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THE ANOMALY OF 28 DAYS BETWEEN THE EX-DIVIDEND AND PAYMENT DATES IN TAIWANESE STOCK MARKETS

Jen-Chang Liu[1†] --- Mark Yeats[2]

[1]*Department of Banking and Finance, Takming University of Science and Technology, Taiwan*

[2]*Department of Applied Foreign Languages, Takming University of Science and Technology, Taiwan*

ABSTRACT

After 16 years of suspension during the leadership of Steve Jobs, Apple now pays cash dividends. Since the death of Jobs, Apple has distributed twelve quarterly dividends. Of these, cash was paid 7 days after the ex-dividend date on ten occasions, and twice after 8 days. It has been well documented that individuals prefer numbers with salient final digits, such as 0 and 5, when making quantitative decisions. These phenomena motivates us to examine if 7 is a salient number (in other words, a weekly cycle effect is at work) in determining the period between the ex-dividend and payment dates. Since Taiwanese firms pay annual dividends, we conjecture that in Taiwan a period of 28 days is the most common period chosen for annual dividend distribution. This conjecture is verified and we provide evidence that the period decision is mainly affected by weekly cycle effect, and liquidity discretion. The periods are clustering around multiples of 7 from 21 to 49 days. We advance that the cycle of weekdays governs our daily life, just as two hands and ten fingers characterize our human body. Subsequently, we propose a behavioral and heuristic argument to explain why market participants are prone to number with final digits of 0, 5, and even numbers when making quantitative decisions.

Keywords: Dividend policy, Payment date, Price clustering, Record date, Taiwan, Weekday, Weekly cycle, Weekend effect, Heuristics, Number clustering.

JEL Classification: G30, G35.

† Corresponding author
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Contribution/ Originality

This paper shows that decision makers tend to link Fridays to the final transfer date of shares and choose time spans that follow 7-day patterns, corresponding to the weekly cycle. We hope to liberate firms from the anchoring effect imposed by the weekday framework and weekly cycles, to allow for more efficient an d rational decisions by both firms and shareholders.

1. INTRODUCTION

Apple Inc. never paid dividends while Steve Jobs was the CEO[1]. In particular, Apple paid no dividends from December 1996 (when Apple was negotiating with Jobs to buy NeXT and invited him to return) through August 2011 (when Jobs resigned again due to his deteriorating health). Apple declared dividend distribution on 19 March 2012, when is nine months after the leaving of Jobs and sixteen years after its last distribution of cash dividends. The subsequent ex-dividend date was 9 August 2012 (Thursday) and the cash was paid seven days later on 16 August 2012 (Thursday). Hereafter, we will refer to the period between the ex-dividend date and the payment date as the waiting period.

Since Steve Jobs passed away, Apple has paid twelve quarterly dividends (with ex-dividend dates ranging from 9-Aug-2012 to 7-May-2015), the cash payment dates always fell on Thursdays. As for the ex-dividend dates, ten of them fell on a Thursday resulting in waiting periods of 7 days, and two fell on a Wednesday resulting in waiting periods of 8 days. Obviously, the stability (in the terms of Lintner (1956)) and the smoothing (in terms of Allen and Michaely (2003)) of Apple's dividend policy seems to be more than what we thought of.

After observing the largest corporate in terms of market value in the world, let us examine Taiwan's largest firm Taiwan Semiconductor Manufacture Corp. (TSMC, its recent market value was around US$120 billion and was among the global top 100, as ranked by the Financial Times). For the last three years, it went ex-dividend on 29-Jun-2011, 4-Jul-2012, and 3-Jul-2013, and all were on Wednesday. As for the payment date, all fell on the Wednesday with waiting periods of exactly 21 days. Although its prior ex-dividend date was 6-Jul-2010 (Tuesday) and the payment date was 16 days after the ex-dividend date, it seems that TSMC is intending to follow a consistent policy of paying dividends for the last three years, just like what Apple is doing recently.

These phenomena leads us to ask whether a dividend-paying firm or its managers has a preference or pattern in deciding the weekday (day of the week) of the ex-dividend and payment dates. Interestingly, Apple tends to decides on Thursday as both the ex-dividend date and payment date with waiting periods of 7 days, whereas TSMC tends to decides on Wednesday as both dates with waiting periods of 21 days. More importantly, we would like to know whether there exists a weekly cycle effect or a monthly cycle effect when a firm makes a decision relating to time span,

[1] Apple went public on December 12, 1980. All the information about Steve Jobs (Feb 24, 1955 – Oct 5, 2011) is retrieved from)Isaacson, (2011). as well as the websites of Apple and NASDAQ.

such as the waiting periods. Does the (possible) clustering of time-span decisions provide explanation to the clustering of quantitative decisions? The clustering of quantitative decisions is still waiting for explanation (Hornik *et al.*, 1994; Hung and Teng, 2013).

More importantly, the discrepancy between the waiting periods of 7 days (Apple) and 21 days (TSMC) can lead to financial issues concerning both firms' working capital management and the investors' interest cost of waiting for cash delivery. In the U.S. market, the payment date falls about one month after the record date (Berk and DeMarzo, 2007), while the record date is mostly two business day after the ex-dividend date. From the perspective of a firm's working capital management, "a firm should strive to keep its money working for it as long as possible without developing a bad relationship with its suppliers or engaging unethical practices... to ensure that it is making its payments at an optimal time." Berk and DeMarzo (2007) Similarly. Hence, a dividend-paying firm should strive to keep its money working for it as long as possible without deviating from the general routine of the market. Accordingly, we want to investigate if there is an optimal level of waiting periods and how the payers determine the ex-dividend and payment dates.

On the other hand, late paying of cash not only incurs cost to the investors but also deprives their options of exploiting the cash in time. For example, the share price of Apple closed at US$125.26 on its most recent ex-dividend date (7-May-2015), and it closed at US$128.95 on the payment date (Table A1 of the Appendix). Yet, it was US$131.75 on 28-May-2015. If Apple had followed the policy of TSMC and paid the cash on 28-May-2015, those shareholders intending to reinvest the dividends on Apple would have owned less shares. Although it would benefit the shareholders if they follow the principle of reinvesting on the payment date (Ogden, 1994) and the share price goes down after the ex-dividend date, we cannot deny the fact that early paying of dividend cash grant shareholders more timely options of using the cash.

It goes without saying that we should collect a comprehensive set of whole-market data, especially firms listed in the NASDAQ, NYSE and AMEX. The databank of the Center for Research in Security Prices (CRSP) is the ideal source of retrieving the whole-market data sets. Unfortunately, the authors of this article are forced to abandon this ideal approach due to the limited financial resources of our organization. However, through examining the Taiwanese market, we derive a sizable body of information for interpreting many important financial issues, including price clustering (Chiao and Wang, 2009; Hung and Teng, 2013) and size clustering (Hung and Teng, 2013) in the stock markets.

It has been well documented that individuals prefer numbers with salient final digits, such as 0 and 5, when making decisions regarding price or quantity in both Taiwanese and Western markets (Alexander and Peterson, 2007; Ikenberry and Weston, 2008). As regards making decisions relating to time span or period, no study has yet been undertaken to examine if the salient numbers 0 and 5 still play a dominant role in the decision-making process. However, the decision of the dates for the director meeting and shareholder meeting by TSMC suggests that corporate decisions

reflect weekly cycle effect since our daily life routines and decisions have a strong relationship with weekdays and the counting of weeks (multiple of 7 days). A typical description is as follows: The payment date is the day on which firm actually disburses the dividends, which is typically "two to five weeks" after the ex-dividend date (Ogden, 1994).

The cycle of weekdays governs our daily life, just as two hands and ten fingers characterize our human body. We claim that human decisions reflect these heuristics and simple schemata (Hornik *et al.*, 1994). The recent story of Apple in paying dividends, as well as statements of Ogden (1994) or textbooks (e.g. Brealey *et al.* (2006)) describing periods in unit of weeks, motivates us to examine if multiples of 7 (weekly cycle effect) are salient numbers in determining the period between the ex-dividend date and the payment date.

Relative to the paying of quarterly dividends in U.S. market, we conjecture that corresponding periods should be 28 days, as in the annual dividend paying tradition of Taiwanese markets. Three plausible reasons justify this conjecture: four quarterly seasons comprise one year, 28 days is the nearest multiple of weeks to a month, and the last digit 8 is regarded as bring good luck in Chinese tradition (Brown *et al.*, 2002). We conjecture that 28 days is the most likely waiting periods in Taiwan.

Through analyzing the data set retrieved from the Taiwan Economic Journal (TEJ), we verify this conjecture and we provide evidence that the period decision is affected by weekly cycle effect, monthly cycle effect, and liquidity discretion. The most frequent waiting period (the mode) is 28 days and the waiting period distribution exhibits a pattern of multiple secondary peaks due to the weekly cycle effect. In particular, we find waiting period clustering around 22, 35, 43, and 50 days as a result of the combination of weekly cycle effect and liquidity discretion. A dividend-paying firm tends to pay the cash on Friday, the last working days of the week, and we call it as weekday liquidity discretion. On the other hand, a payer is most likely to go ex-dividend on a Thursday, which leads to clustering of waiting periods around one plus multiples of 7. We suggest behavioral argument for the tendency of going ex-dividend on Thursday. Additionally and more importantly, we propose a behavioral and heuristic argument to explain why market participants are prone to number with final digits of 0, 5, and even numbers when making quantitative decisions.

Our primary data source is TEJ. The sample period is from 2000 to 2013 and the sample firms are listed in Taiwan Stock Exchange (TWSE) and the Taipei Exchange (traditionally called the Gretai Securities Exchange, or the Over-the-Counter market, OTC)[2]. The TWSE is the most important market in Taiwan with aggregate market value of around TW$25 trillion, which accounts for 90% of the three markets. Note that the exchange rate for U.S. dollars and Taiwanese dollars is very stable at 1 to 32.

[2] It is an electronic order-driven exchange in spite of its name OTC. Either of the following webpage address can visit the OTC: http://www.gretai.org.tw/ or http://www.otc.org.tw. The webpage of TWSE is http://www.twse.com.tw.

This paper is organized as follows. Section II presents a literature review. Section III establishes the hypotheses. Section IV describes the distribution of the waiting periods of Taiwanese firms. Section V analyzes the weekday distribution of the ex-dividend date and the payment date. Section VI illustrates the weekly cycle effect of the waiting periods by controlling the weekday liquidity effect. Section VII concludes this paper. The Appendix presents the dividend history of Apple Inc.

2. RELATED LITERATURE

Readers of this article may be curious about the waiting periods of Apple during Jobs' absence between 1987 and 1995. Were the waiting periods 7 or 8 days, as is current Apple policy? The answer is negative, with Apple's policy in line with other U.S. firms having typical waiting periods ranging from 2 weeks to 5 weeks (Ogden, 1994). Other typical statements relating to the timing of paying dividends include: the payment date is normally "four weeks"or so after the record date (McGuigan *et al.*, 2006) "about two weeks"later dividend checks are mailed to stockholders (Brealey *et al.*, 2006). Note that the dividend history of Apple before the millennium was distributed from 18 to 36 days, and with mean 26.6 days and median 26 days (Table A1 of the Appendix).

In addition to academic papers or textbooks, we can find much more casual approximations, expressing a time span in terms of weeks. It is intuitively logical that we prefer 10 days to 9 or 11 days if these three numbers are seemingly as good. However, it is doubtful if we make a similar decision when facing the three time spans: 14, 15, and 16 days. It is very likely that 14 days (2 weeks) instead of 15 days would be an intuitive and instantaneous answer. Even researchers tend to count on multiple of weeks instead of making a precise calculation, maybe something like approximating the median by "four weeks" (McGuigan *et al.*, 2006)[3], or approximating the first quartile and the third quartile by "2 weeks to 5 weeks" (Ogden, 1994). As we claim that the weekly cycle effect plays a significant role in the period decisions, we shall clarify the theoretical foundation of the behavior finance behind these observed anomalies.

2.1. Behavioral Aspect of Decision Making

Steve Jobs was obsessed with hoarding cash, not least because of Apple's near-bankruptcy in the mid-1990s. Returning money to shareholders would mark a big departure from the revered founder's philosophy (The Economist, 2012). This is a typical demonstration that the preference of a company's CEO dominates its decision making. Cronqvist *et al.* (2012) show that firms behave consistently with how their CEOs behave personally in the context of leverage choices, thorough analyzing data on the CEO's leverage (mortgage level) in their most recent primary home

[3] The exact statement is that "the payment date is normally four weeks or so after the record date." McGuigan, Kretlow and Moyer (2006). The record date is typically 2 or 3 business days after the ex-dividend date in U.S. and is 6 to 8 days after the ex-dividend date in Taiwan.

purchases. Their findings not only enhance our understanding of the determinants of corporate capital structure, they also show that CEOs' personal behavior can explain corporate financial behavior of the firms they manage.

There exist specific variables linking CEOs' personal leverage choices and their determinants of capital structure; however, it seems difficult to find a personal payout variable to match the dividend decision variable. In spite of this, this paper takes the first step illustrating the behavioral aspect of a firm's dividend policy. The word "policy" implies some consistency over time, and that dividends in particular, do not simply evolve in an arbitrary and random manner (Allen and Michaely, 2003). Much of the literature in the past fifty years has attempted to find and explain the pattern in dividend policies of corporations. We intend to show that human behavioral factors play a role in the decision of the waiting period. In particular, this paper is related to three puzzles in finance: the dividend puzzle, the seven percent puzzle, and the nominal share price puzzle.

In his celebrated paper entitled the dividend puzzle, Black (1976) argues that "The harder we look at the dividend picture, the more it seems like a puzzle, with pieces that just do not fit together." Feldstein and Green (1983) echo Black's remarks and start their paper with the first sentence: "The nearly universal policy of paying substantial dividends is the primary puzzle in the economics of corporate finance." Although the puzzle of why firms distribute dividends and why investors prefer dividends remains unsolved, Ben-David (2010) proposes that dividend-paying has become a social norm. The notion behind such a hypothesis is that paying dividends might have had an initial function, such as mitigation agency problem or signaling prospects.

Over time, however, paying dividend evolved into a deeply entrenched custom. There must be many others in addition to Rockefeller[4], who derive special and irreplaceable joy from receiving dividend checks or from witnessing dividends flowing into his bank account. Following the social norms is similar to following a rule of thumb, typically a decision exploiting the ease with which relevant instances can be retrieved (Kahneman, 1992). In other words, although paying dividends is economically unwise, the service of delivering dividends by a firm has evolved into a social norm which injects great pleasure into the lives of investors, much like it did for Rockefeller.

The second puzzle is directly related to numerical value and is called the seven percent solution by Chen and Ritter (2000). Chen and Ritter (2000) document that in the late 1990s, almost all IPOs in the USA paid gross spreads of exactly 7%.[5] Possible explanations for this clustering are a subject of high sensitivity. Although the article title of Chen and Ritter (2000) is "The Seven Percent Solution", it specifies that "the convergence remains puzzling" after they offer a few ideas about the clustering pattern. Since choosing between 5% and 10% may be recognized as too modest and too greedy, 7% provides a balanced salient number. We believe that the number 7

[4] "Do you know the only thing that gives me pleasure? It's to see my dividends coming in." So goes one of the most famous quotes by John D. Rockefeller (1839-1937).
[5] Apple was also charged with a 7% commission when going IPO on December 12, 1980 Isaacson, (2011).

reflects the daily routine of weekdays and even the notion of "Lucky 7" makes it be a focal point just as Chinese culture takes 8 as an auspicious number (Brown *et al.*, 2002).

The third puzzle is called the nominal share price puzzle advanced by Dyl and Elliott (2006) and Weld *et al.* (2009). These scholars document that the average share price has centered around $25 since the Depression of 1930s. This is not logical in face of a dramatic deflation in the value of nominal dollar over the last century. In markets that are rising because of inflation or real growth, this average is maintained by stock splits managed by the firm. Weld *et al.* (2009) propose that US firms seem to follow a **norm** that keeps their nominal share price in a narrow and roughly constant range through time. The most famous recent case is Apple executing a 7 for 1 split on 9 June 2014, whose share price used to be around $650 and its current price is around $110.

Following the norms can be interpreted as behaving in accordance with heuristics rules: representativeness, availability, and anchoring (Tversky and Kahneman, 1974). Rounding numbers to the nearest integer or half reveals the notion of making representativeness due to human limited computation ability or bounded rationality (Simon, 1955). We frequently make decision "by the ease with which instances or occurrences can be brought to mind," the so-call availability decision rule (Tversky and Kahneman, 1974). The most typical availability for making quantitative decision is that the circulating coins are in denominations of 1, 5, 10, and 50 Taiwan Dollar. Similarly, the U.S. circulating coins are in denominations of 1, 5, 10, 25, 50, and 100 cents. We claim that both the coin system and the quantitative clustering phenomena are a natural evolution of human native calculator: finger counting. One hand with five fingers corresponds to the salience of 5, two hands with ten fingers corresponds to the salience of 10, which is the basis of the decimal system.

2.2. Quantitative Clustering in Decision Making

Quantitative clustering results from imprecise, or haziness, about the true values together with the availability of conventional, salient focal points within region of haziness (Aitken *et al.*, 1996). Psychological experiments demonstrate more generally that number clustering at round numbers with the last digit being 0 or 5 is a fundamental attribute of human behavior, whether we are making decisions or simply recording measurements (Hornik *et al.*, 1994). Either 5 or 10 can be a focal point among market participants from the perspective of game theory (Schelling, 1960). These focal points or salient numbers develop based on heuristics and simple schemata. On the other hand, this paper will suggest that heuristics or schemata are connected to either human physical attributes (such as five fingers in both hands) or to long-evolved convention (such as 7 in the Western and 8 in Chinese society). These kind of numbers are called prominent numbers (Ikenberry and Weston, 2008) or prototypic values (Hornik *et al.*, 1994) or numbers which humans "are accustomed to deal with." (Niederhoffer, 1965)

Ikenberry and Weston (2008) gathered from data in the years after decimalization was adopted in the U.S. markets. Although prior studies which documented clustering around even-eighths

argue that these phenomena were a rational market response to trading impediments. They show that the overall level of post-decimalization clustering is far more extensive than is reasonably explained by prior hypotheses. Accordingly, they suggest a more fundamental human bias for prominent numbers. Brown *et al.* (2002) find there are price clustering in six Asia-Pacific markets (Australia, Hong Kong, Indonesia, Philippines, Singapore, and Taiwan, from 1994 to 1998), in which 0 is more conspicuous than 5 and they are in turn more pervasive than other numbers. Moreover, there is significant evidence that the number 8 is more prevalent than 4 in Hong Kong. Chinese culture and superstition appear to play a role in stock price clustering.

Chiao and Wang (2009) examines the order prices of the TWSE from an intraday tick data set ranging from October 2005 to May 2006. This study finds 0 is more salient than 5, which in turn is more salient than other eight numbers. In particular, when examining only the ask prices, the number 8 is more frequent than other seven numbers excluding 0 and 5 (Table 8 of Chiao and Wang (2009))[6]. This result conforms to the argument of Brown *et al.* (2002) that 8 is preferred to other non-round numbers (numbers excluding 0 and 5).

Hung and Teng (2013) examine both price clustering and trade-size clustering from an intraday tick TWSE data set with 20 trading days in June 2007. In addition to collaborating with the findings of Chiao and Wang (2009) on price clustering, this study finds that a trading size of multiple of 5 lots (one lot is comprised of 1,000 shares) dominates its nearby trading size, such as 4, 6, 9, 11…etc. In addition, the trading size of multiple of 10 lots dominates its nearby trading size with a gap of 5 lots. The results conform to what Alexander and Peterson (2007) find in the NYSE and NASDAQ. It is noteworthy that Hung and Teng (2013) reveals that prices with last digit 8 is more prevalent than those with 6, 7, and 9, whereas prices with last digit 2 is more prevalent than those with 1, 3, and 4. Although they do not discuss issues on numbers 8 and 4, their works suggest evidence supporting (Brown *et al.*, 2002).

Since price clustering and size clustering issues have been well developed, this paper intends to examine the issue of number clustering from a new perspective: the decision of the waiting periods between the ex-dividend date and the payment date. In addition, we shall examine the weekday decisions (day of the week decisions) of the ex-dividend date and the payment date. This paper will employ the notion of availability, norm, and reference points in the weekday determinants of the ex-dividend date and the payment date, and the waiting period between the two dates. The salient numbers include even numbers and multiples of 7. Although these numbers are economically irrelevant and uninformative, they influence the decisions of the dividend decisions of Taiwanese firms.

[6] Although the studies of both Chiao and Wang (2009). and Hung and Teng (2013). did not examine the relative prevalence of 8 in price clustering, it is evident through examining their tables and figures. Besides, Chiao and Wang (2009). seems to be an English adapted version of their Chinese version, Chiao and Wang (2008). We provide this information to help native Chinese-Language readers, since both papers did not cite each other.

2.3. Dividend Payment Date

The existing literature on cash dividend-paying behavior mainly concerns with the trading behavior of the dividend-paying shares around the announcement date or the ex-dividend date. See Allen and Michaely (2003) or Baker (2009) for a detailed review. Yet, few studies discuss issues concerning with the payment date of cash dividends. In fact, the survey of the above works reveals nothing about the dividend payment date or about the waiting period. To the best of our knowledge, only two published paper ever discussed issues relating to dividend payment dates: Ogden (1994) and Yilmaz and Gulay (2006). The former discussed the price and the trading volume of the dividend-paying shares around the payment date; while the latter discussed similar issue for the Turkish market. Both found that there existed abnormal return and abnormal volume around the payment date. Ogden (1994) infers that investors receiving the cash dividends are very likely to reinvest the same shares when receiving the dividends. Besides, Ogden (1994) found that the average period the ex-dividend date and the payment date is 17.9 days and is typically two to five weeks. But Ogden (1994) does not further discuss this issue.

The study of Liu *et al.* (2014) is one of the few published articles examining the waiting periods in Taiwan. This research finds that the waiting periods distributed between 6 and 155 days over 2002 to 2009 and they increased gradually between 2002 and 2006, but decreased afterwards. The changing is due to the Formosa Group's dominant proportion in aggregate dividends. The change of policy incurred a potential opportunity cost of $161 million of interest revenue to the Formosa. When limiting the sample firms to the members of the largest fourteen group and controlling the Group member factor, Liu *et al.* (2014) find that the waiting periods are correlated negatively to the ratio of cash to assets.

It is noteworthy that the primary results of Liu *et al.* (2014) are based on member firms of the largest Group, such as TSMC, Hon Hai (with a market value of US$41 billion and among global top 500), and Formosa Plastics, etc., we explicate the behavioral aspects of the waiting period decision by pooling together both TWSE and OTC firms over 2000 to 2013. On the other hand, Lee *et al.* (2014) show that the decision of setting waiting periods is based on a reference point from which an adaption is made to the market. The reference point for a firm initiating dividend payments is derived from that firm's past experience and other firms' past behavior. However, some Taiwanese firms delayed paying dividend cash for more than one year due to liquidity problem (Liu *et al.*, 2015). Through analyzing TWSE dividend-paying firms with long waiting periods over 1999-2012, these authors show that some firms exploited the newly issued shares to finance cash dividends. When such firms failed to raise new equities, they tried to borrow from banks, sell assets, or make private placement. Hence, investors of these firms are exposed to both interest loss and credit risk.

2.4. The Weekday Effect

Finally, we have noted that Apple mostly goes ex-dividends on Thursdays and always pays the cash on Thursday for the last three years. This fact inspires us to examine the weekday (day of the week) effect on decision making. French (1980) tested the calendar time hypothesis (the expected return for Monday is supposed to be three times the expected return for other days of the week) and the trading time hypothesis (the expected returns is supposed to be the same for each day of the week). Both models are not supported as the average return for Monday was significantly negative and the returns for the other four days were positive.

Keim and Stambaugh (1984) derive similar results when including larger sample and longer period. Basher and Sadorsky (2006) do a similar research in 21 emerging markets including Taiwan over 1993 to 2003. Taiwan market exhibits significantly negative return on Monday and positive on Friday. However, an exactly opposite result is shown in the Kuwait Stock Exchange, which is probably due to its market structure of being less developed and efficient (Gharaibeh and Al Azmi, 2015)

Lee *et al.* (2014) collect the TEJ data and show that Taiwanese non-financial firms tend to go ex-dividend on Thursday and pay the cash on Friday. They conclude that there exists no association between the ex-dividend anomaly and the week-of-the-day effects. They also collect the U.S. data from the Internet, and conclude that U.S. firms tend to go ex-dividend on Wednesday and pay the cash on Friday. In other words, our paper shall call it the weekday liquidity discretion for the phenomena that both the U.S. and Taiwanese firms are prone to pay the cash on Friday after they go ex-dividend. Besides, Taiwanese firms have a tendency to hold directors' meetings and the shareholders' meetings on the same weekdays, especially when both meeting dates were held on Fridays, with a gap of 12 weeks in between (Liu *et al.*, 2015).

3. HYPOTHESIS ESTABLISHMENT

In addition to the above illustration of Ogden (1994) there are a lot more example of counting time span in terms of weeks or months. Here are some examples quoted from famous textbooks:

- The payment date is normally “four weeks” or so after the record date (McGuigan *et al.*, 2006).
- Then about “two weeks” later dividend checks are mailed to stockholders (Brealey *et al.*, 2006).
- On the payable date (or distribution date), which is generally about “a month” after the record date, the firm mails dividend checks to the registered shareholders (Berk and DeMarzo, 2007).
- Companies always pay cash dividends within one year of declaration, generally within “three months” (Kieso *et al.*, 2010).

Based on these statements, we claim that decision makers are prone to count duration (periods or time span) in units of weeks because of the convention that we schedule our daily life based on weekdays. This behavior feature is similar to the argument that we are prone to numbers as multiples of 5 since humans are naturally characterized by two hands and ten fingers.

In the last three years, Apple has distributed twelve quarterly dividends, of which ten events going ex-dividend on Thursday and paying at 7 days after the ex-dividend date. Taiwanese firms distribute annual dividends only because Article 240 of the Company Act regulates that dividend policy must be endorsed by annual general assembly of shareholders. This fact suggests that a Taiwanese payer probably delivers the cash 28 days after the ex-dividend date as one year comprises four seasonal quarters.

More importantly, we believe that both weekly cycle effect and monthly cycle effect play a role in human decision making. Hence, the number 28 has two conspicuous features: it is multiples of weeks nearest to a month, and the last digit 8 is regarded as bring good luck in Chinese tradition (Brown *et al.*, 2002). The pronunciation of 8 in Chinese sounds like "fortune" and "prosperous". We conjecture that 28 days is the most likely waiting periods, while 21 and 35 days are the secondly ones due to the weekly cycle effect in the decision making for time span. Accordingly, we have:

Hypothesis 1 (Combination of Weekly and Monthly Cycle Effect). The most likely waiting periods is 28 days.

Hypothesis 2 (Weekly Cycle Effect). A dividend-paying firm is most likely to pay the cash on the same weekday that it goes ex-dividend. For example, it goes ex-dividend on Monday, it is most likely to pay the cash on Monday, i.e. 7 or 14 or 21 or 35… days later.

For ease of the following exposition, we shall define variables i and j (i, j=1, 2, 3, 4, 5) to denote Monday to Friday, and $exd=i$ represents the weekday of the ex-dividend date and $pay=j$ represents the weekday of the payment date. Accordingly, the conditional probability paying the cash on $pay=j$ conditioning on going ex-dividend on $exd=i$ is denoted as

$$\mathrm{P}(pay = j | exd = i), \text{ for } i, j = 1 \text{ to } 5. \qquad (1)$$

As to the weekday (day-of-the-week) decisions for the ex-dividend date and the payment date, there seems to be no reason for a particular choice. Similar to the trading time hypothesis and calendar time hypothesis of French (1980) each of the weekday has an equal chance of being chosen as the ex-dividend date or the payment date under the trading time hypothesis. On the other hand, Monday or Friday has two or three times chance for the other days of the week because a dividend-paying firm will delay to Monday or move forward to Friday if it initially schedules to go ex-dividend or pay the cash on weekends. According, we have

Hypothesis 3 (Trading Time Effect). The likelihood of a payer's decision to go ex-dividend or to pay the cash on each of the weekdays is the same. That is,

$$\mathrm{P}(exd = i) = \mathrm{P}(pay = j) = \frac{1}{5}, \text{ for } i, j = 1 \text{ to } 5. \quad (2)$$

Hypothesis 4 (Calendar Time Effect). The likelihood of a payer's decision to go ex-dividend or to pay the cash on Monday or Friday is higher than other three weekdays. In particular, the proportion for Monday and Friday should be 4/7 (but with 1 minimum of 1/7 on either) and the proportion for each of the other three weekdays should be 1/7. That is,

$$\begin{cases} \mathrm{P}(exd = 1) + \mathrm{P}(exd = 5) = \mathrm{P}(pay = 1) + \mathrm{P}(pay = 5) = \frac{4}{7}, \\ \mathrm{P}(exd = 1) \geq \frac{1}{7}, \mathrm{P}(exd = 5) \geq \frac{1}{7}, \mathrm{P}(pay = 1) \geq \frac{1}{7}, \mathrm{P}(pay = 5) \geq \frac{1}{7}, \\ \mathrm{P}(exd = i) = \mathrm{P}(pay = j) = \frac{1}{7}, \text{ for } i, j = 2, 3, 4. \end{cases} \quad (3)$$

Managers tend to hold cash as longer as possible due to precautionary motive or liquidity consideration. In the extreme situation, a manager can be obsessed with hoarding cash, just as how the media described Steve Jobs (The Economist, 2012). However, it is reasonable that managers decide on Friday as the payment so that they can hold cash until the last day of the weekday. If they do not pay the dividends on Friday, they have to delay at least another three calendar days until next Monday, which could cause complains from the shareholders. Based on this argument, we would like to test the weekday liquidity hypothesis.

Hypothesis 5 (Weekday Liquidity). A dividend-paying firm tends to pay the cash on Friday, i.e.

$$\mathrm{P}(pay = 5 | exd = i) > P(pay = j | exd = i), \text{ for } i = 1 \text{ to } 5 \text{ and } j = 1 \text{ to } 4. \quad (4)$$

Although Hypothesis 2 (weekly cycle effect) and Hypothesis 5 cannot sustain simultaneously, we cannot exclude the possibility that both are partly right. Hypothesis 2 is a behavioral hypothesis and Hypothesis 5 is an economic hypothesis with abundant financial sense. Consequently, we establish the following Hypothesis of weekly cycle effect under weekday liquidity.

Hypothesis 6 (Weekly Cycle Effect under the Weekday Liquidity). The conditional probability of paying on the same weekday on which it goes ex-dividend is higher when a payer goes ex-dividend on Friday than when it does on other four weekdays. That is,

$$\mathrm{P}(pay = 5 | exd = 5) > P(pay = 5 | exd = i) \text{ for } i = 1 \text{ to } 4. \quad (5)$$

4. DISTRIBUTION OF THE WAITING PERIODS

We collect the data of dividend-paying firms listed on the TWSE and the OTC markets from TEJ. Table 1 shows the annual number of firms that pay out cash dividends, the descriptive

statistics of the waiting periods and the dollar amount of aggregate dividends. Dividends contributed by the TWSE firms contribute more than 90% of the whole markets. In fact the market value of TWSE firms also accounts for more than 90% of the whole markets (not shown in this study).

Table-1. The annual waiting periods and the aggregate cash dividends

Panel A. Descriptive summary of the waiting periods and aggregate dividends (million TWD) for TWSE firms.										
Year	No.	Min	Q1	Md.	Q3	Max	Mode	Mean	W.A.	Aggregate dividends
2000	206	9	26	32	37	85	37	32.40	31.86	$111,307
2001	333	8	28	35	40	155	36	35.64	35.61	$185,230
2002	362	8	27	33	38	89	36	33.43	27.99	$169,551
2003	436	6	26	32	39	107	36	33.44	29.34	$251,690
2004	486	8	27	32	39	134	29	33.73	30.77	$393,098
2005	527	7	26	32	40	72	28	33.54	31.22	$586,062
2006	513	8	25	31	39	78	28	32.62	32.26	$648,724
2007	549	6	25	30	39	70	28	32.38	29.87	$767,868
2008	594	8	24.25	30	39	582	28	33.15	29.69	$955,507
2009	469	8	24	29	37	99	28	30.85	29.77	$471,755
2010	548	8	23	28	36	69	28	29.54	26.51	$718,732
2011	620	8	22	28	36	74	21	29.17	27.45	$887,838
2012	561	8	22	27	34	62	28	28.25	27.16	$708,222
2013	575	13	22	28	32	61	28	28.17	27.37	$633,883
Total	6779	6	24	29	37	582	28	31.61	29.24	$7,489,466
Panel B. Descriptive summary of the waiting periods and aggregate dividends (million) for OTC.										
2000	62	7	18	27	37	65	24	28.05	22.08	$6,660
2001	155	7	22	33	39	109	35	33.03	38.17	$8,928
2002	163	6	21	30	38	107	35	31.45	32.14	$6,960
2003	222	6	23.25	31	40	84	24	32.65	34.01	$12,298
2004	269	6	25	32	41	93	28	33.79	32.77	$17,813
2005	342	8	25	31	39	69	28	33.11	32.35	$37,507
2006	338	6	26	31	39	155	28	32.91	33.80	$37,076
2007	369	14	25	32	41	142	36	34.31	35.72	$67,068
2008	374	10	25	32	42	78	28	33.43	31.70	$56,558
2009	314	8	23	29.5	39	125	22	32.06	30.37	$35,775
2010	346	10	23	28	37	98	22	30.36	30.66	$43,645
2011	399	11	22	28	36	61	22	29.43	29.85	$68,377
2012	410	11	22	26.5	32	58	22	27.96	27.29	$58,534
2013	389	14	22	27	32	78	28	28.17	27.67	$57,699
Total	4152	6	23	29	38	155	28	31.47	31.13	$514,899

Table 1 shows that both the number of dividend payers and the aggregate dollar amount of dividends increase steadily over time. The number of TWSE payers increased from 206 firms in

2000 to 620 firms in 2011, whereas the aggregate dividends increased from \$111 trillion TWD in 2000 to \$955.5 trillion TWD in 2008. The increasing trends were interrupted in 2009 due to global recession triggered by the 2008 U.S. subprime crisis; however, the increasing trends resumed again till they were disturbed again in 2012 due to the European debt crisis. Panel B of Table 1 shows that the number of payers and the aggregate dividend amounts follow a similar pattern.

Next, we observe the waiting periods between the ex-dividend date and the payment date. Among the TWSE firms the waiting periods distribute between 5 and 155 days (but excluding the extreme of 582 days occurring in 2008), the first quartile (Q1), median, and the third quartile (Q3) are 24, 29, and 37 days, respectively, as shown in the bottom row of Panel A of Table 1. On the other hand, the waiting periods of OTC firms distribute between 6 and 155 days too, the Q1, median, and the Q3 are 23, 29, and 38 days, respectively, as shown in the bottom row of Panel B of Table 1. In other words, although the magnitude of dividends has a discrepancy of more than ten times between the TWSE and OTC payers, the waiting periods present patterns. This fact conforms to our notion that investors receive the dividend payment about one month after the ex-dividend date. In particular, the modes of the waiting periods of both TWSE and OTC payers are 28 days. When observing the annual records, two striking features emerge from the time-series. Of the fourteen annual models of TWSE firms, eight of which are 28 days, and three of which are 36 days. As to the OTC firms, five of annual models are 28 days, four are 22 days. These phenomena suggest that there could be number clustering on the waiting days, centering on 28 days and presenting a cycle pattern of 7 days potentially having secondary peaks around 21, 35, 42, and 49 days.

4.1. Testing Hypothesis 1

To vividly illustrate the distribution patterns of the waiting periods, Figure 1 presents the distribution histograms for waiting periods from 10 to 60 days, which comprising 98.22% of the samples of Table 1. The portion in white denotes TWSE payers, while the portion in black denotes OTC payers. The mode locates at 28 days (826 events) having the highest histogram in Figure 1.To test the significance of Hypothesis 1 (Combination of Weekly and Monthly Cycle Effect), we can use the goodness-of-fit statistics.

$$X = \sum_k \frac{(O_k - E_k)^2}{E_k}. \qquad (6)$$

We range k over a subset of waiting periods with 28 days included and posit all E_k are the same. For example, we can arrange the sample subset to be {27, 28, 29} or {22, 28, 29, 26}…etc., and test if the distribution is uniform. The calculated Chi-square statistics (6) are always highly significant. Hypothesis 1 is highly supported by testing the sample of either of the TWSE payers, or OTC payers, or the pooling of both.

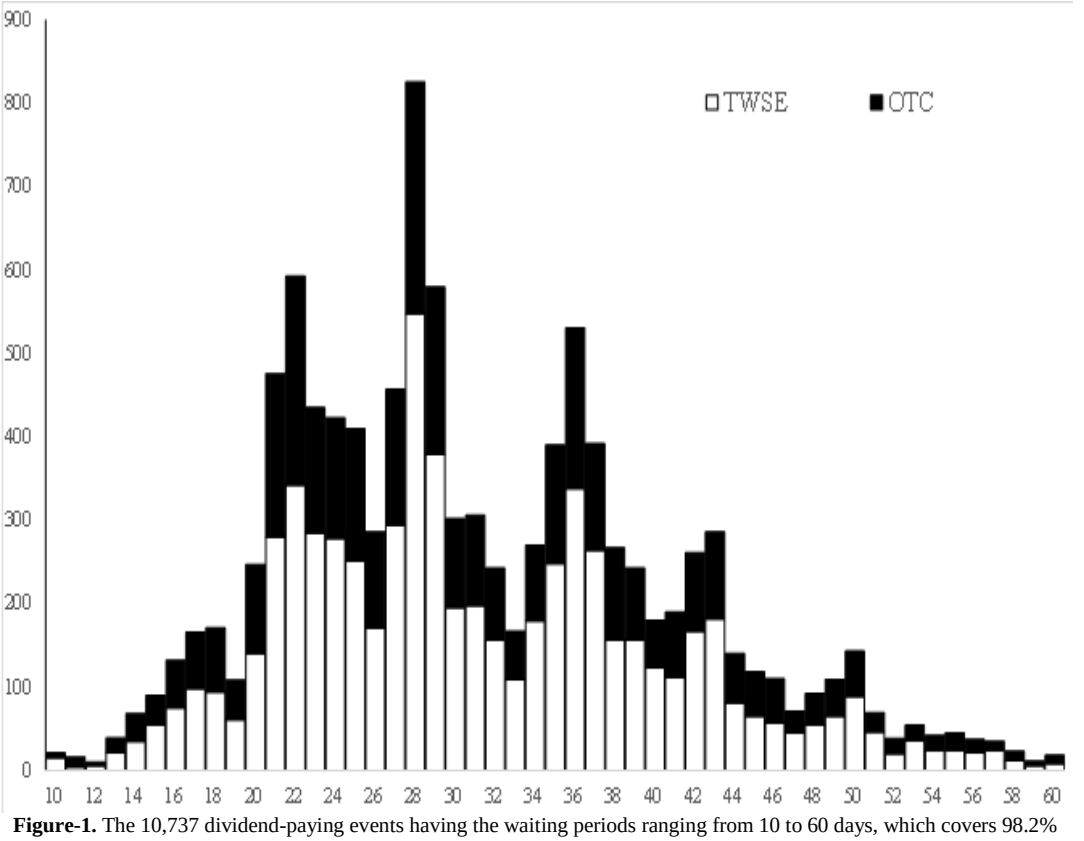

Figure-1. The 10,737 dividend-paying events having the waiting periods ranging from 10 to 60 days, which covers 98.2%

4.2. Testing Hypothesis 2

Figure 1 shows that there are another four local peaks in addition to the universal mode of 28 days (826 events). These local peaks locate at 22 (593 events), 29 (580 events), 36 (531 events), 43 (286 events), and 50 (143 events). For example, the histogram of 43 days dominates those from 38 to 42 days. The histogram of 50 days dominates those from 44 to 49 days. Although he gap between these peaks are constantly 7 days, they do not include 21, 35, 42, and 49 when Hypothesis 2 sustains.

In summary, Hypothesis 1 is strongly supported, but Hypothesis 2 does not sustain. The conspicuous patterns of the local peaks in Figure 1 reveal that considerable numbers of firms pays the cash on the weekday next to the weekday that it goes ex-dividend. For example, TSMC went ex-dividend on 3 July 2013 (Wednesday) and it paid the cash on 24 July 2013 (Wednesday), resulting in a waiting period of 21 day. However, it seems that many other such payers going ex-dividend on 3 July 2013 paid the cash on 25 July 2013 (Thursday), resulting in a waiting period of 22 days. This contributes the salient peak of 22 days in Figure, while the histogram of 21 days is considerable lower.

Hence, we conclude that Hypothesis 2 does not sustain. The next section shall reveal story behind the distribution of peaks in Figure 1 through investigating the distribution of the weekdays of the ex-dividend dates and the payment dates.

5. THE WEEKDAYS OF EX-DIVIDEND AND PAYMENT DATES

As discussed in the prior section, the mode of 28 days of the waiting periods derived from the tendency of paying the cash on the weekday exactly 4 weeks after the same weekday. We would expect the histogram rectangles for 21, 35, 42, and 49 days to form local peaks following Hypothesis 2 of weekly cycle effect. However, these peaks locate consistently at numbers larger than the aforementioned numbers by one.

The clustering waiting days of 22 to 50 days with a cycle of 7 days is somewhat similar to the clustering of price or size decisions with multiple of 5 or 10 (Ikenberry and Weston, 2008; Chiao and Wang, 2009; Hung and Teng, 2013). The former reflects our convention of scheduling depending on weekdays and counting time span in multiple of weeks. The latter reflects human natural and original ability of counting on two hands with ten fingers.

Based on our observation of Apple Inc., having ex-dividend dates and payment dates mostly falling on Thursday with waiting periods of 7 days, and TSCM, having ex-dividend dates and payment dates on Wednesday with waiting periods of 21 days, during the last three years, we should examine how the waiting periods are affected by the weekday distributions of the ex-dividend and payment dates. It is inevitable to investigate the weekday distributions for finding out how the waiting day clustering is formulated (clustering on 22, 29, 36, 43, and 50 days in Figure 1).

5.1. Testing Hypothesis 3 and Hypothesis 4

Table 2 lists the annual weekday distributions of TWSE payers in Panel A, and those of OTC payers in Panel B. The most salient feature of Table 2 is that a dividend payer is most likely to go ex-dividend on Thursdays and pay the cash on Fridays.

When applying the statistic formula of (6) to test Hypothesis 3 or Hypothesis 4, with the expected numbers of events governed by equations (2) and (3) respectively, both Hypotheses are strongly rejected. That is, both the Trading Time Hypothesis and the Calendar Time Hypothesis do not sustain, and it is evident that dividend-paying firms have a strong tendency to go ex-dividend on Thursday and pay the cash on Friday, as Table 2 shows.

Explaining these anomalies of going ex-dividend on a Thursday and paying the cash on a Friday are our new challenges. However, it will soon be clarified by plausible economic and behavioral interpretation.

Table-2. Distributions of weekdays of the ex-dividend dates and payment dates. The largest proportion in each sector of weekdays is typed in boldface. The summation of each sector is can be less than 1, but nearly 1, because Saturday is sometime a trading date due the Government policy of flexible consecutive holidays.

Panel A. Weekday distribution of the ex-dividend date and the payment date for the TWSE firms.										
	Ex-dividend date					Payment date				
Year	Monday	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday
2000	0.117	0.223	0.165	0.204	0.243	0.161	0.112	0.205	0.132	0.288
2001	0.108	0.246	0.243	0.306	0.096	0.133	0.121	0.191	0.206	0.342
2002	0.124	0.213	0.188	0.345	0.116	0.147	0.125	0.177	0.177	0.360
2003	0.163	0.200	0.197	0.307	0.126	0.161	0.135	0.218	0.149	0.335
2004	0.134	0.228	0.154	0.395	0.084	0.146	0.132	0.185	0.150	0.381
2005	0.125	0.228	0.184	0.351	0.112	0.139	0.154	0.209	0.167	0.332
2006	0.119	0.220	0.214	0.349	0.097	0.115	0.135	0.160	0.218	0.372
2007	0.142	0.233	0.173	0.335	0.111	0.102	0.135	0.140	0.213	0.395
2008	0.123	0.246	0.173	0.320	0.138	0.099	0.120	0.212	0.175	0.394
2009	0.188	0.232	0.177	0.294	0.109	0.077	0.136	0.213	0.196	0.375
2010	0.175	0.219	0.184	0.277	0.144	0.102	0.137	0.184	0.173	0.403
2011	0.168	0.240	0.160	0.277	0.155	0.081	0.126	0.218	0.183	0.393
2012	0.160	0.209	0.225	0.273	0.132	0.111	0.109	0.221	0.152	0.408
2013	0.176	0.217	0.191	0.296	0.118	0.096	0.117	0.223	0.162	0.394
sum	0.147	0.226	0.187	0.312	0.124	0.115	0.129	0.197	0.177	0.376
Panel B. Weekday distribution of the ex-dividend date and the payment date for OTC firms.										
2000	0.145	0.177	0.145	0.242	0.210	0.210	0.161	0.194	0.226	0.145
2001	0.090	0.200	0.161	0.432	0.116	0.197	0.086	0.184	0.197	0.316
2002	0.215	0.166	0.190	0.294	0.098	0.224	0.124	0.168	0.193	0.286
2003	0.176	0.230	0.153	0.293	0.117	0.180	0.131	0.162	0.194	0.311
2004	0.126	0.141	0.216	0.439	0.078	0.154	0.150	0.206	0.127	0.363
2005	0.146	0.260	0.140	0.342	0.111	0.162	0.094	0.203	0.179	0.359
2006	0.133	0.207	0.163	0.343	0.154	0.121	0.142	0.192	0.198	0.343
2007	0.184	0.187	0.220	0.301	0.108	0.125	0.114	0.173	0.171	0.382
2008	0.134	0.251	0.168	0.324	0.123	0.107	0.123	0.179	0.147	0.441
2009	0.182	0.258	0.175	0.264	0.121	0.127	0.124	0.226	0.153	0.366
2010	0.205	0.246	0.145	0.292	0.113	0.104	0.173	0.199	0.171	0.350
2011	0.193	0.251	0.168	0.291	0.098	0.105	0.105	0.203	0.208	0.378
2012	0.205	0.237	0.154	0.241	0.163	0.115	0.124	0.178	0.234	0.346
2013	0.204	0.214	0.191	0.250	0.139	0.110	0.102	0.214	0.183	0.386
sum	0.172	0.223	0.172	0.307	0.122	0.133	0.124	0.193	0.182	0.360

5.2. The First Testing of Hypothesis 5

Although we propose to use a stricter condition of equation (4) to test Hypothesis 5, we would like to present a first test of Hypothesis 5 according to the marginal probability distribution of Table 2. A simple statistic for comparing the time-series means of proportions of firms going ex-dividend or paying the cash on Friday (i=5) and any other weekdays (i =1 to 4) is as follows.

$$t = \frac{\overline{p_5} - \overline{p_i}}{\sqrt{\frac{s_5^2}{n_5} + \frac{s_i^2}{n_i}}}, \text{ where } s_i^2 \text{ is the corresponding sample variance.} \quad (7)$$

If we limit the sample to either TWSE firms or OTC firms, then set $n_i = 14$. We can also pool the annual data across the two markets, and set $n_i = 28$. Either way, the resulting statistics is highly significant with P-value less than 0.01 (and *t*-statistics larger than 6). That is, a dividend-paying firm has a strong tendency to pay the cash on Friday relative to any other weekday. However, this kind of testing is somewhat abusing the statistic theory since the decisions on different weekdays to go ex-dividend is not independent. A more appropriate procedure should be done by way of a goodness-of-fit test of equation (6). It also shows that a dividend-paying firm's tendency to pay the cash on Friday is significantly larger than that for other weekdays.

5.3. The Salient Tendency of Going Ex-Dividend on Thursdays

Similarly, through making use statistics (6) or (7), we can prove that a firm's tendency to go ex-dividend on a Thursday is significantly larger than for other weekdays. However, it seems difficult to find a plausible explanation for a dividend-payer's tendency to go ex-dividend on Thursday most likely. Hence, we conjecture that it is related to the record date and we quote Paragraph 2 of Article 165 of the Company Act as:

> "The entries in the shareholders' roster referred to in the preceding Paragraph shall not be altered…within 5 days prior to the target date fixed by the issuing company for distribution of dividends, bonus or other benefits." (Highlighted in bold face type by the authors.)

The last day of the 5 working days (book closure period) when the shareholder entries are forbidden to be altered is the target date (the record date). It is noteworthy that the record date is also called the book closure date in the US market, which is the final day that a new shareholder can register his identity in the roster of shareholders. On the other hand, in Taiwan the corporate shareholder roster book cannot be altered during the 5-day book closure period and a new shareholder must register his or her identity to the firm by the end of the business day preceding the book closure period. It is called the last transfer day, which is similar to the so-called book closure date of the US market. The business date preceding the final transfer day is the ex-dividend date as demonstrated in Figure 2.

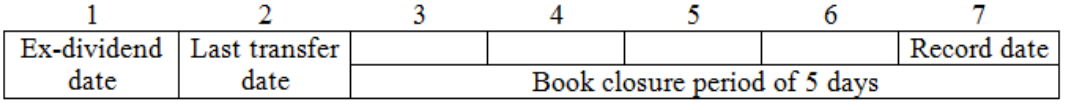

Figure-2. Schedule of identifying shareholders

Figure 2 demonstrates that there is a time span of 6 business days between the ex-dividend and record dates. On the other hand, there should be 8 calendar days between them if the 5-day book closure period is interpreted as 5 business days instead of 5 calendar days. Article 165 of the Taiwanese Company Act does not specify whether they are 5 business days or calendar days. Table 3 decomposes the joint distribution of the ex-dividend and record dates, and reveals that most firms interpret the 5 days of the book closure period as 5 calendar days. Hence, a firm going ex-dividend on a Monday is most likely to set the following Sunday as the record day, with a likelihood of 95.9% (1640/1710), as demonstrated in the first row of Table 3. Similarly, a firm going ex-dividend on a Tuesday is most likely to set the following Monday as the record day (97.8%=2402/2456). Further similar scenarios occur when firms go ex-dividend on a Wednesday (98%=1942/1981) or on a Friday (90.9%=1224/1347).

However, a different story happens when firms go ex-dividend on a Thursday. A proportion of 51.5% (1746/3392) of such firms set the record date on the following Wednesday, while another 34% (1155/3392) of such firms interpret the 5-day book closure period as 5 business days in length and set the record date on the Friday of the following week. In other words, concerning the issue that it is altering the roster of shareholders is forbidden during that 5-days period, the former firms would decide on a period from a Saturday to the following Wednesday, the latter firms deciding on a Monday to Friday period. Either way, it makes Fridays (the day next to the preferred ex-dividend date) the last transfer date on which a new shareholder can register his claim to the firm. We believe that the contents of the Company Act lead managers of the firm to associate Friday as the "final" business weekday, which in turns is linked to the "final transfer date" that a new shareholder can register his or her claim.

In summary, we provide a liquidity argument to explain the conspicuous tendency of a firm to pay the cash on Friday, and a behavioral argument for the tendency to go ex-dividend on Thursday.

Table-3. Joint distribution of the ex-dividend date and the record date. The table pools together payers of TWSE and OTE due to their similar pattern shown in Tables 1 and 2. Data source: TEJ.

Ex-dividend dates	Record dates							Sum
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Monday	27		1		20	22	**1,640**	1,710
Tuesday	2,402	11	2	1	1	9	30	2,456
Wednesday	4	1,942	1	3	10	2	19	1,981
Thursday	61	29	1,746	387	1,155	11	3	3,392
Friday	8	18	21	21	37	1,224	18	1,347
Saturday			19			20		39
Sum	2,502	2,000	1,790	412	1,223	1,288	1,710	10,920

6. THE WEEKLY CYCLE EFFECT

Prior investigation reveals that Taiwanese dividend payers are most likely to go ex-dividend on Thursday and to pay the cash on Friday (Lee *et al.*, 2014). We suggest that the former is due to behavioral factors, while the latter is due to weekday liquidity consideration of the dividend-paying firm. These characteristics result in the multiple peaks of the waiting periods clustering at 22, 29, 36, 43, and 50 days. In particular, Figure 1 presents a nearly tri-mode distribution of 22, 29, and 36 when ignoring the prominent histogram column that represents 28 days. We have justified the particular salience of 28 days in two-fold: it is a multiple of 7 nearest to one month, and the number 8 is traditionally considered an auspicious number in Chinese culture.

The particular dominance of 28 days over 22, 29, and 36 days suggests that the weekly cycle effect plays an important role in decision-making pertaining to waiting periods. This section will prove that the most conspicuous time-spans are 21, 28, and 35 days, if we remove those when the payment of cash for dividends was made on Friday. Moreover, the secondary peaks of 43 and 50

days in Figure 1 are dominated by 42 and 49 days in Figure 3. For this purpose, we first verify Hypotheses 5 and 6.

6.1. Testing of Hypothesis 5 and Hypothesis 6

In the prior section, we test Hypothesis 5 (weekday liquidity effect of paying dividends) by comparing the marginal probabilities of paying the cash on different weekday (Table 2). Now we go on to test Hypothesis 5 based on their conditional probabilities. Similar to Table 3, we present the joint distribution of the weekdays of the ex-dividend and payment dates in Table 4.

Table-4. Joint distribution of the weekdays of the ex-dividend and payment dates. It pools together the TWSE payers (Panel A of Table 2) and OTC payers (Panel B of Table 2).

Ex-dividend\Payment	Monday	Tuesday	Wednesday	Thursday	Friday	Proportion
Monday	207	198	336	292	627	0.158
Tuesday	263	357	448	433	843	0.224
Wednesday	219	242	414	342	678	0.181
Thursday	416	361	604	622	1225	0.308
Friday	163	166	253	188	525	0.124
Proportion	0.121	0.126	0.196	0.179	0.371	

Table 4 shows that a payer is always most likely to pay the cash on Friday no matter which weekday it went ex-dividend. By using equation (1) for each row of Table 4, Friday dominates other weekdays by calculating statistics (6) of the goodness-of-fit test. Through ranging any set of weekdays containing j=5, e.g. testing if paying on Thursday (j=4) has the same tendency as paying on Friday (j=5), we find that statistics (6) is always significant. That is,

$$\mathrm{P}(pay = 5|exd = i) > P(pay = j|exd = i), \text{ for } i, j = 1 \text{ to } 5 \text{ and } j \neq i.$$

Next, we would like to test if Hypothesis 6 (Weekly cycle effect under the weekday liquidity) sustains. As a matter of fact, we have

$$\mathrm{P}(pay = 5|exd = 5) = 0.403 > 0.378 > P(pay = 5|exd = i) \text{ for } i = 1 \text{ to } 4.$$

This relation is significantly true by using statistics (7) to verify the above relation. Hence, we prove that the conditional probability of paying on the same weekday on which it goes ex-dividend is higher when a payer goes ex-dividend on Friday than for the other four weekdays. Table 5 decomposes Table 4 for events with waiting periods ranging from 14 to 62 days, including 97.23% of the whole sample.

6.2. The Joint Distribution of the Weekday and the Waiting Periods

The waiting periods are partitioned into seven blocks in Table 5 so that we can observe how the waiting period decisions are affected by the interactions of the weekday liquidity, weekly cycle effect, monthly cycle effect, and integer effects. In Table 5, the number of events is typed in boldface when it is the largest one among the row (corresponding to ex-day from Monday to Saturday) within each block. It shows that the weekday liquidity effect (paying the cash on Friday) dominates in the block beginning with 21, 35, and 42 days. Intuitive interpretation suggests that, when deciding to pay the cash in the 4th, 6th or 7th weeks after the ex-dividend date, the payer tends to decides on the Friday within that week to pay the cash. Before discussing the 5th week, including the waiting period of 28 days, let us examine the weekday liquidity effect.

Table-5. Distribution of the waiting periods conditioning on the various weekday of the ex-dividend date. The number is typed in boldface when it is the largest one among the row (corresponding to ex-day from Monday to Friday) within each block. Empty cell denotes 0. A few payment dates fall on Sunday according to the databank of TEJ. The TEJ recorded what the payers reported to the Authority (http://mops.twse.com.tw/), however, such payers delay the paying to Monday.

Ex-dividend dates				Waiting periods (days) between the ex-dividend date and the payment date.																			
Weekdays	Ratio		Number	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Monday	.1529		1,831	5	17	27	45	120	3		47	59	110	91	233	2	1	84	47	69	61	**115**		
Tuesday	.2201		2,611	17	9	37	105	3		53	75	134	122	282	2	1	99	143	113	93	**198**	1	3	53
Wednesday	.1779		2,099	13	17	64	2	1	32	51	108	107	199	3		67	77	156	88	131	2	1	52	54
Thursday	.3013		3,614	18	47	2	1	31	52	108	157	293	3	1	114	128	221	220	330	5	2	89	57	114
Friday	.1216		1,414	15		1	12	16	18	34	89			41	58	88	57	223	2		43	36	52	46
Saturday	.0033		36			1			3	1			1	4	3		2			4			2	3
Sum			10,682	68	90	131	165	171	105	246	476	593	434	418	407	286	455	826	580	298	306	242	164	267
ratio			0.9723	.006	.008	.012	.015	.016	.010	.023	.044	.054	.040	.038	.037	.026	.042	.076	.053	.027	.028	.022	.015	.024

Table-5. (Continued for waiting periods from 35 to 62 days.)

35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
40	49	80	54	110	1		19	17	27	25	39	1		8	5	19	11	12			4	4	6	1	4		
70	120	115	165	1		38	42	56	47	70	3		13	21	24	22	20	1		11	6	2	4	9			2
67	78	188	4		37	35	46	44	64	2		13	23	25	20	28	1	1	13	5	4	4	13			3	
113	282	5	2	104	88	93	75	165	2		43	25	42	29	94			31	14	23	17	25			11	4	4
100	2	0	41	25	53	24	78	4		21	23	32	14	26			6	9	14	6	6			1	3	1	5
		4	1	3	1		1				1								1								
390	531	388	266	240	179	190	260	286	140	118	108	71	92	109	143	69	38	54	41	45	37	35	23	11	18	8	11
.036	.049	.035	.024	.022	.016	.017	.024	.026	.013	.011	.010	.006	.008	.010	.013	.006	.003	.005	.004	.004	.003	.003	.002	.001	.002	.001	.001

Table-6. Part of the distribution of waiting periods. There are 10,931 events originally, and 6,763 events after excluding events paying the cash on Friday, and 7,434 events after excluding events going ex-dividend on Thursday.

Panel A. Number of events with various waiting periods. The waiting period is typed in boldface it is multiples of 7.																													
Waiting periods (days)	14	15	16	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	42	43	44	49	50	51
Original	68	90	131	246	476	593	434	418	407	286	455	826	580	298	306	242	164	267	390	531	388	260	286	140	109	143	69
Excluding paying the cash on Friday	53	43	68	246	387	300	236	141	177	286	455	603	250	171	108	128	166	267	290	249	204	183	121	76	83	49	41
Excluding going ex-dividend on Thursday	50	43	130	139	319	300	432	422	296	158	236	606	250	297	304	154	110	156	277	249	387	186	121	138	80	49	69
Panel B. Ranking on the number of events. Numbers less than 7 are typed in boldface.																											
Original	38	35	29	19	5	2	7	8	9	14	6	1	3	13	12	20	25	16	11	4	10	18	14	28	32	27	37
Excluding paying the cash on Friday	33	38	31	10	3	4	11	19	16	6	2	1	8	17	23	21	18	7	5	9	12	14	22	28	27	35	41
Excluding going ex-dividend on Thursday	34	38	24	21	5	7	2	3	9	17	14	1	12	8	6	19	27	18	10	13	4	15	25	23	30	36	31

Table 5 shows that a firm going ex-dividend on Monday (Tuesday, Wednesday) is most likely to pay the cash at 25 (24, 23) days after the ex-dividend date, all of which falls on a Friday. The corresponding numbers of events are 233, 282, and 199. Moreover, the second largest numbers of

the three rows also fall on a Friday, with the corresponding waiting periods being 18, 31, and 37 days. Besides, a firm going ex-dividend on Thursday (Friday) is most likely to pay the cash at 29 (28) days after the ex-dividend date, both of which fall on Friday, too. The corresponding numbers of events are 330 and 223. Similarly, the second largest numbers of the two rows also fall on Friday, with the corresponding waiting periods of 22 and 35 days.

It is noteworthy that the third largest number of each row (except Wednesday) also falls on Friday. On the row for Wednesday, the third number is 156 events located at 28 days, corresponding to Wednesday. Quite different from the other blocks in Table 5, the numbers of events in the first column (matching multiples of 7) in this area are always the largest two among the row of numbers within the block. This fact illustrates the conspicuous status of 28 days, which contributes to the mode of Table 1 and Figure 1.

Another remarkable feature appears in the first block of Table 5, corresponding to the waiting periods between 14 and 20 days (the 3rd week). Firms going ex-dividend on Monday, Tuesdays, and Wednesday and deciding to pay the cash in the 3rd week, they are most likely to pay the cash on Friday. However, firms within this block that go ex-dividend on Thursday and Friday, are most likely to pay cash on a weekday other than Friday (resulting in waiting periods of 14 and 15 days), as appears in other blocks of Table 5. Instead, such firms are most likely to choose a waiting period of 20 days. This is logical since we can argue that 14- and 15-day waiting periods are normally too short according to the traditional norms of Taiwanese markets (Kahneman, 1992). When abandoning the consideration of weekday liquidity, the number 20 is a behaviorally plausible choice (Hornik *et al.*, 1994).

6.3. Examining the Weekly Cycle Effect after Controlling Weekday Liquidity Effect

In this section, we further investigate the potential effects of weekly-cycle effects by removing the effects of the tendency to going ex-dividend on Thursday and paying the cash on Friday. This issue is important because if the weekly cycle effect exists, then it would suggest "the five finger and two hands" effect that leads to the 0 and 5 quantitative clustering phenomena (Ikenberry and Weston, 2008; Chiao and Wang, 2009; Hung and Teng, 2013).

We list part of the waiting periods over the range of 14 to 51 days in Table 6, especially those including multiples of 7. The second row lists the distribution of waiting periods after excluding events paying the cash on Friday, and the third row lists those after excluding events going ex-dividend on Thursday. The former results in a sample size of 6,763(62%) and, while the latter results in 7,434 (68%).

The second row of Table 6, as well as Figure 3, shows that the weekly cycle effect dominates the distribution pattern of the waiting periods after excluding events where the cash is paid on Friday. The local peaks of 21, 28, and 35 days in Figure 3 replace those of 22, 28, and 36 days in Figure 1. In particular, the number of 29 days is ranked 3rd in the original sample (the first row of

Table 6), and ranked 8th in the second row of Table 6. The local peaks of 43 and 50 days in Figure 1 are also dominated by 42 and 29 days, respectively, in Figure 3. Note that in Figure 3, the histogram columns representing 42 and 49 days are mildly dominated by 41 and 48 days, respectively. Consequently, we cannot argue that the local peaks of 21 through 49 completely replace those of 22 through 50 days.

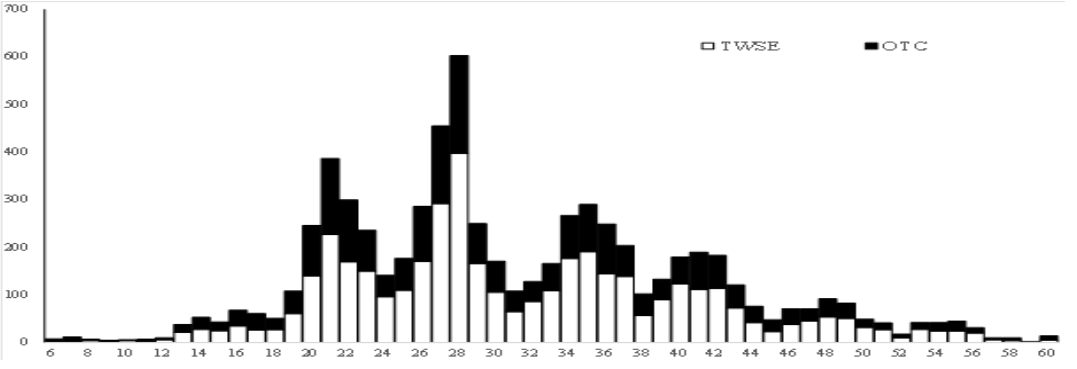

Figure-3. Distribution of waiting periods excluding firms paying the cash on Friday.

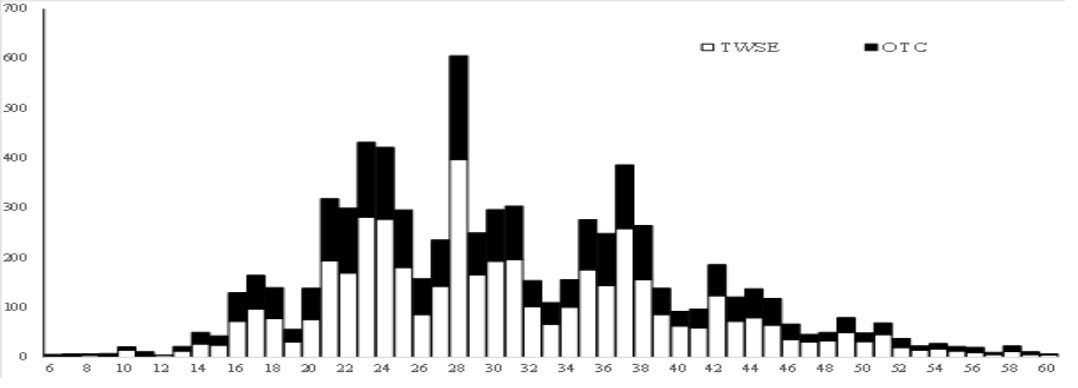

Figure-4. Distribution of waiting periods excluding firms going ex-dividend on Thursday.

The reason for the inadequacy of 42 and 49 to form local peaks in Figure 3 is because of the prevalence of firms going ex-dividends on Thursday and paying the cash on Wednesday. This fact is also manifested in the abundance of the 27-day waiting period in Figure 3, which is ranked the 2nd (455 events) in the second row of Table 6. In spite of these, the comparison of Figure 1 and Figure 3 illustrates that the weekly-cycle effect of 7 days has a strong effect on the decisions relating to waiting periods.

6.4. Examining the Weekly Cycle Effect after Excluding Thursday Ex-dividend event

We also list the distribution of the waiting periods in the third row of Table 6 and in Figure 4 after excluding those events where the ex-dividend date fell on a Thursday. Similar to Figure 3, the

numbers of payers with waiting periods of 14, 21, 35, 42, and 49 days, are larger than those of 15, 22, 36, 43, and 50 days, respectively, in Figure 4. However, there appears no obvious "peak replace" effect when comparing Figure 4 with Figure 1, although it is apparent when comparing Figure 3 with Figure 1.

This phenomenon results from the fact that dividend-payers are mostly likely to go ex-dividend on a Thursday and pay the cash on a Friday. After excluding payers going ex-dividend on Thursday, there is still a considerable number of payers that go ex-dividend on a Tuesday and Wednesday, while still paying the cash on a Friday. This fact leads to the popularity of waiting periods of 23, 24, 30, 31, 37, 38, 44, and 45 days. In particular, the prevalence of 23 and 37 days (Figure 4) results from those firms going ex-dividend on Wednesday and paying the cash on Friday. On the other hand, a considerable number of firms went ex-dividend and paid the cash on Thursday (Table 5). These events are deleted in the third row of Table 6 and in Figure 4. Consequently, evidence of the weekly-cycle effect is diminished in Figure 4 due to the removal of these events.

In summary, the weekly-cycle effect of 7 days is significant in affecting decision-making pertaining to time spans, at least in those decisions regarding the waiting periods between the ex-dividend date and the payment date.

7. CONCLUSION

After the ex-dividend date, shareholders have to wait for a period until cash dividends are received. The longer the waiting period, the more severely discounted the supposed pleasure of receiving dividends becomes. However, no academic research or practical articles discussing this issue have yet been published in international journals.

Due to the anchoring effects of schedules being planned in weekly and monthly cycles, as well as the auspicious significance of the number 8 in Chinese culture, the most popular waiting period is 28 days. Although one may expect 21- and 35-day waiting periods to be the next most popular, based on the anchoring effects of weekly cycles, we find that this is not the case. Instead, 22- and 36-day waiting periods are generally favored. This is because a Taiwanese firm is most likely to go ex-dividend on a Thursday and pay the cash on a Friday, which manifests the effect of weekday liquidity discretion.

This research suggests that a payer tends to go ex-dividend on Thursday due to behavioral factors. Such firms tend to set Friday as the last transferring date, on when new shareholders register their claim to the paying firm for dividends. We suggest that corporate directors do so because Friday is perceived as the final day of the working week. Another possible behavioral factor concerns the matching up of Monday through Friday to the five-day suspension period, as regulated in Article 165 of the Company Act.

A dividend-paying firm tends to pay the cash on Friday, the last working days of the week. This can be explained by managers' liquidity discretion. These behavioral and economic factors cause the distribution of the waiting periods present multiple peaks around 22, 28, 36, 43, and 50 days. When excluding events on which Friday is the payment date, the resulting distribution shows a pattern with multiple peaks around 21, 28, and 35 days. In addition, 43 and 50 days are dominated by 42 and 49 days, respectively. In particular, the salience of 29 days disappears. These phenomena illustrate the prominent role of the weekly-cycle effect in making decision involving time spans, especially the waiting period between the ex-dividend date and the payment date.

However, it is not fully rational for firms to make heuristic decisions based on the availability of weekdays and weekly cycles. While corporate financial officers strive to keep funds working for the firm as efficiently as possible and pay corporate accounts payable at optimal times (Berk and DeMarzo, 2007) the board of directors decide the timing for the payment of dividend cash in terms of multiples of 7 days. The most important contribution of this paper makes is to highlight phenomenon that has, so far, never been noticed by either academic and practical circles: decision makers tend to link Fridays to the final transfer date of shares and choose time spans in terms of multiple of weekly cycle. We hope that this paper will emancipate firms from the anchoring effect embedded by the weekday framework and weekly cycles so as to make more efficient and rational decisions for both firms and shareholders. On the other hand, late payment of cash not only incurs additional cost to the investors, but deprives them of options of exploiting their cash in a timely manner. We cannot deny the fact that the early payment of dividend cash grants shareholders a broader range of options for using their cash.

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APPENDIX

Table-A1. Dividend history of Apple Inc. Steve Jobs executed zero-dividend policy when he was in power from 1997 to 2011. Data sources are Apple webpage (http://investor.apple.com/dividends.cfm) and NASDAQ webpage (http://www.nasdaq.com/symbol/aapl/dividend-history). Date format is yyyy/mm/dd.

Ex-day	Payment	DPS	Period	Ex-day	Payment	DPS	Period
1987/05/11 Mon	1987/06/15 Mon	$0.06	35	1993/05/28 Fri	1993/06/25 Fri	$0.12	28
1987/08/10 Mon	1987/09/15 Tue	$0.06	36	1993/08/16 Mon	1993/09/10 Fri	$0.12	25
1987/11/17 Tue	1987/12/15 Tue	$0.08	28	1993/11/19 Fir	1993/12/17 Fri	$0.12	28
1988/02/12 Fri	1988/03/15 Tue	$0.08	32	1994/02/07 Mon	1994/03/04 Fri	$0.12	25
1988/05/16 Mon	1988/06/15 Wed	$0.08	30	1994/05/27 Fri	1994/06/24 Fri	$0.12	28
1988/08/15 Mon	1988/09/15 Thu	$0.08	31	1994/08/15 Mon	1994/09/09 Fri	$0.12	25
1988/11/21 Mon	1988/12/15 Thu	$0.10	24	1994/11/18 Fri	1994/12/16 Fri	$0.12	28
1989/02/17 Fri	1989/03/15 Wed	$0.10	26	1995/02/13 Mon	1995/03/10 Fri	$0.12	25
1989/05/22 Mon	1989/06/15 Thu	$0.10	24	1995/05/26 Fri	1995/06/23 Fri	$0.12	28
1989/08/21 Mon	1989/09/15 Fri	$0.10	25	1995/08/16 Wed	1995/09/08 Wed	$0.12	23
1989/11/17 Fri	1989/12/15 Fri	$0.11	28	1995/11/21 Tue	1995/12/15 Fir	$0.12	24
1990/02/16 Fri	1990/03/15 Thu	$0.11	27	2012/08/09 Thu	2012/08/16 Thu	$2.65	7
1990/05/21 Mon	1990/06/15 Fri	$0.11	25	2012/11/07 Wed	2012/11/15 Thu	$2.65	8
1990/08/20 Mon	1990/09/14 Fri	$0.11	25	2013/02/07 Thu	2013/02/14 Thu	$2.65	7
1990/11/16 Fri	1990/12/14 Fri	$0.12	28	2013/05/09 Thu	2013/05/16 Thu	$3.05	7
1991/02/15 Fri	1991/03/15 Fri	$0.12	28	2013/08/08 Thu	2013/08/15 Thu	$3.05	7
1991/05/20 Mon	1991/06/14 Fri	$0.12	25	2013/11/06 Wed	2013/11/14 Thu	$3.05	8
1991/08/19 Mon	1991/09/13 Fri	$0.12	25	2014/02/06 Thu	2014/02/13 Thu	$3.05	7
1991/11/18 Mon	1991/12/13 Fri	$0.12	25	2014/05/08 Thu	2014/05/15 Thu	$3.29	7
1992/02/14 Fri	1992/03/13 Fri	$0.12	28	2014/06/09 Mon	(7-for-1 stock splits)		
1992/06/01 Mon	1992/06/19 Fri	$0.12	18	2014/08/07 Thu	2014/08/14 Thu	$0.47	7
1992/08/17 Mon	1992/09/11 Fri	$0.12	25	2014/11/06 Thu	2014/11/13 Thu	$0.47	7
1992/11/30 Mon	1992/12/18 Fri	$0.12	18	2015/02/05 Thu	2015/02/12 Thu	$0.47	7
1993/02/12 Fri	1993/03/12 Fri	$0.12	28	2015/05/07 Thu	2015/05/14 Thu	$0.52	7