# Ex-Dividend Day Behaviour in the Absence of Taxes and Price Discreteness

Khamis Al Yahyaee, Toan Pham*, and Terry Walter

The University of New South Wales

**Abstract**

We examine the ex-dividend day behaviour in a unique setting where (1) there are neither taxes on dividends nor on capital gains, (2) stock prices have been decimalized, (3) dividends are distributed annually, and (4) we have data that enable us to examine bid-ask bounce effects. In this economy, any price decline that is smaller than the dividends can not be attributed to taxes and price discreteness. Like previous studies, we find that the stock price drops by less than the amount of dividends and there is a significant positive ex-day return. By examining abnormal volumes around the ex-dividend day, we find no evidence of short-term trading. We are able to account for our results using market microstructure models. When the impact of market microstructure is taken into account, the ex-dividend drop is not significantly different to the value of the dividend paid.

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*Keywords:* dividends, bid-ask spread, tax effects, market microstructure, tick size

* Corresponding/presenting author: School of Banking and Finance, University of New South Wales, Sydney, NSW 2052, Australia. Email: t.pham@unsw.edu.au, Phone: +61 2 9385 5869.
Khamis Al Yahyaee, School of Banking and Finance, University of New South Wales, Sydney, NSW 2052, Australia. Email: z3108417@student.unsw.edu.au
Terry Walter, School of Banking and Finance, University of New South Wales, Sydney, NSW 2052, Australia. Email:t.walter@unsw.edu.au

## 1. Introduction

In a frictionless market with no transaction costs and no taxes, the drop in stock price when a stock goes ex-dividend should equal the value of dividend paid on that stock. However, it is well documented that on average stock prices do not drop by the full amount. In particular, numerous studies have shown that stock prices drop by less than the amount of the dividend. Several types of interpretations are advanced in the literature to explain the ex-dividend day behaviour. For example, Elton and Gruber (1970) interpret this as a reflection of the tax differential between dividends and capital gains. Many other studies share the same interpretations. However, as discussed in Frank and Jagannathan (1998), the complexity of the U.S. tax system makes it difficult to validate whether this interpretation is indeed correct.[1]

Other interpretations include price discreteness, transaction costs and bid-ask bounce. Bali and Hite (1998) suggest that tick sizes can explain ex-dividend price ratios which are not equal to one. They argue that the drop in price less than the dividend is due to discreteness in prices rather than taxes. According to them, because stock prices trade in discrete ticks but dividend amounts are continuous and, on average, fairly small in amount, the ex-day premium will be less than one even in the absence of differential tax rates. Since investors are not willing to pay more than the dividend amount for the dividend received, the ex-day price drop will be rounded down to the nearest tick, so that the change in stock price on the ex-dividend day is always less than the amount of the dividend. Similarly, when a dividend received is between ticks, there will be positive abnormal returns. Frank and Jagannathan (1998) offer another market microstructure

[1] For a description of how complex the U.S. tax system, see Callaghan and Barry (2003).

interpretation where they argue that collection and reinvestment is bothersome for individual investors but not for market makers. In other words, market makers have a comparative cost advantage to collecting and reinvesting dividends, so they buy shares before a stock goes ex-dividend and resell them after the stock goes ex-dividend. Most of the trades occur at the bid price before the stock goes ex-dividend and at the ask price on the ex-dividend day. The resulting shift from bid to ask causes positive ex-day returns. In their model, the resulting bid-ask bounce contributes, if not totally explains the ex-dividend day behaviour.

The third interpretation concentrates on how the interaction of transaction costs, taxes, and risk impacts ex-dividend day return and trading volume (e.g., Kalay (1982), Lakonishok and Vermaelen (1986), Heath and Jarrow (1988), Kaproff and Walking (1988, 1990), Grammatikos (1989), Boyd and Jagannathan (1994), Michaely and Vila (1995, 1996), and Michaely, Vila, and Wang (1996), among others). A common prediction among these papers is that transaction costs and risk exposure inhibit arbitrage opportunities and dividend capture beyond some point, and consequently in equilibrium, the drop of stock price on the ex-dividend day may not be equal to the amount of dividends.

In this paper, we use a unique data set from Oman where the above factors are either absent or limited. These data offer significant advantages over data used by previous studies. First, the absence of taxation of dividends and capital gains in Oman provides an ideal opportunity to examine the ex-dividend behaviour without any ambiguity regarding effective marginal tax rates on dividends and capital gains. Hence, these data allows us to avoid the complexities of the U.S. tax system where the

population of US investors includes many different types of traders subject to a variety of tax structures. In Oman, the marginal trader is not subject to taxes on dividends and capital gains which make this economy a promising laboratory to test the ex-dividend day behaviour. Second, another major advantage of examining the ex-dividend behaviour in Oman is that the confounding effects of stock price discreteness on ex-day behaviour are much smaller compared to other market where prices are not decimalized (until recently the minimum tick size was one-eighth in the US). Kadapakkam (2000, p. 2843) state that the "coarseness in U.S. price data hinders the evaluation of the magnitude of ex-dividend day price drop relative to the typically small quarterly dividends". Price discreteness is less of a problem in Oman, because stock prices are decimalized. In addition, dividends are usually paid once a year in Oman, whereas in many other countries (e.g., US, UK, Australia) dividends are paid quarterly or semi-annually. These factors increase the size of the dividends relative to the minimum tick size for the stock compared to other countries, and this reduces the importance of the tick size as a driver of the ex-day behaviour. Third, transaction costs become more important when dividends are relatively small, and act like a barrier against short-term trading. However, since dividends are usually distributed annually rather than quarterly, this would suggest that transaction cost models may not be important in Oman. Fourth, in addition to the daily stock prices, the data set contains intra-daily data which allow us to directly test the Frank and Jagannathan (1998) market microstructure model. Because of these data advantages, we can examine the ex-dividend day behaviour in a less noisy and a more powerful manner than previous studies.

Moreover, further research on ex-day behaviour is extremely important as it helps in determining the identity of the marginal investor who sets the ex-day prices which is useful for corporate management in setting their dividend policies (see Hamada and Scholes (1985) and Brav et al. (2004), as well as in assessing the influence of dividend yield on stock returns (see Miller and Scholes (1982) and Keim (1988)).

We find that stock prices on the ex-dividend days fall by significantly less than the amount of dividends and ex-day abnormal returns are significantly positive. We examine whether transaction costs and risk inhibit arbitrage. Our results show that neither is significant. We also examine abnormal volume around the ex-days and find a reduction in volume around the ex-day. These results do not support the short-term trading hypothesis which predicts a positive abnormal volume around the ex-days. We also test Frank and Jagannathan's (1998) model which argues that the ex-day premium deviate from one due to the effects of the bid-ask bounce. This is what we find. In particular, we find that when midpoint prices are used instead of transaction prices, stock prices drop by the full amount of the dividend on the ex-day. We also find that the ex-day abnormal return is insignificantly different from zero. Similar results emerge from using bid-to-bid and ask-to-ask prices. In general, our results demonstrate that the microstructure of the stock markets explains the ex-day pricing anomaly. This finding supports the views of Kalay (1982), Miller and Scholes (1982), Frank and Jagannathan (1998), and Liano, Hardin, and Huang (2003) who question the importance of taxes as a key factor driving the ex-dividend day pricing.

The remainder of the paper is organized as follows. Section 2 discusses the relevant theories and empirical literature for this study. The theories considered are (A)

tax explanations, (B) transaction cost models, and (C) market microstructure models. This section also summarises the empirical literature for each of theories and develops testable hypotheses about what should happen on the ex-day according to these theories. Section 3 describes the institutional settings in Oman. It also discusses the specific data sources used in this paper, describes our data sample and provides summary statistics. Section 4 presents empirical results and Section 5 concludes the paper.

## 2. Theory, Hypothesis, and Empirical Evidence

As described in Graham et al. (2003), the explanation of the ex-dividend day return can be categorized into three groups: pure tax explanation, transaction costs and risk, and market microstructure. We next review each group in details.

### A. Tax Explanations

An investor who has decided to sell his stock in a corporation faces a timing decision of whether to sell on the cum-day or the ex-dividend day. If a US investor decides to sell his stock on the cum-day, he receives the cum dividend price ($P_{cum}$) and he pays tax at the capital gain tax rate ($t_g$) on excess of the cum dividend price over the original purchase price of the stock ($P_o$). If he were to sell on the ex-dividend day, he receives the ex-dividend price ($P_{ex}$), and pays tax on the excess of the ex-dividend price over the original purchase price of the stock at the capital gains tax rate. In addition, on the ex-dividend day he will receive the dividend (D) and pays tax at the ordinary tax rate ($t_o$). For him to be indifferent between selling the stocks on or before the ex-dividend date Elton and Gruber (1970) show that,

$$P_{cum} - t_g (P_{cum} - P_o) = P_{ex} - t_g (P_{ex} - P_o) + D(1 - t_o) \quad (1)$$

Rearranging equation (1), we obtain

$$\frac{P_{cum} - P_{ex}}{D} = \frac{1 - t_o}{1 - t_g} \quad (2)$$

The left-hand-side of this expression is called the ex-day premium or the dividend drop off ratio. This ratio will be referred to as the ex-day premium henceforth. The right-hand-side variable captures the differential tax treatment of dividends versus capital gains and is called the ex-day tax preference ratio (Chetty, Rosenberg, and Saez (2005)). Elton and Gruber (1970) argue that equation (2) can be used to infer clientele effects (originally proposed by Miller and Modigliani (1961)): if investors with high marginal tax brackets hold low dividend yield stocks, then these stocks should have relatively small premiums, reflecting the tax bracket of their median shareholder. Equation (2) predicts that the higher the dividend yield, the higher the premium. This is the intuition underlying the tax clientele hypothesis.

For the case of Oman, there are neither taxes on dividends nor on capital gains, therefore $t_g$ and $t_o$ in equation (1) is zero and it simplifies to:

$$P_{cum} = P_{ex} + D \quad (3)$$

Rearranging terms:

$$\frac{P_{cum} - P_{ex}}{D} = 1 \quad (4)$$

Based on the above equation, the premium is expected to be equal to one: the price drops by the exact amount of dividends.

Equation (1) can be rewritten as follows to express the effect of differential taxation on ex-day pricing in terms of ex-day returns:

$$\text{Return} = \frac{P_{cum} - P_{ex} + D}{P_{cum}} = \frac{t_o - t_g}{1 - t_g}\frac{D}{P_{cum}} \quad (5)$$

Again for the case of Oman capital gains tax and ordinary income taxes are zero so equation (5) simplifies to:

$$\text{Return} = \frac{P_{cum} - P_{ex} + D}{P_{cum}} = \frac{0}{P_{cum}} = 0 \quad (6)$$

From this expression it can be seen that the ex-day return is expected to be equal to zero for the case of Oman.

Hypothesis 1: *we expect the ex-dividend day premium to be one and the ex-day returns to be zero in the case of Oman.*

**A.1. Empirical Evidence**

In one of the earliest published studies on ex-dividend day pricing, Campbell and Beranek (1955) document that the ex-dividend behaviour of stock prices has an impact on the portfolio decisions of investors. They report evidence that on average, ex-day stock prices drop by less than the amount of dividends. Barker (1959) and Durand and May (1960) report similar results. Elton and Gruber (1970) provided more detailed evidence of a tax differential effect and of a tax-induced clientele. Using the U.S. data for the period April 1966 to March 1967, they documented a premium of 0.78. In addition, they report evidence that the premium on ex-day is positively associated with the dividend yield. In fact, for the highest yielding decile of stocks, the price actually dropped more than the amount of dividend. Their conclusion about the importance of tax effects are confirmed by Barclay (1987), who presents evidence that the ex-day premium is equal to one prior to the adoption of income taxes in 1913. He also documents that the amount of

stock price decrease is approximately equal to one for all dividend yield levels. He interpreted these results to support the hypothesis that in the pretax period investors viewed dividends and capital gains to be perfect substitutes and that differential tax rates on dividends and capital gains have caused investors to discount the value of taxable cash distributions relative to capital gains. Poterba (1986) re-examines the ex-day price drop for two classes of Citizens Utilities originally studied by Long (1978), one of which distributed only a cash dividend while the other distributed only a stock dividend of equal size. He documents that the ex-day drop for cash dividend shares' is only 77% of the dividend yield. The ex-day drop for stock dividends is 97% of the dividend yield. On average, the fall in stock price on the ex-day is the same the value of dividends for stock dividends. This evidence is consistent with the tax hypothesis.

Recently, Elton, Gruber, and Blake (2003) analyze the ex-day pricing under different tax regimes of two mutual funds for the 1988-2001 period. What makes their sample interesting is that it contains a set of securities (municipal bond funds) for which the ex-dividend price drop should be greater than the dividend if taxes matter as well as a set of securities (taxable bonds) for which the drop should be in general less than the dividend. For taxable closed ended mutual funds, they report evidence that drop in price on the ex-date is smaller than the amount of dividends when dividends are taxed higher than capital gains. In the case of non-taxable closed end municipal bond funds, they document that stock prices drop by more than the amount of dividends on the ex-date. This is consistent with a tax argument and inconsistent with the standard microstructure arguments. For the case where dividends and capital gains are taxed at the same rate, they find that stock prices fall by the exact amount of dividends. Their findings are

consistent with the hypothesis that taxes determine the value of dividends relative to capital gains. Further evidence of the tax affect is reported by Callaghan and Barry (2003) who examined ex-dividend date trading of American Depositary Receipts using a sample of 1,043 dividends over the period 1988 to 1995. They report evidence that is consistent with tax-motivated trading. In a similar vein, Li (2005) examines whether institutions and individuals react to ex-dividend events and how their reaction impact ex-day excess returns. The results show that both type of investors' trade around the ex-days to relieve their tax burdens. The results reported are consistent with differential taxation of dividends and capital gains influencing the ex-day price behaviour.

Tax-related behaviour has also been tested as an explanation of ex-dividend day behaviour in countries other than the U.S, but with mixed success. In Canada, Lakonishok and Vermaelen (1983) use the Elton and Gruber (1970) approach to study the effect of major tax reform on the ex-day behaviour of the stocks in Canadian firms. They find that the ex-day drop was less correlated to dividend yields and was not affected by the change in taxation differences of ordinary income and capital gains. They conclude that the effects are more likely to be a short-term trading effect than a tax clientele effect. Booth and Johnston (1984) extend the work of Lakonishok and Vermaelen (1983) and investigate the ex-dividend day behaviour using the Elton and Gruber methodology over four distinct tax regimes between 1970 and 1980. They provide evidence of equity pricing with a premium that is significantly less than one. However, unlike Elton and Gruber (1970), they were unable to find any evidence of a tax driven clientele effect with respect to investors' preference for dividend yield. More recently, Dutta, Jog, and Saadi (2005) re-examine the ex-dividend day price and volume behaviour in the Canadian stock

market. Unlike previous studies, they provide evidence on the co-existence of both tax and short-term trading effects. By examining the abnormal returns as well as abnormal volumes around the ex-day, they find strong evidence of short-term trading which is consistent with the dividend capturing activities around the ex-dividend day.

Bartholdy and Brown (1999) examine the same issues using data from New Zealand where companies could pay either or both taxable and nontaxable dividends. They report evidence consistent with the presence of a tax clientele effect. In a comprehensive empirical analysis of stock price behaviour around the ex-day in Japan, Kato and Loewenstein (1995) find that tax considerations associated with dividends are able to explain the ex-day behaviour. However, the tax effect appears to be of secondary importance. Hietala (1990) analyzes the stock market in Finland, which has a tax structure similar to the post 1987 U.S. system, and documents price movements consistent with the tax clientele hypothesis.

Further evidence supporting the tax interpretation is provided by McDonald (2001) who examined the ex-dividend day behaviour in Germany which has an imputation dividend system. He finds that the ex-day price drop of German stock is approximately 126% of the value of dividend, thereby concluding that the market values the tax credit at about 50% of the amount of credit. This supports the tax-based interpretation. For the U.K., Bell and Jenkinson (2002) investigate the effects of a July 1997 tax reform under the imputation system and they report evidence that taxation affects the valuation of companies, and pension funds were the effective marginal investors for high-yielding companies. In a similar environment, Bellamy (1994) examines the imputation system in Australia. They also find evidence consistent with the

tax hypothesis. Clarke (1992) also investigates the ex-dividend day behaviour for Australia where they report similar results to Bellamy (1994). Prior to the imputation, Brown and Walter (1986) report an average drop-off ratio of 0.74 suggesting that the Australian stock market has been discounting dividends to capital gains by approximately 25%. They report weak evidence that the drop-off ratio is related to the dividend yield. They conclude that several confounding effects and the wide dispersion of tax status in Australia prevent them from concurring with the tax clientele hypothesis.

Green and Rydqvist (1999) took the advantage of Swedish lottery bonds to examine the ex-day affects. In this environment, cash distributions are tax advantaged relative to capital gains. In addition, there are barriers to short-term trading. They find that the ratio of price drop to coupon averages 1.30 for Swedish Lottery bonds, implying that the relative tax advantage of coupons relative to capital gains are impounded into bond prices. Green and Rydqvist (1999) conclude that bonds are priced around the ex-day to reflect the differential tax rates on income and capital gains. Florentsen and Rydqvist (2001) find a premium greater than one for similar lottery bonds in Denmark. Michaely and Murgia (1995) investigate the effect of taxation on stock price and trading volume around the ex-day in Italy. By examining block trading activity around the ex-day, they present evidence consistent with the tax-related trading around the ex-dividend day. As predicted by a tax effect hypothesis, abnormal volume is higher for securities with greater tax heterogeneity. In addition, trading activity is higher for stocks with lower transaction costs. Lasfer and Zenonos (2003) examine the ex-dividend behaviour in four European countries namely France, Germany, Italy and U.K. They provide evidence that supports the tax hypothesis. Milonas et al. (2002) analyze the ex-dividend

day price behaviour in the Chinese stock market where dividends can be either taxable or non-taxable. For non-taxable sample, they find that stock prices fall be the full amount of dividends. For taxable stocks, stock prices of small dividend yield stocks drop proportionally to the dividend paid, while the price adjustment for large dividend yield stocks depends on the effective tax rate of dividend income. The overall findings are consistent with the tax hypothesis.

On the other hand, some studies directly challenge the tax-based interpretations of ex-dividend day behaviour. For example, Eades, Hess, and Kim (1984) find that abnormal rates of returns were not confined to taxable distributions. For instance, non-taxable stock dividends and splits were found to offer positive abnormal returns over the ex-dividend day period. Similarly, Woolridge (1983), and Grinblatt, Masulis, and Titman (1984) also report positive excess returns on the ex-days of non-taxable stock distributions. Likewise, Shaw (1991) reports evidence of positive abnormal returns and volume for the days preceding the ex-day and negative excess returns on the ex-day and for the following days for non-taxable master limited partnership distributions around the distribution date. They also find that dividend yield is negatively correlated with the ex-day price movements and positively correlated with abnormal volume around the ex-day. These results question whether the price and volume reactions observed around the ex-day are totally tax motivated.

Evidence against the tax-based explanation is not confined to the U.S. For example, Kadapakkam and Martinez (2005) examine the ex-dividend day behaviour in Mexico where the tax laws are such that dividend imputation system is in place and capital gains on stock market transactions are tax free. They find positive abnormal ex-

day return which is inconsistent with the tax-based explanation. In a similar vein, Daunfeldt (2002) analyzes how changes in the Swedish tax system have influenced stock prices and trading volume around the ex-dividend day. His findings are inconsistent with the tax clientele hypothesis. The results are not all together supportive of the short-term trading hypothesis as they do not confirm the positive association between abnormal volumes and dividend yields. Weak evidence for the tax based explanations is reported also by Hu and Tseng (2004) who examine order flows around the ex-dividend dates using a unique dataset from Taiwan stock exchange where the tax code allows them to separate the tax hypothesis from other explanations. They report weak evidence in favour of the tax hypothesis and strong evidence that tax-neutral institutions play the role of short-term arbitrageurs around ex-dividend dates: they buy before the ex-date and sell afterwards. Milonas and Travlos (2001) also report results that are at odds with the tax interpretations. They examine the ex-dividend day stock behaviour in the Athens stock exchange where neither dividends nor capital gains are taxed. They report a premium less than one which can not be attributed to tax effects.

**B. The Interactions of Taxes, Transaction Costs and Risk**

Kalay (1982) argues that the tax hypothesis has a major flaw because it is consistent with positive trading profits for various short-term traders. By focusing on the impact of transaction costs, Kalay shows that, in a world of certainty, investors not subject to differential taxation of dividends and capital gains, referred to as short-term traders, will capture dividends and eliminate any excess returns on the ex-dividend day.[2]

[2] Elton, Gruber, and Rentzler (1984) argue that when Kalay estimated the transaction costs of trading securities, he omitted several important components, including transfer taxes, registration fees, clearance

In this case, ex-day returns, if any, will reflect transaction costs of short-term traders. Kalay's argues that ex-dividend day premium is bounded by transaction costs:

$$1 - 2\alpha \Big/ \left( \frac{D}{P_{cum}} \right) \leq \frac{P_{cum} - P_{ex}}{D} \leq 1 + 2\alpha \Big/ \left( \frac{D}{P_{cum}} \right) \qquad (7)$$

where 2α represents transaction costs of a round trip. The above equation gives the range, in the presence of transaction costs, in which the ex-day premium can be situated without profitable arbitrage opportunities arising for any investor. As can be seen, if transaction costs are zero, the premium would be constrained to unity. The allowable range of the premium which is consistent with the no profit opportunities is inversely proportional to the dividend yield, with the range of variation being narrower when the dividend yield is greater. Consequently, the presence of transaction costs might result in the ex-dividend premium deviating from one without the possibility of arbitrage. Koski (1996, p. 318) succinctly observes, "Short-term traders can eliminate abnormal ex-dividend returns caused by tax clientele trading only up to the bounds imposed by transaction costs".

Another factor that may inhibit arbitrage is the uncertainty about the ex-dividend day price. In this regard, Heath and Jarrow (1988) demonstrate that when the arbitragers are uncertain whether the change in price from the cum-day to ex-day will be above or below the dividend, then the equilibrium premium may deviate from one. They argue that the actual ex-day price drop is unknown and short-term trading around the ex-day is risky. Michaely and Vila (1996) show that this risk is not trivial. Their analysis implies that ex-dividend day returns must include risk premium. Boyd and Jagannathan (1994)

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costs, and bid-ask spreads. They claim that when all costs are considered, transaction costs prevent even the lowest costs traders from affecting the ex-dividend day price through short-term trading.

allow for the risk by adding a risk premium to the discount rate when they model the ex-dividend day return.

**B.1. Empirical Evidence**

There is extensive empirical evidence that is consistent with transaction cost models. Numerous studies document that the premium is closest to one and abnormal ex-day volume is highest among high dividend yield and low transaction cost stocks. This evidence is in line with arbitrage or dividend capture activity. In this regard, Lakonishok and Vermaelen (1986) find that trading volume increases significantly around the ex-dividend day. They document that abnormal volume is highest among high dividend yield stocks and that it increased after the reduction in transaction costs as measured by commissions. They interpret this as an evidence of the presence of short-term traders. Grammatikos (1989) confirm the importance of short-term trading by reporting that the average market-adjusted ex-dividend day return after the introduction of the U.S. 1984 Tax Reform Act is significantly lower than before the Act. The increased premium is consistent with the inability of short-term traders to remove all of the risk of engaging in a dividend trading strategy.

Kaproff and Walking (1988) provide further support for the short-term trading hypothesis. Using four proxies for transaction costs, they find that excess ex-day returns are positively related to transaction costs. They also find that this relationship primarily exists among high yield stocks and after the introduction of negotiated commissions. In a follow-up paper, Kaproff and Walking (1990) examine the relationship between trading costs and ex-day behaviour for NASDAQ firms. They document that ex-day returns increase in transaction costs, as measured by the bid-ask spread. They also find that this

relationship becomes stronger as the dividend yield increases, and is most significant in high yielding stocks. In a similar vein, Michaely and Vila (1995) report evidence of positive abnormal trading volume around ex-dividend day. In a subsequent study, Michaely and Vila (1996) show that risk and transaction costs reduce the volume of trades around the ex-dividend date, while heterogeneity in investors' taxes increase volume. Eades et al. (1994) and Naranjo et al. (2000) also reported evidence that dividend capturing is affecting ex-day returns. Prices adjust to a full ex-dividend drop off in the most liquid, highest yielding stocks, which are the securities arbitrageurs and dividend capturers are most likely to trade, and an incomplete drop off is found in stocks that are less likely to be traded. Further evidence on the presence of short-term traders is provided by Koski and Scruggs (1998) who analyze the identity of traders around the ex-dividend days and find strong evidence of dividend capture trading by security dealers, some evidence of corporate dividend capture trading, but little evidence of tax clientele trading.

On the other hand, Poterba and Summers (1986) analyze short-term trading activity in the U.K. by comparing the ex-day returns before and after the introduction of the legislation against dividend capture and provide a weak evidence of this activity. Lasfer (1995) extend the work of Poterba and Summers (1986) and investigates the relevance of short-term trading to the U.K. He concluded that "unlike the U.S. market, ex-day returns in the U.K. are not affected by short-term trading". In contrast, he shows that taxation regime in the U.K. does affect ex-dividend day prices. Using Canadian data, Athanassakos and Fowler (1993) test the short-term trader hypothesis employing a modified version of the model of delay and acceleration of trade over different tax and

transaction costs regimes from 1970 to 1984. Their findings are consistent with short-term trading hypothesis where short-term traders transact around the ex-dividend days with the intention of capturing or avoiding dividend subject to the prevailing tax and transaction cost regime.

**C. Market Microstructure Theories**

These theories argue that taxes are not the main driver of ex-dividend day behaviour. Rather, ex-dividend day behaviour can be explained by market frictions such as price discreteness and bid-ask bounce. Focusing on price discreteness, Bali and Hite (1998) argue that if share prices are constrained to trade in discrete ticks while dividend amounts are continuous, then the ex-dividend premium can not, in most cases, be equal to the dividend amount. They claim that the market always will round down the value of the dividend to the tick just below the dividend. Bali and Hite argue that differential taxation is not necessary to explain why observed ex-day premium are, on average, less than one. According to them, price discreteness can explain premium less than one and positive ex-day returns.

Bali and Hite argument implies that the greater the tick size, the further from one the premium will be. This suggests that the tick size is not important in Oman as stock prices have been decimalized; the tick size is RO 0.01. In fact, Graham et al. (2003) tested the Bali and Hite argument after decimalization and they report evidence that the tick size is not an important driver of ex-dividend day behaviour. Kadapakkam and Martinez (2005) also suggest that the tick size effect is not applicable in countries where stock prices are decimalized.

Another market microstructure model is proposed by Frank and Jagannathan (1998). In their model, buyers and sellers find dividends to be a nuisance because of their collection and reinvestment and therefore of less value then they are to market makers. Market makers, for whom collection costs are lower, will buy shares cum-dividend at the bid price and resell them on the ex-dividend date at the ask price. This results in stock prices rising on average on ex-dividend days quite independent of the amount of dividend, with the rise being related to the magnitude of the bid-ask spread. In other words, the bid-ask price movement can lead to premiums less than one and positive ex-dividend day returns and that are positively associated with the magnitude of the bid-ask spread.[3] As described in Graham et al. (2003) and Cloyd, Li, and Weaver (2004), Frank and Jagannathan model implies that, if price are measured at the midpoint of the bid-ask spread, the premium should be one or close to one compared to when it is measured with closing prices.

Hypothesis 2: *we expect the premium to be closer to one when we measure it using midpoint bid-ask spread. Likewise, we expect the ex-day returns to be closer to zero when measured using midpoint bid-ask spread.*

**C.1. Empirical Evidence**

Using a sample of stocks from NYSE and AMEX, Dubofsky (1992) provides evidence that ex-dividend day excess returns arise from the mechanics of NYSE Rule 118, AMEX Rule 132, and the fact the prices constrained to discrete tick multiples. They

[3] Frank and Jagannathan (1998) report evidence consistent with their argument on Hong Kong, where the average premium was approximately one-half during 1980-1993, even though there are no taxes on dividends and capital gains. Kadapakkam (2000) strengthen this argument by documenting that after Hong Kong switched from physical settlement procedures to electronic settlement, which enabled short-term arbitrage trades, ex-day abnormal returns were no longer significantly different from zero.

find that abnormal ex-day returns are induced by rules, which dictate the specialists lower all outstanding limit buy orders by the dividend. Overall, Dubofsky (1992) results support the hypothesis that market microstructure affects ex-dividend day returns.

Jakob and Ma (2004a) conduct direct empirical tests of Bali and Hite (1998) and Dubofsky (1992) models in which market microstructure affect the ex-day price behaviour. They test these models by examining the ex-day price drop during the one-eighth, one-sixteenth, and decimal tick size regimes. They report that as discreteness is eliminated the price drop anomaly actually increases. In addition, they find that for the most common dividend amounts, the ex-day price drop is just as likely to be the tick above the dividend as to be the tick below the dividend. This is evidence against Bali and Hite (1998) model which predicts that the ex-day price drop will always equal the tick below the dividend. In a subsequent paper, Jakob and Ma (2004b) devise a new approach to determine whether microstructure or taxes influence ex-dividend day prices changes. They base their analysis on the techniques employed by Fama and French (1992) that investigates whether beta or other factors explain the cross-section of expected stock returns. They find that within a tick multiple, as dividend size increases, dividends yields increase, but the premium decreases. For dividends that are less than a tick, they find no relationship between the premium and dividend yield, and for dividends that are less than half a tick, the premium is higher than one. These results are qualitatively consistent with Dubofsky's argument that the limit order mechanism affects ex-day price behaviour.

Further evidence consistent with the limit order market microstructure model is reported by Jakob and Ma (2005). In this paper, Jakob and Ma examine the ex-day behaviour for stocks on the Toronto Stock Exchange (TSX). In contrast to the NYSE, the

TSX does not automatically adjust limit orders on the ex-dividend date. They document that the lack of an automated TSX limit order adjustment is consistent with the unusually small ex-day premium in Canada. All of these papers support Dubofsky's findings that the limit order adjustment mechanism is affecting the ex-day behaviour.

Graham et al. (2003) also examine the effect of tick size reduction on the ex-dividend price drop in the US. Similar to Jakob and Ma (2004a), they find that the premium fell as the pricing grid changed from 1/8 to 1/16 to decimals. They interpret this as evidence against the ex-day premium deviating from one due to price discreteness and bid-ask bounce. Their results also are inconsistent with an implication of the transaction cost models. Graham et al. (2003) find evidence consistent with the original Elton and Gruber tax hypothesis. They find that the ex-day premium fell in conjunction with the 1997 reduction in capital gain tax rates. They conclude that their results support the tax-effect explanation.

Cloyd et al. (2004) examine the joint effects of prices discreteness and taxation on ex-dividend day returns using a longer time period than Graham et al. (2003) and Jakob and Ma (2004a). Their findings are in contrast of Graham et al. (2003) and Jakob and Ma (2004a). In particular, they find that decimalization significantly decreased the relationship between dividend yield and ex-day abnormal returns which is consistent with microstructure-based arguments that price discreteness is at least partially responsible for positive ex-day abnormal returns. Moreover, they find that equalization of the Federal statutory tax rates on dividend income and long-term capital gains in May 2003 further reduced the relationship between dividend yield and ex-day abnormal returns. They interpret this as evidence that is consistent with the tax hypothesis. In general, their

findings indicate that both price discreteness, differential taxation and transaction costs all play a role in determining ex-dividend day stock price behaviour.

## 3. Oman Stock Market: Institutional Aspects

### A. Trading Rules and Practices

Trading in the MSM was computerized in 1997. MSM is a pure auction market where trades are affected through brokerage firms. It is very different from the NYSE in that there are no specialists or market makers. Trading in the market is conducted by stockbrokers, who can not trade on their own account which means that they have no role in setting cum- and ex-day prices. Orders are initiated from brokerage firms via computer terminals in their offices or on the exchange floor. Brokerage firms match buy and sell orders. Investors intending to buy or sell stocks execute their transactions through these brokerage firms that charge them a commission or transaction fees. The minimum fee that can be charged by a brokerage firm is 0.4% and the maximum is 0.75% (0.015% of the fee is revenue for the MSM).

As Oman is a petroleum producing country, taxes play a minor role in generating income for the economy. As a result, shareholders are not subject to any taxes on dividends. Likewise, there are no taxes on capital gains. The only taxes are the 12% flat tax rate on corporate income. This makes Oman taxing system one of the simplest in the world.

During the period of study a number of trading rules and practices were effective. (1) Trades are cleared in three days after the day of transaction, (2) A tick size of RO 0.01

for all shares traded, (3) Short selling of securities is not permitted, and (4) There are no derivative securities such as options and futures.

**B. Dividends**

Firms listed at the MSM distribute dividends in two forms namely, cash dividends and stock dividends. Paying dividends in one form or another is not compulsory. If the board of directors proposes to distribute dividends, the details must be published in the daily newspapers. The proposed dividend is subject to the final approval at the shareholders Annual General Meeting (AGM). Generally, most dividend propositions are accepted at the AGM as the board of directors usually represents the majority of the share capital. The date when the AGM is held is the record date. Investors whose names are recorded as stockholders on this date are entitled to receive the declared dividend. The following date is the ex-dividend date. Firms usually pay dividends once a year. Some firms complement their cash dividends with stock dividends.

**C. Data**

Our sample consists of the universe of Omani stocks paying cash dividends between January 1, 1997 and July 31, 2005. All cash and stock dividends and their cum-dates and ex-dates are obtained from the Muscat Depositary Company Database. We have two sources of stock prices data, namely MSM prices and RASP (Research Application Service Provider) database.[4] The MSM provided us with the stock price data, volume data, and the MSM index from 1997 to July 2005. The RASP database

[4] RASP database is supplied by SIRCA (Securities Industry Research Center of the Asia-Pacific). SIRCA is an industry-sponsored financial markets research center consisting of a consortium of Australian universities. SIRCA receives MSM data from Reuters.

covers Oman for the period 1997 to June 2003. Similar to MSM data, the RASP database contains daily stock price data, volume data, and the MSM index. In addition, the RASP database contains intra-daily data for the same period. To maintain accuracy, the data supplied by the MSM were randomly selected and compared with the prices provided by RASP; the comparison reveals no difference. As MSM data have longer period, we decided to use the MSM data as the main source of data for this paper. However, we also use the intra-daily data from RASP to examine Frank and Jagannathan market microstructure model.

We restricted attention only to cash dividend payments in this sample period. To avoid potential confounding effects of other announcements, a concern first raised by Miller and Scholes (1982), an ex-dividend day is excluded if it coincides with other corporate events such as stock dividends, splits, or subscription rights. Also, if a security did not trade on its ex-dividend day, that observation is eliminated from the sample. The premium is notorious for its extreme values so it is trimmed by excluding 0.5% of the upper and lower values. This filter ensures that our results are robust and not driven by outliers. The final sample contains 507 cash dividend distributions. The annual number of observations varies from a low of 50 to a high of 105.

**Table 1: Sample Characteristics**
The sample contains 507 observations for all cash dividend paying firms listed on the MSM during the period from January 1997 to July 2005. The stock price ($P_c$) denotes the stock price on the cum-day. D denotes the dividend per share.

| Statistic | Dividend (D, RO) | Stock Price ($P_{cum}$, RO) | Dividend Yield ($D/P_{cum}$) |
|---|---|---|---|
| Mean | 0.1760 | 2.7963 | 0.0735 |
| Median | 0.1300 | 2.2500 | 0.0615 |
| Standard Deviation | 0.1468 | 1.8681 | n/a |
| Minimum | 0.0200 | 0.3900 | 0.0129 |
| Maximum | 1.0000 | 11.2100 | 1.1223 |

Table 1 describes the sample. The average dividend is RO 0.176 and the average stock price on the cum-day is RO 2.8. The average dividend yield is 7.35% which is much higher than many countries such as the U.S. (e.g., Lakonishok and Vermaelen (1986) and Graham et al. (2003)) and Hong Kong (e.g., Frank and Jagannathan (1998) and Kadapakkam (2000)). This is, however, not surprising since dividend are not paid annually in these countries.

## 4. Empirical Results

### A. Price Behaviour on Ex-Dividend Day

Table 2 presents summary statistics for ex-day premium. We calculate the premium using close cum-day prices and open ex-day prices. The price adjustment between the cum- and the ex-day should occur between the cum-day close and the ex-day open. Measuring the premium using the opening ex-day price rather than ex-day close can eliminate noise associated with daily price movements. Elton and Gruber (1970) suggest that opening price is not a market price, but reflects the specialists' adjusted closing price. While this is not a factor on the MSM, we also provide the premium using closing prices on both cum and ex-dividend days, both adjusted and unadjusted for MSM market movements. We adjust the closing prices using the same approach used by Elton et al. (2003) and Jakob and Ma (2004b) paper. The market adjustment is designed to compensate for returns during the ex-dividend day.

**Table 2: Premium Summary Statistics**
The sample consists of 507 observations for all cash dividend paying firms listed on the MSM during the period from January 1997 to July 2005. The premium is defined as $(P_{cum} - P_{ex})/ D$. T-statistics are for the null hypothesis that the mean premium is equal to one. Adjusted premium uses the MSM index.

| | Unadjusted | | Adjusted |
|---|---|---|---|
| Statistic | Close-Open | Close-Close | Close-Close |
| Mean | 0.6460 | 0.6919 | 0.6628 |
| T-statistic | -4.8474 | -4.1668 | -4.5426 |
| Median | 0.2500 | 0.4000 | 0.3917 |
| Minimum | -5.1667 | -5.1667 | -5.0428 |
| Maximum | 13.7000 | 13.7000 | 13.7403 |

In all three cases, we test the null hypothesis that the premium is equal to one (Hypothesis 1). The results show that in all cases the premium is statistically significantly less than one. This implies that the average decline in the stock price on the ex-dividend day is less than the dividend per share. The average decline in stock price on the ex-dividend day ranges from 0.65 to 0.69. This evidence is consistent with previous findings by Frank and Jagannathan (1998) on Hong Kong which has similar tax treatment for dividends and capital gains as in Oman and Milonas and Travlos (2001) on the Athens Stock Exchange where taxes on dividends and capital gain are also absent.

**B. Abnormal Returns on Ex-Dividend Day**

Although premium measures are intuitively appealing, they suffer from heteroscedasticity (See Eades, Hess, and Kim (1984), Lakonishok and Vermaelen (1986), Barclay (1987), and Michaely (1991)).[5] The heteroscedasticity problem is caused by the fact that price changes are divided by dividend amounts which are not equal across

[5] A complete discussion of the problems caused by heteroscedasticity in the price change to dividend ratio is contained in Michaely (1991).

securities.[6] Our second measure of ex-day price change, AR, avoids this problem. The ex-day raw return is $(P_{ex} - P_{cum} + D)/P_{cum}$ such that, if the price drops equal D, then the raw return is zero. Following Graham et al. (2003), Liano et al (2003), and Cloyd et al. (2004), we calculate the ex-day abnormal return (AR) as

$$\text{AR} = \frac{P_{ex,it} - P_{cum,it} + D_{it}}{P_{cum,it}} - E(R_{it}), \tag{8}$$

where $E(R_{it})$ is the expected return for firm *i* on event day *t*, as calculated from the market model:

$$E(R_{it}) = \alpha_{it} + \beta_{it}(E(R_{mt}) - R_{ft}). \tag{9}$$

where $E(R_{mt})$ is the expected return on the market at time *t* and $R_{ft}$ is the risk-free rate of return at time *t*. We use the MSM value-weighted return as a proxy for the market return and one-month rate of Treasury bills as a proxy for the risk-free rate.[7] We estimated the parameters for the market models using daily returns from -240 through -41 relative to the ex-dividend day.

Table 3 presents the results for abnormal returns on the ex-dividend day. We are testing the null hypothesis that the abnormal return on the ex-dividend day is zero (Hypothesis 1). Our results show that the mean abnormal returns are significantly greater than zero. In particular, we find that the average abnormal return on the ex-day is 4.45% which is highly significant with a t-statistic of 7.50. The median abnormal return is 3.43%. These abnormal returns appear to be substantially higher than those reported by Graham et al. (2003) for the U.S. and by Lasfer and Zenonos (2003) for France, Italy, Germany, and U.K. However, this is not surprising since dividend yields are much lower

[6] Clustering is not an important issue for our sample as there are very limited cases where firms go ex-dividend on the same calendar date.
[7] Risk-free rate of return is obtained from the Central Bank of Oman.

in these countries. In general, these results are similar to those reported by Eades et al. (1984), and Grinblatt, Masulis, and Titman (1984) who documented abnormal return behaviour around ex-days of non-taxable distributions such as stock splits and stock dividends.

**Table 3: Ex-Day Abnormal Returns Summary Statistics**
The sample includes 507 observations for all dividend cash paying firms listed on the MSM during the period from January 1997 to July 2005. The Ex-Day Abnormal Return is defined as $((P_{ex} - P_{cum} + D)/P_{cum}) - ER$, where ER is the expected return defined by the Market Model. T-statistic is for the null hypothesis that the mean abnormal return is equal to zero.

| Statistic | Ex-Day Abnormal Return |
|---|---|
| Mean | 0.0445 |
| T-statistic | 7.5008 |
| Median | 0.0343 |
| Minimum | -0.4420 |
| Maximum | 1.1208 |

As a robustness check and to test the sensitivity of our results to beta estimation, we calculate abnormal return, $AR_{it}$, by subtracting the market's (MSM) daily return, $R_{mt}$, from the observed stock's return over a given period *t*. That is,

$$AR_{it} = R_{it} - R_{mt} \qquad (10)$$

Under this technique, stocks are assumed to have a beta of 1.0.[8]

Our results from employing this approach is very similar to those reported previously. In particular, we find that the ex-day abnormal return is 0.0482 with a t-statistic of 7.2751.

A possible explanation behind the positive abnormal returns (and premium less than one) may be market frictions. However, the tick size effect proposed by Bali and

[8] Brown and Warner (1980) have shown that this approach is powerful and often more powerful than the market model.

Hite (1998) is not applicable, since stock prices are decimalized in Oman. However, we examine whether the bid-ask bounce drives our results in a section below.

**C. Transaction Costs and Risk**

Since abnormal returns are not eliminated, the implication is that arbitrage may be inhibited by transaction costs and risk. To examine this issue, we run the following regression model:

$$AR = \beta_0 + \beta_1 DVYLD_i + \beta_2 1/P_{CUMi} + \beta_3 \sigma_{\varepsilon i} / \sigma_{Mi} + e_i \quad (11)$$

Where,

$AR_i$: is the abnormal return as estimated in equation (8),

$DVYLD_i$: the dividend yield for stock i,

$1/P_{CUMi}$: the inverse of stock *i*'s closing price on the last cum dividend day as a proxy for transaction costs,

$\sigma_{\varepsilon i} / \sigma_{Mi}$ : the standard deviation of the residuals from estimating equation (9), normalized by market risk (a proxy for idiosyncratic risk).

Kalay (1982) argues that stock prices should drop by the full amount of the dividend. Otherwise, short-term traders, who face no differential taxes on dividends versus capital gains, could make excess returns. On the other hand, transaction costs could inhibit the ability of short-term traders to make arbitrage profit. Higher transaction costs should act like a barrier against short-term trading in the period around the ex-dividend day, and thereby, reduce the volume of trading and ex-dividend day premium. To capture this affect, we follow previous research (e.g., Kaproff and Walking (1988), Naranjo et al. (2000), and Cloyd et al. (2004)) and include the inverse of the closing stock

price on the last cum-dividend day ($1/P_{cum}$) as a proxy for transaction costs. Previous studies report evidence of a positive association between ex-day abnormal returns and transaction costs which is usually interpreted as evidence of dividend capture. This is because transaction costs prevent ex-day abnormal return being arbitraged away (Kalay (1982a)). Kaproff and Walking (1988, 1990) argue that ex-day abnormal returns are eliminated up to the marginal cost of trading around the ex-day, which implies a positive association between ex-day returns and transaction costs. Therefore, if dividend capture trading occurs, the resulting ex-day returns will be positively correlated with the cost of trading. Consequently, we expect a positive association between abnormal returns and transaction costs proxy (Lakonishok and Vermaelen (1986), Kaproff and Walking (1988, 1990), Michaely et al. (1996), and Naranjo et al. (2000)).

Another factor potentially limiting dividend capture is risk. Heath and Jarrow (1988) demonstrate that the ex-dividend day stock price may differ arbitrarily from the dividend for each individual stock: consequently, short-term traders can not generate riskless arbitrage profits. As a result, ex-dividend returns must include a risk premium because ex-day share prices are unknown (see also Michaely and Vila (1996)). Grammatikos (1989) and Boyd and Jagannathan (1994) argues/argue that risk exposure is a major cost faced by short-term traders. Empirical evidence supporting the existence of such risk premia is provided by Grammatikos (1989) in his study of the effects of the Tax Reform Act of 1984. Fedenia and Grammatikos (1993) also report evidence consistent with the risk premium. To capture this affect, we use a risk measure similar to that used by Michaely and Vila (1996) and Cloyd et al. (2004). We measure $\sigma_{\varepsilon i} / \sigma_{Mi}$ as the standard deviation of the residuals from a market model regression of daily returns for the

dividend paying stocks on daily market returns, divided by the standard deviation of daily market returns. Since a short-term trader has to be compensated for taking extra risk, we expect a positive relationship between the ex-day abnormal returns and our risk proxy.

Table 4 reports the results on the relationship between ex-day abnormal returns and transaction costs and risk. Following previous research (Kadapakkam (2000)), we include dividend yield as a control variable.

**Table 4. The Effect of Dividend Yield, Transaction Costs, and Risk on Ex-Day Abnormal Returns**

The regression results are based on 507 observations for all cash dividend paying firms listed on the MSM during the period from January 1997 to July 2005. The dependent variable is the ex-day abnormal return. The explanatory variables are the stock's dividend yield (measured as the dividend per share over the cum-day price), transaction costs measured as the inverse of the cum-day price, and stock's variance relative to market variance ($\sigma_{\varepsilon i}/\sigma_{Mi}$). T-statistics are heteroscedastic consistent (White (1980)).

| Statistic | Coefficients | T- statistics |
|---|---|---|
| Intercept | 0.0352 | 1.9745 |
| DVYLD | -0.1301 | -3.0314 |
| $1/P_c$ | -0.0386 | -1.4814 |
| $\sigma_{\varepsilon i}/\sigma_{Mi}$ | 0.0015 | 0.5534 |
| Adjusted $R^2$ | | 0.0695 |

Contrary to our expectations, there is no significant relationship between transaction costs and abnormal returns indicating that transaction costs do not prevent arbitrage activity. Our risk proxy is also insignificant suggesting that risk considerations do not deter arbitrage activity. The fact that the transaction cost and risk proxies are insignificant suggests that a high level of ex-day transaction costs and trading risks do not prevent short-term traders from arbitraging away the ex-day abnormal returns and a full adjustment of stock price to the amount of dividends, which is inconsistent with Kalay (1982a) and Michaely and Vila (1995). The significant negative coefficient on dividend

yield suggests that short-term traders are eliminating or reducing abnormal returns in high-dividend-yield stocks.

**D. Behaviour of Trading Volume around Ex-Days**

To investigate the presence of short-term trading around the ex-dividend day, we analyze volume data. Lakonishok and Vermaelen (1986) argue that the influence of short-term traders around the ex-day can best be investigated by examining abnormal volume around the ex-day. The presence of short-term traders would be shown through positive abnormal volume around the ex-day. Green's (1980) analysis suggests that this abnormal trading volume will be highest on the cum-day and ex-day. There are many studies that report abnormal trading volume around the ex-days. For the U.S., Lakonishok and Vermaelen (1986) find positive abnormal volume around the ex-day for taxable securities which supports the presence of short-term traders for those securities. However, they document negative abnormal volume for nontaxable stock splits and stock dividends. Michaely and Vila (1995, 1996), and Michaely et al. (1996) also report abnormal trading volume around the ex-days. Further evidence of short-term trading around the ex-days is reported by Michaely and Murgia (1995) for Italy, Kato and Loewenstein (1995) for Japan, and Green and Rydqvist (1999) for Sweden.

We examine abnormal trading volume over the 11-day period centered on the ex-day. In doing so, we follow the methodology of Graham et al. (2003) where turnover is computed as the aggregate number of shares traded on a given day divided by the number of outstanding shares. We estimate normal turnover as the average daily turnover for the 80 days from day -45 to day -6 and day 6 to day 45 relative to the ex-dividend day.

Abnormal trading volume (ATV) for each day in the event window is defined as the ratio of a stock's trading turnover on a particular day to that stock normal trading turnover, minus one.

Table 5 presents evidence on trading volume around ex-dates. Significant positive abnormal volume around the ex-day will be a clear evidence of presence of short-term trading activities.

**Table 5: Daily Abnormal Trading Volume**
The sample contains 495 observations for all cash dividend paying firms listed on the MSM during the period from January 1997 to June 2005. Abnormal trading volume is presented for a 11-day window centered on the ex-day. Abnormal trading volume (ATV) for each day in the event window is defined as the ratio of a stock's trading turnover on a particular day to that stock normal trading turnover, minus one. Turnover is computed as the aggregate number of shares traded on a given day divided by the number of outstanding shares. Normal turnover is estimated as the average daily turnover for the 80 days from day -45 to day -6 and day 6 to day 45 relative to the ex-dividend day.

| Event Day | ATV | Standard Error |
|---|---|---|
| -5 | -0.0291* | 0.0145 |
| -4 | -0.0336* | 0.0090 |
| -3 | -0.0272 | 0.0147 |
| -2 | -0.0347* | 0.0099 |
| -1 | -0.0383* | 0.0142 |
| 0 | -0.0821* | 0.0049 |
| 1 | -0.0618* | 0.0076 |
| 2 | -0.0612* | 0.0060 |
| 3 | -0.0614* | 0.0056 |
| 4 | -0.0528* | 0.0092 |
| 5 | -0.0550* | 0.0064 |

*denotes significance at the 5% level using a two-tailed test.

Table 5 indicates that the abnormal volume prior to the ex-day is uniformly negative around the ex-days. That is, on each of the five days prior to the ex-day, trading volume decreases substantially and the reduction in volume is significantly different from zero. There is also a significant drop in trading volume on the ex-day and on each of the

following five days. These results are inconsistent with the hypothesis that short-term traders have a significant impact on ex-day behaviour. Rather, it is consistent with the market microstructure model by Frank and Jagannathan (1998) which predicts negative volume around the ex-days due to a shortage of buyers in the cum-period and a shortage of sellers in the ex-period (Cloyd et al. (2002)). These results are very similar to those reported by Lakonishok and Vermaelen (1986) for stock splits and stock dividends. It is also consistent with the findings of Copeland (1979), who studied trading volume behaviour of 25 NYSE firms around stock splits during the period 1963-1973. He reports evidence that trading volume decreased in anticipation of the stock split and continued to be lower following the split. In general, unlike the U.S. markets where short-term traders affect ex-day prices (e.g., Lakonishok and Vermaelen (1986), Kaproff and Walking (1990), and Michaely (1991)), our results do not provide support for the short-term trading hypothesis.

**E. Midpoint Pricing Using RASP Data**

Until now we have been using MSM daily closing prices to conduct our analysis which is the standard methodology in prior research. In this section, we repeat our analysis and calculate the ex-day premium and ex-day abnormal return utilizing the RASP intra-daily data. The reason for this is to test for the market microstructure argument proposed by Frank and Jagannathan (1998). Frank and Jagannathan (1998) argue that the premium, to a large extent, is an artifact of bid-ask spread. Their model implies that if prices are measured at the midpoint of the bid-ask spread, the premium should be one, or at least closer to one compared to when measured by closing daily

prices. Similarly, the ex-day abnormal return should be zero or closer to zero when measured using the midpoint of the bid-ask quotes relative to when measured by transaction prices (Hypothesis 2). As discussed in Graham et al. (2003), these hypotheses can not be tested using daily closing prices because bid-ask bounce may cause a bias in the ex-day premium and abnormal returns.

In order to see if our previous results hold when using the RASP data, we first use the RASP closing transaction prices and recompute the ex-day premium and abnormal returns.

**Table 6: Premium and Ex-Day Abnormal Return (AR) Using RASP Closing Transaction Prices.**
The sample contains 382 observations for all dividend cash paying firms listed on the MSM during the period from January 1997 to June 2003 that have information available in both the MSM data and RASP database. The premium is defined as $(P_{cum} - P_{ex})/ D$. The Ex-Day Abnormal Return is defined as $((P_{ex} - P_{cum} + Div)/P_{cum}) - ER$, where ER is the expected return defined by the Market Model. T-statistic is for the null hypothesis that (1) the mean premium is equal to one and (2) the mean ex-day abnormal return is equal to zero. The $P_{cum}$ and $P_{ex}$ are calculated using RASP closing transaction prices.

| Statistic | Premium | AR |
|---|---|---|
| Mean | 0.6532 | 0.0422 |
| T-statistic | -3.1659 | 6.9010 |

Our results reported in Table 6 show that there is almost no difference with the MSM analysis reported in Table 2 and 3. For instance, we find the mean ex-day premium is 0.65 and the mean ex-day abnormal return is 0.04. These results are almost identical to those reported in Table 2 and 3. Next, we follow the methodology of Graham et al. (2003) and measure $P_{ex}$ and $P_{cum}$ at the close of the trading day using the midpoint of the bid and ask quotes (rather than transaction prices).[9] As explained in Graham et al. (2003), the use of the midpoint prices should attenuate bid-ask bounce that might impact

[9] For more information on the methodology, see Graham et al. (2003).

traditional ex-day analysis and allow us to test Frank and Jagannathan bid-ask bounce hypothesis. If bid-ask bounce is the primary cause of the ex-day behaviour, we should find that the ex-day premium is closer to one and ex-day abnormal return is closer to zero when we use the midpoint prices (Hypothesis 2). This is exactly what we find.

**Table 7: Premium and Ex-Day Abnormal Return (AR) Using RASP Closing Quote Midpoints**

The sample includes 382 observations for all dividend cash paying firms listed on the MSM during the period from January 1997 to June 2003 that have information available in both the MSM data and RASP database. The premium is defined as $(P_{cum} - P_{ex})/ D$. The Ex-Day Abnormal Return is defined as $((P_{ex} - P_{cum} + Div)/P_{cum}) - ER$, where ER is the expected return defined by the Market Model. T-statistic is for the null hypothesis that (1) the mean premium is equal to one and (2) the mean ex-day abnormal return is equal to zero. The $P_{cum}$ is calculated using the midpoint of bid-ask spread of the closing quote on the cum-day. $P_{ex}$ is calculated using the midpoint of the bid-ask spread of the closing quote on the ex-day.

| Statistic | Premium | AR |
|---|---|---|
| Mean | 0.9816 | 0.0001 |
| T-statistic | -0.1211 | 1.3909 |

In particular, Table 7 indicates that the premium is slightly less than one and the abnormal return is slightly greater than zero, but as expected the differences are not statistically different from one and zero at any reasonable level of significance. These results are very different from the one reported in Table 2 and 3 based on closing daily stock prices. Consequently, using midpoint prices to eliminate bid-ask bounce makes a huge difference compared to using transaction pricing. This clearly indicates that the bid-ask bounce in transaction prices is an important driver of the ex-day pricing in our sample. This finding support the predictions that the premium differing from one because of bid-ask bounce and the ex-day abnormal return differing from zero for the same reason.

Eades et al. (1994) and Boyd and Jagannathan (1994) point out that price noisiness is a major obstacle in the examination of the ex-dividend day behaviour. Graham et al. (2003) suggest that the use of closing prices in the examination of ex-dividend day behaviour is adding noise to the ex-day analysis which makes it hard to make accurate inferences. To avoid this problem, we repeat our analysis using the opening quotes on the ex-dividend day. The use of opening quotes should eliminate noise associated with daily price movements (Graham et al. (2003)).

**Table 8: Premium and Ex-Day Abnormal Return (AR) Using RASP Opening Quote Midpoints**

The sample consists of 382 observations for all dividend cash paying firms listed on the MSM during the period from January 1997 to June 2003 that have information available in both the MSM data and RASP database. The premium is defined as $(P_{cum} - P_{ex})/ D$. The Ex-Day Abnormal Return is defined as $((P_{ex} – P_{cum} + Div)/P_{cum}) – ER$, where ER is the expected return defined by the Market Model. T-statistic is for the null hypothesis that (1) the mean premium is equal to one and (2) the mean ex-day abnormal return is equal to zero. The $P_{cum}$ is calculated using the midpoint of bid-ask spread of the closing quote on the cum-day. $P_{ex}$ is calculated using the midpoint of the bid-ask spread of the opening quote on the ex-day.

| Statistic | Premium | AR |
|---|---|---|
| Mean | 1.0238 | 0.0001 |
| T-statistic | 0.1504 | 1.1528 |

We find that the premium is very close to and not statistically significantly different from one. The abnormal return is very close to zero and the difference from zero is not statistically significant. These results are almost identical to the one reported using the closing prices on the ex-day. This indicates that the noisiness of using the closing prices is not an important driver for our results.

Another implication of Frank and Jagannathan model is that bid-to-bid and ask-to-ask prices should drop by the amount of dividend in the absence of taxes and discrete tick size effects. We repeat our analysis using bid-to-bid and ask-to-ask quotes.

**Table 9: Premium and Ex-Day Abnormal Return (AR) Using RASP Closing Bid and Ask Quotes**

The sample includes 382 observations for all dividend cash paying firms listed on the MSM during the period from January 1997 to June 2003 that have information available in both the MSM data and RASP database. The premium is defined as $(P_{cum} - P_{ex})/ D$. The Ex-Day Abnormal Return is defined as $((P_{ex} – P_{cum} + Div)/P_{cum}) – ER$, where ER is the expected return defined by the Market Model. T-statistic is for the null hypothesis that (1) the mean premium is equal to one and (2) the mean ex-day abnormal return is equal to zero. The $P_{cum}$ is calculated using (1) bid quote of the closing quote on the cum-day and (2) the ask quote of the closing quote on the cum-day. $P_{ex}$ is calculated using the (1) bid quote of the closing quote on the ex-day and the (2) ask quote of the closing quote on the ex-day.

| Statistic | Premium bid | Premium ask | AR bid | AR ask |
|---|---|---|---|---|
| Mean | 0.9916 | 0.9716 | 0.0001 | 0.0001 |
| T-statistic | -0.0381 | -0.1015 | 1.1654 | 1.0994 |

We find that stock prices fall by almost the exact amount of the dividend using these prices. These results are evidence that systematic bid-ask bounce around ex-dividend days bias closing transaction prices for this sample. The results from cum-day close ask to ex-day close ask is slightly smaller than the average drop from cum-day bid to ex-day close bid. Most importantly, in both cases, we can not reject the null hypothesis that ex-day premium is equal to one and ex-day abnormal returns are equal to zero.

To avoid the noisiness of using closing prices on the ex-day, we also repeat our previous analysis using the opening quotes. We present the results in Table 10.

**Table 10: Premium and Ex-Day Abnormal Return (AR) Using RASP Opening Bid and Ask Quotes**

The sample consists of 382 observations for all dividend cash paying firms listed on the MSM during the period from January 1997 to June 2003 that have information available in both the MSM data and RASP database. The premium is defined as $(P_{cum} - P_{ex})/ D$. The Ex-Day Abnormal Return is defined as $((P_{ex} – P_{cum} + Div)/P_{cum}) – ER$, where ER is the expected return defined by the Market Model. T-statistic is for the null hypothesis that (1) the mean premium is equal to one and (2) the mean ex-day abnormal return is equal to zero. The $P_{cum}$ is calculated using (1) bid quote of the closing quote on the cum-day and (2) the ask quote of the closing quote on the cum-day. $P_{ex}$ is calculated using the (1) bid quote of the opening quote on the ex-day and the (2) ask quote of the opening quote on the ex-day.

| Statistic | Premium bid | Premium ask | AR bid | AR ask |
|---|---|---|---|---|
| Mean | 1.0343 | 1.0133 | 0.0001 | 0.0001 |
| T-statistic | 0.1491 | 0.0456 | 0.9666 | 0.9076 |

We find that the premium is very close to one whether we use the bid price or the ask price. The abnormal return also is very close to zero. In both cases, the ex-day premiums are not statistically different from one and the abnormal returns are not statistically different from zero. In general, the results using the midpoint quotes show that the inferences based on premium are very similar to those based on returns, and results for bid quotes are virtually identical to those for ask quotes. Overall, inferences based on quotations are different from those based on transaction prices.

In summary, the above results indicate that market microstructure explanations are the dominant cause of the ex-day premium deviating from one and the ex-day abnormal returns deviating from zero. Once these market microstructure effects are taken into account, at the margin, a Rial of dividends and a Rial of capital gains are valued equally in Oman.

**F. Volume Analysis Using RASP Data**

In order to see if our previous results hold when using the RASP data, we repeat our previous volume analysis using the RASP data. The results are reported in Table 11.

**Table 11: Daily Abnormal Trading Volume Using RASP Data**
The sample includes 364 observations for all cash dividend paying firms listed on the MSM during the period from January 1997 to June 2003. Abnormal trading volume is presented for a 11-day window centered on the ex-day. Abnormal trading volume (ATV) for each day in the event window is defined as the ratio of a stock's trading turnover on a particular day to that stock normal trading turnover, minus one. Turnover is computed as the aggregate number of shares traded on a given day divided by the number of outstanding shares. Normal turnover is estimated as the average daily turnover for the 80 days from day -45 to day -6 and day 6 to day 45 relative to the ex-dividend day.

| Event Day | ATV | Standard Error |
|---|---|---|
| -5 | -0.0163 | 0.0163 |
| -4 | -0.0333* | 0.0095 |
| -3 | -0.0207 | 0.0173 |
| -2 | -0.0267* | 0.0101 |
| -1 | -0.0474* | 0.0156 |
| 0 | -0.0827* | 0.0052 |
| 1 | -0.0636* | 0.0083 |
| 2 | -0.0620* | 0.0070 |
| 3 | -0.0590* | 0.0066 |
| 4 | -0.0514* | 0.0089 |
| 5 | -0.0532* | 0.0064 |

*denotes significance at the 5% level using a two-tailed test.

Similar to our previous findings using the MSM data, our results show that the abnormal volume is generally negative around the ex-dividend days. Volume is below normal on each of the five days prior to the ex-day. There is also a reduction in volume on the ex-day and on each of the following five days. In most cases, the drop in volume is statistically significantly different from zero. These results are practically identical to those reported using the MSM data (see Table 5). This is evidence against the short term

trading hypothesis which predicts a positive abnormal volume around the ex-dividend days.

## 5. Conclusion

In this paper, we examine ex-dividend day behaviour in a unique setting which is characterized by less frictional trading: no taxes on dividend and capital gains, dividends paid annually, and prices are decimalized. While one would expect that in this market stock prices should drop by an amount equal to the dividend, our evidence shows that stock prices drop by less than the amount of dividends. Similarly, we find significant positive abnormal returns on the ex-day. These results can not be explained by taxes and price discreteness.

We examined whether transaction costs and risk inhibit arbitrage trading around ex-days. We find neither of these variables is significant, which suggests that these variables do not hinder investors' ability to trade and arbitrage the excess returns. These results are inconsistent with the hypothesis that dividend-capture traders affect the ex-dividend day returns. We also examine abnormal trading volume around the ex-days. Our results reveal that there is a significant reduction in trading volume around ex-days. The reported results show that, unlike the U.S. market, ex-day behaviour in Oman is not affected by the short-term trading. Finally, we tested Frank and Jagannathan (1998) model which predicts that the bid-ask bounce is the primary factor behind the ex-dividend day behaviour. Our results indicate that when midpoint prices are used instead of transaction prices, stocks prices drop by the full amount of dividends on the ex-day and

the ex-day abnormal return is insignificantly different from zero. Our analysis of bid-to-bid and ask-to-ask prices reveals similar results.

In sum, the results indicate that market microstructure influences the ex-dividend day premium and ex-day return. Once market microstructure effects are taken into account, dividends and capital gains are valued equally at the margin.

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