Management Review: An International Journal · Volume 5 · Number 1 · Summer 2010

Tax-Induced Excess Trading Behaviors on ADR Ex-Dividend Days

Bi-Huei Tsai
Department of Management Science
National Chiao Tung University
Hsinchu 300, Taiwan
E-mail: bhtsai@faculty.nctu.edu.tw

I-Chih Chen
Department of Management Science
National Chiao Tung University
Hsinchu 300, Taiwan
Email: bhtsai@faculty.nctu.edu.tw

Received May 9, 2009; Revised Mar 28, 2010; Accepted Jun. 12, 2010

ABSTRACT

Under U.S. regulations, the differential tax obligations for investors with various status and income levels give rise to investor heterogeneity. In contrast to tax dividend income imposed on U.S. stocks, foreign tax liability is the minimums of the taxation imposed on American depositary receipt (ADR) dividend income. Identical foreign tax rates enable ADR investors to be more homogenous in taxation than U.S. stock holders. The characteristics are likely to enable investors to sell ADRs before cash dividend distributions and repurchase ADRs on ex-dividend dates. As expectations, our analysis exhibits prominent excess returns and excess volume on ADR ex-days.

This implies that heavy foreign tax liability simultaneously causes excess returns and excess volumes on ADR ex-dividend days (ex-days). The 3SLS estimation further supports the view that ADR ex-day excess returns are causally and positively related to excess volume. In particular, the ex-day excess returns are significantly associated with dividend yields, transaction costs and risk factors. This suggests the tax-induced returns constrained by transaction costs and firm's risks.

Keywords*: ADR, Tax-induced Hypothesis, 3SLS, Ex-dividend Day, Dividend Yield*

INTRODUCTION

In a perfect capitalist market with no transaction costs, no trading barriers, and no uncertainty, the price of a share following a dividend release should fall by the exact amount of the dividend paid on each share. However, it is well known that share prices on average do not fall by the full amount of the dividend. There is much literature in which this discrepancy is seen as result of tax considerations (Elton and Gruber, 1970; Eades et al., 1984; Poterba and Summers, 1984; Lakonishok and Vermaelen, 1986; Barclay, 1987; Michaely, 1991; Lasfer, 1995; Lasfer, 1996; Bartholdy and Brown, 1999; McDonald, 2001; Elton et al. 2005; Chay et al., 2006; and Armitage, et al., 2006). Their line of research has explored the effects of dividend income tax on investor behavior around the time of ex-dividend days (ex-days). They argue that investors who receive a tax disadvantage from the dividends will accelerate their sales before the ex-dividend days and delay their purchases until those days.

Hence, excess returns and increased trading volumes will be observed during ex-dividend periods. The existing evidence on the effect of tax on investors is mixed. Some studies have provided

evidence of tax-induced investor behavior around ex-dividend days. Barclay (1987), for instance, has indicated that stock prices fell by the full amount of the dividend on ex-dividend days prior to the adoption of dividend income taxes in 1913. Lasfer (1995) examined the behavior of share prices around the ex-dividend days both before and after the 1988 Income and Corporation Taxes Act in the U.K. The study found significant ex-dividend day returns in the pre-1988 period when the tax differential between dividends and capital gains was high, while ex-day returns were insignificantly negative in the post-1988 period. Elton et al. (2005) employed two types of closed-end funds. One type of closed-end fund had taxable dividend distributions but the other did not, and both types were subject to taxes on capital gains. They stated that ex-dividend-day prices differed greatly between these two types of funds due to the effect of taxes.

Other studies have not found evidence to support the tax hypothesis. Shaw (1991) explored the significant the excess return and volume around ex-dividend days of untaxed master limited partnerships (MLPs). Frank and Jagannathan (1998) found that the average fall in stock prices on ex-dividend days appeared to be smaller than the amount of the dividend, even though neither dividends nor capital gains are taxed in Hong Kong. Such results cast serious doubt on the effects of tax as a valid explanation for abnormal behavior on dividend days. Other researchers suggest that microstructure can be an alternative explanation. Dubofsky (1992), Bali and Hite (1998), as well as Jakob and Ma (2004) have proposed that discrete tick (price discreteness), instead of tax factors, plays a critical role in the ex-dividend day price drop.

These previous studies mostly employed U.S. stock samples as part of their tax-induced trading hypothesis, but U.S. stock investor trading behaviors are heterogeneous in ex-dividend days due to the tax regulations. Dhaliwal et al. (2006) focus on U.S. stocks to determine whether or not differential tax obligations for investors with various

status levels give rise to investor heterogeneity. Under U.S. regulations, some institutional investors are exempt from dividend income tax, so those for whom dividends are taxed at lower effective rates will prefer to receive dividends. They tend to acquire stocks cum-dividend and sell stocks ex-dividend to capture the dividends. On the other hand, individuals for whom dividends are taxed at higher effective rates will tend to sell stocks cum-dividend and repurchase stocks ex-dividend to avoid dividends. Regulatory tax heterogeneity induces inconsistent trading strategies for various investors who are subject to differential tax obligations, so trading volume are likely to increase. Meanwhile, it is difficult to forecast the return patterns of ex-dividend days since individuals buy stocks and institutional investors sell stocks on ex-dividend days. A correlation is unlikely to exist between excess returns and volume on ex-dividend days.

This paper uses a sample of American Depositary Receipts (ADR) to test the tax-induced relations between trading volume and returns because investor trading behaviors are more homogeneous in ex-dividend days for ADRs than for U.S. stocks. ADRs are securities traded on U.S. exchanges that represent foreign companies outside the U.S.. ADR dividend incomes are subject to two kinds of taxes; one is dividend income tax under U.S. jurisdiction and the other is the foreign withholding tax (imposed on dividend income). As Cyrus et al. (2006) indicate the regulations deviate across different country, ADRs, which issued from different countries, are subject to discrepant foreign withholding rates. Meanwhile, U.S. stock holders only have to pay dividend income tax under U.S. jurisdiction. The main difference in dividend income tax between ADRs and U.S. stocks is that ADR investors are subject to foreign withholding tax liability.

As for foreign withholding taxation, ADR dividend incomes are subject to foreign withholding tax. In a way that is different from the dividend income tax that applies to U.S. stocks, the foreign tax rate for a given dividend distribution is known and remains constant across all

of the ADR investors regardless of U.S status and income levels. The tax-exempt institutions in the U.S. have the same obligations to pay foreign withholding taxes as do other investors. The major advantages of using ADR data is that all ADR investors are subject to an identical foreign withholding tax rate associated with the ADR dividend income.

Furthermore, all ADR investors who pay foreign dividend withholding tax are entitled to a foreign tax credit bound to the U.S. effective tax rate according to Section 904 of the Internal Revenue Code. Thus, the U.S. tax-exempt institutions, which do not pay any tax to the U.S. government, cannot benefit from the tax credit. The total amount of tax they have to pay for an ADR dividend income is the foreign tax liability to the country where the company that issues the ADR is located. For individual investors, when their foreign withholding tax rates are greater than the U.S. effective tax rate, the excess portion is not able to offset the U.S. tax liability. The total amount of tax that individuals have to pay is also equal to the amount of foreign tax liability. In summary, foreign tax liability represents the minimum of the taxation imposed on an ADR dividend income, so ADR investors are more homogeneous in dividend income taxation than U.S. stock holders, especially when a heavy foreign tax rate is imposed on an ADR dividend income.

Specifically, higher dividend yields generate a heavier foreign tax liability and are more likely to encourage ADR investors to sell stocks cum-dividend and to repurchase stocks on ex-dividend days. Dividend yield is an important tax factor which results in contemporaneous excess returns and excess volumes precisely on ex-days. It is critical to apply simultaneous systems equations in order to calculate the ex-day trading from the ADR market. Although prior studies on tax-induced ADR trading have pointed out the impact of dividend yields on ADR excess volume (e.g. Callaghan and Barry (2003)), they do not discuss the ex-day relationship between ADR returns and ADR volume through dividend yield variables.

This paper attempts to apply the three-stage least square (3SLS) methods to determine the interactive relevance of ADR excess returns and excess volumes on ex-days in the control of the exogenous impact of dividend yield, transaction cost and risk factors. In addition, the results of 3SLS estimation methods are compared with those of 2SLS or OLS estimation methods to ascertain if the former estimations are more efficient.

The results reveal the ex-day excess returns and excess volumes on ex-dividend days. In addition, ex-day excess returns run positively to the dividend yield but are constrained by the transaction cost and firm risks. Only when the determinants of ex-day trading behaviors in this study are controlled by the 3SLS estimation method, the empirical results exhibit significant and causal positive relations between excess returns and excess volumes on ex-days. The above-mentioned results are not found if the relationship of the ADR excess returns and volumes are estimated based upon the 2SLS or OLS methods. This suggests the more efficient estimation when our models consider the contemporaneous covariance in simultaneous equation.

The reminder of this paper is organized as follows: in section 2, we state the hypothesis development. In section 3, we explain the data and sample. In section 4, the methodology is described. In section 5, the empirical results are discussed. Finally, conclusions will be drawn in section 6.

HYPOTHESIS DEVELOPMENT

Ex-day excess returns

Elton and Gruber (1970) and Kalay (1982) argue that a market will value a dollar of dividends less than a dollar of capital gains because investors, who receive dividends, must pay taxes that are due on the dividends. Hence, the ex-day prices of ADRs will on average fall by less than the amount of the taxable dividend since ADRs are subject

to dividend income tax under both U.S. and foreign regulations. In other words, we may observe abnormal returns on ex-days. To formalize this reasoning, we define the after-tax rate of return on the ith ADR as:

$$\tilde{R}_{i,t}^{\tau} \equiv \frac{\tilde{P}_{i,t} - P_{i,t-1}}{P_{i,t-1}}(1-\tau_{i,g}) + \frac{D_{i,t}}{P_{i,t-1}}(1-\tau_{i,d}-\tau_{i,f}) \qquad \text{(i)}$$

Where $\tilde{R}_{i,t}^{\tau}$ is the after-tax rate of return on day t to the marginal investor in the ith ADR under U.S. regulations; $\tilde{P}_{i,t}$ is the price of the ith ADR at the end of day t; $\tau_{i,g}$ and $\tau_{i,d}$ are the present values of the capital gain and dividend income effective tax rate of the marginal investor for the ith ADR under U.S. tax regulations, respectively; $\tau_{i,f}$ is the foreign factor, which is defined as the excess value of the foreign withholding tax rate that exceeds the foreign tax credit boundary under U.S. jurisdiction for the ith ADR dividend income; and $D_{i,t}$ is the dividend paid per share for the ith ADR on day t. By taking the expectations for equation (i) and rearranging terms, we obtain:

$$E(\tilde{R}_{i,t}^{\tau}) = E(\tilde{R}_{i,t})(1-\tau_{i,g}) - \frac{D_{i,t}}{P_{i,t-1}}(\tau_{i,d} + \tau_{i,f} - \tau_{i,g}) \qquad \text{(ii)}$$

$$E(\tilde{R}_{i,t}) = \frac{E(\tilde{P}_{i,t}) - P_{i,t-1} + D_{i,t}}{P_{i,t-1}}$$

Where is the expected pre-tax rate of return on day t for the ith ADR. If the expected after-tax rates of return are constant over time, then $E(\tilde{R}_{i,t}^{\tau}) = E(\tilde{R}_{i}^{\tau})$, for all t. Equation (ii) can be written as:

$$E(\tilde{R}_{i,t}) = \gamma_{0,i} + \gamma_{1,i} d_{i,t} \qquad \text{(iii)}$$

Where

$$\gamma_{0,i} = \frac{E(\tilde{R}^{\tau}_{i,t})}{(1-\tau_{i,g})}$$

$$\gamma_{1,i} = \frac{(\tau_{i,d} + \tau_{i,f} - \tau_{i,g})}{(1-\tau_{i,g})}, \quad d_{i,t} \equiv \frac{D_{i,t}}{P_{i,t-1}}$$

Equation (iii) captures the essence of the tax hypothesis in its simplest form. Because dividend yields ($d_{i,t}$) are zero on all days except the ex-day, the tax effects of dividends will only be reflected in the ex-day returns. In equation (iii), the tax factor $\gamma_{1,i}$ and dividend yield $d_{i,t}$ are attributed to the tax premium $(\gamma_{1,i} d_{i,t})$. The dividend yield $d_{i,t}$ is a positive function of the required rate of pre-tax returns $E(\tilde{R}_{i,t})$ on ex-dividend days, if the marginal investor's tax rate on dividend income, including U.S. and foreign taxation $(\tau_{i,d} + \tau_{i,f})$, is greater than the present value of the capital gains tax rate $\tau_{i,g}$, namely, $(\gamma_{1,i} > 0)$. When the dividend yield is high, ADR investors are subject to an extra tax liability $(\tau_{i,f} d_{i,t})$ that causes the tax premiums $(\gamma_{1,i} d_{i,t})$ to increase significantly. Such tax premiums result in apparently abnormal returns on ex-dividend days for ADRs with high dividend yields. ADR investors are thus more inclined to sell ADRs cum-dividend and repurchase ADRs ex-dividend. To analyze the effect of dividend yields on ex-day abnormal returns, this paper seeks to test the following hypothesis:

> H1: ADR excess returns on ex-dividend days are positively associated with the dividend yield.

Ex-day excess volumes

We follow Michaely and Vila (1995) in our model of ex-dividend day trading activities. Ex-day excess trading is determined in the following manner:

$$V_{i,t} = \frac{1}{2} D_{i,t} \{ \sum_{j=1}^{N} \left| (\alpha_j - \overline{\alpha})(K_j / \sigma_e^2) \right| \} \qquad \text{(iv)}$$

Where $D_{i,t}$ is the amount of dividend paid per share for ith ADR on day t, K_j is the level of risk to tolerance for investor j. $\overline{\alpha}$ is the average preference for dividends versus capital gains in the economy, weighted by investors levels of risk tolerance K_j. σ^e_2 is the total risk of a stock, and N is the total number of investors in the economy. Equation (iv) indicates that trading volume is a positive function of the dividend yield $D_{i,t}$. This paper offers the following hypotheses:

> H2: ADR excess volumes on ex-dividend days are positively associated with the dividend yield

The Relation between ex-day excess returns and volumes

Under U.S. regulations, some institutional investors are exempt from dividend income tax[1], so these tax-exempt organizations are tax-

[1] Tax-exempt organizations include corporations organized under Act of Congress, title holding corporations for exempt organizations, teachers' retirement fund associations, benevolent life insurance associations, mutual ditch or irrigation companies, mutual or cooperative telephone companies, cemetery companies, state chartered credit unions, mutual reserve funds, mutual insurance companies or associations, cooperative organizations to finance crop operations, employee funded pension trusts, black lung benefit trusts, withdrawal liability payment funds, title holding corporations or trusts with multiple parents, state-sponsored high-risk health coverage organizations, state-sponsored worker's compensation reinsurance organizations, religious and apostolic associations, cooperative hospital service organizations, cooperative service organizations of operating educational organizations, child care organizations, and farmers' cooperative associations.

privileged. Other investors are subject to a differential marginal tax rate on dividend income in accordance with investor income levels. The differential tax obligations for investors with various status and income levels give rise to investor heterogeneity. For institutional investors (including corporations and tax-exempt organizations), dividends are on average less tax-disadvantaged relative to capital gains than for individual investors (e.g., Dhaliwal et al., 1999; Allen et al., 2000; and Dhaliwal et al., 2003). This means that, on average, dividend income, compared to capital gains, is worth relatively more to an institutional investor than it is to an individual investor.

In contradiction of dividend income tax imposed on U.S. stocks, ADR dividend incomes are subject to two kinds of taxes; one is dividend income tax under U.S. jurisdiction and the other is the foreign withholding tax (imposed on ADR dividend income) to the country where the company that issues the ADR is located. Because all ADR investors who pay foreign dividend withholding tax are only eligible for a foreign tax credit bound to the U.S. effective tax rate according to Section 904 of the Internal Revenue Code, the total amount of tax they have to pay for an ADR dividend income is the foreign tax liability and the excess portion that U.S. effective tax rates exceed the foreign tax rates. Foreign tax liability is the minimums of the taxation imposed on ADR dividend income. Especially, the foreign tax rate for a given dividend distribution remains constant across all of the ADR investors regardless of U.S status and income levels, so identical foreign tax rates enable American depositary receipt (ADR) investors to be more homogenous in taxation than U.S. stock holders.

In particular, as the foreign tax rate imposed on dividend income is fairly high, the U.S. effective tax rate is unlikely to be higher than the foreign tax rates. Hence, ADR investors equally have to pay the foreign tax liability. The tax ratio paid by individual investors is the same as that paid by institutional investors. This consistently encourages ADR investors to sell stocks cum-dividend and to

repurchase stocks on ex-dividend days. Excess returns are contemporaneously relevant to excess volumes on ex-days. Because of this, the hypothesis is offered:

> H3: ADR excess returns on ex-dividend days are positively associated with excess volumes.

DATA AND SAMPLE

We constructed a sample of ADR distributions from the Center for Research in Securities Prices (CRSP) database, consisting of cash distributions over the period from 1988 to 2004. The CRSP database provides ex-dividend date and rates of returns for each ADR. To include the ADRs with complete data, this paper has summarized 5,715 cash distributions for 455 firms from 17 different countries. The final sample is composed of 331 NYSE-listed, 7 AMEX-listed, 117 NASDAQ-listed ADRs with 3,980, 115, and 1,620 cash distributions, respectively. Table 1 presents the sample distribution by country.

METHODOLOG

Estimation of excess returns and excess volumes

This paper employs Serra (2000) two-factor models to explore the excess returns. This paper defines the ex-dividend days as day 0. Negative (positive) days represent days prior (subsequent) to the ex-days. The estimation interval represents the periods from day –260 to day –11 and the ex-dividend interval represents the periods from day -10 to day 10. We utilize the data in the estimation interval to measure the parameters in equation (1):

$$R_{i,t} = \alpha_i + \beta_i^{ADR} R_{crsp,t} + \beta_i^{OR} R_{m,t} + \varepsilon_{i,t} \qquad (1)$$

Where $R_{i,t}$, $R_{crsp,t}$ and $R_{m,t}$ are the rates of return on day t for ADR i, the CRSP weighted index, Datastream weighted market index for the mth country where the ADR is issued.

Table 1 Sample distribution

Country	Observations	Firm number
ARGENTINA	130	17
AUSTRALIA	367	19
BRAZIL	249	15
CHILE	463	32
CHINA	113	24
FRANCE	188	34
IRELAND	111	9
ISRAEL	130	12
ITALY	132	21
JAPAN	753	44
MEXICO	259	32
NETHERLANDS	265	19
NEW ZEALAND	102	10
SOUTH AFRICA	352	21
SPAIN	267	8
SWEDEN	128	19
UNITED KINGDOM	1706	119
Total	5715	455

After the regression (1) is performed in the estimation interval, we obtain the parameters $\hat{\alpha}_i$, $\hat{\beta}_i^{ADR}$, $\hat{\beta}_i^{OR}$. This paper captures the risk factors by beta coefficients $\hat{\beta}_i^{ADR}$ and $\hat{\beta}_i^{OR}$. The sample firms in our research execute cash dividend distributions for several times.

However, risk factors $\hat{\beta}_i^{ADR}$, $\hat{\beta}_i^{OR}$ are estimated for each cash distribution event which occurs in different time because Jurun, Pivac and Arnerić (2007) emphasize the time-varying risks factors. This paper then applies equation (1) to calculate the expected returns, $E(R_{i,t}) = \hat{\alpha}_i + \hat{\beta}_i^{ADR} R_{crsp,t} + \hat{\beta}_i^{OR} R_{m,t}$. We then calculate the actual returns minus the expected returns to measure the excess return $AR_{i,t}$ for the ith ADR on day t during the ex-dividend periods using equation (2) below.

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i^{ADR} R_{crsp,t} + \hat{\beta}_i^{OR} R_{m,t}) \quad (2)$$

The excess trading volume is estimated as the daily trading volume minus daily normal trading volume during event period as proposed by Michaely and Vila (1995). We define normal daily trading volumes NV_i as the mean of daily trading volume during the non-event periods as equation (3), so excess trading volume during event (ex-dividend) period AV_i is as equation (4).

$$NV_i = \frac{\sum_{t \in [-40,-10] \cup [10,40]} Vol_{i,t}}{60} \quad (3)$$

$$AV_{i,t} = \frac{EV_{i,t}}{NV_{i,t}} - 1 \quad t \in [-10,\ 10] \quad (4)$$

Where $EV_{i,t}$ and $VOL_{i,t}$ are the daily trading volumes during the event (ex-dividend) period and non-event period, respectively.

Regression test

After calculating the excess returns and excess volume, we employ OLS, 2SLS, and 3SLS to estimate the determinants of excess trading behaviors considering the contemporaneous movement of returns and volumes. We construct simultaneous equation systems (5):

$$AR_{0,it} = \omega_0 + \omega_1 AV_{i,t} + \omega_2 Yield_{i,t} + \omega_3 Tran_{i,t} + \omega_4 \beta_{i,t}^{ADR} + \omega_5 \beta_{i,t}^{OR} + \varepsilon_{1i,t}$$
$$AV_{0,it} = \gamma_0 + \gamma_1 AR_{i,t} + \gamma_2 Yield_{i,t} + \gamma_3 Tran_{i,t} + \varepsilon_{2i,t} \quad (5)$$

Where $AR_{0,it}$ and $AV_{0,it}$ are the excess return and excess volume on ex-days (day 0). $Yield_{i,t}$ is computed as the cash dividend divided by the price. $Tran_{i,t} = \frac{bid_{i,t} - ask_{i,t}}{(bid_{i,t} + ask_{i,t})/2}$ is the ex-day bid-ask spread and is calculated from the bid minus ask prices divided by the average bid and ask prices for the ith ADR at time t. $\hat{\beta}_{i,t}^{ADR}$ and $\hat{\beta}_{i,t}^{OR}$ are beta coefficients estimated from CRSP index and the local market index where the ith ADR is issued, so $\hat{\beta}_{i,t}^{ADR}$ and $\hat{\beta}_{i,t}^{OR}$ capture the risk factors. Because Nagase, Scott, Yoshika, Araki, and Nakamura (2004), along with Caballero, Ahmed, Azhar (2004) emphasize that risk management is critical in making decisions, the two risk factors based on conventional financial theory are included in the regression (5).

This research examines the significance of the coefficients ω_2 and γ_2 by t-statistics to test the hypothesis H1 and H2, respectively. In addition, t-statistics also examines whether or not the coefficients ω_1 and γ_1 are significant from zero to test the hypothesis H3 that indicates the relevance between excess returns and excess volumes on ex-dividend days.

EMPIRICAL RESULTS

Average excess returns and volume from day -10 to +10 for our sample firms are presented in Figure 1. The patterns of excess returns and excess volume approximately run together around the exdividend periods. Especially, excess returns and excess volume dramatically jump precisely on exdays. Because ADR investors are more homogenous in dividend income taxation, they accelerate their sales prior to exdays and consistently repurchase ADRs exactly on exdays. As a result, both the excess returns and excess volumes are obviously observed on exdays and the finding suggests tax-motivated trading activities.

The OLS, 2SLS, and 3SLS estimation results are exhibited in Table 2. Excess returns reveal significantly positive relationships with dividend yield under the 3SLS, 2SLS and OLS estimations of the first equation. When the dividend yield is high, ADR investors are to a larger extent subject to an extra tax liability withheld by the foreign tax jurisdiction. This leads to the sale of ADRs cum-dividend and the consistent acquisition of ADRs ex-dividend. As a result, positive associations between ADR excess returns and dividend yields. The result is consistent with hypothesis H1 that states the tax impact on ADR investor behaviors.

Table 2 3SLS, 2SLS, and OLS estimation results of the excess trading behavior regressed on tax, transaction costs and risk factors

$$AR_{0,it} = \omega_0 + \omega_1 AV_{i,t} + \omega_2 Yield_{i,t} + \omega_3 Tran_{i,t} + \omega_4 \beta_{i,t}^{ADR} + \omega_5 \beta_{i,t}^{OR} + \varepsilon_{1i,t}$$
$$AV_{0,it} = \gamma_0 + \gamma_1 AR_{i,t} + \gamma_2 Yield_{i,t} + \gamma_3 Tran_{i,t} + \varepsilon_{2i,t} \quad (5)$$

The result of the OLS estimation shows that the dividend yield is positively related to the excess volume, but the relation is not significant. The result does not support hypothesis H2. Furthermore,

exday excess returns are significantly related to excess volumes under 3SLS estimations. This suggests the interactive relations between excess returns and excess volume during exdividend days, consistent with hypothesis H3. On the other hand, this positive relationship is not statistically significant under OLS or 2SLS estimations. Because 3SLS consider the contemporaneous covariance between error terms, the 3SLS estimators are asymptotically efficient.

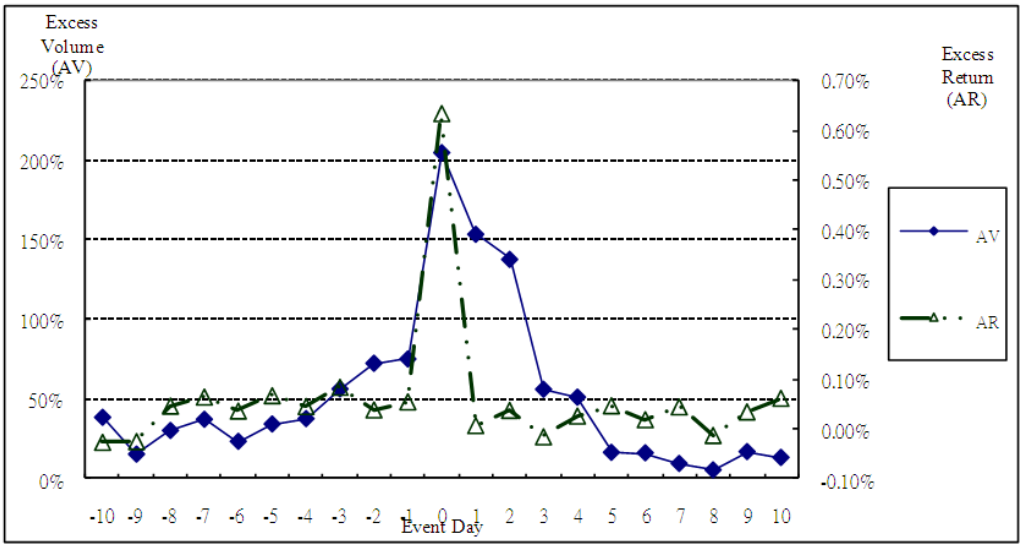

Figure 1 Excess trading behavior during ex-dividend period

In general, the coefficients of transaction costs are positive and highly significant under the 3SLS, 2SLS and OLS estimations of the first equation.

Table 2 3SLS, 2SLS and OLS estimation results

	3SLS	2SLS	OLS
Panel A：Equation 1			
Intercept	0.0045	0.0064	0.0024
	(2.74)***	(3.18)***	(2.92)***
$AV_{i,t}$	0.0011	0.0006	0.0004
	(2.23)**	(0.90)	(0.41)
$Yield_{i,t}$	0.0062	0.0061	0.1069
	(2.58)**	(2.53)**	(10.66)***
$Tran_{i,t}$	0.1951	0.1898	0.2102
	(8.99)***	(8.67)***	(11.51)***
$\beta_{i,t}^{ADR}$	-0.0052	-0.0059	0.0002
	(-9.58)***	(-9.87)***	(0.29)
$\beta_{i,t}^{OR}$	-0.0013	-0.0014	-0.0009
	(-1.57)	(-1.43)	(-0.78)
R2 (%)	24.26	4.09	5.40
Panel B：Equation 2			
Intercept	1.9549	2.4162	3.1941
	(3.47)***	(4.24)***	(5.35)***
$AV_{i,t}$	173.5742	76.2937	7.5474
	(2.39)**	(1.02)	(0.40)
$Yield_{i,t}$	-1.2424	-0.6229	5.7405
	(-0.53)	(-0.26)	(0.45)
$Tran_{i,t}$	-41.6801	25.6456	-16.2010
	(-1.64)	(-0.84)	(-0.70)
R2 (%)	2.21	0.20	0.02

T-statistics in parentheses
*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

This implies that investors may engage in trading activities only when the returns from the trading activities exceed the transaction costs. Only when the ADR returns can cover the transaction costs, can ADR investors engage in trading. Thus, the excess returns increase with our transaction costs in our study. Furthermore, we find the ADR risk factors $\hat{\beta}^{ADR}_{i,t}$ or $\hat{\beta}^{OR}_{i,t}$ decrease their ex-day excess returns.

CONCLUSION

Previous studies have not well discussed the ex-day simultaneous relationships between excess returns and excess trading volume through dividend yield factors. ADR unique setting provides us to apply 3SLS to obtain more robust result of the tax-induced behaviors. We find that ex-day excess returns run positively to the dividend yields but constrained by the transaction cost and firm's risk. Because high dividend yields increase foreign tax liability for ADR investors, investors are more inclined to sell ADRs cum-dividends and repurchase ADRs on ex-days. This suggests that excess returns are driven by the foreign tax factors. Furthermore, our empirical results reveal a significantly positive relationship between the excess returns and excess volumes on ex-dividend days. The finding is consistent with tax-motivated hypothesis and specifically supports the casual relevance of ex-day returns and volumes from ADR markets.

REFERENCES

Allen, F., Bernardo, A.E. and Welch, I., A theory of dividends based on tax-clienteles, *The Journal of Finance*, 55(6), 2000, 2499-2536.

Armitage, S., Hodgkinson, L. and Partington, G., The market value of UK dividends from shares with differing entitlements, *Journal of Business Finance & Accounting*, 33(1,2), 2006, 220-244.

Bali, R. and Hite, G.L., Ex dividend day stock price behavior: discreteness or tax-induced clienteles?, *Journal of Financial Economics*, 47(2), 1998, 127-159.

Barclay, M.J., Dividends, taxes, and common stock prices: the ex-dividend day behavior of common stock prices before the income tax, *Journal of Financial Economics*, 19, 1987, 31-44.

Bartholdy, J. and Brown, K., Ex-dividend day pricing in New Zealand, *accounting and finance*, 39(2), 1999, 111-129.

Caballero, A., Ahmed, S. and Azhar, S., Risk evaluation using a fuzzy logic model, *WSEAS Transactions on Business and Economics*, 1(1), 2004, 18-23.

Callaghan, S.R. and Barry C.B., Tax-induced trading of equity securities: evidence from the ADR market, *The Journal of Finance*, 2003, 1583-1611.

Chay, J.B., Choi, D. and Pontiff, J., Market valuation of tax-timing options: evidence from capital gains distributions, *The Journal of Finance*, 61(2), 2006, 837-865.

Cyrus, T.L., I˙ Scan, T.B. and Starky, S., Investor protection and international investment positions: an empirical analysis, *International Finance*, 9(2), 2006, 197-221.

Dhaliwal, D.S., Erickson, M. and Trezevant, R., A test of the theory of tax clienteles for dividend policies, *National Tax Journal*, 52(2), 1999, 179-194.

Dhaliwal, D.S., Li, O.Z. and Trezevant, R., Is a dividend tax penalty incorporated into common stock return?, *Journal of Accounting and Economics*, 35(2), 2003, 155-178.

Dhaliwal, D. and Li, O.Z., Investor tax heterogeneity and ex-dividend day trading volume, *The Journal of Finance*, 61, 2006, 463-490.

Dubofsky, D.A., A market microstructure explanation of ex-day abnormal returns, *Financial Management*, 21(4), 1992, 32-43.

Eades, K.M., Hess, P.J. and Kim, E.H., On interpreting security returns during the ex-dividend period, *Journal of Financial Economics*, 13, 1984, 3-34.

Elton, E.J. and Gruber, M.J., Marginal stockholder tax rates and the clientele effect, *Review of Economics and Statistics*, 52, 1970, 68-74.

Elton, E.J., Gruber, M.J. and Blake, C.R., Marginal stockholder tax effects and ex-dividend day price behavior: evidence from taxable versus nontaxable closed funds, *Review of Economics and Statistics*, 87, 2005, 579-586.

Frank, M. and Jagannathan, R., Why do stock price drop by less than the value of the dividend?, Evidence from a country without taxes, *Journal of Financial Economics*, 47(2), 1998, 161-188.

Jakob, K. and Ma, T., Tick size, NYSE rule 118, and ex-dividend day stock price behavior, *Journal of Financial Economics*, 72(3), 2004, 605-623.

Jurun, E., Pivac, S. and Arnerić, J., Historical and prognostic risk measuring across stocks and markets, *WSEAS Transactions on Business and Economics*, 4(8), 2007, 126-134.

Kalay, A., The ex-dividend day behavior of stock prices: a re-examination of the clientele effect, *The Journal of Finance*, 37(4), 1982, 1059-1070.

Lakonsihok, J. and Vermaelen, T., Tax-induced trading around ex-dividend behavior, *Journal of Finance Economics*, 16(3), 1986, 287-319.

Lasfer, M.A., Ex-day behavior: tax or short-term trading effects, *The Journal of Finance*, 50(3), 1995, 875-897.

Lasfer, M.A., Taxes and dividend: the UK evidence, *Journal of Banking and Finance*, 20(3), 1996, 455-472.

McDonald, R.L., Cross-border investing with tax arbitrage: the case of German dividend tax credits, *The Review of Financial Studies*, 14(3), 2001, 617-646.

Michaely, R., Ex-dividend day stock price behavior: the case of the 1986 tax reform act, *The Journal of Finance*, 46(2), 1991, 845-859.

Michaely, R. and Vila, J.L., Investors heterogeneity, prices and volume around the ex-dividend day, *Journal of Financial Markets*, 3, 1995, 83-111.

Nagase, T., Scott, R., Yoshika, Y., Araki, T. and Nakamura, T., The risk and response implications of security and privacy in digital society: a four sector analysis, *WSEAS Transactions on Business and Economics*, 1(1), 2004, 139-142.

Poterba, J.M. and Summers, L.H., New evidence that taxes affect the valuation of dividends, *The Journal of Finance*, 39(3), 1984, 1397-1415.

Serra, A.P., The valuation impact of dual-listing on international exchanges: the case of emerging markets' stocks, *Emerging Markets Review*, 1, 2000, 127-151.

Shaw, W.H., An examination of ex-dividend day stock price movements: the case of nontaxable master limited partnership distributions, *The Journal of Finance*, 46(2), 1991, 755-771.