Do Criminal Sanctions Deter Insider Trading?

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Abstract

Many countries have adopted criminal sanctions as a way to deter insider trading. Although criminal sanctions represent a much greater penalty than civil sanctions, the enforceability of criminal sanctions is weaker given the higher burden of proof required. This trade off between severity and enforceability implies that the impact of introducing criminal sanction is not unambiguous. In this paper we examine this issue by investigating the impact of the introduction of criminal sanctions in New Zealand, where criminal sanctions (at the expense of civil sanctions) were enacted in February 2008. Using measures for the cost of trading and the degree of information asymmetry, we find that the enactment of this law has led to deterioration in the market, indicating that the weaker enforceability outweighs the increased severity of the penalties. Our findings suggest that laws on sanctions should be considered jointly with their enforceability to assure their successfulness.

JEL Codes : C22, D82, G18

Key Words: Insider Trading, Criminal Sanctions, Bid-Ask Spreads, Information Asymmetry Costs

1. Introduction

Deterrence of prohibited activities is a function of both the severity of the punishment (sanctions) and probability of detection and prosecution (enforcement) and it is the combination of both that determines a law's efficacy (Becker, 1968). As a result it is important for law makers to develop laws with an eye on both severity and enforceability of the laws. In finance, this debate has largely evolved around the issue of illegal insider trading, where different countries have developed different approaches in an attempt to deter insiders from expropriating their shareholders. However, as noted by Bhattacharya and Daouk (2009) for insider trading laws to be effective they must be enforceable, and if they are not enforced, a country may actually be worse off than having no laws at all.

In the insider trading debate, the discussion around severity and enforceability mainly centres on criminal versus civil sanctions. Criminal sanctions represent a much greater penalty than civil given the potential for jail sentences in addition to the stigma of a criminal conviction if the prosecution is successful. However, the burden of proof required (i.e. the level of certainty required for a guilty verdict to be delivered) is also significantly higher in a criminal case.[1] Therefore, while criminal sanctions offer more severe penalties they are also less likely result in a successful prosecution. This trade off between severity and enforceability means there is an uncertain effect on the deterrence of insider trading.

[1]Civil cases in common law jurisdictions are decided on the balance of probabilities, requiring it to be simply more likely than not that an offence was committed. Criminal cases, however, are decided on the beyond a reasonable doubt test, a much tougher burden to meet, especially when prosecuting on the basis of largely circumstantial evidence as is often the case for insider trading.

In this paper, we contribute to the literature on criminal versus civil sanctions by examining the efficacy of criminal sanctions for insider trading in New Zealand. Changes in the structure of laws are relatively infrequent and mostly result in increases in the level of existing sanctions rather than dramatic changes in the approach to sanctions. However, in 2006, the New Zealand government passed the Securities Market Amendment Act 2006 (hereafter "SMAA") covering a number of areas of security laws. The most notable change in this act was the introduction of a new sanctions regime for insider trading. Prior to the SMAA, the law allowed for civil penalties of three times the value of the gain made or loss avoided or one million dollars, which ever was greater. The SMAA removed the previous civil penalties and replaced them with a maximum penalty of 5 years imprisonment and/or a NZ$300,000 fine for an individual found guilty of insider trading. This change in legislation offers a unique opportunity to examine whether criminalisation of insider trading is beneficial.

To empirically investigate the impact of these new laws on the market, we collect data for the most liquid companies on the New Zealand Stock Exchange (NZX) for the six months prior to and following the date that the new rules came into effect, February 2008.[2] To investigate the impact of criminalisation of insider trading in New Zealand, we examine a range of information asymmetry measures based on bid-ask spreads (the percentage spread, the effective spread, the price impact of trades and the proportion of information asymmetry by Lin, Sanger and Booth (1995)). Using an event study type of methodology, we explore changes in these measures for information asymmetry before and after the enactment of the SMAA. The results for all four measures indicate that the introduction of criminal sanctions

[2] This gives us a sample period that runs from August 2007 until August 2008.

has led to an increase in the cost of trading and the proportion of information asymmetry. These findings suggest that the change has reduced the deterrence value of the laws, mostly like as a result of the public perception that the probability of prosecution has decreased.

The remainder of the paper is organised as follows. Section two provides a background on the literature on insider trading and introduces the New Zealand market and insider trading regulatory setting. Section three sets out the bid-ask spread based measures that we employ in this study. Section four outlines the sample employed while section five presents the papers major findings. Finally we conclude the paper.

2. Background

2.1 Criminal Sanctions and Insider Trading

Criminal sanctions have been widely imposed by market regulators in many countries. Beny (2004) finds criminal sanctions in 27 out of 36 countries in her sample, and more recently, Frijns et al. (2010) find them present in 26 out of 31 countries. This popularity has been largely driven by the perception held by lawmakers and market observers that criminal sanctions offer a much greater deterrence than civil penalties. For example, after its introduction of a criminal-only regime, the Dutch regulators lauded their approach as the "toughest regime" (Financial Times, 1998). In addition, Joo (2007) argues that increasing criminal sanctions satisfies the appearance of being tough on market manipulation, by sending a message that insider trading will be treated extremely seriously. This also conforms with Easterbrook (1985), who suggested that the threat of imprisonment may lead to optimal deterrence. A Ministry of Economic Development discussion document in New Zealand also notes that criminal penalties may carry a stigma that a civil prosecution does not, and that this

reputational consideration may be a significant deterrent for insiders (Ministry of Economic Development, 2000).

However, while the seriousness of the threat imposed by criminal sanctions is not disputed, its impact on deterrence has been questioned widely. A number of academics have suggested that while the punishment may be severe, the increased burden of proof makes prosecution much less likely, especially for insider trading (Seyhun, 1992; Rakoff and Eaton, 1993; Engelen, 2006). This is also a view articulated in a speech by members of the US Securities Exchange Commission in 1998, where they argued that insider trading is a difficult crime to prove to the criminal burden of proof. In this speech they argue that the largely inferential nature of the crime, where a case is often based around circumstantial evidence relating to meetings, phone calls and opportunity, will be difficult to establish to the standard of beyond a reasonable doubt (Newkirk and Robertson, 1998). As they note, one of the key elements of insider trading is the use of non-public information for trading, which requires insight into the mind of the defendant. Engelen (2006) even goes so far as to argue that criminalisation in Europe has failed to achieve the goal of ensuring integrity in financial markets, a sentiment echoed by Bainbridge (1998) and Seyhun (1992), who argue that in spite of significant increases in penalties in the US, insider trading remains prevalent and profitable.

Some empirical investigation of the impact of insider trading regulations on markets has been conducted. For example, Bhattacharya and Daouk (2002) look at the impact of the introduction and first enforcement of insider trading laws on the cost of capital. They find that the introduction of laws has no effect on the cost of capital, but that there is a significant reduction following the first enforcement. In a follow up paper they find that those countries that enact laws but do not enforce actually wind up with higher costs of capital than those that

do not enact insider trading laws at all (Bhattacharya and Daouk, 2009). This strongly suggests that enforceability is key in improving market conditions.

Beny (2005) and Bris (2005) go beyond simple introduction and enforcement and consider the strength of the insider trading laws by looking at factors like the scope of the laws, sanctions available and the enforcement probabilities. They both find that stronger laws are more effective in controlling the harm from insider trading (Beny, 2005) and the profitability of insider (Bris, 2005). Frijns et al. (2008) looks at an earlier introduction of new insider trading laws in New Zealand in 2002 that increased the strength of the local rules. They show that those laws resulted in a marked reduction in information asymmetry in the market and so an improvement in the market. While these studies do not specifically look at the effect of criminalisation, they do show that insider trading laws can have a marked impact on the markets and therefore their effectiveness can be examined using market based measures. While several papers have looked at the impact of insider trading laws on markets in general, no empirical studies have looked at the introduction of criminal sanctions and the impact on deterrence.

2.2 The New Zealand Situation

The NZX is one of the smallest and least liquid developed markets in the world (Bhattacharya and Daouk, 2002). The NZX currently lists 160 companies and this number has not changed significantly in the past decade (Frijns et al., 2008 show that the NZX had between 149 and 164 listed companies in the period from 2002 to 2004). In addition, trading activity is low with just 41,598 trades, representing a combined value of NZ$ 2.7 billion for the month of February 2008. These numbers have also remained relatively static (Frijns et al., 2008 find between 40,000 to 60,000 trades per month valued at around $NZ 2 billion per

month for the period 2002 to 2004). The market capitalisation for the total market is small at NZ$ 37 billion. The NZX runs an electronic limit order book, and New Zealand rates relatively high in most of the law and finance investor protection measures. Given the importance of well-functioning capital markets for economic growth within a country, the underdevelopment of the local exchange has been the subject of political investigation for nearly a decade with limited success.

In 1999 and the early 2000s, the government put a strong focus on looking at regulatory factors that may have been undermining the local markets. In particular, it was argued that the relatively light-handed regulation in the past had resulted in a lack of investor confidence in the local markets. One area that was highlighted in particular was insider trading. Since insider trading was explicitly included in securities legislation in 1988, no insiders had been successfully prosecuted and in several cases relatively high profile individuals had avoided prosecution either through legal loopholes (Eric Watson for his trading in McCollum Printers) or by settling out of court (Kerry Hoggard, former CEO of Fletcher Challenge). The government undertook a significant review of the laws and introduced changes in 2002 in the Securities Market Amendment Act 2002. These changes, amongst others, empowered a public watchdog to prosecute insiders (previously New Zealand had a private enforcement regime); required much swifter disclosure by insiders of their trades; and added a NZ$ 1 million floor on civil penalties. At the time of these changes, and in the early discussion documents, the idea of criminal sanctions was mooted as a way of increasing deterrence. While there did not seem to be significant support from market participants for criminalisation, it was introduced in a second round of amendments in 2006. Of interest is the fact that the new law only makes reference to criminal sanctions, highly indicative of a

complete removal of civil penalties. This offers an interesting opportunity to see if criminal sanctions are an effective way of deterring insiders.

3. Methodology

Evaluating the efficacy of insider trading laws is difficult because of the unobservable nature of most illegal insider trading activity. Given the potential penalties associated with being caught, insiders have strong incentives to hide their trading from the market and regulators. As such, obtaining a direct measure for the impact of insider trading can be difficult. Based on the idea that normal (uninformed) investors must be compensated for the cost of insider trading, Bhattacharya and Daouk (2002) explore changes in the country-level cost of capital to proxy for the harm from insider trading. Beny (2005) looks at price synchronicity, the concentration of shareholdings and liquidity, while Bris (2005) looks at price run-ups and abnormal trading in advance of takeover announcements. While Bris (2005) uses a relatively direct measure of the prevalence of insider trading, it requires a significant amount of takeover activity before and after new legislation is introduced, and these restrictions are particularly problematic for a small exchange like New Zealand. The measures of Beny (2005), and Bhattacharya and Daouk (2002) are less direct and could be significantly influenced by non-insider trading related factors.

As an alternative approach to measuring the harm from insider trading, we turn to the market microstructure literature which focuses on the bid-ask spread and its components. The bid-ask spread is often considered as the cost of trading or the market maker's compensation for these costs. These costs relate to operational costs, such as order processing or inventory holding costs, but also contain information asymmetry costs, i.e. the costs incurred when

trading again a better informed counterparty. Insider, when trading on their inside information are clearly better informed counterparties, and anyone trading against an insider will lose in the transaction, a notion supported by the considerable wealth of literature detailing the profitability of insiders even when trading legally (see among others, Jaffe 1974; Finnerty 1976; Seyhun 1986, 1998; Rozeff and Zaman 1988; and Lakonishok and Lee 2001 for the US, Baesel and Stein 1979 for Canada, Del Brio et al. 2002 for Spain, Etebari, et al. 2004 for New Zealand and Pope et al. 1990; Friederich et al. 2002 for the U.K). To compensate for this risk of trading with a better informed counterparty, the bid-ask spread includes compensation to cover the cost of trading losses incurred. This compensation can be thought of as the market's expectation of the probability of trading against a better informed party and the average loss incurred. If insiders, who are clearly better informed, make up a sizeable proportion of the market, then this should be reflected in the spread. If a law reduces the prevalence of insider trading, then the proportion of informed traders in the market decreases, and this should lead to a decrease in the spread. We explore the impact of criminalisation of insider trading by considering four spread measures: the percentage spread; the effective spread; the price impact; and the proportion of information asymmetry by Lin Sanger and Booth (1995).

3.1 The Percentage Spread

The percentage spread is a simple measure of the overall bid-ask spread. It measures the spread as the percentage cost of a round trip if the trades were conducted at the quoted ask and bid prices. The percentage spread is measured as the difference between the ask and bid prices divided by the midpoint of the quotes, i.e.

$$PS_{i,t} = \frac{(Ask_{i,t} - Bid_{i,t})}{(Ask_{i,t} + Bid_{i,t})/2}. \quad (1)$$

We employ intraday data to obtain the percentage spread at the time of each trade which is then averaged over all trades and companies in the sample.

While the percentage spread is a simple measure, it is a visible and obvious measure of the overall cost of trading. If the cost of trading reduces, i.e. percentage spread decreases, then it will encourage more trading, increasing liquidity in the market and the value of the firm (Amihud and Mendelson, 1986). As the goal of insider trading regulation is to reduce the harm from insider trading and ultimately promote market efficiency, a reduction in overall trading costs should be considered a good outcome.

3.2 The Effective Spread

The effective spread is similar to the percentage spread. However, the effective spread recognises that trades can occur at different prices than the quoted bid and ask. This is particularly true in opaque markets where liquidity may not be fully reflected in quotes and opportunities exist to trade within the spread (Ready, 1999). But even in electronic markets traders can better existing quotes, or large orders can exhaust the shares available at the best price, resulting in execution prices that differ from quoted nrpices (Bessembinder and Venkataraman, 2010). In such cases, the effective spread can better measure the actual trading costs. We measure the effective spread as the difference between the actual price at which a transaction occurs and the midpoint of the prevailing quoted spread at the time of the trade i.e.

$$ES_{i,t} = \frac{\left|P_{i,t} - (Ask_{i,t} + Bid_{i,t})/2\right|}{(Ask_{i,t} + Bid_{i,t})/2}. \quad (2)$$

One issue with both the effective and quoted spreads is that they represent all the trading costs an investor incurs. As stated above, a reduction in these measures is positive for the market and is a desirable outcome. However, while these improvements could be due to a reduction in insider trading they may be related to other factors, such as an improvement in liquidity. As such, we employ two measures that focus specifically on the information asymmetry component of the spread.

3.3 The Price Impact of Trades

A number of studies looking at the decomposition of spreads have noted that it is possible to identify the different cost components based on the impact on subsequent prices. Specifically, order-processing and inventory holding costs lead to price reversals after the trade and have only a temporary impact on prices. On the other hand, information driven trades represent new information and result in a permanent change in the underlying value of the security. As such we can identify the informational component of the spread by looking at the impact on subsequent prices.

Informed traders are not easily identified but their presence can be detected in imbalances observed in the order book, albeit that this is a noisy measure. For instance, informed traders who have positive news will place buy orders but not sell orders, resulting in extra demand to buy. Market makers and liquidity providers will observe this imbalance and adjust the spreads to incorporate the information disclosed by the imbalance. As such, changes in the underlying value of security between the time of the trade and some point in the near future

can reveal the markets assessment of the informational component of a trade. Although the underlying value of the security is not directly observable it is commonly proxied by the quoted midpoint (Bessembinder and Kaufman, 1997; Huang and Stoll, 1996). As such we measure the price impact of a trade as the difference between the quoted midpoint *n* periods after the trade less the quoted midpoint at the time of the trade scaled by the midpoint at the time of the trade, i.e.

$$PI_{i,t} = \left| \frac{M_{i,t+n} - M_{i,t}}{M_{i,t}} \right|, \qquad (3)$$

where $M_{i,t}$ is the quoted midpoint. The selection of the number of periods after the trade at which point to measure the price impact has been shown to be relatively insensitive to the time period employed (Werner, 2003) although using too longer a window risks the arrival of extraneous information. We employ a 5 minute window in this study which is in line with the window employed in Huang and Stoll (1996). If we observe an increase (decrease) in information asymmetry as a result of the change in legislation we should see an increase (decrease) in the price impact of the trade.

3.4 Lin, Sanger and Booth Proportion of Information Asymmetry

Lin, Sanger and Booth (1995) (LSB) offer a model for calculating the information asymmetry based on a similar line of reasoning to the price impact of trades measure. They also view information asymmetry as the permanent price change as a response to a trade. They argue that in response to a buy (sell) order a market specialist will increase (decrease) the quotes they offer. They do this to attract a sell (buy) order to balance their position and to ensure their costs are covered. To the extent that the market follows this pattern, a buy (sell) followed by a sell (buy) we see only temporary price changes. Where we see order

persistence (a buy followed by a buy) we see imbalances in the order book and a permanent impact on prices. LSB argue that quote revisions in response to a trade reflect the degree to which there is information asymmetry and therefore permanent price changes by assuming $B_{i,t+1} = B_{i,t} + \lambda z_t$ and $A_{i,t+1} = A_{i,t} + \lambda z_t$ where $B_{i,t}$ and $A_{i,t}$ are the bid and ask prices respectively, z_t is the effective spread and λ is the information asymmetry component of the spread. The authors estimate λ using the following regression

$$\Delta Q_{t+1} = \lambda z_t + e_{t+1}, \tag{4}$$

where $\Delta Q_{t+1} = Q_{t+1} - Q_t$, Q_t is the log of the quoted midpoint at time *t*, $z_t = P_t - Q_t$ and P_t is the log of the trade price at time *t*.

Several other bid-ask spread decomposition models have been proposed by Madhavan et al. (1997), Huang and Stoll (1997) and Glosten and Harris (1988). All the approaches use similar reasoning although the specific methodologies do differ considerably in the method of estimation. The Lin, Sanger and Booth (1995) methodology however has been shown to estimate better than other models producing fewer implausible estimates (Van Ness et al. 2001).

4. Data

To examine the impact of the introduction of the criminalisation of insider trading on the markets, we collect data on New Zealand companies around the period that the law came into effect (29 February 2008). We collect intra-day price data for the period from six months before the date that the law came into effect until six months after, August 2007 until August

2008. We do not consider longer windows pre and post as other factors may have an impact on spreads (such as start of the Global Financial Crisis late 2008). We do consider a shorter window three month pre- and post-change period, November 2007 until May 2008. We collect the intra-day prices from the Thompson Reuters Tick History database available from SIRCA[3] for all available companies that survived over the sample period. However, as we need intra-day data to estimate the information asymmetry component, we impose several restrictions on the sample. Specifically, we require that companies must have at least five trades per day on average and have trades on at least 30 days for both the pre- and post-change periods. This results in a final sample of 51 companies, or roughly one-third of the total number of companies listed on the NZX.

Table 1 presents summary statistics for the sample companies. Over the full period we observe that the companies in our sample averaged 35.53 trades per day, although this is subject to considerable variation with the smallest company having just 5.4 trades per day and the largest company 222.78. Compared with studies on other exchanges these values are very low. Madhaven et al. (1997) reports an average of 95 trades per day for the NYSE and Ahn et al. (2002) reports 296 trades per day for the Tokyo Stock Exchange. However, compared with an earlier study in NZ (Frijns et al., 2008) the mean trades per day is nearly double. We also observe that the average is slightly higher for the six month window compared with the three month window.

INSERT TABLE 1 HERE

[3] Securities Industry Research Centre of Asia-Pacific

We can see that the average dollar spread is about 7.5 cents per share, although again there is a considerable skew in the data with a median of 4.96 cents per share. The minimum is close to one cent and the maximum nearly 60 cents. However that was for a company with an average price of $29.63 which is considerably higher than the average price of all companies of $4.51. We also see a skew in the average prices with a median of $2.78 and a minimum and maximum of $0.16 and $29.63, respectively. Of note is that we see that quoted spreads have increased in the post-change period for both windows and that the average prices and volume traded have decreased. These changes are across the entire spectrum of the values affecting the minimums, maximums and medians as well. This may provide some evidence that criminalisation has harmed the market. However, these are noisy measures and may be influenced by other factors.

5. Results

To study whether the criminalisation of insider trading in New Zealand has had a positive or negative impact on the market, we examine a range of bid-ask spread based measures that incorporate or measure the information asymmetry cost component of the spreads. The spreads offer a relatively direct way of measuring the market's expectations regarding the impact of a change in insider trading laws. This is also similar to previous studies looking at earlier changes in the New Zealand legislation around insider trading (Gilbert et al. 2007; Frijns et al. 2008).

5.1 Percentage Spreads

Panel A of Table 2 presents the results for the percentage spread. The percentage spread incorporates all the cost components representing the total cost of trading. Given that the goal

of effective legislation should be to reduce market frictions overall, it is appropriate to look at the effect on percentage spreads. If the introduction of criminal sanctions has been positive (negative) we would expect the percentage spreads to decrease (increase).

For the full sample we find that the average percentage spread is 2.27%. This is pushed up by a few companies that have larger percentage spreads as the median is slightly lower at 2.06%. The percentage spreads are, however, larger than those reported by Frijns et al. (2008) (1.18%) in their study on the NZX or in studies of other markets which typically find percentage spreads of less than 1% (Madhaven et al., 1997; Ahn et al. 2002). Most likely, this is a result of the minimum tick size of 1c per share and the low prices as shown in Table 1. When we examine the differences between the pre- and post-change periods, we see a marked increase in the percentage spreads for both the six and three month windows. The average spreads in the six month sample rise on average by nearly 0.6% and for the three month sample by nearly 0.3%. These increases are also observed in the medians by similar amounts and also in the tails of the sample. We conduct a t-test on the differences between the pre- and post-change periods and find strong significance at the 1% level for both the six and three month samples. In addition, we see increases in over 80% of the six month sample and two-thirds of the three month sample. The results are therefore strongly supportive of an increase in quoted spreads following the introduction of criminalisation.

INSERT TABLE 2 HERE

5.2 Effective Spreads

The effective spreads also measure the total cost components of the spreads. However, they measure actual trading costs by relaxing the assumption that all trade occur at the quoted

spreads. Again, we would expect that if the criminalisation of insider trading has reduced (increased) insider trading then we would see a decrease (increase) in the effective spread indicating an improvement in the efficiency of the market.

The results in Panel B of Table 2 show that when we compare the effective spreads with the quoted spreads, we see evidence of trades occurring within the quoted spreads. The average effective spread is 0.4% lower than the average quoted spread, although the effective spreads are still relatively high. When we look at the pre- and post-change periods we again see evidence of a worsening in the trading costs within the market. Effective spreads for the six month window increase by a statistically significant 0.28% and for the three month window 0.12% although with reduced significance. We also see that the increase is omnipresent, although the first quartile values are lower suggesting that a few companies may have had some gain. Overall, we observe that 30 and 29 companies see an increase in the effective spread, in the 6 month and 3 month windows, respectively, nearly 60% of the total sample. The results for both total trading cost measures suggest that there has been a worsening of the market efficiency around the introduction of criminal sanctions.

5.3 Price Impact of Trades

The results for overall trading costs suggest that there was a marked worsening in the efficiency of the market around the time of the introduction of the criminalisation of insider trading. To look at whether this is related to the change in insider trading laws we employ two measures to identify the information asymmetry component of the spread. The first is the price impact of trades, defined as the permanent change in quoted midpoints following a trade. If insider trading has reduced (worsened) as a result of the change in law we would expect to see a decrease (increase) in the price impact of trades.

Panel A of Table 3 shows the results for the price impact of trades. We see that on average there is a permanent price change following a trade of approximately 0.43%. Of more interest is the fact that we observe a significant change following the introduction of the new law. In the six month window we see a 0.0008 increase which is significant at the 1% level and for the three month window the increase is about half that but still significant at the 5% level. We also notice that the increase is omnipresent with increases in the medians and third quartile values for both samples and the first quartile for the six month window. Finally, the number of companies with increases is greater than the number of companies with decreases; over 80% of companies for the six month window and nearly two-thirds for the three month window.

5.4 Information Asymmetry

We also employ the Lin, Sanger and Booth (1995) model to decompose the proportion of information asymmetry in the spreads. This model regresses the change in quoted midpoints between trades against the effective spread. We conduct Wald tests on the difference in regression coefficients estimated for the pre- and post-change periods to see the number of significant increases and decreases and also a Chow test to see if there is a structural break around the time of the introduction of the new laws. Again, if the law has resulted in changes to the attitude of market participants about the prevalence and harm of insider trading, we expect to see changes in the size of the information asymmetry component of the spread.

On average, Panel B of Table 3 shows that 26% of the spread is made up of information asymmetry costs. As with the three measures previously discussed we see an increase in the average, median and quartile values for the proportion estimated. We see just over a 3%

increase in the information asymmetry component for the six month window and about 1.8% increase for the three month window. In addition, over one-third of the sample sees a significant increase in λ for the six month window, although it is only 25% for the three month window. Only five companies see a significant decrease in λ in the six month window. The results do indicate however that more companies see an increase than decrease. In addition, we see evidence of a structural break for over 80% of the companies in both samples suggesting that the law change was responsible for the changes observed.

5.5 Size and Information Asymmetry sorts

As has been discussed in a number of papers (Easley et al. (1996), Gregory et al. (1997) and Friederich et al. (2002)) not all companies are affected by insider trading to the same extent. More liquid companies with more attention from analysts and the media tend to have less opportunities for insider trading as prices remain close to fundamentals and so are less affected. Frijns et al. (2008) showed that this difference in prevalence also has an impact in the way legislation affects companies with less trading activity and those with greater pre-change information asymmetry getting the greatest benefit out of earlier changes. In line with this, we sort on the basis of total number of trades observed and also the pre-change theta estimates from the LSB model and test to see if the law changes have a disproportionate effect on some companies. We take the twenty highest and lowest companies for each sort and recalculate the average values for each of the measures employed. In addition, we test for significant differences in the means.

Panel A of Table 4 shows the results for each of the four measures when we sort on the basis of the number of trades. The results are strongly supportive of the idea that the changes in insider trading laws are responsible for the worsening in the measures employed. Only the

three month high trade proportion of information asymmetry sees a decrease in the mean value, although this is insignificant and relatively small. All the other measures see an increase in the measures being estimated. However, only for the low trade group do we see significant differences suggesting that low liquidity groups are impacted more severely by the measures introduced in the new law. Although the significance is sporadic for the three month window with only percentage spreads and proportion of information asymmetry being significant. The difference for effective spreads and price impact are larger, numerically, for the low trade group compared to the high trade group and it is likely the small sample size that has driven the insignificance.

Panel B repeats the sort but uses pre-change information asymmetry as measured by the LSB theta estimates for the sort rather than the size. The picture is less clear than for the six month window. We obtain significance for both low and high information asymmetry firms for three of the measures.

Overall, however, the results indicate that, for a variety of different spread based measures which incorporate the cost of information asymmetry to liquidity providers, there has been a worsening in the cost of trading as a result of the introduction of the SMAA. The key provision of this legislation was the introduction of criminal sanctions for insider trading. This result suggests that while criminal sanctions have the appearance of a tough stance, the difficulties in enforcement and possible the poor enforcement history in New Zealand has given the market the belief that these new sanctions will make enforcement significantly less likely.

6. Conclusion

Criminal sanctions for insider trading laws have been widely introduced around the globe by regulators in an effort to deter insider trading. While commentators and academics have questioned this approach, little empirical evidence has been presented to support either their efficacy or their inability to deter insiders. This study uses a relatively unique opportunity to examine the replacement of civil sanctions with criminal sanctions in New Zealand. This offers a perfect opportunity to look at the impact of criminal sanctions within a relatively developed market and see what deterrence value criminal sanctions have.

We collect data on companies on the NZX for the six months prior to and following the date that the new rules came into effect (August 2007 until August 2008). Using an event study methodology, we explore changes in four bid-ask spread based measures that incorporate the cost of information asymmetry; namely the percentage spread, effective spread, price impact of trades and Lin, Sanger and Booth (1995) proportion of information asymmetry measure. The results for all four measures show that the introduction of criminal sanctions in New Zealand for insider trading offences has resulted in an increase in the cost of trading and the cost of information asymmetry. This finding suggests that the change has reduced the deterrence value of the laws.

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Table 1. Summary Statistics

		Six Month Window		Three Month Window	
	Full Sample	Pre Enactment	Post Enactment	Pre Enactment	Post Enactment
Number of Trades					
Average	8898.67	4473.84	4391.33	2076.22	2043.90
Std Dev	10974.71	5063.07	5976.66	2424.72	2530.49
Min	1268	721	529	247	275
Max	55917	24435	31305	11576	13067
Trades Per Day					
Average	35.53	35.86	35.20	34.68	34.12
Std Dev	43.68	40.46	47.77	40.36	42.14
Min	5.40	6.15	4.64	5.04	5.00
Max	222.78	195.48	250.44	192.93	217.78
Average Volume					
Average	12512.34	12859.12	12136.77	14449.75	11866.97
Std Dev	11565.08	14426.15	10913.52	22765.38	11143.58
Min	1855.30	1783.33	1799.18	1712.70	1604.56
Max	54921.00	90173.25	50850.20	158344.02	56156.48
Average Quoted Spread					
Average	0.0754	0.0747	0.0840	0.0735	0.0802
Std Dev	0.0920	0.0952	0.1242	0.0836	0.0993
Min	0.0093	0.0098	0.0088	0.0107	0.0091
Max	0.6008	0.5083	0.8614	0.4582	0.6471
Average Price (in $NZ)					
Average	4.51	4.91	4.05	4.53	4.19
Median	2.78	4.34	4.05	2.73	2.24
Std Dev	0.53	0.53	0.20	0.25	0.13
Min	0.16	0.18	0.15	0.17	0.16
Max	29.63	32.25	27.54	29.99	28.19

Note: Full Sample contains data on all trades for the sample of 51 companies for the period 28 August 2007 until August 28 2008. Six (Three) month pre-enactment covers the period 28 August 2007 (28 November 2007) till 27 February 2008 and six (three) month post-enactment covers 29 February 2008 till 28 August 2008 (28 May 2008). *Number of trades* is the cross-sectional average of the number of trades in each period. *Trades per Day* is computed as the cross-sectional average of the total number of trades divided by the number of days a company was traded. *Average Volume* is the cross-sectional average of the total volume within a period divided by the number of trades. *Average Quoted Spread* is computed as the cross-sectional average of the average of the difference between the ask and bid prices. *Average Price* is the cross-sectional average of the daily closing prices.

Table 2. Percentage and Effective Spreads

		Six Month Window		Three Month Window	
	Full Sample	Pre Enact	Post Enact	Pre Enact	Post Enact
		Panel A: Percentage Spreads			
Average	0.0227	0.0186	0.0246	0.0208	0.0238
Median	0.0206	0.0153	0.0207	0.0176	0.0207
Std Dev	0.0112	0.0102	0.0133	0.0117	0.0131
First Quartile	0.0150	0.0113	0.0150	0.0123	0.0146
Third Quartile	0.0293	0.0241	0.0341	0.0272	0.0307
Average Diff			0.0057***		0.0029***
T-Stat			5.71		3.17
Number Increases			43		34
		Panel B: Effective Spreads			
Average	0.0188	0.0175	0.0203	0.0188	0.0200
Median	0.0158	0.0115	0.0157	0.0129	0.0120
Std Dev	0.0161	0.0148	0.0181	0.0158	0.0173
First Quartile	0.0075	0.0081	0.0075	0.0085	0.0073
Third Quartile	0.0259	0.0234	0.0296	0.0257	0.0295
Average Diff			0.0028***		0.0012*
T-Stat			3.057		1.72
Number Increases			30		29

Note: Full Sample contains data on all trades for the sample of 51 companies for the period 28 August 2007 until August 28 2008. Six (Three) month pre-enactment covers the period 28 August 2007 (28 November 2007) till 27 February 2008 and six (three) month post-enactment covers 29 February 2008 till 28 August 2008 (28 May 2008). *Percentage Spreads* were calculated as the cross-sectional average of the bid-ask spread divided by the midpoint of the spread. *Effective Spreads* were calculated as the cross-sectional average of the transaction price less the midpoint of the spread all divided by the midpoint of the spread. Statistical significance is calculated using a matched-pairs t-test.

*** Significant at 1% level.

** Significant at 5% level.

* Significant at 10% level.

Table 3. Price Impacts and LSB Theta Estimates

		Six Month Window		Three Month Window	
	Full Sample	Pre Enact	Post Enact	Pre Enact	Post Enact
Panel A: Price Impacts					
Average	0.0043	0.0040	0.0047	0.0044	0.0046
Median	0.0038	0.0034	0.0042	0.0039	0.0041
Std Dev	0.0018	0.0017	0.0020	0.0018	0.0022
First Quartile	0.0029	0.0027	0.0031	0.0031	0.0031
Third Quartile	0.0055	0.0050	0.0063	0.0054	0.0063
Average Diff			0.0008***		0.0004**
T-Stat			5.46		2.06
Number Increases			44		33
Panel B: Proportion of Information Asymmetry					
Average	0.2602	0.2449	0.2753	0.2557	0.2736
Median	0.2586	0.2305	0.2816	0.2501	0.2662
Std Dev	0.0896	0.0871	0.0998	0.0969	0.1135
First Quartile	0.1811	0.1830	0.2007	0.1850	0.1898
Third Quartile	0.3239	0.3186	0.3360	0.3130	0.3447
# Sig. Increase		37.3%	19	25.4%	18
# Sig. Decrease		9.8%	5	15.7%	12
Structural Breaks		84.3%	43	88.2%	45

Note: Full Sample contains data on all trades for the sample of 51 companies for the period 28 August 2007 until August 28 2008. Six (Three) month pre-enactment covers the period 28 August 2007 (28 November 2007) till 27 February 2008 and six (three) month post-enactment covers 29 February 2008 till 28 August 2008 (28 May 2008). *Price Impacts* were calculated as the cross-sectional average of the midpoint of the spreads 5 minutes after a trade less the midpoint of the spread at the time of the trade all divided by the midpoint of the spread at the time of the trade. Statistical significance is calculated using a matched-pairs t-test. *Proportion of Information Asymmetry* were computed using the Lin, Sanger and Booth (1995) decomposition model. This was calculated as the cross-sectional average of the theta estimate in the regression formula $\Delta Q_{t+1} = \lambda z_t + e_{t+1}$ where $\Delta Q_{t+1} = Q_{t+1} - Q_t$, Q_t is the log of the quoted midpoint at time *t*, $z_t = P_t - Q_t$ and P_t is the log of the trade price at time *t.* Significant increase/decrease was calculated using a Wald Test.

*** Significant at 1% level.

** Significant at 5% level.

* Significant at 10% level.

Table 4: Size and Information Asymmetry Sorts

	Six Month Window			Three Month Window		
	Pre Enact	Post Enact	Diff	Pre Enact	Post Enact	Diff
Panel A: Sort by Pre-Change Trading Activity						
Quoted Spread						
Low Trades	0.0279	0.0347	0.0077***	0.310	0.0340	0.0041**
High Trades	0.0140	0.0144	0.0014	0.0141	0.0142	0.0001
Effective Spread						
Low Trades	0.0334	0.0408	0.0074**	0.0367	0.0428	0.0061
High Trades	0.0103	0.0105	0.0003	0.0106	0.0109	0.0003
Price Impact						
Low Trades	0.0052	0.0064	0.0012***	0.0057	0.0063	0.0006
High Trades	0.0030	0.0031	0.0001	0.0030	0.0033	0.0001
Prop of I. A.						
Low Trades	0.2719	0.3240	0.0521***	0.2601	0.3183	0.0581**
High Trades	0.1937	0.2075	0.0134	0.2192	0.2179	-0.0013
Panel A: Sort by Pre-Change Information Asymmetry						
Quoted Spread						
Low IA	0.0179	0.0231	0.0052***	0.0188	0.0225	0.0029**
High IA	0.0193	0.0233	0.0055**	0.0208	0.0232	0.0028
Effective Spread						
Low IA	0.0102	0.0112	0.0010	0.0107	0.0120	0.0013
High IA	0.0524	0.0642	0.0101**	0.0591	0.0648	0.0046
Price Impact						
Low IA	0.0036	0.0040	0.0005**	0.0038	0.0041	0.0003
High IA	0.0044	0.0055	0.0011***	0.0050	0.0054	0.0003
Prop of I. A.						
Low IA	0.1670	0.2114	0.0444**	0.1842	0.2055	0.0213
High IA	0.3313	0.3498	0.0250*	0.3242	0.3641	0.0163

Note: Full Sample contains data on all trades for the sample of 51 companies for the period 28 August 2007 until August 28 2008. Six (Three) month pre-enactment covers the period 28 August 2007 (28 November 2007) till 27 February 2008 and six (three) month post-enactment covers 29 February 2008 till 28 August 2008 (28 May 2008). *Percentage Spreads* were calculated as the cross-sectional average of the bid-ask spread divided by the midpoint of the spread. *Effective Spreads* were calculated as the cross-sectional average of the transaction price less the midpoint of the spread all divided by the midpoint of the spread.*Price Impacts* were calculated as the cross-sectional average of the midpoint of the spreads 5 minutes after a trade less the midpoint of the spread at the time of the trade all divided by the midpoint of the spread at the

time of the trade. Statistical significance is calculated using a matched-pairs t-test. *Proportion of Information Asymmetry* were computed using the Lin, Sanger and Booth (1995) decomposition model. This was calculated as the cross-sectional average of the theta estimate in the regression formula $\Delta Q_{t+1} = \lambda z_t + e_{t+1}$ where $\Delta Q_{t+1} = Q_{t+1} - Q_t$, Q_t is the log of the quoted midpoint at time *t*, $z_t = P_t - Q_t$ and P_t is the log of the trade price at time *t*. Significant increase/decrease was calculated using a Wald Test.

*** Significant at 1% level.

** Significant at 5% level.

* Significant at 10% level.