The Role of Enforcement Strategy in Disclosure Regulations

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This thesis is presented for the degree of

Doctor of Philosophy

Department of Applied Finance & Actuarial Studies

Faculty of Business and Economics

Macquarie University

August 2015

Declaration

I certify that the work in this thesis entitled *"The Role of Enforcement Strategy in Disclosure Regulations"* has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree to any other university or institution other than Macquarie University.

I also certify that the thesis is an original piece of research and it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself have been appropriately acknowledged.

In addition, I certify that all information sources and literature used are indicated in the thesis.

Signed:

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Ka Wai (Stanley) CHOI

Acknowledgements

I recall in a seminar, Prof Robert Faff (humorously) identified the two most difficult things about research: the first being *starting* it, and the second, *finishing* what you have started. And of course, finishing is irrelevant if one has not even started. A couple of years back, I gave my Ph.D. a start. But it would not have come to finishing without help from many people, and I would love to take this opportunity to show my appreciation.

First of all, I would like to thank my Ph.D. supervisors: A/Prof Sue Wright, Dr Steven Wu (ANU) and Dr Charlene Chen. Thank you for granting me the time and freedom to explore new ideas and giving me guidance whenever I needed it. Thank you also for tolerating my many mistakes throughout these years and encouraging me to move forward. This research would not have been accomplished without your significant inputs.

My thanks go to many academics who have given me constructive feedback in conferences and doctoral symposia. In particular, Prof Tom Smith (UQ) and Prof Bruce Grundy (Melb) who have been the discussants of the papers on which this dissertation is based; A/Prof Marvin Wee (UWA) who has guided me with constructing market microstructure measures; and Roc Lv (Melb) for recommending a difference-in-difference approach which I adopted in this thesis. Special thanks to Prof Philomena Leung, for giving me unwarranted trust and a stepping stone to kick-start an academic career; as well as to Dr Rajni Mala for guiding my every steps when I was the unit convener for the very first time.

Moreover, I am very thankful to Peter Kell (Deputy Chair of ASIC), Cathie Armour (Commissioner) and Mark Adams (Senior Executive Specialist) for inviting my supervisors and me to presentations on two occasions and showing interest in the findings of this thesis. Receiving your attention has been priceless and tremendously encouraging to me.

I am also indebted to my family, friends and colleagues. In particular, I am appreciative to my wife, Debbie Wang, for all her support throughout my Ph.D. work and bringing into the world two lovely little boys; to my in-laws, Prof Tai Wang and Prof Ciyun Zhu, for help taking care of their grandsons; and to my parents, Mr Peng Hou Choi and Ms Kit Lan Chu, for providing me the luxury of being not as independent as a father-of-two should be. In addition, thanks to my much respected Ph.D. buddy, Dr Frances Chang, who has inspired me a lot with her wealth of experience; as well as to Dr Tandy Xu, Dr Chris Adrian, Ms Angela Chow, Mr Thomas Kern, Dr Nick McGuigan, Miss Chung Yan Chan and Ms Iok Lan Chan for all their support and encouragement.

Last but not least, I thank my Lord, Jesus Christ, for leading me through this tough yet blessed journey. May you continue to bless my family in the years to come.

Information for the Examiners

Dear Examiners,

I would like to thank you for agreeing to examine my thesis. I understand that you are all eminent professors and examining a thesis requires significant investment of your time and intellectual inputs. I have thus prepared the following with the hope of saving you some precious time:

- Digital copy of the thesis (pdf) http://bit.ly/phd_pdf
- PowerPoint presentation slides http://bit.ly/phd_ppt
- PowerPoint presentation slides (with audio walkthrough) http://bit.ly/phd_ppt_audio
- Examiner report form (pdf) http://bit.ly/mqphdexam_pdf

Thank you again for examining my thesis.

Best Regards,

Ka Wai (Stanley) CHOI

Abstract

The advanced world has witnessed significant increases in securities regulation in recent years. Regulators and academics have shown overwhelming agreement on the importance of enforcement in delivering desirable regulatory outcomes. However, the question of what constitute effective enforcement is less clear. Borrowing from the law and economics literature, this thesis posits that a regulator's enforcement strategy is an important factor in effective enforcement. Focusing on the responsive enforcement strategy (Ayres and Braithwaite 1992), one of the most established and applied enforcement strategies, this thesis examines the impacts of the adoption by the Australian regulator of the strategy of corporate compliance with its continuous disclosure regulations. With compliance inferred from changes in the analyst' information environment and in market liquidity, results show that after full adoption of the responsive enforcement strategy, analysts' forecast error and forecast dispersion is incrementally reduced. In addition, as implied in analysts' forecasts (Barron et al. 1998), the precision of and analysts' reliance on public information have incrementally increased. With respect to market liquidity, a difference-in-difference approach is applied to control for influences from concurrent technological and economic developments. Benchmarking with the New Zealand market, bid-ask spread (turnover rate) has shown significant decreases (increases) as the strategy was being implemented. The improvements found in analysts' information and market liquidity are consistent with the strategy being successful in enhancing corporate compliance with the continuous disclosure requirements. The findings extend the enforcement literature and inform regulators by demonstrating the importance of devising an appropriate enforcement strategy for securing compliance and favorable regulatory outcomes.

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Chapter 1:

Introduction

1.1 Research Question & Motivations

This thesis explores the role of enforcement strategy in enhancing corporate compliance of corporate disclosure regulations. In recent years, there have been significant increases in securities regulations in many countries. Some are in direct response to prominent corporate failures and financial market crises. Examples include the enactment in the US of the Sarbanes–Oxley Act in response to the collapses of Enron and WorldCom, and the introduction of the Dodd-Frank Act in the aftermath of the Global Financial Crisis in 2010. Others reflect the underlying trend of globalization, such as the development and worldwide adoption of International Financial Reporting Standards (IFRS) and the enhanced enforcement efforts accompanying the adoption of IFRS in many countries (Christensen, Hail, & Leuz, 2013). Government agencies appear to have assumed ever greater roles in regulating capital markets. With this greater responsibility comes greater emphasis on the effectiveness of public enforcement to ensure the success of regulatory changes.

Academic research generally provides evidence that the presence of public enforcement improves the outcomes of securities regulations (Hope 2003; Jackson and Roe 2009; Jayaraman 2012; Christensen et al. 2013). The literature typically measures public enforcement using the formal enactments of regulatory enforcement or the formal powers of regulators on paper. However, public enforcement is a complex task which involves the use of significant resources, managing large number of regulatory personnel, as well as dealing with complicated financial and securities transactions. These simple aggregate measures of enforcement are perhaps less than ideal and most likely inadequate in informing regulators

about what makes public enforcement effective. In other words, the factors that determine the outcome of public enforcement remain unclear. Recent literature has begun to investigate this issue focusing on regulators' resource constrain (Jackson & Roe, 2009; Blackburne, 2014) as well as their political leverages (Correia, 2014). This thesis extends the prior literature to examine whether another factor, namely, regulators' strategy of enforcing securities laws, affects their regulatory outcomes.

Although the role of enforcement strategy has not yet been empirically explored in the arena of securities regulations, its usefulness for public enforcement has long been recognized in the (theoretical) economic and law literature. In these lines of literature, the focal point is on the optimal design of public enforcement. It suggests that regulators can design and implement certain strategies in their enforcement that optimize compliance.

The economic and law literature has developed three well-established enforcement approaches. The first established enforcement strategy follows a deterrence-based approach. Becker (1968) suggests that the effectiveness of public policy depends on deterrent effects, and punishment plays a central role in any public policy. But since enforcement is costly, perfect enforcement is neither practicable nor ideal. As a result, Becker (1968) and Stigler (1970) suggest that very severe penalties need to be in place to maximize deterrence. Deterrence in turn minimizes the need for costly law enforcement and hence minimize potential social losses due to law contraventions. An ideal policy is one that penalizes contraventions to an extent so that "crime would not pay" in the optimality condition (Becker 1968, 208).

The second strategy follows a compliance-based approach. Advocates of this softer enforcement approach do not believe in heavy punishments (e.g. Hawkins 1990; Bardach and Kagan 1982). They argue that unjustifiably high penalties may in fact decrease marginal deterrent effects (Stigler 1970; Feess and Wohlschlegel 2009) and foster legal resistance

(Bardach and Kagan 1982). They also question the validity of the economic assumption underlying the deterrence model that all individuals are 'rational' and profit-maximizing. They argue that, in reality, many market agents are law-abiding individuals who obey the law simply because it is the law. For this law-abiding group, nurturing the role of trust through persuasion and education, rather than heavy penalties, are believed to be the best and least expensive ways to deliver compliance (Hawkins 1990; Bardach and Kagan 1982).

The third type is a mixed approach, where the responsive enforcement strategy is one of the most prominent in this category. The responsive approach reconciles the two polarized approaches above. The Responsive Regulatory Theory, developed by Ayres and Braithwaite (1992, 19), recognizes that a mixed approach is optimal because the deterrence strategy works for the 'rational' group and the compliance strategy works for the law-abiding group. They suggest that a regulation is best complied with if a regulator has severe sanctions at their disposal but would enforce it using soft enforcement tools wherever possible. Such a regulator who has severe sanctions available in their toolbox is believed to be more able to secure compliance through soft means.

Grounded on the game theory in economics, this strategy acknowledges the co-existence of both the profit-maximizing and the law-abiding groups and suggests that the best enforcement is one that can be "provokable and forgiving contingently" (Ayres and Braithwaite 1992, 19). Ayres and Braithwaite (1992) believe that the availability to the regulator of a multi-layered "enforcement pyramid" is the key to securing compliance. In other words, a regulator should possess a range of enforcement tools or sanctions from the very severe (e.g. license revocation and criminal sanctions) to the very light (e.g. warning letter and persuasion). The larger is the sanction range, the more credible the light enforcement tools are expected to become. With many sanctions in the background, in case light enforcement fails to rectify undesirable behavior, the regulator can always threaten to

escalate to the more severe sanctions, making the regulator always remains dominant in the compliance "game". The sanction escalation feature of this strategy also improves the legitimacy of using severe sanctions when they are applied after light sanctions fail to work.

In summary, while the effectiveness of a carefully devised enforcement strategy is well recognized in the economics and law literature, very little is known in the accounting and finance literature to date about how an enforcement strategy can enhance corporate compliance with securities regulations. This research seeks to provide empirical evidence on the role of enforcement strategy in disclosure regulations.[1]

Responding to calls for more research that clearly isolates the effect of enforcement (Holthausen 2009, 456), the analysis is conducted in the Australian context. For clear isolation of the enforcement effect, Holthausen (2009, 456) recommends "looking for places where enforcement changed and other institutions were held constant", I identify the adoption of the responsive enforcement strategy (Ayres and Braithwaite 1992) by the Australian regulator (the Australian Securities & Investments Commission, ASIC) in the Continuous Disclosure Regime (CDR) to be such a case. Enacted in 1994, the underlying requirement and implementation of CDR is largely unchanged except that ASIC has adopted the responsive enforcement strategy since 2002 (Lucy 2004). Beginning with criminal sanctions only during enactment in 1994, the penalty structure of CDR has expanded to include civil sanctions in 2002, and further include administrative sanctions in 2004. By 2004, ASIC was equipped with a multi-layered "enforcement pyramid". Using this context, this thesis examines the effect of the adoption of the responsive enforcement strategy on the corporate compliance of CDR, with the level of compliance inferred from the changes in analyst's information environment and market liquidity.

[1] The focus of the thesis is on strategies for public enforcement. Private enforcement strategies (such as securities class actions) do exist in Australia throughout the sample period, but there have not been many (15 in my sample period, including those with no relevance to continuous disclosure) (Houston et al. 2010).

Research Question: *Does ASIC's adoption of the responsive enforcement strategy affect corporate compliance with the regulated continuous disclosure regime?*

The rest of this chapter is organized as follows. Section 1.2 provides a slightly more detailed background on the adoption of the responsive enforcement strategy in the Australian CDR. Section 1.3 presents the hypotheses, followed by a result summary in Section 1.4. Section 1.5 discusses the contributions. Finally, the structure of the thesis is outlined in Section 1.6.

1.2 Background: Responsive Enforcement Strategy & Australian CDR

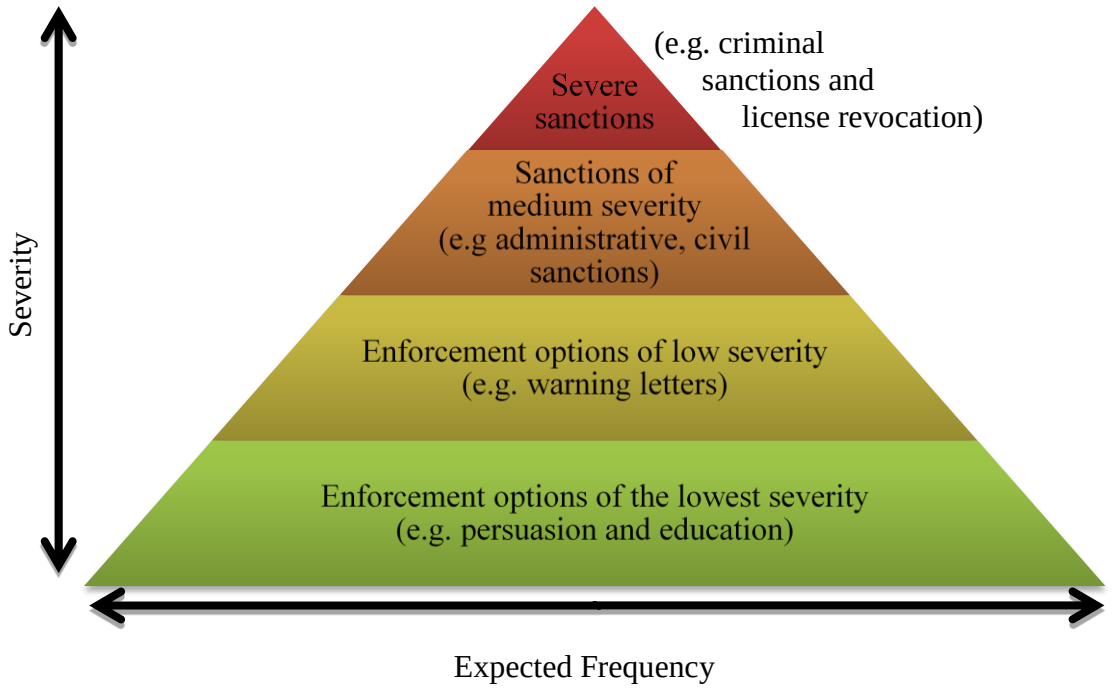
This section aims to provide a slightly more detailed background on the responsive enforcement strategy and how it is adopted in the Australian context.[2] The responsive enforcement strategy is formulated based on the Responsive Regulatory Theory developed by Ayres and Braithwaite (1992). This enforcement strategy has become one of the most influential enforcement strategies and received wide application around the world (Baldwin and Black 2008; Braithwaite 2006; Parker 2013; Mascini 2013). As of 2010, it has been applied by at least 35 government agencies or professional bodies in Australia, the UK, Canada, Indonesia, New Zealand, European Union, Netherlands, and the US (Wood et al. 2010).

The responsive enforcement strategy is characterized by a multi-layered "enforcement pyramid" (as depicted in Figure 1), which is essentially a hierarchical collection of

[2] A more detailed discussion can be found in the literature review in Chapter 2.

enforcement tools which typically escalate from persuasion at the base of the enforcement pyramid to the administrative and civil sanctions in the middle layers, and ultimately to criminal sanctions and license suspension at the tip of the pyramid. It is believed that the steeper (i.e. more layers) the enforcement pyramid, the higher the compliance level (Ayres and Braithwaite 1992).

Figure 1: Enforcement Pyramid



Taking into consideration the cost of enforcement, the Responsive Regulatory Theory argues that the best strategy for securing regulatory compliance is, where possible, to start from the bottom of the enforcement pyramid: having dialogue with the regulated entities, while keeping a hierarchy of sanctions in the background for deterrence. Effective deterrence is achieved through the collection of a variety of sanctions, which not only equips the regulators with tools to fend off any form of non-compliance, but also enables them to

strategically escalate punishments for offenders. With such an enforcement strategy, the regulator is believed to be most capable of conveying the message that compliance is the least costly option, which in turns secures the desired compliance. It is therefore particularly suitable for budget-constrained regulators (Braithwaite 2006). Its great flexibility and cost-effectiveness appeals potentially make the responsive approach a more powerful strategy than the deterrence and compliance strategies (Baldwin and Black 2008).

The progressive adoption of the responsive enforcement strategy for Australian CDR is identified as a preferable context where the observed changes in enforcement do not accompany the implementation of or changes to the law. The distinctive Australian setting allows clear attribution of effects to enforcement (Holthausen 2009), while most securities laws are introduced simultaneously with their accompanying enforcement (Jayaraman 2012; Christensen et al. 2013). The purpose of CDR is "to enhance the integrity and efficiency of Australian capital markets by ensuring that the market is fully informed".[3] Statutory provisions mandating continuous disclosure were first introduced in 1994, providing CDR with very severe (criminal) sanctions.[4] Despite the severe penalty, the effectiveness of the early CDR regime was subject to much criticism. Since then ASIC has gradually adopted the responsive enforcement strategy (Lucy 2004). From 2002, ASIC started a process of progressively completing a multi-layered enforcement pyramid where civil sanctions were introduced in 2002 and administrative sanctions in 2004.[5] During this period, the underlying requirement and implementation of CDR was largely unaltered. This progressive expansion of sanctions is aimed at improving corporate compliance with CDR taking place almost eight

[3] James Hardie Industries NV v ASIC [2010] NSWCA 332 at [355] (Spigelman CJ Beazley JA and Giles JA).
[4] In 1994, the *Corporations Act 2001* added section 674 to require listed disclosing entities to comply with the provision of continuous disclosure mandated by ASX Listing Rule 3.1. Failure to comply may attract criminal penalties.
[5] Section 674 of *Corporations Act 2001* was amended by the enactment of the *Financial Services Reform Act 2001* in 2002 to add the civil penalty regime. Essentially, the amendment provides the basis for a civil penalty to be applicable to certain provisions of the *Corporations Act 2001*. The Corporate Law Economic Reform Program (Audit Reform and Corporate Disclosure) Act 2004 introduced the administrative penalty regime in 2004. Under the administrative penalty regime, ASIC can issue infringement notices when dealing with minor contraventions.

years after its enactment.[6] As a result, the evolution of the Australian CDR provides a natural experimental setting to identify the effect of the responsive enforcement strategy in securing compliance by regulated firms with the underlying disclosure policies.

1.3 Hypotheses

Applying the prediction of Responsive Regulatory Theory (Ayres and Braithwaite 1992), it is expected that ASIC's adoption of the responsive enforcement strategy would have improved corporate compliance with CDR. I test this proposition by examining the effect of the progressive expansion of the CDR sanctions on: (i) the analyst's information environment, and (ii) market liquidity.

Financial analysts are important information intermediaries in capital markets. Their coverage and outputs are known to help improve market efficiency (Barth and Hutton 2004; Hollie et al. 2015) and reduce information asymmetry (Healy and Palepu 2001). Prior literature shows that the availability and amount of public disclosures are associated with various properties of the analyst's information environment, such as forecast accuracy and dispersion (Lang and Lundholm 1996; Hope 2003; Dhaliwal et al. 2012). These forecast properties have been used as proxies for the quality of the information environment in capital markets to infer the effectiveness of disclosure regulations (e.g. Heflin et al. 2003; Mohanram and Sunder 2006). Following the prior literature, these forecast properties are adopted to infer the level of compliance with CDR. Specifically, my hypotheses are:

[6] For example, the new administrative penalty was welcomed by the Department of Treasury as it "would remedy a significant gap in the current enforcement framework by facilitating the imposition of a financial penalty in relation to relatively minor contraventions of the regime that would not otherwise be pursued through the courts and in relation to which ASIC considers a relatively small financial penalty would be justified". (Department of Treasury, Commonwealth of Australia, Corporate Disclosure Strengthening the Financial Reporting Framework [2002] 147)

H1a: Analysts' earnings forecast accuracy improves in the periods after additional sanctions are added to the Continuous Disclosure Regime compared with the period before.

H1b: Analysts' earnings forecast dispersion reduces in the periods after additional sanctions are added to the Continuous Disclosure Regime compared with the period before.

H1c: The precision of public information used in analyst forecasts improves in the periods after additional sanctions are added to the Continuous Disclosure Regime compared with the period before.

H1d: Analysts' reliance on public information increases in the periods after additional sanctions are added to the Continuous Disclosure Regime compared with the period before.

Improving market liquidity is one of the official objectives of CDR set by the Australian Government (Treasury of Australian Government 2002). If the adoption of the responsive enforcement strategy has improved corporate compliance with the Australian CDR, the reduction in information asymmetry is expected to have enhanced market liquidity. The mechanisms through which better corporate disclosure affects liquidity are two-fold. First, it is more difficult and expensive for traders to become privately informed when more information is made publicly available. This moderates the likelihood of trading with a privately informed counterparty in the market. Second, more public disclosure of a firm's private information lowers the uncertainty in a firm's valuation, and in turn reduces the potential value of the information held by privately informed traders (Leuz and Wysocki 2008; Verrecchia 2001). Both effects diminish the need for un-informed investors to protect themselves through price and/or non-participation. Therefore, I hypothesize that:

H2a: Bid-ask spread reduces in the period after additional sanctions are added to the Continuous Disclosure Regime as compared with the period before.

H2b: Turnover rate increases in the period after additional sanctions are added to the Continuous Disclosure Regime as compared with the period before.

1.4 Summary of Results

The results reveal that as more CDR sanctions of different severity are introduced, both the analyst's information environment and market liquidity gradually improved. Specifically, analysts have increasingly relied on public information and the precision of public information as implied in analysts' forecasts has also shown incremental improvement. In addition, bid-ask spread has narrowed and turnover rate has increased. The findings are consistent with firms making timelier and more equitable disclosures following the strategy adoption. Together these empirical results support my expectation that the adoption of the responsive enforcement strategy improves corporate compliance with disclosure regulations. It is further documented that the largest improvements in analyst's information environment and in market liquidity occur after the inclusion of the final type of (administrative) sanctions. The result is consistent with the prediction of Responsive Regulatory Theory that a multi-layered enforcement pyramid is instrumental to best achieve compliance.

Several alternative explanations are also examined. First, to alleviate concerns that the information and liquidity improvements are driven by other concurrent events, especially those affecting disclosures and regulators' efforts globally, I re-examine the research question with a difference-in-difference approach using the neighboring New Zealand market as a control sample. The rationale is that while concurrent economic and technological factors may have impacted the analyst's information environment and liquidity similarly across Australian and New Zealand markets, the adoption of the responsive enforcement strategy is exogenous to the Australian market only. That is, to conclude that the responsive enforcement strategy has been effective, the various analysts' forecast properties and liquidity

proxies in the Australian market need to display improvements *incremental* to those in New Zealand after the sanction expansion. To a large extent, these are what I found. In addition, propensity-score matching is applied to minimize the differences in observable firm characteristics (such as firm size and return volatility) between the two markets that are unrelated to the enforcement strategy. The inferences remain largely the same.

Second, sensitivity analyses are conducted to preclude that the findings are driven by the increasing regulatory effort and resources instead of the adoption of the responsive enforcement strategy. I further show that the results hold after controlling for both variations in enforcement effort and resources expended by the Australian regulator over time, suggesting that the desirable outcomes of improving analyst's information environment and liquidity are at least partially achieved by way of the deterrent effect of the new strategy. Third, I show that the improvement in market liquidity is due to a reduction in the adverse selection component of spread (Lin et al. 1995), a more precise measure of information asymmetry from the market microstructure literature. Finally, falsification tests are conducted and their results support the internal validity of the models used.

1.5 Contributions

1.5.1 Theoretical contributions

This thesis contributes to the growing literature examining the impact of enforcement on securities regulations. With the recent increases in securities regulations around the world, the question of how to improve enforcement becomes increasingly important. Undertaking a particular enforcement strategy has been suggested in the economics and law literature to be useful means of improving compliance (Becker 1968; Stigler 1970; Ayres and Braithwaite 1992; Baldwin and Black 2008). Yet little is known about the impact of enforcement strategy

on capital market regulations in the accounting and finance literature. This study extends this line of literature by documenting that the responsive enforcement strategy may have a significant impact on compliance with disclosure regulations. With compliance inferred from changes in analyst's information environment and market liquidity, this study suggests that the enforcement strategy of escalating sanctions (Ayres and Braithwaite 1992) may be an important mechanism through which regulators can obtain effective public enforcement of securities legislation. This finding contributes to advancing the understanding of the optimal form of enforcement (Leuz and Wysocki 2008).

Prior literature shows that the quantity of resources available to financial regulators constrains their enforcement efforts and hence their enforcement outcomes (Cox et al. 2003; Jackson and Roe 2009). Budgetary constraints can result in regulators applying an uneven enforcement effort across different industries and geographical locations, causing cross-sectional differences in deterrent effects (Kedia and Rajgopal 2011; Blackburne 2014; Correia 2014). After controlling for changes in regulatory resources, the finding of incremental explanatory power with the responsive enforcement strategy suggests that the adoption of this strategy may act as a cost-effective enforcement mechanism. This thesis suggests that carefully designed enforcement strategies may achieve deterrence in relation to securities regulations. Simple enforcement strategies such as the development of an enforcement pyramid provide an effective non-recurring investment by policymakers that apply to all firms across different industries and locations, offering a potentially cost-effective method of securing compliance.

This study also adds to the law and economics literature by providing empirical evidence on the effect of enforcement strategy on securities laws. The enforcement of securities law by regulators is often very costly and difficult due to the complexity of financial transactions (Brunnermeier and Oehmke 2009; Kell 2013; Spatt 2012). The success

of enforcement is also uncertain especially when the counterparties (e.g. multinational companies) are potentially very large and resourceful. Using the abundant accounting and finance data and relatively well-established quantitative measures of regulatory effectiveness, this study examines the effective use of the responsive enforcement strategy in securities regulations and the findings from the study complement the debate on what constitutes the optimal form of enforcement.

1.5.2 Practical Implications

The findings of this thesis are potentially useful for regulators around the world who aim to improve their enforcement. First, the results suggest that enforcement strategy plays an important role in the effectiveness of a regulation. This study shows that a carefully devised enforcement strategy may create significant deterrent effects which help to secure compliance. While enforcement actions have also been shown to create deterrent effects (Bhattacharya and Daouk 2002), intensive law enforcement may not be socially optimal when the costs of legal actions and implementation (especially imprisonment) are taken into account (Stigler 1970). Therefore, regulators should seriously consider investing in devising an appropriate enforcement strategy that achieves compliance and at the same time reduces the need for costly enforcement.

Second, while the evidence on the effectiveness of the responsive enforcement strategy is found within the context of disclosure regulations, the results may possibly be generalizable in other regulations. The responsive enforcement strategy is not specifically designed for a certain type of regulations. In fact, it was first developed and applied in the regulation overseeing occupational safety in the coal mining industry (Braithwaite 1985). It has since been applied in a wide range of industries around the world (Wood et al. 2010). The fact that it did not originate in relation to security regulations but is found to work in such a

context suggests that the theory has a strong predictive power, and thus may be applied in other contexts.

Finally, the findings should inform ASIC that the enforcement strategy that they employed has been effective in terms of improving market liquidity and analyst' information environment. Moreover, prior studies on CDR effectiveness typically involve comparisons of the pre- and post-regulation values of some effectiveness measures within Australia (Brown et al. 1999; Hsu et al. 2012; Hsu 2009), and this method is known to be subject to contamination by concurrent events (Healy 2007; Francis et al. 2006). To the best of my knowledge, this research is the first to evaluate the effectiveness of CDR in Australia using the New Zealand market as a benchmark. This thesis thus provides ASIC with another form of evaluation of the Australian CDR which better controls for concurrent events.

1.6 Structure of Thesis

The remainder of this thesis is organized as follows. In Chapter 2, I review the prior literature on the effect of public enforcement on capital market regulations. It also provides some background on Responsive Regulatory Theory and the Australian Continuous Disclosure Regime. Chapter 3 examines the impact of the responsive enforcement strategy on analyst's information environment, while Chapter 4 examines that on market liquidity. Each of Chapter 3 and 4 includes a review of related literature, hypothesis development, research design, measurement, data and sampling, results, as well as sensitivity and additional analyses. At last, Chapter 5 synthesizes the results and forms a conclusion.

Chapter 2:

Literature Review & Institutional Background

This chapter reviews the literature in relation to this thesis and details the institutional background of the Australian Continuous Disclosure Regime. Disclosure regulation is very pervasive around the world. It is argued that disclosure regulation provides potential benefits include positive externality of corporate disclosure, market-wide cost savings and the introduction of disincentives for misreporting (Section 2.1). Prior literature has shown that enforcement is critically important in securing positive outcomes for securities regulations. In the extant literature, four factors that are associated with effective enforcement can be identified (Section 2.2). They are enforcement actions, deterrent effects, certain legal infrastructures and regulatory resources. However, perfect enforcement is simply not practical (Stigler 1970), and many of these existing factors are beyond the control of financial market regulators. Regulators who wish to enhance their enforcement may find it difficult to apply these findings in practice.

Section 2.3 explores the law and economics literature for a potential new factor of effective enforcement, enforcement strategy, which regulators tend to have control over. While the important role of enforcement strategy in enforcement effectiveness has long been recognized in the law and economics literature, little is known about its role in relation to securities regulations in the empirical accounting and finance literature. Section 2.3 identifies the three most established enforcement strategies and focuses on reviewing an influential and widely-applied enforcement strategy: the responsive enforcement strategy (Ayres and Braithwaite 1992). The responsive enforcement strategy is believed to be suitable for securities regulations due to its flexibility and cost appeals. In this context, the Australian

Continuous Disclosure Regime (CDR) is identified as an experimental setting for analyzing the effect of the responsive enforcement strategy. Section 2.4 details the institutions of Australian CDR and discusses why it is a preferable natural experimental setting. The chapter concludes in Section 2.5.

2.1. Rationales for Regulating Corporate Disclosures

Disclosure regulation is very pervasive in advanced economies and has played a significant role in the efficient operation of capital markets (Leuz and Wysocki 2008). It is well-documented in the literature that corporate disclosure yields a series of benefits. For firms, corporate disclosure may increase firm valuation through improving market liquidity (Verrecchia 2001) and risk sharing (Merton 1987); and mitigating estimation risks (Lambert et al. 2007) and agency conflicts (Shleifer and Wolfenzon 2002). In addition, a firm's disclosure may also have effects beyond the firm itself by way of information transfers and liquidity spillovers (Foster 1981; Dye 1990; Admati and Pfleiderer 2000). However, the existence of the many benefits of firm disclosure does not automatically justify regulating such activities, because a firm will choose to disclose when there are net benefits for them to do so (i.e. the unravelling arguement: Grossman and Hart 1980; Grossman 1981; Milgrom 1981; Milgrom and Roberts 1986; Ross 1979). If it is to the advantage of the firm to disclose, one may question why disclosure is regulated at all.

There are four major and interrelated arguments to justify disclosure regulation in the extant literature. First, it is argued that regulating corporate disclosure creates externalities that are socially desirable (Dye 1990; Admati and Pfleiderer 2000; Fischel and Easterbrook 1991). For example, investors (and competitors) can make more informed decisions if they are provided with information about a firm's industry prospects and its competitive stance (Darrough 1993; Pae 2002). Second, regulating disclosure requirements can result in market-wide cost savings and efficiency gains by enhancing comparability of disclosures across

firms (Dye and Sunder 2001) and reducing investors' duplication of information processing (Mahoney 1995; Dye and Sridhar 2008). Third, regulating disclosure can be beneficial by offering access to severe penalties (e.g. sanctions of a criminal nature) which are inaccessible through private means (Leuz and Wysocki 2008). Deterrent effects may fail to materialize without severe penalties. Fourth, regulating disclosure provides disincentives for management to misreport which in turn assists the stewardship role of performance disclosure (Hölmstrom 1979) and alleviates agency conflicts (Jensen and Meckling 1976; Shleifer and Wolfenzon 2002).

While regulating corporate disclosure may potentially yield a number of benefits and be socially desirable, it is important to recognize the fact that disclosure regulations are not without their costs. Regulated disclosure regimes are costly to design, implement and enforce. It is therefore essential for financial regulators to ensure that these regulations are effectively implemented so that they do deliver benefits. Prior research has shown that the desirability and effectiveness of disclosure requirements largely depend on the chosen enforcement mechanism (Leuz and Wysocki 2008, 22).

2.2. Enforcement & Factors of Effective Enforcement

2.2.1. Enforcement & regulatory effectiveness

The literature has singled out the concept of enforcement to be an essential element in regulatory effectiveness. In the accounting and finance literature, the importance of enforcement of security regulations and accounting standards on a country's financial development and financial reporting outcomes has been well-recognized since the early 1990's. The topic of enforcement has received increasing interest from accounting and finance academics in the recent decade, with the majority of work being done in the last few years. The effectiveness of a regulation regime is often referred to as the extent to which the

regulated population complies with the prescribed rules. It is believed that when the prescribed law is fully complied with, social losses (gains) will be minimized (maximized) (Becker 1968; Stigler 1970).

In the enforcement literature, there is a strong consensus that enforcement plays a critical role in achieving favorable regulatory outcomes by creating credible deterrent effects and thus securing compliance. For example, Bhattacharya and Daouk (2002) examine a sample covering all stock exchanges in the world in 1998 and find capital market benefit (cost of capital) to manifest only in countries which have enacted and enforced their insider trading regulation. Without law enforcement, the regulation itself yields little benefit. In fact, in a related paper, Bhattacharya and Daouk (2009) show that the countries which have enacted an insider trading regulation but have never enforced it are found to fare even worse than those without such law altogether: the cost of capital in the former is significantly increased. The same is true in the context of market manipulation regulations (Humphery-Jenner 2013). Humphery-Jenner (2013) shows that insider trading and information asymmetry increase following the imposition of a strong law in a weak enforcement environment. In a nutshell, these studies highlight that regulation can only be as effective as its enforcement.

Nevertheless, regulators who are keen to improve their enforcement outcomes may find it difficult to apply these research findings in practice. It is primarily because the concept of enforcement is defined very diversely and sometimes rigidly by different researchers. The measurement of enforcement ranges from a regulator's enforcement actions (e.g. Bhattacharya and Daouk 2002) and a country's legal infrastructures (e.g. La Porta et al. 1997) to the quantity of resources available to regulators (e.g. Jackson and Roe 2009), and sometimes a combination of some or all of these (e.g. Hope 2003; Brown et al. 2014). The rigidity of some of these enforcement measures is largely due to the cross-country nature of

these studies. To make cross-country inferences, it is inevitable that researchers have to abstract the common characteristics of successful regulatory regimes and attribute some of these to enforcement. Yet, enforcement in practice is by no means a simple task. It often involves substantial public resources in terms of public finances, and regulatory and judiciary efforts; and can sometimes be highly political (Correia 2014). Not only that, the success of some law enforcement activities can be quite uncertain. Measuring enforcement with oversimplified metrics is unlikely to be very informative for the regulators. Given the diversity and rigidity of how enforcement is measured, the practical question of what constitutes effective enforcement is unclear.

In an attempt to consolidate the extant findings about enforcement thus far, the following sections review the factors that have been identified as crucial to effective enforcement in the literature. For an overview, I identify and summarize the four interrelated factors that follow and review each factor subsequently. These factors are, respectively:

1. *Enforcement actions* refer to a regulator's enforcement actions or investigations, but the focus of the earlier studies is on the target firms only (e.g. Feroz et al. 1991).
2. *Deterrent effect* refers to the externality of the regulator's actual investigations or enforcement actions on peer firms or the market as a whole (e.g. Bhattacharya and Daouk 2002).
3. *Legal infrastructures* refer to the legal, political, regulatory and judiciary characteristics of a country (e.g. La Porta et al. 1997). This stream is typically in cross-country studies, focusing on the market-wide effects of enforcement and measuring the effectiveness of enforcement based on the surveys of legal infrastructures across countries. More recent studies focus on carefully disentangling the effect of enforcement from other confounding effects, which typically involves identifying contexts where there has been a change in enforcement while other institutions were held constant (Christensen et al. 2013).

4. *Regulatory resources* refer to the financial budget, staffing level and political position of a regulator. These studies are also typically of cross-country nature (e.g. Jackson and Roe 2009; Correia 2014).

2.2.2. Enforcement actions

The first two factors of effective enforcement identified are related to a regulator's enforcement actions or prosecutions. The first stream in the literature focuses on the impacts of the regulator's investigations or enforcements on the target firms only, where the second focuses on the wider deterrent effect. Feroz et al. (1991) represents the earliest research in this stream. Using a sample of 224 accounting-based enforcement actions by the SEC compiled in the Accounting and Auditing Enforcement Releases (AAERs) in the 1980s, Feroz et al. (1991) examines the job market consequences for the senior managers/auditor and the capital market consequences for the target firms. They find that 72% of the target firms fired their top managers and 42% of the targets' auditors were censured by the SEC. In a two-day window, they also report -6% abnormal returns around disclosures of investigations only; and -13% for disclosures of reporting violations.

With a similar focus on the target firms only, Karpoff et al. (2008b) investigate all 585 penalties applied by the SEC and Department of Justice (DOJ) and the reputational losses borne by the target firms regarding enforcement actions on financial misrepresentation from 1978 through 2002. They find that while the size of penalty applied is economically significant on its own (with an average penalty size of US$23 million), it only represents roughly 30% of the estimated gain due to the misrepresentation in terms of market value. Although the penalty applied is only a fraction of the estimated gain, Karpoff et al. (2008b) further reveal that the reputational loss (in terms of market value) imposed by the market is

more than ten times as large.[7] On average, the target firm's total loss in terms of market value upon enforcement (i.e. legal penalty plus reputational loss) is estimated to be four times higher than the gain due to misrepresentation.

Similar pain is also felt by the senior executives and auditors who were held responsible for the misrepresentation. In a related paper, Karpoff et al. (2008a) present evidence that the senior management who were responsible for the misrepresentation subsequently suffered negative job market consequences. In addition, the auditors involved are more likely to be sued (Bonner et al. 1998), especially when the prosecution is related to fraud and fictitious transactions.

However, regulators' enforcement activity may sometimes carry unintended (negative) consequences. Dechow et al. (2014) investigate the level of insider sales surrounding the public releases of SEC comment letters. The SEC issues comment letters with an aim to elicit better compliance with applicable disclosure rules and Generally Accepted Accounting Principles (GAAP). Yet, SEC is only allowed to publicly release those comment letters and responses at least 20-45 days after the review is completed. Dechow et al. (2014) find that insiders have been exploiting this time gap by selling shares around public disclosure of SEC comment letters that relate to material reporting issues. Their findings show that a regulator's monitoring and enforcing actions may have unintended effects that may be detrimental to market integrity and investor protection.

Overall, this stream of literature forms a clear message that when penalties and reputational damage are taken into consideration, it is neither in the interests of the investors of the target firm, nor its managers, nor its auditors to engage in financial misrepresentations or frauds. However, it does not imply that firms would not contravene the law due to the lack of net benefits from doing so. Each year, it is estimated that a mere of 0.7% of the listed

[7] The present value of loss due to higher future contracting and financing costs is estimated at 7.5 times the legal and regulatory penalties.

population are subject to SEC enforcements and investigations, and this figure includes all types of misbehavior not just accounting-related (Jennings et al. 2011). In addition, over the past two decades in the US, only approximately 600 firms had faced enforcement actions. In a world where complete enforcement is impracticable (Stigler 1970), what is more important to the investing public is perhaps what these enforcement actions imply to the wider market (i.e. externality).

2.2.3. Deterrent effect

The second key factor in effective enforcement is the wider deterrent effect of enforcement actions. This stream of literature extends the investigation of the effect of enforcement actions from the target firms to their externality or deterrent effect on their industry peers and the market as a whole. As mentioned in Section 2.2.1, Bhattacharya and Daouk (2002) place their focus on the first enforcement actions taken with respect to insider trading regulations in 103 countries,[8] arguing that the initial law enforcement sends a credible signal to capital market participants of a strengthened regulatory paradigm. They find that the cost of capital is not reduced if a country simply enacts the law; the capital market only enjoys the benefit of a lower cost of capital if the regulator begins to enforce it. In their related study, Bhattacharya and Daouk (2009) show that the cost of capital actually increases for the countries that have insider trading regulation but do not enforce it – a situation which is even worse than those countries which have no such law altogether.

Using the first-time insider trading enforcement data of Bhattacharya and Daouk (2002), Jayaraman (2012) examines the impact of enforcement on timely loss recognition (or accounting conservatism) across 16 countries. He adopts a difference-in-difference research design, matching each country with an enforcement history with a non-enforcing

[8] Their sample includes all countries with a stock market in the world as of 1998.

"neighboring" country[9] to isolate the effect of enforcement from concurrent events. He finds the significant evidence of timelier recognition of losses by firms in the countries which have previously enforced the relevant law, but no difference in their "neighboring" non-enforcing countries. His finding is consistent with greater enforcement increasing the usefulness of accounting data and therefore reporting quality.

Other studies have focused on the impact of enforcement actions on the financial reporting performance of peer firms, rather than of the entire market. Considering peer firms as firms in the same industry, Jennings et al. (2011) find that the average peer firm reports less aggressively (using discretionary accruals as proxies) if one or more other firm(s) in the same industry were subject to SEC enforcement actions. This finding is consistent with positive externality of enforcement actions within an industry. They also find that the deterrent effect is higher if the target firm is more "visible" (defined as whether a firm is in a competitive industry, with larger size, higher growth and greater market share), suggesting that regulators may adopt strategic targeting to maximize deterrent effects. In addition, repeated and sustained enforcement actions in a particular industry are found to provide more effective deterrence, relative to isolated enforcement.

Kedia and Rajgopal (2011) find evidence that a firm that is located closer to a SEC regional office is less likely to adopt aggressive accounting practices (as proxied by the likelihood of restatements). This finding is consistent with regulators exhibiting enforcement preferences given their budgetary constraints. The same is true for firms in a geographic region where there had been greater past SEC investigation and enforcement activities, consistent with Jennings et al. (2011). Their findings suggest that both the regulator's presence and enforcement intensity produce a deterrent effect.

[9] Jayaraman (2012) refers countries of similar characteristics (such as legal origin) as neighboring countries. For example, he matches Australia with New Zealand, Argentina with Brazil, and Hong Kong with Singapore, etc (Table 2, p.84).

Collectively, the second stream of studies has shown securities law enforcement provides positive externality beyond just the target firms. Securities laws need to be enforced for market-wide capital market benefits to materialize. Regulators setting a precedent of law enforcement appear to be critical in making deterrence credible. Enforcement with persistence appears to provide even greater deterrent effects. In addition, considering the fact that regulators work under a predefined budget, strategic targeting of visible firms may optimize the resultant deterrent effect.

2.2.4. Legal infrastructures

Legal infrastructure and financial market development

The third effectiveness factor identified is a country's legal infrastructures. This stream of literature extends our understanding of the effect of legal infrastructures on capital market outcomes by exploiting their cross-country variations. La Porta et al. (1997) represents one of the earliest studies in this stream. They argue that a country's legal infrastructures, such as the strength of its investor protection laws, its origins of law and judicial efficiency, are important determinants of investor protections which in turns affect where and how firms source their finances. They formulate a series of indices measuring the quality of legal infrastructures across 49 countries, based on surveys of attorneys all over the world. La Porta et al. (1997) show that common law countries generally have the strongest legal protections of investors' rights and a good quality of law enforcement; in contrast, French-civil-law countries are the weakest in these two aspects. They find that equity and debt markets in strong investor protection countries enjoy significantly better development in terms of their size and breadth. In addition, common law countries tend to enjoy higher quality accounting standards and financial reporting quality (Ball et al. 2000), especially for countries with stronger enforcement mechanisms (Ball et al. 2003).

In a related paper to La Porta et al. (1997), La Porta et al. (1998) provide evidence that public companies tend to concentrate equity ownership in countries where investor protection is low. They interpret this result as major shareholders holding majority shares to defend themselves from management expropriations; because the existing legal system is unlikely to protect their rights. Ownership concentration therefore becomes a substitute for legal protection when law enforcement is poor. Concentrated ownership comes at the expense of forgoing potential diversification benefits for controlling shareholders and low participation of small investors. In other words, the allocative efficiency of capital is compromised due to poor protection of investors' interests. This in turns helps explain the association between investor protection and financial market development (La Porta et al. 1997).[10]

Legal infrastructure and financial reporting

With respect to corporate disclosures, Hope (2003) is among the earliest studies that explicitly associates enforcement with the quality of financial reporting in a cross-country setting. In measuring enforcement, Hope (2003) uses a mixture of what La Porta et al. (1998), i.e. legal infrastructures and Bhattacharya and Daouk (2002), i.e. enforcement actions used in their measurements.[11] Using a sample from 22 countries, he finds that on average, analysts based in countries with stronger enforcement regimes make more accurate forecasts. He interprets the evidence as meaning that enforcement encourages managers to comply with prescribed accounting rules, which in turn reduces analysts' uncertainty about future earnings. In addition, he finds that enforcement is more powerful when accounting flexibility is high, and disclosure is particularly important when analysts' coverage is low. These findings

[10] It is noteworthy that while some legal infrastructure measures are proxies of public enforcement, others are proxies of private enforcement (La Porta et al. 2006; Djankov et al. 2008; La Porta et al. 2013).
[11] Hope (2003) constructs a comprehensive measure of enforcement based on another set of five country-level factors: audit spending, insider trading laws, judicial efficiency, rule of law, and shareholder protection.

suggest that law enforcement combined with certain legal infrastructures may lead to more useful corporate disclosures which help improve analyst's information environment.

Leuz et al. (2003) examine the effect of investor protection on earning management across 31 countries. Their investor protection measure consists of legal infrastructure scores such as outside investor rights and legal enforcement, sourced from La Porta et al. (1997, 1998). They find that earnings management in countries with strong legal enforcement (or investor protection) is significantly less pervasive. Strong investor protection limits the insiders' ability to expropriate control benefits, which reduces their incentive to use earnings management to mask firm performance. The results of Leuz et al. (2003) are consistent with those of Hope (2003) that better enforcement leads to desirable reporting outcomes.

2.2.5. Regulatory resources

The fourth factor identified is regulatory resources. The quantity of financial and staffing resources a country provides their financial regulator with to a large extent determines the level of monitoring and enforcement activities that can be afforded (Jackson 2007; Jackson and Roe 2009; Blackburne 2014; Kedia and Rajgopal 2011; Cox et al. 2003). This view is supported by Kedia and Rajgopal (2011) who show that the SEC is more likely to investigate the firms located closer to its regional offices and, in response, the firms located closer to SEC offices are less likely to engage in aggressive accounting practices. Their evidence is consistent with the SEC being resource-constrained and conducting their enforcement activities based on their allocated budget.

Regulatory resource levels across countries have thus been used as proxies for (public) enforcement in the literature. Jackson and Roe (2009) incorporate the budget sizes and staffing levels of financial regulators around the world as proxies for public enforcement. They argue and present evidence that their proxies are superior in terms of objectivity to the legal infrastructure survey-based proxies of La Porta et al. (2006). Their argument that the

resource proxies are superior is sensible because a poorly-funded regulator is unlikely to enforce law infringements properly even if the country has excellent legal infrastructures. Jackson and Roe (2009) find that public enforcement is more important than private enforcement in determining a country's financial development as measured by a range of macroeconomic indicators. Their findings contrast with those of La Porta et al. (2006) using the legal infrastructure proxies which suggest the opposite.[12]

Using a novel dataset that contains detailed office-level budget data about the SEC, Blackburne (2014) finds evidence of improved reporting quality in firms coming from an industry in which the SEC is allocated more regulatory resources for oversight of corporate disclosures. When SEC oversight is more intense, managers tend to report lower discretionary accruals and are less likely to subsequently restate a financial report. Moreover, firms under intense oversight experience a drop in their bid-ask spreads. The SEC is also found to concentrate resources to monitor industries which are more politically active and visible. Jackson and Roe (2009) and Blackburne (2014) present consistent findings that a regulator's financial and staffing resources are a fundamental factor in securing firm compliance.

Moreover, a regulator's political resources are also found to affect the outcomes of its enforcement efforts. Correia (2014) presents evidence that firms and executives with long-term political connections (through political contributions and lobbying) incur lower costs from SEC enforcement actions. These politically connected firms are not just less likely to be involved in SEC actions; in case they are involved, they usually face a lower penalty. The evidence shows that just as a resourceful regulator tends to enforce more effectively, resourceful counterparties (regulated firms) create effective barriers to the regulator's enforcement efforts. It is unfortunate because bringing enforcement actions against large and

[12] More recently, in an attempt to develop a comprehensive set of enforcement proxies, Brown et al. (2014) incorporate inputs from both Jackson and Roe (2009) and La Porta et al. (2006), as well as other sources.

visible firms is shown to be associated with higher levels of deterrence (Jennings et al. 2011). Nevertheless, Correia's (2014) study infers that loading up the regulator with resources can still be effective against firms that are not politically active, which represents the vast majority (about 80%) of the listed population.

2.3. Enforcement Strategy: a potential Fifth Factor

Having reviewed the four factors of effective enforcement, the central message is unambiguous: enforcement is of utmost importance to a rule's effectiveness. However, there exist limitations on how these factors may translate into practical actions by regulators. As Jackson (2007, 254) indicates in his seminar on financial reform in South Korea, he was not asked by the regulators whether or not law enforcement is important. Instead, he was asked very specific questions such as how many staff the then newly-established regulator should hire. While the literature would advise the regulator to continue hiring until the marginal cost exceeds marginal benefit, the regulator was expecting specific answers like 100, 1000, or 10,000. In a similar vein, a regulator in practice may not find the well-documented finding that "enforcement is important" to be of practical use.

To be specific, for the four factors identified, many are out of the financial regulator's direct influence. For example, it is almost impossible for a country to change its legal origin even though common law countries are shown to have higher enforcement quality and law than countries with other origins of law. Similarly, it is most likely beyond the financial regulator's control to alter a country's existing legal infrastructures such as judicial efficiency. In fact, Stigler (1970, 534-535) advises against modifying the "considerable inertia in the legislative process" when devising optimal law enforcement. Regulators who are determined to strengthen their enforcement would find it confusing or impossible to follow suit.

Second, law enforcement can be very costly and perfect enforcement in reality is impossible (Becker 1968; Stigler 1970). In other words, when cost is considered, even knowing that enforcement is beneficial, one still cannot automatically assume that more enforcement is always better. Rather, it is often the opposite that is considered effective: an optimal enforcement policy should take form in which to minimize costly law enforcements while maximizing deterrent effects (Becker 1968; Stigler 1970). It is especially relevant when financial market regulators operate with a predefined and limited budget (Kedia and Rajgopal 2011; Blackburne 2014; Cox et al. 2003; Jackson and Roe 2009).

Third, even though the levels of regulatory resources are shown to be associated with positive market outcomes, regulators typically have little control over the size of their allocated budget (Correia 2014) and their budget is often constrained (Jackson 2007; Kedia and Rajgopal 2011). Moreover, the publicly available data on their gross budget may not be a true reflection of their internal enforcement budget (Blackburne 2014). For example, unlike most regulators, the Australian regulator, ASIC, is in charge of managing company registration as well as overseeing the financial markets.[13] The size of their gross budget may not be as reflective of their enforcement activities as regulators in other countries.

In summary, the four factors of effective enforcement that are reviewed here are all significant determinants of regulatory effectiveness, but perhaps these factors are not means which financial regulators can easily access to achieve results. The recent findings by Christensen et al. (2013) shed some light on what regulators may do. They find that substantive government-led reform in the enforcement regime can be a powerful means of ensuring compliance. Countries that are deemed to have undergone substantive changes in reporting enforcement are those which "created new enforcement agencies, moved to a proactive review process for financial statements to ensure compliance with IFRS, tightened

[13] "Federal Government's plans to sell ASIC registry raises governance concerns", Sydney Morning Herald, 13 May, 2015 (accessed July 2015: http://www.smh.com.au/business/federal-governments-plans-to-sell-asic-registry-raises-governance-concerns-20150513-gh0y8y.html).

penalties for violating accounting standards, increased resources available to supervisory authorities, or made other enforcement changes" (Christensen et al., 2013, 153).[14] In other words, the regulator may achieve more effective enforcement by adjusting its monitoring activities and/or penalty structure. The same viewpoint has long existed in the law and economic literature that optimal enforcement requires the regulator to devise a suitable enforcement strategy (Becker 1968; Stigler 1970; Ayres and Braithwaite 1992; Baldwin and Black 2008).

2.3.1. Existing types of enforcement strategies

This section briefly reviews some of the most compelling enforcement theories in the law and economics literature,[15] but places its focus on one well-established and widely applied enforcement strategy: the responsive enforcement strategy (Ayres and Braithwaite 1992). The three most established enforcement approaches are: (i) the deterrence-based approach which emphasizes the use of penalties and prosecutions to deter contravention; (ii) the compliance-based approach which educates and coerces potential offenders to comply with the law; and (iii) the responsive approach which combines both the deterrence and compliance approaches.

The first established enforcement strategy is a deterrence-based approach. Becker (1968, 204) suggests that the effectiveness of public policy relies on deterrent effects. Since enforcement is costly, the regulator needs to determine "optimal policies to combat illegal behavior as part of an optimal allocation of resources" (Becker 1968, 208-209). Focusing on punishment, an optimal policy, according to Becker (1968), is one that penalizes more

[14] To code these changes, they use a survey of regulators, accounting firm (Pricewaterhouse Coopers) partners, and academics to determine substantive enforcement changes over the sample period. But as the authors admit, the coding process inevitably remains somewhat subjective.

[15] There is another emerging regulatory theory, known as the 'risk-based approach', advocates the concentration of regulator's resources to where risks are the greatest, i.e. different industries and firms should face different level of risk (Rothstein et al. 2006).

damaging contraventions more severely and frequently so that "crime would not pay" in the optimality condition (Becker 1968, 208). Similar to Becker (1968), Stigler (1970) emphasizes that a "penalty structure" which allows "variation in enforcement provides desirable flexibility in public policy" (Stigler 1970, 534-536). In short, both Becker (1968) and Stigler (1970) suggest that very severe penalties need to be in place to maximize deterrence, while at the same time, minimize the need for costly law enforcement.

The second is a compliance-based approach. The compliance approach disagrees with the belief in heavy penalties as suggested by Becker (1968) and Stigler (1970) on two grounds. First, heavy punishment has its own limitations. Unjustifiably high penalties may decrease marginal deterrent effects rather than increase them (Stigler 1970; Feess and Wohlschlegel 2009). Constantly applying unreasonably heavy sanctions may foster a subculture of legal resistance (Bardach and Kagan 1982), which is detrimental to public compliance. Second, believers in the compliance model (e.g. Hawkins 1990; Bardach and Kagan 1982) cast doubt on the economic assumption underlying the deterrence model that all individuals are "rational" and profit-maximizing. This assumption posits that an individual chooses to violate the law if there are net expected benefits to do so. This assumption is unlikely to hold true because there exist a large group of market agents who are law-abiding individuals. These individuals obey the law not because they expect net benefits, but simply because they believe it is the right thing to do. For this law-abiding group, nurturing the role of trust through persuasion and education, rather than heavy penalties, is believed to best deliver compliance. Moreover, in terms of the regulatory resources required, persuasion is a much cheaper alternative compared to prosecutions (Hawkins 1990; Bardach and Kagan 1982).

2.3.2. Responsive enforcement strategy

The third is a responsive regulatory approach. Among these approaches, the responsive approach has stood out as an influential theory in the law literature and has received wide application internationally in recent decades (Raykovski 2004; Baldwin and Black 2008; Mascini 2013). Ayres and Braithwaite (1992) argue that the two distinctive regulatory strategies (deterrence and compliance) are effective for two different types of regulated actors. While some rational corporate actors will evade the law as long as the benefits from evasion outweigh the costs of potential litigation, other regulated actors are simply law abiding citizens who consider that complying with the law is socially responsible.[16] A pure cooperation or compliance regulatory strategy without deterrence measures will not work against economically rational players who exploit the light approach of the regulator. Similarly, a pure deterrence strategy may lose legitimacy because it is too heavy-handed for otherwise responsible corporate actors who choose to comply in response to the low-cost approaches of dialogues and guidance. These observations lead Ayres and Braithwaite (1992) to believe that the optimal regulatory strategy is one that merges persuasion with punitive enforcement.

Reconciling the long history of polarization of the deterrence and compliance models is not easy. In fact, successfully reconciling them is one of the greatest contributions of Ayres and Braithwaite (1992) (Baldwin and Black 2008; Sparrow 2003). In Sparrow's words (2003, 184: Chapter 19), Responsive Regulatory Theory reconciles the disputation "between those who think that corporations will comply with the law only when confronted with tough sanctions and those who believe that gentle persuasion works in securing business

[16] Recent archival studies show that socially responsible firms are less likely to engage in questionable conducts including earnings management (Kim et al. 2012) and tax avoidance (Hoi et al. 2013). These results suggest that corporate actors may be constrained by social and ethical consideration.

compliance with the law." To arrive at the right balance between the two extremes, Responsive Regulatory Theory would have to offer solutions to two key questions.

When to punish; when to persuade?

Scholz (1984) inspires the answer for the first question: "when to punish; when to persuade?" (Braithwaite 1985). Grounded in the game theory in economics, Scholz (1984) models regulation as a repeated prisoner's dilemma game between the regulator (who may choose to be either cooperative or deterrent) and the rational regulated actors (who can either comply with the regulation or evade the law). Scholz (1984) further shows that the *Pareto* optimal choice for both the regulator and the regulated is to cooperate. In such equilibrium, the regulator incurs minimum supervision costs,[17] while the regulated entity would rather spend its resources on compliance than on fighting a complaint of having breached the rules. If any party deviates from this point, the other party is expected to retaliate by either imposing punitive sanctions or evading the rules, resulting in higher costs for both parties.

Building upon Scholz (1984), Ayres and Braithwaite (1992, 19) suggest that the best enforcement is one that can be "provokable and forgiving contingently". They acknowledge the co-existence of both the profit-maximizing and the law-abiding groups and argue that a regulation is best complied with if a regulator is "the benign big gun". In other words, when it is necessary for a regulator to have some very severe sanctions, it is expected that the regulation rarely use these but typically use the soft enforcement means such as persuasion. Nevertheless, the possession of severe sanctions is critical in making the use of soft enforcement successful, because the regulator will be more able "to speak softly when they carry big sticks" (Ayres and Braithwaite 1992, 19). From the regulators' perspective, the cost-effective regulatory strategy has two essential components: to cooperate with the

[17] These costs include monitoring, legal and enforcement costs.

regulated industry by way of dialogue and engagement, and at the same time reserve the option to impose punitive sanctions.

What is the appropriate mix of sanctions?

The second question is: what is the appropriate mix of sanction tools to maximize deterrence? Ayres and Braithwaite (1992) propose that a hierarchy of sanctions should be adopted and kept in the background as long as the regulated entities can be persuaded to comply with the regulation. This is because matching sanctions are needed to deter breaches from different groups. For rational players who are ready to take calculated risk, more punitive sanctions at the top of the hierarchy are needed for deterrence purposes. If applying light sanctions fail to secure compliance from this group, the regulator may escalate to the next level of punishment until no appropriate sanctions are available to punish such evasion. On the other hand, lighter sanctions are also necessary because applying tough sanctions on minor breaches of the law is not only socially unacceptable (Stigler 1970) but also can create resistance from otherwise law-abiding actors (Bardach and Kagan 1982). A hierarchy of sanctions enables regulators to escalate enforcement in response to the extent of the evasion. As a result, the regulator maintains dominance over the regulated entities.

Essentially, the Responsive Regulatory Theory advocated by Ayres and Braithwaite (1992) is a responsive approach: the regulator should not impose a preconceived regulatory structure, but rather be responsive to different regulatory contexts (Braithwaite 2011). It should be flexible in choosing a range of enforcement tools/sanctions according to the regulated actors' needs and actions. These enforcement tools/sanctions form an "enforcement pyramid".[18] Each layer in the enforcement pyramid represents an enforcement tool or

[18] A generic enforcement pyramid has been illustrated in Figure 1 in Chapter 1.

sanction. The level of a layer signifies its severity (the higher the more severe); the breadth of a layer symbolizes the frequency of its expected use (the wider the more frequent).

Moving up the pyramid from its base, self-regulatory solutions such as persuasion and cooperation are applied at the lowest level, with enforcement sanctions extending from enforced self-regulation (e.g., warnings) through commanding regulations with discretionary punishment (e.g., administrative penalties) further up, to regulations with non-discretionary punishment at the top (e.g., civil proceeding, criminal sanctions, license suspensions and revocations) (Ayres and Braithwaite 1992). It is noteworthy that the responsive enforcement strategy is not so much about punishing but securing compliance. Punishments are only resorted to when the soft means fail to secure compliance. The fact that the regulator "responds to" the regulated group's unwillingness to comply (or rectify an existing contravention) with more severe actions is what makes this enforcement strategy "responsive".

The enforcement pyramid needs to be multi-layered to address the different compliance motivations of different groups of regulatees. While light sanctions or persuasion would be sufficient to ensure compliance from voluntary compliers who are good citizens but may unintentionally breach the law, the existence of some very severe sanctions is necessary to deter "rational" agents who are prepared to take calculated risks. The middle layers are also necessary so that people between the two extremes would be deterred, and more importantly, so as to ensure that the escalation to a one-step-higher severity sanction is always available. In addition, it is believed that the steeper (i.e. the more layers) is the enforcement pyramid that the regulator possesses, the greater is the pressure to motivate compliance from the regulatees (Ayres and Braithwaite 1992; Walker and Fisse 1994). The goal of this enforcement pyramid is to deter players from non-compliance and push the application of enforcement down to the base of the pyramid, relying on the possibility of the

regulator escalating to more severe responses as sufficient pressures for compliance (Ayres and Braithwaite 1992).

2.3.3. Merits of the responsive enforcement strategy and its widespread influence

In summary, merging the deterrence and compliance enforcement models has given the responsive enforcement strategy several advantages, as well as avoided some shortcomings from each side (Raykovski 2004). First, similar to the deterrence approach, having heavy penalties helps deter rational opportunists and is argued to be highly effective in changing corporate cultures and regulating their behaviors (Baldwin et al. 1999, 98). On the other hand, unlike the deterrence approach, having softer enforcement tools as well alleviates the concern that only the most serious contraventions will be prosecuted. If a regulator is equipped with a multi-layered enforcement pyramid, less serious contraventions can be matched with less severe enforcement actions. Second, comparable to the compliance model, the responsive enforcement strategy emphasizes self-regulation from regulatees which reduces the need for costly prosecutions. Moreover, the emphasis on respect and trust in the Responsive Regulatory Theory tends to promote compliance from the voluntary compilers. These voluntary compliers are good citizens who may otherwise feel discouraged when they observe unintentional contraventions being penalized too heavily under the deterrence approach. This perceived unfairness may damage the judiciary's credibility and in turn reduce compliance (Feess and Wohlschlegel 2009). More importantly, Responsive Regulatory Theory, like the compliance model, is less likely to result in excessive regulations in contrast to the deterrence-based regulatory strategy. Firms overly burdened with red tape and legal threats may drop out of business, which causes unemployment and dampens economic growth (Baldwin et al. 1999, 98).

Not only is the responsive enforcement strategy theoretically sound in the literature, it has also been widely applied by many institutions around the world. Wood et al. (2010)

report that, as of 2010, there were as many as 19 government agencies identified as adopting this strategy in Australia alone (including ASIC, ACCC and ATO),[19] as well as another 16 government institutions based in the US, the EU, the UK, Canada, New Zealand, the Netherlands and Indonesia.

The well-established responsive enforcement strategy appears to be an outstanding candidate in how disclosure regulations can be effectively administered. As Leuz and Wysocki (2008) indicate, the form in which a disclosure regulation should be effectively governed is an important yet largely unexplored issue. And yet, the extant literature "typically analyses and evaluates disclosure regulation in a static way." (Leuz and Wysocki 2008, 22). This thesis attempts to fill this gap in the literature by empirically examining its effect in the Australian context. The Australian Continuous Disclosure Regime (CDR), which began to adopt the responsive enforcement strategy in 2002, is identified to be a preferable natural experimental setting due to its distinctive development pattern.

2.4. The Australian Continuous Disclosure Regime and Related Sanctions

The Continuous Disclosure Regime in Australia aims to create a fair and fully informed market by imposing continuous disclosure obligations onto listed firms.[20] CDR has been jointly enforced by ASX and ASIC since 1994. These obligations, as prescribed in section 674 of the Corporations Act 2001 (Cth) and the Listing Rules 3.1, 3.1A and 3.1B of the ASX, require firms to disclose price-sensitive information in a *timely* and *equitable* manner. Specifically, the ASX Listing Rule 3.1 reads:

> *"Once an entity is or becomes aware of any information concerning it that a reasonable person would expect to have a material effect on the price or*

[19] ASIC: Australian Securities and Investment Commission; ACCC: Australian Competition and Consumer Commission; ATO: Australian Taxation Office.
[20] Per the NSW Court of Appeal in James Hardie Industries NV v ASIC [2010] NSWCA 332, at paragraph 355.

value of the entity's securities, the entity must immediately tell ASX that information."

In order to improve corporate compliance with CDR, ASIC has been progressively expanding the types of sanctions: from criminal sanctions only since initial enactment in 1994, to include civil sanctions in 2002, and administrative penalties in 2004. Prior to 1994, the continuous disclosure requirements were part of the ASX Listing Rules (and their antecedents). In response to a series of corporate failures in the late 1980s, in which poor quality corporate disclosures were viewed as one important cause (Brown et al. 1999), the Australian federal government enacted Corporations Act section 674 (2) in 1994 to provide statutory backing for CDR. Embedded in the statutory CDR was a severe form of penalty: criminal sanctions.[21]

As an attempt to improve compliance with CDR, ASIC was equipped with civil penalty provisions through the passage of the Financial Services Reform Act 2001 (Cth), effective from March 11, 2002. The civil sanctions were applied to contraventions that are related to continuous disclosures and other market misconduct. They represent a reduced burden of proof and commensurately reduced penalties compared to criminal sanctions (Golding and Kalfus 2004).[22] Administrative sanctions for CDR were introduced following the enactment of the Corporate Law Economic Reform Program (CLERP) 9 Act, effective

[21] A monetary criminal liability of up to A$170,000 (at the time of writing) is payable by the contravening firm. The company's officers, who are involved in the contravention, may also face criminal penalties, including a fine of up to 200 penalty units and/or five years imprisonment. Each penalty unit is currently $170 according to Corporations Act Section 674(2), Note 1 and s 1311 and Sch 3 to the Corporations Regulations, equivalent to A$34,000 at the time of writing.

[22] With respect to its penalty terms, Part 9.4B of the Corporations Act permits a court to make civil penalty orders for a contravention of a civil penalty provision, which include a declaration of contravention, a pecuniary penalty order, a disqualification order and a compensation order. The maximum pecuniary penalty was A$200,000 plus investigation costs for the firm.

July 1, 2004. The CLERP 9 Act enables ASIC to issue infringement notices to firms alleged to have contravened continuous disclosure requirements.[23]

The series of sanction escalations reflects ASIC's adoption of the responsive regulatory strategy. This is perhaps best capsulated in an open speech by the then ASIC Chairman Jeffery Lucy in 2004, in which he illustrated ASIC's role using a "regulatory pyramid" with three layers (Lucy 2004, 3). The base and the largest layer of the pyramid represents the "compliers" who always voluntarily comply with the law. The second and middle layer of the regulatory pyramid contains the "opportunists" who seek economic benefits by pushing legal compliance to its limit, and the top and smallest layer refers to those who deliberately engage in "improper and illegal behavior". To secure compliance from all three groups, ASIC's role changes accordingly. For the "compliers", ASIC's role is to educate and provide guidance. For the "opportunists", ASIC closely monitors and intervenes lightly. For contraveners, ASIC uses its full enforcement strength to regulate (Lucy 2004, 3; Grant 2005, 24). The responsive enforcement philosophy clearly applies to CDR under ASIC's administration.

The progressive nature of how the expansion of sanctions has taken place makes Australian CDR a preferable natural experimental setting for conducting empirical testing. Recognizing the fact that many securities regulations are introduced almost simultaneously with their accompanied enforcement, the enforcement literature has tended towards demanding clear isolation of the effects of enforcement from the underlying implementation of the law (Leuz and Wysocki 2008; Holthausen 2009). An important means of how that isolation can be achieved is through "looking for places where enforcement changed and

[23] The process is as follows: ASIC first holds a private hearing to determine whether the continuous disclosure provisions were breached. The firm associated is invited to make a submission. If ASIC decides that the firm has breached the disclosure requirements, an infringement notice which carries a penalty ranging from AUD33,000 to AUD100,000 is issued, depending on the market capitalisation of the firm (Respectively, the penalty sizes are A$33,000 / A$66,000 / A$100,000 for firms with <A$100M / A$100M-1Billion / > A$1Billion of market capitalisation). The case is closed upon payment. If a firm chooses not to pay the fine, ASIC may choose to commence court proceedings under administrative, civil or criminal provisions.

other institutions were held constant" (Holthausen 2009, 456). The Australian CDR has the capacity to be such a context. The regime was enacted in 1994 and, since then, the underlying requirement and implementation of CDR have gone largely unchanged except that ASIC adopted responsive enforcement strategy in 2002 (Lucy 2004). When it was enacted in 1994, the regime began with only criminal provisions. Since then the penalty structure of CDR has been expanded to include civil sanctions in 2002 and administrative sanctions in 2004. As a result, from 2004 onwards, ASIC has been equipped with a multi-layered "enforcement pyramid". The progressive development of the regime has thus clearly separated the change of enforcement from the law's underlying implementation.

2.5. Chapter Summary

This chapter reviews the four identified factors that make up effective enforcement: (i) the effect of a regulators' enforcement actions on the target firms; (ii) the wider deterrent effect of enforcement actions; (iii) certain country-level legal infrastructures; and (iv) regulatory resources. Despite the wide consensus that enforcement is critical to regulatory effectiveness, many of these identified factors are found to be inaccessible by regulators. The recent insight of (Christensen et al. (2013)) that substantive changes in enforcement regimes deliver positive capital market outcomes inspired this review of the most established enforcement strategies in the extant law and economic literature. It reveals that the responsive enforcement strategy, characterized by its enforcement pyramid, has the potential to be the fifth factor of effective enforcement. Finally, this chapter details the institutions of Australian Continuous Disclosure Regime (CDR) and suggests that the regime provides a preferable natural experimental context for empirical analysis.

Chapter 3:

Responsive Enforcement Strategy & Analysts' Information Environment

3.1. Introduction

This chapter examines empirically the impact of ASIC's adoption of the responsive enforcement strategy in the CDR on the analyst's information environment. Australian CDR requires listed firms to disclose their price-sensitive information in a timely and equitable manner.[24] The possession of a multi-layered "enforcement pyramid" by the regulator, according to Responsive Regulatory Theory (Ayres and Braithwaite 1992), is expected to improve corporate compliance significantly. I test this proposition by examining the association between the financial analyst's information environment and the progressive expansion of the CDR sanctions between 1992 and 2006. Prior literature shows that the availability and the quantity of public disclosures are positively associated with the properties of the analyst's information environment, such as forecast accuracy and dispersion (Lang and Lundholm 1996; Hope 2003; Dhaliwal et al. 2012). In particular, I use these forecast properties to infer the level of compliance with CDR. My empirical tests focus on the effect of the progressive expansion of the CDR sanctions on analysts' forecast accuracy and dispersion and their reliance on public information and the precision of public information. It is expected that the analyst's information environment has incrementally improved as ASIC fully adopted the responsive enforcement strategy.

The rest of the chapter is structured as follows. Section 3.2 briefly reviews the relationship between disclosure regulations and the analyst's information environment. Section 3.3 develops the hypotheses. Section 3.4 details the method design, followed by data

[24] ASX Listing Rule 3.1, Corporations Act 2001 section 674.

and sample selection in Section 3.5. Empirical results are presented in Section 3.6. Results for sensitivity analyses and additional analyses are displayed in Section 3.7 and 3.8 respectively. Finally, Section 3.9 concludes the chapter.

3.2. Disclosure Regulations and Financial Analysts

This section reviews the literature that relates disclosure regulations and the financial analyst's information environment. Financial analysts are important information intermediaries in capital markets. Their coverage and outputs are known to help improve market efficiency (Barth and Hutton 2004; Hollie et al. 2015) and reduce information asymmetry (Healy and Palepu 2001). Analysts are considered to be the expert users of accounting information. For example, the properties of analysts' forecasts (such as accuracy and dispersion) have been extensively used in prior research as the proxies for the quality of the overall information environment at the market/country level (e.g. Hope 2003; Heflin et al. 2003; Bailey et al. 2003; Clinton et al. 2014). Furthermore, analysts' rankings of firms' disclosure activities compiled by the Association for Investment Management and Research (AIMR) have been widely applied as a usefulness measure of firms' disclosures in the US (Lang and Lundholm 1993; Lang and Lundholm 1996; Welker 1995; Healy et al. 1999; Nagar et al. 2003; Dhaliwal et al. 2011).

Prior research examining the effectiveness of disclosure regulations often adopts analysts' forecast properties as proxies for firms' information environments (e.g. Heflin et al. 2003; Agrawal et al. 2006; Mohanram and Sunder 2006). Analysts' forecast output is associated with the quality of information environments because analysts are sophisticated public information processors who respond to new information quickly. They typically update their forecasts monthly or even more frequently if there have been significant

corporate releases or economic events (Bradshaw 2010). Significant declines in analysts' forecast errors and dispersion are interpreted as improvements in the overall information environment. Hope (2003) finds that analysts who are based in countries with stronger enforcement regimes make more accurate forecasts. The studies that examine the effect of the introduction of Regulation Fair Disclosure (Reg FD) also conduct empirical tests on the changes in analysts' forecast accuracy and dispersion after the enactment of the legislation (Heflin et al. 2003; Bailey et al. 2003; Francis et al. 2006).

In addition to promoting timelier and more equally accessible corporate disclosures that analysts rely on (i.e. the emphasis is on the public source of information), effective disclosure regulation also increases the precision of public information. Mohanram and Sunder (2006) adopt the model developed by Barron et al. (1998) (hereafter, the BKLS model) which disaggregates analysts' information into public and private sources.[25] Mohanram and Sunder (2006) examine the precision of public information and conclude that it was not significantly different before and after the passage of Reg FD, and they find no significant differences in the precision of public information contained in analysts' forecasts between the pre-FD and post-FD periods. Byard et al. (2011) study the effect of the mandatory adoption of IFRS on the analyst's information environment including forecast error, dispersion, analysts following and the BKLS measures for public and private information conveyed in analysts' forecasts. They find that the analyst's information environment significantly improves in countries where the changes mandated by IFRS are both substantial and rigorously enforced.

[25] In the BKLS model, common information mainly consists of information disclosed by firms to all analysts, together with all other publically available information such as media press and macroeconomic information. Private (or idiosyncratic) information largely consists of information that individual analysts generate through their own efforts at data collection and research analysis.

3.3. Hypothesis Development

Following the prior literature, this thesis uses analyst forecasts properties to evaluate the effect of enforcement strategy in disclosure regulations on the analyst's information environment.

3.3.1 Responsive Regulatory Theory & Australian Continuous Disclosure Regime

Responsive Regulatory Theory suggests that an effective enforcement strategy should contain a multi-layered "enforcement pyramid" (Ayres and Braithwaite 1992). The regulator should be equipped with a range of enforcement tools or sanctions ranging in severity from weak to strong to deal with all levels of law evasion:

1. At the base of the enforcement pyramid are the lightest enforcement options such as persuasion, a warning letter or a light sanction. The wide base of the shape of a pyramid symbolizes that this layer should be the most frequently used. The theory proposes that these options should be made available for voluntary compliers, who are good citizens and choose to comply with the law under most circumstances. The role of trust exercised by the regulator is emphasized for this group to whom persuasion and dialogue are deemed sufficient for rectifying minor or unintentional breaches.
2. At the tip of the pyramid are the most severe sanctions. The narrowness of the sharp tip signifies the expectation that such sanctions will be rarely used. The theory suggests that the regulator's access to severe penalties such as criminal sanctions and license suspension is essential to deter rational players from contraventions. The rational individuals are those who decide whether or not to breach a law after calculating their expected net benefits.

3. In the middle layers are the sanctions of medium severity. The width of the middle layer of the pyramid again represents the frequency of their expected usage. Having the middle layers is to ensure that an appropriate action is available for each type of breach and, more importantly, that an escalation to more severe penalties is available if lighter remedies fail to secure compliance. Thus, the steeper the enforcement pyramid, the greater the pressure to motivate compliance (Ayres and Braithwaite 1992; Walker and Fisse 1994).

This thesis argues that the Australian CDR has created an effective pyramidal penalty structure for securing compliance from regulated firms. This penalty structure has been achieved progressively in Australia, as the three types of sanctions were introduced in 1994 (criminal), 2002 (civil) and 2004 (administrative), respectively.[26]

Initially, ASIC adopted a more deterrence-based enforcement strategy as was evident in that criminal sanctions were the only sanctions that came with the enactment of CDR in 1994. However, when CDR was enforced with only criminal sanctions, the regulator's enforcement actions are unlikely to have been effective in deterring firms from non-compliance. While criminal sanctions increase the potential costs of non-compliance, the likelihood of the regulator imposing criminal sanctions is low. This is because society requires a higher justification for more severe punishment. To successfully prosecute under the criminal regime, the regulator had to prove that such a violation was intentional and reckless. Firms could mount an adequate defense if they had formally adopted continuous disclosure policies and training programs (Golding and Kalfus 2004, 394), as was often the case. The high evidential burden required for a successful criminal prosecution on continuous

[26] A prior study has positioned "price queries" at lower end of the CDR enforcement pyramid (Chapple and Truong 2014). But given that price queries are not themselves sanctions or penalty, and are administered by the market operator ASX not ASIC, it is excluded from the pyramid in this thesis. Nonetheless, a brief review of the effect of price queries can be found in the Appendix.

disclosure violations was used to explain its lack of enforcement (Treasury of Australian Government 2002, 147).[27] For regulated firms, because the threat of enforcement was minimal, the cost of deviation from compliance with CDR was low during the criminal sanction period. Rational players are likely to contravene continuous disclosure requirements when the benefits of non-disclosure outweigh the costs of potential litigation, reducing the effectiveness of CDR.

The lack of effectiveness of the deterrence-based strategy in the early CDR implementation is backed by empirical evidence. Brown et al. (1999)[28] empirically examine the effectiveness of the CDR in the short timeframe after its statutory enactment (1992 to early 1996). They find that analysts' earnings forecasts did not become more accurate or less diverse following the enactment of CDR in 1994. There is limited evidence of higher disclosure frequency and lower abnormal returns around earnings announcements, but these improvements are limited to small and poorly performing firms only. Studying a longer timeframe (1988-2001), Hsu et al. (2012) find that analysts' forecast accuracy and dispersion improve in the first few years of CDR implementation (with criminal sanctions only), but deteriorate after 1998. A recent study by Harford and Powell (2015) finds that after the enactment, firms actually become *less* likely to make investment (capital expenditure) disclosures. Moreover, Poskitt (2005) presents evidence suggesting the enactment has not significantly improved information-based trading. Neither is the increased number of price-sensitive disclosures associated with an improved bid-ask spread. Overall, the results suggest that CDR in the criminal sanction era has been ineffective.

In light of the ineffectiveness of a deterrence-based strategy, ASIC gradually completed the adoption of the responsive enforcement strategy from 2002 to 2004 (Lucy

[27] In fact, the first criminal prosecution (ASIC vs Harts) was not commenced until 2006 (twelve years after the statutory CDR introduction) and was unsuccessful.
[28] The government has commissioned a series of reports in assessing the early effectiveness of CDR, these reports eventually lead to the academic publication of Brown, Taylor, and Walter (1999).

2004, 4). After progressively developing the responsive enforcement strategy by way of sanction expansions, the regulator has been able to use persuasion and dialogue to engage compliers, administrative sanctions to monitor and deter opportunists, and full enforcement options including civil and criminal penalties to punish those who act illegally. With the completion of a multi-layered enforcement pyramid by 2004, a clear signal has been sent to the market that any level of non-compliance with CDR will be met with a tough yet appropriate level of retaliation. In addition, the successful application of less punitive sanctions can make escalation to criminal sanctions appear more legitimate.

A completed enforcement pyramidal structure may increase the probability of successful criminal prosecution, further affecting the choices of rational players. It is expected that the sanction escalations under the Australian CDR are associated with improved compliance with the regulation. This expectation appears to be consistent with the findings of Chan et al. (2007) and Harford and Powell (2015). Using hand-collected data of Australian management earnings forecasts, significant increases in disclosure frequency of non-routine management forecasts (as opposed to routine disclosure) are detected after year 2000 (Chan et al. 2007). Further analysis reveals that the increased disclosure frequency is only detected among forecasts containing bad news. Chan et al. (2007) attribute the results to an increase in perceived litigation costs by firms after legislative and enforcement changes by ASIC around year 2000. Harford and Powell (2015) show that the likelihood of investment disclosure in Australia drops after 1994 (initial enactment), but increases after 2003 (around the time of ASIC's adoption of the responsive enforcement strategy).

3.3.2 Progressive Expansion of Sanctions and Analyst's information environment

Prior literature shows that better corporate disclosures improve the analyst's information environment. Lang and Lundholm (1996) find that analysts' forecasts are more accurate for firms with better disclosures. Hope (2003) provides evidence that strong enforcement of accounting and disclosure standards is associated with lower analyst forecast errors and forecast dispersion. These findings suggest that corporate disclosures reduce analysts' uncertainty about forecast earnings and support the regulators' view that such disclosures are important for investors. In the literature, the findings of lower forecast error and forecast dispersion are typically interpreted as improvements in the analyst's information environment. As the Australian CDR requires firms to disclose information they are aware of that could have "a material effect on the price or value of the entity's securities", the enforcement of the sanction escalation is expected to enhance timelier and more equal information access among market participants. With the progressive expansion of sanctions for the Australian CDR, analysts' forecasts are expected to be more accurate and less dispersed. The is because if firms make more timely and leveled disclosures in the public domain, as a whole, public disclosures available to all analysts and investors will increase, which in turn reduces analysts and investors' uncertainty about forecast earnings (Hope 2003). In addition, having firms make timelier disclosures of significant events is expected to reduce management's capacity to commit fraud in financial reporting, which increases the reliability of financial reports (Ball 2001). The first two hypotheses are thus:

H1a: Analysts' earnings forecast accuracy improves in the periods after additional sanctions are added to the Continuous Disclosure Regime compared with the period before.

H1b: Analysts' earnings forecast dispersion reduces in the periods after additional sanctions are added to the Continuous Disclosure Regime as compared with the period before.

The next two hypotheses place the focus on the public information used by analysts. Making information available to the market in a timely manner can level the analysts' information playing field by prohibiting management from selectively disclosing information. The precision of public information is expected to increase if firms do indeed respond to the enforcement strategy adoption by increasing their disclosure to the public domain as a whole (Mohanram and Sunder 2006; Begley et al. 2009). Equal information access ensures that price-sensitive disclosures reach out to all analysts and other market participants, which may in turn crowd out the level of inside information available to individual analysts (Francis et al. 2006; Heflin et al. 2003). The effects are two-fold. First, more equitable firm disclosure means that analysts who used to be privy to management access are less likely to be selectively briefed. While the formerly privileged analysts may suffer from reduced private information, an average analyst without such privilege may in fact benefit from the larger amount of firm-specific information that is made publicly available. Obtaining an information edge without selective briefing by insiders is likely to be increasingly more difficult and costly. Second, if firms do indeed become more committed to keeping the market informed and release price-sensitive information sooner than before the enforcement strategy comes into effect, the potential benefit of analysts uncovering idiosyncratic knowledge about the firm may become shorter-lived. Both arguments suggest that analysts may have lower incentive to expend their resources and efforts to produce their own private information. As a result, analysts may choose to place greater weight on the public information more than their

private information in forming their forecasts. Consequently, I examine the following hypotheses:

H1c: The precision of public information used in analyst forecasts improves in the periods after additional sanctions are added to the Continuous Disclosure Regime as compared with the period before.

H1d: Analysts' reliance on public information increases in the periods after additional sanctions are added to the Continuous Disclosure Regime as compared with the period before.

3.4. Research Design

3.4.1 Measuring changes in enforcement strategies

Multivariate regressions are used to test the hypotheses that the adoption of the responsive enforcement strategy improves the analyst's information environment. I take the Australian CDR as a natural experimental setting because of its distinctive development pattern whereby the enactment of the first sanction and the two additions of further sanctions came about at three different points in time. While the underlying law has been largely the same throughout, the key difference to the regime has been the adoption of the responsive enforcement strategy – as manifested in the progressive expansion of sanctions (Lucy 2004). Since it is the change in the forecast metrics between the several development stages that is of interest, the test variables are therefore a series of period indicator variables – $P_{Criminal}$, P_{Civil} and P_{Admin} – which take the value of 1 if the observation falls within the period when criminal, civil and administrative sanctions were added, respectively, and 0 otherwise. The base is the pre-statutory period when CDR had not yet received statutory backing (1 January 1992 – 4 September 1994). The CDR period indicators are defined as below:

$P_{Criminal}$: a period indicator that indicates when CDR received statutory backing and criminal sanctions were the only sanctions available (5 September 1994 – 10 March 2002).

P_{Civil}: a period indicator that indicates when civil sanctions (only) were made available in addition to criminal sanctions (11 March 2002 – 30 June 2004).

P_{Admin}: a period indicator that indicates when administrative sanctions were introduced in addition to criminal and civil sanctions (1 July 2004 – 31 December 2006).

Since the period when CDR was not backed by statutory provisions is treated as the base case, these period indicators test the difference in the forecast metric between each of the sanction-periods and the period with no sanctions. The hypotheses of this thesis are that the adoption of the responsive enforcement strategy (progressive expansion of sanctions) has an *incremental* impact on the forecast metrics. That is, what is of interest are the changes of the forecast metrics when additional (civil or administrative) sanctions were added, compared to the preceding period. To test the *incremental* impact of the responsive strategy, I take the differences of the coefficients of the period indicators:

$P_{Civil} - P_{Criminal} = 0$: this is to test whether after adding civil sanctions to the regime, there had been statistically significant changes in the forecast metrics.

$P_{Admin} - P_{Civil} = 0$: this is to test whether after administrative sanctions were added to the regime, there had been statistically significant changes in the forecast metrics.

The test of the addition of administration sanctions (i.e. $P_{Admin} - P_{Civil} = 0$) is of particular interest here because at this point, ASIC had three (criminal, civil and administrative) sanctions on its list of employable enforcement tools. In other words, ASIC then had a multi-layered enforcement pyramid. A multi-layered enforcement pyramid, as the Responsive Regulatory Theory predicts, creates significant deterrent effects that secure corporate compliance (Ayres and Braithwaite 1992).

3.4.2 Measuring analyst forecast properties

The dependent variables cover four properties of analysts' forecast: forecast accuracy, forecast dispersion, precision of public information contained in analysts' forecast and analysts' reliance on public information. First, following prior literature (e.g. Heflin et al. 2003; Agrawal et al. 2006), the absolute forecast error (FE) is measured as the absolute value of the difference between actual annual earnings and one-year-ahead median earnings forecasts, scaled by the stock price at the beginning of the financial year:

$$FE_m = \frac{|\ (\text{Actual EPS}_t - \text{Median EPS Forecast}_m)\ |}{\text{Stock Price}_{t-1}}$$

where subscript t indicates the financial year of the firm, and m indicates month. Using median rather than mean forecasts helps to avoid the distortion caused by extreme forecasts.

Second, forecast dispersion (DISP) is the standard deviation of individual analyst forecasts scaled by stock price at the beginning of the financial year. By definition, this measure requires at least two analysts following the firm:

$$DISP_m = \frac{\text{Standard Deviation of individual EPS forecasts}_m}{\text{Stock Price}_{t-1}}$$

The third and fourth measures are analysts' reliance on and the precision of public information. I adopt the BKLS model developed by Barron et al. (1998) which disaggregates total information into a public component and a private component.[29] The BKLS model (1998, 428) firstly constructed two measures, the precision of public information (PUBLIC) and the precision of private information (PRIVATE):

$$\text{PUBLIC} = \frac{\text{SE} - \text{D/N}}{[(1-1/N)*\text{D} + \text{SE}]^2}; \quad \text{PRIVATE} = \frac{\text{D}}{[(1-1/N)*\text{D} + \text{SE}]^2}$$

where SE is the squared error of the consensus mean forecast (Actual EPS – Forecast EPS)^2; D stands for dispersion (variance) among the individual forecasts; and N refers to the number of analysts making forecasts.

The relative reliance on public-to-total information (RELIANCE) is defined as the ratio of PUBLIC to the sum of PUBLIC and PRIVATE:

$$\text{RELIANCE} = \frac{\text{PUBLIC}}{\text{PUBLIC} + \text{PRIVATE}}$$

BKLS analyst information measures have been used extensively in accounting research including studies that examine the impact on analysts' forecasts of disclosure regulation (Mohanram and Sunder 2006), adoption of IFRS (Byard et al. 2011), changes in disclosure quality (Byard and Shaw 2003) and the release of public information (Barron et al. 2002). I extend the use of the BKLS measures to examine the effect of the enforcement strategy adoption in disclosure regulations on the analyst's information environment.

[29] Public information comprises publicly available information such as macroeconomic and industrial news and firm's disclosures, whereas idiosyncratic information refers to analysts' insights through individual research and analysis. Noise in consensus forecasts is averaged out, so that error in the consensus forecasts primarily reflects error in the public information. Dispersion among individual analysts' forecasts reflects error from the idiosyncratic information. In this way, BKLS model offers a linkage between properties of analysts' information and the observable characteristics of their forecasts.

3.4.3 Regression Models

I hypothesize that the adoption of the responsive enforcement strategy is associated with changes in listed firms' information disclosures that affect various analysts' forecast properties. To test these predictions, I estimated the following class of regressions. For brevity, the firm and time subscripts are omitted:

$$\begin{aligned}\text{Forecast Metric} = {} & \alpha + \beta_1 P_{Criminal} + \beta_2 P_{Civil} + \beta_3 P_{Admin} + \beta_4 SIZE + \beta_5 LOSS + \beta_6 LROA \\ & + \beta_7 STD\_ROA3 + \beta_8 EARN\_CHG + \beta_9 LGROWTH + \beta_{10} LLEV \\ & + \beta_{11} COVERAGE + \beta_{12} MISS + \beta_{13} TIMELINESS + \beta_{14} IFRS \\ & + \beta_{15} GDPShock + \sum \beta \text{ Industry-fixed effects} + \varepsilon \end{aligned} \quad (1)$$

where Forecast Metric refers to Absolute Forecast Error (FE), Forecast Dispersion (DISP), precision of public information (PUBLIC) and reliance on public information (RELIANCE). The period indicators, $P_{Criminal}$, P_{Civil} and P_{Admin}, represent separate periods during which criminal, civil and administrative sanctions were added to the Continuous Disclosure Regime. Among the three period indicators, P_{Civil} and P_{Admin} represent when ASIC adopted the responsive enforcement strategy and expanded sanctions. A full list of variable definitions can be found in the Appendix - Table 18 (P.135).

To examine the hypotheses, I test the difference in the coefficients of these test variables. Specifically, if adding additional sanctions to CDR incrementally reduces forecast errors and dispersion, I expect to find $\beta_3 < \beta_2 < \beta_1$ in the respective regressions. Similarly,

finding $\beta_3 > \beta_2 > \beta_1$ in the PUBLIC and RELIANCE regressions indicates support for the prediction that additional sanctions incrementally increase the precision of public information and analysts' reliance on public information.

In the model, I have included four sets of control variables for factors that affect analyst forecast properties over time, but are unrelated to CDR. First, since analysts are more likely to experience difficulty forecasting in periods of substantial changes in macroeconomic conditions, I include the surprise in Gross Domestic Product (GDPshock) as a control variable, measured as the absolute value of quarterly GDP growth rate (Heflin et al. 2003; Mohanram and Sunder 2006).

The second set of control variables captures firms' specific characteristics. Prior research suggests that firms that are larger in size (SIZE: market capitalization), more profitable (LROA: lag return on asset) and have more growth opportunities (LGROWTH: lag market-to-book ratio) normally provide higher quality financial information (Lang and Lundholm 1996). Greater analyst coverage (COVERAGE: number of analysts forecasting) is also associated with a better information environment for the firm (Healy and Palepu 2001). In contrast, firms that make a loss (LOSS) or miss the consensus forecast (MISS) are associated with greater information asymmetry (Ertimur 2004). Firms with higher level of liabilities (LLEV: lag total liabilities to total asset), larger changes in earnings (EARNCHG: difference in earnings of this year and prior year scaled by market capitalization), or more variable earnings history (STD_ROA3: one standard of deviation on ROA in the past three years) are associated with higher uncertainty and are harder to predict.

The third set of controls relates to the characteristics of analysts' forecasts. Forecast timeliness, measured as the number of days by which a forecast precedes an earnings announcement (TIMELINESS), is included because later forecasts are usually more accurate

than earlier ones (Clement 1999). Finally, IFRS is included as a dummy indicating when Australia has adopted the International Financial Reporting Standards.

3.5. Data & Sample Selection

3.5.1 Data sources

Data is collected from four sources. Data on analysts' forecasts is obtained from the I/B/E/S Summary and Detail databases. Stock price data used to compute market capitalization and as a deflator of forecast variables is sourced from the Securities Industry Research Centre of Asia Pacific (SIRCA) – Australian Equities database (AE). Earnings announcement dates are sourced from the SIRCA Australian Company Announcement (Signal G) database. Annual financial reporting data is obtained from the Morningstar Datalink database. Macroeconomic data is taken from the Australian Bureau of Statistics (ABS). [30] The sample is constructed on the intersection of these data sources.

Data for New Zealand companies are needed for the difference-in-difference tests in the additional analysis. The analyst forecast data is sourced from the same I/B/E/S databases. Stock price and accounting data come from the NZX Company Research Database, maintained by the New Zealand Stock Exchange.

Other data for the additional analyses is used. Budgetary and staffing data about the financial market regulators is sourced from the regulators' annual reports.[31] Data on actual enforcements is taken from a wide range of sources: regulator's reports, their media releases, news articles, legal or law papers and through direct enquiry with the Australian Securities and Investments Commission (ASIC, Australia) and the Financial Market Authority (FMA,

[30] Australian Bureau of Statistics: www.abs.gov.au
[31] ASIC: www.asic.gov.au / FMA: www.fma.gov.nz. Annual reports of ASC (the ancestor body of ASIC) and NZSC (the ancestor body of FMA) can be obtained through inter-library loan services with the National Library of Australia and National Library of New Zealand. Missing data between years are extrapolated.

New Zealand; formerly known as NZSC, the New Zealand Securities Commission, before 2011).

To examine how adding sanctions for CDR has impacted the analyst's information environment, the selected sample period covers the four periods during which CDR grew from no statutory sanctions to all three sanctions. The sampling period begins in 1992 at the commencement of I/B/E/S's more stable coverage of Australian analysts. The chosen starting point at 1992 provides a two-year period before the continuous disclosure requirements were officially written into legislation in late 1994 (i.e. when criminal sanctions were introduced). The sample period ends in 2006 for two reasons. First, to avoid the potentially confounding impact of the GFC which peaked in around 2007 and 2008. Second, ASX handed over much of its regulatory role to ASIC in 2010, and ASIC launched real-time surveillance of equity trading on the ASX on 31 October 2011. These two events may well mark a new era of regulation which is beyond the scope of the current research on enforcement strategy.

The sample is further restricted to observations in I/B/E/S with at least two analysts following. This is to ensure a valid computation of forecast dispersion and the two BKLS metrics. Focusing on one-year-ahead forecasts yields an initial sample of 30,250 firm-month observations or 636 firms. Calculation of the control variable TIMELINESS[32] requires earnings announcement dates from SIRCA (29,513 observations or 631 firms). The biggest loss of sample comes from including financial accounting data from Morningstar Datalink database. The final sample consists of 22,058 firm-month observations, corresponding to 466 distinct firms.[33]

[32] TIMELINESS is defined as the number of days by which the forecast precedes earnings announcement.
[33] This sample consists of firms that are cross-listed between both markets. Deleting the cross-listing firms would exclude up to 47 of the 65 distinct NZ firms and is therefore not undertaken. This is a limitation for the results of this thesis.

3.5.2 Sample Description – Australian firms only

The summary statistics are displayed in Panel A of Table 1 with the correlation matrix in Panel B. For the forecast characteristics, the mean (median) absolute EPS forecast error (FE) amounts to 2.3% (0.7%) of stock price. The mean (median) dispersion of consensus EPS forecast (DISP) is 1% (0.5%) of stock price. Similar to FE and DISP, the mean value of the precision of public (common) information (PUBLIC=1797.2) is higher than the median (238.8), indicating that this measure is right-skewed. The mean reliance of public-to-total information (RELIANCE) at 0.51 indicates that, on average, analysts use public and private source of information evenly in forming their forecasts. The sample contains 22,058 firm-month observations with loss-making firms accounting for 7% of the sample. Mean ROA is 7.3%. The average market capitalization is A$652M. Firms in the sample on average have a liability-to-asset ratio of 48.3% and a market-to-book ratio of 2.5 times. Average TIMELINESS is -181 days, which is consistent with the fact that forecasts are issued throughout the year. The average firm has eight analysts following. Firms' earnings fall short of analysts' forecasts 53% of the time. Finally, the absolute quarterly change in GDP is 0.9% on average.

Table 1: Descriptive Statistics

Panel A: Descriptive statistics for the entire sample (1992 – 2006)

Variable	Mean	25th Percentile	Median	75th Percentile	S.D.
FE	0.023	0.002	0.007	0.020	0.051
DISP	0.010	0.003	0.005	0.010	0.015
RELIANCE	0.510	0.155	0.611	0.892	0.415
PUBLIC	1797.210	22.565	238.773	1110.920	9232.450
$P_{CRIMINAL}$	0.505	0.000	1.000	1.000	0.500
P_{CIVIL}	0.198	0.000	0.000	0.000	0.399
P_{ADMIN}	0.212	0.000	0.000	0.000	0.409
SIZE	20.297	19.262	20.251	21.328	1.500
LOSS	0.070	0.000	0.000	0.000	0.256
LROA	0.073	0.048	0.067	0.091	0.072
STD_ROA3	0.025	0.007	0.014	0.027	0.048
EARN_CHG	0.009	-0.008	0.007	0.021	0.090
LGROWTH	2.493	1.213	1.741	2.777	2.517
LLEV	0.483	0.397	0.495	0.576	0.156
COVERAGE	7.959	5.000	8.000	11.000	4.046
MISS	0.530	0.000	1.000	1.000	0.499
TIMELINESS	-181.230	-278.000	-182.000	-90.000	109.672
IFRS	0.140	0.000	0.000	0.000	0.347
GDPShock	0.922	0.564	0.841	1.335	0.516

Notes: ***FE*** is the absolute forecast error defined as |(actual EPS-median EPS forecast)|/stock price at the beginning of fiscal year; ***DISP*** is the standard deviation of consensus forecast divided by stock price at the beginning of fiscal year; analysts' information is as defined in BKLS (1998) model: ***PUBLIC*** (h) refers to the precision of public/common information; ***RELIANCE*** (ρ) refers to the reliance of public-to-total information; $\boldsymbol{P_{CRIMINAL}}$, $\boldsymbol{P_{CIVIL}}$ and $\boldsymbol{P_{ADMIN}}$ are period dummies: $\boldsymbol{P_{CRIMINAL}}$ equals 1 when CDR has criminal sanctions only (5/9/1994-10/3/2002), $\boldsymbol{P_{CIVIL}}$ equals 1 when CDR has both criminal and civil sanctions (11/3/2002-30/6/2004), $\boldsymbol{P_{ADMIN}}$ equals 1 when CDR has criminal, civil and administrative sanctions (1/7/2004-31/12/2006) and 0 otherwise; ***SIZE*** is the log of market capitalization; ***LOSS*** is a dummy that equals 1 if earnings is negative; ***LROA*** is the lag return on asset; ***STD_ROA3*** is one standard deviation of ROA in the past three years; ***EARN_CHG*** refers to the change of earnings scaled by market capitalization; ***LGROWTH*** refers to the lag market-to-book ratio; ***LLEV*** refers to lag total liabilities over total assets; ***COVERAGE*** is the number of estimates or forecast forming that consensus; ***MISS*** is a dummy that equals 1 if a firm fails to meet consensus EPS forecast and 0 otherwise; ***TIMELINESS*** is defined as the number of days by which the forecast precedes earnings announcement; ***IFRS*** is a dummy that equals 1 when the mandatory adoption of IFRS take place on 1/7/2005, and 0 otherwise; ***GDPShock*** is defined as the absolute value of quarterly GDP growth (%). All continuous variables are winsorized at 1 and 99 percentiles. N=22,058 firm-month observations

Panel B: Correlation Analysis

	Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1)	$P_{CRIMINAL}$		-0.50	-0.52	0.07	0.05	0.04	*-0.01*	0.22	-0.17	0.02	-0.08	-0.02	-0.03	-0.09	0.01	0.10	*0.01*	-0.41	0.04
(2)	P_{CIVIL}	-0.50		-0.26	*0.03*	0.02	-0.01	0.01	-0.13	0.02	0.02	*0.01*	0.00	0.00	0.04	0.02	-0.10	*0.00*	-0.20	-0.01
(3)	P_{ADMIN}	-0.52	-0.26		-0.07	-0.08	0.00	0.02	-0.26	0.19	-0.04	0.12	0.04	0.03	0.12	*0.02*	-0.03	-0.04	0.78	-0.13
(4)	***FE***	0.07	*-0.01*	-0.05		0.49	0.33	*-0.06*	-0.15	-0.27	0.35	-0.19	0.22	-0.05	-0.15	*0.03*	0.15	-0.11	-0.06	0.01
(5)	***DISP***	0.10	-0.05	-0.13	0.53		-0.09	-0.09	-0.21	-0.33	0.34	-0.25	0.23	*0.04*	-0.17	0.02	0.11	-0.06	-0.06	0.01
(6)	***RELIANCE***	0.03	*0.00*	0.01	0.71	-0.09		0.17	-0.01	-0.05	0.08	-0.04	0.05	-0.05	-0.03	0.03	0.15	-0.19	*-0.01*	*0.01*
(7)	***PUBLIC***	*0.00*	0.02	-0.03	*0.00*	-0.31	0.31		*-0.08*	-0.09	-0.02	0.03	0.01	0.07	*0.00*	-0.04	*-0.04*	0.07	-0.01	*-0.01*
(8)	***COVERAGE***	0.22	-0.12	-0.26	-0.23	-0.17	-0.06	*-0.01*		0.58	-0.15	*0.02*	-0.16	-0.05	0.02	0.13	-0.03	0.02	-0.22	0.08
(9)	***SIZE***	-0.17	0.02	0.19	-0.34	-0.37	-0.09	-0.08	0.59		-0.24	0.11	-0.18	-0.01	0.17	0.15	-0.19	*-0.02*	0.17	-0.01
(10)	***LOSS***	0.02	0.02	-0.04	0.25	0.24	0.11	-0.09	-0.15	-0.22		-0.37	0.25	-0.21	-0.05	-0.08	0.15	*0.00*	-0.05	*0.01*
(11)	***LROA***	-0.06	*0.01*	0.12	-0.20	-0.27	-0.05	0.02	*0.00*	0.09	-0.33		-0.20	-0.19	0.39	-0.06	-0.06	-0.02	0.10	-0.02
(12)	***STD_ROA3***	-0.06	0.02	0.08	0.28	0.30	0.09	-0.11	-0.23	-0.23	0.26	0.10		*0.13*	0.10	-0.13	0.01	*0.00*	0.02	-0.02
(13)	***EARN_CHG***	-0.12	0.05	0.07	-0.09	*0.00*	-0.12	0.04	-0.05	0.11	-0.22	-0.11	*0.00*		*-0.01*	0.05	-0.18	*0.02*	0.02	*0.01*
(14)	***LGROWTH***	-0.10	0.02	0.17	-0.28	-0.40	-0.04	*0.01*	0.09	0.26	-0.12	0.55	0.13	*0.00*		0.15	-0.03	-0.03	0.13	-0.02
(15)	***LLEV***	0.02	0.02	*0.00*	0.01	*-0.01*	0.04	-0.03	0.13	0.16	-0.07	-0.09	-0.20	0.07	0.10		-0.03	-0.02	*0.02*	0.01
(16)	***MISS***	0.10	-0.10	-0.03	0.23	0.16	0.16	*-0.01*	-0.03	-0.19	0.15	-0.08	0.06	-0.36	-0.05	-0.03		-0.10	*0.00*	*0.01*
(17)	***TIMELINESS***	*0.00*	*0.00*	-0.03	-0.23	-0.09	-0.20	0.05	0.02	*-0.01*	*0.00*	-0.02	*0.01*	*0.00*	-0.03	-0.01	-0.10		-0.05	-0.09
(18)	***IFRS***	-0.41	-0.20	0.78	-0.05	-0.11	*0.00*	-0.05	-0.22	0.17	-0.05	0.11	0.08	0.06	0.16	*0.01*	*0.00*	-0.05		-0.07
(19)	***GDPShock***	0.04	0.01	-0.16	0.02	0.04	*0.00*	*-0.01*	0.07	-0.02	*0.01*	-0.02	-0.02	*-0.01*	-0.03	0.01	*0.00*	-0.07	-0.08	

Notes: Pearson (Spearman rank) correlations are displayed above (below) the diagonal. All correlations are statistically significant except those presented in *italic*. ***FE*** is the absolute forecast error defined as |(actual EPS-median EPS forecast)|/stock price at the beginning of fiscal year; ***DISP*** is the standard deviation of consensus forecast divided by stock price at the beginning of fiscal year; analysts' information is as defined in BKLS (1998) model: ***PUBLIC*** (h) refers to the precision of public/common information; ***RELIANCE*** (ρ) refers to the reliance of public-to-total information; $P_{CRIMINAL}$, P_{CIVIL} and P_{ADMIN} are period dummies: $\boldsymbol{P_{CRIMINAL}}$ equals 1 when CDR has criminal sanctions only (5/9/1994-10/3/2002), $\boldsymbol{P_{CIVIL}}$ equals 1 when CDR has both criminal and civil sanctions (11/3/2002-30/6/2004), $\boldsymbol{P_{ADMIN}}$ equals 1 when CDR has criminal, civil and administrative sanctions (1/7/2004-31/12/2006) and 0 otherwise; ***SIZE*** is the log of market capitalization; ***LOSS*** is a dummy that equals 1 if earnings is negative; ***LROA*** is the lag return on asset; ***STD_ROA3*** is one standard deviation of ROA in the past three years; ***EARN_CHG*** refers to the change of earnings scaled by market capitalization; ***LGROWTH*** refers to the lag market-to-book ratio; ***LLEV*** refers to lag total liabilities over total assets; ***COVERAGE*** is the number of estimates or forecast forming that consensus; ***MISS*** is a dummy that equals 1 if a firm fails to meet consensus EPS forecast and 0 otherwise; ***TIMELINESS*** is defined as the number of days by which the forecast precedes earnings announcement; ***IFRS*** is a dummy that equals 1 when the mandatory adoption of IFRS take place on 1/7/2005, and 0 otherwise; ***GDPShock*** is defined as the absolute value of quarterly GDP growth (%). Absolute forecast errors (***FE***) and dispersion (***DISP***) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles.

In Panel B, the correlation matrix shows that the period indicators of the enforcement strategy adoption (P_{Civil} and P_{Admin}) are significantly correlated with most forecast metrics. P_{Admin} is negatively correlated with forecast error (FE). P_{Civil} and P_{Admin} are negatively correlated with forecast dispersion (DISP). In addition, analysts' reliance on public information is positively correlated with P_{Civil} and P_{Admin}. The precision of public information is positively correlated with P_{Civil} but negatively correlated with P_{Admin}. These correlations are generally consistent with an improvement in the information environment after the strategy adoption.

Table 2 presents the results of the univariate analysis. It first compares the frequency of company announcements and various forecast metrics over the four CDR periods. The number of announcements made through the Australian Stock Exchange has grown steadily from 4.10 announcements per firm-month in the pre-statutory period to 5.11, 6.20 and 6.81 in the periods after the introduction of criminal, civil and administrative sanctions respectively. These increases are all positive and significant at less than the 1% level. The frequency of price-sensitive voluntary announcements, however, drops from 1.09 announcements per firm-month in the pre-statutory period to around 0.83 in the next three periods.[34] Hence, it appears that companies have made more non-price-sensitive and less price-sensitive disclosures over time.

[34] The price-sensitivity of each company announcement is assigned by specialists employed by the ASX.

Table 2: Comparison for the four periods of Continuous Disclosure Regime

CDR Periods†	**None**	**Criminal**		**Civil**		**Administrative**	
	(N=1,874) Mean *(S.D.)*	**(N=11,134) Mean *(S.D.)***	**Two tailed t-test for H_0: Criminal – None = 0 *[t-stat]***	**(N=4,373) Mean *(S.D.)***	**Two tailed t-test for H_0: Civil – Criminal = 0 *[t-stat]***	**(N=4,677) Mean *(S.D.)***	**Two tailed t-test for H_0: Admin – Civil = 0 *[t-stat]***
#Company Announcements	4.10 *(4.81)*	5.11 *(5.64)*	**1.01***** ***[9.14]***	6.20 *(5.87)*	**1.09***** ***[12.94]***	6.81 *(6.96)*	**0.61***** ***[5.29]***
#Price-Sensitive Announcements	1.09 *(1.97)*	0.84 *(1.52)*	**-0.25***** ***[-7.90]***	0.82 *(1.38)*	**-0.02** ***[-0.91]***	0.83 *(1.27)*	**0.01** ***[0.42]***
FE	0.013 *(0.021)*	0.026 *(0.056)*	**0.013***** ***[8.880]***	0.025 *(0.062)*	**-0.001** ***[-0.578]***	0.016 *(0.033)*	**-0.009***** ***[-8.183]***
DISP	0.010 *(0.012)*	0.011 *(0.016)*	**0.001** ***[1.242]***	0.010 *(0.018)*	**0.000** ***[-0.549]***	0.007 *(0.011)*	**-0.003***** ***[-8.519]***
RELIANCE	0.424 *(0.388)*	0.525 *(0.404)*	**0.102***** ***[9.202]***	0.505 *(0.427)*	**-0.020**** ***[-2.504]***	0.512 *(0.436)*	**0.007** ***[0.679]***
PUBLIC	1269.563 *(5467.694)*	1680.120 *(8794.423)*	**410.558*** ***[1.779]***	2000.979 *(9590.899)*	**320.858*** ***[1.809]***	2096.781 *(10940.076)*	**95.802** ***[0.401]***

Notes: **#Company Announcements** refers to the number of company announcements made on Australian Stock Exchange (ASX) per firm-month**;** Consistent with Brown et al. (1999), **#Price-Sensitive Announcements** is defined as the number of announcements that are classified by ASX as price-sensitive per firm-month, excluding non-voluntary disclosures such as half-year or annual reports, trading halts and ASX queries**;** ***FE*** is the absolute forecast error defined as |(actual EPS-median EPS forecast)|/stock price at the beginning of fiscal year; ***DISP*** is the standard deviation of consensus forecast divided by stock price at the beginning of fiscal year; analysts' information is as defined in BKLS (1998) model: ***PUBLIC*** (h) refers to the precision of public/common information; ***RELIANCE*** (ρ) refers to the reliance of public-to-total information; †CDR Periods: ***None*** refers to the pre-statutory CDR period (5/9/2002-4/9/1994); ***Criminal*** refers to when CDR has criminal sanctions only (5/9/1994-10/3/2002); ***Civil*** refers to when CDR has both criminal and civil sanctions (11/3/2002-30/6/2004), ***Administrative*** refers to when CDR has criminal, civil and administrative sanctions (1/7/2004-31/12/2006). Absolute forecast errors (***FE***) and dispersion (***DISP***) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles. */**/*** denotes *p-value* is less than the 0.10/ 0.05/ 0.01 significance level.

Table 2 also shows univariate results for the changes in the various forecast properties over the CDR periods. While there is evidence that adding sanctions helps reduce forecast errors and dispersion, and improves the precision of public information, I also observe signs that analysts' reliance on public information is reduced. In summary, results from the univariate correlations provide mixed evidence that expanding CDR-related sanctions positively affects the analyst's information environment. In the next section, I present the results for multivariate analyses that control for factors known to be associated with analysts' forecast properties.

3.6. Empirical Results

Table 3 presents regression results for the model (1). The FE (forecast error) regression in column 1 tests H1a. If the expansion of sanctions does incrementally force compliance from firms, I expect P_{Civil} and P_{Admin} to be negative and, more importantly, for the coefficients to have a decreasing pattern ($P_{Criminal} > P_{Civil} > P_{Admin}$). However, the results show that the coefficients on $P_{Criminal}$ (coef. = 0.0098, t = 13.436), P_{Civil} (coef. = 0.0145, t = 11.693) and P_{Admin} (coef. = 0.0085, t = 6.856) are all significantly positive, indicating that compared with the pre-statutory CDR period, forecast errors are higher in all three subsequent periods. The finding of a significant and positive $P_{Criminal}$ is in contrast with Brown et al. (1999) who find no significant change in forecast error after the introduction of criminal sanctions. This difference may be due to the much shorter time-frame of their sample (total sample period of 43 months versus 14 years in my sample).

Table 3: Main Regression

Dependent variable =	(1) FE	(2) DISP	(3) RELIANCE	(4) PUBLIC
$P_{CRIMINAL}$	0.0098***	-0.0002	0.0811***	0.1249
	(13.436)	(-0.782)	(7.858)	(0.705)
P_{CIVIL}	0.0145***	0.0008**	0.0920***	0.4590*
	(11.693)	(1.993)	(7.337)	(1.823)
P_{ADMIN}	0.0085***	**-0.0010****	**0.1220*****	**1.2924*****
	(6.856)	**(-2.240)**	**(7.728)**	**(3.242)**
SIZE	-0.0063***	-0.0023***	-0.0108***	-0.5528***
	(-14.466)	(-18.348)	(-3.522)	(-5.358)
LOSS	0.0569***	0.0136***	0.0938***	-0.3940
	(19.828)	(16.680)	(7.032)	(-1.086)
LROA	0.0032	-0.0079***	-0.0206	5.3801**
	(0.356)	(-2.922)	(-0.392)	(2.092)
STD_ROA3	0.0611***	0.0108***	0.2957***	-0.7063
	(6.274)	(4.616)	(6.138)	(-0.668)
EARN_CHG	0.0112	0.0129***	-0.0826**	5.6008***
	(0.922)	(3.771)	(-2.314)	(3.140)
LGROWTH	-0.0026***	-0.0008***	-0.0036***	0.0412
	(-16.882)	(-17.139)	(-2.685)	(0.791)
LLEV	0.0455***	0.0169***	0.0893***	-2.7438***
	(13.844)	(16.711)	(4.264)	(-6.461)
COVERAGE	-0.0004***	-0.0004***	0.0048***	-0.0273
	(-3.098)	(-9.425)	(4.349)	(-1.000)
MISS	0.0074***	0.0007***	0.1052***	-0.3661**
	(12.450)	(3.868)	(16.882)	(-2.256)
TIMELINESS	-0.0001***	-0.0000***	-0.0007***	0.0064***
	(-17.108)	(-9.747)	(-26.612)	(8.851)
IFRS	-0.0008	0.0004	-0.0372***	-0.9634**
	(-0.772)	(1.086)	(-2.741)	(-2.570)
GDPShock	0.0003	0.0001	-0.0003	0.1202
	(0.613)	(0.524)	(-0.057)	(1.008)
Constant	0.1091***	0.0502***	0.3782***	14.9900***
	(13.545)	(21.990)	(6.536)	(7.807)
Industry Fixed-Effects	Yes	Yes	Yes	Yes
N	22,058	22,058	22,058	22,058
Adj R-sq	0.2513	0.2865	0.0853	0.0379
Tests of diff. in coef.				
P_{CIVIL} - $P_{CRIMINAL}$=0	+0.0047	+0.0010***	**+0.0109*****	**+0.3341*****
[p-value]	[0.1106]	[0.1916]	**[0.0006]**	**[0.0001]**
P_{ADMIN} - P_{CIVIL}=0	**-0.0060****	**-0.0018****	**+0.0300*****	**+0.8334*****
[p-value]	**[0.0238]**	**[0.0214]**	**[<0.0001]**	**[<0.0001]**

Notes: To facilitate the interpretation of the results, any statistically significant improvement (deterioration) is highlighted in green (red) color.

This table display results from a panel regression with industry fixed-effects. Definitions of other variables can be found in Table 2. The sample contains 466 Australian firms from 1992 to 2006. Observations are at firm-month level. Observations must have positive sales, 1-year ahead earnings forecasts of up to 360 days before earnings announcements and with at least 2 analysts following. Absolute forecast errors (***FE***) and dispersion (***DISP***) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Results are consistent if the one-year lag dependent variable is included in the model. Coefficients of the ***PUBLIC*** models are divided by 1,000 for presentation purpose. A full list of variable definitions can be found in Appendix - Table 18.

I now move on to examine the differences between the coefficients on $P_{Criminal}$, P_{Civil} and P_{Admin}. Results show that forecast accuracy does not significantly change after the introduction of civil sanctions ($P_{Civil} - P_{Criminal}$ = 0.0047, p-value = 0.1106). But it improves significantly after the introduction of administrative sanctions (P_{Admin} - P_{Civil} = - 0.006, p-value = 0.0238). Considering that the mean value of FE is 0.023, the improvement after including administrative sanctions represents a 26% reduction in forecast error. Although the inclusion of the administrative sanctions appears to provide both an economically and statistically significant incremental deterrent effect, the fact that the coefficient on P_{Admin} remains significantly positive (coef. = 0.0085, t = 6.856) means that forecast accuracy is still worse than the pre-statutory period. In sum, this part of the evidence provides limited support for the first hypothesis (H1a) that the expansion of sanction types for CDR improves the accuracy of analysts' forecasts.

The regression model presented in column 2 tests H1b on forecast dispersion (DISP). It is expected that P_{Civil} and P_{Admin} are both negative, and the coefficients display a decreasing pattern ($P_{Criminal} > P_{Civil} > P_{Admin}$). Consistent with Brown et al. (1999), the coefficient on P_{Civil} is positive (coef. = 0.0008, t = 1.993). The finding that P_{Admin} is negative (coef. = -0.001, t = -2.224) indicates dispersion is significantly lower after the administrative sanctions compared to the pre-statutory period. Turning to the differences in coefficients, no significant changes in forecast dispersion are found following the addition of civil sanctions ($P_{Civil} - P_{Criminal}$ = 0.0010, p-value = 0.1916). After adding administrative sanctions, analysts' forecast dispersion significantly declines (P_{Admin} - P_{Civil} = - 0.0018, p-value = 0.0214) by a magnitude of approximately 18% of the mean of DISP. The significant and negative coefficient on P_{Admin} and the significant incremental reduction in dispersion after the administrative sanctions together provide strong support for H1b. Specifically, the evidence is consistent

with firms better complying with the continuous disclosure rules which reduces analysts' forecast uncertainty and analysts' disagreement.

The last two columns (3 and 4) of Table 3 reports the results for testing H1c and H1d which concern the public component of analysts' information. Consistent with expectations, results of the RELIANCE (analysts' reliance on public information) model show that the coefficients on $P_{Criminal}$ (coef. = 0.0811, t = 7.858), P_{Civil} (coef. = 0.092, t = 7.337), and P_{Admin} (coef. = 0.1220, t = 7.728) are all positive, significant and display the expected stepwise patterns (i.e. $P_{Criminal} < P_{Civil} < P_{Admin}$). More importantly, the differences between P_{Civil} and $P_{Criminal}$ (P_{Civil} - $P_{Criminal}$ = 0.011, p-value = 0.0006), and between P_{Admin} and P_{Civil} (P_{Admin} - P_{Civil} = 0.030, p-value < 0.0001) are statistically significant and positive. To put the numbers into perspective, the value of RELIANCE increases by around 8%[35] since ASIC committed to the responsive enforcement strategy, relative to its mean of 0.51. This increase is economically meaningful because RELIANCE, measured as the ratio of public information over analysts' total information, is bounded by 0% and 100%. Hence, H1c is strongly supported.

Similar strong support is found in the model for PUBLIC (precision of public information). P_{Civil} (coef. = 459.0, t = 1.823) and P_{Admin} (coef. = 1292.4, t = 3.242) are significantly positive and show the expected stepwise patterns (i.e. $P_{Criminal} < P_{Civil} < P_{Admin}$). Consistent with H1d, both tests of difference between P_{Civil} and $P_{Criminal}$ (P_{Civil} - $P_{Criminal}$ = 334, p-value = 0.0001), and between P_{Admin} and P_{Civil} (P_{Admin} - P_{Civil} = 833, p-value < 0.0001), show positive and significant differences. Putting the figures into perspective, the increase since the switch in enforcement strategy represents 65%[36] of the mean value of PUBLIC, highlighting the substantial improvement in the precision of public information used by analysts. Thus, H1d is also strongly supported.

[35] [(P_{Admin} - P_{Civil}) + (P_{Civil} - $P_{Criminal}$)] / mean RELIANCE = (0.030+0.011)/0.51 = 8.04%.
[36] [(P_{Admin} - P_{Civil}) + (P_{Civil} - $P_{Criminal}$)] / mean PUBLIC = (833+334)/1797.21 = 64.9%.

Overall, the results are consistent with the predictions of H1c and H1d. On one hand, the evidence is consistent with the precision of the public information component of analysts' forecasts significantly improving as firms disclose information on a more timely and equitable basis. On the other hand, the findings suggest that analysts rely more on public information following the implementation of the responsive enforcement strategy.

Table 3 also reports several control factors that are associated with forecast properties and have signs that are consistent with prior literature (e.g. Lang and Lundholm 1996). First, size is found to have a negative association with all four forecast properties. Second, better firm performance is associated with lower forecast errors and dispersion. Analysts of better-performing firms are also more likely to rely on private information (Mohanram and Sunder 2006). Earnings variability is negatively (positively) associated with forecast accuracy (forecast dispersion). Third, analysts' forecast errors, dispersions and reliance on public information are all lower when the forecasts are issued closer to earning announcement. Firms that miss forecasts seem to have less accurate forecasts and greater variability in the forecasts (Kross et al. 2011). All four models have reasonable explanatory power (R-squared) compared to Mohanram and Sunder (2006).[37]

Summary of results in the main regressions

To summarize, the main regression results show that the full adoption of the responsive enforcement strategy in CDR is strongly associated with incremental improvement in analysts' forecast accuracy, forecast dispersion, the precision of public information and analyst's reliance on public information. These results are consistent with greater corporate compliance with disclosure regulations when multiple sanctions at various levels of severity are available to the regulator. In addition, the results suggest that the increase of firm compliance is greatest after having a complete hierarchy of sanctions – a

[37] The focus of Mohanram and Sunder (2006) is on the imposition of the US Reg-FD on analysts' operation.

finding that is consistent with the prediction of the Responsive Regulatory Theory (Ayres and Braithwaite, 1992). It is noteworthy that while the above regression models have included a rather comprehensive list of control variables, there may be other uncontrolled (unobservable) factors which drive the results. Section 3.8.1 addresses this concern by using a difference-in-difference research design.

3.7. Sensitivity Analyses

3.7.1 Is the change in enforcement intensity driving the results?

Prior research suggests that the initiation and success of law enforcement generates significant deterrent effects and reduces non-compliance (Bhattacharya and Daouk, 2002; Jennings et al., 2011). While the main results suggest that the expansion of sanctions improves firm compliance, firms may be deterred by (recent) past enforcement actions. As displayed in the summary of CDR enforcements in Table 4, there has been a sharp increase in enforcement activities in the latter part of the sample period, starting in 2003. The majority of the enforcement activities sought either administrative or civil sanctions, and most are successfully pursued by the regulator. In contrast, there has been only one criminal prosecution commenced during the sample period (and it was unsuccessful).

In addition to the main results, I explore the possibility that the above results are driven by ASIC's actual enforcement activities, rather than the sanction expansion. To test whether the regulator's enforcement intensity has confounded the results, additional analyses are performed to ensure that changes in the operations of the regulator are controlled for. If the enforcement strategy is effective, I expect to observe that a complete hierarchy of sanctions as an enforcement strategy has incremental explanatory power over the actual enforcement intensity.

Specifically, I include the enforcement intensity as additional control variables in the regression models. Enforcement intensity is proxied in three ways for robustness: in the past 24 months, (i) the number of prosecutions commenced (RollSum24_Commence), (ii) the number of prosecutions finalized or penalized (RollSum24_Final) and (iii) the amount of pecuniary penalty or fines applied in thousands (RollSum24_Fine).[38] The relevant results are shown in Columns (1) to (3) of Table 5, respectively. Both the commencement and conclusion of an enforcement action are used because a case may take years to conclude. The cases are most likely to be reported in the media, and thus deterrent effect may materialize well before a case closes. In addition, the amount of penalty is used to reflect the fact that heavy penalties deliver more deterrence. The rolling window feature is incorporated to place greater weight on more recent enforcement activities, because the effect of prosecutions is expected to fade over time. This feature is consistent with the finding of Jennings et al. (2011) that persistent enforcement is more effective than isolated enforcement.

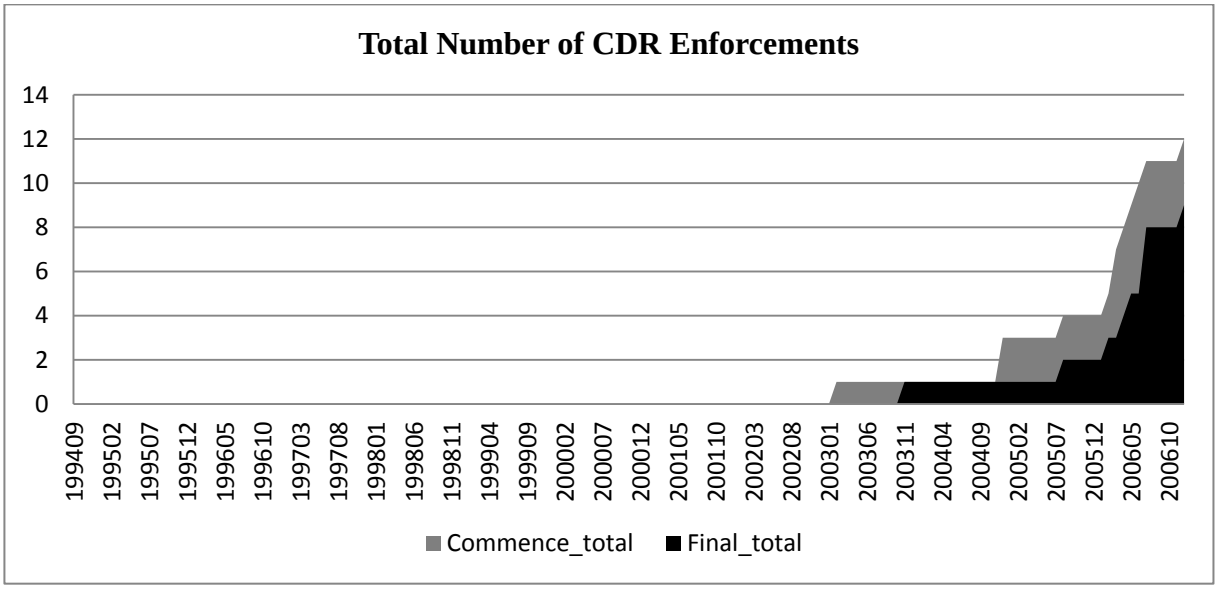
[38] The results are qualitatively the same when a 12- and 36-month rolling window is applied.

Table 4: Summary of ASIC Enforcements under Continuous Disclosure Regime

Periods	Sanctions Available to ASIC	# Enforcement Commenced	# Enforcement Finalised
Pre-Statutory CDR [Before 5/9/1994]	n.a.	n.a.	n.a.
$P_{CRIMINAL}$: [Since 5/9/1994]	Criminal	0	0
P_{CIVIL}: [Since 11/3/2002]	Criminal	0	0
	Civil	1	1
P_{ADMIN}: [Since 1/7/2004]	Criminal	1	0 [a]
	Civil	4	2 [b]
	Administrative	6	6

Notes: This table summarizes the number of CDR enforcements by the type of sanctions from 1994 to 2006. Information above is extracted from sources including ASIC (or ASC before 1997) annual reports, ASIC media releases and a range of legal papers and newspapers.

[a] The only criminal case was found not guilty by Court.
[b] Two other civil cases found not guilty.



Notes: The chart above displays the total number of CDR enforcements from September 1994 to December 2006. ***Commence_total*** refers to the monthly cumulative number of enforcements commenced/first announced; ***Final_total*** refers to the monthly cumulative number of enforcements finalized/penalized.

Table 5: Additional Analysis – Controlling for Enforcement Intensity

Panel A: Dependent variable = Absolute Forecast Error (FE)

Enforcement Intensity variable=	(1) *RollSum24 _Commence*	(2) *RollSum24 _Final*	(3) *RollSum24 _Fine*	(4) *ASIC_OpExp _GDP*	(5) *ASIC_OpRev _GDP*	(6) *ASIC_eft _nList*
$P_{CRIMINAL}$	0.0099***	0.0099***	0.0099***	-0.0061***	-0.0125***	-0.0142***
(t-stat)	(13.488)	(13.458)	(13.427)	(-5.669)	(-9.682)	(-8.944)
P_{CIVIL}	0.0149***	0.0146***	0.0146***	-0.0039**	-0.0110***	-0.0079***
	(11.765)	(11.640)	(11.615)	(-2.366)	(-5.932)	(-4.505)
P_{ADMIN}	0.0095***	0.0088***	0.0085***	-0.0086***	-0.0141***	-0.0146***
	(7.364)	(6.901)	(6.761)	(-5.308)	(-8.022)	(-7.691)
Enf_Intensity	-0.0006***	-0.0003	-0.0000	-0.0002***	-0.0003***	-0.0634***
	(-3.138)	(-1.103)	(-0.255)	(-15.686)	(-17.205)	(-15.090)
Controls & Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	22,058	22,058	22,058	22,058	22,058	22,058
Adj R-sq	0.2514	0.2513	0.2512	0.2586	0.2612	0.2584
Tests of diff. in coef.						
P_{CIVIL}-$P_{CRIMINAL}$=0	+0.0050***	+0.0047	+0.0047*	+0.0022***	+0.0015***	+0.0063***
[p-value]	[<0.0001]	[0.1925]	[0.0603]	[0.0001]	[0.0001]	[<0.0001]
P_{ADMIN}-P_{CIVIL}=0	-0.0054***	-0.0058**	-0.0061***	-0.0047***	-0.0031***	-0.0067***
	[<0.0001]	[0.0140]	[<0.0001]	[<0.0001]	[<0.0001]	[<0.0001]

Panel B: Dependent variable = Forecast Dispersion (DISP)

Enforcement Intensity variable=	(1) *RollSum24 _Commence*	(2) *RollSum24 _Final*	(3) *RollSum24 _Fine*	(4) *ASIC_OpExp _GDP*	(5) *ASIC_OpRev _GDP*	(6) *ASIC_eft _nList*
$P_{CRIMINAL}$	-0.0002	-0.0003	-0.0003	-0.0032***	-0.0041***	-0.0030***
(t-stat)	(-0.789)	(-0.817)	(-0.850)	(-7.595)	(-8.812)	(-5.732)
P_{CIVIL}	0.0008*	0.0008*	0.0008*	-0.0025***	-0.0035***	-0.0018***
	(1.925)	(1.873)	(1.835)	(-4.819)	(-6.157)	(-3.217)
P_{ADMIN}	-0.0011**	-0.0012**	-0.0012**	-0.0042***	-0.0049***	-0.0037***
	(-2.288)	(-2.466)	(-2.566)	(-7.464)	(-8.396)	(-6.044)
Enf_Intensity	0.0000	0.0001	0.0000**	-0.0000***	-0.0000***	-0.0074***
	(0.458)	(1.295)	(2.014)	(-9.400)	(-10.092)	(-6.113)
Controls & Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	22,058	22,058	22,058	22,058	22,058	22,058
Adj R-sq	0.2865	0.2865	0.2866	0.2892	0.2897	0.2875
Tests of diff. in coef.						
P_{CIVIL}-$P_{CRIMINAL}$=0	+0.0010***	+0.0011*	+0.0011*	+0.0007***	+0.0006***	+0.0012***
[p-value]	[0.0001]	[0.0935]	[0.0504]	[0.0011]	[0.0010]	[0.0009]
P_{ADMIN}-P_{CIVIL}=0	-0.0019***	-0.0020***	-0.0020***	-0.0017***	-0.0014***	-0.0019***
	[<0.0001]	[0.0004]	[<0.0001]	[<0.0001]	[<0.0001]	[<0.0001]

Panel C: Dependent variable = Reliance on Public Information (RELIANCE)

Enforcement Intensity variable=	(1) *RollSum24_Commence*	(2) *RollSum24_Final*	(3) *RollSum24_Fine*	(4) *ASIC_OpExp_GDP*	(5) *ASIC_OpRev_GDP*	(6) *ASIC_eft_nList*
$P_{CRIMINAL}$	0.0813***	0.0814***	0.0814***	0.0202	-0.0016	0.0016
(t-stat)	(7.878)	(7.885)	(7.882)	(1.485)	(-0.108)	(0.094)
P_{CIVIL}	0.0941***	0.0933***	0.0929***	0.0218	-0.0022	0.0178
	(7.438)	(7.401)	(7.375)	(1.340)	(-0.127)	(0.984)
P_{ADMIN}	0.1275***	0.1258***	0.1243***	0.0571***	0.0386**	0.0457**
	(7.773)	(7.757)	(7.737)	(3.093)	(2.014)	(2.217)
Enf_Intensity	-0.0030	-0.0031	-0.0000	-0.0008***	-0.0011***	-0.2097***
	(-1.249)	(-1.033)	(-0.773)	(-6.707)	(-7.592)	(-5.746)
Controls & Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	22,058	22,058	22,058	22,058	22,058	22,058
Adj R-sq	0.0854	0.0853	0.0853	0.0870	0.0875	0.0866
Tests of diff. in coef.						
P_{CIVIL}-$P_{CRIMINAL}$=0	+0.0128*	+0.0119	+0.0115	+0.0016	-0.0006	+0.0162
[p-value]	[0.0546]	[0.9411]	[0.8504]	[0.1726]	[0.1589]	[0.1333]
P_{ADMIN}-P_{CIVIL}=0	+0.0334**	+0.0325***	+0.0314***	+0.0353**	+0.0408**	+0.0279**
	[0.0324]	[0.0019]	[0.0070]	[0.0169]	[0.0142]	[0.0123]

Panel D: Dependent variable = Precision of Public Information (PUBLIC)

Enforcement Intensity variable=	(1) *RollSum24_Commence*	(2) *RollSum24_Final*	(3) *RollSum24_Fine*	(4) *ASIC_OpExp_GDP*	(5) *ASIC_OpRev_GDP*	(6) *ASIC_eft_nList*
$P_{CRIMINAL}$	0.1229	0.1181	0.1163	0.7898***	1.1009***	1.0582***
(t-stat)	(0.693)	(0.665)	(0.655)	(2.782)	(3.395)	(2.736)
P_{CIVIL}	0.4400*	0.4317*	0.4345*	1.2258***	1.5716***	1.3310***
	(1.734)	(1.706)	(1.716)	(3.449)	(4.015)	(3.273)
P_{ADMIN}	1.2421***	1.2098***	1.2235***	2.0019***	2.2771***	2.1891***
	(3.006)	(2.963)	(3.020)	(4.446)	(4.848)	(4.342)
Enf_Intensity	0.0276	0.0689	0.0005	0.0009***	0.0013***	2.4616***
	(0.505)	(0.981)	(1.008)	(3.029)	(3.711)	(2.769)
Controls & Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	22,058	22,058	22,058	22,058	22,058	22,058
Adj R-sq	0.0379	0.0379	0.0379	0.0382	0.0384	0.0382
Tests of diff. in coef.						
P_{CIVIL}-$P_{CRIMINAL}$=0	+0.3171	+0.3136**	+0.3182**	+0.4360	+0.4707	+0.2728
[p-value]	[0.1952]	[0.0256]	[0.0390]	[0.1291]	[0.1345]	[0.1318]
P_{ADMIN}-P_{CIVIL}=0	+0.8021**	+0.7781*	+0.7890**	+0.7761**	+0.7055**	+0.8581**
	[0.0199]	[0.0579]	[0.0362]	[0.0338]	[0.0376]	[0.0332]

Notes: ***Enf_Intensity*** is in turns: (1) ***RollSum24_Commence***, (2) ***RollSum24_Final***, (3) ***RollSum24_Fine*** (the number of CDR prosecutions commenced/finalized and the amount of pecuniary penalty by ASIC in the past 24 months in a rolling window); (4) ***ASIC_OpExp_GDP***, (5) ***ASIC_OpRev_GDP*** (ASIC's operating expense/revenue); and (6) ***ASIC_eft_nList*** (the ratio of ASIC equivalent-full-time staff over the number of ASX listed firms). Coefficients in Panel D are divided by 1,000 for presentation purpose. Budgetary data is sourced from ASIC annual reports. CDR prosecution data is collected from ASIC releases, news articles and published law and legal studies.

The inclusion of the above controls does not change the key results which suggests that the implementation of enforcement strategy has incrementally improved firm compliance. It is also noteworthy that the number of prosecutions commenced is significantly associated with a reduction in forecast errors (RollSum24_Commence: coef. = -0.0006, p-value < 0.0001), but insignificant (negative) for the number of prosecutions finalized (RollSum24_Final). This set of results is consistent with the commencement of public enforcement contributing towards an improved information environment in terms of forecast accuracy. All other forecast metrics are basically unaffected by the regulator's enforcement intensity. What is more important is that I continue to observe evidence that expanding sanction types remains associated with better forecast accuracy, decrease in forecast dispersion, and increases in both the precision of and analysts' reliance on public information. This analysis provides more confidence for the conclusion that there are additional deterrent effects associated with sanction escalations apart from increased enforcement activities. This is consistent with the prediction of the Responsive Regulatory Theory that many players would be deterred by the mere existence of the sanction hierarchy (Ayres and Braithwaite 1992).

3.7.2 Is the change in regulatory resources driving the results?

Jackson (2007) and Jackson and Roe (2009) have proxied the level of enforcement activities using the quantity of regulatory resources that are at the disposal of regulators. The rationale is that the size of a regulator's budget directly determines the level of enforcement activities that can be afforded. Financial constraints limit the regulators' ability to bring enforcement actions against non-compliance (Jackson 2007; Jackson and Roe 2009; Cox et al. 2003). A regulator's budgetary and staffing levels are therefore used in the literature to measure enforcement intensity (Jackson and Roe 2009; Brown et al. 2014). Following Jackson and Roe (2009), I use (i) ASIC's Operating Expenses as a percentage of GDP, (ii)

ASIC's Operating Revenue as a percentage of GDP and (iii) the ratio of ASIC equivalent-full-time staff over the number of ASX listed firms. Respectively, their results are presented in Table 5 columns (4) to (6). Similarly, they are added as control variables to the regression models.

Once again, the key inferences are unchanged and continue to support the Responsive Regulatory Theory. The results are consistent with expanding sanction types reducing forecast error and dispersion, and increasing analysts' reliance on and the precision of public information. The effect of the enforcement strategy is incremental to the increased enforcement intensity, as proxied by the budgetary and staffing capacity of the regulator to undertake enforcement actions. Another noteworthy finding is that enforcement intensity as measured by regulatory resources appears to be consistently associated with a reduction in forecast errors and forecast dispersion, and increases in the precision of public information. It is, however, found to be negatively rather than positively associated with analysts' reliance on public information.

Collectively, the results on enforcement intensity are consistent with the prior studies that actual enforcement is important in promoting disclosure quality (Kedia and Rajgopal 2011; Jennings et al. 2011). Enforcement intensity appears to complement the expansion of sanctions to achieve effectiveness. The inferences on the enforcement strategy (expansion of sanctions) remain robust to controlling for enforcement intensity.

3.7.3 Other sensitivity analyses

I conduct several other analyses to ensure that the results are robust. These tables are presented in the appendices. First, the OLS regression analysis (Appendix - Table 20) produces outcomes that are entirely consistent with the regression analysis in Table 3 which controls for fixed industry effects. Inferences also remain the same using Newey-West

procedures which produces standard errors that are heteroskedasticity and autocorrelation consistent (Appendix - Table 21).[39]

Second, the original sample period spans 14 years (1992-2006), with the pre-statutory period covering two years, the criminal sanction period covering eight years, and the civil and administrative periods covering two years each. A potential concern is that the sample lengths for each period are not equal. I restrict the sample period to include only three balanced periods from 2000 to 2006, each with two years, so that the intervals for the criminal/civil/administrative periods are even (Appendix - Table 22). While this restriction drops the number of observations by half to 10,408, the inferences stay the same as the main results.

Third, I perform a robustness check to see if inferences are affected by the change in sample composition over time by including only firms that survived throughout the sample period (Appendix - Table 23). This substantially reduces the sample size by three quarters to 5,157. The results are largely the same except for analysts' reliance on public information (RELIANCE). While the level of RELIANCE is still significantly higher than the pre-statutory period, the change in coefficients is insignificant after the inclusion of more sanctions.

Finally, I follow the prior research by adding a lagged dependent variable (forecast metric) to the model as a control for potentially omitted factors (Heflin et al. 2003; Mohanram and Sunder 2006). It produces the same conclusions (Appendix - Table 24). In summary, the results are broadly robust to various specifications.

[39] The results are mixed if clustering standard errors by firm is used.

3.8. Additional Analyses

3.8.1 Controlling for concurrent events: Difference-in-difference approach

Additional analysis using a difference-in-difference approach is conducted to alleviate the concern that concurrent events other than the enforcement strategy have driven the results.[40] A difference-in-difference approach has been used in prior research to assess the effectiveness of a regulation (e.g. Francis et al. 2006; Humphery-Jenner 2013; Jayaraman 2012). This approach is considered to be a superior method in establishing the causation inferences (Gassen forthcoming; Ittner forthcoming).

The New Zealand market, Australia's neighboring country, is used as a control sample. New Zealand is similar to Australia in many aspects. Their populations have comparable social and cultural features. They are exposed to similar economic risks and technological development. They follow the same English common law legal origin. More importantly, both markets have very similar financial market regulations, including similar continuous disclosure rules. In fact, in an effort to maintain and strengthen close economic ties within the trans-Tasman relationship, many of New Zealand's securities regulations either originated in Australia or were specifically designed to stay aligned with those in Australia (Prada and Walter 2009, 7).[41] The high level of integration between the two countries is reflected in their closely correlated exchange rate movements and the fact that

[40] While it is true that concurrent events such as better information technology might also have impacted analysts' forecast properties, the impact of these events may not be as profound as one may initially expect. It is because working in a competitive environment, financial analysts are more concerned about relative forecasting performance than absolute performance (Mikhail et al. 1999). When better information technology allows them to access a larger amount of homogenous information, it does not necessarily mean that analysts will simply adopt them in their analysis. In order to compete and differentiate themselves, analysts may instead choose to invest extra research efforts to conduct more private information search (Mohanram and Sunder 2006; Beyer et al. 2010). Nonetheless, I still investigate this possibility in an additional analysis.

[41] For example, the recommendation no.2 in the report (p.7) conducted by the New Zealand Securities Commission reads "in framing this new legislation, careful attention be paid to New Zealand's close economic ties with Australia and the importance of maintaining and strengthening regulatory alignment within the trans-Tasman relationship.".

both countries are classified in the same economic region by MSCI.[42] The matching of Australia and New Zealand is also used in the prior literature (e.g. Jayaraman 2012).

Concurrent economic activities and technological advancements which have affected market liquidity in Australia over the sample period should also have driven that in New Zealand. Yet, Australian-specific events, such as the shift in enforcement strategy leading to the introduction of additional sanctions to the Australian disclosure regulation, should not have affected the New Zealand market.

Propensity-Score Matching

In addition, the propensity-score matching (PSM) method is adopted to mitigate concerns regarding selection bias and to minimize the possibility that the results are driven by sample selection (Roberts and Whited 2012; Ittner forthcoming).[43] Table 6 describes the New Zealand sample and the combined sample. While the means of most variables are quite similar, there exist some notable differences. For example, an average New Zealand firm has a market capitalization (number of analysts following) of NZ$371M[44] (5.7) which is much smaller compared to A$652M (8.0) for an average Australian firm. Moreover, there are a lot less loss-making firms in the New Zealand sample than in that of Australia, possibly due to lower analyst coverage in the New Zealand market.

[42] Australia and New Zealand are in the same economic regions according to MSCI, both of them are included in many MSCI regional indices (e.g. Bloomberg code: MXPC, MXPCJ, MXAPJ, and MXPFJ).
[43] Prior accounting and finance studies which use PSM include: Armstrong et al. (2010), Cheng et al. (2013) and Humphery-Jenner (2013).
[44] Or A$331M, based on the foreign exchange rate NZD 1.1204 = AUD 1 (quotation on 30/12/2006).

Table 6: Descriptive Statistics – New Zealand and Combined Samples

Variable	N	Mean	25th Percentile	Median	75th Percentile	S.D.
Panel A: Aus & NZ combined (466 firms)						
FE	26,181	0.025	0.003	0.008	0.021	0.057
DISP	26,181	0.011	0.003	0.005	0.011	0.018
RELIANCE	26,181	0.511	0.112	0.628	0.920	0.436
PUBLIC	26,181	8002	18.50	250.7	1400.7	58506
SIZE	26,181	20.05	19.026	19.978	21.085	1.508
LOSS	26,181	0.076	0.000	0.000	0.000	0.265
LROA	26,181	0.072	0.046	0.068	0.095	0.078
STD_ROA3	26,181	0.030	0.008	0.015	0.031	0.066
EARN_CHG	26,181	0.040	0.008	0.016	0.038	0.095
MISS	26,181	0.531	0.000	1.000	1.000	0.499
LGROWTH	26,181	2.562	1.181	1.757	2.882	2.628
LLEV	26,181	0.473	0.369	0.486	0.575	0.165
COVERAGE	26,181	7.059	4.000	6.000	10.000	3.952
TIMELINESS	26,181	182.9	91.00	182.0	279.0	107.9
IFRS	26,181	0.142	0.000	0.000	0.000	0.349
GDPShock	26,181	0.952	0.561	0.861	1.389	0.567
Panel B: New Zealand only (65 firms)						
FE	4,123	0.025	0.003	0.008	0.020	0.063
DISP	4,123	0.010	0.003	0.005	0.011	0.024
RELIANCE	4,123	0.533	0.012	0.738	0.982	0.456
PUBLIC	4,123	41142	11.70	367.6	4305	141902
SIZE	4,123	19.73	18.75	19.59	20.49	1.285
LOSS	4,123	0.036	0.000	0.000	0.000	0.187
LROA	4,123	0.074	0.044	0.068	0.107	0.064
STD_ROA3	4,123	0.023	0.008	0.014	0.027	0.030
EARN_CHG	4,123	0.040	0.006	0.014	0.029	0.132
MISS	4,123	0.504	0.000	1.000	1.000	0.500
LGROWTH	4,123	2.330	1.022	1.684	2.927	1.998
LLEV	4,123	0.454	0.318	0.457	0.575	0.173
COVERAGE	4,123	5.674	4.000	6.000	7.000	2.547
TIMELINESS	4,123	176.3	88.00	174.0	263.0	102.1
IFRS	4,123	0.147	0.000	0.000	0.000	0.355
GDPShock	4,123	1.104	0.475	0.854	1.797	0.768

Note: Summary statistics for Australian firms only are the same as those in Table 1. The combined sample contains 531 firms (466 Aus 65 NZ) from 1992 to 2006. Observations are at firm-month level. Observations must have positive sales, 1-year ahead earnings forecasts of up to 360 days before earnings announcements and with at least 2 analysts following. Absolute forecast errors (**FE**) and dispersion (**DISP**) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles. The foreign exchange rate applicable is NZD 1.1204 = AUD 1 (30/12/2006).

FE is the absolute forecast error defined as |(actual EPS-median EPS forecast)|/stock price at the beginning of fiscal year; ***DISP*** is the standard deviation of consensus forecast divided by stock price at the beginning of fiscal year; analysts' information is as defined in BKLS (1998) model: ***PUBLIC*** (h) refers to the precision of public/common information; ***RELIANCE*** (ρ) refers to the reliance of public-to-total information; $P_{CRIMINAL}$, P_{CIVIL} and P_{ADMIN} are period dummies: $P_{CRIMINAL}$ equals 1 when CDR has criminal sanctions only (5/9/1994-10/3/2002), P_{CIVIL} equals 1 when CDR has both criminal and civil sanctions (11/3/2002-30/6/2004), P_{ADMIN} equals 1 when CDR has criminal, civil and administrative sanctions (1/7/2004-31/12/2006) and 0 otherwise; ***SIZE*** is the log of market capitalization; ***LOSS*** is a dummy that equals 1 if earnings is negative; ***LROA*** is the lag return on asset; ***STD_ROA3*** is one standard deviation of ROA in the past three years; ***EARN_CHG*** refers to the change of earnings scaled by market capitalization; ***LGROWTH*** refers to the lag market-to-book ratio; ***LLEV*** refers to lag total liabilities over total assets; ***COVERAGE*** is the number of estimates or forecast forming that consensus; ***MISS*** is a dummy that equals 1 if a firm fails to meet consensus EPS forecast and 0 otherwise; ***TIMELINESS*** is defined as the number of days by which the forecast precedes earnings announcement; ***IFRS*** is a dummy that equals 1 when the mandatory adoption of IFRS take place on 1/7/2005, and 0 otherwise; ***GDPShock*** is defined as the absolute value of quarterly GDP growth (%)

Details of the PSM procedures are as follows. I retain firms in the sample for regressions if they are found to be matched according to their propensity scores which are estimated based on their industry classifications, general firm characteristics, financial performance attributes and the extent of analysts' attention. Specifically, they are:

Category of firm attributes	Variable
General characteristics:	(1) market capitalization; (2) market-to-book; (3) leverage
Financial performance:	(4) ROA; (5) ROA variability; (6) loss occurrences
Financial analyst coverage:	(7) number of analyst following
Industry classifications:	(8) Industry indicators

The matching algorithm used is nearest-neighbor within a caliper width of 0.01; firms which failed to find a match according to the algorithm are dropped (Cheng et al. 2013). Considering the fact that there are many more Australian firms than New Zealand firms, replacement is allowed to minimize selection bias.[45] For a sensitivity check, the analysis is repeated without replacements to keep variance low at the expense of increased bias (Roberts and Whited 2012). Specifically, the first-stage logistic model for PSM is as follows:

$$\text{Logit(AUS)} = \alpha + \beta_1 \text{SIZE} + \beta_2 \text{LOSS} + \beta_3 \text{LROA} + \beta_4 \text{STD\_ROA3} + \beta_5 \text{LGROWTH} + \beta_6 \text{LLEV} + \beta_7 \text{COVERAGE} + \sum \beta \text{ Industry-fixed effects} + \varepsilon \quad (2)$$

where AUS is an indicator variable that takes the value of 1 for Australian firms, 0 for New Zealand firms; the rest of the variables are as defined in the main analysis.

[45] Allowing replacement means a New Zealand firm may be used for more than once in the matching procedure.

Panel A of Table 7 presents the results for the first stage logistic regression for the computation of propensity scores, with a pseudo R-square of 18.4% that indicates a reasonably good fit for the model.[46] The summary statistics indicate that the differences between the Australian and New Zealand samples are substantially narrowed after matching with propensity scores. Out of the above seven firm-level characteristics, the differences in six (five) narrowed with (without) replacement.[47]

Difference-in-difference Regression Model

The difference-in-difference regression model is as follows:

$$\begin{aligned}\text{Forecast Metrics} = {} & \alpha + \beta_1 \text{AUS} + \beta_2 P_{\text{Criminal}} + \beta_3 P_{\text{Civil}} + \beta_4 P_{\text{Admin}} \\ & + \beta_5 \text{AUS} * P_{\text{Criminal}} + \beta_6 \text{AUS} * P_{\text{Civil}} + \beta_7 \text{AUS} * P_{\text{Admin}} \\ & + \beta_8 \text{SIZE} + \beta_9 \text{LOSS} + \beta_{10} \text{LROA} + \beta_{11} \text{STD\_ ROA3} + \beta_{12} \text{EARN\_CHG} \\ & + \beta_{13} \text{LGROWTH} + \beta_{14} \text{LLEV} + \beta_{15} \text{COVERAGE} + \beta_{16} \text{MISS} \\ & + \beta_{17} \text{TIMELINESS} + \beta_{18} \text{IFRS} + \beta_{19} \text{GDPShock} \\ & + \sum \beta \text{ Industry-fixed effects} + \varepsilon \end{aligned} \quad (3)$$

where Forecast Metrics is, in turn, (i) FE: Absolute Forecast Error, (ii) DISP: Forecast Dispersion, (iii) RELIANCE: BKLS Reliance on Public Information, and (iv) PUBLIC: BKLS Precision of Public Information; AUS is an indicator variable which equals 1 for Australian firms and 0 for New Zealand firms; P_{Criminal} / P_{Civil} / P_{Admin} is a period indicator for the period when criminal / civil / administrative sanctions were introduced. Control variables are as defined in the main analysis.

[46] Cheng et al. (2013) evaluate their logit model used for propensity score matching with pseudo-R-squared of 17% as a model of good fit. Other models appear to have a rather low pseudo-R-squared (e.g. Haggard et al. 2015, pseudo-R-sq. = 2.38%).
[47] Based on tests of differences that is not tabulated.

The two interaction terms, $AUS*P_{Civil}$ and $AUS*P_{Admin}$ are the key variables of interest in the model since they test whether and how the application of the responsive enforcement strategy in Australia has impacted the Australian information environment, relative to the control group in New Zealand where such sanctions would have no impact. In particular, P_{Admin} (the period when administrative sanctions are added) marks the completion of a multi-layered "enforcement pyramid". With it, the Responsive Regulatory Theory predicts that compliance will substantially improve (Ayres and Braithwaite 1992). To support my hypotheses, the coefficients on $AUS*P_{Civil}$ and $AUS*P_{Admin}$ would be significant, being signs that are consistent with better information environment and display a stepwise pattern: $|AUS*P_{Admin}| > |AUS*P_{Civil}| > |AUS* P_{Criminal}|$.

Difference-in-difference regressions results and discussion

Panel B of Table 7 presents the main results for difference-in-difference regressions. Forecast error (FE) is found to be significantly lower in Australia than matched New Zealand firms as the CDR sanctions expanded in Australia. All three interaction variables are negative, significant and conform to a stepwise pattern, with $AUS*P_{Civil}$ (coef. = -0.021, $p<0.001$) smaller than $AUS*P_{Criminal}$ (coef. = -0.004, $p = 0.059$), and $AUS*P_{Admin}$ (coef. = -0.032, $p<0.001$) smaller than $AUS*P_{Civil}$.[48] The results for the precision of public information available to analysts (PUBLIC) resemble those for forecast accuracy. All three interaction terms are significantly positive although $AUS*P_{Admin}$ is not larger than $AUS*P_{Civil}$. These results are generally consistent with the prediction of Responsive Regulatory Theory that a pyramid of sanctions has improved corporate compliance with CDR as reflected in the significantly improved analysts' forecast accuracy.

[48] The results for PSM with no replacement are similar but weaker ($AUS*P_{Admin}$ coef. = -0.008, p=0.1153).

Table 7: Difference-in-difference Analysis

Panel A: Logit regression model estimates of the propensity-score matching procedure

Dependent var. =	AUS	
	Coef.	z-stat
SIZE	-0.114	(-0.811)
LOSS	1.205*	(1.819)
LROA	3.095	(1.492)
STD_ROA3	7.415*	(1.856)
LGROWTH	0.058	(0.618)
COVERAGE	0.195***	(3.112)
LLEV	0.248	(0.303)
Industry fixed-effects	Yes	
N firms	531	
Pseudo-R-sq	0.1838	

Panel B: Multivariate analysis results

Dependent var. =	FE			DISP		
	(1)	(2)	(3)	(4)	(5)	(6)
	No Match	PSM Replace	PSM No Replace	No Match	PSM Replace	PSM No Replace
AUS	0.002	0.011***	-0.002	-0.003	-0.021***	-0.009**
(t-stat)	(0.874)	(4.727)	(-0.517)	(-0.955)	(-13.392)	(-2.376)
$P_{CRIMINAL}$	0.015***	0.009***	0.012***	-0.002	-0.017***	-0.004
	(5.327)	(4.344)	(3.174)	(-0.560)	(-10.958)	(-1.208)
P_{CIVIL}	0.025***	0.023***	0.021***	-0.002	-0.020***	-0.004
	(7.899)	(10.265)	(4.745)	(-0.648)	(-13.012)	(-1.144)
P_{ADMIN}	0.009***	0.011***	0.007*	-0.006*	-0.025***	-0.008**
	(3.148)	(4.912)	(1.649)	(-1.882)	(-15.596)	(-2.360)
$AUS*P_{CRIMINAL}$	-0.005*	-0.004*	-0.006	0.001	0.015***	0.004
	(-1.672)	(-1.891)	(-1.365)	(0.424)	(9.669)	(1.109)
$AUS*P_{CIVIL}$	-0.013***	-0.021***	-0.006	0.002	0.018***	0.004
	(-4.027)	(-7.870)	(-1.007)	(0.603)	(11.374)	(0.853)
$AUS*P_{ADMIN}$	-0.005*	-0.032***	-0.008	0.004	0.024***	0.007*
	(-1.812)	(-11.602)	(-1.575)	(1.281)	(14.590)	(1.789)
Controls & Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
N	26,181	39,724	5,280	26,181	39,724	5,280
Adj R-sq	0.2962	0.3651	0.3360	0.2758	0.4433	0.2639

Table continues…

Dependent var. =	RELIANCE			PUBLIC		
	(7)	(8)	(9)	(10)	(11)	(12)
	No Match	PSM Replace	PSM No Replace	No Match	PSM Replace	PSM No Replace
AUS	0.000	-0.033*	-0.061	-71.352***	-41.545***	-86.644***
(t-stat)	(0.013)	(-1.909)	(-0.900)	(-4.582)	(-12.698)	(-5.449)
$P_{CRIMINAL}$	0.105***	-0.050***	0.068*	-32.555**	-15.461***	-38.232**
	(2.731)	(-4.274)	(1.657)	(-2.043)	(-4.668)	(-2.458)
P_{CIVIL}	0.206***	-0.038***	0.118***	-44.960***	-34.152***	-54.685***
	(5.134)	(-3.009)	(2.678)	(-2.788)	(-10.224)	(-3.450)
P_{ADMIN}	0.151***	0.047***	0.036	-37.818**	-32.066***	-51.623***
	(3.714)	(3.310)	(0.781)	(-2.331)	(-9.070)	(-3.168)
$AUS*P_{CRIMINAL}$	-0.026	0.097***	0.047	31.405**	10.295***	39.391**
	(-0.654)	(5.546)	(0.671)	(1.976)	(3.195)	(2.502)
$AUS*P_{CIVIL}$	-0.121***	0.045**	0.061	44.679***	28.249***	58.332***
	(-2.898)	(2.345)	(0.846)	(2.789)	(8.777)	(3.595)
$AUS*P_{ADMIN}$	-0.042	-0.024	0.082	40.132**	23.831***	57.060***
	(-0.998)	(-1.252)	(1.123)	(2.506)	(7.161)	(3.524)
Controls & Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
N	26,181	39,724	5,280	26,181	39,724	5,280
Adj R-sq	0.0792	0.1230	0.1007	0.0924	0.0914	0.0973

Note: Penal A shows the logit regression model used for the propensity-score matching procedure. Penal B shows the difference-in-difference regression results of analyst's information environment measures between Australia and New Zealand. The nearest-neighbor matching algorithm (within a caliper width of 0.01) is used. The combined sample contains 531 firms (466 Aus 65 NZ) from 1992 to 2006.
All models include control variables, intercept and industry indicators. t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level. Observations must have positive sales, 1-year ahead earnings forecasts of up to 360 days before earnings announcements and with at least 2 analysts following. Absolute forecast errors (**FE**) and dispersion (**DISP**) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles. Coefficients of the **PUBLIC** models are divided by 1,000 for presentation purpose.

However, contrary to prediction, forecast dispersion (DISP) results are the opposite to those for forecast accuracy. In other words, forecast dispersion has widened compared to the control group. All three interaction variables are positive and significant with the stepwise pattern, although results with no matching or matching without replacement are mostly insignificant. What is more, the results for reliance on public information (RELIANCE) appear to be mixed, mostly insignificant and sensitive to the type of matching used.

In summary, the difference-in-difference results suggest that the incremental improvements in the amount and/or quality of public information available to analysts (PUBLIC) and thus analysts' forecast accuracy (FE) are likely to be attributable to the expanding sanctions, rather than confounding events. However, when compared to the control group, Australian analysts do not appear to rely more on public information (RELIANCE), and there is some evidence suggesting that the disagreement among their forecasts (DISP) actually increases. The fact that the difference-in-difference results on RELIANCE and DISP are different to those in the main results suggests that concurrent events may have affected analysts' forecasting behaviors. Collectively, the results suggest that sanction expansion has played a positive role in forcing more continuous disclosures from firms.

3.8.2 Falsification tests: Are the models capturing something else?

Furthermore, a falsification test is performed to check internal validity (Roberts and Whited 2012). This is to check if the model is capturing the effects of some unobservable forces instead of the effects of the enforcement strategy. The approach follows Almeida et al. (2012).[49] By focusing on a time period when there had not been a change in enforcement strategy (2008-2013), I do not expect to find the interaction terms of the Australian firm and the period indicators to be consistently significant and display a stepwise pattern. More specifically, I begin the sample period from 2006 which is already after the completion of the enforcement pyramid (July 2004) and end the sample in 2013. The first two years serve as the base, and $P_{Criminal}/P_{Civil}/P_{Admin}$ is redefined as P1_f/P2_f /P3_f (where f stands for "falsification") with each covering a two-year period of 2008-09/2010-11/2012-13,

[49] Almeida et al. (2012) examine the link between corporate debt maturity structure and investment after the onset of the 2007 credit crisis. As a falsification test to preclude that it is something other than the 2007 credit crisis that drives the result, they redefine the breakpoint from 2007 to 2006 and 2005 and rerun their analyses. The fact that they find no results when the breakpoint is redefined shows that it is the effect of the 2007 credit crisis that they have isolated.

respectively. The interaction variables of interest are also updated accordingly (i.e. AUS*P1_f, AUS*P2_f and AUS*P3_f). Since there has not been any switch in enforcement strategy over 2008-2013, I do not expect to see the signs, significance and patterns comparable to those in the main regression analysis.

Consistent with expectations, the falsification test shows pattern-less results (Table 8). Panel A shows the results for the Australia-only sample. Although there are a few incidences of significant differences, the differences in coefficients are not of the directions and patterns which are predicted by the Responsive Regulatory Theory. A similar conclusion is reached based on the results for the difference-in-difference sample, as presented in Panel B. None of AUS*P1_f, AUS*P2_f or AUS*P3_f are consistently significant, nor is a stepwise pattern observed. Since the falsification test is conducted in a time period without the occurrence of a shift in enforcement strategy, the fact that the results are not consistent with the main findings is a positive signal that the models used in the main analyses are unlikely to be capturing something other than the responsive enforcement strategy.

Table 8: Falsification Tests

Panel A: Falsification Test Period 2006/01-2013/12 – Australian Sample Only

Dependent variable =	(1) FE	(2) DISP	(3) RELIANCE	(4) PUBLIC
P1_f2 ('08-'09)	0.0095***	0.0004	0.0727***	7.3429***
	(8.179)	(0.320)	(8.713)	(3.906)
P2_f2 ('10-'11)	-0.0001	-0.0032***	0.0638***	15.5111***
	(-0.072)	(-2.908)	(7.475)	(7.449)
P3_f2 ('12-'13)	0.0037***	0.0017	0.0302***	12.6779***
	(2.664)	(1.274)	(3.161)	(5.621)
Controls & Intercept	Yes	Yes	Yes	Yes
Industry fixed-effects	Yes	Yes	Yes	Yes
N	25,081	25,081	25,081	25,081
Adj R-sq	0.3506	0.2128	0.1562	0.0319
Tests of diff. in coef.				
P2_f2 – P1_f2 = 0	-0.0096***	-0.0036***	-0.0089	8.1682***
[p-value]	[<0.0001]	[0.0001]	[0.2183]	[<0.0001]
P3_f2 – P2_f2 = 0	0.0038***	0.0049***	-0.0336***	-2.8332
	[0.0032]	[<0.0001]	[<0.0001]	[0.1603]

Panel B: Falsification Test Period 2006/01 – 2013/12 – Difference-in-difference sample

Dep. var. =	FE			DISP		
	(1) No Match	(2) PSM Replace	(3) PSM No Replace	(4) No Match	(5) PSM Replace	(6) PSM No Replace
AUS	-0.001	-0.012***	0.003*	0.002***	0.007***	0.004***
	(-0.591)	(-7.296)	(1.664)	(2.820)	(6.169)	(2.628)
P1_f2 ('08-'09)	-0.010***	-0.020***	0.002	-0.004***	0.001	0.004**
	(-4.018)	(-12.062)	(0.921)	(-4.463)	(1.577)	(2.503)
P2_f2 ('10-'11)	0.003	0.000	0.011**	0.007*	0.016***	0.013***
	(0.825)	(0.076)	(2.426)	(1.913)	(9.078)	(3.010)
P3_f2 ('12-'13)	-0.006**	-0.011***	0.001	-0.000	0.007***	0.005**
	(-2.132)	(-7.729)	(0.487)	(-0.185)	(6.151)	(2.057)
*AUS*P1_f2*	0.020***	0.033***	0.010***	0.005***	0.003**	0.005**
	(7.718)	(16.438)	(3.468)	(4.205)	(2.276)	(2.437)
*AUS*P2_f2*	-0.003	-0.000	-0.007*	-0.009**	-0.015***	-0.009**
	(-0.760)	(-0.131)	(-1.658)	(-2.499)	(-7.524)	(-2.260)
*AUS*P3_f2*	0.010***	0.014***	-0.002	0.004	-0.000	0.002
	(3.542)	(7.425)	(-0.740)	(1.607)	(-0.010)	(0.626)
Controls & Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
N	28,434	37,011	4,645	28,434	37,011	4,645
Adj R-sq	0.3242	0.2213	0.1853	0.1850	0.1410	0.1080

Table continues…

Dep. var. =	RELIANCE			PUBLIC		
	(7)	(8)	(9)	(10)	(11)	(12)
	No Match	PSM Replace	PSM No Replace	No Match	PSM Replace	PSM No Replace
AUS	0.007	0.003	0.078***	0.054	1.541	-10.190
	(0.388)	(0.284)	(2.633)	(0.012)	(0.661)	(-1.477)
P1_f2 ('08-'09)	0.052**	-0.006	0.058**	8.306	23.800***	7.859
	(2.372)	(-0.698)	(2.384)	(1.444)	(10.328)	(1.221)
P2_f2 ('10-'11)	0.053**	0.061***	0.039	26.365***	18.933***	23.690***
	(2.400)	(6.396)	(1.555)	(4.070)	(7.678)	(3.243)
P3_f2 ('12-'13)	0.044*	-0.017*	0.064**	23.804***	42.827***	27.396***
	(1.877)	(-1.805)	(2.411)	(3.530)	(13.666)	(3.431)
*AUS*P1_f2*	0.015	0.060***	-0.102***	-1.515	-13.824***	2.992
	(0.631)	(4.619)	(-2.648)	(-0.254)	(-4.279)	(0.319)
*AUS*P2_f2*	0.004	-0.032**	-0.055	-11.640*	-6.769**	-13.358
	(0.174)	(-2.307)	(-1.447)	(-1.714)	(-1.978)	(-1.318)
*AUS*P3_f2*	-0.021	0.004	-0.058	-12.037*	-32.440***	-13.646
	(-0.864)	(0.294)	(-1.449)	(-1.722)	(-8.232)	(-1.252)
Controls & Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
N	28,434	37,011	4,645	28,434	37,011	4,645
Adj R-sq	0.1490	0.1617	0.1672	0.0329	0.1076	0.0572

Note: This table shows the results of the falsification test. The sample ranges from January 2006 to December 2013 (which begins well after the addition of sanctions).

Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level. Observations with less than 10 trading days in a month, relative spread below 0 or above 25% of mid-point price are removed. Continuous variables are trimmed at 1st and 99th percentiles. The natural logarithms of variables are used since most market variables are highly skewed.

P1_f: indicator variable which equals 1 when observations fall between January 1, 2008 and December 31, 2009, 0 otherwise; ***P2_f***: indicator variable which equals 1 when observations fall between January 1, 2010 and December 31, 2011, 0 otherwise; ***P3_f***: indicator variable which equals 1 when observations fall between January 1, 2012 and December 31, 2013, 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms. The same set of control variables are applied.

3.9. Chapter Summary

This chapter examines empirically the impact of ASIC's adoption of the responsive enforcement strategy in the CDR on the analyst's information environment. It is expected that the strategy adoption would have improved corporate compliance with CDR and thus the analyst's information environment. In conclusion, the empirical evidence on the analyst's information environment is supportive of the effectiveness of the responsive enforcement strategy (i.e. the expansion of sanctions). In particular, after ASIC adopted the responsive enforcement strategy and acquired a multi-layered enforcement pyramid, analysts' forecast error and dispersion are lower, and analysts' reliance on and the precision of public information are higher. These sensitivity and additional analyses generally support the key inferences. The next chapter will investigate whether the strategy adoption would have impacted an important capital market outcome – market liquidity.

Chapter 4:

Responsive Enforcement Strategy & Market Liquidity

4.1. Introduction

Chapter 3 has presented evidence that ASIC's adoption of the responsive enforcement strategy is associated with improvements in the analyst' information environment. This chapter complements the previous chapter by examining the impact of the strategy adoption on market liquidity, an important capital market outcome and one of the official objectives of CDR (Treasury of Australian Government 2002). Under the Australian CDR, listed firms are required to disclose their price-sensitive information in a timely and equitable basis. After a series of sanctions expansions between 2002 and 2004, ASIC has possessed a multi-layered "enforcement pyramid" which is expected to improve corporate compliance with CDR significantly (Ayres and Braithwaite 1992). The reduced information asymmetry among market participants is also expected to improve market liquidity (Diamond and Verrecchia 1991; Welker 1995; Leuz and Verrecchia 2000; Heflin et al. 2005; Balakrishnan et al. 2014).

The rest of the chapter proceeds as follows. Section 4.2 briefly reviews the relationship between disclosure regulation and market liquidity. Section 4.3 develops the hypotheses. Section 4.4 details the methodological design, followed by data and sample selection in Section 4.5. Results on the Australia-only sample are presented in Section 4.6. The (main) difference-in-difference results are presented in Section 4.7. Section 4.8 and 4.9 show the findings of the sensitivity analyses and additional analyses. Finally, the chapter concludes in Section 4.10.

4.2. Disclosure Regulations and Market Liquidity

This section reviews the literature that relates disclosure regulations and market liquidity. It is well documented in the literature that firms that commit to better corporate

disclosures enjoy higher liquidity. The seminal theoretical model proposed by Diamond (1985) and Diamond and Verrecchia (1991) suggests that better corporate disclosures improve market liquidity through the reduction of information asymmetry. An important channel through which managers can reduce information asymmetry is voluntary disclosure. As a result of the additional information disclosure, shareholder welfare will improve due to "explicit information cost saving and improved risk sharing" (Diamond 1985, 1071). This view is consistent with a survey finding that managers provide voluntary disclosure to "reduce the information risk that investors assign to our stock" (Graham et al. 2005, 57). The theoretical conclusion of Diamond (1985) and Diamond and Verrecchia (1991) is well supported by the empirical evidence. Firms with better corporate disclosures are found to enjoy lower bid-ask spreads (Welker 1995; Healy et al. 1999; Leuz and Verrecchia 2000; Balakrishnan et al. 2014) and higher quoted depth and order sizes (Heflin et al. 2005).

In an attempt to more clearly attribute the effect on market liquidity to corporate disclosure, Leuz and Verrecchia (2000) identify a group of German firms that have switched from the German reporting regime (which is believed to be of a lower standard) to an international reporting regime such as IAS or US GAAP (which is believed to be of a higher standard). Viewing the switch as an exogenous shock, the endogeneity concern is somewhat moderated. The authors find that, compared to the firms that use German reporting regime, market liquidity (as proxied by bid-ask spread and turnover rate) is significantly higher for those German firms that commit themselves to higher standard reporting. However, due to the restriction that trade data for German firms only began coverage from 1998, which is concurrent with when German firms were given the choice to adopt the international reporting regime, the approach used by Leuz and Verrecchia (2000) is a cross-sectional test of the liquidity difference between German firms which do and do not adopt international standard in the year 1998 only.

Acknowledging outright that the relationship between disclosure and liquidity is endogenous, Balakrishnan et al. (2014) examines whether managers influence the liquidity of their firms' shares through voluntary disclosure using a plausibly exogenous loss in the supply of public information. Balakrishnan et al. (2014) also apply a difference-in-difference research design to establish a more causal linkage between disclosure and liquidity. This exogenous shock is originally identified in Kelly and Ljungqvist (2012). The exogenous shock refers to the rare and large-scale closure of research operations by 43 brokers due to the downturn of the sell-side research market from 2000 to 2008, which resulted in lost coverage for over 4,000 US firms. Their results show that the firms that actively manage their information environment by voluntary disclosure enjoy higher market liquidity. But the liquidity improvement is not detected among firms that do not make additional disclosures. As a result, these unresponsive firms suffered a permanent loss of market liquidity. Balakrishnan et al. (2014, 2237) argue that the firms' responses appear to be motivated by "a desire to reduce information asymmetries between retail and institutional investors." They further provide evidence that the resulting liquidity improvement has in turn increased firm value.

Other related studies suggest that transparency and information quality do not just enhance the level of market liquidity, but are also found to be particularly important in mitigating liquidity risk during crises and liquidity events (Sadka 2011; Lang and Maffett 2011). For example, using an international sample, Lang and Maffett (2011) find that firms with a more transparent information environment have lower liquidity volatility. Similarly, Ng (2011) provides evidence that higher information quality reduces a firm's exposure to systematic liquidity risk.

In summary, the positive association of corporate disclosure and market liquidity has been solidly established. In fact, Leuz and Wysocki (2008, 7) in their review of research on

disclosure regulations, state that "the firm-specific benefit of disclosure best supported by theory is the effect on market liquidity". In a similar vein, the Treasury of the Australian Government has made its expectation explicit that an effective disclosure regulation should, among other goals, help improve market liquidity (e.g. Treasury of Australian Government 2002, 129). This chapter of the thesis examines whether ASIC's adoption of the responsive enforcement strategy has indeed helped achieve this objective.

4.3. Hypothesis Development

The level of information asymmetry in the market has implications for the bid-ask spread and trade turnover at the aggregate level (two common proxies of market liquidity). In the presence of information-motivated traders who trade with private information, liquidity-motivated traders (or market makers) face the risk of suffering losses by executing orders at un-informed or less-informed prices.[50] Therefore, to be compensated for this adverse selection risk, market makers can either charge a premium by widening the bid-ask spread (Copeland and Galai 1983; Diamond and Verrecchia 1991) or directly reducing their exposure (Lee et al. 1993). The same set of responses of market makers also apply for un-informed investors. To protect themselves from exploitation by informed investors, un-informed investors are only willing to buy at a cheaper price (or sell at a higher price) with the presence of informed investors, compared to the "fair" price assessed upon their information set (Glosten and Milgrom 1985). In other words, market participants price in the risk of information asymmetry and adverse selection. This form of price protection among investors contributes to the bid-ask spread in the secondary share market. In addition to achieving protection through pricing, un-informed investors may also choose to directly

[50] Market makers stand ready to take buy and sell orders in the market, and thus they need to hold inventory. The difference between the bid and ask quotes (i.e. bid-ask spread) represent their total revenue.

reduce their exposure through adjusting the level of participation. They may reduce the number of shares that they are willing to trade or hold off trading altogether, if they perceive that the information asymmetry and adverse selection in the market is high.

If the adoption of the responsive enforcement strategy with expanded sanctions has improved corporate compliance with the Australian CDR, the reduction in information asymmetry is expected to have increased market liquidity. The price-sensitive information that firms disclose on timelier and less selective bases is expected to be more quickly received by a broader group of market participants. Consequently, a more level playing field among market participants will have helped mitigate the adverse selection problem and increase market liquidity (Verrecchia 2001). The mechanism through which better corporate disclosure affects liquidity are two-fold. First, it is more difficult and expensive for traders to become privately informed when more information is made publicly available. This moderates the likelihood of trading with a privately informed counterparty in the market. Second, more public disclosure of a firm's private information lowers the uncertainty in a firm's valuation. This in turn reduces the potential value of the information held by privately informed traders (Leuz and Wysocki 2008; Verrecchia 2001). Both effects are expected to diminish the need for un-informed investors to protect themselves through price and/or reduced participation. Therefore, I hypothesize that:

H2a: Bid-ask spread reduces in the period after additional sanctions are added to the Continuous Disclosure Regime as compared with the period before.

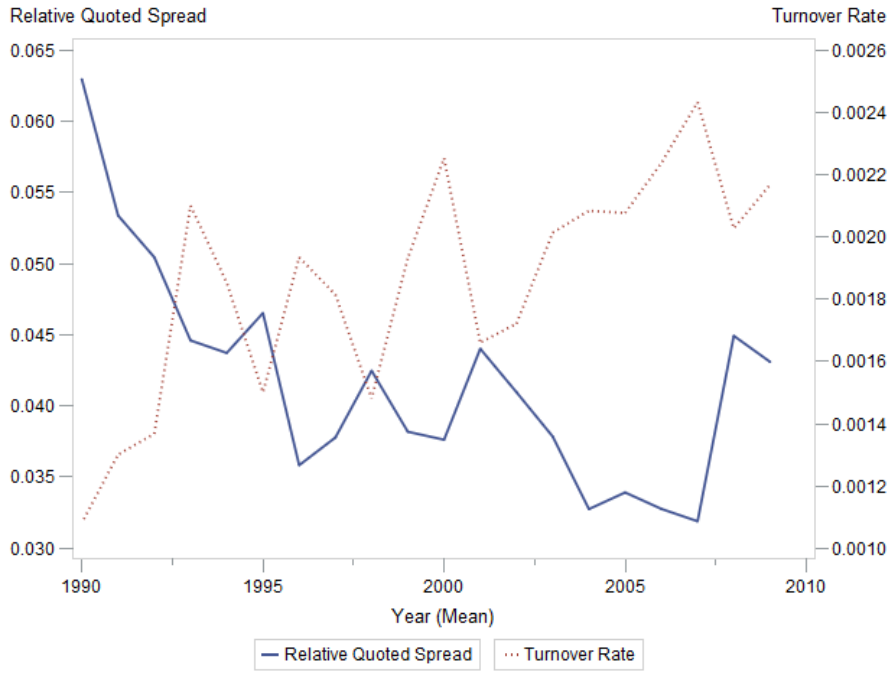
H2b: Turnover rate increases in the period after additional sanctions are added to the Continuous Disclosure Regime as compared with the period before.

4.4. Research Design

4.4.1 Difference-in-difference approach

The need to handle confounding effects dominates the analysis of market liquidity. There is no doubt market liquidity has significantly improved internationally over the past two decades. The various CDR stages span more than a decade, during which market liquidity in the Australian market (and that of the world) has experienced a substantial increase. As depicted in Figure 2, a declining trend for relative spread can easily be observed (except for a spike in 2008 as a result of the Global Financial Crisis). Turnover rate has been quite volatile, but the increasing trend is still clearly observable.

Figure 2: The Trend of Liquidity in Australia (1990 - 2009)



This figure shows the yearly mean of relative quoted spread (time-weighted quoted spread as a percentage of mid-point price) and turnover rate (value traded as a percentage of market capitalization) in Australia for all firms listed on Australian Stock Exchange (ASX) from 1990 to 2009.

This increasing trend in liquidity coincides with the expanding disclosure regulation sanctions over the same period. While disclosure regulations may have affected market liquidity, changes in economic development (such as integration and liberalization of international capital markets) and technological advancement in particular (such as the popularity of electronic trading and the emergence of algorithmic trading) also appear to be significant drivers (Stoll 2006; Levine and Schmukler 2006; Hendershott et al. 2011).

To address concurrent events, I adopt a difference-in-difference approach using Australia's neighboring country, New Zealand, as a control sample. As discussed in Section 3.8.1, New Zealand is similar to Australia in many aspects. The matching of Australia and New Zealand in a difference-in-difference context has been used in prior studies (e.g. Jayaraman 2012). While concurrent economic shocks and technological developments have affected market liquidity in Australia and New Zealand in a similar manner, the adoption of the responsive enforcement strategy is specific to the Australian market and should not have affected the New Zealand market. In order to infer that the Australian enforcement strategy has improved market liquidity in Australia, the increase in Australian liquidity would have to be significantly higher than the increase in New Zealand liquidity for the relevant period. The rationale of the difference-in-difference approach may be better illustrated in Figure 3 below:

Figure 3: Illustration of the difference-in-difference design

Market		Concurrent factors affecting market liquidity
Australia (Treatment)		Enforcement Strategy + Technological + Economic
New Zealand (Control)	-	Technological + Economic
Difference		Enforcement Strategy

4.4.2 Propensity-score matching

In addition to the difference-in-difference design, propensity-score matching (PSM) methodology is adopted to minimize other observable differences between the two markets other than the enforcement strategy. The underlying idea of PSM is to ensure that a like-for-like comparison is being made, by retaining in the sample only the treatment and control subjects that have similar non-treatment related characteristics. Armstrong et al. (2010, 227) explicitly point out that PSM is a superior "research design that better addresses the potential confounds inherent in observational studies". PSM can also reduce the potential "overt bias" and alleviate model misspecification problems. In this case, for a New Zealand firm to be included in the control sample, the firm would need to have similar firm characteristics to an Australian firm, as determined by their propensity scores. Thus it is much more likely that the effects estimated from the difference-in-difference regressions are attributable to the adoption of the responsive enforcement strategy in Australia.

The matching procedures used in this paper resemble those used by Humphery-Jenner (2013). The matching process follows the nearest-neighbor matching algorithm within a caliper width of 0.01. The process matches a firm in the treated sample (Australia) with a firm in the control sample (New Zealand) which has the closest propensity-score, computed from a logit regression on a set of firm-level characteristics. Firms which failed to find a match are dropped. Moreover, Roberts and Whited (2012) point out that whether to use a sample with or without replacement is a tradeoff between bias and variance. Allowing for replacement is considered preferable because matched firms would have the closest propensity scores, and therefore the results are the least biased. Given the fact that the number of Australian firms (2505) is substantially larger than that of New Zealand (333), allowing each New Zealand firm to be used more than once in the matching procedure helps retain the completeness of the Australian sample. Nevertheless I redo the analyses without

replacements to keep variance low at the expense of increased bias, loss of observations and reduced explanatory power (Roberts and Whited 2012).

4.4.3 Measurements

Market liquidity is the dependent variable in this chapter. Two commonly-used liquidity measures are used: time-weighted relative quoted spread and turnover rate (e.g. Welker 1995; Eraker and Ready 2015; Christensen et al. 2013; Hendershott et al. 2011; Leuz and Verrecchia 2000). They are defined as follows:

1. Time-weighted relative quoted spread

   $$\text{Time weighted relative quoted spread}_k = \sum_{k=1}^{k} \frac{(Ask - Bid)_k}{MidPoint_k} * Time_k / \sum_{k=1}^{k} Time_k$$

   where *MidPoint* = (Ask + Bid)/2 , *Time* refers to the time duration between trades and subscript *k* stands for the number of trades on a trading day, for a particular firm. Ask refers to the selling price asked for by the seller of the security; Bid refers to the buying prices offered by the buyer of the security.

2. Turnover rate

   $$Turnover\ rate = \frac{Value\ of\ shares\ traded}{Market\ value\ of\ shares\ outstanding}$$

   The raw trade volume data is on trading day interval which is then averaged to obtain monthly observations.

The period indicators are defined similarly to Chapter 3 (Section 3.4.1) as follows:

$P_{Criminal}$: a period indicator that indicates when CDR received statutory backing and criminal sanctions were the only sanctions available (5 September 1994 – 10 March 2002).

P_{Civil}: a period indicator that indicates when only civil sanctions were made available in addition to criminal sanctions (11 March 2002 – 30 June 2004).

P_{Admin}: a period indicator that indicates when administrative sanctions were introduced in addition to criminal and civil sanctions (1 July 2004 – 31 December 2006).

4.4.4 Difference-in-difference Regression Models

Following prior research that used a difference-in-difference approach (in particular, Humphery-Jenner (2013)), the following regression model is adopted:

$$\begin{aligned} Liquidity = {} & \alpha + \beta_1 AUS + \beta_2 P_{Civil} + \beta_3 P_{Admin} + \beta_4 AUS*P_{Civil} + \beta_5 AUS*P_{Admin} \\ & + \beta_6 lnSize + \beta_7 lnPrice + \beta_8 lnRet\_Std + [\beta_9 lnTurnover] + \varepsilon \end{aligned} \quad (4)$$

where Liquidity in turn refers to relative spread and turnover rate; AUS is an indicator variable which equals 1 for Australian firms and 0 for New Zealand firms; P_{Civil} (P_{Admin}) is a period dummy which equals 1 in the period when civil (administrative) sanctions were added and 0 otherwise. The last control variable, [lnTurnover], is included in the model for relative spread, but not in the model for turnover rate. A full list of variable definition can be found in the Appendix - Table 19 (P.136).

It is noteworthy that the difference-in-difference analysis is based on a shorter sample than in Chapter 3 due to the data restrictions. The sample begins from 1996 instead of 1992, implying that the base period is the period with criminal sanctions instead of the pre-statutory CDR period as in Chapter 3.

To determine whether market liquidity increases as a result of the responsive enforcement strategy under a difference-in-difference design, I am testing how market liquidity is different between the Australian and New Zealand markets in the relevant CDR periods. The two interaction terms, $AUS*P_{Civil}$ and $AUS*P_{Admin}$, are thus the variables of

interest in the model which capture if and by how much liquidity has increased in the Australian market beyond that in the New Zealand market.

To infer that expanding sanctions have been an effective enforcement strategy, one would expect: (i) the coefficients on both $AUS*P_{Civil}$ and $AUS*P_{Admin}$ to be statistically significant and negative (positive) for the spread (turnover) model, controlling for other factors. That is, not only will Australian liquidity increase after the introduction of additional sanctions, but the increase is expected to be larger than that in the New Zealand market; and (ii) in addition, the coefficient of $AUS*P_{Admin}$ is expected to be greater than $AUS*P_{Civil}$ in absolute terms. In other words, I expect to observe *incremental* liquidity improvements in the period when the latest sanctions (administrative) were added because it was at that time that the regulator completed the responsive enforcement strategy with a multi-layered enforcement pyramid (Ayres and Braithwaite 1992).

The choice of control variables used in the liquidity model follows the prior literature. It includes firm size (market capitalization), price per share, return volatility and value traded (Cowan et al. 1992; Welker 1995; Healy et al. 1999; Christensen et al. 2013; Daske et al. 2013). I also follow the prior literature to take the natural logarithm of these continuous variables because these variables tend to be highly skewed. Specifically, they are defined as follows: Firm size (lnSize) is measured as the natural log of market capitalization; Share price (lnPrice) is the natural log of share price; Return volatility (lnRet_Std) is measured as the natural log of the standard deviation of daily returns in that month; and, Trade turnover (lnTurnover) is the natural log of the mean daily value traded in that month. Standard errors are clustered by firm and time to correct for cross-sectional and time series dependence (Gow et al. 2010).

4.4.5 First-stage model for Propensity-Score Matching

Following (Humphery-Jenner (2013)), the PSM process matches a firm in the treated sample (Australia) with a firm in the control sample (New Zealand) which has the closest propensity-score, itself is computed from a logit regression on a set of firm-level characteristics: market capitalization, turnover and returns volatility. Specifically, the first-stage logistic model for PSM is as follows:[51]

$$\text{Logit(AUS)} = \alpha + \beta_1 \text{lnSize} + \beta_2 \text{lnTurnover} + \beta_3 \text{lnRet\_Std} + \varepsilon \quad (5)$$

where AUS is an indicator variable that takes the value of 1 for Australian firms, 0 for New Zealand firms; lnSize is the natural log of market capitalization; lnRet_Std refers to the natural log of the standard deviation of daily returns in that month; lnTurnover is the natural log of the mean daily value traded in that month.

4.5. Data & Sample Selection – Difference-in-difference analysis

4.5.1 Data sources

All data used in this analysis is extracted from local and international data providers. Time-weighted quoted relative spread is computed using the intraday data of the Australian Equities (AE) database provided through the Securities Industry Research Centre of Asia Pacific (SIRCA). The same database also provides end of day data on trading volume. Market

[51] The first-stage model used is different to that used in Chapter 3. The main reason is the severe loss of observations (half of all) if financial reporting data is included.

capitalization and the number of shares outstanding for Australian firms are extracted from the SPPR CRIF database.[52]

The corresponding New Zealand trading and market capitalization data is sourced from Thomson Reuters Ticker History (TRTH) via SIRCA, supplemented by the Worldscope database via Datastream. The fact that TRTH begins coverage only from 1996 restricted the starting year for the multivariate analysis. The analyses hence focus on examining the impact of the expansion on market liquidity of two sanctions –civil and administrative– which took place in 2002 and 2004, respectively. These two sanctions represent ASIC's adoption of the responsive enforcement strategy.

Consistent with Chapter 3, the budgetary and staffing data of the financial market regulators for the additional analyses is sourced from the regulators' annual reports.[53] Data on actual enforcements is taken from a wide range of sources: regulator's reports, their media releases, news articles, legal or law papers and through direct enquiry with ASIC (Australia) and FMA (New Zealand).

4.5.2 Sample description

Summary statistics and correlations

The sample period for the difference-in-difference analysis dates back to 1996 when TRTH began coverage for New Zealand firms. It ends in 2006 to avoid potential confounding impacts of Global Financial Crisis.[54] I filter out invalid and possibly erroneous observations: zero trade days in a month, and negative/zero/greater than 25% bid-ask spreads to the mid-

[52] Data on the number of shares is only available from 2008 in TRTH via Sirca. Maintained by the Australian Business School of University of New South Wales (Sydney), SPPR CRIF database contains monthly market data (including number of shares outstanding) of all ASX trade equities since the 1960s. Number of shares data is in monthly intervals. Extreme changes in the monthly number of shares at 1st and 99th percentiles are trimmed, because they possibly represent large split/consolidation events which may significantly affect the liquidity measures.

[53] ASIC: www.asic.gov.au / FMA: www.fma.gov.nz.

[54] Figure 3 in Section 4.4 shows that relative spread spikes in the middle of GFC in 2008.

point price. In addition, the liquidity metrics are trimmed at their 1 and 99 percentiles to prevent extreme values from unduly influencing the analyses.

Table 9 reports the summary statistics for the sample used for regression analyses. The combined sample for the main analysis consists of 138,980 firm-month observations, with about 120,939 or 87% coming from 2,505 distinct Australia-based firms and the rest of them, 18,041 or 13%, from 333 New Zealand firms. In the sample, the average Australian firm has a market capitalization of A$720 million compared to NZ$1.1 billion[55] for the average New Zealand firm. Australian firms also have, on average, a higher return volatility (3.1%) than their New Zealand counterparts (1.7%). The mean relative spread is higher for Australian firms (3.7%) while the mean turnover rate is lower for New Zealand firms (2.7%). As mentioned previously, this is expected because the data provider is an international source (TRTH) which tends to cover New Zealand firms of larger size. Propensity-score matching is adopted to alleviate sample bias concerns.

[55] Or A$981M based on the foreign exchange rate NZD 1.1204 = AUD 1 (quotation on 30/12/2006).

Table 9: Descriptive Statistics - Australia and New Zealand

	N	Mean	Std. Dev.	Min	Max
Panel A: Australian and New Zealand combined					
Relative spread (%)	138,980	3.6181	3.2179	0.0354	22.9594
Turnover rate (%)	138,980	0.2446	0.5029	1.96E-05	46.2346
Market capitalization ($mil)	138,980	777.00	3490.0	0.1230	99,200.0
Price per share	138,980	2.6418	23.6456	0.0039	2033.00
Return volatility (%)	138,980	2.9355	2.3096	0.0082	81.6874
Panel B: Australia only					
Relative spread (%)	120,939	3.7574	3.3014	0.0354	22.9594
Turnover rate (%)	120,939	0.2653	0.5309	1.96E-05	46.2346
Market capitalization ($mil)	120,939	720.00	3280.0	0.1230	99,200.0
Price per share	120,939	2.6072	25.3004	0.0039	2033.00
Return volatility (%)	120,939	3.1178	2.3485	0.0082	81.6874
Panel C: New Zealand only					
Relative spread (%)	18,041	2.6845	2.3890	0.1354	22.2222
Turnover rate (%)	18,041	0.1059	0.1901	1.87E-04	4.7479
Market capitalization ($mil)	18,041	1,160.0	4650.0	0.4260	69,600.0
Price per share	18,041	2.8742	4.0114	0.0049	61.9829
Return volatility (%)	18,041	1.7138	1.5507	0.0291	50.9641

Notes: Observations are at firm-month level. Observations with number of trading days in a month less than 10, relative spread below 0 or above 25% of mid-point price are removed. Continuous variables are trimmed at 1st and 99th percentiles. The foreign exchange rate applicable is NZD 1.1204 = AUD 1 (30/12/2006).
Relative spread is defined as the monthly mean of the daily time-weighted bid-ask spread as a percentage of mid-point price; ***Turnover rate*** is the monthly mean of daily value traded as a percentage of market capitalization; ***Price per share*** refers to the monthly mean of daily closing price; ***Market capitalization*** is monthly mean of the product of daily closing price and number of shares outstanding; ***Return volatility*** is defined as the standard deviation of daily returns in the month.

4.6. Australia-only analysis

To digress slightly, before the main difference-in-difference results are presented, this sub-section provides preliminary evidence on a sample with Australian firms only. There are two reasons for doing this. First, the analysis with Australian firms only is not restricted by the availability of New Zealand data, which allows the analysis to date back to 1992 when CDR had not yet received statutory backing and criminal sanctions. Second, by focusing on the Australia-only sample, the extent of the actual change of bid-ask spread and turnover rate is made clear. In summary, since the ultimate aim of the entire analysis is to assess the effectiveness of the responsive enforcement strategy (which happens in Australia only), this analysis gives us a more complete picture of how market liquidity has evolved in Australia over time, before introducing the New Zealand control.

4.6.1 Univariate analysis on Australia-only sample

The univariate analysis is based on the Australia-only sample which covers 15 years from 1992 to 2006. Similarly to Chapter 3, the selected sample period begins about two years before the enactment of statutory CDR (in 1994) and ends two years after the addition to the regime of the last sanction (in 2004).

Panel A of Table 10 shows strong preliminary evidence that liquidity (on firm-day level) has significantly improved. The median relative spread (turnover rate) declined (climbed) steadily from 3.22% (0.07%) in the pre-statutory CDR to 2.73% (0.08%) after CDR became law; it improved to 2.41% (0.09%) after civil sanctions were added and, finally, 2.11% (0.11%) after administration sanctions were also added. All of these changes are significant at 0.1% from the Mann-Whitney-Wilcoxon rank sum tests.

Table 10: Descriptive statistics & univariate tests of liquidity over the CDR development phrases

Panel A:											
Firm-day level		**Pre-CDR**	**CDR & Crim.**			**+Civil**			**+Admin.**		
		P0	**P_{Crim}**	**Diff (P_{Crim}-P0)**	**Test Stat**	**P_{Civil}**	**Diff (P_{Civil}-P_{Crim})**	**Test Stat**	**P_{Admin}**	**Diff (P_{Admin}-P_{Civil})**	**Test Stat**
	N=	342,141	1,458,268			519,371			563,255		
Relative Spread											
Mean		0.0479	0.0420	**-0.0060*** **	**-69.170**	0.0395	**-0.0025*** **	**-35.590**	0.0339	**-0.0056*** **	**-70.810**
Median		0.0322	0.0273	**-0.0049*** **	**-74.103**	0.0241	**-0.0033*** **	**-70.243**	0.0211	**-0.0030*** **	**-72.350**
Std Dev.		0.0459	0.0429			0.0433			0.0385		
Turnover Rate											
Mean		0.0021	0.0021	**-0.0001*** **	**-11.480**	0.0021	**+0.0001*** **	**10.230**	0.0023	**+0.0002*** **	**27.710**
Median		0.0007	0.0008	**+0.0001*** **	**22.070**	0.0009	**+0.0001*** **	**44.223**	0.0011	**+0.0002*** **	**47.742**
Std Dev.		0.0040	0.0038			0.0036			0.0037		
Panel B:											
Firm level		**Pre-CDR**	**CDR & Crim.**			**+Civil**			**+Admin.**		
		P0	**P_{Crim}**	**Diff (P_{Crim}-P0)**	**Test Stat**	**P_{Civil}**	**Diff (P_{Civil}-P_{Crim})**	**Test Stat**	**P_{Admin}**	**Diff (P_{Admin}-P_{Civil})**	**Test Stat**
	N=	825	1,628			1,200			1,164		
Relative Spread											
Mean		0.0518	0.0488	**-0.0030** **	**-2.100**	0.0455	**-0.0033*** **	**-2.680**	0.0393	**-0.0062*** **	**-4.480**
Median		0.0461	0.0468	**+0.0007**	**1.421**	0.0379	**-0.0089*** **	**-4.017**	0.0320	**-0.0059*** **	**-4.717**
Std Dev.		0.0343	0.0306			0.0343			0.0330		
Turnover Rate											
Mean		0.0023	0.0021	**-0.0002** **	**-2.4500**	0.0021	**+2.26E-05**	**0.3900**	0.0023	**0.0002** **	**2.4600**
Median		0.0017	0.0017	**+1.60E-05**	**0.7638**	0.0017	**-2.23E-05**	**-0.0569**	0.0019	**0.0001** **	**2.2599**
Std Dev.		0.0017	0.0015			0.0015			0.0016		

Notes: To facilitate the interpretation of the results, any statistically significant improvement (deterioration) is highlighted in green (red) color.

Observations with relative spread below 0 or above 25% of mid-point price are removed. Continuous variables are trimmed at 1st and 99th percentiles. Test statistics for differences in means for various sanction periods are t-statistics from two sample t-tests (Satterthwaite, allowing for unequal variance); those for differences in medians are z-statistics from Mann-Whitney-Wilcoxon rank sum tests. All tests are two-tailed: *** p<0.01, ** p<0.05, * p<0.1.
Panel A displays univariate results on firm-day level, summarized from intraday data.
Panel B displays results on firm level. Each firm-period observation is computed with at least 120 trading days (approximately 1/2 year).
Period definitions: The selected entire sample period ranges from January 1, 1992 to December 31, 2006;

- ***Pre-CDR*** refers to the period before Continuous Disclosure Regime (CDR) became statutory obligations: January 1, 1992 – September 4, 1994;
- ***CDR & Crim.*** refers to the introduction of statutory CDR which was built with criminal sanctions only: September 5, 1994 – March 10, 2002;
- ***+Civil*** refers to the period when CDR expanded to include civil sanctions: March 11, 2002 – June 30, 2004;
- ***+Admin.*** refers to the period when administrative sanctions were added: July 1, 2004 – December 31, 2006.

Variable definitions:

- ***Relative spread*** is defined as the period mean of the daily time-weighted bid-ask spread as a percentage of mid-point price (using intraday data);
- ***Turnover rate*** is defined as the period mean of daily value traded as a percentage of market capitalization.

The results for the firm level analysis presented in Panel B are largely consistent. Median relative spread is found to have significantly tightened only when administrative sanctions were added. Median turnover rate has remained largely the same for the first three CDR stages (pre-statutory CDR, the period with criminal sanctions, and the period with civil sanctions), but has significantly improved only when administrative sanctions were introduced. The difference in the results found in Panel B from Panel A is likely due to the fact that Panel A (firm-day level) tends to bias towards bigger firms since big firms have more trading days than small firms.

The evidence for improved liquidity is mixed for its enactment in 1994, consistent with the mixed findings in other capital market measures by (Brown et al. (1999)). The evidence for liquidity improvements is strong for the period when CDR expanded to include civil sanctions, and is especially strong for the period when administrative sanctions were added. Taken together, the univariate results from both Panel A and B provide preliminary support to the hypothesis that ASIC's adoption of the responsive enforcement strategy helps improve market liquidity.

4.6.2 Regression analysis on Australia-only sample

I include the same set of control variables in the regression analysis on the Australia-only sample. Specifically, the following regression model is used:

$$\begin{aligned} \text{Liquidity} = {} & \alpha + \beta_1 P_{\text{Criminal}} + \beta_2 P_{\text{Civil}} + \beta_3 P_{\text{Admin}} + \beta_4 \text{lnSize} + \beta_5 \text{lnPrice} \\ & + \beta_6 \text{lnRet\_Std} + [\beta_7 \text{lnTurnover}] + \varepsilon \end{aligned} \quad (6)$$

where Liquidity in turns refers to relative spread and turnover rate; P_{Civil} (P_{Admin}) is a period dummy which equals 1 in the period when civil (administrative) sanctions were

added and 0 otherwise. The last control variable, [lnTurnover], is included in the model for relative spread, but not in the model for turnover rate.

Similar to the model used for the Australia-only sample in Chapter 3, I test the *incremental* impact of the responsive strategy. I take the differences of the coefficients of the period indicators:

$P_{Civil} - P_{Criminal} = 0$: this is to test after adding civil sanctions to the regime, whether there have been statistically significant changes in the forecast metrics compared to the preceding period.

$P_{Admin} - P_{Civil} = 0$: this is to test after administrative sanctions were added to the regime, whether there have been statistically significant changes in the forecast metrics compared to the preceding period.

To recall the earlier oint, the test of the addition of administration sanctions (i.e. $P_{Admin} - P_{Civil} = 0$) is of particular interest because by then ASIC had a multi-layered enforcement pyramid. A multi-layered enforcement pyramid, as the Responsive Regulatory Theory predicts, would have created significant deterrent effects that secures corporate compliance (Ayres and Braithwaite 1992).

Table 11: Regression Results using the Australia-only sample

Dependent variable =	(1) lnR_Spread	(2) lnT/ORate
$P_{CRIMINAL}$	-0.0294*	0.1420**
	(-1.934)	(2.361)
P_{CIVIL}	-0.1750***	0.2020***
	(-10.264)	(2.744)
P_{ADMIN}	-0.1985***	0.2994***
	(-11.261)	(4.360)
lnSize	-0.0889***	0.0406*
	(-9.683)	(1.804)
lnPrice	-0.0917***	-0.0174
	(-12.352)	(-0.832)
lnRet_Std	0.3032***	0.5601***
	(35.683)	(19.123)
lnTurnover	-0.2673***	
	(-38.538)	
Constant	2.0793***	-5.4279***
	(18.879)	(-13.521)
N	148,495	148,495
Adj. R-sq.	0.8705	0.1143
Tests of diff. in coef.		
P_{CIVIL} - $P_{CRIMINAL}$ = 0	-0.1456***	+0.0600
[p-value]	[<0.0001]	[0.2096]
P_{ADMIN} - P_{CIVIL} = 0	-0.0235**	+0.0974**
[p-value]	[0.0469]	[0.0338]

Note: To facilitate the interpretation of the results, any statistically significant improvement (deterioration) is highlighted in green (red) color.

This table shows the regression results using the sample with only Australian firms. The sample contains 2,660 Australian listed firms covering the period January 1, 1992 and December 31, 2006. Observations are at firm-month level. Observations with less than 10 trading days in a month, relative spread below 0 or above 25% of mid-point price are removed. Continuous variables are trimmed at 1st and 99th percentiles. The natural logarithms of variables are used since most market variables are highly skewed. Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test).

lnR_Spread: the natural log of time-weighted bid-ask spread as a percentage of mid-point price; ***lnT/ORate***: the natural log of value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

The regression results are reported in Table 11. Consistent with the predictions of H2a, P_{Civil} and P_{Admin} are both negative and significant for relative spread (lnR_Spread), with P_{Admin} more negative than P_{Civil}. Similarly for H2b regarding turnover rate (lnT/ORate), where P_{Civil} and P_{Admin} are both positive and significant, the stepwise pattern is observed with P_{Admin} larger than P_{Civil}. The results based on the Australian sample suggest that, compared to the period when CDR had not received statutory backing, bid-ask spread has decreased significantly by 0.626%[56] (or 16.1% of the mean spread of 3.897%) as civil sanctions was added, and significantly decreased further by 0.076% (or 1.95% of mean) as ASIC's enforcement pyramid was completed with the addition of administrative sanctions. Likewise, the respective figures for turnover rate show an increase of 0.058% (insignificant, 22% of the mean turnover rate of 0.259%) after civil sanctions were added and a further increase of 0.032% (significant, 12.5% of mean) after administrative sanctions.

These findings are consistent with the responsive enforcement strategy improving market liquidity by reducing information asymmetry among market participants. However, given the fact that the increasing trend in market liquidity may have been a universal phenomenon, the attribution of results to the responsive enforcement strategy alone is premature.

[56] Since the dependent variables are in natural logarithm, the calculation of the actual magnitude of the dependent variable is calculated as: [exp(coefficient on the period dummy)-1]*mean of the dependent variable. For example, in this case, the coefficient on P_{Civil} is -0.1750 and the mean spread is 3.8967%, the actual magnitude on spread equals: [exp(-0.1750)-1]*3.8967% = 0.62559%.

4.7. Empirical Results – Difference-in-difference regressions on Propensity-score matched samples

4.7.1 Difference-in-difference results (without propensity-score matching)

The difference-in-difference method is adopted so as to control for concurrent events that may drive market liquidity. I first present the difference-in-difference results without propensity-score matching. The relevant regression results using the New Zealand market as a control are reported in Table 12. Note that the difference-in-difference sample begins from 1996, so the base period is when CDR was equipped with criminal sanctions only.

The results on relative spread in column (6), whose model includes all control variables, provide evidence that expanding sanctions helps lower relative spreads. The coefficient on $AUS*P_{Civil}$ is negative indicating the Australian spread was lower by 0.04% compared to the New Zealand liquidity in the period where only Australia has added civil sanctions (coef.= -0.012, z-stat.= -0.520), although the drop is not large enough to be statistically significant. $AUS*P_{Admin}$ is strongly significant and negative (coef.= -0.135, z-stat.= -4.718) which indicates a further significant drop of 0.41% in spread after administrative sanctions were added in Australia, relative to the New Zealand market. Taking into account that both countries' spreads had been reducing significantly over time, as is shown in columns (1) and (2), the results suggest that the Australian spread has tightened at a faster rate than that of New Zealand.

Table 12: Multivariate analysis using New Zealand as control sample

Dependent variable =	lnR_Spread						lnT/ORate					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	NZ only	AUS only	Combined	Combined with interactions	Combined with controls	All	NZ only	AUS only	Combined	Combined with interactions	Combined with controls	All
P_{Civil}	-0.173***	-0.131***	-0.134***	-0.173***	-0.124***	-0.113***	-0.193***	0.024	0.006	-0.193***	0.034	-0.148**
	(-3.775)	(-4.156)	(-4.516)	(-3.779)	(-9.420)	(-4.833)	(-2.754)	(0.473)	(0.127)	(-2.758)	(0.736)	(-2.115)
P_{Admin}	-0.212***	-0.312***	-0.298***	-0.212***	-0.132***	-0.015	-0.192**	0.127***	0.089**	-0.192**	0.122***	-0.103
	(-4.464)	(-9.557)	(-10.037)	(-4.470)	(-9.133)	(-0.518)	(-2.257)	(3.051)	(2.228)	(-2.260)	(3.078)	(-1.215)
AUS				0.207***		-0.066***				0.912***		0.601***
				(3.883)		(-3.058)				(10.608)		(7.712)
$AUS*P_{Civil}$				0.042		-0.012				0.217***		**0.198*** **
				(0.887)		(-0.520)				(2.767)		**(2.684)**
$AUS*P_{Admin}$				-0.100*		**-0.135*** **				0.319***		**0.250*** **
				(-1.829)		**(-4.718)**				(3.495)		**(2.846)**
lnSize					-0.040***	-0.045***					0.033	0.031
					(-4.151)	(-5.002)					(1.283)	(1.309)
lnPrice					-0.094***	-0.095***					0.005	0.007
					(-12.479)	(-12.609)					(0.221)	(0.322)
lnRet_Std					0.318***	0.326***					0.688***	0.601***
					(37.473)	(37.127)					(21.906)	(19.748)
lnTurnover					-0.300***	-0.294***						
					(-47.305)	(-48.220)						
Constant	-3.841***	-3.634***	-3.661***	-3.841***	1.579***	1.700***	-7.516***	-6.604***	-6.725***	-7.516***	-4.715***	-5.531***
	(-81.292)	(-131.118)	(-145.084)	(-81.399)	(13.013)	(14.524)	(-92.381)	(-205.935)	(-213.001)	(-92.507)	(-9.902)	(-12.966)
N	18,041	120,939	138,980	138,980	138,980	138,980	18,041	120,939	138,980	138,980	138,980	138,980
Adj R^2	1.54%	1.40%	1.37%	1.77%	86.47%	86.59%	0.51%	0.21%	0.09%	8.36%	15.33%	18.90%

Note: To facilitate the interpretation of the results, any statistically significant improvement (deterioration) is highlighted in green (red) color.
This table shows the regression results of the differences in liquidity between Australia and New Zealand in Period 2 and 3. Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level. Observations with less than 10 trading days in a month, relative spread below 0 or above 25% of mid-point price are removed. The sample contains 2,505 (333) Australian (New Zealand) listed firms covering the period January 1, 1996 and December 31, 2006. Continuous variables are trimmed at 1st and 99th percentiles. The natural logarithms of variables are used since most market variables are highly skewed.
lnR_Spread: the natural log of time-weighted bid-ask spread as a percentage of mid-point price; ***lnT/ORate***: the natural log of value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

With regard to turnover rate, results including all controls are reported in column (12). Both AUS*P_{Civil} (coef.= 0.198, z-stat.= 2.684) and AUS*P_{Admin} (coef.= 0.250, z-stat.= 2.846) are significantly positive at 1% level, after controlling for other factors. The results suggest that the turnover rate in Australian firms has significantly increased by 0.053%, in addition to New Zealand firms, as civil sanctions were added to the regulated disclosure regime; and a further significant increase of 0.016% incremental to New Zealand firms as administrative sanctions were introduced. Considering the mean turnover rate is 0.24%, the two increases representing 22% and 6.5% of mean spread are economically meaningful.

4.7.2 First stage model for propensity-score matching

To further control for the possibility that the difference is due to compositional differences between firms in the two markets, this analysis progresses to retain firms of similar characteristics using propensity-score matching. The first stage model used in the PSM is reported in Panel A of Table 13. All variables are statistically significant and the pseudo-R-squared of 18.75% suggests a reasonably good fit of the model.[57]

Table 13: Multivariate analysis using propensity-score matched sample

Panel A: Logit regression model estimates of the propensity-score matching procedure

Dependent variable =	AUS
lnSize	-0.492***
	(-7.43)
lnTurnover	0.695***
	(10.66)
lnRet_Std	1.292***
	(10.75)
Constant	8.325***
	(12.38)
N (firms)	2,838
Adj. Pseudo-R^2	18.75%

[57] Cheng et al. (2013) evaluate their logit model used for propensity score matching with pseudo-R-squared of 17% as a model of good fit. Other models have a relatively low pseudo-R-squared (e.g. Haggard et al. 2015, 2.38%).

Table continues…

Panel B: Multivariate analysis results using propensity-score matched sample

	Propensity-score matching approach			
	Firm-level matching allowing for replacement		Firm-level matching with no replacement	
Dependent variable =	(1) lnR_Spread	(2) lnT/ORate	(3) lnR_Spread	(4) lnT/ORate
P_{Civil}	-0.030	0.554***	-0.133***	-0.113*
	(-1.400)	(7.226)	(-5.866)	(-1.680)
P_{Admin}	-0.096***	-0.166**	-0.054**	-0.049
	(-4.170)	(-2.270)	(-2.058)	(-0.607)
AUS	-0.014	-0.128	-0.017	-0.713***
	(-0.505)	(-1.570)	(-0.620)	(-6.184)
$AUS*P_{Civil}$	**-0.110*** **	**0.376*** **	**-0.087** **	**0.215***
	(-3.868)	**(4.325)**	**(-2.472)**	**(1.956)**
$AUS*P_{Admin}$	**-0.270*** **	**0.417*** **	**-0.205*** **	**0.253** **
	(-8.423)	**(4.492)**	**(-5.342)**	**(2.095)**
lnSize	-0.019	0.870***	0.030**	-0.285***
	(-1.525)	(20.963)	(2.573)	(-5.463)
lnPrice	-0.092***	0.108***	-0.072***	0.078*
	(-7.448)	(2.636)	(-6.532)	(1.647)
lnRet_Std	0.333***	0.556***	0.308***	0.173***
	(23.042)	(11.531)	(22.151)	(2.814)
lnTurnover	-0.274***		-0.322***	
	(-30.268)		(-37.580)	
Constant	1.007***	-2.704***	0.523***	-1.472
	(5.603)	(-3.555)	(3.018)	(-1.478)
N	116,585	116,585	27,495	27,495
Adj. R-sq.	84.06%	17.03%	70.78%	16.79%

Note: Penal A shows the logit regression model used for the propensity-score matching procedure. Penal B shows the regression results of the differences in liquidity between Australia and New Zealand in Period 2 and 3 using the propensity-score matched sample.

Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level. Observations with less than 10 trading days in a month, relative spread below 0 or above 25% of mid-point price are removed. The matched sample contains 2,155/330 (330/330) Australian/New Zealand listed firms with (without) replacements from January 1, 1996 to December 31, 2006. Continuous variables are trimmed at 1st and 99th percentiles. The natural logarithms of variables are used since most market variables are highly skewed.

lnR_Spread: the natural log of time-weighted bid-ask spread as a percentage of mid-point price; ***lnT/ORate***: the natural log of value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

The propensity-score matched sample allowing for replacements (without replacements) includes 116,585 (27,495) observations which consist of 2,155 (330) Australian firms and 330 (330) New Zealand firms. Compared to the sample before matching, the average Australian and New Zealand firms in the matched samples have much more similar market capitalization, turnover and return volatility. Specifically, the average Australian / New Zealand firm in the matched sample with (without) replacements has, in natural logarithms, a firm size of 18.03/18.17 (18.57/18.18), a turnover of 10.86/10.78 (10.48/10.62) and a return volatility of -4.16/-4.26 (-4.60/-4.25). As a result, analyses based on the matched sample are less likely to be driven by selection bias.

4.7.3 Difference-in-difference results on propensity-score matched samples

As presented in Panel B of Table 13, the regression results using propensity-score matched samples are consistent with the results of Table 12. They also provide much stronger support to the hypothesis that the implementation of the responsive enforcement strategy in Australia improves market liquidity. For spread (column 1), $AUS*P_{Civil}$ (coef.= -0.110, z-stat.=-3.868) and $AUS*P_{Admin}$ (coef.= -0.270, z-stat.= -8.423) are both significantly negative at 0.1% level, after controlling for other factors. The corresponding magnitudes of the drops in spread amount to 0.38% (10% of mean) and a further drop of 0.48% (13% of mean). For turnover (column 2), having included control variables, both $AUS*P_{Civil}$ (coef.= 0.376, z-stat.=4.325) and $AUS*P_{Admin}$ (coef.= 0.417, z-stat.= 4.492) are positive at 0.1% significance level. This is equivalent to an initial increase in turnover rate of 0.11% (46% of mean) and a significant further 0.015% increase (6.1% of mean). The increases in market liquidity are both statistically and economically significant following the implementation of the responsive enforcement strategy.

More importantly, for both models, the size of the coefficients on $AUS*P_{Admin}$ is substantially larger than $AUS*P_{Civil}$ in absolute terms. That is, when the Australian disclosure

regime expanded to include civil sanctions (P_{Civil}), spread and turnover improved by a larger magnitude than in New Zealand where such sanctions did not apply. And the improvement in liquidity was of even larger magnitude when Australia expanded its regime further to include administrative sanctions (P_{Admin}) in an effort to achieve a complete enforcement pyramid. Results in columns (3) and (4) are consistent when replacements are not allowed in the matching procedures.

Compared to Table 12 (with no matching), the stronger results reported using the matched samples in Table 13 indicates selection bias may have affected the previous results in Table 12. The more rigorous method using PSM produces consistent evidence adding extra support to the hypothesis that equipping the regulator with a multi-layered enforcement pyramid appears to improve corporate compliance, as evident in improved liquidity.

4.8. Sensitivity Analyses

4.8.1 Is the change in Enforcement Intensity driving the results?

I repeat the above difference-in-difference analysis controlling for the difference in enforcement intensity between the two countries. I operationalize the level of enforcement intensity as the number of actual enforcements commenced, finalized and the value of fines applied in the past 12, 24 and 36 months in a rolling window by the two regulators – ASIC and New Zealand Financial Markets Authority (FMA).

As shown in Table 14, the results are robust to controlling for enforcement intensity. The interaction variables of interest $AUS*P_{Civil}$ and $AUS*P_{Admin}$, consistently show significantly negative (positive) coefficients for the models of spread (turnover rate) across all the nine enforcement variables.[58] The results for the 24-month window are reported in

[58] The nine enforcement variables are: the 12-, 24- and 36-month rolling sum of actual enforcements (i) commenced, (ii) finalized, and (iii) the value of fines applied.

Table 14.[59] The size of the coefficients on AUS*P_{Admin} are consistently larger than those on AUS*P_{Civil} in absolute terms, suggesting that the effect on liquidity is primarily driven by the enforcement strategy rather than by the level of enforcement activities. The results are also consistent with the two propensity-score matching procedures (i.e. with or without replacements).

Another notable finding in this additional analysis is that the coefficients on the nine enforcement variables are consistently positive (negative) for the spread (turnover rate) models, although not consistently significant, indicating that enforcement intensity appears, if anything, to be detrimental to market liquidity. Caution needs to be exercised when interpreting these results because the total number of actual enforcements in the sample was low (twelve for Australia, none for New Zealand[60]).

[59] Robust results are found for analyses based on the 12- and 36-month rolling windows.

[60] The very first prosecution (civil proceedings) related to continuous disclosure was commenced by the NZ FMA was against Nuplex Industries Limited and six of its present or past directors. The case was successfully settled on February 23, 2011 (http://www.fma.govt.nz/keep-updated/newsroom/releases-from-the-old-securities-commission/2011/securities-commission-and-nuplex-reach-settlement/).

Table 14: Additional Analysis on Enforcement Intensity

Dependent variable =	lnR_Spread			lnT/ORate		
	(1) Cases Commenced	(2) Cases Finalized	(3) Fines Value	(4) Cases Commenced	(5) Cases Finalized	(6) Fines Value
P_{Civil}	-0.096***	-0.096***	-0.096***	-0.163**	-0.163**	-0.163**
	(-4.368)	(-4.368)	(-4.368)	(-2.174)	(-2.174)	(-2.174)
P_{Admin}	-0.005	-0.005	-0.005	-0.142*	-0.142*	-0.142*
	(-0.180)	(-0.180)	(-0.180)	(-1.707)	(-1.708)	(-1.708)
AUS	-0.029	-0.029	-0.029	0.583***	0.583***	0.583***
	(-1.276)	(-1.276)	(-1.276)	(7.387)	(7.387)	(7.387)
$AUS*P_{Civil}$	**-0.110*** **	**-0.109*** **	**-0.108*** **	**0.407*** **	**0.405*** **	**0.405*** **
	(-4.059)	**(-4.012)**	**(-4.008)**	**(4.469)**	**(4.446)**	**(4.447)**
$AUS*P_{Admin}$	**-0.308*** **	**-0.300*** **	**-0.296*** **	**0.492*** **	**0.477*** **	**0.476*** **
	(-8.695)	**(-8.739)**	**(-8.978)**	**(4.700)**	**(4.644)**	**(4.767)**
lnSize	-0.011	-0.011	-0.011	-0.164***	-0.164***	-0.164***
	(-0.943)	(-0.942)	(-0.942)	(-3.533)	(-3.533)	(-3.533)
lnPrice	-0.092***	-0.092***	-0.092***	0.138***	0.138***	0.138***
	(-7.255)	(-7.254)	(-7.253)	(3.289)	(3.288)	(3.288)
lnRet_Std	0.350***	0.350***	0.350***	0.573***	0.573***	0.573***
	(24.624)	(24.621)	(24.619)	(11.130)	(11.129)	(11.128)
lnTurnover	-0.269***	-0.269***	-0.269***			
	(-28.155)	(-28.155)	(-28.155)			
Cases_commenced (24)	0.006**			-0.005		
	(2.028)			(-0.627)		
Cases_finalized (24)		0.006*			-0.003	
		(1.649)			(-0.247)	
Fines_value (24)			0.000*			-0.000
			(1.883)			(-0.324)
Constant	0.878***	0.878***	0.878***	-2.027**	-2.027**	-2.027**
	(4.699)	(4.700)	(4.700)	(-2.460)	(-2.460)	(-2.460)
N	116,585	116,585	116,585	116,585	116,585	116,585
Adj, R-sq.	83.07%	83.07%	83.07%	16.71%	16.71%	16.71%

Note: This table shows the regression results controlling for enforcement intensity. Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level.

Cases_commenced (24): number of CDR-related prosecutions commenced in the past 24 months in a rolling window; ***Cases_finalized (24)***: number of CDR-related prosecutions finalized in the past 24 months in a rolling window; ***Fines_value (24)***: value of fines imposed on CDR-related prosecutions in the past 24 months in a rolling window, in A$'000s.

lnR_Spread: the natural log of time-weighted bid-ask spread as a percentage of mid-point price; ***lnT/ORate***: the natural log of value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

4.8.2 Is the change in Regulatory Resources driving the results?

Another potential alternative explanation of the results is that the regulatory resources of ASIC and FMA (NZ) may have changed in different ways throughout the sample period. Following Jackson and Roe (2009), I use the regulators' budgetary and staffing resource levels as another set of proxies for enforcement intensity.

I repeat the analyses (results in Table 15) using similar resource-based enforcement proxies as used in Jackson and Roe (2009). Again, the key results are found to be robust to using this set of controls. Specifically, the three enforcement proxies used are: (i) the regulators' operating funding scaled by GDP, (ii) the regulators' operating expenses scaled by GDP and (iii) the number of staff employed scaled by the number of listed firms in the stock markets. The coefficients on the two budgetary variables (operating funding and expenses) are very small, where the coefficients on the staffing variable are of the expected sign (i.e. negative for spread, positive for turnover) but are insignificant.

Table 15: Additional Analysis on Resource-based Enforcement variables

Dependent variable =	lnR_Spread			lnT/ORate		
	(1) Regulator's Operating Expenses/ GDP	(2) Regulator's Operating Funding/ GDP	(3) Regulator's staffing/ No. of listed firms	(4) Regulator's Operating Expenses/ GDP	(5) Regulator's Operating Funding/ GDP	(6) Regulator's staffing/ No. of listed firms
P_{Civil}	-0.100***	-0.101***	-0.098***	-0.168**	-0.166**	-0.163**
	(-4.568)	(-4.602)	(-4.351)	(-2.235)	(-2.205)	(-2.165)
P_{Admin}	-0.017	-0.021	-0.008	-0.154*	-0.149*	-0.141*
	(-0.595)	(-0.714)	(-0.275)	(-1.855)	(-1.793)	(-1.694)
AUS	-0.432***	-0.513***	-0.081	0.173	0.363	0.604
	(-3.535)	(-3.552)	(-0.539)	(0.572)	(1.018)	(1.639)
$AUS*P_{Civil}$	**-0.092*** **	**-0.086*** **	**-0.108*** **	**0.419*** **	**0.414*** **	**0.405*** **
	(-3.302)	**(-3.060)**	**(-3.976)**	**(4.665)**	**(4.576)**	**(4.390)**
$AUS*P_{Admin}$	**-0.275*** **	**-0.288*** **	**-0.278*** **	**0.478*** **	**0.467*** **	**0.467*** **
	(-8.934)	**(-9.245)**	**(-7.811)**	**(4.986)**	**(4.823)**	**(4.628)**
lnSize	-0.011	-0.012	-0.012	-0.164***	-0.164***	-0.164***
	(-0.943)	(-0.950)	(-0.945)	(-3.536)	(-3.535)	(-3.531)
lnPrice	-0.092***	-0.092***	-0.092***	0.138***	0.138***	0.138***
	(-7.255)	(-7.254)	(-7.252)	(3.289)	(3.289)	(3.289)
lnRet_Std	0.350***	0.349***	0.350***	0.573***	0.573***	0.573***
	(24.648)	(24.657)	(24.613)	(11.132)	(11.135)	(11.146)
lnTurnover	-0.269***	-0.269***	-0.269***			
	(-28.160)	(-28.145)	(-28.150)			
OpExp/GDP	0.002***			0.002		
	(3.447)			(1.412)		
OpRev/GDP		0.002***			0.001	
		(3.487)			(0.626)	
No. Staff/No. Listed_firms			0.062			-0.025
			(0.353)			(-0.055)
Constant	0.800***	0.783***	0.868***	-2.106**	-2.070**	-2.023**
	(4.154)	(4.035)	(4.507)	(-2.558)	(-2.518)	(-2.473)
N	116,585	116,585	116,585	116,585	116,585	116,585
Adj, R-sq.	83.09%	83.09%	83.07%	16.72%	16.71%	16.71%

Note: This table shows the regression results controlling for regulatory resources. Results are similar without replacements and are not presented for brevity. Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level.

OpExp/GDP: the regulator's operating expenses divided by GDP, multiplied by 1,000,000; ***OpRev/GDP***: the regulator's operating funding divided by GDP, multiplied by 1,000,000; ***No. Staff/No. Listed_firms***: the number of the regulator's staff (full-time equivalent) per company listed on the stock exchange.

lnR_Spread: the natural log of time-weighted bid-ask spread as a percentage of mid-point price; ***lnT/ORate***: the natural log of value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

4.8.3 Other Sensitivity Analyses

For sensitivity checks, the multivariate results are also tested against a number of other specifications. Consistent results are found under OLS (Appendix - Table 25) and firm fixed-effect panel regressions settings (Appendix - Table 27). The inferences are identical if the standard errors are one-way clustered by firm, instead of firm and time (Appendix - Table 26).

In addition, to test if the high R-square of the model is due to the use of scaled spread as the dependent variable, I use the non-scaled quoted spread instead of spread scaled by share price as the dependent variables (Appendix - Table 28). The inferences are unchanged and the high R-square's remain (Welker 1995). The findings are robust to whether or not to undertake natural logarithmic transformation of variables used in the models (Appendix - Table 29).

4.9. Additional Analyses

4.9.1 Is the change in Market Liquidity due to Information Asymmetry?

This additional analysis is to provide further evidence whether the improvement in market liquidity was (at least partly) due to reduced information asymmetry rather than other drivers. Bid-ask spread has been a commonly used proxy of information asymmetry in the literature (e.g. Eleswarapu et al. 2004; Chiyachantana et al. 2004). But as Sidhu et al. (2008) show in their study on Regulation Fair Disclosure (Reg FD) in the US, bid-ask spread may not be the best proxy of information asymmetry because bid-ask spread is a function of order-processing costs, inventory holding costs, competition, and adverse selection costs. Among these components of spread, adverse selection cost is believed to be the best proxy of information asymmetry (Sidhu et al. 2008; Huang and Stoll 1997).

I draw on the market microstructure literature for a method to isolate the adverse selection component of bid-ask spread. According to a review of the five most commonly used decomposition models by Van Ness et al. (2001), the Lin et al. (1995) model appears to produce relatively more accurate estimates of adverse selection costs. Therefore, I use the Lin et al. (1995) adverse selection cost estimates, expressed as a percentage of the total spread, as the dependent variable and re-run the regressions using the same set of control variables used for spread. The model used to estimate the adverse-selection component follows Lin et al. (1995) and Heflin and Shaw (2005) using OLS:

$$\Delta \log(M_{i,t}) = ASC_i \, [\log(P_{i,t-1}) - \log(M_{i,t-1})] + \varepsilon \qquad (7)$$

where Δ is the first difference operator; M is the quoted spread midpoint on the transaction; P is the transaction price; and ASC is the estimated adverse-selection component of the effective spread, expressed as a percentage of the spread.

Reliably calculating this microstructure estimate requires a firm's shares to be actively traded. I therefore only include firms in the most traded cohort (i.e. firms which have been a constituent of ASX100 and NZX50) across the sample period of 1996-2006.[61] The fact that ASX and NZX recorded all trade and quote orders in one consolidated book is favorable because it allows accurate identification of trade initiation, and thus more accurate estimates. The mean adverse selection component of 38.1% (min: 1.4% and max: 78%) is comparable to prior research (e.g. Van Ness et al. 2001).

[61] Since firms are continuously added and dropped from the ASX100 and NZX50 indices, there are 255 Australian and 70 New Zealand firms altogether. The sample yields 20,576 firm-month observations. Data was sourced from the same databases as identified above.

Table 16: Additional Analysis on Information Asymmetry

Dependent variable =	Adverse Selection Component of Spread (Lin et al. 1995)		
	(1) No PS-matching	(2) PS-matching allowing for replacement	(3) PS-matching with no replacement
P_{Civil}	0.082***	0.050**	0.082***
	(3.695)	(2.060)	(4.175)
P_{Admin}	0.110***	0.064**	0.102***
	(3.783)	(2.408)	(4.127)
AUS	0.188***	0.124***	0.177***
	(7.580)	(5.306)	(9.166)
$AUS*P_{Civil}$	**-0.150*** **	**-0.129*** **	**-0.164*** **
	(-6.389)	**(-5.148)**	**(-7.445)**
$AUS*P_{Admin}$	**-0.194*** **	**-0.132*** **	**-0.187*** **
	(-6.275)	**(-4.750)**	**(-7.079)**
lnSize	-0.021***	-0.017	-0.015**
	(-3.170)	(-1.339)	(-2.072)
lnPrice	0.094***	0.095***	0.097***
	(13.478)	(6.010)	(11.869)
lnRet_Std	0.083***	0.077***	0.108***
	(10.037)	(4.615)	(11.182)
lnTurnover	-0.044***	-0.022***	-0.022***
	(-10.217)	(-2.768)	(-4.903)
Constant	1.566***	1.200***	1.263***
	(14.636)	(8.892)	(11.831)
N	20,576	20,594	5,408
Adj. R-sq.	36.85%	21.71%	31.83%

Note: This table shows the regression results of the differences in the adverse selection component of spread between Australia and New Zealand in Period 2 and 3 using the propensity-score matched sample. The sample includes the most traded shares in the two markets (ASX100 and NZX50 constituents) from 1996-2006.
Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level. Observations with less than 10 trading days in a month, relative spread below 0 or above 25% of mid-point price are removed. Continuous variables are trimmed at 1st and 99th percentiles. The natural logarithms of variables are used since most market variables are highly skewed.
Adverse Selection Component of Spread is computed following the algorithm as detailed in Lin et al. (1995); $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

As reported in Table 16, consistent with the results found on bid-ask spread, AUS*P_{Civil} and AUS*P_{Admin} are both significant and negative. The pattern that AUS*P_{Admin} is more negative than AUS*P_{Civil} is observed. The results hold true with or without propensity-score matching and whether or not replacement is allowed. This set of results affirms that information asymmetry has reduced significantly as ASIC's enforcement strategy was rolled out. This market microstructure evidence indicates that the expansion of sanctions has likely helped level the information playing field.

4.9.2 Falsification tests: Are the models capturing something else?

Similar to Chapter 3, I perform a falsification test to check the internal validity of the model used (Roberts and Whited 2012). This is to check if the model is capturing the effects of some unobservable forces instead of the effects of the enforcement strategy. The approach adopted is consistent with Almeida et al. (2012). I focus on a time period when the adoption of the responsive strategy did not occur (1996-2001).[62] The first two years serve as the base, and P_{Civil}/P_{Admin} is redefined as P2_f /P3_f (where f stands for "falsification") with each covering a two-year period of 1998-99/2000-2001, respectively. The interaction variables of interest are also updated accordingly (i.e. AUS*P2_f and AUS*P3_f). Since there has not been any switch in enforcement strategy over 1996-2001, I do not expect to see the signs, significance and patterns comparable to those in the main regression analysis.

[62] The adoption of the responsive enforcement strategy began in 2002 and a multilayer enforcement pyramid is adopted in 2004.

Table 17: Falsification test

	No PS-matching		PS-matching with replacement		PS-matching without replacement	
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent var. =	lnR_Spread	lnT/ORate	lnR_Spread	lnT/ORate	lnR_Spread	lnT/ORate
P2_f ('98-'99)	0.133***	-0.200***	0.120***	0.021	0.128***	-0.006
	(4.468)	(-3.323)	(4.210)	(0.237)	(4.362)	(-0.109)
P3_f ('00-'01)	0.002	-0.324***	0.010	-0.093	0.006	-0.108
	(0.085)	(-4.057)	(0.348)	(-0.999)	(0.227)	(-1.343)
AUS	0.039	0.495***	0.023	0.686***	0.050*	-0.535***
	(1.641)	(5.702)	(0.832)	(7.005)	(1.657)	(-4.166)
*AUS*P2_f*	-0.156***	0.019	-0.131***	-0.191*	-0.125***	-0.238***
	(-6.717)	(0.308)	(-4.758)	(-1.912)	(-3.691)	(-2.621)
*AUS*P3_f*	-0.099***	0.109	-0.129***	-0.075	-0.058	-0.290**
	(-3.765)	(1.246)	(-3.659)	(-0.762)	(-1.432)	(-2.251)
lnSize	-0.071***	0.963***	-0.038***	0.831***	-0.001	0.685***
	(-7.619)	(38.306)	(-2.582)	(14.345)	(-0.092)	(11.177)
lnPrice	-0.044***	0.059**	-0.086***	0.149**	-0.057***	0.130**
	(-5.129)	(2.377)	(-4.548)	(2.388)	(-3.945)	(2.195)
lnRet_Std	0.325***	0.673***	0.315***	0.633***	0.280***	0.258***
	(35.268)	(16.659)	(17.053)	(9.898)	(17.124)	(3.845)
lnTurnover	-0.286***		-0.241***		-0.288***	
	(-41.839)		(-20.959)		(-29.272)	
Constant	2.027***	-3.786***	0.889***	-1.675	0.562***	-0.515
	(16.133)	(-7.958)	(3.513)	(-1.596)	(2.807)	(-0.444)
N	72,059	72,059	77,109	77,109	14,572	14,572
Adj. R-sq.	84.43%	73.32%	80.96%	66.89%	67.21%	54.38%

Note: This table shows the results of the falsification test. The sample ranges from January 1996 to December 2001 (which ends before any addition of sanctions).

Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level. Observations with less than 10 trading days in a month, relative spread below 0 or above 25% of mid-point price are removed. Continuous variables are trimmed at 1st and 99th percentiles. The natural logarithms of variables are used since most market variables are highly skewed.

P2_f: indicator variable which equals 1 when observations fall between January 1, 1998 and December 31, 1999, 0 otherwise; ***P3_f***: indicator variable which equals 1 when observations fall between January 1, 2000 and December 31, 2001, 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

Consistent with expectation, the falsification test shows pattern-less results (Table 17). Although there are a few incidences of significant liquidity differences, the differences are sensitive to propensity-score matching and in some cases contradictory (columns 5 and 6) to the findings in Table 13 and Table 14. More importantly, neither AUS*P2_f and AUS*P3_f are consistently significant, nor are the coefficients on AUS*P3_f consistently larger than AUS*P2_f. Since the falsification test is conducted in a time period without the occurrence of a shift in enforcement strategy, the fact that the results are not consistent with the main findings is a positive signal that the models used in the main analyses are unlikely to be capturing something other than the responsive enforcement strategy.

4.10. Chapter Summary

This chapter examines the effect of ASIC's adoption of the responsive enforcement strategy on market liquidity. Using a difference-in-difference design, relative spread (turnover rate) is found to significantly decrease (increase). The results do not appear to be sensitive to propensity-score matching. The findings remain consistent after considering the changes in the regulator's enforcement intensity and regulatory resources. Results on the adverse selection component of spread tie the increase in market liquidity to a more levelled information environment. The pattern-less outcomes from a falsification test indicate that the results are unlikely to be coincidental. The results are also robust to using several other commonly-used model specifications. Consistent with the hypotheses, the empirical evidence on market liquidity is supportive of the effectiveness of the responsive enforcement strategy. The following chapter is going to synthesize both results from the analyst's information environment (Chapter 3) and market liquidity (Chapter 4) to form a conclusion.

Chapter 5:

Conclusion

5.1. Summary of Research Objectives and Hypotheses

There is a clear consensus in the prior literature that public enforcement is critical in delivering desirable regulatory outcomes (Bhattacharya and Daouk 2002; Hope 2003; Christensen et al. 2013). Understanding what constitutes good enforcement is important when the advanced world is experiencing significant increases in securities regulations, and at the same time, casting ever greater public expectations on governments in maintaining market integrity and confidence after financial crises. The extant literature provides some insights on what constitute good enforcement. However, a regulator that aims to improve its enforcement may find it difficult to adopt practices from the extant findings. This is because, while a regulator's enforcement actions are shown to associate with significant deterrent effect, complete enforcement is simply impracticable (Stigler 1970). Moreover, many other identified factors of effective enforcement are either unchangeable (such as a country's origin of law) or beyond the regulator's direct influence (such as the judiciary's efficiency).

Contributing to this line of literature, this thesis investigates and finds a regulator's enforcement strategy to be an additional factor in effective enforcement that the regulator has more control over. Although the role of enforcement strategy is little known in the accounting and finance literature, its prominence in creating deterrence and delivering legal compliance has long been recognized in the law and economics literature (e.g. Becker 1968; Stigler 1970; Ayres and Braithwaite 1992). The literature suggests that a well-devised enforcement strategy can be a potentially cost-effective means of securing corporate compliance. It is particularly applicable considering regulators are subject to budgetary constraints (Cox et al. 2003; Baldwin and Black 2008). Taking this factor on board, this study provides empirical evidence on the effectiveness of one well-established enforcement strategy, the responsive

enforcement strategy (Ayres and Braithwaite 1992), in the context of disclosure regulations. In a nutshell, the responsive enforcement strategy suggests that the creation of a multi-layered "enforcement pyramid" of sanctions by the regulator may best improve compliance.

The Australian Continuous Disclosure Regime (CDR) provides a natural experimental setting to conduct this study. The Australian CDR, first enacted in 1994 and adopting the responsive enforcement strategy from 2002, is identified to be a context where "enforcement changed while other institutions were held constant" (Holthausen 2009, 456) and thus allows clear isolation of the enforcement effects. The adoption of the responsive enforcement strategy began with introducing civil sanctions to the CDR in 2002 and was completed with the introduction of administrative sanctions in 2004. Applying the predictions of the Responsive Regulatory Theory (Ayres and Braithwaite 1992), corporate compliance with the continuous disclosure requirements is expected to have improved. Since CDR requires managers to provide more timely and equitable disclosure of their price-sensitive information, it is expected that firms would have been motivated to disclose more continuously and equitably following ASIC's progressive expansion of sanctions. As a result, this thesis hypothesizes that: (i) the financial analyst's information environment would have become richer; and (ii) market liquidity would have increased.

5.2. Summary of Findings

The empirical evidence supports the hypotheses. The evidence on analyst forecast properties supports the notion that the analyst's information environment has improved with the full adoption of the responsive enforcement strategy. Separating the sample period into four sub-periods[63] to reflect the stages of CDR development, the emphasis is placed on the

[63] The four CDR stages, as defined in this thesis, include: (i) Pre-statutory CDR; (ii) Statutory CDR with criminal sanctions; (iii) Civil sanctions introduced; and (iv) Administrative sanctions introduced.

incremental changes in these forecast properties between the CDR stages which are likely to be attributable to the enforcement strategy, rather than their *levels*. At the early stage of the strategy adoption, the incremental changes are mixed. The precision of and analysts' reliance on public information, as inferred in analysts' forecasts, have shown incremental increases. But analysts' forecast dispersion has deteriorated and their forecast accuracy is little changed. When the enforcement pyramid for CDR is completed with the introduction of administrative sanctions, the improvement in analyst's information environment is evident. Significant incremental improvements can be seen in all four analyst forecast properties concerned. Specifically, analysts' forecast error and dispersion have incrementally decreased, and analysts' reliance on public information and the precision of public information have incrementally increased even further. However, a note of caution is that the results on analysts' information environment, especially on forecast accuracy, appear to be sensitive to the choice of method including the ways the samples are matched.

Similarly, the evidence on market liquidity also supports the hypotheses. Addressing the increasing trend of market liquidity over the past two decades that is due to technological and economic advancements, the research design adopted for market liquidity analysis follows a difference-in-difference approach benchmarking the New Zealand market. Propensity-score matching is also used to eliminate as much as possible any firm differences between the two markets that are unrelated to the enforcement strategy. The results strongly illustrate that the bid-ask spread (turnover rate) has significantly reduced (increased) at the early adoption stage, incremental to the New Zealand controls. The reduction (increase) in spread (turnover rate) is further enlarged following the introduction of administration sanctions and hence the completion of the enforcement pyramid of CDR. Additional analysis reveals that the reduction in spread is due to the reduction of adverse selection cost, a more direct measure of information asymmetry.

The collective evidence suggests the responsive enforcement strategy is a factor in effective enforcement. Moreover, as the Responsive Regulatory Theory predicts (Ayres and Braithwaite 1992), compliance is best achieved when there is exhibited a hierarchy of enforcement tools ranging from severe to light at the discretion of the regulator. This thesis argues that the improvements observed in the analyst's information environment and market liquidity are likely due to the reduction in information asymmetry. More symmetric information between investors and management is likely to be an outcome of a significantly more powerful enforcement regime which has motivated more timely and equitable corporate disclosure. Analysts potentially have taken advantage of a richer information environment and thus have produced superior forecasts. With the presence of informed traders being less prominent, the investing public may have felt a lessened need to protect their market transactions through price (i.e. bid-ask spread) or reduced participation (i.e. trading volume).

Further, to preclude the alternative explanation that the results are driven by the intensity of the regulator's enforcement rather than the enforcement strategy (Jennings et al. 2011; Bhattacharya and Daouk 2002), the number of recent CDR enforcements and the sum of the recent fines imposed are controlled for. The conclusions remain unchanged. Similarly, to preclude the alternative explanation that the findings are due to the changes in regulatory resources (Jackson and Roe 2009), controlling for the level of regulatory resources in terms of regulators' budget and staffing leads to the same conclusions.

In summary, the collective evidence suggests the enforcement strategy that a regulator adopts plays a significant role in the regulatory outcomes, and the impact is incremental to those factors that are identified in the extant literature.

5.3. Implications

The findings of this thesis have several implications. First, the results inform regulators of a cost-effective means of improving their enforcement. While law enforcement has been identified in the prior literature to be associated with deterrent effects (e.g. Bhattacharya and Daouk 2002), active law enforcement may not be socially optimal when the costs of legal actions and implementation (especially imprisonment) are taken into consideration (Stigler 1970); frequent enforcement may not even be feasible for many regulators who are constrained by tight budgets (Cox et al. 2003; Jackson 2007). Similarly, the practicality of prior research which associates certain legal infrastructures with superior enforcement may be limited because many of these legal infrastructures (e.g. a country's origin of law, and judicial efficiency) are either unchangeable or beyond the regulator's influence. In fact, Stigler (1970, 534-535) specifically advises that when devising optimal law enforcement, regulators should avoid modifying the "considerable inertia in the legislative process", but instead "make continuous marginal adjustments in a policy". By showing that a carefully devised enforcement strategy may create significant compliance benefits, this thesis provides regulators with a potentially cost-effective solution of improving enforcement: investing in the design of the enforcement strategy such as a completed hierarchy of sanction mix – a one-off investment by the lawmakers – can yield significant benefits. An implication of this thesis is that regulators, especially those with rather tight enforcement budget (Braithwaite 2006), should review their enforcement approaches or to form an appropriate enforcement strategy if they have not already.

Second, the evidence supporting the effectiveness of the responsive enforcement strategy in enforcing disclosure regulations is likely to be generalizable to the enforcement of other regulations outside the securities regulation sector. The responsive enforcement strategy is an enforcement approach and was not specifically developed for a particular regulation.

This enforcement approach was first developed and applied in the regulation overseeing occupational safety in the coal mining industry (Braithwaite 1985). The responsive enforcement strategy has since been applied in a wide range of regulations around the world. Regulations which have adopted this approach include securities, tax, environmental, chemical uses, consumer protection, privacy, health and food safety (Wood et al. 2010). The fact that this strategy was not originated for security regulations but is found to be effective in such contexts suggest that the underlying enforcement theory is robust, and may be applied in other contexts.

Third, on the design of an enforcement regime, regulators who are considering whether to adopt the responsive enforcement strategy in their enforcement regimes should note the importance of incorporating a large range of enforcement tools, to include some severe sanctions, and the capacity to escalate to higher penalties. The Responsive Regulatory Theory predicts that once a multi-layered pyramid is completed, significant deterrent effects will be created (Ayres and Braithwaite 1992). The importance of having a large range of sanctions is highlighted in the theory and, as well, is backed by the results of this thesis. Moreover, while most enforcement activities are expected to involve soft enforcements only, and understanding that the most severe sanctions are almost never going to be used (except in the most damaging cases), Ayres and Braithwaite (1992) do emphasize the necessity to include severe sanctions (such as license provocation and criminal sanctions) in the background for deterrence. In addition, the capacity to be able to escalate from light sanctions to more severe sanctions is emphasized in cases where light sanctions fail to secure compliance. In their enforcement designs, regulators should address these details for the best outcomes as prescribed by the Responsive Regulatory Theory.

Last but not least, the evidence provided in this thesis is relevant to the local regulator, ASIC. The findings should serve the purpose of evaluating the effectiveness of an important

strategy applied in the enforcement of disclosure regulations in Australia. Prior studies on CDR effectiveness typically involve the comparison of the pre- and post-regulation values of some effectiveness measures (Brown et al. 1999; Hsu et al. 2012; Hsu 2009). This method, however, is known to be subject to contaminations by concurrent events (Healy 2007; Francis et al. 2006). In addition, with the exception of Harford and Powell (2015), most existing studies cover the earlier period of CDR. Using a more robust (difference-in-difference) method to address concurrent events on an extended timeframe, the findings of this thesis inform ASIC on its enforcement effectiveness by providing a more thorough evaluation.

5.4. Limitations & Suggestions for Future Research

This research is subject to the limitations of the efficacy of the robustness and sensitivity tests applied. In particular, while the difference-in-difference approach is acknowledged to be a superior research method (Gassen forthcoming; Ittner forthcoming; Roberts and Whited 2012), there is still a possibility that there exist other differences between the New Zealand and Australian markets that could have driven the results found in this thesis. The concern over this limitation is yet moderated by several additional analyses performed, as well as the propensity-score matching which eliminates some observable differences unrelated to the enforcement strategy. Overall, this limitation is not expected to substantially affect the inferences.

Future research may investigate the interplay of a regulator's enforcement strategy and their resource constraints. While this study shows that the enforcement strategy is potentially a cost-effective means of securing compliance, it is conducted in a country where the regulatory resources given to the regulator have been quite stable over time. Both regulatory resources and the enforcement strategy have been identified to be factors of

effective enforcement. It is plausible that the success of the enforcement strategy is conditional on the level of the regulatory budget, because the level of regulatory resources may play a signaling role in determining the credibility of the deterrence message. The understanding of the interplay between regulatory resources and the enforcement strategy will further our knowledge about optimal enforcement design.

Appendices

Appendix - Table 18: Variable definitions (Chapter 3)

Variable	Definition
Forecast metrics	
FE	Forecast error is the absolute difference of actual EPS and the median EPS forecast, divided by the stock price at the beginning of the fiscal year
DISP	Standard deviation of individual EPS forecasts divided by stock price at the beginning of the fiscal year
PUBLIC	BKLK (1998) measure of the precision of public information
PRIVATE	BKLK (1998) measure of the precision of private information
RELIANCE	BKLK (1998) measure of analysts' reliance on public information, measured as the proportion of PUBLIC to total information (PUBLIC + PRIVATE)
Control variables	
SIZE	Market capitalization in natural logarithm
LOSS	Loss indicator that equals one when net profit after tax before extraordinary items is negative, and zero otherwise
LROA	Return on asset ratio with one period lag
STD_ROA3	Standard of deviation of earnings over the past three years
EARN_CHG	Change in earnings between the current and previous year, scaled by market capitalization
LGROWTH	Market to book ratio with one period lag
LLEV	Liability to asset ratio with one period lag
COVERAGE	Analyst' coverage measured as the number of analysts following a firm
MISS	An indicator that equals one when the forecast falls short of the actual earnings
TIMELINESS	The number of days by which the forecast precedes earnings announcement
IFRS	Period indicator that equals one when IFRS is adopted in Australia
GDPShock	The absolute value of quarterly GPD growth rate

Appendix - Table 19: Variable definitions (Chapter 4)

Variable	Definition
Liquidity metrics	
lnR_Spread	Relative spread measured as the time weighted quoted bid-ask spread divided by the mid-point stock price
lnT/ORate	Turnover rate measured as the value traded divided by market capitalization in natural logarithm
Control variables	
lnSize	Market capitalization in natural logarithm
lnPrice	Stock price in natural logarithm
lnRet_Std	Return volatility measured as the standard deviation of daily stock returns in natural logarithm
lnTurnover	Value traded in natural logarithm

Appendix - Table 20: Robustness check - Main regressions using OLS

Dep. var. =	(1) FE	(t-stat)	(2) DISP	(t-stat)	(3) RELIANCE	(t-stat)	(4) PUBLIC	(t-stat)
$P_{CRIMINAL}$	0.0097***	(7.620)	-0.0008**	(-2.010)	0.0814***	(7.523)	410.74	(1.583)
P_{CIVIL}	0.0135***	(9.306)	-0.0004	(-0.824)	0.0896***	(7.244)	822.80***	(2.773)
P_{ADMIN}	0.0072***	(3.982)	**-0.0023*** **	**(-4.330)**	**0.1222*** **	**(7.933)**	**1,530.1*** **	**(4.143)**
SIZE	-0.0058***	(-18.077)	-0.0020***	(-20.941)	-0.0091***	(-3.336)	-576.82***	(-8.789)
LOSS	0.0609***	(41.933)	0.0156***	(35.849)	0.0941***	(7.583)	-585.77**	(-1.968)
LORA	-0.0049	(-0.945)	-0.0088***	(-5.717)	0.0402	(0.915)	4,964.0***	(4.708)
STD_ROA3	0.0674***	(13.322)	0.0156***	(10.319)	0.2735***	(6.330)	-1,235.8	(-1.193)
EARN_CHG	0.0156***	(4.022)	0.0147***	(12.615)	-0.0686**	(-2.064)	5,363.4***	(6.735)
LGROWTH	-0.0025***	(-18.732)	-0.0008***	(-19.116)	-0.0055***	(-4.705)	64.133**	(2.303)
LLEV	0.0313***	(14.870)	0.0094***	(14.880)	0.1072***	(5.962)	-1,946.77***	(-4.515)
COVERAGE	-0.0002**	(-1.973)	-0.0003***	(-7.822)	0.0050***	(4.891)	-21.663	(-0.889)
MISS	0.0080***	(11.436)	0.0010***	(4.825)	0.1063***	(17.784)	-420.17***	(-2.930)
TIMELINESS	-0.0001***	(-16.503)	-0.0000***	(-8.933)	-0.0007***	(-26.118)	6.435***	(10.360)
IFRS	-0.0003	(-0.206)	0.0005	(1.122)	-0.0401***	(-3.059)	-991.41***	(-3.158)
GDPShock	0.0003	(0.447)	0.0001	(0.578)	0.0004	(0.080)	109.743	(0.822)
Constant	0.1052***	(17.373)	0.0479***	(26.459)	0.3377***	(6.529)	14,831***	(11.959)
N	22,086		22,086		22,086		22,086	
Adj R-sq	0.2198		0.2156		0.0648		0.0192	
Tests of diff. in coef.								
P_{CIVIL} - P_{CRIM}=0	0.0038		0.0004		0.0082		412.06	
[p-value]	[<0.0001]		[0.1465]		[0.3018]		[0.0309]	
P_{ADMIN} - P_{CIVIL}=0	**-0.0063*** **		**-0.0019*** **		**0.0326*** **		**707.30** **	
[p-value]	**[<0.0001]**		**[<0.0001]**		**[0.0096]**		**[0.0189]**	

Notes: This table display results from a panel regression with industry fixed-effects. Definitions of other variables can be found in Table 2. The sample contains 466 Australian firms from 1992 to 2006. Observations are at firm-month level. Observations must have positive sales, 1-year ahead earnings forecasts of up to 360 days before earnings announcements and with at least 2 analysts following. Absolute forecast errors (***FE***) and dispersion (***DISP***) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Results are consistent if the one-year lag dependent variable is included in the model.

Appendix - Table 21: Robustness check - Main regressions using Newey-West

Dep. var. =	(1) FE	(t-stat)	(2) DISP	(t-stat)	(3) RELIANCE	(t-stat)	(4) PUBLIC	(t-stat)
$P_{CRIMINAL}$	0.0091***	(7.534)	-0.0000	(-0.083)	0.0797***	(4.925)	52.196	(0.237)
P_{CIVIL}	0.0117***	(5.664)	0.0009	(1.453)	0.0814***	(4.072)	170.180	(0.503)
P_{ADMIN}	0.0062***	(3.091)	**-0.0014****	**(-2.010)**	**0.1143*****	**(4.551)**	**1,300.4****	**(2.182)**
SIZE	-0.0061***	(-8.405)	-0.0023***	(-10.828)	-0.0092*	(-1.796)	-542.55***	(-3.216)
LOSS	0.0532***	(9.871)	0.0134***	(9.646)	0.0816***	(3.571)	-27.281	(-0.045)
LORA	0.0423**	(2.534)	-0.0040	(-0.857)	-0.0456	(-0.453)	5,688.8	(1.174)
STD_ROA3	0.1473***	(4.804)	0.0307***	(4.039)	0.3917***	(3.234)	-2,324.0	(-0.748)
EARN_CHG	-0.0001	(-0.006)	0.0108*	(1.842)	-0.1056*	(-1.930)	7,545.0**	(2.421)
LGROWTH	-0.0031***	(-9.733)	-0.0008***	(-9.933)	-0.0061**	(-2.533)	-14.3351	(-0.179)
LLEV	0.0488***	(7.877)	0.0167***	(9.045)	0.1340***	(3.739)	-2,644.8***	(-4.370)
COVERAGE	-0.0002	(-0.808)	-0.0003***	(-3.838)	0.0034*	(1.894)	-34.684	(-0.862)
MISS	0.0057***	(5.978)	0.0007**	(2.364)	0.0992***	(10.382)	-489.55**	(-2.291)
TIMELINESS	-0.0000***	(-10.554)	-0.0000***	(-7.619)	-0.0007***	(-16.905)	5.5523***	(5.824)
IFRS	0.0011	(0.658)	0.0011**	(2.097)	-0.0389*	(-1.824)	-1,096.5*	(-1.931)
GDPShock	-0.0005	(-0.708)	-0.0000	(-0.118)	-0.0028	(-0.382)	23.964	(0.165)
Constant	0.0979***	(6.904)	0.0496***	(11.871)	0.3830***	(3.332)	15,320.4***	(4.626)
Industry fixed effects	Yes		Yes		Yes		Yes	
N	18,197		18,197		18,197		18,197	
Adj R-sq	0.2492		0.2865		0.0831		0.0379	
Tests of diff. in coef.								
P_{CIVIL} - P_{CRIM}=0	0.0026		0.0009*		0.0017		117.984	
[p-value]	[0.1699]		[0.0615]		[0.9003]		[0.6747]	
P_{ADMIN} - P_{CIVIL}=0	**-0.0055*****		**-0.0023*****		**0.0329***		**1130.22****	
[p-value]	**[0.0044]**		**[0.0044]**		**[0.1057]**		**[0.0402]**	

Notes: This table display results from a panel regression with industry fixed-effects. Definitions of other variables can be found in Table 2. The sample contains 466 Australian firms from 1992 to 2006. Observations are at firm-month level. Observations must have positive sales, 1-year ahead earnings forecasts of up to 360 days before earnings announcements and with at least 2 analysts following. Absolute forecast errors (***FE***) and dispersion (***DISP***) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Results are consistent if the one-year lag dependent variable is included in the model. Coefficients of the

Appendix - Table 22: Robustness check - Main regressions between 2000 and 2006

Dep. var. =	(1) FE	(t-stat)	(2) DISP	(t-stat)	(3) RELIANCE	(t-stat)	(4) PUBLIC	(t-stat)
P_{CIVIL}	0.0057***	(4.913)	0.0010***	(3.373)	0.0190**	(2.285)	346.56*	(1.672)
P_{ADMIN}	**-0.0005**	**(-0.463)**	**-0.0008****	**(-2.168)**	**0.0478*****	**(3.800)**	**1,178.1*****	**(3.222)**
SIZE	-0.0062***	(-14.412)	-0.0023***	(-18.351)	-0.0106***	(-3.450)	-552.55***	(-5.357)
LOSS	0.0569***	(19.801)	0.0136***	(16.679)	0.0943***	(7.035)	-393.35	(-1.084)
LORA	0.0039	(0.427)	-0.0079***	(-2.929)	-0.0152	(-0.290)	5,388.3**	(2.095)
STD_ROA3	0.0621***	(6.355)	0.0108***	(4.605)	0.3035***	(6.295)	-694.27	(-0.657)
EARN_CHG	0.0105	(0.857)	0.0129***	(3.777)	-0.0890**	(-2.484)	5,591.0***	(3.138)
LGROWTH	-0.0026***	(-16.780)	-0.0008***	(-17.141)	-0.0034**	(-2.548)	41.490	(0.796)
LLEV	0.0468***	(14.213)	0.0169***	(16.740)	0.0995***	(4.754)	-2,728.1***	(-6.445)
COVERAGE	-0.0005***	(-3.728)	-0.0004***	(-9.378)	0.0041***	(3.723)	-28.430	(-1.046)
MISS	0.0076***	(12.666)	0.0007***	(3.834)	0.1065***	(17.083)	-364.09**	(-2.246)
TIMELINESS	-0.0001***	(-17.363)	-0.0000***	(-9.736)	-0.0007***	(-26.881)	6.422***	(8.851)
IFRS	-0.0008	(-0.750)	0.0004	(1.084)	-0.0370***	(-2.728)	-963.13**	(-2.569)
GDPShock	-0.0002	(-0.411)	0.0001	(0.603)	-0.0049	(-0.916)	113.11	(0.961)
Constant	0.1175***	(14.599)	0.0500***	(22.023)	0.4474***	(7.787)	15,097***	(7.830)
Industry-fixed effects	Yes		Yes		Yes		Yes	
N	10,408		10,408		10,408		10,408	
Adj R-sq	0.2492		0.2865		0.0831		0.0379	
Tests of diff. in coef.								
P_{ADMIN} - P_{CIVIL}=0	**-0.0062*****		**-0.0018*****		**0.0288****		**831.5****	
[p-value]	**[<0.0001]**		**[<0.0001]**		**[0.0276]**		**[0.0241]**	

Notes: This table display results from a panel regression with industry fixed-effects. Definitions of other variables can be found in Table 2. The sample contains Australian firms from 2000 to 2006. Observations are at firm-month level. Observations must have positive sales, 1-year ahead earnings forecasts of up to 360 days before earnings announcements and with at least 2 analysts following. Absolute forecast errors (***FE***) and dispersion (***DISP***) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Results are consistent if the one-year lag dependent variable is included in the model.

Appendix - Table 23: Robustness check - Main regressions with Survivors only

Dep. var. =	(1) FE	(t-stat)	(2) DISP	(t-stat)	(3) RELIANCE	(t-stat)	(4) PUBLIC	(t-stat)
$P_{CRIMINAL}$	0.0102***	(5.016)	0.0005	(1.005)	0.1045***	(5.949)	211.46	(0.858)
P_{CIVIL}	0.0170***	(6.871)	0.0006	(1.037)	0.0973***	(4.552)	-255.40	(-0.852)
P_{ADMIN}	0.0017	(0.541)	**-0.0028*** **	**(-3.909)**	**0.1176*** **	**(4.201)**	**1,121.2*** **	**(2.856)**
SIZE	-0.0048***	(-7.363)	-0.0006***	(-3.858)	-0.0124**	(-2.195)	-132.41*	(-1.667)
LOSS	0.0605***	(10.858)	0.0083***	(6.625)	-0.0125	(-0.259)	-876.50	(-1.295)
LORA	0.1035***	(4.371)	0.0387***	(7.269)	-0.7142***	(-3.481)	-2,945.19	(-1.024)
STD_ROA3	0.1640***	(6.625)	0.0278***	(5.003)	1.4225***	(6.633)	-4,950.8*	(-1.647)
EARN_CHG	0.0692***	(4.712)	0.0439***	(13.306)	-0.2834**	(-2.228)	-2,268.5	(-1.272)
LGROWTH	-0.0054***	(-11.371)	-0.0012***	(-11.464)	-0.0076*	(-1.866)	68.840	(1.203)
LLEV	0.0770***	(16.648)	0.0192***	(18.507)	0.3524***	(8.797)	-2,463.4***	(-4.385)
COVERAGE	-0.0009***	(-4.057)	-0.0006***	(-11.599)	-0.0038**	(-1.972)	-42.448	(-1.558)
MISS	0.0021	(1.643)	0.0010***	(3.355)	0.0709***	(6.461)	-356.50**	(-2.318)
TIMELINESS	-0.0000***	(-5.751)	-0.0000***	(-4.410)	-0.0006***	(-12.217)	3.876***	(5.725)
IFRS	0.0016	(0.524)	0.0006	(0.816)	-0.0807***	(-3.032)	-433.86	(-1.162)
GDPShock	-0.0020*	(-1.747)	-0.0006**	(-2.200)	-0.0039	(-0.389)	242.41*	(1.715)
Constant	0.0751***	(5.911)	0.0128***	(4.481)	0.4523***	(4.112)	6,308.2***	(4.091)
Industry-fixed effects	Yes		Yes		Yes		Yes	
N	5,157		5,157		5,157		5,157	
Adj R-sq	0.1530		0.1761		0.0797		0.0171	
Tests of diff. in coef.								
P_{CIVIL} - P_{CRIM}=0	0.0068***		0.0001		-0.0072		-466.86**	
[p-value]	[0.0001]		[0.7686]		[0.6383]		[0.0298]	
P_{ADMIN} - P_{CIVIL}=0	**-0.0153*** **		**-0.0034*** **		0.0203		**1376.6*** **	
[p-value]	**[<0.0001]**		**[<0.0001]**		[0.4117]		**[<0.0001]**	

Notes: This table display results from a panel regression with industry fixed-effects. Definitions of other variables can be found in Table 2. The sample contains 466 Australian firms from 1992 to 2006. Observations are at firm-month level. Observations must have positive sales, 1-year ahead earnings forecasts of up to 360 days before earnings announcements and with at least 2 analysts following. Absolute forecast errors (***FE***) and dispersion (***DISP***) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Results are consistent if the one-year lag dependent variable is included in the model.

Appendix - Table 24: Robustness check - Main regressions controlling for lag dependent variables

Dep. var. =	(1) FE	(t-stat)	(2) DISP	(t-stat)	(3) RELIANCE	(t-stat)	(4) PUBLIC	(t-stat)
$P_{CRIMINAL}$	0.0091***	(7.304)	0.0008**	(2.298)	0.0764***	(6.773)	52.235	(0.205)
P_{CIVIL}	0.0106***	(7.164)	0.0015***	(3.855)	0.0761***	(5.699)	170.13	(0.564)
P_{ADMIN}	0.0064***	(3.479)	0.0001	(0.154)	**0.1097*** **	**(6.617)**	**1,300.7*** **	**(3.466)**
SIZE	-0.0059***	(-16.60)	-0.0022***	(-23.07)	-0.0085***	(-2.627)	-542.61***	(-7.427)
LOSS	0.0511***	(32.069)	0.0102***	(23.347)	0.0797***	(5.550)	-26.670	(-0.082)
LORA	0.0396***	(6.616)	-0.0070***	(-4.298)	-0.0357	(-0.658)	5,690.9***	(4.634)
STD_ROA3	0.1405***	(17.893)	0.0246***	(11.488)	0.3827***	(5.397)	-2,323.6	(-1.446)
EARN_CHG	-0.0051	(-1.271)	0.0059***	(5.381)	-0.1132***	(-3.118)	7,546.4***	(9.176)
LGROWTH	-0.0029***	(-17.63)	-0.0007***	(-14.65)	-0.0060***	(-4.044)	-14.360	(-0.429)
LLEV	0.0439***	(17.470)	0.0128***	(18.671)	0.1282***	(5.684)	-2,645.1***	(-5.178)
COVERAGE	-0.0001	(-0.494)	-0.0000	(-1.181)	0.0032***	(2.748)	-34.670	(-1.324)
MISS	0.0057***	(8.181)	0.0006***	(3.405)	0.0995***	(15.789)	-489.83***	(-3.429)
TIMELINESS	-0.0000***	(-15.87)	-0.0000***	(-9.827)	-0.0007***	(-23.83)	5.5537***	(8.977)
IFRS	0.0010	(0.658)	0.0013***	(3.104)	-0.0399***	(-2.910)	-1,096.5***	(-3.526)
GDPShock	-0.0005	(-0.827)	0.0001	(0.390)	-0.0029	(-0.490)	23.952	(0.181)
Constant	0.0953***	(11.812)	0.0440***	(20.039)	0.3601***	(4.930)	15,323***	(9.266)
Lag(metric)	0.0696***	(14.260)	0.2240***	(45.403)	0.0397***	(5.606)	-0.0001	(-0.073)
Industry Dummies	Yes		Yes		Yes		Yes	
N	18,197		18,197		18,197		18,197	
Adj R-sq	0.2648		0.3869		0.0855		0.0508	
Tests of diff. in coef.								
P_{CIVIL} - P_{CRIM}=0	0.0015		0.0007***		-0.0003		117.895	
[p-value]	[0.1249]		[0.0032]		[0.9740]		[0.5473]	
P_{ADMIN} - P_{CIVIL}=0	**-0.0042*** **		**-0.0014*** **		**0.0336** **		**1130.57*** **	
[p-value]	**[0.0037]**		**[0.0002]**		**[0.0101]**		**[0.0001]**	

Notes: This table display results from a panel regression with industry fixed-effects. Definitions of other variables can be found in Table 2. The sample contains 466 Australian firms from 1992 to 2006. Observations are at firm-month level. Observations must have positive sales, 1-year ahead earnings forecasts of up to 360 days before earnings announcements and with at least 2 analysts following. Absolute forecast errors (***FE***) and dispersion (***DISP***) are winsorized at 100% of share price. Other continuous variables are winsorized at their 1st and 99th percentiles. Robust t-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Results are consistent if the one-year lag dependent variable is included in the model.

Appendix - Table 25: Robustness check – Main regression using OLS

	No PS-matching		PS-matching with replacement		PS-matching without replacement	
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent var. =	lnR_Spread	lnT/ORate	lnR_Spread	lnT/ORate	lnR_Spread	lnT/ORate
P_{Civil}	-0.113***	-0.148***	-0.096***	-0.163***	-0.133***	-0.113***
	(-15.292)	(-7.064)	(-34.224)	(-19.394)	(-15.613)	(-4.765)
P_{Admin}	-0.015**	-0.103***	-0.005*	-0.142***	-0.054***	-0.049**
	(-2.195)	(-5.142)	(-1.855)	(-16.929)	(-6.712)	(-2.158)
AUS	-0.066***	0.601***	-0.029***	0.583***	-0.017**	-0.713***
	(-15.296)	(49.611)	(-6.853)	(45.535)	(-2.067)	(-32.553)
$AUS*P_{Civil}$	-0.012	**0.198*** **	**-0.107*** **	**0.404*** **	**-0.087*** **	**0.215*** **
	(-1.512)	**(8.814)**	**(-13.861)**	**(17.459)**	**(-6.096)**	**(5.392)**
$AUS*P_{Admin}$	**-0.135*** **	**0.250*** **	**-0.283*** **	**0.470*** **	**-0.205*** **	**0.253*** **
	(-17.886)	**(11.649)**	**(-38.326)**	**(21.092)**	**(-14.761)**	**(6.531)**
lnSize	-0.045***	1.031***	-0.011***	0.836***	0.030***	0.715***
	(-34.340)	(402.703)	(-10.358)	(338.467)	(11.428)	(123.021)
lnPrice	-0.095***	0.007**	-0.092***	0.138***	-0.072***	0.078***
	(-81.445)	(2.092)	(-81.654)	(40.810)	(-23.264)	(9.001)
lnRet_Std	0.326***	0.601***	0.350***	0.573***	0.308***	0.173***
	(166.336)	(111.995)	(184.088)	(103.814)	(66.326)	(13.393)
lnTurnover	-0.294***		-0.269***		-0.322***	
	(-312.708)		(-302.705)		(-148.498)	
Constant	1.700***	-5.531***	0.878***	-2.027***	0.523***	-1.472***
	(88.871)	(-105.290)	(52.918)	(-40.750)	(11.377)	(-11.524)
N	138,980	138,980	138,980	138,980	27,440	27,440
Adj. R-sq.	0.8659	0.7493	0.8307	0.6881	0.7054	0.5492

Note: This table shows the regression results using OLS. T-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level.

lnR_Spread: the natural log of time-weighted bid-ask spread as a percentage of mid-point price; ***lnT/ORate***: the natural log of value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

Appendix - Table 26: Robustness check – Main regression clustered by firm

	No PS-matching		PS-matching with replacement		PS-matching without replacement	
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent var. =	lnR_Spread	lnT/ORate	lnR_Spread	lnT/ORate	lnR_Spread	lnT/ORate
P_{Civil}	-0.113***	-0.148**	-0.096***	-0.163**	-0.133***	-0.113*
	(-5.580)	(-2.202)	(-4.691)	(-2.298)	(-6.902)	(-1.694)
P_{Admin}	-0.015	-0.103	-0.005	-0.142*	-0.054***	-0.049
	(-0.685)	(-1.259)	(-0.191)	(-1.695)	(-2.749)	(-0.609)
AUS	-0.066***	0.601***	-0.029	0.583***	-0.017	-0.713***
	(-3.319)	(7.757)	(-1.378)	(7.438)	(-0.640)	(-6.237)
$AUS*P_{Civil}$	-0.012	**0.198*** **	**-0.107*** **	**0.404*** **	**-0.087*** **	**0.215** **
	(-0.547)	**(2.757)**	**(-4.112)**	**(4.797)**	**(-2.597)**	**(1.976)**
$AUS*P_{Admin}$	**-0.135*** **	**0.250*** **	**-0.283*** **	**0.470*** **	**-0.205*** **	**0.253** **
	(-5.486)	**(2.902)**	**(-8.864)**	**(4.885)**	**(-5.546)**	**(2.095)**
lnSize	-0.045***	1.031***	-0.011	0.836***	0.030***	0.715***
	(-5.222)	(46.403)	(-0.959)	(18.123)	(2.663)	(13.660)
lnPrice	-0.095***	0.007	-0.092***	0.138***	-0.072***	0.078*
	(-15.084)	(0.339)	(-7.377)	(3.329)	(-6.688)	(1.649)
lnRet_Std	0.326***	0.601***	0.350***	0.573***	0.308***	0.173***
	(39.769)	(28.739)	(25.997)	(11.764)	(23.707)	(2.852)
lnTurnover	-0.294***		-0.269***		-0.322***	
	(-50.557)		(-29.946)		(-40.661)	
Constant	1.700***	-5.531***	0.878***	-2.027**	0.523***	-1.472
	(15.164)	(-14.420)	(4.794)	(-2.472)	(3.063)	(-1.480)
N	138,980	138,980	138,980	138,980	27,440	27,440
Adj. R-sq.	0.8659	0.7493	0.8307	0.6881	0.7054	0.5492

Note: This table shows the regression results with standard errors are clustered by firm. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level.

lnR_Spread: the natural log of time-weighted bid-ask spread as a percentage of mid-point price; ***lnT/ORate***: the natural log of value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

Appendix - Table 27: Robustness check – Main regression using firm-fixed effects

	No PS-matching		PS-matching with replacement		PS-matching without replacement	
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent var. =	lnR_Spread	lnT/ORate	lnR_Spread	lnT/ORate	lnR_Spread	lnT/ORate
P_{Civil}	-0.101***	-0.101***	-0.063***	-0.150***	-0.103***	-0.105***
	(-16.337)	(-6.273)	(-24.710)	(-22.777)	(-14.205)	(-6.607)
P_{Admin}	-0.016**	-0.194***	-0.017***	-0.186***	-0.043***	-0.135***
	(-2.346)	(-11.319)	(-5.921)	(-24.765)	(-5.352)	(-7.676)
$AUS*P_{Civil}$	**-0.014****	**0.222*****	**-0.146*****	**0.432*****	**-0.152*****	**0.252*****
	(-2.085)	**(12.769)**	**(-19.864)**	**(22.647)**	**(-11.431)**	**(8.601)**
$AUS*P_{Admin}$	**-0.148*****	**0.373*****	**-0.327*****	**0.607*****	**-0.285*****	**0.336*****
	(-20.723)	**(20.178)**	**(-42.944)**	**(30.689)**	**(-20.237)**	**(10.851)**
lnSize	-0.163***	0.999***	-0.107***	0.783***	-0.133***	0.817***
	(-71.369)	(189.499)	(-48.672)	(148.104)	(-18.902)	(55.641)
lnPrice	-0.094***	0.196***	-0.098***	0.206***	-0.063***	0.097***
	(-46.184)	(37.189)	(-50.067)	(40.733)	(-9.530)	(6.681)
lnRet_Std	0.273***	0.489***	0.292***	0.458***	0.253***	0.161***
	(150.710)	(108.279)	(159.446)	(99.475)	(57.723)	(16.745)
lnTurnover	-0.200***		-0.172***		-0.183***	
	(-191.544)		(-165.126)		(-65.153)	
Constant	2.503***	-4.784***	1.308***	-1.398***	1.819***	-3.697***
	(65.913)	(-48.995)	(34.627)	(-14.228)	(14.426)	(-13.346)
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
N	138,980	138,980	138,980	138,980	27,440	27,440
Adj. R-sq.	0.9207	0.8775	0.8941	0.8547	0.8240	0.8316

Note: This table shows the regression results in a firm-fixed effect panel setting. T-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level.

lnR_Spread: the natural log of time-weighted bid-ask spread as a percentage of mid-point price; ***lnT/ORate***: the natural log of value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

Appendix - Table 28: Robustness check – Main regression using Spread (non-scaled) as dependent variable

Dependent variable =	lnRawSpread		
	(1) No PS-matching	(2) PS-matching with replacement	(3) PS-matching without replacement
P_{Civil}	-0.113***	-0.096***	-0.133***
	(-4.833)	(-4.368)	(-5.866)
P_{Admin}	-0.015	-0.005	-0.054**
	(-0.518)	(-0.180)	(-2.058)
AUS	-0.066***	-0.029	-0.017
	(-3.058)	(-1.275)	(-0.620)
$AUS*P_{Civil}$	-0.012	**-0.107*** **	**-0.087** **
	(-0.520)	**(-3.981)**	**(-2.472)**
$AUS*P_{Admin}$	**-0.135*** **	**-0.283*** **	**-0.205*** **
	(-4.718)	**(-8.890)**	**(-5.342)**
lnSize	-0.045***	-0.011	0.030**
	(-5.002)	(-0.941)	(2.573)
lnPrice	0.905***	0.908***	0.928***
	(119.804)	(71.383)	(84.138)
lnRet_Std	0.326***	0.350***	0.308***
	(37.127)	(24.616)	(22.151)
lnTurnover	-0.294***	-0.269***	-0.322***
	(-48.220)	(-28.154)	(-37.580)
Constant	1.700***	0.878***	0.523***
	(14.524)	(4.699)	(3.018)
N	138,980	138,980	27,440
Adj, R-sq.	0.8863	0.8839	0.8448

Note: This table shows the regression results using raw quoted spread (instead of scaled spread) as the dependent variable. Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level.

lnSpread: the natural log of time-weighted bid-ask spread, not scaled; ***lnT/ORate***: the natural log of value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***lnSize***: the natural log of market capitalization; ***lnPrice***: the natural log of share price; ***lnRet_Std***: the natural log of the standard deviation of daily returns in that month; ***lnTurnover***: the natural log of the mean daily value traded in that month.

Appendix - Table 29: Robustness check – Main regression using non-logged variables

	No PS-matching		PS-matching with replacement		PS-matching without replacement	
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent var. =	R_Spread	T/ORate	R_Spread	T/ORate	R_Spread	T/ORate
P_{Civil}	-0.001	-0.000*	0.002	-0.000***	-0.001	-0.000***
	(-1.359)	(-1.795)	(0.772)	(-2.611)	(-1.364)	(-2.823)
P_{Admin}	-0.002*	-0.000	0.003	-0.000***	-0.001	-0.000**
	(-1.668)	(-0.524)	(1.197)	(-3.256)	(-1.240)	(-2.361)
AUS	0.000	0.000***	-0.002	0.001***	0.006***	-0.001***
	(0.320)	(4.341)	(-1.612)	(5.169)	(5.228)	(-9.274)
$AUS*P_{Civil}$	0.002	0.000	**-0.005***	**0.001*****	**-0.003****	**0.000*****
	(1.216)	(1.042)	**(-1.876)**	**(3.467)**	**(-2.343)**	**(3.093)**
$AUS*P_{Admin}$	**-0.002***	**0.000****	**-0.008*****	**0.001*****	**-0.006*****	**0.000*****
	(-1.650)	**(2.514)**	**(-3.274)**	**(4.990)**	**(-4.315)**	**(2.583)**
Size	-0.000***	0.000***	-0.000***	0.000	-0.000***	-0.000
	(-3.721)	(4.809)	(-3.274)	(0.054)	(-3.219)	(-1.220)
Price	-0.000	0.000	-0.000	0.000	-0.000*	0.000**
	(-1.635)	(0.848)	(-1.510)	(0.625)	(-1.749)	(2.038)
Ret_Std	0.729***	0.075***	0.791***	0.030***	0.850***	0.026***
	(25.218)	(12.631)	(14.971)	(8.844)	(15.473)	(6.938)
Turnover	-0.000*		-0.000*		-0.000***	
	(-1.745)		(-1.717)		(-3.247)	
Constant	0.017***	-0.000**	0.016***	0.001***	0.014***	0.001***
	(16.496)	(-2.066)	(9.157)	(6.652)	(10.854)	(10.372)
N	139,760	139,760	138,980	138,980	27,440	27,440
Adj. R-sq.	0.3133	0.1232	0.3631	0.0743	0.2616	0.0807

Note: This table shows the regression results using non-logged variables. Standard errors are clustered by firm and time. Z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (two-tailed test). Observations are at firm-month level.

R_Spread: the time-weighted bid-ask spread as a percentage of mid-point price; ***T/ORate***: the value traded as a percentage of market capitalization; $\boldsymbol{P_{Civil}}$ ***(Civil)***: indicator variable which equals 1 when observations fall between the introduction of civil sanctions (March 11, 2002) and right before the introduction of administrative sanctions (July 1, 2004), 0 otherwise; $\boldsymbol{P_{Admin}}$ ***(Admin)***: indicator variable which equals 1 when observations fall between the introduction of administrative sanctions (July 1, 2004) and the end of sample period (December 31, 2006), 0 otherwise; ***AUS***: indicator variable which equals 1 for Australian firms, otherwise, 0 for New Zealand firms; ***Size***: the market capitalization in $mil; ***Price***: share price; ***Ret_Std***: the standard deviation of daily returns in that month; ***Turnover***: the mean daily value traded in that month in mil shares.

Appendix: A brief review of the ASX's "price queries"

The issue of "price queries" is one distinctive feature of the Australian Securities Exchange (ASX) as the market operator. ASX has the regulatory power in their listing rules to issue "price queries" to their market participants to explain unusual fluctuations in trading price or volume in the market. This appendix is to review a few prior studies which examine the effects of ASX's price queries.

Examining the market reactions on firms' responses to price queries on ASX from 1998 to 2000, Gong (2007) finds around 30% of firms respond to price queries with new information. Stock price tends to stabilise after the release of responses and that both bid-ask spread and trading volume drops, consistent with inside information being released and information asymmetry being alleviated.

Also, positioning "price queries" at the base of ASIC's enforcement pyramid, Chapple and Truong (2014) find that the market operators' uses of price queries are associated with an increase in firms' disclosure frequency, and conclude that the use of less severe means of enforcement actions appear to be effective in motivating corporate disclosure.

However, the linkage between ASX's price queries issuance and ASIC's enforcement action or securities class actions remains vague. It is reported that very few price queries responses were followed by a further response from ASX (Gong 2007), and even fewer will be enforced by ASIC – even if the firms' responses are of "questionable" standard (Di Lernia and Aspris 2011). Di Lernia and Aspris (2011) analyse the details of firms' responses to price queries, and find that none of the "questionable" responses as categorized by the authors were later enforced by ASIC in their sample. With respect to private enforcement, Chapple et al. (2014) report no correlation between price queries and securities class actions.

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