EVASION OF INTEREST WITHHOLDING TAX: EVIDENCE FROM TRADING VOLUMES IN AUSTRALIAN GOVERNMENT BONDS

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There is very little evidence on the evasion of interest withholding tax. We find such evidence by focussing on the 5 December 2009 abolition of interest withholding tax on foreign investors in Australian government bonds. Prior to this date, foreign investors had an incentive to evade the tax by selling bonds 'just prior to' ex-interest days and (possibly) reinvesting on or after the ex-interest day. This practice is referred to as 'coupon washing'. To detect the presence of coupon washing, we analyse daily trading volumes in Australian government bonds between 1998 and 2013. We find clear evidence of coupon washing in the period before the abolition of the tax. Evidence of coupon washing is much weaker after the abolition. We also find that abnormally high volumes are concentrated in high-coupon bonds, which further supports our findings, because high coupons provide a greater incentive for coupon washing than low coupons.

1. INTRODUCTION

Investors care about tax. Income taxes directly reduce the net returns that investors receive, while transaction taxes do so

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indirectly by increasing the cost of transacting. Many investors take steps to reduce their tax burden, which in turn may affect security prices and/or trading volumes. Some investors may take actions that are illegal but finding clear statistical evidence of these actions is relatively uncommon. Hence, the existence of such effects in security markets is frequently more a matter of belief and anecdote than of rigorous empirical evidence.

A major problem confronting research into tax evasion is that its illegal nature causes evaders to take care to hide evidence of their activities. As Chiarini, Manzano and Schneider ruefully note 'collecting unobservable variables is a difficult task'.[1] However, the Italian government has attempted to do so and has published estimates of VAT evasion in that country. Chiarini, Manzano and Schneider analyse these data to study, inter alia, the relation between tax rates and the occurrence of evasion. In similar vein, Hanlon, Maydew and Thornock observe that 'the effects of tax evasion—the illegal reduction of taxes—on financial decisions have gone largely unexplored'.[2] They analyse data on flows of foreign portfolio investment into US stocks and bonds from foreign tax havens and find that these flows increase when US tax rates on ordinary income and capital gains rise: the expected result if US investors decide to masquerade as foreign investors to benefit from the preferential tax treatment of foreign investors compared to domestic investors.

In this paper, we present evidence consistent with evasion of interest withholding tax applicable to non-resident investors in Australian government bonds. In particular, we provide statistical evidence consistent with trading volumes being affected by the

[1] Bruno Chiarini, Elisabetta Marzano and Friedrich Schneider, 'Tax Rates and Tax Evasion: An Empirical Analysis of the Long-run Aspects in Italy' (2013) 35 *European Journal of Law and Economics* 273, 276.
[2] Michelle Hanlon, Edward Maydew and Jacob Thornock, 'Taking the Long Way Home: US Tax Evasion and Offshore Investments in US Equity and Debt Markets' (2015) 70 *Journal of Finance* 257, 257.

tax prior to its abolition in 2009, and that this evidence is much weaker after the abolition.

Until 5 December 2009, non-resident investors in Australian government bonds were required to pay interest withholding tax of 10 per cent on coupon interest they received from their investments. Hence, these investors had an incentive to avoid the tax by selling 'just before' an ex-interest day. If an investor wished to maintain an investment in that particular bond, the same bond could be repurchased on or shortly after the ex-interest day. This procedure, often referred to as 'coupon washing', was illegal because it was a form of tax evasion. If an investor wished merely to evade interest withholding tax but not maintain an investment in that particular bond, the funds from the bond sale could be reinvested in other bond(s) or, indeed, in any other asset. This strategy also has the attraction of being more difficult for authorities to detect and easier for investors to defend if it is detected. We refer to the former as 'pure coupon washing' and the latter as 'modified coupon washing'. Hence, pure coupon washing is a special case of modified coupon washing. Dividend washing is a similar practice in the equity markets and researchers have considered its possible effects on stock prices and trading volumes around ex-dividend days. However, we know of no corresponding bond market study in any country.

Using event study methodology, we examine trading volume surrounding 404 ex-interest days for Australian government bonds in the period 8 January 1998 to 8 August 2013. We reach three main conclusions. First, consistent with both forms of coupon washing, positive abnormal trading volume is detected prior to ex-interest days in the period before the abolition of the tax. Abnormal volumes (in dollars) and standardised abnormal volumes are consistently positive, as are abnormal volumes measured in percentage terms, especially on days −5, −3, −1 and 0. Cumulative abnormal trading volume (in percentage terms) on ex-interest days exceeds 100 per cent—that is, more than double. There is no consistent pattern in the five-day period after the ex-

interest day. These findings suggest the presence of modified coupon washing.[3] Second, we find strong evidence in the pre-abolition period that the positive abnormal trading before the ex-interest day is concentrated in high-coupon bonds, which exhibit significantly higher abnormal volumes than low-coupon bonds. This finding is consistent with the hypothesis that positive abnormal trading volume should be greater on higher-coupon bonds because for these bonds coupon washing leads to the greatest savings of interest withholding tax. Third, we find that the trading effects are considerably weaker in the post-abolition period. This finding also supports the hypothesis that most of the abnormal patterns in trading volumes in the pre-abolition period were due to transactions designed to evade interest withholding tax.

2. LITERATURE REVIEW

2.1 Statistical Evidence on Evasion of Interest Withholding Tax

It is rare to find compelling statistical evidence of tax evasion. Because tax evasion is illegal, tax evaders are expected to take steps to disguise their activities. In addition, even when tax evasion occurs, it may not have a large enough impact on market data for its presence to be statistically discernible. As Jüttner and Carlsen pessimistically note, 'any attempt at measuring the extent of interest withholding tax avoidance is doomed to failure'.[4] Nevertheless, Jüttner and Carlsen report evidence that is consistent with widespread evasion of taxes on interest income.

[3] The positive abnormal volumes on Day 0 could be interpreted as evidence of pure coupon washing if the reversing trades are concentrated on the ex-interest day.

[4] Johannes Jüttner and Norman Carlsen (1998), 'Taxing International Capital Income: Interest Withholding Tax' (1998) 1 *Journal of Australian Taxation* 219 [225].

They point out that by definition the global level of interest paid abroad should equal the global level of interest received from abroad but in fact the *reported* interest paid far exceeds the *reported* interest received.

An article by Klautke and Weichenrieder[5] appears to be the only published empirical study of the evasion of a particular interest withholding tax. The European Union Savings Directive, introduced in 2003, imposed interest withholding tax on certain classes of bonds. However, exemptions were granted for various bonds that would otherwise have been caught by the tax. Klautke and Weichenrieder identified 69 pairs of bonds in which one bond was almost identical to the other bond, except that one was exempt from the tax while the other was not. They argue that if tax evaders are the marginal traders of bonds, then the tax-exempt bonds should trade at a higher price (and hence a lower yield) than the matching taxable bonds. They found that, empirically, there was very little difference between the paired returns and consequently they suggest that 'the supply of existing loopholes (exempt bonds included) is large enough to allow tax evaders to continue evasion at negligible additional cost'.[6]

The Klautke and Weichenrieder study provides very useful evidence but has two limitations. First, Klautke and Weichenrieder assume that tax evaders are the marginal investors in bonds but they provide no evidence to support this assumption. An alternative assumption is that tax-exempt investors are the marginal investors in both tax-exempt bonds and taxable bonds. In that case, their evidence cannot be interpreted as evidence of tax evasion. Second, their conclusion is based on their inability to reject the null hypothesis that the savings directive does not affect

[5] Tina Klautke and Alfons Weichenrieder, 'Interest Income Tax Evasion, the EU Savings Directive and Capital Market Effects' (2010) 31 *Fiscal Studies* 151.
[6] Ibid 165.

returns. Presumably, with a large enough sample, the null could be rejected.

2.2 The Legal Status of Coupon Washing in Australia

The *Income Tax Assessment Act 1936* (Cth) was amended in 1997 specifically to outlaw coupon washing by inserting s 128A(1AB) which broadened the definition of 'interest' to include any amount 'to the extent that it could reasonably be regarded as having been received in exchange for interest in connection with a washing arrangement'. In turn, a 'washing arrangement' was defined to be 'an arrangement under which the title to a security is transferred [from a non-resident] to a resident shortly before an interest payment is made where the sole or dominant purpose of the arrangement is to reduce the amount of withholding tax payable'. Hence, on a literal reading, modified coupon washing became a form of tax evasion. Simultaneous amendments were made to broaden the general anti-avoidance provisions (Part IVA) to include interest withholding tax. These provisions applied throughout our sample period.[7]

[7] It has been suggested that a literal reading may not be warranted because the example of a washing arrangement given in the supplementary memorandum accompanying the Act is an example of pure coupon washing; see Emanuel Hoiu, 'Withholding Tax Developments are of Real Interest' (1998) 1 *Journal of Australian Taxation* 180. However, Hiou suggests that modified coupon washing would be caught by the expanded pt IVA. In Taxation Determination 2014/10 'Income tax: can section 177EA of the *Income Tax Assessment Act 1936* apply to a "dividend washing" scheme of the type described in this Taxation Determination?', the Australian Taxation Office stated that in its view pt IVA will generally apply to dividend washing schemes.

2.3 Tax-induced Trading around Ex Dates

Studies by Constantinides and Ingersoll[8] and Ehrhardt, Jordan and Prisman[9] suggest that tax can be an important influence on the trading behaviour of bond investors. The tax considerations mentioned by Constantinides and Ingersoll include capital loss realisation, capital gain deferment, change of investor status from long-term to short-term by sale and repurchase of a bond and deducting the amortised premium from ordinary income. They generate a sample of simulated bond prices under the assumption of optimal trading policies with known tax rates and yield curves and conclude that the tax timing option is an important part of the bond price. Ehrhardt, Jordan and Prisman suggest that the existence of tax clienteles may also contribute to the difference between the price of a bond and its present value. They find clear evidence supporting the existence of a tax timing option but cannot rule out the existence of tax clienteles.

Dividends on equities and coupons on bonds are taxable distributions. In equity markets, 'dividend washing' is a form of tax minimisation, while in bond markets, 'coupon washing' is a similar practice. Both practices have the potential to affect trading volumes in predictable ways but the empirical evidence is limited to the equity markets. Many aspects of the equity market literature are transferable to the bond market and therefore the equity market literature provides an important background for the present study.

[8] George Constantinides and Jonathan Ingersoll, 'Optimal Bond Trading with Personal Taxes' (1984) 13 *Journal of Financial Economics* 299.
[9] Michael Ehrhardt, James Jordan and Eliezer Prisman, 'Tests for Tax-clientele and Tax-option Effects in US Treasury Bonds' (1995) 19 *Journal of Banking and Finance* 1055.

Michaely and Vila[10] analyse US stock market behaviour around ex-dividend days. The stocks in their sample are listed on the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX) between January 1963 and December 1991. They test the interaction between investors' heterogeneity, risk, transaction costs and trading volume. Since different people are taxed at different rates, differences in asset valuation are generated. Thus, tax-induced trading will occur around the ex-dividend day. They report three main findings. First, variations in the abnormal trading volume around the ex-dividend day are positively correlated with the degree of tax heterogeneity. Second, the volume of trading and a stock's dividend yield are positively correlated. Third, trading activity and transaction costs are negatively correlated. In addition, Michaely and Vila draw an important policy implication. They show that the amount of tax-induced trading is significant and generates a deadweight loss created by the cost of trading the tax shield and the risk involved in the transactions. They conclude that this loss may be of concern to governments.

Michaely and Murgia[11] study the effect of taxation on trading on the Italian stock market around ex-dividend days. They assume that dividends are more heavily taxed than capital gains; hence, holding all else constant, a higher dividend yield should generate a higher pre-tax return. In Italy, stocks are classified as either 'savings stocks' or 'common stocks' and different tax arrangements apply to these different classes of stocks. They find that the homogeneous tax rate applied to dividends on savings stocks results in no abnormal trading volume around the ex-

[10] Roni Michaely and Jean-Luc Vila, 'Trading Volume with Private Valuations: Evidence from the Ex-dividend Day' (1996) 9 *Review of Financial Studies* 471.

[11] Roni Michaely and Maurizio Murgia, 'The Effect of Tax Heterogeneity on Prices and Volume around the Ex-dividend Day: Evidence from the Milan Stock Exchange' (1995) 8 *Review of Financial Studies* 369.

dividend day. In contrast, common stock dividends are taxed at various rates for different investors. Similar to the result found by Michaely and Vila, Michaely and Murgia find that the tax heterogeneity affecting common stocks induces an abnormally high volume of trading before ex-dividend days. Moreover, the trading volume around the ex-dividend day is also affected by transaction costs: stocks that can be traded with lower transaction costs stocks exhibit more tax-induced trading.

Lakonishok and Vermaelen[12] study trading volume of 2300 NYSE and AMEX stocks around ex-dividend days during the period from 1970 to 1981. This time period precedes the *Tax Reform Act 1986*, which eliminated some short-selling tax benefits and forbade some tax-effective hedging strategies. As expected, tax-related short-term trading is found to be important. There is a significantly abnormal increase in trading volume both before and after ex-dividend days. This tax-induced trading volume effect is more pronounced for high-yield, actively traded stocks, especially in the period after brokerage commissions became negotiable. On average, the cumulative trading volume is 30 per cent above the normal daily trading volume in the five days around the ex-dividend day. For high-yield and actively traded stocks, the corresponding measure is 65 per cent.

2.4 Event Study Methodology

In this paper we use event study methodology[13] to study trading volumes. Unlike Klautke and Weichenrieder, this methodology does not require us to assume that tax evaders are the marginal traders. Moreover, our conclusions are based on rejection of the null, rather than failure to reject the null. We use

[12] Josef Lakonishok and Theo Vermaelen, 'Tax-induced Trading around Ex-dividend Days' (1986) 16 *Journal of Financial Economics* 287.

[13] For a full discussion of event study methodology, including coverage of statistical issues, see, eg, John Y Campbell, Andrew W Lo and A Craig MacKinlay, *The Econometrics of Financial Markets* (Princeton University Press, 1996) ch 4.

both parametric and non-parametric tests. The parametric tests are summarised in two papers by Brown and Warner,[14] who compare tests with and without crude dependence adjustment.[15] The non-parametric test used is the rank test developed by Corrado.[16]

Brown and Warner[17] employ various event study methodologies on observed monthly stock return data to investigate abnormal stock price performance around firm-specific events. They conclude that, relative to more complicated methods, a simple, one-factor market model is both well-specified and relatively powerful under a range of conditions. They also argue that without considering the asymmetric distribution of security-specific performance measures, certain non-parametric tests, such as the Wilcoxon and sign tests, will deliver an incorrect number of rejections. In an extension, Brown and Warner[18] examine characteristics of daily stock returns. After testing how the properties of daily data affect event study methodology, they find that it is useful to recognise autocorrelation in daily excess returns. As in their earlier study, they find that standard parametric tests perform well. Among parametric tests, those tests assuming cross-sectional independence might have greater power than tests allowing for cross-sectional dependence.

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[14] Stephen Brown and Jerrold Warner, 'Measuring Security Price Performance' (1980), 8 *Journal of Financial Economics* 205; Stephen Brown and Jerrold Warner, 'Using Daily Stock Returns: The Case of Event Studies' (1985) 14 *Journal of Financial Economics* 3.

[15] 'Crude dependence adjustment' is defined as a procedure in which cross-sectional dependence in the security-specific performance measures is taken into account.

[16] Charles Corrado, 'A Non-parametric Test for Abnormal Security Price Performance in Event Studies' (1989), 23 *Journal of Financial Economics* 385.

[17] Brown and Warner, 'Measuring Security Price Performance', above n 14.

[18] Brown and Warner, 'Using Daily Stock Returns', above n 14.

Lakonishok and Vermaelen[19] define the ex-dividend date of a given stock as the event day. For each event date, the event window is the period of eleven days beginning five days before the ex-dividend date and ending five days after the ex-dividend date. Abnormal trading volume is calculated on each of the days in the event window. The normal trading volume on each ex-dividend day is estimated as the average daily volume using a 40-day period starting 64 days before the ex-dividend date and ending 25 days before the ex-dividend date. As a robustness check, this procedure is repeated for three sample periods: the total observation period and two sub-periods.[20]

Ajinkya and Jain[21] provide additional insights into the analysis of trading volume in an event study setting. In determining abnormal trading volume, they examine the distributional properties of daily trading volume of common stocks listed on the New York Stock Exchange. They find that raw trading volume for the NYSE is non-normally distributed. This finding raises further concerns about the appropriateness of parametric tests in an event study using trading volume.

Campbell and Wasley[22] make two main contributions. The first is that they not only study the daily trading volume of NYSE/ASE securities (as in prior research), but also test the empirical characteristics of NASDAQ volume. By comparing these two data sets, they find that their test has greater power to

[19] Lakonishok and Vermaelen, above n 12.

[20] Lakonishok and Vermaelen also use a variant of this methodology in which all stocks that share an ex-dividend day (in calendar time) are treated as a single event. The results are almost identical to those found using the methodology described above.

[21] Bipin Ajinkya and Prem Jain, 'The Behavior of Daily Stock Market Trading Volume' (1989) 11 *Journal of Accounting and Economics* 331.

[22] Cynthia Campbell and Charles Wasley, 'Measuring Abnormal Daily Trading Volume for Samples of NYSE/ASE and NASDAQ Securities Using Parametric and Nonparametric Test Statistics' (1996) 6 *Review of Quantitative Finance and Accounting* 309.

detect abnormal volume in NASDAQ securities than in NYSE securities. Their second contribution is the more important. They employ non-parametric tests to examine abnormal trading volume and compare these tests with parametric tests previously used by Ajinkya and Jain.[23] They conclude that non-parametric tests have two advantages over parametric tests. The first is that, unlike parametric tests, non-parametric tests do not require a normal distribution assumption under the null hypothesis. The second is that, in detecting abnormal trading volume, non-parametric tests are more powerful compared to their counterpart parametric tests. Since the results apply to both NYSE/ASE and NASDAQ securities, Campbell and Wasley suggest that non-parametric tests should be used in future trading volume studies.

Corrado[24] examines the specification and power of event study tests and develops a non-parametric test called the 'rank test for abnormal security-price performance'. This test is preferred to the parametric *t*-test for a broad spectrum of fat-tailed security-return distributions. Even where deviations from normality are not obvious, Corrado finds that the rank test is still superior to the parametric tests in terms of improved specification under the null hypothesis and more power under the alternative hypothesis. He finds that the superiority of the rank test is greater for highly non-normal distributions but the superiority diminishes with longer return intervals. However, under perfect conditions for the parametric *t*-test, the rank test is (unsurprisingly) inferior to the parametric *t*-test. Therefore, neither test has an absolute advantage over the other, so the choice depends in part on the characteristics of the data. Corrado compares the performance of the rank test with that of the non-standardised *t*-test and the standardised *t*-test.[25] Moreover, compared with other non-

[23] Ajinkya and Jain, above n 22.

[24] Corrado, above n 17.

[25] In the tests reported below, we follow Corrado and use all three tests.

parametric tests, the rank test is correctly specified even if the distribution of the cross-sectional excess returns is asymmetric.

3. HYPOTHESES

The wholesale government bond market in Australia is a highly liquid market that is dominated by banks and other 'professional investors', who hold bonds as trading stock, and hence are taxed at the same rate on both capital gains and coupons. Consequently, income tax does not give traders an incentive to engage in coupon washing. Until 5 December 2009, foreign investors (but not domestic investors) were also required to pay interest withholding tax on their coupon income. This tax did provide foreign investors with an incentive to engage in coupon washing.

On 21 August 2009, in a joint press release, the Treasurer and the Assistant Treasurer of Australia announced that the government was preparing legislation that would exempt non-resident investors in Commonwealth Government Securities ('government bonds') from interest withholding tax. The release stated that the abolition of the tax would eliminate a major difference in the tax treatment of domestic and foreign investors in Australian government bonds, would bring Australian practice into line with most other countries, including the US and the UK, and would bring the treatment of Australian government bonds into line with those issued by State governments and the private sector. The exemption would apply from the day after the legislation received Royal Assent. The relevant legislation[26] received Royal Assent on 4 December 2009 and hence interest withholding tax was no longer payable on interest received on or

[26] *Tax Laws Amendment (2009 Measures No. 5) Act 2009* (Cth).

after 5 December 2009.[27] With the abolition, a major incentive for foreign investors to engage in coupon washing was removed.

3.1 Hypothesis 1

If the amount of coupon washing undertaken by foreign investors was sufficiently large, it may be statistically detectable in trading volume data. Hypothesis 1 is therefore:

> If modified coupon washing has a significant effect on trading volumes, then in the pre-abolition period, positive abnormal trading volume should be observed 'just prior to' ex-interest days.

Hypotheses 2, 3 and 4 are contingent on Hypothesis 1 being supported by the data.

3.2 Hypothesis 2

In the pure form of coupon washing, bond investors repurchase the same bond after the ex-interest day. Risk-averse investors seeking to minimise interest rate risk have an incentive to minimise the period between the sale and repurchase of the bond, which implies that trading will be concentrated immediately before and immediately on and after the ex-interest date. In the modified form of coupon washing, bond investors do not reinvest in the same bond and instead use the funds in some other way. Trading will be concentrated in the period before the ex-interest date but there is no strong incentive to minimise the time period between the sale and the ex-interest date. Increased trading may be observed for some days prior to the ex-interest date. The advantage of pure coupon washing is that investors are able to maintain their previous investment choice. The advantages of modified coupon washing are that the activity is more difficult

[27] Hence, in this study we define the abolition date to be 5 December 2009.

to detect and probably easier to defend if an accusation is made. Hypothesis 2 is:

> If a significant proportion of coupon washing is of the pure form, then in the pre-abolition period, positive abnormal trading volume should be observed 'just before', on and 'just after' ex-interest days.

3.3 Hypothesis 3

Other things being equal, a higher coupon rate implies higher coupon payments, which in turn implies that a greater amount of interest withholding tax is payable.[28] Hypothesis 3 is:

> Positive abnormal trading volume should be greater on higher-coupon bonds than on lower-coupon bonds.

3.4 Hypothesis 4

If coupon washing occurred in response to the interest withholding tax, then evidence consistent with coupon washing should be weaker[29] after the abolition of the tax on 5 December 2009. Hypothesis 4 is:

> Evidence of coupon washing should be weaker in the post-abolition period.

[28] This hypothesis corresponds to the dividend yield effect found in equity markets. Note that, unlike the equity market studies, we do not propose any hypothesis related to transaction costs because the marginal transaction costs of professional bond investors in Australia are extremely small.

[29] The evidence should be weaker (rather than non-existent) if there are other motives to engage in coupon washing. For example, if foreign governments tax foreign investors in Australian bonds, those taxes could create incentives to trade around ex-interest days.

4. METHODOLOGY

4.1 Event Study Design

The design of our event study largely follows that of Lakonishok and Vermaelen.[30] In addition, we also use the non-parametric tests developed by Corrado.[31] Trading volume is defined as the market value of bonds traded and comprises two parts: the number of bonds traded and the price of each bond traded. We identified the ex-interest days for all Australian government bonds traded in the period from 8 January 1998 to 8 August 2013.[32] This provided a sample of 404 events (ex-interest days) for 37 bond series. Of these events, 290 occur before the abolition of interest withholding tax on 5 December 2009, and 114 occur after the abolition of the tax. Tests of Hypotheses 1, 2 and 3 are based on the pre-abolition sample, with the post-abolition sample being used in the test of Hypothesis 4. The ex-interest date is denoted Day 0. The event window is a 10-day period, beginning five trading days before the ex-interest date and ending four trading days after the ex-interest date.[33] For every event, an estimate of abnormal daily trading volume is required for each day in the event window. 'Normal' daily trading volume is the average daily trading volume in the estimation period, which is the 20-trading-day period beginning 25 trading days

[30] Lakonoshik and Vermaelen, above n 12.

[31] Corrado, above n 17.

[32] The Reserve Bank ceased publishing the data in September 2013.

[33] Lakonishok and Vermaelen, above n 12, use an 11-day event window, comprising the five days before Day 0, Day 0 itself and the five days following Day 0. This is a logical choice when, as in many event studies, a reaction is expected on Day 0 but not before Day 0 or after Day 0. In the present case, bonds begin trading on an ex-interest basis from the start of trading on Day 0, and the hypotheses concern volumes before and after the instant at which ex-interest trading begins. Therefore, we define the pre-event period as the five days from Day -5 to Day -1 (inclusive) and the post-event period as the five days from Day 0 to Day +4 (inclusive).

before the ex-interest date and ending six trading days before the ex-interest date. Abnormal daily trading volume is the difference between the actual daily trading volume and normal daily trading volume as defined above. The average abnormal volume on any given day in the event window is defined as the mean of the abnormal volumes for that day, across the number of events. These averages are then cumulated across event time.

The test of Hypothesis 1 is whether the average abnormal volume is significantly positive in the 5 pre-event trading days of the event window. The test of Hypothesis 2 is whether the average abnormal volume is also significantly positive on and/or after the event day.

4.2 Test Statistics under the Null Hypothesis

We use both parametric and non-parametric tests. In the parametric tests, for each of the 10 days in the event window (Day −5 to Day +4), the average abnormal trading volumes across 404 events are calculated and tested for statistical significance. Under the null hypothesis, the *t*-test assesses whether the average abnormal trading volume is equal to zero.[34] The *t*-tests take into account cross-sectional dependence through a procedure known as crude dependence adjustment.[35] The standard deviation of the average trading volume measure during the estimation period (Day −25 to Day −6) is treated as an estimate of the volatility of abnormal trading volume in the event window. The test statistic is the average abnormal trading volume divided by its standard deviation. If the average abnormal trading volume for each day in the event period is normal, independent, and identically distributed, then under the null hypothesis it is distributed Student-*t* with 403 degrees of freedom. Parametric tests are conducted in both non-standardised and standardised form. In the

[34] In the standardised method, average standardised abnormal trading volume is calculated instead of the average trading volume.
[35] See Brown and Warner, 'Using Daily Stock Returns', above n 14.

former, abnormal trading volumes are used, whereas in the latter, abnormal trading volumes are first standardised by dividing by an estimate of the standard deviation.

Parametric tests rely on assumptions regarding the distribution of the variable to be tested. In the returns literature, parametric tests tend to over-reject the test for positive abnormal performance and under-reject the test for negative abnormal performance. Less is known about the distribution of trading volume but caution suggests that a non-parametric test should also be used.[36]

4.3 Coupon Size Effect (Hypothesis 3)

Higher dividend yields are associated with stronger evidence of dividend washing.[37] In principle, a similar argument applies to coupon interest rates and we therefore test whether the coupon rate is positively related to abnormal trading activity. We divide the sample of pre-abolition events into two categories (high coupon and low coupon). Two methods are used to conduct this categorisation—the simple ranking method and the clustered ranking method.

4.3.1 Simple ranking method

First, we rank the 290 pre-abolition events according to their coupon rates and identify the median coupon rate. The low-coupon group consists of all bonds whose coupon rate is less than or equal to the median; the remainder are classified as high-coupon bonds. We then conduct the tests outlined above.

4.3.2 Clustered ranking method

During the sample period, the coupon rate on Australian government bonds exhibits a decreasing trend through time.

[36] We use the test developed in Corrado, above n 16.
[37] Lakonishok and Vermaelen, above n 12.

Therefore, on average, the later in the sample period a bond is issued by the Australian government, the lower the coupon rate. Hence, the simple ranking method might suffer from a time-clustering effect. To deal with this issue, we first rank the 290 pre-abolition events based on their ex-interest dates, so that events with the same or very close ex-interest dates are clustered together. Next, we divide the events into deciles. Within each decile we rank the coupon rates and identify the median coupon rate. Within each decile, the low-coupon group consists of all bonds whose coupon rate is less than or equal to the median; the remainder are classified as high-coupon bonds. Finally, the sample-wide group of low- (high-) coupon bonds consists of the low- (high-) coupon bonds identified within each decile.[38] A paired *t*-test (one-tailed) is used to test whether high-coupon bonds exhibit higher abnormal trading volume compared to low-coupon bonds.

5. DATA

The data source is the Reserve Bank of Australia. The main data required are the daily turnover of Commonwealth Government Securities ('bonds') from December 1998 to August 2013. In total, there were 37 government bond series on issue during this period. The coupon rates and maturity dates of these bonds are also obtained from the Reserve Bank of Australia. For any given bond series, there are two coupon payment dates each year, six calendar months apart.[39] The ex-interest date is seven

[38] Using the event number as a proxy for time, the mean difference between the low- and high-coupon groups' event numbers is 76.8 (prob 0 per cent) using the simple method but only 3.3 (prob = 38 per cent) using the clustered method.

[39] For example, the 12.00 per cent July 1999 bond series had coupon payment dates on 15 January and 15 July every year. The coupon payment dates for all bonds in the pre-abolition period were the 15th of the relevant months. For some bonds in the post-abolition period the payment dates were the 21st of the relevant months.

calendar days before the coupon payment date. In Australia, government bonds trade in the wholesale market on all days except Saturdays, Sundays and days that are public holidays in both Sydney and Melbourne. However, bond trading is heavily concentrated in Sydney, and trading volume is extremely low on days that are public holidays in Sydney but not in Melbourne. These days were excluded from the study.

The data set is divided into two sub-periods: pre-abolition (trading days on or before Friday 4 December 2009), and post-abolition (trading days on and after Monday 7 December 2009). The sample consists of 404 events (ex-interest dates), of which 290 occur in the pre-abolition period and 114 occur in the post-abolition period.

6. RESULTS

6.1 Results for Hypotheses 1 and 2

6.1.1 Parametric t-test: non-standardised procedure

Table 1 shows the results for the average abnormal trading volume around ex-interest days in the pre-abolition period. Abnormal trading volume is shown in both absolute dollar terms and percentage terms.

TABLE 1

Average abnormal daily trading volume in the five days prior to ex-interest days and the five days on and after ex-interest days, for the pre-abolition period; parametric test

Day	Average AV ($)	*t*-stat	Average AV (%)	*t*-stat
–5	34.05	0.86	21.24%	2.48
–4	15.87	0.40	10.91%	1.28
–3	43.40	1.10	17.98%	2.10
–2	2.21	0.06	13.44%	1.57
–1	57.83	1.47	29.24%	3.42
0	18.52	0.47	20.14%	2.36
1	–17.21	–0.44	–1.47%	–0.17
2	–27.44	–0.70	–1.68%	–0.20
3	–15.63	–0.40	–2.04%	–0.24
4	4.35	0.11	8.65%	1.01

Notes: AV ($) is the average of the abnormal trading volumes in millions of dollars; AV (%) is the average of the percentage abnormal trading volumes, each of which is the ratio of abnormal trading volume to normal trading volume, expressed as a percentage. The results are based on the 290 events in the pre-abolition period.

As shown in Table 1, in the pre-abolition period, abnormal trading volume in dollar terms is positive on each of the five days prior to ex-interest days, although none of these is individually significant.[40] When abnormal volume is assessed in percentage terms, the findings are considerably stronger. Abnormal volume is positive on each of the five days prior to the ex-interest day, of which days –5, –3 and –1 are statistically significant. These results are consistent with modified coupon washing. Abnormal volume is also significantly positive on the ex-interest day, which

[40] We note, however, that if the probability of observing positive abnormal volume on any given day is 0.5, then the probability of observing five consecutive positives is about 3.1 per cent. Further, because the data set is long and trading conditions varied, dollar values have low power as a statistical test.

is consistent with pure coupon washing if the re-investment takes place immediately in order to reduce interest rate risk.

The corresponding cumulative abnormal volumes are shown in Table 2.

TABLE 2

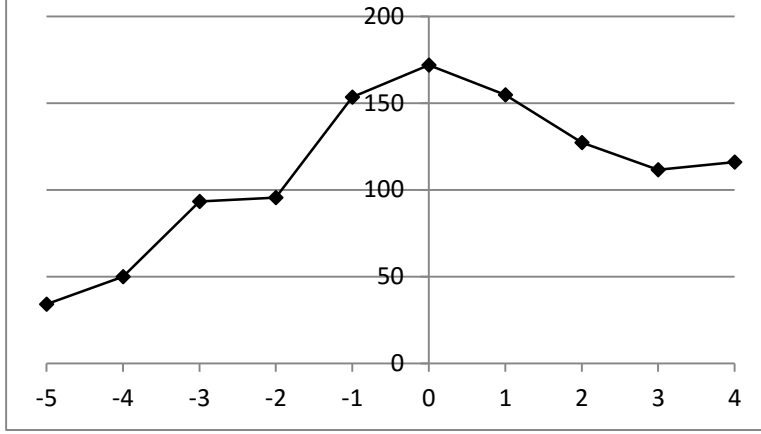
Cumulative average abnormal daily trading starting five days prior to ex-interest days and the five days on and after ex-interest days, for the pre-abolition period

Day	CAV ($)	CAV (%)
–5	34.05	21.24%
–4	49.93	32.15%
–3	93.32	50.13%
–2	95.54	63.57%
–1	153.36	92.81%
0	171.88	112.94%
1	154.67	111.47%
2	127.23	109.79%
3	111.61	107.75%
4	115.95	116.40%

Notes: CAV ($) is the cumulative average abnormal trading volume in dollars; CAV (%) is the cumulative average percentage abnormal trading volume. The results are based on the 290 events in the pre-abolition period.

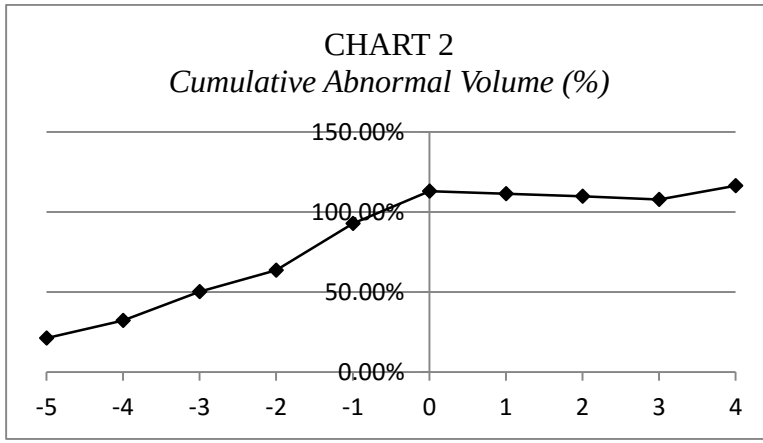
These results are plotted in Charts 1 and 2.

CHART 1
Cumulative abnormal volume ($)



As shown in Chart 1, cumulative abnormal volume in dollar terms grows steadily until Day 0 and then falls away.

CHART 2
Cumulative Abnormal Volume (%)



In percentage terms, abnormal volume grows steadily until Day 0, when it reaches a level more than 100 per cent

above normal. It then levels off in the post-event period. This pattern is consistent with modified coupon washing.

6.1.2 Parametric t-test: standardised procedure

Table 3 shows the results for the average abnormal trading volume around ex-interest days in the pre-abolition period using the standardised procedure.

TABLE 3

Average standardised abnormal daily trading starting five days prior to ex-interest days and the five days on and after ex-interest days, for the pre-abolition period; parametric test

Day	SAV ($)	*t*-stat
–5	0.13	0.96
–4	0.12	0.91
–3	0.27	1.95
–2	0.01	0.04
–1	0.21	1.50
0	0.08	0.58
1	–0.01	–0.06
2	–0.01	–0.09
3	0.03	0.21
4	0.10	0.74

Notes: SAV ($) is the average standardised abnormal trading volume in millions of dollars. The results are based on the 290 events in the pre-abolition period.

As expected, these results are similar to those shown in Table 1 for abnormal dollar values using the non-standardised procedure: abnormal volume is positive on each of the days from Day –5 to Day 0, although only one is significant at the 10 per cent level.

6.1.3 Non-parametric test

Table 4 shows the results using the non-parametric test. In this table, negative values indicate a lower-numbered rank, which corresponds to a higher volume of trading.

TABLE 4

Standardised average abnormal daily trading volume in the five days prior to ex-interest days and the five days on and after ex-interest days, for the pre-abolition period; non-parametric test

Day	Rank Statistic
–5	–0.41
–4	–0.07
–3	–1.26
–2	–0.02
–1	–1.53
0	–0.08
1	0.62
2	0.90
3	1.15
4	0.34

Notes: AV ($) is the average of the abnormal trading volumes in millions of dollars; the results are based on the 290 events in the pre-abolition period. Note that, because none of the standardisations affect the ranks, only the variances, only one non-parametric test is required.

These results are consistent with those shown in Tables 1 and 3: high volumes prior to, and on, the ex-interest day but no individual results are significant.

6.2 Results for Hypothesis 3

Table 5 compares abnormal volumes for low-coupon bonds and high-coupon bonds. Hypothesis 3 suggests that high-coupon bonds should exhibit greater abnormal volumes than low-coupon bonds. Panel A of the table defines ‘high’ and ‘low’ coupon bonds

using a simple ranking method that is subject to a time clustering problem. Panel B uses a clustering approach to mitigate this problem. Hence, we expect the results in Panel B to be more reliable than those in Panel A.

TABLE 5

Abnormal daily trading volume in the five days prior to ex-interest days and the five days on and after ex-interest days, for high-coupon and low-coupon bonds in the pre-abolition period

Day	High-coupon bonds		Low-coupon bonds		High – Low	
	Average AV ($)	*t*-stat	Average AV ($)	*t*-stat	Average AV ($)	*t*-stat
Panel A: Simple ranking method						
–5	4.59	0.13	57.33	1.04	–52.74	–9.92
–4	26.16	0.75	7.75	0.14	18.41	3.46
–3	35.30	1.01	49.80	0.91	–14.50	–2.73
–2	33.50	0.95	–22.51	–0.41	56.01	10.53
–1	88.83	2.53	33.33	0.61	55.51	10.44
0	60.56	1.73	–14.70	–0.27	75.25	14.15
1	12.81	0.37	–40.93	–0.74	53.74	10.11
2	3.36	0.10	–51.77	–0.94	55.12	10.37
3	–41.70	–1.19	4.98	0.09	–46.68	–8.78
4	17.34	0.49	–5.92	–0.11	23.26	4.37
Panel B: Clustered ranking method						
–5	38.72	1.32	29.94	0.57	8.78	1.78
–4	44.94	1.54	–9.80	–0.19	54.74	11.07
–3	45.54	1.56	41.50	0.78	4.04	0.82
–2	32.39	1.11	–24.45	–0.46	56.84	11.50
–1	89.83	3.07	29.56	0.56	60.27	12.19
0	–5.97	–0.20	40.14	0.76	46.11	–9.33
1	–4.06	–0.14	–28.83	–0.55	24.77	5.01
2	–37.37	–1.28	–18.66	–0.35	–18.71	–3.78
3	–52.04	–1.78	16.53	0.31	–68.57	–13.87
4	–6.95	–0.24	14.33	0.27	–21.28	–4.30

Notes: AV ($) is the average of the abnormal trading volumes in millions of dollars. The results are based on the 290 events in the pre-abolition period. Using the simple (clustered) ranking method, 128 (136) are classified as relating to high-coupon bonds and 162 (154) are classified as relating to low-coupon bonds.

In both panels, prior to the ex-interest day, high-coupon bonds exhibit abnormally high volumes, especially on the day before the ex-interest day. In contrast, there is no consistent

pattern for low-coupon bonds. The results for the difference between abnormal volumes between high- and low-coupon bonds are remarkably strong. Using the clustered method, high-coupon bonds exhibit significantly higher volume than low-coupon bonds before the ex-interest day and (in most cases) significantly lower volumes on and after the ex-interest day. These findings support Hypothesis 3.

We repeat this analysis using percentage abnormal volumes (reported in Table 6) and standardised abnormal volumes (reported in Table 7).

TABLE 6

Abnormal daily trading volume in the five days prior to ex-interest days and the five days on and after ex-interest days, for high-coupon and low-coupon bonds in the pre-abolition period

Day	High-coupon bonds		Low-coupon bonds		High – Low	
	Average AV (%)	*t*-stat	Average AV (%)	*t*-stat	Average AV (%)	*t*-stat
Panel A: Simple ranking method						
–5	27.06%	2.93	16.64%	1.39	10.42%	8.38
–4	12.34%	1.34	9.78%	0.82	2.56%	2.06
–3	17.91%	1.94	18.03%	1.51	–0.12%	–0.10
–2	28.62%	3.10	1.45%	0.12	27.17%	21.85
–1	48.68%	5.28	13.87%	1.16	34.81%	27.99
0	42.72%	4.63	2.29%	0.19	40.42%	32.51
1	3.35%	0.36	–5.28%	–0.44	8.63%	6.94
2	4.09%	0.44	–6.24%	–0.52	10.33%	8.31
3	–6.92%	–0.75	1.81%	0.15	–8.74%	–7.03
4	9.64%	1.04	7.86%	0.66	1.78%	1.43
Panel B: Clustered ranking method						
–5	29.67%	3.39	13.79%	1.31	15.88%	14.03
–4	20.61%	2.35	2.35%	0.22	18.26%	16.13
–3	23.31%	2.66	13.26%	1.26	10.05%	8.88
–2	29.73%	3.39	–0.95%	–0.09	30.68%	27.10
–1	49.03%	5.59	11.76%	1.12	37.27%	32.91
0	23.15%	2.64	17.47%	1.66	5.68%	5.01
1	0.03%	0.00	–2.79%	–0.27	2.82%	2.49
2	–4.52%	–0.52	0.83%	0.08	–5.34%	–4.72
3	–10.93%	–1.25	5.80%	0.55	–16.73%	–14.77
4	4.17%	0.48	12.60%	1.20	–8.43%	–7.44

Notes: AV (%) is the average of the percentage abnormal trading volumes, each of which is the ratio of abnormal trading volume to normal trading volume, expressed as a percentage. The results are based on the 290 events in the pre-abolition period. Using the simple (clustered) ranking method, 128 (136) are classified as relating to high-coupon bonds and 162 (154) are classified as relating to low-coupon bonds.

The results shown in Table 6 are consistent with, and generally stronger than, the results shown in Table 5. Prior to the ex-interest day, the percentage volume is high, especially for high-coupon bonds, and differences between high- and low-coupon bonds are highly significant. This pattern persists until about Day 2, after which high-coupon volumes are significantly lower than low-coupon bonds.

TABLE 7

Standardised abnormal daily trading volume in the five days prior to ex-interest days and the five days on and after ex-interest days, for high-coupon and low-coupon bonds in the pre-abolition period

Day	High-coupon bonds SAV ($)	Low-coupon bonds SAV ($)	High – Low SAV ($)	*t*-stat
Panel A: Simple ranking method				
–5	0.200	0.210	–0.011	–0.24
–4	0.115	0.097	0.018	0.41
–3	0.201	0.246	–0.046	–1.02
–2	0.280	–0.021	0.301	6.73
–1	0.495	0.183	0.312	6.97
0	0.413	0.018	0.395	8.83
1	0.066	–0.080	0.146	3.26
2	0.051	–0.103	0.154	3.45
3	–0.115	0.069	–0.185	–4.13
4	0.148	0.054	0.093	2.08
Panel B: Clustered ranking method				
–5	0.276	0.143	0.133	3.16
–4	0.216	0.006	0.210	4.99
–3	0.262	0.195	0.066	1.58
–2	0.287	–0.042	0.330	7.83
–1	0.494	0.167	0.327	7.76
0	0.138	0.241	–0.103	–2.45
1	0.019	–0.046	0.065	1.54
2	–0.061	–0.012	–0.048	–1.15
3	–0.155	0.114	–0.269	–6.38
4	0.054	0.132	–0.079	–1.86

Notes: SAV ($) is the average standardised abnormal trading volume in millions of dollars. The results are based on the 290 events in the pre-abolition period. Using the simple (clustered) ranking method, 128 (136) are classified as relating to high-coupon bonds and 162 (154) are classified as relating to low-coupon bonds.

The results shown in Table 7 are broadly consistent with those shown in Tables 5 and 6. High-coupon bonds exhibit greater abnormal volumes prior to ex-interest dates. Evidence for the period beginning on the ex-interest date is, however, mixed, with some inconsistent results for this period, depending on the ranking method used.

Taken together, the results presented in Tables 5, 6 and 7 provide strong evidence that in the period prior to the ex-interest date, trading volumes for high-coupon bonds significantly exceed those of low-coupon bonds. This result supports Hypothesis 3 and is consistent with the modified form of coupon washing. Results for the period on and after the ex-interest date are inconsistent, with some tests suggesting that this difference persists into the later period while others do not support this conclusion.

6.3 Results for Hypothesis 4

Corresponding results for the post-abolition period are shown in Table 8.

TABLE 8

Average abnormal daily trading volume in the five days prior to ex-interest days and the five days on and after ex-interest days, for the post-abolition period; parametric test

Day	Average AV ($)	*t*-stat	Average AV (%)	*t*-stat	SAV ($)	*t*-stat
–5	11.68	0.28	3.41%	0.55	0.06	0.59
–4	–72.99	–1.74	–3.52%	–0.57	–0.09	–0.97
–3	46.97	1.12	13.00%	2.09	0.16	1.60
–2	–31.46	–0.75	0.17%	0.03	–0.03	–0.31
–1	61.35	1.46	16.44%	2.64	0.23	2.39
0	–60.53	–1.44	–2.10%	–0.34	–0.09	–0.97
1	–55.48	–1.32	–9.36%	–1.50	–0.18	–1.88
2	34.77	0.83	7.10%	1.14	0.10	1.06
3	–22.37	–0.53	–2.61%	–0.42	–0.05	–0.53
4	43.12	1.03	4.85%	0.78	0.16	1.63

Notes: AV ($) is the average of the abnormal trading volumes in millions of dollars; AV (%) is the average of the percentage abnormal trading volumes, each of which is the ratio of abnormal trading volume to normal trading volume, expressed as a percentage. SAV ($) is the average standardised abnormal trading volume in millions of dollars. The results are based on the 114 events in the post-abolition period.

Columns 2 and 3 of Table 8 present results for average abnormal volume in millions of dollars for the post-abolition period. Unlike the corresponding results for the pre-abolition period (shown in Table 1), there is no pattern in the signs. None of the results is significant. Columns 4 and 5 show the results for percentage abnormal volumes. While the results for days –3 and –1 are statistically significant, the pattern up to an including the ex-interest day is considerably weaker than in the pre-abolition period (shown in Table 1). In Table 1, the percentages ranged between 10.91 per cent and 29.24 per cent, and four days were statistically significant. Columns 6 and 7 present results for standardised abnormal volumes in the post-abolition period. Again, there is no pattern in the signs. Overall, the results in the

post-abolition period are considerably weaker than in the pre-abolition period, which is consistent with the abolition of the tax considerably reducing the incentive to engage in coupon washing.

7. POLICY DISCUSSION

The explanatory memorandum accompanying the legislation that abolished interest withholding tax on foreign investors in Australian government bonds gave two reasons for the change: first, the foreign demand for bonds would increase, thus reducing the government's borrowing costs and, second, it would restore equal treatment for Australian government bonds with bonds issued by other entities. It does not mention tax evasion. Yet eliminating the incentive to evade tax can also be a worthwhile objective. In an important review article on the economics of tax evasion, Slemrod[41] identifies some of the harms caused by tax evasion. Among these are undermining of the voluntary / ethical component that underlies the tax system, the inefficiency of taxpayers using resources to hide evasion and taxation authorities using resources to discover evasion, and horizontal inequity brought about by equally well-off entities having different tax burdens. As might be expected, he believes that 'good tax policy should be designed with the realities of evasion in mind'.[42] It should not have been difficult to predict that the interest withholding tax arrangements invited coupon washing as a means of evading the tax. Coupon washing is nothing new; in 1953 it was described by Marshall in terms that suggest that even at that time it was a well-known technique.[43]

[41] Joel Slemrod, 'Cheating Ourselves: The Economics of Tax Evasion' (2007) 21 *Journal of Economic Perspectives* 25.
[42] Ibid 41.
[43] J Marshall, 'British Government Securities' (1953) 22 *Transactions of the Faculty of Actuaries* 19, 30.

8. CONCLUSIONS

Interest withholding tax on foreign investors in Australian government bonds was abolished on 5 December 2009. This change in taxation provides an opportunity to test whether there was evasion of the tax prior to its abolition. Investors could escape the tax by engaging in coupon washing—selling their bonds prior to an ex-interest date and (possibly) repurchasing them after the ex-interest date. This means of escaping the tax was illegal and hence efforts to do so constitute tax evasion. Coupon washing may be discernible in the patterns of bond trading volumes before and after ex-interest dates. Pure coupon washing will cause higher trading volumes immediately before, on and immediately after ex-interest days. Modified coupon washing will cause higher trading volumes in the days preceding ex-interest days but only normal trading volumes on and after ex-interest days. Using an event study approach, we report clear statistical evidence supporting the existence of coupon washing before the abolition of the interest withholding tax but only weak evidence in the period after the abolition. Higher trading volumes are found for high-coupon bonds, which is consistent with coupon washing because higher coupons provide a greater incentive to evade the tax. Because the existing literature provides very limited evidence on the incidence of the evasion of interest withholding tax, and uses a different methodology, the present study adds significantly to our knowledge of tax evasion.