
		N	R(%)	N	R(%)	N	R(%)
Div. All	All	1,029	0.59*** (0.14)	1,281	1.86*** (0.07)	509	0.90*** (0.25)
	Gain	636 (62%)	3.19*** (0.12)	1,035 (81%)	2.62*** (0.07)	315 (62%)	4.35*** (0.19)
	Loss	393 (38%)	-3.62*** (0.15)	246 (19%)	-1.33*** (0.10)	194 (38%)	-4.70*** (0.24)
High DY	All	342	1.37*** (0.24)	426	2.99*** (0.14)	169	1.85*** (0.43)
	Gain	228 (67%)	3.63*** (0.21)	382 (90%)	3.54*** (0.12)	111 (66%)	5.05*** (0.35)
	Loss	114 (33%)	-3.16*** (0.26)	44 (10%)	-1.81*** (0.35)	58 (34%)	-4.27*** (0.39)
Middle DY	All	344	0.55** (0.26)	430	1.91*** (0.11)	170	1.01** (0.47)
	Gain	210 (61%)	3.39*** (0.22)	368 (86%)	2.42*** (0.10)	106 (62%)	4.72*** (0.36)
	Loss	134 (39%)	-3.91*** (0.29)	62 (14%)	-1.13*** (0.19)	64 (38%)	-5.14*** (0.47)
Low DY	All	343	-0.15 (0.21)	425	0.68*** (0.10)	170	-0.16 (0.37)
	Gain	198 (58%)	2.45*** (0.15)	285 (67%)	1.63*** (0.10)	98 (58%)	3.16*** (0.25)
	Loss	145 (42%)	-3.71*** (0.25)	140 (33%)	-1.26*** (0.12)	72 (42%)	-4.66*** (0.38)

23) The after-tax return is evaluated at the withholding rate of individuals.

Zero DY	All	439	-2.00*** (0.28)	588	-0.47*** (0.11)	296	-2.28*** (0.39)
	Gain	197 (45%)	2.96*** (0.27)	301 (51%)	1.20*** (0.12)	128 (43%)	3.86*** (0.38)
	Loss	242 (55%)	-6.03*** (0.23)	287 (49%)	-2.23*** (0.13)	168 (57%)	-6.97*** (2.28)

Panel B : Selling at the Closing price

		January Ex-day (1994~2000)		December Ex-day (2001~2007)		Financial Crisis (1997~2000)	
		N	R(%)	N	R(%)	N	R(%)
Div. All	All	1,029	3.92*** (0.16)	1,281	2.19*** (0.09)	509	5.33*** (0.27)
	Gain	842 (82%)	5.39*** (0.15)	1,001 (78%)	3.24*** (0.08)	424 (83%)	7.11*** (0.24)
	Loss	187 (18%)	-2.70*** (0.18)	280 (22%)	-1.56*** (0.11)	85 (17%)	-3.56*** (0.32)
High DY	All	342	4.00*** (0.28)	426	2.60*** (0.16)	169	5.40*** (0.49)
	Gain	278 (81%)	5.49*** (0.26)	350 (82%)	3.55*** (0.15)	140 (83%)	7.29*** (0.43)
	Loss	64 (19%)	-2.49*** (0.33)	76 (18%)	-1.75*** (0.20)	29 (17%)	-3.72*** (0.58)
Middle DY	All	344	4.36** (0.27)	430	2.22*** (0.14)	170	6.07*** (0.47)
	Gain	290 (84%)	5.63*** (0.26)	344 (80%)	3.16*** (0.12)	148 (87%)	7.47*** (0.43)
	Loss	54 (16%)	-2.45*** (0.27)	86 (20%)	-1.51*** (0.20)	22 (13%)	-3.33*** (0.45)
Low DY	All	343	3.40*** (0.27)	425	1.74*** (0.15)	170	4.52*** (0.46)
	Gain	274 (80%)	5.04*** (0.24)	307 (72%)	2.97*** (0.14)	136 (80%)	6.54*** (0.40)
	Loss	69 (20%)	-3.09*** (0.32)	118 (28%)	-1.47*** (0.17)	34 (20%)	-3.56*** (0.56)
Zero DY	All	439	3.74*** (0.33)	588	0.35** (0.17)	296	4.56*** (0.47)
	Gain	320 (73%)	6.91*** (0.28)	347 (59%)	2.61*** (0.16)	214 (72%)	8.52*** (0.36)
	Loss	119 (27%)	-4.78*** (0.34)	241 (41%)	-2.91*** (0.18)	82 (28%)	-5.80*** (0.42)

<Table 6> reports the return from dividend capture for the various sample periods using each year's withholding tax rate for individual investors as the tax rate. Stocks of each dividend yield group are further dividend into gain stocks and loss stocks, depending on the sign of the return.

<Table 6> shows that dividend capture on average is profitable even for individual investors. Selling at the closing price makes dividend capture even more profitable; both probability of profit and the average return are higher. The difference between the opening price return and the closing price return is most pronounced during the Asian financial crisis when selling at the closing price is exceptionally profitable while selling at the opening price is not so profitable.[24)]

If other things are equal, high dividend yield stocks will be the best candidate for dividend capture activities. Therefore, they will have a lower probability of success and a lower return for individual investors. Yet, <Table 6> shows selling high dividend yield stocks at their opening prices provides not only the highest probability of profit, but also the highest average return. Especially in the period after the financial crisis, high dividend yield stocks had a 90% success probability and an average return of 2.99%.

<Table 6> again clearly show that there is marked difference between the two sub-sample periods. First, both the probability of success and the average return have increased. For dividend paying stocks, the probability of success has increased from 62% to 81% between the two sub-sample periods with high-dividend yield stocks enjoying a 90% success probability. Second, the difference in returns between selling stocks at the opening price and the closing price is much smaller in the second sub-sample period. The difference between the two returns is greatest during the financial crisis.[25)]

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24) The probability of profitable dividend capture was getting lower before the start of the financial crisis, only to shoot up in 1998 and come down again 1999. The overall probability of profitable dividend capture was 72% in 1994, 69% in 1995, 46% in 1996, and 40% in 1997. In 1998 and 1999, the probability was 82% and 53%, respectively. Considering the high financing costs during this period, the low probability of success is probably not due to the increased dividend capture activities, but due to increased uncertainties about the size of the current dividend.

25) Yet, later we will see that this conclusion is not valid when we consider the daily movement of stocks that are not related to dividends.

3. Return around Ex-Dividend Days

Even if the return from dividend capture is positive, it does not mean investors are earning an excess return if the average daily return is not zero. We incorporate estimates of $E(\tilde{R})$ into our analysis and look at the extra return defined in equation (8) on days around the ex-dividend day. <Table 7> and Table 8 report the extra return EXR_t of (8) based on selling at the opening and closing price, respectively.

<Table 7> and <Table 8> show that throughout our sample period, stocks that pay cash dividends earn significantly positive (pre-tax) extra return on the ex-dividend day. This result does not depend on which price is used. The extra return of the dividend paying stocks based on the opening price is positive, yet insignificant during the financial crisis, and then becomes bigger and significant after the crisis. Note that the extra return is increasing in the dividend yield when we use the opening price whereas the closing price extra return does not show such a relationship. In contrast, stocks paying no cash dividend earn significantly negative extra return on the ex-dividend day throughout our sample period even though the return becomes closer to zero after financial crisis.

The excess returns on days around the ex-dividend day show that there is difference between the two sub-sample periods.[26] The first sub-sample period is characterized by negative opening price excess returns on days immediately before the ex-dividend day. The second sub-sample period exhibits mostly positive extra returns right before the ex-dividend day and significantly negative returns on days immediately following the ex-dividend day. <Table 7> shows significantly negative excess returns right after the ex-dividend day after the financial crisis.

One may consider this as a result of the calendar day effect. In terms of the calendar date, day +2 of the second sub-sample period is the first trading day of the following year and is thus the ex-dividend day of the first sub-sample period. And three days from day -1 to day +1 of the second sub-sample period correspond to the three days before the ex-dividend day of the first sub-sample period. Since the signs of these three days in the second sub-sample period are mostly positive except for day -1, one can conclude there is no clear calendar day effect.

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26) Recall that absence of capital gains tax implies that the pre-and after-tax excess returns are the same on non ex-dividend days.

<Table 7> Pre-Tax Opening Price Excess Return around Ex-Dividend Day

<Table 7> reports the daily pre-tax opening price excess return 5 days before, on and after the ex-dividend day, using the return on the non-December firms. The opening price return refers to the return from buying at the closing price of the previous trading day and selling at today's opening price. The ex-dividend return is the pre-tax return, so that it takes into account the present value of dividend per share, but not the dividend income tax. Panel A, B and C, respectively, reports excess returns of January ex-dividend period, December ex-dividend period and financial period. Numbers with *, **, *** significantly at the level of 10%, 5% and 1%, respectively.

Day	Div.All	High DY	Middle DY	Low DY	Zero DY
Panel A : January Ex-day(1994~2000)					
-5	-0.0006	-0.0017	-0.0012	0.0010	-0.0002
-4	0.0008	0.0006	0.0005	0.0012	0.0015
-3	-0.0036***	-0.0010	-0.0023	-0.0075***	-0.0119***
-2	-0.0023***	-0.0004	-0.0033**	-0.0032**	-0.0049***
-1	-0.0080***	-0.0049***	-0.0083***	-0.0109***	-0.0175***
Ex-day	0.0046***	0.0114***	0.0043*	-0.0018	-0.0246***
+1	0.0005	-0.0012	0.0015	0.0011*	0.0064***
+2	0.0016	0.0014	0.0028	0.0005	0.0093***
+3	-0.0017*	0.0011	-0.0021	-0.0042***	0.0021
+4	-0.0050***	-0.0052***	-0.0032*	-0.0068***	0.0034*
+5	-0.0005	-0.0013	0.0010	-0.0012	0.0054***
Panel B : December Ex-day(2001~2007)					
-5	-0.0021***	-0.0023***	-0.0021***	-0.0018***	-0.0028***
-4	-0.0012***	-0.0008	-0.0016**	-0.0013*	-0.0004
-3	-0.0050***	-0.0043***	-0.0049***	-0.0058***	-0.0062***
-2	0.0011**	0.0017**	0.0011	0.0005	-0.0026**
-1	0.0009**	0.0028***	0.0008	-0.0008	-0.0006
Ex-day	0.0193***	0.0305***	0.0197***	0.0077****	-0.0052***
+1	-0.0050***	-0.0067***	-0.0050***	-0.0033***	-0.0044***
+2	-0.0041***	-0.0055***	-0.0035***	-0.0034***	0.0018*
+3	0.0000	-0.0018***	0.0006	0.0012	0.0028***
+4	-0.0005	-0.0017***	-0.0006	0.0008	0.0008
+5	0.0000	0.0011	-0.0006	-0.0005	0.0006
Panel C : Financial crisis(1997~2000)					
-5	-0.0035**	-0.0059**	-0.0011	-0.0036	-0.0019
-4	-0.0029**	-0.0047**	-0.0034*	-0.0005	0.0003
-3	-0.0089***	-0.0060***	-0.0056**	-0.0149***	-0.0188***
-2	0.0005	0.0020	-0.0014	0.0007	-0.0055**
-1	-0.0068***	-0.0036	-0.0073**	-0.0095***	-0.0193***
Ex-day	0.0040*	0.0118**	0.0047	-0.0046	-0.0312***
+1	0.0006	-0.0025	0.0042*	0.0003	0.0059**
+2	0.0074***	0.0074***	0.0102***	0.0047*	0.0137***
+3	0.0035**	0.0078***	0.0035	-0.0009	0.0069**
+4	0.0041***	0.0013	0.0075***	0.0036	0.0105***
+5	0.0050***	0.0040	0.0055**	0.0053***	0.0087***

<Table 8> Pre-Tax Closing Price Excess Return around Ex-Dividend Day

<Table 8> reports the daily pre-tax closing price excess return 5 days before, on and after the ex -dividend day, using the return on the non-December firms. The closing price return refers to the return from buying at the closing price of the previous trading day and selling at today's closing price. The ex-dividend return is the pre-tax return, so that it takes into account the present value of dividend per share, but not the dividend income tax. Panel A, B and C, respectively, reports excess returns of January ex-dividend period, December ex-dividend period and financial period. Numbers with *, **, *** significantly at the level of 10%, 5% and 1%, respectively.

Day	Div.All	High DY	Middle DY	Low DY	Zero DY
Panel A : January Ex-day(1994~2000)					
-5	0.0032***	-0.0002	0.0015	0.0083***	0.0092***
-4	-0.0036***	-0.0014	-0.0038*	-0.0056***	-0.0107***
-3	-0.0051***	-0.0018	-0.0088***	-0.0047**	-0.0240***
-2	-0.0074***	-0.0046**	-0.0076***	-0.0100***	-0.0153***
-1	-0.0025*	-0.0006	-0.0036	-0.0032	-0.0227***
Ex-day	0.0159***	0.0155***	0.0187***	0.0134***	0.0054*
+1	0.0054***	0.0038*	0.0070***	0.0054**	0.0252***
+2	0.0027**	0.0033	0.0036	0.0011	0.0145***
+3	-0.0039***	0.0020	-0.0074***	-0.0062**	0.0001
+4	-0.0053***	-0.0020	-0.0049**	-0.0089***	0.0004
+5	0.0014***	0.0122***	0.0122***	0.0098***	0.0198***
Panel B : December Ex-day(2001~2007)					
-5	-0.0003	-0.0004	-0.0017	0.0014	-0.0062***
-4	-0.0055***	-0.0048***	-0.0047***	-0.0069***	-0.0076***
-3	-0.0072***	-0.0048***	-0.0094***	-0.0074***	-0.0145***
-2	0.0015**	0.0043***	0.0014	-0.0014	-0.0069***
-1	0.0027***	0.0049***	0.0043***	-0.0012	-0.0057***
Ex-day	0.0111***	0.0160***	0.0115***	0.0057***	-0.0067***
+1	-0.0025***	-0.0074***	-0.0016	0.0014	0.0006
+2	-0.0034***	-0.0078***	-0.0028**	0.0005	0.0149***
+3	-0.0019***	-0.0044***	-0.0006	-0.0009	0.0037***
+4	0.0004	-0.0020*	0.0009	0.0022*	0.0043***
+5	-0.0027***	-0.0018	-0.0017	-0.0047***	-0.0006
Panel C : Financial crisis(1997~2000)					
-5	-0.0022	-0.0039	-0.0044	0.0019	0.0091***
-4	-0.0109***	-0.0074**	-0.0123***	-0.0129***	-0.0160***
-3	-0.0081***	-0.0047*	-0.0133**	-0.0064*	-0.0333***
-2	0.0005	0.0054	-0.0001	-0.0036	-0.0144***
-1	0.0046*	0.0058	0.0038	0.0043	-0.0263***
Ex-day	0.0140***	0.0118**	0.0182***	0.0120***	0.0022
+1	0.0086***	0.0016	0.0151***	0.0091**	0.0337***
+2	0.0202***	0.0217***	0.0217***	0.0173***	0.0286***
+3	0.0016	0.0070*	-0.0038	0.0017	0.0050
+4	0.0082***	0.0070**	0.0107***	0.0068**	0.0071**
+5	0.0156***	0.0165***	0.0170***	0.0133***	0.0246***

This result is different from what both the U.S. and the Japanese findings. Eades, Heases, and Kim (1984) report that in the U.S., the five days after the ex-dividend day earns negative excess return while five from day-5 to(and including) the ex-dividend day is 0.43%, and the cumulative excess return from day +1 to +5 is -0.24%. In Japan, Kato and Loewenstein (1995) find that five days before the ex-dividend day exhibit negative excess return. While the first sub-sample period shows some similarity with the Japanese result, the second sub-sample period is similar to neither.[27)]

The difference between the two sub-sample periods shows up again in the extra returns based on closing prices in <Table 8>. Dividend paying stocks earn significantly positive pre-tax extra returns in both sub-sample periods when sold at the closing price. In the first sub-sample period, the closing price extra return is higher than that of the opening price. In contrast, the inequality is reversed in the second sub-sample period. Therefore, selling at the opening price is a better strategy after the financial crisis.[28)]

Moreover, contrary to our previous finding, selling at the closing price did not generate any excess return during the financial crisis once we take into account the average daily return $E(\tilde{R})$ unrelated to the cash dividend; the average difference between the two extra returns for the whole period of 1994 to 2000 is 1.13%(=1.59~0.46%) while it is only 1%(=1.40~0.4%) during the financial crisis.[29)]

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27) <Table 10> below shows that the after-tax excess return on the ex-dividend day in Korea is negative in contrast to the U.S. and Japan where the ex-dividend day earns a positive excess return. See below.

28) Another difference is that no-dividend paying stocks that earn positive closing price extra returns on the ex-dividend day in the first sub-sample period earn significantly negative extra returns in the period after the crisis.

29) We also looked at the excess trading volume around the ex-dividend day using the mean-adjusted model. The result is not reported here because the result turns out to be sensitive to which mean is used to scale the trading volume. If we use the average trading volume of each stock as the scale factor, it fails to take into account the fact that the ex-dividend day before 2001 was the first trading day of the New Year which had one hour less trading hours than other trading days. The excess trading volume calculated in this way will be biased downward and turns out to be negative. We can avoid this problem by scaling trading volume by the total market turnover. Calculated in this way, the excess trading volume turns out to be positive.

4. Absence of Tax Clientele Effect

We noted before that the pre-tax extra return based on the opening price is increasing in the dividend yield. According to equation (8), the extra return on the ex-dividend day is equal to $\tau_d PV(D_t)/P_{t-1}$. If the tax clientele effect is present, the tax rates implied by the extra return should be increasing in $PV(D_t)$. <Table 9> reports the implied tax rates defined by

$$\tilde{\tau} \equiv \frac{EXR_t}{[PV(D_t)/P_{t-1}]} \tag{15}$$

<Table 9> Implied tax rate

<Table 9> reports the tax rates implied by the extra return on the ex-dividend day. Formally, implied tax rates are computed according to

$$\hat{\tau} = \frac{EXR_t}{[PV(D_t)/P_{t-1}]} = \frac{E(\tilde{R}_t) - E(\tilde{R})}{[PV(D_t)/P_{t-1}]}$$

We used both the opening and the closing price of the ex-dividend day. Implied tax rates with *, **, *** different from the average prevailing withholding tax rate for each period at the significance level of 10%, 5% and 1%, respectively. Numbers in parentheses are standard errors. All numbers are in percentages.

	Group	January Ex-day (1994~2000)		December Ex-day (2001~2007)		Financial Crisis (1997~2000)	
$\hat{\tau}_o(\%)$	Div.All	10.71	(7.57)	51.39***	(4.42)	0.43	(12.52)
	High	26.14**	(4.87)	54.11***	(2.26)	13.18	(6.59)
	Middle	12.51	(9.18)	60.56***	(4.30)	6.47	(14.33)
	Low	-6.49	(20.16)	39.38*	(12.37)	-18.30	(34.04)
$\hat{\tau}_c(\%)$	Div.All	82.86***	(9.99)	21.19	(7.08)	50.32***	(14.85)
	High	45.54***	(6.02)	27.76	(2.65)	14.72	(7.41)
	Middle	74.96***	(9.32)	31.66***	(5.28)	45.28**	(13.74)
	Low	127.99***	(27.67)	4.00	(20.47)	90.76**	(41.53)

<Table 9> shows the implied tax rates are not decreasing in the dividend yield. Before 2001, they are even increasing in the dividend yield. In the case of opening prices, the low dividend yield stocks have the lowest implied tax rates throughout our sample period. <Table 9> thus confirms that there is no evidence that the tax clientele effect exists

in Korea even after considering the general market movements unrelated to dividends.

In addition, <Table 9> reaffirms our previous findings that dividend capture at the opening price becomes more profitable in the second sub-sample period. In fact, dividend capture based on the closing price, which was more profitable in the first sub-sample period, is less profitable than based on the opening price. One complication is that Korean investors do not have perfect information regarding the current dividend. However, if we take the imperfect information seriously, <Table 9> suggests that investors are consistently underestimating the current dividend, which is very unlikely. Thus, the imperfect information alone cannot explain the big discrepancy between the tax clientele hypothesis and the findings of <Table 9>.

5. Univariate Test

With the estimated daily return unrelated to the dividend $E(\widetilde{R})$, we can now formally test whether dividend capture really earns an excess return. <Table 10> reports the difference between the *after-tax* return $\widetilde{R_t^\tau}$ and the average daily return $E(\widetilde{R})$ on the ex-dividend day. Since $\widetilde{R_t^\tau}$ is equal to the return from dividend capture, this difference provides the test statistics on whether dividend capture earns excess return.

First of all, note that stocks earn negative excess returns on ex-dividend days in the first sub-sample period including the financial crisis period even though they are not so significant. In other words, once we incorporate $E(\widetilde{R})$ into the analysis, dividend capture at the opening price is not so profitable in this period. This is in contrast to the U.S. and Japanese findings where stocks earn positive excess returns on ex-dividend days. Note also that the excess returns turn positive in the second sub-sample period, making dividend capture at the opening price profitable in this period.

<Table 10> again shows the marked difference between the two sub-sample periods. First, after the financial crisis, dividend capture becomes more profitable and earn an excess return, which is higher for each and every group of stocks than before. Even no-dividend paying stocks that earn negative excess returns throughout our sample period show smaller losses after 2001. Second, for dividend paying stocks, the excess returns become all positive and statistically different from zero after the crisis whereas

they are either insignificantly positive (high-dividend yield stocks) or negative (middle- and low-dividend yield stocks) before 2001. Third, after the crisis, the excess return based on the opening price becomes higher than the excess return based on the closing price whereas the opposite is true before 2001; selling stocks at the opening price of the ex-dividend day becomes a better strategy after 2001. Returns calculated under the assumption of $E(\tilde{R})=0$ <Table 6> show that after the crisis only the high-dividend yield stocks have a higher opening return than the closing return. <Table 10> shows that once we incorporate $E(\tilde{R})$, all stocks earn a higher return when they are sold at the opening price.

<Table 10> Univariate Test

<Table 10> reports results from univariate test of the daily after-tax returns at the margin. Each number represent the difference between the after-tax return on the ex-dividend day and the estimated return if there were no dividend as follow :

$$\widetilde{R}_t^{\tau}-\widetilde{R}_t \equiv \frac{P_t+(1-\tau_d)PV(D_t)-P_{t-1}}{P_{t-1}}-\left[\hat{\alpha}_i+\hat{\beta}_i\times R_t^{NonDec}\right]$$

The theory predicts that the excess return be zero. The numbers after-tax excess returns where both the opening and closing excess returns are reported and tested. Numbers marked with *, **, *** significant at 10%, 5% and 1% level, respectively. The numbers in parentheses are standard errors.

Period	Dividends	N	$\widetilde{R}_t^{\tau}-\widetilde{R}_t$(opening)		$\widetilde{R}_t^{\tau}-\widetilde{R}_t$(closing)	
1994~2007	All	2,310	0.0071***	(0.0007)	0.0076***	(0.0008)
January Ex-day (1994~2000)	Div.All	1,029	-0.0009	(0.0013)	0.0104***	(0.0470)
	High	342	0.0027	(0.0022)	0.0068***	(0.0015)
	Middle	344	-0.0009	(0.0025)	0.0136***	(0.0026)
	Low	343	-0.0043**	(0.0021)	0.0108***	(0.0025)
	No. Div	439	-0.0246***	(0.0027)	0.0054*	(0.0030)
December Ex-day (2001~2007)	Div.All	1,281	0.0135***	(0.0007)	0.0053***	(0.0009)
	High	426	0.0210***	(0.0013)	0.0065	(0.0016)
	Middle	430	0.0143***	(0.0011)	0.0062***	(0.0014)
	Low	425	0.0052***	(0.0010)	0.0032**	(0.0014)
	No. Div	439	-0.0052***	(0.0011)	-0.0067***	(0.0017)
Financial Crisis (1997~2000)	Div.All	509	-0.0036	(0.0023)	0.0064**	(0.0026)
	High	169	-0.0005	(0.0039)	-0.0005	(0.0046)
	Middle	170	-0.0024	(0.0044)	0.0111**	(0.0044)
	Low	170	-0.0079**	(0.0035)	0.0087**	(0.0043)
	No. Div	296	-0.0312***	(0.0038)	0.0022	(0.0042)

The test result on whether the excess return is statistically different from zero is reported in <Table 10>. The univariate test shows that in the first sub-sample period, the excess return is no different from zero. In other words, the opening price of the ex-dividend day fell just by the amount of the after-tax dividend per share. Then, after the financial crisis, the ex-day stock price falls by an amount significantly less than the after-tax dividend per share. As for closing prices, the excess returns are mostly positive and significant except for the financial crisis period.

We also run a simple univariate regression. <Table 11> reports the coefficients of the following regression equation :

$$EXR_{i,t} = a_0 + a_1\left[\frac{\tau_d \bullet PV(D_{i,t})}{P_{i,t-1}}\right] + \epsilon_{i,t} \tag{16}$$

Recall our theory predicts $a_0 = 0$ and $a_1 = 1$.

<Table 11> roughly confirms our findings so far. The constant term a_0 is statistically insignificant in the first sub-sample period and becomes significant in the second sub-sample period. Yet, its mean value 0.28% of the second sub-sample period does not seem economically significant. During the financial crisis, the constant term is negative and significant, suggesting that factors other than dividends contribute to the ex-dividend day excess returns.

The coefficient a_1 after the financial crisis is 2.8 and is significantly different from 1 whereas it is statistically not different from 1 in the first sub-sample period. Therefore, the opening stock price on the ex-dividend day fell by an amount not different from the dividend per share in the first sub-sample period, but it falls less than the after-tax dividend per share after the crisis. Overall, the results suggest that the ex-dividend day stock prices in the first sub-sample period behaved in a manner consistent with our theory, but their behavior in the second sub-sample period is quite different from the predictions of the theory.[30]

30) One caveat is that the regression for the first sub-sample period has a much smaller adjusted R^2 than that for the second sub-sample period. As we will see in <Table 12> and 13, this seems to be the case for multiple regressions.

<Table 11> A Univariate Test

<Table 11> reports results from a univariate regression of the pre-tax return on the present value of dividend income tax per dollar of investment. The regression equation is :

$$EXR_{i,t} = a_0 + a_1[\tau_d \cdot PV(D_{i,t})]/P_{i,t-1} + \epsilon_{i,t}$$

Panel A and B report the regression coefficients when computation of the pre-tax extra return EXR is based on the opening price and closing price, respectively. The theory predicts that $a_0 = 0$ and $a_1 = 1$. Constant terms marked with *, **, ***, significant at 10%, 5% and 1% level, respectively. Coefficients a_1 marked with *, **, ***, significantly different from 1 at 10%, 5% and 1% level, respectively. The number in parentheses are standard errors.

Panel A : Opening Price

Independent Variables	Groups	January Ex-day (1994~2000)	December Ex-day (2001~2007)	Financial Crisis (1997~2000)
a_0	Div.All	-0.0028 (0.0023)	0.0028*** (0.0012)	-0.0120*** (0.0047)
	High	0.0055 (0.0050)	0.0099*** (0.0034)	-0.0273** (0.0160)
	Middle	-0.0044 (0.0058)	0.0037 (0.0027)	-0.0246* (0.0159)
	Low	-0.0006 (0.0046)	-0.0011 (0.0021)	-0.0070 (0.0085)
a_1	Div.All	1.2723 (0.3578)	2.8256*** (0.1743)	2.0095** (0.5648)
	High	0.5225 (0.5404)	2.0689*** (0.3525)	3.0536 (1.3196)
	Middle	1.6448 (0.9945)	2.9644*** (0.4654)	4.0512 (2.1020)
	Low	-0.4626 (1.5204)	3.5548*** (0.7047)	0.6608 (2.2734)
Adjusted R^2	Div.All	0.0115	0.1739	0.0232
	High	-0.0002	0.0765	0.0279
	Middle	0.0050	0.0844	0.0158
	Low	-0.0027	0.0565	-0.0055

Panel B : Closing Price

Independent Variables	Groups	January Ex-day (1994~2000)	December Ex-day (2001~2007)	Financial Crisis (1997~2000)
a_0	Div.All	0.0164*** (0.0026)	0.0018 (0.0016)	0.0094** (0.0053)
	High	0.0250** (0.0059)	0.0057* (0.0042)	-0.0018 (0.0190)
	Middle	0.0110* (0.0059)	-0.0052 (0.0036)	-0.0179 (0.0158)
	Low	0.0104** (0.0056)	-0.0062** (0.0030)	0.0005 (0.0105)
a_1	Div.All	-0.1638*** (0.4022)	1.5480*** (0.2325)	0.5024 (0.6382)
	High	-1.2827*** (0.6361)	0.9215 (0.4364)	0.8963 (1.5730)
	Middle	1.4583 (1.0007)	3.0935*** (0.6236)	4.9797** (2.0965)
	Low	1.0930 (1.8541)	4.7879*** (1.0135)	3.3236 (2.7977)
Adjusted R^2	Div.All	-0.0008	0.0337	-0.0008
	High	0.0093	0.0085	-0.0045
	Middle	0.0033	0.0522	0.0267
	Low	-0.0020	0.0497	0.0025

The regression on the closing prices paints a completely different picture. The high return from dividend capture at the closing price in the first sub-sample period must have come from factors other than the dividend yield, as seen by the high value of the constant term a_0 and significantly negative coefficient a_1. In stark contrast to the opening price excess return, the constant term turns insignificant after the crisis. As seen before, the coefficient a_1 for the closing price regression is on average smaller than that for the opening price regression, implying that selling at the opening price will do better.

6. Multiple Regressions of Price Changes on Ex-Dividend Days

Our results from the univariate test are now to be confirmed by multiple regressions. The return from dividend capture may depend on factors other than the dividend yield. Even if the dividend yield is high enough to make dividend capture attractive, concerns about the market liquidity may prevent investors from engaging in it. Thus, we posit that the pre-tax return from dividend capture is determined by the taxes on the dividend yield and other liquidity variables. More specifically, we run the following regression :

$$EXR_{i,t} = a_0 + a_1\left[\frac{\tau_d PV(D_{i,t})}{P_{i,t-1}}\right] + bX_{i,t} + \epsilon_{i,t} \tag{17}$$

Here, $EXR_{i,t}$ is the pre-tax excess return defined in equation (8), and $X_{i,t}$ is a vector of control variables. Our theory predicts $a_0 = 0$ and $a_1 = 1$.

Among the control variables are the natural log of the total market capitalization(MV), the square root of the Amihud measure of illiquidity($\sqrt{ILLIQ}$) and turnover (TURN). We expect these variables to have positive coefficients since investors engaged in dividend capture will choose to trade in liquid stocks. Also included are the beta, the unsystematic risk(UNSYS), and volatility of return (VOL) of each stock. These variables measure the risk of each stock uncovered by the average daily return $E(\tilde{R})$. Another control variable is the foreign stock ownership (FOR), defined as the percentage of the outstanding number of stocks owned by foreigners. We expect FOR to have a negative

coefficient because companies with a high FOR tend to pay out more cash dividends, so they make a better target for dividend capture.

Following Naranjo, Nimalendran and Ryngaert (2000), who use the daily three-month Treasury bill rate, the three month CD rate (R_f) is also included as one of the control variables. Since a high CD rate would imply a low return from dividend capture, the coefficient on R_f should be negative. On the other hand, since a high CD rate implies a high cost of financing dividend capture, it will raise its return and make the coefficient on R_f positive. Thus, a priori the sign on R_f is ambiguous. We also include a dummy variable D(-1), which is 1 if the firm paid cash dividend in the previous year, and 0 otherwise.

<Table 12> reports the regression results for all stocks and for the whole period. To eliminate the outlier effect, we eliminate stocks whose dividend yield are either too high or too low.[31] For all 6 regressions, the constant term is quite big and significant, and the coefficient for the dividend yield is significantly greater than one.[32] In other words, for the whole sample period, the ex-dividend stock price falls by an amount less than the after-tax dividend per share. As expected, both the Amihud illiquidity measure ($\sqrt{ILLIQ}$) and turnover(TURN) as a measure of liquidity have positive coefficients. Yet, since the coefficient on TURN is insignificant, we cannot say for sure that there are a lot of short-term trading going on.

The three-month CD rate R_f term carries a significantly negative coefficient. Therefore, a higher CD rate simply lowers the return from dividend capture, not affecting the level of dividend capture activities. Beta is insignificant except for Regression 5. This suggests that our estimate of the general market movement $E(\widetilde{R})$ is doing a fine job. The significantly negative coefficients for the unsystematic risk (UNSYS) and the volatility measure(VOL) are hard to interpret. FOR turns out to be insignificant.

Last year's dividend dummy variable D(-1) has a significantly negative coefficient.

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31) Stocks whose dividend yields are higher than 10% or lower than 0.3% are eliminated, 16 and 21 high dividend yield stocks. As a result, the sample size in smaller by 24 for the first sub-sample period and by 37 for the second sub-sample period.

32) A test for heteroscadasticity came out negative, Furthermore, heteroscadasticity-adjusted t-statistics are not very different from those reported in <Table 12> and <Table 13>. These results are available from the corresponding author upon request.

If they do not have good information regarding the current dividend, investors will try to gather information about it. One piece of the information they can easily get is last year's cash dividend. If the company paid cash dividend last year, and if other things

<Table 12> Multiple Regression for the Whole Sample Period

<Table 12> reports multiple regression results. The pre-tax extra return is regressed on the present value of dividend income tax per dollar of investment and on the other control variables. The regression equation is :

$$EXR_{i,t} = a_0 + a_1[\tau_d PV(D_{i,t})/P_{i,t-1}] + bX_{i,t} + \epsilon_{i,t}$$

Control variables $X_{i,t}$ include (a) risk factors such as β, UNSYS and VOL and (b) liquidity variables such as $\sqrt{ILLIQ}$ and TURN, (c) the three-month CD rate as the risk free rate, (d) the foreign ownership variable FOR, and (e) the last year cash dividend dummy D(-1). Each column reports coefficients of different regression. Computation of the pre-tax extra return EXR is based on the opening price. Coefficient marked with *, **, *** significant at 10%, 5% and 1% level respectively. Coefficients on $\tau \cdot DY$ marked with *, **, *** significantly different from 1 at 10%, 5% and 1% level, respectively. The numbers in parentheses are standard errors.

Variables	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6
a_0	0.0473*** (0.0078)	0.0427*** (0.0075)	0.0359*** (0.0044)	0.0341*** (0.0042)	0.0388*** (0.0042)	0.0369*** (0.0040)
$\tau \cdot DY^{*}$	1.9958*** (0.2005)	1.9958*** (0.2014)	1.9418*** (0.1962)	2.0303*** (0.1977)	1.9649*** (0.1929)	2.0472*** (0.1945)
β	-0.0021 (0.0024)	0.0002 (0.0024)	-0.0008 (0.0024)	0.0018 (0.0025)	-0.0038* (0.0022)	-0.0009 (0.0022)
R_f	-0.5535*** (0.0598)	-0.5413*** (0.0597)	-0.5418*** (0.0581)	-0.5360*** (0.0581)	-0.5238*** (0.0571)	-0.5220*** (0.0571)
D(-1)	-0.0113*** (0.0598)	-0.0112*** (0.0025)	-0.0015*** (0.0025)	-0.0114*** (0.0025)	-0.0112*** (0.0025)	-0.0111*** (0.0025)
MV	-0.0007 (0.0005)	-0.0005 (0.0005)				
$\sqrt{ILLIQ}$			0.0143** (0.0061)	0.0137** (0.0061)		
TURN					0.0006 (0.0007)	0.0005 (0.0006)
UNSYS	-0.5321*** (0.0766)		-0.5240*** (0.0734)		-0.5424*** (0.0865)	
VOL		-0.4993*** (0.0718)		-0.4990*** (0.0697)		-0.5146*** (0.0813)
FOR			-0.0013 (0.0054)	-0.0000 (0.0054)		
Adj-R^2	0.1122	0.1122	0.1134	0.1135	0.1118	0.1121

are equal, there will be more dividend capture activity for the stock, lowering its return. Thus, D(-1) has a negative coefficient, However, D(-1) will have a positive coefficient if investors have good information about the size of the current dividend. Then, D(-1) will not affect the extent of dividend capture activities and their returns, and its coefficient will just reflect roughly the positive correlation between the current dividend

<Table 13> Multiple Regression for Each Sub-Sample Period

<Table 13> reports multivariate regression results for each sub-sample period. The pre-tax extra return is regressed on the present value of dividend income tax per dollar of investment and on the other control variables. The regression equation is :

$$EXR_{i,t} = a_0 + a_1[\tau_d PV(D_{i,t})/P_{i,t-1}] + bX_{i,t} + \epsilon_{i,t}.$$

Control variables $X_{i,t}$ include (a) risk factors such as β, UNSYS and VOL and (b) liquidity variables such as $\sqrt{ILLIQ}$ and TURN, (c) the three-month CD rate as the risk free rate, (d) the foreign ownership variable FOR, and (e) the last year cash dividend dummy D(-1). Each column reports coefficients of different regression. Computation of the pre-tax extra return EXR is based on the opening price. Coefficient marked with *, **, ***, significant at 10%, 5% and 1% level respectively. Coefficients on $\tau \cdot DY$ marked with *, **, ***, significantly different from 1 at 10%, 5% and 1% level, respectively. The numbers in parentheses are standard errors.

Variable	Reg. 1			Reg. 2		
	January Ex-day	December Ex-day	Financial Crisis	January Ex-day	December Ex-day	Financial Crisis
a_0	0.0325** (0.0175)	0.0480*** (0.0093)	-0.0122 (0.0339)	0.0192 (0.0160)	0.0496*** (0.0091)	-0.0260 (0.0329)
$\tau \cdot DY^{*}$	1.6701** (0.3998)	2.5678*** (0.1955)	1.9127 (0.5880)	1.7032** (0.4065)	2.5719*** (0.1930)	1.9330 (0.5888)
β	-0.0100*** (0.0047)	0.0038** (0.0022)	0.0022 (0.0110)	-0.0067 (0.0047)	0.0049** (0.0024)	0.0039 (0.0120)
R_f	-0.4296*** (0.1272)	-1.7666*** (0.5147)	0.0145 (0.0111)	-0.3876*** (0.1252)	-1.7666*** (0.5147)	-0.4514*** (0.2107)
D(-1)	-0.0157*** (0.0047)	-0.0041** (0.0024)	-0.7318*** (0.1868)	-0.0153*** (0.0047)	-0.0041** (0.0024)	-0.0150*** (0.0071)
MV	0.0016 (0.0011)	-0.0018 (0.0005)	0.0035 (0.0020)	0.0022*** (0.0011)	-0.0019*** (0.0005)	0.0041*** (0.0019)
UNSYS	-0.6681*** (0.1603)	-0.1125 (0.0858)	-0.3396 (0.3269)			
VOL				-0.5285*** (0.1405)	-0.1547** (0.0856)	-0.1918*** (0.3473)
Adj-R^2	0.0464	0.1885	0.0576	0.0434	0.1895	0.0561

Variable	Reg. 3			Reg. 4		
	January Ex-day	December Ex-day	Financial Crisis	January Ex-day	December Ex-day	Financial Crisis
a_0	0.0537***	0.0191***	0.0400**	0.0457***	0.0207***	0.0326*
	(0.0098)	(0.0067)	(0.0189)	(0.0092)	(0.0066)	(0.0190)
$\tau \cdot DY^*$	1.6378	2.7978***	1.7371	1.6338	2.7897***	1.7214
	(0.4021)	(0.1892)	(0.5896)	(0.4091)	(0.1880)	(0.5911)
β	-0.0076	0.0029	0.0145	-0.0033	0.0034	0.0236**
	(0.0049)	(0.0023)	(0.0111)	(0.0049)	(0.0024)	(0.0120)
R_f	-0.4884***	-1.5554***	-0.7318***	-0.4462***	-1.5645***	-0.7369***
	(0.1239)	(0.5138)	(0.1868)	(0.1230)	(0.5137)	(0.1974)
D(-1)	-0.0160***	-0.0047**	-0.0159**	-0.0155***	-0.0051**	-0.0154**
	(0.0047)	(0.0024)	(0.0071)	(0.0048)	(0.0024)	(0.0071)
$\sqrt{ILLIQ}$	0.0096	0.0175***	0.0346*	0.0067	0.0178***	0.0331*
	(0.0117)	(0.0057)	(0.0180)	(0.0117)	(0.0057)	(0.0183)
UNSYS	-0.7968***	-0.0069	-0.8470***			
	(0.1534)	(0.0817)	(0.3092)			
VOL				-0.6299***	-0.0569	-0.7502**
				(0.1374)	(0.0823)	(0.3392)
FOR	-0.0069	0.0041	-0.0034	-0.0023	0.0036	0.0014
	(0.0132)	(0.0045)	(0.0213)	(0.0132)	(0.0045)	(0.0211)
Adj-R^2	0.0445	0.1848	0.0567	0.0388	0.1851	0.0517

Variable	Reg. 5			Reg. 6		
	January Ex-day	December Ex-day	Financial Crisis	January Ex-day	December Ex-day	Financial Crisis
a_0	0.0524***	0.0231***	0.0277	0.0455***	0.0253***	0.0195
	(0.0096)	(0.0067)	(0.0187)	(0.0089)	(0.0066)	(0.0188)
$\tau \cdot DY^*$	1.6142	2.8146***	1.7829	1.6069	2.8030***	1.7822
	(0.3984)	(0.1863)	(0.5733)	(0.4047)	(0.1848)	(0.5739)
β	-0.0083*	-0.0004	0.0132	-0.0043	0.0000	0.0158
	(0.0047)	(0.0020)	(0.0108)	(0.0046)	(0.0021)	(0.0109)
R_f	-0.4748***	-1.5493***	-0.6766***	-0.4439***	-1.5599***	-0.6564***
	(0.1231)	(0.5145)	(0.1812)	(0.1225)	(0.5143)	(0.1888)
D(-1)	-0.0161***	-0.0042*	-0.0156**	-0.0158***	-0.0046*	-0.0150**
	(0.0047)	(0.0024)	(0.0071)	(0.0047)	(0.0024)	(0.0071)
TURN	-0.0014	0.0002	-0.0041**	-0.0021	0.0005	-0.0047
	(0.0015)	(0.0006)	(0.0021)	(0.0014)	(0.0006)	(0.0020)
UNSYS	-0.6693***	-0.0066	-0.2964			
	(0.1745)	(0.0981)	(0.3294)			
VOL				-0.5033***	-0.0836	-0.1239
				(0.1545)	(0.0995)	(0.3549)
Adj-R^2	0.0453	0.1792	0.0590	0.0414	0.1797	0.0577

and the last year's dividend. Therefore, the negative coefficient of D(-1) implies that the uncertainty about the current dividend matters.

When we break the sample period into two sub-sample period of financial crisis, the difference between the two sub-sample periods we noted several times before becomes apparent. <Table 13> reports results of six different regressions on each sub-sample period. The numbering of regression is the same as in <Table 12>.

Note first the high constant term which is significant most of the time. It is around 5% in the first sub-sample period, and then becomes smaller afterwards. The smaller constant term may be due to omission of relevant variables in the regression. For example, in Regression 2 where MV is included, it becomes significant and the constant term becomes smaller and only weakly significant.

During the first sub-sample period including the financial crisis period, the coefficients on the dividend yield are statistically not different from one. However, they become bigger and statistically different from one after the financial crisis. This confirms our previous finding that the ex-dividend day opening price that used to fall by the amount of the after-tax dividend per share in the early years now falls must less than that after the financial crisis.[33] The difference is quite sizable; the coefficients in early years are about 1.6 whereas they are about 2.8 later. All the rest of variables have coefficients of the same sign as in <Table 12>.

Another differences are as follow. First, the Amihud measure of illiquidity becomes very significant in the second sub-sample period. The unsystematic risk that is important in the first sun-sample period becomes very small and insignificant. Moreover, the impact of the three month CD rate becomes greater in the second sub-sample period. While still significant, the coefficient of the dummy variable D(-1) is smaller in the same period and it seems that payout of cash dividend in the previous year become less important than before. One possible explanation is that this is caused by elimination of the measures for ex-dividends. Because the measures for ex-dividend set the base price of the ex-divi-

33) While the results are reported here, we also run separate regressions for stocks of each dividend yield group. The results are basically the same. In the first sub-sample period, all the coefficients for the dividend yield term are statistically not different from one. They all become greater than one after financial crisis.

dend day using the previous year's dividend per share, they may have rendered last year's cash dividend more relevant than it should have been.

Ⅵ. Conclusion

This paper studies the ex-dividend day stock price behavior in the Korean stock market between 1994 and 2007. Using non-December firms to estimate general stock price movements unrelated to the cash dividends, we conduct an event study and estimate the excess return on days around the ex-dividend day. Clustering of the ex-dividend day on a single calendar date, the changes in institutional details around 2001, and the Asia financial crisis all made the study not an easy one to carry out.

Our methodology allows us to consider explicitly the daily risk-adjusted return that has nothing to do with cash dividends. We find that there is no tax clientele effect in Korea, and dividend capture could be quite profitable in Korea. A set of findings also point to the marked differences between years before and after 2001. The major differences are : the opening stock prices fell by the amount of the current cash dividend per share before 2001, but it does not fall as much since 2001. In contrast to the U.S. and the Japanese findings, middle- and low-dividend yield stocks earned negative excess returns on the ex-dividend day before 2001, after which all stocks earn positive excess returns on the ex-dividend day. The closing stock price on the ex-dividend day that used to be even higher than the cum-dividend price before 2001 is lower than the opening price since 2001.

While the evidence suggests a structural break has happened around year 2001, we did not investigate its causes. The comprehensive financial income tax, first implemented in 2001, may have reduced dividend capture activities and improved their profitability. Or, the change of the ex-dividend to the second last day of trading in December, which also occurred in 2001, may have contributed to the break. Yet another possibility is that investors' behavior may have changed since the experience of the financial crisis. Which of these factors are responsible for the structural break is a question left to be answered by further study.

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